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SELCUK MEDICAL JOURNAL

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Araştırma Makalesi / Research Article

Olgu Sunumu / Case Report

DERGİ HAKKINDA

İlk olarak 1984 yılında yayın hayatına başlayan Selçuk Tıp Dergisi (Selcuk Med J) (ISSN: 1017-6616, e-ISSN: 2149-8059), Necmettin Erbakan Üniversitesi, Meram Tıp Fakültesi'nin bağımsız, çift kör, hakemli bilimsel yayın organıdır. Dergimiz Mart, Haziran, Eylül ve Aralık aylarında üç ayda bir yayımlanmaktadır.

Derginin sayılarına tam erişim aşağıdaki adresten temin edilebilir.

http://www.selcukmedj.org

Selçuk Tıp Dergisi (Selcuk Med J) dünya genelinden yayınları kabul etmektedir. Yayınlar en az iki hakem tarafından orijinal bilgi, fikir ve sunum açısından değerlendirilmektedir.

Selçuk Tıp Dergisi (Selcuk Med J), Türkçe ve/veya İngilizce makaleleri yayınlar, dergi içeriklerine ücretsiz erişim sağlar (Open Access) ve yazarların makalelerin son kabul edilmiş halini OAI uyumlu kurumsal / konu bazlı bir havuzda kendi arşivleyebilmelerine izin verir.

Selçuk Tıp Dergisi (Selcuk Med J) tıp doktorları, araştırmacılar ve bilim adamlarından oluşan bir kitleye yönelik çok disiplinli bir dergidir.

Etik Kurallara Uygunluk

Derginin yayın ve yayın süreçleri Uluslararası Medikal Dergisi Editörleri Komitesi (International Committee of Medical Journal Editors) (ICMJE), Dünya Tıbbi Editörler Birliği (World Association of Medical Editors) (WAME), Bilim Editörleri Konseyi (Council of Science Editors) (CSE), Yayın Etiği Komitesi (Committee on Publication Ethics) (COPE)), Avrupa Bilim Editörleri Derneği (European Association of Science Editors) (EASE) ve Ulusal Bilgi Standartları Örgütü (National Information Standards Organization) (NISO) yönergelerine uygun olarak şekillendirilmiştir.

Dergimiz 'Şeffaflık ve Akademik Yayıncılık En İyi Uygulamalar İlkelerine' (Principles of Transparency and Best Practice in Scholarly Publishing) (doaj.org/bestpractice) uygundur.

Makalelerin daha önce hiçbir yerde yayınlanmamış ve yayın için başka bir dergiye gönderilmemiş olması gerekir. Selçuk Tıp Dergisi'nde intihal programı (iThendicate) kullanılmaktadır. Akademik atıf sınırını aşan benzerlik taşıyan makaleler ve yayın kurallarına uygun olarak hazırlanmamış makaleler değerlendirmeye alınmayacaktır. Tüm çalışmalarda etik kurul onayı gerekmektedir ve bu onamın belgelendirilmesi yazıların yayınlanmasında esas teşkil edecektir.

Tüm çalışmalarda yazarların çalışmaya katkı düzeyi ve onayı bildirilmelidir. Çalışmada veri toplanması, deney aşaması, yazım ve dil düzenlemesi dahil olmak üzere herhangi bir aşamasında finansal çıkar çatışması olmadığı bildirilmelidir. Çalışmada varsa ticari sponsorluk bildirilmelidir.

Yazarlardan Selçuk Tıp Dergisi'nde yayımlanacak makaleleri için herhangi bir ödeme istenmez.

Bütün makaleler editor ve yayın kurulu tarafından üç ay içerisinde sonuçlandırılacaktır. Fakat elde olmayan gecikmelerden dolayı bu süre uzayabilir.

Dergi Amaç ve Kapsamı

Selçuk Tıp Dergisi amacı, genel tıp alanında tanı ve tedavideki güncel gelişmeler, cerrahi yenilikler ve bilim dünyasına katkıda bulunacak deneysel çalışmaların ulusal ve uluslararası literatürde paylaşımının sağlanmasıdır.

Selçuk Tıp Dergisi, sağlık bilimlerindeki tüm etik yönergelere uygun olarak hazırlanmış klinik ve deneysel araştırma makaleleri, olgu bildirileri, derleme makaleleri, teknik notlar ve editöre mektupları yayınlamaktadır.

Bu Sayıda Görev Alan Hakemler

1. Prof. Dr. Ahmet SERT
2. Prof. Dr. Ali BAYRAM
3. Prof. Cem KARADENİZ
4. Prof. Dr. Hayri OĞUL
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19. Dr. Öğr. Üyesi Selçuk KUZU

YAZARA AÇIKLAMA

Selçuk Tıp Dergisi (Selcuk Med J) Necmettin Erbakan Üniversitesi, Meram Tıp Fakültesi Dekan'lığının yayın organıdır. Dergimize yazı hazırlanırken aşağıdaki açıklamaları lütfen bütünüyle okuyunuz.

Selçuk Tıp Dergisi (Selcuk Med J) tıp bilimine ve akademik çalışmalara katkısı olan, klinik ve deneysel çalışmaları, editoryal yazıları, kısa raporları, klinik olgu bildirimlerini, teknik ve eğitici derlemelerini, tıp konusundaki son gelişmeler ile orijinal görüntü raporlarını, görüntülü hastalık tanımlama sorularını ve editöre mektupları yayınlar. Ayrıca daha önce yayınlanmış makale ve deneysel çalışmalarla ilgili okuyucu soru ve katkıları kısaca yayınlanır. Yayına kabul edilme, editöryal komite ile en az iki hakem kararı ile alınır. Bir hakem, hakemlik talebini kabul etmeye karar vermeden önce, hakem değerlendirme süreci ve gözden geçirmenin nasıl yapılacağı hakkında daha fazla bilgi edinmek isteyebilir.

Hakemler, Selçuk Tıp Dergisi'nin gereklerine, önceden tanımlanmış kriterlere ve sunulan araştırmanın kalitesine, eksiksizliğine ve doğruluğuna dayanarak makale gönderimini değerlendirir. Hakemler makale hakkında geri bildirimde bulunur, iyileştirmeler önerir ve makalede yapılan değişiklikleri kabul edip etmeme, talep etme veya reddetme konusunda editöre tavsiyede bulunur. Nihai karar her zaman baş editöre aittir, ancak hakemler sonucu belirlemede önemli bir rol oynamaktadır. Bir hakemin makaleyle çıkar çatışması varsa, editöre bildirmesi gerekir. Hakemler, hakem gözden geçirme sistemine katılarak bilimsel sürecin katı standartlarını sağlamalıdır. Ayrıca, geçersiz araştırmaları tespit ederek ve derginin kalitesini korumaya yardımcı olarak derginin bütünlüğünü korumalıdırlar. Hakemler, intihal, araştırma sahtekarlığı ve diğer sorunları tespit ederek etik konuların ihlal edilmesini önlemeye gönüllü olmalıdır.

Yayına kabul edilen yazıların her türlü yayın hakkı dergiye aittir. Bu hak özel düzenlenmiş yayın hakkı devir formu ile bütün yazarların imzası ile tespit edilir. Dergi 3 ayda bir, yılda 4 kez yayınlanır. Derginin yayın dili Türkçe ve/veya İngilizcedir. Gönderilen yazılar daha önce herhangi bir dergide yayınlanmamış olmalıdır (Bilimsel kongrelerde sunulan sözlü bildiri ve posterler bildirmek kaydı ile hariçtir). Dergide yayımlanan yazıların her türlü sorumluluğu (etik, bilimsel, yasal vb.) yazarlara aittir. Yazım kurallarına uygun olarak hazırlanmamış olan yazıların incelenmeye alınıp alınmaması Yayın Kurulu'nun insiyatifindedir.

Makalelerin daha önce hiçbir yerde yayınlanmamış ve yayın için başka bir dergiye gönderilmemiş olması gerekir. Selçuk Tıp Dergisi'nde intihal programı (iThendicate) kullanılmaktadır. Akademik atıf sınırını aşan benzerlik taşıyan makaleler ve yayın kurallarına uygun olarak hazırlanmamış

makaleler değerlendirmeye alınmayacaktır. Tüm çalışmalarda etik kurul onayı gerekmektedir ve bu onamın belgelendirilmesi yazıların yayınlanmasında esas teşkil edecektir.

Tüm çalışmalarda yazarların çalışmaya katkı düzeyi ve onayı bildirilmelidir. Çalışmada veri toplanması, deney aşaması, yazım ve dil düzenlemesi dahil olmak üzere herhangi bir aşamasında finansal çıkar çatışması olmadığı bildirilmelidir. Çalışmada varsa ticari sponsorluk bildirilmelidir.

Derginin editöryal ve yayın süreçleri 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) organizasyonlarının kılavuzlarına uygun olarak biçimlendirilmiştir. Selçuk Tıp Dergisi'nin editöryal ve yayın süreçleri, Principles of Transparency and Best Practice in Scholarly Publishing (doaj.org/bestpractice) ilkelerine uygun olarak yürütülmektedir. Yayın Kurulu, dergimize gönderilen çalışmalar hakkındaki intihal, atıf manipülasyonu ve veri sahteciliği iddia ve şüpheleri karşısında COPE kurallarına uygun olarak hareket edecektir.

Derginin Yayın Kurulu, itiraz ve şikayet vakalarını, COPE rehberleri kapsamında işleme almaktadır. Yazarlar, itiraz ve şikayetleri için doğrudan baş editör veya yayın kurulu ile temasa geçebilirler. İhtiyaç duyulduğunda Yayın Kurulu'nun kendi içinde çözemediği konular için tarafsız bir temsilci atanmaktadır. İtiraz ve şikayetler için karar verme süreçlerinde nihai kararı Baş Editör verecektir. Yayıncı ve editör gerektiğinde düzeltmeler, açıklamalar, geri çekilmeler ve özürler yayınlamaya her zaman hazırdır.

Selçuk Tıp Dergisi (Selcuk Med J) ile ilgili tüm yazışmalar, makale gönderme, makalenin takibi, danışman raporları, düzeltmelerin yapılıp yüklenmesi, kabul yazısı gönderimi ve diğer tüm makale ile ilgili formların yüklenmesi https://www.selcukmedj.org sayfasından yapılacaktır. Bu site üzerinden yüklenecek makaleler için kurallar aşağıda belirtilmiştir.

YAZIM KURALLARI
Yayına gönderilen yazılar Microsoft Word programında yazılmalıdır. Yazı, şekil ve grafilerin tamamı elektronik ortamda https://www.selcukmedj.org word ve pdf formatında gönderilmelidir.

Tüm yazılar:
1. Başlık sayfası,
2. Türkçe özet,
3. İngilizce özet,

4. Makale kısmı,
5. Kaynaklar,
6. Tablolar,
7. Şekiller ve resimler,
8. Alt yazılar şeklinde dizilmelidir.

Araştırma inceleme yazılarının makale kısmı (özet, referanslar, tablo, şekil ve alt yazılar hariç) toplam 4000 kelimeyi, özet kısmı 400 kelimeyi, referanslar 60'ı, tablo ve şekil sayısı 10'u geçmemelidir. Özet amaç, gereç ve yöntemler, bulgular ve sonuç bölümlerini içermelidir.

Olgu bildirileri şu bölümlerden oluşmalıdır: Başlık, İngilizce başlık, Türkçe ve İngilizce özet, giriş, olgunun/ olguların sunumu, tartışma ve kaynaklar. Olgu sunumları toplam 8 sayfayı geçmemeli ve 3 resimden fazla olmamalıdır. Özet 200 kelimeyi geçmemeli ve tek bir paragraf şeklinde olmalıdır.

Derlemeler İngilizce ve Türkçe özet içermeli ve özet kelime sayısı 300'ü aşmamalıdır. Tablo sayısı ve şekiller (veya resimler) toplam 6 adedi aşmamalıdır. REferanslar 80'i geçmemelidir. Özet tek bir paragraf şeklinde olmalıdır. Editöre mektup, kısa raporlar, görüntü raporları, teknik ve tıp alanındaki gelişmelere ait yazılar ve orijinal konulara ait görüntü sunumları 2 sayfayı geçmemelidir. Kısa bir (100 kelime) İngilizce ve Türkçe özet içermelidir.

YAZILARIN HAZIRLANMASI

Yazının başlığı hem İngilizce hem de Türkçe olarak yazılmalıdır. Yazıda çalışmaya katkısı olan yazarların ad ve soyadları açık olarak yazılmalı. Yazıların altına çalışmanın yapıldığı kurumun açık adresi yazılmalıdır. Çalışma daha önce herhangi bir kongrede sunulmuş ise kongre adı, zamanı (gün-ay-yıl olarak) belirtilmelidir. Başlık sayfasının en altına iletişim kurulacak yazarın adı, soyadı, açık adres, posta kodu, telefon ve faks numaraları ile e-posta adresi yazılmalıdır.

Özetler

Ayrı bir sayfa olarak verilmelidir. İngilizce özetin başında İngilizce başlık bulunmalıdır. Araştırma inceleme yazılarında 400, olgu sunumlarında 200 kelimeyi geçmemelidir. Araştırma makalelerinde özet amaç, gereç ve yöntemler, bulgular ve sonuç bölümlerini içermelidir. Araştırma ve inceleme yazılarında özetlerden sonra Türkçe ve İngilizce anahtar kelimeler verilmelidir. Anahtar kelime sayısı 5'i geçmemelidir. Anahtar Kelimelerin İngilizcesi Index Medicus'daki Medical Subjects Headings'e uygun olmalı, Türkçe Anahtar kelimeler ise Türkiye Bilim Terimleri'nden (http://www.bilimterimleri. com) seçilmelidir. Özetlerde kısaltma olmamalıdır.

Makale

Yazı Giriş, Gereçler ve Yöntem, Bulgular ve Tartışma bölümlerinden oluşur.

Giriş: Konuyu ve çalışmanın amacını açıklayacak bilgilere yer verilir.

Gereçler ve Yöntem: Çalışmanın gerçekleştirildiği yer, zaman ve çalışmanın planlanması ile kullanılan elemanlar ve yöntemler bildirilmelidir. Verilerin derlenmesi, hasta ve bireylerin özellikleri, deneysel çalışmanın özellikleri ve istatistiksel metotlar detaylı olarak açıklanmalıdır. Çalışma klinik bir çalışma ise başlık 'Hastalar ve Yöntem' şeklinde olmalıdır.

Bulgular: Elde edilen veriler istatistiksel sonuçları ile beraber verilmelidir.

Tartışma: Çalışmanın sonuçları literatür verileri ile karşılaştırılarak değerlendirilmelidir.

Tüm yazımlar Türkçe yazım kurallarına uymalı, noktalama işaretlerine uygun olmalıdır. Kısaltmalardan mümkün olduğunca kaçınılmalı, eğer kısaltma kullanılacaksa ilk geçtiği yerde ( ) içerisinde açıklanmalıdır. Kaynaklar, şekil tablo ve resimler yazı içerisinde geçiş sırasına göre numaralandırılmalıdır. Metin içerisindeki tüm ölçüm birimleri uluslararası standartlara uygun biçimde verilmelidir.

Kaynaklar

Kaynaklar iki satır aralıklı olarak ayrı bir sayfaya yazılmalıdır. Kaynak numaraları cümle sonuna nokta konmadan ( ) içinde verilmeli, nokta daha sonra konulmalıdır. Kaynak yazar isimleri cümle içinde kullanılıyorsa ismin geçtiği ilk yerden sonra ( )
içinde verilmelidir. Birden fazla kaynak numarası veriliyorsa arasına ",", ikiden daha
fazla ardışık kaynak numarası veriliyor ise rakamları arasına "-" konmalıdır [ör.(1,2), (1-3)gibi]. Kaynak olarak dergi kullanılıyorsa: yıl, cilt, başlangıç ve bitiş sayfaları verilir. Kaynak olarak kitap kullanılıyorsa: sadece yıl, başlangıç ve bitiş sayfaları verilir. Kaynaklarda yazarların soyadları ile adlarının baş harfleri yazılmalıdır. Dergi isimleri Index Medicus'a göre kısaltılmalıdır. Kaynak yazılma şekli aşağıdaki örnekler gibi olmalıdır. Yazar sayısının üçten fazla olması durumunda ise ilk üç yazarın ismi yazılmalı, sonrasında "et al." eklenmelidir.

Dergiler için
1) Kocakuşak A, Yücel AF, Arıkan S. Karına nafiz delici-kesici alet yaralanmalarında rutin abdominal eksplorasyon yönteminin retrospektif analizi. Van Tıp Dergisi 2006;13(3):90-6.
2) Vikse BE, Aasard K, Bostad L, et al. Clinicalprognostic factors in biopsy-proven benign nephrosclerosis. Nephrol Dial Transplant 2003;18:517-23.

Kitaplar için
1) Danovitch GM. Handbook of Kidney Transplantation. Boston: Little, Brown and Company (Inc.), 1996: 323-8.

Kitaptan Bölüm İçin
1) Soysal Z, Albek E, Eke M. Fetüs hakları. Soysal Z, Çakalır C, ed. Adli Tıp, Cilt III, İstanbul Üniversitesi Cerrahpaşa Tıp Fakültesi Yayınları, İstanbul, 1999:1635-50.
2) Davison AM, Cameron JS, Grünfeld JP, et al. Oxford Textbook of Clinical Nephrology. In: Williams G, ed. Mesengiocapillary glomerulonephritis. New York: Oxford University Press, 1998: 591- 613.

Tablolar

Tablolar ayrı sayfaya iki satır aralıklı yazılmalı, her tablonun üzerinde numara ve açıklayıcı ismi olmalıdır. Tabloda kısaltmalar varsa tablonun altında alfabetik sıraya göre açılımları yazılmalıdır. Örnekler: PS: pulmoner stenoz, VSD: ventriküler septal
defekt. Tablolar yazı içindeki bilgilerin tekrarı olmamalıdır.

Şekil ve Resimler

Şekil ve resimler mutlaka isimlendirilmeli ve numaralandırılmalıdır. Resimler minimum 300 dots per inch (dpi) çözünürlüğünde ve net olmalıdır. Resimler makaleden ayrı bir şekilde makale gönderimi esnasında elektronik olarak JPEG formatında gönderilmelidir.

Makale içerisinde geçen resimler kabul edilmeyecektir. Renkli resimlerin basımı ancak yazarın basım ücretini kabul etmesi ve bu ücreti ödemesi halinde mümkün olacaktır. Aksi takdirde resim siyah-beyaz olarak basılır. Şekil ve resim altlarında kısaltmalar kullanılmış ise, kısaltmaların açılımı alfabetik sıraya göre alt yazının altında belirtilmelidir. Mikroskobik resimlerde büyütme oranı ve tekniği açıklanmalıdır. Yayın kurulu, yazının özünü değiştirmeden gerekli gördüğü
değişiklikleri yapabilir.

HAKEM RAPORU SONRASINDA DEĞERLENDİRME

Yazarlar hakem raporunda belirtilen düzeltme istenen konuları maddelendirerek bir cevap olarak kendilerine ayrılan cevap bölümüne yazmalıdırlar ve ek bir dosya

şeklinde yüklenmelidir https://www.selcukmedj.org. Ayrıca makale içerisinde de gerekli değişiklikleri yapmalı ve bunları makale içerisinde belirterek (boyayarak) online olarak tekrar göndermelidirler.

SON KONTROL

1. Yayın hakkı devir ve yazarlarla ilgili bildirilmesi gereken konular formu gereğince
doldurulup imzalanmış,
2. Özet makalede 400, olgu sunumunda 200 kelimeyi aşmamış,
3. Başlık Türkçe ve İngilizce olarak yazılmış,
4. Kaynaklar kurallara uygun olarak yazılmış,
5. Tablo, resim ve şekillerde bütün kısaltmalar açıklanmış olmalıdır.

ONLİNE YÜKLEME BASAMAKLARI

https://www.selcukmedj.org sayfasında
1. Makale şekli *
2. Türkçe ve İngilizce başlık *
3. Kısa başlık *
4. Türkçe ve İngilizce özet*
5. Türkçe ve İngilizce anahtar kelimeler *
6. Yüklenmesi gerekli bölümler (word makale dosyası, makale dosyasının pdf
formatı, Başlık sayfası, copyright formu, ek dosyalar (resim, şekil ve tablolar) şeklinde
5 basamakta tamamlanmalıdır.

INSTRUCTIONS FOR AUTHORS

Selcuk Medical Journal (Selcuk Med J) is a scientific publication of Necmettin Erbakan University, Meram Faculty of Medicine.

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2) Vikse BE, Aasard K, Bostad L, et al. Clinicalprognostic factors in biopsyproven benign nephrosclerosis. Nephrol Dial Transplant 2003;18:517-23.

Book references:

1) Danovitch GM. Handbook of kidney transplantation. Boston: Little, Brown and Company (Inc.), 1996: 323-8. Chapter in book references:

1) Soysal Z, Albek E, Eke M. Fetüs hakları. Soysal Z, Çakalır C, ed. Adli Tıp, Cilt III, İstanbul Üniversitesi, Cerrahpaşa Tıp Fakültesi Yayınları, İstanbul, 1999: 1635-50.

2) Davison AM, Cameron CS, Grünfeld CF, et al. Oxford textbook of clinical nephrogology. In: Williams G, ed. Mesengiocapillary glomerulonephritis. New York: Oxford University Press, 1998: 591- 613.

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Araştırma Makalesi / Research Article

Evaluation of Patients Operated Because of Velopharyngeal Insufficiency with Dynamic Magnetic Resonance Imaging

Velofarengeal Yetmezlik Sebebiyle Opere Edilen Hastaların Dinamik Manyetik Rezonans Görüntüleme ile Değerlendirilmesi

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Öz

Amaç: Yarık damak sebebiyle ameliyat edilen hastaların yaklaşık %30'u velofarengeal yetmezlik(VFY) sebebiyle ek müdahelelere ihtiyaç duyarlar. Ameliyat öncesi planlama için radyolojik değerlendirme kesinlikle gerekirken ameliyat sonrası değerlendirmede de oldukça faydalıdır. Bu çalışmada, velofaringeal yetmezlik sebebiyle opere edilen hastalarda velofarinksin dinamik manyetik rezonans(MR) ile değerlendirilmesi ile ilgili tecrübelerimizi paylaşmayı planladık.
Hastalar ve Yöntem: Nisan 2014- Mayıs 2020 tarihleri arasında VFY ile başvuran ve postoperatif dinamik MR ile değerlendirilen 17 hasta çalışmaya dahil edildi. 7 hastaya faringeal flep, 7 hastaya posterior duvar augmentasyonu (2 kıkırdak, 5 yağ grefti) ve submukoz yarık mevcut 3 hastaya myomukozal onarım yapıldı. Ameliyat öncesi ve ameliyat sonrası 3. ayda tüm hastalara dinamik MRG yapıldı. Ameliyat sonrası sonuçlar dinamik MR ile değerlendirildi.
Bulgular: Bu çalışmaya ortalama yaşı 13± 2.5 (9-29) olan, 11 (%65) kadın ve 6 (%35) erkek hasta dahil edildi. Posterior duvar yerleşimli greftlerin ikinci servikal vertebra seviyesinde ve yaşayabilir oldukları görüldü. Posterior faringeal fleple onarım yapılan hastalarda sagital planda nazal hava kaçağı görülmezken, aksiyel dinamik görüntülerde hava yolu için gerekli açıklık gözlendi. Submuköz kleftli hastalarda levator kas seyrinin normal düzleme geldiği gözlendi. Nazal hava kaçak alanı tüm tekniklerde preoperatif ölçümlere göre belirgin azalmıştı(p<0.05).
Sonuç: Velofarinks 3-boyutlu ve dinamik yapısı sebebi ile tüm planlarda ve dinamik olarak değerlendirilmelidir. Bu amaçla kullanılan pekçok teknik olmakla birlikte hiçbiri ideal ve objektif değildir. Dinamik MRG planlamada olduğu gibi postoperatif takipte de kullanılabilir. Farengeal flep atrofisi, greftlerin ve velofarengeal açıklığın kalitatif veriler ile değerlendirilmesi sağlanır.

