Mehmet Akif Ersoy Üniversitesi

Sağlık Bilimleri Enstitüsü Dergisi

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İletişim Adresi / Correspondence Address: Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Müdürlüğü MAKÜ Sağlık Bilimleri Enstitüsü Dergisi Sekreterliği 15030 - BURDUR
Telefon: +90 248 2133181 **Faks:** +90 248 2133190 **E-posta:** sagbild@mehmetakif.edu.tr
Web Adresi: http://dergipark.ulakbim.gov.tr/maeusabed/

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Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi yılda 3 sayı olarak yayımlanır (Aralık-2019 itibariyle). Dergi, *DOAJ, Google Scholar, SciLib, Researchbib, SOBIAD, Türkiye Atıf Dizini* gibi ulusal ve uluslararası indeksler tarafından taranmaktadır.

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Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi
YAZARLARA BİLGİ

I- Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi Genel Bilgiler

Mehmet Akif Ersoy Üniversitesi (MAKÜ) Sağlık Bilimleri Enstitüsü Dergisi, Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü'nün yayın organıdır. Derginin kısaltılmış adı "MAKÜ Sag. Bil. Enst. Derg" dir. Yılda 2 kez yayınlanır. MAKÜ Sağlık Bilimleri Enstitüsü Dergisi sağlık bilimleri, (veteriner, tıp, diş hekimliği, hemşirelik ve spor bilimleri) alanlarında temel ve klinik hakemli bilim yazılarının yayınlandığı hakem-denetimli bir dergidir. Derginin dili İngilizce'dir. Dergiye gönderilen yazıların başka herhangi bir dergide yayınlanmamış, yayına kabul edilmemiş ya da yayınlanmak üzere değerlendirme aşamasında olmaması gerekir. Bu kural bilimsel toplantılarda sunulan ve özeti yayınlanan bildiriler için geçerli değildir. Ancak, bu gibi durumlarda bildirinin sunulduğu toplantının adı, tarihi ve yeri bildirilmelidir. Makalelerin formatı "Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication (http:/www.icmje.org/)" kurallarına göre düzenlenmelidir.

Gönderilen yazılar yayın kuruluna ulaştıktan sonra öncelikle, yazım kurallarına uygunluğu yönünden değerlendirilir; sonucu yazara dört hafta içinde bildirilir. Yazının, gerek teknik özellikleri gerekse genel kapsamı açısından derginin genel yayın ilkelerine uygun bulunmaması durumunda yazı reddedilir. Ya da, gerekirse, yazar(lar)ın yazıyı yazım kurallarına uygun biçimde yeniden göndermeleri istenebilir. Yeniden gönderilen yazılar benzer bir teknik incelemenin ardından yazım kurallarına uygun ise danışman denetimi sürecine alınır. Yazı, editör ve yardımcı editörler ile yazının başlık sayfasını görmeyen en az iki danışmana gönderilerek incelenir. Yazı, yayın kurulunun belirlediği ve bilimsel içerik ve yazım kuralları açısından değerlendirilir. Editör ve yardımcı editörler gerek gördüğünde makaleyi üçüncü bir danışmana gönderebilir. Hakem belirleme yetkisi tamamen editör ve yardımcı editörler ve yayın kuruluna aittir. Danışmanlar belirlenirken derginin uluslararası yayın danışma kurulundan isimler seçilebileceği gibi yazının konusuna göre ihtiyaç duyulduğunda yurt içinden veya yurt dışından bağımsız danışmanlar da belirlenebilir. Daha sonra, danışman raporları dikkate alınarak ve gerekirse yazar(lar)la tekrar iletişim kurularak yayın kurulunca son redaksiyon yapılır. Yazıların kabulüne editör karar verir.

Editör yayın koşullarına uymayan yazıları; düzeltmek üzere yazarına geri gönderme, biçimce düzenleme veya reddetme yetkisine sahiptir. Yazılarını geri çekmek isteyen yazarlar bunu yazılı olarak editöre bildirmek durumundadır. Editör görülen lüzum halinde bazı makaleler hakkında yayın yürütme kurulunun görüşüne başvurur. Bu değerlendirme süreci dergiye gönderilen yazı türlerinden araştırma yazılarını, olgu sunumlarını ve özgün yazıları kapsar. Diğer yazı türlerindeki yazılar doğrudan yayın kurulunca değerlendirilir. Dergiye gönderilen yazılar yayınlansın ya da yayınlanmasın geri gönderilmez. Tüm yazarlar bilimsel katkı ve sorumluluklarını ve çıkar çatışması olmadığını bildiren toplu imza ile yayına katılmalıdır. Araştırmalara yapılan kısmi de olsa nakdi ya da ayni yardımların hangi kurum, kuruluş, ilaç-gereç firmalarınca yapıldığı dip not olarak bildirilmelidir. Dergide yayınlanan yazılar için herhangi bir ücret ya da karşılık ödenmez.

Yayın kurulu yazar(lar)ın dergiye gönderdikleri yazıları değerlendirme süreci tamamlanmadan başka bir dergiye göndermeyeceklerini taahhüt ettiklerini kabul eder. İnsanlar ve hayvanlar üzerinde yapılan deneysel araştırmaların bildirildiği yazıların gereç ve yöntem bölümünde, bu araştırmanın yapıldığı gönüllü ya da hastalara uygulanan işlemler anlatıldıktan sonra kendilerinin onaylarının alındığını (informed consent) gösterir bir cümle bulunmalıdır. Yazar(lar), bu tür araştırmalarda, uluslararası alanda kabul edilen kılavuzlara (2002 yılında revize edilen 1975 Helsinki Deklarasyonu- http://www.wma.net/e/policy/b3.htm, Guide for the care and use of laboratory animals - www.nap.edu/catalog/5140.html), T.C. Sağlık Bakanlığı tarafından getirilen, 29 Ocak 1993 tarih ve 21480 sayılı Resmi gazetede yayınlanan "İlaç Araştırmaları Hakkında Yönetmelik" ve daha sonra yayınlanan diğer yönetmeliklerde belirtilen hükümlere uyulduğunu belirtmeli ve kurumdan aldıkları Etik Kurul Onayı'nın bir kopyasını göndermelidir. Metin içinde standart kısaltmalar kullanılır, bunlar ilk geçtikleri yerde açık olarak yazılır. İlaç adları kullanımında ilaçların jenerik adları Türkçe okunuşlarıyla yazılır. Ölçüm birimleri metrik sisteme uygun olarak verilir; örneğin, "mg" olarak yazılır, nokta kullanılmaz; ek alırsa („) ile ayrılır. Laboratuar ölçümleri Uluslararası Sistem (US; Systéme International: SI) birimleri ile bildirilir.

Bilimsel sorumluluk

Makalelerin tüm bilimsel sorumluluğu yazarlara aittir. Gönderilen makalede belirtilen yazarların çalışmaya belirli bir oranda katkısının olması gereklidir. Yazarların isim sıralaması ortak verilen bir karar olmalıdır. Sorumlu yazar, yazar sıralamasını "Yazar Sorumluluk ve Yayım Hakkı Devir Formu'nu" doldurarak tüm yazarlar adına kabul etmiş sayılır. Yazarların tümünün ismi makale başlığının altındaki bölümde yer almalıdır.

Yayın Ücretleri

Bu dergide yayın tamamen ücretsizdir. Yayın ücreti, başvuru ücreti, makale işleme ücreti ve bir figürün, rakamın veya tamamlayıcı verinin uzunluğuna göre ek ücret ödenmesi gerekmez. İçerik öğeleri (Editörler, Düzeltmeler, İlaveler, Geri Çekmeler, Mektuplar, Yorumlar vb.) tamamen ücretsizdir.

Etik sorumluluk

Makalelerin etik kurallara uygunluğu yazarların sorumluluğundadır. Hayvanlar üzerinde yapılan deneysel çalışmalarda, çalışma protokolünün çalışmanın yapıldığı kurumdaki hayvan deneyleri etik kurulu tarafından onaylandığı belirtilmelidir. Yazarlar etik kurul onayını makale ile birlikte göndermelidir. Eğer makalede daha önce yayımlanmış alıntı yazı, tablo, resim vs. var ise yazarlar; yayım hakkı sahibi ve yazarlarından yazılı izin alarak bu durumu makalede belirtmek zorundadır. Makalenin değerlendirilmesi aşamasında yayın kurulunun gerek görmesi halinde, makale ile ilgili araştırma verilerinin ve/veya etik kurul onayı belgesinin sunulması yazarlardan talep edilebilir.

İntihal politikası

Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi'ne (MAKÜ Sag. Bil. Enst. Derg.) Gönderilen yazılar intihal açısından değerlendirilir. Her gönderilen makale, iThenticate ve Turnitin yazılımı ile intihal için kontrol edilir. Makalenin benzerlik oranı %20'nin üzerinde ise, revize edilmesi için ilgili yazara geri gönderilir. Eğer makalenin yayınlanmasından sonra intihal kanıtlanırsa, bu makale derhal web sitesinden kaldırılır ve ilgili yazarlara makalelerinin MAKÜ Sag. Bil. Enst. Derg.'de yayınlanmasının uygun olmadığı bildirilecektir.

II- Dergiye Gönderilecek Yazı Türleri ve Özellikleri

a) Araştırma Makaleleri: Bu yazılar daha önce yayınlanmamış özgün araştırma verilerinin değerlendirildiği net anlam taşıyan bilimsel çalışmaları kapsar. Araştırma makaleleri "Öz, Giriş, Gereç ve Yöntem, Bulgular, Tartışma ve Kaynaklar" bölümlerinden oluşmalıdır. Dergide yayınlanmak üzere gönderilen araştırma makaleleri kapak sayfası hariç en fazla 20 sayfa olmalıdır. Araştırma makalelerinde kullanılacak tablo, çizim ve resim sayısı toplam 10'u geçmemelidir. Yazarlar gerek duydukları takdirde "Tartışma" bölümünden sonra "Teşekkür" bölümü açarak gerekli açıklamaları yapabilirler.
b) Derleme Makaleleri: Derleme makaleleri dergi editör/yayın kurulu tarafından "çağrılı derlemeler" başlığı altında oluşturulan alnında katkı sağlama potansiyeli olan yazıları içerir. Kaynakça bölümü en fazla 30 kaynakçadan oluşturulmalıdır. Derlemelerde kullanılacak tablo, çizim ve resim sayısı toplam 10'u geçmemelidir. Kapak sayfası hariç en fazla 20 sayfa olarak hazırlanmalıdır. Derlemelerde mutlaka "Öz, Giriş, Sonuç ve Kaynaklar" bölümleri bulunmalıdır.
c) Olgu Sunumları: Yazarların, herhangi planlanmış bir araştırmaya dayanmayan ancak karşılaştıkları yeni veya ender gözlemlenen olguların ele alındığı, bilimsel değere sahip bilgileri içeren eserlerdir. Bu eserlerde gereksiz uzatmaları önlemek amacıyla en fazla 15 kaynak kullanılmalı ve bu kaynakların güncel olmasına özen gösterilmelidir. Kapak sayfası hariç en fazla 5 sayfa olmalı; "Öz, Giriş, Olgu, Tartışma ve Kaynaklar" bölümlerinden oluşmalıdır.
d) Kısa Araştırma Raporu: Dar kapsamlı ele alınmış (sınırlı sayıda örneğin analiz edildiği çalışmalar vb.) ancak önemli ve yeni bilgiler sunan bilimsel araştırmaya dayalı makalelerdir. Kısa bildiriler araştırma makalesi formatında hazırlanmalı ve kapak sayfası hariç en fazla 10 sayfa olmalıdır. Bu eserlerde kullanılacak tablo ve şekil sayısı beşi geçmemelidir.
e) Özel Bölümler:
1. Editöre mektuplar: Dergide yayınlanan yazılara ilişkin değerlendirme ve eleştirileri içeren yazılardır. Mümkün olduğunca eleştirilen yazının yazar(lar)ınca verilen yanıtlar ile birlikte yayınlanır. Editöre mektuplar 3 sayfayı geçemez.
2. Toplantı haberleri/izlenimleri: Derginin yayın alanıyla ilgili konularda yapılmış ya da yapılacak olan bilimsel toplantıları tanıtıcı yazılardır. 1 sayfayı geçemez.
3. Dergi haberleri: Derginin yayın alanıyla ilgili konularda yayınlanmakta olan bilimsel dergileri tanıtıcı yazılardır; 1 sayfayı geçemez.
4. Web siteleri tanıtımı: Derginin yayın alanıyla ilgili konulardaki web sitelerini tanıtıcı yazılardır; 1 sayfayı geçemez.
5. Kitap/tez tanıtımı: Derginin yayın alanıyla ilgili konularda yayınlanmış bulunan kitapları/tezleri tanıtan yazılardır; 3 sayfayı geçemez.

III- Makalelerin Düzenlenmesi

Dergiye gönderilecek yazılar türlerine göre, başlık sayfası, İngilizce ve Türkçe özetler, ana metin, kaynaklar, tablo/şekil/resim bölümlerini içerir. Dergiye yayınlanması için gönderilen makalelerde aşağıdaki biçimsel esaslara uyulmalıdır: Yazı Microsoft Word programında Times New Roman yazı stilinde 12 punto büyüklüğünde, siyah renkte, 1,5 satır aralığında hazırlanmalıdır. Kenarlardan 2,5 cm boşluk bırakılmalıdır. Her

sayfaya satır numarası eklenmelidir.

