

Travmada tüm vücut BT ne kadar gerekli?

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Sunum Hedefi

- Travmada tüm vücut BT
 - Terminoloji ve teknik
- Literatüre genel bakış

ÇKBT ve Travma

- Hızlı çekim yapabilme ve izotropik görüntüleme
- Multiplanar rekonstrüksiyonlar
- MIP
- 3 boyutlu görüntüleme

Helikal BT ve ÇKBT'nin kullanım alanına girmesiyle birlikte travma görüntülemesinde değişmeyen sadece beyin BT tetkikidir

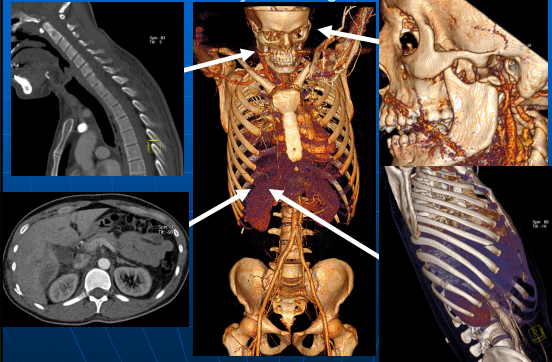
Yüksek hızla giden bir aracın takla atması ile başvuran olgu

Toraks BT+BT Anjiyografi+Spinal
BT+Abdomen BT+ Pelvis BT

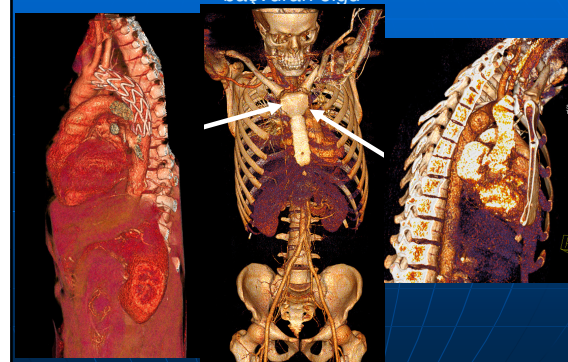


ÇKBT ile yapılan tek inceleme

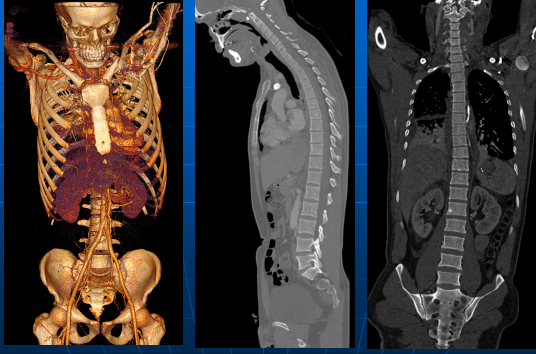
Yüksek hızla giden bir aracın takla atması ile başvuran olgu



Yüksek hızla giden bir aracın takla atması ile başvuran olgu



Yüksek hızla giden bir aracın takla atması ile başvuran olgu



Literatüre genel bakış

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1. **is utilisation of computed tomography justified in clinical practice? Part I, application in the emergency department.**
Sait Z, Ng KH, Vijayananthan A.
Singapore Med J. 2010 Mar;51(3):200-6.
PMID: 20428740 [Published - in process]
Related citations

2. **Detection of chest trauma with whole-body low-dose linear slit digital radiography: a multireader study.**
Stacy-Farkas Z, Kaelin I, Flach PM, Roskopf A, Ruder TD, Triantafyllou M, Zimmermann H, Vock P, Bonel HMD.
AJR Am J Roentgenol. 2010 May;194(5):W288-95.
PMID: 20410383 [Published - in process]
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Typical with your search terms

- Effect of whole-body CT during trauma resuscitation on survival: a retrospective, multicentre study
- Whole-body CT trauma imaging with contrast-enhanced CT in the emergency department
- Effective whole-body CT in whole-body trauma CT in paediatric trauma

See more

Literatüre genel bakış

Whole-body CT in multiple trauma

Published Online March 24, 2009
DOI:10.1016/S0140-6736(09)60544-8
See Articles page 1455

Sometimes you're right, and sometimes you're wrong. At the 1988 Clinical Congress of the American College of Surgeons, I attended the Scudder Oration. Abdominal trauma management in America, by Gerald Shanley. Speaking of the future he stated: "More rapid, almost instantaneous, computerized tomographic scanning with improved resolution will be available, certainly in the emergency department. As the patient enters the emergency treatment center, he passes through a multiple beam CT unit that will provide all the initial evaluation films." I thought he was being overly optimistic. At that time, my institution was in the midst of a prospective trial of

CT for many conclusions. CT offers a rapid, non-invasive, and accurate method of diagnosing abdominal trauma. In The Lancet's study, German Trauma Society's data to the care of researchers for CT technology in a statistic in mortality.

