ÇOCUKLARDA KAFA TRAVMASI VE YÖNETİMİ

Doç. Dr. Murat AYAN
Tokat Gaziosmanpaşa Üniversitesi
Tıp Fakültesi
Acil Tıp AD

SUNUM PLANI

Tanım

Epidemiyoloji

Fizyopatoloji

Klinik

Algoritmalar

Özet

TANIM

Travmatik beyin yaralanması (TBY) :

Mekanik güçler sonucunda beyin fonksiyonlarında bozulma olarak tanımlanır.

2 yaş

2 yaş altı

İnfantlarda klinik değerlendirmenin büyük cocuklara gore daha zor oluşu,

intrakraniyal yaralanmalı infantların genellikle asemptomatik oluşu,

İnfantlardaki minör travmada bile kilinik olarak önemli TBY görülebilmesi

Otorlerin coğu bu yaş grubundaki kafa travmasının derecesini hastanın hikayesinden, künt travmanın skalp veya kafatasındaki fizik muayene bulguları ve hafif dokunma ve ses ile uyanıklık durumuna göre tanımlamışlar.

Pediatrics. 2001 May;107(5):983-93.
Evaluation and management of children younger than two years old with apparently minor head trauma: proposed guidelines.
Schutzman SA[1], Barnes P, Duhaime AC, Greenes D, Homer C, Jaffe D, Lewis RJ, Luerssen TG, Schunk J.

2 yaş üstü

Travmatik kafa yaralanması seviyesi daha çok Glaskow Koma Skoru'na (GKS) dayanır.

Ciddi kafa travması (GKS 8 ve

altında)

Orta kafa travması(GKS 9-13)

Hafif kafa travması (GKS 14-15)

Ann Emerg Med. 2001 Jan;37(1):65-74.
Pediatric minor head trauma.
Schutzman SA[1], Greenes DS.

Glasgow Coma Scale and Pediatric Glasgow Coma Scale

Sign	Glasgow Coma Scale[1]	Pediatric Glasgow Coma Scale[2]	Score
Eye opening	Spontaneous	Spontaneous	4
	To command	To sound	3
	To pain	To pain	2
	None	None	1
Verbal response	Oriented	Age-appropriate vocalization, smile, or orientation to sound, interacts (coos, babbles), follows objects	5
	Confused, disoriented	Cries, irritable	4
	Inappropriate words	Cries to pain	3
	Incomprehensible sounds	Moans to pain	2
	None	None	1
Motor response	Obeys commands	Spontaneous movements (obeys verbal command)	6
	Localizes pain	Withdraws to touch (localizes pain)	5
	Withdraws	Withdraws to pain	4
	Abnormal flexion to pain	Abnormal flexion to pain (decorticate posture)	3
	Abnormal extension to pain	Abnormal extension to pain (decerebrate posture)	2
	None	None	1
Best total score			**15**

Up To Date-2016

GKS

Ciddi kafa travması
(GKS 8 ve altında)

Orta kafa
travması**(GKS 9-13)**

Hafif kafa travması
(GKS 14-15)

TBY oranı % 20

TBY oranı % 5, % 1 'de ciddi TBY

Ciddi kafa travması
(GKS 8 ve altında)

orta kafa
traması**(GKS9-12)**

Hafif kafa travması
GKS ≥13 (13-15)

EPİDEMİYOLOJİ

Kafa travması çocuklardaki yaralanmaya bağlı ölümlerin en önemli nedenidir.

Yıllık ~ 500,000 acil başvuru

Yıllık ~ 37,000 hastane yatış

Yıllık ~ 2000 ölüm

Yıllık ~ 1 milyar $ maliyet

Küçük çocuklar daha riskli

Langlois JA, et al. Traumatic Brain Injury in the United States: Emergency Department Visits, Hospitalizations, and Deaths, Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, Atlanta 2004

Çocuklar yetişkinlerin küçültülmüş hali değildir

Çocuğun kafası vücut kitlesinin ve alanının göreceli olarak geniş olması

Boyun kemikleri tam gelişmediğinden kafa kemikleri bol ligaman yapılarla bağlıdır.

Beynin myelizasyonu tamamlanmamış olduğundan dolayı travma süresince oluşan makaslama kuvvetlerine hassastır

Kafatası kemikleri ince, fontaneller ve sütürler açık olduğundan intrakranial yapıları yeterince koruyamaz

Travma Mekanizması

İnfantlarda

düşme

Okul çağı

Düşme ve motorlu araç kazaları

Ergenlerde

Motorlu araç kazaları ve spor yaralanmalar

Fizyopatoloji

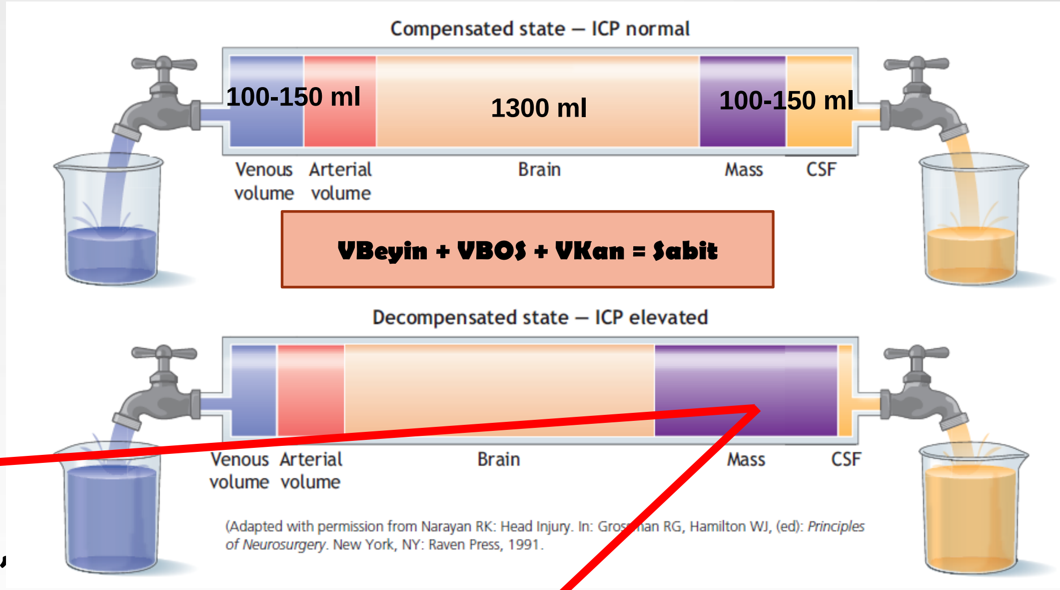
BİRİNCİL YARALANMA:

Travmanın direkt etkisine bağlı meydana gelen hasarlanmadır (kontuzyon, hematom vs)

İKİNCİL YARALANMA:

Kalsiyum ve iyon değişimleri, mitokondrial hasar, serbest radikallerin üretimi ve hücre ölümüne yol açan enzimatik aktivite)

Monro-Kellie Doctrine



(Adapted with permission from Narayan RK: Head Injury. In: Grossman RG, Hamilton WJ, (ed): *Principles of Neurosurgery*. New York, NY: Raven Press, 1991.

SPB: OAB-KİB (50-150 mmHg)

KİB: < 15
Çocuklarda 3-7 mmHg
YD:1.5-6 mmHg

KİLİNİK

Bilinç kaybı:

% 5 <2 yaş

% 13≥2 yaş

Skalp hematom;

TBY önemli bir göstergesi (>3 cm, nonfrontal yerleşim)

Kusma;

% 13 tek kusma episodu mevcut

Başağrısı;

% 46 kadar görülebilmekte

KİLİNİK

Nöbet: % ≤0.6

Kafatası kırığı; % 10

Pariyetal(%60-70)
Oksipital
Frontal
Temporal

ÖYKÜ

Ebeveyn ilgisinin bozulması
Nöbet, konfüzyon, bilinç kaybı
Şiddetli veya kötüleşen başağrısı
Kusma
Yüksek risk mekanizması
- 3- 5 feet'den yüksek düşme
- Motorlu trafik kazaları
- Penetran yaralanmalar

İntrakranial hemorajiyi artıracak medikal hastalıklar(hemofili , AVM vs)

FİZİK MUAYENE

Skalp

- hematom
- hassasiyet
- depresyon

Ön fontanellerde şişkinlik

Anormal mental durum

Fokal nörolojik anomallikler

FİZİK MUAYENE

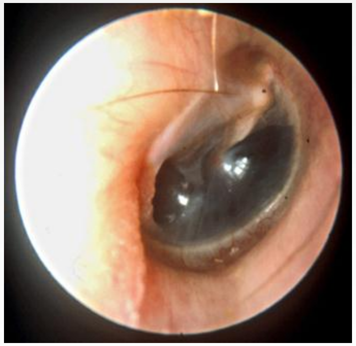
Baziller kafatası kırığı bulguları

otorrhea,

rhinorrhea

battle's sign (mastoid ecchymosis)

hemotympanum



raccoon eyes (periorbital hematomas)

KİLİNİK SINIFLAMA

YÜKSEK RİSK	ORTA RİSK	DÜŞÜK RİSK
Fokal nörolojik muayene Değişmiş mental durum 3 aydan küçük infantlar Antikoagülan kullanan hasta Kafatası kırık bulguları; rhinorrhea otorrhea, Battle's sign, hemotympanum, raccoon eyes	Nöbet Bilinç kaybı Bulantı Kusma 2 yaşından küçük infant 1 yaş altı infantlarda non frontal skalp hematomu Dirençli baş ağrısı Belirgin travma(motorlu araç kazaları yüksekten düşme >0.9- 1.5 m	bilinç kaybı, amnezi, kusma, yaygın baş ağrısı olmayan hastalar

Orta=% 15 hasta
ciddi=% 10 hasta
GKS: 3- 13

Tomografi

A,B,C

Entübasyon

Operasyon

Yoğun bakım

Minör = %75
GKS:14-15

Tomografi ???