Anatomik terimler Latincede yazıldığı gibi kullanılmalıdır. Günlük tıp diline yerleşmiş terimler ise okundukları gibi Türkçe yazım kurallarına uygun olarak yazılmalıdır. İngilizce veya başka bir yabancı dildeki şekli ile yazılan terimler tırnak içinde belirtilmelidir. Yazının başlık sayfasında, yazının Türkçe ve İngilizce başlığı ve sayfa üstünde kullanılmak üzere boşluklar da dahil 40 karakteri aşmayacak şekilde Türkçe ve İngilizce kısa başlık önerisi bulunmalı. Çalışmaların yapıldığı klinik, anabilim dalı/bilim dalı, enstitü ve kuruluşun adı belirtilmelidir.

a) Başlık Sayfası: Gönderilen makalenin kategorisini, başlığını (Türkçe-İngilizce ve sadece ilk sözcüğün baş harfi büyük), yazarların adlarını (sadece baş harfleri büyük yazılır), çalıştıkları kurumları (rakamla dipnot olarak belirtilmeli), yazışmaların yapılacağı sorumlu yazarın adı, açık adresi, telefon ve faks numaraları ile e-posta adresini içermelidir. Sorumlu yazar yıldız (*) ile belirtilir. Makale daha önce bilimsel bir toplantıda sunulmuş ise toplantının adı, tarihi ve yeri belirtilerek yazılmalıdır.

b) Ana Metin Bölümü: Yazının ana metni Öz ve Anahtar Kelimeler, Giriş, Gereç ve Yöntem, Bulgular ve Tartışma başlıkları içinde düzenlenir. Özler ve anahtar sözcükler: Türkçe ve İngilizce olmak üzere iki dilde yazılır ve yazının başlığını da içerir.

Öz 200 kelimeyi geçmemeli, çalışmanın ana noktaları olan amacını, hayvan ve örnek popülasyonunu, metodunu ve önemli sonuçlarını, çalışmadan elde edilen çıkarımı klinik olarak uygulanabilirliğini içermelidir. Yayını okumadan okuyucular için anlaşılır olmalıdır ve özet içinde kaynaklara atıf yapılmamalıdır. Türkçe ve İngilizce özetler ayrı sayfalarda yazılmalı ve özetlerin sonunda her iki dilden en az 3, en çok 5 anahtar sözcük yer almalıdır. Anahtar kelimeler Index Medicus Medical Subject Headings (MeSH)'e uygun olmalıdır. Anahtar kelimeler için www.nlm.nih.gov/mesh/MBrowser.html adresine başvurulmalıdır.

Giriş bölümünde yazının dayandığı temel bilgilere ve gerekçelere kısaca değinildikten sonra, son paragrafında amaç açık bir anlatımla yer alır. Gereç ve yöntem bölümü gerekirse araştırma/hasta/denek grubu, araçlar, uygulama ve istatistik değerlendirme gibi alt başlıklara göre düzenlenebilir. Bu bölüm çalışmaya katılmayan birisinin de rahatlıkla anlayabileceği açıklıkta yazılmalıdır. Bulgular bölümü çalışmanın sonuçlarını özetler ve temel bulgular gerekirse tablo ve şekillerle desteklenir. Tartışma bölümünde çalışmanın bulguları ilgili yurt içi ve yurt dışı çalışmaların sonuçları bağlamında tartışılır; genel bir gözden geçirmeyi değil, özgün bulguların tartışılmasını içerir. Yayın sisteme yüklenirken ana metin bölümü ana dosya olarak yüklenmelidir.

c) Teşekkür: Yazarlar çalışmalarında vermek istedikleri ek bilgiler ile katkı sağlayan destekçi kurumlara ve/veya şahıslara teşekkür yazılarını bu bölümde belirtebilirler.

d) Kaynaklar: Kaynaklar listesi alfabetik sıraya göre yazılmalıdır. Sadece yayınlanmış veya yayına kabul edilmiş kaynaklar yer almalıdır. Kabul edilmiş ancak henüz yayınlanmamış kaynaklar için "baskıda" ifadesi kullanılmalıdır. Yazarlar kaynaklar listesinde bulunan bütün kaynakların metin içinde kullanılmış olduğunu kontrol etmelidirler.

Yayındaki bütün kaynaklar kullanılmalıdır. Makale içinde referans kullanma şekline örnekler.

Metin içinde doğrudan atıf yapılırken yazar veya yazarların soyadından sonra parantez içinde kaynağın yayın yılı belirtilmelidir.
Örnekler: Bell (2005) tarafından; Nielsen ve Engberg (2006) tarafından; Doyle ve ark. (2007) tarafından
Cümlenin sonunda atıf yapıldığında ise yazar ismi ve yayın yılı parantez içinde belirtilmelidir.
Örnekler: ...bildirilmiştir (Bell, 2005); ....bildirilmiştir (Nielsen ve Engberg, 2006); .....bildirilmiştir (Doyle ve ark., 2007).
Birden çok kaynağa atıf yapılması durumunda kronolojik sıralama yapılmalıdır.
Örnekler: ….bildirilmiştir (Bell, 2005; Nielsen ve Engberg, 2006; Doyle ve ark., 2007).
Aynı yazarın aynı yıl yayınları söz konusu ise her biri "a" harfinden başlayarak küçük harflerle işaretlenmelidir.
Örnek: …. (Bell, 2005a; Bell, 2005b; Bell, 2005c …). Atıf yapılırken aşırı kaynak kullanımından kaçınılmalıdır.

Kaynaklar listesinin düzenlenmesi:

Mendeley programı kullanan yazarlar aşağıda linki verilen dergi format stilini kullanarak çalışmalarını düzenleyebilir:
https://csl.mendeley.com/styles/529990351/makusagbilensderg

Kaynaklar listesinde yazar isimleri ve yayın yılı koyu harflerle yazılmalıdır. Kaynak listesi şu şekilde hazırlanmalıdır:
i) Kaynak makale ise
Yazarların soyadları ve adlarının ilk harfi yazılmalıdır. Devamında sırasıyla makalenin yayın yılı, makalenin adı,

yayınlandığı derginin açık adı, cilt, sayı ve sayfa numaraları belirtilmelidir.
Örnekler:
Cohen, N.D., Vontur, C.A., Rakestraw, P.C., 2000. Risk factors for enterolithiasis among horses in Texas. Journal of the American Veterinary Medical Association 216, 1787-1794.
Rajmohan, S., Dodd, C.E., Waites, W.M., 2002. Enzymes from isolates of *Pseudomonas fluorescens* involved in food spoilage. Journal of Applied Microbiology 93, 205-213.
Ono, K., Yamamoto, K., 1999. Contamination of meat with *Campylobacter jejuni* in Saitama, Japan. International Journal of Food Microbiology 47, 211-219.
Yayınlanmak üzere kabul edilen ve DOI numarası bulunan, ancak henüz basılmamış makaleler için; makale künyesinin sonunda DOI numarası belirtilmelidir.
McGregor, B.A., Butler, K.L., 2014. The value of visual fleece assessment in addition to objective measurements in identifying Angora goats of greater clean mohair production. Small Ruminant Research, in press (DOI: 10.1016/j.smallrumres.2014.04.001).

ii) Kaynak kitap ise

Yazarların (veya editörün) soyadları ve adlarının ilk harfi yazılmalıdır. Devamında sırasıyla kitabın yayın yılı, adı, yayınevi veya yayınlayan kuruluş ve yayınlandığı yer belirtilmelidir. Kaynak, kitaptan bir bölüm ise bölüm yazarlarının isminden sonra sırasıyla kitabın yayın yılı, bölümün adı, editörün soy ismi ve adının ilk harfi, bölümün alındığı kitabın adı, yayınevi veya kuruluş, yayınlandığı yer, bölümün sayfa numaraları yazılmalıdır.
Örnekler:
Combs, G.F., 1992. The Vitamins: Fundamental Aspects in Nutrition and Health. Academic Press, San Diego.
Concannon, P.W., 1986. Physiology and Endocrinology of Cannine Pregnancy. In: Marrow, D.A. (Ed.), Current Therapy in Theriogenology. Philadelphia, W.B. Saunders Company, pp. 491-497.
Perkins, J.B., Pero, J., 2002. Vitamin biosynthesis. In: Sonenshein, A., Hoch, J., Losick, R. (Eds.), Bacillus subtilis and Its Closest Relatives: from Genes to Cells. ASM Press, Washington D.C., pp. 271-286.
Kramer, J.M., Gilbert, R.J., 1989. Bacillus cereus. In: Doyle, M.P. (Ed.), Foodborne Bacterial Pathogens. Marcel Dekker, New York, pp. 22-70.

iii) Kaynak bir tez ise

Tezi yazan kişinin soyadı ve adının ilk harfi koyu olarak yazılmalı, kabul edildiği yıl, tezin başlığı, tezin cinsi (yüksek lisans veya doktora), üniversitesi ve enstitüsü belirtilmelidir.
Örnek:
Bacınoğlu, S., 2002. Boğa spermasında farklı eritme süreleri ve eritme sonrasında oluşturulan soğuk şoklarının spermatolojik özelliklere etkisi. Doktora Tezi, İstanbul Üniversitesi Sağlık Bilimleri Enstitüsü, İstanbul.

iv) Kaynak internette bulunan bir web sitesi ise

Yazarların soyadları ve adının ilk harfi (Yazar adı yoksa web sitesinin veya kaynağın adı) yazılır. Daha sonra sırasıyla yılı, makalenin adı, varsa yayıncı, internet adresi ve erişim tarihi belirtilir.
Örnekler:
FDA, 2001. Effect of the use of antimicrobials in food-producing animals on pathogen load. Systematic review of the published literature. http://www.fda.gov/cvm/antimicrobial/PathRpt.pdf (Erişim 14.12.2001)
Cleveland, C.W., Peterson, D.S., Latimer, K.S., 2005. An Overview of Canine Babesiosis. Clinical Pathology. College of Veterinary Medicine, The University of Georgia: http://www.vet.uga.edu/vpp/clerk/Cleveland (Erişim 17.12.2005).
Thierry, F., 2006. Contagious equine metritis: a review. Equine Reproductive Infections: http://www.equinereproinfections.com (Erişim 07.07.2006].
FSAI, 2008. Report of the Implementation Group on Folic Acid Food Fortification to the Department of Health and Children. Food Safety Authority of Ireland: http://www.fsai.ie/assets/0/86/204/cc3c2261-7dc8-4225-bf79-9a47fbc2287b.pdf (Erişim 20.06.2008)

v) Kaynak bilimsel toplantıda sunulmuş bir bildiri ise

Yazarların soyadı ve adının baş harfinden sonra sırasıyla toplantının yılı, bildirinin başlığı, toplantının adı, toplantı yeri, bildiri kitabındaki sayfa no yazılmalıdır.
Örnekler:
Cardinali, R., Rebollar, P.G., Mugnai, C., Dal Bosco, A., Cuadrado, M., Castellini, C., 2008. Pasture availability and genotype effects in rabbits: 2. development of gastro-intestinal tract and immune function of the vermiphorm appendix. In: Proc. 9th World Rabbit Congress, Verona, Italy, 1159-1164.
Mauget, R., Legendre, X., Comizzoli, P., 1998. Assisted reproductive technology in sika deer: a program to preserve endangered deer subspecies. In: Proc. 4th Int. Deer Biology Congress, Kaspovar, 185-186.

e) Tablolar: Kullanım sırasına göre numaralandırılmalı, kısa başlıklarla ifade edilmeli ve metin içinde tablo numarası verilerek (örneğin Tablo 1) atıfta bulunulmalıdır. Tablo başlıkları tablonun üst bölümüne yazılmalıdır. Tabloda kullanılan kısaltmalar ve gerekli açıklamalar tablo altında verilmelidir.

f) Şekil ve Resimler: Metinde kullanılan fotoğraflar, grafikler ve çizimler metin içinde şekil adı ile kullanılmalıdır. Şekiller kullanım sırasına göre numaralandırmalı ve kısa başlıklarla ifade edilmeli, metin içinde

şekil numarası verilerek (örneğin Şekil 1) atıfta bulunulmalıdır. Şekil başlıkları şekillerin altında yer almalıdır. Şekillerde istenilen noktaya dikkat çekmek amacıyla; üzerlerine işaret konulmalı ve başlıklardan sonra yer alacak olan şekil altı notta kullanılan işaretler belirtilerek gerekli açıklamalar yapılmalıdır.

IV- Makale Süreci (Kör hakemlik)

Makale başvurusu yalnızca online olarak http://dergipark.gov.tr/maeusabed adresi üzerinden kabul edilmektedir. Sorumlu yazar, makale ile birlikte göndereceği tüm dosyaları yukarıdaki internet adresinde bulunan yeni makale gönder ikonunu tıklayarak sisteme ekleyebilir. Yazarlar dergiye gönderi yapmadan önce kayıt olmalıdır. Kaydolduktan sonra, ana sayfadaki Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi ikonuna tıklayarak; yazım kurallarına göre düzenlenmiş bilimsel çalışmayı dergi panelindeki Makale Gönder kısmından 4 basamaklı (başlarken, yükleme, kaynaklar, önizleme&gönder) gönderi işlemini yapabilir. Gönderilen makalede ön değerlendirme aşaması sırasında yazar künyeleri, çalışmanın yapıldığı kurum, etik kurul ya da özel izin adres bilgileri gibi tanıtıcı bilgiler içermemelidir. Ön değerlendirmeden (bilimsel nitelik, dil, yazım kuralları kontrolü, İntihal kontrolü iThenticate ve Turnitin programı,) geçen bilimsel çalışmaların hakem ataması yapılır. Sorumlu yazar makalenin hangi aşamada olduğunu sistem panelindeki Süreçteki Makaleler kısmından takip edebilir. Atanan hakemlere, kör hakemlik kuralları çerçevesinde çalışmanın tam metni, şekil, tablo, grafik ve resimleri sistem üzerinden yüklenerek e-posta aracılığıyla makale değerlendirme talebi gönderilir. Hakemler e-posta aracılığıyla gönderilen linke tıklayarak talebi kabul ya da reddederler. Kabul eden hakemler, kararlarını sistem üzerinden en fazla 1 ay içinde sebeplerle birlikte yüklemelidirler. Hakemin önerdiği düzeltme var ise tekrar yazara gönderilir. İstenilen düzeltmeler 1 ay içinde tamamlanıp gönderilmediği takdirde makale otomatik olarak iptal edilecektir. Editör, makalelerin yayın değerliliği ve hakemlerin görüşlerine dayanarak yayına kabul veya red kararını verir. İstenilen düzeltmeler yapıldıktan sonra makale yazar tarafından sisteme tekrar yüklenir. Derginin gizlilik bildiriminde belirtildiği gibi, yazarların kimlik bilgileri ve e-posta adresleri hiçbir şekilde başka amaçlar için kullanılmayacaktır.

