Clearing the C-spine in Obtunded Trauma Patients Based on Admission CT: A Prospective Randomized Trial

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Disclosures: none
Introduction

• C-spine clearance in the obtunded blunt trauma patient (OBTP) is a highly debated topic in the Trauma and Spine surgery literature

• Multiple studies have assessed the value of plain films, CT, and MRI for clearing uninjured c-spines in the population

• The current system at our institution, and nationwide, lacks standardization
  - Patients can remain in cervical collar indefinitely until C-spine exam is possible
  - Spine services are haphazardly consulted for clearance

• What can we do to avoid unnecessary and prolonged immobilization?
It’s just a C-collar

• Immobilization is NOT without consequence
  – Associated with respiratory deterioration
  – Skin breakdown
  – Venous thrombosis
  – Delay of head/neck surgical procedures
  – increased risk of decubitus ulcer by 66%
  – Prolonged intubation

Image 1. Full thickness skin ulcer secondary to prolonged cervical collar

Morris CG, McCoy E. Clearing the cervical spine in unconscious polytrauma victims, balancing risks and effective screening. Anaesthesia. 2004;59:464-482
Ackland HM, Cooper DJ, Malham GM, Kossmann T. Factors predicting cervical collar-related decubitus ulceration in major trauma patients. Spine. 2007;32:423-428
It’s just a C-collar

- Countless algorithms exist across the U.S. for clearing the C-spine in OBTPs
  - NO standardization
  - Algorithms include CT +/- MRI, and most typically include clinical examination

Image 2. Illustration of the complexity of clearance protocols at some institutions
MRI Protocol

• Expensive
  – Shuster et al
    • Eliminating MRI from protocol = $1661 health care dollars saved per study
  – Como et al
    • Eliminating MRI = $250,000 decrease in health care costs over 2 years

• Unnecessary
  – Como et al
    • 115 pts: 6 injuries found on MRI but not on CT
    • No changes in management after MRI results
  – Tomycz
    • 180 pts CT+MRI; 38 pts with injury on MRI
    • No unstable injury
    • No operative interventions required

Image 3. Full thickness skin ulcer 6 months after injury
Our Study Goal

• To demonstrate:
  • The C-spine of obtunded patients are being cleared safely by CT prior to an available clinical exam
  • Our data agrees with current literature indicating cervical CT is an adequate imaging modality
  • Likelihood of a missed unstable injury is essentially zero
Methods

- One orthopaedic spine attending agreed to clear the C-spine in OBTPs in consult (1/3)

- Consults for clearance when the remaining spine surgeons were on call remained in cervical collar until clinical examination was possible (2/3)

- Demographic data was recorded for each pt

- Inclusion criteria
  - 18-75 y/o
  - Decreased mental status

- Exclusion criteria
  - Age out of range
  - Return to normal mentation before 48 hours
  - Evidence of C-spine injury on admission CT scan
  - Known spinal cord injury at arrival
Methods

- IRB approval was obtained

- Obtunded patients admitted between Jan 1, 2010 and Dec 30, 2010 were screened for participation

- Subjects randomized based on spine surgeon on call at admission

- At 48 hours the admission CT was reviewed by attending staff and clinical examination was performed on those patients randomized to early clearance

- Cervical spine stability was based on two scoring methods used to predict unstable injury
  - White and Panjabi
  - Cervical Spine Injury Severity Score

- Pts followed daily until return to normal mentation or discharge

- Clinical examination performed once “awake”

- Control group remained in collar until a clinical examination was possible
Results

- 96 patients met criteria for enrollment
  - 41 cleared radiographically
    - Mean of 4 days (2-14 days)
  - 55 remained in C-collar
    - Mean 15 days (2-44 days)

- 11/55 patients were discharged in C-collar

- 3/96 died of injuries unrelated to C-spine

- 1/55 cleared via MRI before clinical exam

- White & Panjabi and CSI/SS scores were all zero in the early clearance group

Statistical analysis

- GCS (p=0.9)
- Age (p=0.7)
- Hospital days (p=0.8)

- Days in c-collar greater for control group (p=0.001)

- No incidence of skin breakdown documented in either group

- No patients cleared radiographically had missed injury resulting in clinical instability
  - 100% follow-up on clearance pts

<table>
<thead>
<tr>
<th></th>
<th>Clearance N=41</th>
<th>Control N=55</th>
<th>Sig.</th>
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<tbody>
<tr>
<td>GCS</td>
<td>7.73</td>
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<td>Age (years)</td>
<td>42.1</td>
<td>42.4</td>
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<td>Hospital Stay: (days)</td>
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<td>C-collar duration: (days)</td>
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<td>CSI/SS/White Panjabi score</td>
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<td>N/A</td>
<td>N/A</td>
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Conclusions

- The advent of the helical CT scanner has greatly increased the sensitivity of cervical injury detection

- Fewer and fewer *clinically significant* injuries are remaining undiagnosed on admission cervical CT scan of the OBTPs

- The goal of this study was to analyze radiographic clearance of the C-spine for overall safety and rates of missed injury when compared to the traditional protocol

- Rates of missed C-spine injuries were zero in this prospective analysis

- Limitations
  - Small sample size
  - Underpowered
  - Non-blinded