Spinal Cord Imaging and Injury in Trauma

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Lecture Objectives – Review

- *EAST practice management guidelines*
- *Supplemental publications*
- *Plain radiograph "Primer"*
- *Spinal cord injury*
  - *Background / statistics*
  - *Neuroanatomy – SCI syndromes*
  - *Patient subsets*
  - *Steroids*

Beating a Dead Horse

Practice Management Guidelines for Identification of Cervical Spine Injuries Following Trauma: Update From the Eastern Association for the Surgery of Trauma Practice Management Guidelines Committee

John J. Como, MD, Jose J. Diaz, MD, C. Michael Dunham, MD, William C. Chiu, MD, Therese M. Duane, MD, Jeannette M. Capella, MD, Michele R. Holcomb, MD, Kosar A. Khwaja, MD, Julie A. Mayglothling, MD, Michael B. Shapiro, MD, and Eleanor S. Winston, MD

(*J Trauma*. 2009;67: 651–659)

EAST Practice Management Guidelines

Blunt Cervical Spine Trauma

Which patient's require C-spine imaging?

C – Spine Imaging

- Hoffman JR, Mower WR, Wolfson AB, et al. Validity of a Set of Clinical Criteria to Rule Out Injury to the Cervical Spine in Patients with Blunt Trauma *NEJM*. 2000;343:94-99
- Stiell IG, Wells GA, Vandemheen KL, et al. The Canadian C-Spine Rule for Radiography in Alert and Stable Trauma Patients *JAMA*. 2001;286:1841-1848

NEXUS Criteria

Box 1. National Emergency X-Radiography Utilization Study Criteria

All low risk criteria met?

1. No posterior midline cervical spine tenderness
2. No evidence of intoxication
3. Normal level of alertness
4. No focal neurologic deficit
5. No painful distracting injuries

If yes, no radiography. If no, then radiography is indicated.

34,069 patients / 818 cervical spine injuries

NEXUS

Screening for an injury	Yes	No
Positive	810	28,950
Negative	8	4,301

Clinically Significant Injury

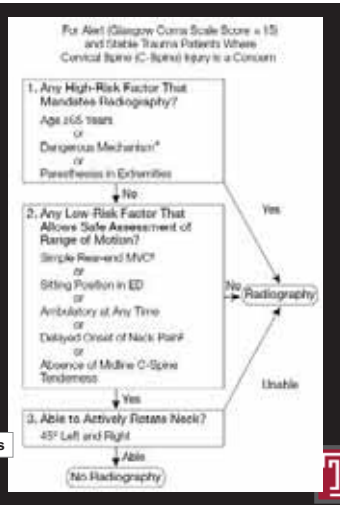
Sensitivity	99.6%
Specificity	12.9%

Canadian C – Spine Rule

*Dangerous Mechanism:
- Fall From ≥1 Meter/5 Stairs
- Axial Load to Head, eg, Diving
- MVC High Speed (>100 km/hr), Rollover, Ejection
- Motorized Recreational Vehicles
- Bicycle Collision

†Simple Rear-end MVC Excludes:
- Pushed Into Oncoming Traffic
- Hit by Bus/Large Truck
- Rollover
- Hit by High-Speed Vehicle

‡Delayed:
- Not Immediate Onset of Neck Pain



8924 patients / 151 cervical spine injuries

CCS Rule

Screening for an injury	Yes	No
Positive	151	5,041
Negative	0	3,732

Clinically Significant Injury

Sensitivity	100%
Specificity	42.5%

The Canadian C-Spine Rule versus the NEXUS Low-Risk Criteria in Patients with Trauma

Ian G. Stiell, M.D., M.Sc., Catherine M. Clement, R.N., R. Douglas McKnight, M.D., Robert Brison, M.D., M.P.H., Michael J. Schull, M.D., M.Sc., Brian H. Rowe, M.D., M.Sc., James R. Worthington, M.B., B.S., Mary A. Eisenhauer, M.D., Daniel Cass, M.D., Gary Greenberg, M.D., Iain MacPhail, M.D., M.H.Sc., Jonathan Dreyer, M.D., Jacques S. Lee, M.D., Glen Bandiera, M.D., Mark Reardon, M.D., Brian Holroyd, M.D., Howard Lesiuk, M.D., and George A. Wells, Ph.D.

N Engl J Med 2003;349:2510-8.

Table 4. Sensitivity, Specificity, and Negative Predictive Value of the Two Rules for 162 Cases of "Clinically Important" Injury among 7438 Patients.*

Result of Assessment	Canadian C-Spine Rule		NEXUS Criteria	
	Injury	No Injury	Injury	No Injury
Positive (no.)	161	3995	147	4599
Negative (no.)	1	3281	15	2677
Sensitivity (%)	99.4 (95% CI, 96–100)†		90.7 (95% CI, 85–94)†	
Specificity (%)	45.1 (95% CI, 44–46)†		36.8 (95% CI, 36–38)†	
Negative predictive value (%)	100		99.4	

EAST Practice Management Guidelines

- Patients meeting low risk criteria who can be clinically cleared do not need radiographic imaging of the cervical spine
- Patients who can not be clinically cleared must undergo radiographic evaluation

Blunt Cervical Spine Trauma

(Not meeting LRC)

What type of imaging should be obtained? (Plain films or CT)

Guidelines for the Management of Acute Cervical Spine and Spinal Cord Injuries

September 20, 2001

Guidelines for the Management of Acute Cervical Spine and Spinal Cord Injuries

RADIOGRAPHIC ASSESSMENT OF THE CERVICAL SPINE IN SYMPTOMATIC TRAUMA PATIENTS

RECOMMENDATIONS

Standards: A three view cervical spine series (AP, lateral, and odontoid views) is recommended for radiographic evaluation of the cervical spine in patients who are symptomatic following traumatic injury. This should be supplemented with computed tomography to further define areas that are suspicious or not well visualized on the plain cervical x-rays.

Computed Tomography Versus Plain Radiography to Screen for Cervical Spine Injury: A Meta-Analysis

James Frederick Holmes, MD, MPH, and Radha Akkinepalli

J Trauma. 2005;58:902–905.

The Inefficiency of Plain Radiography to Evaluate the Cervical Spine After Blunt Trauma

Stephen C. Gale, MD, Vicente H. Gracias, MD, Patrick M. Reilly, MD, and C. William Schwab, MD

J Trauma. 2005;59:1121–1125.

ACR Appropriateness Criteria® on Suspected Spine Trauma

Richard H. Daffner, MD[a], David B. Hackney, MD[b]

J Am Coll Radiol 2007;4:762-775.

