ÇOCUK ACİL ve YOĞUN BAKIM DERGİSİ

Journal of Pediatric Emergency and Intensive Care Medicine

TÜRK ÇOCUK ACİL TIP VE YOĞUN BAKIM DERNEĞİ

Volume / Cilt: 10 **Issue / Sayı:** 3 **Year / Yıl:** 2023

E-ISSN: 2148-7332

3

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The Journal of Pediatric Emergency and Intensive Care Medicine is a publication of "Society of Pediatric Emergency and Intensive Care Medicine".

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Web: www.galenos.com.tr
Yayıncı Sertifika No/Publisher Certificate Number: 14521

Yayın Tarihi/Publication Date: Aralık 2023/ December 2023
ISSN: 2146-2399 **E-ISSN:** 2148-7332

Yılda üç kez yayımlanan süreli yayındır.
International periodical journal published three times in a year.

ÇOCUK ACİL ve YOĞUN BAKIM DERGİSİ

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AMAÇ VE KAPSAM

2014 yılında yayımlanmaya başlayan Çocuk Acil ve Yoğun Bakım Dergisi, "kritik hasta çocuk" konusundaki Türkiye'deki tek dergi olarak ulusal ve uluslararası makaleleri yayımlayan, hakemli-ön değerlendirmeli bir dergidir. İngilizce ve Türkçe dillerinde yayın kabul eden dergimiz, elektronik olarak yayımlanmaktadır. Yayın sıklığı dört ayda bir olmak üzere; yılda 3 sayı (Nisan, Ağustos, Aralık) şeklindedir. Çocuk Acil ve Yoğun Bakım Dergisi; çocuk acil tıp, çocuk acil sağlık hizmetleri, çocuk kritik hasta bakımı ve çocuk yoğun bakım hizmetleri konusunda bilimsel içerikli makaleleri yayınlamaktadır.

Dergi; özgün araştırma, olgu sunumu, derleme, editöre mektup türündeki makaleleri, klinik raporları, tıbbi düşünceleri ve ilgili eğitimsel ve bilimsel duyuruları yayınlar. Dergi içeriğinde temel bölümler; çocuk acil tıp sistemleri, akademik çocuk acil tıp ve çocuk acil tıp eğitimi, çocuk acil servis yönetimi, afet, çevresel aciller, travma, olgu sunumları, ergen acilleri, çocuk acilleri, yenidoğan acilleri, sağlık politikaları, etik, zehirlenme, çocuk acil hemşireliği, çocuk yoğun hemşireliği, koruyucu hekimlik, çocuk yoğun bakımı, kritik hastalıklar, kritik hasta yönetimi, tanı yöntemleri, sepsis ve septik şok, organ ve sistem yetersizlikleri, yoğun bakım teknolojisi, non-invazif ve invazif monitörizasyon, non-invazif ve invazif ventilasyon, vücut dışı destek sistemleri, etik değerlendirmeler, laboratuvar, acil radyoloji ve girişimsel işlemlerden oluşmaktadır.

Derginin editöryal ve yayın süreçleri ile etik kuralları International Committee of Medical Journal Editors (ICMJE), World Association of Medical Editors (WAME), Council of Science Editors (CSE), Committee on Publication Ethics (COPE), European Association of Science Editors (EASE), ve National Information Standards Organization (NISO) gibi uluslararası kuruluşların kurallarına uygun olarak şekillenmektedir. Dergimiz, şeffaf olma ilkeleri ve "DOAJ Akademik Yayıncılıkta En İyi Uygulama İlkeleri" ile uyum içindedir.

Çocuk Acil ve Yoğun Bakım Dergisi editörü veya editörleri Çocuk Acil Tıp ve Yoğun Bakım Derneği Yönetim Kurulu tarafından, üç yılda bir Ocak ayında belirlenir.

Çocuk Acil ve Yoğun Bakım Dergisi, **Tübitak-ULAKBİM TR Dizini, Directory of Open Access Journals (DOAJ), Scopus, CINAHL Complete, Gale, ProQuest, Embase, Directory of Research Journal Indexing (DRJI), J-Gate, Livivo-German National Library of Medicine (ZB MED), BASE - Bielefeld Academic Search Engine, Ulrich's Periodicals Directory, Ebsco, CiteFactor, IdealOnline, Türkiye Atıf Dizini, Hinari, GOALI, ARDI, OARE, AGORA, WorldCat ve Türk Medline** tarafından indekslenmektedir.

Dergi Adı: Çocuk Acil ve Yoğun Bakım Dergisi

Dergi Adı (İngilizce): The Journal of Pediatric Emergency and Intensive Care Medicine

Dergi resmi kısaltması: J Pediatr Emerg Yoğun Bakım Med

E-ISSN: 2717-9206

Eski E-ISSN (2014-2021): 2146-2399

Eski ISSN (2014-2020): 2148-7332

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Bu dergi, araştırmaları halka ücretsiz olarak sunmanın daha büyük bir küresel bilgi alışverişini desteklediği ilkesine dayanarak içeriğine anında açık erişim sağlar.

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AIMS AND SCOPE

The Journal of Pediatric Emergency and Intensive Care Medicine is a peer-reviewed periodical journal that publishes national and international articles since 2014, and it is the first journal that is about "Critical pediatric patient" field in Turkey. Our journal, which accepts publications in English and Turkish languages, is published electronically. The publication frequency is 3 times a year (April, August, December) in every 4 months. The Journal of Pediatric Emergency and Intensive Care Medicine publishes the scientific articles that are written about pediatric emergency medicine, pediatric emergency health services, pediatric critical patient care, and pediatric intensive care issues.

The journal publishes original research, case reports, reviews, articles like letters to the editor, clinical reports, medical opinions and related educational and scientific notifications. The basic sections of the contents are composed of medical systems of pediatric emergency, academic pediatric emergency medicine and education, management of pediatric emergency department, disaster and environmental emergency, trauma, case reports, adolescence emergencies, pediatric emergencies, new born emergency, health policy, ethics, intoxication, pediatric emergency nursery, pediatric intensive care nursery, preventive medicine, pediatric intensive care, critical diseases, critical patient management, diagnostic methods, sepsis and septic shock, organ and system failures, intensive care technology, invasive and non-invasive monitorization, invasive and non-invasive ventilation, extra-corporal body support systems, ethical assessment, laboratory, emergent radiology and interventional procedures.

The editorial and publication processes of the journal are shaped in accordance with the guidelines of the International Committee of Medical Journal Editors (ICMJE), World Association of Medical Editors (WAME), Council of Science Editors (CSE), Committee on Publication Ethics (COPE), European Association of Science Editors (EASE), and National Information Standards Organization (NISO). The journal is in conformity with the Principles of Transparency and Best Practice in Scholarly Publishing.

The editors of the Journal of Pediatric Emergency and Intensive Care are determined by the Administrative Board of Society of Pediatric Emergency and Intensive Care Medicine periodically every 3 years at January.

The Journal of Pediatric Emergency and Intensive Care Medicine is indexed in **Tübitak-ULAKBİM TR Dizini, Directory of Open Access Journals (DOAJ), Scopus, CINAHL Complete, Gale, ProQuest, Embase, Directory of Research Journal Indexing (DRJI), J-Gate, Livivo-German National Library of Medicine (ZB MED), BASE - Bielefeld Academic Search Engine, Ulrich's Periodicals Directory, EBSCO Host, CiteFactor, IdealOnline, Türkiye Atıf Dizini, Hinari, GOALI, ARDI, OARE, AGORA, WorldCat** and **Türk Medline.**

Title: The Journal of Pediatric Emergency and Intensive Care Medicine

Title in Turkish: Çocuk Acil ve Yoğun Bakım Dergisi

Journal abbreviation: J Pediatr Emerg Intensive Care Med

E-ISSN: 2717-9206

Former E-ISSN (2014-2021): 2146-2399

Former ISSN (2014-2020): 2148-7332

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Journal of Pediatric Emergency and Intensive Care Medicine
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YAZARLARA BİLGİ

Yayımlanmaya 2014 yılında başlayan Çocuk Acil ve Yoğun Bakım Dergisi, ulusal ve uluslararası makaleleri yayımlayan, çift-kör hakemlik ilkeleri çerçevesinde yayın yapan bir dergidir. Dergi özgün araştırma, olgu sunumu, derleme, editöre mektup türündeki makaleleri, klinik raporları, tıbbi düşünceleri ve ilgili eğitimsel ve bilimsel duyuruları yayınlar.

Dergi içeriğinde temel bölümler çocuk acil tıp sistemleri, akademik çocuk acil tıp ve çocuk acil tıp eğitimi, çocuk acil servis yönetimi, afet, çevresel aciller, travma, olgu sunumları, ergen acilleri, çocuk acilleri, yenidoğan acilleri, sağlık politikaları, etik, zehirlenme, çocuk acil hemşireliği, çocuk yoğun hemşireliği, koruyucu hekimlik, Çocuk Yoğun Bakımı, kritik hastalıklar, kritik hasta yönetimi, tanı yöntemleri, sepsis ve septik şok, organ ve sistem yetersizlikleri, yoğun bakım teknolojisi, non-invazif ve invazif monitörizasyon, non-invazif ve invazif ventilasyon, vücut dışı destek sistemleri, etik değerlendirmeler, laboratuvar, acil radyoloji ve girişimsel işlemlerden oluşmaktadır.

Derginin İngilizce kısaltması; "J Pediatr Emerg Intensive Care Med" olarak kaydedilmiştir.

Editörler ve Yayın Kurulu üç yılda bir Ocak ayında Çocuk Acil Tıp ve Yoğun Bakım Derneği Yönetim Kurulu tarafından belirlenir.

Türkçe yazılarda Türk Dil Kurumu'nun Türkçe Sözlüğü ve Yazım Kılavuzu temel alınmalıdır.

Çocuk Acil ve Yoğun Bakım Dergisi, hiçbir makale başvuru veya işlem ücreti uygulamamaktadır.

Dergiye yayımlanmak üzere gönderilen tüm yazılar "iThenticate" programı ile taranarak intihal kontrolünden geçmektedir. İntihal taraması sonucuna göre yazılar ret ya da iade edilebilir.

Çocuk Acil ve Yoğun Bakım Dergisi, Türk Tıp Dizini koşullarına uygun olarak bir yıl içindeki toplam özgün araştırma makalesi sayısı 15'den az olmayacak ve toplam makale sayısının (özgün araştırma makalesi, olgu sunumu, kitap kritiği, editöre mektup, derleme, kılavuzlar) en az %50'sini oluşturacak şekilde yayımlanır. Her sayıda en az 5 araştırma, en fazla araştırma makalesi sayısı kadar olgu sunumu ve/veya derleme yayımlar. Derlemeler editörün daveti üzerine hazırlanır.

Derginin arşiv sisteminde tüm hakem kararları, başvuru yazılarının imzalı örnekleri ve düzeltme yazıları en az beş yıl süreyle saklanır.

Dergide yayımlanan makaleler, içindekiler sayfasında ve makale başlık sayfalarında türlerine göre (araştırma, olgu sunumu, kısa rapor, derleme, editöre mektup vb.) sınıflandırılır.

Yazarlar ilk gönderim sırasında aşağıdaki formalrı sağladığından emin olmalıdır:

- Telif Hakkı Devir ve Yazarlık Katkı Formu
- ICMJE Potansiyel Çıkar Çatışması Formu tüm yazarlar tarafından imzalanması gerekir.

HAKEM DEĞERLENDİRME SÜRECİ

Çocuk Acil ve Yoğun Bakım Dergisi'ne gönderilen yazılar ilk olarak editör tarafından değerlendirilir. Editör her yazıyı değerlendirmeye alınıp alınmaması konusunda gözden geçirir ve yazıya editör yardımcısı atar. Editör ve yazıya atanan editör yardımcısı yazıyı değerlendirmeye uygun bulursa, iki hakem veya bir hakem ve bir yayın/danışma kurulu üyesine değerlendirmek üzere gönderir. Eğer yazı bilimsel değerliliğinin ve orijinalliğinin olmaması, kritik hasta çocuk alanına ve dergi okuyucu kitlesine hitap etmemesi gibi nedenlerle yayın/danışma kurulu üyelerinin veya hakem değerlendirmesini gerektirmiyorsa yazı değerlendirme altına alınmaz.

Yazıların bilimsel ve etik sorumlulukları yazarlara, telif hakkı ise Çocuk Acil ve Yoğun Bakım Dergisi'ne aittir. Yazıların içeriğinden ve kaynakların doğruluğundan yazarlar sorumludur. Yazarlar, yayın haklarının devredildiğini belirten onay belgesini (Yayın Hakkı Devir Formu) yazıları ile birlikte göndermelidirler. Bu belgenin tüm yazarlar tarafından imzalanarak dergiye gönderilmesi ile birlikte yazarlar, gönderdikleri çalışmanın başka bir dergide yayınlanmadığı ve/veya yayınlanmak üzere incelemede olmadığı konusunda garanti vermiş, bilimsel katkı ve sorumluluklarını beyan etmiş sayılırlar.

MAKALE KATEGORİLERİ

Özgün Araştırma Makaleleri: Kritik hasta çocuk alanında yapılmış temel veya klinik araştırma makaleleridir. Kaynaklar ve İngilizce özet gereklidir (Bkz. Yazı hazırlığı bölümü). En fazla 5000 sözcük (20 çift aralıklı sayfa), yedi tablo ve/veya resim, ek olarak İngilizce, Türkçe özet ve kaynakları içermelidir. Etik kurul onayı çalışma içinde bahsedilmelidir.

Olgu Sunumları: Çocuk Acil Tıp ve Çocuk Yoğun Bakım alanında karşılaşılan eğitimsel yönü olan klinik olguların veya komplikasyonların sunumudur. Bu bölüme yayım için gönderilen yazılarda daha önce bilimsel literatürde sıklıkla bildirilmemiş klinik durumları, bilinen bir hastalığın bildirilmemiş klinik yansımaları veya komplikasyonlarını, bilinen tedavilerin bilinmeyen yan etkilerini veya yeni araştırmaları tetikleyebilecek bilimsel mesajlar içermesi gibi özellikler aranmaktadır. Olgu sunumları Türkçe ve İngilizce özet, giriş, olgu sunumu ve sunulan olguya yönelik tartışmayı içermelidir. En fazla uzunluk 2000 sözcük (8 çift aralıklı sayfa), 15 veya daha az kaynak, üç tablo veya resim içermelidir.

Özet Raporlar: Ön çalışma verileri ve bulguları, daha ileri araştırmaları gerektiren küçük sayılı araştırmalar. Kaynaklar ve İngilizce özet gereklidir (Bkz. yazı hazırlığı bölümü). En çok uzunluk 3000 sözcük (sekiz çift aralıklı sayfa), ek olarak İngilizce ve Türkçe özet, 15 veya aşağı sayıda referans, üç tablo ve/veya şekil. Etik kurul onayı gereklidir.

Konseptler: Çocuk acil tıp ve çocuk yoğun bakım ile ilgili ve bu alanı geliştirmeye yönelik klinik veya klinik olmayan konularda yazılardır. Kaynaklar ve İngilizce özet gereklidir. En çok uzunluk 4000 kelime (16 çift aralıklı sayfa), ek olarak İngilizce ve Türkçe özet (her biri 150 kelimenin altında) ve kaynaklar içermelidir.

Derleme Yazıları (Reviews): Çocuk acil tıp ve çocuk yoğun bakım ile ilgili ve konuyla ilgili son ulusal ve dünya literatürlerini içeren geniş inceleme yazılarıdır. Çocuk Acil ve Yoğun Bakım Dergisi davetli derleme yazısı yayımlamaktadır. Davetli olmayan derleme başvuruları öncesinde editör ile iletişime geçilmelidir. En çok 5000 kelime (20 çift aralıklı sayfa). Kaynak sayısı konusunda sınırlama yoktur. Derleme yazma konusunda gerekli bilgi aşağıdaki makaleden elde edilebilir;

Burney RF, Tintinalli JE: How to write a collective review. Ann Emerg Med 1987;16:1402.

Kanıta Dayalı Bilgi: Klinik ve tıbbi uygulamalara yönelik sorulara yanıt verebilen makaleler. Makale şu bölümleri içermelidir; Klinik senaryo, soru ve sorular, en iyi kanıtın araştırılması ve seçilmesi, kanıtın ayrıntılı incelenmesi ve kanıtın uygulanması. En çok 4000 kelime (15 çift aralıklı sayfa), ek olarak Türkçe ve İngilizce özet. Yazarlar kullandıkları makalelerin kopyasını da ekte editöre göndermelidir.

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Editöre Mektup: Çocuk acil tıp ve çocuk yoğun bakım ile ilgili konulardaki görüşler, çözüm önerileri, Çocuk Acil ve Yoğun Bakım Dergisi'nde veya diğer dergilerde yayımlanan makaleler hakkında yorumları içeren yazılardır. En çok 1500 kelime (altı çift aralıklı sayfa), ek olarak kaynaklar yer almalıdır.

Nöbet Öyküleri: Çocuk acil tıp ve çocuk yoğun bakımın doğasını ve dinamizmini yansıtan, çocuk acil tıbbın ve çocuk yoğun bakımın mizahi yönünü yakalamış kişisel ve/veya ekip deneyimleri. En çok 1000 sözcük içermelidir.

Makale Başvurusu

Makale Gönderim Sözleşmesi: Çocuk Acil ve Yoğun Bakım Dergisi'nin her yeni baskısında yer almakta olup, ihtiyaç duyulması halinde Çocuk Acil ve Yoğun Bakım Derneği ve internet sitesinde de yer almaktadır. Tüm makale gönderimlerinde doldurulmalıdır.

Kapak Mektubu: Yazar, bu mektupta, araştırmasının veya yazısının kısa bir açıklamasını, çalışmanın türünü (randomize, çift kör, kontrollü vb.), gönderildiği kategoriyi, bilimsel bir toplantıda sunulup sunulmadığını ayrıntılı olarak belirtmelidir. Ayrıca yazı ile ilgili iletişim kurulacak kişinin adresi, telefonu, faks numaraları ve e-posta adresi yazının alt kısmında yer almalıdır.

Makale gönderilirken yazışma yazarının ORCID (Open Researcher and Contributor ID) numarası verilmelidir. http://orcid.org adresinden ücretsiz kayıt oluşturulabilir.

MAKALE HAZIRLAMA

Biçim: Başvurusunu yaptığınız yazının kopyasını saklayın. Makale çift aralıklı olarak (1,5 aralık kullanmayın) A4 kağıdına standart kenar boşlukları (tüm kenarlardan ikişer santim) kullanılarak Arial yazı formatında 10 punto ile hazırlanmış olarak dört kopya gönderilmelidir. Online başvurularda basılı kopya gönderilmesine gerek yoktur.

Başlık Sayfası: Bu sayfa başlık, yazarların tam isimleri, bir yazar için ikiyi aşmayacak akademik derece, çalışma yapıldığı anda yazarların adresi şehri de içerecek şekilde, eğer yazı her hangi bir bilimsel toplantıda sunulmuş veya sunulmak için kabul edilmiş ise bu toplantı, kongre, vb.'nin tarih, yer ve adı (buna ilişkin kanıt), alınan finansal destek ve kimden olduğu, yazıya katkısı bulunan konsültan varsa ismi akademik derecesi ve adresi, makalenin kelime sayısı (Türkçe, İngilizce özetler ve referanslar hariç), yazı konusunda bağlantıya geçilecek kişinin ismi, adresi, telefon-faks numaraları ve varsa e-mail adresi mektubun alt bölümünde yer almalıdır.

Kör Ön Değerlendirme İçin: Makalenin sayfalarında ve Türkçe-İngilizce özet sayfalarında yazarların isminin, akademik derecesinin, adresinin, şehrinin yer almamasına dikkat edin. Bu şartı bulundurmayan makaleler geri gönderilebilir.

Türkçe ve İngilizce Özet: Özgün makaleler ve özet raporlar 250 sözcüğü aşmayan hipotez veya amaç, yöntemler, sonuçlar, tartışma içeren özet bulundurmalıdır. Konsept ve olgu sunumları için 150 kelimeyi aşmayan Türkçe ve İngilizce özet bulunmalıdır. Anahtar sözcükler, her türlü yazıda Türkçe ve İngilizce özetlerin altındaki sayfada 3-10 adet verilmelidir. Anahtar sözcük olarak Index Medicus'un Tıbbi Konu Başlıkları'nda (Medical Subject Headings, MeSH) yer alan terimler kullanılmalıdır.

İstatistiksel Testler: Çalışmalar istatistik alanında deneyimli kişilerin kontrolünde değerlendirilmelidir. Sonuçlar için güven aralığı, P değerleri verilmelidir.

Yazı İçeriği:

Araştırma makaleleri aşağıdaki bölümleri içermelidir;

- Giriş
- Gereç ve Yöntem
- Bulgular
- Tartışma
- Çalışmanın Kısıtlılıkları
- Sonuç

Değerler: Kullanılan madde, ilaç, laboratuvar sonuçları değerlerinde genel standartlara uyulmalıdır. İlaçlar: Jenerik isimler kullanılmalıdır.

Kaynaklar: Kaynaklar çift aralıkla ayrı bir sayfada yazılmalıdır. Kaynakları makale içinde kullanım sırasına göre numaralandırılmalıdır. Alfabetik sıralama yapılmamalıdır. Özet olarak yararlanılmış makaleler için parantez içinde İngilizce yazılar için "abstract", Türkçe yazılar için "öz" yazılmalıdır. Bir kaynaktaki yazarların sadece ilk beşi belirtilmeli, geri kalanlar için İngilizce kaynaklar için "et al.", Türkçe kaynaklar için "ve ark." kısaltmasını kullanın. Kaynakların doğruluğu yazarların sorumluluğundadır.

Örnekler;

- Makale: Raftery KA, Smith-Coggins R, Chen AHM. Gender-associated differences in emergency department pain management. Ann Emerg Med. 1995;26:414-21.
- Baskıdaki Makale için: Littlewhite HB, Donald JA. Pulmonary blood flow regulation in an aquatic snake. Science 2002 (baskıda)
- Kitap: Callaham ML. Current Practice of Emergency Medicine. 2nd ed. St. Luis, MO:Mosby;1991.
- Kitap Bölümü: Mengert TJ, Eisenberg MS. Prehospital and emergency medicine thrombolytic therapy. In: Tintinal-li JE, Ruiz E, Krome RL (eds). Emergency Medicine: A Comprehensive Study Guide. 4th ed. New York, NY:McGraw-Hill;1996:337-43.
- Kitaptan Bir Bölüm için, Bir Editör Varsa: Mc Nab S. Lacrimal surgery. In: Willshaw H (ed). Practical Ophthalmic Surgery. NewYork: Churchill Livingstone Inc, 1992: 191-211
- Türkçe Kitap Bölümü: Yilmaz HL. Çocuk Acil Mimarisi. İçinde: Karaböcüoğlu M, Yılmaz HL, Duman M (ed.ler). Çocuk Acil Tıp: Kapsamlı ve Kolay Yaklaşım. 1. Baskı. İstanbul, İstanbul Tıp Kitabevi, 2012:7-13
- Editörler Aynı Zamanda Kitabın İçindeki Metin ya da Metinlerin Yazarı ise: Önce alınan metin ve takiben kitabın ismi yine kelimeler büyük harfle başlatılarak yazılır: Diener HC, Wilkinson M (editors). Drug-induced headac-he. In Headache. First ed., New York: Springer-Verlag, 1988: 45-67
- Çeviri Kitaptan Alıntı için: Milkman HB, Sederer LI. Alkolizm ve Madde Bağımlılığında Tedavi Seçenekleri. Doğan Y, Özden A, İzmir M (Çevirenler) 1. Baskı, Ankara: Ankara Üniversitesi Basımevi, 1994: 79-96
- Kongre Bildirileri için: Felek S, Kılıç SS, Akbulut A, Yıldız M. Görsel halüsinasyonla seyreden bir şigelloz olgusu.

XXVI. Türk Mikrobiyoloji

- Basılmamış Kurslar, Sunumlar: Sokolove PE, Needlesticks and high-risk exposure. Course lecture presented at: American College of Emergency Physicians, Scientific Assembly, October 12, 1998, San Diego, CA.

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- Tezden Alıntı için: Kılıç C. Genel Sağlık Anketi: Güvenirlik ve Geçerlilik Çalışması. Yayınlanmamış Uzmanlık Tezi, Hacettepe Üniversitesi Tıp Fakültesi, Psikiyatri AD, Ankara: 1992
- İnternet: Fingland MJ. ACEP opposes the House GOP managed care bill. American College of Emergency Physici-ans Web site. Available at: http://www.acep.org/press/pi980724.html . Accessed August 26,1999.
- Kişisel Danışmanlık: Kişisel danışmanları kaynak göstermekten kaçının. Fakat eğer çok gerekli ise kişinin adı, akademik derecesi, ay, yıl bilgilerine ek olarak kişiden yazılı olarak bu bilgiyi kullanabileceğinize dair mektubu makale ile birlikte gönderin.

Tablolar: Tablolar verileri özetleyen kolay okunur bir biçimde olmalıdır. Tablo'da yer alan veriler, makalenin metin kısmında yer almamalıdır. Tablo numaraları yazıda ardışık yer aldığı biçimde verilmelidir. Metinde tabloları işaret eden cümle bulunmalıdır. Her tablo "Kaynaklar" sayfasından sonra her sayfaya bir tablo gelecek şekilde gönderilmelidir. Tablolar hazırlanırken sayfa kenarı kurallarına uyulmalıdır. Metin içinde her tabloya atıfta bulunulduğuna emin olunmalıdır. Yazı içindeki grafik, şekil ve tablolar "Arabik" sayılarla numaralandırılmalıdır. Her tablo ayrı bir sayfaya çift aralıklı olarak basılmalıdır. Tabloları metindeki sıralarına göre numaralayıp, her birine kısa bir başlık verilmelidir. MS Word 2000 ve üstü sürümlerde otomatik tablo seçeneğinde "tablo klasik 1" ya da "tablo basit 1" seçeneklerine göre tablolar hazırlanmalıdır. Yazarlar açıklamaları başlıkta değil, dipnotlarda yapmalıdır. Dipnotlarda standart olmayan tüm kısaltmalar açıklanmalıdır. Dipnotlar için sırasıyla aşağıdaki semboller kullanılmalıdır: (*,+, ^ ,§,ii,I,**,++, ^ ^).

Şekiller/Resimler: Şeklin/Resmin içerdiği bilgi metinde tekrarlanmamalıdır. Metin ile şekilleri/resimleri işaret eden cümle bulunmalıdır. Resimler EPS veya TIF formatında kaydedilmelidir. Renkli resimler en az 300 DPI, gri tondaki resimleren az 300 DPI ve çizgi resimler en az 1200 DPI çözünürlükte olmalıdır.

DERGİ POLİTİKASI

Orijinal Araştırma Makalesi: Yeni bilgi ve veri içeren makaleler daha önce bir bilimsel dergide yayınlanmamış ve yayınlanması için aynı anda bir başka dergiye başvurulmamış olmalıdır. Bu sınırlama özet halinde bilimsel toplantı ve kongrelerde sunulmuş çalışmalar için geçerli değildir.

Birden Fazla Yazar: Makalede yer alan tüm yazarlar makalenin içeriğindeki bilgilerin sorumluluğunu ve makale hazırlanma basamaklarındaki görevleri paylaşırlar.

İstatistik Editörü: İstatistiksel analiz içeren tüm makaleler istatistik uzmanına danışılmış olmalıdır. Yazarlardan biri ya da yazarların dışında belirlenmiş ve istatistik konusunda deneyimli ve yetki sahibi bir kişi bu analizin sorumluluğunu üstlenmelidir. İstatistiksel değerlendirme için kullanılan istatistik uzmanının ismi başlık sayfasında belirtilmelidir.

Randomize Kontrollü Çalışmalar: Dergi bu tip çalışmaları yayınlamayı yeğlemektedir.

İzinler: Makalede yer alan herhangi bir resim, tablo vs. daha önceden başka bir bilimsel dergi veya kitapta yayınlanmış ise bu tablo ve resimlerin kullanılabilirliğine dair yazı alınması gerekmektedir.

Etik Komite Onayı İzni: Yazarlar, eğer çalışmaları insan ve hayvanlar üzerinde araştırmayı gerektiriyorsa, yayın değerlendirme kurulundan (araştırma etik kurulları) yazılı onay belgesini almalıdırlar.

DEĞERLENDİRME VE BASIM SÜRECİ

Ön değerlendirme: Dergi kör ön değerlendirmeyi tüm makale tipleri için uygulamaktadır. Tüm makaleler dergi editörü tarafından incelenir ve uygun bulunan makaleler ön değerlendirme amacıyla danışmanlara (editör yardımcılarına) iletilir. Dergi editöründen doğrudan yazara geri gönderilen yazılar Çocuk Acil ve Yoğun Bakım Dergisi'nde basılamaz. Başvuru ile derginin ön değerlendirmeye alınma arasında geçen süre en çok 15 gündür. Yazının alındığına ve durum bildirir mektup dergi editörünce yazara bu süre içinde bildirilir. Dergide basımı uygun bulunmayan makaleler geri gönderilmez.

Tüm makaleler editörlerce dergi yazım kuralları ve bilimsel içerik açısından değerlendirilirler. Gerekli görüldüğünde yazıda istenen değişiklikler yazara editörlerce yazılı olarak bildirilir.

Yazının Sorumluluğu: Yazarlar yayınlanmış halde olan makalelerinde bulunan bilgilerin tüm sorumluluğunu üstlenirler. Dergi bu makalelerin sorumluluğunu üstlenmez. Yazarlar basılı haldeki makalenin bir kopyasını alırlar.

Basım Hakkı: Dergide yayınlanmış bir makalenin tamamı veya bir kısmı, makaleye ait resimler veya tablolar Çocuk Acil ve Yoğun Bakım Dergisi editörü ve Çocuk Acil Tıp ve Yoğun Bakım Derneği Yönetim Kurulu, bilgisi ve yazılı izni olmadan başka bir dergide yayınlanamaz..

Gerekli Bilgiler: Dergi editörleri ön değerlendirme sürecinde gerek duyduklarında makalenin dayandırıldığı verileri incelemek için yazardan isteyebilirler. Bu nedenle yazara kolay ulaşımı sağlayacak adres ve diğer iletişim araçlarının başlık sayfasında yer alması önemlidir.

Ek: Yayın kurulu, yazarların iznini alarak yazıda değişiklikler yapabilir. Editör ve dil editörü dil, imla ve kaynakların Index Medicus'ta geçtiği gibi yazılmasında ve benzer konularda tam yetkilidir.

Makale yayınlanmak üzere gönderildikten sonra yazarlardan hiçbiri, tüm yazarların yazılı izni olmadan yazar listesinden silinemez, ayrıca yeni bir isim yazar olarak eklenemez ve yazar sırası değiştirilemez.

Ölçüm Birimleri: Uzunluk, ağırlık ve hacim birimleri metrik (metre, kilogram, litre) sistemde ve bunların onlu katları şeklinde rapor edilmelidir. Sıcaklıklar celsius derecesi, kan basıncı milimetre civa cinsinden olmalıdır. Ölçü birimlerinde hem yerel hem de Uluslararası Birim Sistemleri'ni (International System of Units, SI) kullanmalıdır. İlaç konsantrasyonları ya SI ya da kütle birimi olarak verilir, seçenek olarak parantez içinde verilebilir.

Kısaltmalar ve Semboller: Sadece standart kısaltmaları kullanın, standart olmayan kısaltmalar okuyucu için çok kafa karıştırıcı olabilir. Başlıkta kısaltmadan kaçınılmalıdır. Standart bir ölçüm birimi olmadıkça kısaltmaların uzun hali ilk kullanılışlarında açık, kısaltılmış hali parantez içinde verilmelidir.

Teşekkür(ler)/Acknowledgement(s): Yazının sonunda kaynaklardan önce teşekkür(ler)/ acknowledgement(s) bölümüne yer verilir. Bu bölümde yazı hazırlanırken içeriğe, düzene, bilgilerin istatistiksel analizine katkıları olanlar belirtilebilir.

Kaynaklara Ek: Tek tip kurallar esas olarak Amerikan Ulusal Tıp Kütüphanesi (National Library of Medicine, NLM) tarafından uyarlanmış olan bir ANSI standart stilini kabul etmiştir. Kaynak atıfta bulunma örnekleri için yazar(lar) http://www.nlm.nih.gov/bsd/uniform_requirements.html sitesine başvurabilir(ler).

Dergi isimleri Index Medicus'taki şekilleriyle kısaltılmalıdır. Ayrı bir yayın olarak yıllık basılan ve Index Medicus'un Ocak sayısında da liste olarak

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yer alan Index Medicus'taki Dergiler Listesi'ne (List of Journals Indexed in Index Medicus) başvurulabilir. Liste ayrıca http://www.nlm.nih.gov sitesinden de elde edilebilir.

ETİK

Bilimsel Sorumluluk: Makalelerin bilimsel kurallara uygunluğu yazarların sorumluluğundadır. Tüm yazarların gönderilen makalede akademik ve bilimsel olarak doğrudan katkısı olmalıdır. Bu bağlamda "yazar" yayınlanan bir araştırmanın kavramsallaştırılmasına ve desenine, verilerin elde edilmesi, analizi ya da yorumlanmasına belirgin katkı yapan, yazının müsveddesi ya da bunun içerik açısından eleştirel biçimde gözden geçirilmesinde görev yapan birisi olarak görülür. Yazar olabilmenin diğer koşulları ise, makaledeki çalışmayı planlamak veya icra etmek ve/veya makaleyi yazmak veya revize etmektir.