Literatüre genel bakış

Articles

Effect of whole-body CT during trauma resuscitation on survival: a retrospective, multicentre study

Stefan Huber-Wagner, Ralf Lefring, Lars-Michael Quick, Markus Körner, Michael Vögt, Klaus-Jürgen Pfeiffer, Maximilian Reiser, Wolf Mutschler, Karl-Georg Kang, on behalf of the Working Group on Polytrauma of the German Trauma Society

Summary
Background The number of trauma centres using whole-body CT for early assessment of primary trauma is increasing. There is no evidence to suggest that use of whole-body CT has any effect on the outcome of patients with major trauma. We therefore compared the probability of survival in patients with blunt trauma who had whole-body CT during resuscitation with those who had not.

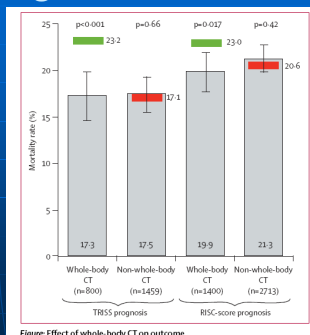
Lancet 2009; 373: 1455-61
March 24, 2009
DOI:10.1016/S0140-6736(09)60544-8
See Comment page 1488

Literatüre genel bakış

- Effect of whole-body CT during trauma resuscitation on survival: a retrospective, multicentre study. **Working Group on Polytrauma of the German Trauma Society. Lancet.** 2009 Apr 25;373(9673):1455-61.
- Çok merkezli, retrospektif
- 4621 künt travmalı hasta çalışmaya dahil edilmiş
 - 1494 olguya tüm vücut BT
 - Kontrastsız beyin BT
 - İVKM sonrası tüm omurgayı içine alacak şekilde toraks-abdomen-pelvis
 - 3127 olgu (tüm vücut BT yapılmayan grup)

Literatüre genel bakış

- Trauma and injury severity score (TRISS)
- Revised injury severity classification (RISC) score,
- Standardised mortality ratio (SMR)



Literatüre genel bakış

- Çalışma sonucunda:
 - Çoklu travma olgularında vücut BT incelemesinin erken dönemde bakıma entegre edilmesi ölüm oranını belirgin şekilde düşürmüştür.
 - Çoklu travma olgularında erken resüsitasyon ve emilimde; standart tanısal yaklaşımın bir parçası olarak tüm vücut BT yapılması önerilmiştir.

Ancak tartışma devam ediyor

Literatüre genel bakış

Hastaneye başlıyarak Tanı ve Tedavi: Tanı, Enfeksiyon, ve Kritik Care

Whole-Body Multislice Computed Tomography as the First Line Diagnostic Tool in Patients With Multiple Injuries: The Focus on Time

Torrey E. Evans, MD, Peter F. Abella, MD, Nikko Hoffner, MD, Thomas K. Keil, MD, Markus Knefel, MD, Jörg Brederlau, MD, Norbert Roewer, MD, and Herbert Kohnigk, MD

OBJECTIVE: Whole-body multislice computed tomography (MSCT) becomes the mainstay for the diagnosis of multiple injuries. The time requirement of two different diagnostic approaches to multiple injuries was compared: MSCT versus CT. **DESIGN:** Retrospective study. **SETTING:** Level I trauma center. **PATIENTS:** 100 patients with multiple injuries. **MEASUREMENTS AND MAIN RESULTS:** The time requirement of MSCT was significantly shorter than that of CT. **CONCLUSION:** MSCT is the first line diagnostic tool for multiple injuries. **KEY WORDS:** Multiple injuries, Multislice computed tomography, Trauma management, Resuscitation time, Trauma emergency radiology.

