



Yeni Nesil Hemostatik ajanlar



Murat DURUSU
GATA

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**3rd INTERNATIONAL CRITICAL CARE
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EPAT
Emergency Physicians
Association of Turkey



Travma bakımında ne değişti

Comparison of available diagnostic and treatment technologies for the battlefield available in 1831 compared to 2010.

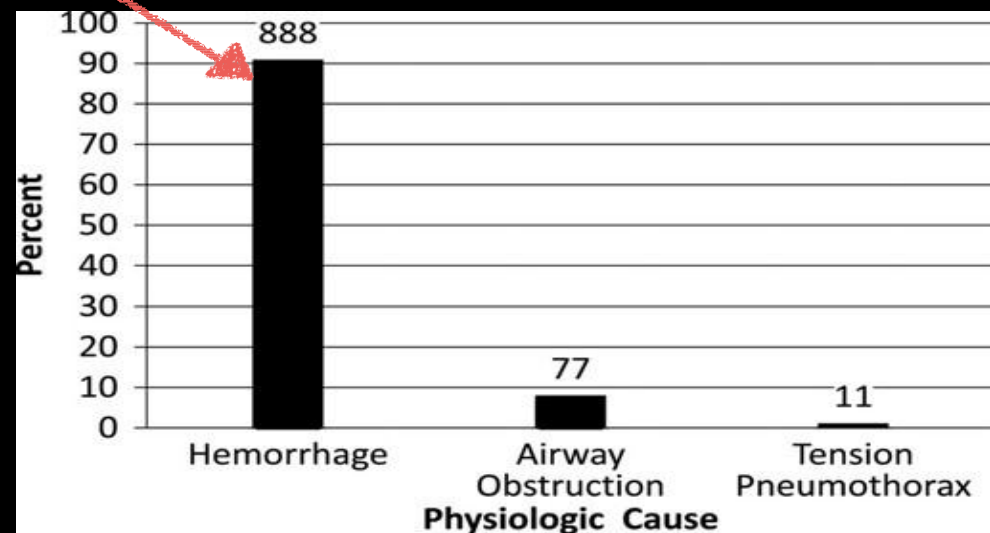
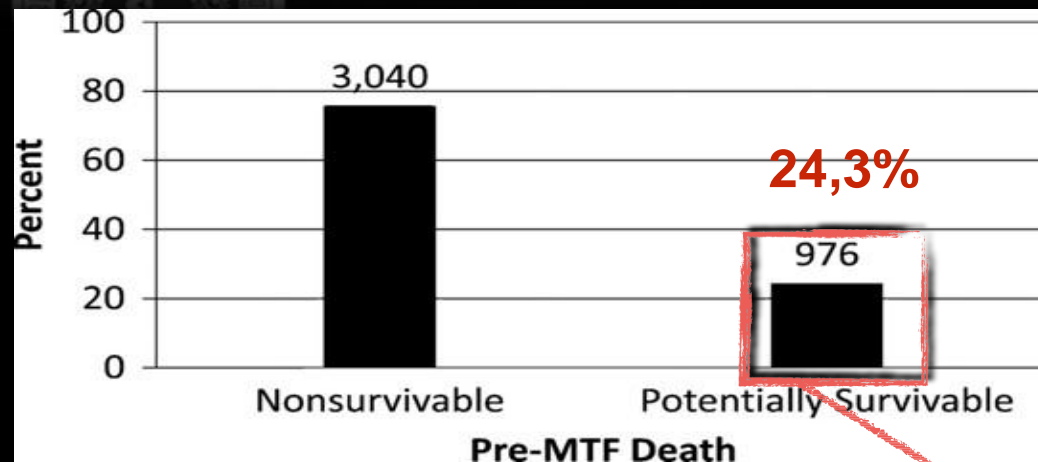
Diagnosis	Available Diagnostic Technology 1831	Available Diagnostic Technology 2010	Available Treatment Technology 1831	Available Treatment Technology 2010	Major Technologic Advance?
Penetrating truncal injury	Physical exam	Physical exam	Crystalloid	Crystalloid or colloid	NO
Intravenous access			Sharpened quill	Intraosseous catheter	YES
Extremity arterial hemorrhage	Physical exam	Physical exam	Tourniquet	Tourniquet	NO
Junctional compressible, nontourniquetable hemorrhage	Physical exam	Physical exam	Cloth packing	Combat Gauze	YES
Tension pneumothorax	Physical exam, auscultation	Physical exam, auscultation	Decompression with sharpened quill	Decompression with hollow needle	NO
Open chest wound	Physical exam	Physical exam	Waterproof cloth	Plastic sealant	NO
Hemothorax	Physical exam, auscultation	Physical exam, auscultation	Intravenous fluid	Intravenous fluid, bag valve mask ventilation	NO
Traumatic Brain injury	Physical exam	Physical exam	None	None	NO
Hypothermia prevention	Physical exam, thermometer	Physical exam, thermometer	Wool blanket	Active warming systems	YES
Prehospital documentation			Pen and paper	Pen and paper	NO
Pain control	Physical exam	Physical exam	Opium	Morphine	NO
Remote Triage			Voice	Voice	NO
Monitors for Shock and resuscitation	Physical exam	Physical exam			NO

Blackbourne et al, *AMEDD Journal* 2011



Travma bakımı...

