

ER case conference

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Case 1: 15433848

Case 1:

- 29 y/o, male
- Date: 2012/XX/XX, 18:52
- E3V2M6
- TPR: ? /136/26 BP:109/44 mmHg
- SpO2: 100%
- 檢傷主訴: 騎車被車撞
- Triage: 1

Patient Data

- Chief Complaint:
Hit by a car while riding a motorcycle
- E3V2M6

History

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- Allergy: No known allergy
- No DM
- No HTN
- No history of heart disease
- No OP history
- No alcohol consumption

Past History

- Cons: E3V2M6
- Neck: on neck collar
- Chest: clear BS
 - RHB, no murmur
 - Right chest deformity
- Abdomen: soft,
- Extremity: warm
 - Left arm deformity

Impression:
• Multiple trauma

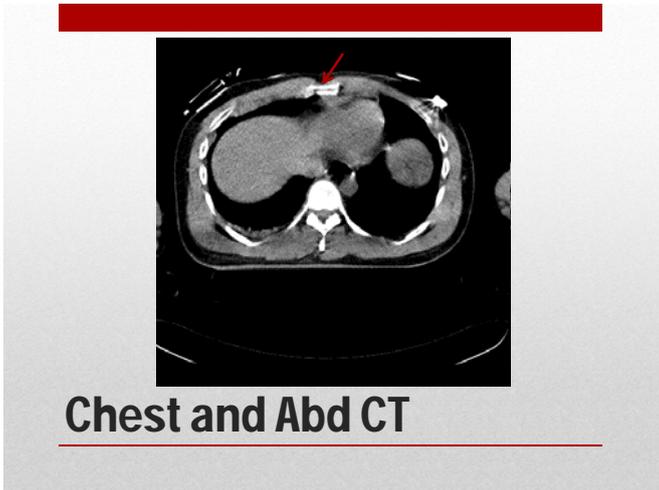
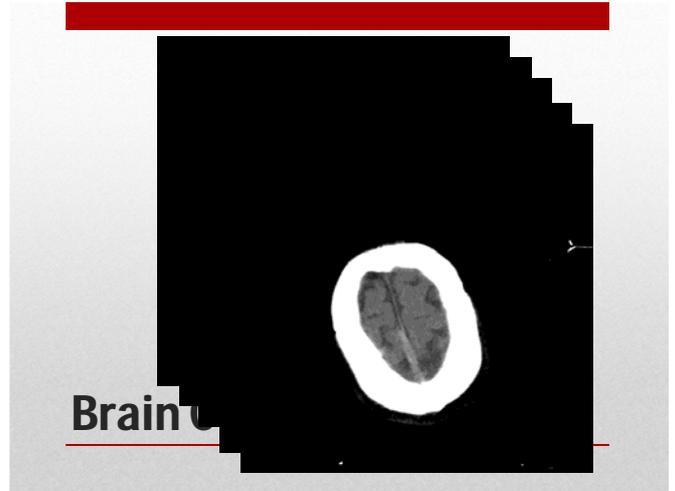
Physical Examination

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Day1

- Trauma blue
- Hb, WBC/DC
- GOT, Cr, Na/K, CPK, CK-MB, Troponin I
- N/S
- ECG
- Abdominal echo:
 - No pericardial effusion
 - No ascites
- Brain CT
- Left forearm X-ray
- Chest to pelvis CT

Initial management



Lab Data

CBC/DC		PT/aPTT		Biochemistry	
WBC (x10 ³ /uL)	18.7	PTp	9.8	GLU (mg/dL)	109
RBC (x10 ⁶ /uL)	5.28	PTc		GOT (U/L)	111
Hb (g/dL)	16.8	PT (INR)	0.93	BUN (mg/dL)	13
HCT (%)	48.2	PTTp		Cr (mg/dL)	1.2
MCV (fl)	91.3	PTTc		Na (meq/L)	142
MCH (Pg)	31.8			K (meq/L)	4.5
MCHC (%)	34.9			CPK (u/L)	736
PLT (x10 ³ /uL)	247			Troponin I (ug/L)	0.244
Seg (%)	58			CK-MB (U/L)	263
Lymph (%)	32			Ethyl alcohol	37.58
Mono (%)	7				
Eosin (%)					
Band (%)					