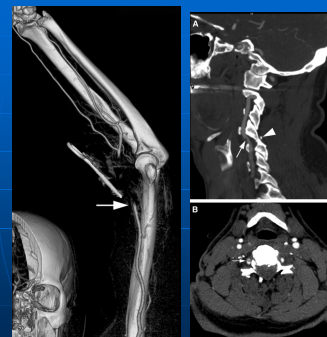
Literatüre genel bakış

Table 1

Table 1	Table 1
Falls >6 m	Falls >6 m
High speed	High speed
Crash against	Crash against
Pedestrian	Pedestrian
Patient trapped	Patient trapped
Roll over	Roll over
Head-on collision	Head-on collision
Ejection from	Ejection from
Death in car	Death in car
Explosion, bus	Explosion, bus

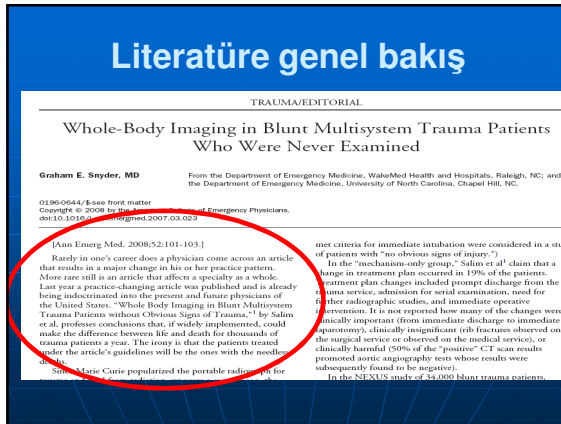
Literatüre genel bakış

The Journal of TRAUMA® Injury, Infection, and Critical Care			
Interval	Time interval	Duration	
		Mean time (min) ± SD	Min /Max (min)
1	Prehospital time	74.4 ± 37.2	17 / 220
2	First emergency room phase	31.0 ± 13.9	8 / 85
3	Acquisition interval	12.0 ± 4.9	8 / 35
4	Reformatting and evaluation interval	7.0 ± 2.1	4 / 15
5	Second emergency room phase	33.6 ± 30.1	3 / 139
6	CT time	19.0 ± 8.5	7 / 38
7	Emergency unit time	84.2 ± 30.5	31 / 175

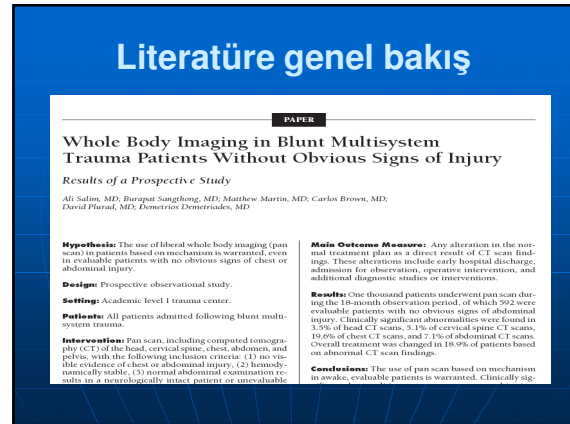


Initial clinical experience with a 64-MDCT whole-body scanner in an emergency department: better time management and diagnostic quality? Heiger M, Czernak B, El Altar H, Summ G, Jaschke W, Friess M. J Trauma. 2009 Mar;65(3):648-57.

Literatüre genel bakış



Literatüre genel bakış

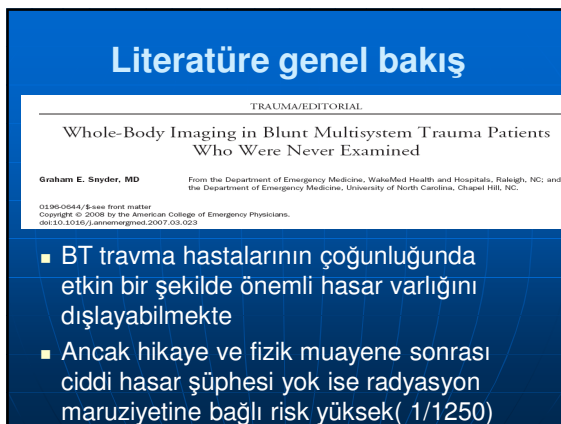


Literatüre genel bakış

- Whole body imaging in blunt multisystem trauma patients without obvious signs of injury: results of a prospective study, Salim A, et al. J Trauma. 2007;62(3):473-479. doi:10.1097/TA.0b013e3180140000
- Prospektif çalışma
- Çalışmaya alınma kriterleri
 - Abdominal ya da göğüs travmasının görülebilir bir bulgusu olmayanlar
 - Hemodinamik olarak stabil
 - Bilinç açık hastada normal abdominal muayene bulguları veya bilinç düzeyinde değişme nedeniyle karın muayenesi yapılamayan olgular
 - Travma mekanizması ciddi olanlar
- 18 aylık dönemde 592 olgu bu gruba uygun