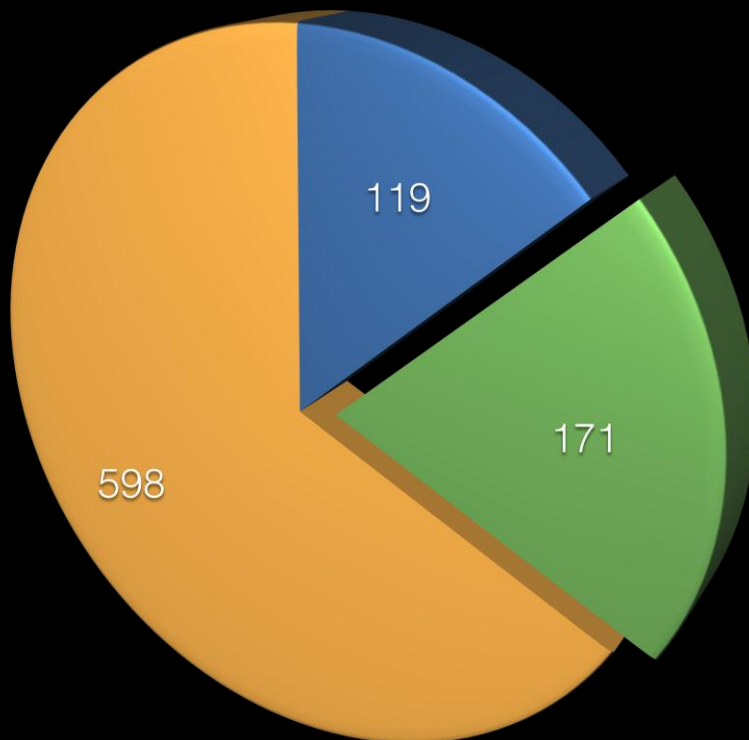
- Önlenebilir ölümler...



Eastridge BJ et al, J Trauma Acute Care Surg 2012



● Extremities ● Junctional ● Truncal



Eastridge, J Trauma Acute Care Surg 2012



Kanama yönetimi

1. Kanamayı durdur

- Baskı uygulanabilir...
- Baskı uygulanamaz...

2. Kaybedileni yerine koy

- Kan
- Sıvı...
 - Damar yolu

3. Tamir et...

I. Hastane öncesi

II. Acil servis

III. Cerrahi



Kanamayı durdur !

- I. Direk baskı
- II. Turnike
- III. Lokal hemostatikler
- IV. Eksternal baskı araçları



Topikal hemostatikler

TABLE I. Commercially Available Hemostatic Agents

Categories	Types	Pros	Cons
Physical and Absorbable ^{10,12}	Bone wax, ostene, gelatin foams, sponges, and powders, oxidized cellulose, microfibrillar collagen, bovine and porcine collagen	Tamponades bone surface bleeding, absorbable, and controls small vessel low pressure bleeding	May embolize, prevent bone fusion, reduce structural stability, possible interference with healing process
Biologically Active ^{10-12,16,25}	Pooled and recombinant thrombin, thrombin and gelatin, fibrin sealants, platelet gels, albumin and glutaraldehyde	Easily applied, rapid response, effective against mild to moderate bleeding, effective in heparinized patients, and broad applications	Immunological response, viral infection, expensive cost per application, short shelf lives, and adverse distal thrombotic events
Synthetic sealants ¹⁰⁻¹²	Cyanoacrylates, polyethylene glycol hydrogel	Waterproof barrier, replacement for sutures, full strength within minutes, arterial bleeding	Limited topical usages, dangerous if unreacted, and difficult to apply to irregular wounds
Hemostatic Dressings ^{10,11,13}	Dry fibrin, chitin, chitosan, alginate, mineral zeolite, kaolin, and smectite	Military and emergency response usage, can stop heavy arterial bleeding, long shelf-life, enhances normal compression treatment, and typically inexpensive	High pressure wounds can expel powders, zeolite causes exothermic reaction, success related to responder training, inconsistent results from animal studies

Behrens AM, Sikorski MJ, Kofinas P. 2014. Hemostatic strategies for traumatic and surgical bleeding.