Taburcu ???

Gözlem ???

Yatış ???

Beyin Cerrahi ???

Tanı- görüntüleme

Kraniyografiler

Beyin tomografisi (Gold Standart)

Magnetic Resonance Imaging (MRI)

Minör Kafa Travmalarında Kraniyografi

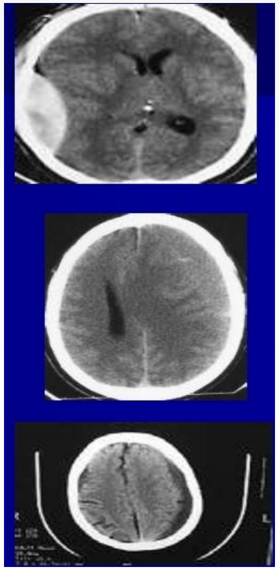
Düz kraniyografilerin minör kafa travmalarındaki injuri tespitindeki rolü kısıtlıdır.

Kraniyal kırıkların yarıdan fazlası düz kraniyografilerde tespit edilemiyor

Kırığı olan hastaların bir kısmında intrakraniyal bir patoloji tespit edilemezken, İntrakraniyal patolojisi olan olgularda kraniyal kırık saptanmamıştır

Minör kafa travmasında tomografinin kullanımı

Akut beyin hasarı tanısında en önemli tetkik..



Tomografide radyasyon riski

Tek seferde kranial BT malignensi riski;

1 yaşından küçük infantlarda 1:1500

10 yaşında; 1:5000

Brenner D,, **et al.** AJR Am J Roentgenol. 2001;176(2):289

Eşit dozda iyonize radyasyon maruziyetinde çocuklarda malignensi gelişme oranı erişkinlerden 10-15 kat fazla

Hall EJ, et al. ***Pediatric Radiol*** . 2009; 57-64

Tomografi kar zarar oranı

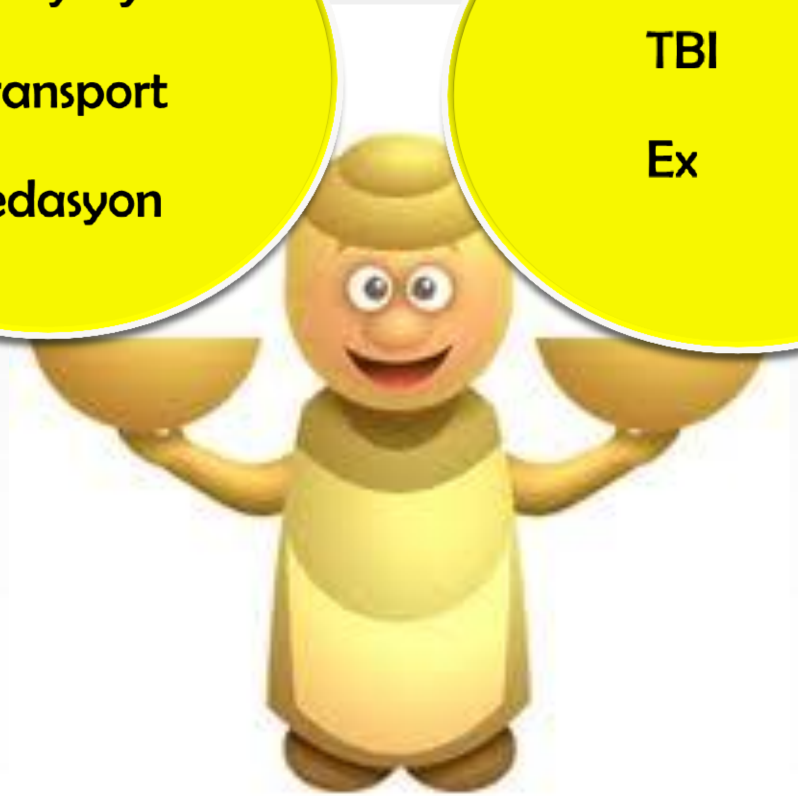
Radyasyon

Transport

Sedasyon

TBI

Ex



Minör kafa travmasında tomografinin kullanımı

Tomografi kullanımı son 20 yılda;

ABD de 20 kat

İngilterede 12 kat artmış

Türkiye'de ???

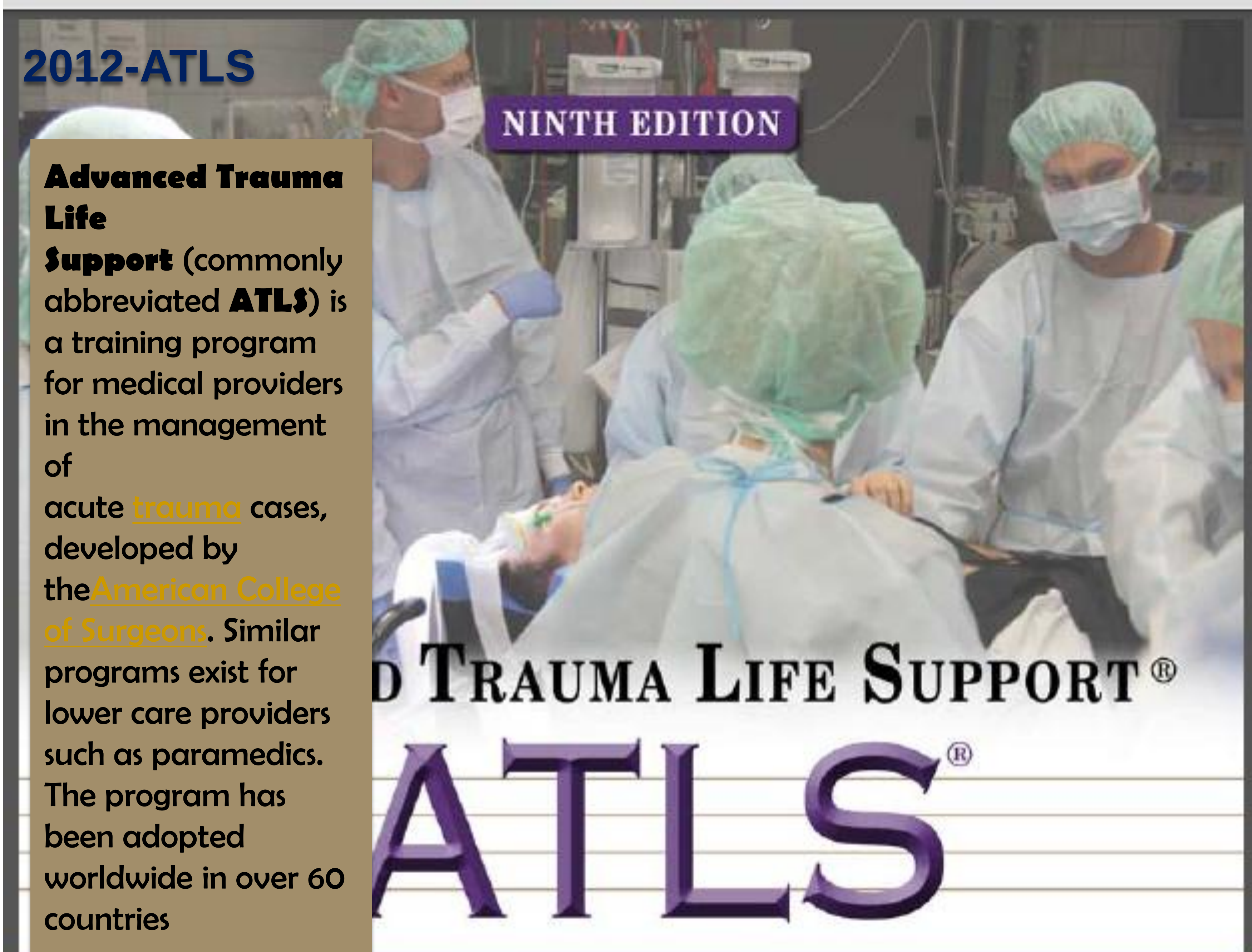
Hangi hastalarda Tomografi çekelim!!!!

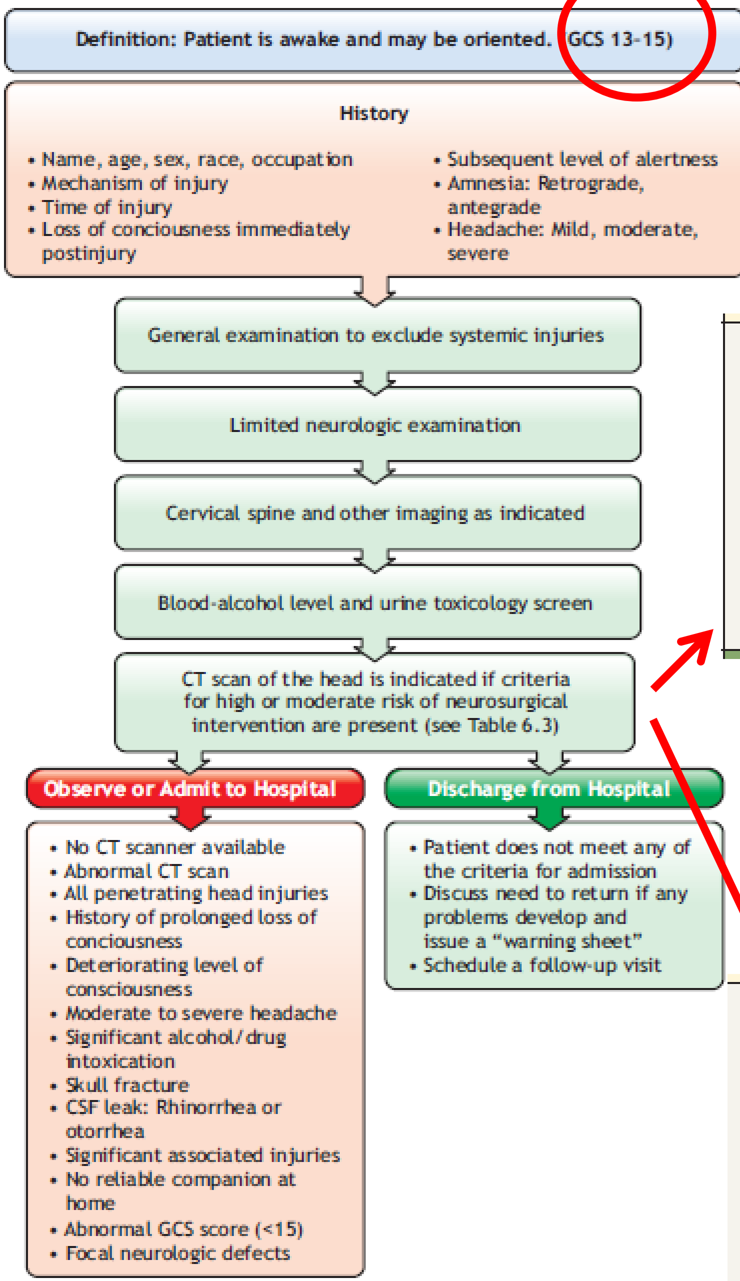
Minör kafa travmalı çocuklarda BT kullanımı açısından güncel olarak