Fon sağlanması, veri toplanması ya da araştırma grubunun genel süpervizyonu tek başlarına yazarlık hakkı kazandırmaz. Yazar olarak gösterilen tüm bireyler sayılan tüm ölçütleri karşılamalıdır ve yukarıdaki ölçütleri karşılayan her birey yazar olarak gösterilebilir. Çok merkezli çalışmalarda grubun tüm üyelerinin yukarıda belirtilen şartları karşılaması gereklidir. Yazarların isim sıralaması ortak verilen bir karar olmalıdır. Tüm yazarlar yazar sıralamasını Telif Hakkı Devir Formu'nda imzalı olarak belirtmek zorundadırlar.

Yazarlık için yeterli ölçütleri karşılamayan ancak çalışmaya katkısı olan tüm bireyler "teşekkür/bilgiler" kısmında sıralanmalıdır. Bunlara örnek olarak ise sadece teknik destek sağlayan, yazıma yardımcı olan ya da sadece genel bir destek sağlayan kişiler verilebilir. Finansal ve materyal destekleri de belirtilmelidir.

Yazıya materyal olarak destek veren ancak yazarlık için gerekli ölçütleri karşılamayan kişiler "klinik araştırıcılar" ya da "yardımcı araştırıcılar" gibi başlıklar altında toplanmalı ve bunların işlevleri ya da katılımları "bilimsel danışmanlık yaptı", "çalışma önerisini gözden geçirdi", "veri topladı" ya da "çalışma hastalarının bakımını üstlendi" gibi belirtilmelidir. Teşekkür (acknowledgement) kısmında belirtilecek bu bireylerden de yazılı izin alınması gerekir.

Etik Sorumluluk: Çocuk Acil ve Yoğun Bakım Dergisi, 1975 Helsinki Deklarasyonu'nun 2013 yılında revize edilen İnsan Deneyleri Komitesi'nin etik standartlarına uymayı ilke edinmiş bir dergidir.

Bu yüzden Çocuk Acil Ve Yoğun Bakım Dergisi'nde yayınlanmak üzere gönderilen klinik deneylere katılan sağlıklı bireyler/hastalarla ilgili olarak belirtilen komitenin etik standartlarına uyulduğunun mutlaka belirtilmesi ve deneyin türüne göre gerekli olan yerel veya ulusal etik komitelerden alınan onay yazılarının yazı ile birlikte gönderilmesi ve ayrıca deneye katılan kişi/hastalardan ve hastalar eğer temyiz kudretine sahip değilse hastaların vasilerinden yazılı bilgilendirilmiş onam (informed consent) alındığını belirten bir yazı ve tüm yazarlar tarafından imzalanmış bir belgenin editöre gönderilmesi gerekir.

Bu tip çalışmaların varlığında yazarlar, makalenin YÖNTEM(LER) bölümünde bu prensiplere uygun olarak çalışmayı yaptıklarını, kurumlarının etik kurullarından ve çalışmaya katılmış insanlardan bilgilendirilmiş onam (informed consent) aldıklarını belirtmek zorundadırlar. Çalışmada "deney hayvanı" kullanılmış ise yazarlar, makalenin YÖNTEM(LER) bölümünde "Guide for the Care and Use of Laboratory Animals" ilkeleri doğrultusunda çalışmalarında hayvan haklarını koruduklarını ve kurumlarının etik kurullarından onay aldıklarını belirtmek zorundadırlar.

Hayvan deneyleri rapor edilirken yazarlar laboratuvar hayvanlarının bakımı ve kullanımı ile ilgili kurumsal ve ulusal rehberlere uyup uymadıklarını yazılı olarak bildirmek zorundadırlar.

Makalelerin kurallara uygunluğu yazarın sorumluluğundadır. Çocuk Acil ve Yoğun Bakım Dergisi, ticari kaygılara bağlı olmaksızın makalelerin en iyi etik ve bilimsel standartlarda olmasını şart koşar.

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XXVI. Turkish Microbiology

- Un-published Courses, Presentations: Sokolove PE, Needlesticks and high-risk exposure. Course lecture presented at: American College of Emergency Physicians, Scientific Assembly, October 12, 1998, San Diego, CA.
- For citation from a Thesis study: Kılıç C. General Health Survey: Reliability and Validity Study. Un-published Proficiency Thesis, Hacettepe University Faculty of Medicine, Department of Psychiatry, Ankara: 1992
- İnternet: Fingland MJ. ACEP opposes the House GOP managed care bill. American College of Emergency Physici-ans Web site. Available at: http://www.acep.org/press/pi980724.html Accessed August 26,1999.
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Research Article / Özgün Araştırma

DOI: 10.4274/cayd.galenos.2022.52244
J Pediatr Emerg Intensive Care Med 2023;10:162-8

Utility and Efficacy of Trauma Scoring Systems in Multiple Trauma Children with Cranial Computed Tomography

Kraniyal Tomografi Çekilmiş Çoklu Travmalı Çocuklarda Travma Skorlama Sistemlerinin Kullanılabilirliği

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Abstract

Introduction: To assess the association between cranial computed tomography (CCT) findings and Glasgow Coma scale (GCS), and abbreviated injury scale (AIS) and to investigate the efficacy of GCS for determination of the indication of CT in pediatric polytrauma patients.

Methods: This retrospective study was performed using the data of patients who admitted to the emergency department between February 2017 and June 2018. The 120 pediatric patients due to polytrauma were reviewed for demographic, clinical and radiological information. The relationship between GCS, AIS, and the presence of findings consistent with polytrauma in CCT was evaluated.

Results: Patients with positive findings on computed tomography (CT) had significantly higher AIS ($p<0.001$) and AIS squared ($p<0.001$) compared to those of patients without positive CT findings for trauma. The GCS and AIS squared scores were found to be significantly associated with positive findings for trauma in CT scans.

Conclusion: Trauma score systems such as GCS and AIS were associated with the presence of trauma in CCT in pediatric patients.

Keywords: Multiple trauma, computed tomography, Glasgow Coma scale

Öz

Giriş: Bu çalışmada, çoklu travması bulunan çocuklarda, kranial bilgisayarlı tomografi bulguları ile Glasgow Koma Skalası (GCS) ve kısaltılmış yaralanma ölçeği (AIS) arasındaki ilişkinin değerlendirilmesi ve BT endikasyonun belirlenmesinde GCS'nin etkinliğinin araştırılması amaçlanmıştır.

Yöntemler: Bu geriye dönük çalışma, Şubat 2017-Haziran 2018 tarihleri arasında çocuk acil servise çoklu travma nedeni ile getirilen 120 çocuk hastanın verileri kullanılarak yapılmıştır. Bu kayıtların demografik, klinik ve radyolojik verileri incelendi. KBT'de çoklu travma ile uyumlu bulguların varlığı ile GCS, AIS arasındaki ilişki değerlendirildi.

Bulgular: Çoklu travmalı çocukların bilgisayarlı tomografilerinde (BT) pozitif bulgusu olanların, pozitif bulgusu olmayanlara göre AIS ($p<0,001$) ve AIS squared ($p<0,001$) skorları anlamlı olarak daha yüksekti. Kullanılan GCS skorlamalarının, BT'de pozitif bulgu bulunması ile önemli ölçüde ilişkili olduğu bulundu.

Sonuç: Çocuk çoklu travmalı hastalarda çekilen KBT'deki travma kanıtı ile GCS ve AIS gibi travma skorlama sistemleri arasında ilişki olduğu gösterildi.

Anahtar Kelimeler: Çoklu travma, bilgisayarlı tomografi, Glasgow Koma skalası

Introduction

Trauma constitutes the leading cause of death among children in developed countries.[1] In case of trauma, computed tomography (CT) can be necessary for the successful treatment of life-threatening injuries. Whole-body CT (WBCT) scanning is often used in trauma centers as a single-pass primary assessment for traumatic injuries. Even though the specific imaging protocol is variable in different institutions,

***We are terribly sorry to announce that Ali Öztürk passed away. We thank her for him contributions.**

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Received/Geliş Tarihi: 10.06.2021 **Accepted/Kabul Tarihi:** 09.08.2022

WBCT mostly involves CT of the head and cervical spine as well as CT of the chest, abdomen, and pelvis with or without contrast material.[1]

The word "polytrauma" is usually defined in terms of a high injury severity score (ISS) and is sometimes interchanged with terms like "severely injured" or "multiple trauma".[2] The internationally accepted criterion is based on ISS ≥16 on the statement of an ISS of 16 as being indicative of a mortality risk of more than 10%.[2]

Polytrauma occurs infrequently in pediatric population; however, it has a higher rate of mortality.[3] Imaging modalities have a critical role in the evaluation and management of patients with polytrauma. In adult patients with severe trauma, the utility of WBCT is supposed to improve the survival rates.[4] On the other hand, risks associated with ionizing radiation must be taken into account during making a decision for use of WBCT in pediatric polytrauma patients.[5-7] The use of WBCT in pediatric patients remains controversial. Pediatric patients with trauma have different trauma patterns than adult patients, with injuries in children commonly being less severe, and posttraumatic interventions and operations are less frequently needed in them. However, children often undergo WBCT following trauma, with clinicians applying adult trauma protocols in pediatric trauma care.[8-10] Garcia and Cunnigham[11] reported that the indication for WBCT can be reliably and effectively established with respect to a combination of findings derived from history, physical examination and vital signs.The use of cranial CT (CCT) scans in children has been increasing, in part due to increased awareness of sports-related trauma.[12] The CCT scans are mostly obtained in the evaluation of blunt head trauma in children. These scans may detect unexpected incidental findings. A small but important number of children evaluated with CT scans after blunt head trauma may have incidental findings. Physicians who order cranial CTs must be ready to interpret incidental findings, communicate with families, and ensure appropriate follow-up.[13]

The trauma scoring system is an important aspect of triage, to compare the different types of trauma care and their quality. Glasgow Coma scale (GCS) is an important predictor of in-hospital mortality, but there is still concern about the suitability of using anatomical-based scoring systems.[14]

Novel scoring systems based on age-specific physiological criteria have been developed and attempts to compare and validate different scoring systems in pediatric patients have yielded varying results.[15] However, an ideal tool for prediction in pediatric trauma could not be still identified. The performance of trauma score may vary on the different systems of care as well as a different mechanism of injury.

In this study, we aimed to assess the relationship between cranial CT findings AIS and GCS. We aimed to reveal the efficacy of GCS for the determination of the indication of CCT in pediatric polytrauma patients.

Materials and Methods

Study Design

Following the approval of the local institutional review board (2019/09-31), we conducted a retrospective review of our hospital records. We included all children 18 years or younger who were initially admitted to the pediatric emergency department of the hospital due to polytrauma including blunt head trauma and underwent cranial CT as a component of WBCT (cranial, cervical and thoraco-abdominal CT images) from February 2017 to June 2018 in this study. Written informed consent was obtained from the patients' parents or legal guardians for the anonymized information to be published in this article.

The calculation of the sample size was based on a power analysis. At a power of 80% using a significance level of $p<0.05$, the sample size required was 110 subjects.

Exclusion criteria were pre-hospital cardiopulmonary arrest; non-blunt traumas such as penetrating injuries, burns, or unknown trauma mechanisms; and patients with incomplete or inaccessible CT data. It is noteworthy that thoraco-abdominal CT scans could not be reached in this series. Revised pediatric trauma scores (RPTS) were calculated with respect to information recorded in our HIMS data set and nurse follow-up sheets. The injuries were classified according to the site of involvement such as head, neck, face, thorax, abdomen, and extremities and type of injuries like external, abrasion, contusion, and burns.

The abbreviated injury scale (AIS), was calculated based on the sum of every anatomical site. The AIS squared is the sum of squares of the AIS of each anatomical region.

The original version of AIS was a scale of mixed severity and outcome and different AIS codes could be assigned to similar injuries. To overcome this problem, the revised AIS was developed and information for survival and severity were separated.

The GCS was recorded twice: One at admission and the next after the imaging study. The trauma mechanism was classified with respect to Pediatric Emergency Care Applied Research Network (PECARN) study.[16] Accordingly, type 1 injury mechanisms were defined as ground-level falls or running into stationary objects with clinical symptoms or signs suggestive of traumatic brain injury. Type 3 injury mechanism was defined as a motor vehicle collision with patient ejection, death of

another passenger, or rollover; a pedestrian or cyclist without helmet struck by a motorized vehicle; falls (at a height of >3 feet for children 2 years and >5 feet for children 2 years); or the head struck with a high impact object. All other injury mechanisms were defined as type 2 injury mechanism.[16]

Severe injury is defined as patients who received a critical degree of force due to trauma mechanism as described in PECARN study. Moderate trauma was defined as a fall from a level equivalent to the patient's height which exposes the patient to a substantial force. All traumas else than these definitions were considered mild.[16]

All patients underwent monitorization of vital signs such as oxygen saturation, pulse, and respiratory rates as well as systolic and diastolic blood pressures.

Computerized Tomography Imaging

Computerized tomography images were obtained using a Toshiba Aquilion Prime CT (160-channel) device. All images were obtained at the same tertiary care center and stored by our picture archive and communication system. The measurements were carried out by 2 radiologists with 6-year and 9-year experience and they were blinded to the data of each other.

Outcome Measures

We aimed to analyze a total of 148 pediatric polytrauma patients who were diagnosed with blunt head trauma. However, data for 23 patients were either missing, unavailable or their CT scans were performed in other centers. Five patients refused to consent. Therefore, these patients were excluded from this study.

The independent variables used in this study were age and sex. The dependent variables were CCT findings, GCS at admission and at control, respiratory rate, arterial oxygen saturation, systolic and diastolic blood pressures.

Statistical Analysis

The calculation of the sample size was based on a power analysis. At a power of 80% using a 95 significance level of $p<0.05$, the sample size required was 110 subjects. Our data were analyzed using Statistical Package for Social Sciences program version 15.0 (SPSS Inc., Chicago, IL, USA). Univariate comparisons were conducted using various statistical tests. The normality of the continuous variables was assessed with Kolmogorov-Smirnov tests. Mann-Whitney U tests were used for continuous variables. Categorical variables were analyzed with chi-square tests, with Fisher's Exact correction where required. Multivariate logistic regression analysis was performed to evaluate the independent predictors of involvement in multiple sites in CT and the odds ratio (OR) for each predictor was calculated after adjusting for the effects of the variables that showed an association with $p<0.1$ in univariate analysis. ROC curve analysis was used to predict whether or not the parameters can assess the number of

Table 1. Comparison of the characteristics of patients with and without findings consistent with trauma in cranial CT scans

	Traumatic involvement in cranial CT scans		
	No detected pathologies in CT scans (n=82)	**Detected pathologies in CT scans (n=38)**	**p-value**
Age (months)	67.5 (1-187)	99 (8-192)	0.106[a]
Sex			0.089
Female	30 (36.6)	8 (21.1)	
Male	52 (63.4)	30 (78.9)	
Mechanism of trauma			
1	73 (89.0)	38 (100.0)	0.127
2	6 (7.3)	0 (0.0)	
3	3 (3.7)	0 (0.0)	
Trauma severity	4 (1-6)	3.5 (1-7)	0.497[a]
Glasgow Coma scale (GCS)	15 (13-15)	15 (3-15)	0.064[a]
Oxygen saturation (SO_2)	99 (94-100)	99 (75-100)	0.577[a]
Respiratory rate (RR)	24 (20-50)	24 (9-35)	0.628[a]
Systolic blood pressure (SBP)	117 (81-160)	113.5 (59-157)	0.228[a]
Diastolic blood pressure (DBP)	75 (45-107)	71.5 (30-94)	0.505[a]
Abbreviated injury scale (AIS)	1 (0-3)	4 (2-14)	**<0.001[a]**
AIS squared	1 (0-9)	7 (2-51)	**<0.001[a]**

Data expressed as n (%) or median (min-max). Bold p-values indicate statistical significance at α=0.05. [a]Multivariate logistic regression adjusted for all other variables, Mechanisms of trauma were defined in accordance with the definitions of Nigrovic et al.[16]

involvement in the CT scan. The cut-off values were calculated by estimation of 2 standard deviations from the difference between mean values of 2 groups under the independence assumption.

Results

An overview of baseline descriptives for our patient population (n=120) has been demonstrated in Table 1. This series consisted of 38 females (31.67%) and 82 males (68.33%). Patients with and without CCT findings consistent with trauma were compared in terms of demographic and clinical data. The detected pathologies on CCT images after blunt head trauma were cerebral contusion (n=17), subdural hematoma (n=9), skull fracture (n=9), subarachnoid hemorrhage (n=7), cerebral hematoma (n=6), and extra-axial hematoma (n=2). Patients with detected pathologies on CT had significantly AIS ($p<0.001$) and AIS squared ($p<0.001$) compared to those of patients without CT findings for polytrauma. Diagnosis for polytrauma was based on an ISS ≥16.[2] There was no significant difference between the 2 groups with respect to age, sex, mechanism or severity of the trauma, GCS, oxygen saturation, respiratory rate, as well as systolic and diastolic blood pressures.

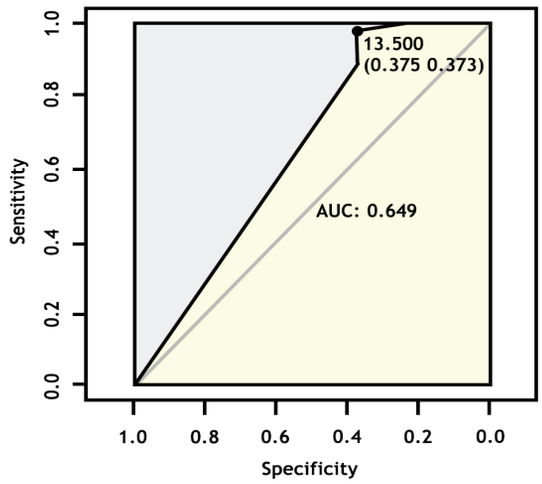

Figure 1. ROC curve for Glasgow Coma scale

Table 2. The results of multivariate analysis for variables associated with multiple traumatic involvement in cranial CT images

	OR	95% CI for OR	p[a]
Sex, male	2.792	(0.669, 11.652)	0.159
Age (months)	1.009	(0.998, 1.021)	0.109
GCS	0.246	(0.062, 0.979)	**0.046**

CI: Confidence interval, OR: Odds ratio. Bold p-values indicate statistical significance at α=0.05. [a]Multivariate logistic regression adjusted for all other variables, GCS: Glasgow Coma scale, CT: Computed tomography

As shown in Table 2, multivariate analysis was conducted with a logistic regression model adjusted for age, sex, and all the variables which were found to have $p<0.1$ in the univariate analysis. The adjusted R-Squared of the regression model is 0.870, which means that 87.0% of the variance in the detected pathologies in CT can be explained by the independent variables.

One unit increase in GCS decreased the risk of involvement in multiple sites in CT by 75.4% [odds ratio (OR): 0.246; 95% confidence interval (CI): 0.062-0.979; p=0.046] (Table 3).

GCS (cut-off: 13.5) demonstrated an accuracy of 0.649 (95% CI: 0.413-0.885, p=0.160). Systolic blood pressure (cut-off: 109.5) yielded an accuracy of 0.814 (95% CI: 0.651-0.977, p=0.003), whereas diastolic blood pressure (cut-off: 67.5) indicated an accuracy of 0.820 (95% CI: 0.612-1.000, p=0.003). The oxygen saturation (cut-off value: 97.5) demonstrated an accuracy of 0.781 (95% CI: 0.563-0.998, p=0.008). Respiratory rate (cut-off: 19) revealed an accuracy of 0.610 (95% CI: 0.324-0.897, p=0.160). Figure 1 demonstrates the ROC curve for GCS.

Discussion

The aim of the present study was to seek whether various trauma scores were associated with WBCT findings in pediatric polytrauma patients. Our results yielded that the three trauma scores under investigation, the GCS was found to be significantly associated with involvement in multiple sites in CT. Systolic and diastolic blood pressures, as well as RPTS and oxygen saturation, provided useful hints for polytrauma in the

Table 3. ROC analysis for the relationship between presence of findings consistent with trauma in cranial CT scans and other variables

Variables	Optimum cut-off	AUC	95% CI	p[a]	Sensitivity (%)	Specificity (%)
GCS	13.0	0.649	0.413-0.885	0.160	97.3	37.5
RR	19.0	0.610	0.324-0.897	0.298	37.5	100.0
SBP	109.0	0.814	0.651-0.977	**0.003**	75.0	78.6
DBP	67.0	0.820	0.612-1.000	**0.003**	75.0	89.3
SO_2	97.0	0.781	0.563-0.998	**0.008**	62.5	90.2

AUC: Area under the curve, CI: Confidence interval, [a]Hyphotesis test for H0: AUC=0.5, GCS: Glasgow Coma scale, RR: Respiratory rate, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, SO_2: Oxygen saturation

pediatric population. Our findings indicate that clues derived from GCS can be used to determine the need for WBCT in pediatric patients with polytrauma. Our data indicated that 82 children (68.3%) revealed no remarkable findings in CCT, while 38 patients (31.7%) had positive findings on CCT. A routine CCT cannot be routinely recommended for pediatric polytrauma patients; however, a CCT can provide useful data for the evaluation of trauma scores and the acquisition of predictive information in the pediatric emergency department. Previous publications have focused on rates of mortality rather than the relationship between trauma scores and the indication for CT.[17,18] Previous studies has shown that vital signs like heart rate, respiratory rate, and GCS may be more accurate predictors for in-hospital mortality [14]

Pediatric trauma patients presenting to referring facilities often undergo CT scans to identify injuries before transfer to a pediatric trauma center.[19] Attention must be paid for evaluation of CCT scans not to skip any cranial or central nervous system injury that may lead to significant morbidity and mortality. Emergency radiology has a critical role in the diagnostic process of a polytraumatized child. Radiological and ultrasonographic examinations play a critical role in hemodynamically unstable patients. In hemodynamically stable patients, CCT scanning may allow the examination of all the body parts of a polytraumatized child, thereby reducing the number of minor injuries which might otherwise be neglected.[20]

Recent publications did not support the view that the use of WBCT is associated with lower mortality than with the use of selective CT.[10] Considering the potential long-term risks of cumulative radiation exposure, they advocated the judicious use of CTs in pediatric patients with blunt trauma.[10] Our findings yielded that CCT may provide useful data for the triage and further management of pediatric patients with multiple trauma.

Even though trauma is the leading cause of death in the pediatric population in developed countries, trauma-related deaths are relatively rare. Thus, during the management of children with blunt trauma, clinicians should be careful about selecting the patients for CT. Pediatric polytrauma patients with less significant injuries may be considered as relatively unsuitable candidates for WBCT at initial admission. The indications for CT were not always based on simple vital signs or patient categories. Notably, hypotensive patients may be harmed due to CT procedure and patients with signs of shock must be resuscitated before WBCT scanning.[10] In terms of cost, no difference was reported between administration of selective CT and WBCT in trauma patients.[20] Decreasing the radiation exposure may provide long-term benefits in children, since non-life-threatening injuries can be alternatively detected during follow-up by selected regional CT or other non-radiation-associated modalities. The recognition and diagnosis of injuries, non-life-threatening injuries, or incidental findings during initial examination is still controversial. Thus, efforts must be spent to identify patients who require WBCT.

An important advantage of WBCT compared with the standard workup with radiographs, ultrasound, and selective CT scanning is the rapidity and completeness of evaluation for patients with life-threatening traumatic injuries. An important disadvantage of WBCT of patients with polytrauma is the increased exposure to radiation and incidental findings unrelated to trauma are more often found with WBCT than standard work-up.[21] Any delay during CCT can be due to time-consuming procedures such as patient transfer, and life-saving interventions in the trauma room.[21]

Although technological efforts still focus on diminishing the amount of radiation per CT scan, it is clear that any decrease in the number of unnecessary CT scans would be useful. To improve the cost-effectivity and safety of CT use in children with minor trauma, and to help clinicians with CT decision-making, clinical prediction rules were derived and validated by PECARN.[22]

Children with blunt head trauma and initial emergency department GCS scores of 14 or 15 and normal cranial CT scan results have a very low probability of later traumatic neuroimaging abnormalities and require very little neurosurgical intervention. Children with minimal head injuries should not be admitted to the hospital for neurologic surveillance if their CT scan results are normal.[23]

Children with minor head trauma and normal initial CCT scan results are at such a low risk of neurologic deterioration and neurosurgical procedures that hospitalization for serial neurologic tests is rarely required.[23,24]

Although some patients with minor blunt head injuries and normal cranial CT scan results may need to be admitted to the hospital for specific reasons, many of the individuals did not. Reduced hospitalization rates in this demographic have the potential to lower medical expenditures, alleviate hospital overcrowding, and provide better care to patients and their families.[23,24]

Hospitalized patients were more likely to have further imaging examinations (CT or MRI), and these subsequent imaging studies were more likely to reveal traumatic abnormalities. The convenience and accessibility of follow-up neuroimaging examinations in hospitalized patients is certainly one of the reasons. However, despite normal first CT scan results, emergency physicians were likely admitting patients with more severe head injuries who were more symptomatic.

The two critical questions remain to be answered in further trials: Who will benefit from initial total-body CT and what are the best screening criteria to identify those patients? In our opinion, answering these questions in trauma research will help us achieve the next level of evidence and improve patient safety in trauma care.

This study possesses certain limitations such as retrospective design, data restricted to the experience of a single-center and possible impacts of socio-economical factors. Moreover, working under the stressful conditions of the emergency department may affect the outcomes. The lack of CT findings of other sites such as thorax, abdomen, and pelvis constitutes another important restriction of the present study.

The blood pressure and respiratory rates may vary with the patients' age and lack of analysis of the performance of these vital signs corrected by the age is another restriction of our study. Further prospective, multi-centric trials on larger series are necessary to reach more accurate conclusions on the relationship between various trauma scores and the need for CCT in pediatric polytrauma patients.

Conclusion

To conclude, our results yielded that trauma score systems such as GCS, and AIS were associated well with the presence of polytrauma and therefore the need for CCT in the initial diagnostic study of pediatric patients admitted to the emergency departments. We suggest that ISS may have clinical implications in the emergency department settings since it had a predictive potential for the presence of polytrauma. In addition, hemodynamic and respiratory parameters such as pulse and respiratory rates, arterial oxygen saturation, systolic and diastolic blood pressures displayed association with the requirement for CCT. Even though our preliminary findings are promising, there is a need for further data to elucidate the relationship between trauma scores and the need for CCT in pediatric patients with polytrauma.

Ethics

Ethics Committee Approval: Following the approval of the local institutional review board of Dokuz Eylül University (2019/09-31).

Informed Consent: Retrospective study.

Peer-review: Internally and externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Y.E.Ç., U.M., A.Ö., H.G.U., M.D., Concept: Y.E.Ç., U.M., A.Ö., H.G.U., M.D., B.B., Design: Y.E.Ç., U.M., A.Ö., H.G.U., M.D., B.B., Data Collection or Processing: Y.E.Ç., U.M., A.Ö., M.D., Analysis or Interpretation: Y.E.Ç., A.Ö., H.G.U., M.D., Literature Search: Y.E.Ç., A.Ö., H.G.U., M.D., Writing: Y.E.Ç.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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Research Article / Özgün Araştırma

DOI: 10.4274/cayd.galenos.2023.48569
J Pediatr Emerg Intensive Care Med 2023;10:169-74

The Effect of Cardiopulmonary Resuscitation Training and Practices on the Knowledge Level of Pediatrics Residents

Kardiyopulmoner Resüsitasyon Eğitimi ve Uygulamalarının Çocuk Sağlığı ve Hastalıkları Asistan Doktorlarının Bilgi Düzeyi Üzerine Etkisi

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Abstract

Introduction: Cardiopulmonary resuscitation (CPR) is a dynamic and memorizing process that is fully defined by guidelines. This process requiring urgent approach can only be achieved through repetitive training and practice. It is aimed to determine whether there are differences of knowledge between these trainings before and after, or whether the repeated training periodically increases the knowledge and skills of trained practitioners.

Methods: CPR trainings were given to pediatric health and diseases assistant physicians by advanced cardiac life certified trainer. Pre-training, post-training and 6 months after the training, 20 questions were prepared based on the 2015 American Heart Association guide assessment questions were applied.

Results: The most correct answers were given to the evaluation questions made immediately after the training (average number of correct answers 16.06±2.50) and the least correct answers were given to the evaluation questions made before training (average number of correct answers 8.41±2.26). Six months after the training, although the number of correct answers of the participants decreased significantly after the post-training; it was found that the scores in the sixth month were still considerably higher than before the training (average number of correct answers 12.76±3.30). There was a significant difference between the correct answers given to pre-training evaluation questions according to the duration of work in emergency, between physicians who have never worked yet and physicians with experience of working in the emergency department for 5 months and more (p=0.024). A significant difference was found between the first year assistant and the third year assistant (p=0.024) and between the first year assistant and the fourth year assistant (p=0.017) in terms of the number of correct answers to the pre-training evaluations questions.

Conclusion: Theoretical and practical training in small groups increases the level of knowledge and skills about CPR.

Keywords: Cardiopulmonary resuscitation training, pediatric residents, level of knowledge

Öz

Giriş: Kardiyopulmoner resüsitasyon (KPR) uygulaması, kılavuzlarla tam olarak belirlenmiş dinamik ve ezber gerektiren bir süreçtir. Acil yaklaşım gerektiren bu işlemin akılda kalıcılığı ancak tekrarlayan eğitim ve uygulamalarla sağlanabilir. Bu eğitimlerin öncesi ve sonrası arasında bilgi farklılıkları olup olmadığı ya da eğitimin belli aralıklarla tekrarlanmasının eğitimli uygulayıcıların bilgi ve becerilerinde artış oluşturup oluşturmayacağının ortaya konulması amaçlandı.

Yöntemler: Çocuk sağlığı ve hastalıkları asistan hekimlerine 2018-2019 eğitim yılları arasında, ileri kardiyak yaşam sertifikalı eğitici tarafından KPR eğitimleri verilerek eğitim öncesi, eğitim sonrası ve eğitimden 6 ay sonra olmak üzere 2015 American Heart Association kılavuzu esas alınarak hazırlanan yirmişer sorudan oluşan değerlendirme soruları uygulandı.

Bulgular: En fazla doğru yanıt eğitimden hemen sonra yapılan değerlendirme sorularına (ortalama doğru yanıt sayısı 16,06±2,50), en az doğru yanıt ise eğitimin öncesinde yapılan değerlendirme sorularına verilmiştir (ortalama doğru yanıt sayısı 8,41±2,26). Eğitimden altı ay sonra ise katılımcıların doğru yanıt sayısının eğitim sonrası yapılan postteste göre anlamlı azalma olmasına rağmen; altıncı aydaki puanların eğitim öncesine göre yine de oldukça yüksek olduğu tespit edildi (ortalama doğru yanıt sayısı 12,76±3,30). Acilde çalışma sürelerine göre eğitim öncesi değerlendirme sorularına verilen doğru yanıtlar arasında, henüz hiç çalışmamış hekimlerile 5 ay ve üzerinde acil serviste çalışma tecrübesi olan hekimler arasında anlamlı fark saptandı (p=0,024). Birinci yıl asistanı ile üçüncü yıl asistanı arasında (p=0,024) ve birinci yıl asistanı ile dördüncü yıl asistanı arasında (p=0,017) eğitim öncesi değerlendirme sorularına verilen doğru yanıt sayısı açısından anlamlı fark saptandı.

Sonuç: Küçük gruplar halinde teorik ve pratik eğitim KPR konusunda bilgi ve beceri düzeyini artırır.

Anahtar Kelimeler: Kardiyopulmoner resüsitasyon eğitimi, pediatri asistanı, bilgi düzeyi

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Received/Geliş Tarihi: 07.09.2022 **Accepted/Kabul Tarihi:** 17.01.2023

Introduction

Cardiopulmonary resuscitation (CPR), applied to protect the cellular functions of vital organs and to restore spontaneous respiration and circulation, is a set of methods consisting of techniques that require knowledge, experience and skill. While cardiopulmonary arrest mostly develops due to respiratory causes in children, cardiac factors are prominent in adults. In addition, there are differences in CPR practices due to anatomical and physiological differences in children and adults. Pediatric resuscitation practices also differ in themselves depending on age groups. These differences are determined by updating the international guidelines periodically.

The main goal in CPR is to initiate basic life support and advanced cardiac life support (ACLS) within the first four golden minutes before irreversible brain damage occurs.[1] This can only be achieved if the knowledge and skills of the health staff who will firstly aid are sufficient.[2]

In this study, it was aimed to reveal whether there were differences in knowledge between before and after CPR training and after 6 months.