Anahtar Kelimeler: Dinamik MRG, velofarinks, yetmezlik, greft

Abstract

Aim: Nearly 30% of the patients with cleft palate need another surgery for velopharyngeal insufficiency. While preoperative radiologic evaluation is necessary for planning, postoperative evaluation is also so important. In this study, we plan to share our experience about evaluation of the velopharynx with dynamic MRI at patients who were operated oving for velopharyngeal insufficiency.
Patients and Methods: The study included seventeen patients who were presented with velopharyngeal insufficieny and we applied dynamic MRI for postoperative evaluation between April 2014 and May 2020. Pharyngeal flap was applied for 7, posterior augmentation was performed for 7 (2 costal cartilaginous, 5 fat graft) and myomucosal repair was done for 3 patients with submucosal cleft. Dynamic MRI were obtained preoperatively and postoperatively at 3rd month. Postoperative results were evaluated with dynamic MRI.
Results: The study included seventeen patients, with an age range of 9-29 (mean 13± 2.5), 11 women (65%), and 6 men (35%). Posterior wall located grafts were found at the second cervical vertebra and viable. While there was no nasal air escape in superior pharyngeal flap applied patients at sagittal plane, in axial dynamic images, gap was detected which is all essential for airway and must be obtained. The levator muscle direction was observe normal postoperatively at patients with submucous clef. Nasal air escape area was decreased in both methods significantly comparing with preoperative measurement (p<0.05)
Conclusion: Because of the three-dimensional and dynamic structure of the velopharynx, it must be evaluated in both planes and dynamic. Although there are many techniques for this purpose, none of them is ideal or objective. Dynamic MRI can be used for postoperative follow-up as it is used for preoperative planning. Evaluation of the pharyngeal flap atrophy, grafts and also gap size are provided with qualitative values.

Key words: Dynamic MRI, velopharynx, insufficiency, graft

INTRODUCTION

Velopharyngeal insufficiency (VPI) is an inability of velopharyngeal valve closure while oral sound production because of structural or anatomical defect. It is the subset of velopharyngeal dysfunction due to insufficient tissue or mechanical restriction (1). Common causes of VPI are submucous cleft, cleft palate, and surgeries like adenoidectomy(2). Nearly 30% of the patients with cleft palate need another surgery for velopharyngeal insufficiency related to speech problems (3). Since the velopharynx is a three dimensional anatomical structure, it must be overviewed in each projection (4). There are four different closure patterns of velopharynx as coronal, sagittal, circular, and both and it is too important to detect the defect of the closing pattern for planning the treatment method.

Nasoendoscopy, videofluoroscopy, magnetic resonance imaging (MRI), cephalometric studies, nasometry and speech tests are techniques for follow-up and diagnosis (5). These methods obtain anatomical and functional evaluation but usually, objective measurement is not possible. While preoperative radiologic evaluation is necessary for planning, postoperative evaluation is also so important for the assessment of flap contracture at pharyngeal flaps, graft viability of fat or cartilaginous tissue also placement of them at posterior wall augmentation. Additionally, evaluation of nasal air escape and dynamic closure function is too important for speech outcome. Especially in patients with speech disorders despite surgery, nasal air leakage and functional evaluation are provided, and the correct planning of additional interventions is ensured.

In this study, we plan to share our experience about the evaluation of the patients that were operated because of VPI by using the pharyngeal flap, posterior wall augmentation, and muscle repair in submucosal cleft palate through with dynamic MRI.

PATIENTS AND METHODS

The study included seventeen patients who were presented with velopharyngeal insufficieny and we applied dynamic MRI for postoperative evaluation between April 2014 and May 2020. Patients younger than 7 years old and patients with orthodontic treatment were excluded related to artifact. No patient has required sedation. Preoperative Dynamic MRI and videofluoroscopy had been applied for detecting the closure pattern of the velopharynx to choose the treatment modality. Pharyngeal flap was applied

for 7, posterior augmentation was performed for 7 (2 costal cartilaginous, 5 fat graft) and myomucosal repair was done for 3 patients with submucosal cleft. Posterior wall augmentation was added to 2 patients after pharyngeal flap because of insufficient closure of the sphincter mechanism in two planes, sagittal and coronal. Approval was obtained from the ethics committee for clinical researches at a local university hospital (Registration number: 2021/392).

All the patients were followed-up by speech therapists. Preoperative and postoperative endoscopic videos were taken during preoperative and postoperative periods. Speech records were taken by reading a standard text. Dynamic MRIs were obtained preoperatively and postoperatively at 3rd month. Levator muscle was evaluated in axial and coronal images. Patients were asked to say "MMMM, PPPP, Pokemon" and palate movement was observed. Anatomical structures, levator muscle anatomy, and function, pharyngeal wall movements, graft placement and size, flap size, and nasal air leakage were evaluated.

MR imaging technique

Magnetic Resonance Imaging subjects were scanned with a 1.5 Tesla MRI scanner (Siemens MAGNETOM Aera, Erlangen, Germany) and a 16-channel head coil in the supine position. All examinations were performed without any sedation. To evaluate the anatomic structure, T1 fast spin echo [repetition time (TR) 650 ms; time to echo (TE) 20 ms; slice thickness (ST) 4 mm] weighted investigations in axial, sagittal, and coronal planes during rest were performed. In addition, we used the half-Fourier acquisition single-shot turbo spin-echo (HASTE) (TR=1,860 ms, TE=116 ms, ST= 4 mm, Voxel size: 1.6×1.6×4.0 mm, field of view (FOV) 300 mm) and true fast imaging with steady-state precession (TrueFISP) sequences (TR=3.45 ms, TE=1.45 ms, ST= 4 mm, voxel size: 0.8×0.8×4.0 mm, FOV 300 mm).

We used the below protocol for dynamic MRI after a localizer view:

1) T2 HASTE in the axial and sagittal planes according to the localizer during rest,
2) Repeated sagittal, axial, and coronal TrueFISP sequences without speech and during the speech

The T2 HASTE sequences lasted 48 seconds, the TrueFISP sequences lasted an average of 20 seconds, coronal images were taken with 22 seconds and all MR examination took about 15 minutes. Axial images were taken as parallel to the axis of the hard palate. Sagittal TrueFISP sequences were

taken according to the median sagittal T2 HASTE image and axial planes were taken at the height of maximal velopharyngeal closure in the sagittal planes. The images of all MR imaging patients were archived in the picture archiving and communication system (PACS) system. In addition, all images were transferred to the workstation (Syngo.via) for better evaluation and measurement. In dynamic images, the movement of the uvula and the velopharyngeal patency was investigated. Velopharyngeal area, and nasal air escape area was measured by a semiotomatic software program. Percentage of VPO closure was calculated by comparing preoperative and postoperative images. Statistical analysis was applied by Paired Student's t-test through with SPSS-Statistics-22 program. Differences in means or percentages were considered significant if a P value was below 0.05.

RESULTS

The study included seventeen patients, mean age of 13± 2.5 years, 11 women (65%), and 6 men (%25). In the evaluation of anterior, posterior, and lateral wall movements, the best plane was detected as axial (Video 1). Preoperative closure patterns were suitable for planning. The location and viability of the posterior wall located grafts were evaluated, found at the second cervical vertebra and viable. The cartilage graft was seen as hypointense and the fat graft was seen as hyperintense (Video 2a, Video 2b). All of the pharyngeal flaps were superior pharyngeal flap. While there was no nasal air escape at sagittal plane, in axial dynamic images, gap was detected which is all essential for the airway and must be obtained. According to the preoperative images, the decrease in leakage was evident (Video 3a, Video 3b).

Video 1. Anterior, posterior and lateral wall movements are best observed in the axial T2 weighted dynamic images.

Video 2a. In sagittal dynamic T2 weighted images, cartilage grafts are observed as hypointense (a) and fat grafts as hyperintense (b).

Video 2b. Fat grafts as hyperintense

Video 3a. Video 3b. In sagittal dynamic T2 weighted images, while there is no nasal air leakage, the required opening for the airway is observed in the axial dynamic images.
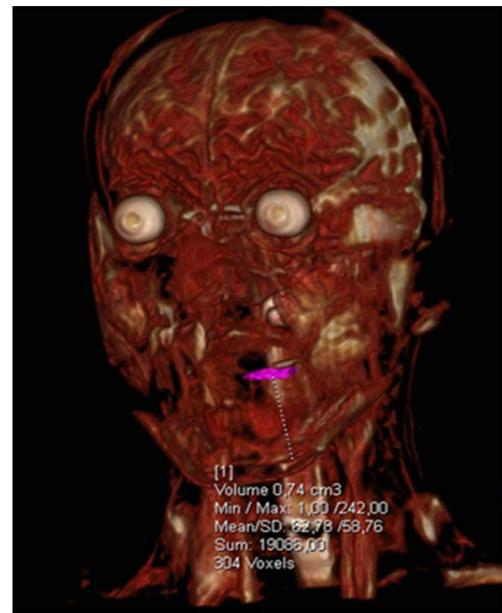
Figure 1. Three dimension volume rendered image is shown the nasal air leak area in detail.

Levator muscle was examined in all patients. While the levator muscle structure and functions were normal in the preoperative and postoperative images in patients who were operated for cleft palate at an early ages and has been refered us for VPI, the dramatical change was observed in preoperative and postoperative images of submucous cleft palate patients who were operated first time in our clinic because of changing the direction of the muscle from vertical to horizontal. Nasal air escape areas were examined in the axial plane and compared with preoperative images. It was decreased in both methods significantly compared with preoperative measurement (p<0.05) (Table 1). The nasal air leak area was also shown in detail through 3D images (Figure 1).

At 3rd month, posterior wall augmentation procedure was added for two patients who have detected with speech pathology also insufficiency in the flap size and closure in dynamic MRI.

DISCUSSION

Velopharyngeal insufficiency (VPI) is incomplete closure of the muscular valve or sphincter mechanism between oropharynx and nasopharynx during speech and there becomes hipernasality, and articulation errors during nasal voices (mmm, nnn). Velopharyngeal sphincter mechanism is consist of anteriorly velum,

Table 1. Preoperative and Postoperative MR values of VPO (cm^2) at Rest

	Preoperative	Postoperative	P value
mean±SD	1.96 ±0.86	1.43±0.38	0.032

Table 2. Treatment methods accoring to the closure patterns

Surgical Technique	İdeal Patient
Posterior wall augmentation	Sagittal closure pattern
Pharyngeal flap	Sagittal closure pattern
Sphincter pharyngoplasty	Coronal closure pattern
Furlow palatoplasty	Submucous cleft

lateraly lateral wall, posteriorly posterior wall, and muscles name of tensor veli palatini, levator veli palatini, palatopharyngeus, palatoglossus, constrictor pharyngeus superior and uvula (6). Except of nasal sounds closes and prevents nasal air escape. There are 4 closure patterns. Coronal, sagittal, circular and both.

The incidence of VPI after cleft surgery is high as 20% to 50% despite successful surgery and it is one of the most controversial the velopharynx to to about cleft palate due to speech, and social problems (7). VPI can occur due to insufficiency of superior and posterior movement of the velum because of levator dysfunction he velopharynx to tion, malposition, or shortens of the soft palate. On the other hand, lateral and posterior wall movement problems and additional surgeries like adenectomy, tonsillectomy… etc can cause incompetence. Besides, patients come in older age with speech problems with nondiagnosed submucous cleft palate. Multidisciplinary team approach with the otolaryngologist, speech therapist, orthodontist, pediatrician, plastic surgeon, psychologist and prosthodontist is required for the management of velopharyngeal insufficiency. For treatment there are surgical and nonsurgical techniques (2). Prosthetic matherials and speech therapies are nonsurgical options for suitable patients. For surgical treatment, it is important to evaluate the gap size, location of the defect, and closure pattern (Table 2) (2).

For preoperative and postoperative evaluation there are clinical and instrumental methods. While intraoral physical examination, evaluation of speech, and history of previous surgeries are clinical methods, cephalometric studies, videofluoroscopy, nasoendoscopy, nasometry, MRI, and electromyography (EMG) are instrumental methods

for evaluation. Videofluoroscopy, cephalometric studies, nasoendoscopy, and speech tests are the most common techniques used for diagnosis and follow up (5) but none of these methods is ideal or objective (2,8). Goal of instruments is to assess structure, movement, the extent of closure, and timing (9). Nasoendoscopy is applied by inserting a flexible fiberoptic laryngoscope through a nasal cavity. Posterior and lateral pharyngeal wall movement, orientation of the levator veli palatini, soft palate, and any gaps during speech can be evaluated. It is still gold standard in evaluation for many institutes (10). It was found insufficient in the evaluation of the lateral wall (11). Difficulty of patient cooperation and obtaining qualitative values are disadvantages.

Radiographic views are obtained by injecting contrast via syringe into a nose to coat the nasopharynx through with videofluoroscopy. Length of velum, posterior, anterior, and lateral wall movement and timing can be assessed (4). Compliance and exposure to ionizing radiation are disadvantages of this technique. It is shown as one of the two primary state-of-the-art tools for examination like endoscopy in recent studies and recommend to do lateral videofluoroscopy as the first stage not to exposure high radiation than nasoendoscopy as a next stage if videofluoroscopy is not enough (4). Nasometry obtains ability of objective measures the amount of nasal acoustic energy and air escape from velum to nose but it is unable to estimate the anatomic and physiological problem and the closure pattern (12).

Velopharenx is a three dimensional anatomical structure, because of this must be overview in each projection (4). Dynamic MRI is another available technology for preoperative and postoperative evaluation with qualitative values (13,14). It is a non-

invasive method that obtains images and videos in each of three planes (15, 16). So it is very usefull for anatomical and also physiological examination due to being objective, noninvasive, effective, fast, reliable, and easy to tolerate without contrast and ionizing radiation. Patient compliance is easier than nasoendoscopy the because of not being invasive method. Surgical follow up with dynamic MRI is not common but can be used safely. It provides a complete anatomical assessment compared to other methods (17). Movement of the pharyngeal walls can be evaluated during speech. And we can assess our questions in postoperative period like if there is an the atrophy of the flap, atrophy of the graft whether graft position is like our plan or changed, and if there is an air leak in sagittal, coronal, or axial plane. Disadvantages of this technique are cost, claustrophobia, toleration difficulty in children due to sound and long-term period, and taking images at supine position because gravity may affect the speech and closure (12).

In the evaluation of the velopharyngeal area, only sagittal images were used in some studies, while in our study, axial and coronal images were used as well as sagittal images. Anterior, posterior and lateral wall movements were best evaluated on axial T2-weighted images. In addition, nasal air leakage was best evaluated on axial images, and a significant reduction in air leakage was detected in postoperative images, which was found to be consistent with the literature. The limitation of this study is that being designed with a small patient group. We think that it offers a new concept in the evaluation of common atrophy problems, especially of autologous grafts and pharyngeal flaps, or other anatomical or physiological problems after VFI surgery. On the other hand, there is a need for large series, comparing dynamic MRI with videofluoroscopy and nasoendoscopy.

In conclusion, Dynamic MRI can be used for postoperative follow-up as it used for preoperative planning. Evaluation of the atrophy of the pharyngeal flap and grafts that are used for augmentation and also gap size are provided with qualitative values. With limitations like cost, claustrophobia, and toleration problem in children, dynamic MRI obtains three- dimensional, objective, and anatomical also physiological evaluation of the velopharyngeal valve without ionizing radiation, contrast, and invasive techniques.

Conflict of interest: Authors declare that there is no conflict of interest between the authors of the article.

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Araştırma Makalesi / Research Article

Index of Cardiac Electrophysiological Balance in Electrocardiography of Children with Acute Rheumatic Carditis

Akut Romatizmal Karditli Çocukların Elektrokardiyografilerinde Kardiyak Elektrofizyolojik Denge İndeksi

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Öz

Amaç: Çalışmamızda akut romatizmal karditli çocukların elektrokardiyografilerinde kardiyak elektrofizyolojik denge indeksi (iCEB), ve kardiyak aritmi için diğer risk belirteçlerinin incelenmesi amaçlanmıştır.
Hastalar ve Yöntem: Ocak 2016-Ağustos 2018 tarihleri arasında, akut romatizmal kardit tanılı 40 çocuk hasta ile yaş ve cinsiyet olarak benzer 40 sağlıklı çocuk retrospektif olarak çalışmaya alındı. Tüm vakaların demografik özellikleri kayıtlardan elde edildi. Elektrokardiyografide; P dalga dispersiyonu (Pd), QT dispersiyonu (QTd) ve düzeltilmiş QTd (QTcd) süreleri, Tp-e intervali (Tp-e), Tp-e/QT ve Tp-e/QTc oranları, ve iCEB ve düzeltilmiş iCEB (iCEBc) ölçüm değerleri gruplar arasında karşılaştırıldı. İstatistiksel olarak p <0,05 olması anlamlı kabul edildi.
Bulgular: Hasta ve kontrol gruplarının yaş ortalaması sırasıyla; 11,40±3,48 yıl ve 11,41±3,31 yıldı. Her iki grupta 16 kız (%40) ve 24 erkek (%60) çocuk vardı. Hasta grupta, kalp hızı, PR intervali, Pd, QTd, QTcd, Tp-e, Tp-e/QT oranı ve iCEBc ölçümleri anlamlı derecede yüksek saptandı. iCEB düzeyi hasta grubunda sağlıklı kontrollere daha yüksek olmasına rağmen istatistiksel anlamlı bir fark yoktu.
Sonuç: Akut romatizmal karditli çocuklarda, repolarizasyon-depolarizasyon dengesi bozulmuş olabilir. Bu nedenle aritmi için diğer elektrokardiyografik risk parametrelerine ilave olarak iCEB(c) kullanımı da yararlı olabilir. Ancak, bu konuda daha ileri çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Akut romatizmal ateş, çocuklar, elektrokardiyogram, kardit, kardiyak aritmi

Abstract

Aim: In this study, examination of the index of cardiac-electrophysiological balance (iCEB) and of other risk markers for cardiac arrhythmia in electrocardiography of children with acute rheumatic carditis was aimed.
Patients and Methods: Forty pediatric patients with acute rheumatic carditis and 40 healthy children matched in terms of gender and age were retrospectively enrolled in the study between January 2016 and August 2018. Demographic data of all cases were obtained from records. By electrocardiography, P dispersion (Pd), dispersion durations of QT (QTd) and corrected QT (QTcd), Tpeak-to-end interval (Tp-e), ratios of Tp-e/QT and Tp-e/QTc, and measurements of iCEB and corrected iCEB (iCEBc) were all compared between the groups. Statistically significant difference was accepted as p< 0.05.
Results: In the patient and control groups, mean ages were 11.40±3.48 years and 11.41±3.31 years, respectively. Both groups had 16 female (40%) and 24 male (60%) children. In the patient group, heart rate, PR interval, Pd, QTd, QTcd, Tp-e, Tp-e/QT ratio and iCEBc were found to be significantly increased. Though iCEB level was higher in the patient group, there was no statistically significant difference with healthy controls.
Conclusion: In children with acute rheumatic carditis, repolarization-depolarization balance may be impaired. Therefore, in addition to other electrocardiographic risk parameters for arrhythmia, use of iCEB(c) may also be beneficial. However, further studies on this issue are needed.

Key words: Acute rheumatic fever, children, electrocardiogram, carditis, cardiac arrhythmia

INTRODUCTION

After a group A streptococcal infection, acute rheumatic fever (ARF) may be seen through an autoimmune response. Although the incidence of disease has been recently declined in developed countries, it takes an important place among acquired heart diseases in children and continues to be a significant public health issue, especially in developing countries. Carditis, most severe complication of ARF, is observed in approximately half of the patients (1-3). Various atrial and ventricular conduction disorders due to ARF may be observed. In addition to first degree atrioventricular block, other rhythm disorders including bradycardia, supraventricular tachycardia, nodal rhythm, ventricular tachycardia and complete heart block may also be seen (4-7).

An increased P dispersion (Pd), a marker used for showing atrial conduction disorders, demonstrates an irregular conduction in atria and also has been found to be related to increased atrial arrhythmia risk (8). It has been shown in previous studies that various risk markers for arrhythmia on ECG including durations of QT and corrected QT (QTc), dispersion durations of QT (QTd) and QTc (QTcd), Tpeak-to-end interval (Tp-e), and ratios of Tp-e/QT and Tp-e/QTc can be used for predicting ventricular arrhythmias (9-12). Tp-e, the duration between peak of T-wave and its junction with the isoelectric line, is considered to reflect transmural dispersion of ventricular repolarization. An increase in Tp-e duration, thus, may suggest abnormal dispersion of repolarization. Recently, ratios of Tp-e/QT and Tp-e/QTc have also been accepted as novel markers showing transmural (Tp-e) and spatial (QT) dispersions (10-13).

Another novel marker, called index of cardiac-electrophysiological balance (iCEB) that can be obtained as division of the QT duration to QRS duration (QT/QRS) in predicting malignant ventricular arrhythmias, was firstly defined by Lu et al. (14). This marker expresses the balance between the ventricular depolarization (QRS) and repolarization (QT). It has been stated that iCEB is an equivalent of the cardiac wavelength. And also, iCEB has some advantages including possibility of being measured non-invasively and simply on surface ECG. Thus, an increase in iCEB may be used in predicting polymorphic ventricular tachycardia and a decrease in iCEB may be used in predicting non-polymorphic ventricular tachycardia and ventricular fibrillation (14-16).

In children with acute rheumatic carditis, we have encountered no study related to iCEB. To assess measurement of iCEB and of other risk markers in ECG of children with ARF carditis was aimed.

