Yanık Yaraları ve İnfeksiyonu

Uzm. Dr. Nur Benzonana

Dr. Lütfi Kırdar Kartal Eğitim ve Araştırma Hastanesi


20170818_143621.jpg

- «Benim yaptığımı sen yapamazsın, senin yaptığını ben yapamam , ihtiyaçlar çok fazla ve hiç birimiz ben dahil büyük şeyler yapamayız ama her birimiz sevgi ile küçük şeyler yapabiliriz ve hep beraber harikalar yaratabiliriz.»

  Rahibe Teresa

- «What I do you cannot do, but what you do I cannot do. The needs are great, and none of us, including me ever do great things. But we can all do small things with great love and together we can do something wonderful»

Butler DP. The 21st century burn care team BURNS 2013;39:375-79

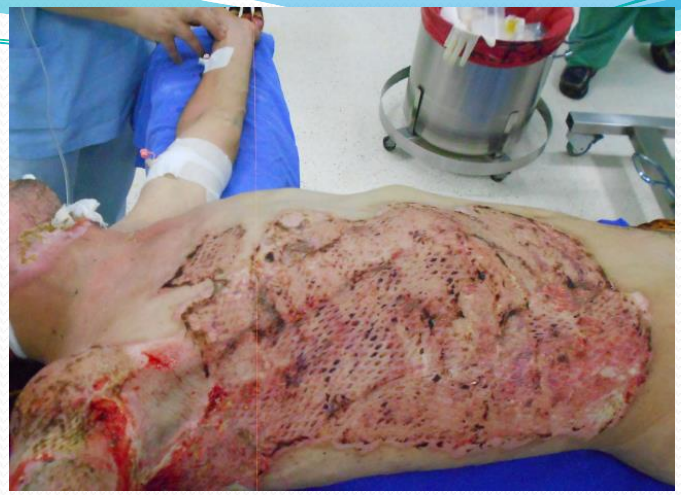
Yanık üzerine eğitim almış multidisipliner bir ekip

- Genel cerrahi
- Plastik ve rekonstüktif cerrahi
- Çocuk cerrahisi
- Anestezi ve reanimasyon
- İnfeksiyon Hastalıkları ve Klinik Mikrobiyoloji
- Su altı hekimliği ve Hiperbarik tıp uzmanı
- Pratisyen hekim
- Anestezi teknisyenleri
- Yıkama hemşireleri
- Yoğun bakım ve servis hemşireleri
- Fizyoterapist
- HBOT teknisyeni
- Sterilizasyon ekibi
- Bilgi işlem elemanları
- Teknik elemanlar
- Yardımcı personel

Deri

- Vücuttaki en büyük organlardan biri
  - Sıvı hemostazı
  - Termoregülasyon
  - İmmünolojik fonksiyonlar
  - Nörosensör fonksiyonlar
  - Metabolik fonksiyonlar
  - Fiziki bariyer

Yanık



- Termal hasar
  - Alev
  - Sıcak sıvılar
  - Sıcak objeler
  - Buhar
- Kimyasal hasar
  - Asit
  - Alkali
  - Petrol ürünleri
- Radyasyon hasarı
  - Solaryum
  - X ray
- Elektrik
  - Isı
  - Hücre membran hasarı
    - Kaslar
    - Sinirler
    - Damarlar
- İnhalasyon hasarı
  - Sıcak duman
    Mekanik hasar
  - Toksik ürünler
    Kimyasal hasar

Sınıflama

- Yanığın derinliği
  - Birinci derece
    - Epidermis
  - Parsiyel yanık (2.ci derece)
    - Epidermis + Dermis
      - Yüzeyel parsiyel yanık
      - Derin parsiyel yanık
  - Tam kat (3.cü derece)
    - Epidermis + Dermis + Yağ tabakası + ...

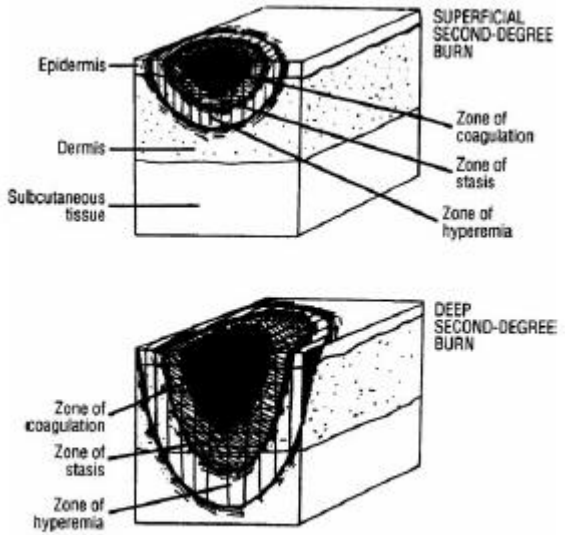


FIG. 2. Zones of injury for superficial and deep second-degree burns. (Adapted from reference 369 with permission of the publisher.)

Sınıflama

- Tüm vücut yüzey alanına oranı (TVYA)
- 9'lar kuralı

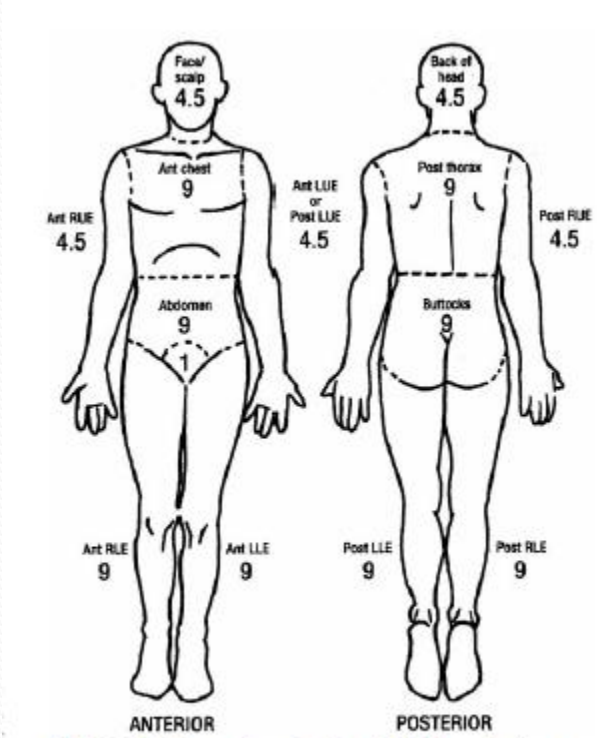


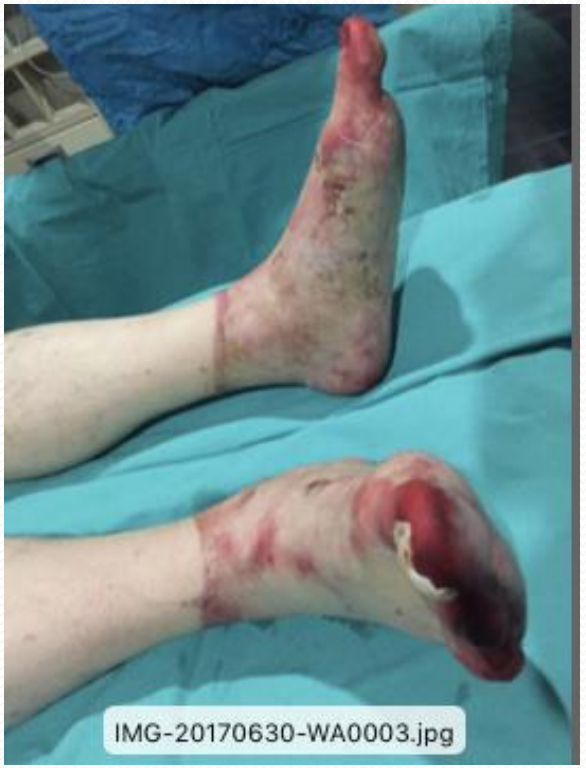
FIG. 3. Body diagram for estimation of total burned surface area (%TBSA) in adults, using the rule of nines (numbers are for anterior only and posterior only). (Adapted from reference 369 with permission of the publisher.)

Amerikan Yanık Derneği (ABA) – Minör Yanık

- Erişkinlerde TVYA: %10
- Çocuk ve yaşlılarda
  - %5inden daha az veya
  - %2 den az tam kat yanıkları

ABA – Orta yanık

- Erişkinlerde TVYA %10-20'si
- Çocuk ve yaşlılarda %5-10'u
- Yüksek-voltaj hasarı
- İnhalasyon hasarı şüphesi
- Sirküler yanık,
- Komorbiditelerin varlığı



ABA – Majör Yanık

- Erişkinlerde TVYA'nın %20sinden fazlasını
- Çocuk ve yaşlılarda %10 dan fazlasını tutan veya, %5'ten fazla tam kat yanığı,
- Yüksek voltaj yanığı,
- Bilinen inhalasyon yanığı
- Yüz, gözler, kulaklar, genital bölge veya eklemlerin üzerinde dikkate değer yanıklar
- Yanık hasarıyla birlikte kırık veya majör hasar gibi kayda değer diğer hasarların olması

Duyarlı hasta

- Küçük çocuklar ve yaşlılar
- İntihar girişimleri ve engelliler
- Obes hastalar
- Komorbidite
- İmmün yetmezlikli hastalar
- İlaç bağımlıları
  - Bonzai
  - Hepsinden biraz

Komplikasyonlar

- Lokal
  - Eskar
  - Skarlar
  - Kontraksyonlar
  - Deformiteler
  - İnfeksiyon
- Sistemik
  - Hipovolemi
  - Metabolik problemler
    - Hipoalbüminemi
    - Elektrolit bozuklukları
    - Rabdomiyoliz
    - Hemoliz
  - Hipotermi
  - İleus
  - İnfeksiyon
  - Mortalite