Materials and Methods

Seventy pediatric health and diseases residents studying at University of Health Sciences Turkey, Dr. Sami Ulus Maternity and Children Training and Research Hospital Health Application and Research Center were included in the study. This study was a prospective, observational analytical study and a pretest-posttest model was used. During the 2018-2019 academic year, residents were given two-stage CPR training by a pediatric emergency education officer with an "Advanced life support in children" certificate. In teams of ten, training was given with a visual presentation on CPR for 2.5 hours. The presentation was prepared using current guideline data on basic and advanced life support in children. In the second stage, hands-on CPR training was given for one hour using baby and child simulation models, and then the participants performed one-on-one practice to reinforce them. With this training, it was aimed to increase the knowledge level of resident doctors about anatomy, physiology, practical application, drug dosage, and current guideline information.

They were allowed to answer the multiple-choice evaluation forms, consisting of twenty questions each, prepared together with the pediatric emergency education officer, with the same difficulty level, just before the training, immediately after the training and 6 months after the training. Evaluation items were prepared to question the same information, but the pre-training and post-training questions were different from each other.

Before training, they were asked about their age, the year they graduated from medical school, the years of working in the profession, the years of working in the residency, the status of receiving neonatal resuscitation program training, the status of receiving CPR training, the duration of working in the emergency room, whether they followed experienced people while performing CPR in real cases, how many times they participated in active CPR, and intubation experiences in real cases. This information was not asked again before the evaluation questions to be made 6 months after the training.

The protocol of this study was approved by the Local Ethics Committee of University of Health Sciences Turkey, Ankara Keçiören Training and Research Hospital (KAEK-12-15/1677).

Statistical Analysis

The data of the study were analyzed with the SPSS 22.0 program (Statistical Package for the Social Sciences Inc; Chicago, IL, USA). It was determined whether the variables were normally distributed using visual (histogram) and analytical methods (Kolmogorov-Smirnov). Normally distributed numerical variables were presented as mean and standard deviation, non-normally distributed variables were presented as median and interquartile range (IQR). Qualitative data were presented as numbers (n) and percentages (%). Since the subjects participating in the study constituted a dependent group, the ANOVA and One-Way ANOVA tests were used for repeated measurements for normally distributed continuous variables, and the Wilcoxon, Kruskal-Wallis and Mann-Whitney U tests were used for non-normally distributed variables based on the number of groups. A chi-square test or Fisher's Exact test was applied for categorical variables. A value of $p<0.05$ was considered as a significant difference in the analyses.

Results

The mean age of pediatrics residents included in the study was 27±1.9 years. The professional experience information of all participants and the rate of answering the questions are given in Table 1. The average period of professional experience after graduation was 2.79±1.4 years.

There were 15 people (21.4%) who participated in CPR in the real case 1-4 times before, 10 people (14.3%) who participated 5-10 times, 45 people (64.3%) who participated more than 10 times had. All of the participants followed the experienced people while performing CPR in the real case. There was no significant difference between the number of participation in CPR, intubation experience and correct answers to the pre-training evaluation questions in the real case ($p=0.594$, $p=0.277$, respectively).

There were 31 people (44.3%) who received neonatal resuscitation program training and 39 people (55.7%) who

did not. When the correct answers given to the pre-training evaluation questions of the groups that had received this training and those that had not were compared, it was observed that the participants who had received neonatal resuscitation program training gave 1.68 more correct answers to the pre-training evaluation questions (p=0.02).

Considering the duration of working in the emergency department, there was a significant difference in the correct answers given to the pre-training evaluation questions between the doctors who had never worked in the pediatric emergency clinic and those who had worked in the pediatric emergency clinic for 5 months or more (p=0.024). However, there was no significant difference between doctors who had not worked yet and those who had worked for 2 to 4 months (p=0.237).

It was seen that the number of correct answers given to the evaluation items applied just before the training, right after the training and 6 months after the training was different. While the most correct answers were given to the evaluation questions asked immediately after the training (16.06±2.50), the least correct answers were given to the evaluation questions just before the training (8.41±2.26). It was observed that there was a slight decrease in the number of correct answers given 6 months after the training (12.76±3.30). The correct answers of 70 pediatric resident physicians to the 20-item evaluation just before, immediately after, and 6 months after the CPR training were compared for each question. The answers given to different questions measuring the same information with equal difficulty were compared (Figure 1).

Table 1. Professional experience information of all participants and rate of answering questions

Parameter	n=70
Professional experience, year (median, IQR)	2.79±1.4
Duration of residency	
First year	32 (45.7%)
Second year	8 (11.4%)
Third year	18 (25.7%)
Fourth year	12 (17.1%)
Duration of pediatric emergency rotation	
Had never worked	24 (34.3%)
0-2 months	0 (0%)
2-4 months	8 (11.4%)
>5 months	38 (54.3%)
CPR experience	
1-4 times	15 (21.4%)
5-10 times	10 (14.3%)
>10 times	45 (6.3%)
Intubation experience	59 (84.2%)
Status of taking NRP training	31 (44.3%)
Rate of giving correct answers to the questions	
Before training	8.41±2.26
After training	16.06±2.50
6 months after training	12.76±3.30

CPR: Cardio pulmonary resuscitation, NRP: Neonatal resuscitation program, IQR: Interquartile range

Among the resident doctors in the study, who were receiving specialization training in pediatric health and diseases, the number of first-year residents was 32 (45.7%), the number of second-year residents was 8 (11.4%), the number of third-year residents was 18 (25.7%), and the number of fourth-year residents was 12 (17.1%). The correct answers to the evaluation questions before, after and 6 months after the training were compared according to the years of residency. There was a significant difference in the correct answers given before, after, and 6 months after the training between the first-year residents and the third-year residents (p=0.024, p=0.01, p<0.001, respectively). Similarly, a significant difference was found between first-year residents and fourth-year residents in terms of the correct answers given before, after and 6 months after education (p=0.017, p<0.001, p<0.001, respectively). On the other hand, there was no difference in the correct answers given by the first-year residents and second-year residents to the evaluation questions (p>0.05).

In terms of duration of working in the emergency department, there were 24 people (34.3%) who never worked, 8 people (11.4%) who worked for 2 to 4 months, and 38 people (54.3%) who worked for 5 months or more. There was a significant difference in the correct answers given to the pre-training evaluation questions according to the duration of working in the emergency department, between residents who had never worked in the emergency department and those who had worked in the emergency department for 5 months or more (p=0.024). However, no significant difference was detected between residents who had not worked yet and those who had worked for 2 to 4 months (p=0.237). It is noteworthy that the evaluation questions about epinephrine dose calculation could not be correctly answered right after the training, even by those who worked in the emergency

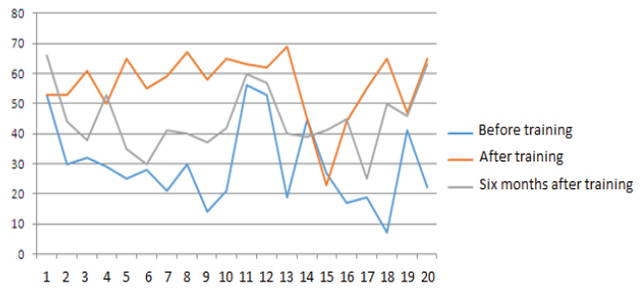

Figure 1. Graphical comparison of pediatric residents' correct answers to twenty questions before, after and six months after training

room and intensive care for a long-time during their residency. For the question 15 evaluating drug administration, while 27 people (38.6%) were able to give correct answer before the training, 23 (32.9%) participants gave the correct answer immediately after the training and 41 (58.6%) six months after the training. It was determined that there were deficiencies in basic knowledge levels, especially in drug administration in resuscitation, before the training.

Discussion

CPR is undoubtedly the most urgent and most important of all medical interventions. In this intervention, which is the most important moment of their lives for the patient and their relatives, it is a race against time. In order for this process to be managed in the most appropriate way, the knowledge, skills and experience of the health personnel should be quite high.

As studies on resuscitation are reported, it is seen that there is a need for updating CPR practices. For this purpose, the American Heart Association has published guidelines for CPR and emergency cardiovascular care every 5 years since 1966, in 1974, 1980, 1986, 1992, 2000, 2005, 2010, 2015, and most recently in 2020, with the aim of researching new approaches and treatments related to CPR, suggesting joint treatment and intervention strategies, and organizing training on CPR.

Although the number of studies measuring the level of knowledge again after a certain period of CPR training is limited in the literature, it has been emphasized that skill levels decrease after an average of 3-6 months when they are not applied frequently.[3] There are studies showing that basic knowledge levels worsen within 1-6 months following the education.[4-7] Studies have shown that repetitive training at the 6th month is effective in maintaining the level of knowledge[8] and it has been recommended to shortly repeat the training every 3-6 months and to repeat the full training once a year.[9] There are studies showing that basic and advanced life support knowledge and skills are quickly forgotten after initial training. Studies have shown that there is a decrease in basic skills in the 1st to 6th months or 7th to 12th months following the training.[10] In the evaluations of advanced life support providers at the 3rd to 6th months, 7th to 12th months and after 12th months, decreases in their knowledge and skills were also shown.[11] These studies differ in participant quality, course duration, training format, type of instructor, and frequency of participants' participation in actual resuscitation.

Studies have been carried out to evaluate the level of knowledge through training in healthcare workers. In a study conducted on the knowledge levels of nurses, the success rate was 36% before the training, while it was 68.3% after the training.[12] In a similar study conducted on doctors, it was shown that while the success rate before the education was 43.15%, it increased to 89.7% after the education.[13] It has been proven by various studies how successful these trainings are, especially in 112 emergency aid and rescue physicians, when critical patient intervention is required and on ACLS.[14-16] It is seen that receiving CPR training at any time after graduation has an effect on success, and results consistent with similar studies have been obtained. In our study, it was determined that those who received postgraduate training on resuscitation were more successful in CPR than those who did not. The average number of correct answers in people who had received neonatal resuscitation program training was higher than that in those who had not received this training. Although there are general similarities in pediatric resuscitation practices, they also show differences within themselves depending on age groups. Therefore, neonatal resuscitation program and CPR training should be repeated independently of each other at certain intervals in the light of current guidelines.

In our study, it is noteworthy that while the average number of correct answers increased by 91.0% after the training, 20% decreased at the end of 6 months. This situation shows us that resuscitation knowledge and practices should be repeated at certain intervals in order to increase the knowledge and skills of health personnel, since resuscitation knowledge and practices are constantly renewed in order to be more efficient and information that is not applied is forgotten over time.

According to the core education curriculum of pediatrics specialty applied in our country, during the four-year training period, rotations of the emergency and pediatric intensive care services are completed within the first two years. When the answers given to the evaluation before, after and six months after the training were compared according to the duration of the residency, a significant difference was found between the answers given by the first year and third year residents, and first year and fourth year residents. Based on these data, it is seen that the doctors who received six-year medical education are insufficient in terms of resuscitation knowledge in the early post-graduate period, and this deficiency is eliminated by applying the courses taken after graduation and in real cases in the emergency and intensive care services.

It is obligatory to complete the pediatric emergency education process for two months, including outpatient and inpatient services, within the four-year education period.[17] In our study, it was observed that the correct response rate of resident physicians who worked in the emergency department for 5 months or longer was higher. This result suggests that if the training period, which is required to be completed in the

emergency department, as specified in the core education curriculum, is arranged to be at least five months in centers with pediatric emergency clinics, the level of knowledge and skill in CPR will be better. When the effect of the participants' working time in the emergency room on the level of knowledge about CPR is evaluated, the fact that the doctors who have worked in the emergency for five months or more are intertwined with resuscitation frequently and that they constantly update themselves in practice can be considered as a factor in the highest success rate.

In our study, it was determined that there were deficiencies in basic knowledge levels of the resident doctors participating in our study before the training, especially in drug administration during resuscitation. It is noteworthy that drug-related deficiencies were detected both in those who completed the emergency service training and in the posttest performed immediately after the training. According to current guidelines, epinephrine is the main drug for CPR therapy. In CPR, there are differences in epinephrine treatment dose, concentration and application form when compared to its use in different indications. For this reason, mistakes can be made in the calculation of epinephrine dose based on rote-learning in current practice. In order to administer drug doses accurately and quickly in life-threatening conditions, easily accessible mind cards can be used in the dose calculation or drug dose reminder boards can be used in emergency services.

The quality of practitioner training and the frequency of training are critical factors in increasing the effectiveness of resuscitation and survival.[18] Measurement, evaluation and feedback during trainings increase the success of resuscitation. While assessments at the end of the resuscitation course are useful in preserving trainees' skills when used for teaching purposes, trainees' competencies should not be assessed using only a written test. In our study, the level of knowledge of the resident doctors about anatomy, physiology, practical application, drug dosage, current guidelines, and case questions and skill levels were measured. In addition, skill level measurement studies can be planned with simulation models or one-to-one questions and applications in real cases.

Study Limitations

The limitations of our study included that assessment was made on a limited sample and practical skill could not be assessed. Studies with simulation models are more suitable for practical skill assessment. In addition, it was another limitation of the study that within six months after the training of the resident doctors, it was not known whether they performed pediatric emergency and/or pediatric intensive care rotations, whether they received an additional course or training, and whether they worked to increase their education level on CPR with their individual efforts.

Conclusion

It is thought that CPR training repetitions will be beneficial for resuscitation knowledge and practice skills to be more efficient and to maintain competence at the highest level. Arranging the emergency service rotation training, which is included in the core education curriculum, for at least 5 months can increase the level of knowledge and skills related to CPR.

Ethics

Ethics Committee Approval: The protocol of this study was approved by the Local Ethics Committee of University of Health Sciences Turkey, Ankara Keçiören Training and Research Hospital (KAEK-12-15/1677).

Informed Consent: Prospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: B.A., N.T., Concept: B.A., N.T., Design: N.T., Data Collection or Processing: B.A., C.D.K., Analysis or Interpretation: C.D.K., Literature Search: B.A., Writing: B.A.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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Research Article / Özgün Araştırma

DOI: 10.4274/cayd.galenos.2023.99267
J Pediatr Emerg Intensive Care Med 2023;10:175-9

Knowledge Levels of Pediatric Intensive Care Staff About Delirium, Single Center Experience

Çocuk Yoğun Bakım Çalışanlarının Deliryum Hakkındaki Bilgi Düzeyleri, Tek Merkez Deneyimi

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Abstract

Introduction: Delirium is frequently encountered in pediatric intensive care units (PICUs) in critical patients and is characterized by fluctuating acute impaired awareness and cognition. An inadequate level of knowledge in critical care staff can bring about a significant risk that would delay diagnosis and treatment. This study investigated the delirium knowledge of PICU staff.

Methods: This was a single-center, cross-sectional, descriptive survey study. A 17-item online questionnaire was administered to PICU staff who worked in the PICU, surgery PICU and burn PICU.

Results: We invited 120 PICU staff to the study, and 88% (n=106) responded to the questionnaire. Of the responders, 30% had an inadequate level of knowledge regarding hypoactive delirium, 57% inaccurately chose the Glasgow-Coma score as the appropriate screening tool for delirium, 80% incorrectly responded that benzodiazepines were used in the treatment of delirium, and 79% thought that patients did not remember their moments of delirium.

Conclusion: The results indicated that PICU staff required training on the importance, risk factors, diagnosis, and treatment of pediatric delirium. The lack of a screening tool in the native language further complicates the assessment of delirium. PICU staff equipped with improved knowledge and the appropriate screening tools can make a difference in recognizing, preventing, and proper treatment of pediatric delirium.

Keywords: Delirium, pediatric intensive care, knowledge, survey

Öz

Giriş: Deliryum, dalgalı, akut, bozulmuş farkındalık ve biliş ile karakterize, çocuk yoğun bakım ünitelerinde (ÇYBÜ) sıklıkla karşılaşılan bir durumdur. Yoğun bakım çalışanlarının yetersiz bilgi düzeyi, tanı ve tedaviyi geciktirebilir. Bu çalışma ÇYBÜ çalışanlarının deliryum bilgi düzeyini araştırmayı amaçlamıştır.

Yöntemler: Bu çalışma, tek merkezli, kesitsel, tanımlayıcı bir tarama çalışmasıdır. ÇYBÜ'de, cerrahi ÇYBÜ'de ve yanık ÇYBÜ'de görev yapan çalışanlara 17 maddelik çevrimiçi anket uygulandı.

Bulgular: Çalışmaya 120 ÇYBÜ çalışanı davet edildi ve %88'i (n=106) anketi yanıtladı. Yanıt verenlerin %30'u hipoaktif deliryum hakkında yetersiz bilgi düzeyine sahipti, %57'si hatalı bir şekilde deliryum için uygun tarama aracı olarak Glasgow-Koma skorunu seçti, %80'i deliryum tedavisinde benzodiazepinlerin kullanımı ile ilgili yanlış bilgiye sahipti. %79'u ise hastaların deliryum anlarını hatırlamadıklarını düşünüyordu.

Sonuç: Çalışmamız, ÇYBÜ çalışanlarının pediyatrik deliryumun önemi, risk faktörleri, tanı ve tedavisi konusunda eğitim alması gerektiğini göstermiştir. Ana dilde bir tarama aracının olmaması, deliryumun değerlendirilmesini daha da zorlaştırmaktadır. Gelişmiş bilgi birikimi ve uygun tarama araçlarıyla donatılmış ÇYBÜ çalışanları, çocuk deliryumun tanınması, önlenmesi ve uygun tedavisinde fark yaratabilir.

Anahtar Kelimeler: Deliryum, çocuk yoğun bakım, bilgi, anket

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Received/Geliş Tarihi: 09.05.2022 **Accepted/Kabul Tarihi:** 05.03.2023

Introduction

Delirium is a prevalent condition in pediatric intensive care units (PICUs), and it causes acute impaired awareness and cognition with a fluctuating course in critical patients.[1] In the literature, studies have reported the prevalence of delirium in PICUs to be 25%, in adult burn ICUs to be 77%.[2,3] The predisposing factors for delirium in critically ill children include younger age, neurodevelopmental retardation, severe disease, and mechanical ventilation. Furthermore, delirium has also been associated with prolonged ventilation and hospital stay and increased mortality and morbidity rate.[4-6] Studies with children and adults have demonstrated that patients remember the moments experienced during delirium, even under the influence of benzodiazepines. Delirium has also been suggested to be associated with long-term cognitive impairment and elevated posttraumatic stress scores.[7,8] Therefore, it is crucial to recognize and appropriately treat pediatric patients' delirium, especially those with high life expectancy. The early recognition of delirium can be achieved by increasing delirium awareness of the PICU staff and routine delirium screening of the patients.[9,10] The present study aimed to measure the level of delirium knowledge of staff in a PICU setting.

Materials and Methods

We planned a single-center, cross-sectional, descriptive survey study. We invited 120 PICU staff working at the PICU, surgery PICU, and burn PICU. We received ethical approval from the Ethics Committee of Ankara City Hospital (approval no: E2-21-376). The participants were informed in advance about the confidentiality of their responses and that they would not share them with any institution or organization. We collected the relevant consent forms from the participants online. The participants who did not provide their consent were excluded from the study. The participants' demographic information, including age, gender, education level, and professional and PICU experience, was recorded. The questionnaire was administered online and sent the link to the participants via e-mail. The questionnaire used for data collection was developed by the pediatric delirium specialists at John Hopkins Hospital based on the risk factors, screening methods, treatments, and diagnostic criteria for adult and pediatric delirium.[11] This is a published questionnaire established for assessing the knowledge level regarding delirium in healthcare professionals providing care for critically ill children. We obtained permission of use from the author of the original questionnaire. We coded the statements of knowledge based on the responses to the 17-item questionnaire as true or false. The evaluation was based on the percentage of correct answers to the items in the questionnaire.

Statistical Analysis

Statistical analyzes were performed using SPSS (Statistical Package for Social Sciences) for Windows 25.0. Frequency data were expressed as % (number) and non-parametric data as median (25^{th}-75^{th} percentile).

Results

Of the 120 PICU staff, 106 (88.3%) completed the questionnaire and were included in the study. The percentage of the responders working in the PICU, burn PICU, and surgical PICU were 56.6% (n=60), 23.6% (n=25), and 19.8% (n=21), respectively. Of the responders, 83% were female and 17% were male. The median age was 25 years [interquartile range (IQR) 24-28]. 92.5% were university graduates and 5.7% had a postgraduate degree out of the responders. The median experience in the intensive care setting was 18 months (IQR 1-132).

No participant answered all the items accurately. One responder answered with 94% accuracy, four with 88% accuracy, and 88.7% of the responders answered with 50% accuracy. Accordingly, 97.2% (n=103) of the responders were aware of the perceptual disturbances experienced by the patients during delirium, 90.6% (n=96) confirmed that behavioral changes occurred during the day, and 72.6% (n=77) responded that fluctuation between the states of orientation and disorientation was typical in delirium. The majority of the responders (91.5%) displayed awareness regarding altered sleep-wakefulness cycle as a symptom of delirium, and 86.8% of the responders were aware that symptoms of depression could mimic those of delirium. The percentage of the responders who inaccurately stated that the episodes of delirium last only a few hours, that it was not affected by the patients' sex, and that it would always manifest as a hyperactive condition were 36.8%, 39.6%, and 30.2%, respectively. The participants identified poor nutrition (83.9%), dehydration (90.6%), hearing and vision impairment (87.7%), and multiple drug use (77.3%) as risk factors for the development of delirium. 34% of the responders incorrectly thought that the risk of delirium would decrease in the presence of a Foley catheter. Concerning the Glasgow-Coma score (GCS), 43.3% of the responders were aware that it was not used in the diagnosis of delirium, whereas 56.7% answered the question incorrectly. Only 17.9% of the responders were aware that benzodiazepines would not facilitate delirium treatment, and 79.2% believed that patients would not remember their delirious moments. The distributions of the correct and incorrect responses to each questionnaire item are shown in Table 1.

Table 1. Survey answers

Survey item	Correct	Incorrect
Fluctuation between orientation and disorientation is not typical of delirium (FALSE)	77 (72.6%)	29 (27.4%)
Poor nutrition increases the risk of delirium (TRUE)	89 (83.9%)	17 (16.1%)
The GCS score is the best way to diagnose delirium in critically ill children (FALSE)	46 (43.3%)	60 (56.7%)
Hearing or vision impairment increases the risk of delirium (TRUE)	93 (87.7%)	12 (12.3%)
Delirium in children always manifests as a hyperactive, confused state (FALSE)	74 (69.8%)	32 (30.2%)
Benzodiazepines can be helpful in the treatment of delirium (FALSE)	19 (17.9%)	87 (82.1%)
Behavioral changes in the course of the day are typical of delirium (TRUE)	96 (90.6%)	10 (9.4%)
Patients with delirium will often experience perceptual disturbances (TRUE)	103 (97.2%)	3 (2.8%)
Altered sleep/wake cycle may be a symptom of delirium (TRUE)	97 (91.5%)	9 (8.5%)
Symptoms of depression may mimic delirium (TRUE)	92 (86.8%)	14 (13.2%)
The greater the number of medications a patient is taking, the greater their risk of delirium (TRUE)	82 (77.3%)	24 (22.7%)
Delirium usually lasts several hours (FALSE)	67 (63.2%)	39 (36.8%)
A urinary catheter *in situ* reduces the risk of delirium (FALSE)	70 (66.0%)	36 (34.0%)
Gender has no effect on the development of delirium (FALSE)	64 (60.4%)	42 (39.6%)
Dehydration can be a risk factor for delirium (TRUE)	96 (90.6%)	10 (9.4%)
Children generally do not remember being delirious (FALSE)	22 (20.8%)	84 (79.2%)
A family history of dementia predisposes a patient to delirium (FALSE)	14 (13.2%)	92 (86.8%)

GCS: Glasgow-Coma score

Discussion

Our study has revealed a significant lack of knowledge in PICU staff. Results of our study has indicated a lower level of knowledge concerning diagnosis, treatment, and prognosis of delirium than the level in relevant studies in literature. The results indicated that the PICU staff required periodical trainings regarding the importance, risk factors, diagnosis, and treatment of pediatric delirium.

Delirium can be categorized into three types, hypoactive (decreased physical activity, lethargy, reduced response), hyperactive (agitated and/or aggressive behavior), and mixed delirium.[12] Most of our nurses demonstrated awareness regarding behavioral changes during the day and fluctuations between orientation and disorientation in cases of delirium; however, 30% of the responders described delirium as solely a hyperactive condition, suggesting a lower rate of awareness concerning hypoactive delirium compared with the results of relevant studies in the literature. As demonstrated by Traube et al.[5] in their research, hypoactive (45%) and mixed delirium (46%) were much more prevalent in PICU compared with hyperactive delirium (8%). Hyperactive delirium leads to complications in patient care, and therefore, can be readily diagnosed.[13] On the other hand, the gravity of the symptoms of patients with hypoactive delirium may go unrecognized.[14,15] Given the prevalence of hypoactive delirium in the pediatric population[2,4-6] the results of our questionnaire indicate that hypoactive delirium is often ignored by the PICU staff and is not treated as a problem.

Most of our staff were aware of the risks, including poor nutrition, dehydration, hearing and vision impairment, and multiple drug use associated with delirium.[16] In addition to the risk of infection, and induce urethral complications in a child with hyperactive delirium. However, 34% of our staff had incorrect knowledge that a foley catheter would reduce the risk of delirium. A PICU staff aware of such risks may help prevent the development of delirium by providing care intended to eliminate these risks.[16-18]

There are two scales reported in the literature, the Pediatric Confusion Assessment Method for the ICU for the ICU and Cornell Assessment of Pediatric Delirium with proven validity and reliability, which can be used in critically ill children for delirium diagnosis. Despite the availability of verified screening tools, most of PICUs do not the routine delirium screening. A multicenter study by Kudchadkar et al.[19] found that only 2% of the pediatric intensive care specialists conducted routine delirium screenings. Inadequate knowledge about the usage of GCS to diagnose cases of delirium was demonstrated by 57% of our staff, which was a higher rate compared with the rates reported in the relevant literature.[17,18] This result can be associated with the lack of routine delirium screening. The reason behind lack of routine screening associated with the language barrier as most of the PICU staff has not enough language skills to perform screening using a tool other than their native language.

When assessing children with hyperactive delirium, staff who have lower delirium awareness could think that sedation levels are insufficient and consequently ask the intensive

care residents to increase the benzodiazepine dose. In the literature, studies have reported benzodiazepines to be an independent risk factor in developing delirium.[5,7,20] However, compared with the relevant studies in the literature using the same questionnaire, which reported 33-38% of nurses considering that benzodiazepine was used in delirium treatment,[17,18] 82% of the responders who participated in the present study responded incorrectly about benzodiazepine use in delirium treatment.

In research by Colville et al.[8] one in three children remembered the moments they experienced during a delirium episode, which was associated with the duration of benzodiazepine administration, and the children who reported remembering delirious memories had higher posttraumatic stress scores. Nevertheless, consistent with the results reported in the relevant literature,[11,18] approximately 79% of the staff in the present study thought that pediatric patients did not remember their delirious moments. Therefore, it is crucial to raise the PICU staff's awareness about pediatric delirium. Two effective methods to reach this goal can be giving periodical trainings and conducting routine delirium screening at PICUs.

Studies have reported that one in every 3-4 children in the PICU has experienced delirium, which emphasizes the importance and severity of the problem in question.[2,21,22] Recognizing delirium in pediatric patients may be challenging. An inadequate level of knowledge in the critical care staff may pose a significant obstacle delaying in diagnosis and treatment.[23,24] Given that the course of delirium fluctuates, nurses who provide continual care can closely monitor and recognize orientation disorders, abnormal behaviors, or hallucinations in the patients.[20,23] Following up and keeping accurate records of the objective and specific findings regarding the mental state of the patients by PICU staff would facilitate the recognition of delirium and ensure adequate treatment.[20,24]

Complex screening tools constitute difficulties for practitioners during routine screening.[25,26] The lack of a screening tool in the native language further complicates the assessment of delirium. Therefore, it is important to validate the established screening tools in native languages and use them for routine screening.

Conclusion

The PICU staff with improved knowledge who use appropriate screening tools can potentially improve the recognition, prevention, and proper treatment of pediatric delirium.

The lack of validation of the questionnaire used in this study to assess the knowledge level of the staff who provide critical care to pediatric patients as a Turkish instrument is a limitation of the present study.

Acknowledgement

We want to thank Dr. Sapna Kudchadkar for permission to use the delirium knowledge survey.

Ethics

Ethics Committee Approval: We received ethical approval from the Ethics Committee of Ankara City Hospital (approval no: E2-21-376).

Informed Consent: We collected the relevant consent forms from the participants online.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: E.U., S.E., A.E., Design: E.U., S.E., Data Collection or Processing: E.U., S.E., S.Ö., O.P., A.E., E.E.E., S.A.B., Analysis or Interpretation: E.U., S.Ö., O.P., Writing: E.U., S.E., M.N.A.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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Research Article / Özgün Araştırma

DOI: 10.4274/cayd.galenos.2023.55707
J Pediatr Emerg Intensive Care Med 2023;10:180-5

The Caregiving Burden and Perception of Quality of Life of Caregivers of Technology Dependent Children with Chronic Disease and Disabilities: A View from One Center

Teknolojik Desteğe Bağımlı Yaşayan Kronik Hastalık ve Sakatlıkları Olan Çocukların Bakım Verenlerinin Yükü ve Hayat Kaliteleri: Bir Merkezden Görünüm

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Abstract

Introduction: Children with chronic diseases and disabilities those need support of medical technologies (TD) for living, have led to a load of complex nursing care being carried out usually by parents at their home. This study was carried out to evaluate the caregiving burden and perception of the quality of life of the caregivers of technology dependent children followed in our center.

Methods: A retrospective survey-based observational study carried out with primary caregivers of the TD children with chronic disease. Zarit burden scale (ZBS) and Turkish version of the SF-36 quality of life scale were used.

Results: Most of the primary caregivers were mothers (61%) or fathers of the TD children. 62% of the participants had been caring for these children for more than 3 years, and 75% of them cannot benefit from institutional home nursing services. More than half of the caregivers reported not having enough income to make ends meet, and about half of them stated to have to quit own jobs. It was seen that 74% of caregivers had at least one chronic disease, 32% of them had psycological problems under treatment. The mean score of caregivers' burden in total measured by ZBS was 52.8±14.3 points that indicating moderate load. Caregivers' burden showed a high strenght of positive correlation with ZF1 and ZF2 sub dimensions. Caregivers' increasing age, female gender, low income level, presence of chronic health problems of caregivers showed a significance in ZF1sub dimension. Quality of life scores of caregivers were found below than averages of Turkey in all 8 sub-categories ($p<0.05$). As the mean caregiver burden increased, quality of life scores of caregivers in all 8 categories decreased.

Öz

Giriş: Kronik hastalığı ve engeli olan, yaşamak için tıbbi teknolojilerin desteğine (TD) ihtiyaç duyan çocukların evde yürütülen karmaşık hemşirelik bakımı, genellikle ebeveynlerin üzerinde olan bakım yüküne yol açmıştır. Bu çalışma, merkezimizde izlenen teknolojik desteğe bağımlı çocukların bakım verenlerinin bakım verme yüklerini ve yaşam kalitesi algılarını değerlendirmek amacıyla yapılmıştır.

Yöntemler: Kronik hastalığı olan TD çocuklarına birincil bakım verenleri ile gerçekleştirilen ankete dayalı geriye dönük, gözlemsel bir çalışma yürütüldü. Zarit yük ölçeği (ZBS) ve SF-36 yaşam kalitesi ölçeğinin Türkçe versiyonu kullanıldı.

Bulgular: Birincil bakım verenlerin çoğu, TD'li çocukların anneleri (%61) veya babalarıydı. Katılımcıların %62'si bu çocuklara 3 yıldan fazla süredir bakmaktaydı ve %75'i kurumsal evde bakım hizmetlerinden yararlanamamaktaydı. Bakıcıların yarısından fazlası geçimlerini sağlamak için yeterli gelire sahip olmadığını ve yaklaşık yarısı bakım vermek için kendi işini bırakmak zorunda kaldığını belirtti. Bakım verenlerin %74'ünün en az bir kronik hastalığı olduğu, %32'sinin tedavi altında psikolojik sorun yaşadığı görüldü. ZBS ile ölçülen toplam bakım yükü puan ortalaması 52,8±14,3 puan olup orta düzeyde yüke işaret etmektedir. Bakım verenlerin yükü, ZF1 ve ZF2 alt ölçek boyutları ile yüksek güçlü bir pozitif korelasyon gösteriyordu. ZF3 ve ZF4 alt ölçek boyutları ile orta düzeyde pozitif korelasyon gösteriyordu ($p<0,05$). Bakım verenlerin artan yaşı, kadın cinsiyetinde oluşu, düşük gelir düzeyi, kronik sağlık sorunlarının varlığı ZF1 alt boyutunda anlamlı fark yaratıyordu. Bakım verenlerin yaşam kalitesi puanları 8 alt kategoride de Türkiye ortalamasının altında bulundu ($p<0,05$). Ortalama bakım verme yükü arttıkça, 8 kategorinin tamamında bakım verenlerin yaşam kalitesi puanları azalıyordu.

*The manuscript has been presented in "Uluslararası Katılımlı 16. Çocuk Acil Tıp ve Yoğun Bakım Kongresi, 2-5 Ekim 2019, Antalya" congress orally (S-080. http://cayd.org.tr/files/16.-cocuk-acil-tip-ve-yogun-bakim-kongresi-2019-Uj.pdf).