PATIENTS AND METHODS
Subjects

Our retrospective study was conducted as cross-sectional in pediatric patients with ARF carditis between January 2016 and August 2018. Forty pediatric patients, aged between 5-18 years and diagnosed with ARF carditis in accordance with revised Jones 2015 criteria (17), were enrolled to the study. Beside carditis, patients with accompanying other major or minor findings of ARF were also taken into patient group. All patients were initially treated with corticosteroid (Prednisolone) and then salisilate to avoid rebound. However, all evaluations (demography, blood work-ups, electrocardiography, echocardiography) in patient group were performed before treatment. So, no effects of anti-inflammatory treatment on these parameters were evaluated. Of the cases diagnosed with carditis; among the laboratory findings, on-admission hemoglobin, WBC (leukocyte), thrombocyte, hematocrit, ESR (erythrocyte sedimentation rate), CRP (C reactive protein) and ASO (Antistreptolysin O titer) were obtained. From the study group, those with insufficient data, not meeting the Jones criteria, with a chronic disease and using a medication effective on heart were excluded from the study.

As the control group, 40 cases similar to those in the patient group in regard to age, gender and anthropometric measurements, which had no chronic disease and were found to be healthy, were included in the study. Demographic characteristics (age, gender, body weight), blood pressure measurements, electrocardiography and echocardiography records of all cases were evaluated. No laboratory data could be obtained from the cases in the control group, as detailed blood work-ups could not be ordered. Local ethics committee approved the study with a decision number of 2019/2002 (July 12th 2019).

Echocardiography

An experienced pediatric cardiology specialist performed echocardiographic examinations by using Vivid S5 N (GE, Horten, Norway) echocardiography machine and a 3S sector probe. The standard imaging techniques, suggested by American Society of Echocardiography, were used (18).

Electrocardiography

Electrocardiography records were taken (25 mm/

sec, 10 mV) with a 12-lead ECG device (Nihon Kohden Cardiofax, Tokyo, Japan), and then, were analyzed manually by an experienced pediatric cardiologist in an electronic environment. On the lead DII, arithmetic means of three consecutive beats were taken to obtain PR interval duration and heart rate per minute. Durations of QT, P and QTc, used to obtain dispersions (QTd, Pd, QTcd), were measured in at least nine different leads. From the beginning of P-wave to returning to isoelectric line was accepted as P-wave duration. The difference between the longest (Pmax) and shortest (Pmin) P-wave durations was considered as P dispersion. From the beginning of QRS complex to the end of T-wave was accepted as QT interval duration. Tangential method was used to determine the endpoint of T-waves, when the last portion of T wave was not able to be clearly seen (19). Bazzett's formula was used for QTc calculations (QTc = QT/√RR) (20). Dispersions of QT and QTc were considered to be the difference between longest (QTmax, QTcmax) and shortest (QTmin, QTcmin) QT and QTc interval durations, respectively. Duration of Tpeak-to-end, and ratios of Tp-e/QT, Tp-e/QTc, QT/QRS (iCEB) and QTc/QRS (corrected iCEB; iCEBc) measurements were performed on precordial ECG leads. Also, QRS, QT and QTc measurements, used in these ratios, were obtained from precordial leads by taking arithmetic means of three consecutive beats.

Statistical Analysis

The obtained data were analyzed by using the SPSS 17 (SPSS Inc., Chicago, IL, USA) statistics program on computer. Shapiro Wilk's test was applied to test normality of distribution of the variables. Of the quantitative variables; the variables exhibiting normal distribution were expressed as mean ± standard deviation (SD) and those not exhibiting normal distribution as median (interquartile range). In analyzing categorical variables, chi-square test was used. Independent samples Student t-test and Mann Whitney U test were applied in independent group comparisons according to suitability of the data. In statistical evaluation, a p<0.05 was considered significant.

RESULTS

Both patient (n:40) and control (n:40) groups had 16 female (40%) and 24 male (60%) children. In patient and control groups, mean age was found to be 11.40±3.48 years and 11.41±3.31 years, respectively. Blood pressure measurements of both groups were within normal range. Between the groups, no significant differences were determined in terms of body weight (p:0.541), age (p:0.985), gender (p:1.00), and systolic (p:0.458) and diastolic (p:0.654) blood pressure measurements (Table 1). Among the on-admission blood work-ups of the patient group; mean

Table 1. Demographic features and blood pressures of the groups

	Patient Group (n:40)		Control Group (n:40)		p
	mean±SD or n	median (IQR)	mean±SD or n	median (IQR)	
Age (years)	11.40±3.48	11.54(8.93-14.31)*	11.41±3.31	11.91(9.1-14.55)*	0.985
Gender (female/male)	16/24		16/24		1.00
Weight (kg)	44.75±19.74	45.50(28.25-59.25)*	41.60±15.72	40(28.25-53.5)*	0.541
SBP (mmHg)	103.87±10.28	100(100-110)*	102.75±12.95	100(90-110)*	0.458
DBP (mmHg)	63.50±8.85	60(60-70) *	63.50±9.48	60(60-70)*	0.654

DBP, diastolic blood pressure; IQR, interquartile range; SBP, systolic blood pressure. Data were presented as mean ± standard deviation and median (IQR {interquartile range: first quartile-third quartile}). *, shows the parameters that used for statistical comparisons.

Table 2. Laboratory results of the patient group

	Patient Group (n:40)		Laboratory
	mean±SD	median (IQR)	reference ranges
WBC (/mm³)	10529±2848.60	10300 (8725-12175)	4-10x10³
Hb (g/dl)	11.50±1.28	11.25(10.8-12.35)	12.1-17.2
Hct (%)	34.44±3.77	34.05(31.75-36.47)	36.1-50.3
Plt (/mm³)	358450±72441.64	357500(301750-406000)	150-400x10³
ESR (mg/h)	66.90±21.65	68.00(52.75-80.75)	0-20
CRP (mg/L)	103.44±69.68	80.00(56.57-141.95)	0-5
ASO (Todd IU/ml)	1294.90±843.11	1035.00(749.5-1555)	0-200

ASO, Anti-streptolysin O; CRP, C-reactive protein; ESR, Erythrocyte sedimentation rate; Hb, Hemoglobin; Hct, Hematocrit; Plt, Thrombocyte; WBC, White blood cell, Data were presented as mean±standard deviation and median (IQR {interquartile range: first quartile-third quartile}).

Table 3. Echocardiographic measurements of the groups

	Patient Group (n:40)		Control Group (n:40)		p
	mean±SD	median (IQR)	mean±SD	median (IQR)	
IVSd (mm)	7.96±1.36	8.00 (7-9)*	7.50±0.86	7.50 (7-8)*	0.162
LVPWd (mm)	7.73±1.44	8.00 (6.62-9)*	7.32±0.81	7.50(7-7.5)*	0.198
LVEDD (mm)	43.35±6.09*	44.50 (39-47)	41.17±4.30*	42.00 (38-45)	0.069
LVESD (mm)	26.12±4.13*	26.00 (22.25-29)	24.40±2.65*	24.00 (23-26)	0.03
EF (%)	70.25±3.64*	70.00 (67-73.75)	71.55±2.93*	72.00 (69-74)	0.083
FS (%)	39.50±2.97	39.00 (37-42)*	40.30±2.40	40.00(38.25-42)*	0.206
LA (mm)	26.77±4.29	27.50(24-29)*	25.02±3.10	25.00(23-27.5)*	0.02
Ao (mm)	21.60±3.31	21.00(19.25-23)*	20.75±2.43	21.00(20-22)*	0.227
LA/Ao	1.24±0.14	1.21 (1.15-1.29)*	1.20±0.09	1.22 (1.13-1.27)*	0.586

Ao, aortic root; EF, left ventricular ejection fraction; FS, left ventricular fractional shortening; IVSd, interventricular septum end-diastolic thickness; LA, left atrial width; LA/Ao, left atrium to aortic root ratio; LVEDD, left ventricular end-diastolic dimension; LVESD, left ventricular end-systolic dimension; LVPWd, left ventricular posterior wall end-diastolic thickness; mm, millimeter. Data were presented as mean ± standard deviation and median (IQR {interquartile range: first quartile-third quartile}). *, shows the parameters that used for statistical comparisons.

WBC, ESR, CRP and ASO values were found to be higher than laboratory reference range (Table 2).

In patient group, statistically significant increments of echocardiographic measurements of LVESD (left ventricular end-systolic dimension) and LA (left atrial width) were found (p:0.03 and p:0.02, respectively). Between the groups, there was no significant difference in regard to other echocardiographic parameters (p>0.05). Table 3 summarizes the echocardiography results.

On electrocardiography examination, heart rate (p:0.006), PR interval (p<0.001), Pmax (p:0.026), Pd (p<0.001), QTd (p<0.001), QTcmin (p:0.013), QTcmax (p<0.001), QTcd (p<0.001), Tp-e (p:0.02) and ratio of Tp-e/QT (p:0.005) measurements were found to be significantly increased and Pmin measurement, however, significantly lower (p:0.009) in the patient group. In patients with ARF carditis, though iCEB level was determined to be higher, no significant difference was seen (p:0.718). However, a significant increase in iCEBc was found in patient group (p:0.007). Table 4 shows the electrocardiographic measurements.

DISCUSSION

In acute rheumatic fever (ARF), an increased heart rate, as well as various rhythm disorders ranging from atrial conduction disorders to ventricular arrhythmias may occur (4-7). A prolonged PR interval that is

Table 4. Electrocardiographic measurements of the groups

	Patient Group (n:40)		Control Group (n:40)		p
	mean±SD	median (IQR)	mean±SD	median (IQR)	
Heart rate (/minute)	93.00±20.91*	93.5(76.5-110)	81.25±16.08*	78.5 (68.25-92)	0.006
PR (ms)	161.75±34.08	156 (137-189)*	130.95±16.43	132(120-144)*	< 0.001
Pmin(ms)	52.80±8.74	52 (48-60)*	57.40±6.11	56 (52-60)*	0.009
Pmax(ms)	89.00±9.57	88 (81-96)*	84.80±6.54	84 (80-88)*	0.026
Pd (ms)	36.20±5.93	36 (32-40)*	27.40±4.20	28 (24-32)*	< 0.001
QTmin(ms)	305.00±41.04*	294(277-336)	313.60±25.05*	316(300-336)	0.262
QTmax(ms)	345.20±41.71*	336(317-371)	344.50±25.34*	344(328-364)	0.928
QTd(ms)	40.20±6.52	40 (36-44)*	30.90±3.50	30 (28.35)*	< 0.001
QTcmin(ms)	372.00±21.92*	367(358.25-389.5)	360.37±18.99*	359.5(349.5-371.75)	0.013
QTcmax(ms)	421.70±23.25*	418(408.5-436.25)	396.32±20.80*	397.5(382.25-408.75)	< 0.001
QTcd(ms)	49.70±9.51*	49(42-55.75)	35.95±4.99*	36(32-39.75)	< 0.001
Tp-e (ms)	65.00±7.34	62 (60-71)*	61.40±4.75	60 (56-64)*	0.02
Tp-e/QT	0.20±0.02	0.19 (0.18-0.22)*	0.18±0.02	0.18 (0.17-0.2)*	0.005
Tp-e/QTc	0.16±0.01*	0.16 (0.15-0.17)	0.16±0.01*	0.15 (0.14-0.17)	0.554
iCEB(QT/QRS)	5.04±0.80	5 (4.35-5.5)*	4.94±0.58	4.75 (4.54-5.3)*	0.718
iCEBc(QTc/QRS)	6.18±0.89*	6.25 (5.4-6.74)	5.69±0.67*	5.71 (5.16-6.19)	0.007

iCEB, index of cardiac electrophysiological balance; iCEBc ,corrected index of cardiac electrophysiological balance; ms, millisecond; Pd, P-wave dispersion; Pmax, maximum P duration; Pmin, minimum P duration; QTc, corrected QT interval; QTcd, QTc dispersion; QTd, QT dispersion; QTcmax, maximum QTc duration; QTcmin, minimum QTc duration; QTmax, maximum QT duration; QTmin, minimum QT duration; Tp-e, Tpeak to end. Data were presented as mean ± standard deviation, and median (IQR {interquartile range: first quartile-third quartile}). *, shows the parameters that used for statistical comparisons.

considered as a minor finding according to the Jones diagnostic criteria is the most common conduction disorder in ARF (4,17). In children, PR interval varies by heart rate and age. In younger children, PR interval is shortened as the heart rate increases, whereas PR interval prolongs in older children as they have lower heart rates (21). Our study groups had similar age, however, the heart rate in patient group was found to be significantly increased. While a shortened PR interval was expected under normal conditions due to higher heart rate in the patient group, it was found to be significantly prolonged compared to the control group. In patient group, it was thought that prolonged PR interval was a common consequence of ARF and consistent with previous studies.

A higher P dispersion (Pd) has been reported to be related to atrial arrhythmias (8). Kucuk et al. (22) found that Pd was significantly higher in children with rheumatic carditis and that susceptibility to atrial arrhythmias might be increased in ARF. Alp et al. (23) found Pd significantly increased in children with both ARF carditis and chronic rheumatic heart disease compared to the healthy group and, furthermore, determined a positive correlation between higher Pd and valvular insufficiency. Kocaoglu et al. (24) reported that Pd was statistically increased in children with newly-diagnosed ARF compared to healthy children and that the higher Pd might be associated with carditis-induced left atrial enlargement, valvular insufficiency and atrial conduction disorders. Also in our study, Pd was found to be significantly increased in the patient group. This may suggest that children with acute rheumatic carditis may have atrial conduction disorders. However, we have encountered no atrial arrhythmias other than prolonged mean PR interval in patient group.

There are studies showing prolongation of QTd and QTcd durations in children with ARF. Remigio de Aguiar et al. (25) stated that a prolonged QTd in ARF may reflect cardiac involvement. Kucuk et al. (22) reported that these patients may become more susceptible to ventricular arrhythmias in long term due to permanent effect of ARF on the myocardium. Polat et al. (26) observed that both QTcd and QTd in children with ARF were statistically increased due to carditis and concluded that this increase was directly related to degree of valvular insufficiency. Similarly, Alp et al. (23) revealed that durations of QTcd and QTd were significantly increased in children with ARF carditis and with chronic rheumatic heart disease. Karaagac et al. (27) reported that Tp-e duration and

ratio of Tp-e/QT were increased significantly in adult patients with coronary artery ectasia compared to the healthy group and that these parameters may indicate increased risk of arrhythmia. Alsancak et al. (28) also determined higher Tp-e interval duration and ratio of Tp-e/QT in patients with coronary artery ectasia and that these values were in tendency to increase with increasing number of coronary arteries affected by ectasia. In the study of Kucuk (22), Tp-e interval and ratio of Tp-e/QT were found to be increased in children with ARF carditis compared to the healthy control group and also reported that these parameters may be beneficial markers to be used in predicting myocardial involvement. In our study, no significant ventricular arrhythmias were observed in patient group. However, most of the risk markers on ECG for ventricular arrhythmia (QTd, Tpeak-to-end interval, QTcd, and ratio of Tp-e/QT) were determined to be significantly higher in children with acute rheumatic carditis compared to the healthy group. In acute rheumatic fever carditis, we are in thought of that increment of these ventricular repolarization parameters should warn the clinician for increased ventricular arrhythmia risk.

Index of cardiac-electrophysiological balance (iCEB), a novel marker in predicting ventricular arrhythmias, expresses the balance between ventricular depolarization and repolarization. Previous studies have shown that an increase or decrease in iCEB levels may be related to increased ventricular arrhythmia risk (14-16). Robyns et al. (29) demonstrated that QRS duration was directly correlated with cardiac mass in patients with hypertrophic cardiomyopathy (HCMP). However, iCEB level of HCMP group was found to be similar to the control group. They suggested that arrhythmias seen in HCMP may develop due to different mechanisms other than iCEB irregularities. Alsancak et al. (28) showed increased levels of iCEB and iCEBc levels in patients with coronary artery ectasia compared to the healthy cases, although they could not find any statistically significant difference. Sivri et al. (30) found iCEB and İCEBc values higher in patients with chronic renal failure compared to the healthy cases. In the same study, they detected significantly higher iCEB and iCEBc values after hemodialysis compared to pre-hemodialysis and they suggested that malignant ventricular arrhythmia risk may also be increased after hemodialysis. Ucar et al. (31) revealed significantly increased iCEB and iCEBc levels in adult cases with rheumatoid arthritis and stated that

these parameters may be used for determination of increased risk of arrhythmia in rheumatoid arthritis. In the study of Nafakhi (32), conducted in patients with suspected coronary artery disease, they revealed that patients with increased iCEB levels had higher pericardial adipose tissue volume compared to those with low iCEB values and suggested that pericardial adipose tissue volume may have a potential role in cardiac arrhythmogenesis. Yumurtaci et al. (33) observed that higher iCEB and iCEBc values were found to be associated with episodes of ventricular arrhythmia in cases with acute myocarditis. In literature, no study was found related to iCEB in children with ARF carditis. In our study, although iCEB (QT/QRS) value was increased in patient group, no statistically significant difference was determined between the groups. However, statistically significant increment was determined in iCEBc (QTc/QRS) value of the patient group. In children with acute rheumatic carditis, in addition to use of other risk markers for ventricular arrhythmia (dispersions of QT and QTc, Tpeak-to-end, and ratio of Tp-e/QT), evaluation of iCEB(c) may also contribute to the identification of risky patients.

Small number of patients and to be a cross-sectional study may be accepted as limitations. In patient group, all evaluations were performed at the time of admission, so the effects of anti-inflammatory treatment on ECGs and other parameters were not able to be evaluated. For arrhythmia detection, unfortunately no 24-hour-rhythm Holter monitorings were performed. Therefore, the study population could not be followed-up for possibility of arrhythmia development.

CONCLUSION

In this study, PR interval, Pd, heart rate, dispersion durations of both QT and QTc, Tpeak-to-end interval, iCEBc and ratio of Tp-e/QT were observed to be significantly increased in patient group. As our knowledge, this is the first study in which the index of cardiac-electrophysiological balance has been used in ECG of children with ARF carditis. Given that repolarization-depolarization balance may be impaired in children with acute rheumatic carditis, use of iCEB(c) may also beneficial in addition to other cardiac arrhythmia risk parameters measured on ECG. However, conduction of more extensive studies are necessary to reveal the role of repolarization-depolarization balance (iCEB) on emerging rhythm disorders in children with acute rheumatic carditis.

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COVID-19 Pandemi Öncesi ve Pandemi Döneminde Trakeotomi Sonuçlarının Karşılaştırılması

A Comparison of Tracheotomy Results From Before the COVID-19 Pandemic and During the Pandemic

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Öz

Amaç: Bu çalışmada COVID-19 pandemi öncesi ve COVID-19 pandemi döneminde uzamış entübasyon nedeniyle trakeotomi açılmış hastaları karşılaştırmayı amaçladık.

Hastalar ve Yöntem: Bu çalışmada Karaman Eğitim ve Araştırma Hastanesi yoğun bakım ünitesinde, Eylül 2018 ile Ağustos 2021 tarihleri arasında uzamış entübasyon sonrası trakeotomi açılmış 179 hastanın kayıtları retrospektif olarak incelendi. COVID-19 pandemi öncesi 18 aylık dönemde (Eylül 2018 ile Şubat 2020) trakeotomi açılmış olan hastalar grup 1 (n:80) ve COVID-19 pandemi (Mart 2020 ile Ağustos 2021) döneminde trakeotomi açılmış hastalar grup 2 (n:99) olacak şekilde iki gruba ayrıldı. İki grup demografik özellikler, entübasyon süreleri, trakeotomiye bağlı erken ve geç komplikasyonlar, hastaların nihai sonuçları (exitus, eve taburcu, palyatif ve diğer servislere devri) açısından karşılaştırıldı.

Bulgular: Grup 1'deki hastaların %45'i kadın, % 55'i erkekti. Grup 2'deki hastaların % 51'i kadın, % 49'u erkekti. Cinsiyet bakımından gruplar arasında istatistiksel fark saptanmadı. Gruplar arasında yaş ve entübasyon süreleri bakımından istatistiksel olarak anlamlı fark saptandı (p<0.05). Trakeotomi komplikasyonu bakımından gruplar arasında istatistiksel olarak anlamlı bir fark saptanmadı (p>0.05).

Sonuç: Çalışmamızda COVID-19 pandemi döneminde trakeotomi açılan hastaların pandemi öncesi döneme göre daha genç yaşta olduğu gözlendi. Ayrıca pandemi döneminde entübasyon süresi pandemi öncesi dönemine göre daha uzun saptandı.

Anahtar Kelimeler: Trakeotomi, COVID-19, entübasyon süresi, komplikasyon

Abstract

Aim: To compare patients applied with tracheotomy because of prolonged intubation before the COVID-19 pandemic and during the pandemic.

Patients and Methods: A retrospective examination was made of the records of 179 patients with a tracheotomy opened following prolonged intubation in the Intensive Care Unit of Karaman Training and Research Hospital between September 2018 and August 2021. The patients were separated into two groups as group 1 (n:80) of patients with tracheotomy in the 18-month period before the COVID-19 pandemic (September 2018 – February 2020) and group 2 (n:99) of patients with tracheotomy during the COVID-19 pandemic (March 2020-August 2021). The two groups were compared in respect of demographic characteristics, duration of intubation, early and late complications associated with tracheotomy, and patient outcomes (exitus, discharge to home, transfer to palliative and other wards).

Results: Group 1 comprised 45% females and 55% males and group 2 comprised 51% females and 49% males, with no statistically significant difference determined between the groups in respect of gender. A statistically significant difference was determined between the groups in respect of age and the duration of intubation (p<0.05). Tracheotomy-related complications were not determined to be significantly different between the groups (p>0.05).

Conclusion: The patients in this study with a tracheotomy opened during the COVID-19 pandemic were observed to be younger than patients with tracheotomy applied before the pandemic. In addition, the duration of intubation was determined to be longer during the pandemic than in the pre-pandemic period.

Key words: Tracheotomy, COVID-19, intubation duration, complications

GİRİŞ

Yaklaşık olarak 3.000 yıllık geçmişe sahip olan trakeotomi işlemi, hem üst solunum yolu obstrüksiyonları hem de uzamış invaziv mekanik ventilasyon desteği gereken hastalar için uygulanan cerrahi bir müdahaledir. Güncel çalışmalarda uzamış mekanik solunum desteği için açılan trakeotomi sayısında artış olduğu gösterilmiş ve bu oran %76 olarak bildirilmiştir(1). Entübasyonun kaçıncı gününden sonra trakeotominin açılması gerektiği hakkında kesin bir görüş birliği olmamasına rağmen 7-21. gün arasında trakeotomi açılması önerilmektedir(2). Trakeotominin erken açılmasının, endotrakeal entübasyon tüpünün komplikasyon riskini azalttığı, hastanın konforunu artırdığı, hasta bakımını kolaylaştırdığı, daha da önemlisi mortaliteyi azalttığı gösterilmiştir(3).

Trakeotomi işlemi her ne kadar faydalı bir işlem olsa da erken ve geç komplikasyonlara neden olabilmektedir. Erken komplikasyonların en sık görüleni kanamadır. Bunun dışında pnömotoraks, cilt altı amfizem, hemotoraks, kanülün yanlış yere yerleştirilmesi, bunlara bağlı hipoksi ve exitus olabilmektedir. Geç komplikasyon olarak; trakeal stenoz, trakeo-özofageal fistül, trakeo-innominate arter kanaması, trakeomalazi, stoma etrafında ve trakeada granülasyon dokusu oluşumu ve aspirasyon pnömonisi görülebilir(4).