- 592 olgunun
 - %3,5 beyin BT
 - % 5,1 servikal spinal BT
 - %19,6 toraks BT
 - % 7,1 Abdominal BT önemli hasar bulgusu saptanmış
- Olguların yaklaşık %19'unda BT bulguları tedaviye karar verme sürecinde değişime neden olmuş(erken taburculuk dahil)

Literatüre genel bakış



- BT travma hastalarının çoğunluğunda etkin bir şekilde önemli hasar varlığını dışlayabilmekte
- Ancak hikaye ve fizik muayene sonrası ciddi hasar şüphesi yok ise radyasyon maruziyetine bağlı risk yüksek(1/1250)

Literatüre genel bakış

- NEXUS çalışması
 - Sadece klinik muayene ile kırıkların %99'dan fazlası yakalanabilir
- Salim ve arkadaşları ' Tipik olarak, herhangi bir problem varmış gibi görünmeyen ve Acil Tıp uzmanının eve göndermek istediği hasta grubu'
- Ancak: Hiçbir Acil Tıp Uzmanı, hikaye ve fizik muayene olmadan sadece görünüme göre karar vermez
- Aynı şekilde; hiçbir Acil Tıp Uzmanı, hikaye ve fizik muayene tarafından desteklenmeyen görüntüleme gerekliliği ile hastasını 15 mSv radyasyon maruziyetine bırakmaz

Literatüre genel bakış

- BT incelemesi daha hassas olduğu ve radyologlar normal tarama raporu yazmak konusunda tereddütlü olduğu için incidental hasarlar veya anlamı olmayan bulguların sayısı artmakta.
 - Bu bulgular hasta tedavi sonucunda anlamlı farklılık oluşturma şansı az
- Takip ve ikinci değerlendirmeler önemli hasar varlığı konusunda uyarıcı

Literatüre genel bakış

- Tüm vücut tarama eve gönderme konusunda işimizi kolaylaştırabilir
 - Eğer hasta eve gönderme kriterlerini taşıyorsa
 - Klinik muayene hasar şüphesi taşıyorsa tüm vücut tarama negatif bile olsa gönderemeyiz! (ör bağırsak travması DAI)
- Diğer bir istenme sebebi de : Ya dava edilirse? Atlandı dava edildi
- VOMIT—victims of modern imaging technology

Literatüre genel bakış

Potential Impact of the American College of Radiology Appropriateness Criteria on CT for Trauma

Matthew L. Hadley¹, Agila¹, Wong^{1,2}

OBJECTIVE. The purpose of our study was to identify the current imaging utilization patterns at a level 1 trauma center, the radiation dose and financial costs of this imaging, and what impact, if any, the American College of Radiology (ACR) appropriateness criteria might have on these factors.

MATERIALS AND METHODS. Two hundred trauma patients were retrospectively chosen for inclusion in the study. Patients were selected on the basis of receiving any form of ionizing radiation within the first 3 hr of arrival at an academic level 1 trauma center. Exclusion criteria included an absence of imaging, patients transferred from outside institutions with previously acquired imaging studies, and patients who first underwent surgery and subsequently returned for imaging within the 3-hr inclusion time of the study. These data were then analyzed for imaging utilization practices, estimation of radiation dose, cost, and the impact of the ACR criteria on these factors.

RESULTS. A total of 660 CT examinations were performed for a total charge of \$100,000. An estimated 10% of the ACR criteria was found to be applicable to the study. Overall, application of the ACR criteria was found to have the potential to reduce imaging costs by 39% and the estimated radiation dose by 44%.

CONCLUSION. The ACR criteria have the potential to have a strong positive impact on the overall cost of imaging and radiation dose received for patients in the setting of trauma. These criteria should be emphasized to clinicians to help guide their imaging decisions.

Literatüre genel bakış

The Journal of TRAUMA[®] Injury, Infection, and Critical Care

Changes in Thoracolumbar Computed Tomography and Radiography Utilization Among Trauma Patients After Deployment of Multidetector Computed Tomography in the Emergency Department

Richard T. Griffey, MD, MPH, Stephen Ledbetter, MD, MPH, and Ramin Khorasani, MD, MPH

Background: Diagnostic-quality thoracolumbar spine (TLS) images, generated from routine thoracolumbar multidetector computed tomography (MDCT) scans, have been demonstrated superior to conventional radiography (CR) for TLS injury. We evaluated thoracolumbar computed tomography (CT) and TLS utilization among trauma patients after deployment of MDCT. We hypothesized that reformatting MDCT images replaced CR for evaluation of TLS trauma among patients undergoing chest or abdominal CT, and that utilization of thoracolumbar CT and TLS screening in trauma increased post-MDCT.