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Received/Geliş Tarihi: 30.11.2022 **Accepted/Kabul Tarihi:** 25.05.2023

Conclusion: This may contribute to medical and institutional professionals to develop targeted strategies to support these childrens' caregivers.

Keywords: Children with disabilities, home nursing, life support care, palliative care, biomedical technology, caregiver burden, quality of life, Zarith burden scale, SF-36 quality of life scale

Sonuç: Bu yerel ve küçük ölçekli çalışma sonuçları, medikal ve kurumsal profesyoneller tarafından bu çocukların bakım verenlerinin tanımlanmasına ve desteklenmesine yönelik hedefli stratejiler geliştirilmesine ve aile düzenlerinin sürdürülmesine katkıda bulunabilir.

Anahtar Kelimeler: Engelli çocuklar, evde hemşirelik, yaşam destek bakımı, palyatif bakım, biyomedikal teknoloji, bakım veren yükü, yaşam kalitesi, Zarith yük ölçeği, SF-36 yaşam kalitesi ölçeği

Introduction

The term "technology-dependent" (TD) is widely used to describe children; who need both a medical device to compensate for the loss of a vital body function, and substantial and ongoing nursing care to avert death or further disability.[1] In a report from UK on hospital discharge situations of technology dependent children was pointed that 41% of all hospital discharges were deemed to be technology dependent.[2] In one of our recent studies, we surveyed technology dependent children that have been following up at 14 centers of all over Turkey. The most reasons of technological dependency were congenital neuromuscular disease (30.6%), cerebral palsy and hypoxic ischemic encephalopathy (24.2%) and inborn errors of methabolism (17.7%) respectively. We revealed that 60% of them were dependent upon mechanical ventilation with tracheostomy, 47.9% of them dependent upon nutritional support with nasogastric tube and 37.9% of them dependent upon gastrostomy.[3] Children with chronic diseases and disabilities of congenital or acquired problems those need support of medical technologies for living, have led to load of complex nursing care being carried out usually by parents at their home. It was reported that long-term caregiving at chronic illnesses and at end of life situations of adults has a dramatic impact on the health and well-being of family caregivers.[4-7] However, there has been relatively less information on caregiving burden and quality of life of the family members as caregivers for their TD children in literature. Till to day could not found any study from Turkey that specifically examined this group.[8-12]

Purpose

Present study was carried out to evaluate the caregiving burden and perception of quality of life of caregivers of technology dependent children with chronic disease those followed in our hospital.

Materials and Methods

A retrospective survey-based observational study carried out between June and December 2017. During hospital admission and hospitalization of children, the purpose of the study and how to do it has been explained to caregivers. After written informed consent was obtained and caregivers were assured of confidentiality, they were requested to fill in the questionnaire. In addition, the families of the patients reached by phone from the hospital records were invited for survey. Primary caregivers of the TD children with chronic disease aged under 18 years, who are at least literate, able to read, understand and fill in the questionnaire and volunteer to participate in the study were included the study. Sample size was determined according to the sample calculation nomogram developed for retrospective studies. Three of 103 people who did not agree to participate were excluded from the study.

Zarit burden scale (ZBS) were used for evaluation of caregiving burden.[13] Caregivers asked to indicate to extent of burden experienced while providing care to their TD children. Burden is defined as the extent to which a caregiver perceives emotional, physical, health, social life and financial consequences that impair one's ability to provide care. It is a scale based on 22 questions that answer the objective and subjective burdens of the individual and are answered with 5-step option that range from "not at all" to "extremely". Total scores are obtained by summing all items endorsed. The total scoring range is between 22-110 points. It is defined as "light load" between 22-46 points, as "moderate load" between 47-55 points, and as "heavy load" between 56-110 points. Zarit consists of four sub-categories as; Zarit factor 1 (ZF1) (general assessment of physical, mental and social health, personal assessment of the economic situation), Zarit factor 2 (ZF2) (evaluation of social relations), Zarit factor 3 (ZF3) (evaluation of personal anxiety and satisfaction on the adequacy of the care provided), Zarit factor 4 (ZF4) (assessment of emotional load and tension). ZBS has been found to be practical and validated in the Turkish population by various studies such as in caregivers of elders and caregivers of patients with psychiatric disorders.[14,15] Cronbach's alpha reliability test was performed to determine the reliability level of the Zarit caregiver burden scale. Cronbach's alpha reliability coefficient with standardized substances was 0.875 in this study, indicating adequate internal consistency (>0.70 acceptable internal consistency).

Cronbach's alpha reliability statistics of Zarit caregiver burden scale and subdimensions					
	Chronbach's alpha	**Number of items**	**Overall mean of dimension**	**Between items**	**Hotellings**
Zarit total	0.870	17	2.40	0.000	0.000
ZF1	0.800	7	2.50	0.000	0.000
ZF2	0.752	4	2.25	0.001	0.004
ZF3	0.719	3	2.65	0.000	0.000
ZF4	0.536	3	2.15	0.000	0.000

Caregivers' perception of quality of life were evaluated by using Turkish version of the SF-36 quality of life Scale, an established questionaire for health related quality of life (QoL) assessment. There are 36 questions in the scale, and consists of eight subscales covering physical and mental components, role restriction due to physical and emotional problems, social function, mental health, energy and vitality, pain, general perception of health. The score of each sub-scale ranges from 0-100 points. Points and quality of life are directly proportional. SF-36 quality of life scale scores calculated by the score calculation method, which belongs to Turkey itself, were compared with the overall average scores of Turkey.[16,17] In addition, a 25-questions general evaluation form was used to determine the demographical and social characteristics of the participants.

Statistical Analysis

In the statistical evaluation, according to the characteristics of the variables, Mann-Whitney U and X^2 tests, and bivariate and multivariates correlation tests were used. Significance accepted as $p<0.05$.

Approval to conduct the study was obtained from Local Clinical Research Ethics Committees of Akdeniz University (09.22.2017- 70904504/329).

Results

A convenience sample of 103 caregivers of technology dependent children with chronic illness those followed in our hospital was invited to participate. Most of the 100 included primary caregivers who agree to participate in the study, were middle aged females. 94% of participants were mothers (61%) or fathers of the TD children. Caregivers of TD children were mostly moderately educated (83%) and living in urban. More than half of participant reported not having enough income to make ends meet, and about one third of caregivers were employed full or part-time outside the home. It was seen that 74% of caregivers had at least one chronic disease, 32% of those had psycological problems under treatment such as depression (22 person), anxiety disorder (9 person) and obsessive-compulsive disorder (1 person). Details of caregivers' socio-demografical features are shown in Table 1.

62% of the participants had been caring for these children for more than 3 years. More than two-thirds of caregivers spent ≥3 hours a day and ≥30 hours a week to care, and 42% of caregivers had to quit their jobs for caring the children. More than half of the participants did not receive assistance from other members of the family while providing care, and only 2% of them had a paid caretaker. Table 2 shows the characteristics of caregivers related to caregive.

Features of caregivers' perception of quality of life and caregiving burden, and correlation between them, are given in Table 3.

Discussion

Cronbach's alpha for the ZBS with both full scale and deleted items were 0.875 and 0.800 respectively, pointing out an adequate internal consistency. The mean score of caregivers' burden measured by ZBS was 52.8±14.3 points that indicating moderate load.

In another study from Turkey, caregiving burden of the vast majority of parents of children with peritoneal dialysis evaluated by ZBS, has been reported to be moderate to high.[12] Similarly, studies from different countries, indicated that the burden of care shouldered by parents of children with special health care needs and chronic diseases was considerable.[8,18,19] Caregivers' burden showed a high strenght of positive correlation with ZF1 sub dimension that covers caregiver's perception of own physical health, mental and social well-being and economic status, and with its evaluation of social relations (ZF2 sub dimension). Also caregivers' burden was moderately positive correlated with ZF3 and ZF4 sub dimensions. These findings are consistent with those of other studies from different parts of the world.[20] A report from United States of America, of a 5-month longitudinal study in monthly face-to-face interviews with caregivers, mostly mothers, revealed that the vast majority of them were feeling tired and weak even when they wake up, and frustrated, anxious, angry, helpless or hopeless and, were not having time and energy for social activities.[8] And another study from middle-east region showed that caregivers had high to moderate scores of general strain, disappointment, isolation, emotional involvement and environment sub dimensions respectively.[18] As in many reports

Table 1. Demographical features of caregivers (n=100)

Characteristics		%	p*	r**
Age (year)	<25 26-45 >46	5 65 10	0.003 (ZF1)	0.335
Gender	Female Male	63 37	0.012 (ZF1)	-0.251 (ZF1)
Resident place	Urban Rural	71 29		ns
Education status	Primary High school University	50 33 17	>0.05	0.204 (ZF2)
Social security	Yes No	87 13	0.029 (ZF3)	-0.290 (ZF3)
Employment status	Employed Unemployed	36 64		0.198 (ZF1)
Income level by self assesment	Low Middle-high	52 48	0.007 (ZF1)	-0.223
Chronic health problem	Yes No	74 26	0.002 (ZF1)	-0.226
Habits	Yes No	37 63		ns
Number of children	Non 1-2 3-4	2 63 35		0.332 (ZF1)

*p significance of difference in caregiver burden
**r correlation with caregiver burden, ZF: Zarit factor

Table 2. Characteristics of caregivers related with caregiving (n=100)

Characteristics		%	p*	r**
How many years has she/he been caring?	<1 1-3 >3	12 26 62	0.015	0.215 (ZF1)
How many hours in a day does caregiving take?	<1 1-3 >3	19 17 64	0.000 (ZF1)	0.293
How many hours in a week does caregiving take?	<10 10-30 >30	20 15 65		0.291
Does family members help the caregiver for caring?	Yes No	45 55	>0.05	ns
Does the caregiver be paid a salary by the government?	Yes No	45 55	0.001 (ZF1)	-0.222
Has the caregiver been working before?	Yes No	56 44	0.013 (ZF1)	-0.203 (ZF4)
Did the caregiver have to quit his/her job?	Yes No	42 28	0.017 (ZF1)	-0.223
Have you employed a paid caretaker?	Yes No	2 98		ns
Do you get support of the instutional home nursing services?	Yes No	25 75	0.007 (ZF4)	-0.254
Would you like a caregiver support from the instutional home nursing services at your home?	Yes No	48 52	0.003	-0.479

*p significance of difference in caregiver burden
**r correlation with caregiver burden, ZF: Zarit factor

Table 3. Features of caregivers' perception of quality of life and caregiving burden

	Score (mean ± SD)	**Cronbach α R.C**		
Zarit total	52.8±14.3	0.875		
	r *			**p***
Zarit factor 1	0.877	0.80		0.000
Zarit factor 2	0.708	0.75		0.000
Zarit factor 3	0.386	0.71		0.000
Zarit factor 4	0.644	0.53		0.000
SF-36 QoL subcategories	**r ****	**Score (mean ± SD)**	**Average score in Turkey (mean ± SD)**	**p****
Physical functioning	-0.298	75.8±26.2	86.6±25.2	0.003
Role-physical	-0.400	55±46.1	89.5±29.6	0.000
Social functioning	-0.381	68.1±29.8	94.8±14.4	0.000
Role-emotional	-0.294	63±41.5	94.7±20.9	0.003
Mental health	-0.410	70±17.7	73.5±11.6	0.000
Energy and vitality	-0.463	54.3±23.7	67±13.8	0.000
Bodily pain	-0.402	75.5±25	86.1±20.6	0.000
General health	-0.410	68.9±20.5	73.9±17.5	0.000

*p significance of difference in Zarit factors on caregiver burden
**p significance of difference in scores of SF-36 QoL subcategories between avarage of Turkey and study group
*r correlation of Zarit factors with caregiver burden
**r correlation of scores of SF-36 QoL subcategories with caregiver burden
QoL: Quality of life, SD: Standard deviation

had been stated, in present study caregivers' increasing age, female gender, low income level, presence of chronic health problems of caregivers showed a significance in ZF1sub dimension.[8,18] Significant moderate streght of correlation was found between ZF1 subdimension and increasing number of children owned by caregivers. Length of time performing the role of caregiver showed a significant difference in caregivers' burden (p=0.015), as shown in literature.[8] The ZF1sub-dimension scores of caregivers were significantly higher in those who had longer daily hours devoted to caregiving, and those who recieved payment for care from the state, worked before and had to leave the job (p<0.005). It could be said that the burden of care, especially in the physical sense, is mostly on the mothers' shoulders whose have other household responsibilities as well. Beside these, absence of social security made a significant difference in ZF3 sub dimension covering that caregivers' personal anxiety, and satisfaction with a sense of competence of caregiving. Caregivers those who cannot get help from state home care services had significantly higher scores of ZF4 subdimension signify emotional load and tension (p=0.007). The fact that more than thirty percent of caregivers have psychological problems under treatment can be considered as another sign of the emotional burden of caregiving. These findings are consistent with those of other studies.[8,21-25] Quality of life scores of caregivers were found to be lower than averages of Turkey in all 8 sub-categories (p<0.05).[16] These especially in physical and emotional role restriction and social function subcategories were remarkable. As caregivers' burden related to caregiving increased, the quality of life scores of caregivers in all 8 categories decreased. The correlations between ZBS and QoL score subcategories of vitality and energy sensation, mental health, general perception of health, pain, and physical role restriction were most pronounced. These findings are consistent with prior studies from Turkey and the other countries of world.[7,8,19]

Conclusion

It can be said that ZBS is a reliable and valid tool with an acceptable Chrohnbach alpha for measuring of caregiving burden in caregivers of TD children with chronic illness. The average burden of caregivers' was indicating a moderate load. It's revealed an another remarkable point that, 75% of caregivers' in our study population cannot benefit from institutional home nursing services. The increase in the burden of caregiving reduces the caregiver's quality of life in every sense. This local and small scale study may contribute to pave the way for medical and institutional professionals to identify and develop targeted strategies to support these childrens' caregivers and maintenance of their families. Within certain limits of the present study results, arrangements of health care programs to train skilled caregivers, education on coping strategies for different medical conditions, practical accessible home care support services, and psychological counselling services are reccomended.

Ethics

Ethics Committee Approval: Approval to conduct the study was obtained from Local Clinical Research Ethics Committees of Akdeniz University (09.22.2017- 70904504/329).

Informed Consent: Written informed consent was obtained.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: N.E., M.A., A.K., Concept: N.E., M.A., A.K., Design: N.E., M.A., Data Collection or Processing: A.K., Analysis or Interpretation: N.E., M.A., Literature Search: N.E., A.K., Writing: N.E.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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Research Article / Özgün Araştırma

DOI: 10.4274/cayd.galenos.2023.22599
J Pediatr Emerg Intensive Care Med 2023;10:186-97

Self-assessment of the Feelings and Thoughts of Healthcare Professionals Regarding Their Social Lives and View of the Profession at the Onset and at the End of the First Year of the COVID-19 Pandemic

COVID-19 Pandemisi Başında ve Birinci Yılın Sonunda Sağlık Çalışanlarının Sosyal Yaşamları ve Mesleğe Bakışları Konusunda Duygu ve Düşüncelerinin Öz Değerlendirmesi

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Abstract

Introduction: We aimed to self-evaluate the impact of front-line health workers' perspective on their profession, family, social life and to determine how emotions and thoughts changed in the process.

Methods: This is a questionnaire answered according to a 5-point Likert scale, which involved the demographic characteristics of the staff and the self-assessment of their views on their profession, family, and social life. Evaluations were made in the categories of occupational satisfaction, individual fear, professional ethics, meeting physical needs, trust in institution-infrastructure support, trust in the work team, and the effects on family life through categorized queries. Volunteer healthcare staff work actively in the units, where the patients with suspected or diagnosed infection were treated, included in the study. A year later, the questionnaire was administered again. The multiple logistic regression model was used to determine the factors.

Results: Regarding the first year of the pandemic, no significant difference was determined in the individual fear of getting sick and professional ethics scores of healthcare professionals in Turkey. The scores of meeting physical needs, trust in the team, and institutional infrastructure support in the working environment were significantly decreased ($p<0.05$). While working conditions affected the family significantly ($p<0.05$), ethical behavior scores were above the average in both periods.

Conclusion: The study reveals a profile of healthcare staff who maintain their professional ethical behaviors, are satisfied with their profession and can tolerate the impact of working conditions on family order, despite the drawbacks of the ongoing fear of getting sick.

Keywords: Healthcare workers, professional ethics, fear

Öz

Giriş: Ön saflarda yer alan sağlık çalışanlarının bakış açılarının mesleklerine, ailelerine, sosyal yaşamlarına etkisini kendi kendine değerlendirmeyi ve bu süreçte duygu ve düşüncelerinin nasıl değiştiğini belirlemeyi amaçladık. Bildiğimiz kadarıyla sağlık çalışanlarının pandemi gölgesinde mesleğine bakışını da değerlendiren Türkiye'de yapılmış ilk çalışmadır.

Yöntemler: Bu, personelin demografik özelliklerini ve meslek, aile ve sosyal hayata ilişkin görüşlerinin öz değerlendirmelerini içeren 5'li Likert ölçeğine göre yanıtlanan bir ankettir. Kategorize edilmiş sorgular aracılığıyla mesleki doyum, bireysel korku, meslek etiği, fiziksel ihtiyaçların karşılanması, kurum-altyapı desteğine güven, çalışma ekibine güven ve aile yaşamına etkileri kategorilerinde değerlendirmeler yapılmıştır. Çalışmaya enfeksiyon şüphesi olan veya enfeksiyon tanısı konan hastaların tedavi edildiği birimlerde aktif olarak çalışan gönüllü sağlık personeli dahil edilmiştir. Bir yıl sonra anket tekrar uygulanmıştır. Faktörleri belirlemek için çoğul lojistik regresyon modeli kullanıldı.

Bulgular: Pandeminin ilk yılına göre Türkiye'de sağlık çalışanlarının bireysel hastalanma korkusu ve meslek etiği puanlarında anlamlı bir farklılık saptanmadı. Çalışma ortamında fiziksel ihtiyaçların karşılanması, ekibe duyulan güven ve kurumsal altyapı desteği puanları anlamlı olarak azaldı ($p<0,05$). Çalışma koşulları aileyi önemli ölçüde etkilerken ($p<0,05$), etik davranış puanları her iki dönemde de ortalamanın üzerindeydi.

Sonuç: Bu çalışma, Türkiye'de süreç boyunca devam eden hastalanma korkusu, iş yoğunluğu ile ilişkili fiziksel ihtiyaçlarının karşılanamaması, kurum altyapı ve çalışma ortamı desteğinin daha az hissedilmesi olumsuzluklarına rağmen, mesleki etik davranışlarını koruyan, mesleklerinden memnun olan ve çalışma koşullarının aile düzenine olan etkisini tolere edebilen bir sağlık çalışanı profilini ortaya koymaktadır.

Anahtar Kelimeler: Sağlık çalışanları, mesleki etik, korku

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Received/Geliş Tarihi: 18.11.2022 **Accepted/Kabul Tarihi:** 26.05.2023

Introduction

Serious cases of pneumonia of unknown cause, which broke out in China and spread rapidly all over the world. With the increasing workload amid all the unknowns, it is thought that the Coronavirus disease-2019 (COVID-19) pandemic, as in other previous outbreaks in the world, has multifaceted negative effects in addition to the increasing workload on healthcare professionals (HP).[1]

Previous studies revealed that the risk of developing psychiatric problems in HPs was directly associated with being young, being a woman, being a nurse, having a child, insufficient social support, quarantine experience, lack of experience in the profession, long working hours, lack of education and equipment, as well as unknowns about the virus.[1-4]

This study was designed to search for answers to questions of "How do HP view their profession in the shadow of the pandemic?" and "how do they consider their own life?". As far as we know, this study is the first study in Turkey that involves the perspective of HP toward his/her profession under pandemic conditions. Moreover, it is forecasted that the study would provide basic data to support the moral-mental well-being and teamwork dynamics of HPs in extraordinary situations and epidemics and would guide the studies to be planned and the institutional structuring.

Materials and Methods

The first part of the study was carried out in May 2020, which can be considered the onset of the pandemic in Turkey, and the second part was carried out at the end of the first year of the pandemic by the Pediatric Emergency Department of Akdeniz University. Ethics Committee approval of Akdeniz University Faculty of Medicine (no: 2012-KAEK-20) and Ministry of Health Ethics Committee approval (no: 2020-05-12T11_46_12) were obtained.

This is a questionnaire study composed of two parts prepared in the electronic environment and consisting of 30 questions. The first part involves 14 open-ended/multiple-choice questions regarding the descriptive characteristics of HPs. The second part consists of 16 questions answered according to a 5-point Likert scale, which involves the self-assessment of HPs' views on their profession, family, and social life during the COVID-19 pandemic. In the first 14 questions, the participants were asked about their age, sex, city of residence, occupation and professional experience, place of duty, working hours, institution, marital status, whether they lived with anyone over the age of 60, whether they had children, and whether they lived apart from the family while living with their families before the pandemic. Through the questions grouped in the questionnaire, assessments were made in the categories of occupational satisfaction, individual fear, professional ethics, meeting physical needs, trust in institution-infrastructure support, trust in the work team, and the effects of circumstances on family life. The questionnaire was delivered to the participants via the network. The inclusion criteria for the study were to be actively working in the units where patients with COVID-19 infection/suspect or diagnosis were cared for. Volunteer practitioners, research associates, specialist physicians, lecturers, sub-branch assistants/specialists, nurses, and paramedics were included in the study. In the second part of the study, nearly one year later, the same questionnaire was administered again with the same method. The data of the two periods were compared. Among the main subjects of professional satisfaction, individual fear, professional ethics, meeting physical needs, trust in institution-infrastructure support, trust in the work team, and the effect of conditions on family life, the factors that most affect the change in the process were determined.

Statistical Analysis

The software SPSS (Statistical Package for the Social Sciences) 23.0 was used for statistical analysis of the data. Categorical measurements were summarized as numbers and percentages, and continuous measurements as mean and standard deviation (median and minimum-maximum where appropriate). Shapiro-Wilk test was used to determine whether the parameters in the study showed a normal distribution. Mann-Whitney U test was used in the analyzes of non-normally distributed two groups, and Kruskal-Wallis tests were used in the comparison of groups of more than two. Tamhane's T2 test, one of the post-hoc tests, was used to determine the source of the difference between groups in more than two groups. In the multiple logistic regression modeling, those with scale scores below the mean values were considered low, while those above it were considered high. The multiple logistic regression model was used to determine the factors impacting the patients' individual fear, professional ethics, ability to meet physical needs, trust in the team in the working environment, trust in the institution-infrastructure support, occupational satisfaction, the impact of working conditions on family order, and the total score of the scale. The results were considered statistically significant at $p<0.05$.

Results

Demographic Characteristics

A total of 1.216 HPs, 809 (66.5%) of whom were female, and 1.078 (88.7%) of whom were living and working in

31 metropolitan cities where lockdown was mandated and the pandemic was relatively intense as of May 2020 were included.

At the end of the COVID pandemic, the same questionnaire was administered again based on a simple random sampling method to 300 HPs, 126 of whom also participated in the first phase of the study, 275 living and working same.

The socio-demographic characteristics of the healthcare personnel who participated in the study at the onset and at the end of the first year of the pandemic are presented in Table 1.

Data on the Reliability and Validity of the Scale Used

Individual fear scale score range (SSR) and professional ethics, meeting physical needs, trust in the team in the working environment, trust in the institutional infrastructure support, and the effect of working conditions on family order SSR were between 2-10 points, while professional satisfaction SSR was 4-20, and total SSR was 16-80 points.

In the first phase of the study, the reliability Cronbach's alpha coefficient value of the scale, namely Cronbach's alpha internal consistency was found to be 0.788 (reliable) and 0.763 (reliable) in the second phase. Tables 2a and 2b show the reliability and validity tables of the questionnaire scales administered at the onset and the first year of the pandemic.

In the first phase of the study, the Kaiser-Mayer-Olkin value of the total scale size was 0.822, and 0.763 in the second phase. This value indicated that the sample size was "excellent" in the first phase and "moderate" in the second phase for factor analysis. Besides, when the results of the Barlett sphericity test were analyzed, it was noticed that the chi-square values were significant (X^2=3767.269; p<0.05), (X^2=1122.543; p<0.05), respectively.

The scale scores evaluating the participants' view of their own life in 7 categories in both periods are tabulated in Table 3.

Table 4 a and b show the distribution of the scale scores of the participants, at the onset (a) and at the end of the first year (b) of the pandemic, in terms of the socio-demographic characteristics.

The effects of the socio-demographic characteristics of the participants on the total score of the "social life and professional perspective of healthcare professionals" scale and the sub-domain scores during the pandemic were assessed via multiple logistic regression analysis on a sample of 1.516 people who responded to the questionnaire at the onset and at the end of the first year of the pandemic. In this evaluation, ranges for related characteristics were specified as follows; <31 years of age ≤31, 6 years < professional experience ≤6 years, institutions worked in -training/public hospitals and university hospitals-others, departments served: emergency services and others, 12< working hours ≤12, 5< weekly working days ≤5. The multiple logistic regression analysis results of the relationship between the scale total and sub-domain scores of HP and their socio-demographic characteristics are presented in Table 5.

Discussion

As in the rest of the world, in Turkey the COVID pandemic has rapidly affected healthcare workers. They sought to adapt themselves to the rapid and compelling changes in family and social lives as well as to the changing working conditions.

Fear is an emotion arising from the unknown associated with the individual's feeling of safety or the safety of others at risk.[5] Albeit the fear of getting sick individually and transmitting the disease to their relatives decreased at the end of the first year compared to the beginning of the pandemic, the difference between the two periods was not significant. In publications discussing severe acute respiratory syndrome, Middle East respiratory syndrome, Ebola, HIV, and influenza outbreaks, it has been reported that 22-80% of front-line healthcare workers have high fears and anxieties of getting sick and transmitting the disease.[1,4,6-8] It has been emphasized that fear increases the level of anxiety and stress in healthy individuals.[6,7]

In our study, the high fear of getting sick and transmitting the disease individually at the onset of the pandemic was found to be significantly correlated with the profession, place of duty, and working hours. The mean scores of the faculty members, those working in the outpatient clinics, and HPs who had shorter daily working hours were higher. This seemingly contradictory result might be due to the "uncertainty" factor that constitutes the essence of fear. Because at the onset of the pandemic, institutions channeled protective equipment and resources to emergency services and intensive care units, where patients were admitted first. The HPs working in these departments gained knowledge and experience more actively and rapidly, and they started to learn about the disease. At the end of the first year of the pandemic, fear was significantly higher in those who were over 45 years old and worked for more than 20 years, and was married. Over time, it has become clear that the risk of contracting COVID-19 disease and a severe course of the disease is higher among the older age group. Hence, as the pandemic progressed, older people were started to be employed in a flexible working schedule by institutions. This result might also explain the relationship between individual fear of getting sick and short working time.

At the onset of the pandemic, there were many unanswered questions regarding the clinical manifestations, transmission

Table 1. Demographic characteristics of healthcare personnel participated in the study at the onset and at the end of the first year of the pandemic

Characteristic		The onset of the pandemic	At the end of the first year of the pandemic
		n (%)	n (%)
Sex	Male	407 (33.5)	103 (34.3)
	Female	809 (66.5)	197 (65.7)
Age (years)	<25	161 (13.2)	21 (7)
	26-35	566 (46.5)	203 (67.7)
	36-45	354 (29.1)	61 (20.3)
	>45	135 (11.1)	15 (5)
Living place	Cities where COVID is common	1.078 (88.7)	275 (91.7)
	Other	138 (11.3)	25 (8.3)
Profession	Nurse	489 (40.2)	43 (14.3)
	Specialist physician	364 (30)	134 (44.7)
	Research assistant physician	292 (24)	108 (36)
	Faculty member physician	71 (5.8)	15 (5)
Professional experience (years)	≤5	441 (36.3)	136 (45.3)
	6-10	272 (22.4)	93 (31)
	11-20	327 (26.9)	55 (18.3)
	>20	176 (14.5)	16 (5.3)
Employed institution	Public hospital	705 (58)	150 (50)
	University hospital	422 (34.7)	129 (43)
	Other	89 (7.3)	21 (7)
Marital status	Single	484 (39.8)	110 (36.7)
	Married	732 (60.2)	190 (63.3)
Status of having children	Yes	603 (49.6)	141 (47)
	No	613 (50.4)	159 (53)
Department where the participant served during the pandemic	COVID service	345 (28.4)	54 (18)
	112 and emergency service	461 (37.9)	95 (31.7)
	More than one	410 (33.7)	151 (50.3)
Daily working time (hours) during the period of pandemic	>12	518 (42.6)	149 (49.6)
	8-12 hours	457 (37.6)	80 (26.7)
	<8 hours	241 (19.8)	71 (23.7)
Weekly working time (days)	1-2 days	273 (22.5)	34 (11.3)
	3 or 4 days	543 (44.7)	44 (14.7)
	>5 days	400 (32.9)	222 (74)
Mode of transportation to the hospital	With my own means	1084 (89.1)	287 (95.7)
	Other	132 (10.9)	13 (4.3)
Presence of individuals over 60 years of age living together at home during the period of the pandemic	No	1.012 (83.2)	255 (85)
	Yes	204 (16.8)	45 (15)
The situation of living with the family during the period of pandemic	I am living with my family/children	786 (64.6)	223 (74.3)
	I am living separated from my family/children	430 (35.4)	77 (25.7)

COVID: Coronavirus

Table 2a. Intraclass correlation coefficient

	Intraclass correlation[b]	95% confidence interval		F test with true value 0			
		Lower bound	Upper bound	Value	df1	df2	Sig
Single measures	0.189	0.173	0.205	4.718	1215	18225	0
Average measures	0.788	0.77	0.805	4.718	1215	18225	0

Table 2b. Intraclass correlation coefficient

	Intraclass correlation[b]	95% confidence interval		F test with true value 0			
		Lower bound	Upper bound	Value	df1	df2	Sig
Single measures	0.168	0.14	0.201	4.224	299	4485	0
Average measures	0.763	0.722	0.801	4.224	299	4485	0

Table 3. Distribution of scale scores expressing the participants' own social life and view of the profession at the onset and at the end of the first year of the pandemic

Category	Scale score		
	At the onset of the pandemic	In the first year of the pandemic	p
	Mean ± standard deviation (min-max)	Mean ± standard deviation (min-max)	
Individual fear	5.17±2.11 (2-10)	4.90±2.06 (2-10)	0.216
Professional ethical behavior	6.74±1.89 (2-10)	6.88±1.81 (2-10)	0.260
Meeting physical needs	6.28±2.10 (2-10)	5.89±2.16 (2-10)	**0.004**
Trust in the team in the work environment	6.07±1.92 (2-10)	5.31±1.55 (2-10)	**<0.001**
Confidence in institution-infrastructure support	6.20±1.60 (3-10)	4.23±1.80 (2-10)	**<0.001**
Professional satisfaction	11.76±3.19 (4-20)	12.94±2.65 (8-19)	**<0.001**
The impact of working conditions on family life	5.76±2.05 (2-10)	4.61±1.77 (2-10)	**<0.001**
The total score of the scale	48.00±9.90 (21-79)	44.79±8.98 (24-71)	**<0.001**

routes, lethality, treatment, and prevention of the disease. Under these circumstances, the fear score measured at baseline was moderate, slightly higher than that determined in the first year, but did not show any significant difference. This can be explained by the practical experience gained with patients and the increase in scientific elucidating data over time. The fact that the decrease in fear did not show a significant difference at the end of the first year might be due to the intensity and the fact that the threat of fatal disease has not yet disappeared.