SARS-CoV-2'nin neden olduğu koronavirüs hastalığında (COVID-19) vakaların yaklaşık olarak % 20'sinde viral pnömoni gelişebilmektedir. Viral pnömoni gelişen hastaların yaklaşık olarak % 5'i akut solunum yetmezliği sendromuna [acut erespiratory distress syndrome (ARDS)] ilerlemekte ve yoğun bakım takibi gerekmektedir. Yoğun bakıma alınan gerçek zamanlı-polimeraz zincir reaksiyonu [real time-polymerase chain reaction (RT-PCR)] pozitif COVID-19 hastaların büyük bir kısmında endotrakeal entübasyon ve invaziv mekanik ventilasyon ihtiyacı duyulmaktadır(5-7). Uzun süre endotrakeal entübasyon uygulanan ve invaziv mekanik ventilasyon ihtiyacı olan COVID-19 pozitif hastalara trakeotomi gerekebilmektedir(8).

Bu çalışmamızda COVID-19 pandemi öncesinde ve COVID-19 pandemi döneminde uzamış entübasyon nedeniyle trakeotomi açılmış hastaların demografik özeliklerini, trakeotomiye bağlı erken ve geç komplikasyonları, entübasyon sürelerini ve hastaların nihai sonuçlarını karşılaştırmayı amaçladık.

HASTALAR VE YÖNTEM

Bu çalışmada Karaman Eğitim ve Araştırma Hastanesi yoğun bakım ünitesinde, Eylül 2018 ile Ağustos 2021 tarihleri arasında uzamış entübasyon sonrası trakeotomi açılmış 179 erişkin hastanın (≥18 yaş) kayıtları retrospektif olarak incelendi. COVID-19 pandemi öncesi 18 aylık dönemde (Eylül 2018 ile Şubat 2020) trakeotomi açılmış olan hastalar grup 1 (n:80) ve COVID-19 pandemi döneminde (Mart 2020 ile Ağustos 2021) trakeotomi açılmış hastalar grup 2 (n:99) olacak şekilde iki gruba ayrıldı. Çalışmamız için Karamanoğlu Mehmetbey Üniversitesi Tıp Fakültesi Etik Kurulundan izin alındı. (11.10.2021 tarihli ve 07'nolu karar). Ayrıca çalışmamız için Sağlık Bakanlığın'dan onay alındı (2021-08-22T14_35_25). Çalışmamız Helsinki ilkeleri Bildirgesi'ne uygun olarak yapılmış olup, çalışmaya dahil edilen hasta veya hasta yakınlarından yazılı aydınlatılmış onam alınmıştır.

Çalışmaya dahil edilen hastaların yaşı, cinsiyeti, entübasyon zamanı (trakeotominin entübasyonun kaçıncı gününde açıldığı), trakeotomiye bağlı erken ve geç komplikasyonlar, hastaların nihai sonuçları (exitus, eve taburcu, palyatif ve diğer servislere devri) dosya arşivleri incelenerek veriler oluşturuldu. Grup 2'deki hastalarda ayrıca COVID-19 hastalığı için RT-PCR pozitif varlığı araştırıldı.

Bütün trakeotomiler elektif şartlarda ve kliniğimizde çalışan 6 farklı kulak burun boğaz hastalıkları uzmanı tarafından cerrahi diseksiyon yöntemiyle yoğun bakım odasında genel anestezi altında gerçekleştirildi. Trakeotomi işlemi öncesinde, hastanın omuz altına destek koyularak boynun ekstansiyona gelmesi sağlandı. Boyun bölgesi antiseptik solüsyonla temizlendikten sonra krikoid kartilaj ile suprasternal çentik arasından boyuna horizontal yaklaşık 3 cm'lik cilt insizyonu yapıldı. Yumuşak dokular ve strep kaslar eleve edildi. Tiroid dokusu ekartör yardımı ile yukarı doğru ekarte edilerek trakeaya ulaşıldı. Trakeanın 2. ve 3. kıkırdak halkaları arasından pencere açılarak trakeotomi kanülü trakeaya yerleştirildi. Hastanın solunum sesleri dinlendikten sonra akciğer grafisi çektirildi. Kadın hastalarda 7.5 mm-8 mm, erkek hastalarda ise 8 mm-8.5 mm çapında tek kaflı plastik trakeotomi kanülü kullanıldı.

Trakeotomi işlemi sonrasında, stoma çevresinin günlük steril spanç ve antiseptik solüsyonla pansuman yapılması, ilk 24-48 saatte daha sık olmak üzere düzenli olarak kanülün aspire edilmesi ve trakeotomi kanül kafının her iki saatte bir 15 dk indirilerek kanül kaf jimnastiği yapılması yoğun bakım ekibine önerildi. Daha önce trakeotomi açılmış, üst havayolu obstrüksiyonuna bağlı açılan acil trakeotomi hastaları

ve boyun bölgesine radyoterapi almış olan hastalar çalışmadan dışlandı.

İstatistiksel Analiz

İstatistiksel analiz IBM SPSS ver. 22.0 versiyonu ile kategorik verilerin karşılaştırılmasında ki-kare testi, parametrik değişkenlerin analizi için bağımsız ve eşleştirilmiş t-testi kullanıldı. Verilerin dağılım modeline göre parametrik olmayan değişkenlerin analizi için Wilcoxon ve Mann-Whitney U-testleri kullanıldı. P <0.05 değeri istatistiksel olarak anlamlı kabul edildi.

BULGULAR

Grup 1'deki hastaların %45'i kadın, %55'i erkekti. Grup 2'deki hastaların %51'i kadın %49'u erkekti. Cinsiyet bakımından gruplar arasında istatistiksel fark saptanmadı. Grup 1 ve 2'deki hastaların yaş ortalamalarını sırasıyla 81,19±14,11(yıl), 73,42±15,9(yıl) ve orotrakeal entübasyon sürelerini 18,45±6,58(gün), 21,5±6,95(gün) olarak bulduk. Gruplar arasında yaş ve entübasyon süresi bakımından istatistiksel olarak anlamlı fark saptandı (p<0.05). Grup 1' de 13 hastada ve grup 2' de 16 hastada trakeotomiye bağlı erken ve geç komplikasyon gördük. Trakeotomi komplikasyonu bakımından gruplar arasında istatistiksel anlamlı bir fark saptanmadı (p>0.05-tablo 1).

Grup 2'deki 24 hastaya COVID-19 pnömonisi, 75 hastaya ise COVID-19 pnömonisi dışı nedenlere bağlı olarak uzamış orotrakeal entübasyondan dolayı trakeotomi açıldı. COVID-19 pnömonisi nedeniyle trakeotomi açılan 24 hastanın yaş ortalamasını 73,75±13,5(yıl), COVID-19 pnömonisi dışı nedenlerden dolayı trakeotomi açılan 155 hastanın yaş ortalamasını 77,38±15,8(yıl) olarak bulduk.

Orotrakeal entübasyon sürelerini ise COVID-19 pnömonisi nedeniyle trakeotomi açılan 24 hastada 23,1±5(gün), COVID-19 pnömonisi dışı nedenlerden dolayı trakeotomi açılan 155 hastada 19,6±7(gün) bulduk. COVID-19 pnömonisi nedeniyle trakeotomi açılan hastalarımızda geç komplikasyon görülmez iken, 4(%16,6) hastada erken komplikasyon olarak kanama görüldü.

Grup 1 ve 2'deki hastaların nihai sonuçları sırasıyla exitus 57(%71,25), 60(%60,61), eve taburculuk 3(%3,75), 5(%5,05) ve palyatif ve diğer servislere nakil 20(%25), 34(%34,34) hasta olarak bulduk (tablo 2). Grup 2' de COVID-19 pnömonisi nedeniyle trakeotomi açılan 24 hastanın 16(%66,6)'sında exitus görüldü. Grup 1'de toplam 13 hastanın dekanülasyon işlemi tamamlanmışken, Grup 2'de 16 hastanın dekanülasyon işlemi tamamlandı. Gruplar arasında trakeotomi kapatılması açısından istatistiksel anlamda bir fark saptanmadı (p>0.05). Eve taburcu edilen hastaların bir kısmında dekanülasyon yapılamadı. (Grup 1'de 10, Grup 2'de 23 hasta). Toplamda 20 hastada gümüş kanüle geçiş yapılarak taburcu edilirken, 13 hasta plastik trakeotomi kanülü ile taburcu edildi. Grupların erken ve geç komplikasyon nedenleri ve sayıları tablo 3'de gösterilmiştir.

COVID-19 pnömonisi nedeniyle trakeotomi açılan 21 hasta komorbid hastalığa sahipti. Hastalarımızdaki bu komorbid hastalıklar görülme sıklığına göre hipertansiyon, kardiyovasküler hastalık, diabetes mellitus, solunum sistemi hastalıklarıydı. COVID-19 pnömonisi nedeniyle trakeotomi açılan 3 hasta ise komorbid hastalığa sahip değildi.

TARTIŞMA

Çalışmamızda COVID-19 pnömonisi nedeniyle

Tablo 1. Hastaların demografik verilerinin, entübasyon sürelerinin ve komplikasyonların karşılaştırılması

	Grup 1 (n=80)	Grup 2 (n=99)	P değeri
Cinsiyet (E/K)	44/36	48/51	P=0.389
Yaş ortalaması(yıl)	81,19±14,11	73,42±15,9	P=0.001
Entübasyon süresi(gün)	18,45±6,58	21,5±6,95	P=0.030
Erken ve geç komplikasyonlar (hasta sayısı)	13(%16,25)	16(%16,16)	P=0.987

Tablo 2. Trakeotomi açılan hastaların nihai sonuçları

	Grup 1 n(%)	Grup 2 n(%)
Exitus	57(%71,25)	60(%60,61)
Eve taburcu	3(%3,75)	5(%5,05)
Palyatif ve diğer servislere nakil	20(%25)	34(%34,34)

Tablo 3. Trakeotomiye bağlı gelişen erken ve geç komplikasyonlar

Komplikasyon türü	Grup 1 n(%)	Grup 2 n(%)
Erken Komplikasyon	9(%11,25)	13(%13,13)
Kanama	6(%7,5)	9(%9,09)
Trakeotomi tüpünün kazara çıkması	2(%2,5)	1(%1,01)
Pnömotoraks	0	1(%1,01)
Cilt altı amfizem	1(%1,25)	2(%2,02)
Geç Komplikasyon	4(%5)	3(%3,03)
Trakeo-özofageal fistül	2(%2,5)	1(%1,01)
Trakeo-innominate arter kanaması	1(%1,25)	0
Trakeal granülom	1(%1,25)	2(%2,02)

trakeotomi açılan 24 hastanın yaş ortalamasını 73,75±13,5(yıl), COVID-19 pnömonisi dışı nedenlerden dolayı trakeotomi açılan 155 hastanın yaş ortalamasını 77,38±15,8(yıl) olarak bulduk. COVID-19 pandemi döneminde trakeotomi açılan hastaların daha genç yaşta olmasının sebebi, COVID-19 hastalığının daha genç yaştaki kişilerde de görülmesi veya hastaların mevcut komorbid hastalıklarının bu dönemde kötüleşmesinin neden olabileceğini düşünmekteyiz. Yapılan bir çalışmada özellikle kalp hastalığı ve diyabet gibi kronik hastalığa sahip olanlarda COVID-19'un daha mortal seyrettiği gösterilmiştir(9). COVID-19 pnömonisi nedeniyle trakeotomi açılan 21 hasta komorbid hastalığa sahipti. Çalışmamızda COVID-19 pnömonisi nedeniyle trakeotomi açılan hasta sayısının, COVID-19 pnömonisi dışı nedenlerden dolayı trakeotomi açılmış hasta sayısından az olmasının sebebi, özellikle komorbid hastalığı olan COVID-19 pnömonili hastaların mortal seyretmesinden dolayı, bu hastalarda trakeotomi açılma zamanına ulaşılamadan mortalite gelişmiş olabileceğini düşündürmektedir.

Çalışmamızda entübasyon süresi açısından gruplar arasında istatistiksel olarak anlamlı fark tespit ettik (p<0.05). Grup 1 ve 2'deki hastaların entübasyon sürelerini sırasıyla 18,45±6,58(gün), 21,5±6,95(gün) olarak bulduk. Ayrıca COVID-19 pnömonisi nedeniyle trakeotomi açılan 24 hastada entübasyon süresini 23,1±5(gün), COVID-19 pnömonisi dışı nedenlerden dolayı trakeotomi açılan 155 hastada ise 19,6±7(gün) bulduk. COVID-19 salgını sonrasında yayınlanan bazı rehberler, COVID-19 hastalığı nedeni ile entübe olmuş hastalarda, trakeotomiyi entübasyonun 14. günü veya daha sonrasına bırakılmasını önermektedir. Bunun sebebi hastanın viral yükünün azalması ve trakeotomi açan ekibin daha az bulaş riskine maruz kalmasını sağlamak için olduğu bildirilmiştir(10,11). Bazı yazarlar COVID-19 pnömonisinde prognozun bilinmediğini ve yüksek viral yükten dolayı hastalığın

başlarında (ilk hafta içinde) trakeotomi açılmasını önermemişlerdir(12). Grup 2'deki COVID-19 pnömonisi nedeniyle trakeotomi açılan hastaların trakeotomi açılma zamanının daha uzun saptanması hastanemizde bu rehberlerdeki öneriye uygun olarak trakeotomi açıldığını göstermektedir.

Ülkümen et al. (13) yaptığı bir çalışmada trakeotomi işlemine bağlı erken komplikasyon oranını %27,2 geç komplikasyon oranını %9,7 bulmuşlardır. Çalışmamızda erken ve geç komplikasyon oranı sırasıyla Grup 1'de %11,2 ve %5, Grup 2'de %13,1 ve %3 olarak tespit ettik. Erken ve geç komplikasyon açısından grup 1 ve grup 2'de istatistiksel olarak anlamlı fark izlenmedi (p>0.05). Her iki grupta da en sık görülen erken komplikasyon kanamaydı. Geç komplikasyonlardan grup 1'de en sık trakeo-özofageal fistül, grup 2'de trakeal granülom izlendi. Grup 1'de bir hastamızda geç komplikasyon olarak trakeo-innominate arter kanaması görüldü. Bu hastamız tüm müdahalelere rağmen kanamaya bağlı kaybedildi. Bunun dışında traketomiye bağlı ölüm olmadı. Grup 2'de COVID-19 pnömonisi nedeniyle trakeotomi açılan 4(%16,6) hastamızda erken komplikasyon olarak kanama görüldü. COVID-19 pnömonisi nedeniyle trakeotomi açılan hastalarda geç komplikasyon görülmez iken kanama dışında başka erken komplikasyonda görülmedi. COVID-19 pnömonisi nedeniyle trakeotomi açılan hastalarda yapılan bir çalışmada trakeotomiye bağlı komplikasyon oranını % 57,4 bulmuşlardır(14). Biz de çalışmamızda COVID-19 pnömonisi nedeniyle trakeotomi açılan hastalarda komplikasyon oranını %16,6 olarak bulduk. Trakeotomi komplikasyonu bakımından gruplar arasında istatistiksel fark olmaması ve COVID-19 pnömonisi nedeniyle trakeotomi açılan 4(%16,6) hastada komplikasyon görülmesi, COVID-19 pnömonisinin trakeotomi komplikasyonlarını artırmadığını düşündürmektedir. Ancak COVID-19 hastalarımızın büyük bir kısmında exitus görüldüğü

ve hastalarımızın uzun dönem takipleri olmadığı için trakeotomiye bağlı geç komplikasyonlar gözlenmemiş olabilir.

Trakeotomi açılmış hastaların nihai sonuçları incelendiğinde grup 1'de 57(%71,3), grup 2'de 60(%60,6) ve toplamda 117(%65,4) hasta da exitus gerçekleşti. Grup 2' de COVID-19 pnömonisi nedeniyle trakeotomi açılan 24 hastanın 16(%66,6)'sında exitus görüldü. COVID-19 pnömonisi nedeniyle trakeotomi açılan hastalarda yapılan daha önceki çalışmalar mortalite oranını %7 ile %41 arasında bulmuşlardır(15,16). Biz de çalışmamızda grup 2' de COVID-19 pnömonisi nedeniyle trakeotomi açılan hastalarda mortalite oranını %66,6 olarak bulduk. Bizim mortalite oranımız literatürden biraz daha yüksekti. COVID-19 pnömonisi nedeniyle trakeotomi açılan hastalarda yüksek oranda exitus görülmesine rağmen, gruplar arasında mortalite açısından istatistiksel fark saptanmadı (p>0.05). Kırca et al. (17) yapmış olduğu bir çalışmada mortalite oranını %55,2 bulmuşlardır. Mortalite oranımız bu çalışmayla benzer şekildeydi.

Çalışmamızın en önemli kısıtlılığı, hastaların uzun dönem takipleri kısa olduğu için trakeal stenoz ve diğer geç komplikasyonlar hakkında yeterli bilgi elde edilememesidir. Diğer bir kısıtlılık ise, COVID-19 pnömonisi nedeniyle trakeotomi açılan hastaların çalışmamızda sayıca az olmasıdır. COVID-19 pnömonisi nedeniyle trakeotomi açılan daha fazla sayıda hastaların çalışmaya alındığı çalışmalar bu konuda daha detaylı bilgi sahibi olmamızı sağlayabilir. Trakeotominin geç komplikasyonları hakkında ayrıca uzun dönem takipli çalışmalara ihtiyaç vardır.

SONUÇ

Sonuç olarak çalışmamızda COVID-19 pandemi döneminde trakeotomi açılan hastaların daha genç yaşta olduğunu tespit ettik. COVID-19 hastalığının trakeotomi komplikasyonları üzerine etkisinin olmadığını bulduk. Ayrıca COVID-19 pandemi döneminde, entübasyon süresini pandemi öncesi döneme göre daha uzun olarak bulduk.

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Araştırma Makalesi / Research Article

Factors Associated with Intensive Care Hospitalization in Patients with Covid-19

Covid-19 Hastalarında Yoğun Bakım Yatışı ile İlişkili Faktörler

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Öz

Amaç: Bu çalışmada biyokimyasal parametreler, vital bulgular ve nötrofil-lenfosit oranı (NLR) değerlerinin COVID-19 hastalarında yoğun bakım yatış endikasyonunun belirlenmesinde kullanılabilir olup olmadığı amaçlandı.
Hastalar ve Yöntem: Bu retrospektif gözlemsel çalışma, bir üniversite hastanesinin acil servisinde gerçekleştirildi. 1-31 Temmuz 2020 tarihinde hastanemize başvurmuş SARS-CoV-2 PCR testi pozitif olan hastalar çalışmaya dahil edildi. Elektronik ortamda hastaların laboratuvar sonuçları, demografik bulguları ve klinik sonuçları toplandı. Hastalar taburcu edilmiş, servise veya yoğun bakıma yatışı yapılmış olarak 3 gruba ayrıldı. Gruplar arasında semptomların görülme sıklığı, şiddeti, ek hastalıklar, laboratuvar değerleri, NLR değerleri kıyaslandı.
Bulgular: Çalışmaya toplam 489 hasta dahil edildi. Dahil edilen hastaların ortalama yaşı 48.69 + 17.25 yıl iken bunların 260'ı (%53,16) kadındı. Bu hastaların 248'i (%50,9) taburcu edilirken, 207'si (%42,3) servislere, 33 (%6,7)'ü de yoğun bakım ünitelerine alındı. Yoğun bakıma yatış yapılan hastaların yaş, kalp hızı, üre, kreatinin, CRP, D-dimer ve NLR değerleri diğer gruplara kıyasla yüksekken, bu grupta oksijen saturasyonu ise istatiksel olarak anlamlı derecede düşüktü. Yoğun bakımı yatışı olanlarda Diabetes Mellitus, Esansiyel Hipertansiyon, Kronik Obstrüktif Akciğer hastalığı gibi eşlik eden sistemik rahatsızlıklar daha fazlaydı. Çok değişkenli analizde oksijen satürasyonu (OR:0.803) ve nötrofil-lenfosit oranı (OR:1.09) yoğun bakım ünitesinde yatış endikasyonunun bağımsız öngördürücüsü olarak bulundu.
Sonuç: Çalışmamızın sonucunda acil servise COVID-19 nedeni ile başvuran hastalarda özellikle düşük oksijen satürasyonu ve yüksek nötrofil-lenfosit oranının yoğun bakım yatış endikasyonun belirlenmesinde kullanılabileceklerini düşünüyoruz.

Anahtar Kelimeler: Acil servis, COVID-19, pandemi, NLR, yoğun bakım

Abstract

Aim: In this study, it was aimed whether biochemical parameters, vital signs and neutrophil-lymphocyte ratio (NLR) values could be used in determining the indication for intensive care hospitalization in COVID-19 patients.
Patients and Methods: This retrospective observational study was conducted in the emergency department of a university hospital. Patients with positive SARS-CoV-2 PCR test who applied to our hospital on 1-31 July 2020 were included in the study. Laboratory results, demographic findings and clinical results of the patients were collected electronically. The patients were divided into 3 groups as discharged, admitted to the service or intensive care unit. The incidence and severity of symptoms, comorbidities, laboratory values, and NLR values were compared between the groups.
Results: A total of 489 patients were included in the study. The mean age of the included patients was 48.69 + 17.25 years, of which 260 (53.16%) were female. While 248 (50.9%) of these patients were discharged, 207 (42.3%) were taken to the service and 33 (6.7%) to the intensive care units. Age, heart rate, urea, creatinine, CRP, D-dimer and NLR values of the patients admitted to the intensive care unit were higher than the other groups, while oxygen saturation was statistically significantly lower in this group. Concomitant systemic diseases such as Diabetes Mellitus, Essential Hypertension, Chronic Obstructive Pulmonary Disease were more common in those hospitalized in the intensive care unit. In multivariable analysis, oxygen saturation (OR:0.803) and neutrophil-lymphocyte ratio (OR:1.09) were found to be independent predictors of the indication for hospitalization in the intensive care unit.
Conclusion: As a result of our study, we think that especially low oxygen saturation and high neutrophil-lymphocyte ratio can be used in determining the indication for intensive care hospitalization in patients who apply to the emergency department due to COVID-19.

Key words: Emergency department, COVID-19, pandemic, NLR, intensive care

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INTRODUCTION

Towards the end of 2019, cases of unexplained lung disease were reported in China (1). On January 7, 2020, a new beta-coronavirus was detected from patients' throat swab sample and was later named 2019-novel coronavirus disease (COVID-19) by the World Health Organization (WHO) (2,3). Upper respiratory tract disease findings such as cough, fever, shortness of breath, fatigue and sputum production are among the common symptoms of the disease. [4]. Approximately 81% of their patients had mild symptoms (low-grade fever, fatigue, dry cough, and abnormal chest findings, etc.), while signs of serious illness (severe acute respiratory distress syndrome, diffuse lung infiltration, renal failure or development of failure in many organs) are observed in 14% of cases. (4,5). Dyspnea and/or hypoxemia symptoms predominate in those with severe disease symptoms, and the majority of cases result in death. As we learn more about the spectrum of COVID-19 disease, it has been found that there is a complex interaction within the immune system initiated by viral infection, and the resulting uncontrolled and altered hyperinflammatory response contributes to high morbidity and mortality in addition to direct viral damage [5]. As there is no specific treatment and medication for this disease, it is necessary to identify the severity and diagnostic risk factors for COVID-19 infection. Biomarkers of circulating inflammation and immune status are prognostic predictors for patients with COVID-19. In this context, systemic inflammation markers such as peripheral white blood cell count (WBC), neutrophil-lymphocyte ratio (NLR) have been shown to be important in predicting the prognosis of the disease in different studies (6-10).