- Day1 Initial impression:
 - 1.Right rib fracture
 - 2.Left fore arm fracture
 - 3.Right 2nd 3rd 4th 5th metacarpal fracture
 - 4.Sternal fracture
 - 5.Right clavicular fracture
 - 6.Parafalcine SDH
 - Day1 19:04
 - E3V2M6
 - BP dropped to 98/48, HR 133, RR 32
 - N/S 500ml iv st then run 100ml/hr
- ER course

- Day1 19:30
 - E4M6V5(?)
 - BP 108/55, HR 135, RR 30, SpO2 100%
 - Placed short arm splint
 - Removed long back board
- Day1 19:55
 - E4M6V5(?)
 - BP 85/53
 - Dopamine run 20ml/hr
- Day1 20:17
 - E4M6V5
 - Trauma red

ER course

- Trauma red consultation:
 - GS:
 - No obvious intraabdominal free air or ascites
 - Suggest arrange CT with contrast for F/U
 - Orthopedic:
 - Arrange OP for left arm and right metacarpal fractures when condition is stable
 - CS:
 - Place chest tube for hemothorax
 - Use prophylactic antibiotics
 - NS:
 - Keep SBP>100mmHg with dopamine
 - High dose steroid: 30mg/kg loading, then 54mg/kg/hr for 23 hours

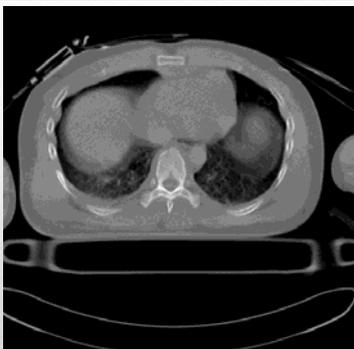
ER course

- Day1 20:45
 - E4M6V5(?)
 - BP 123/55, HR 120, RR 35
 - Patient complained of bilateral lower limb weakness
 - Place long back board again
 - Arrange CT with contrast
 - Review CT: T-spine 4,5,9 fracture
 - NE: Bilateral lower limbs MP=0; Sensory level T4-T10
 - NS Impression: T5 anterior body fracture with cord stenosis and spinal shock

ER course

- Day1 21:35
 - BP 122/56, HR 120, RR 30
 - Solumedrol 2100mg iv, then 8700mg in N/S 500ml run 23 hours
- Day1 21:49
 - E4V5M6
 - BP 116/61, HR 118, RR 22
 - Place right chest tube
 - Admission
- Day2 NS OP

ER course



Chest CT review - T5



Chest CT review – T4 & T9



Chest CT sagittal

Spine and spinal cord trauma

- Goals in the ER:
 - Establish the diagnosis and prevent further neurologic injury
- American Spinal Injury Association(ASIA):
 - Incomplete tetraplegia: 29.5%
 - Complete paraplegia: 27.9%
 - Incomplete paraplegia: 21.3%
 - Complete tetraplegia: 18.5%
- Most common level of injury: **C5**
- Most common level of injury in paraplegia: **T12**

Background

- Traumatic spinal cord injury in the U.S.:
 - 40 cases per million
 - Mean age: 40 years old
 - Male-to-female predominance of 4 to 1
 - More frequently on weekends, holidays, and during summer months
- Etiology:
 - 42% due to motor vehicle collisions
 - 27% due to falls
 - 15% due to acts of violence (primarily gunshot wounds)
 - 8% from sports, and 8% from other mechanisms.

Epidemiology

- Three Methods to judge stability:
- 1. An injury with separation of adjacent vertebral bodies or arches obviously has enough ligamentous disruption to be unstable
- 2. Radiography
- 3. The Denis three-column

Spinal stability

- The three columns in the Denis system:
 - **Anterior:** Anterior part of the vertebral body, the anterior annulus fibrosus, and the anterior longitudinal ligament
 - **Middle:** Posterior wall of the vertebral body, the posterior annulus fibrosus, and the posterior longitudinal ligament
 - **Posterior:** Bony complex of the posterior vertebral arch and the posterior ligamentous complex
- Disruption of **at least two columns** → Unstable
- Any patient with neurologic deficits or radiographic evidence of injury should be considered to have an unstable injury.