- Adult patients who does not fall into low risk criteria for CSI should undergo thin-section CT of the CS that includes sagittal and coronal multiplanar reconstructed images

EAST Practice Management Guidelines

- CT CS has supplanted plain radiography as the primary modality for screening suspected CS injury after trauma
- Must include axial images from the occiput to T1 with sagittal and coronal reconstructions

CT Should Replace Three-View Radiographs as the Initial Screening Test in Patients at High, Moderate, and Low Risk for Blunt Cervical Spine Injury: A Prospective Comparison

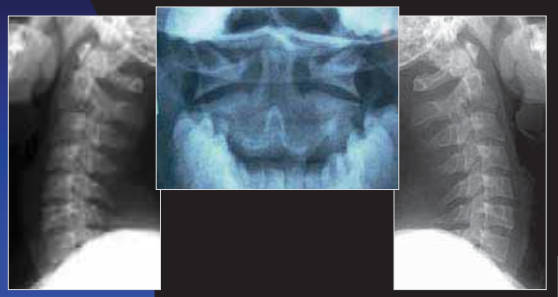
John Bailitz, MD, Frederic Starr, MD, Matthew Beecroft, MD, Jon Bankoff, MD, Roxanne Roberts, MD, Faran Bokhari, MD, Kimberly Joseph, MD, Dorian Wiley, MD, Andrew Dennis, MD, Susan Gilkey, MD, Paul Erickson, MD, Patricia Raksin, MD, and Kimberly Nagy, MD

J Trauma. 2009;66:1605–1609.

- 1,505 patients
- 50 patients had clinically significant injury
- CT detected all clinically significant injuries
- CSR detected only 18 (36%)
- In the 16 patients with clinically significant injury and adequate radiographs 6 patients had normal radiographs

Plain Radiographs

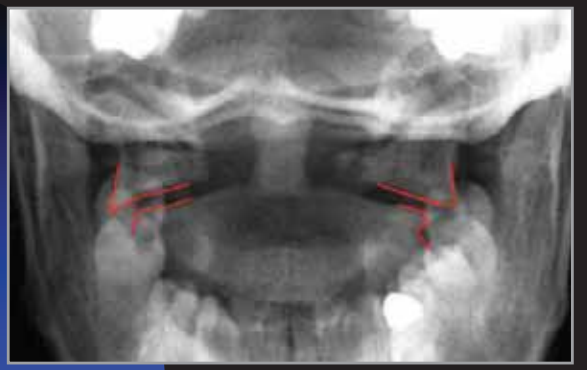
A soon to be lost and forgotten skill?



