



Article Appraisal

Article: Study Title: Cervical spine collar clearance in the obtunded adult blunt trauma patient: A systematic review and practice management guidelines from the Eastern Association for the Surgery of Trauma

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Background and Study Objective(s):

Guidelines for cervical spine (C-Spine) Clearance include CCS and NEXUS, which recommend radiography for all trauma patients with GCS < 15, decreased level of alertness, intoxication or a painful distracting injury. There is a lack of evidence in the literature regarding what investigations are sufficient to clear the cervical spine in obtunded blunt trauma patients, with a trend in practice to pursue adjunct imaging following a negative C-spine computed tomography (CT) scan to identify missed unstable injuries. The perceived medical, legal and economic risks of missing a serious ligamentous injury in patients with a negative C-spine CT combined with a lack of guidelines or prospective studies results in excessive costs and resource utilization, including the use of MRI, to rule out rare but dangerous injuries. The goal of this study was to determine whether a single negative high-quality CT scan alone is sufficient to clear the C-spine in the obtunded blunt trauma patient population, or whether adjunct imaging is required. Also, it has been suggested in the literature that thick axial CT slices may miss horizontal fractures, and so the authors focused on studies which utilized modern 'thin axial slice' CT scans.

The Eastern Association for the Surgery of Trauma (EAST) is a leader in evidence-based medicine and the development of practice management guidelines in trauma and acute care surgery. The recommendations in this article replace the previous 2009 EAST guidelines, which gave a 'Level 3' recommendation to weigh the risks and benefits of obtaining MRI in addition to CT in these patients, and for the use of MRI to be individualized in each institution. Since then, EAST has adopted the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) system.

The authors' objective for the systematic review was to determine whether a cervical collar should be removed following a negative high quality CT C-spine alone while reducing peri-clearance events.

Study Design:

The authors conducted a systematic review of the literature regarding c-spine clearance of obtunded adult blunt trauma patients. Studies were selected using electronic literature search, and then underwent a two-stage screening process by two reviewers to determine eligibility. Specifically, they included studies involving blunt

trauma patients >16 years of age who were obtunded, as defined by the individual study, and underwent C-spine CT scan with axial slice thickness of <3mm. Partial cohort (cohort studies following only those with negative CT c-spine) and pre-post study designs were accepted due to a paucity of randomized control trials. Exclusion criteria were studies not defining the CT slice axial thickness or those greater than or equal to 3mm, as well as publications containing no original data.

The primary outcomes were new neurologic change following collar removal and identification of unstable C-spine injury on adjunct imaging following negative CT scan. Secondary outcomes included identification of stable C-spine injury, post-clearance imaging, false-negative CT imaging result on re-review, incidence of pressure ulcers, and time to collar removal. A meta-analysis was not performed given 11 of 12 included studies were partial cohort or retrospective in design which results in incomplete diagnostic accuracy data and precludes quantitative synthesis.

Results:

12 studies were included in the review, 11 of which were partial cohort or pre-post imaging studies, 4 of which were prospective and the remainder retrospective. MRI was the most common adjunct imaging modality, while other methods included upright C-spine films, flexion-extension CT scans and clinical reassessment. There was significant variation in the definition of an obtunded patient, ranging from a GCS <15 to those having a physical examination that was unreliable or not possible to elicit. Five studies (1,017 subjects) assessing presence of neurologic change, defined as paraplegia or quadriplegia, after collar removal, reported an incidence of 0. Eleven studies (1,713 subjects) evaluating presence of C-spine injuries identified by adjunct investigation demonstrated an incidence of unstable C-spine injuries of 0 and of stable C-spine injuries of 9%. This suggests a negative high-quality CT scan has a negative predictive value of 100% (95%CI) for detecting unstable C-spine injuries, and 91% (95%CI) for detecting stable C-spine injuries.

The most common finding detected using adjunct imaging was ligamentous injury. False-negative CT results were not reported, and the presence of pressure ulcers and time to collar removal were inconsistently reported. Weaknesses identified included publication bias, variability in the definition of obtunded and differing institutional imaging protocols. Grading according to the GRADE methodology was challenging due to the study design limitations and inability to perform a meta-analysis. The quality of evidence across all outcomes was rated as Very Low (D) – little confidence; true effect is likely substantially different from estimate. Evidence for finding an unstable C-Spine injury was moved up a rating to Low (C) – limited confidence; true effect may be substantially different from estimate – because of the consistently high (100%) NPV. The authors, and the 2015 EAST guidelines, conditionally recommend cervical collar removal after a negative high-quality C-spine CT scan result alone.

Validity of Results:

The results of the study are weakened by the Low/Very Low quality evidence available. There is a lack of randomized control trials and cohort studies addressing C-spine clearance in the obtunded blunt trauma patient, precluding their ability to perform a quantitative synthesis. Given that the studies failed to address the incidence of positive C-spine CT findings, we are also unable to draw upon the accuracy of C-spine CT scan.

In addition, many of the studies in the literature are likely underpowered to detect the primary outcomes of unstable C-spine injury and neurologic change after collar removal. In addition, as eluded to by the study authors, publication bias likely affects the available literature.

Generalizability of Results:

Despite the Low/Very Low quality of evidence, the trial has generalizable results to larger healthcare centres with up-to-date high-quality CT scanners and experienced radiologists interpreting the studies. In addition, this pertains specifically to initial investigations done in the emergency department patient population.

The patient population studied is also fitting, given that the majority of trauma in our emergency departments is blunt trauma affecting a broad patient population as reflected by their broad age ranges. However, there is variation in the definition of “obtunded” between the studies, producing a heterogenous population, making it unclear as to what specific patient population this may or may not apply to.

The Bottom Line:

Whether C-Spine CT scan alone can "clear" the cervical spine is still controversial. The authors, and the 2015 EAST guidelines, conditionally recommend cervical collar removal after a negative high-quality C-spine CT scan result alone. It is important to keep in mind that this is based on Low/Very Low-quality evidence, placing a strong emphasis on the high negative predictive value of modern CT imaging in excluding an unstable C-spine injury. We do not believe that the evidence provided from the 12 studies, and the resulting GRADE of evidence was enough to support this recommendation if all injuries are taken into consideration. We would also suggest emphasis on the CT scan being read by an experienced trauma radiologist.

This recommendation is further supported by the high costs of magnetic resonance imaging (MRI) or other additional imaging, and the authors quote choosingwisely.org saying our goal should be to... efficiently use finite resources and to eliminate low-value, low-impact services. We are using C-spine CT as a screening test aiming to achieve the greatest good for the greatest number of patients. Other clinical guidelines have not yet adopted this approach. The ACR Appropriateness Criteria panel recommends that MRI be used to evaluate the cervical spine in patients whose neurologic status cannot be fully evaluated within 48 hours of injury, including those in whom the CT examination is normal.

Currently, the algorithm for C-spine clearance in obtunded blunt trauma patients at Vancouver General Hospital (VGH) allows the most responsible physician to use their discretion with regards to managing the obtunded adult blunt trauma patient following negative CT c-spine. Options include ongoing C-spine immobilization, MRI for high-risk mechanism or projected delay in clinical clearance, or collar removal based on this guideline. This being said, attendees came to the consensus that there is variation amongst clinicians at VGH, with some removing the collar while others obtain an MRI spine prior to collar removal. At KGH the common practice is to remove the collar in this setting, and MRI is reserved for those with a high clinical suspicion of ligamentous or spinal cord injury, in consultation with the neurosurgeons.