It has been determined that COVID-19 cases need more follow-up in the intensive care unit and 40% to 96% of the patients hospitalized to the intensive care unit have acute respiratory distress syndrome. The need for invasive mechanical ventilation (IMV) has varied widely between different case series, but has always been associated with high mortality. When the mortality rates in the patients followed in the intensive care unit are examined, it has been shown that although it differs according to the anoher study, it varies between 16% and 78% (11).

In this study, we investigated whether biochemical parameters, vital signs and neutrophil lymphocyte ratio could be used to determine the indication for intensive care hospitalization in COVID-19 patients.

PATIENTS AND METHOD

With the approval of the ethics committee, patients who applied to our hospital between 1-31 July 2020 and whose diagnosis of COVID-19 were confirmed with a swab sample were retrospectively screened and included in the study. Under 18 years old, pregnant, missing data, voluntary discharged or referred another hospital were not included in the study. In the study, the medical records of 489 patients were searched through the hospital database. Laboratory results, demographic findings and clinical results of the patients were collected electronically. Complete blood count values, biochemical parameters, d-dimer and CRP values were checked for laboratory tests. The patients were divided into 3 groups as discharged, hospitalized to the service or intensive care unit. The incidence and severity of symptoms, comorbidities, laboratory values, and NLR values were compared between the groups. The local ethics committee approved the study protocol (decision no. 2021-31982).

The data obtained were evaluated using the Statistical Package for Social Sciences for Windows 21.0 (SPSS Inc., Chicago, Illinois, USA) statistical program. Descriptive statistics were determined for each variable. After analysis of normality of parameters, data were expressed as mean ± standard deviation or median and interquartile range (IQR). Mixed ANOVA models were used to assess differences between groups in terms of continuous variables. Bonferroni test was used for Post-Hoc analysis. A difference was considered statistically significant when p-value <0.05. We regrouped the patients as those admitted to the intensive care unit and not. And then binomial logistic regression analysis was performed to determine independent predictors for the intensive care hospitalization. Factors with a p value of <0.2 were included in the univariate analysis in the regression test, while those that were significant in the univariate analysis were included in the multivariable evaluation

RESULTS

This was a cross-sectional study evaluating 489 people (260 females, 229 males; mean age, 48.69 + 17.25 years) who applied to the emergency department due to COVID-19. Demographic, clinical characteristics and biochemical parameters of 489 patients with COVID-19 were depicted in Table 1.

When patients are grouped in terms of hospitalization indication after admission to the

Table 1. Demographic, Clinic, and Biochemical Features of The Patients.

Parameters	Patients with COVID-19 (n=489) (Mean±SD), Median (IQR) or Frequency (n-%)
Age (years)	48.69+17.25
Female/Male	260/229
History of Diabetes Mellitus	66 (%13.5)
History of Hypertension	96 (%19.6)
History of Coronary Artery Disease	62 (%12.7)
History of Chronic Obstructive Pulmonary Disease	50 (%10)
History of Malignancy	10 (%2)
Oxygen saturation (%)	93.72 + 5.84
Fever (C°)	36.86 + 0.66
Heart rate (bpm)	97.76 + 18.46
Systolic blood pressure (mmHg)	124.16 + 19.47
Diastolic blood pressure (mmHg)	78.99 + 13.16
Urea (mg/dl)	29 (13)
Creatinine (mg/dL)	1.05 + 0.46
Lymphocyte count (10^3/µL)	1.38 (1.16)
Neutrophil count (10^3/µL)	3.85 (2.55)
Neutrophil lymphocyte ratio	2.69 (3.62)
CRP (mg/L)	11.2 (30.4)
D-Dimer (µg/mL)	580.5 (631)
Troponin positivity	18 (%3.7)
Thorax tomography finding	339 (69.3%)
Outcome	
Discharged	248 (%50.9)
Follow-up in service	207 (%42.3)
Follow-up in intensive care	33 (%6.7)

hospital there were no significant diferences with respect to the following variables between groups; gender, and lymphocyte counts. The group that was given an indication for hospitalization in the intensive care unit had significantly lower oxygen saturation, while age, fever, heart rate, serum urea, creatinine, neutrophil count, neutrophil-lymphocyte ratio, CRP, and D-Dimer were significantly higher in this group (Table 2). When the patients were examined in terms

of threshold chronic diseases, systemic diseases such as diabetes mellitus, primary hypertension, chronic obstructive pulmonary disease were more common in those hospitalized in the intensive care unit.

We also performed binomial logistic regression analysis to define variables that are independently associated with the indication of hospitalization in the intensive care unit (Table 3). Age, oxygen saturation, fever, heart rate, urea, creatinine, neutrophil-

Table 2. Treatment methods accoring to the closure patterns

Parameters	Discharged (n=249) (Mean±SD), Median (IQR) or Frequency (n-%)	Service (n=207) (Mean±SD), Median (IQR) or Frequency (n-%)	Intensive care (n=33) (Mean±SD), Median (IQR) or Frequency (n-%)	p
Age (years)	39.81 + 12.65	55.86 + 15.63	70.73 + 16.75	<0.001
Female/Male	134/115 (53.8/46.2)	107/100(51.6/48.4)	19/14(57.6/42.4)	0.719
Oxygen saturation (%)	95.9 + 1.9	93.21 + 3.98	79.8 + 12.69	<0.001
Fever (C°)	36.7 + 0.58	36.9 + 0.68	37 + 1.03	0.01
Heart rate (bpm)	94.58 + 15.1	99.49 + 16.31	111.28 + 38.27	<0.001
Urea (mg/dl)	28 (12)	32 (20)	96.5 (109)	<0.001
Creatinine (mg/dL)	0.93 + 0.19	1.04 + 0.35	2.01 + 1.07	<0.001
Lymphocyte count (10^3/µL)	1.25 (1.16)	1.05 (0.78)	0.6 (0.43)	0.138
Neutrophil count (10^3/µL)	3.59 (1.89)	4.23(3.62)	9.5 (4.67)	<0.001
Neutrophil lymphocyte ratio	2.96 (3.27)	3.32 (5.32)	16.72 (29.54)	<0.001
CRP (mg/L)	6 (16.8)	26.4 (41)	148 (176.3)	<0.001
D-Dimer (µg/mL)	254 (195)	615 (468)	2169 (2581)	<0.001

Table 3. Binomial Logistic Regression Analysis of Intensive Care Hospitalization and Other Parameters in Patients with COVID-19.

	Univariate Analysis		Multivariable Analysis	
Parameters	OR (95% CI)	p value	OR (95% CI)	p value
Age (years)	1.09 (1.06-1.11)	<0.001	0.99 (0.95-1.03)	0.729
Oxygen saturation (%)	0.69 (0.63-0.76)	<0.001	0.803 (0.72-0.89)	<0.001
Fever (C°)	1.59 (1.01-2.52)	0.045	0.52 (0.24-1.11)	0.094
Heart rate (bpm)	1.03 (1.01-1.05)	<0.001	0.98 (0.96-1.01)	0.276
Urea (mg/dl)	1.04 (1.03-1.05)	<0.001	1.00 (0.97-1.04)	0.757
Creatinine (mg/dL)	13.13 (6.38-26.98)	<0.001	1.68 (0.61-4.62)	0.316
Neutrophil lymphocyte ratio	1.22 (1.15-1.29)	<0.001	1.09 (1.02-1.17)	0.01
CRP (mg/L)	1.02 (1.01-1.02)	<0.001	0.99 (0.98-1.01)	0.817
D-Dimer (µg/mL)	1.00 (1.00-1.002)	<0.001	1.00 (1.00-1.001)	0.098

lymphocyte ratio, CRP, and D-dimer were included in this model. As a result of our multivariable analysis, oxygen saturation and NLR values were found to be independent predictors of the indication for hospitalization in the intensive care unit (Table 3).

DISCUSSION

COVID-19 caused a rapid outbreak with human-to-human transmission, with a median incubation period of 3 days and a relatively low death rate (1). However, despite the low mortality rate, the disease progresses severely in elderly patients with concomitant chronic diseases such as diabetes or hypertension. It has been found that intensive care hospitalizations and mortality rates increase in direct proportion with age in studies examining COVID-19 cases worldwide (12-14). In another study conducted by Maddani et al. (15)., it was found that the risk of death in people over the age of 80 was 20 times higher than in those between 50 and 59 years of age, which supports the literature. In our study, we observed that the group with an indication for intensive care hospitalization was older and the presence of concomitant systemic disease caused an increase in the indication for intensive care admission.

Recent studies have shown that the virus binds to alveolar cells through receptor mediated and stimulates macrophages to release inflammatory markers (16). Accordingly, factors and chemokines that use other mononuclear cells are released. Mononuclear cells,

mostly lymphocytes, were found to predominate in the interstitial space of the lung. The current situation partially explains the lymphopenia picture in peripheral blood. In another study, patients with severe disease had significantly lower lymphocyte levels, but no significant difference was found between neutrophil levels (16,17). At the same time, it has been stated that there is a direct proportional relationship between the degree of lymphopenia and the severity of the disease and intensive care admissions in different studies (4,15). In a meta-analysis evaluating patients with severe COVID-19, it was found that higher white blood cell counts and elevated leukocyte levels are hallmarks of patients in critical condition (18,19). In our findings, although it was not statistically significant, the lymphocyte count was found to be lower in patients with intensive care hospitalization, while the neutrophil count was significantly higher.

Although the lungs are the main target organ for the coronavirus, the end organ damage is not just the lungs. It is known that lymphocytes inhibit immune reactions caused by viral infection. Therefore, it has been shown that the lack of effective lymphocyte levels caused by SARSCoV-2 infection causes an increase in cytokines and exacerbation of inflammatory responses, leading to liver and kidney damage (20,21). In addition, coagulation abnormalities frequently occur in COVID-19 patients, which complicates patient management. This disorder is manifested by a marked increase in D-dimer levels (22,23). Laboratory

parameters such as increased CRP, D-dimer, and NLR were associated with the incidence of severe disease, and as a result, it was mentioned that these markers can help predict severity and prognosis (15). In our study, urea, creatinine and D-dimer levels were found to be increased in patients admitted to the intensive care unit, in line with the literature.

Shang et al. (9) showed in a study that values such as platelet count, CRP, and NLR were effective in determining the prognosis of the disease. In another study, the relationship between the hematological values of the patients and the length of stay in the hospital was examined, and a decrease in lymphocyte count and a significant increase in NLR were found in patients with severe disease symptoms. When they examined the length of hospital stay, they found a positive correlation with NLR and as a result they stated that NLR could be used to predict the prognosis of the disease (17). In a study conducted to determine the cut-off value of NLR, which can be used for prognosis prediction, it was found that mortality and intensive care hospitalizations increased significantly when the NLR was above 4,5. In the same study, it was reported that NLR can help clinicians detect potentially serious cases early, perform early triage, and initiate effective management in a timely manner (24). In our study, in support of the above findings, serum NLR and CRP values were statistically significantly higher in the patient group requiring intensive care admission. In addition, age, oxygen saturation, fever, heart rate, urea, creatinine, neutrophil-lymphocyte ratio, CRP and D-dimer were found to be statistically significant in the univariate regression analysis we performed to define the variables associated with the indication for hospitalization in the intensive care unit. In multivariable analysis, high NLR and low oxygen saturation were independent predictors of intensive care hospitalization indication.

There are some limitations in our study. First of all, our study was designed as a single center because it was the only hospital in the province that evaluated pandemic patients, and our sample was not large enough. Almost all of the patients included in the study were Turkish. It should be considered that our results cannot be applied to all patients due to the differences that may occur between nationalities.

CONCLUSION

As a result, we found that oxygen saturation and neutrophil-lymphocyte ratio were independent predictors of the indication for hospitalization in the intensive care unit. Therefore, we think that these parameters can be used in determining the indication for intensive care hospitalization in patients who apply to the emergency department due to COVID-19.

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Reliability of Corneal Subbasal Nerve Plexus Analyses Using Semi-Automated Software

Yarı-Otomatik Bir Yazılım Kullanılarak Yapılan Korneal Subbazal Sinir Pleksusu Analizlerinin Güvenilirliği

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Öz

Amaç: Bu çalışmanın amacı yarı-otomatik bir yazılım kullanılarak yapılan kantitatif korneal subbazal sinir pleksusu (KSSP) analizlerinin gözlemciler-arası ve gözlemci-içi güvenilirliğinin değerlendirilmesidir.
Hastalar ve Yöntem: Çalışmaya Necmettin Erbakan Üniversitesi Meram Tıp Fakültesi Göz Hastalıkları Bölümüne 20 Aralık 2021 – 20 Ocak 2022 tarihleri arasında başvuran 40 gönüllü dahil edildi. Katılımcıların sağ gözlerinden Heidelberg Retina Tomografisi III ile entegre Rostock Kornea Modülü kullanılarak KSSP'nu gösteren görüntüler alındı. Her bir gözden en kaliteli üç görüntü seçildi. ImageJ yazılımı için NeuronJ eklentisi ile sinir lifleri işaretlendi ve sinir lifi uzunluğu (SLU), sinir lifi dansitesi (SLD) ve sinir dalı dansitesi (SDD) hesaplandı. Tüm bu ölçümler iki farklı gözlemci tarafından yapıldı ve bir gözlemci tarafından bir hafta ara ile ikinci kez tekrar edildi ve sınıf-içi korelasyon katsayısı (SKK) kullanılarak gözlemciler-arası ve gözlemci-içi güvenilirlik analiz edildi.
Bulgular: Çalışmaya dahil edilen 12'si kadın, 28'i erkek 40 katılımcının ortalama yaşı 34.70±5.86 yıldır. Gözlemciler-arası güvenilirlik analizinde SKK değerleri SLU için 0.967 (95% CI 0.939-0.982), SLD için 0.826 (95% CI 0.696-0.904) ve SDD için 0.949 (95% CI 0.906-0.973) tespit edilmiş olup iyi-mükemmel güvenilirliği göstermekteydi. Gözlemci-içi güvenilirlik analizinde SKK değerleri SLU için 0.964 (95% CI 0.932-0.981), SLD için 0.803 (95% CI 0.657-0.891) ve SDD için 0.890 (95% CI 0.802-0.941) tespit edilmiş olup iyi-mükemmel güvenilirliği göstermekteydi.
Sonuç: Yarı-otomatik yazılım kullanılarak yapılan kantitatif KSSP analizlerinin gözlemciler-arası ve gözlemci-içi güvenilirliği yüksektir ve bu sayede hem klinik pratikte, hem de klinik çalışmalarda, kornea sinirlerinin iyilik halinin ve hasarının tespitinde, takibinde ve tedaviye yanıtın değerlendirilmesinde kullanılabilir.

Anahtar Kelimeler: Korneal subbazal sinir pleksusu, NeuronJ, güvenilirlik analizi

Abstract

Aim: The aim of this study was to evaluate the interobserver and intraobserver reliability of quantitative corneal subbasal nerve plexus (CSNP) analyses using semi-automated software.
Patients and Methods: Forty volunteers who applied to the Ophthalmology Department of the Necmettin Erbakan University Meram Faculty of Medicine between 20 December 2021 and 20 January 2022 were enrolled in the study. Images showing CSNP were obtained from the right eyes of the participants by using Heidelberg Retina Tomograph III with Rostock Cornea Module. Three best quality images were selected from each case. NeuronJ plugin for ImageJ software was used to trace nerve fibers and calculate nerve fiber length (NFL), nerve fiber density (NFD), and nerve branch density (NBD). All these measurements were performed by two different observers, and repeated for the second time by one of the observers with an interval of one week, and interobserver and intraobserver reliability were determined using the intraclass correlation coefficient (ICC).
Results: The mean age of 40 participants (12 female and 28 male) was 34.70±5.86 years. The ICCs for interobserver reproducibility were 0.967 (95% CI 0.939-0.982) for NFL, 0.826 (95% CI 0.696-0.904) for NFD, and 0.949 (95% CI 0.906-0.973) for NBD indicating good to excellent reliability. The ICCs for intraobserver repeatibility were 0.964 (95% CI 0.932-0.981) for NFL, 0.803 (95% CI 0.657-0.891) for NFD, and 0.890 (95% CI 0.802-0.941) for NBD indicating good to excellent reliability.
Conclusion: Quantitative CSNP analyzes using semi-automated software have high interobserver and intraobserver reliability and can therefore be used in both clinical practice and clinical studies for detection and follow-up of corneal nerves' well-being, damage, and evaluation of response to treatment.

Key words: Corneal subbasal nerve plexus, NeuronJ, reliability analysis

INTRODUCTION

The cornea is the foremost transparent layer of the eye and is one of the tissues with the most intense innervation in the human body. Corneal nerves are mainly sensory and most of them originate from the ophthalmic branch of the trigeminal nerve. In addition to sensory functions, corneal nerves also play an important role in the blink reflex, tear production, corneal wound healing, and maintaining a healthy ocular surface (1,2). Corneal nerves enter the cornea radially from the stroma layer at the periphery and branch out parallel to the corneal surface. Then they turn anteriorly and penetrate the Bowman's layer and form the corneal subbasal nerve plexus (CSNP), which runs parallel to the corneal surface, under the basal epithelial layer. Branches originating from here also terminate as free nerve endings in the corneal epithelium (1).

It is not possible to evaluate the corneal nerves in detail with standard examination methods. Ex vivo light microscopy and electron microscopy studies provide information about corneal nerves (3). In vivo confocal microscopy (IVCM) is a relatively new, non-invasive technique that provides high-resolution and cellular imaging of corneal layers. Nowadays, IVCM is widely used in the diagnosis of various corneal pathologies and in monitoring the response to treatment (4). IVCM also enables visualization of the corneal nerves and CSNP in detail (5). Various parameters in CSNP images can be quantitatively evaluated using manual, semi-automated or automated software (6).

In this study, we aimed to evaluate the interobserver reproducibility and intraobserver repeatability of nerve fiber length (NFL), nerve fiber density (NFD) and nerve branch density (NBD) parameters that were analyzed using a semi-automated software on CSNP images obtained with IVCM.

PATIENTS AND METHODS

Forty volunteers who applied to the Ophthalmology Department of the Necmettin Erbakan University Meram Faculty of Medicine between 20 December 2021 and 20 January 2022 and met the study criteria were included in the study. The study was carried out with the approval of the Ethics Committee of the Necmettin Erbakan University, approval number 2021/3565. The study was conducted in accordance with the terms of the Declaration of Helsinki. After the participants were given detailed information about the study, informed consent was obtained from each participant. All participants underwent a complete ophthalmologic examination, including measurement of refraction, measurement of intraocular pressure, best corrected visual acuity, and slit-lamp examination of the anterior segment and posterior segment. Patients with any systemic disease that may affect corneal innervation such as diabetes mellitus, connective tissue diseases, autoimmune diseases; patients with any ocular pathology such as uveitis, glaucoma, blepharitis, conjunctivitis, keratitis, dry eye, corneal dystrophy, eyelid disorders; patients with a history of chemical or thermal ocular injury; patients with a scar or nephelia on the cornea; those using contact lenses; those with a history of intraocular or periocular surgery including refractive surgery; patients using any topical ocular medication including artificial tears, patients with a refractive error greater than $\pm$ 3 diopters of spherical equivalent; patients who had a history of COVID-19 and who were pregnant or breastfeeding were excluded.

CSNP imaging was performed using Heidelberg Retina Tomograph III (HRT III) in combination with the Rostock Cornea Module (RCM) (Heidelberg Engineering, Heidelberg, Germany). Topical anesthetic drops (0.5% proparacaine HCl, Alcaine®, S.A. Alcon-Couvreur N.V., Puurs, Belgium) were applied before the procedure. Only the right eyes of all participants were examined in the study. Serial images of 400*400 microns showing the CSNP were taken from the central cornea. Corneal confocal microscopy imaging for all participants was performed under the same standard conditions by the same experienced investigator. Then, for each eye included in the study, three images with the best quality display of the CSNP were selected. An open-source semi-automatic plugin (NeuronJ by Erik Meijering; ver. 1.4.3) for ImageJ software (Wayne Rasband and contributors, National Institutes of Health, USA; ver. 1.53f) was used to trace nerve fibers in selected images. Figure-1 shows an example for tracing of the nerve fibers with NeuronJ. After the nerve fibers were traced, the total nerve length calculated by the software on 400*400 micron images was converted to mm/mm^2 and recorded as nerve fiber length (NFL). The nerve fiber density (NFD; the number of major nerves per mm^2) and the nerve branch density (NBD; the number of branches emanating from major nerve trunks, per mm^2) in each selected image were recorded in units of fibers/mm^2 and branches/mm^2, respectively, as described by Malik et al. (7). The results from 3 different CSNP images from each eye examined in the study were averaged. All these measurements were
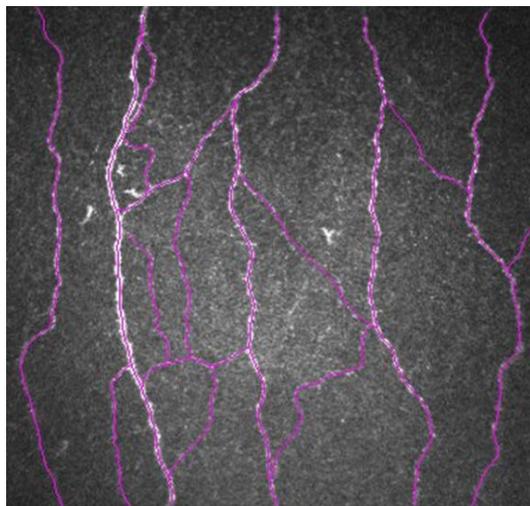
Figure 1. An example for tracing of the nerve fibers with NeuronJ plugin. (400x400 micron image)

performed by two different observers (Observer-1 and Observer-2), and repeated for the second time by one of the observers (Observer-1) with an interval of one week. Interobserver reproducibility was evaluated by analyzing the consistency of the results obtained by Observer-1 (SB) and Observer-2 (AOG). Intraobserver repeatability was evaluated by analyzing the consistency of the results obtained by Observer-1 (SB) at two different times.