In our study, the views of HPs regarding professional ethical behavior were similar at the end of the first year compared to the onset of the pandemic, the mean scores they obtained from this category were almost the same in both periods, and their mean ethical behavior scores were above the middle level according to the scale dimension. In the literature, it is suggested that in the display of ethical behavior in critical times, the adequacy of resources and the perception of combating a deadly disease, as well as the contamination concerns of HPs with their families, might be determining factors.[9,10] It has been underscored that ethical behavior anxiety of healthcare workers may increase, particularly in countries where the question of "who needs critical care more" has to come to the fore in this pandemic.[9,10] It is stated that at the onset of the pandemic, the videos of patients appearing on social media, begging for help, healthcare workers are being attacked by patients' relatives, and being described as "heroes" just because they are doing their job, can contribute to this chaos, and that cultural differences might also play a role in the process.[9-11]

In our study, based on the results of the first period, professional ethical behavior scores increased with advancing age and increasing professional experience. Ethical behavior scores were higher for those who were married, had children, and those working in COVID services. It can be explained by the contribution of the positive support created by professional experience and familial integrity. Likewise, the professional ethical thoughts of the HPs, who continued to live with the family, were similar in the second period. In this study, which is based on the self-assessment of HPs, the fact that HP in Turkey uphold their professional principles in the extraordinary circumstances of the pandemic

Table 4a. Distribution of the scale scores of the health workers' perceptions of their own social life and profession at the onset of the pandemic according to socio-demographic characteristics

Socio-demographic characteristics Individual fear of getting sick		Scale scores (mean ± SD) Professional ethical behavior	Status of meeting physical needs	Status of trusting the work team	Status of trusting in institution infrastructure support	Professional satisfaction	The impact of working conditions on family life	The total score of the scale	
Sex	Male	5.26±2.19	6.59±1.93	6.21±2.18	6.33±1.87	6.22±1.63	11.99±3.51	6.05±2.08	48.68±10.36
	Female	5.12±2.07	6.82±1.86	6.31±2.06	5.94±1.93	6.19±1.58	11.65±3.01	5.62±2.02	47.67±9.64
	p	0.275	0.041	0.526	0.001	0.824	0.02	<0.001	0.101
Age	<25	5.21±2.08	6.50±1.81	6.50±1.93	5.89±1.80	6.31±1.51	11.90±3.00	6.11±1.89	48.42±9.03
	26-35	5.09±2.15	6.66±1.94	5.88±2.09	5.90±1.88	5.93±1.56	11.38±3.23	5.56±2.08	46.40±9.89
	36-45	5.12±2.04	6.95±1.90	6.66±2.08	6.21±1.98	6.43±1.60	11.90±3.12	5.83±2.01	49.09±9.74
	>45	5.60±2.19	6.87±1.71	6.71±2.17	6.67±2.00	6.64±1.71	12.82±3.20	6.08±2.19	51.41±0.15
	p	0.12	0.026	<0.001	<0.001	<0.001	<0.001	0.007	<0.001
City of residence	Cities where COVID is common	5.16±2.11	6.72±1.91	6.28±2.09	6.14±1.94	6.21±1.61	11.82±3.14	5.87±2.06	48.22±9.94
	Other	5.18±2.12	6.80±1.82	6.28±2.14	5.87±1.86	6.18±1.58	11.59±3.35	5.45±2.00	47.38±9.75
	p	0.922	0.671	0.969	0.029	0.883	0.25	0.001	0.109
Profession	Paramedic, emergency medical technician	5.33±2.29	6.72±2.19	6.74±0.32	5.96±1.95	6.46±1.76	12.02±3.38	6.04±0.35	
	Minor assistant-minor specialist physician	5.54±2.18	7.40±1.72	6.47±0.19	5.70±2.05	6.32±1.59	12.03±3.15	5.87±0.19	
	Research assistant physician	5.14±2.10	6.39±1.94	5.24±0.16	5.87±1.94	5.47±1.47	10.91±3.40	5.13±0.16	
	Nurse	5.04±2.14	6.66±1.89	6.58±0.09	6.19±1.85	6.20±1.59	11.86±2.99	5.92±0.09	
	Faculty member physician	5.99±2.03	7.66±1.58	6.90±0.21	6.30±1.96	6.92±1.53	13.74±2.67	6.56±0.23	
	General practitioner	4.97±2.03	5.88±1.91	6.00±0.20	5.64±1.76	6.16±1.55	11.24±2.94	5.26±0.16	
	Specialist physician	5.10±2.05	7.00±1.70	6.26±0.13	6.34±1.99	6.44±1.59	11.68±3.38	5.86±0.13	
	p	0.010	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	
Year of professional experience	<5	5.07±2.11	6.41±1.92	5.83±2.14	5.79±1.83	5.90±1.59	11.34±3.22	5.58±2.07	
	6-10	5.25±2.13	6.93±1.76	6.32±1.94	6.03±1.95	6.32±1.51	11.95±3.01	5.92±1.99	
	11-20	5.07±2.04	7.00±1.95	6.53±2.03	6.21±1.91	6.37±1.62	11.84±3.16	5.80±2.05	
	>20	5.48±2.23	6.85±1.78	6.90±2.19	6.59±2.03	6.48±1.66	12.40±3.37	5.95±2.13	
	p	0.168	<0.001	<0.001	<0.001	<0.001	<0.001	0.145	

Table 4a. continued

Socio-demographic characteristics Individual fear of getting sick		Scale scores (mean ± SD) Professional ethical behavior	Status of meeting physical needs	Status of trusting the work team	Status of trusting in institution infrastructure support	Professional satisfaction	The impact of working conditions on family life	The total score of the scale	
The institution where the healthcare staff worked	Public hospital	5.13±2.13	6.72±1.84	6.60±2.08	6.11±1.88	6.42±1.61	11.59±3.09	5.98±1.97	48.55±9.78
	Other	5.28±2.19	6.48±2.17	6.47±2.25	6.76±1.85	6.39±1.70	12.35±3.37	5.39±2.07	49.13±10.48
	Training and research hospital	5.30±2.13	6.79±1.75	6.29±1.93	5.88±2.01	6.13±1.50	12.06±3.26	5.69±2.10	48.14±9.12
	University hospital	5.11±2.09	6.81±1.96	5.89±2.15	6.01±1.91	5.97±1.62	11.65±3.22	5.67±2.10	47.11±10.31
	p	0.7	0.54	<0.001	0.002	<0.001	0.045	0.016	0.276
Marital status	Single	5.18±2.10	6.61±1.90	6.17±2.08	5.68±1.79	6.12±1.54	11.70±3.11	5.82±2.05	47.31±9.62
	Married	5.15±2.12	6.83±1.87	6.35±2.11	6.33±1.96	6.25±1.64	11.80±3.25	5.72±2.05	48.46±10.05
	p	0.847	0.027	0.143	0	0.27	0.371	0.347	0.066
Status of having children	Yes	5.11±2.08	6.86±1.84	6.56±2.10	6.33±1.93	6.37±1.63	12.00±3.18	5.81±2.04	49.07±9.95
	No	5.22±2.15	6.63±.92	6.00±2.07	5.81±1.88	6.03±1.55	11.53±3.19	5.72±2.06	46.95±9.74
	p	0.463	0.021	<0.001	<0.001	<0.001	0.003	0.496	<0.001
Department where the participant served	Emergency service	5.12±2.07	6.55±1.87	6.33±2.06	6.14±1.87	6.35±1.57	11.82±2.99	6.10±2.00	48.41±9.65
	Outpatient clinic	5.39±2.07	6.67±1.98	6.20±2.22	6.23±1.97	6.15±1.62	11.80±3.44	5.60±2.16	48.03±10.56
	COVID service	4.98±2.22	7.10±1.77	6.32±2.04	5.80±1.92	6.07±1.62	11.66±3.17	5.52±1.96	47.45±9.42
	p	0.008	<0.001	0.72	0.006	0.024	0.572	<0.001	0.231
Working hours	<8 hours	5.63±2.09	6.70±1.93	6.68±2.09	6.51±1.90	6.53±1.65	12.49±3.10	6.12±2.06	50.65±9.62
	8-12 hours	5.18±2.10	7.08±1.82	6.41±2.07	5.95±1.97	6.28±1.68	12.02±3.06	5.87±2.04	48.79±9.83
	>12 hours	4.95±2.12	6.47±1.89	5.98±2.11	5.98±1.87	5.98±1.48	11.21±3.27	5.52±2.04	46.09±9.74
	p	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001
Number of working days per week	1-2 days	5.31±2.08	6.64±1.86	6.47±1.92	6.51±1.78	6.23±1.53	11.63±3.13	6.04±1.99	48.83±9.39
	3 or 4 days	5.22±2.15	6.76±1.84	6.27±2.06	6.11±1.89	6.21±1.59	11.82±3.18	5.94±2.06	48.34±9.82
	>5 days	5.01±2.10	6.81±1.98	6.17±2.29	5.72±2.00	6.18±1.67	11.79±3.27	5.34±2.03	47.01±10.29
	p	0.126	0.279	0.348	<0.001	0.816	0.607	<0.001	0.045
Presence of a person aged ≥60 years in the home	Yes	4.83±2.00	6.65±1.86	6.27±2.19	6.05±2.03	6.20±1.60	11.8±2.92	5.73±2.06	47.33±9.88
	No	5.62±2.13	6.76±1.89	6.28±2.09	6.07±1.90	6.20±1.60	11.80±3.24	5.77±2.05	48.14±9.90
	p	0.009	0.318	0.994	0.923	0.929	0.253	0.824	0.286
Status of living with family	I am living separated from my family/ children	5.06±2.19	6.72±1.90	6.20±2.08	5.28±1.8	6.20±1.60	11.91±3.21	5.83±1.99	47.23±9.25
	I am living with my family/ children	5.22±2.07	6.76±1.88	6.32±2.12	6.50±1.95	6.20±1.60	11.68±3.18	5.73±2.08	48.43±10.22
	p	0.173	0.871	0.401	<0.001	0.849	0.323	0.284	0.038

COVID: Coronavirus, SD: Standard deviation

Table 4b. Distribution of the scale scores of health care staff regarding their social life and view of the profession in the first year of the pandemic according to socio-demographic characteristics

Socio-demographic characteristics		Individual fear of getting sick	Professional ethical behavior	Meeting physical needs	Trusting the work team	Trusting in the institution infrastructure	Occupational satisfaction	Impact of working conditions on family life	Total score of the scale
		Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Sex	Male	4.9±2.2	6.7±1.9	6.1±2.1	5.3±1.6	4.5±1.8	13.2±2.7	4.7±1.9	45.7±9.1
	Female	4.8±1.9	6.9±1.7	5.7±2.1	5.2±1.5	4.0±1.7	12.8±2.6	4.5±1.6	44.3±8.8
	p	0.831	0.356	0.175	0.406	0.024	0.162	0.547	0.219
Age	≤25	5.6±2.0	6.9±2.0	6.5±2.2	5.0±1.0	4.0±1.3	13.2±2.5	5.2±1.7	46.6±9.3
	26-35	4.7±2.0	6.7±1.8	5.4±2.1	5.1±1.4	4.0±1.7	12.4±2.6	4.4±1.8	42.9±8.4
	36-45	4.9±2.0	7.1±1.6	6.8±1.9	5.6±1.7	4.6±2.0	13.9±2.5	4.9±1.7	48.1±8.6
	>45	6.4±2.0	7.4±2.0	6.9±1.8	6.4±1.9	5.6±1.3	14.7±1.6	5.3±1.1	52.9±8.0
	p	0.01	0.129	<0.001	0.042	0.001	<0.001	0.014	<0.001
City of residence	Cities where COVID is common	4.9±2.0	6.9±1.8	5.9±2.1	5.3±1.5	4.2±1.8	12.9±2.6	4.6±1.8	44.9±9.0
	Other	4.4±1.6	6.6±1.9	5.6±2.4	4.8±1.0	4.2±1.4	12.5±2.3	4.4±1.3	42.7±8.1
	p	0.26	0.49	0.475	0.172	0.739	0.48	0.644	0.243
Profession	Paramedic-emergency medical technician	4.6±1.7	6.7±1.5	5.8±1.9	6.3±1.6	3.3±1.9	12.6±2.6	4.1±1.9	43.8±9.1
	Minor assistant-minor specialist physician	5.0±2.0	7.6±1.5	6.1±2.0	5.5±1.6	4.7±1.8	13.3±2.1	4.9±1.6	47.4±7.4
	Research assistant physician	4.8±2.0	6.8±1.6	4.8±2.0	4.9±1.3	3.3±1.4	12.2±2.6	3.8±1.8	40.8±9.2
	Nurse	4.9±2.2	6.7±1.9	6.1±2.1	5.3±1.6	4.5±1.8	13.2±2.7	4.7±1.9	45.7±9.1
	Faculty member physician	4.8±1.9	6.9±1.7	5.7±2.1	5.2±1.5	4.0±1.7	12.8±2.6	4.5±1.6	44.3±8.8
	General practitioner	0.831	0.356	0.175	0.406	0.024	0.162	0.547	0.219
	Specialist physician	5.6±2.0	6.9±2.0	6.5±2.2	5.0±1.0	4.0±1.3	13.2±2.5	5.2±1.7	46.6±9.3
	p	4.8±2.2	6.8±1.9	6.6±1.6	5.2±1.3	6.2±1.5	13.5±1.8	4.8±1.4	46.1±6.5
Year of professional experience	<5	6.8±1.5	7.8±1.7	7.4±2.0	7.1±1.5	3.7±1.2	16.4±1.2	5.9±1.2	57.8±6.1
	6-10	4.4±2.1	6.2±2.2	6.0±2.2	5.1±1.1	4.7±1.7	11.9±3.3	4.9±1.8	42.4±8.0
	11-20	4.7±1.9	6.5±1.8	6.2±2.1	5.1±1.5	4.7±1.7	12.8±2.6	4.8±1.6	45.0±8.2
	>20	0.599	0.762	0.706	0.043	0.182	0.457	0.519	0.518
	p	4.5±1.9	6.6±1.7	5.1±2.0	4.9±1.3	3.6±1.5	12.2±2.6	4.1±1.7	41.2±8.6
Institution	Public hospital	5.0±2.0	7.0±1.9	6.1±2.1	5.4±1.5	4.7±1.8	13.1±2.4	4.9±1.7	46.6±7.4
	Other	5.0±2.0	7.0±1.5	7.0±1.8	5.6±1.8	4.4±1.9	13.9±2.5	4.9±1.8	48.1±8.9
	Training and research hospital	6.1±2.1	7.3±2.0	6.9±1.7	6.3±1.8	5.6±1.3	14.6±1.6	5.3±1.1	52.5±7.9
	University hospital	0.024	0.112	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
	p	4.7±2.2	6.7±1.7	6.6±1.9	4.9±1.5	4.3±1.6	12.5±2.6	4.7±1.7	44.8±7.8

Table 4b. continued

Socio-demographic characteristics		Individual fear of getting sick Mean ± SD	Professional ethical behavior Mean ± SD	Meeting physical needs Mean ± SD	Trusting the work team Mean ± SD	Trusting in the institution infrastructure Mean ± SD	Occupational satisfaction Mean ± SD	Impact of working conditions on family life Mean ± SD	Total score of the scale Mean ± SD
Marital status	Single	3.9±1.4	6.0±2.2	5.1±1.8	5.8±1.9	3.6±1.4	12.3±2.5	3.8±1.6	40.8±6.5
	Married	5.1±1.9	6.8±1.8	6.1±2.0	5.3±1.3	4.9±1.9	13.2±2.5	4.8±1.5	46.6±8.3
	p	5.0±2.0	7.1±1.7	5.3±2.2	5.4±1.5	3.8±1.7	13.1±2.6	4.5±1.8	44.5±10.1
Status of having children	Yes	0.07	0.071	<0.001	0.062	0.001	0.241	0.082	0.054
	No	4.5±1.9	6.8±1.8	5.8±2.0	4.7±1.2	3.9±1.8	12.4±2.5	4.4±1.8	42.7±8.7
	p	5.1±2.0	6.9±1.7	5.9±2.2	5.6±1.6	4.4±1.7	13.2±2.6	4.7±1.7	45.9±8.9
	Department emergency service	0.016	0.659	0.801	<0.001	0.011	0.017	0.078	0.002
	Outpatient clinic	5.1±2.1	6.9±1.8	6.1±2.1	5.7±1.6	4.6±1.8	13.5±2.4	4.9±1.8	47.1±8.8
	COVID ward	4.7±2.0	6.8±1.7	5.6±2.1	4.9±1.3	3.8±1.6	12.3±2.6	4.3±1.7	42.7±8.5
	p	0.11	0.5	0.074	<0.001	<0.001	<0.001	0.004	<0.001
	Working hours <8 hours	5.2±2.2	7.0±1.6	6.5±2.0	5.6±1.5	4.2±1.7	13.2±2.6	5.2±1.8	47.2±9.2
	8-12 hours	4.6±1.9	6.6±1.8	5.3±1.9	5.1±1.4	3.9±1.6	12.6±2.7	4.1±1.6	42.4±8.6
	>12 hours	4.8±2.2	6.8±1.9	6.6±1.6	5.2±1.3	6.2±1.5	13.5±1.8	4.8±1.4	46.1±6.5
	p	6.8±1.5	7.8±1.7	7.4±2.0	7.1±1.5	3.7±1.2	16.4±1.2	5.9±1.2	57.8±6.1
	Number of working days per week 1-2 days	4.4±2.1	6.2±2.2	6.0±2.2	5.1±1.1	4.7±1.7	11.9±3.3	4.9±1.8	42.4±8.0
	3-4 days	4.7±1.9	6.5±1.8	6.2±2.1	5.1±1.5	4.7±1.7	12.8±2.6	4.8±1.6	45.0±8.2
	>5 days	0.599	0.762	0.706	0.043	0.182	0.457	0.519	0.518
	p	4.5±1.9	6.6±1.7	5.1±2.0	4.9±1.3	3.6±1.5	12.2±2.6	4.1±1.7	41.2±8.6
Presence of a person aged ≥60 years in the home	Yes	5.0±2.0	7.0±1.9	6.1±2.1	5.4±1.5	4.7±1.8	13.1±2.4	4.9±1.7	46.6±7.4
	No	5.0±2.0	7.0±1.5	7.0±1.8	5.6±1.8	4.4±1.9	13.9±2.5	4.9±1.8	48.1±8.9
	p	6.1±2.1	7.3±2.0	6.9±1.7	6.3±1.8	5.6±1.3	14.6±1.6	5.3±1.1	52.5±7.9
	Status of living with family I am living separated from my family/children	0.024	0.112	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
	I am living with my family/children	4.7±2.2	6.7±1.7	6.6±1.9	4.9±1.5	4.3±1.6	12.5±2.6	4.7±1.7	44.8±7.8
	p	3.9±1.4	6.0±2.2	5.1±1.8	5.8±1.9	3.6±1.4	12.3±2.5	3.8±1.6	40.8±6.5

COVID: Coronavirus, SD: Standard deviation

Table 5. Multiple logistic regression analysis of the relationship between the scale total and sub-domains scores of healthcare professionals and their socio-demographic characteristics

Scale score X socio-demographic characteristics	B	S.E	Wald	df	p	Exp(B)	95% CI for Exp(B)	
							Lower	Upper
The total score of the scale								
≤6/year professional experience	-0.823	0.338	5.921	1	0.015	0.439	0.226	0.852
Individual fear of getting sick								
Presence of individuals aged >60 years living together	0.591	0.179	10.957	1	0.001	1.806	1.273	2.563
Status of having children	0.531	0.197	7.280	1	0.007	1.701	1.156	2.502
Professional ethical behavior								
Female gender	0.430	0.133	10.442	1	0.001	1.537	1.184	1.995
Assistant + general practitioner	0.500	0.164	9.320	1	0.002	1.648	1.196	2.272
Working in public institutions	0.417	0.141	8.742	1	0.003	1.517	1.151	1.999
Working in emergency services	0.284	0.136	4.375	1	0.036	1.329	1.018	1.734
Status of meeting physical needs								
Paramedic + nurse	-0.376	0.176	4.555	1	0.033	0.686	0.486	0.970
Assistant + general practitioner	-0.431	0.167	6.662	1	0.010	0.650	0.468	0.901
Working in public institutions	-0.549	0.144	14.446	1	0.000	0.578	0.435	0.767
Status of trusting the work team								
Working in cities where COVID is common	-0.719	0.227	10.049	1	0.002	0.487	0.312	0.760
Living with family and children	1.582	0.177	79.802	1	0.000	4.862	3.437	6.879
Confidence in institution-infrastructure support								
Living with family and children	-0.595	0.170	12.273	1	0.000	0.551	0.395	0.769
Working in public institutions	-0.529	0.153	12.021	1	0.001	0.589	0.437	0.795
Working in emergency services	-0.277	0.143	3.747	1	0.053	0.758	0.573	1.003
Professional satisfaction								
Female gender	-0.340	0.139	5.969	1	0.015	0.712	0.542	0.935
Specialist/minor specialist physician	0.768	0.339	5.139	1	0.023	2.156	1.110	4.189
≤6/year professional experience	-0.301	0.143	4.391	1	0.036	0.740	0.559	0.981
The impact of working conditions on family life								
Female gender	-0.499	0.147	11.485	1	0.001	0.607	0.455	0.810

CI: Confidence interval, COVID: Coronavirus, S.E.: Standard error

in both periods can also be explained by the intense feeling of empathy experienced during this challenging period. On the other hand, in both periods, long working hours, which reduced physical and psychological tolerance, adversely impacted professional ethical thinking.

In our study, the mean scores of HPs in meeting their physical needs at the end of the first year compared to the onset of the pandemic were significantly lower. Employees thought they were in more distress. Of the participants, the assistant physicians, who were generally at the forefront of the pandemic conditions, were younger, had less experience in the profession, had long working hours and worked at the university hospital, thought that they could not meet their physical needs adequately in both periods of the study. This can be explained by the fact that the number of patients in our study increased throughout the pandemic, as well as by the long working hours and working in more than one service associated with a higher rate of COVID. Similarly, it has been emphasized in the literature that the main concern of HPs is the lack of meeting their physical needs.[1,7]

Patient care and treatment services are basically provided in institutional integrity. The systematic functioning of the process, staff, and material management should always be patient-oriented. In crises such as outbreaks, institutions are responsible for eliminating all disruptions, arranging team and equipment needs, optimal personnel management for patients and healthcare workers, and taking necessary precautions.[9] At the end of the first year of the pandemic, the mean score of HPs in the categories of trusting the team in the working environment and the support of the institution they work for in terms of opportunities, working conditions, and infrastructure was significantly lower compared to the mean score obtained at the onset of the pandemic. This might be associated with the possible burnout due to the increased workload of HPs, whose positive thoughts on ethical behavior did not differ throughout the pandemic. Because the institutions were applying a flexible working schedule at the onset of the pandemic, they switched to working with less leave and for longer periods to meet the workload created by the increasing patient admissions during pandemic course. In support of this finding, in the second period of our study, participants were working in more than one ward with a higher percentage of working days and hours. Besides, due to the illness of an HP in a team, they had to stay in quarantine causing a decrease in the number of active personnel. Throughout the pandemic, the feeling of loneliness of HPs

may have deepened with the contribution of weariness, restriction of life, increased frequency of encountering mortal situations, and changes and challenges in working conditions.

Nonetheless, despite all the drawbacks, HPs were significantly more satisfied with their jobs at the end of the first year than at the beginning of the pandemic. In both periods, those who were older and had a longer professional life (>20 years), had shorter working hours and were more satisfied with being a member of this occupational group. This situation can be explained by the feeling of trust that experience gives and the happiness of being able to touch lives despite all the risks.

Participants believed that working conditions during the pandemic had a more adverse impact on their family life at the end of the first year than at the beginning. As reported in the literature that the family life of HPs is adversely affected during outbreaks.[1,12-14] Although the rate of those living separately from their families and children during the pandemic course is fewer in our study, the necessity to work more frequently and with longer working hours due to the increasing workload throughout the pandemic may cause HPs to spend less time with their families and affect their familial social life.

When logistic regression analysis was conducted on all participants in our study, it was found that the total scores of the scale, which represents the self-evaluation of the HPs under pandemic conditions and their perspectives on their profession and social life, were significantly negatively correlated with being at the beginning of their profession during the period of the pandemic. This group, which admitted patients on the front line and intensively during the pandemic, also felt inexperienced in their profession and considered that their social lives were adversely impacted.

HPs who have children and live with the elderly at home were more afraid of getting sick and infecting them and their relatives. Likewise, it has been revealed in the literature that being a woman, being married, having children, and working as a nurse have a greater impact on the fear and anxiety of getting sick and being contagious.[1,4,6,8,15,16]

The ethical behavior score in the profession was positively correlated and significantly higher among those working in public hospitals and emergency services, residents and general practitioners and females. This can be interpreted as a sign that the group, which has intense contact with patients in the continuation of medical service during the pandemic, continues to adhere to ethical principles.

Of the professional groups included in the study, assistants, general practitioners, paramedics, nurses, and those working in public institutions, those who met pandemic patients more frequently had significantly lower scores in meeting their physical needs. This outcome might be arising from the adverse impact of the increased burden of work.

Living in metropolitans, where admissions due to COVID-19 were high, and working in government institutions and emergency services were found to be significantly and negatively correlated with the scores of trusting institution infrastructure and work team. This can be explained by the potential increased workload and the inability to meet physical needs. On the other hand, living with his family and children was significantly positively correlated with the score of trust in the team in the work environment. This situation might be indicating the positive contribution of family support to the HPs.

The occupational satisfaction score was significantly negatively correlated with being a woman and having less experience in the profession. This might be due to the cumulative effect of increased workload as well as domestic responsibilities of women. It indicates that the health worker, who is at the beginning of her profession and has shouldered the heavy pandemic burden, might be questioning this situation and the professional alternatives. Similar to the category of occupational satisfaction, being a woman showed a negative correlation in the category of the effect of working conditions on family life.

Study Limititations

The main limitation of this study is that only 126 employees participated in both stages, since not all of the HP who participated in the study at the first stage could be reached.

Conclusion

The study reveals a profile of healthcare staff who maintain their professional ethical behaviors, are satisfied with their profession and can tolerate the impact of working conditions on family order, despite the drawbacks of the ongoing fear of getting sick during the pandemic in Turkey.

Ethics

Ethics Committee Approval: The first part of the study was carried out in May 2020, which can be considered the onset of the pandemic in Turkey, and the second part was carried out at the end of the first year of the pandemic by the Pediatric Emergency Department of Akdeniz University. Ethics Committee approval of Akdeniz University Faculty of Medicine (no: 2012-KAEK-20) and Ministry of Health Ethics Committee approval (no: 2020-05-12T11_46_12) were obtained.

Informed Consent: In the electronic environment, the relevant consent was obtained from the participants at the beginning of the survey application.

Peer-review: Internally and externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Ö.T.K., N.E., R.G., Concept: Ö.T.K., N.E., R.G., Design: Ö.T.K., N.E., Data Collection or Processing: Ö.T.K., R.G., Analysis or Interpretation: Ö.T.K., N.E., Literature Search: Ö.T.K., Writing: Ö.T.K., N.E.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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Research Article / Özgün Araştırma

DOI: 10.4274/cayd.galenos.2023.36693
J Pediatr Emerg Intensive Care Med 2023;10:198-204

Comparison of Citrate and Heparin for Continuous Renal Replacement Therapy in Pediatric Intensive Units

Çocuk Yoğun Bakım Ünitelerinde Sürekli Renal Replasman Tedavisinde Sitrat ve Heparinin Karşılaştırılması

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Abstract

Introduction: The choice of anticoagulation in continuous renal replacement therapy (CRRT) is very important for circuit life and bleeding complications. The primary outcome of our study was circuit lifespan. Secondary outcomes, we aimed to identify metabolic complications.

Methods: This retrospective study was conducted in our pediatric intensive care unit between November 2019 and March 2021.

Results: The study included 35 patients, 19 with regional citrate anticoagulation (RCA) and 16 with heparin anticoagulation (HA). The patient's pediatric risk of mortality III score was similar in both groups (p=0.76); also, p-SOFA score was higher in the RCA group and was significant [(HA: 6.43±5.24, RCA: 10.21±3.96, p=0.024)]. 100 hemofilter were used in all therapies (total CRRT times 4115.50 h), 43 in HA and 57 in the RCA group. Median circuit life and total CRRT duration were longer for RCA [(33.0; 3.0-168.0) (30.5; 9.0-520.0) (14.0; 0.75-285.0) (94.0; 11.0-394.0) (p=0.043\0.021)] than for HA. Hypocalcemia was detected 9/19 in the RCA and 4/16 in the HA (p=0.021). HA was preferred in 3 patients and RCA in 4 patients who needed ECMO simultaneously with CRRT. The most common reason for circuit change in RCA groups is patient-related and clotting in the heparin group. Mortality rates were not the same in both groups (p=0.012).

Conclusion: Citrate 18/0 has better safety and efficacy with a long filter life and easily manageable systemic complications. In addition, anticoagulation with RCA may be preferred in patients monitored with ECMO and in need of CRRT.

Keywords: Heparin, regional citrate anticoagulation, citrate 18/0, continuous renal replacement therapy, pediatric intensive care unit

Öz

Giriş: Sürekli renal replasman tedavisinde (CRRT) antikoagülasyon seçimi devre ömrü ve kanama komplikasyonları için çok önemlidir. Çalışmamızın birincil sonucu devre ömrü idi. İkincil sonuçlar, metabolik komplikasyonları belirlemeyi amaçladık.

Yöntemler: Bu geriye dönük çalışma, Kasım 2019-Mart 2021 tarihleri arasında çocuk yoğun bakım ünitemizde yapılmıştır.

Bulgular: Çalışmaya 19'u bölgesel sitrat antikoagülasyon (RCA) ve 16'sı heparin antikoagülasyonlu (HA) olmak üzere 35 hasta dahil edildi. Hastanın çocuk ölüm riski III skoru her iki grupta da benzerdi (p=0,76); SOFA puanları da benzer değildi [(HA: 6,43±5,24, RCA: 10,21±3,96, p=0,024)]. Toplam CRRT süresi 4115,50 saat idi. HA grubunda 43 ve RCA grubunda 57 olmak üzere toplam 100 hemofiltre seti kullanıldı. HA grubuna göre; medyan devre ömrü ve toplam CRRT süresi RCA grubunda daha uzundu [(33,0; 3,0-168,0) (30,5; 9,0-520,0) (14,0; 0,75-285,0) (94,0; 11,0-394,0) (p=0,043\0,021)]. Hipokalsemi RCA grubunda daha fazla idi [RCA: 9/19, HA: 4/16 (p=0,021)]. CRRT ile eş zamanlı ECMO ihtiyacı olan 3 hastada HA, 4 hastada RCA tercih edildi. RCA gruplarında devre değişikliğinin en sık nedeni hasta kaynaklı iken heparin grubunda pıhtılaşmadır. Mortalite oranları her iki grupta da aynı değildi (p=0,012).

Sonuç: Sitrat 18/0, uzun filtre ömrü ve kolayca yönetilebilen sistemik komplikasyonlar ile daha iyi güvenlik ve etkinliğe sahiptir. Ayrıca ECMO ile izlenen ve CRRT ihtiyacı olan hastalarda RCA ile antikoagülasyon tercih edilebilir.

Anahtar Kelimeler: Heparin, bölgesel sitrat antikoagülasyon, sitrat 18/0, sürekli renal replasman tedavisi, çocuk yoğun bakım ünitesi

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Received/Geliş Tarihi: 16.05.2023 **Accepted/Kabul Tarihi:** 20.06.2023

Introduction

Continuous renal replacement therapies (CRRT) are frequently used in pediatric intensive care units (PICUs). In particular, acute kidney injury, volume overload and multiple organ failure are the most important causes. It has both essential and widespread as well as technical and management difficulties. It has hardly been performed in small children, especially severe clinical status and multi-organ failure due to vascular access and anticoagulation difficulties. In CRRT, anticoagulation is crucial for circuit lifespan and bleeding complications. Circuit runtime is key to the efficacy of treatment.[1] Systemic heparin anticoagulation (HA) is the traditional method because it is cheap and has much experience. However, HA increases bleeding and may cause heparin-induced thrombocytopenia (HIT).[2] Regional citrate anticoagulation (RCA) is an alternative method. Anticoagulation in the RCA is limited to the extracorporeal circuit. This makes RCA a good option in patients at risk of bleeding and in HIT. Moreover, evidence suggests that RCA extends filter lifespan.[3-6]

Few studies compared heparin and citrate efficacy and side effects in children on CRRT.[7] We used prismocitrate 18\0 (Baxter, US®) because, in the literature, there are few studies about prismicitrate 18\0. This study aims to compare the effectiveness of HA and RCA to circuit lifespan, metabolic complications, bleeding, and outcomes in critically ill children on CRRT in our PICU.

Materials and Methods

The study was retrospectively planned and was conducted in our PICU between November 2019 and March 2021. Demographic information, pediatric risk of mortality III (PRISM III) scores, pediatric sequential organ failure assessment (pSOFA) score, indication for CRRT, risk factors of acute kidney injury, CRRT modality (CVVH, CVVHD, CVVHDF) were recorded. We accepted the indication of CRRT as acute kidney injury, fluid overload (FO), electrolyte abnormalities, metabolic acidosis, multi-organ failure, poisoning.

Prismaflex (Baxter, USA) device was used. Hemodialysis catheters between 7F and 12F were preferred based on the age and weight of the child. We preferred that extracorporeal membrane oxygenation (ECMO) circuit connection be used if the patient was under ECMO running. We inserted different central venous catheters for other therapies with or without ECMO patients.

HF 20, M 60, M 100 membranes were used for CRRT circuit. The priming solution selection was based on clinical status, weight and hemoglobin value. For 10 kilograms and below, packed red cells were preferred. Up to 10 kilograms and in circulatory failure, 5% albumin was used. Normal saline was used in non-decompensated patients and patients over 10 kilograms.