geniş oranda kabul görmüş, kanıta dayalı kurallar mevcut değildir

2012-ATLS

Advanced Trauma Life Support (commonly abbreviated **ATLS**) is a training program for medical providers in the management of acute trauma cases, developed by the American College of Surgeons. Similar programs exist for lower care providers such as paramedics. The program has been adopted worldwide in over 60 countries





■ FIGURE 6-8 Algorithm for Management of Minor Brain Injury.

High risk for neurosurgical intervention

- GCS score less than 15 at 2 hours after injury
- Suspected open or depressed skull fracture
- Any sign of basilar skull fracture (e.g., hemotympanum, raccoon eyes, CSF otorrhea or rhinorrhea, Battle's sign)
- Vomiting (more than two episodes)
- Age more than 65 years

Moderate risk for brain injury on CT

- Loss of consciousness (more than 5 minutes)
- Amnesia before impact (more than 30 minutes)
- Dangerous mechanism (e.g., pedestrian struck by motor vehicle, occupant ejected from motor vehicle, fall from height more than 3 feet or five stairs)

Adapted from Stiell IG, Wells GA, Vandemheen K, et al. The Canadian CT Head Rule for patients with minor head injury. *Lancet* 2001;357;1294.

Hangi hastalarda Tomografi çekelim

- Kanada BT Kuralları
- New Orleans Kriterleri
- NEXUS-II kriterleri
- PECARN
- CATCH
- CHALICE

PECARN

Pediatric Emergency Care Applied Research Network

Identification of children at very low risk of clinically-important brain injuries after head trauma: a prospective cohort study

*Nathan Kuppermann, James F Holmes, Peter S Dayan, John D Hoyle, Jr, Shireen M Atabaki, Richard Holubkov, Frances M Nadel, David Monroe, Rachel M Stanley, Dominic A Borgialli, Mohamed K Badawy, Jeff E Schunk, Kimberly S Quayle, Prashant Mahajan, Richard Lichenstein, Kathleen A Lillis, Michael G Tunik, Elizabeth S Jacobs, James M Callahan, Marc H Gorelick, Todd F Glass, Lois K Lee, Michael C Bachman, Arthur Cooper, Elizabeth C Powell, Michael J Gerardi, Kraig A Melville, J Paul Muizelaar, David H Wisner, Sally Jo Zuspan, J Michael Dean, Sandra L Wootton-Gorges, for the Pediatric Emergency Care Applied Research Network (PECARN)**

Lancet 2009; 374: 1160–70

Published Online September 15, 2009
http://dx.doi.org/10.1016/S0140-6736(09)61558-0

This online publication has been corrected. The corrected version first appeared at thelancet.com on January 24, 2014

See Comment page 1127

*Members listed at end of paper

Departments of Emergency Medicine (Prof N Kuppermann MD, Prof J F Holmes MD), Pediatrics (Prof N Kuppermann), Neurological Surgery (Prof J P Muizelaar MD), Surgery (Prof D H Wisner MD), and Radiology (Prof S L Wootton-Gorges MD), University of California, Davis School of Medicine, Davis, CA, USA; Department of Pediatrics, Columbia University College of Physicians and Surgeons, New York, NY, USA (P S Dayan MD); Division of Emergency Medicine, Michigan State University School of Medicine/Helen DeVos Children's Hosp, Grand Rapids

Summary

Background CT imaging of head-injured children has risks of radiation-induced malignancy. Our aim was to identify children at very low risk of clinically-important traumatic brain injuries (ciTBI) for whom CT might be unnecessary.

Methods We enrolled patients younger than 18 years presenting within 24 h of head trauma with Glasgow Coma Scale scores of 14–15 in 25 North American emergency departments. We derived and validated age-specific prediction rules for ciTBI (death from traumatic brain injury, neurosurgery, intubation >24 h, or hospital admission ≥2 nights).

Findings We enrolled and analysed 42 412 children (derivation and validation populations: 8502 and 2216 younger than 2 years, and 25 283 and 6411 aged 2 years and older). We obtained CT scans on 14 969 (35·3%); ciTBIs occurred in 376 (0·9%), and 60 (0·1%) underwent neurosurgery. In the validation population, the prediction rule for children younger than 2 years (normal mental status, no scalp haematoma except frontal, no loss of consciousness or loss of consciousness for less than 5 s, non-severe injury mechanism, no palpable skull fracture, and acting normally according to the parents) had a negative predictive value for ciTBI of 1175/1175 (100·0%, 95% CI 99·7–100·0) and sensitivity of 25/25 (100%, 86·3–100·0). 167 (24·1%) of 694 CT-imaged patients younger than 2 years were in this low-risk group. The prediction rule for children aged 2 years and older (normal mental status, no loss of consciousness, no vomiting, non-severe injury mechanism, no signs of basilar skull fracture, and no severe headache) had a negative predictive value of 3696/3698 (99·95%, 99·80–99·99) and sensitivity of 61/63 (96·8%, 89·0–99·6). 438 (19·7%) of 2223 CT-imaged patients aged 2 years and older were in this low-risk group. Neither rule missed neurosurgery in validation populations.

Interpretation These validated prediction rules identified children at very low risk of ciTBIs for whom CT can routinely be obviated.

Funding The Emergency Medical Services for Children Programme of the Maternal and Child Health Bureau, and the Maternal and Child Health Bureau Research Programme, Health Resources and Services Administration, US Department of Health and Human Services.

Lancet 2009; 374: 1160–70

PECARN

Pediatric **E**mergency **C**are **A**pplied **R**esearch **N**etwork

25 merkezde yürütülen prospektif kohort çalışması-**42 212 hasta**

2004 Haziran-2006 Eylül (2004 haziran-2006 mart, 2006 mart – 2006 eylül)

Amaç: TBI açısından düşük riskli olan minör kafa travmalı hastalarda tomografinin gerekliliği

Çalışmaya alınma kriterleri; 18 yaş altı, < 24 saat içerisinde başvuran, künt kafa travmalı, GKS 14-15,

PECARN Sonlanım değişkenleri

Ciddi TBI

TBI bağlı ölüm
Cerrahi müdahale
Endotrakeal entübasyon ≥ 24 saat
Hospitalizasyon ≥ 2 gece
Tomografide TBI ile ilgili çoksayıda bulgu

Tomografide TBI

- İntrakranial hematom, hemoraji, kontüzyon, ödem
- Pnömosefali
- Deprese kafatası fraktürü

PECARN

14 969 (35.3%) hastada tomografi görüntülemesi

Sonuç:

780 (%5.2) hastada tomografide travmatik beyin hasarı görüntülenmiş

Çalışmaya alınan 42 412 hastanın 376 (%0.9) ‘sında klinik olarak önemli beyin hasarı gözlenmiş,

Klinik olarak önemli beyin hasarı bulunan 376 hastanın 60 (%15.9) ‘ına cerrahi müdahale yapılmış

Tomografi Karar Kuralları
Pediatric Emergency Care Applied Research Network(PECARN)

2 yaş altında	2 yaş üstü
GKS=14 yada mental durum değişikliği	GKS=14 yada mental durum değişikliğ
Temporal/parietal/oksipital skalp hematomu	Kafa kaide fraktürünün klinik belirtileri
Geçici bilinç kaybı > 5 sn	Kusma
Şiddetli travma	Şiddetli travma
Palpabl yada şüpheli kafatası fraktürü	Geçici bilinç kaybı
Ailesine göre normal olmayan hareketler	Şiddetli başağrısı

Şu klinik önemli belirteçlerden herhangibirinin olmaması durumunda çok düşük riskli kafa travmasından bahsedilir.