J Biomed Mater Res Part A 2014;102A:4182–4194.

Lokal hemostatikler

I. İlk jenerasyon...



Dry Fibrin Sealant Dressing



HemCon Bandage



QuikClot



QuikClot ACS+



Chitosan (HemCon ve Celox)

- Chitin'in de-asetil formu.
- Platelet fonksiyonlarını arttırır.
- Bakteriostatik özelliği var.
- FDA onayı var.



Zeolite (QuikClot)

- Volkanik bir kaya extresi.
- Granüler formu; okside silicon, alüminyum, magnezyum vb. mineraller içerir
- Ortamdaki sıvıyı absorbe ederken pıhtılaşma fak. ve trombositlerin pıhtı oluşumunu sağlar. İntrinsik koagülasyonu aktive eder.
- Yan etki; **ekzotermik hasar ve koagülasyon nekrozu**.
- Zeolit içeren bez ürünler mevcut.



1. Champion, H.R., Bellamy R.F., Roberts C.P., Leppaniemi, A., A profile of combat injury, The Journal of Trauma, 2003;54(5):13-19.
2. Martin, M., Oh, J., Currier, H., Tai, N., Beekley, A., ve ark., An analysis of in-hospital deaths at a modern combat support hospital, The Journal of Trauma, 2009;66(4):51-60.

İkinci jenerasyon



Celox powder



Combat Gauze



WoundStat granules

Kaolin (QuikClot, Combat Gauze) ;



- Aliminyum silikat yapısındadır.
- İntrensek pıhtılaşma mekanizmasını aktive eder.
- Hareketli bölgeye kolayca uygulanır.
- FDA onayı var

Clinoptilolite

Eur J Trauma Emerg Surg
DOI 10.1007/s00068-015-0506-z

REVIEW ARTICLE

Comparison of the topical haemostatic efficacy of nano-micro particles of clinoptilolite and kaolin in a rat model of haemorrhagic injury

A. Bayır¹ · M. Eryılmaz² · M. Demірbilek³ · E. B. Denkbaşı³ · I. Arzıman² · M. Durusu²

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© Springer-Verlag Berlin Heidelberg 2015

Abstract

Purpose This study was designed to investigate if the potential haemostatic efficacy of gauze-impregnated clinoptilolite created with nano-technology is as strong as the widely used kaolin to control pulsatile arterial bleeding due to major vascular injury.

Methods 42 rats were separated into three groups of kaolin, clinoptilolite and control groups. The femoral artery was isolated and active arterial haemorrhage was performed. After 30 s of free arterial haemorrhage, compression was applied with a standard 100 g scale and haemostasis was assessed at the 1st, 3rd and 5th minutes. All groups were observed throughout 60 min for survival without any fluid resuscitation and the mean arterial pressure, pulse, body/surface temperature and arterial blood gas values were measured.

Results In the control group, haemostasis did not develop in any of the 12 rats and the survival rate was 5/12 (41.66 %). In the kaolin group, haemostasis developed in seven rats and of these, bleeding reoccurred in four. The survival rate was 10/13 (76.92 %). In the clinoptilolite group, haemostasis developed in eight rats and bleeding recurred in only one. The survival rate was 100 %. In terms of survival, the clinoptilolite and kaolin groups showed

superiority to the control group ($p = 0.002$, $p = 0.082$). In the evaluation of recurrent haemorrhaging in the rats with haemostasis, clinoptilolite was observed to provide better coagulation than kaolin.

Conclusion A statistically significant difference was determined in clinoptilolite and kaolin group, when they are separately compared with the control group in respect of the effect on MAP, HCO_3^- , lactate, base excess, haemostasis duration and survival rates. The effect of clinoptilolite on haemostasis and survival time was observed to be at least as good as that of kaolin; therefore, clinoptilolite can be used as an active ingredient in a topical haemostat.

Keywords Clinoptilolite · Kaolin · Topical haemostat · Haemorrhage · Nano-particle · Rat

Introduction

Just as in the past, uncontrollable bleeding remains the most common cause of death in wars and combat zones [1, 2] and is the main cause of death in civil life associated with trauma [3]. Mortality in haemorrhaging occurring after battle presents generally in the first hour and at the scene.