Bu dergi; bilimsel araştırmaları halka ücretsiz sunmanın bilginin küresel paylaşımını artıracağı ilkesini benimseyerek, içeriğine anında açık erişim sağlamaktadır.

Mehmet Akif Ersoy University Journal of Health Sciences Institute
INSTRUCTIONS TO AUTHORS

I- Mehmet Akif Ersoy University Journal of Health Sciences Institute General Information

Mehmet Akif Ersoy University Journal of Health Sciences Intitute (MAKU J. Health Sci. Inst.) is the publication of Mehmet Akif Ersoy University Health Sciences Institute. It is published two times annualy. The journal is a peer-reviewed scientific journal in which basic and clinical scientific articles in the field of medical sciences (veterinary, medicine, dentistry, nursing and sports sciences) are published. The language of the journal is English. Papers submitted to the journal should not have been previously published, accepted for publication or be in the process of evaluation for publication in any other journal. This rule does not apply to articles presented as bulletins in scientific meetings and whose summaries are published. In such cases, however, the name, date and place of the meeting in which the paper was presented should be notified. The format of the article should be in accordance with the rules of "Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication (http:/www.icmje.org/)".

On receipt of the paper by the Editorial Board, the paper is evaluated for compliance with the format rules and the authors are informed about the result in four weeks. In the event that the paper is not found to comply with the general publication principles of the journal from the standpoint of either technical characteristics or general scope, the paper is rejected. Alternatively, the author(s) may be asked to re-submit the paper in accordance with the writing requirements. Papers resubmitted are passed through a similar technical examination and, if found to comply with the rules, are passed on for peer review. The paper is sent, without the title, to two reviewers selected by the board, who then assess the paper for scientific content and format compliance. When necessary the Editorial Advisory Board can send the paper to third reviewers. The selection of reviewers is ultimately at the discretion of the editor, associate Editors and/or the editorial board. The appropriate reviewers can be selected from journal's international database of reviewers listing or, if needed; independent reviewers can be determined from inland or abroad. Thereafter the Editorial Advisory Board carries out the final editing, taking the reports of the reviewers into consideration, and, when necessary, communicating with the author(s).

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The Editorial Board assumes that the author(s) are obliged not to submit the paper to another journal before completion of the assessment process. In the "method" section of articles concerned with experimental research on humans or animals, a sentence showing that the informed consent of patients and volunteers has been obtained following a detailed explanation of the interventions carried out on them. In such studies, authors should clearly state the compliance with internationally accepted guidelines (1975 Helsinki declaration revised in 2002 http://www.wma.net/e/policy/b3.htm, Guide for the care and use of laboratory animals-www.nap.edu/catalog/5140.html) issued by the Republic of Turkey Ministry of Health and published in the Official Journal dated 29 January 1993 number 21480 "Regulations Concerning Drug Research", and other more recently published rules laid out in governing statutes. They should forward a copy of the Ethic Committee Approval received from the relevant institution. Standard abbreviations used in the text are written in full when first mentioned. In the use of drugs, the generic names should be written in their Turkish pronunciation spelling form. Measurement units are given according to the metric system; e.g. written as "mg", no punctuation is used, in the case of extensions (,,) is used as a separator. Laboratory measurements are reported in International System Units (US; Systeme Internationale; SI).

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Manuscripts submitted to Mehmet Akif Ersoy University Journal of Health Sciences Institute is evaluated in terms of plagiarism. Every submitted article is checked for plagiarism through iThenticate and Turnitin software. When Smilarity Index of the article is above %20, it is sent back to the corresponding author to revise it. If plagiarism is proved after publication of the article, that article will be immediately removed from the website and the concerned authors will be considered ineligible for publication of their articles in Mehmet Akif Ersoy University Journal of Health Sciences Institute.

II- Types and Characteristics of Papers to be Submitted to the Journal

a) Research Articles: These articles are prepared in full accordance with the writing style definitions given below, in which previously unpublished original research data are evaluated. The main text section of the research articles should include (Title, Introduction Materials and Methods, Results, Discussion and Conclusion) sections and (excluding title page, bibliography, tables/figures/pictures) should not exceed 20 pages. If some parts of the research data given in these articles have previously been discussed in another paper, this must be notified without fail when sending the paper and, in addition, reference should be made to the relevant paper within the bibliography.

b) Review Articles: Review Articles should cover subjects falling within the scope of the journal which are of active current interest. They may be submitted or invited. Invited reviews will normally be solicited by the Review's Editor, but suggestions for appropriate review topics may be sent to editor.

c) Case Reports: These are articles which present and discuss the characteristics of one or more cases which have special features and scientific importance from the clinical evaluation, observation or other standpoint. Case presentations include the title page, summary, main text (includes introduction, case and discussion), bibliography, table/figure/picture sections; subtitles in the main text are organised according to the text content. Abstracts of the case presentations should have 150 words. The main text (excluding title page, bibliography, table/figure/picture) should not exceed 10 pages.

d) Brief Reports: These are articles in which original ideas dealing with important theoretical or practical problems related to a specific subject are presented and discussed. Original articles include a title page, summary, main text, bibliography, table/figure/picture sections; subtitles in the main text are organised according to the text content. The main text of original articles (excluding title page, bibliography, table/figure/picture) should not exceed 10 pages.

e) Special Sections:

1. Letters to the Editor: These articles include evaluation and criticisms of articles published in the journal. These are published together with the responses of the author(s) of the paper concerned where possible. Letters to the Editor may not exceed 5 pages.

2. Meeting news/notes: These articles introduce scientific meetings held or to be held on subjects within the scope of the journal. The paper may not exceed 1 page.

3. Journal news: These articles introduce scientific journals being published within the scope of the journal. The paper may not exceed 1 page.

4. Introduction of websites: These articles introduce websites relevant to the scope of the journal. These articles may not exceed 1 page.

5. Book/Thesis Section: These articles introduce books/theses published on subjects related to the scope of the journal and may not exceed 3 pages.

III- Preparation of Manuscripts

Papers to be submitted to the journal include the sections of title page, abstract, main text, references and tables/figures/pictures. Articles submitted for publication in the journal should follow the following formal principles: The text should be prepared in Microsoft Word program in Times New Roman font style with a font size of 12 font, black and 1.5 line. All side of the paper, page margins should be as 2.5 cm. Line numbers should be added to the beginning of the page.

Anatomical terms should be used as written in Latin. Running title (not exceed 40 characters) of the manuscript should add to title page. The name of the clinic, department / science, institute and institution should be stated.

a) Title Page: should contain the category, the title (only first letter capital), the names of the authors (only the first letters capital), the institution (s) where they work (indicated with numbered footnotes), corresponding author (address, phone, fax numbers and e-mail address). Corresponding author is indicated by an asterisk (*). If the article was previously presented at a scientific meeting, the name, date and place of the meeting must be stated.

b) Main Text: The main text of the paper is organised under the subtitles of Abstract and Keywords, Introduction, Materials and Methods, Results and Discussion.

Abstract and Keywords: This is written in two languages, Turkish and English, and also includes the title of the paper. The abstract is consists of 200 words. The abstract should bring out the main points of the manuscript and should include the following information: objective, the animals or sample population involved, design, the materials and methods used, the main results, a brief conclusion and clinical relevance, where applicable. They should be comprehensible to readers before they have read the paper, and abbreviations and reference citations should be avoided. At the end of the abstract, at least 3, at most 5 keywords in both languages are included.

In the introduction, following a brief statement of basic information and justifications which constitute the basis of the paper, the objective is clearly given in the last paragraph. If necessary, the “method” section may be organised according to sub-titles such as research/patient/ test group, instruments, application and statistical analysis. This section should be written with clarity so that a person not involved in the study may easily understand. Results summarize the findings of the study and, when necessary, basic findings are supported with tables and figures. In the discussion section, the findings of the study are discussed in the light of relevant national and international studies; this section includes discussion of original findings, not a general review.

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All citations in the text should refer to: the year of publication of the reference should be indicated in parentheses after the surname of the author or authors.
Examples: Bell (2005), Nielsen and Engberg (2006), Doyle et al. (2007) were indicated that.....
The name of the author and the year of publication should be stated in parentheses at the end of the sentence.
Examples: ...were detected as 23% of the samples (Bell, 2005); ....were detected as 23% of the samples (Nielsen and Engberg, 2006); ...were detected as 23% of the samples (Doyle et al., 2007).
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i) Examples of journal articles:
Cohen, N.D., Vontur, C.A., Rakestraw, P.C., 2000. Risk factors for enterolithiasis among horses in Texas. Journal of the American Veterinary Medical Association 216, 1787-1794.

Rajmohan, S., Dodd, C.E., Waites, W.M., 2002. Enzymes from isolates of *Pseudomonas fluorescens* involved in food spoilage. Journal of Applied Microbiology 93, 205-213.
Ono, K., Yamamoto, K., 1999. Contamination of meat with *Campylobacter jejuni* in Saitama, Japan. International Journal of Food Microbiology 47, 211-219.
For articles that are accepted for publication and have a DOI number but not yet published; DOI number must be specified at the end of the article.
McGregor, B.A., Butler, K.L., 2014. The value of visual fleece assessment in addition to objective measurements in identifying Angora goats of greater clean mohair production. Small Ruminant Research, in press (DOI: 10.1016/j.smallrumres.2014.04.001).
ii) Books:
Combs, G.F., 1992. The Vitamins: Fundamental Aspects in Nutrition and Health. Academic Press, San Diego.
Concannon, P.W., 1986. Physiology and Endocrinology of Cannine Pregnancy. In: Marrow, D.A. (Ed.), Current Therapy in Theriogenology. Philadelphia, W.B. Saunders Company, pp. 491-497.
Perkins J.B., Pero, J., 2002. Vitamin biosynthesis. In: Sonenshein, A., Hoch, J., Losick, R. (Eds.), Bacillus subtilis and Its Closest Relatives: from Genes to Cells. ASM Press, Washington D.C., pp. 271-286.
Kramer, J.M., Gilbert, R.J., 1989. Bacillus cereus. In: Doyle, M.P. (Ed.), Foodborne Bacterial Pathogens. Marcel Dekker, New York, pp. 22-70.
iii) Thesis:
Bacınoğlu, S., 2002. Boğa spermasında farklı eritme süreleri ve eritme sonrasında oluşturulan soğuk şoklarının spermatolojik özelliklere etkisi. Doktora Tezi, İstanbul Üniversitesi Sağlık Bilimleri Enstitüsü, İstanbul.
iv) Web site or author is an institution:
FDA, 2001. Effect of the use of antimicrobials in food-producing animals on pathogen load. Systematic review of the published literature. http://www.fda.gov/cvm/antimicrobial/PathRpt.pdf (Accessed: 14.12.2001)
Cleveland, C.W., Peterson, D.S., Latimer, K.S., 2005. An Overview of Canine Babesiosis. Clinical Pathology. College of Veterinary Medicine, The University of Georgia: http://www.vet.uga.edu/vpp/clerk/Cleveland (Accessed: 17.12.2005).
Thierry, F., 2006. Contagious equine metritis: a review. Equine Reproductive Infections: http://www.equinereproinfections.com (Accessed: 07.07.2006).
FSAI, 2008. Report of the Implementation Group on Folic Acid Food Fortification to the Department of Health and Children. Food Safety Authority of Ireland:http://www.fsai.ie/assets/0/86/204/cc3c2261-7dc8-4225-bf79-9a47fbc2287b.pdf (Accessed: 20.06.2008).
v) Paper presented at a scientific meeting
Cardinali, R., Rebollar, P.G., Mugnai, C., Dal Bosco, A., Cuadrado, M., Castellini, C., 2008. Pasture availability and genotype effects in rabbits: 2. development of gastro-intestinal tract and immune function of the vermiphorm appendix. In: Proc. 9th World Rabbit Congress, Verona, Italy, 1159-1164.
Mauget, R., Legendre, X., Comizzoli, P., 1998. Assisted reproductive technology in sika deer: a program to preserve endangered deer subspecies. In: Proc. 4th Int. Deer Biology Congress, Kaspovar, 185-186.
e) Tables: Each table is printed on a separate page and numbered according to the sequence of referral within the text (Table 1). Each table has a title and, when necessary, explanations are given under the table (e.g. abbreviations given in the table). Each table should be understandable without need for referral to the text. Each table should be referred to in the text..
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IV- Submission of Articles (Blind Peer-Review)

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Araştırma Makaleleri / Research Articles

MAKU J. Health Sci. Inst. 2021, 9(2): 1-9.
doi: 10.24998/maeusabed.971037

Mehmet Akif Ersoy University
Journal of Health Sciences Institute
http://dergipark.gov.tr/maeusabed

Research Article / Araştırma Makalesi

Evaluation of Subcutaneous Adipose Tissue in the Thigh and Calf Region for Subcutaneous Injection by Computed Tomography

Uyluk ve Baldır Bölgesindeki Deri Altı Yağ Dokusunun Subkutan Enjeksiyona Uygunluğunun Bilgisayarlı Tomografi ile Değerlendirilmesi

Eren İSMAİLOĞLU[1*], Elif Günay İSMAİLOĞLU[2*]

[1]İzmir Bakırçay University, Faculty of Medicine, Department of Radiology, İzmir, Turkey
[2]İzmir Bakırçay University, Faculty of Health Sciences, Department of Nursing, İzmir, Turkey

Abstract: The most commonly used areas in the lower extremity in subcutaneous injection applications are anterior and lateral surface of the thigh. The calf region, which is an alternative to these areas, is located in the lateral region of the gastrocnemius muscle. The aim of the study is to retrospectively evaluate of suitability of thigh and calf site subcutaneous adipose tissue thickness for subcutaneous injection through computed tomography sections. The sample of this descriptive study consisted of 140 adult patients over the age of 18 who underwent Contrast-Enhanced Lower Extremite Computed Tomography Angiography between March 2020 and March 2021. Subcutaneous tissue thicknesses of the anterior thigh, lateral thigh, and calf injection site of the subjects were measured by a specialist radiologist using computed tomography sections. As a result of the study, a comparison of subcutaneous tissue thickness in the thigh and calf was achieved according to gender and body mass index. The mean subcutaneous tissue thickness of the patients was 13.64 ± 6.85 mm on the anterior thigh, 8.82 ± 7.21 mm on the lateral side of the thigh, and 6.15 ± 3.12 mm in the calf area. It was found that there was a significant difference between subcutaneous tissue thicknesses according to their gender and body mass index. Subcutaneous tissue thickness on the anterior thigh was thicker than the lateral thigh and the calf injection site. Subcutaneous tissue thickness in females was greater than in males. Subcutaneous tissue thickness in the calf region was thicker than 4 mm in 77.1%, 8 mm in 19.3% and 12 mm in 12.3%.