Yanık - fizyopatoloji

3 karakteristik tutulum alanı

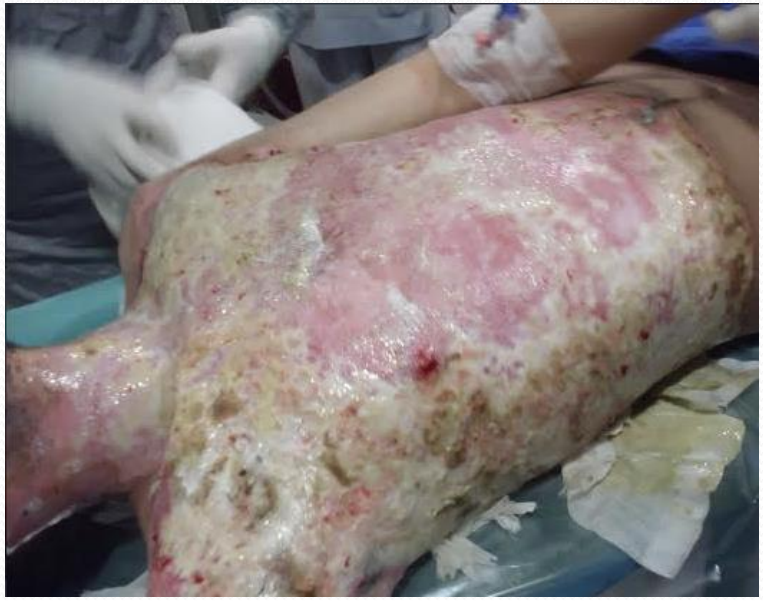
- Isı kaynağına en yakın olan eskar dokusu
- Staz zonu
  - Nekroz alanına komşu
  - Canlı
    - Perfüzyon defektleri nedeniyle nekroz ve iskemi riski
- Hiperemi zonu
  - Relatif olarak sağlıklı
  - Artmış kan akımı ve vazodilatasyon
  - Hücre hasarı minimum

Yanık - Fizyopatoloji

- İrreversbl protein denaturasyonu ve koagülasyon nekrozu
- Trombosit agregasyonu
- Vazokonstriksyon ve sonucunda doku perfüzyonunda bozulma
- Epidermal sıvı kaybı
- Ödem
- Termoregülasyonda bozulma
- Humoral ve hücresel bağışıklığa ciddi bir darbe
- Derinin doğal koruyucu özelliğinde bozulma

Eskar dokusu

- Derin parsiyel ve tam kat yanıklarda ortaya çıkan proteinden zengin avasküler sert nekrotik doku
  - Dairesel olduğu zaman
    - Doku ekspansiyonunu engelleyerek lokal iskemi
  - Mikrobiyal kolonizasyon
  - Mikrobiyal proliferasyon
  - Avasküler
    - Bağışık hücreler bölgeye göç edemez
    - Sistemik antibiyotikler ulaşamaz
    - Toksik maddeler lokal bağışık cevabı baskılar



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A NEW CONCEPT IN THE EARLY EXCISION AND IMMEDIATE GRAFTING OF BURNS

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Maribor, Yugoslavia

Aggressive excision of the slough in extensive deep burns has not improved upon the survival rate associated with conservative management (1, 4). Our experience was similar until 1961, when we began to include in the excision areas of only partial skin injury. Our reduction in mortality has led us to believe that the dermal burns, which are supposed to heal spontaneously, have been the important influence in the disappointing results of extensive primary excisions. Injured dermis defends itself poorly against infection, so that a program of slough excision with immediate grafting seems better than focusing upon antibacterial measures.

The importance of preserving the dermis has been stressed by many authors (6–8). Although Lorthioir (3) removed the nonviable dermal layer by abrasion, he did not provide the wound with the biological conditions needed for quick healing. The partial-thickness burn has not generally been excised because of overestimation of spontaneous healing, and because of the difficulties in assessing burn depth and the interface between dead and viable dermis.

METHOD

Burns are immediately covered with tulle gras and an absorptive dressing. On the third to the fifth day the Blair knife, which permits appropriate adjustments in the depth of cutting, is used to excise the burn down to a level of profuse bleeding (Figs. 1–3). Nonbleeding areas of the cut surface are excised again (Figs. 4, 5), as are areas of thrombosed vessels. When the operation can be performed under tourniquet, the excision is carried to a white moist surface in the dermis and a bright yellow surface in the fat. Any hemoglobin-stained layers of the dermis, and grey or brown areas of the subcutaneous tissue, are removed. We endeavor to preserve at least the deepest dermis of the scalp, ears, face, hands, and joints so as to obviate graft and scar contractions.

When bleeding stops, or while the tourniquet is still in place, the wounds are covered with split-thickness grafts spread on tulle gras. When insufficient autografts are available in extensive burns, autografts and homografts are used in combination, the former being reserved for important regions, for the deepest dermal wounds, and for islands of exposed fat. The grafted areas are dressed with Chloromycetin® compresses, followed by layers of gauze, cotton, and metallic wool pads (for immobilization), and finally elastic bandages. When the dressing is changed the next day, any collections of air, serum, blood, or pus are evacuated. Any raw spots due to graft displacement are covered with stored grafts. Subsequently the dressings are changed every second day.

Physiotherapy is begun 8 to 10 days after grafting. The grafted hypertrophic areas are treated with greasy creams, careful massage, and elastic compression. The larger subepidermal keratin collections and pustules that commonly appear after a fortnight are opened, while the smaller ones disappear spontaneously after 4 to 6 weeks. All patients are followed at monthly intervals for 1 to 2 years.

The following aspects of the program deserve special emphasis.

TIMING OF THE EXCISION

There may be progressive vascular changes in the first days after the burn, so that the

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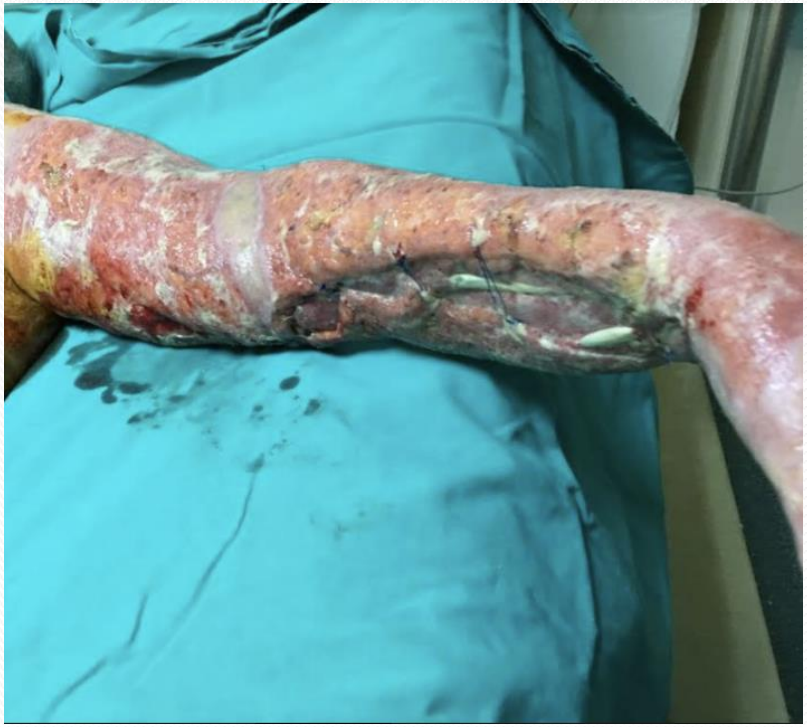
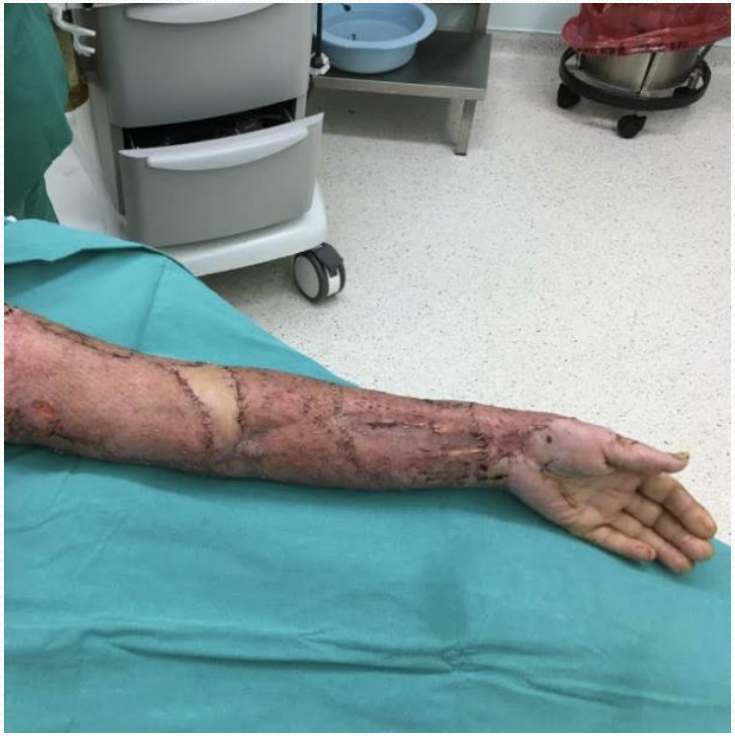
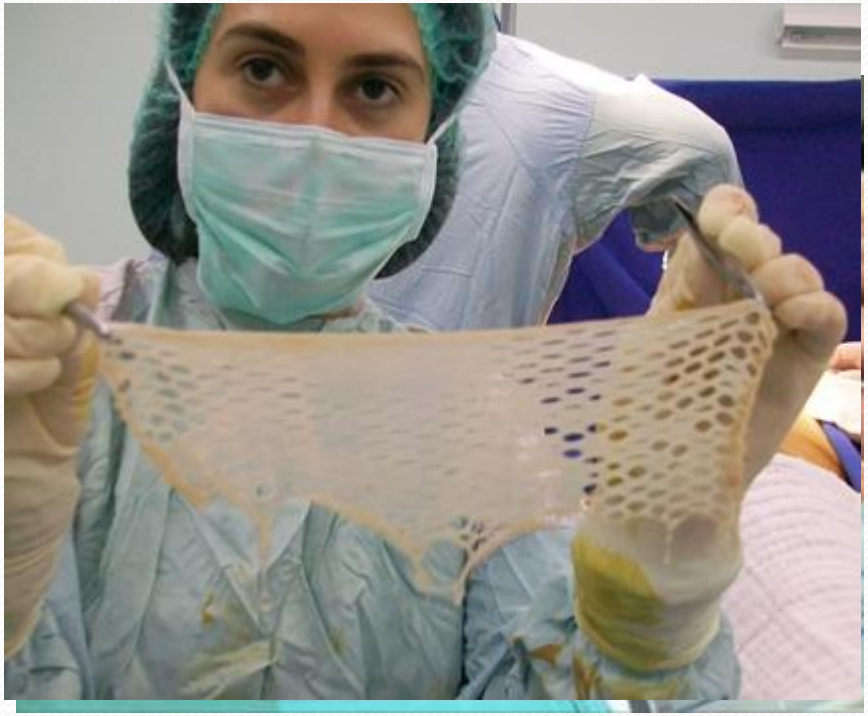
Erken eksizyon ve hızlı greftleme morbidite ve mortaliteyi azaltır