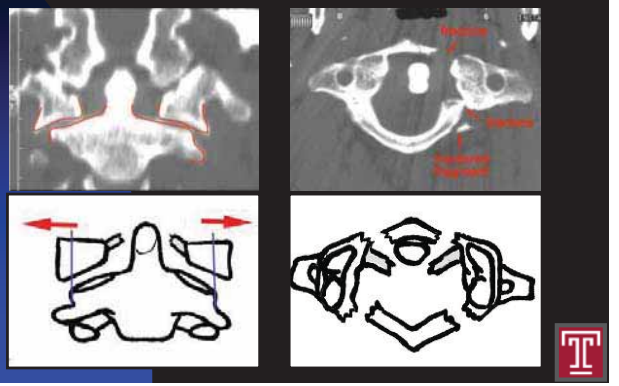
ABC's of CS Imaging

- Adequate
- Alignment
- Bones
- Cartilage
- Disc space
- Soft tissue

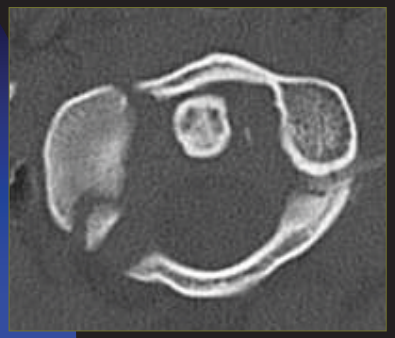
A – A Alignment



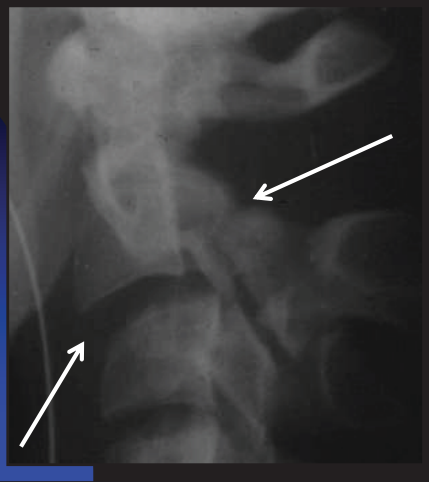
Jefferson Fracture



Jefferson Fracture

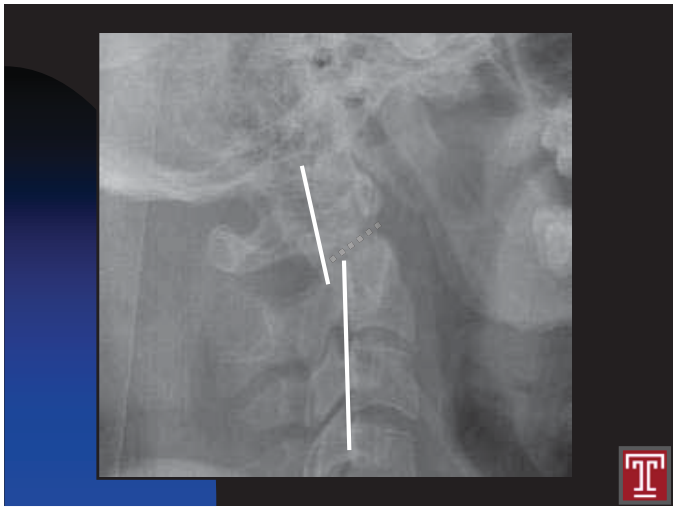


- 34 y/o male
  high speed MVA

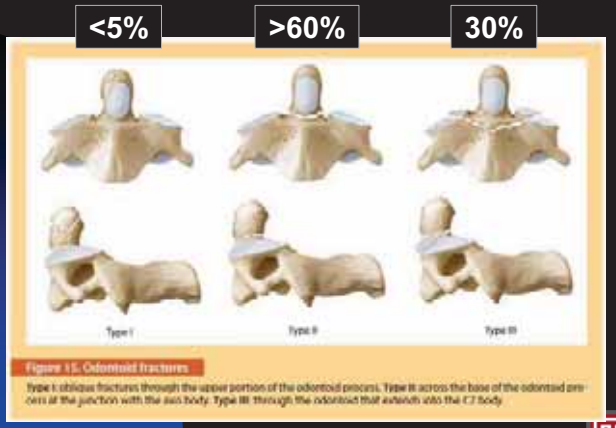


Hangman's Fracture

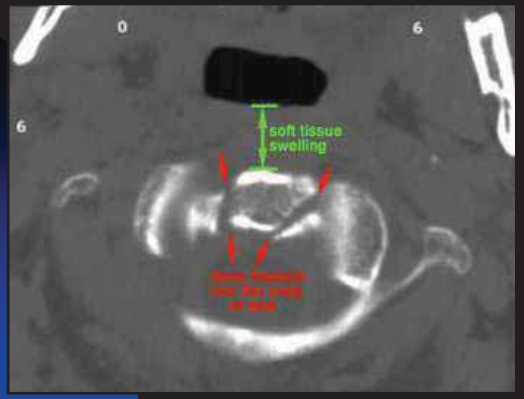
- 36 y/o male
  motorcycle accident

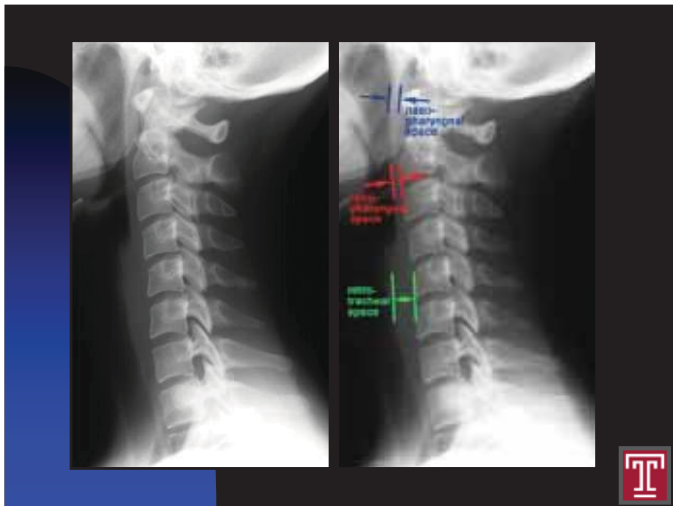


Dens Fracture – Sagital CT

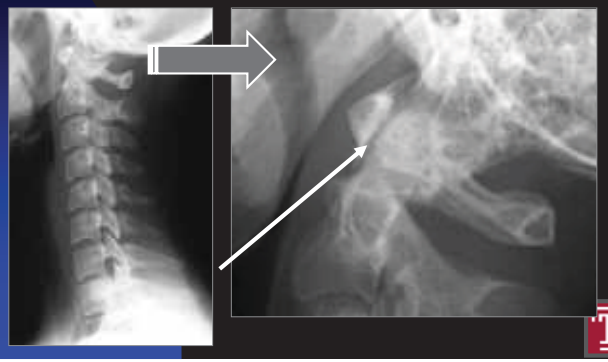


- 42 y/o male - MVA



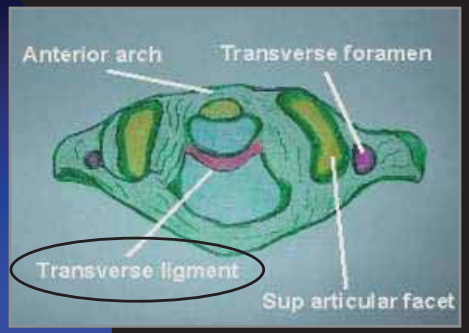


Predentate Space



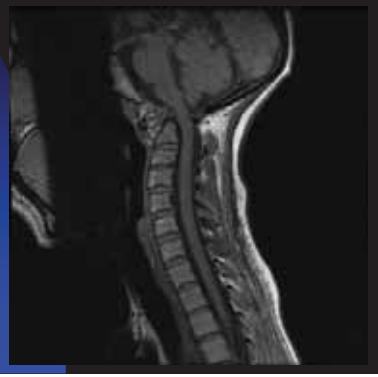
Predentate Space

Transverse Ligament



Predentate Space

MRI



F/E Views

Persistent neck pain with a negative CT (AAO, no deficits)

Magnetic Resonance Imaging Is Not Needed to Clear Cervical Spines in Blunt Trauma Patients With Normal Computed Tomographic Results and No Motor Deficits

Rob Schuster, MD; Kenneth Waxman, MD; Barry Sanchez, MD; Salvador Becerra; Richard Chung, MD; Scott Conner, MD; Thomas Jones, MD

Arch Surg. 2005;140:762-766

- 2,854 patients
- 100 (3.8%) patients with CS fx / SCI
- 93 awake patients, normal motor exam, normal CT, severe persistent neck pain
- MRI negative for clinically significant injury

Cervical Spine Magnetic Resonance Imaging in Alert, Neurologically Intact Trauma Patients With Persistent Midline Tenderness and Negative Computed Tomography Results

Helen M. Ackland, MHSc, Peter A. Cameron, MBBS, MD, Dinesh R. Varma, MBBS, MD, Gregory J. Fitt, MBBS, D. James Cooper, MD, BS, Rory Wolfe, BSc, PhD, Gregory M. Malham, BSc, MB ChB, Jeffrey V. Rosenfeld, MBBS, MD, Owen D. Williamson, MBBS, GradDipClinEpi, Susan M. Liew, MBBS

Ann Emerg Med. 2011 Aug 3. [Epub ahead of print]

- Prospective study of 178 patients with persistent midline neck tenderness after a negative CT scan
  - 78 (44%) had acute injury on MRI
    - 33 (42%) treated with a cervical collar
    - 5 (6%) received operative treatment

EAST Practice Management Guidelines

Persistent neck pain, negative CT

- **Multiple options – limited data**
  - Continue c-spine immobilization
  - MRI CS – remove collar if negative
  - Flexion / extension films – remove collar if negative

Obtunded / unreliable with a negative CT

ACR Appropriateness Criteria® on Suspected Spine Trauma

Richard H. Daffner, MD[a], David B. Hackney, MD[b]

J Am Coll Radiol 2007;4:762-775.

- The panel recommends that MRI be used to evaluate the CS in patients whose neurologic status cannot be fully evaluated within 48 hours of injury, including those in whom CT results are normal

Is Magnetic Resonance Imaging Essential in Clearing the Cervical Spine in Obtunded Patients With Blunt Trauma?

John J. Como, MD, Marsha A. Thompson, RN, James S. Anderson, MD, Rajiv R. Shah, MD, Jeffrey A. Claridge, MD, Charles J. Yowler, MD, and Mark A. Malangoni, MD

J Trauma. 2007;63:544–549.

MRI Is Unnecessary to Clear the Cervical Spine in Obtunded/Comatose Trauma Patients: The Four-Year Experience of a Level I Trauma Center

Nestor D. Tomycz, MD, Brandon G. Chew, BS, Yue-Fang Chang, PhD, Joseph M. Darby, MD, Scott R. Gunn, MD, Federia H. Nicholas, RN, Juan B. Ochoa, MD, Andrew B. Peitzman, MD, Eric Schwartz, MD, Hans-Christoph Pape, MD, Richard M. Spero, MD, and David O. Okonkwo, MD, PhD

J Trauma. 2008;64:1258–1263.

Screening cervical spine MRI after normal cervical spine CT scans in patients in whom cervical spine injury cannot be excluded by physical examination

Megan Steigelman, M.D., Peter Lopez, M.D.*, Daniel Dent, M.D., John Myers, M.D., Michael Cornelius, M.D., Ronald Stewart, M.D., Stephen Cohn, M.D.

The American Journal of Surgery (2008) 196, 857–863

Computed Tomography Alone for Cervical Spine Clearance in the Unreliable Patient—Are We There Yet?

