

UAMS EM Journal Club
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Drs. Jordan Takasugi and Thomas Reeve
Faculty Advisor: Dr. Carly Eastin

Evaluating the utility of MRI in trauma patients with negative CT C spine

Clinical Bottom Line: While limited as these studies only included admitted patients, in trauma patients with no neurological deficit, the use of MRI on patients with negative CT C spines and whose C spine could not be cleared is likely to detect injuries but rarely adds a change in clinical management.

PICO Question: In trauma patients with negative CT c spine imaging, does the addition of MRI imaging identify additional clinically relevant cervical injuries?

P: Trauma patients

I: CT cervical spine + MRI cervical spine

C: CT cervical spine

O: Clinically significant injuries

Background: Trauma patients with cervical spine tenderness make up a significant portion of presentations to the ED. While the consensus is to clear the cervical spine in obtunded patients after a negative cervical spine CT, at this time there is no clear consensus on an evidenced based protocol to adequately clear a cervical spine in alert patients with persistent tenderness after negative cervical spine CT. The following studies examined the benefit of MRI in addition to CT imaging to assess for further cervical spine injuries.

Trial 1:

Maung et. Al. "Cervical spine MRI in patients with negative CT: A prospective, multicenter study of the Research Consortium of New England Centers of Trauma (ReCONNECT)" J Acute Care Surg. 2016 November; 2(82):e

Pubmed link: <https://pubmed.ncbi.nlm.nih.gov/27893647/>

Risk of Bias: Moderate risk of bias due to prospective, uncontrolled nature of the study.

The Basics: This is a prospective trial of eight level I and II trauma centers on blunt trauma patients who underwent cervical MRI after a negative CT spine. The primary endpoint was how often MRI would change management.

Methods: This study included 767 blunt trauma patients who were admitted over a 30-month period. Patients had a negative CT cervical spine and either had persistent midline cervicalgia or were deemed unevaluable and then underwent MRI cervical spine.

Results: 767 trauma patients were enrolled in the study. 402 of these patients underwent MRI after negative CT based on the criteria of persistent midline c spine neck pain. The MRI was abnormal in around 23 percent of these patients, however only 5 (1.2%) patients without neurologic symptoms went on to need surgery.

Limitations/Bias: There are limitations in this study due to the individual variability of the attendings reading CT. The study admits that it is unclear if the findings may be due to limited imaging by CT, or limited reading by the radiologist. The radiologists were also not blinded to the symptoms of the patient or why there was need for further imaging by MRI. Additionally, MRI was obtained at the discretion of the ordering team. This may vary by institution.

Trial 2: Malhotra, Ajay, et al. "Utility of MRI for cervical spine clearance in blunt trauma patients after a negative CT." *European Radiology* 28 (2018): 2823-2829.

<https://link.springer.com/article/10.1007/s00330-017-5285-y>

The Basics:

This was a retrospective cohort study performed at a tertiary level 1 trauma center to identify all adult patients who underwent CT scan of the C-spine followed by MRI of the cervical spine. The purpose of the study was to determine the level of unstable cervical spine injuries missed by CT cervical spine, but present of MRI C-spine imaging.

Methods:

Included patients at level 1 trauma center who had both CT cervical spine and MRI cervical spine within 48 h of each other. Retrospective data was gathered between February 2013 and November 2015. Only patients with blunt cervical spinal injuries were included. MRI exams were confirmed by experienced neuroradiologist blinded to patient information to ensure accurate reads. Unstable injuries were strictly defined as multicolmn injuries and cord injuries. Secondary outcomes including cervical collar use, surgical vs nonsurgical management, and post discharge follow up were measured.

Results: After exclusion criteria were applied total 1,271 patient with blunt cervical spine injury at CT followed by MRI within 48 horus were included. 66% of patients had negative CT cervical spine imaging, of these 66% of patients, 20.9% had positive MRI findings. Although this number is quite significant only 7.3% of this subset had unstable or potentially unstable cervical spine fracture. Overall, this makes NPV for CT for detecting unstable injuries 98.5%. When looking secondary outcomes, traditionally considered sensitive tests for unstable cervical spine fracture proved unreliable. Mechanism of blunt injury had no effect on predicting likelihood of unstable injury. Unstable injuries were significantly more common in men than women and those with GCS<13. Age had no association with unstable injury. Surprisingly neuro deficits and midline tenderness were not associated with increased likelihood of unstable cervical spine fracture.

Limitations/Bias: There is inherent bias for retrospective cohort studies. This study was also performed at only 1 institution and included no information about patient demographics besides gender and age. There was also a significant number of patients excluded who did not receive MRI but did receive CT, these patients may have been more ill and thus increased the likelihood for unstable pathology, potentially skewing towards more significant results. Lack of information available on chart review contributes to this.