IBM SPSS statistics software version 20.0 was used for statistical analysis (IBM Corp, Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables as number (n) and percentage (%). Conformity of continuous variables to normal distribution was evaluated by Shapiro-Wilk test. Intraclass correlation coefficient (ICC) was used for reliability analyzes. For interobserver reproducibility analysis, ICC two-way random-effects model, absolute agreement type and single measures were preferred. For intraobserver repeatability analysis, ICC two-way mixed-effects model, absolute agreement type and single measures

were preferred. When evaluating ICC results, an ICC value of <0.5 was considered poor reliability, a value of 0.5-0.75 was considered moderate reliability, a value of 0.75-0.9 was considered good reliability, and a value of >0.90 was considered excellent reliability per recommendation published by Koo et al. (8). In all statistical analyses, two-sided $p<0.05$ was considered statistically significant.

RESULTS

The ages of the 40 participants included in the study were in the range of 25–44 years, with a mean of 34.70±5.86 years. Twelve (30%) of the participants were female and 28 (70%) were male. The mean NFL found in the first measurement of Observer-1 was 19.06±3.75 mm/mm^2, mean NFD was 24.79±5.08 fibers/mm^2 and mean NBD was 54.43±17.97 branches/mm^2. The mean NFL found in the second measurement of Observer-1 was 18.99±4.01mm/mm^2, mean NFD was 24.89±4.42 fibers/mm^2, and mean NBD was 54.69±20.26 branches/mm^2. The mean NFL found by Observer-2 was 19.04±3.52 mm/mm^2, mean NFD was 24.48±4.80 fibers/mm^2, and mean NBD was 54.84±16.78 branches/mm^2.

The ICCs for interobserver reproducibility were 0.967 (95% CI 0.939-0.982) for NFL, 0.826 (95% CI 0.696-0.904) for NFD, and 0.949 (95% CI 0.906-0.973) for NBD indicating good to excellent reliability. (Table 1). The ICCs for intraobserver repeatibility were 0.964 (95% CI 0.932-0.981) for NFL, 0.803 (95% CI 0.657-0.891) for NFD, and 0.890 (95% CI 0.802-0.941) for NBD indicating good to excellent reliability. (Table 2)

DISCUSSION

In addition to their sensory functions, corneal nerves play an important role in maintaining a healthy ocular surface via their trophic effects (2). Deterioration of corneal innervation can lead to a degenerative process called neurotrophic keratopathy. Quantitative evaluation of corneal innervation is of great importance in the evaluation of the well being of the cornea, in the diagnosis and follow-up of neurotrophic processes, and in the evaluation of the response to treatment.

Table 1. Interobserver Reproducibility analyses for NFL, NFD and NBD

	Observer-1 (mean±SD)	Observer-2 (mean±SD)	Interobserver Reproducibility (ICC [95% CI])
Nerve Fiber Length (mm/mm^2)	19.06±3.75	19.04±3.52	0.967 [0.939-0.982]
Nerve Fiber Density (fiber/mm^2)	24.79±5.08	24.48±4.80	0.826 [0.696-0.904]
Nerve Branch Density (branch/mm^2)	54.43±17.97	54.84±16.78	0.949 [0.906-0.973]

SD standard deviation, ICC intraclass correlation coefficient, CI confidence interval

Table 2. Intraobserver reliability analyses for NFL, NFD and NBD

	Observer-1 Measurement-1 (mean±SD)	Observer-1 Measurement-2 (mean±SD)	Intraobserver Repeatibility (ICC [95% CI])
Nerve Fiber Length (mm/mm^2)	19.06±3.75	18.99±4.01	0.964 [0.932-0.981]
Nerve Fiber Density (fiber/mm^2)	24.79±5.08	24.89±4.42	0.803 [0.657-0.891]
Nerve Branch Density (branch/mm^2)	54.43±17.97	54.69±20.26	0.890 [0.802-0.941]

SD standard deviation, ICC intraclass correlation coefficient, CI confidence interval

CSNP can be viewed in detail with IVCM. In addition, various features such as length, density, branching, and torticity of the nerves that make up the CSNP can be evaluated from these images. NFL, NFD, and NBD, which were defined by Malik et al. (7) in their study published in 2003, constitute the most commonly used parameters in the quantitative analysis of CSNP. These parameters determine potential indicators of corneal nerve fiber damage and repair. In the literature, corneal nerve fiber damage has been detected in various ocular and systemic diseases by using these parameters (9–14). In addition, the effects of various surgical procedures such as cataract surgery, refractive surgery and pterygium excision on corneal nerve fibers have also been shown with these parameters (15–17).

Another very important point in the quantitative analysis of CSNP is the evaluation of these parameters objectively, accurately and consistently. These conditions must be met in order to use these parameters in clinical practice and to compare the results obtained from different studies. With the understanding of the importance of quantitative analysis of CSNP, studies on this subject have also increased, and various manual, semi-automated and automated software have been prepared for this purpose. The CCMetrics software (University of Manchester, Manchester, UK) calculates parameters such as NFL, NFD and NBD after manual tracing of all the nerve fibers that can be seen in the CSNP images. In the ACCMetrics software (University of Manchester, Manchester, UK) developed later by the same group, nerve fibers are automatically detected and parameters are calculated. In the study of Petropoulos et al. (18), in which they used the manual CCMetrics software, it was shown that interobserver reproducibility (ICC 0.70 and 0.74, respectively) and intraobserver repeatability (ICC 0.66 and 0.82, respectively) were good for NFL and NFD, but the reliability was low in NBD measurements. Chin et al.'s study (19), which included 20 patients who underwent refractive surgery, compared manual measurements performed with the CCMetrics software and automatic measurements performed with the ACCMetrics software. In their study, the ICCs for interobserver reproducibility in NFL, NFD and NBD measurements performed with CCMetrics software were 0.740, 0.728 and 0.591, respectively, while the ICCs for intraobserver repeatability was 0.799, 0.757 and 0.653, respectively. In the same study, all NFL, NFD and NBD measurements performed with the ACCMetrics software were lower than the measurements performed with the CCMetrics software. It has been stated that this may be due to the inability of the ACCMetrics software to detect thin or pale nerve fibers and nerve fibers in low contrast areas.

NeuronJ (by Erik Meijering), a plugin for ImageJ software (Wayne Rasband and contributors, National Institutes of Health, USA), can trace nerve fibers in a semi-automatic way. In this plugin, when the mouse pointer is brought closer to the starting point of the nerve fiber in a CSNP image, the most likely line for it is drawn by the software, and the nerve fiber can be traced by following it to the point where it ends. NFL can be calculated in mm/mm^2 by proportioning the total nerve fiber length calculated by the software to the total area of the image. NFD and NBD can be calculated in terms of fibers/mm^2 and branches/mm^2, respectively, by proportioning the number of main nerve trunks and branchs to the total area of the image. In the study by Dehghani et al. (20), NFL analyses using automated, semi-automated and manual software were shown to give consistent results in both healthy controls and diabetics. In the study by Cottrell et al. (21) in which corneal nerve damage was evaluated in eyes of patients with herpes simplex keratitis, it was reported that NFL measurement with NeuronJ, and NFD and NBD calculations showed good interobserver reproducibility with the ICCs of 0.96, 0.90 and 0.97, respectively. In the study by Parissi et al. (22), which included 106 people between the ages of 15-88 years, the mean NFL detected with the NeuronJ software was 19 mm/mm^2 and was

negatively correlated with age.

Analyzes performed using NeuronJ software in our study showed that NFL, NFD and NBD measurements had good to excellent interobserver (ICC 0.967, 0.826 and 0.949, respectively) and intraobserver (ICC 0.964, 0.803 and 0.890, respectively) reliability. Both interobserver and intraobserver reliability were highest in NFL, and lowest in NFD. In Chin et al.'s study (19), similar to our study, the parameter with the highest interobserver and intraobserver reliability was NFL, but the parameter with the lowest reliability was NBD. The most important limitation of this study is that the analyses were performed using a single software. Consistency between different softwares can also be evaluated by analyzing the same images with different softwares. In addition, the relatively low number of participants and observers is another limitation. The reliability of this method can be confirmed by the results obtained from studies in which images from more participants are analyzed by three or more observers.

In conclusion, quantitative CSNP analyzes with semi-automatic NeuronJ software have good to excellent interobserver and intraobserver reliability. This technique can be used both in clinical practice and in clinical studies for detection and follow-up of corneal nerves' well-being and damage, and in evaluating the response to treatment.

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Araştırma Makalesi / Research Article

Analysis of 69 Cases of Adenocarcinoma of the Esophagogastric Junction (Siewert Type II/III): 10-Year Single Center Experience

Özofagogastrik Bileşke Adenekarsinomu (Siewert Type II/III) Bulunan 69 Hastanın Analizi: 10 Yıllık Tek Merkez Deneyimi

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Öz

Amaç: Bu çalışmada özofagogastrik bileşke adenekarsinomu (AEJ) bulunan 69 hastanın klinikopatoloji özellikleri ve genel sağ kalımı ile ilgili 10 yıllık deneyimimizi paylaşmaktır.
Hastalar ve Yöntem: AEJ tanısı konulan ve kliniğimizde opere edilen 69 ardışık hasta çalışmaya dahil edilmiştir. Hastaların demografik özellikleri; laboratuvar parametreleri, cerrahi rezeksiyon yaklaşımı; TNM evreleri; rezeksiyon kapsamı; alınan lenf nodu toplam sayısı; tümör lokalizasyonu; lenfatik, vasküler ve perinöral invazyon varlığı ile genel sağ kalım (OS) durumu kaydedilmiştir. Hastalar Siewert Type II ve Siewert Type III olmak üzere iki gruba ayrılmıştır.
Bulgular: Gruplar arasında yaş (p=0.696) ve cinsiyet (p=0.140) bakımından anlamlı fark yoktur. T evresi dağılımı gruplar arasında istatistiksel olarak anlamlı şekilde farklıdır (p=0.0026). R0 düzeyindeki hastalarda OS, R1 düzeyindeki hastalara kıyasla anlamlı olarak daha yüksektir. Lenfatik, vasküler ve perinöral invazyon bulunmayan hastalarda OS istatistiksel olarak anlamlı şekilde daha yüksektir. Bir yıllık OS %85.50, 3 yıllık OS %49.10 ve 5 yıllık OS %43.60 olarak belirlenmiştir. Mortalite riski perigastrik yağ infiltrasyonu varlığında 8.63 kat, vasküler invazyon durumunda 12.60 kat ve perinöral invazyon durumunda 13.45 kat artmıştır. Sağ kalım oranı Siewert Type II ve Type III hastalarda 10 yıllık medyan izlem süresinde sırasıyla %51 ve %41 olarak saptanmıştır.
Sonuç: Bu çalışma klinikopatolojik özellikleri ve genel sağ kalımı başarılı bir şekilde değerlendirmiş ve Siewert Type II tümörler ile Siewert Type III tümörlerin benzer sağ kalım sonuçlarına sahip olduklarını göstermiştir. AEJ hastalarının sonuçları konusundaki mevcut bulgulara katkı sağlamak amacıyla daha geniş serili ve uzun dönem kapsamlı, çok merkezli ileri çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Adenokarsinom, gastroözofageal bileşke, Siewert type II, lenf nodu metastazı, lenf nodu diseksiyonu

Abstract

Aim: In this study, we aimed to present our 10-year experience regarding clinicopathology characteristics and overall survival of 69 patients with adenocarcinomas of esophagogastric junction (AEJs).
Patients and Methods: A total of 69 consecutive patients diagnosed with AEJ and operated in our clinics were included in the study. Patients' demographic characteristics; laboratory parameters, surgical resection approach; TNM stages; resection extent; total number of removed lymph nodes; tumor localization; presence of lymphatic, vascular and perineural invasion and overall survival (OS) status were recorded. The patients were divided into two groups as Siewert Type II and Siewert Type III.
Results: There was no statistically significant difference between the groups in terms of age (p=0.696) and gender (p=0.140). Distribution of T stage was statistically significantly different between the groups (p=0.026). OS was found to be significantly higher in patients at R0 level compared to those at R1 level. OS was statistically significantly higher in patients without lymphatic, vascular and perineural invasion. 1-year OS was determined as 83.50%, 3-year OS as 49.10% and 5-year OS as 43.60%. The risk of mortality increased by 8.63 folds in the presence of perigastric fat infiltration, 12.60 folds in the case of vascular invasion and 13.45 folds in the case of perineural invasion. The survival rate was found as 51% and 41% in the Siewert Type II and Type 3 patients at median 10-year follow-up.
Conclusion: This study had successfully evaluated the clinicopathological characteristics and overall survival, and demonstrated that Siewert II tumors and Siewert III tumors had similar survival outcomes. Further comprehensive multicenter studies with larger series and long-term studies are needed to provide contribution to the existing evidence on outcomes of patients with AEJs.

Key words: Adenocarcinoma, gastroesophageal junction, Siewert type, lymph node metastasis, lymph node dissection

INTRODUCTION

Because of the borderline location of adenocarcinoma of the distal esophagus (AEJ) between the esophagus and stomach, many differencies exist among the studies ragarding the cause and classification of these tumors. Based on purely topographic anatomical criteria, Siewert et al. classified these tumors in three types, including Type I: adenocarcinoma of the distal esopgahus, Type II: true carcinoma of the cardia and Type III: subcardial gastric carcinoma (1). Accordingly, a tumor can be defined as AEJ if it centers within 5 cm above and 5 cm below the anatomic esophagogastric junction. Siewert II/III tumors are the major subtypes in East Asian countries, whereas Siewert I tumor is the major subtype in the Western countries (2). Studies have reported that Siewert III tumors are typically larger with poorer survival outcomes compared to Siewert II tumors, and are seen in the majority of patients with advanced gastric cancer (3).

AEJ is a malignant tumor with early hematogenous and lymphatic dissemination. In recent years, although the incidence of gastric cancer decreased gradually, the incidence of AEJ has risen, particularly in Western countries. In the developed countries, the prevalence of AEJ is rising at an alarm level. Despite multimodality treatment, prognosis of these tumors is still poor with a 5-year survival rate of around 30% (4). Lymph node metastasis is another important predictor of survival, and studies have reported a decrease from 53% to 11% in 5-year OS with the presence of lymph node metastasis (5). The etiology of AEJs is still unclear. Increasing trends of obesity and gastroesophageal reflux disease (GERD) have been blamed (6). It has been reported that there is a strong link between obesity and the development of AEJs (7). Smoking and alcohol intake have also been associated with the development of AEJs (8).

Complete tumor resection is the primary therapeutic strategy for tumor of AEJ (9). In Siewert II tumors, distal esophagectomy and total gastrectomy are the preferred approaches. Whereas, surgical treatment of Siewert tumors includes total gastrectomy and D1 lymp node dissection (10). However, since currently there is no guideline for the treatment of AEJs, treatment of the disease is based on existing guidelines for gastric and esophageal cancers. Recent research has focused on lymph node metastasis, surgical approaches and surgical resection methods. Numerous studies have been performed on clinicopathology characteristics and overall survival of patients with AEJ. However, particularly long-term outcomes are still insufficient. In this study, we aimed to present our 10-year experience regarding clinicopathology characteristics and overall survival of 69 patients with AEJs.

PATIENTS AND METHODS

The study protocol was approved by the local ethics committee of our hospital with the 18.11.2020 dated and 2020-10/3 numbered decision. Patients' consent was not deemed necessary as the study was designed as retrospective. The necessary permission to use patient data was obtained from the hospital management. The study was executed following the ethical principles of the Declaration of Helsinki. A total of 69 consecutive patients aged 4-65 years, diagnosed with AEJ and operated in our clinics using either total or proximal gastrectomy were enrolled in the study. Patients with other gastric or esophageal tumors were excluded from the study. Data used in this study were obtained from the hospital information technologies system and hospital archives. Patients' demographic characteristics such as age and gender; laboratory parameters, including albumin, hemoglobin and lymphocytes; blood ABO group; surgical resection approach (total or proximal gastrectomy); simultaneous organ resection; TNM stages; Borman classes, Lauren classes; resection extent (R0 or R1); total number of removed lymph nodes; tumor localization; histological differentiation status; resected lymph nodes; presence of lymphatic, vascular and perineural invasion; chemotherapy and radiotherapy status; and survival status were recorded. The patients were divided into two groups as Siewert Type II and Siewert Type III and the data obtained were compared between these two groups.

Surgical Approach

A lesion centered between 1 cm oral and 2 cm aboral of the anatomic gastroesophageal junction (GEJ) was considered as Siewert Type II cancer, and a tumor centered more than 2 cm below the anatomic GEJ was considered as Siewert Type III cancer. The diagnostic evaluation included endoscopy with biopsy, barium swallow, abdominal ultrasonography and computed tomography (CT) of the chest and abdomen. No patient underwent preoperative chemotherapy or radiotherapy. The tumors were staged according to the International Union Against Cancer Cancer Staging (IUACC) 8th edition (11). The choice of surgical approach (total vs proximal resection) was based on the tumor type and the goal of achieving microscopic and macroscopic resection.

In patients with Siewert type II tumors, an attempt was made to obtain complete tumor resection by means of an extended gastrectomy with transhiatal resection of the distal esophagus. Whereas in patients with Siewert type III cancer, an extended total gastrectomy with transhiatal resection of the distal esophagus was performed. The removed lymph nodes were counted and identified according their locations. The lesions were further classified according to the Borman and Lauren classification. Overall survival (OS) was calculated from the time of diagnosis until death or the last follow-up contact. Follow-up assessments were made in the form of outpatient visits or telephone interviews.

Statistical Analysis

SPPS (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) software was used for performing the statistical analysis. The Shapiro–Wilk test was used to assess whether the variables followed normal distribution. Variables were reported as mean ± SD and median (minimum:maximum) values. According to the normality test results, Mann-Whitney U test and independent samples t-test were used to compare type II siewert and type III siewert groups. Categorical variables were compared by Chi square test, Fisher's exact test and Fisher-Freeman-Halton test. To estimate survival times Kaplan-Meier method was performed and the log-rank test was used to compare survival times across groups. Cox regression analysis was performed to determine the factors affecting mortality. $p<0.05$ values were considered statistically significant.

RESULTS

A total of 69 consecutive patients with a mean age of 64.20±10.75 years were included in the study. The median follow-up duration for OS was 10 years. Female/male ratio was found as 6/31 in the Siewert type II group and 10/22 in the Sievert type III group. There was no statistically significant difference between the groups in terms of age (p=0.696) and gender (p=0.140). Among the studied parameters, only distribution of T stage was statistically significantly different between the groups (p=0.026). In the subgroup analysis, the rate of patients in T1/T2 stage was higher in the Siewert type III group (21.90% vs 5.40%), while the rate of patients in T3 stage was higher in the Siewert type II group (56.80% vs 28.10%). The rate of patients in T4 stage was not different between the groups. No statistically significant difference was found between the Siewert type II and type III groups in terms of the other studied parameters (Table 1). The rate of survival in both

Table 1. Clinicopathological characteristics of Siewert type II and type III groups

Baseline information	Siewert type II (n=37)	Siewert type III (n=32)	p value
Gender (F/M)	6/31	10/22	0.140[a]
Age (year)	64.70±9.54	63.69±11.96	0.696[b]
Albumin	36 (10:49)	35(23:48)	0.918[c]
Hemoglobin	10.90 (1.20:14.80)	11(7.70:15.40)	0.485[c]
Lymphocyte	1.60 (1:4.78)	1.60 (0.60:3.70)	0.833[c]
Blood Group			
A	17 (45.90%)	15 (46.90%)	
B	8 (21.60%)	6 (18.80%)	0.955[a]
0	12 (32.40%)	11 (34.40%)	
Surgical Resection Ways			
Total Gastrectomy (Open)	34 (91.90%)	31 (96.90%)	0.618[d]
Proximal Gastrectomy	3 (8.10%)	1 (3.10%)	
Simultaneous Organ Resection	10 (27%)	9 (28.10%)	0.919[a]
T Stage			
T1/T2	2 (5.40%)	7 (21.90%)	
T3	21 (56.80%)	9 (28.10%)	0.026[e]
T4	14 (37.80%)	16 (50%)	
N Stage			
N0	6 (16.20%)	7 (21.90%)	
N1	6 (16.20%)	4 (12.50%)	0.925[a]
N2	8 (21.60%)	7 (21.90%)	
N3	17 (45.90%)	14 (43.80%)	

Table 1. more

TNM Stage			
IA	1 (2.70%)	2 (6.30%)	
IB	0	3 (9.40%)	
IIA	4 (10.80%)	1 (3.10%)	0.406[e]
IIB	5 (13.50%)	4 (12.50%)	
IIIA	11 (29.70%)	7 (21.90%)	
IIIB	9 (24.30%)	6(18.80%)	
IIIC	7 (18.90%)	9 (28.10%)	
TNM Stage			
Stage I	1 (2.70%)	5 (15.60%)	
Stage II	9 (24.30%)	5 (15.60%)	0.167[e]
Stage III	27 (73%)	22 (68.80%)	
Borman Classification			
Type I	0	3 (9.40%)	
Type II	10 (27%)	8 (25%)	0.119[e]
Type III	23 (62.20%)	14 (43.80%)	
Type IV	4 (10.80%)	7 (21.90%)	
Lauren Classification			
Intestinal	28 (75.70%)	19 (59.40%)	
Diffuse	5 (13.50%)	5 (15.60%)	0.258[a]
Mix	4 (10.80%)	8 (25%)	
Grade			
Grade I	1 (2.70%)	4 (12.50%)	
Grade 2	12 (32.40%)	10 (31.30%)	0.324[e]
Grade 3	24 (64.90%)	18 (56.30%)	
Rezeksiyon			
R0	33(89.20%)	27 (84.40%)	0.723[d]
R1	4(10.80%)	5 (15.60%)	
Surgical Margin			
Negative	30 (81.10%)	24 (75%)	0.541[a]
Positive	7 (18.90%)	8 (25%)	
Totaol number of resected lymph nodes	25 (3:60)	19 (1:44)	0.081[c]
Number of metastatic lymph nodes	6 (0:26)	5 (0:35)	0.986[c]
Tumor diameter			
<5 cm	9 (24.30%)	8 (25%)	0.948[a]
≥5 cm	28 (75.70%)	24 (75%)	
Tumor localization			
Lesser curvature	17 (45.90%)	22 (68.80%)	
Greater curvature	7 (18.90%)	2 (6.30%)	0.143[e]
Bilateral involvement	13 (35.10%)	8 (25%)	
Histological Differentiation			
Differentiated	2 (5.40%)	4 (12.50%)	
Moderately differianted	10 (27%)	10 (31.30%)	0.491[e]
Slightly differianted	35 (67.60%)	18 (56.30%)	
Lymph node dissection			
D0 – D1	3 (8.10%)	6 (18.80%)	0.285[d]
D2 – D3	34 (91.90%)	26 (81.30%)	
Lymphatic invasion	30 (81.10%)	23 (71.90%)	0.366[a]
Vascular Invasion	24 (64.90%)	17 (53.10%)	0.322[a]
Perineural Invasion	25 (67.60%)	20(62.50%)	0.659[a]
Omental Implantation	1 (2.70%)	4 (12.50%)	0.175[d]
Perigastric Fat Infiltration	6 (16.20%)	3 (9.40%)	0.489[d]
Adjuvant Chemotherapy	30 (81.10%)	23 (71.90%)	0.366[a]
Adjuvant Radiotherapy	15 (40.50%)	12 (37.50%)	0.796[a]

Data were presented as median (minimum:maximum) and n (%).

groups is seen in Figure 1.