Jay Menaker, MD, Allan Philp, MD, Sharon Bornwell, ACNP, and Thomas M. Scalea, MD

J Trauma. 2008;64:898–904.

- 734 patients
- 203 patients
  - No obvious deficits
  - Negative CT
  - Unreliable exam
- 18 (8.9%) patients – abnormal MRI
  - 14 required extended CS immobilization
  - 2 required operative repair

EAST Practice Management Guidelines

Obtunded/unreliable, negative CT

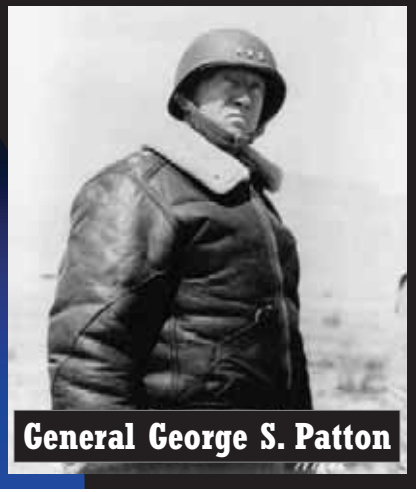
- **Multiple options**
  - Flexion / extension films – no longer recommended
  - Continue c-spine immobilization
  - Remove collar based on CT alone
  - MRI CS – remove collar if negative

In Summary

- Meets LRC
  - **No imaging necessary**
- Does not meet LRC
  - **CT – Primary imaging modality (adults)**
- Persistent pain, no deficits, negative CT
  - **Limited data – no decisive guideline**
- Obtunded / unreliable, negative CT
  - **Some data supports MRI may be necessary – no decisive guideline**

EAST Practice Management Guidelines

- C-spine immobilization after penetrating to the brain is not necessary unless the trajectory suggests direct injury to the cervical spine


General George S. Patton

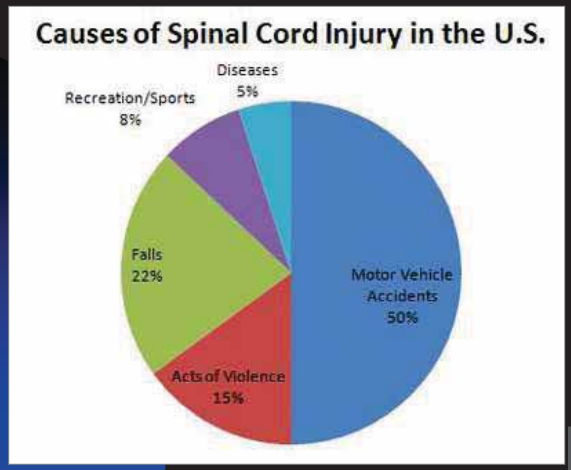
The Death of a Hero

December 9th, 1945

- Rear seat passenger
- Front end collision w/ 2 ½ ton GMC truck
- No one else injured
- Paralyzed from the neck down
- Military hospital in Heidelberg, Germany
  - HR 45, BP 86/60 mmHg

Died December 21st – Suspected PE

FOUNDATION FOR SPINAL CORD INJURY PREVENTION, CARE & CURE



Scope of SCI

- Estimated 11,000 new cases annually
- Incidence c-spine injury 2º to blunt injury is 2-6%
- Cervical spine injury is increased in patients with head trauma
  - GCS≤ 8 doubles risk of bony injury

Spinal Injuries

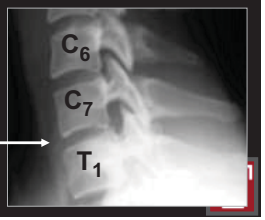
Spinal Injuries

- 55% involve the cervical spine
- 15% the thoracic spine
- 15% the lumbar spine
- 15% the lumbosacral spine

Cervical Spine Injuries

- 1/3 of cervical spine fractures involve C2 (24% NEXUS)
  - 15% involve the odontoid process
- 1/2 of fractures involve C5, C6 or C7
  - 39%; C6,C7 (NEXUS)

Cervico-thoracic junction

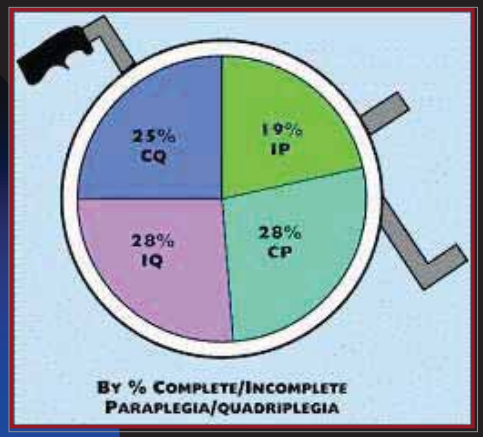


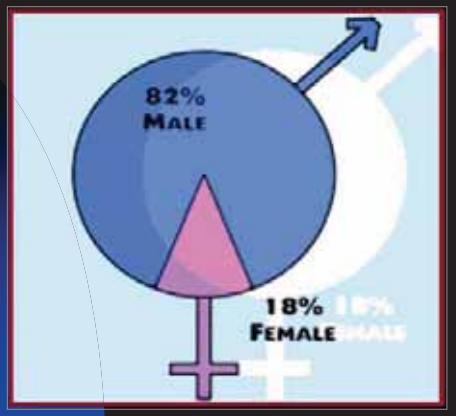
Relationship Between Cervical Spine Injury and Helmet Use in Motorcycle Road Crashes

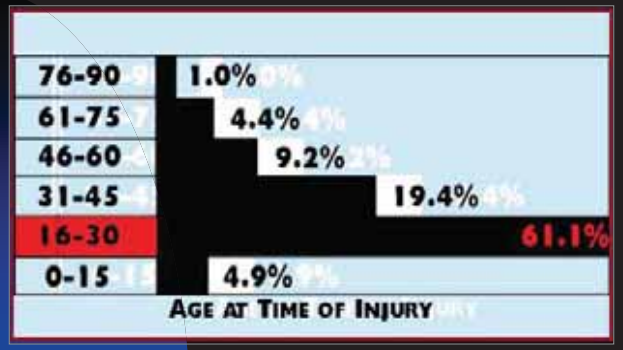
S. S. Ooi, BSc, MSc[1], S.V. Wong, BE, PhD[1,2], J. S. Yeap, MBBS[3], and Radin Umar R.S., BE, PhD[3]

Asia-Pacific Journal of Public Health. 2011;23:608-19.