Cerrahi tedavi

- Derin parsiyel yanık ve tam kat yanıklarda
- Eskarektomi + Eksizyon
- Greftleme
  - Otogreft
  - Allogreft
- Fasiyotomi
  - Kompartman sendromunun önlenmesi
- Amputasyon





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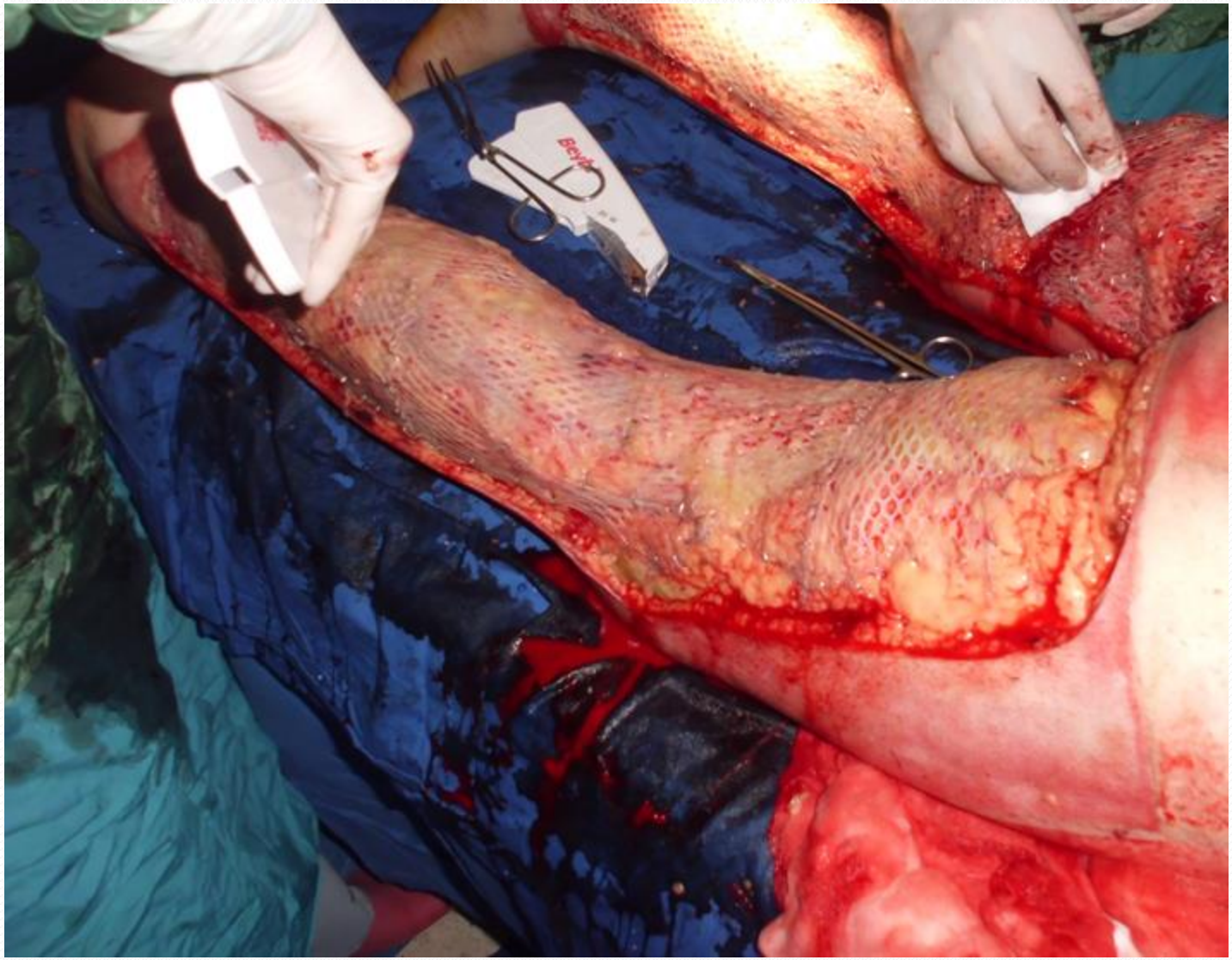


Topikal ajanlar

- Mafenid asetat
- Gümüş sülfadiazin
- Gümüş nitrat
- Gümüşlü pansuman

ABA 2014 Mortalite Oranları

Table 4 LIVED/DIED BY BURN GROUP SIZE (%TBSA)

	Lived	Died	
%TBSA	Cases	Cases	Mortality Rate
0.1 - 9.9	123,097	787	0.6
10 - 19.9	24,940	703	2.7
20 - 29.9	7,116	651	8.4
30 - 39.9	3,059	608	16.6
40 - 49.9	1,501	553	26.9
50 - 59.9	782	461	37.1
60 - 69.9	527	411	43.8
70 - 79.9	273	333	55.0
80 - 89.9	197	425	68.3
> 90	105	548	83.9
Subtotal	**161,597**	**5,480**	**3.3**
Missing or 0%	23,877	894	3.6
TOTAL	**185,474**	**6,374**	**3.3**

Total N=191,848

Morbidite ve Mortalite

- Erken dönem resüsitasyon
- Hava yolu yönetimi ve ventilasyon stratejileri
- Nutrisyonel destek
- Yara bakımı
- İnfeksiyon yönetimi ve kontrolü

- TVYA %40'tan fazla olduğu ciddi yanıklarda ölümlerin %75inin nedeni sepsis

Murray CK. Infection in burns. J trauma 2007;62:73

Table 1. Tobiasen's Abbreviated Burn Severity Index (ABSI) score and prediction.

Parameter	Finding	Points
Sex	Female	1
	Male	0
Age (years)	0–20	1
	21–40	2
	41–60	3
	61–80	4
	81–100	5
Inhalation injury	Yes	1
	No	0
Presence of full-thickness burn	Yes	1
	No	0
BSA burn (%)	1–10	1
	11–20	2
	21–30	3
	31–40	4
	41–50	5
	51–60	6
	61–70	7
	71–80	8
	81–90	9
	91–100	10

ABSI score and prediction.

ABSI	Treat to Life	Probability of survival (%)
2–3	Very low	≥ 99
4–5	Moderate	98
6–7	Moderately severe	80–90
8–9	Serious	50–70
10–11	Severe	20–40
≥ 12	Maximum	≤ 10

Yanık, Genel ve Travma Yoğun Bakım Sepsis ve Mortalite

Sepsis Oranları	%
Yanık Yoğun Bakım	8 - 42.5
Genel Yoğun Bakım	19 - 38
Travma Yoğun Bakım	2.4 - 16.9

Sepsis Nedeniyle Mortalite Oranları	%
Yanık Yoğun Bakım	28 - 65
Genel Yoğun Bakım	21 - 53
Travma Yoğun Bakım	7 - 36.9

Mann EA, Baun MM, Meininger JC, Wade CE. Comparison of mortality associated with sepsis in the burn, trauma and general intensive care unit patient: A systematic review of the literature. Shock. 2012;37(1):4-16

İnfeksiyona yatkınlık

- TVYA %30 dan fazla olması
- Tam kat yanıklar
- Bağışıklık sisteminde baskılanma
- Kolonize eden mikroorganizma
  - Virulans
  - Direnç paterni
- Greftin tutmaması
- Uzun süre açık kalmış yanık yarası
- Yetersiz yara bakımı
- Hospitalizasyonun uzaması
- İnvazif tanısal ve terapötik işlemler ve alet kullanımı

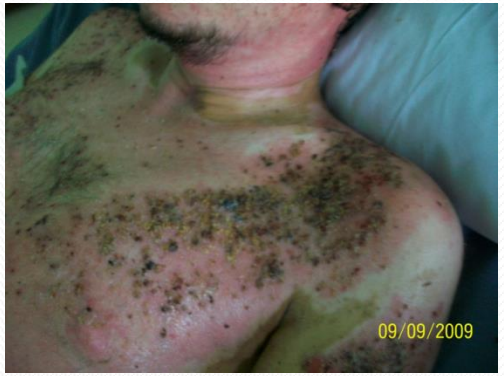
Yanıklı Hastalarda Görülen İnfeksiyonlar

- Yara infeksiyonları
- Kan dolaşımı infeksiyonları
- Pnömoni
- Üriner sistem infeksiyonları
- Süpüratif kondrit
- Subakut bakteriyel endokardit
- Süpüratif tromboflebit
- Süpüratif sinüzit
- İntraabdominal infeksiyon

Yanık – Mikrobiyal kolonizasyon

- Yanık yarası steril
- 5 – 7 gün
  - Ter bezleri ve kıl foliküllerindeki organizmalar
  - KNS, enterokoklar, *S. aureus*, A grubu β hemolitik streptokoklar,
- 7 günden sonra
  - Endojen
    - Gastrointestinal sistem
    - Solunum sistemi
  - Eksojen
    - Hastane ortamı
    - Personelin elleri

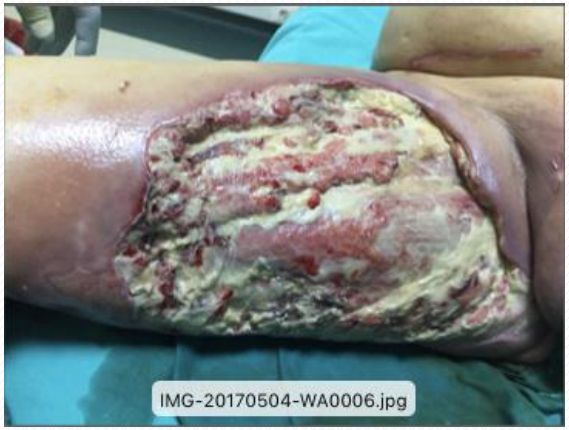
Yanık yara infeksiyonu



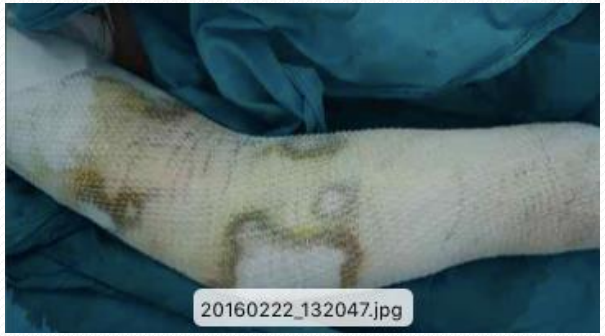
- İmpetigo
- Yanık yara selüliti
- Yanık ilişkili cerrahi yara infeksiyonları
  - Eksize edilmiş yanık alanları
  - Donör alanları
- İnvazif yanık yara infeksiyonları
  - Eksize edilmemiş derin parsiyel veya tam kat yanıklar
  - İnflamasyon bulguları
  - Patolojide canlı dokuda mikrobiyal invazyon
  - Kan kültüründe üreme
  - Sepsis

İnvazif yanık yara infeksiyonu?