PECARN

Şiddetli Travma

Motorlu araç kazası sonrasında
- Hastanın fırlaması
- Ölümlü kaza
- Takla atma

2 yaş altında 3 feet (90 cm), 2 yaş üstünde 5 feetden (150 cm) fazla yükseklikten düşme
Kasksız bisiklet yada motosiklet kazaları
Yüksek hızlı objelerin kafaya çarpması

Hafif Travma

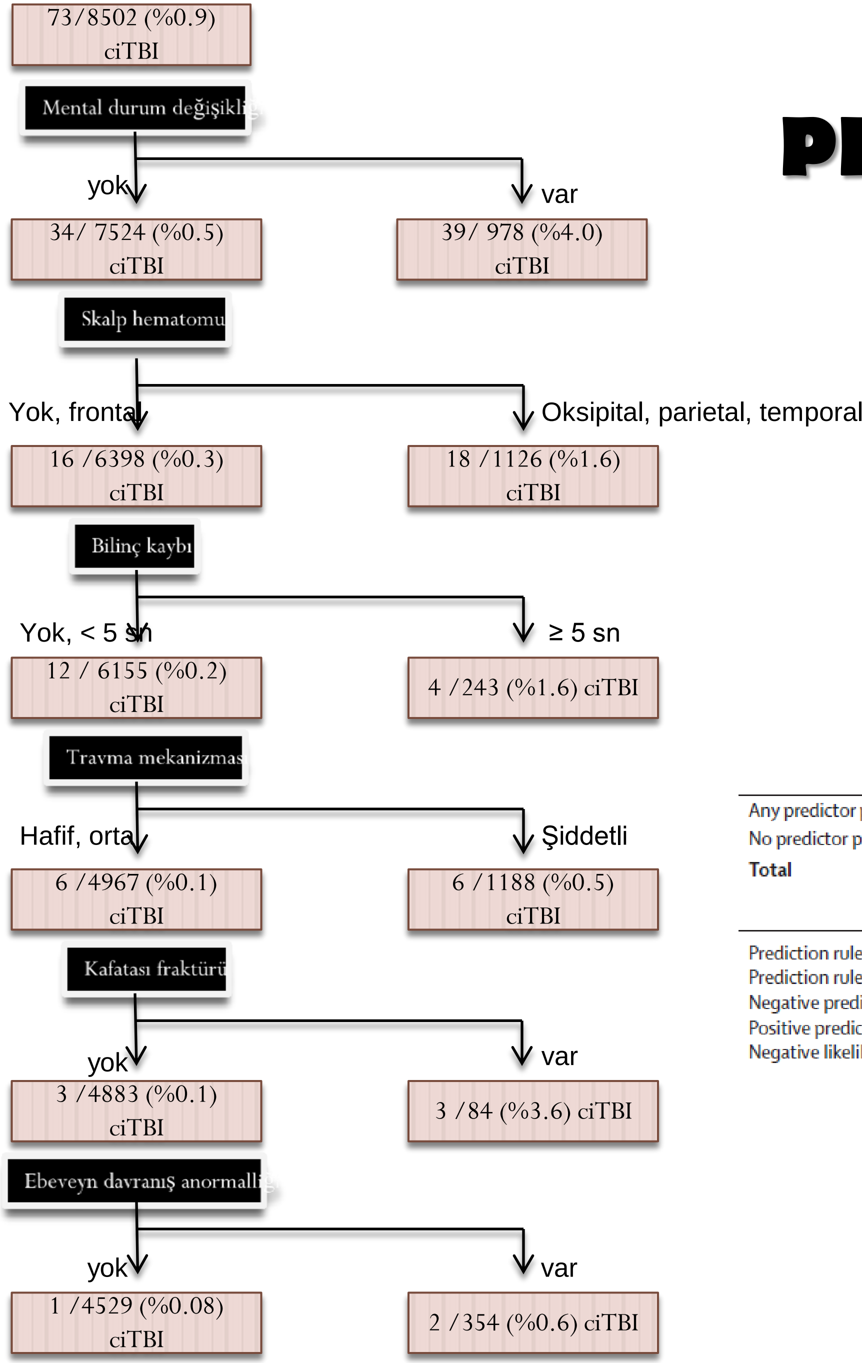
Yer seviyesi hizasında düşme

Duran sabit nesnelere çarpma

Orta Travma

Bunların dışında herhangi bir mekanizmayla oluşan travma

PECARN < 2 yaş



	Derivation			Validation		
	ciTBI	No ciTBI	Total	ciTBI	No ciTBI	Total
Any predictor present	72	3903	3975	25	1016	1041
No predictor present	1	4526	4527	0	1175	1175
Total	**73**	**8429**	**8502**	**25**	**2191**	**2216**

	Derivation	Validation
Prediction rule sensitivity (95% CI)	98·6% (92·6–99·97)	100·00% (86·3–100·00)
Prediction rule specificity (95% CI)	53·7% (52·6–54·8)	53·6% (51·5–55·7)
Negative predictive value (95% CI)	99·9% (99·88–99·999)	100·00% (99·7–100·00)
Positive predictive value (95% CI)	1·8% (1·4–2·3)	2·4% (1·6–3·5)
Negative likelihood ratio (95% CI)	0·03 (0·001–0·14)	0·0 (0–0·26)

Tomografi Karar Kuralları
PECARN < 2 Yaş

GKS=14 yada mental durum değişikliği

yada palpabl kafatası fraktürü

Popülasyonun %13,9 u
ciTBI riski %4.4

BT çek

Oksipital, paryetal, temporal skalpte hematom,

Anamnezde ≥ 5 sn bilinç kaybı

Travma mekanizmasının şiddetli olması

Ebeveyn davranış anormalliği

Popülasyonun
%32.6 sı
ciTBI riski %0.9

Şu değerlendirmeler ışığında tomografi gerekebilir:

Hekimin deneyimi

Acil servisteki takipte semptom ve belirtilerde kötüleşme

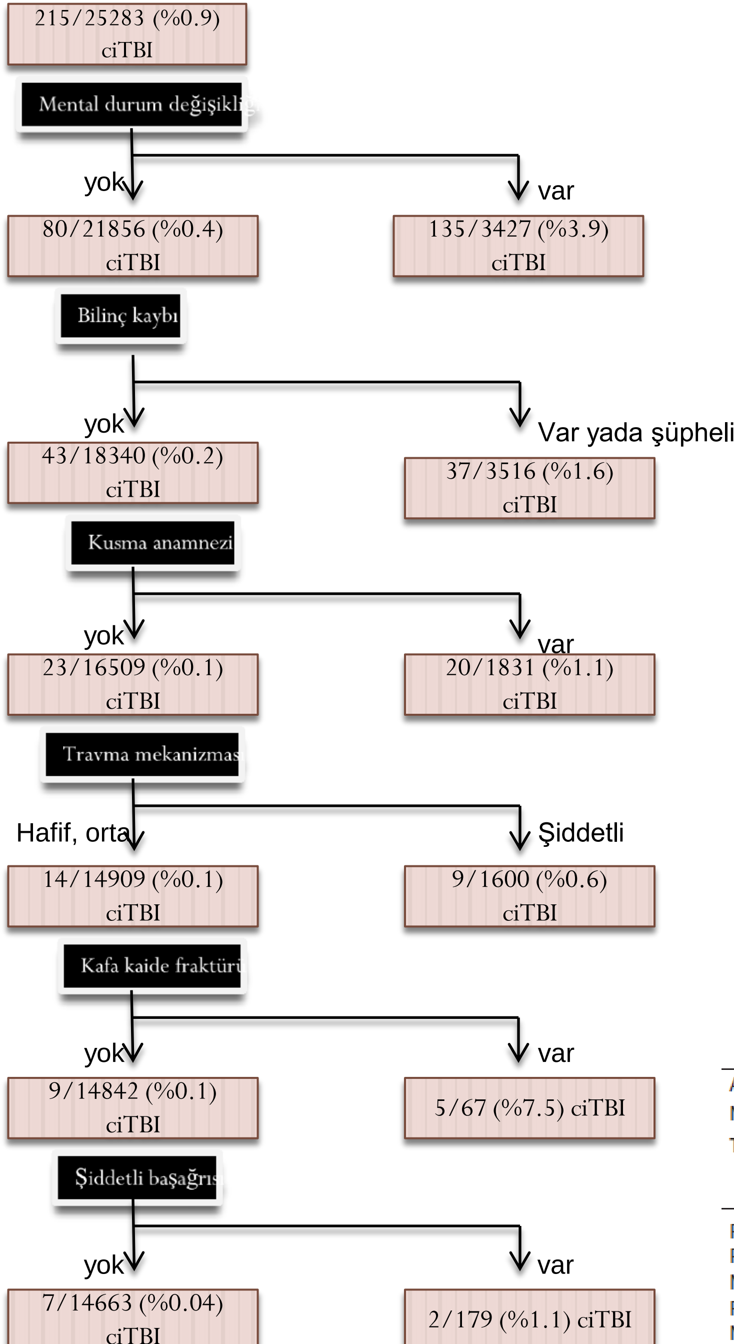
Ebeveynin yönlendirmesi

Yaş < 3ay olması

Popülasyonun %53.5 i
ciTBI riski < %0.02

BT önerilmez

PECARN ≥ 2 yaş



	Derivation			Validation		
	ciTBI	No ciTBI	Total	ciTBI	No ciTBI	Total
Any predictor present	208	10635	10843	61	2652	2713
No predictor present	7	14433	14440	2	3696	3698
Total	**215**	**25068**	**25283**	**63**	**6348**	**6411**

	Derivation	Validation
Prediction rule sensitivity (95% CI)	96·7% (93·4–98·7)	96·8% (89·0–99·6)
Prediction rule specificity (95% CI)	57·6% (57·0–58·2)	58·2% (57·0–59·4)
Negative predictive value (95% CI)	99·95% (99·9–99·98)	99·95% (99·80–99·99)
Positive predictive value (95% CI)	1·9% (1·7–2·2)	2·2% (1·7–2·9)
Negative likelihood ratio (95% CI)	0·06 (0·03–0·12)	0·05 (0·01–0·19)

Tomografi Karar Kuralları
PECARN 2 yaş üstü

GKS=14 yada mental durum değişikliği yada kafa kaide fraktürü belirtileri

Var → **BT çek**

Popülasyonun %14 u
ciTBI riski %4.3

Yok

Anamnezde geçici bilinç kaybı
Kusma
Travma mekanizmasının şiddetli olması
Şiddetli başağrısı

Var →

Şu değerlendirmeler ışığında tomografi gerekebilir:

Hekimin deneyimi

Acil servisteki takipte semptom ve belirtilerde kötüleşme

Ebeveynin yönlendirmesi

Popülasyonun %27.7 sı
ciTBI riski %0.9

Yok

Popülasyonun %58.3 i
ciTBI riski <0.05

BT önerilmez

PECARN

< 2 yaş	2-18 yaş
Sensitivite %100	Sensitivite %96.8
Spesifite %53.6	Spesifite %58.2
NPV %100	**NPV %99.95**
PPV %2.4	PPV %2.2

Canadian **A**ssessment of **T**omography for **C**hildhood **H**ead injury
CATCH

CMAJ RESEARCH

CATCH: a clinical decision rule for the use of computed tomography in children with minor head injury

Martin H. Osmond MD CM, Terry P. Klassen MD, George A. Wells PhD, Rhonda Correll RN, Anna Jarvis MD, Gary Joubert MD, Benoit Bailey MD, Laurel Chauvin-Kimoff MD CM, Martin Pusic MD, Don McConnell MD, Cheri Nijssen-Jordan MD, Norm Silver MD, Brett Taylor MD, Ian G. Stiell MD; for the Pediatric Emergency Research Canada (PERC) Head Injury Study Group

Previously published at www.cmaj.ca

CMAJ 2010;182:341-48.