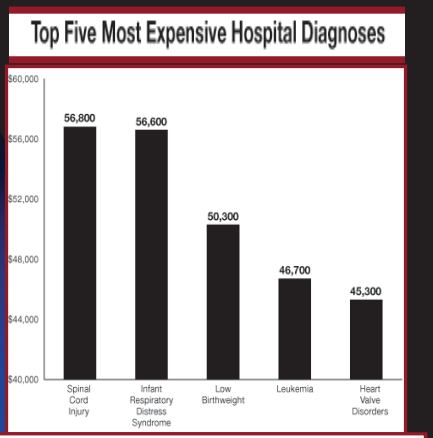
- Helmet use may affect the incidence of severe CSI
  - Frontal collisions, helmets use reduces the severity of CSI
  - In rear-end, side impact, and skidded accidents, the use of helmets increases the probability of a severe CSI



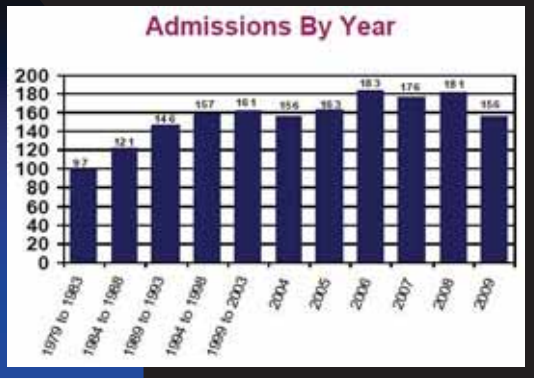


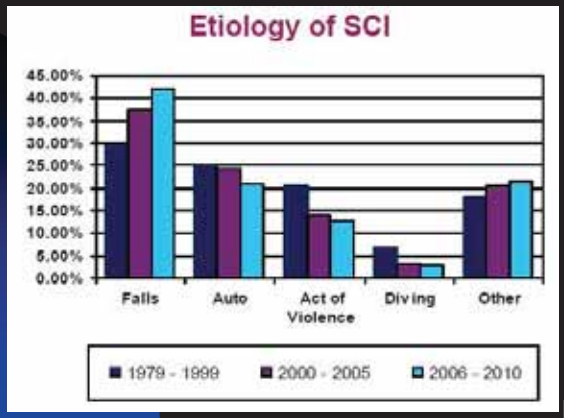


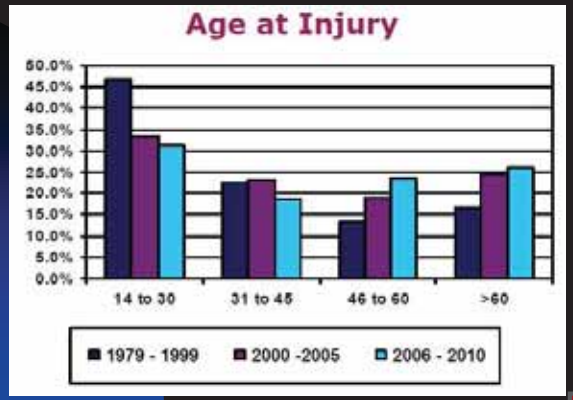
AHRQ Data

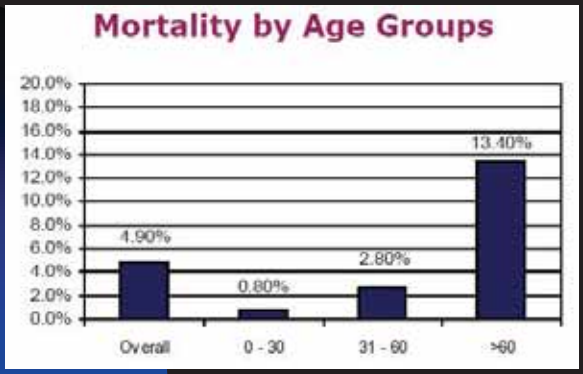


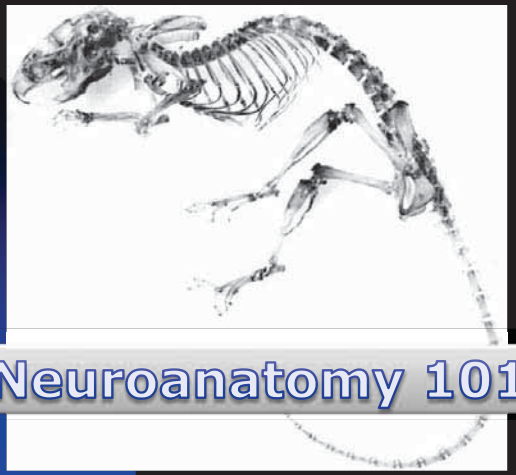
RSCICDV

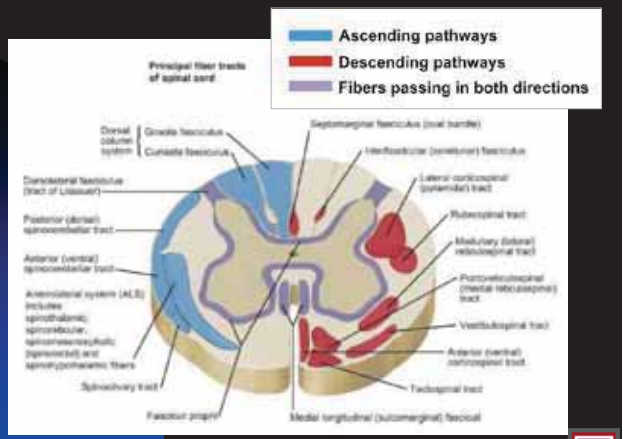


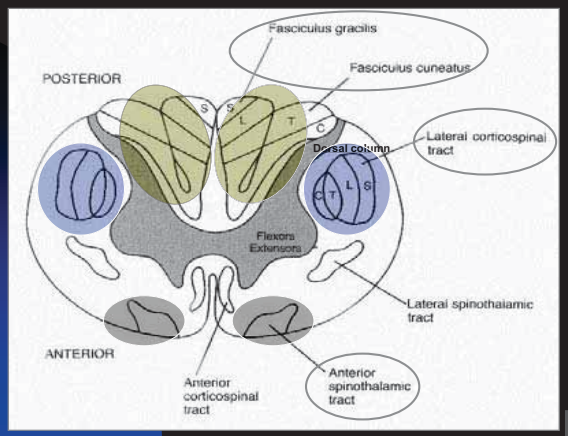






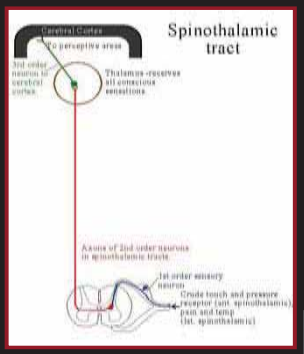






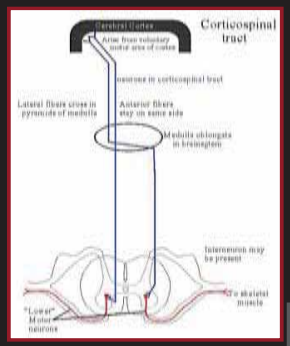
A. Spinothalamic Tract

- Pain
- Temperature
- Light touch



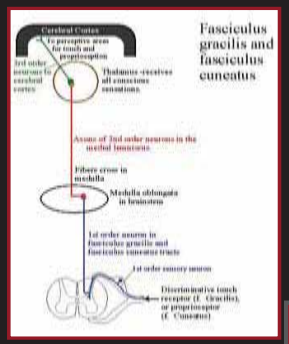
L. Corticospinal Tract

- Motor function (voluntary)