Spinal stability - The Denis system

- Patients who have complaints of **neck or back pain** should be presumed to have a spine injury until proven otherwise.
- Patients with **significant injury above the clavicles** are also presumed to have cervical spine injury.
- Patients with neurologic complaints should be presumed to have a spinal cord injury
- Overtriage is acceptable because the consequences of undertriage can be devastating.

Prehospital Care

- Motor Vehicle-Related Injuries (acceleration-deceleration injuries)
 - Cervical spine
- Falls
 - Thoracolumbar junction
- Sports Injuries
 - More related to the mechanism, the force involved, and the point of application of the force

Mechanism of injury

- Immediate airway control
 - Any patient with an injury at **C5 or above** should have his or her airway secured via endotracheal intubation (roots of the phrenic nerve: C3-4-5)
- Neurologic assessment should be performed before patients are intubated and sedated
- **Spinal immobilization** should be maintained while securing the airway
- Use a two-person spinal stabilization technique
 - Maintaining in-line immobilization and prevent excessive movement

ED Stabilization

- Hypotension
 - IV crystalloid
 - Never assume that a patient with hypotension and bradycardia is suffering from isolated neurogenic shock (Vital signs cannot be relied upon to differentiate)
 - Blood loss should be presumed to be the cause of hypotension until proven otherwise
 - More than 90% of hypotensive patients with penetrating spinal cord injury have blood loss

ED Stabilization

- Skin breakdown and pressure sores can develop very quickly, particularly in obese patients.
- The goal is to remove patients from the backboard in less than 2 h
- The standard hospital mattress provides adequate spinal support (keep spinal immobilization)
- If the patient is obtunded, assume there is a cervical spine injury until proven otherwise

ED Stabilization

- Level of spinal cord injury
- Neck or back tenderness
- Motor function
- Level of sensory loss
- Proprioception or vibratory function (posterior column function)
- DTR
- Anogenital reflexes (bulbocavernosus reflex, cremasteric reflex, anal wink reflex)

Neurologic examination

Table 255-4 Motor Grading System

Grade	Movement
0	No active contraction
1	Trace visible or palpable contraction
2	Movement with gravity eliminated
3	Movement against gravity
4	Movement against gravity plus resistance
5	Normal power

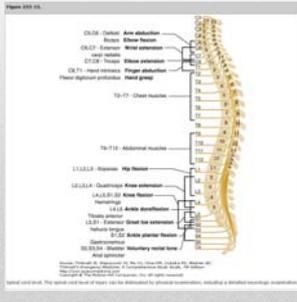
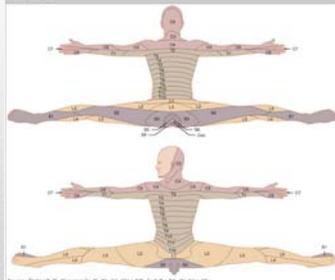


Figure 255-16



Source: Tintinalli JE, Stoppaurovič JS, Ma OJ, Cline DM, Cuddeback RK, Meckler GD: Tintinalli's Emergency Medicine: A Comprehensive Study Guide, 7th Edition. Philadelphia: Elsevier; 2016. Copyright © The McGraw-Hill Companies, Inc. All rights reserved. Determinations for sensory examination.

- Not all patients require cervical spine radiographs:
 - **National Emergency X-Radiography Utilization Study (NEXUS):** 99.6% sensitivity, low specificity (12.9%)
 - **Canadian cervical spine study:** 100 percent sensitivity and 42.5 percent specificity
 - NEXUS then Canadian
- For "low-risk" patients (risk of <0.5% or <5 per 1000 for cervical spine injury)

Imaging

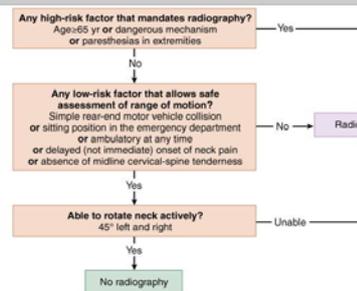
Table 250-5 National Emergency X-Radiography Utilization Study (NEXUS) Criteria for Omitting Cervical Spine Imaging*

No posterior midline cervical spine tenderness
No evidence of intoxication
Alert mental status
No focal neurologic deficits
No painful distracting injuries

*Failure to meet any one criterion indicates need for cervical spine imaging.