- Parsiyel yanığın tam kat yanığa ilerlemesi
- Yaranın renginde değişiklik
- Sağlıklı dokuya hızla yayılan selülit
- Cilt altı yağ dokusunun yeşermesi
- Yara sınırlarında morarma ve ödem
- Greftin tutmaması



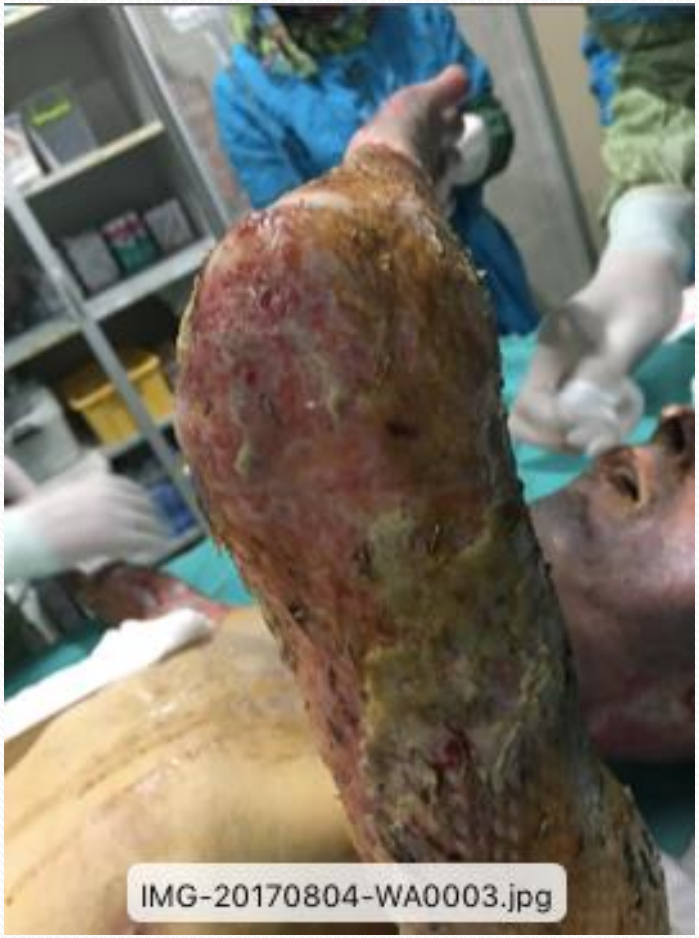
İnvazif yanık yara infeksiyonu?



- Eskar altında kanama
- Eskarın kolay ayrılması
- Yanık alanlarında aşırı sekresyon
- Yanık alanlarından kötü koku gelmesi
- Yanık alanlarında sabunlaşma görülmesi
- Pansumanların sık değiştirilme gereksinimi

Neden önemli?

- İyileşmede gecikme
- Skar oluşumu
- Bakteriyemi
- Sepsis
- Çoklu organ yetmezliği



Düzenli yara sürveyans kültürleri

- Klinik belirti ve bulgular tanı için yeterli değil
- Kolonizan mikroorganizmaların erken tanınması
- Tedavi etkinliğinin izlenmesi
- Empirik antibiyotik tedavisinin yönlendirilmesi
- Çapraz kolonizasyonların takibi

Yara kültürleri

- Altın standart
  - Doku biyopsi kültürleri
    - Eksize edilmemiş veya edilemeyen bölgelerden
    - >10^5cfu/g dan fazla bakteri hematojen yayılım riski
    - Emek yoğun
  - Histolojik tanı
    - Vaskülerizasyonu olmayan alanlarda bakteri kolonizasyon
    - Canlı dokuda bakteri varlığı infeksiyon
- Yanık yüzeyinin kalitatif ve semikantitatif sürüntü kültürleri
  - Eksize edilmiş alanlar
  - Derinin ince olduğu alanlar
    - Kulak, göz, parmak

Yanık yarası - İnfeksiyon

- Yara kolonizasyonu
  - Bakteri yoğunluğu düşük - $< 10^5$ cfu/g doku
  - İnvazif infeksiyon yok
- Selülit
  - Yara ve/veya eskar dokusunda bakteri yoğunluğu yüksek $> 10^5$ cfu/g doku
  - Çevre dokuda
    - Eritem
    - Endurasyon
    - Isı artışı ve/veya hassasiyet

Yanık yarası - İnfeksiyon

- Yara infeksiyonu
  - Yara ve/veya eskar dokusunda bakteri yoğunluğu yüksek > 10^5 cfu/g doku
  - İnvazif infeksiyon bulgusu yok
- İnvazif infeksiyon
  - Yara ve/veya eskar dokusunda bakteri yoğunluğu yüksek > 10^5 cfu/g doku
  - Derin
  - Eskarın süpüratif bir şekilde ayrılması
  - Greft kaybı
  - Yanıktan etkilenmemiş komşu dokuların invazyonu
  - Sepsis

Yanık yarası - İnfeksiyon

- Nekrotizan İnfeksiyon
  - Agresif
  - Doku nekrozu

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BURNS

A systematic review of quantitative burn wound microbiology in the management of burns patients

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ABSTRACT

Background: The early diagnosis of infection or sepsis in burns are important for patient care. Globally, a large number of burn centres advocate quantitative cultures of wound biopsies for patient management, since there is assumed to be a direct link between the bioburden of a burn wound and the risk of microbial invasion. Given the conflicting study findings in this area, a systematic review was warranted.

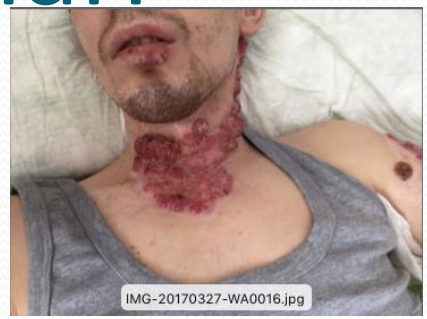
Methods: Bibliographic databases were searched with no language restrictions to August 2015. Study selection, data extraction and risk of bias assessment were performed in duplicate using pre-defined criteria. Substantial heterogeneity precluded quantitative synthesis, and findings were described narratively, sub-grouped by clinical question.

Results: Twenty six laboratory and/or clinical studies were included. Substantial heterogeneity hampered comparisons across studies and interpretation of findings. Limited evidence suggests that (i) more than one quantitative microbiology sample is required to obtain reliable estimates of bacterial load; (ii) biopsies are more sensitive than swabs in diagnosing or predicting sepsis; (iii) high bacterial loads may predict worse clinical outcomes, and (iv) both quantitative and semi-quantitative culture reports need to be interpreted with caution and in the context of other clinical risk factors.

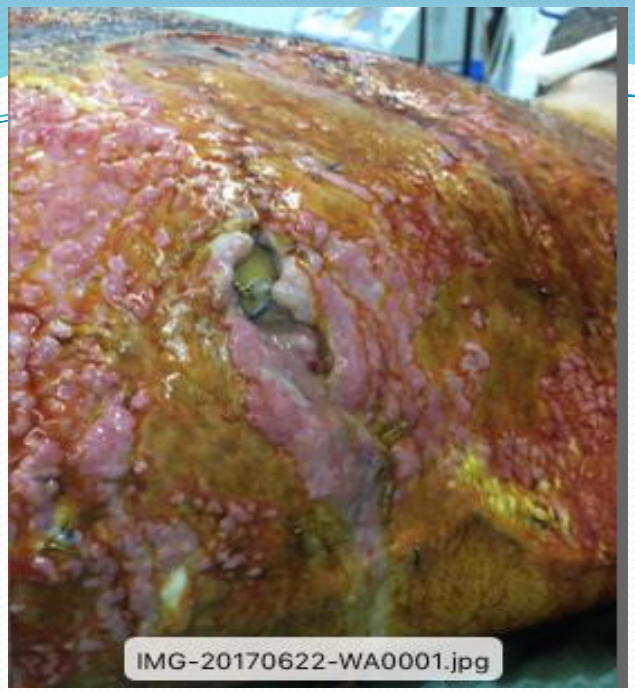
Conclusion: The evidence base for the utility and reliability of quantitative microbiology for diagnosing or predicting clinical outcomes in burns patients is limited and often poorly reported. Consequently future research is warranted.