Dorsal Column

- Proprioception
- Vibration
- Touch-pressure

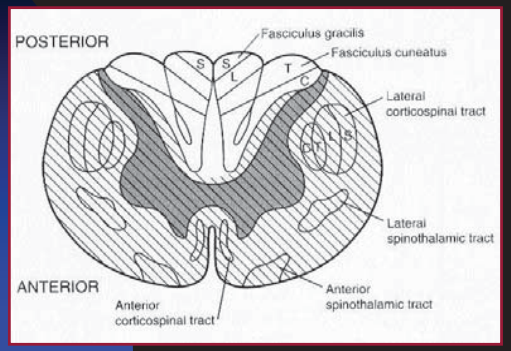


SCI Syndromes

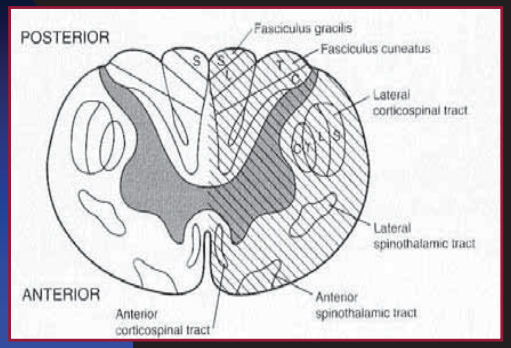
Syndromes

- Anterior cord
- Brown-Séquard
- Central cord

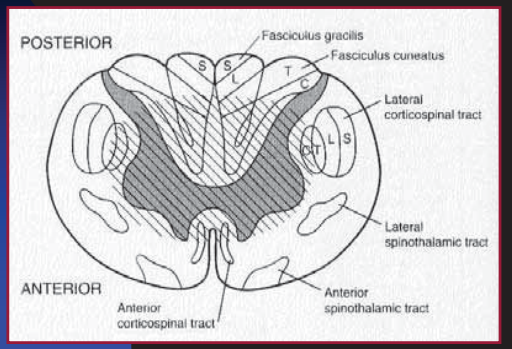
Anterior Cord Syndrome



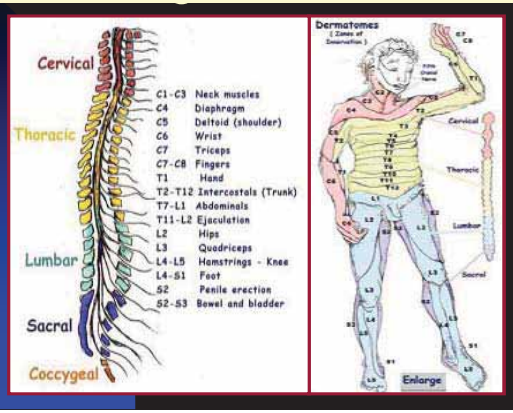
Brown-Séquard Syndrome



Central Cord Syndrome



Neurologic Examination

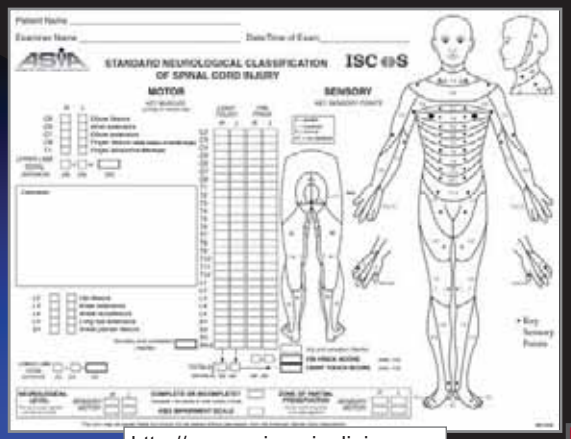


Neurologic Examination

- Patient observation
  - Voluntary motor activity
  - Respiratory pattern
- Motor and sensory examination
- Dorsal column function
- Reflex examination
- Evidence of sacral sparing

Respiratory Effects

- Diaphragmatic paralysis above C_4
  - Hypoventilation
  - Hypercapnia
- Variable loss of intercostal muscle function below C_5
- Decrease in FRC, FVC
- ABG/VBG, FVC measurements may be helpful



http://www.asia-spinalinjury.org

Motor Testing

- Brachial plexus – C_5 to T_1

	R	L	KEY MUSCLES
C2			
C3			
C4			
C5			Elbow flexors
C6			Wrist extensors
C7			Elbow extensors
C8			Finger flexors (distal phalanx of middle finger
T1			Finger abductors (little finger)
T2			

Motor Testing

- Lumbosacral plexus – L_2 to S_1

	R	L	KEY MUSCLES
T11			
T12			
L1			
L2			Hip flexors
L3			Knee extensors
L4			Ankle dorsiflexors
L5			Long toe extensors
S1			Ankle plantar flexors
S2			

Reflex Testing

- C_5 Biceps
- C_6 Brachioradialis
- C_7 Triceps
- L_4 Patella
- S_1 Achilles

Sensory Testing

- Pin prick
- Light touch
- Intact to impaired
- Impaired to intact

Sacral Sparing

- Perianal sensation
- Preserved rectal sphincter tone
- Slight flexor toe movement

Spinal Shock

- Can mimic a complete cord injury
- Flaccid paralysis below lesion
- Insensate
- Areflexia
- Urinary retention / decreased rectal tone
- Neurogenic shock

Neurogenic Shock

Autonomic dysfunction

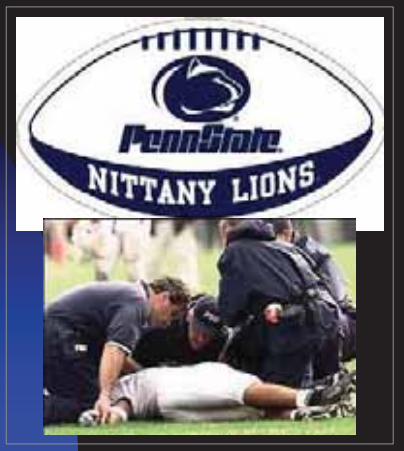
- Form of distributive shock
- Functional sympathectomy above T_5
- Loss of sympathetic tone
  - Decrease in SVR
  - Increase in venous capacitance
- **Hypotension**
- **Relative bradycardia**

Patient Subsets

- Athletes
- Elderly
- Pediatrics

- Represents 1/3 of new SCI patients

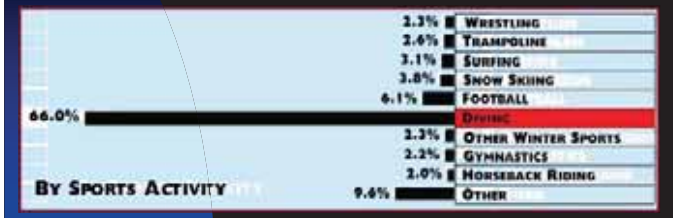
SCI in Athletes



SCI in Athletes

- 10% of spinal cord injuries
  - As high as 20% in some reviews
- Average age is 22 years
- 92% of all sports injuries result in quadriplegia
- Most injuries involve the lower cervical spine