CATCH

10 merkezde yürütülen çok merkezli prospektif kohort çalışma...
Temmuz 2001- Kasım 2005 arası- 3866 hasta

Amaç: TBI açısından yüksek riskli olan minör kafa travmalı hastaların belirlenmesi

Çalışmaya alınan hasta grubu:24 saat içerisinde başvuran akut kafa travmalı
GKS 13-15
0-16 yaş arası

CATCH

Çalışma popülasyonu; 17 yaş altı kafa travma hastaları ve aşağıdaki kriterlerin mevcudiyeti;

- GKS 13-15
- Geçici bilinç kaybı
- Amnezi
- Oryantasyon bozukluğu
- İki yada daha fazla epizodda (en az 15 dk ara) kusma
- İritabilite (2 yaş ve altında)

CATCH

Table 1: Characteristics of 3866 children with head injury

Characteristic	No. (%) of patients*
Age, yr	
Median (range)	10 (0–16)
Interquartile range	5–14
Sex, male	2505 (64.8)
Time from injury to assessment by physician, h, mean (SD)	4.5 (4.3)
Arrived by ambulance	1476 (38.2)
Transfer from another hospital	665 (17.2)
Loss of consciousness (witnessed)	1267 (32.8)
Disorientation or confusion (witnessed)	2080 (53.8)
Amnesia (*n* = 2956)	1730 (58.5)
Repeated vomiting (≥ 2 episodes)	1582 (40.9)
Initial score on Glasgow Coma Scale	
15	3489 (90.2)
14	282 (7.3)
13	95 (2.5)
Mechanism of injury	
Fall	1737 (44.9)
Sports	872 (22.6)
Head struck or hit by object	447 (11.6)
Bicycle-related	334 (8.6)
Pedestrian struck	139 (3.6)
Motor vehicle collision	131 (3.4)
Assault	102 (2.6)
Motorized recreational vehicle	83 (2.1)
Other	21 (0.5)

Note: SD = standard deviation.
*Unless otherwise indicated.

Table 2: Management and outcomes for the 3866 patients

Management or outcome	No. (%) of patients*
CT of head performed	2043 (52.8)
Cases with follow-up by telephone†	3122 (80.8)
Skull radiography performed	182 (4.7)
Skull fracture	
Linear	167 (4.3)
Basal	25 (0.6)
Acute brain lesion‡	159 (4.1)
Epidural hematoma	55 (1.4)
Cerebral contusion	41 (1.1)
Pneumocephalus	38 (1.0)
Subdural hematoma	32 (0.8)
Depressed skull fracture	28 (0.7)
Subarachnoid hemorrhage	19 (0.5)
Intracerebral hematoma	10 (0.3)
Diffuse cerebral edema	6 (0.2)
Extra-axial hematoma (undifferentiated)	6 (0.2)
Cerebellar hematoma	3 (0.1)
Intraventricular hemorrhage	1 (0.03)
Neurologic intervention§	24 (0.6)
Craniotomy	20 (0.5)
Intubation for head injury	6 (0.2)
Elevation of skull fracture	2 (0.1)
Death secondary to head injury	0

Note: CT = computed tomography.
*Unless otherwise indicated.
†Some of these patients also underwent CT of the head.
‡Some patients had more than one lesion.
§Some patients had more than one intervention.

CATCH

YÜKSEK RİSK FAKTÖRLERİ

Yaralanma sonrası 2 saatte GKS<15 altında oluşu

Şüpheli veya açık kafatası kırığı

Şiddeti giderek artan baş ağrısı

Muayenede irritabilite

ORTA RİSK FAKTÖRLERİ

Geniş skalp hematomu

Kafa kaide fraktürü klinik

- hemotimpaniyum
- raccon eyes
- otorrhea
- rhinorrehea
- battle's sign

Şiddetli travma mekanizması

- 1 metre yüksekten ya da
- 5 basamak merdivenden düşme
- Kasksız motosiklet-bisiklet kazaları
- Motorlu taşıt kazaları

Cerrahi müdahale göstergesi olarak;
Sensitivite %100 (%95 Cl: 86,2-100),
Spesifite %70.2 (%95 Cl: 68.8–71.6

TBI göstergesi olarak;
Sensitivite %98.1 (%95 Cl: 94.6–99.4)
Spesifite %50.1 (%95 Cl: 48.5–51.7)

Children's **H**ead Injury **Al**gorithm for the Prediction Of **I**mportant **C**linical **E**vents

CHALICE

Derivation of the children's head injury algorithm for the prediction of important clinical events decision rule for head injury in children

J Dunning, J Patrick Daly, J-P Lomas, F Lecky, J Batchelor, K Mackway-Jones, on behalf of the children's head injury algorithm for the prediction of important clinical events (CHALICE) study group

Arch Dis Child 2006;**91**:885–891. doi: 10.1136/adc.2005.083980

Background: A quarter of all patients presenting to emergency departments are children. Although there are several large, well-conducted studies on adults enabling accurate selection of patients with head injury at high risk for computed tomography scanning, no such study has derived a rule for children.
Aim: To conduct a prospective multicentre diagnostic cohort study to provide a rule for selection of high-risk children with head injury for computed tomography scanning.
Design: All children presenting to the emergency departments of 10 hospitals in the northwest of England with any severity of head injury were recruited. A tailor-made proforma was used to collect data on around 40 clinical variables for each child. These variables were defined from a literature review, and a pilot study was conducted before the children's head injury algorithm for the prediction of important clinical events (CHALICE) study. All children who had a clinically significant head injury (death, need for neurosurgical intervention or abnormality on a computed tomography scan) were identified. Recursive partitioning was used to create a highly sensitive rule for the prediction of significant intracranial pathology.
Results: 22 772 children were recruited over 2 ½ years. 65% of these were boys and 56% were <5 years old. 281 children showed an abnormality on the computed tomography scan, 137 had a neurosurgical operation and 15 died. The CHALICE rule was derived with a sensitivity of 98% (95% confidence interval (CI) 96% to 100%) and a specificity of 87% (95% CI 86% to 87%) for the prediction of clinically significant head injury, and requires a computed tomography scan rate of 14%.
Conclusion: A highly sensitive clinical decision rule is derived for the identification of children who should undergo computed tomography scanning after head injury. This rule has the potential to improve and standardise the care of children presenting with head injuries. Validation of this rule in new cohorts of patients should now be undertaken.

See end of article for authors' affiliations

Correspondence to: J Dunning, Emergency Medicine Research Group, Emergency Department, Manchester Royal Infirmary, Oxford Road, Manchester M13 9WL, UK; joeldunning@doctors.org.uk

Accepted 12 June 2006

CHALICE

10 merkezde yürütülen çalışma...

2000 Şubat-2002 Ağustos

22772 hasta poulasyonlu prospektif bir kohort çalışması

Amaç: TBI açısından yüksek riskli olan kafa travma hastaların belirlenmesi

Çalışma popülasyonu; 16 yaş altı tüm kafa travmalı

CHALICE

Table 1 Demographics of the children's head injury algorithm for the prediction of important clinical events study (n = 22 772)

Clinical variable	Patients n (%)
Age*	
0–6 months	852 (3.7)
6 months–1 year	1600 (7.0)
1–2 years	3777 (16.6)
2–5 years	6492 (28.5)
5–11 years	6577 (28.9)
11–16 years	3340 (14.7)
Sex†	
Male:female	14767 (64.8):7941 (34.9)
LOC	
Any LOC	1185 (5.2)
LOC >1 min	524 (2.3)
LOC >5 min	213 (0.9)
Amnesia	
Any amnesia	720 (3.2)
Amnesia 1 min	488 (2.1)
Amnesia >5 min	288 (1.3)
Vomiting	
≥1	2498 (11)
≥2	1418 (6.2)
≥3	857 (3.8)
Headache	
Any headache	4783 (21)
Severe headache	95 (0.4)
GCS	
15	21996 (96.6)
14	229 (1.0)
13	73 (0.3)
<13	193 (0.9)
Doctor unable to determine GCS	281 (1.2)

GCS, Glasgow Coma Score; LOC, loss of consciousness.
*134 (0.6%) patients had undocumented category.
†64 (0.3%) patients had undocumented category.

CHALICE

Anemnez

5 dk.dan uzun süren bilinç kaybı tanıklığı

5 dk.dan uzun süren amnezi

Anormal uyku hali

Kafa travması sonrası 3 kereden fazla kusma

Kaza dışı yaralanma şüphesi.

Nöbet geçmişi olmayan hastada kafa travması sonrası nöbet

Mekanizma

- Yüksek hızda trafik kazaları ya da 40 km/h'den daha hızlı bisikletçi kazaları
- 3 metreden daha yüksek olan düşmeler
- Bir mermi ya da yüksek hızlı nesneden yaralanma

Muayene

GKS<14 ya da 1 yaştan küçük olanda GKS<15

Penetran kafatası yaralanması veya gergin fontanel

Kafatabanı kırığına dair işaretler

Fokal nörolojik defisit varlığı

Sıyrık, şişme ve laserasyonun > 5cm olması (1 yaş altında)

Anamnez.....

Muayene.....

Mekanizma .....

Kriterlerden herhangi bir tanesinin olması tomografi endikasyonudur.