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Ankaferd Blood Stopper

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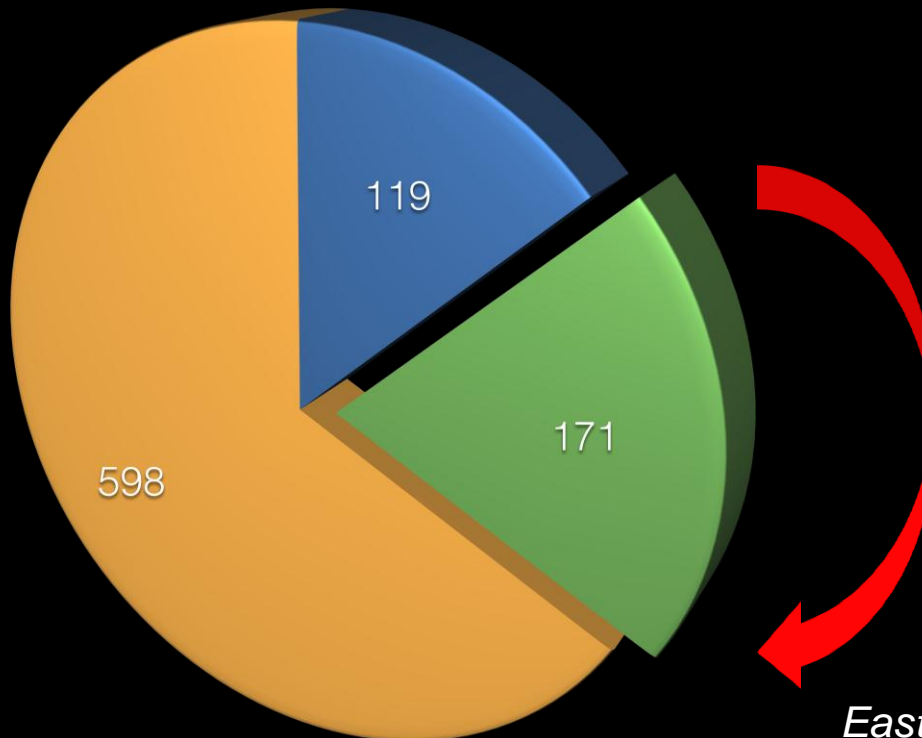
Yeniler...



● Extremities




● Junctional

● Truncal



Eastridge, J Trauma Acute Care Surg 2012



DEVICE	IMAGE
Junctional Emergency Treatment Tool (JETT)	
Combat Ready Clamp (CROC)	
SAM Junctional Tourniquet	
Abdominal Aortic Tourniquet (AAT/AAJT)	