We used for anticoagulation heparin or citrate for hemofilter lifespan prolongation. In our PICU, we prefer RCA for patients whom bleeding risks such as thrombocytopenia (<150.000/mm^3) and coagulation troubles. Heparin is chosen in patients with relatively stable and without bleeding risks such as poisoning and inborn metabolic disease crises. Inpatient heparin is preferred for anticoagulation; we also used activated partial thromboplastin time (aPTT) value and activated clotting time (ACT) for effectiveness evaluation. HA group, the patient received an initial intravenous bolus of unfractionated heparin at doses ranging from 20 to 30 IU/kg body weight. This was followed by infusion at a rate of 10 IU/kg/hour. During the procedure, a post-filter ACT of 180 to 220 seconds and aPTT values of 60 to 80 seconds were targeted. MultiBic potassium-free (Fresenius, Germany) was preferred as a dialysate and replacement fluid. Prismocitrare 18/0 (Baxter, USA) solutions were used in the citrate group. The initial citrate infusion rate (mL/h) was determined based on blood flow (Qb×1.6 mL/h). The flow rate was adjusted so that the target post-filter (venous port) ionized calcium concentration was between 0.25 and 0.35 mmol/L. The systemic ionized calcium concentration was targeted at 1.0 to 1.2 mmol/L, and a calcium gluconate infusion (10% calcium gluconate with 5% glucose-0.1 mmol/mL) was administered through the return line of the circuit to maintain it in this range. The citrate effect was neutralized using a continuous calcium infusion. Ionized calcium values were monitored pre and post filtration. Arterial blood gases were closely monitored to determine the acid-base status. Metabolic acidosis with total calcium/ionized calcium ≥2.5 for more than 48 hours and high anion gap is characterized by citrate accumulation CA). The primary outcome of our study was circuit lifespan. Secondary outcomes, we aimed to identify metabolic complications. Clinical complications (bleeding, hemodynamic instability, HIT) and metabolic complications including hypocalcemia (total calcium level <9 mg\dL), hypercalcemia (iCa++>1.25 mmol\L), metabolic acidosis [pH<7.35 or base excess (BE) <-3], metabolic alkalosis (pH>7.45 or BE>+3) and citrate toxicity were noted. HIT diagnostic criteria are shown in Figure 1.[7] The Ankara University Ethics Committee approved the study (number: İ6-441-21).

Statistical Analysis

Statistical Package for Social Sciences (SPSS version 26.0 for Windows, Chicago, IL) was used. Groups were compared using the independent-samples Student's t-test, Mann-Whitney U, chi-squared tests where appropriate. P<0.05 was considered statistically significant.

4 Ts score for estimating the pretest probability of heparin-induced thrombocytopenia (HIT)

4 Ts score parameters:	
Thrombocytopenia:	
▪ PLT decrease >50% **AND** nadir ≥20,000/microL **AND** no surgery within preceding 3 days	2 points
▪ PLT decrease >50% **BUT** surgery within preceding 3 days **OR** any combination of PLT fall and nadir that does not fit criteria for 2 or 0 points (eg, 30 to 50% fall or nadir 10,000 to 19,000/microL)	1 point
▪ PLT decrease <30% **OR** nadir <10,000/microL	0 points
Timing of onset after heparin exposure:	
▪ 5 to 10 days **OR** 1 day if exposure within past 5 to 30 days	2 points
▪ Probable 5 to 10 days (eg, missing PLT counts) **OR** >10 days **OR** <1 day if exposure within past 31 to 100 days	1 point
▪ ≤4 days without exposure within past 100 days	0 points
Thrombosis or other clinical sequelae:	
▪ Confirmed new thrombosis, skin necrosis, anaphylactoid reaction, or adrenal hemorrhage	2 points
▪ Suspected, progressive, or recurrent thrombosis, skin erythema	1 point
▪ None	0 points
Other cause for thrombocytopenia:	
▪ None	2 points
▪ Possible (eg, sepsis)	1 point
▪ Probable (eg, DIC, medication, within 72 hours of surgery)	0 points
Interpretation:	
0 to 3 points – Low probability (<1%)	
4 to 5 points – Intermediate probability (approximately 10%)	
6 to 8 points – High probability (approximately 50%)	

HIT is a clinical and laboratory diagnosis, and this score is not intended to take the place of clinical judgment by a clinician with experience in diagnosing and managing HIT. Refer to UpToDate for details of the evaluation.

PLT: platelet; DIC: disseminated intravascular coagulation.

Adapted from: Lo GK, Juhl D, Warkentin TE, et al. Evaluation of pretest clinical score (4 T's) for the diagnosis of heparin-induced thrombocytopenia in two clinical settings. J Thromb Haemost 2006; 4:759.

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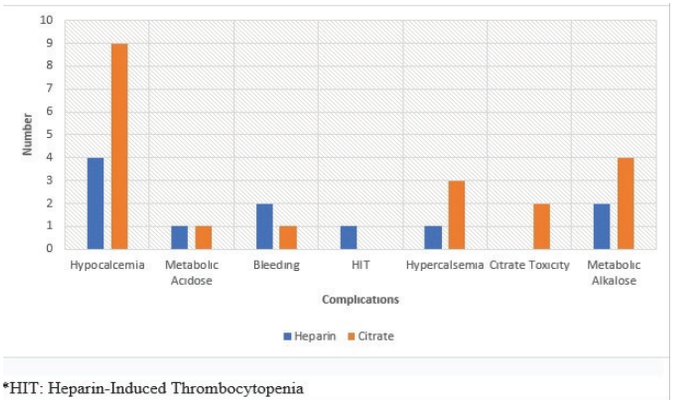
Figure 1. 4 Ts score for estimating the pretest probability of heparin-induced thrombocytopenia (HIT)



*HIT: Heparin-Induced Thrombocytopenia

Figure 2. Frequency of metabolic complications

Results

Between the dates included in the study, 94 patients were hospitalized in the PICU and 35 (3.8%) required CRRT. Citrate was preferred for anticoagulation in 19 patients and heparin in 16 patients. Twelve (34.3%) patients were female. The mean age was 52.84 months in the HA group and 94.16 months in the RCA group (p=0.96). Also, there was a significant difference between the pSOFA scores as 6.43±5.24 in HA 10.21±3.96 in RCA groups (p=0.024) and PRISM III scores were similar in both groups (p=0.76). The most frequent reason for the need for dialysis was acute metabolic disease attack in heparin group and FO in citrate group. Other indications were hyperammonemia, electrolyte imbalance, acute renal failure, and metabolic acidosis. There was a significant difference in mortality rates between the groups [heparin groups 7/16 (20%) vs. citrate groups 9/19 (45.7%), p=0.012)]. There was no significant difference between the demographic and clinical characteristics of the patients for both groups (Table 1). One hundred hemofilter were used in all therapies (total CRRT times 4115,50 h), 43 in the heparin group and 57 in the citrate group. Median circuit lifetime and total CRRT duration was significantly longer for RCA [(33.0; 3.0-168.0), 30.5; (9.0-520.0)] than for HA (14.0; 0.75-285.0) (94.0; 11.0-394.0) (p=0.043\0.021). CRRT characteristics of patients for both groups are given in Table 2.

Blood parameters before CRRT were similar for both groups. Patients were assessed for side effects developed during CRRT (with a blood sample taken 1, 3, 7, 14 days after CRRT initiation). The frequency of metabolic complications is shown in Figure 2. Hypocalcemia was detected 47.3% (n=9/19) in the RCA and 25% (n=4/16) in the HA (p=0.021). In the RCA group, eight patients (22.8%, n=8/35) and ın HA group 4 patients (11.4%, n=4/35) had an increased liver transaminase enzyme during CRRT. There was no difference in increased liver transaminase enzyme between the two groups (p=0.365).

Only two patients who had citrate toxicity in citrate groups were continued with heparin. In the heparin group, one patient had HIT.

Twenty-eight children (80%) were under mechanical ventilation at the initiation of CRRT. PEX was applied to 17 children with CRRT (48%). HA and RCA were used 3 and 4 patients who had undergone ECMO running together with CRRT. In the HA group, the mean aPTT value of patients on ECMO was 34.1±8.5, and the mean aPTT value of patients who were not on ECMO was 35.5±9.7. There was no significant difference found (p=0.73). In the HA group, bleeding occurred in a patient on ECMO running. There was no significant difference in total CRRT duration (p=0.724), median circuit lifetime (p=0.480), and the number of filters per patient on ECMO (p=0.711) with respect to anticoagulation modality Table 3. There was no significant difference between the two anticoagulation protocols in reasons for circuit failure. In ECMO patients, the most common cause of circuit change in RCA groups is the patient source, and in the heparin groups are clotting Table 2.

Table 1. The demographic and clinical characteristics of patients

	Heparin (n=16)	Citrate (n=19)	p*
Age (months) (mean ± SD)	52.84±67.38	94.16±74.09	0.96
Sex Male, n (%) Female, n (%)	 4 (11.4%) 12 (34.3%)	 8 (22.9%) 11 (31.4%)	0.288
Weight (kg) (mean ± SD)	15.06±12.39	21.89±15.02	0.15
PRISM III, (mean ± SD)	16.1±14.83	19.8±10.9	0.76
pSOFA score	6.43±5.24	10.21±3.96	0.024
Size 5F, n (%) 7F, n (%) 8-12F, n (%) ECMO circuit connection, n (%)	 1 (2.9%) 6 (17.1%) 6 (17.1%) 3 (8.6%)	 0 (0%) 5 (14.3%) 10 (28.6%) 4 (11.4%)	0.574
Length of stay of PICU (days), (mean ± SD)	15.13±14.09	18.47±16.36	0.52
Mechanical ventilation, (n), (%)	10 (62.5)	18 (94.7)	0.701
Mechanical ventilation (days), (mean ± SD)	18.10±10.56	18.56±16.34	0.21
Mortality, n (%)	7 (20%)	16 (45.7%)	0.012
VIS*	60.0 (20-140)	60.0 (10-275)	0.54
Before CRRT, (mean)			
WBC * (mean ± SD)	13533,38±5.731,94	14682,11±14018,74	0.76
Hemoglobin, (median)	9.4 (7.2-12.6)	9.1 (5.7-12.4)	0.707
Platelet count, (median)	276000 (41000-706000)	122000 (24000-532000)	0.145
aPTT, (median)	36.4 (30.4-59.6)	33.0 (24.7-58.0)	0.385
PT, (median)	15.9 (11.4-27.8)	15.0 (12.1-67.2)	0.806
INR, (median)	1.5 (1.04-2.39)	1.33 (1.02-5.89)	0.659
Fibrinogen, (median)	2.39 (0.85-6.89)	2.99 (1.07-4,60)	0.531
BUN (mean)	19.47±16.77	38.96±23.38	0.09
Creatinine (mean)	0.68 (0.18-3.75)	0.89 (0.22-2.41)	0.728
Potassium (mean)	4.02±0.66	3.88±1.08	0.63
Sodium (mean)	142.19±7.82	140.63±10.5	0.62
Albumin (mean)	32.54±6.92	31.01±4.76	0.94
ALT (mean)	218.67±510.35	156.16±380.65	0.685
AST (mean)	295.53±866.86	352.26±914.57	0.855
ALT (during CRRT)	239.33±518.134	229.94±432.647	0.955
AST (during CRRT)	758.33±1521.342	876.44±1984.94	0.852
Indication of CRRT Fluid overload, n (%) Acute renal failure, n (%) Electrolyte imbalance, n (%) Metabolic acidosis, n (%) Acute attacks of inborn metabolic disease, n (%) Hyperammonemia, n (%)	 4 (11.4) 3 (8.6) 1 (2.9) 1 (2.9) 5 (14.3) 2 (5.7)	 10 (28.6) 5 (14.3) 1 (2.9) 2 (5.7) 1 (2.9) 0 (0)	0.163

VIS: Vasoactive inotrop score, BUN: Blood urea nitrogen, WBC: White blood cell, aPTT: Activated partial thromboplastin time, PT: Protrombin time, INR: International normalized ratio, *p<0.05 was accepted statistically significant. Values represent as median (min-max); values represent as number (percentages); "±'' indicate values as mean ± SD, SD: Standard deviation, CRRT: Continuous renal replacement therapy, AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, PICU: Pediatric intensive care unit

There were eight patients whose anticoagulation choices changed during the procedure. Because of the bleeding that developed in 4 of these patients, heparin was switched to citrate. In 2 of these patients, citrate was switched from citrate to heparin due to hypocalcemia and citrate toxicity. These values are presented in Table 4.

Discussion

In CRRT, anticoagulation is essential for circuit lifespan and is related to bleeding complications. Few studies compare heparin and citrate anticoagulation in the pediatric population on CRRT. A retrospective study by Sık et al.[4] in critically ill

Table 2. Properties of CRRT in both groups and reasons for circuit failure

	Heparin (n=16)	Citrate (n=19)	p*
Total CRRT duration (hour), median	30.5 (9.0-520.0)	94.0 (11.0-394.0)	0.021
Median circuit lifetime (hour), median	14.00 (0.75-285.0)	33.0 (3.0-168.0)	0.043
Number of filters per patient, median	2.5 (1.0-8.0)	2.0 (1.0-8.0)	0.745
Blood flow rate, median	60.0 (40.0-350.0)	100.0 (40.0-200.0)	0.152
Dialysate flow (ml\H), median	775 (300-1500)	850 (300-2100)	0.690
Citrate dose (Mmol\L), median		511.7	
Calcıum rate (Mmol\L), median		37.08	
Clotting, n (%)	9 (25.7)	12 (34.2)	0.678
Technical reason, n (%)	4 (11.4)	3 (8.5)	0.49
Patient related causes (mortality, for radiology etc..), n (%)	8 (22.8)	14 (40)	0.148
Input negative alarms, n (%)	2 (5.7)	5 (14.2)	0.349

Values represent as median (min-max), *p<0.05 was accepted statistically significant, CRRT: Continuous renal replacement therapy

Table 3. Properties of CRRT in ECMO and non-ECMO groups

	ECMO (n=7)	Non- ECMO (n=28)	p*	ECMO-HA (n=3)	ECMO-RCA (n=4)	p*
CRRT duration, (hour), median	168.0 (72.0-520.0)	46.0 (9.0-393.0)	0.005	138.0 (72.0-520.0)	258.25 (80.0-394.0)	0.724
Circuit lifetime, (hour), median	80.0 (7.0-285.0)	24.0 (0.75-72.0)	0.009	30.0 (7.0-285.0)	105.0 (57.0-168.0)	0.480
Filters per patient, (hour), median	3.0 (1.0-8.0)	2.0 (1.0-8.0)	1.0	3.0 (1.0-3.0)	2.5 (1.0-8.0)	0.711

Values represent as median (min-max), *p<0.05 was accepted statistically significant, CRRT: Continuous renal replacement therapy, ECMO: Extracorporeal membrane oxygenation, HA: Heparin anticoagulation, RCA: Regional citrate anticoagulation

Table 4. Anticoagulation switches for any cause

	Heparin to citrate (n=4)	Citrate to heparin (n=2)	p*
Hemoglobin, (median)	8.5 (8.0-9.0)	9.7 (9.0-10.1)	0.468
Trombosit, (median)	31000 (12000-50000)	45000 (33000-78000)	1.0
aPTT, (median)	42.0 (38.0-46.6)	35.7 (30.0-41.2)	1.0
PT, (median)	22.5 (15.9-29.1)	13.6 (12.4-27.8)	0.248
INR, (median)	2.05 (1.39-2.71)	1.16 (1.03-2.39)	0.245
Fibrinogen, (median)	3.75 (3.72-3.78)	1.59 (0.85-2.63)	0.06

Values represent as median (min-max)
aPTT: Activated partial thromboplastin time, PT: Protrombin time, INR: International normalized ratio

children compared RCA versus HA. In this study, filter lifetime was reported to be significantly higher in RCA, with 12.75 hours (IQR: 40-70). In another study, the median half-life for citrate was 17 hours higher than for heparin.[5] An another study,[8] they were used only prismocitrate 18/0 and reported circuit lifetime was higher in RCA than in HA (p=0.030). In a study in 59 adult patients was used 10\2 formulation in 28 patients and 18\0 formulation in 31 patients and reported median circuit lifetime was higher in 18\0 formulation than in 10\2 formulation (p=0.001). In our study, similar to pediatric studies in the literature, it was shown that the filter lifetime longer in CRRT performed with RCA. Long filter life decreases the possibility of blood loss and hemodynamic instability during circuit replacement.[9] This is important for the risk of bradykinin release syndrome and in children with low blood volume.[10] The longer median circuit lifetime demonstrated in these studies proves the advantages of RCA. However, our study was retrospective and was not double-blind and stratified according to the clinical condition of the patients, which was a major concern when interpreting the results. We choose citrate in case of bleeding risk such as thrombocytopenia. This may cause less clotting in the circuit.

The most important metabolic complication associated with citrate is metabolic alkalosis due to citrate metabolism; a multicenter study by Bunchman et al.[11,12] reported metabolic alkalosis of 11% in patients. Another study by Sık et al.[4] showed that metabolic alkalosis was detected 7.01% in the

citrate group. A retrospective review used only prismocitrate 18/0 of 30 critically ill children[8] metabolic alkalosis observed only in four cases (25%). We used prismocitrate 18\0 in the RCA groups due to problems associated with the use of prismocitrate 10/2 solution, such as hypomagnesemia, hypophosphatemia and the need for additional bicarbonate infusion. However, we reported that the rate of metabolic alkalosis with RCA was 21% higher than literature and similar to that reported by Soltysiak et al.[8] When we notified citrate-induced metabolic alkalosis, we increased the dialysis flow rate or decreased citrate flow rate and observed a high Ca++ level in the extracorporeal circuit.

The most commonly reported metabolic side effect of citrate is hypocalcemia as it affects cardiac contractility; we reported 47.3% hypocalcemia in the citrate group and 25% in the heparin group (p=0.021). Soltysiak et al.[8] reported a similar rate of hypocalcemia in the citrate group with 43.76%. Sık et al.[4] reported a hypocalcemia rate of 12.28% in the citrate group. In our study, the lowest calcium value was 0.45 mmol/L in a patient undergoing RCA. This value was immediately corrected by calcium reinfusion through a line and no cardiac dysrhythmia due to hypocalcemia was observed. Hypercalcemia was reported in 16.6% in the RCA group and 4.1% in the HA-CRRT group. The maximum systemic Ca++ value in the RCA group was 1.41 mmol\L. In our opinion, the main cause of hypercalcemia was due to additional calcium infusion and it is essential to control the composition and infusion rate of all extra fluids such as total parenteral nutrition in the management of hypercalcemia. The electrolyte balance of patients is affected by multiple factors and close follow-up is essential.

HA may increase the risk of bleeding in the critically ill pediatric patient group. Eleven retrospective and prospective observational studies compared the two anticoagulation options for bleeding and found that RCA was safer.[13-15] RCA has been shown to reduce the risk of bleeding with a risk ratio of 0.28 (95% CI: 0.15 to 0.50),[13] and there are studies showing a significant difference between the two groups[5-12] and Liao et al.[16] reported a similar finding in a meta-analysis. In our study, hemorrhagic complications developed in two patients in the HA group and one patient in the RCA group. Especially when performing HA in patients at risk of bleeding, for example in cardiac patients, the heparin dose should be kept comparatively lower to reduce the risk of bleeding. In the heparin group, one patient had HIT and was continued with citrate.

The mortality rate was higher in the citrate group (p=0.012). The pSOFA scores of the patients in the citrate group were also high during their hospitalization (p=0.024). Sık et al.[4] reported that both groups' mortality rates and PRISM scores were similar (p=0.954 and p=0.725). Another study reported mortality rates in the heparin group 25% and the RCA group 25% (p=1.00).[5] To date, there is no safe result that heparin reduces mortality because most studies have included very small groups of patients. In addition, Liao et al.[16-18] found the mortality rate to be similar in the two groups in their meta-analysis for adult patients.

Our study, unlike the literature, can be explained by the high mortality rate in the citrate group, high pSOFA score, and the presence of a patient group, most of whom had bleeding diathesis and multiorgan failure.

We also included patients in need of ECMO in our study. In a study in adult patients, RCA was also used in CRRT cycles in ARDS patients supported with ECMO and treated with HA and analyzed retrospectively. It was reported that the coagulation rate in the CRRT cycle was significantly higher in the HA group (p<0.001).[19-22] We found that the median circuit duration was longer in the ECMO group than in the non-ECMO group with a difference of 56 hours, but there was no significant difference in CRRT duration (p=0.724).

Our study has several limitations. First, the patient number is small. Second, retrospective. However, the superiorities of our study are that we were used only prismocitrate 18\0 for RCA, and we preferred a single CRRT modality (CVVHD), and the second advantage is notified count patients underwent ECMO running.

Conclusion

RCA is a safe and effective method of anticoagulation for CRRT in children as it has no frequent and severe systemic complication; it may be more effective than systemic HA in prolonging the hemofilter lifespan. Citrate is an available and good choice for CRRT. It causes minimal metabolic and electrolyte abnormality that can be easily resolved with good monitoring and interventions. RCA-CRRT in patients followed up with ECMO circuit is possible, safe and effective anticoagulation method.

Ethics

Ethics Committee Approval: The Ankara University Ethics Committee approved the study (number: İ6-441-21).

Informed Consent: Approval was obtained from the family of the participants.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: E.B., T.K., Concept: E.B., T.K., Design: T.K., Data Collection or Processing: E.B., A.D., E.G., A.G.,

B.B., F.K., H.Ö., H.U., A.G.G., Analysis or Interpretation: E.B., A.G.G., T.K., Literature Search: E.B., F.K., Writing: E.B.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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DOI: 10.4274/cayd.galenos.2022.22448
J Pediatr Emerg Intensive Care Med 2023;10:205-8

Important Points of Diagnosis and Treatment Strategy of Intraperitoneal Bladder Perforation due to Blunt Pelvic Trauma in a Pediatric Case

Pediyatrik Bir Olguda Künt Pelvik Travmaya Bağlı İntraperitoneal Mesane Perforasyonunun Tanı ve Tedavi Stratejisinde Önemli Noktalar

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Abstract

Intraperitoneal bladder perforation is a vital condition that is characterized by perforation of the bladder into the intra-abdominal area. It can lead to severe peritonitis and a delayed diagnosis can be life-threatening. Bladder perforations are occurred by high-energy blunt trauma that disrupts the bony pelvis, direct blow to a distended bladder, penetrating traumas, urogynecological interventions, indwelling catheters and iatrogenic causes. A 9-year-old boy who was involved in a moderate velocity a motor vehicle accident was referred to our hospital due to pelvic fracture. Primary assessment of the patient suggested hemodynamic stability without any signs of peritonitis and/or distention. With this case report, we aimed to present the clues in the diagnosis of intraperitoneal bladder perforation and our treatment strategy in cases where the symptoms and signs are insufficient to show intraperitoneal bladder perforation.

Keywords: Bladder perforation, pelvic fracture, laparoscopy

Öz

İntraperitoneal mesane perforasyonu, mesanenin karın içi bölgeye perforasyonu ile karakterize yaşamsal bir durumdur. Şiddetli peritonite yol açabilir ve gecikmiş tanı hayatı tehdit edici olabilir. Mesane perforasyonları, kemik pelvisi bozan yüksek enerjili künt travmalar, dolu mesaneye direkt darbe, penetran travmalar, ürojinekolojik girişimler, kalıcı kateterler ve iyatrojenik nedenlerle oluşur. Orta hızlı motorlu trafik kazası geçiren 9 yaşında erkek çocuk pelvis kırığı nedeniyle hastanemize sevk edildi. Birincil değerlendirmede olgu hemodinamik olarak stabildi, herhangi bir peritonit bulgusu ve/veya distansiyonu yoktu. Bu olgu sunumu ile semptom ve bulguların intraperitoneal mesane perforasyonunu göstermede yetersiz kaldığı durumlarda intraperitoneal mesane perforasyonu tanısının koyulmasındaki ipuçlarını ve tedavi stratejimizi sunmayı amaçladık.

Anahtar Kelimeler: Mesane perforasyonu, pelvis kırığı, laparoskopi

Introduction

Bladder perforations are occured by high-energy blunt trauma that disrupt the bony pelvis, a direct blow to a distended bladder, penetrating traumas, urogynecological interventions, indwelling catheters and iatrojenic causes.[1] In pediatric age group, it is uncommon, in approximately accounting for only 0.05-2.0% of all pelvic trauma cases.[2] Intraperitoneal perforation of bladder accounts for nearly 17% of the bladder injuries in children[3] and may lead to cause a wide clinical spectrum such as abdominal pain, gross hematuria, inability to urinate, infection, peritonitis, sepsis and death.[1,4] Computed tomography (CT) with contrast scan with retrograde cystography is the most sensitive and specific radiologic imaging to reveal intraperitoneal bladder perforation.[5]

Herein, we report a pediatric case with intraperitoneal bladder perforation due to motor vehicle accident. The main purpose in this case report to emphasize important and challenging points of diagnosis and treatment strategy.

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Received/Geliş Tarihi: 28.04.2022 **Accepted/Kabul Tarihi:** 12.07.2022

Case Report

A 9-year-old boy who was involved in a moderate velocity motor vehicle accident was referred to our hospital due to pelvic fracture after his initial treatment at the 12th hour of the trauma. Primary assessment of the patient suggested hemodynamic stability without any signs of peritonitis and distention. The patient had a 8 FR Foley catheter and urine output during the follow-up was 1.1 cc/kg/h. While the patient had gross hematuria upon arrival, the urine gradually became clear visual appearance. Digital rectal examination was uneventful. No concomitant rectal injury was detected.

Laboratory results showed increased blood urea nitrogen (BUN) (21.7 mg/dL) and creatinine (0.8 mg/dL) levels, leukocystosis (26.800/uL), thrombocytosis (410.000/uL), slight anemia (11.7 g/dL) and microscobic hematuria. Plain radiographs were uneventful except for pelvic fractures (Figure 1). CT images ruled out thoracic injury or solid organ pathology and revealed pelvic and paracolic free fluid. The superior and inferior right pubic ramus and the left iliac wing were fractured. Hematoma was detected in presacral area. Bladder perforation could not be ruled out due to presence of presacral hematoma, persistence of microscopic hematuria, presence of intraabdominal fluid without any solid organ injury, and inability to clearly assess the bladder because of the Foley catheter. CT scan with retrograde cystography using water-soluble contrast was performed and revealed intraabdominal contrast extravasation with a 2 mm defect from the superiolateral aspect of the bladder (Figure 2A). An orthopedic consultation regarding pelvic fractures was requested. No surgery was planned by the orthopedics and immobile follow-up was recommended.

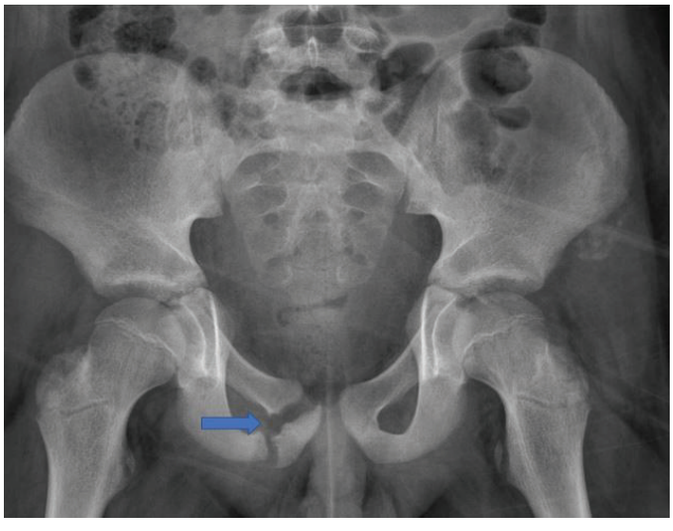

Figure 1. A plain radiograph showing of the superior and inferior right pubic ramus fracture (arrow)

Laparoscopy was performed with three 5 mm ports. Laparoscopic examination of the abdomen revealed approximately 5 cm perforation at the dome of the bladder (Figure 2B). The perforation was repaired in two layers using continuous 3/0 polyglactin (Ethicon, Inc., Somerville, NJ, USA) for mucosa and water-tight 2/0 polyglactin (Ethicon, Inc., Somerville, NJ, USA) for detrussor muscle. The repair was tested using dilute methylene blue. No extravasation was observed and no drains were used. Under recommendation of orthopedics, the patient was kept immobile. Proper intravenous (IV) hydration, IV ampicillin-sulbactam [150 mg/kg/day ter in die or three times a day (t.i.d.)] and oxybutynin were given. The follow-up laboratory results showed normalized BUN and creatinine levels with a normal leukocyte count. The Foley catheter was removed on day 10 after a control cystography (Figure 3A, 3B) and the patient was discharged with no complications. Postoperative first month control visit was uneventful.

All procedures performed in this study involving human participants were in accordance with the Declaration of Helsinki. Written informed consent was obtained from the patient and parents for publication of this manuscript.

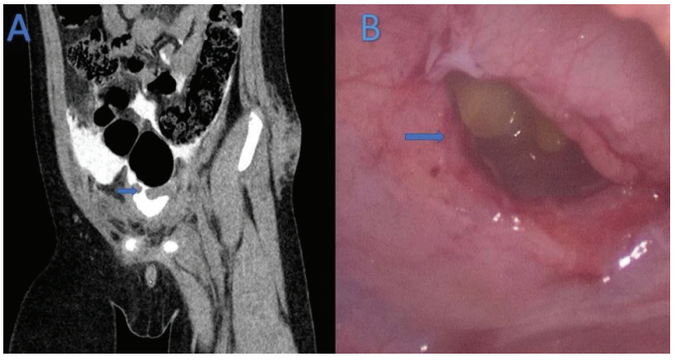

Figure 2. (A) CT-assisted cystography revealed of contrast medium extravasation from superiolateral aspect of bladder (arrow) **(B)** Laparoscopic view of the bladder wall defect (arrow)
CT: Contrast scan

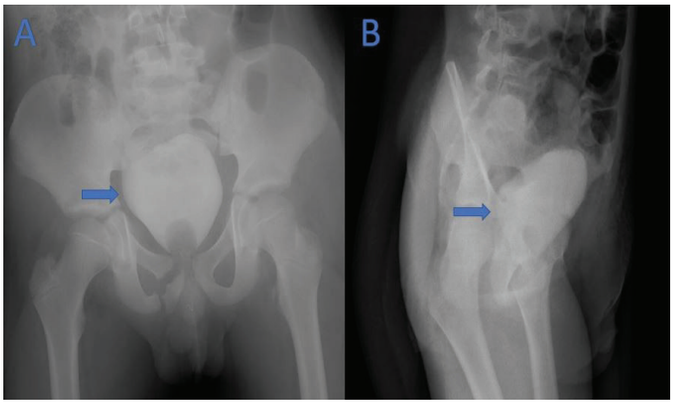

Figure 3. (A) Retrograde cystogram confirmed an intact bladder with no extravasation (anteroposterior view) (arrow) **(B)** Lateral view (arrow)

Discussion

Injury to the urinary bladder is rare, challenging situation for pediatric emergency specialists and pediatric surgeons due to controversieries in diagnosis and treatment. Basically, four types of bladder injuries can be observed, these are bladder contusion, extraperitoneal perforation, intraperitoneal perforation, and combined perforation with extraperitoneal and intraperitoneal. While extraperitoneal bladder perforation usually occurs at anterolateral aspect near the bladder neck related to pelvic fracture, intraperitoneal bladder perforation occurs via a large horizontal tear in the dome of the full bladder and is believed to be the result of a blow delivered to the lower abdomen.[1]

Clinically, abdominal pain and/or abdominal distention, hematuria, inability to urinate or no urine output via catheter are suggestive findings regarding intraperitoneal bladder perforation. Intraperitoneal bladder perforation and urinary ascites can lead to severe peritonitis, electrolite imbalance and acute kidney failure.[6-8] In present case, there was no peritonitis signs and/or abdominal distension. Throughout the whole diagnostic process, the urine output was above >1 cc/kg/h and hematuria was gradually cleared. In laboratory analyzes, the patient had increased value of BUN and creatinine levels and microscopic hematuria. When the clinical findings of the patient were evaluated, although the vital signs were stable, acute renal failure signs and decreased urine output that did not improve despite appropriate fluid replacement and microscopic hematuria were conditions suggestive of intraperitoneal bladder perforation.

The diagnostic methods for bladder perforation are conventional cystography or CT-assisted cystography. CT-assisted cystography with high sensitivity and specificity[5] has some advantages that gives valuable information in terms of showing the perforation area in detail, demonstrating adjacent and distant organ injuries and determining the perforation relationship with the surrounding bony tissues. In present case, the diagnosis of intraperitoneal bladder perforation was confirmed by CT-assisted cystography. CT-assisted cystography revealed a perforation area of approximately 2 mm in the superolateral of the bladder, contrast extravasation from this localization to the intraabdominal area, and hematoma in the adjacent presacral area.

In the literature, intraperitoneal bladder perforations are repaired via laparotomy or laparoscopy.[1,3] Conservative treatment is also applied in the treatment of intraperitoneal bladder perforation.[9] In current case, perforation was repaired with laparoscopy, which is a minimally invasive method. During laparoscopy, the perforation area, which was evaluated as 2 mm radiologically, was detected to be approximately 5 cm. We think that it is remarkable that the 2 mm perforation, which encourages the conservative method, is observed to be quite large during laparoscopy. This observation indicate us that in case of intraperitoneal injury, laparoscopy should be performed regardless of radiological size of defect. Intraperitoneal injuries of the bladder should be laparoscoically evaluated and repaired. Laparoscopic repair is a safe method in hemodynamically stable patients with no significant intraabdominal injuries.

Conclusion

Microscopic hematuria and impaired renal function tests without abdominal pain or abdominal distension may indicate intraperitoneal bladder perforation, while clear visual appearance of urine with a catheter or presence of urine output may not exclude perforation. CT-assisted cystography must be performed in the presence of clinical suspicion in multi trauma patients with pelvic fracture.

Considering the anatomical features of the bladder, it may be misleading to decide on conservative treatment with the perforation area evaluated only radiologically, as in our case. In the presence of intraperitoneal bladder perforation, laparoscopy should be performed to avoid the morbidity and mortality caused by intraperitoneal bladder perforation and to determine the defect size. Laparoscopic repair can be performed as an effective method in both diagnosis and treatment.