- Bakteriyel yükü tahmin etmek için 1 taneden fazla biyopsi kültürü almak gerekebilir
- Sepsis tanısında veya olasılığına işaret etmesi açısından biyopsi kültürleri sürüntü kültürlerine göre daha duyarlı
- Bakteriyel yükün fazla olması kötü prognoz belirtisi olabilir
- Hem kantitatif hem semi-kantitatif kültürlerin diğer klinik risk faktörleriyle birlikte değerlendirimesi gerekir

İnvazif yanık yara infeksiyonları - etkenler



- Gram (+) bakteriler
  - KNS
  - *S. aureus*
  - *Enterococcus* spp.
- Gram(-) bakteriler
  - *Acinetobacter* spp.
  - *Pseudomonas* spp.
  - *Serratia marcescens*
  - *K. pneumoniae*
  - *E. coli*
  - *Proteus* spp.
- Mantarlar
  - *Candida* spp.
  - *Aspergillus* spp.
  - *Fusarium* spp.
  - *Alternaria* spp.
  - *Rhizopus* spp.
  - *Mucor* spp.
- Viruslar
  - Orf virus
  - Herpes simplex virus
  - Cytomegalovirus
  - Varicella-zoster virus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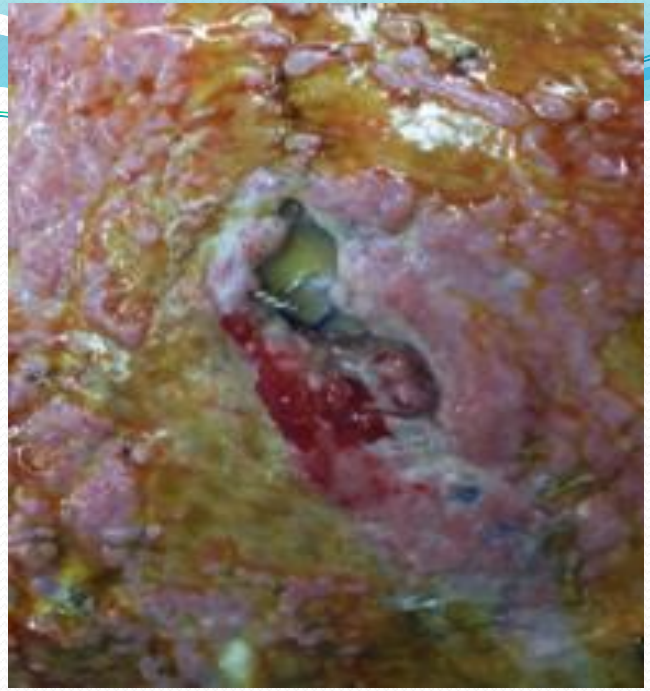

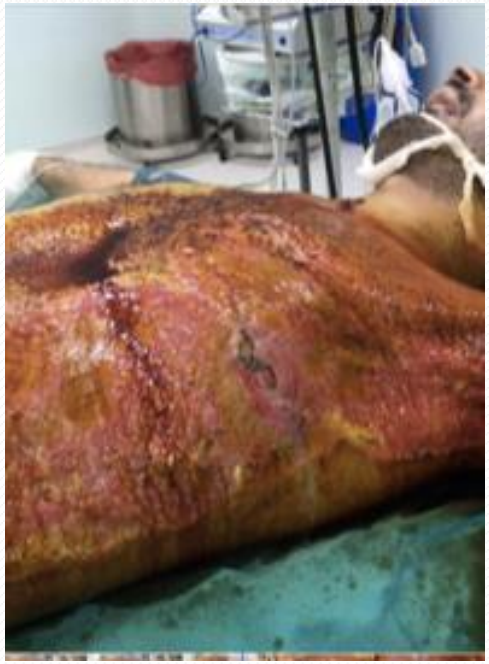


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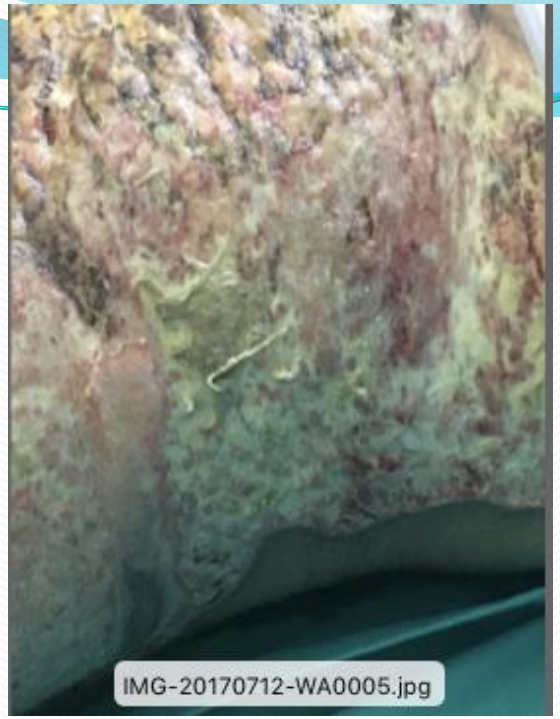
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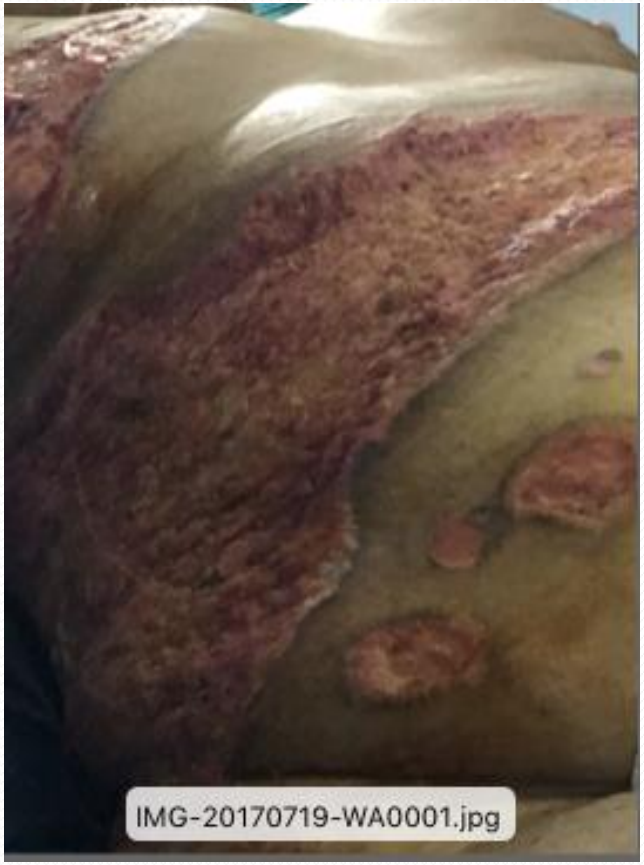
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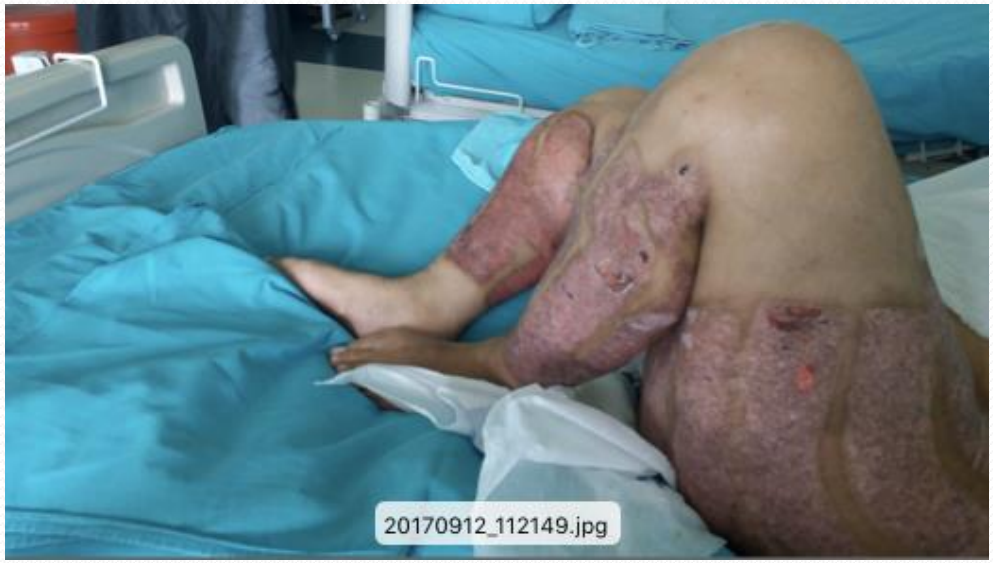
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26/8/2017
28/8/2017
1/9/2017
3/9/2017

Yanık Yara İnfeksiyonu Etkenleri - Kartal

Gram Negatif

- ***A. baumanii***
- ***P. aeruginosa***
- ***K. pneumoniae***
- ***Enterobacter spp.***
- ***E. coli***
- ***P. mirabilis***

Gram Pozitif

- ***Enterococcus spp.***
- **MRSA**
- ***MSSA***
- ***S. pyogenes***

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journal homepage: www.elsevier.com/locate/burns

Nosocomial infection characteristics in a burn intensive care unit: Analysis of an eleven-year active surveillance

Oral Öncül [a], Sinan Öksüz [b,*], Ali Acar [a], Ersin Ülkür [b], Vedat Turhan [a], Fatih Uygur [b], Asım Ulçay [a], Hakan Erdem [a], Mustafa Özyurt [c], Levent Görenek [a]

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ARTICLE INFO

Article history:
Accepted 6 November 2013

Keywords:
Burn intensive care unit
Nosocomial infection
Surveillance
Invasive device associated infection

ABSTRACT

Aims: The objective of this study was to describe nosocomial infection (NI) rates, risk factors, etiologic agents, antibiotic susceptibility, invasive device utilization and invasive device associated infection rates in a burn intensive care unit (ICU) in Turkey.

Methods: Prospective surveillance of nosocomial infections was performed according to Centers for Disease Control and Prevention (CDC) and National Healthcare Safety Network (NHSN) criteria between 2001 and 2012. The data was analyzed retrospectively.

Results: During the study period 658 burn patients were admitted to our burn ICU. 469 cases acquired 602 NI for an overall NI rate of 23.1 per 1000 patient days. 109 of all the cases (16.5%) died. Pseudomonas aeruginosa (241), Acinetobacter baumannii (186) and Staphylococcus aureus (69) were the most common identified bacteria in 547 strains.

Conclusion: Total burn surface area, full thickness burn, older age, presence of inhalation injury were determined to be the significant risk factors for acquisition of NI. Determining the NI profile at a certain burn ICU can lead the medical staff apply the appropriate treatment regimen and limit the drug resistance. Eleven years surveillance report presented here provides a recent data about the risk factors of NI in a Turkish burn ICU.

Table 2 – Infection agent distribution among infections.