Kragh et al, *Am J Emerg Med* 2013 Simulateur



Lyon et al, *J Trauma*, 2012 Croushorn,
JSOM, 2014



Yeniler -

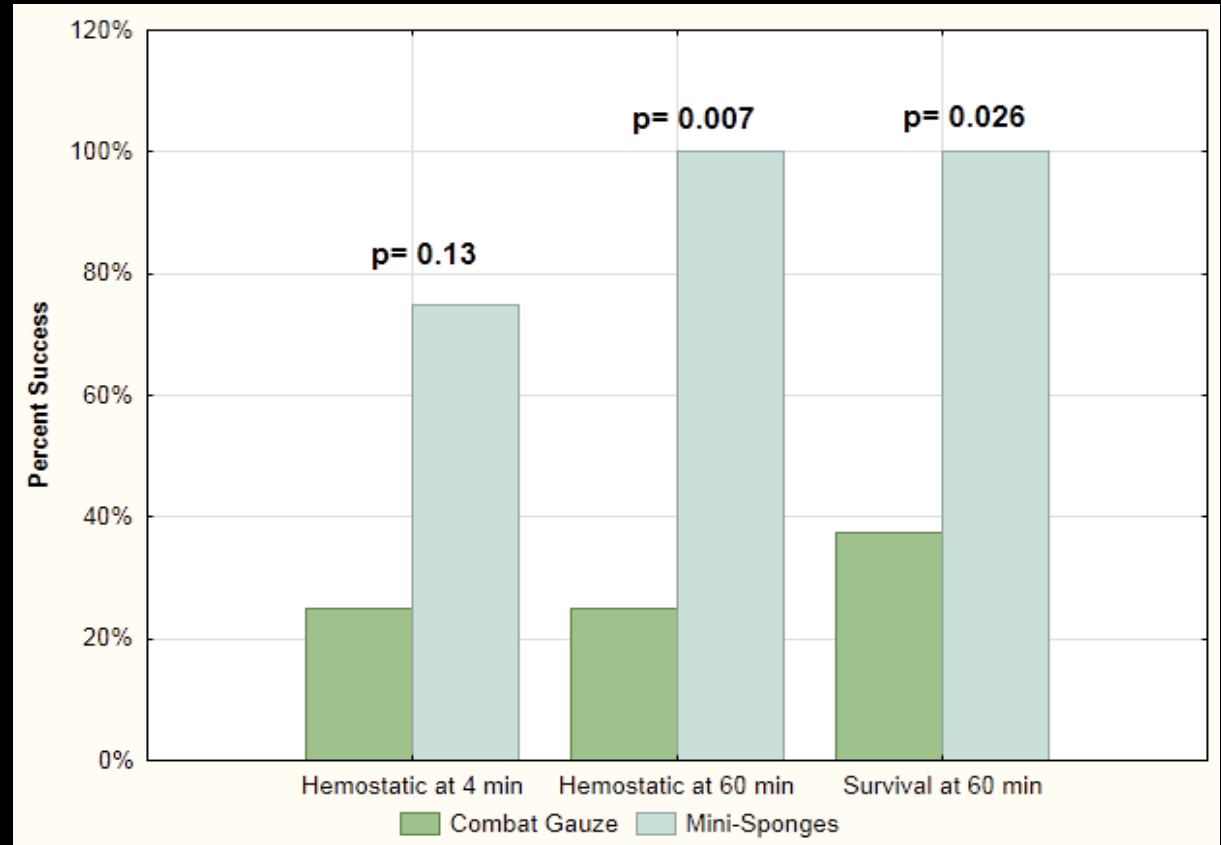
XSTAT™

A novel sponge-based wound stasis dressing to treat lethal noncompressible hemorrhage

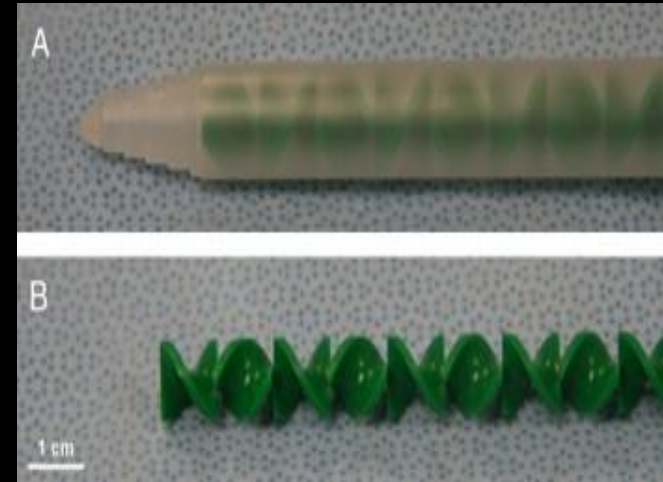
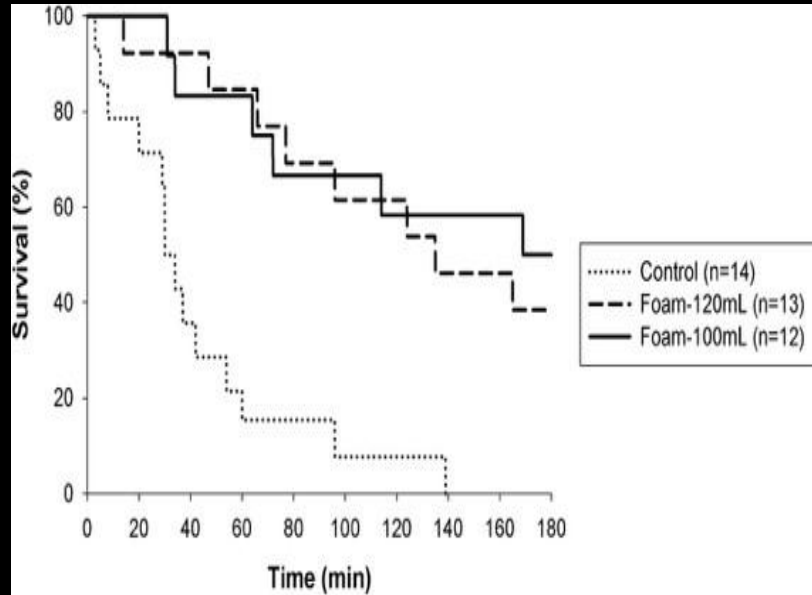
Genevieve R. Mueller, BS, Teresa J. Pineda, BS, Hua X. Xie, MD, Jeffrey S. Teach, RN, Andrew D. Barofsky, JD, MBA, James R. Schmid, DSc, PA-C, US Army, MHCS, and Kenton W. Gregory, MD, *Portland, Oregon*