Keywords: Calf region, Computed tomography, Subcutaneus injection, Subcutaneus tissue, Needle length.

Öz: Subkutan enjeksiyon uygulamalarında alt extremitede en fazla kullanılan bölgeler uyluk ön ve yan yüzüdür. Literatürde geçen ve pratikte kullanılan bu bölgelere alternatif olan baldır bölgesi gastroknemius kasının yan bölgesinde yer almaktadır. Araştırmanın amacı, bireylerde uyluk ve baldır bölgesi deri altı yağ dokusu kalınlığının subkutan enjeksiyona uygunluğunun bilgisayarlı tomografi kesitleri üzerinden ölçülerek retrospektif değerlendirilmesidir. Tanımlayıcı tipte olan araştırmanın örneklemini Mart 2020 – Mart 2021 tarihleri arasında Kontrastlı Alt Extremite Bilgisayarlı Tomografi Anjiografi çekilen 18 yaş üzeri 140 yetişkin birey oluşturdu. Bireylerin uyluk ön yüz, uyluk yan yüz ve baldır bölgesindeki subkutan doku kalınlıkları bir uzman radyolog tarafından bilgisayarlı tomografi kesitleri üzerinden ölçüldü. Araştırma sonucunda cinsiyet ve beden kitle indeksine göre uyluk ve baldır bölgesindeki subkutan doku kalınlığının karşılaştırılması sağlandı. Bireylerin subkutan doku kalınlığı ortalamaları uyluk ön yüzde 13,64±6,85 uyluk yan yüzde 8,82±7,21 ve baldır bölgesinde 6,15±3,12 mm olarak bulundu. Bireylerin cinsiyet ve beden kitle indeksine göre subkutan doku kalınlıkları arasında anlamlı fark olduğu saptandı. Uyluğun ön yüzündeki subkutan doku kalınlığı uyluğun yan yüzü ve baldır bölgesine göre daha kalındı. Kadın bireylerde tüm enjeksiyon bölgesindeki subkutan doku kalınlığı erkeklerden daha fazlaydı. Baldır bölgesinde subkutan doku kalınlıkları bireylerin %77,1'inde 4 mm'den, %19,3'ünde 8 mm'den ve %12,3'ünde 12 mm'den daha kalındı.

Anahtar Kelimeler: Baldır bölgesi, Bilgisayarlı tomografi, İğne uzunluğu, Subkutan enjeksiyon, Subkutan doku

*Corresponding author : Elif Günay İSMAİLOĞLU e-mail : elif.ismailoglu@bakircay.edu.tr
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Introduction

Subcutaneous injection, which is one of the parenteral drug administration types, is the administration of the drug to the fat layer located under the dermis and above the muscle layer. Since the subcutaneous fat layer is not rich in blood vessels, the drug is absorbed more slowly from the muscle tissue. In subcutaneous injection, only small doses (0.5-1-2 ml) of water-soluble drugs should be administered (Potter et al. 2017; Berman et al. 2016; Turan et al. 2019). Otherwise, the excess amount of drug causes pressure on the nerve endings (Zijlstra et al. 2018; Turan et al. 2019). The most commonly used areas for subcutaneous injection are the outer aspect of the upper arm, the abdomen and the anterior and lateral aspect of the thigh (Potter et al. 2017; Berman et al. 2016). In particular, individuals who use self-injection prefer these regions. Although it is not used much in practice, the lower aspect of the scapula and the upper aspects of the dorsogluteal region on the back are also included in the literature for subcutaneous injection. Absorption is fastest in the abdominal region, moderate in the arms, and slower on the anterior aspect of the thigh (Potter et al. 2017; Berman et al. 2016, Dalkıran 2014).

Insulin, heparin, analgesics, drugs used in allergy treatment and mixed vaccines in children are administered by subcutaneous route (Potter et al. 2017; Berman et al. 2016). Patients who are constantly administered insulin or heparin experience discomfort and pain due to repeated injections. As a result of frequent injections in the same area and accumulation of the drug in the subcutaneous tissue (ST), sterile abscesses are formed under the skin in the form of hardened, painful lumps and may lead to lipohypertrophy and lipoatrophy. In such cases, patients are faced with the risk of skipping the injection dose or interrupting the treatment. In order to eliminate these disadvantages, patients who are constantly administered insulin or heparin should rotate between regions in injection practices (Dalkıran 2014; Pozzuoli et al. 2018). A study was found in the literature that reported that the calf region is suitable for the subcutaneous injection region which can be used as an alternative to the subcutaneous injection regions that are in practice. The study stated that the calf region is important because it is easy to access and adds extra injection sites to the rotation (Torun and Mutluay 2017). The calf region is located in the lateral region of the gastrocnemius muscle. The study which investigated the suitability of the region for subcutaneous injection in Turkey utilized a skinfold caliper to measure the skinfold thickness in the calf region and found that the subcutaneous injections made with 8 mm needle in 86.3% of the individuals were applicable to the region (Torun and Mutluay 2017). In addition, the above mentioned study proposed evaluating the region with radiological methods. Therefore, the present study aimed to measure the thickness of the subcutaneous adipose tissue in the lower extremity subcutaneous injection sites (thigh and calf regions) through Computed Tomography (CT) sections. The study set out to retrospectively evaluate the suitability of thigh and calf region ST thickness for subcutaneous injection through CT sections. Thus, the study aimed to;

- reveal the suitability of the thigh and calf regions for subcutaneous injection,
- compare ST thickness in thigh and calf regions based on gender and body mass index

Material and Method

The population of the retrospective descriptive study consisted of adult individuals over the age of 18 who underwent Contrast-Enhanced Lower Extremity CT Angiography between March 2020 and March 2021 in a training and research hospital in Izmir (N=400). While determining the sample of the research, stratified sampling method was chosen among the probabilistic sampling methods to be unbiased and represent the universe. Individuals were stratified by age and gender to represent the universe. The targeted sample size was determined as 140 for 95% power as a result of the sample size calculation. The research was completed with 140 participants. CT images including the distance from the umbilical level to

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the distal part of the foot were included in the study. Individuals with an anatomical defect in the thigh and calf regions, with any fractures and open wounds and those with flexion in the knee joint and external rotation in the calf region sufficient to cause compression were excluded from the study.

A case report form was used to collect and record research data on the age, sex, height and weight of the individuals and the ST thicknesses obtained by CT measurement in the thigh and calf injection sites.

Data Collection

A 128-slice CT device (Optima CT 660, GE Healthcare System, Milwaukee, USA) was used to obtain Contrast-Enhanced Lower Extremity CT Angiography images of the participating individuals. In the study, Contrast-Enhanced Lower Extremity CT Angiography examinations were evaluated retrospectively by a radiologist.

The following measurements were taken to collect the data in the study.

1. The age, gender, height and weight values of the patients were obtained from the hospital database.

2. Subcutaneous injection points in the thigh and calf regions were detected on CT images using the method mentioned in the literature. Coronal and sagittal plane reformat images were used to detect injection sites on tomography sections. The region on the lateral aspect of the gastrocnemius muscle (approximately 10 cm below the lateral aspect of the knee) was used to determine the calf region (Torun and Mutluay 2017). The anterior (1/3 distal part of the rectus femoris muscle) and the lateral aspect (1/3 distal part of the vastus lateralis muscle) of the thigh were used to determine the thigh region (Potter et al. 2017; Berman et al. 2016). Measurement points were determined on the reference lines passing through the center of the muscles in the thigh.

3. After the points were determined, ST thicknesses (mm) in the calf and thigh regions were measured on axial plan CT images with a section thickness of 0.625 mm. All measurements were taken from the left leg (Fig. 1,2).

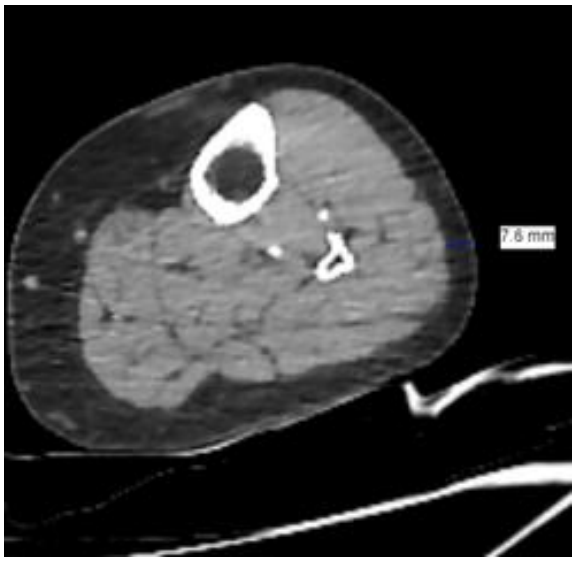

Figure 1. Subcutaneous tissue thickness of the calf region.

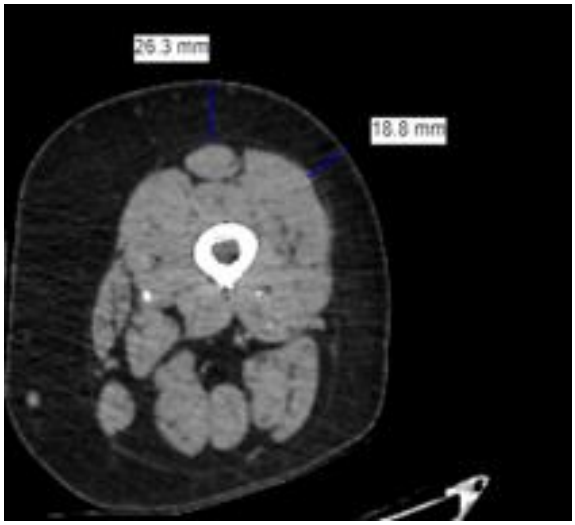

Figure 2. Subcutaneous tissue thickness of the anterior (A) and lateral (B) sides of the thigh

Statistical analysis

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Data were analyzed by using The Package for Social Sciences (SPSS) 20 package program. The number, percentile, mean and standard deviation of the data regarding the physical measurements of the individuals were presented. The *t*-test was used to analyze the difference between the ST thicknesses in the thigh and calf regions based on gender while the analysis of variance was used to analyze the difference between the ST thicknesses in the thigh and calf regions based on body mass index. Statistical significance level was accepted to be $p<0.05$.

Ethical Approach

Before the study, permission was obtained from the ethics committee of non-interventional clinical studies (dated 01/04/2020, decision no 239, research number 220).

Results

Table 1 presents the descriptive characteristics of the individuals included in the study. The mean age of the participants was 56,29±17.44. 53,6% (n=75) were male, 21,4% (n=30) had normal weight, 52,1% were slightly overweight (n=73) and 26,4% were overweight. (n=37) was found. Participants' mean body mass index was 27,98±3.84.

Participants' mean ST was 13,64±6,85, 8,82±7,21 and 6,15±3,12 mm, respectively in the thigh anterior, thigh lateral and calf injection regions (F=55,66; df=2; p=000) (Table 2). The post hoc analysis determined that the ST thickness in the anterior thigh was thicker than it was in the lateral thigh ($p<0.001$) and in the calf region ($p<0.001$) and the ST thickness in the lateral thigh was thicker than the calf region (p=0.000).

The mean ST thickness according to the gender was 18,24±7,07 mm in females and 9,64±3,19 mm in males on the anterior thigh; 13,46±8,17 mm in females, 4,8±2,16 mm in males on the lateral thigh and 8,04±3,5 mm in females and 4,5±1,37 mm in males in the calf region. The analysis showed that the ST in the anterior thigh, lateral thigh and calf injection regions was thicker in females (Table 3).

Table 1. Descriptive Characteristics of Individuals

	n	**%**
Age (M±SD) (Min-Max)	56,29±17,44 (18-88)	
Gender		
Female	65	46,4
Men	75	53,6
Body mass index (ort±SS) (Min-Max)	27,98±3,84 (20,83-38,46)	
20-24,99 (normal weight)	30	21,4
25 -29.9 (slightly overweight)	73	52,1
30-39.9 (overweight)	37	26,4
Total	**140**	**100**

M= Mean; SD= Standard deviation;

Table 2. Subcutaneous Tissue Thicknesses at the Thigh and Calf Injection Sites of Individuals

	ST thickness (n=140)		**Statistical analysis**		
Regions	**Mean±SD (mm)**	**Min-Max**	**F**	**df**	**p**
Anterior thigh	13,65±6, 85	3,7- 44			
Lateral thigh	8,82±7,21	2,1 – 45,2	55,66	2	0,000
Calf	6,15±3,12	2,3- 19,5			

ST= Subcutaneous tissue; SD= Standard deviation; F= One Way Anova

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Table 3. Average Subcutaneous Tissue Thickness in Thigh and Calf Regions by Gender and Body Mass Index

	n	Anterior thigh ST thickness (M±SD)	Lateral thigh ST thickness (M±SD)	Calf ST thickness (M±SD)
Gender				
Female	65	18,24±7,07	13,46±8,17	8,04±3,5
Men	75	9,64±3,19	4,8±2,16	4,5±1,37
		t= 9,04 p= .000	**t= 8,3 p= .000**	**t=7,66 p= .000**
Body mass index (kg/m²)				
20-24,99 (normal weight)	30	8,67±3,38	4,4±2,65	4,39±2,2
25 -29.9 (slightly overweight)	73	12,29±5	7,12±4,76	5,65±2,13
30-39.9 (overweight)	37	20,31±7,22	15,75±8,83	8,56±3,96
		F=43,141 df=2 p=,000	**F=38,004 df=2 p=,000**	**F=21,64 df=2 p=,000**

ST= Subcutaneous tissue; M= Mean; SD= Standard deviation; t= Independent sample t test; F= Oneway Anova

The mean ST thickness according to the body mass index was 8,67±3,38 mm on the anterior thigh in normal-weight individuals, 12,29±5 mm on the anterior thigh in slightly overweight individuals and 20,31±7,22 mm on the anterior thigh in overweight individuals. On the lateral thigh, ST thickness was 4,4±2,65 mm in normal-weight individuals, 7,12±4,76 mm in slightly overweight individuals and 15,75±8,83 mm in overweight individuals. In the calf region, ST thickness was 4,39±2,2 mm in normal-weight individuals, 5,65±2,13 mm in slightly overweight individuals and 8,56±3,96 mm in overweight individuals. According to body mass index, there was a significant difference between ST thicknesses in anterior thigh, lateral thigh and calf injection regions (Table 3).