Overall survival (OS) was analyzed in both groups.

OS was found to be significantly higher in patients at R0 level compared to those at R1 level (64.91 vs
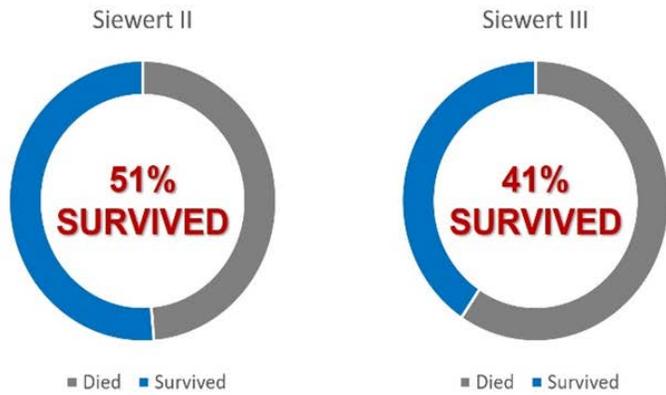
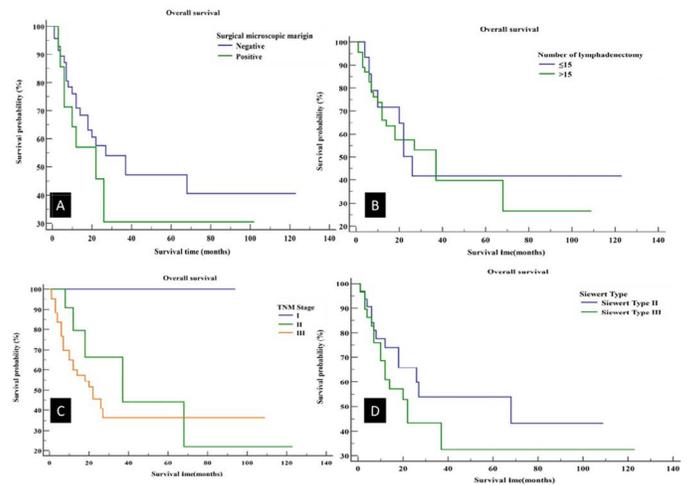**Figure 1.** OS status of the patients in the Siewert type II and III groups.

Figure 2. Kaplan-Meier curves based on surgical microscopic margin (A), number of lymphadentomy (B), TNM stage (C) and Siewert type (D).

Table 2. Kaplan-Meier analysis for 61 cases (Siewert type II/III)

n=61	Number of patients at risk (%)^{ξ}	Number of Death (%)^{ψ}	OS (months)	p-value^{f}
Gender				
Female	14 (23%)	6 (42.90%)	58.52±12.98	0.763
Male	44 (77%)	23 (48.90%)	56.64±9.37	
ABO Blood Group				
A	29 (47.50%)	11 (37.90%)	69.85±12.44	
B	13 (21.30%)	8 (61.50%)	31.37±11.23	0.113
0	19 (31.20%)	10 (52.60%)	40.51±9.38	
Siewert type				
Type II	32 (52.50%)	13 (40.60%)	60.45±9.82	0.297
Type III	29 (47.50%)	16 (55.20%)	50.08±12.06	
Surgical Resection Approach				
Total Gst.	58 (95.10%)	27 (46.60%)	58.63±8.81	0.439
Proksimal Gst.	3 (100%)	2 (66.67%)	32±24.65	
Simultaneous Organ Resection				
Yes	16 (26.20%)	9 (56.30%)	35.82±12.76	0.294
No	45 (73.80%)	20 (44.40%)	65.24±9.33	
T Stage				
T1/T2	8 (13.10%)	1 (12.50%)	79.75±12.34	
T3	28 (45.90%)	15 (53.60%)	50.89±11.90	0.06
T4	25 (41%)	13 (52%)	53.21±10.21	
N Stage				
N0	12 (19.70%)	2 (16.70%)	78.06±10.11	
N1	8 (13.10%)	4 (50%)	62.09±21.27	0.06
N2	14 (23%)	7 (50%)	44.90±14.80	
N3	27 (44.30%)	11 (40.70%)	32±8.81	
TNM Stage				
IA	3 (4.90%)	0*	-	
IB	3 (4.90%)	0*	-	
IIA	5 (8.20%)	1 (20%)	24±8.49	0.577
IIB	7 (11.50%)	4 (57.10%)	56.34±18.25	
IIIA	16 (26.20%)	8 (50%)	58.64±12.61	
IIIB	13 (21.30%)	8 (61.50%)	16.69±2.89	
IIIC	14 (23%)	8 (57.10%)	36.14±11.17	

Table 2. more

TNM Stage				
Stage I	6 (9.80%)	0*	-	0.287
Stage II	12 (19.70%)	5 (41.70%)	54.86±16.97	
Stage III	43 (70.50%)	24 (55.80%)	47.35±8.16	
Grade				
Grade I	5 (8.20%)	1 (20%)	85.33±7.08	0.078
Gade 2	19 (31.10%)	7 (36.80%)	53.55±19.89	
Grade 3	37 (60.70%)	21 (56.80%)	46.17±8.72	
Resection				
R0	53(86.90%)	23 (43.40%)	64.01±9.05	0.034
R1	8(13.10%)	6 (75%)	14.38±3.62	
Surgical Margin				
Negative	47 (77%)	21 (44.70%)	62.28±9.59	0.32
Positive	14 (23%)	8 (57.10%)	40.49±13.48	
Total number of removed lymph nodes				
≤15	15 (24.60%)	8 (53.30%)	60.20±14.61	0.836
>15	46 (34.40%)	21 (45.70%)	47.69±9.87	
Tumor diameter				
<5 cm	16 (26.20%)	6 (37.50%)	66.67±13.50	0.592
≥5 cm	45 (73.80%)	23 (51.10%)	53.45±9.72	
Tumor localization				
Lesser Curvature	36 (59%)	16 (44.40%)	67.38±10.23	
Greater Curvature	8 (13.10%)	4 (50%)	22.01±2.60	0.989
Bilateral Involvement	17 (27.90%)	9 (52.90%)	47.06±11.19	
Histological Differentiation				
Differentiated	6 (9.80%)	2 (33.30%)	72.44±13.16	
Moderately Differentiated	17 (27.90%)	6 (35.30%)	55.78±21.44	0.214
Slightly Differentiated	38 (62.30%)	21 (55.30%)	47.51±8.60	
Lymph node dissection				
D0 – D1	8 (13.10%)	1(50%)	59.88±14.98	0.429
D2 – D3	53 (86.90%)	25(47.70%)	52.44±10.28	
Lymphatic invasion				
Yes	15 (24.60%)	4(26.70%)	82.74±15.78	0.021
No	46 (75.40%)	25(54.30%)	45.99±8.22	
Vascular Invasion				
Yes	26 (42.60%)	7(26.90%)	85.83±11.72	<0.001
No	35 (57.40%)	22(62.90%)	34.45±8.90	
Perineural Invasion				
Yes	21 (34.40%)	4 (19%)	72.67±9.34	0.001
No	40 (65.60%)	25 (62.50%)	44.14±9.19	
Omental Implantation				
Yes	57 (93.40%)	26 (45.60%)	61.15±8.78	0.465
No	4 (6.60%)	3 (75%)	18.50±2.51	
Perigastric Fat Infiltration				
Yes	55 (90.20%)	25 (45.50%)	62.03±8.84	0.117
No	6 (9.80%)	4 (66.70%)	14.50±3.83	
Adjuvant Chemoterapy				
Yes	53 (86.90%)	25 (47.20%)	57.42±9.08	0.948
No	8 (13.10%)	4 (50%)	51±15.34	
Radiotherapy				
Yes	27(44.30%)	13 (48.10%)	60.21±11.75	0.781
No	34 (55.70%)	16 (47.10%)	49.72±7.81	

[I]: n=69 kişi içerisindeki sayı ve oran olarak verilmiştir.
[J]: risk altındaki hasta sayısı içerisindeki sayı ve oran olarak verilmiştir.
*: The relevant category was excluded from the analysis due to the insufficient number of data.
Overall survival (OS) time was represented as median ± standart error or mean ± standart error, f: Log-rank Test

14.38; p=0.034). OS was statistically significantly higher in patients without lymphatic invasion (82.74 vs 45.99; p=0.021). Similarly, OS was significantly higher in patients without vascular invasion (85.83 vs 34.45; p<0.001). In addition, OS was significantly higher in patients without perineural invasion (72.67 vs 44.14; p=0.001). The other variables did not affect OS (Table 2). 1-year OS was determined as 83.50%, 3-year OS as 49.10% and 5-year OS as 43.60%.

In order to determine the factors affecting mortality, a cox regression analysis was performed and the results are presented in Table 3. Variables that provide p<0.25 condition in the univariate cox regression were included in the multivariate cox regression model and the obtained model was found to be significant (p=0.008). When the results of multivariate regression analysis were examined; it was found that resection at R1 level increased the hazard of mortality by 12.37 folds. A one-unit increase in the number of metastatic lymph nodes was found to increase the hazard of mortality 1.13 times. The hazard of mortality increased by 8.63 folds in the presence of perigastric fat infiltration, 12.60 folds in the case of vascular invasion and 13.45 folds in the

Table 3. Determination of the factors affecting mortality

	Univariate Cox Regression Model			Multivariate Cox Regression Model		
	Wald	HR(95%CI)	p	Wald	HR(95%CI)	p
Siewert (Type III)	1.05	1.47(0.71:3.05)	0.306			
Gender (Male)	0.09	1.15(0.47:2.82)	0.767			
Age	5.78	1.05(1.01:1.09)	0.016	1.05	1.05(0.98:1.12)	0.167
Blood Type	4.04	0.133	0.104			
B	3.95	2.55(1.01:6.40)	0.047	4.45	4.45(0.80:24.80)	0.088
0	1.32	1.66(0.70:3.91)	0.250	3.55	3.55(0.89:14.12)	0.072
Albumin	2.22	0.96(0.91:1.01)	0.137	0.96	0.96(0.88:1.04)	0.322
Hemoglobin	0.03	0.99(0.86:1.14)	0.868			
Lymphocyte	0.13	1.10(0.67:1.79)	0.716			
Surgical Resection Approach (Proksimal Gastrectomy)	0.57	1.75(0.41:7.49)	0.449			
Simultaneous organ resection (Yes)	1.06	1.51(0.69.3.33)	0.304			
Borrman Classification	9.93	2.55(1.43:4.57)	0.002	1.07	1.07(0.37:3.10)	0.900
Lauren Classification	2.21	1.39(0.91:2.14)	0.137	0.44	0.44(0.18:1.09)	0.077
Resection (R1)	4.04	2.56(1.02:6.42)	0.045	12.37	12.37(1.97:77.80)	0.007
Tumor diameter (>5 cm)	0.28	1.28(0.52:3.14)	0.597			
Tumor localization	0.022		0.989			
Greater curvature	0.01	1.04(0.34:3.14)	0.946			
Bilateral involvement	0.02	1.06(0.47:2.41)	0.885			
T Stage	4.10		0.129			0.088
T3	4.06	8.16(1.06:62.90)	0.044	16.48	16.48(0.07:3715.20)	0.311
T4	3.28	6.59(0.86:50.70)	0.070	6.39	6.39(1.23:33.33)	0.028
N Stage	6.22		0.102			0.453
N1	2.25	3.66(0.67:20.01)	0.134	0.33	0.33(0.01:8.10)	0.500
N2	2.05	3.18(0.65:15.49)	0.152	0.05	0.05(0.00:4.52)	0.187
N3	5.39	5.87(1.32:26.11)	0.020	0.03	0.03(0.00:2.98)	0.138
Lymph node dissection(D2-D3)	0.60	1.53(0.52:4.49)	0.438			
Number of lymphadenectomy(>15)	0.60	1.53(0.52:4.49)	0.438			
Number of metastatic lymph nodes	2.91	1.04(0.99:1.08)	0.088	1.13	1.13(1.00:1.28)	0.043
Omental Implantation (Present)	0.51	1.55(0.46:5.20)	0.475			
Perigastric Fat Infiltration (Present)	2.25	2.28(0.78:6.66)	0.134	8.63	8.63(1.18:63.15)	0.034
TNM STAGE	5.51	2.66(1.18:6.04)	0.019	22.43	22.43(0.70:719.36)	0.079
Vascular Invasion (Present)	1.66	4.76(1.94:11.64)	0.001	12.60	12.60(1.38:115.17)	0.025
Lymphatic Invasion (Present)	4.65	3.24(1.11:9.45)	0.031	0.16	0.16(0.02:1.46)	0.104
Perineural Invasion (Present)	8.45	4.87(1.68:14.14)	0.004	13.45	13.45(1.43:126.17)	0.023
Surgical Marigin (Positive)	0.95	1.50(0.66:3.41)	0.330			
Histological differentiation	0.285		0.241			0.239
Moderate	1.83	0.37(0.08:1.58)	0.177	3.59	3.59(0.07:197.63)	0.532
Differentiated	1.40	0.58(0.23:1.43)	0.237	15.10	15.10(0.54:419.10)	0.109
Grade	4.32		0.115			0.115
II	1.06	3.03(0.37:25.03)	0.302	0.02	0.02(0.00:22.95)	0.279
III	2.80	5.60(0.74:42.20)	0.094	0.57	0.57(0.00:228.56)	0.854
Radiotherapy (Yes)	0.08	0.90(0.43:1.89)	0.784	1.06	1.06(0.28:4.09)	0.932
Chemotherapy (Yes)	0.54	0.97(0.33:2.79)	0.948	1.36	1.36(0.22:8.50)	0.745

HR: Hazard Ratio, CI:Confidence Interval

case of perineural invasion. Figure 2 shows survival curves based on surgical microscopic margin, number of lymphadentomy, TNM stage and Siewert type.

DISCUSSION

In this study, clinicopathologic characteristics and overall survival were compared between Siewert type II and type III AEJs. No statistically significant difference was found between the two group in terms of demographic variables, including age and gender. Similarly, Yuasa et al. found no significantly different variables between Siewert type II and type III AEJs (12). In most countries, AEJ is twice to four times more frequent in men compared to women (13), which was supported in our study with a M:F ratio of 31/6 in the Siewert type II group and 22/10 in the Siewert type III group. Likewise, Siewert et al. was found a M:F of 5.4:1 and 2.1:1 in Siewert type II and III, respectively (1). In the present study, no significant difference was found between the two groups in terms of the studied parameters except for T stage (p=0.026). The T indicator is related to the extent of the tumor invasion. The T stage has a direct effect on patient's stage, the likelihood of metastatic nodal disease and outcome. In the subgroup analysis, the rate of patients in T1/T2 stage was higher in the Siewert type III group, while the rate of patients in T3 stage was higher in the Siewert type II group. Unlike our result, Zhang et al. found higher T1/T2 and T3 stages in type II compared to type II AEJ (2). Similarly, Yang et al. found higher rates of T1/T2 and T3 stages in type II AEJs (4). The differences might be resulted from patient selection and staging criteria.

The overall survival (OS) rate is poor in most patients with AEJ, because lymph node metastasis is often present at the time patients become symptomatic. A few patients are identified early in the disease upon screening for GERD and Barrett's esphagus. In our study, 51% of the patients in the Siewert type II group and %41 of the patients in the Siewert type III group survived. OS was reported as 27.5% and 24.5% by Bai et al. in the Siewert type II group and type III group, respectively (14). Zhang et al. reported 3-year OS as 59.1% for the Siewert type II group and 57.1% for the Siewert type III group. On the other hand, in the present study 1-year OS was determined as 83.50%, 3-year OS as 49.10% and 5-year OS as 43.60%. Cellini et al. followed their AEJ patients for median 45.4 months and reported 3-year OS as 58% and 5-year OS as 44% (15). As is seen, although different rates of OS were reported, in general

the results are within a similar range. In majority of the studies no statistically significant difference was observed between Siewert type II and type III groups in terms of OS. R0 resection is the most important determinant of long-term survival in AEJs (16). The 5-year OS after R0 resection was reported as 43.2% (17). In our study, OS was higher in the patients with resection at R0 level (64.01 months). Siewert et al. reported 5- and 10-year survival rates as 38.7% and 28.3%, respectively, for patients with R0 resection, while this rate was 13.7% and 11.6% in patients with R1/R2 resection (1). Although results of the studies vary, most of these studies reported higher survival rates with R0 resection as in our study.

Lymphatic, vascular and perineural invasions are the factors affecting OS negatively. Junior et al. reported that lymphatic invasion is involved in the worsening survival prognosis (18). In addition, lymphatic invasion is associated with increased lymph node metastasis. The incidence of lymphovascular invasion of AEJ appears to be higher than that of esophageal and gastric cancers (19). However, the roll of vascular invasion has been yet to be clarified. In a study by Chen et al., multivariate regression analysis revealed perineural invasion was found to be an independent prognostic factor for overall survival (20). In our study, OS was significantly higher in patients without lymphatic (p=0.021), vascular (p<0.001) and perineural (p=0.001) invasions. From this point of view, our study is consistent with the literature. In our study, according to the results of multivariate analysis, resection at R1 level, number of metastatic lymph nodes >15, presence of perigastric fat infiltration, vascular invasion and perineural invasion were determined as the factors affecting mortality. In a study by Zheng et al., multivariate regression analysis revealed that neoplasms by histological type, lymphatic embolus and depth of perigastric fat infiltration were independent risk factors for lymph node metastasis in Siewert II/III AEJs (21). In a study by Ustaalioglu et al., according to the multivariate regression analysis, stage, grade, and recurrence were found as independent risk factors for OS, while grade, surgical margin, and preoperative chemoradiotherapy were independent risk factors for diseasse free survival (DFS) (22). Various parameters have been determined as independent risk factors of mortality, OS and DFS. Although the differences among the studies obtained from multivariate analysis are resulted from many factors ranging from patient selection criteria, surgical

approach, using adjuvant therapies preoperatively etc., yet these factors congregate at some points with mutual futures.

This study has some limitations. The study was designed as retrospective and executed in a single center with relatively small number of patients. On the other hand, this study had successfully evaluated the clinicopathological characteristics and overall survival, and demonstrated that Siewert II tumors and Siewert III tumors had similar survival outcomes. As a strength, long-term OS outcomes could be guiding for future comprehensive studies.

CONCLUSION

The findings of this study indicate that T1/T2 stage was higher in the Siewert type III group, while T3 stage was higher in the Siewert type II group. OS was higher in R0 resection. Lymphatic, vascular and perineural invasions affect OS negatively. Number of metastatic lymph nodes >15, presence of perigastric fat infiltration and were determined as the factors affecting mortality. Further comprehensive multicenter studies with larger series and long-term studies are needed to provide contribution to the existing evidence on outcomes of patients with AEJs.

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The Decrease in Regular and Emergency Visits to Urology Clinics During COVID-19 Pandemic: An Observational Study

COVID-19 Sırasında Üroloji Kliniklerine Normal ve Acil Başvurulardaki Azalma: Gözlemsel Bir Çalışma

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Öz

Amaç: Bu önce ve sonra çalışmasının amacı, 2019 ve 2020'nin aynı döneminde pandemi öncesi ve sonrası ürolojik konsültasyon ve acil durumlardaki değişiklikleri iki grup olarak karşılaştırmaktır.
Hastalar ve Yöntem: Hasta dosyaları geriye dönük olarak taranmış ve konsültasyon, ameliyat ve yatış sayıları değerlendirilmiştir. İki grup triyaj renk kodları ve nihai kararlar açısından karşılaştırılmıştır. Hastaların yaş ve cinsiyet gibi demografik verileri, triyaj renk kodu, konsültasyon kliniği, vizit tipi (düzenli vs kontrol) ve operasyon verileri (ameliyat tipi, profilaksi durumu, ameliyat yeri vb.) kaydedilmiştir.
Bulgular: 2019 yılında 50 günlük dönemde acil servise toplam 89.674 hasta, 2020 yılında ise aynı dönemde 53.745 hasta başvurmuştur. Aynı dönemde acil servise başvuran hasta sayısı bir önceki yıla göre %40,07 azalmıştır. Yeşil triaj kodlu hastaların oranı 2020 yılında 2019 yılına kıyasla %30 azalırken, aynı dönemde sarı triaj kodlu hastaların oranı ise %28.9 artmıştır. Üroloji vizitlerinde 2020'de %85.91 gibi dramatik bir düşüş yaşanmıştır.
Sonuç: COVID-19 pandemisi hala devam etmekte olup, aşılama programları ve kısa sürede kullanıma sunulacak olan yeni ilaçlar dahil olmak üzere tüm çabalara rağmen bir süre daha devam edecek gibi görünmektedir. Pandemi ile birlikte üroloji kliniğine konsülte edilen hastaların sayısında azalma olmuştur.

Anahtar Kelimeler: COVID-19, üroloji, acil cerrahi, triyaj, yatış, poliklinik

Abstract

Aim: In this pre-and post- study, we aimed to compare changes in urological consultations and emergencies between before and after the pandemic at the same time period of 2019 and 2020 as two groups.
Patients and Methods: Patient files were retrospectively screened and numbers of consultations, surgeries and admissions were evaluated. The two groups compared in terms of triage color codes, and final decisions. Patients' demographic data such as age and gender, triage color code, consultation order clinic, type of visit (regular vs control), and operational data (type of surgery, prophylaxis status, place of OR etc) were recorded.
Results: A total of 89,674 patients presented to the emergency department in the 50-day period in 2019 and 53,745 patients in the same period of time in 2020. The number of patients presenting to the emergency department decreased by 40.07% within the same period compared to the previous year. The percentage of patients with the green triage code was decreased in 2020 by 30% compared to 2019, while the percentage of yellow triage code was increased in 2020 by 28.9% compared to 2019. There was a dramatic fall in urology visits in 2020 by 85.91%.
Conclusion: The COVID-19 pandemic is still ongoing, and it seems likely to continue for some time, despite all efforts including vaccination programs and novel drugs that will also become available in a short time. The number of patients cosulted with urology outpatient clinic has decreased during the pandemic.

Key words: COVID-19, urology, emergency surgery, triage, admission, outpatient

INTRODUCTION

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) - the virus causing COVID-19 - has been quickly infecting an increasing number of people worldwide (1). Governments have established control measures in a wide range in order to reduce transmission of COVID-19 and to diminish pressure on health care systems. The Turkish government began imposing lockdowns, terminated face-to-face education in school and regulated flexible working hours in numerous types of institutions, including hospitals and the number of staff working from home dramatically increased (2).

The primary focus was on providing the best health care for COVID-19 patients, while regular outpatient care was negatively affected in all medical specialties. In hospitals, even non-emergency surgeries have been postponed indefinitely in many centers. Especially from the beginning of the lockdown and restrictions, non-critical care and elective services were postponed by official regulations, leading hospital volumes to fall (3, 4). For example, studies from the USA have reported a dramatic decrease in utilization of many elective procedures and hospital admissions during the first two months (March and April 2020) of the pandemic (5, 6). In a cross-sectional telephone survey by Hung et al., 30.4% of the participants stated that they avoided medical consultations during the first few months of the COVID-19 pandemic (7).