SCI in Athletes



October 10th, 1999

- Dallas Cowboys vs. Philadelphia Eagles

SCI in Athletes

- Transient quadriplegia
- Burning hands syndrome
- *"Stingers" or "Burners"

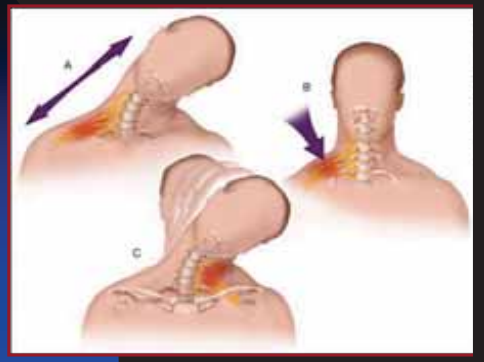
Transient Quadriplegia

- Spinal cord neurapraxia or concussion
- Should raise the suspicion of spinal cord compromise
- **Recommendation**: Athletes who have spinal cord symptoms and have true functional spinal canal stenosis on MRI should not be allowed to return to contact sports

Burning Hands Syndrome

- Analogous to the central cord syndrome seen in older adults
- Hyperextension injury
- May occur without a fracture or dislocation
- **Key Point**: Painful dysesthesias may be the only complaints of patients with SCI

"Stingers" or "Burners"



Stingers or Burners

- Pain, burning, or tingling down an arm occasionally accompanied by weakness
- Symptoms typically last seconds to minutes
- C_5 - C_6 dermatomes are most commonly affected
- **Key Point**: Symptoms are always unilateral and should not involve the LE's

The Helmeted Athlete

GUIDELINE 4e

Guidelines for Helmet Fitting and Removal in Athletics

June 1990 • Revised June 2008

NCAA

Management of the Helmeted Athlete With Suspected Cervical Spine Injury

Kevin N. Waninger,* MD
From the Department of Emergency Medicine, Saint Luke's Hospital, Bethlehem, Pennsylvania

The American Journal of Sports Medicine, Vol. 32, No. 5
DOI: 10.1177/0363546504264560

The Helmeted Athlete

- Unless there are special circumstances such as respiratory distress coupled with an inability to access the airway, the helmet should never be removed during the pre-hospital care of the student-athlete with a potential head/neck injury

General Recommendations

- The facemask should be removed prior to transportation
- At the emergency facility initial cervical X-rays usually can be obtained with the helmet in place

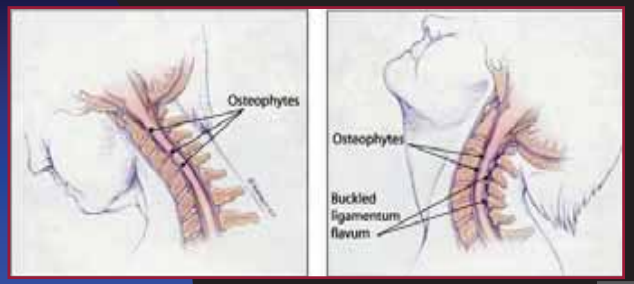
Helmet Removal

- Stabilize the head, neck and helmet, remove the chin strap
- Remove the cheek pads
- Deflate air cell-padding system if present
  - Can use an 18g needle
- Rotate helmet slightly forward to slide off the occiput. May need to apply slight traction
- Do not spread the helmet by the ear holes

SCI in the Elderly

- 10% of all SCI's
- Higher incidence of CS fractures than general population (2X)
  - More likely to injure the upper cervical spine
- Higher incidence of falls
- 2/3 of all injuries after age 60 result in quadriplegia
- Increased mortality from SCI

SCI in the Elderly



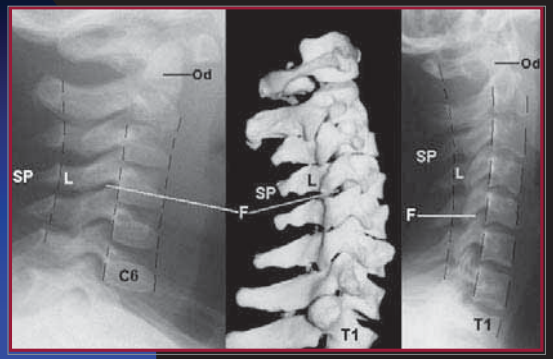
NEXUS

	NEXUS	Pediatrics	Geriatrics
Fractures	818 (2.4%)	30 (0.98%)	135 (4.6%)
Total # of Patients	34,069	3,065	2,943

SCI in Children

- Up to 10% of SCI
- Higher incidence of vehicular trauma and sports related injuries
- More likely to injure the upper cervical spine (younger children)
- SCIWORA

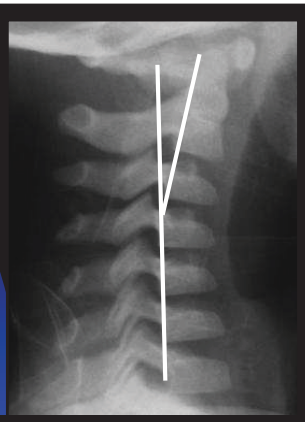
Pediatric – C-Spine



Pediatric C-Spine

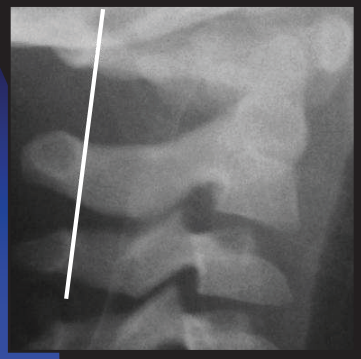
- Wedge shape vertebral bodies
- Small facets, horizontal orientation
- Immature paraspinal musculature
- Ligamentous laxity

Predispose to upper cervical spine injuries



Pseudosubluxation – Up to 40% of children < 8 years of age

The Swischuk Line



Blunt Cervical Spine Trauma

What to do about the children?

NEXUS Summary

	Pediatric	Non-Pediatric	Total
# of Cases	3,065 (9%)	31,004	34,069
CSI	30 (0.98%)	788 (2.54%)	818 (2.4%)
Low Risk	603 (19.7%)	3,706 (12%)	4,309 (12.6%)
Low Risk w/ CSI	0	8	8

C-Spine Clearance

What to do about children?

NEXUS

- 34,069 patients
  - 2.5% 8 years or younger
  - Most (87%) CS fractures were >9 years

CCS Rule

- 8924 patients
- No patients < 16 years

Head Injury

Triage, assessment, investigation and early management of head injury in infants, children and adults

SEPTEMBER 2007
Commissioned by the National Institute for Health and Clinical Excellence

Recommendation

Children aged 10 years or more can be treated as adults for the purposes of cervical spine imaging.