Methods: We reviewed all TLS imaging for trauma patients undergoing chest or abdominal CT for 18 months pre- and post-MDCT. We compared the relative use of CR and CT in TLS imaging, and the volume of TLS screening, and chest and abdominal CT across the study period. We also reviewed TLS CR in patients undergoing chest or abdominal CT.

Results: After MDCT deployment, CT replaced CR for TLS imaging among those undergoing chest or abdominal CT for trauma. Utilization of chest and abdominal CT and TLS screening significantly increased, despite unchanged volume and severity of trauma patients during the study period. There was a corresponding decrease in CR use.

Conclusion: Reformatting TLS images using thoracolumbar CT data have replaced CR in our evaluation of TLS trauma. However, reasons for increased utilization remain unclear. Further studies are needed to determine whether clinical yield and cost-effectiveness of these changes in utilization are maintained. **Keywords:** Thoracolumbar spine, computed tomography, Spinal injuries, Physician's practice patterns, Trauma centers.

J Trauma. 2007;62:1153-1156.

Literatüre genel bakış

ORIGINAL ARTICLE

Is the Use of Pan-Computed Tomography for Blunt Trauma Justified? A Prospective Evaluation

Arrett Tillou, MD, MSc, Mukket Gupta, MD, MS, Larry J. Baraff, MD, David L. Schriger, MD, Jerome R. Hoffman, MD, MPH, FACEP, Jonathan R. Hunt, MD, and Henry M. Cryer, MD, PhD

Objective: Many trauma centers use the pan-computed tomography (CT) scan (head, neck, chest, and abdomen/pelvis) for the evaluation of blunt trauma. This prospective observational study was undertaken to determine whether a more selective approach could be justified.

Methods: We evaluated injuries in blunt trauma victims receiving a pan-CT scan at a level 1 trauma center. The primary outcome was injury needing immediate intervention. Secondary outcome was any injury. The posterior need for each scan was independently recorded by the emergency medicine and trauma surgery services before patients went to CT. A scan was unsupported if at least one of the physicians deemed it unnecessary.

Results: Between July 1, 2007, and December 26, 2007, 284 blunt trauma patients (average Injury Severity Score = 11) underwent a pan-CT after the survey form was completed. A total of 311 CT scans were judged to be unnecessary in 143 patients (27%), including scans of the head (62), neck (59), chest (116), and abdomen/pelvis (83). Of the 284 patients, 48 (17%) had injuries on 52 unsupported CT scans. As immediate intervention was required in 2 of the 48 patients (4%). Injuries that would have been missed included 2 of 62 unsupported head scans (3%), 2 of 59 neck scans (3%), 33 of 116 chest scans (28%), and 12 of 83 abdominal scans (14%). These missed

Advances in the technology of computed tomography (CT) have markedly altered the management of blunt trauma. The most dramatic example is the evolution of nonoperative management of solid organ injuries diagnosed by CT. CT angiography (CTA) has supplanted invasive diagnostic angiography, allowing rapid diagnosis of injuries, such as pelvic arterial bleeding requiring embolization and aortic transection requiring operative or stent repair. In addition, CT has improved the care of patients by rapidly characterizing multiple injuries so that priorities of management and timing of operations can be established with more precise information. Finally, the recognition that many injuries are initially occult has often required admission of patients for observation.¹⁻⁴ With the pressure for bed availability in most trauma centers, the liberal use of CT can rapidly identify or exclude occult injury to better select patients for inpatient observation or early discharge.⁵⁻¹¹ As a result, the use of CT in the evaluation of patients with blunt trauma has increased to the point that, in many centers, every trauma activation patient is evaluated with at least one CT.

Literatüre genel bakış

- Prospektif çalışma
- 284 travma olgusu çalışmaya dahil edilmiş

TABLE 1. Proportion of Unsupported CT Scans in 284 Patients With Blunt Trauma

	Emergency Medicine	Trauma Surgery
Head	23% (62/274)	1% (3/257)
Neck	18% (59/276)	0% (1/257)
Chest	42% (116/276)	3% (8/257)
Abdomen/pelvis	30% (83/276)	1% (3/257)
All scans	28% (311/1102)	1% (15/1028)

* Denominator varies because some scans were not completed for all 284 scans of each body part.