ST on the anterior thigh was thicker than 4 mm in 99,3% of the individuals (n=139), thicker than 8 mm in 80,7% of the individuals (n=113) and thicker than 12 mm in 53,6% of the individuals (n=75). ST on the lateral thigh was thicker than 4 mm in 74,3% (n=104) of the individuals, thicker than 8 mm in 39,3% of the individuals (n=55) and thicker than 12 mm in 23,6% of the individuals (n=33). ST on the calf region was thicker than 4 mm in 77,1% of the individuals (n=108), thicker than 8 mm in 19,3% of the individuals (n=27) and thicker than 12 mm in 12,3% of the individuals (n=8). In addition, Table 4 presents the distribution of ST thicknesses greater than 4 mm, 8 mm and 12 mm in all regions by gender.

Discussion

In subcutaneous injection, the drug is usually administered to the abdomen, hips, arms and legs with rotation. The anterior and lateral aspects of the thigh on the leg are theoretically acknowledged and used in practice (Potter et al. 2017; Berman et al. 2016). In addition, a study reported that the lateral aspect of the calf may used as a subcutaneous injection site (Torun and Mutluay 2017). Therefore, this study aimed to evaluate the suitability adult individuals' thigh and calf regions for subcutaneous injection with the help of CT. For this purpose, thigh and calf injection sites were measured for ST thickness with CT by a specialist radiologist. The mean ST thickness values in the anterior thigh, lateral thigh and calf injection regions obtained from the measurements were 13,64±6,85, 8,82±7,21 and 6,15±3,12 mm respectively. Similarly, the mean ST thickness in the thigh region was calculated as 10.4 mm by Gibney et al. (2010), as 7.92 mm by Akkuş et al. (2012), as 12.4±4.1 mm by Dalkıran (2014) and as 11.2 mm in by Akyer (2014). In the present study,

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ST on the anterior thigh was found to be thicker compared to the lateral thigh and the calf region. The study conducted by Torun and Mutluay (2017) also reported that ST thickness on the anterior thigh was quantitatively higher than that of the lateral thigh. The ST thickness in the calf region was found to range from 2.3 mm to 19.5 mm. In their study, Akyer et al. (2014) concluded that the mean ST thickness in the calf region was 8,3±4,7 mm. As a matter of fact, subcutaneous adipose layer in the calf region is thinner than the anterior and lateral aspects of the thigh. Similar results were found in different studies as well (Akyer et al. 2014; Pe´rez-Chirinos Buxade et al. 2018). Compared to other injection sites in the leg, the calf region is thinner but short needles can be used in this region.

Table 4. ST thicknesses greater than 4 mm, 8 mm and 12 mm by gender

ST thickness	Female (n=65)		Male (n=75)		Total (n=140)	
	n	%	n	%	n	%
Anterior thigh						
>4 mm	65	100	74	98,7	139	99,3
>8 mm	62	95,4	51	68	113	80,7
>12mm	42	64,6	33	44	75	53,6
Lateral thigh						
>4 mm	61	92,8	43	57,3	104	74,3
>8 mm	48	73,8	7	9,3	55	39,3
>12mm	32	49,2	1	1,3	33	23,6
Calf						
>4 mm	60	92,3	48	64	108	77,1
>8 mm	26	40	1	1,3	27	19,3
>12mm	8	12,3	-	-	8	12,3

ST= Subcutaneous tissue

The subcutaneous injections, based on injecting the drug into the subcutaneous adipose tissue, require needles that must pass through the dermis and reach the subcutaneous adipose tissue (Potter et al. 2017; Berman et al. 2016). Since the blood flow in the subcutaneous adipose tissue is slower than the muscle layer, the administered drug is absorbed at a more controllable rate (Lo Presti et al. 2012). ST thickness is one of the parameters that determines the suitability of the regions for subcutaneous injection. The distance from the skin surface to the muscle fascia largely depends on ST thickness (Hirsch and Strauss 2019). In the present study, ST thickness of the anterior thigh, lateral thigh and calf region was measured to evaluate the suitability of these regions for subcutaneous injection. Needle length is one of the main factors affecting the access to the subcutaneous layer in subcutaneous injection (Hirsch and Strauss 2019). Needle lengths used in subcutaneous injection vary from 4 mm to 15 mm. According to the measurement values obtained in the study, it was found that the calf region was suitable for a 4 mm needle in 77,1% of individuals, for an 8 mm needle in 19,3% of individuals and for a 12 mm needle in 12,3% of individuals. As a result, it can be argued that the calf region is more suitable for subcutaneous injection with a short needle. For the 4, 8 and 12 mm needles, these rates were found to be 99,3%, 80,7% and 53,6% on the anterior aspect of the thigh and 74,3%, 39,3% and 23,6% on the lateral aspect of the thigh, respectively. As can be seen, the chance of the needle reaching the subcutaneous tissue decreases in all regions as the needle length increases. This will increase the risk of the needle reaching the muscle tissue. These results are supported by the literature. In the literature, it is recommended to

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use short needles in subcutaneous injections so that the drug is not administered intramuscularly (Hirsch et al. 2014; Bergenstal et al. 2015; Spollett et al. 2016; Misnikova et al. 2017; Guo and Wang 2017; Hirsch and Strauss 2019).

It is now widely accepted that 4 mm pen needles (pen injectors) are suitable for all patients, whether they are adults or children, thin or obese, males or females (Hirsch and Strauss 2019). The study conducted by Tubiana rufi et alç (2009) concluded that 84% of the injections made using 12,7 mm needles in children were made into the muscle. It is also known that the use of short needle tips (4-5 mm.) reduces pain and is more effective in controlling blood sugar (Diggle 2014; Hirsch and Strauss 2019; Turan et al. 2019).

Subcutaneous adipose tissue thickness varies depending on BMI, gender and injection site. When the mean ST thicknesses in the thigh and calf injection regions were analyzed by gender, it was found that ST thickness was higher in females in all measurement regions. Torun and Mutluay (2017) reported that ST thickness was higher in females compare to males in all regions where subcutaneous injection was performed. Post-pubertal females have an average of 5 mm more subcutaneous adipose thickness compared to males (Hirsch et al. 2014; Hirsch and Strauss 2019). The findings of the present study also support the results of other studies (Gibney et al. 2010; Torun and Mutluay 2017). However, Dalkıran's (2014) study which used ultrasound for measurements confirmed that gender had no effect on the subcutaneous adipose tissue. Torun and Mutluay (2017) reported the ST thickness values as follows: 29,91 mm in females and 16,22 mm in males for anterior thigh; 29,08 mm for females and 13,88 mm for males for lateral thigh and 23,72 mm in females and 12,09 mm in males for the calf region. In this study, it is noteworthy that the mean thickness values were higher for all regions (Table 4).

Torun and Mutluay measured the subcutaneous tissue thickness with skinfold, while the present study subcutaneous tissue thickness was measured with CT. CT has the advantage of clearly distinguishing adipose tissue from other tissues and measuring directly from cross-sectional images (Pe´rez-Chirinos Buxade et al. 2018; Fraiz et al. 2020). In their study, Akyer et al. (2014) measured the ST thickness in the calf region as 11.1 mm for females with US, while ST thickness was found to be 22.2 mm with skinfold; the ST thickness in the calf region was 5.5 mm for males with US and 12.6 mm with skinfold. The analysis demonstrated this difference as significant. The study determined that there was a significant difference not only in the calf region but also in the thigh region and ST thickness values were always higher with the skinfold method. Similar studies also showed that all variables were higher in skinfold measurement (Wagner et al. 2016; Pe´rez-Chirinos Buxade et al. 2018). This difference is explained by the fact that while other methods directly measure the subcutaneous adipose thickness, the measurements performed with the skinfold caliper take subcutaneous adipose tissue and double-layer skin thickness into consideration as well (Akyer et al. 2014; Pe´rez-Chirinos Buxade et al. 2018).

Subcutaneous adipose tissue thicknesses vary in the thigh and calf regions according to the body mass index. While the mean ST thickness of overweight individuals was found to be significantly higher than that of slightly overweight and normal-weight individuals on the anterior thigh, the mean ST thickness of overweight individuals on the lateral aspect of the thigh and in the calf region were found to be significantly higher compared to individuals with normal-weight. Accordingly, it can be concluded that as BMI increases, the thickness of subcutaneous adipose tissue increases. this result is consistent with other studies (Dalkıran 2014; Hirsch et al. 2019). As a result, it was observed that BMI had an effect on skin thickness and subcutaneous adipose tissue.

It was found that the calf region was suitable for subcutaneous injection when 4 mm needles were used in 92,3% of the females and 64% of the males. However, this ratio was found to be

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decreased as the needle length increased. When an 8 mm needle was used, the calf region was suitable for subcutaneous injection in 40% of the females and only 1,3% of the males. This shows that when a needle longer than 8 mm is used in injection to the calf region, the drug will reach the muscle tissue, not the subcutaneous adipose tissue, especially in males. This result also supports the literature (Turan et al. 2019). Torun and Mutluay also reported that injection to the calf region was found appropriate in 75,3% of the males when an 8-mm needle was used and in 27,2% of the males when a 15-mm needle was used. This result can be explained by the fact that males have less subcutaneous adipose tissue in the calf region and thicker muscle layer compared to females. For this reason, the needle tip longer than 8 mm, especially in thin males or males with normal weight causes the drug to be administered to the muscle (Turan et al. 2019). Considering that 126 mm needles are used in heparin injections, it is concluded that this region is not suitable for females (12,3%) or males (0%).

Conclusion

ST thickness on the anterior aspect of the thigh was higher compared to the lateral aspect of the thigh and the calf injection site. ST thickness at the entire injection site higher in females compared to males. ST thickness in the calf region was higher than 4 mm in 77,1% of the individuals, higher than 8 mm in 19,3% of the individuals and higher than 12 mm in 12,3% of the individuals.

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Research Article / Araştırma Makalesi

Impact of Low-speed Drilling without Irrigation on Dental Implant Success

Düşük Devirli İrrigasyonsuz Frezlemenin Dental İmplant Başarısına Etkisinin Değerlendirilmesi

Mustafa KARACA[1]*, Abubekir ELTAS[2]

[1]Mehmet Akif Ersoy University, Faculty of Dentistry, Department of Periodontology, Burdur, Turkey
[2]Sağlık Bilimleri University, Faculty of Dentistry, Department of Periodontology, İstanbul, Turkey

Abstract: This study aimed to evaluate the effects of low-speed drilling without irrigation in implant site preparation on marginal bone loss around dental implants and implant failure. The study included a total of 23 patients with partial or complete edentation. The drilling of 44 implant sites in the study group was performed at low speed (50rpm) without irrigation, while 30 implant sites in the control group were drilled at high speed (600rpm) with saline irrigation. The same implant brand was used in both groups. In order to determine marginal bone levels, periapical radiographs were taken immediately after implantation and at postoperative 3 months. Also, certain values including implant failure rates, insertion torque values, bone quality in the implant site, drilling time, and total operation time were recorded in the study. There was no statistically significant difference (p>0,05) between low-speed drilling without irrigation (LDWI) and conventional drilling (CD) in terms of mesial, distal, and mean marginal bone loss. Implant failure rates were also similar between the groups (p>0,05). Besides, no difference was observed between groups in terms of insertion torque values, drilling time, and total operation time (p> 0,05). The findings of this study suggest that the impact of LDWI on marginal bone loss in postoperative recovery period, implant failure, and initial torque values is similar to that of CD protocol. However, further research with longer follow-up periods is needed to confirm the reliability of this novel technique.

Keywords: Autogenous bone graft, Dental implant, Low-speed drilling without irrigation.

Öz: Bu çalışmanın amacı; implant yuvasının preparasyonunda düşük devirli irrigasyonsuz frezlemenin implant etrafındaki marjinal kemik kaybına ve implantların kaybedilme oranına etkilerinin değerlendirilmesidir. Çalışmaya parsiyel ve total dişsizliğe sahip toplam 23 hasta dahil edildi. Çalışma grubundaki 44 implantın frezlemesi 50rpm düşük devirli irrigasyonsuz şekilde yapılırken, kontrol grubundaki 30 implantın frezlemesi 600rpm devirli ve irrigasyonlu bir şekilde yapıldı. Her iki grupta da aynı implant markası kullanıldı. Marjinal kemik seviyelerini belirlemek için tüm implantlardan, yerleştirildikten hemen sonra ve postoperatif 3. ayda periapikal radyografiler alındı. Ayrıca, çalışmada implantların kaybedilme oranı, yerleştirme tork değerleri, implant yerleştirilen bölgedeki kemik kalitesi, frezleme ve toplam ameliyat süreleri kaydedildi. Bu çalışmada; düşük devirli irrigasyonsuz frezleme (DDİF) ile standart frezleme (SF) protokolü arasında mesial, distal ve ortalama marjinal kemik kaybı düzeyleri açısından istatistiksel olarak anlamlı bir farklılık görülmedi (p>0,05). İmplantların kaybedilme oranları da gruplar arasında benzerdi (p>0,05). Ayrıca, implant yerleştirme tork değerleri, frezleme ve toplam ameliyat sürelerinde de gruplar arasında farklılık gözlenmedi (p>0,05). Bu çalışmanın bulguları, DDİF'nin cerrahi sonrası iyileşme dönemindeki marjinal kemik kaybı, implant kaybı ve başlangıç tork değerlerine etkilerinin SF ile benzer olduğunu işaret etmektedir. Ancak, tekniğin güvenilirliği açısından daha ileri ve uzun hasta takipli çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Dental implant, Düşük devirli irrigasyonsuz frezleme, Otojen kemik grefti.