CHALICE

Table 4 Clinical utility of the children's head injury algorithm for the prediction of important clinical events rule

	No clinically significant head injury	Clinically significant head injury	Total
CHALICE negative	19 558	4	19 562
CHALICE positive	2 933	277	3 210
Total	22 491	281	22 772
Sensitivity	98.6%	(96.4% to 99.6%)	
Specificity	86.9%	(86.5% to 87.4%)	
Positive predictive value	8.63%	(7.68% to 9.65%)	
Negative predictive value	99.9%	(99.9% to 100%)	
CT ordering rate	14.1%	(13.6% to 14.6%)	

Performance of CHALICE rule for patients with GCS 13–15

	No significant intracranial pathology	Significant intracranial pathology	Total
CHALICE negative	19 558	4	19 562
CHALICE positive	2 853	164	3 017
Total	22 411	168	22 579
Sensitivity	97.6%	(94.0% to 99.4%)	
Specificity	87.3%	(86.8% to 87.7%)	
Positive predictive value	5.44%	(4.65% to 6.31%)	
Negative predictive value	99.9%	(99.9% to 100%)	
CT ordering rate	13.3%	(12.9% to 13.8%)	

Performance of CHALICE rule for prediction of neurosurgical intervention

	No neurosurgical intervention	Neurosurgical intervention	Total
CHALICE negative	19 559	3	19 562
CHALICE positive	3 076	134	3 210
Total	22 635	137	22 772
Sensitivity	97.8%	(93.7% to 99.6%)	
Specificity	86.4%	(86.0% to 86.9%)	

CHALICE, children's head injury algorithm for the prediction of important clinical events; CT, computed tomography; GCS, Glasgow Coma Score.
Values in parentheses are 95% CI.

Comparison of PECARN, CATCH, and CHALICE Rules for Children With Minor Head Injury: A Prospective Cohort Study

Joshua S. Easter, MD, MSc*; Katherine Bakes, MD; Jasmeet Dhaliwal, MD, MPH; Michael Miller, MD; Emily Caruso, MSPH; Jason S. Haukoos, MD, MSc

*Corresponding Author. E-mail: joshua_easter@bshsi.org.

Study objective: We evaluate the diagnostic accuracy of clinical decision rules and physician judgment for identifying clinically important traumatic brain injuries in children with minor head injuries presenting to the emergency department.

Methods: We prospectively enrolled children younger than 18 years and with minor head injury (Glasgow Coma Scale score 13 to 15), presenting within 24 hours of their injuries. We assessed the ability of 3 clinical decision rules (Canadian Assessment of Tomography for Childhood Head Injury [CATCH], Children's Head Injury Algorithm for the Prediction of Important Clinical Events [CHALICE], and Pediatric Emergency Care Applied Research Network [PECARN]) and 2 measures of physician judgment (estimated of <1% risk of traumatic brain injury and actual computed tomography ordering practice) to predict clinically important traumatic brain injury, as defined by death from traumatic brain injury, need for neurosurgery, intubation greater than 24 hours for traumatic brain injury, or hospital admission greater than 2 nights for traumatic brain injury.

Results: Among the 1,009 children, 21 (2%; 95% confidence interval [CI] 1% to 3%) had clinically important traumatic brain injuries. Only physician practice and PECARN identified all clinically important traumatic brain injuries, with ranked sensitivities as follows: physician practice and PECARN each 100% (95% CI 84% to 100%), physician estimates 95% (95% CI 76% to 100%), CATCH 91% (95% CI 70% to 99%), and CHALICE 84% (95% CI 60% to 97%). Ranked specificities were as follows: CHALICE 85% (95% CI 82% to 87%), physician estimates 68% (95% CI 65% to 71%), PECARN 62% (95% CI 59% to 66%), physician practice 50% (95% CI 47% to 53%), and CATCH 44% (95% CI 41% to 47%).

Conclusion: Of the 5 modalities studied, only physician practice and PECARN identified all clinically important traumatic brain injuries, with PECARN being slightly more specific. CHALICE was incompletely sensitive but the most specific of all rules. CATCH was incompletely sensitive and had the poorest specificity of all modalities. [Ann Emerg Med. 2014;64:145-152.]

Please see page 146 for the Editor's Capsule Summary of this article.

A **feedback** survey is available with each research article published on the Web at www.annemergmed.com.
A **podcast** for this article is available at www.annemergmed.com.

0196-0644/$-see front matter
Copyright © 2014 by the American College of Emergency Physicians.
http://dx.doi.org/10.1016/j.annemergmed.2014.01.030

Ann Emerg Med. 2014 Aug;64(2):145-52, 152.e1-5.

PEDIATRICS/ORIGINAL RESEARCH

Comparison of PECARN, CATCH, and CHALICE Rules for Children With Minor Head Injury: A Prospective Cohort Study

Joshua S. Easter, MD, MSc*; Katherine Bakes, MD; Jasmeet Dhaliwal, MD, MPH; Michael Miller, MD; Emily Caruso, MSPH; Jason S. Haukoos, MD, MSc

Amacı; PECARN, CATCH ve CHALICE yöntemlerini ve 3 uygulamayı hekim değerlendirmesiyle karşılaştırmak için yapılan bir çalışmadır

Yöntem;

Prospektif-15 Ocak 2012-15 Haziran 2013

18 yaşından küçük,

minör baş travması (Glasgow Koma Ölçeği skoru 13-15)

yaralanmadan sonra 24 saat içinde başvuran

Künt kafa travmalı çocuklar

Minör kafa travması olan çocuklarda BT istenmesinde karar verme yöntemleri

Değişkenler	PECARN (<2 yıl)	PECARN (≥2 yıl)	CHALICE	CATCH
Öykü				
Bilinç kaybı	≥5 sn	Herhangi	>5 dk	
Kusma		Herhangi	≥3 epizot	
Baş ağrısı		Şiddetli		Kötüleşen
Ebeveyne anormal davranma	Herhangi			
Amnezi			>5 dk	
Nöbet			Herhangi	
Kaza dışı travma endişesi			Herhangi	
Ciddi Mekanizma (*)	Herhangi	Herhangi	Herhangi	Herhangi
Fizik muayene				
Anormal mental durum	Herhangi	Herhangi	Uykulu	Aşırı hassas
Kafatası kırığı	Herhangi	Basilar	Delici, çökmüş ya da basilar	Açık, çökmüş ya da basilar
GCS skoru	<15	<15	<14 (1 yaşından küçük için <15)	<15 (2 saatte)
Nörolojik deficit			Hepsi	
Skalp hematom	Non-frontal		>5 cm (eğer <1 yaş ise morarma ve laserasyonlar dahil)	Büyük

Comparison of PECARN, CATCH, and CHALICE Rules for Children With Minor Head Injury: A Prospective Cohort Study

Joshua S. Easter, MD, MSc*; Katherine Bakes, MD; Jasmeet Dhaliwal, MD, MPH; Michael Miller, MD; Emily Caruso, MSPH; Jason S. Haukoos, MD, MSc

Pediatric Decision Rules for Minor Head Injury

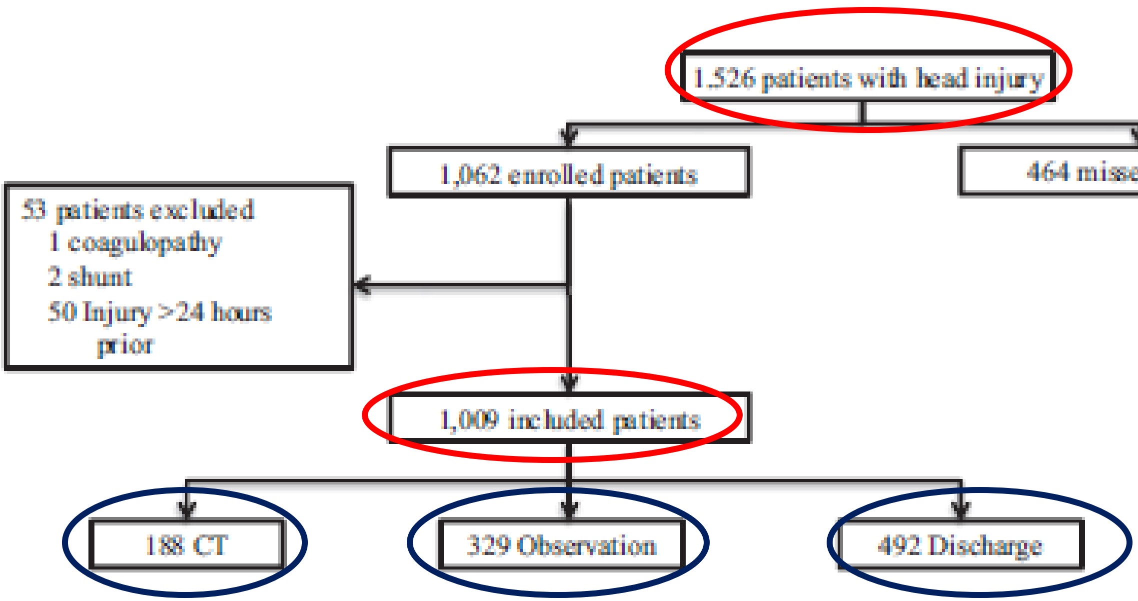


Figure 1. Study flow diagram.

Table 2. Patient characteristics in the study cohort compared with the derivation cohorts of PECARN, CATCH, and CHALICE (number and percentage given for study cohorts).