Ethics

Informed Consent: Written informed consent was obtained from the patient and parents for publication of this manuscript.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: C.K., O.U., Concept: C.K., O.U., E.U., M.D., Design: C.K., O.U., E.U., M.D., Data Collection or Processing: C.K., O.U., E.U., Analysis or Interpretation: O.U., E.U., M.D., Literature Search: O.U., E.U., M.D., Writing: O.U., E.U., M.D.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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Case Report / Olgu Sunumu

DOI: 10.4274/cayd.galenos.2023.02350
J Pediatr Emerg Intensive Care Med 2023;10:209-11

A Case with Multiple Systemic Inflammatory Syndrome Presenting with Acute Appendicitis Symptoms

Akut Apandisit Semptomları ile Başvuran Çoklu Sistemik Enflamatuvar Sendromlu Bir Olgu

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Abstract

Coronavirus disease-2019-associated pediatric multisystem inflammatory disease has been defined as a severe disease that causes fever, abdominal pain, hypotension, and myocardial dysfunction in children with severe acute respiratory syndrome-coronavirus-2 infection. However, some multiple systemic inflammatory syndrome (MIS-C) cases progress to multi-organ failure requiring intensive care follow-up. In the patient who had severe abdominal pain, vomiting and high fever and was diagnosed with acute appendicitis in the emergency room, the diagnosis of MIS-C was considered during the follow-up, and parasitic infestation, which is one of the rare etiological causes of acute appendicitis, was detected.

Keywords: MIS-C, COVID-19, acute appendicitis, pediatric patient

Öz

Koronavirüs hastalığı-2019 ilişkili çocuk multisistem enflamatuvar hastalık, şiddetli akut solunum sendromu-koronavirüs-2 enfeksiyonu geçiren çocuklarda ateş, karın ağrısı, hipotansiyon ve miyokardiyal işlev bozukluğuna yol açan şiddetli bir hastalık olarak tanımlanmıştır. Bununla birlikte bazı MIS-C olguları, yoğun bakım takibi gerektirecek çoğul organ yetmezliğine ilerlemektedirler. Şiddetli karın ağrısı, kusma ve yüksek ateş şikayeti olan, acil serviste akut apandisit tanısı konulan olguda izlemde MIS-C tanısı düşünülmüş ve akut apandisitin ender etiyolojik nedenlerinden paraziter enfestasyonu tespit edilmiştir. Bu olgu çoğul sistemik enflamatuvar sendromun (MIS-C) gastrointestinal sistem tutulumunun nadir bir bulgusu olan akut apandisit ile tanı alması ve akut apandisitin ender etiyolojik nedenlerinde paraziter enfestasyonu tespit edilmesi nedeniyle sunulmuştur.

Anahtar Kelimeler: MIS-C, COVID-19, akut apandisit, çocuk hasta

Introduction

In December 2019, an epidemic of pneumonia of unknown cause occurred in Wuhan, China's Hubei Province, and it was understood that a new type of coronavirus caused the disease. The new virus was named severe acute respiratory failure syndrome-coronavirus-2 (SARS-CoV-2), and the disease it caused was named Coronavirus disease-2019 (COVID-19). The disease spread all over the world in a short time, causing a pandemic.[1] COVID-19, a severe disease that causes fever, abdominal pain, hypotension, and myocardial dysfunction in children infected with SARS-CoV-2, was described in Europe in April 2020. Multiple organ failure and the need for intensive care have been observed in some cases.[2,3] While this syndrome was defined as the pediatric inflammatory multisystem syndrome (PIMS-TS) associated with transient SARS-CoV-2 in Europe, it was named as COVID-19-associated multiple systemic inflammatory syndrome (MIS-C) by the Center for Disease Control and Prevention (CDC).[4,5]

Appendicitis is one of the most common causes of abdominal pain and emergency gastrointestinal surgery. Fecal stasis, fecalitis and lymphoid hyperplasia are frequently involved in the etiology of appendicitis. Intestinal parasites and tumors are rarely found in the etiology of appendicitis.[6] If the emergency

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Received/Geliş Tarihi: 01.10.2022 **Accepted/Kabul Tarihi:** 21.03.2023

surgical intervention of acute appendicitis is delayed, the clinic of simple appendicitis may result in perforation and the delay may increase morbidity and mortality.[7]

This case is presented to emphasize both the differential diagnosis of acute appendicitis with refractory fever and MIS-C with gastrointestinal findings, and the fact that *Enterobius vermicularis* is a very rare etiologic cause of acute appendicitis.

Case Report

An 8.5-year-old girl, whose personal and family history was unremarkable, was admitted to the emergency department with the complaints of severe abdominal pain, vomiting and high fever. In the physical examination, her abdomen was tender and the rebound finding was positive. In the computed tomography imaging, the appendix was measured as 7.3 mm at its thickest point. The pathology of the appendectomy material of the patient who was operated with a preliminary diagnosis of acute appendicitis was reported as follows: "It is chronic inflamed appendix tissue with parasite fragments in the lumen, and morphological findings suggest *Enterobius vermicularis*". Despite the antibiotic treatment, her fever continued, and the patient, who started to have respiratory distress and progressed on the 3rd postoperative day, was admitted to the intensive care unit.

In the intensive care examination, she had toxic-looking, she was conscious, her respiratory was tachypneic (56/min) and dyspneic, pulmonary breath sounds were normal, she had tachycardia (154/min), weak heart rate, arterial blood pressure of 96/56 mmHg, and gallo rhythm. Her abdomen was tender, the liver was palpated as 3 cm, and maculopapular rash in the lower and upper extremities, non-purulent conjunctivitis, and strawberry tongue were detected. In echocardiography, mild mitral insufficiency and ejection fraction of 58% were detected. Laboratory results were as follows: SARS-CoV-2 polymerase chain reaction: Negative, COVID-19 (SARS-CoV-2) IgG-IgM: positive, leukocyte: 6.400 (/µL), hemoglobin: 11.4 (g/dL), platelet: 149 (thousand/µL), lymphocyte: 700 (/µL), activated partial thromboplastin time: 26.3 (sec), pentylenetetrazol: 14.7 (sec), international normalised ratio (INR): 1.25 (sec), fibrinogen: 435.9 (mg/dL), alanine transaminase: 71 (U/L), aspartate transaminase: 42 (U)/L, total protein: 5.7 (g/dL), albumin: 2.4 (g/dL), sodium: 133 (mmol/L), potassium: 2.8 (mmol/L), ferritin: 1.922 (mg/L), troponin: I 0.210 (mg/L), brain natriuretic peptide: 533 (pg/ML), D-dimer: 8.4 (ng/mL), sedimentation: 59 (mm/h), C-reactive protein (CRP): 128 (mg/L), procalcitonin: 10.74.

The patient was started on oxygen with a high-flow nasal cannula. Oral feeding was discontinued, and limited intravascular fluid was planned due to the loading findings. MIS-C was considered due to clinical findings, test results, non-reducing fever and multi-organ failure. When arterial blood pressure continued to decrease (90/50 mmHg) to the hypotensive limit for age, the mean arterial blood pressure was measured as 63 mmHg, and circulatory disorder developed, adrenaline infusion was started. The vasoactive inotrope score was calculated as 5. Antibiotherapy was revised, Intravenous immunoglobulin (IVIG), corticosteroid and enoxaparin sodium treatment were administered. On the second day of her hospitalization, her fever decreased, her respiratory distress regressed, and her circulatory disorder improved. She was transferred to the ward without complications. "Patient consent information" was obtained from the legal representative of the patient.

Discussion

The pathogenesis of multisystemic inflammatory syndrome is still unknown. The fact that these cases usually occur some time after SARS-CoV-2 infection suggests that the cause of the disease may not be the direct effect of the virus, but the reason has not been fully elucidated.[8] Our case was followed up in the intensive care unit and diagnosed with MIS-C because she had high fever lasting more than 5 days, microorganism could not be grown in cultures, she had SARS-CoV-2 serology positivity, she had high laboratory test values of lymphopenia, hypoalbuminemia, hyponatremia, hyperfibrinogenemia, aspartate aminotransferase, alanine aminotransferase, lactate dehydrogenase, INR, pentylenetetrazole, D-dimer, ferritin, CRP, sedimentation, procalcitonin, pro-BNP, troponin-I and multiple organ failure. Our case met both the Ministry of Health MIS-C case definition[9] and CDC's MIS-C diagnostic criteria.[4]

The clinical symptoms of MIS-C manifest themselves in a wide spectrum affecting many systems. Most affected children are previously healthy and have no history of underlying disease.[10] Similar to the studies in the literature, our patient had no history of underlying disease and underwent acute appendectomy 3 days ago. The etiology of appendicitis often includes fecal stasis, fecalitis, and lymphoid hyperplasia. Intestinal parasites, tumors, radiological studies using barium, undigested vegetable scraps and fruit seeds are also rarely found in the etiology of appendicitis.[6] Altun et al.[11] found that 1.8% of 660 acute appendectomy materials had parasite infestation in their histopathological diagnosis, and 75% of them were *Enterobius vermicularis*. In the literature, as in the study of Altun et al.[11] it was important to detect *Enterobius vermicularis* in our patient as a very rare etiological cause of acute appendicitis.

MIS-C is a systemic disease involving multiple systems, and the treatment and follow-up of affected children requires multidisciplinary coordination. The American Society of

Rheumatology MIS-C treatment recommendation should be applied according to the clinical condition of the patient. Antibiotic, IVIG, and antithrombotic therapies are appropriate for patients with moderate to severe symptoms.[12] Our patient was accepted as severe MIS-C with clinical findings and laboratory results. A 15-year-old female patient with similar complaints, as our case, was followed up by Aslan et al.[13]

MIS-C was considered because her fever continued after appendectomy operation. Unlike our case, anakinra and plasmapheresis treatment was applied because it did not respond to IVIG and steroid treatment. According to the MIS-C treatment guidelines, appropriate antibiotic, inotropic drug infusion, IVIG, glucocorticoid and antithrombotic treatment was administered to our patient.

In multisystemic inflammatory syndrome, clinical findings manifest themselves in a wide spectrum including many systems. In a multicenter study by Feldstein et al.[14], gastrointestinal system complaints were found in 92% of 186 MIS-C cases, and acute appendicitis was found in only two (1%) cases. In a similar study conducted by Yilmaz Ciftdogan et al.[15] in a multicenter study with 101 MIS-C patients, gastrointestinal symptoms were found in 80.2%, but acute appendicitis could not be detected.

Similar to the studies of both Feldstein et al.[14] and Yilmaz Ciftdogan et al.[15] in the literature, either no acute appendicitis was detected in MIS-C patients or it was detected very rarely. It is noteworthy that our case was diagnosed with acute appendicitis, which is a rare finding of gastrointestinal system involvement of MIS-C, and that parasitic infestation was detected in rare etiological causes of acute appendicitis. Differential diagnosis should be made with acute appendicitis with treatment-resistant fever and MIS-C with gastrointestinal findings.

Ethics

Informed Consent: "Patient consent information" was obtained from the legal representative of the patient.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: A.K., S.K., Design: A.K., S.K., Data Collection or Processing: A.K., S.K., Analysis or Interpretation: A.K., S.K., Literature Search: A.K., S.K., Writing: A.K., S.K.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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Case Report / Olgu Sunumu

DOI: 10.4274/cayd.galenos.2023.83892
J Pediatr Emerg Intensive Care Med 2023;10:212-5

Distal Intestinal Obstruction Syndrome in Patients with Cystic Fibrosis: Two Separate Cases in the Pediatric Intensive Care Unit

Kistik Fibrosisli Hastalarda Distal İntestinal Obstrüksiyon Sendromu: Çocuk Yoğun Bakım Ünitesinde Takip Edilen İki Ayrı Olgu Yönetimi

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Abstract

Distal intestinal obstruction syndrome (DIOS), also defined as the equivalent of meconium ileus, is a sign of complete or partial ileocecal obstruction with intestinal contents in patients with cystic fibrosis. DIOS may occur because of darkened intestinal secretions, pancreatic insufficiency, undigested food residues and sticky stool stasis. Patients apply with abdominal swelling, constipation, severe abdominal pain in the form of recurrent cramps and vomiting. In direct abdominal radiographs, dilated small intestines, air-fluid levels or foamy appearances are observed in the ileocecal region. Obstruction developed in patients with cystic fibrosis is treated with medical and surgical methods with a multidisciplinary approach depending on the degree of severity and symptoms. In this paper, two critically ill children with cystic fibrosis were presented who were followed up in the pediatric intensive care unit with a diagnosis of DIOS, with one treated conservatively and the other surgically; the treatment methods were also highlighted.

Keywords: Cystic fibrosis, distal intestinal obstruction syndrome, surgery

Öz

Mekonyum ileusu eş değeri olarak da tanımlanan distal intestinal obstrüksiyon sendromu (DIOS), kistik fibrozisli hastalarda bağırsak içeriği ile tam veya parsiyel ileoçekal obstrüksiyon kliniğidir. DIOS, koyulaşmış intestinal sekresyonlar, pankreatik yetmezlik, sindirilmemiş gıda kalıntıları ve yapışkan gaita stazı sonucunda meydana gelmektedir. Batında şişlik, kabızlık, tekrarlayan kramp şeklinde şiddetli karın ağrıları ve kusma kliniği ile hastalar başvurmaktadır. Düz abdominal grafilerde dilate ince bağırsaklar, hava-sıvı seviyeleri ya da ileoçekal bölgede köpüksü görünüm izlenmektedir. Kistik fibrozis hastalarında gelişen obstrüksiyon; derecesine ve semptomlarına bağlı olarak, multidisipliner yaklaşımla medikal ve cerrahi yöntemlerle tedavi edilmektedir. Bu bildiride; çocuk yoğun bakım ünitesinde DIOS tanısı ile takip edilen; biri konservatif, diğeri ise cerrahi olarak tedavi edilen iki kistik fibrozisli kritik hasta çocuktan bahsedilerek tedavi yöntemlerine dikkat çekilmek istenmiştir.

Anahtar Kelimeler: Kistik fibrosis, distal intestinal obstrüksiyon sendromu, cerrahi

Introduction

Cystic fibrosis is an autosomal recessive inherited disease that may lead to various clinical manifestations as a result of the presence of dark and sticky secretions due to a mutation in the chloride channels in secretory cells. In patients with cystic fibrosis, multisystemic problems, including those of the digestive system, are a result of the inability to secrete enzymes or obstructions in the channels. The second most common complications after respiratory system issues were related to the gastrointestinal system in 65% of the patients. Pancreatic or liver involvement may be present, as well as clinical pictures leading to intestinal obstruction.[1] Invagination, meconium ileus, distal intestinal obstruction syndrome (DIOS) and volvulus are the conditions that may cause intestinal obstruction.[2]

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Received/Geliş Tarihi: 14.07.2022 **Accepted/Kabul Tarihi:** 07.04.2023

DIOS also called meconium ileus equivalent, occurs due to darkened intestinal secretions, pancreatic insufficiency, undigested food residues, and sticky stool stasis in patients with cystic fibrosis. Patients may present with abdominal swelling, constipation, severe abdominal pain in the form of recurrent cramps, and vomiting. Direct abdominal radiographs show dilated small intestines, air-fluid levels or a foamy appearance in the ileocecal region.[3]

Various treatment methods are applied according to the symptoms developed in the patients and the degree of obstruction. While the use of nutritional fiber supplements, stool softening agents and oral polyethene glycol solutions are included in the treatment in the chronic period, clinicians attempt to open obstructions with conservative treatment methods, such as hydration, laxatives, drugs that increase gastrointestinal peristalsis, pancreatic enzyme supplements, enema applications or n-acetylcysteine oral and rectal enema applications in the acute period. However, surgical treatment is applied if the obstruction is not fully opened, and complications develop.[2,3] In this case report, two critically ill children with cystic fibrosis who were followed up with a diagnosis of DIOS in the pediatric intensive care unit were presented, and attention was drawn to their treatment management.

Case Reports

Case 1: A 12-year-old male patient who presented with a homozygous Phe508del mutation in the *CFTR* gene, with pancreatic insufficiency, Type 1 diabetes mellitus and chronic lung disease reported severe widespread abdominal pain for five days, an inability to pass stools, a loss of appetite and vomiting for one day. On physical examination, abdominal distention, hypoactive bowel sounds and generalised sensitivity were present; other system examinations were normal. Laboratory tests were normal except for leukocytosis. While air-fluid levels and gas passage to the distal area were not observed in direct radiography (Figure 1A), distension presented significantly in the jejunum and ileum; on abdominal ultrasonography (US), the small intestines were more prominent than the colon and filled with stool, with no paralytic ileus, which was evaluated as mechanical ileus. With the present clinical and radiological findings, given the DIOS in patients with cystic fibrosis, the patient was hospitalised in the intensive care unit. It was determined that he had no history of meconium ileus and had no previous intestinal obstruction attack. Intraabdominal pressure follow-ups were between 12 and 15 mmHg. Enteral feeding of the patient, who also had intraabdominal hypertension, was discontinued and decompression was performed with a nasogastric catheter. A rectal enema was initiated for the patient who did not pass stools. Despite this, there was no defecation; however, vomiting increased on the 3rd day of hospitalisation, and abdominal computed tomography (CT) was performed on the patient, whose abdominal pain worsened. CT revealed that the intestines were distended and filled with stool; the bowel loop was 4.1 cm at the widest part. Both oral n-acetylcysteine and rectal enema with n-acetylcysteine and oral paraffin liquid were added to the patient's treatment. On the 5th day of hospitalisation, there was abundant defecation, and his intraabdominal pressures remained within normal limits. The patient's complaints, whose DIOS symptoms regressed with conservative treatment without the need for surgery and who tolerated oral nutrition on the 7th day of hospitalisation, did not recur. Patient consent was obtained for this report.

Case 2: A 17-year-old male patient who was homozygous for the Phe508del mutation in the *CFTR* gene showed pancreatic insufficiency, chronic lung disease and atopic dermatitis, and two days of severe abdominal pain, a loss of appetite, vomiting and inability to pass stool for five days. Physical examination revealed abdominal distension, hypoactive bowel sounds and widespread tenderness, especially in the right lower quadrant. Other system examinations were normal. Laboratory examinations were normal except for the elevation of acute-phase reactants. Air-fluid levels were found on direct abdominal radiography (Figure 1B). In abdominal tomography, diffuse free fluid, collapsed colonic loops, diffuse distension and air-fluid levels and faeces densities in the jejunal and proximal ileal loops were observed. While he was hospitalised with a diagnosis of DIOS with the current findings, it was determined that the patient had no history of meconium ileus but had a previous intestinal obstruction attack, and he recovered without the need for surgery.

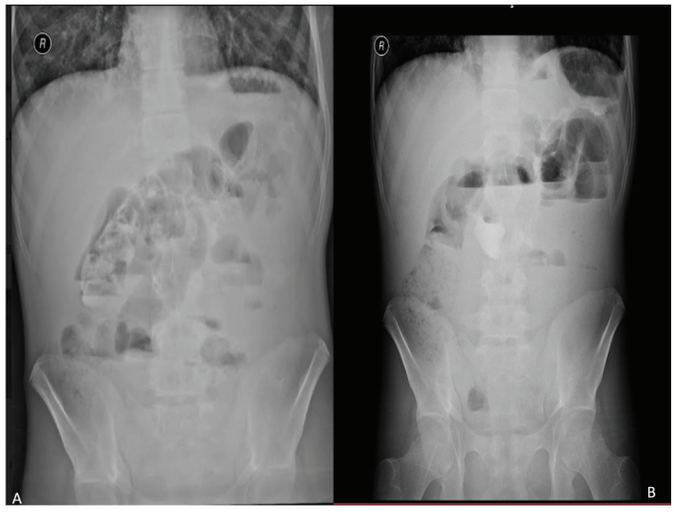

Figure 1. A) Direct abdominal radiography of a 10-year-old patient with distal intestinal obstruction syndrome diagnosis and **B)** Direct abdominal radiography of a 17-year-old patient with distal intestinal obstruction syndrome diagnosis before laparotomy

In his second DIOS attack, the oral intake of the patient was closed, and decompression was performed with a nasogastric catheter. Oral n-acetylcysteine and rectal enema were started as conservative treatments. In the follow-up, the patient had severe abdominal pain, and reported biliary vomiting followed by fecal vomiting; his complete intestinal obstruction symptoms did not regress, and laparotomy was performed by pediatric surgery. In the postoperative follow-up in the intensive care unit, intraabdominal pressures remained in the range of 6-9 mmHg; enemas with n-acetylcysteine were continued. The patient passed gas and stool two days after the operation; he did not have vomiting, tolerated oral feeding on the 5th day, and the acute abdomen symptoms did not recur. Patient consent was obtained for this report.

Discussion

Although there has been a decrease in mortality and morbidity in patients with cystic fibrosis with the advancement of new drugs, respiratory support strategies and approaches in disease exacerbations in recent years, severe complications are still seen. Therefore, complications that may require critical care can often be seen in patients with cystic fibrosis.[4] Patients with cystic fibrosis and distal intestinal obstruction syndrome need to be managed in a multidisciplinary manner, regardless of whether surgery or conservative treatment is applied. While this multidisciplinary approach includes the follow-up of respiratory functions, physiotherapy, the management of comorbid diseases and the regulation of nutrition with oral therapy in the preoperative period, in the postoperative period, it is necessary to focus on preventing pneumonia with early extubation, chest physiotherapy and early mobilisation.[5] Both of our patients were followed up by relevant departments in the intensive care unit with a multidisciplinary approach.

While 65% of the patients with cystic fibrosis are referred with gastrointestinal symptoms, Smith et al.[4] reported that intestinal obstruction and ileus were observed in 24% of critically ill children with cystic fibrosis in their study who were hospitalised in the intensive care unit. Although DIOS may affect patients of all age groups, it is frequently seen in adolescents and young adults.[6] Our patients were in the adolescent age group. The frequency of DIOS in young adults is 18.1%.[7]

The passage of faeces in the intestines slows down due to insufficient fluid secretion as a result of the defect in chloride channels, dehydration, and decreased fat reabsorption caused by pancreatic insufficiency; this plays a role in the pathogenesis of distal intestinal obstruction syndrome. In the differential diagnosis of DIOS, diseases such as chronic constipation, invagination, appendicitis, inflammatory bowel diseases and fibrosing colonopathy are included.[6] The diagnosis of complete or partial DIOS is made using the diagnostic criteria established by the European Society for Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) Cystic Fibrosis Study Group. Intestinal obstruction with air-fluid levels in the small intestines on direct abdominal X-ray and/or biliary vomiting, fecaloid in the ileocecal region and abdominal pain and/or distension constitute the diagnostic criteria.[8] Typical symptoms of the syndrome include abdominal distension, vomiting, weight loss and constipation. The most common obstruction is in the ileocecal junction. Direct abdominal radiographs are used in the diagnosis, with abdominal US and CT shown to help the diagnosis.[9] CT is the gold standard radiological examination with the advantage of precisely visualising the point of obstruction in defining intestinal obstruction and an obstructive mass.[10] Both of our patients were diagnosed with DIOS with ESPGHAN diagnostic criteria and radiological imaging methods, with air-fluid levels on standing direct abdominal radiography, intestinal obstruction and fecaloids seen in advanced imaging methods, constipation, complaints of abdominal pain, abdominal distension and vomiting, and they were all followed up.

The primary treatment of distal intestinal obstruction syndrome is non-surgical, and the conservative approach is successful in most cases. Most of the patients respond well to pancreatic enzymes, hydration, mucolytic agents, intestinal lavage solutions, stool softeners or laxatives, oral polyethylene glycol solution, enema and nasogastric drainage; the colonoscopic approach may eliminate the need for surgical treatment. The regulation of nutrition, oral osmotic laxatives, polyethylene glycol or n-acetylcysteine, is used to avoid DIOS attacks.[11] Surgical intervention is applied when there is no response to medical treatment, and the obstruction cannot be resolved, and when intussusceptions or volvulus develops. In a case series of 80 patients with DIOS, surgical treatment was required in 12.5%.[12] It has been reported in recent publications that the need for surgery has decreased to 3.9%.[5] In another study, it has been reported that only one (4.7%) of 21 DIOS attacks have required surgical intervention, while a pediatric patient who required surgery has been successfully treated with enterotomy and washing procedures.[13] Farrelly et al.[12] examined different surgical procedures over 20 years; they reported that most of the surgically treated patients were successfully treated with enterotomy and washing or small bowel resection with primary anastomosis. Conservative treatments were started after both patients were diagnosed. However, a complete response was obtained with conservative treatment in our first case at the age of 12, and the clinical picture of obstruction regressed. As there was no response to conservative treatments in our 17-year-old patient in his second DIOS attack, laparotomy was performed, enterotomy and washing procedures were performed, and his obstruction was treated.

In conclusion, DIOS is a common gastrointestinal complication that should be considered in patients with cystic fibrosis. Other colon and intestinal pathologies may also occur in these patients. Thus, it is critical to make a fast and accurate diagnosis and provide treatment. In eligible and stable patients, conservative and less invasive approaches should be first attempted to resolve the attack. Surgical treatment methods can also be used when patients with appropriate clinical symptoms do not respond to conservative treatment.

Ethics

Informed Consent: Patient consent was obtained for this report.

Peer-review: Externally peer-reviewed.

Authorship Contributions

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Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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Case Report / Olgu Sunumu

DOI: 10.4274/cayd.galenos.2023.44265
J Pediatr Emerg Intensive Care Med 2023;10:216-20

Kawasaki Disease Shock Syndrome: Think Earlier, Treat Intensively

Kawasaki Şok Sendromu: Erken Tanıyın, Agresif Tedavi Edin

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Abstract

Kawasaki disease shock syndrome (KDSS) is a rare disease characterized by cardiovascular collapse that requires aggressive supportive and immunomodulatory therapy. The purpose of this report is to highlight our management strategies in KSSS patients. Patients who were followed up with a diagnosis of Kawasaki disease in intensive care unit and those who met the criteria for Kawasaki disease shock syndrome were included in the study. Data were obtained retrospectively from hospital records. Between 2005 and 2020, 5 patients with Kawasaki disease were followed up in the pediatric intensive care unit. Three children in the adolescent age group were diagnosed with Kawasaki disease shock syndrome. Two patients had severe coronary artery dilatation, one patient required therapeutic plasma exchange due to multiple organ failure. Kawasaki disease shock syndrome is a serious, life-threatening form of Kawasaki disease and should be suspected in children with severe inflammation and significant cardiac involvement. Administration of plasmapheresis in addition to steroid therapy appears to be effective in controlling severe disease and should not be delayed.

Keywords: Kawasaki disease, vasculitis, shock, steroid therapy

Öz

Kawasaki şok sendromu, agresif destekleyici ve immünomodülatör tedavi gerektiren kardiyovasküler kollaps ile karakterize nadir görülen bir hastalıktır. Bu raporun amacı, Kawasaki şok sendromu hastalarında tedavi stratejilerimizi vurgulamaktır. Kawasaki hastalığı tanısı ile yoğun bakımda izlenen ve Kawasaki şok sendromu ölçütlerini karşılayan hastalar çalışmaya alındı. Veriler geriye dönük olarak hastane kayıtlarından elde edildi. 2005-2020 yılları arasında Kawasaki hastalığı nedeniyle 5 hasta çocuk yoğun bakım ünitesinde izlendi. Ergen yaş grubundaki üç çocuğa Kawasaki şok sendromu tanısı konuldu. İki hastada ciddi koroner arter dilatasyonu vardı, bir hastada çoğul organ yetmezliği nedeniyle terapötik plazma değişimi gerekti. Kawasaki şok sendromu, Kawasaki hastalığının ciddi, hayatı tehdit eden bir şeklidir ve şiddetli enflamasyonu ve belirgin kardiyak tutulumu olan çocuklarda şüphelenilmelidir. Steroid tedavisine ek olarak plazmaferez uygulaması şiddetli hastalığı kontrol etmede etkili görünmektedir ve geciktirilmemelidir.

Anahtar Kelimeler: Kawasaki hastalığı, vaskülit, şok, steroid tedavisi

Introduction

Kawasaki disease (KD) is the most common cause of acquired heart disease causing coronary artery aneurysms.[1,2] It is mostly seen in early childhood (<2 years). The main pathology of the disease is vasculitis of medium and small-sized arteries associated with increased immune response, often triggered by a viral infection, environment and vaccine associated toxins.[3] It is generally a self-limiting disease with a good long-term prognosis that responds well to intravenous immunoglobulin (IVIG) therapy.[4] However, there is also a subgroup which is resistant to IVIG and associated with coronary artery involvement and poor prognosis.[5,6] Kawasaki disease shock syndrome (KDSS) refers to a subgroup of patients with KD who present with cardiovascular dysfunctions and other organ system dysfunctions. The aim of this report was to

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Received/Geliş Tarihi: 20.09.2022 **Accepted/Kabul Tarihi:** 13.04.2023

investigate the characteristic features of children diagnosed with KDSS which is a rare but life-threatening disease, and its clinical presentation is often atypical.

Results

Between 2005-2020, five patients required intensive care treatments; one was admitted for giant aneurysm resulting myocardial ischemia and four for severe organ dysfunction and one for septic shock after immunomodulating treatments. Three patients were met the KDSS criteria. Patient 1 was an 8-year-old boy who suffered from fever at least five days, maculopapular rash, and unilateral painless cervical lymphadenopathy. A strawberry tongue, bilateral non-purulent conjunctivitis, desquamation of fingertips, tachypnea, gallop rhythm along with tachycardia, weak peripheral pulses and hypotension were detected on physical examination. Echocardiography (ECHO) revealed diffuse dilatation of the coronary arteries. The ejection fraction (EF) was 62%. He was admitted to the intensive care unit and received high-dose inotropes, IVIG (2 gr/kg, single dose), acetylsalicylic acid (ASA). After IVIG and ASA therapy, the fever resolved but need of inotropes persisted. Thus, a course of oral prednisolone treatment (2 mg/kg/day) was started. The patient showed clinical improvement after steroid treatment and was discharged on the 10th day of hospitalization (Table 1).

Patient 2 was a 16-year-old girl who had fever for at least five days, generalized rash and abdominal pain. Conjunctival hyperemia, strawberry tongue and maculopapular rash were detected on her physical examination. The laboratory investigations showed increased C-reactive protein (CRP), hypoalbuminemia, elevated creatinine and liver transaminase levels and thrombocytopenia but normal erythrocyte sedimentation rate (ESR). The chest X-ray revealed bilateral pleural effusion, and hydrops of bile sac was detected on abdominal ultrasound. She had decompensated shock requiring high dose inotropes and mechanical ventilation. ECHO studies showed diffuse dilatation of coronary arteries. Figure 1 and Figure 2 show the coronary artery dilatation on reconstructed 3-dimensional (3D) cardiac computerized tomography (CT) scan. She was diagnosed with KDSS and after IVIG therapy with a single dose of 2 gr/kg fever resolved but she remained hypotensive, so high dose methylprednisolone (500 mg/day, 5 days) therapy was initiated. On the second day of steroid therapy, inotropes were stopped. She was

Table 1. General information of the patients' demographic data, laboratory investigations and clinical course

	Patient 1	Patient 2	Patient 3
Age	8 years	16 years	13 years
Sex	Male	Female	Female
Symptoms	Fever Rash Lymphadenopathy Strawberry tongue Non-purulent conjunctivitis	Fever Rash Abdominal pain Conjunctival hyperemia Strawberry tongue	Fever Vomiting abdominal pain Rash Conjunctival hyperemia
Serum CRP level (mg/dL)	29.1	33	9.2
ESR (mm/h)	19	8	2
Ferritin level (µg/L)	-	1.330	1.061
Thrombocyte count (cell/mm^3)	454.000	309.000	204.000
Serum albumin level (gr/dL)	3.05	3.24	2.83
Z-scores of CAs LCA LADA RCA	 1.9 2.7 0.83	 2.5 - 6.3	 0.13 3.07 6.8
Need of mechanical ventilation	No	Yes	Yes
Need of inotropic agents	Yes	Yes	Yes
Immunomodulatory treatment	IVIG (2 gr/kg) Oral prednisolone (2 mg/kg/d)	IVIG (2 gr/kg) IV methylprednisolone (500 mg/d, 5 days) infliximab	IVIG (2 gr/kg) IV methylprednisolone (20 mg/kg/d, 5 days) TPE
Length of stay in PICU	5 days	5 days	5 days
Length of stay in hospital	10 days	18 days	13 days
Mortality	No	No	No

CRP: C-reactive protein, ESR: Erythrocyte sedimentation rate, CA: Coronary artery, LCA: Left coronary artery, LADA: Left anterior descending coronary artery, IVIG: Intravenous immunoglobulin, TPE: Therapeutic plasma exchange, PICU: Pediatric intensive care unit

discharged from the intensive care unit after five days with infliximab for persistent proteinuria.