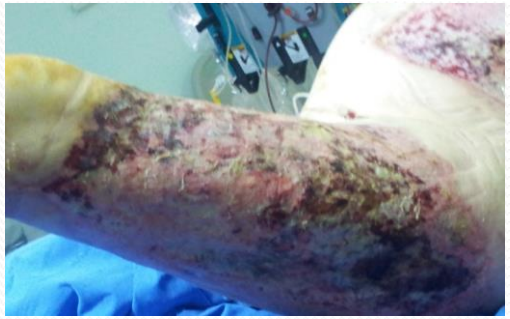
	BWI[a] (n = 223)	BSI[a] (n = 122)	Pneumonia (n = 69)	UTI[a] (n = 33)	Mixed (n = 155)
P. aeruginosa (n = 241)	97	73	12	17	42
A. baumannii (n = 186)	47	36	41	7	55
S. aureus (n = 69)	51	6	2	2	8
E. coli (n = 12)	5	3	–	2	2
Proteus spp. (n = 8)	5	–	–	1	2
Enterococcus spp. (n = 4)	2	–	–	2	–
Coagulase-negative staphylococci (n = 11)	7	2	–	–	2
Candida spp. (n = 13)	7	2	1	2	1
Klebsiella pneumoniae (n = 1)	–	–	1	–	–
Stenotrophomonas maltophilia (n = 1)	1	–	–	–	–
S. pyogenes (n = 1)	1	–	–	–	–
Total isolates (n = 547)	223	122	57	33	112

[a] BWI, burn wound infection; BSI, blood stream infection; UTI, urinary tract infection.

Öncül O, Öksüz S, Acar A, et al. Nosocomial infection characteristics in a burn intensive care unit: Analysis of an eleven-year active surveillance. Burns 2014;40:835-841

Yanık yara infeksiyonları önlem

- Her pansumanda gözlem
  - Görüntü
  - Koku
  - Pürülan akıntı



- Kesinlikle aseptik teknik
- Yaranın durumuna göre pansuman sıklığının ayarlanması

Kan dolaşımı infeksiyonları

- En sık infeksiyöz komplikasyon
  - 7 kat fazla
- Anlamlı mortalite artışı
- Kateterler
  - Hematojen
  - Yanık yüzdesi yüksek hastalarda kateterlerin yaraların üzerinden veya yanından takılma zorunluğu

Kan dolaşımı infeksiyonları - önlem

- Uygun yara bakımı
- Damar içi kateterlerin uygun kullanımı
  - Yanık yarasından olabildiğince uzakta
  - Kateter giriş yeri ıslatılmamalı
  - Gerekirse daha sık değişim

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journal homepage: www.elsevier.com/locate/burns

Review

Site of catheter insertion in burn patients and infection: A systematic review

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University of São Paulo at Ribeirão Preto College of Nursing, Ribeirão Preto, Brazil

- Yanık yarası üzerinde veya çevresinde takılan kateterlerin neden olduğu infeksiyon oranları daha fazla
- Femoral vene takılan kateterlerde infeksiyon riski daha fazla

ARTICLE INFO

Article history:
Accepted 25 October 2013

Keywords:
Burns
Catheters
Catheter-related infections

ABSTRACT

The aim of the study was to conduct a systematic review to identify and appraise the evidence on possible association of the site of venous catheter insertion in burn patients and an increased occurrence of catheter-related infection. Searches were performed in MEDLINE, LILACS, CINAHL, EMBASE, Web of Science and The Cochrane Library. Nine studies were selected for the review; four of them mentioned, directly or indirectly, an association between catheter-related infection and the insertion of the catheter either in the burn wound or in surrounding area, and five studies investigated the occurrence of infection related to both the catheter and the anatomical sites of catheter insertion. Higher infection rates occurred when the catheters were inserted directly in the burn wound or near the wound (level of evidence IV) or in the femoral vein (level of evidence IV). No significant differences in infection occurrence rates were observed between central catheters and peripherally inserted central catheter (level of evidence IV). Further investigations for techniques and types of coverage of venous catheter insertion dressings are important for preventing infection in burn patients. Also, new technologies for venous access must be evaluated.

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Prevalence of multidrug-resistant organisms recovered at a military burn center☆

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Keywords:
Burn
Infection
Antibiotic resistance
Acinetobacter
Klebsiella
Pseudomonas
Staphylococcus

ABSTRACT

Infections caused by multidrug-resistant (MDR) pathogens are associated with significant morbidity and mortality in patients with burn injuries. We performed a 6-year antibiotic susceptibility records review from January 2003 to December 2008 to assess the prevalence of MDR isolates by pathogen at the US Army Institute of Surgical Research Burn Center. During the study period *Acinetobacter baumannii* (780 isolates [22%]) was the most prevalent organism recovered, followed by *Pseudomonas aeruginosa* (703 isolates [20%]), *Klebsiella pneumoniae* (695 isolates [20%]), and *Staphylococcus aureus* (469 isolates [13%]). MDR prevalence rates among these isolates were *A. baumannii* 53%, methicillin-resistant *S. aureus* (MRSA) 34%, *K. pneumoniae* 17% and *P. aeruginosa* 15%. Two isolates, 1 *A. baumannii* and 1 *P. aeruginosa*, were identified as resistant to all 4 classes of antibiotics tested plus carbapenems. *A. baumannii* isolates recovered from patients with burns greater than 30% of total body surface area (TBSA) were more likely to be MDR (61%) with no significant difference for *P. aeruginosa* and *K. pneumoniae*. A higher proportion of MDR *P. aeruginosa* isolates were recovered from respiratory specimens compared to blood specimens (24% vs. 9%) while the opposite was true for MRSA (35% vs. 54%). A comparison of *A. baumannii* recovered during hospitalization days 1–5 and 15–30 revealed higher MDR levels as length of stay increased (48% vs. 75%) while no significant trends were observed for *P. aeruginosa* and *K. pneumoniae*. A similar pattern was observed for MDR *A. baumannii* levels for the facility between 2003 and 2005 and 2006–2008 (39% vs. 70%), with no significant increase in MDR *P. aeruginosa* and MDR *K.*

SPECIAL REPORT

American Burn Association Consensus Conference to Define Sepsis and Infection in Burns

The American Burn Association Consensus Conference on Burn Sepsis and Infection Group: David G. Greenhalgh, MD,* Jeffrey R. Saffle, MD,† James H. Holmes, IV, MD,‡ Richard L. Gamelli, MD,§ Tina L. Palmieri, MD,* Jureta W. Horton, PhD,¶ Ronald G. Tompkins, MD,‖ Daniel L. Traber, PhD,** David W. Mozingo, MD,†† Edwin A. Deitch, MD,‡‡ Cleon W. Goodwin, MD,§§ David N. Herndon, MD,** James J. Gallagher, MD,** Art P. Sanford, MD,** James C. Jeng, MD,¶¶ David H. Ahrenholz, MD,‖‖ Alice N. Neely, PhD,*** Michael S. O'Mara, MD,* Steven E. Wolf, MD,††† Gary F. Purdue, MD,¶ Warren L. Garner, MD,‡‡‡ Charles J. Yowler, MD,§§§ Barbara A. Latenser, MD¶¶¶

Because of their extensive wounds, burn patients are chronically exposed to inflammatory mediators. Thus, burn patients, by definition, already have "systemic inflammatory response syndrome." Current definitions for sepsis and infection have many criteria (fever, tachycardia, tachypnea, leukocytosis) that are routinely found in patients with extensive burns, making these current definitions less applicable to the burn population. Experts in burn care and research, all members of the American Burn Association, were asked to review the literature and prepare a potential definition on one topic related to sepsis or infection in burn patients. On January 20, 2007, the participants met in Tucson, Arizona to develop consensus for these definitions. After review of the definitions, a summary of the proceedings was prepared. The goal of the consensus conference was to develop and publish standardized definitions for sepsis and infection-related diagnoses in the burn population. Standardized definitions will improve the capability of performing more meaningful multicenter trials among burn centers. (J Burn Care Res 2007;28:776–790)

Large burns (>20% total body surface area) lead to the most profound response to injury. Hypermetabolism developing after burn injury leads to an increase in caloric needs that may double normal resting energy expenditure. No other injury or illness approaches this degree of perturbation. As in other critical illnesses, burn patients are at high risk for infection and sepsis. The major cause of death, if the burn patient survives the first 24 hours, is multiple

*From the *Department of Surgery, University of California, Davis and Shriners Hospitals for Children Northern California, Sacramento, California; †Department of Surgery, University of Utah, Salt Lake City, Utah; ‡Department of Surgery, Wake Forest University School of Medicine, Winston-Salem, North Carolina; §Department of Surgery, Loyola University, Maywood, Illinois; ¶Department of Surgery, University of Texas, Dallas, Texas; ‖Department of Surgery, Massachusetts General Hospital and Shriners Hospitals for Children Boston, Massachusetts; **Department of Surgery, University of Texas Medical Branch and Shriners Hospitals for Children Galveston, Texas; ††Department of Surgery, University of Florida, Gainesville, Florida; ‡‡Department of Surgery, University of Medicine and Dentistry, New Jersey Medical School, Newark, New Jersey; §§Department of Surgery, North Ohio; †††Department of Surgery, University of Texas Health Science Center—San Antonio, Texas; ‡‡‡Department of Plastic Surgery, University of Southern California Medical Center, Los Angeles, California; §§§Department of Surgery, Metro Health Medical Center/Case Western Reserve University, Cleveland, Ohio; and ¶¶¶Department of Surgery, University of Iowa, Iowa City, Iowa.*

This study was supported by the American Burn Association.

Proceedings of the Consensus Conference to Define Sepsis and Infection in Burns, Lane's Ventana Canyon Resort, Tucson, Arizona, January 20, 2007.