Characteristics	Study Cohort, n=1,009	PECARN, n=42,412	CATCH, n=3,866	CHALICE, N=22,772
Median age (IQR), y	6.1 (2.6–13.7)	7.1* (SD 5.5)	10 (5–14)	5.7*
Male	650 (64)	NR	2,505 (65)	147,676 (65)
GCS score				
13	4 (0.4)	0	95 (3)	73 (0.3)
14	40 (4)	1,341 (3)	282 (7)	229 (1)
15	961 (95)	41,071 (97)	3,489 (90)	21,996 (97)
Mechanism of injury				
Fall from standing	250 (25)	7,106 (17)	1,029† (27)	NR
Struck from bicycle, unhelmeted	13 (1)	524 (1)	40 (1)	NR
Sports related	90 (9)	2,934 (7)	870 (23)	NR
Motor vehicle accident	91 (9)	3,717 (9)	115 (3)	NR
Unrestrained	23 (2)	NR	115 (3)	NR
Ejected	2 (0.2)	NR	11 (0.3)	NR
Rollover	2 (0.2)	NR	38 (1)	NR
Death of other passenger in vehicle	1 (0.1)	NR	7 (0.2)	NR
High speed	8 (0.8)	NR	14 (0.4)	204 (1)
Fall from height	237 (24)	11,665 (27)	687‡ (18)	129 (0.6)
Fall from stairs	6 (0.6)	2,858 (7)	‡	NR
Fall from bicycle, unhelmeted	27 (3)	1,668§ (4)	294§ (8)	NR
Automobile vs pedestrian	18 (2)	1,303 (3)	133 (4)	NR
Hit with high-speed projectile	1 (0.1)	NR	NR	456 (2)
LOC	201 (20)	6,286 (16)	1,267 (33)	1,185 (5)
Amnesia	101 (10)	NR	1,730 (59)	720 (3)
CT	188 (19)	14,969 (35)	2,043 (53)	766 (3)
Observation	329 (33)	5,433 (14)	NR	NR
Any injury on CT	52 (5)	780 (5)	159 (4)	281 (1)
Clinically important TBI	21 (2)	376 (1)	NR	NR
Neurosurgical intervention	4 (0.4)	60 (0.1)	24 (0.6)	137 (0.6)

IQR, Interquartile range; *NR*, not reported; *TBI*, traumatic brain injury.

*Mean age.

†Not differentiated between fall from standing and fall from less than 3 feet or fewer than 5 stairs.

‡Fall from greater than 3 feet or from 5 stairs or more.

§Not specified whether the patient who fell was unhelmeted.

Table 3. Performance of the PECARN, CHALICE, and CATCH rules for the prediction of injury.*

			Sensitivity		Specificity					
Clinically Important TBI	**Yes**	**No**	**%**	**(95% CI)**	**%**	**(95% CI)**	**LR+**	**(95% CI)**	**LR−**	**(95% CI)**
PECARN										
Met criteria	21	361	100	(84–100)	62	(59–66)	2.7	(2.5–2.9)	0	(0–†)
Did not meet criteria	0	599								
CATCH										
Met criteria	19	550	91	(70–99)	44	(41–47)	1.6	(1.4–1.9)	0.2	(0.1–0.8)
Did not meet criteria	2	431								
CHALICE										
Met criteria	16	128	84	(60–97)	85	(82–87)	5.5	(4.3–7.1)	0.2	(0.1–0.5)
Did not meet criteria	3	711								
Physician practice										
CT or observation	21	496	100	(84–100)	50	(47–53)	2.0	(1.9–2.1)	0	(0–†)
Discharge	0	492								
Physician estimation of risk, %										
≥1	20	317	95	(76–100)	68	(65–71)	3.0	(2.6–3.4)	0.1	(0–0.5)
<1	1	671								
Injury requiring neurosurgical intervention										
PECARN										
Met criteria	4	378	100	(40–100)	61	(58–64)	2.6	(2.4–2.8)	0	(0–†)
Did not meet criteria	0	599								
CATCH										
Met criteria	3	566	75	(19–99)	43	(40–46)	1.3	(0.7–2.3)	0.6	(0.1–3.2)
Did not meet criteria	1	432								
CHALICE										
Met criteria	3	141	75	(19–99)	84	(81–86)	4.5	(2.5–8.2)	0.3	(0.1–1.6)
Did not meet criteria	1	713								
Physician practice										
CT or observation	4	513	100	(40–100)	49	(46–52)	2.0	(1.8–2.1)	0	(0–†)
Discharge	0	492								
Any injury on CT										
PECARN										
Met criteria	51	399	98	(89–100)	64	(61–67)	2.4	(2.2–5.7)	0	(0–0.2)
Did not meet criteria	1	598								
CATCH										
Met criteria	47	522	90	(79–97)	45	(42–48)	1.6	(1.5–1.8)	0.2	(0.1–0.5)
Did not meet criteria	5	428								
CHALICE										
Met criteria	25	119	64	(47–79)	86	(83–88)	4.4	(3.3–5.9)	0.4	(0.3–0.6)
Did not meet criteria	14	700								
Physician practice										
CT or observation	50	467	96	(86–99)	51	(48–54)	2.0	(1.8–2.2)	0.1	(0–0.3)
Discharge	2	490								

LR+, Positive likelihood ratio; *LR−*, negative likelihood ratio.

PECARN, CATCH ve CHALICE

Sensitivite:

- **Hekim değerlendirmesi ve PECARN' ın her biri için %100**
- Hekim tahmini %95 (sadece 1 hasta)
- CATCH %91
- CHALICE %84

Spesifite :

- CHALICE %85
- Hekim değerlendirmesi %68
- PECARN %62
- Hekim tahmini %50
- CATCH %44

PECARN, CATCH ve CHALICE

İncelenen yöntemden sadece hekim değerlendirmesi ve

PECARN klinik olarak önemli travmatik beyin

yaralanmalarının tümünü teşhis edebilmiştir

Original article

Clinical decision rules for children with minor head injury: a systematic review

Alastair Pickering,[1] Susan Harnan,[2] Patrick Fitzgerald,[2] Abdullah Pandor,[2] Steve Goodacre[1]

[1]Health Services Research, ScHARR, University of Sheffield, Sheffield, UK
[2]Health Economics and Decision Science, ScHARR, University of Sheffield, Sheffield, UK

Correspondence to
Dr Alastair Pickering, Health Services Research, ScHARR, University of Sheffield, Regent Court, 30 Regent Street, Sheffield S1 4DA, UK; a.pickering@sheffield.ac.uk

Accepted 1 January 2011
Published Online First 10 February 2011

ABSTRACT

Introduction Clinical decision rules aid clinicians with the management of head injured patients. This study aimed to identify clinical decision rules for children with minor head injury and compare their diagnostic accuracy for detection of intracranial injury (ICI) and injury requiring neurosurgical intervention (NSI).

Methods Relevant studies were identified by an electronic search of key databases. Papers in English were included with a cohort of at least 20 children suffering minor head injury (GCS 13–15). Studies of a decision rule derived to identify patients at risk of ICI or NSI had to include a proportion of the cohort undergoing imaging. Study quality was assessed using the QUADAS checklist.

Results 16 publications, representing 14 cohorts, with 79 740 patients were included. Only four rules were tested in more than one cohort. Of the validated rules the paediatric emergency care applied research network (PECARN) rule was most consistent (sensitivity 98%; specificity 58%). For neurosurgical injury all had high sensitivity (98–100%) but the children's head injury algorithm for the prediction of important clinical events (CHALICE) rule had the highest specificity (86%) in its derivation cohort.

Conclusion Of the current decision rules for minor head injury the PECARN rule appears the best for children and infants, with the largest cohort, highest sensitivity and acceptable specificity for clinically significant ICI. Application of this rule in the UK would probably result in an unacceptably high rate of CT scans per injury, and continued use of the CHALICE-based NICE guidelines represents an appropriate alternative.

What is already known on this topic

- Head injuries account for approximately 5% of ED attendances with a large proportion of these being children.
- Clinical decision rules aid in identifying high-risk patients following minor head injury and in the UK, the current NICE guidelines for children are based on the children's head injury algorithm for the prediction of important clinical events study data.

What this study adds

- Comparing the diagnostic accuracy of existing decision rules has identified what appears to be the best for this population.
- Significant differences exist in criteria used to test these rules and their future development should focus on using standard definitions that would allow more direct comparisons between rules.

There are many clinical decision rules for adults with minor head injury,[1–4] but few that have been validated for the paediatric population. It is also unclear how they compare in terms of diagnostic accuracy. This study aims systematically to identify clinical decision rules for children with minor head injury and compare these rules in terms of diagnostic accuracy for any ICI and injury requiring neurosurgery.

Arch Dis Child. 2011 May;96(5):414-21. doi: 10.1136/adc.2010.202820. Epub 2011 Feb 10.

Clinical decision rules for children with minor head injury: a systematic review.

Pickering A[1], Harnan S, Fitzgerald P, Pandor A, Goodacre S.

- 8000 –Minör kafa travması ile ilgili başlık
- 222 full text review
- 16 makale-14 kohort çalışması
- 79740 hasta
- 8 kohort-ABD
- 1 kohort-ABD ve KANADA
- 1 kohort-İTALYA
- 1kohort-İNGİLTERE
- 1kohort-FİNLANDİYA
- 1kohort-KANADA
- 1 kohort-TÜRKİYE
- 1kohort-7 çalışmanı kullanıldığı çoklu merkezlerden
- 1 kohort-küçük çaplı kohort

Pediatr Neurosurg. 2009;45(4):262-70. doi: 10.1159/000228984. Epub 2009 Jul 17.

Indications for brain computed tomography and hospital admission in pediatric patients with minor head injury: how much can we rely upon clinical findings?

Güzel A[1], Hiçdönmez T, Temizöz O, Aksu B, Aylanç H, Karasalihoglu S.