J Trauma Acute Care Surg 2012

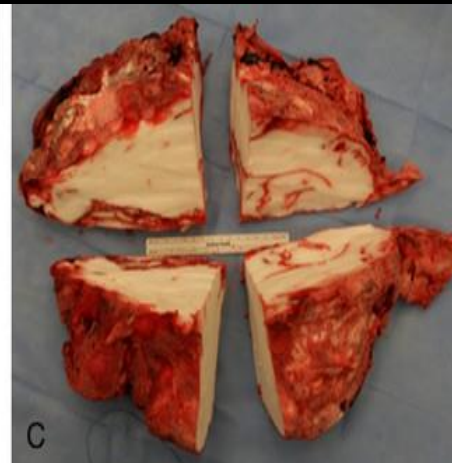
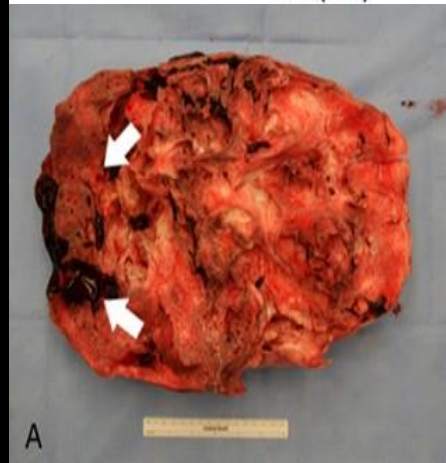




Self expanding foam



Rago et al, J Trauma Acute Care Surg 2014

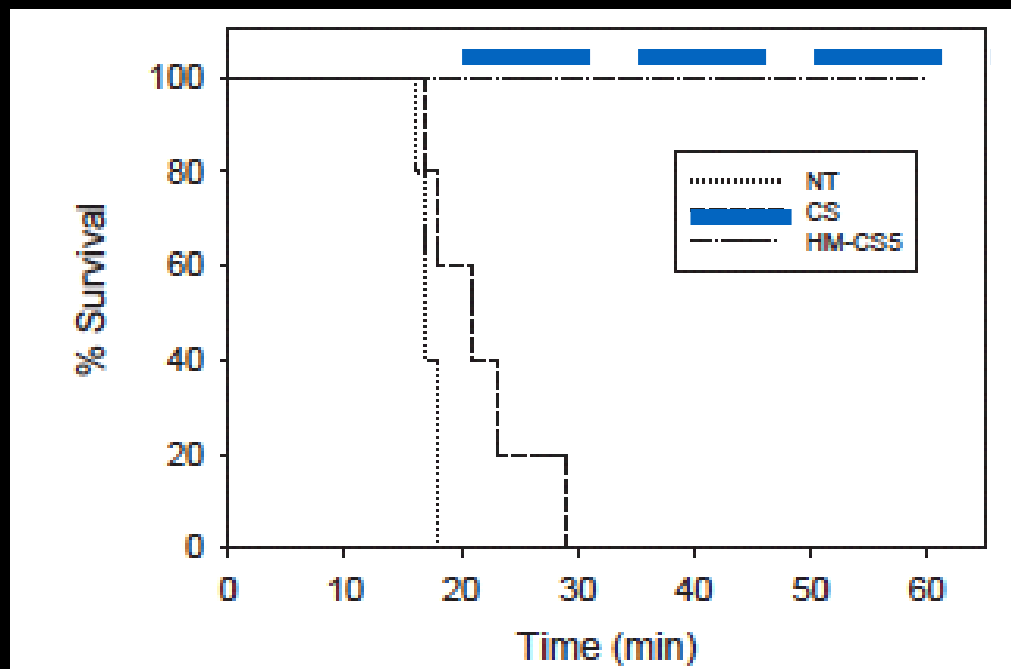




Hydrophobically-modified chitosan foam: description and hemostatic efficacy

Matthew B. Dowling, PhD,^a William Smith, BS,^b Peter Balogh, BS,^b
Michael J. Duggan, DVM,^b Ian C. MacIntire, BS,^c Erica Harris, BS,^a
Tomaz Mesar, MD,^b Srinivasa R. Raghavan, PhD,^{a,c}
and David R. King, MD, LTC, USAR^{b,*}

J Surg Research, 2014





Vasoconstriction by Electrical Stimulation: New Approach to Control of Non-Compressible Hemorrhage