Address correspondence to David G. Greenhalgh, MD, Department of Surgery, University of California, Davis and Shriners Hospitals for Children Northern California, 2425 Stockton

Yanık hastasında sepsis (Erişkin) (En az 3'ü)

- Ateş
  - >39°C veya < 36.5°C
- Progresif taşikardi
  - >110/dak
- Progresif takipne
  - SS >25/dak
- Trombositopeni
  - <100 000/mm^3
- Hiperglisemi
  - Plasma glükozu >200mg/dl
  - İnsülin direnci
- 24 saatten uzun süre enteral beslenememe
  - Abdominal distansyon
  - Enteral beslenme intoleransı
  - Kontrol edilemeyen diyare

- Kültür pozitif infeksiyon veya
- Patolojik tanı veya
- Antimikrobiyallere cevap

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Review

Use of procalcitonin for the detection of sepsis in the critically ill burn patient: A systematic review of the literature☆

Elizabeth A. Mann[a,c,*], *Geri L. Wood*[a,b], *Charles E. Wade*[c]

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Keywords:
Procalcitonin
Sepsis
Intensive care
Burn
Diagnosis

ABSTRACT

The purpose of this systematic review was to assess the evidence for use of routine procalcitonin testing to diagnose the presence of sepsis in the burn patient. The electronic databases MEDLINE, Cochrane, CINAHL, ProQuest, and SCOPUS were searched for relevant studies using the MeSH terms burn, infection, procalcitonin, and meta-analysis. The focus of the review was the adult burn population, but other relevant studies of critically ill patients were included as data specific to the patient with burns are limited. Studies were compiled in tabular form and critically appraised for quality and level of evidence. Four meta-analyses, one review of the literature, one randomized controlled trial, nine prospective observational, and three retrospective studies were retrieved. Six of these studies were specific to the burn population, with one specific to burned children. Only one meta-analysis, one adult burn and one pediatric burn study reported no benefit of procalcitonin testing to improve diagnosis of sepsis or differentiate sepsis from non-infectious systemic inflammatory response. The collective findings of the included studies demonstrated benefit of incorporating procalcitonin assay into clinical sepsis determination. Evaluation of the burn specific studies is limited by the use of guidelines to define sepsis and inconsistent results from the burn studies. Utility of the procalcitonin assay is limited due to the lack of availability of rapid, inexpensive tests. However, it appears procalcitonin assay is a safe and beneficial addition to the clinical diagnosis of sepsis in the burn intensive care unit.

Burns. 2014 Jun;40(4):664-9. doi: 10.1016/j.burns.2013.08.024. Epub 2013 Sep 26.

Evaluation of soluble CD14 subtype (presepsin) in burn sepsis.

Cakır Madenci Ö[1], Yakupoğlu S[2], Benzonana N[3], Yücel N[4], Akbaba D[4], Orçun Kaptanağası A[4].

Author information

Abstract

BACKGROUND: Diagnosing sepsis is difficult in burn patients because of the inflammatory mediators that alter postburn metabolic profile. Here, we compare a new marker presepsin with procalcitonin (PCT), c-reactive protein (CRP) and white blood cell (WBC) in diagnosis and follow up of sepsis in burn patients.

METHODS: Patients admitted to burn center of our institute were prospectively investigated. Presepsin, PCT, CRP and WBC levels were measured at admission and every 6h for first day and daily thereafter. At all timing samples, patients were classified as sepsis or non-sepsis according to the current American Burn Association Consensus Criteria (ABA) 2007.

RESULT: 37 adult patients were evaluated. A total data of 611 time points were supplied. Sepsis time points differ significantly from non-sepsis in presepsin ($p < 0.0001$), PCT ($p = 0.0012$) and CRP ($p < 0.0001$) levels. Non-surviving patient results differ significantly from survivors in presepsin ($p < 0.0001$), PCT ($p = 0.0210$) and CRP ($p = 0.0008$). AUC-ROC % values for diagnosing sepsis were 83.4% for presepsin, 84.7% for PCT, 81.9% for CRP and 50.8% for WBC. Sepsis patients had significantly different presepsin, CRP and WBC but not PCT levels on their first day of sepsis compared to previous days.

CONCLUSION: Plasma presepsin levels have comparable performance in burn sepsis.

Antibiyotik kullanımı

- Kolonizasyon tedavi edilmeye kalkılmamalı
- Empirik antibiyotik kullanımı hedefe yönelik olmalı
  - Hasta ve hastane florası
  - Hastanın önceden kullandığı antibiyotikler
  - Hastanın hastanede kalma süresi
  - Hastaya ait faktörler
- Ciddi infeksiyonda antibiyotik hemen başlanmalı
- Bakterisidal antibiyotikler seçilmeli
- Farmakokinetik ve farmakodinamik parametrelere dikkat

Antibiyotik dozları

- Hastaya
- İlaca bağlı faktörlere
- Renal replasman tedavisine göre bireyselleştirilmeli

- Hastanın böbrek fonksyonları dinamik
- İlaç dozları sıklıkla gözden geçirilmeli

Clinical Therapeutics/Volume 38, Number 9, 2016

Review Article

Intravenous Antibiotic and Antifungal Agent Pharmacokinetic-Pharmacodynamic Dosing in Adults with Severe Burn Injury

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ABSTRACT

Purpose: Despite advances in the care of patients with severe burn injury, infection-related morbidity and mortality remain high and can potentially be reduced with antimicrobial dosing optimized for the infecting pathogen. However, anti-infective dose selection is difficult because of the highly abnormal physiologic features of burn patients, which can greatly affect the pharmacokinetic (PK) disposition of these agents. We review published PK data from burn patients and offer evidence-based dosing recommendations for antimicrobial agents in burn-injured patients.

Methods: Because most infections occur at least 48 hours after initial burn injury and anti-infective therapy often lasts ≥10 days, we reviewed published data informing PK-pharmacodynamic (PD) dosing of anti-infectives administered during the second, hypermetabolic stage of burn injury, in those with >20% total body surface area burns, and in those with normal or augmented renal clearance (estimated creatinine clearance ≥130 mL/min). Analyses were performed using 10,000-patient Monte Carlo simulations, which uses PK variability observed in burn patients and MIC data to determine the probability of reaching predefined PK-PD targets. The probability of target attainment, defined as the likelihood that an anti-infective dosing regimen would achieve a specific PK-PD target at the single highest susceptible MIC, and the cumulative fraction of response, defined as the population probability of target attainment given a specific dose and a distribution of MICs, were calculated for each recommended anti-infective dosing regimen.

Findings: Evidence-based doses were derived for burn-injured patients for 15 antibiotics and 2 antifungal agents. Published data were unavailable or insufficient for several agents important to the care of burn patients, including newer antifungal and antipseudomonal agents. Furthermore, available data suggest that antimicrobial PK properties in burned patients is highly variable. We recommend that, where possible, therapeutic drug monitoring be performed to optimize PK-PD parameter achievement in individual patients.

Implications: Given the high variability in PK disposition observed in burn patients, doses recommended in the package insert may not achieve PK-PD parameters associated with optimal infectious outcomes. Our study is limited by the necessity for fixed assumptions in depicting this highly variable patient population. New rapid-turnaround analytical technology is needed to expand the menu of antimicrobial agents for which therapeutic drug

- Yanık hastasında antimikrobiyallerin farmakokinetik özellikleri son derece değişken
- Bu nedenle standart dozlarla optimal tedavi sonuçlarını elde etmek için yeterli farmakokinetik ve farmakodinamik parametrelere ulaşılamıyabilir

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Review

Colistin in burn intensive care: Back to the future?

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Accepted 12 July 2012

Keywords:
Colistin
Literature trends
Redevelopment

ABSTRACT

Colistin is a venerable antibiotic whose fortunes have been revived by its excellent activity, the diminishing output of novel clinically effective antibiotics and the increasing importance of MDR infection in burn surgery, both in the civilian and military arenas. This review synthesizes current evidence on the usage of colistin in burn surgery including the structure-activity relationship; dosing, pharmacokinetics/pharmacodynamic (PK/PD), analytic methods, resistance and current research efforts into the redevelopment of this antibiotic, to distil recommendations for future research and clinical efficacy.

probability of achieving daptomycin trough concentrations in excess of 24.3 mg/L (a level associated with skeletal muscle toxicity) using this 750-mg fixed-dosing schedule was approximately 1.3%.[77] No patients in our model achieved a trough >24.3 mg/L (data not shown); therefore, daptomycin-induced skeletal muscle toxic effects would be unlikely to occur with these recommendations. Alternative agents would be recommended in those patients infected with *S aureus* isolates having MICs of 1 mg/L given the low daptomycin PTA.

Linezolid should be dosed to achieve an AUC_{0-24}:MIC >80 to 100:1 for improved clinical outcomes.[78] Alternatively, this PD index was also correlated with achieving 80% *f*T>MIC using the only recommended linezolid dosing regimen of 600 mg IV every 12 hours.

dosing results in an AUC_{0-24}:MIC ratio >30:1 or 60:1. Using information from a population PK study of colistin in patients with thermal burn injury, it is unlikely that current maximum recommended colistin doses of 150 mg of colistin base activity given every 12 hours would achieve therapeutic concentrations, assuming these PK PD targets are accurate (Table 1). Higher doses may predispose patients to an excessive nephrotoxicity risk. As such, colistin monotherapy is not recommended for patients with burn injury and normal or augmented renal clearance and may only be of use in the unlikely situation in which pathogen MICs are ≤0.5 mg/L. Furthermore, colistin is administered as the inactive prodrug colistin methanesulfonate (also known as colistimethate), which is converted to active colistin in vivo. The

- Yanık hastasında 2x150mg dozuyla yeterli farmakokinetik ve farmakodinamik hedeflere ulaşılamıyabilir

Table 1 RIFLE classification system for acute kidney injury

RIFLE category	Criteria: Glomerular filtration rate	Criteria: Urine output
Grades of severity		
Risk	Serum creatinine level increased 1.5 times or glomerular filtration rate decreased >25%	<0.5 mL/kg for 6 hours
Injury	Serum creatinine level increased 2 times or glomerular filtration rate decreased >50%	<0.5 mL/kg for 12 hours
Failure	Serum creatinine level increased 3 times or glomerular filtration rate decreased >75% or serum creatinine level >4 mg/dL	<0.5 mL/kg for 12 hours or anuria for 12 hours
Outcomes		
Loss	Complete loss of renal function for >4 weeks	
End-stage kidney disease	Need for renal replacement therapy for >3 months	

- Spektrum daha geniş
- Minör böbrek fonksyon değişiklikleri olan hastalar da kapsama alanında

Kolistin

- 143 hasta
  - 31 Akut böbrek yetmezliği %21
  - 14 Hasar %9

Table 3. Equations for Predicting Creatinine Clearance or GFR in Adults with Kidney Disease

Equation	*Variables*	*Sources*
Cockcroft-Gault	Age, weight, sex, serum creatinine	Nephron Information Center Web site: http://www.nephron.com/cgi-bin/CGSI.cgi
Modification of Diet in Renal Disease	Age, sex, race, serum urea nitrogen, serum albumin, serum creatinine	National Kidney Disease Education Program Web site: http://www.nkdep.nih.gov/professionals/gfr_calculators/index.htm Nephron Information Center Web site: http://www.nephron.com/cgi-bin/MDRDSI.cgi

GFR = glomerular filtration rate; PDA = personal digital assistant.