NEXUS criteria

Figure 250-2



Source: Tintinalli JE, Stoppaurovič JS, Ma OJ, Cline DM, Cuddeback RK, Meckler GD: Tintinalli's Emergency Medicine: A Comprehensive Study Guide, 7th Edition. Philadelphia: Elsevier; 2016. Copyright © The McGraw-Hill Companies, Inc. All rights reserved.

Canadian cervical spine rule. (Reproduced with permission from Stoll IG, Wells GA, Vandemheen K, et al: The Canadian C-spine rule for radiography in alert and stable trauma patients. JAMA 285: 1841, 2001.)

Canadian rule

- **High risk patients:**

Table 255-7 Patients at High Risk for Cervical Spine Injury

Injury mechanism	High speed (>33 mph or 56 kph combined impact) motor vehicle crash Motor vehicle crash with death of an occupant Pedestrian struck by moving vehicle Fall from height >10 ft or 3 m
Primary clinical assessment	Significant or serious closed head injury* Neurologic symptoms or signs referable to the cervical spine Pelvic or multiple extremity injuries
Additional information	Intracranial hemorrhage seen on CT

Imaging

- **AP, Lateral, Odontoid**
- Look for:
 - Smooth and uninterrupted spinolaminar line
 - Loss of normal cervical lordosis (muscle spasm may indicate spinal injury)
 - Prevertebral swelling (prevertebral space anterior to C3 <5 mm, prepedicular space should be <3 mm in an adult)
- Plain radiography may miss up to 15% of all cervical spine fractures

Imaging – C-spine Plain film

- Pain or tenderness but normal C-spine plain films
- Flexion and extension views
 - Fully awake, unsedated, cooperative patient
 - Motion should be limited by increasing pain or the appearance of any neurologic symptomatology
 - 3.7 mm or an angulation of greater than 11 degrees

Imaging – C-spine Flexion & extension views

- CT overall sensitivity: 98%
 - >65 years of age
 - High-risk mechanism injury
 - Those undergoing other scanning such as head, chest, or abdominal CT
 - Adequate visualization of the lower cervical and upper thoracic spine anticipated to be difficult.

Imaging – C-spine CT

- Approximately 10% of patients with a fracture in one segment will have a second fracture at another
- AP and lateral
- Patients with point tenderness and normal plain radiographs are a clinical dilemma
- MRI: neural, muscular, and soft tissue injury
 - Neurologic findings with no clear explanation after plain films and CT scanning.

Imaging – T & L- spine

Table 255-8 Indications for Thoracic and Lumbar Imaging after Trauma

Mechanism	Gunshot
	High energy
	Motor vehicle crash with rollover or ejection
	Fall >10 ft or 3 m
	Pedestrian hit by car
Physical examination	Midline back pain
	Midline focal tenderness
	Evidence of spinal cord or nerve root deficit
Associated injuries	Cervical fracture
	Rib fractures
	Aortic injuries
	Hollow viscus injuries

Imaging – T & L- spine

- Spinal cord injury without radiologic abnormality (SCIWORA)
 - MRI has shown significant pathology in many of these patients
 - Delayed onset of neurologic damage is usually apparent within 48 hours
 - Numbness, paresthesias, or "shock-like" sensations in the extremities

Associated injuries

- Transient quadriplegia
 - Frequently in children, most often in young boys after sports injuries
 - Paresthesias or weakness of the extremities
 - Lasting from seconds to minutes
 - Complete recovery within 48 hours
 - Concussion of the spinal cord

Associated injuries



THANKS FOR YOUR ATTENTION!