SEPTEMBER 2007

Commissioned by the National Institute for Health and Clinical Excellence

- In children <10 years (increased risks associated with irradiation and generally lower risk of significant spinal injury) CT of the cervical spine should be used only in cases of:
  - Severe head injury (GCS ≤ 8)
  - Strong clinical suspicion of injury despite normal plain films
  - Plain films are technically difficult or inadequate

Cervical Spine Clearance in Pediatric Trauma: A Review of Current Literature

Lynn Hutchings, MRCS, and Keith Willett, FRCS

J Trauma. 2009;67:687-91

- There remains no clear evidence-based protocol for the clearance of the cervical spine in the pediatric trauma population

The Other Steroids

The New York Times

U.S. Search All NYTimes.com

Treatment Is Said to Reduce Disability From Spinal Injury

By WARREN E. LEARY, Special to The New York Times
Published: March 31, 1990

For the first time, researchers have shown that drug treatment can reduce paralysis and other disability in people with serious spinal cord injury.

In research announced today at the National Institutes of Health, scientists reported that large doses of a steroid hormone given soon after injury can improve the outcome for people with serious spinal cord injury. The treatment, tested in a trial involving 487 patients at 10 medical centers, includes giving high doses of the steroid methylprednisolone within eight hours of the injury and continuing infusion of the drug for 24 hours.

The researchers said the results were so positive that they took the unusual step of announcing the results before they were published in a medical journal so that emergency room doctors could start using the treatment as soon as possible.

Dr. Michael B. Bracken of the Yale University Medical School, who directed the study, said that the treatment was not a cure for spinal cord injury, but that it offered some hope for reducing the long-term effects of this condition.

Pharmacologic Adjuncts

Glucocorticoid – MPS

- Suppression of vasogenic edema
- Enhancement of spinal cord blood flow
- Stabilization of lysosomal membranes
- Lipid peroxidase inhibitor

NASCIS II

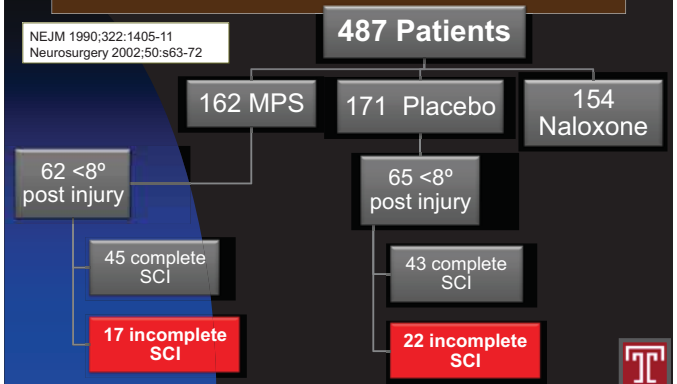
MPS Protocol

- Loading dose:
  - 30 mg/kg IV in first hour, bolus administered over 15 minutes
- Maintenance infusion:
  - 5.4 mg/kg IV over the next 23 hours

NEJM 1990;322:1405-11

NASCIS II (*The Real Numbers*)

NEJM 1990;322:1405-11
Neurosurgery 2002;50:s63-72



A Critical Appraisal of the Reporting of the National Acute Spinal Cord Injury Studies (II and III) of Methylprednisolone in Acute Spinal Cord Injury

William P. Coleman, *Edward Benzel, †David W. Cahill, ‡Thomas Ducker, §Fred Geisler, ¶Barth Green, §Mitchell R. Gropper, ¶Jan Goffin, **Parley W. Madsen III, ††Dennis J. Maiman, ‡‡Stephen L. Ondra, §§Michael Rosner, ¶¶Rick C. Sasso, ¶¶Gregory R. Trost, and ***Seth Zeidman

*WPCMath, Annapolis, Maryland; *The Cleveland Clinic, Cleveland, Ohio; †USF Physicians Group, Tampa, Florida; ‡Johns Hopkins University, Baltimore, Maryland; §Chicago Institute for Neurosurgery and Neuroresearch, Chicago, Illinois; ¶University of Miami, Miami, Florida; ¶Universitaire Ziekenhuis Lueven, Leuven, Belgium; **Microsurgery and Brain Research Institute, St. Louis, Missouri; ††Medical College of Wisconsin, Milwaukee, Wisconsin; ‡‡Northwestern University, Chicago, Illinois; §§Hendersonville, North Carolina; ¶¶Indianapolis Neurosurgical Group, Indianapolis, Indiana; ¶¶University of Wisconsin-Madison, Madison, Wisconsin; and ***Strong Memorial Hospital, Rochester, New York, U.S.A.*

J Spinal Disord, Vol. 13, No. 3, 2000

Methylprednisolone for acute spinal cord injury: an inappropriate standard of care*

R. John Hurlbert, M.D., Ph.D., F.R.C.S.(C)

University of Calgary Spine Program, Foothills Hospital and Medical Centre, Calgary, Alberta, Canada

J Neurosurg (Spine 1) 93:1–7, 2000

Section on Disorders of the Spine and Peripheral Nerves
of the
American Association of Neurological Surgeons
and the
Congress of Neurological Surgeons

Guidelines for the Management of Acute Cervical Spine and Spinal Cord Injuries

- In light of the failure of trials to convincingly demonstrate a significant clinic benefit of administration of MPS, in conjunction with the increased risks of medical complications associated with its use, MPS is recommended as an option that should only be undertaken with the knowledge that the evidence suggesting harmful side effects is more consistent than the suggestion of clinical benefit

September 20, 2001

The Debate Continues

NASCIS II

- Primary outcome negative
- Post hoc analysis positive (<8 hours)
- Treatment effects are small
- Functional significance is questionable at best

NASCIS III

- Primary outcome negative
- Post hoc analysis (3-8 hours w/48° MPS)
- Modest effect (FIM) w/48° MPS
- Increased incidence of sepsis/pneumonia w/48° MPS

Neurosurgery 2002;50:s63-

Canadian Association of Emergency Physicians

Steroids in Acute Spinal Cord Injury

Summary | Review of evidence | References

Position Statement: Methylprednisolone for acute spinal cord injury is not a standard of care; it is only a treatment option.

- There is insufficient evidence to support the use of high-dose methylprednisolone within 8 h following an acute closed spinal cord injury as a treatment ***standard*** or as a ***guideline*** for treatment

POSITION PAPER
National Association of EMS Physicians

High-dose Steroids for Acute Spinal Cord Injury in Emergency Medical Services

Bryan E. Bledsoe, DO, A. Keith Wesley, MD, Jeffrey P. Salomone, MD,
for the National Association of EMS Physicians Standards and Clinical Practice Committee

Prehospital Emergency Care July / September 2004

- Until the true value of high dose steroids for the treatment of acute spinal cord injury determined—as well as what, if any, benefit may exist for out-of hospital administration—NAESMP does not support their routine use in EMS

Final Comments

- The jury is still out on the efficacy of MPS
  - Perhaps a question that will not be easily answered