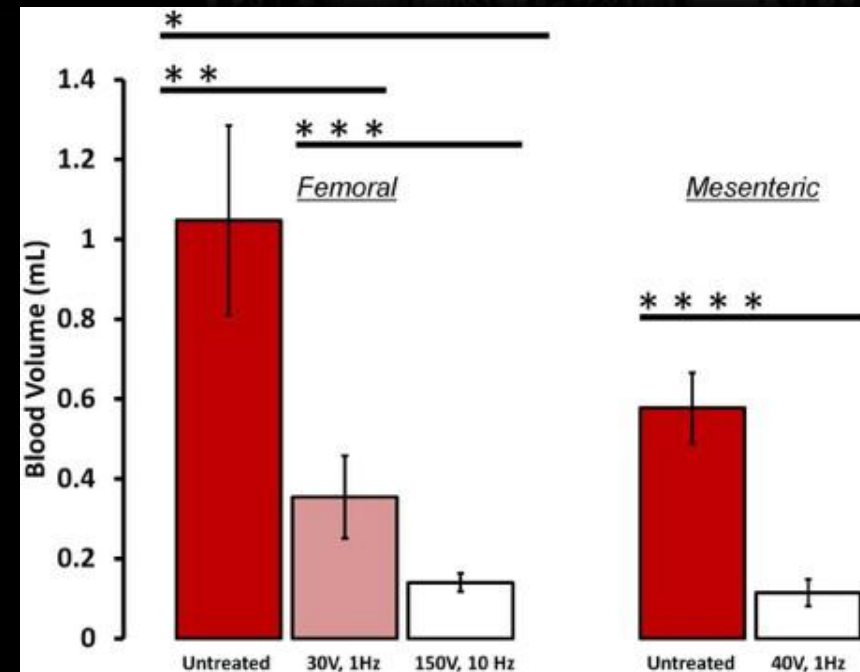
Yossi Mandel^{1,2}, Richard Manivanh², Roopa Dalal², Phil Huie^{1,2}, Jenny Wang¹, Mark Brinton¹ & Daniel Polanker^{1,2}

Battlefield radiology

R N J GRAHAM, MA, FRCR *The British Journal of Radiology*, 85 (2012),

Resuscitative Endovascular Balloon Occlusion of the Aorta: A Gap Analysis of Severely Injured UK Combat Casualties

Morrison, 2014

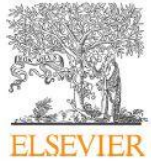




Klavuz önerileri...



Resuscitation 95 (2015) 278–287



Contents lists available at ScienceDirect

Resuscitation

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



Summary of the main changes in the Resuscitation Guidelines

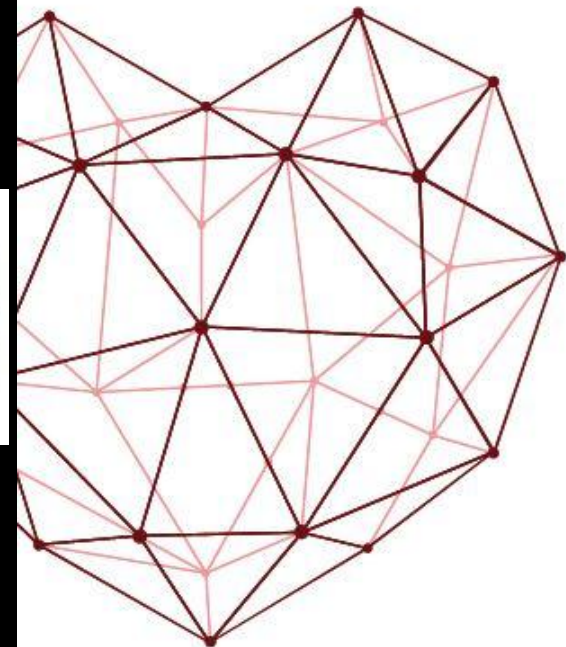
European Resuscitation Council Guidelines for Resuscitation 2015
Section 9. First aid



ERC GUIDELINES 2015

2015 First Aid Guideline

Use a haemostatic dressing when direct pressure cannot control severe external bleeding or the wound is in a position where direct pressure is not possible. Training is required to ensure the safe and effective application of these dressings.





Guideline Summary NGC-10369

Guideline Title

An evidence-based prehospital guideline for external hemorrhage control: American College of Surgeons Committee on Trauma

Bibliographic Source(s)

Bulger EM, Snyder D, Schoelles K, Gotschall C, Dawson D, Lang E, Sanddal ND, Butler FK, Fallat M, Taillac P, White L, Salomone JP, Selfarth W, Betzner MJ, Johannigman J, McSwain N. An evidence-based prehospital guideline for external hemorrhage control: American College of Surgeons Committee on Trauma. *Prehosp Emerg Care*. 2014 Apr-Jun;18(2):163-73. [44 references] [PubMed](#)

Guideline Status

This is the current release of the guideline.

Topical Hemostatic Agents

Recommendation 1: The panel suggests the use of topical hemostatic agents, in combination with direct pressure, for the control of significant hemorrhage in the prehospital setting in anatomic areas where tourniquets cannot be applied and where sustained direct pressure alone is ineffective or impractical.

Strength of Recommendation: Weak

Quality of Evidence: Low

Remarks: While the evidence was low, there are consistent data from animal models, suggesting reduced hemorrhage with these agents compared to standard gauze and the committee felt that junctional hemorrhage and torso wounds may benefit from the combination of direct pressure and hemostatic dressings.



Recommendation 2: The panel suggests that topical hemostatic agents be delivered in a gauze format that supports wound packing.