*Corresponding author : Mustafa KARACA e-mail : karaca0790@gmail.com
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Introduction

Today, dental implants are widely used in the treatment of partial or complete edentulism. The success of dental implants ultimately rests on the extent of osseointegration, that is, the direct adhesion between the bone and the implant surface. To ensure osseointegration, several factors, such as the quality of the bone into which implants are inserted, preferred surgical technique, as well as the tissue compatibility, surface properties, load transfer, and design of the implant material, are known to play a role(Eriksson and Adell, 1986).

During implant surgery, excessive stress and heat should not be created on the bone, avoiding any traumatic procedures. Excessive stress during the procedure causes bone resorption, thus hindering successful osseointegration. The most important issue to consider while drilling an implant site in the bone is the friction heat generated between the burr and the bone (Eriksson and Adell 1986). Authors reported that heating bony tissue to 47°C for one minute leads to death of osteogenic cells with no successful recovery (Tehemar 1999). Exposing bones to high temperatures has been found to cause dislocation in the cage structure of hydroxyapatite minerals and microscopic denaturation. Heat generation during the drilling in the implant site is influenced by several factors which include the torque applied by the surgeon during drilling, drilling speed, drilling time, irrigation and implant systems, design and sharpness of the burr, material of the burr, bone quality in the implant site, drilling depth and patient-related factors (Möhlhenrich et al. 2015).

The speed of drilling is one of the key factors to determine heat generation in the bone during implant surgery. Excessive drilling speeds have been reported to cause heat generation, which may lead to thermal osteonecrosis by limiting the effectiveness of irrigation. On the other hand, some studies found that low-speed drilling might require longer drilling time and higher drilling torque as compared to high-speed drilling, thus resulting in overheating in the bone tissue (Gil et al. 2017).

Dental implantology and surgical techniques are now updated on a continuous basis. In most implant systems, conventional drilling speeds ranging from 600 rpm to 1500 rpm and abundant irrigation are generally recommended to prevent heat generation in the bone tissue (Sharawy et al. 2002; Reingewirtz et al. 1997). Recently, a novel technique involving low-speed drilling without irrigation (LDWI) has been proposed as an alternative to conventional procedures employed to prepare implant site during implant surgery. This technique allows autogenous bone harvesting, which could yield additional bone graft, one of the most important factors in implant surgery today (Anitua et al. 2007). It has been reported that the bone graft harvested during low-speed drilling is easier to manipulate as compared to grafts obtained through other methods such as bone clamp and bone collector. As no irrigation is used in this novel technique, contamination of the collected autogenous graft with saliva can also be avoided. In addition, low-speed drilling ensures a more controlled osteotomy (Gaspar et al. 2013).

In this study, we aimed to determine the impacts of low-speed drilling without irrigation on marginal bone loss around implant site, number of failed implants, insertion torque values and operation time, as it is becoming a more common clinical application despite limited amount of scientific evidence.

Material and Methods

Study Design

This randomized, controlled, clinical trial included 23 patients without any systemic complaints who presented to the Department of Periodontology at the Dentistry Faculty of İnönü University. A total of 74 dental implants (36 maxillary and 38 mandibular implants) were applied in 23 patients with partial or complete edentation. Prior to the commencement of any research protocol, a written approval (no. 2017/71) was obtained from

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Malatya Ethics Committee of Clinical Investigations. Besides, a written informed consent was obtained from each participant before the application of implant treatment.

Two groups were formed: a study group and a control group. In the study group, a new protocol of low-speed drilling without irrigation (LDWI) at 50 rpm, with initial drilling performed at a speed of 600 rpm, was used in the preparation of implant sites (n = 44).

In the control group, conventional drilling (CD) protocol was employed, where implant sites were drilled at a speed of 600 rpm with irrigation using physiological saline (n = 30).

In the study, some patients received implants prepared through both CD and LDWI protocols in their different quadrants, in an attempt to rule out possible differences in implant success due to the personal physiological factors.

Patients

Inclusion criteria

Patients volunteering to participate in the study and meeting the following the criteria were included in the study.

- Age over 18 years
- At least one missing tooth
- Alveolar crest thickness greater than 5 mm
- No systemic health complaints

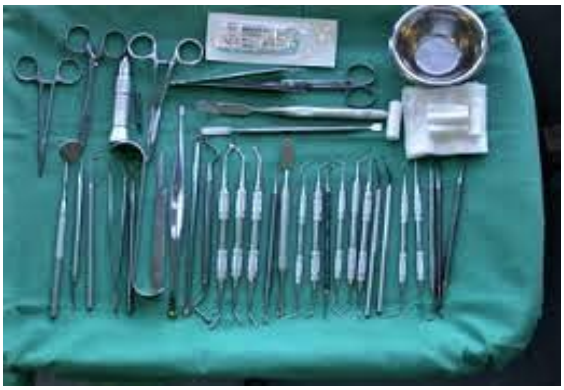
Exclusion criteria

Patients meeting the following the criteria were excluded from the study.

- Non-steroidal anti-inflammatory drug allergy
- History of periodontitis during the implant treatment
- History of chemotherapy and/or radiotherapy
- Tobacco consumption
- Existence of pregnancy or possible pregnancy
- Diseases affecting oral mucosal health
- Systemic disease and drug use that may cause surgical complications
- History of recent tooth extraction in the treatment area (within 4 months of the treatment)
- Failure to attend follow-up appointments scheduled after the operation

Surgical Technique

All surgical procedures were carried out in accordance with sterilization and disinfection guidelines in an operating theater in the



Department of Periodontology at the Dentistry Faculty of Inonu University. Prior to surgery, implant areas were anesthetized with local anesthetics (Maxicaine Fort, Articaine hydrochloride 80 mg + epinephrine 0.020 mg/ampoule). After the state of anesthesia was achieved, sulcular and crestal incisions were made in the implant area by means of a scalpel size no. 15 (Broche Medical scalpel blade, carbon steel). Next, the mucoperiosteal flap was raised through the use of a periosteal elevator (Schwert Periosteal Elevator, Hu-Friedy) to proceed with the preparation of the implant site.

Figure 1. Surgical instruments used for dental implants.

In preparation of the implant site, the initial drilling was performed at a speed of 600 rpm with

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irrigation. Then, two groups were formed as study group and control group. In the study group, drilling was continued at 50 rpm without irrigation, while in the control group the implant site was drilled at 600 rpm with irrigation using physiological saline.

Once the implant site had been prepared, the selected implant was inserted in the site by means of a carrier piece. All implants in the study were positioned at bone level or 1mm below the bone level. As we preferred a two-stage dental implant placement method, first the closure screws were inserted and then the wound edges were primarily closed with 4.0 propylene sutures (Doğsan, Istanbul, Turkey) to cover the implant head. All these surgical procedures were performed by a single surgeon for the standardization of treatments.

Figure 2. Autogenous graft collected with LDWI technique.

Measurement of Insertion Torque

Initial stabilization of the implants was evaluated by measuring the insertion torque values. In accordance with the manufacturer's recommendations, the torque values were measured by a manually calibrated torque ratchet with a digital display. The torque values recorded here were grouped as follows:

T1: 0-19 Ncm

T2: 20-40 Ncm

T3: 41-60 Ncm

T4:> 60 Ncm

Assessment of Bone Quality

The jawbone types of the patients were graded subjectively on a scale of 1 to 4 by the surgeon placing the implants based on the resistance to the drilling process during preparation of the implant sites, in accordance with the classification criteria specified by Bra-nemark et al. 1985 (Bra-nemark et al. 1985).

According to this classification,

• Type I: Almost the entire bone is composed of homogenous compact bone with small amount of trabeculae in the center.

• Type II: The bone is composed of a thick layer of compact bone surrounding a core of dense trabeculae.

• Type III: The bone is composed of a core of low-density trabeculae surrounded by a thin layer of cortical bone.

• Type IV: The bone is composed of fine trabecular bone surrounded by a thin layer of compact bone.

Measurement of Operation Time

The duration of the operation and the total time of drilling (excluding the initial drilling) were recorded by an assistant with a chronometer. Then the operation times were classified as follows:

A1: Less than 10 minutes (min)

A2: 10 minutes and more

The drilling times were classified as follows:

F1: 0-25 seconds

F2: 25.1-40 seconds

F3: 40.1-50 seconds

F4: 50.1 seconds

Postoperative Care

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After surgery, each patient was advised to apply an extraoral ice compress to the affected area for 24 hours. A nonsteroidal anti-inflammatory analgesic drug (ibuprofen 600 mg 2x1) was prescribed for 4 days, as well as antibiotics (500 mg amoxicillin 3x1) and chlorhexidine mouthwash (3x1) for one week.

In addition, important points in the postoperative care were explained to each patient either verbally or in writing. The sutures were remove done week after the surgery.

Measurement of Marginal Bone Loss

Standardized periapical radiographs taken immediately after placement of the implants and at postoperative 3 months were transferred to digital media. The X-ray images were assessed in accordance with specifications described by Dinato et al. Accordingly, all X-ray images were sent using the same equipment with a focus distance of 70 kVp, 8 mA, 0.2 sec and about 30 cm. Next, the size of the dental implants was measured using the Planmeca Romexis 3.5.1.R program on periapical radiographs. The size of the implants measured on the radiograph was calculated to find their direct proportion to the actual size of the implant and then the amount of growth on periapical radiographs was calculated. The mean marginal bone levels measured from mesial and distal points with reference to the implant neck were determined according to the amount of growth. The difference in marginal bone levels obtained from both digital periapical radiographs was measured and recorded 3 times by two researchers. The mean bone level percentage for an implant was calculated by taking the mean value of the mesial and distal measurements ($(M + D)/2$) (Figures 3.3 and 3.4) (Kılıç et al. 2013; Dinato et al. 2016; Sesma et al. 2016)

Statistical Analysis

The research data were analyzed on the software package called IBM SPSS Statistics 22 for statistical analysis (SPSS IBM, Turkey). The Shapiro-Wilk test was used to determine whether the parameters departed from normality, and we found that the parameters did not show normal distribution. Mann-Whitney U test was used for the comparison of parameters between groups. Chi-square test, Fisher's Exact Chi-square test, Continuity (Yates) Correction and Fisher Freeman Halton test were used for comparison of qualitative data. A p-value less than 0.05 ($p<0.05$) was considered statistically significant.

Results

This study included a total of 74 dental implants (44 in the study group and 30 in the control group). The demographic data of the patients are presented in Table 1. Three implants in the study group and two implants in the control group failed in the osseointegration phase, thus the success rate of all implants was 93.3%. There was no implant or patient excluded from the study in either group.

Table 1. Demographic characteristics of the patients by groups

	LDWI	**CD**
Number of patients	15	14
Number of implants (n)	44	30
Age (years)	49.3	43.8
Gender		
Female	7	7
Male	8	7

The mean marginal bone loss was 0.49±0.42mm in the radiographic evaluation (at 3 months) of the implants placed in the LDWI group and 0.44±0.35mm in the control group, and there was no statistical difference between groups. In addition, there was no statistically significant difference between groups in terms of mesial and distal marginal bone loss ($p>0.05$) (Table 2).

Table 2. Mean marginal bone loss around implants.

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	LDWI (n=44) Mean±SD	CD (n=30) Mean±SD	p
Mesial marginal bone loss (mm)	0.45±0.40	0.43±0.35	0.700
Distal marginal bone loss(mm)	0.53±0.47	0.45±0.39	0.431
Mean marginal bone loss(mm)	0.49±0.42	0.44±0.35	0.537

Mann-Whitney U Test.

Table 3. Implant failure rates.

	LDWI (n=44) n (%)	CD (n=30) n (%)	*Total (n=74) n (%)*	P
Implant loss				
Yes	3 (%6.8)	2 (%6.6)	*5 (%6.7)*	[2]1.000
No	41 (%93.1)	28 (%93.3)	*69 (%93.3)*	

[1]Fisher Freeman Halton Test; [2]Continuity (Yates) Correction; *p<0.05; T1:0-19, T2:20-40, T3:41-60, T4:>60.

Table 4. Insertiontorque values and bone quality in implant sites

LDWICD	Total	p (n=44)	(n=30)	(n=74)	
Bone Quality					
	Type 1	1 (%2.3)	2 (%6.7)	*3 (%4.1)*	[1]0.720
	Type 2	16 (%36.4)	13 (%43.3)	*29 (%39.2)*	
	Type 3	21 (%47.7)	12 (%40)	*33 (%44.6)*	
	Type 4	6 (%13.6)	3 (%10)	*9 (%12.2)*	
Insertion Torque					
	T1	9 (%20.5)	5 (%16.7)	*14 (%18.9)*	[1]0.532
	T2	18 (%40.9)	12 (%40)	*30 (%40.5)*	
	T3	5 (%11.4)	1 (%3.3)	*6 (%8.1)*	
	T4	12 (%27.3)	12 (%40)	*24 (%32.4)*	

[1] Chi-square Test; [2] Fisher's Exact Test; [3] Fisher Freeman Halton Test; [4]Continuity (Yates) correction; *p<0.05.