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Literatüre genel bakış

TABLE 2. Abnormal CT Scans by Indication

	Supported, N (%)				Unsupported, N (%) EM
	Signs of Injury		Risk of Injury		
	EM	TS	EM	TS	
Head	48/147 (33)	49/135 (36)	5/65 (8)	7/119 (6)	5/62 (8)
Neck	12/70 (17)	12/72 (17)	9/156 (6)	5/184 (3)	2/50 (4)
Chest	43/67 (64)	36/59 (61)	33/93 (35)	63/190 (33)	33/116 (28)
Abdomen/pelvis	35/76 (46)	35/67 (52)	36/117 (31)	44/187 (24)	12/83 (14)
Total	138/360 (38)	132/333 (40)	83/421 (19)	119/680 (18)	52/311 (17)

Gerekli olduğu düşünülmeyen BT incelemelerinde saptanan patolojik bulgular

TABLE 3. CT Findings

	Unupported CTs		All CTs, N = 284	
	N (Total)	%	N	%
Head				
Normal	57 (62)	92%	223	79%
Abnormal	5 (62)	8%	61	21%
Intracerebral hemorrhage or contusion	4	7%	23	9%
Intraventricular or subarachnoid hemorrhage	3	5%	37	13%
Extradural/subdural hematoma	0	0%	24	8%
Other	0	0%	23	7%
Total	7	10%	107	
Neck				
Normal	48 (50)	96%	261	92%
Abnormal	2 (50)	4%	23	8%
Transverse or spinous process fracture	3	6%	15	5%
Vertebral fracture	1	2%	8	3%
Subluxation	0	0%	2	1%
Other	0	0%	7	2%
Total	4	8%	32	

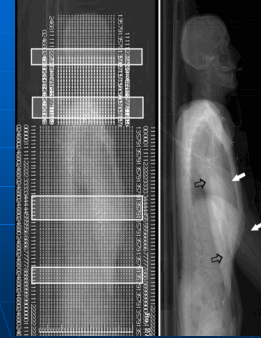
TABLE 3. CT Findings

	Unupported CTs		All CTs, N = 284	
	N (Total)	%	N	%
Chest				
Normal	83 (136)	72%	172	61%
Abnormal	33 (136)	28%	112	39%
Long-ossion or laceration	15	17%	52	19%
Rib fracture	14	12%	65	23%
Hemothorax, pneumothorax	7	6%	44	15%
Clavicle and scapula fracture	6	5%	21	7%
Spine fracture	5	4%	19	7%
Suspected aortic injury	0	0%	3	1%
Other	1	1%	21	7%
Total	48		228	
Abdomen/pelvis				
Normal	71 (83)	86%	198	70%
Abnormal	12 (83)	14%	86	30%
Splenic laceration	5	4%	27	10%
Liver laceration	2	2%	14	5%
Kidney injury	1	1%	10	4%
Possible of small bowel injury	1	1%	4	1%
Pelvic fractures	1	1%	30	11%
Spine fractures	1	1%	33	12%
Other	1	1%	17	6%
Total	12	15%	135	

Çalışma sonu/önerisi:

- Künt travmalı olgularda seçilmiş bölgelerin incelenmesi hasarlı bölgelerin tanımlanmasında eksikliklere neden olabilmektedir
- Negatif tüm vücut BT incelenmesi sonrası hastaların taburculuğu daha rahat olmaktadır

Radyasyon Maruziyeti



Plak T, et al Radiation Dose Is Reduced with a Single-Pass Whole-Body Multi-Detector Row CT Trauma Protocol Compared with a Conventional Segmented Method: Initial Experience. Radiology 2003; 229:902-905

Soru işaretleri:

- Hangi grup hastaya yapılacak
 - Travma skoru?
 - Stabil/unstabil
- Çekim tekniği nasıl olacak
- Radyasyon maruziyetine bağlı zararlı etkiler

Özet

- Travma merkezleri ve acil ünitelerinin uygun şekilde dizaynı ve cihaz alt yapısının sağlanması
- Doğru hasta seçimi
- İnceleme tekniği uygun olması (ör. Konstrat madde)
- Hızlı ve uygun değerlendirme (2 ve 3 boyutlu rekonstrüksiyonlar, gerekirse ikinci değerlendirmeler)