Patient 3 was a 13-year-old-girl who presented with fever, vomiting and abdominal pain. Four days after the onset of the fever, a maculopapular rash that appeared from neck to trunk. Conjunctival hyperemia, rash, decreased respiratory sounds, weak pulses and poor perfusion findings were detected on physical examination. Laboratory findings showed increased CRP, hypoalbuminemia, anemia, pyuria but normal ESR. ECHO showed diffuse dilatation of coronary arteries. Figure 3 shows the coronary artery dilatation on reconstructed 3D cardiac CT scan. EF was 42%. She was mechanically ventilated and treated with IVIG (2 gr/kg single dose) and intravenous methylprednisolone (20 mg/kg/day, for five days). Fever resolved with combined IVIG and steroid therapy but need of vasoactive agents persisted. One episode of therapeutic plasma exchange (TPE) with the amount of plasma volume of the patient was applied. She clinically improved in a short time, inotropic treatments were discontinued, and she discharged from intensive care on the 5th day.

To use clinical data for this case series an informed consent was obtained from the parents of all the patients.

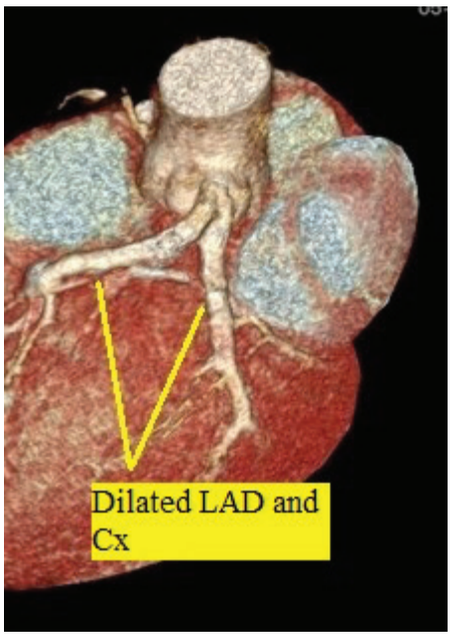

Figure 1. The left coronary artery and left ascending coronary artery of the patient 2 on reconstructed 3D cardiac computerized tomography (CT) scan

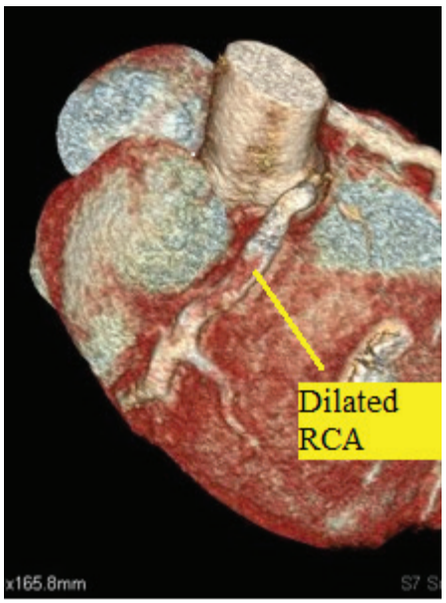

Figure 2. The right coronary artery and circumflex artery of the patient 2 on reconstructed 3D cardiac CT scan
CT: Computerized tomography

Discussion

There is no definitive diagnostic test for KD; thus, diagnosis relies on clinical criteria and laboratory findings. The American Heart Association-AHA (2017) diagnostic criteria are fever lasting five days or more and four of the five major clinical criteria.[7] There is a group of patients who do not fully meet these criteria but still have KD and are at risk for coronary artery disease. For this reason, the single hub and access point for pediatric rheumatology in Europe-SHARE initiative recommends that KD diagnosis and treatment should not be delayed if: 5/6 diagnostic criteria of KD are present before day 5 of fever, coronary artery aneurysms or coronary dilatation are present and there is evidence of persistent (4 days) elevation of inflammatory markers and/or persistent

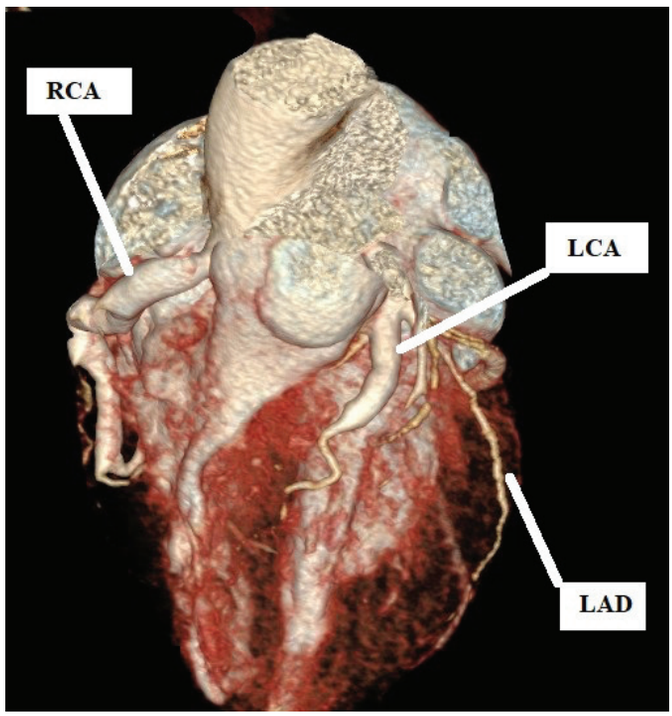

Figure 3. The CA dilatation of the patient 3
CA: Coronary artery, LCA: Left coronary artery

fever, especially in infants or younger children without other explanation.[4] Hypoalbuminemia and thrombocytosis as a late phase finding are minor criteria. As shown in Table 1, all patients had elevated CRP levels, but normal ESR and platelet counts. Only one of them had hypoalbuminemia. The last two of our patients conform to the definition of incomplete or atypical KD and ECHO findings provided the KD diagnosis. The EFs were normal and/or close to normal but multiple organ failure prevailed with severe hypotension and poor perfusion findings. Therefore, it can be said that the severe clinical conditions of these patients were not only associated with coronary artery involvement. In a retrospective study, KDSS was defined as follows; sustained hypotension, need to transfer to an intensive care setting and clinical signs of inadequate organ perfusion.[8] In another large retrospective data of 2.203 patients with KD, the incidence of KDSS reported as 1.23% and the patients with KDSS were older than those with classical KD.[9]

The SHARE initiative recommends that corticosteroid treatment should be given to patients with severe KD which characterized with IVIG resistance, features of hemophagocytic lymphohystiocytes, shock and presentation with coronary and/or peripheral aneurysm.[2] There are no definitive recommendations about the steroid dosing. Both low (1-4 mg/kg/day) and high dose (10-40 mg/kg/day) methylprednisolone seem to be equally effective.[10]

During the Coronavirus disease-2019 pandemic, which is a disease in which adult respiratory distress syndrome is at the forefront in adults, the number of pediatric patients increased with time. We learned from the pandemic that the virus associated hyperinflammatory state showed similarity with KD.[11] It is reported that advanced treatments such as IVIG and plasma exchange can potentially provide immunomodulation in these patients.[12] Although it was not possible to determine the immunological profile of our patients, the obvious clinical improvement with early steroid treatment supports these findings. KDSS is a kind of cytokine storm condition and tighter regiments of immunomodulation are required for success. In a Cochrane review, the authors conclude that the use of steroids in the acute phase of KD can be associated with improved coronary artery abnormalities, shorter length of stay and decreased duration of clinical symptoms.[13] In more severe cases even without coronary artery involvement, early administration of steroid combined IVIG therapy may help to stabilize the patient.[14] Monoclonal antibodies such as infliximab can be used in cases with refractory inflammation.[15] Therapeutic plasma exchange is an alternative third-line treatment for IVIG refractory KD. It is reported that early administration of TPE improves coronary artery involvement when there is IVIG resistance.[16,17] In patient 3, TPE allowed us to withdraw inotropes.

Conclusion

KDSS is severe and acutely life-threatening form of KD and should be suspected in children who do not meet all the criteria of classical KD but have severe inflammation findings and significant coronary artery involvement. Early administration of immunomodulatory treatment is crucial when KDSS is suspected. Steroid treatment and plasmapheresis seem to be effective for controlling disease progress and should not be delayed in patients unresponsive to the initial immunomodulatory treatment.

Acknowledgements: This work was presented by the corresponding author in International Rumi Pediatric Congress-2019, IRUPEC-2019. 1. Uluslararası Rumi Pediatri Kongresi, 4-7 Aralık 2019, Konya, Türkiye.

Ethics

Informed Consent: Informed consent was obtained from the parents of all the patients.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Ö.S.N., A.Ü.Y., Y.B., Concept: S.K., B.B., Design: S.K., Data Collection or Processing: Ö.S.N., Y.B., S.Ö., B.B., Analysis or Interpretation: S.K., Y.B., S.Ö., B.B., Literature Search: Ö.S.N., S.Ö., Writing: Ö.S.N., S.K., S.Ö., B.B.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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Case Report / Olgu Sunumu

DOI: 10.4274/cayd.galenos.2023.24085
J Pediatr Emerg Intensive Care Med 2023;10:221-3

Post-traumatic Carotid Artery Dissection and Infarction

Travma Sonrası Karotis Arter Diseksiyonu ve Enfarktüsü

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Abstract

Post-traumatic internal carotid artery dissection is a very rare condition in children that occurs after blunt force trauma to the head or neck. A 15-year-old male patient who presented to the emergency room with weakness after a trauma to his neck sustained during a physical altercation is presented.

Keywords: Pediatric trauma, internal carotid artery, dissection, ischemic stroke

Öz

Çocuklarda baş boyuna künt travma sonrası internal karotid arter diseksiyonu çok nadir bir durumdur. Kavga esnasında boyun travmasına maruz kalan ve sonrasında acil servise halsizlik, bilinç bulanıklığı şikayetleri ile başvuran 15 yaşında erkek hasta sunulmaktadır.

Anahtar Kelimeler: Pediyatrik travma, internal karotid arter, diseksiyon, iskemik inme

Introduction

Post-traumatic carotid artery dissection (PTCAD) describes mechanical compression of the entire carotid artery wall caused by a subintimal hematoma. The main lumen may be narrowed by the pseudo-lumen, leading to stenosis.[1] In addition, thrombus in the pseudo-lumen may cause intracranial embolism. Arterial ischemic stroke (AIS) can cause morbidity in both children and adults. Early diagnosis and appropriate treatment are important to prevent or limit the damage caused by brain ischemia.[2] The pathophysiology of pediatric and adult carotid artery dissection (CAD) differs according to location and clinical presentation.[3] Most pediatric cases of PTCAD result from direct blunt or penetrating trauma of the internal carotid artery (ICA), acute hypertension, sudden hyperextension, or excessive rotation of the neck. Since children show craniocervical instability due to weak neck muscles, adherence to ligament structure rather than bone structure, a high head-neck ratio, and underdeveloped protective reflexes, their risk of PTCAD is higher than that of adults.[4]

PTCAD typically affects the distal cervical segment of the ICA, and the degree of vascular mobility of the ICA suddenly changes before it enters the carotid canal at the base of the skull in children.[5] During both hyperextension due to rapid deceleration or rotation of the head, the ICA stretches over the upper cervical vertebra, and rupture of the internal wall of the vessel can occur.[6]

Case Report

A 15-year-old male patient involved in a physical altercation with a friend the day before presentation to the emergency department, and who was punched in the neck, presented with weakness and altered mental status. The vitals signs were as follows: Temperature, 36.7 °C; heart rate, 84 beats/min; blood pressure, 125/80 mm Hg; respiratory rate, 18 breaths/min; and oxygen saturation, 97%. On physical examination, besides altered mental status, no patient orientation or cooperation was present. The response to the painful stimulus was weak. The Babinski sign was positive on the right side, but not on the left side. The deep tendon reflex

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Received/Geliş Tarihi: 26.01.2023 **Accepted/Kabul Tarihi:** 26.05.2023

was normal in the right patella. No anisocoria or abnormal pupil reaction was seen, and all other physical examination findings were normal.

Cranial computed tomography (CT) revealed brain edema and a mild hypodense area in the left globus pallidus (Figure 1). Cranial and diffusion magnetic resonance imaging (MRI) showed dissection of the left ICA and acute ischemia in the left lentiform nucleus, respectively (Figure 2). CT angiography (CTA) revealed marked thinning in the calibration, compatible with the PTCAD evident at the level of the skull base and starting from the distal cervical segment of the left ICA (Figure 3).

Surgical and interventional procedures were not required by department of neurosurgery and neuroradiology. The patient was transferred to the intensive care unit, and 1 mg/kg enoxaparin was started. No features other than bradycardia was detected on echocardiography and electrocardiography. A slow wave was observed in the left hemisphere in electroencephalography. During follow-up, the patient regained consciousness and started to respond to questions. Muscle strength improved to 4/5. Enoxaparin maintenance therapy was stopped, and clopidogrel 75 mg/day was started.

The patient was discharged without sequelae, and MRI, MR angiography (MRA), and carotid color Doppler ultrasound findings were normal 3 months after discharge.

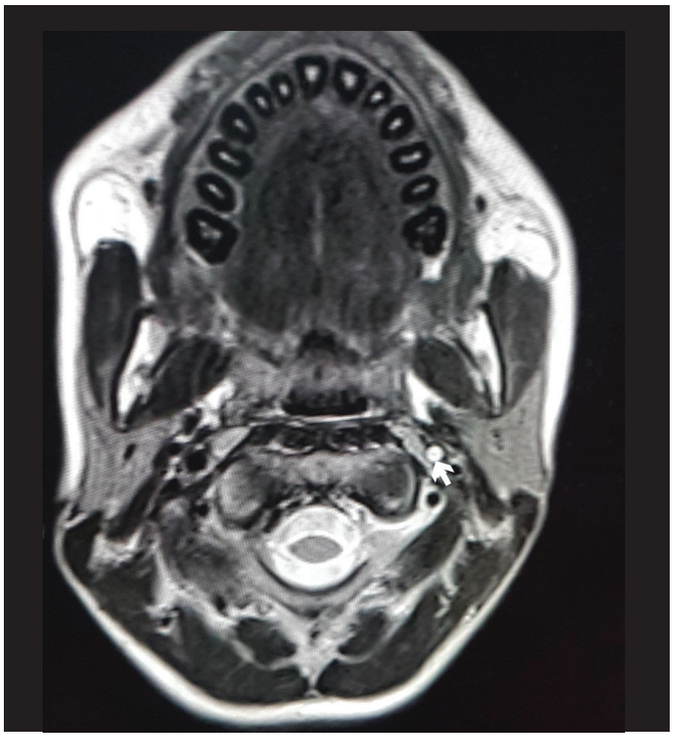

Figure 1. Non-contrast CT showing ventricular compression compatible with brain edema, and a suspicious left-sided hypodense area

CT: Computed tomograhpy

Discussion

The carotid artery dissection accounts for about 2% of all strokes. Carotid artery dissection is most common among young people. Spontaneous or traumatic CAD can affect the intracranial or extracranial segment of the carotid artery. Penetrating or blunt trauma can cause CAD. The carotid artery dissection accounts for about 20% of pediatric cases

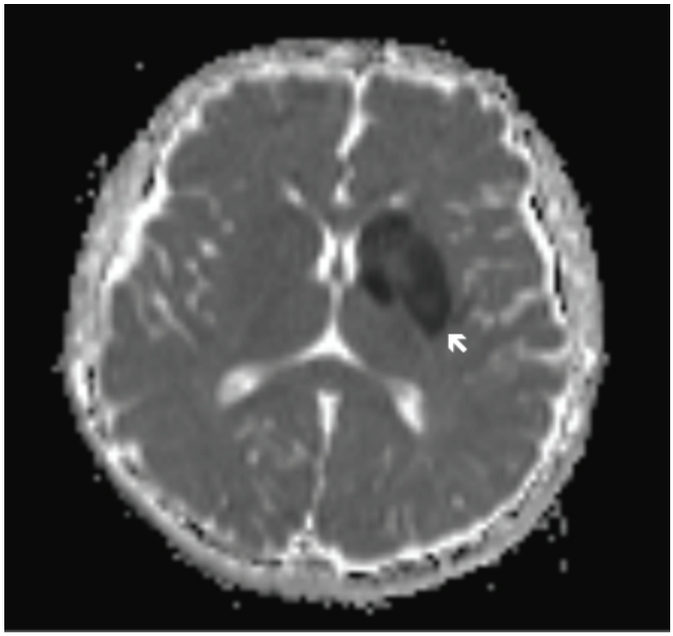

Figure 2. Diffusion MRI showing diffusion restriction, consistent with the ischemic area in the left lentiform nucleus

MRI: Magnetic resonance imaging

Figure 3. CT angiography showing total occlusion of the internal carotid artery

CT: Computed tomograhpy

of AIS.[7] The long-term outcome depends on the size of the brain area affected. Serious neurological sequelae may occur, such as severe hemiparesis, hemiplegia, aphasia, and epileptic seizures.[8] Ischemia-induced damage increases with the size of the affected area. Prodromal symptoms of CAD can vary markedly among pediatric patients. Symptoms such as epileptic-like seizures and coma may delay diagnosis. Early diagnosis and treatment can reduce morbidity.[9]

Many genetic and environmental factors are associated with CAD in children, including upper respiratory tract infections, congenital heart diseases, connective tissue diseases, homocystinuria, and head and neck trauma.[10]

The distal segment of the ICA, before it enters the carotid canal at the base of the skull, is the segment most vulnerable to PTCAD. During hyperextension and neck rotation, the ICA is stretched over the upper cervical vertebrae, which may cause intimal tears.[11]

CT can reveal skull base fractures typically associated with PTCAD in children. In our case, non-contrast CT was performed during the initial assessment, and brain edema and apparent parenchymal damage were detected.[12] Although it has not been used extensively, CTA has been reported to be as sensitive as MRA for CAD detection.[13]

Conventional angiography is the gold standard for diagnosis of PTCAD; however, it is not suitable for all pediatric patients.[14] MRI findings of PTCAD include the absence of a normal flow cavity and narrowing of the arterial lumen caused by hematoma within the arterial wall. MRA may reveal conical narrowing or occlusion of the dissected vessel. The main advantage of MRI over conventional angiography is that it can be used to estimate the time of occurrence of CAD-associated thrombosis. Anticoagulants may be indicated to prevent thromboembolism from affecting the brain. However, evidence regarding their effects in CAD is scarce.[15]

Conclusion

PTCAD is one of the most common causes of pediatric AIS. Emergency physicians should be aware of the increased risk of PTCAD in children with head and neck trauma, arising from the characteristics of the pediatric cranio-cervical junction and the mobility of the neck. PTCAD should be excluded in patients with a history of blunt or penetrating injury, sudden acceleration/deceleration of the head, or excessive rotation of the head and neck region. Early diagnosis and treatment of PTCAD, before the onset of neurological symptoms, are important for good long-term outcomes.

Ethics

Informed Consent: The consent of the patient's parents was obtained for the publication of this case report.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: Y.S., Y.E.D., Design: Y.S., Y.E.D., Analysis or Interpretation: Y.S., Y.E.D., Writing: Y.S., Y.E.D.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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DOI: 10.4274/cayd.galenos.2023.56933
J Pediatr Emerg Intensive Care Med 2023;10:224-7

Moyamoya Disease, Which is Rare in Infancy: A Case Report

Bebeklik Döneminde Nadir Görülen Moyamoya Hastalığı: Olgu Sunumu

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Abstract

Moyamoya disease etiology is an undetermined vasculopathy and is mainly thought to affect the Internal Carotid Artery and Wills circle. An 8-month-old patient without any underlying disease was referred to our hospital with sudden extreme right hemiparesis. There was no evidence of meningeal irritation in the neurological examination, decreased tonus on the right side, strength in the upper right extremity 3/5 and strength in the lower right extremity 2/5, deep tendon reflexes were exaggerated. Cranial brain tomography angiography showed in both distal internal cerebral arteries and branches and a significantly curvy appearance, with similar changes present in the veins forming the Willis circle. Low molecular weight heparin, acetylsalicylic acid, and levetiracetam were started. On the fifth day of follow-up, motor activity in the lower right extremity returned to normal. The power loss of 2/5 in the upper right extremity was continuing. The patient was then transferred to a center with Moyamoya surgery, which may be needed. This case highlights the importance of considering Moyamoya disease as a classical etiologies of acute ischemic strokes in children. It also highlights the rare presentation among the Turkish population and the use of neurovascular imaging techniques to facilitate the diagnosis of Moyamoya diseas

Keywords: Infant, Moyamoya disease, cerebral angiography, acute stroke

Öz

Moyamoya hastalığı etiyolojisi belirlenmemiş bir vaskülopatidir ve esas olarak internal Karotis arteri ve Wills çemberini etkilediği düşünülmektedir. Herhangi bir şikayeti olmayan 8 aylık hasta ani aşırı sağ hemiparezi ile hastanemize sevk edildi. Nörolojik muayenesinde meningeal irritasyon bulgusu yoktu, sağda tonus azalması, sağ üst ekstremitede kuvvet 3/5 ve sağ alt ekstremitede kuvvet 2/5, derin tendon refleksleri abartılı idi. Kraniyal beyin tomografisi anjiyografisi hem distal iç serebral arterlerde ve dallarda hem de Willis çemberini oluşturan damarlarda benzer değişikliklerle birlikte önemli ölçüde kıvrımlı bir görünüm gösterdi. Düşük moleküler ağırlıklı heparin, asetilsalisilik asit ve levetirasetam başlandı. Takibinin beşinci gününde sağ alt ekstremite motor aktivitesi normale döndü. Sağ üst ekstremitede 2/5 güç kaybı devam ediyordu. Hasta daha sonra ihtiyaç duyulabilecek Moyamoya ameliyatı olan bir merkeze transfer edildi. Bu olgu, Moyamoya hastalığının çocuklarda akut iskemik inmelerin klasik etiyolojisi olarak düşünülmesinin önemini vurgulamaktadır. Ayrıca, Türk popülasyonu arasında nadir görülen prezentasyona ve Moyamoya hastalıklarının tanısını kolaylaştırmak için nörovasküler görüntüleme tekniklerinin kullanımına vurgu yapmaktadır.

Anahtar Kelimeler: Bebek, Moyamoya hastalığı, serebral anjiyografi, akut inme

Introduction

Moyamoya disease was first described in Japanese literature in 1957, and 12 years later, in 1969, Suzuki and Takaku used "Moyamoya disease". Its etiology is an undetermined vasculopathy and is thought to be mainly influenced by the Internal carotid artery and the Wills circle. Moyamoya disease has been associated with hereditary conditions (sickle cell anemia, neurofibromatosis type 1, Down syndrome) and acquired conditions (chronic meningitis, intracranial mass, cranial radiotherapy, cerebral vasculitis, etc.). We present an 8-month-old moyamoya case with weakness in the right lower and upper extremities.

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Received/Geliş Tarihi: 05.10.2022 **Accepted/Kabul Tarihi:** 07.06.2023

Case Report

The 8-month-old girl, who had no previous complaints, presented with complaints of weakness in her lower right and upper extremities. The child was admitted to the intensive care unit because he had 4/5 muscle weakness in the right arm and 3-4/5 in the right leg. Although the patient was conscious at the first physical examination, he was restless and could not use his lower right and upper extremity. Other system findings were normal. The patient has been monitored-with oxygen support. Peripheral vascular pathway open. Initial vital findings: Fever: 37.1 °C, heart rate: 160/minute, blood pressure: 85/40 mmHg measured. Fluid support from 100 cc/kg was started. The patient's lower and upper extremity X-rays were taken and interpreted. Encephalitis, meningitis, and intracranial mass were considered in the differential diagnosis of the patient. Cranial tomography of the patient was taken. There was no intracranial mass. The patient underwent a lumbar puncture. Both biochemical tests and culture were sent in the cerebrospinal fluid (CSF). Brain-neck CT angiography examinations and non-contrast cranial computed tomography (CT) examination revealed a large area suggesting ischemia in the left frontoparietal. CT angiography showed numerous slates in both distal internal cerebral arteries (ICA), branches, and a pronounced curvy appearance, and similar changes were present in the veins forming the Willis circle. In addition, very thin collateral veins-Moyamoya veins were noted in the Willis circle (Figure 1).

Cranial diffusion MRI imaging following CT noted the restriction of diffusion in the area of the left middle cerebral artery (MCA) superior segment and partly acute ischemia in the left anterior cerebral artery (ACA) irrigation area, and thickening of the vortex in this area in line with acute ischemia (Figure 2). In addition to the diffusion study, the FLAIR sequence also had gliotic changes at the centrum semiovale level on the right that suggest the previous ischemic process. No intracranial mass lesions were detected in the etiological examinations of the case. Infection scans did not reveal any culture reproduction. The patient's prior family history was found to have a history of cerebrovascular occlusion (SVO) at a young age in his mother, aunt, and grandfather. Moyamoya disease was considered in line with the imaging findings of the case. Low molecular weight heparin (2 mg/kg/day), aspirin (2 mg/kg/day) and levetiracetam (20 mg/kg/day) were started. In clinical follow-up, the patient had focal seizures in the left arm, and electroencephalography showed no seizure activity. On the fifth day of follow-up, motor activity in the lower right extremity was seen to return to normal. Power loss was continuing in the upper right extremity at 2-3/5. The patient was consulted with pediatric hematology, pediatric neurology, and neurosurgery. It was recommended that the patient be discharged with low molecular weight heparin, aspirin, and levetiracetam. In addition, neurosurgery approved his referral to a place where Moyamoya surgery was performed, and the patient was then transferred to a center with Moyamoya surgery, which may be required.

Discussion

Moyamoya disease is a rare vasculopathy characterized by angiographic findings of abnormal vascular distribution and bilateral occlusion of the internal carotid artery terminal section, whose etiology is unclear.[1] The disease often presents in the form of a transient ischemic attack (TTIA) or ischemic

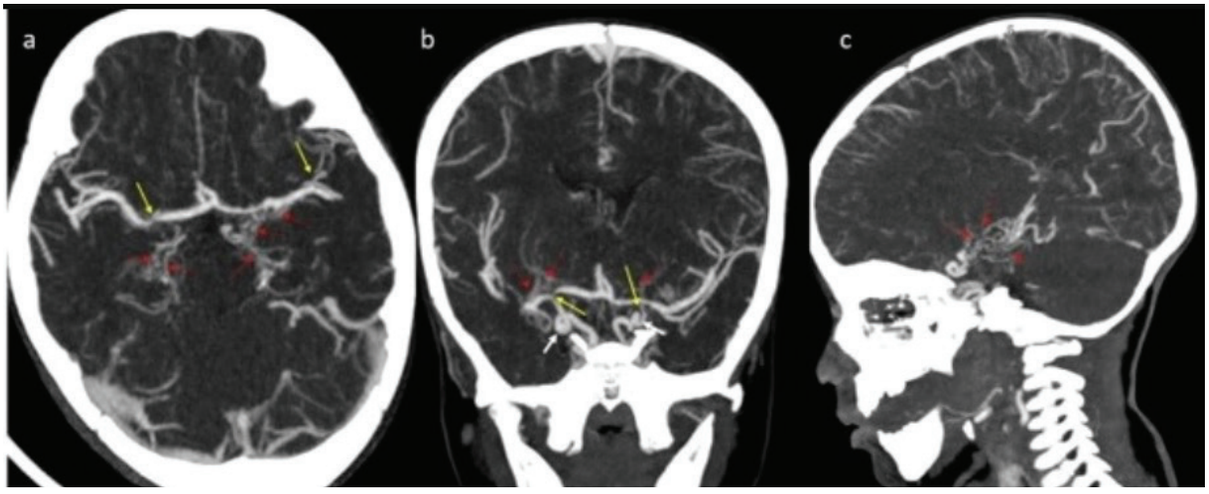

Figure 1. CT angiography examination, axial (a), coronal (b), and sagittal (c) planes; a, occlusions (yellow arrows) in the left MCA superior segment at the right ICA bifurcation level; b, bilateral tortiyoze ICA (white arrows), occlusions in the right ICA bifurcation segment and the left ICA supraklinoid segment (yellow arrows); in all three images, thin curvy collateral veins, Moyamoya veins are shown with red arrows

CT: Computed tomography, MCA: Middle cerebral artery, ICA: Internal cerebral arteries

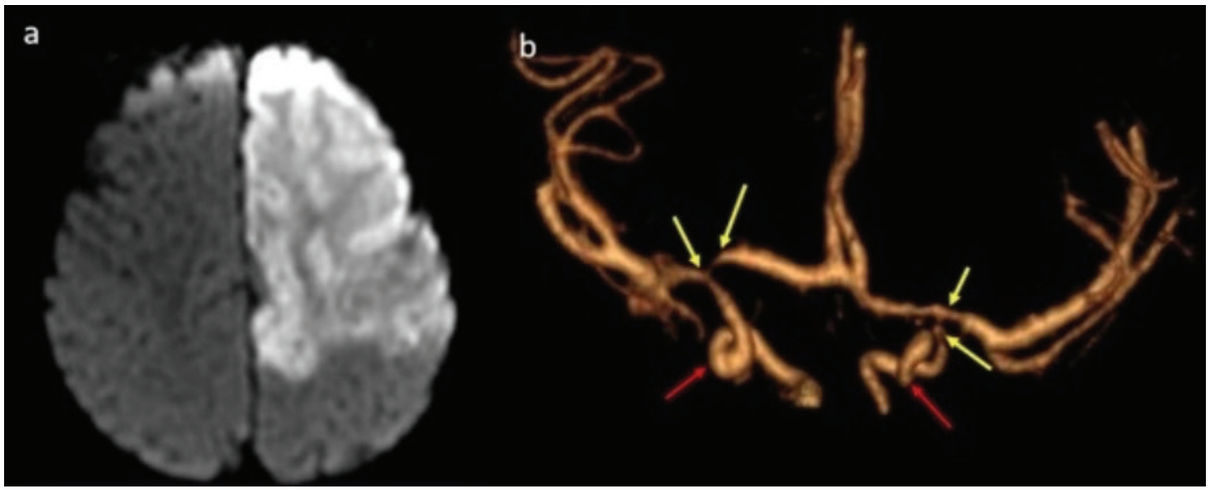

Figure 2. a) Diffusion-weighted MRI imaging, constraint restriction compatible with acute ischemia in the frontal and parietal on the left; b) CT angiography 3D VR imaging shows curvy distal ICA's with red arrows, slacks with yellow arrows

ICA: Internal cerebral arteries, CT: Computed tomography, MRI: Magnetic resonance imaging

infarction.[2,3] However, unlike children, intracranial bleeding was reported in the adult patient group.[4] Seizures occur in child and adult case groups, often complications of ischemic or hemorrhagic events. Children may experience a decline in the cognitive function directly related to the number of ischemic events undergoing and chronic hypoxemia exposed. Although its relationship with hereditary or acquired causes is widely reported in the literature, its etiology is unclear. Moyamoya appearance; neonatal anoxia, trauma, basil meningitis, neurofibromatosis type 1, tuberculosis, Sturge-weber syndrome, brain tumors, Marfan syndrome, Turner syndrome, cerebral dissection, sickle cell anemia, Down syndrome, Alagille syndrome can cause and therefore should be kept in mind in the differential diagnosis.[3] In our case, the perinatal history was normal, and there was no history of trauma, physical examination findings of syndromes, and no clinical findings were detected.

The disease is a bimodal distribution, occurs in children at an average age of 2-17 years, while in adults, it occurs at an average age of 30-40 years. While motor symptoms such as hemiparesis are observed first in ischemic attacks, aphasia, and dysesthesia follow this process.[5] The first symptom was an ischemic cerebrovascular stroke and was an infant patient outside the age range specified in the literature.

As with other cerebrovascular diseases, brain tomography is the first diagnostic imaging method for moyamoya disease suspected. Although the brain is very successful in distinguishing CT ischemic or hemorrhagic stroke, CT or MRI angiography examinations are needed for blocked vessel imaging. In angiographic imaging, moyamoya veins, which give the disease its name, are monitored in very thin collaterals, causing the appearance of clouds or cigarette smoke (Moyamoya).[6] In line with angiographic evaluation, possible or definitive moyamoya disease can be diagnosed.[7] In our case, there were common Moyamoya veins.

Today, an utterly therapeutic approach has not yet been developed. It should be remembered that medical treatments do not stop the progression of the disease but contribute to reducing its complications. Since there is no initial treatment for the disease, standard treatment protocols for stroke or hemorrhage are applied. Each case should be evaluated separately, and the option of surgical treatment should also be considered. Revascularization procedures such as surgical anastomosis from ICA to ECA can reduce the quality of life and ischemic complications.[8] Due to the rapid progression of the clinic in our case, the succession of ischemic attacks over two months, Moyamoya surgery was referred to a center for evaluation of the surgical treatment option. In the literature, there are many patients with moyamoya disease in the older age group. However, moyamoya disease should be kept in mind in patients under the age of 1 who present with muscle weakness and seizures.

Conclusion

The range of differential diagnoses in the child patient presenting with ischemic stroke is vast. Today, there is no optimal treatment for Moyamoya disease, but in fast-moving cases, urgent diagnosis, the necessary anticoagulation treatment should be started, and, where necessary, surgical treatment should be considered. Our case will contribute to the literature in terms of considering vascular pathologies in the differential diagnosis of an infant patient presenting with hemiparesis and hemiplegia.

Ethics

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: E.B., Concept: E.B., M.B., D.B., Design: E.B., M.B., D.B., Data Collection or Processing: E.B., Analysis or Interpretation: E.B., Literature Search: E.B., A.D., Writing: E.B., A.D.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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