About 6.8% of the implants in the LDWI group and 6.6% of the implants in the control group were lost and there was no statistically significant difference between the groups (p>0.05) (Table 3).

Both groups showed similar bone quality in the regions where implants were placed (p>0.05) (Table 4).

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Table 5. Drilling and operation times

	LDWI (n=44)	CD (n=30)	*Total (n=74)*	P
Drilling time				
F1 (%)	22 (%50)	11 (%36.7)	*33 (%44.6)*	[1]0.167
F2 (%)	17 (%38.6)	9 (%30)	*26 (%35.1)*	
F3 (%)	2 (%4.5)	4 (%13.3)	*6 (%8.1)*	
F4 (%)	3 (%6.8)	6 (%20)	*9 (%12.2)*	
Operation time				
A1 (%)	22 (%50)	11 (%36.7)	*33 (%44.6)*	[2]0.371
A2 (%)	22 (%50)	19 (%63.3)	*41 (%55.4)*	

[1]Fisher Freeman Halton Test; [2]Continuity (Yates) Correction; *p<0.05
F1:0-25sec, F2:25.1-40sec, F3: 40.1-50sec, F4:50.1sec; A1:Under 10 min, A2:Over 10 min.

There was no statistically significant difference in the initial torque values between the LDWI and CD groups (p>0.05) (Table 4).

There was no statistically significant difference between the groups in terms of drillingand operation times (p> 0.05) (Table 5).

In both LDWI and CD groups, there was no statistically significant correlation between implant failure and torque values, drilling and operation times (p> 0.05) (Table 6, 7).

Table 6. Evaluation of the relationship between implant failure and initial torque values, drilling and operation times in the LDWI group.

	Implant Failure		p
	No n (%)	Yes n (%)	
Initial torque values			
T1	9 (%100)	0 (%0)	[1]0.223
T2	18 (%100)	0 (%0)	
T3	4 (%80)	1 (%20)	
T4	10 (%83.3)	2 (%16.7)	
Drilling time			
F1	21 (%95.5)	1 (%4.5)	[1]0.548
F2	16 (%94.1)	1 (%5.9)	
F3	2 (%100)	0 (%0)	
F4	2 (%66.7)	1 (%33.3)	
Operation time			
A1	21 (%95.5)	1 (%4.5)	[2]0.345
A2	20 (%90.9)	2 (%9.1)	

[1]Fisher Freeman Halton Test; [2] Fisher's Exact Test; T1: 0-19 Ncm, T2: 20-40 Ncm, T3: 41-60 Ncm, T4: >60 Ncm; F1: 0-25 sec, F2: 25.1-40 sec, F3: 40.1-50 sec, F4: 50.1 secA1:Under 10 min, A2:Over 10 min.

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Table 7. Evaluation of the relationship between implant failure and initial torque values, drilling and operation times in the CD group

	Implant Failure		p
	No n (%)	**Yes n (%)**	
Initial torque values			
T1	4 (%80)	1 (%20)	[1]0.366
T2	12 (%100)	0 (%0)	
T3	12 (%92.3)	1 (%7.7)	
Drilling time			
F1	11 (%100)	0 (%0)	[1]1.000
F2	8 (%88.9)	1 (%11.1)	
F3	4 (%100)	0 (%0)	
F4	5 (%83.3)	1 (%16.7)	
Operation time			
A1	10 (%90.9)	1 (%9.1)	[2]0.537
A2	18 (%94.7)	1 (%5.3)	

[1]Fisher Freeman Halton Test; [2] Fisher's Exact Test; T1: 0-19 Ncm, T2: 20-40 Ncm, T3: 41-60 Ncm, T4: >60 Ncm F1:0-25 sec, F2:25.1-40 sec, F3: 40.1-50 sec, F4: 50.1 secA1:Under 10 min, A2:Over 10 min.

Discussion

This study was carried out to determine the impact of LDWI and CD protocols on marginal bone loss around dental implants and implant failure. When the effect of LDWI on marginal bone loss and implant failure rates was assessed, early results were found to be similar to those of CD protocol. It was also observed that the insertion torque values, drilling and operation times did not differ between the groups.

Modern implantology has been showing a constant progress over the past century (Fiorellini et al., 1998; Lioubavina-Hack et al., 2006). Today, implant surgery often requires bone graft material depending on the amount of insufficient bone in the host tissue. It has been reported that the most ideal bone grafts used in implant surgery are of autogenous origin. Clinicians usually obtain autogenous bone grafts by using instruments specifically designed to harvest bone during drilling in the jawbone or through suction tip to collect bone particles produced by drilling. However, autogenous bone grafts harvested through these methods are generally inadequate and contaminated by oral bacteria existing in saliva (Kim et al. 2010). Anitua et al. (2007) introduced a protocol for the preparation of the implant site, where initial drilling is performed at 800 rpm with irrigation and the subsequent drilling is continued at 50 rpm without irrigation by progressively increasing the diameter of the burr. They reported that this protocol could easily yield more autogenous bone graft that is not contaminated by saliva as compared to other methods. It has also been reported that this technique does not impair bone tissue viability and that implants do not interfere with osseointegration process. Since the introduction of LDWI protocol in the literature, several studies have been carried out to examine the effects of this technique on the temperature change in the bone tissue. In their study conducted on pig rib bones, Kim et al. (2010) compared the effects of conventional drilling (1200 rpm) and low-speed drilling (50 rpm) on temperature changes in bone using infrared thermography. In this study, they found no significant difference between the groups in terms of temperature increase, reporting that drilling at 50 rpm without irrigation did not cause excessive heat in bone and that a few degrees of temperature difference might be related to the burr diameter. Giro et al. (2013), carried out on diaphysial radius of beagles,

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examined the effects of osteotomy at 900 rpm with irrigation and osteotomy at 50 rpm without irrigation on implant integration. They found that both techniques yielded similar results and did not affect implant integration in the early integration period, based on the measurements of bone-to-implant contact and bone area fraction occupancy in follow-up period at 2 and 4 weeks. In their study on rabbit tibia, Gaspar et al. (2013) investigated the histological sections of the implant sites drilled at 50 rpm without irrigation and at 800 rpm with irrigation, and they reported that both surgical techniques protected the vitality of the bone cells. In their laboratory study on type 4 bovine bone disks, Delgado Ruiz et al. (2018)compared the heat changes caused by LDWI technique(50 rpm, 150 rpm, 300 rpm) and drilling at 1200 rpm with irrigation. They concluded that LDWI design caused a temperature increase at the coronal and apical levels, though it remained below the critical level of 47°C.(Oh et al. 2016), in a study on experimental D1 bone, reported that LDWI (50 rpm) and the high-speed drilling with irrigation (1500 rpm) did not cause overheating in the bone tissue. The research in the relevant literature indicates that low-speed drilling without irrigation causes no significant change in bone temperature, but all of the previous work seems to consist of laboratory or animal studies. For this reason, clinical studies on humans are needed to fully understand the effects of LDWI protocol on bone tissue. Our study therefore aimed to examine the clinical effects of the implant site preparation with LDWI on human jawbone, as clinical applications of this novel technique are becoming widespread day by day and respective scientific evidence is currently rather limited in the literature.

Even though various methods are employed in evaluating marginal bone around implants, the most common tool is still radiographs. Radiological evaluation of dental implants involves the use of several different imaging methods. Some researchers utilize periapical radiographs to evaluate the bone around implants in clinical trials, while others prefer panoramic radiographs (Leimola-Virtanen et al. 1995; Spiekermann et al. 1995; Romeo et al. 2002). Åkesson et al. (1992) compared panoramic and periapical radiographs in evaluating marginal bone and reported that the image quality of periapical radiographs was superior. Panoramic radiographs have certain disadvantages; for instance, they cannot provide a detailed image of the bone level around the implant and radiographic images of the implants placed in the anterior region often suffer from deformation and superposition. For this reason, periapical radiographs are preferred in periodic monitoring after an implant surgery (Åkesson et al. 1992; Åstrand et al. 2002; Buser et al. 1997). In our study, we therefore used periapical radiographs to calculate the amount of bone graft required and marginal bone loss during routine follow-up of patients.

Nowadays, radiographic evaluation through computer-assisted measurements allows a more precise assessment of the peri-implant regions. Moberg et al. (1999) used a computer-assisted measurement method to determine the bone level around the implants in a clinical trial. During the measurement, each radiograph was evaluated by comparing the radiographic and actual dimensions of the implants in order to rule out possible errors that might be caused by the magnification differences. Wyatt et al. (2001) reported that the computer-assisted measurement of bone level around the implant was more advantageous and indicated that different perspectives between individuals in the measurements made with magnifiers could vary significantly. Therefore, in our study, computer-assisted measurements were performed to increase the precision of the results obtained on periapical radiographs taken to assess the amount of bone resorption around the implants.

Today, widespread adoption of dental implants has brought about the need for more research to maximize the reliability of implant treatment and successful survival of implants (Sesma et al. 2016). To that end, some success criteria have been defined in order to evaluate the state of dental implants. These criteria mainly cover subjective

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complaints such as pain, foreign body sensation, infection, neuropathy, paresthesia, survival and mobility of implants, and radiographic marginal bone loss (Çetiner and Zor, 2007). According to Albrektsson et al. (1986), marginal bone loss of ≤ 1 mm in the first year after an implant has become functional and ≤ 0.2 mm annually in the following years is considered successful. In Brånemark implant systems, the total loss in the marginal bone should be about 1.2 mm after one year of loading in active implants. It has also been reported that the mean annual bone loss should not exceed 0.1 mm in the follow-up period (Åstrand et al. 2002). Oh et al. (2002) mentioned that the initial marginal bone loss in the osseointegration process of the implant is affected by surgical trauma, excessive occlusal loading, peri-implantitis, peak module of the implant, and the way the surgical procedure is performed. Misch et al. (1999) stated that marginal bone loss during implant osseointegration was 0.21 mm for impacted implants and 0.36 mm for exposed implants. Pham et al. (1994) reported increased bone loss with prolongation of osseointegration in implants, with a mean bone loss of 0.48-0.96 mm in the 3-6 month period before loading. In the current literature, there exists no study to examine the effects of LDWI on marginal bone loss. In our study, the marginal bone loss measured in LDWI and CD groups were similar at the end of the 3-month osseointegration process.

While a failure occurring prior to implant osseointegration is considered an early failure, failures occurring after osseointegration under functional forces are categorized as late failure (Brunski 1992). Factors causing early failure of implants include bone necrosis, bacterial contamination, poor bone quality, micromovement of the implant, premature loading and inadequate primary stabilization (Lee et al. 2011). Dental implants usually feature a relatively high pre-loading success rate (Oh et al. 2002). Relevant studies have generally reported an implant failure rate of 2-3%. Chrcanovic et al. (2017) reported early failure in 642 of 10,096 implants (6.36%) in a retrospective study. In another retrospective research by Lin et al. (2018), 194 of 30,959 implants (0.6%) were reported to suffer early failure. Friberg et al. (1991) stated that 69 of 4,641 (1.5%) Brånemark implants included in the study failed during the osseointegration period. It is evident that implant failure rates may vary significantly from one study to another, which can be associated with the fact that implant failure may be caused by several factors, such as preferred surgical technique, implant surface characteristics, competence of the surgeon, and patient-related risk factors. There is no previous work in the literature attempting to determine the relationship between LDWI and implant failure. In our study, the implant failure rate was 6.8% in LDWI group and 6.6% in the control group, with no significant difference between groups. The rates of implant failure reported by the above-given corpus and meta-analyses involve great number of dental implants. However, the total number of implants in our study was only 74. For this reason, further research including larger number of implants with longer follow-up periods is warranted to confirm the reliability of the implant failure rates achieved by LDWI protocol.

Campos et al. (2012) reported that high insertion torque values could trigger bone necrosis and thus cause implant failure. Ottoni et al. (2005) reported that every 9.8-Ncm increase in torque values reduced the risk of implant failure by 20%, but there was no significant relationship between insertion torque and implant failure. In their systematic review, Berardini et al. (2016) compared the effects of high and low insertion torque values on implant failure, and they found that insertion torque had no significant impact on implant failure. In our study, we found no correlation between insertion torque values and implant failure rates.

The temperature increase in the bone is directly proportional to the drilling time, and one of the primary factors to extend the drilling time is obviously the drilling speed. In a study by Stelzle et al. (2012), which compared three different drilling systems (piezosurgery, spiral burr, trephine

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burr),implant site preparation with spiral burr took 5.9 seconds, with trephine burr 7.3 seconds and with piezoelectric surgery 19.5 seconds. They also reported that the lowest temperature measured at maximum load was achieved by spiral burr (40.3 °C) followed by trephine burr (43.9 °C) and piezoelectric surgery (48.6 °C). Rashad et al. (2011) in their study on animal bones, compared two ultrasonic devices and a conventional device for implant site preparation, and they concluded that preparation with ultrasonic devices resulted in higher bone temperature and longer drilling time, also suggesting that ultrasonic devices can be safely used by increasing the amount of irrigation. Kim et al. (2010) demonstrated lower drilling speed increased drilling time but caused no higher bone temperature. Delgado Ruiz et al. (2018) also reported that the drilling process took longer at low speeds and the amount of heat generated in the bone increased while remaining below the critical threshold of 47°C. Reingewirtz et al.(1997), on the other hand, concluded that the drilling speed would increase the drilling time, which in turn could cause higher bone temperature. Thompson et al. (1958) also reported that the lower drilling speed should require more time and thus generate more heat, adding that increased heat would create necrotic bone tissue in the implant site and result in implant failure or lower implant success. In our study, we also recorded and compared the drilling and operation times required in LDWI and control groups. In addition, the relationship between implant failure and drilling and operation times was examined. Our results showed that both groups had similar drilling and operation times, with no significant difference in the rates of implant failure. Accordingly, low-speed drilling had no effect on the duration of operation and drilling. The similar operation and drilling times in the study and control groups could be explained by the fact that initial drilling was performed at standard speed with irrigation, and so the implant failure rates showed no significant difference between groups.