Changes have occurred in academic and clinical settings across urology centers across Europe. There has been a negative impact on the professional, personal and social life of urologists (8). The characteristics of an "elective" procedure has not been well defined in urology practice. In addition, adequate care should be provided for urological emergencies and urgent urological treatment even during the pandemic. However, like almost all medical specialties, urology practice was also influenced by the COVID-19. Non-COVID-19 presentations to the hospitals have been dramatically decreased worldwide including urological cases. However, studies on the effects of the pandemic on the number of case presenting to the hospitl is limited. In this pre- and post- study, we aimed to compare changes in urological consultations and emergencies between before and after the pandemic at the same time period of 2019 and 2020.

PATİENTS AND METHODS

Before the beginning, the study protocol was approved by the local ethic committee of our hospital with the 2022/265 numbered decision. The written patient consent was waived due to the observational nature of this study, the patient can no longer be found, and the study does not involve personal privacy or commercial interests. The study was executed in accordance with the 1964 Declaration of Helsinki and its later amendments.

In order to observe the complete influence of the COVID-19 pandemic on the urology clinic, the 50-day period between March 12nd and April 30th, 2020 was chosen as the observation period (Group-2). This period of time covered the first 7 weeks of the COVID-19 pandemic. Meanwhile, the same periods in the previous year (ie, between March 12nd and April 30th, 2019) was used as the control period to isolate the association between the COVID-19 pandemic and urology service utilization. Patients were categorized in three colors based on emergency triage.

Patient files were retrospectively screened and numbers of daily consultations, invasive procedures and admissions were evaluated. The two groups compared in terms of triage color codes, time of admission (daytime or night), cause of admission and final decisions. Patients' demographic data such as age and gender, triage color code, consultation order clinic, type of visit (regular vs control), and operational data (type of surgery, prophylaxis status, place of OR etc) were recorded. Outpatients and those undergoing surgery were sepapercentagely evaluated. Patients who presented out of the study periods and those with missing data were excluded from the study.

Statistical Analysis

Statistical analysis of the obtained data was performed using SPSS version 22.0 (SPSS, Social Package for Social Sciences, IBM Inc., Armonk, NY, USA). Normality of the data was tested with Kolmogorov-Smirnov method. Continuous variables were expressed as mean±standard deviation and categorical variables with frequency (n) and percentage (%). Student t test was used to compare continuous variables, because of that all parameters had normal distribution. Chi-square test was used to compare categorical variables. P<0.05 values were considered statistically significant.

RESULTS

A total of 89,674 patients presented to the emergency department in 50-day period in 2019 and 53,745 patients in the same period of time in 2020. Accordingly, the number of patients presenting to the

Table 1. Demographic characteristics of all patients who referred to the urology clinic.
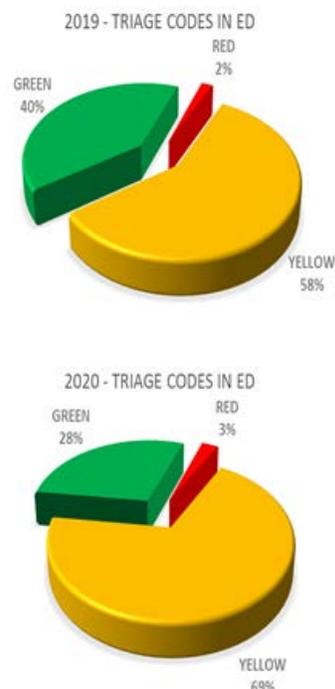
	2019	2020	p
Gender			
Male	6032 (67.08)	947 (74.74)	<0.001
Female	2960 (32.92)	320 (25.26)	
Age group			
< 18 years	388 (4.31)	25 (1.97)	0.01
18-65 years	7147 (79.48)	1051 (82.95)	
> 65 years	1457 (16.2)	193 (15.23)	

p<0.05 significantly different by Chi-squared

Figure 1. Distribution of the triage color codes in 2019 and 2020 in all patients who presented to the emergency department (p= 0.195).

emergency department of our hospital decreased by 40.07% within the same period of time compared to the previous year. In 2019, the mean age of the patients was 26.48±20.45 (min-max: 0-98) years old. Of all patients, 41,747 (46.55%) were male and 47,927 (53.45%) were female patients. In 2020, the mean age of the patients was 34.84±18.96 (min-max: 0-109) years. Of all patients presenting in 2020; 28,838 (53.66%) were male and 24,907 (46.34%) were female patients. Demographic features of the patients are given in Table 1. Distribution of the initial triage color codes in 2019 and 2020 is shown in Figure 1.

The percentage of patients with the green triage code was decreased in 2020 by 30% compared to 2019, while the percentage of yellow triage code was increased in 2020 by 28.9% compared to 2019. No significant change was observed in the percentage of red triage code. There was no statistically significant difference between 2019 and 2020 in terms of the final decision. In 2019, 8992 persons presented or were referred to the urology clinic. This figure was 1267 in 2020. There was a dramatic fall in urology visits in 2020 by 85.91%. The mean age of the patients presenting to the urology clinic in 2019 was 47.23±17.97 (min-max: 0-99) years, and the mean age of the patients presenting to the urology clinic in 2020 was 46.06±17.23 (min-max: 0-95) years. Female patients' ratio was significantly lower in 2020 than 2019, the percentage of patients under 18 ages in all patients decreased about 50% (Table 2).

Table 2. Details of patients who consulted from emergency to urology department.

	2019	2020	P value
Patients (n)	139	57	
Gender (m/f)	107/32	44/13	0.97
Mean age (years)± sd	50.4±30.4	53.2±20.5	0.52
Application time			
Day(07-18) n (%)	119 (85.6)	55 (96.5)	0.03
Night (18-07) n (%)	20 (14.4)	2 (3.5)	
Triage code			
Green n (%)	98 (70.5)	28 (49.1)	0.004
Yellow n (%)	35 (25.2)	28 (49.1)	
Red n (%)	6 (4.3)	1 (1.8)	
Final decision			
Discharged to home n (%)	113 (81.3)	49 (86)	0.48
Hospitalization n (%)	15 (10.8)	3 (5.3)	
Further diagnostic tests without hospitalization n (%)	11 (7.9)	5 (8.7)	

Table 3. Diagnosis of patients who were referred from emergency to the urology department.

	2019	2020
Patients (n)	139	57
Clinical diagnosis n (%)		
Severe LUTS	3 (2.2)	2 (3.5)
Penetrant urinary tract trauma	2 (1.4)	0
Renal Cancer Symptoms	2 (1.4)	1 (1.8)
Others	2 (1.4)	4 (7.0)
Epididymitis and/or Orchitis	16 (11.5)	5 (8.8)
Renal colic with pregnancy	2 (1.4)	4 (7)
Acute urinary retention	11 (7.9)	11 (19.3)
Gross hematuria	13 (9.4)	4 (7)
Uncomplicated UTI	11 (7.9)	2 (3.5)
Complicated UTI	1 (0.7)	3 (5.3)
Nephrostomy failure	3 (2.2)	0
Pelvic fracture with urinary tract trauma	4 (2.9)	1 (1.8)
Urethral, penile or scrotal infection	10 (7.2)	3 (5.3)
Post-renal acute renal insufficiency	6 (4.3)	1 (1.8)
Renal infarct or abscess	3 (2.2)	2 (3.5)
Urethral catheter or cystostomy failure	7 (5)	6 (10.6)
External genitalia trauma	2 (1.4)	1 (1.8)
Ureteral J stent symptoms	2 (1.4)	0
Testicular torsion	3 (2.2)	0
Renal colic	36 (25.9)	7 (12.3)

The number of consultations with the urology department decreased from 139 in 2019 to 57 in 2020. There was a 59% decrease in urologic consultation in 2020 compared to the same period of time in 2020. You can see details in table 2. Percentage of night consultation significance decreased and green code percentage was significantly lower in 2020 than 2019. Table 3 shows the diagnosis of patients who consulted the urology department. All diagnoses were compared using Chi-square test. No statistically significant difference was found between the number of diagnoses in 2019 and 2020 (p=0.1).

DISCUSSION

In the present study, we compared presentation parameters of the patients who presented or were referred to the urology clinic of our hospital in the same period of time with a one-year interval between 2019 and 2020. All studied parameters that indicate patient traffic were significantly decreased during the COVID-19 pandemic. Fear of getting infected by the new coronavirus and having COVID-19 disease prevent many patients from visiting other outpatient clinics or departments. In addition, "stay at home" motto was widely used in Turkey, especially during lockdowns affecting people's intention to go to a hospital or any health center.

The most striking data is that the number of ED presentations decreased to 53,745 in 2020 from 89,674 in 2019. It means that ED visits decreased by 40.7% in 2020 compared with 2019. This large decline in patient health care service utilization during about two months of the pandemic indicated the significant impact of the COVID-19 pandemic on medical services. Kwok et al. reported a significant decline in ED visits immediately following formal declaration of the COVID-19 pandemic, with potential for delayed/missed presentations of time-sensitive emergencies (9). The reason of these significant decrease in presentations to the emergency departments may be explaine by the fear of getting infected by the coronavirus. This decline is observed in almost all medical disciplines. For example, Borrelli et al. reported a decrease in outpatient visit to a tertiary retina center. The authors believe that visits to the retina unit are expected to increase after the quarantine and, even more, after the pandemic (10). According to Moussa et al., urology practice was affected by the COVID-19. In Italy, patients with non-urgent conditions were deferred by a few months or prescriptions were sent electronically (11).

In our study, the percentage of male patients increased by 7.66%, while the percentage of female patients decreased by 7.66% in 2020 compared to 2019. In a study by Wang et al., the percentage of male patients also increased during the pandemic

(12). Probably, the reason why men apply to the ED more may be that they are subject to more exceptions from the lockdown and they continue to daily life at a higher rate. In a large-scale study by Chen et al. with 159 public hospitals in Shanghai, China; it was found that public hospitals experienced considerable losses in medical service and revenue during COVID-19 in 2020 (13). Similar results were reported from the USA and Germany (14, 15). In a study by Kaspner et al., with 18 German University hospitals, the overall inpatient hospital admissions decreased by 35% in weeks 1 to 4 and by 30.3% in weeks 5 to 8 after the lockdown announcement compared to 2018 (15). This situation is similar in our country. In a study by Kucukceran et al. the number of computed tomography pulmonary angiography has increased during the pandemic period compared to the pre-pandemic period (16). In another study again by Kucukceran et al. the number of patients presenting to the emergency department has decreased during the pandemic (17).

In the present study, the percentage of patients with the green triage code was decreased in 2020 by 30% compared to 2019, while the percentage of yellow triage code was increased in 2020 by 28.9% compared to 2019; however, it was not statistically significant. Especially the decrease in the percentage of yellow triage code might be attributed to the fear of getting infected by the virus (18). Similarly, in a study by Goksoy et al., the percentage of patients with a yellow triage code increased during the pandemic period and green-coded patients decreased relative to the non-pandemic period (19). This result indicates that patients with non-urgent conditions did not present to the hospital either due to the fear of being infected by COVID-19 or because of lockdowns. On the other hand, no significant difference was observed in red triage.

In our study, the percentage of emergency surgeries was 6/180 (3.33%) in the study period in 2019, while no emergency surgery was performed at the same period of time in 2020. This might be caused by hesitation of patients and postponing surgery due to declaration of lockdown and again fear of getting infected. In the study by Goksoy et al., a 25% reduction was observed in the number of surgical patients visiting the emergency department (19). The percentage of open surgery was 6.67% in 2019 and 9.52% in 2020 with a significant increase in open surgery during the COVID-19 pandemic. Goksoy et al. also stated that the percentage of open surgery increased during the pandemic period (19).

Performing only emergency procedures during the pandemic and lockdown might cause an increase in more critical open surgeries that cannot be deferred.

We are concerned about the decrease in admissions to urology, especially those requiring hospitalization. Most of the renal colic patients who normally come to the emergency department did not come. Testicular torsion and orchitis disorders under the age of 18 were diagnosed lower in 2020. After returning to normal after quarantine, we saw atrophied kidneys due to delayed ureteric stone treatments, prolonged post-renal acute renal failure turned into chronic renal failure, and atrophied testicular torsion due to lack of timely admission.

Although the number of patients in our study is large, the single center nature of the study may be considered a limitation. Therefore, our results cannot be generalized to other pandemic hospitals. In addition, some patients may have gone to other hospitals they found less risky in terms of hygiene, social distancing and transmission. Finally, since we had no mortality data of the patients presenting to our hospital, we could not compare mortality rates. However, study results could provide contribution to what is known about the effect of COVID-19 on urology practice. Further multicentre, large scale prospective studies are needed to obtain generalizable findings.

CONCLUSION

The COVID-19 pandemic is still ongoing, and it seems likely to continue for some time, despite all efforts including vaccination programs and novel drugs will also become available in a short time. As in almost all medical fields, urology practice has been affected by the COVID-19 and changed. The pandemic underlines the importance of changing some aspects of urology practice from patient consultation to the triage of urological surgeries. The pandemic will lead to the development of new treatment guidelines. Urologists must prioritize the safety of their patients and healthcare staff. Telemedicine can be used as an alternative in this critical situation. It is important to evaluate changes in hospital visits during the COVID-19 pandemic in order to manage the post-pandemic period and prepare for future outbreaks.

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Olgu Sunumu / Case Report

An EMG Case Report with Shoulder Injury Presenting with Isolated High Ulnar Neuropathy

İzole Yüksek Ulnar Nöropatiyle Prezente Olan Bir Omuz Lezyonuna Ait EMG Olgu Bildirimi

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Öz

Ulnar tuzak nöropatiler en sık dirsekte görülür. Ulnar sinir tuzaklanması en sık dirsekte görülmekle birlikte, farklı etiyolojiler ulnar nöropatilerin oluşumunda yer alır C5 ve T1 spinal sinirlerin anterior ramuslarından oluşan Brakiyal pleksus, üst ekstremite kaslarını inerve eder. Brakiyal pleksusun medial kordundan oluşan ulnar sinir, liflerini C8 ve T1 köklerinden alır. Ulnar nöropatilerin tanısı önemli ölçüde elektromyografi bulgularına dayanır. Ulnar tuzak nöropatiler sırayla dirsek, bilek ve elde görülür. Nadiren, aksilla seviyesinde bir lezyona bağlı olarak da hasarlanabilir.
Burada omuz lezyonu sonrasında elin ulnar kısmında duyu ve motor kayıpla prezente olan nadir bir olguyu bildirdik. Bu olgunun bildirilme amacı, brakiyal pleksustan çıkan sinirlerin literatür bilgisi dışında izlenebilen hassasiyetine dikkat çekmekle beraber, periferik sinir hasarı bulgularıyla başvuran hastaların değerlendirilmesinde ayırıcı tanıları kapsayan detaylı anatomik yapı ve varyasyonlarına ait bilginin önemini hatırlatmaktır.

Anahtar Kelimeler: Yüksek ulnar nöropati, omuz lezyonu, brakiyal pleksopati, elektromyografi

Abstract

Compression of the ulnar nerve usually occurs at elbow. Although the most common site of ulnar nerve compression at the elbow, various etiologies may give rise to ulnar neuropathy. The brachial plexus, formed by the anterior rami of C5 through T1 spinal nerves, supply the muscles of the upper limb. Ulnar nerve arises from the medial cord of the brachial plexus, derives its fibers from the C8 and T1 roots. Diagnostic approach to ulnar neuropathy mainly depends on electromyographic findings. Most common places for ulnar entrapment neuropathy are elbow, wrist or hand respectively.) Occasionally, it may be damaged due to a lesions across the axilla. We are reporting a rare case of shoulder injury with immediate loss of sensation and motor functions of the ulnar half of the hand. This case report aims to highlight the susceptibility of nerves arising from brachial plexus to injuries varies beyond the literature knowledge and also illustrate the importance of detailed anatomical knowledge with their variations and a differential diagnosis when evaluating a patient with signs and symptoms of a peripheral neuropathy.

Key words: High ulnar neuropathy, shoulder injury, brachial plexopathy, electromyography

INTRODUCTION

Ulnar nerve compression is one of the typical entrapment neuropathies among upper extremity. Medial cord of the brachial plexus gives rise to ulnar nerve (1) which innervates the muscles in the forearm and hand with sensory innervation to the medial aspect of the hand (2). Most common places for ulnar neuropathy are elbow, wrist or hand respectively (3). Occasionally, it may be damaged due to a lesions crossing the axilla (4,5,6). Patient assessment relies on neurologic examination of upper extremity sensory and motor function, radiological studies and electrodiagnostic studies (7).

Needle electromyography is essential for localization of lesion site with burden of differential diagnoses. It is important to assess that whether the muscles innervated by median and radial nerves arising from C8T1 roots are affected or not. Some limitations to make the exact localization with needle EMG can be concerned. We are reporting a case with isolated high ulnar neuropathy secondary to penetrating shoulder injury which is uncommon in literature. The site of lesion, which is just distal to the medial cord of the brachial plexus is the major differentiating feature of this case. This case report aims to highlight the susceptibility of nerves arising from brachial plexus to injuries varies beyond the literature knowledge.

CASE

The patient was right-handed, 19 year-old male refugee who is referred by orthopedics and traumatology outpatient clinic. Penetrating injury on his right shoulder with a steel bar crossing the axilla was the main reason (Figure-1) for two years. His chief complaints were numbness in the medial aspect of hand and inability to use his ring and little finger after the injury. The radiograph and magnetic resonance imaging of shoulder and plexus was normal without any signs of fracture or dislocation. Physical examination was revealed severe wasting of first dorsal interosseous muscle (FDI) and weakness on resting interosseous muscles. Muscle power assessment on Abductor Digiti Minimi (ADM) and FDI was grade-1 according to Medical Research Council Manual Muscle Testing (MRC). Claw hand was one of the physical sign of ulnar neuropathy.

Touch and pain sensation were severely impaired over dorsal and palmar aspects of ulnar border of hand, over little and ring finger sparing deep tendon reflexes.

Figure 1. Penetrating Shoulder Injury

The electrophysiologic evaluation was critical for definite lesion diagnose. The outcome after EDX examination: recording from little and ring finger ulnar sensory nerve action potentials (SNAP) and mixed antebrachial ulnar SNAP between wrist and ankle. Dorsal ulnar cutaneous sensory nerve (DUC) was absent on the lesion site sparing the other sensory nerves. Ulnar motor compound muscle action potential (CMAP) recorded from Abductor Digiti Minimi (ADM) muscle was inevitable. Ulnar CMAP recorded rom Flexor Carpi Ulnaris (FCU) was showing decrease in amplitude from all points of stimulation, with a marked decrease along with elbow (4,80mV), axilla (6,53mV) and Erb point (4,93mV) stimulation respectively (Table-1). Concentric needle electromyography revealed fibrillation potentials (FP) and positive sharp waves (PSW) at rest and decreased recruitment in ADM and FDI. Right FCU showed motor unit potentials with long durations, suggesting regeneration in the motor unit. Obvious weakness in ulnar nerve innervated muscles, visible evidence of atrophy in the ulnar aspect of hand with active denervation on needle EMG are corresponding to severe ulnar neuropathy. Diagnostic imaging exposed neuropathic changes points out to the peripheral branches of brachial plexus confirming the electromyographic findings.

Table 1. Compound muscle Action Potentials

CMAP	Latency msn	NCV m/s	Amp mV
R N Median	2.92	68.5	4
R N Radial (antebrachial- spiral G)	2.64	64.2	5
R N Radial(spiralG-Erb)	3.64	67	5
R N Ulnar ADM	Absent		
R N Ulnar Elbow-FCU	3.84		4.80
R N Ulnar Axilla-FCU	4.16		6.53
R N Ulnar Erb-FCU	7.44		4.93
R N musculocut Erb- Biceps	4.08		5.87
R N radial Erb-Triceps	3.48		7.73
L N ulnar			

DISCUSSION

The brachial plexus, formed by the anterior rami of C5 through T1 spinal nerves, supply the muscles of the upper limb. The anterior division of the lower trunk, forming the medial cord, gives off the ulnar nerve, medial antebrachial cutaneous nerve and the inner branch of the median nerve. Ulnar nerve arises from the medial cord of the brachial plexus, derives its fibers from the C8 and T1 roots (8).

Peripheral nerve injury in the upper extremity is common. Certain peripheral nerves are at an increased risk of injury because of their anatomic location. There also some exceptional cases like this one.

There is one prospective electromyography (EMG) study addressing the incidence and the clinical consequences of nerve lesions found that nerve injury is the most possible result of shoulder dislocation. The axillary nerve injury is the most common result of this kind of trauma (42%) according to this study and median and ulnar nerves seem to be less vulnerable (9) which can be criticized. According to this case, decreased ulnar CMAP amplitudes sparing the median motor components reflect isolated ulnar neuropathy and makes the plexus lesion less likely. In ulnar neuropathy, medial antebrachial SNAP is extremely helpful to rule out trunkus lesion. Normal MAC sensory action potential (SNAP) rules out the lower brachial plexus lesion. Absent DUC- SNAP is extremely helpful to rule out ulnar nerve lesion on the wrist. All these findings can be interpreted as a quite evidence of proximal involvement. Ulnar CMAP recording from Flexor Carpi Ulnaris (FCU) was showing substantial decrease in amplitude for all stimulation points on elbow (4,80mV), axilla (6,53mV) and Erb (4,93mV) respectively. For individuals with a decrease in ulnar motor amplitude across these three points, it is critical to find a conduction block

with incremental stimulation. The patient avoided to attend resting of the test since Erb stimulation was painful. Focal slowing or substantial decrease in amplitude between these two consecutive sites rarely contributes to localization of ulnar neuropathy. Needle EMG is the gold standart for this cases. Finally, muscles inervated by median and radial nerves with cervical paraspinal muscles should be sampled to exclude radicular lesion which was unremarkable.

According to needle EMG findings, there was moderate reduction in recruitman in FCU and FDP (ulnar part) with increased duration and amplitude, with increase polyphasia. In contrast, all C8/T1-innervated muscles via the median (APB and FPL) and radial (EIP) nerves were unremarkable, excluding lower brachial plexopathy. Diagnostic imaging revealed neuropathic changes of the peripheral branches of right brachial plexus.

Needle EMG findings and its interpretations in patients with ulnar neuropathies may prone to error. Since the ulnar nerve has no motor branches in the arm, definite localizing procedure needs to be more complicated in patients with pure axon-loss lesions (without conduction block and segmental slowing). It is essential to perform EMG at any time during the first three weeks of injury. Follow-up needle examination will need to be done periodically to investigate the recovery of nerve injury and prognosis.

CONCLUSION

Shoulder damage giving rise to isolated ulnar nerve injury may be underrated. We are aiming to highlight the susceptibility of nerves to injuries varies beyond the literature knowledge. Electrodiagnostic study is still the most powerful tool for confirming the diagnosis with suspected neuropathic disorders. Overseeing the findings through the entire EMG process is essential. The lesion site can misguide you

when the subject is brachial plexus.

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