Please fill in the following data

MDRD GFR Calculator (Extended Version)

Plasma creatinine (PCR) (•) mg/dL ( ) umol/L	
Serum Urea Nitrogen (SUN) (•) mg/dL ( ) mmol/L	
Serum Albumin (ALB) (•) g/dL ( ) g/L	
Age	
Race	( ) African-American ( ) All other races
Gender	( ) Male ( ) Female
( ) **GFR value (Age, Race, Gender SUN, PCR, ALB):**	
( ) **GFR value (Age, Race, Gender SUN, PCR):**	
(•) **GFR value (Age, Race, Gender PCR):**	
Submit Reset	

- Böbrek yetmezliği üremi ve oligüri noktasına ilerlediği zaman renal replasman tedavisi endikasyonu
  - Diyabetli hastalarda GFR 15ml/dak
  - Diğer hastalarda GFR 10ml/dak

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JAC

A systematic review of antibiotic dosing regimens for septic patients receiving continuous renal replacement therapy: do current studies supply sufficient data?

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Background: **Drug dosing for septic patients with acute renal failure receiving continuous renal replacement therapy (CRRT) is complicated, and failure to correctly dose may result in either drug toxicity or treatment failure and development of antibiotic resistance. The aim of this study was to establish an ideal dataset that needs to be reported when presenting pharmacokinetic data for these patients and review current literature for completeness of this dataset.**

Methods: **An ideal dataset was established of the parameters that should be reported when calculating a drug dosing regimen from first principles. A Medline search was performed of relevant literature producing 64 citations from which completeness of the specified criteria was examined.**

Results: **None of the studies analysed presented the full dataset that we established as necessary. Of concern, basic pharmacokinetic parameters such as volume of distribution (V_d) and clearance (CL) were specified in only 79% and 81% of studies, respectively.**

Conclusions: **A large proportion of current studies do not report key information necessary to devise a rational dosing regimen for patients with acute renal failure receiving CRRT, and we hope this dataset will be a useful guide when reporting future pharmacokinetic data.**

Keywords: antibiotics, drug dosing, pharmacokinetics, renal replacement therapy, sepsis

INVITED ARTICLE CLINICAL PRACTICE

Ellie J. C. Goldstein, Section Editor

Antibiotic Dosing in Critically Ill Adult Patients Receiving Continuous Renal Replacement Therapy

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COLISTIN

Polymyxins have recently reemerged as therapeutic options for multidrug-resistant gram-negative organisms, such as *P. aeruginosa* and *Acinetobacter* species. Colistimethate sodium is the parenteral formulation of colistin and is the product for which dosing recommendations are made. Colistin is a large cationic molecule with a molecular weight of 1750 D, and it is tightly bound to membrane lipids of cells in tissues throughout the body [52]. These 2 properties suggest that the impact of CRRT on colistin elimination is minimal. Colistin dosing should be based on the following 2 patient-specific factors: underlying renal function and ideal body weight. No clinical data exist on colistin dosing for patients receiving CRRT. On the basis of clinical experience and the pharmacokinetic properties of colistin, we recommend using colistin at a dosage of 2.5 mg/kg q48h in patients undergoing CRRT.

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Review

Systemic antimicrobial prophylaxis in burn patients: systematic review

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SUMMARY

Objective: To review studies of systemic antibiotic prophylaxis in burn patients.
Methods: Electronic databases were searched for human clinical trials performed between 1966 and 2016 that compared prophylactic systemic antibiotics with placebo or no intervention.
Results: Nineteen trials met the selection criteria. Early postburn prophylaxis was assessed in non-severe burn patients (six trials) and severe burn patients (seven trials). Antimicrobial prophylaxis showed no effectiveness for the prevention of toxic shock syndrome or burn wound infection (Grade 1C), but could be useful in patients with severe burns and requirement for mechanical ventilation (Grade 2B). Perioperative prophylaxis was assessed in six trials. Antimicrobial prophylaxis during resection of devitalized tissue is of no benefit in most burn patients (Grade 2B); however, there is insufficient evidence to make a recommendation for patients with extensive burns. Antibiotic prophylaxis may also be effective in preventing split-thickness skin graft infections in selected procedures (Grade 2B).

Conclusions: The available evidence does not support the role of systemic antibiotic prophylaxis in the management of the majority of burn patients. Nevertheless, it may be useful in patients with severe burns who require mechanical ventilation, and in selected split-thickness skin grafting procedures.

- Eldeki veriler yanık hastalarının büyük bir bölümünde profilaktik antibiyotik verilmesini desteklemiyor
- Mekanik ventilasyon ihtiyacı olan ve seçilmiş greft hastalarında yararlı olabilir.

Yanık ünitesi bulaş yolları

- En önemli rezervuar hasta
  - Çevre kontaminasyonu
    - Yara boyutuyla orantılı %25-30
    - Çoklu dirençli mikroorganizmalarla kolonize hastalar
  - Su veya personelin eliyle hastanın vücudundaki diğer riskli bölgelerin kolonizasyonu

Yanık ünitesi bulaş yolları

- Personel
  - Eller
  - Gömlekler
    - Yataklar
    - Yatak kenarları
    - Masalar
    - Ekipman
- Yeterli dekontamine edilmemiş ekipman ve yüzeyler

Yanık ünitesi ve bulaş yolları

- Kontamine veya iyi dekontamine edilmemiş ekipman
  - Tansiyon aletleri
  - Termometre
  - Tekerlekli sandalye
  - Sedye
  - Röntgen cihazı
- Kontamine hidroterapi ekipmanı
  - Organizma koruyucu glikokaliks oluşturur
    - Borular, tahliye boruları
  - Yeterli dekontaminasyon güçlüğü
    - Yıkama masaları
    - Tanklar
- Ortak tedavi alanları

Önlem

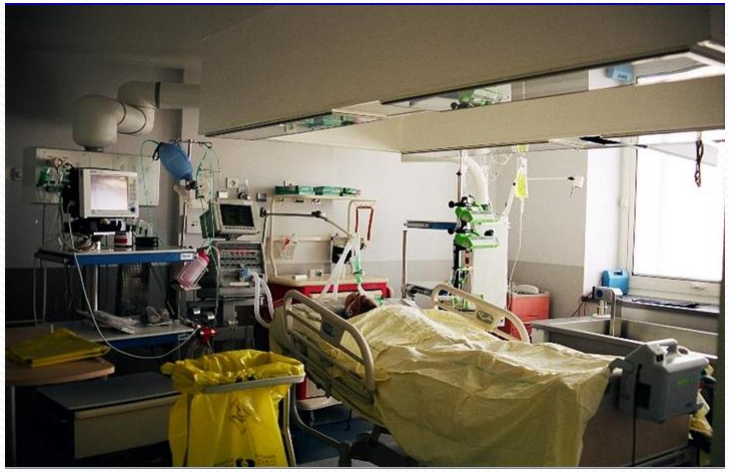
- Tüm hasta temaslarında
  - Koruyucu gömlek
  - Steril işlemlerde maske, bone , eldiven
  - Odadan çıkmadan önce tüm koruyucu ekipmanın çıkartılmalı
- Vücutta temiz bir bölgede işlem yapılacaksa kontamine eldivenin değiştirilmeli
- Tüm ekipman ve yüzeyler kontamine kabul edilmeli

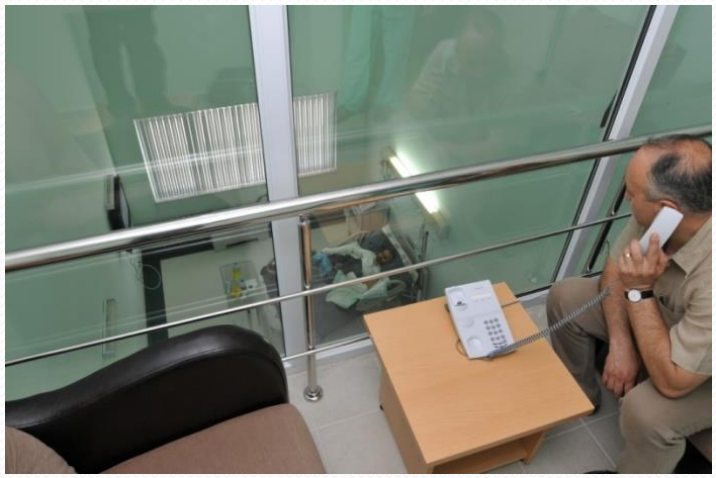
Önlem

- Bitkilere izin verilmez
- Rutin temizlik, atık yönetimi, çarşaf değişimi
- El yıkama

Yanık ünitesi

- İzole odalar
  - Laminer akım
- Bakım personeli kohortlaması
- Tüm işlemler ünitede yapılmalı
  - Yoğun bakım
  - Ameliyathane
- Personel ve ziyaretçi trafiği minimum olmalı





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Review

Honey in modern wound care: A systematic review

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ABSTRACT

Honey, known for centuries as a topical treatment for a wide range of wounds, has recently known a revival in modern wound care. The objective of this systematic review is to evaluate the available evidence and the role of honey in contemporary wound care. The search strategy was developed in the databases PubMed and ISI Web of Science. Fifty-five studies of any design, evaluating the use of honey in human burns, ulcers and other wounds, written in English, French, German or Dutch were eligible for inclusion. In all three wound categories honey seems to be a dressing with wound healing stimulating properties. In burns there is also evidence for its antibacterial capacity. In general, honey is also been mentioned to have deodorizing, debridement, anti-inflammatory and wound pain reducing

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Garlic ointment inhibits biofilm formation by bacterial pathogens from burn wounds

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When thermal injury damages the skin, the physical barrier protecting underlying tissues from invading micro-organisms is compromised and the host's immune system becomes supressed, facilitating colonization and infection of burn wounds with micro-organisms. Within the wound, bacteria often develop biofilms, which protect the bacteria from the immune response and enhance their resistance to antibiotics. As the prophylactic use of conventional antibiotics drives selection of drug-resistant strains, the use of novel agents to prevent biofilm formation by wound pathogens is essential. In the present study, we utilized our recently developed *in vitro* wound biofilm model to examine the antibiofilm activity of garlic (*Allium sativum*). Wound pathogens were