Conclusion

Based on the results of our study, we conclude that low-speed drilling without irrigation can be safely applied for implant site preparation in clinical settings. However, further studies are needed for this novel technique to become a routine clinical practice.

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Research Article / Araştırma Makalesi

Investigation of the Relationship between IgG and Telomerase in Simental Cattle in Different Age Groups

Simental Irkı Değişik Yaş Gurubundaki Sığırlarda Telomeraz Enzimi ve IgG Değerlerinin İlişkisinin Araştırılması

Serkan ÇETİNER[1], Şima ŞAİNDURAN[1*]

[1]Burdur Mehmet Akif Ersoy University, Faculty of Veterinary Medicine, Department of Internal Medicine, Burdur, Turkey

Abstract: Preservation of telomere length suggests that it can play an active role in avoiding diseases that can be seen with aging and in avoiding cellular aging. Telomeres shorten slightly with each cell division. Telomerase enzyme is responsible for elongation of telomere sequences. Immunoglobulins can be thought of as the molecular structure of antibodies. IgG making up 75-80% of antibodies. The aim of this study is to evaluate the levels of IgG and telomerase enzyme, which have an important place in the immune system with aging. The research material consisted of a total of 46 animals of Simmental breed, 1-day-old 8 calves, 6-month-old 8calves, 1-year-old 8 calves, 4-year-old 12 and 6-year-old 10 cattle in various farms. After the blood samples taken from the animals were centrifuged, their serums were removed and telomerase enzyme levels and IgG levels were measured and compared by ELISA method. As a result, in this study, it was observed that telomerase enzyme activity decreases with aging. While IgG levels did not decrease in the first four groups, a positive correlation was found between IgG and telomerase values in 6-year-old animals. In addition, no significant difference was observed in animals in the same age groups.

Keywords: Age, Cattle, IgG, Telomerase.

Öz: Telomer uzunluğunun muhafaza edilmesi yaşlanmayla görülebilecek hastalıklardan kaçınmak ve hücresel yaşlanmadan sakınmada etkin bir rol üstlenebileceğini akıllara getirmektedir. Telomerlerin boyları her hücre bölünmesinde bir miktar kısalır. Telomer dizilerinin uzatılmasından telomeraz enzimi sorumludur. Immunglobulinler, antikorların moleküler yapısı olarak düşünülebilir. IgG antikorların %75-80'nini oluşturur. Bu çalışmanın amacı yaşın ilerlemesi ile immun sistemde önemli yeri olan IgG ile telomeraz enziminin seviyelerini değerlendirmektir. Araştırma materyalini, çeşitli çiftliklerde bulunan Simental ırkı, 1 günlük buzağı 8 adet, 6 aylık buzağı 8 adet, 1 yaşında dana 8 adet, 4 yaşında 12 adet ve 6 yaşında 10 adet sığır toplam olarak 46 hayvan oluşturdu. Hayvanlardan alınan kan örnekleri santrifüj edildikten sonra serumları çıkarılarak ELISA yöntemi ile telomeraz enzim düzeyleri ve IgG düzeyleri ölçülüp karşılaştırıldı. Sonuç olarak bu çalışmada yaşlanmayla birlikte telomeraz enzim aktivitesinin azaldığı gözlenmiştir. İlk dört grupta IgG düzeyi azalmazken 6 yaşındaki hayvanlarda IgG ve telomeraz değerleri arasında pozitif korellasyon ilişkisi saptanmıştır. Ayrıca aynı yaş gruplarında olan hayvanlarda anlamlı fark gözlenmedi.

Anahtar Kelimeler: IgG, Sığır, Telomeraz, Yaş.

*Corresponding author : Şima ŞAHİNDURAN e-mail : sahinduran@mehmetakif.edu.tr
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Introduction

The immune system protects the organism against foreign substances and tumor cells. Fights virus and bacterial infections. It can be considered as a system consisting of some cells and organs that protect the body against abnormal biological factors. If the immune system loses its resistance and the level of immunity decreases, disease-causing factors may develop in the body. Suppression of the immune system weakens the body's defense mechanism against pathogenic microorganisms (Wilkie, 1974). Respiratory and digestive problems that can be frequently seen in

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newborn calves may be immunological, genetic, microbiological, physical, psychological and nutritional (Roy, 1980). It has been reported that immunoglobulins are used in cases of passive transfer failure, myelofibrosis, autoimmune thrombocytopenia and hemolytic anemia that may occur in newborns (Kol, 2008). The antigenic, physiochemical and biological properties of immunoglobulins differ. They are structurally diverse. 4 types of immunoglobulins were observed in ruminants as IgA, IgG, IgM and IgE (Bergmann-Leitner, 2008). IgG, which is the most abundant immunoglobulin in the blood, constitutes almost 85-90% of the immunoglobulins found in blood serum and colostum (Klaus et al., 1969). IgG's can bind to two antigens due to their bivalent structure. It can participate in the agglutination reaction with 2 bacteria or form an immune complex (Gershwin, 1990). IgG have an effective role in bacterial agglutination and opsonization, toxin neutralization and virus neutralization (Mehra et al., 2006).

Telomerase activity is an important determinant of telomere length in mammalian cells, in which lack of telomerase activity could exacerbate cell senescence, especially in highly proliferative tissues (Richard son et al., 2014). Telomerase activity has been shown to be specifically expressed in immortal cells, cancer and germ cells where it compensates for telomere shortening during DNA replication and thus stabilizes telomere length (Harley, 1997). It affects not only the telomere, but also the immune and cell functions (Effros, 2011). In some studies, it has been observed that it has a short and long-term effect on the immune system, and it has been reported that telomere shortening causes a decrease in defense against infections (Miller, 2000). Telomere activity and telomere length are effective in the pathobiology of diseases that can be seen in humans (Blasco, 2005). Oxidative stress that increases in diseases negatively affects telomere sizes. In studies on fibroblasts, it has been reported that oxidative stress affects telomere lengths to a large extent. In this study on fibroblasts, it was reported that oxidative stress factor inhibits telomerase enzyme activity in telomeres and causes more damage compared to non-telomeric chromosomal DNA (Von Zglinicki, 2000). The aim of this study is to investigation of the relationship between IgG and telomerase immunglobulin in Simental Cattle in different age groups.

Materials and Methods

This study was conducted within the scope of the Board decision of Burdur Mehmet Akif Ersoy University Rectorate Animal Experiments Local Ethics Committee dated March 13, 2019 and numbered 503.

The research material was composed of cattle in farms in Burdur province. The animals to be used in this research study are in different age groups and blood samples were collected on the condition that they are only Simental race. Blood samples were collected from a total of 46 animals. Group 1: 8 calves (4 females, 4 males) of 1 day old, Group 2: 8 calves (4 females, 4 males) of 6 months, Group 3: 8 calves (4 females, 4 males) 1 year old (Heifer), Group 4: 4 years old 12 (6 female, 6 male) cattle, Group 5: 6 year old 10 (5 female, 5 male) Simental breed cattle were used. Those who are 1 day old took colostrum up to 10% of their live weight. No disease symptoms were observed during the blood collection process, and no problems were found in eating and drinking and physiological functions. Vaccines were made within the routine vaccination program of the Ministry of Agriculture and Forestry (Brucella, alum, LSD). Venous blood samples from all cattle were taken from the vena jugularis into negative pressure tubes with the help of a 21 gauge needle Vacutainer® holder. Silicone-based plastic tubes (9 ml) with clot activator were used for serum samples. The collected blood samples were ensured to coagulate, and their serums were removed in a centrifuge device at 4000 rpm / 5 min. The extracted serum samples were evenly transferred to Eppendorf tubes (1.5 ml) using a micropipette. The tubes recorded by writing sample numbers on them were stored at -20 ° C until they were processed. A total of 46 blood serum from all cattle was measured for

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telomerase enzyme and IgG by ELISA test. The Bio-X Diagnostics S.A ELISA, Belgium 'test was used for immunoglobulin. For the telomerase enzyme 'Mybiosource For the quantitative detection of Bovine Telomerase catalog Number: MBS281594) was used.

Statistical Analysis

Findings were evaluated using IBM SPSS 22.0 for Windows package program. Shapiro-Wilk test was used to determine the compatibility of the data for normal distribution. Multi-group comparisons were determined by the Kruskal-Wallis test, since the data were not distributed normally. Spearman Correlation coefficient was used to analyze the relationship between variables.

Results

Blood samples were collected from a total of 46 animals in the study. According to the results, although the value of telomerase enzyme gradually decreased, statistically no significant difference was observed in animals between 1 day and 6 months of age and between 1 year and 4 years old animals. However, a significant decrease in the level of telomerase enzyme was detected in animals aged 6 years. According to our findings, the level of telomerase enzyme decreased with the advancement of age. When looking at the level of IgG in 1-day-old animals, it was at the lowest level and increased to 4 years of age, while a decrease was observed after 6 years (Table 1). In the study, no significant difference was found in animals of the same age group. There was no change according to gender.

Discussion

According to scientists, with increasing age, the body's vulnerability to infection gradually increases (Tarry-Adkins et al., 2019). Age-related decline in immunity is characterized by stem cell depletion, telomere shortening and impaired cell-to-cell communication, resulting in an increased patient risk of disease. Recent data have shown that chronic inflammation has a strong effect on immune aging and is closely related to telomere length (Jose et al., 2017). Aging is associated with the increasing prevalence of multiple comorbidities, including infectious and malignant diseases. Many of these disorders are thought to be caused by a decline in immunity due to aging. The immune system consists of a large number of different immunocompetent cells with specific functions that regroup into the adaptive or innate arms of the immune system. In recent years, increasing efforts to characterize the immune system of elderly people have revealed that most immunocompetent cell compartments have qualitative and quantitative impairments (Giraudeau et al., 2019). Studies examining telomere length and telomerase activity focus on the potential interactions between inflammation and telomere biology in immunological aging. Telomere shortening during cell division is a critical process in the progression to aging, and telomerase may play an important role in immunological aging (Jose et al., 2017). IgG, which is the most abundant immunoglobulin in blood, constitutes approximately 85-90% of immunoglobulins in blood serum. Immunolubin Gs are molecules produced by the immune systems of multicellular animal organisms to combat organic structures that are not of their own. They have a glycoprotein structure. They can be detected in all body fluids (Tizard, 2004). In this study, the values of IgG and telomerase enzymes in cattle of different age groups were investigated. A significant difference was found between the IgG values of one-day-old newborn calves and the values of 6 months old, 1 year old, 4 years old and 6 years old cattle and the values were observed to increase gradually. However, while IgG values increased from 1 day to 4 years old, a decrease was detected in animals aged 6 years. According to our findings, as the age increases from the first day of birth to the age of 4, the level of IgG increases and the immune system becomes stronger. However, with the effect of increasing age and aging, the level of IgG and consequently weakening of the immune system were observed after 4 years of age, and a significant difference was found between the groups ($p < 0.05$). Because the cattle population over 6 years old is very low in the livestock sector and cattle are slaughtered after a certain age, older animals could not be included. According to Tarry-Adkins et al. (2019), the rate of immunodeficiency and infection increases significantly with age, and the vulnerability of the body due to age gradually increases. Our findings are in line with the findings of the aforementioned researchers. The findings showing that the infection accelerates telomere erosion in immune cells has been supported by experimental studies

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on laboratory animals (Giraudeau et al., 2019). Jose et al. (2017) revealed in their study that it is characterized by age-related decline in immunity, stem cell depletion, telomere shortening, and cell-cell communication impairment, which leads to an increased risk of disease. With increasing age, as a result of the weakening of the body's defense mechanism and immune system, infections increase and telomere length is negatively affected by the effect of oxidative stress. Telomeres are among the first to be affected by acute oxidative stress, and therefore, it has been reported that there is no repair mechanism for single chain fractures, and to a lesser extent, chronic oxidative stress accelerates the shortening of telomere lengths (Von Zglinicki et al., 2000). Leukocyte's telomere length (LTL) is a biomarker of inflammation and oxidative stress that predicts the risk of chronic diseases with increasing age (Flannagan et al., 2020). Brümmendorf et al. Conducted a study in 2002 in cats aged 2-10 years. In this study, telomere lengths in lymphocytes and granulocytes were measured. According to the study data, telomere lengths gradually decreased with increasing age. In our study, the value of the telomerase enzyme gradually decreased with the increasing age. The highest value was observed on the first day of delivery and the lowest value was observed at age 6 ($p < 0.05$). According to our results, no significant difference was found in the decrease of telomerase enzyme between 1 day and 6 months, but a statistically significant difference was found after 1 year of age.

Table 1. Serum telomerase and IgG levels in different age groups in Simental cattle.

	Group 1*(n=8)* $\bar{x} \pm ss$	**Group 2*(n=8)*** $\bar{x} \pm ss$	**Group 3*(n=8)*** $\bar{x} \pm ss$	**Group 4*(n=12)*** $\bar{x} \pm ss$	**Group 5*(n=10)*** $\bar{x} \pm ss$	***P***
Telomerase (ng/ml)	0,33±0,10^{a}	0,31±0,68^{a}	0,26±0,30^{b}	0,22±0,39^{b}	0,04±0,03^{c}	<0,001
IgG (ngr/mL)	20,21±17,40^{a}	33,18±11,12^{ab}	46,32±11,70^{b}	49,18±17,32^{b}	34,10±13,12^{ab}	<0,001

There is a statistical difference between columns containing different letters ($p < 0.05$).

In the results of working; It was observed that the advancement of age and the activity of the telomerase enzyme also affected the decrease in the activity of IgG, which is an important element of the immune system. Although the levels of telomerase enzyme decreased over time, IgG levels did not decrease in the first four groups, while a positive correlation was found between IgG and telomerase values in 6-year-old animals with advancing age. As can be seen from different studies, it supports the thesis we put forward. In this study, the changes in telomerase enzyme and immunoglobulin G levels with the advancement of age were investigated for the first time in the field of veterinary medicine. In this way, the effect of age on the body's immune system will be investigated, and it will be possible to take precautions for diseases or problems that may arise at an advanced age.

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