Strength of Recommendation: Weak

Quality of Evidence: Low

Remarks: This recommendation was based on the military experience and the animal studies suggesting that products that allow packing of the wound have superior hemorrhage control.

Recommendation 3: Only products determined effective and safe in a standardized laboratory injury model should be used.

Strength of Recommendation: Weak

Quality of Evidence: Low

Remarks: The U.S. Army Institute for Surgical Research has developed a standardized large animal model for comparison of hemostatic dressings. The committee felt that all new products should be subject to this testing.



Alışverişinizi tamamlayın



Lan napiyosun

İyi valla sen napiyosun?

İyi.. Nerdesin

İyi ya sen nerdesin?

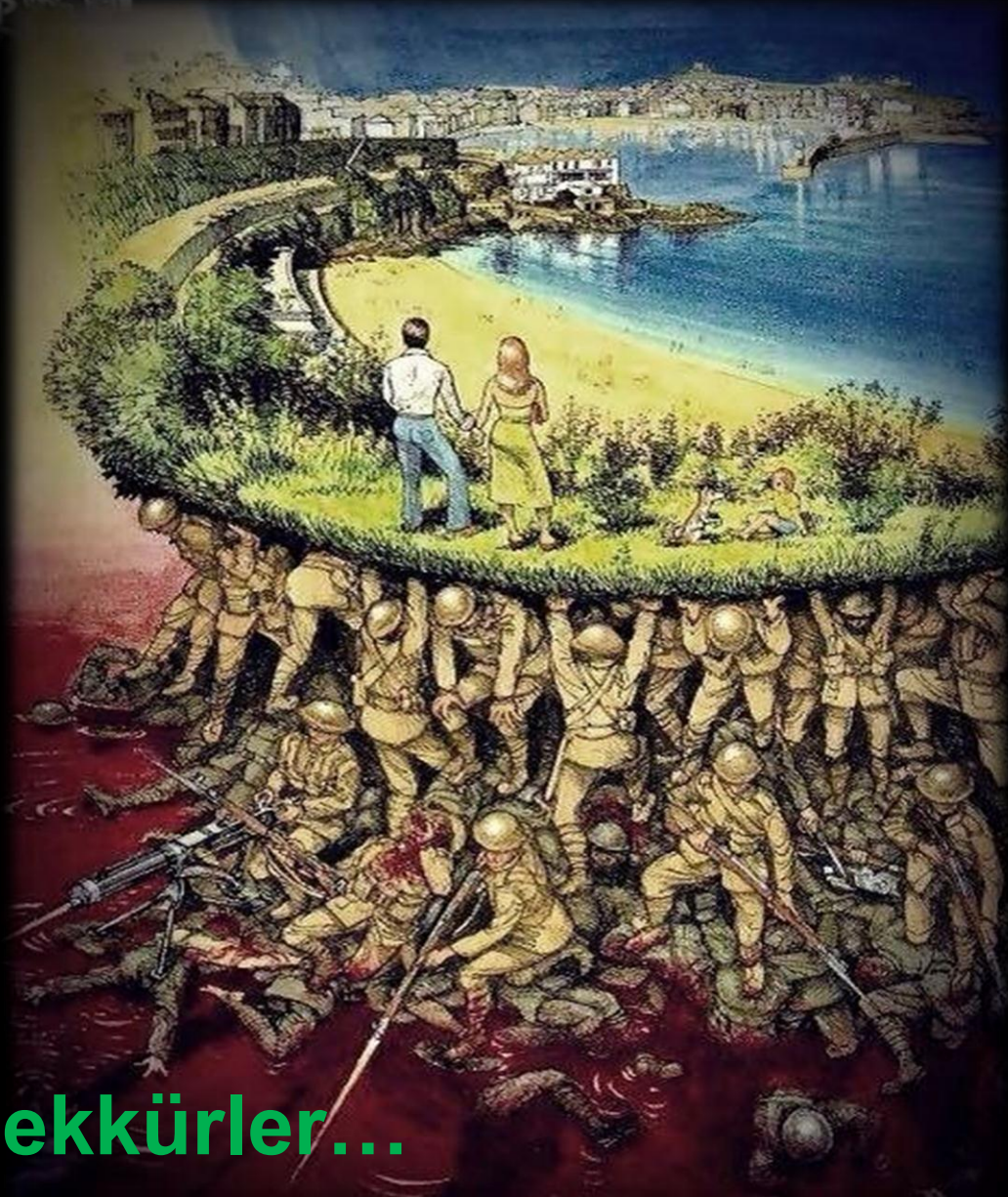
İyi valla nerde olayım

İyi o zaman



Metni girin

Gönder
(160)/1



Teşekkürler...

muratdurusu2000@yahoo.com

mdurusu@gata.edu.tr

+90 544 4421923