UCD rule: TBI with acute intervention or TBI**

Study	TP	FP	FN	TN	Sensitivity	Specificity
Klemetti et al. 2009	82	354	1	48	0.99 [0.93, 1.00]	0.12 [0.09, 0.16]
Palchak 2003	105	1111	0	827	1.00 [0.97, 1.00]	0.43 [0.40, 0.45]
Sun et al. 2007	125	876	13	652	0.91 [0.84, 0.95]	0.43 [0.40, 0.45]

NEXUS II: intracranial injury

Study	TP	FP	FN	TN	Sensitivity	Specificity
Klemetti et al. 2009	80	318	3	84	0.96 [0.90, 0.99]	0.21 [0.17, 0.25]
Oman 2006	136	1298	2	230	0.99 [0.95, 1.00]	0.15 [0.13, 0.17]

Chalice rule: intracranial injury

Study	TP	FP	FN	TN	Sensitivity	Specificity
Dunning et al. 2006	164	2853	4	19558	0.98 [0.94, 0.99]	0.87 [0.87, 0.88]
Klemetti et al. 2009	81	382	2	20	0.98 [0.92, 1.00]	0.05 [0.03, 0.08]

PECARN ≥ 2yrs, < 18yrs rule*: intracranial injury

Study	TP	FP	FN	TN	Sensitivity	Specificity
Kupperman et al. 2009	61	2550	2	3798	0.97 [0.89, 1.00]	0.60 [0.59, 0.61]
Kupperman et al. 2009	208	10412	7	14656	0.97 [0.93, 0.99]	0.58 [0.58, 0.59]

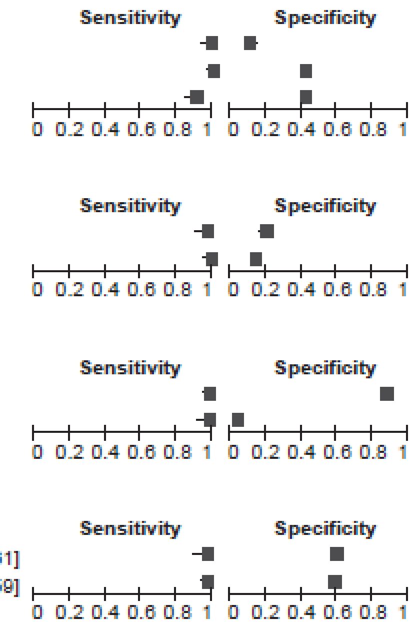


Figure 3 Decision rules for children with minor head injury: sensitivity and specificity of decision rules for which more than one dataset is available for the outcome intracranial injury. CHALICE, Children's Head injury Algorithm for the prediction of Important Clinical Events; FN, false negative; FP, false positive; TN, true negative; TBI, traumatic brain injury; TP, true positive; UCD, University of California–Davis rule.

Figure 3 Decision rules for children with minor head injury: sensitivity and specificity of decision rules for which more than one dataset is available for the outcome intracranial injury. CHALICE, Children's Head injury Algorithm for the prediction of Important Clinical Events; FN, false negative; FP, false positive; TN, true negative; TBI, traumatic brain injury; TP, true positive; UCD, University of California–Davis rule.

PECARN <2yrs rule*: intracranial injury infants

Study	TP	FP	FN	TN	Sensitivity	Specificity
Kupperman et al. 2009	72	3901	1	4528	0.99 [0.93, 1.00]	0.54 [0.53, 0.55]
Kupperman et al. 2009	25	1015	0	1176	1.00 [0.86, 1.00]	0.54 [0.52, 0.56]

UCD rule: traumatic brain injury only, infants**

Study	TP	FP	FN	TN	Sensitivity	Specificity
Palchak 2003	15	119	0	60	1.00 [0.78, 1.00]	0.34 [0.27, 0.41]
Sun et al. 2007	7	179	0	22	1.00 [0.59, 1.00]	0.11 [0.07, 0.16]

Buchanich 2007 rule: intracranial injury infants

Study	TP	FP	FN	TN	Sensitivity	Specificity
Buchanich 2007	22	45	0	30	1.00 [0.85, 1.00]	0.40 [0.29, 0.52]

Dietrich 1993 rule: intracranial injury infants

Study	TP	FP	FN	TN	Sensitivity	Specificity
Dietrich 1993	1	15	0	3	1.00 [0.03, 1.00]	0.17 [0.04, 0.41]

Greenes 1999 rule: intracranial injury infants

Study	TP	FP	FN	TN	Sensitivity	Specificity
Greenes and Schutzman '99	16	161	14	417	0.53 [0.34, 0.72]	0.72 [0.68, 0.76]

Greenes 2001 scoring system: intracranial injury infants

Study	TP	FP	FN	TN	Sensitivity	Specificity
Greenes 2001	13	96	0	63	1.00 [0.75, 1.00]	0.40 [0.32, 0.48]

NEXUS II: intracranial injury infants

Study	TP	FP	FN	TN	Sensitivity	Specificity
Oman 2006	25	269	0	15	1.00 [0.86, 1.00]	0.05 [0.03, 0.09]

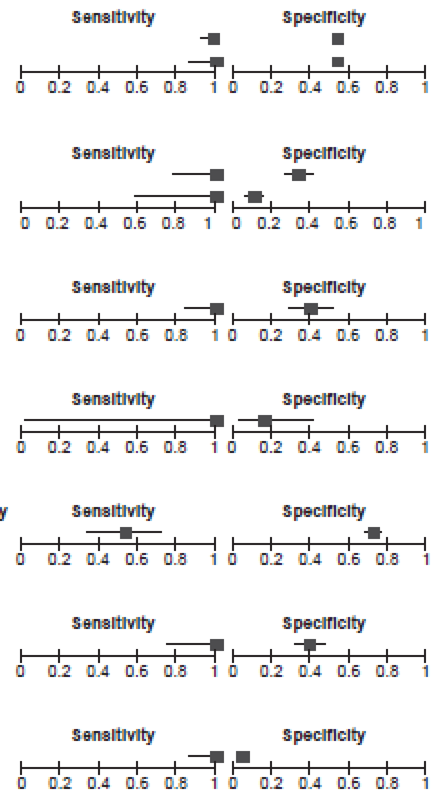


Figure 4 Decision rules for infants with minor head injury: sensitivity and specificity for the outcome intracranial injury. FN, false negative; FP, false positive; NEXUS, National Emergency X-Radiography Utilization Study II; PECARN, paediatric emergency care applied research network; TN, true negative; TP, true positive; UCD, University of California–Davis rule.

Atabaki 2008 rule: neurosurgery

Study	TP	FP	FN	TN	Sensitivity	Specificity
Atabaki 2008	6	534	0	460	1.00 [0.54, 1.00]	0.46 [0.43, 0.49]

CATCH rule: neurosurgery

Study	TP	FP	FN	TN	Sensitivity	Specificity
Osmond et al. 2006	26	1111	0	2643	1.00 [0.87, 1.00]	0.70 [0.69, 0.72]

Chalice rule: neurosurgery

Study	TP	FP	FN	TN	Sensitivity	Specificity
Dunning et al. 2006	134	3076	3	19559	0.98 [0.94, 1.00]	0.86 [0.86, 0.87]

New Orleans Criteria: neurosurgery

Study	TP	FP	FN	TN	Sensitivity	Specificity
Haydel and Schembekar 03	6	128	0	41	1.00 [0.54, 1.00]	0.24 [0.18, 0.31]

UCD rule: neurosurgery

Study	TP	FP	FN	TN	Sensitivity	Specificity
Palchak 2003	29	719	0	1295	1.00 [0.88, 1.00]	0.64 [0.62, 0.66]

PECARN >2 years: neurosurgery

Study	TP	FP	FN	TN	Sensitivity	Specificity
Kupperman et al. 2009	11	2600	0	3800	1.00 [0.72, 1.00]	0.59 [0.58, 0.61]

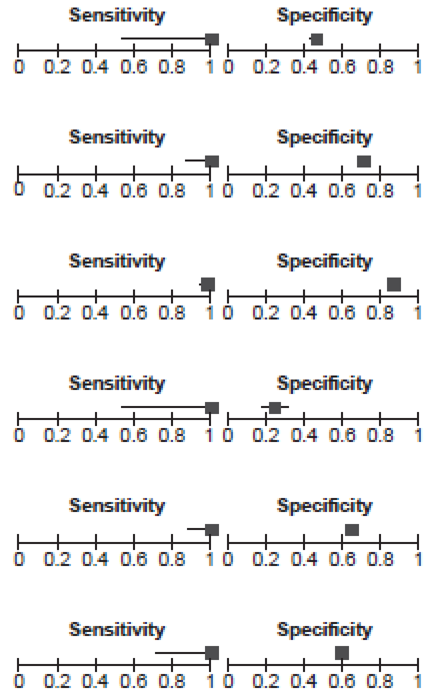


Figure 5 Decision rules for children with minor head injury: sensitivity and specificity for the outcome neurosurgery. CATCH, Canadian Assessment of Tomography for Childhood Injury; CHALICE, Children's Head injury Algorithm for the prediction of Important Clinical Events; FN, false negative; FP, false positive; TN, true negative; TP, true positive; PECARN, paediatric emergency care applied research network.

- PECARN
- Sensivitesi %97
- Spesivitesi % 58
- PECAN kuralları çocuklarda ve infantlarda yüksek sensivite ve kabuledlebilir spesiviteye sahip.

ÖZET

Hafif Kafa Travmasında Beyin Tomografi Endikasyonları çekmek için yaygın kullanılan endikasyonlar;

Bilinç kaybı
Değişmiş mental durum
Baş ağrısı
Mükerrer kusma hikayesi
Kliniğin kötüleşmesi
Fokal nörolojik defisit
Koagülopati
Kafatabanı kırık bulgu ve belirtileri

Mild traumatic brain injury in children

Nicholas A. Hamilton, MD, Martin S. Keller, MD

Seminars in Pediatric Surgery (2010) 19, 271-278

ÖZET

Ciddi ve orta kafa travmasının tanı ve yönetiminde herhangi bir belirsizlik yok.

Minör kafa travması olan hastalarda (GKS 14-15) yönetiminde BT çekilme endikasyonları halen tartışmalıdır

Çocuklarda minör kafa travmasında klinik karar vermede kullanılan 3 güncel algoritm(PECARN, CATCH ve CHALICE)

PECARN kurallarının sensitivitesi yüksek olması nedeniyle kullanmak akılcı görünmektedir

TEŞEKKÜRLER

''Ben ölünce bir elimi tabutumun dışına atın. İnsanlar görsünler ki padişah olan Süleyman bu dünyadan eli boş gitmiştir.''