Pediatric Cervical Spine Clearance

The clinical presentation and diagnostic workup in pediatric cervical spine injury is different from adults owing to the unique anatomy and relative immaturity.

Safe and effective clearance of the pediatric cervical spine presents a challenging problem due to a myriad of reasons, which has often led to further imaging studies such as computed tomographic (CT) scans being performed, exposing the pediatric patient to significant radiation with a potential increased cancer risk.

In 2017 there were few studies assessing the diagnostic test accuracy of the NEXUS criteria and CCR in children. At this moment, there was not enough evidence to determine the accuracy of the Canadian C-spine Rule to detect CSI in pediatric trauma patients following blunt trauma. The confidence interval of the sensitivity of the NEXUS criteria between the individual studies showed a wide range, with a lower limit varying from 0.18 to 0.91 with a total of four false negative test results, meaning that if physicians use the NEXUS criteria in children, there is a chance of missing CSI. Since missing CSI could have severe consequences with the risk of significant morbidity, we consider that the NEXUS criteria are at best a guide to clinical assessment, with current evidence not supporting strict or protocolized adoption of the tool into pediatric trauma care. Moreover, we have to keep in mind that the sensitivity differs among several studies, and individual confidence intervals of these studies show a wide range. Our main conclusion is therefore that additional well-designed studies with large sample sizes are required to better evaluate the accuracy of the NEXUS criteria or the Canadian C-spine Rule, or both, in order to determine whether they are appropriate triage tools for the clearance of the cervical spine in children following blunt trauma [1)].

Pediatric Cervical Spine Clearance: A Consensus Statement and Algorithm from the Pediatric Cervical Spine Clearance Working Group [2)].

Kavuri et al., utilized a cervical spine clearance protocol from 2002 to 2011. In October 2012, the protocol was revised to provide indications for appropriate imaging by utilizing repeat “next day” physical examination. In 2014, the protocol was again revised with the desired goal of decreasing the use of CT scans through increased involvement of the Spine Service. A retrospective review was commenced using information from the Trauma Database from 2011 to 2014. Three groups were analyzed according to which protocol the patients were evaluated under: 2011, 2012, and 2014 protocols.

During the study period, 762 patients underwent cervical spine clearance; 259 (2011 protocol), 360 (2012 protocol), and 143 (2014 protocol). The average age of all patients was 8.8 years, with 28% of patients younger than 5 years of age. There were no missed or delayed diagnoses of cervical spine injury. The use of CT scans decreased during the study period from 90% (2011 protocol) to 42% (2012 protocol) to 28.7% (2014 protocol). There was an increase in time to removal of the cervical collar at 13 to 24 hours from 8% (2011 protocol) to 22% (2012 protocol) to 19% (2014 protocol). This was not associated with an increase in hospital length of stay, which averaged 2.51 days (2011 protocol), 2.45 days (2012 protocol), and 2.27 days (2014 protocol).

Repeat “next day” clinical examinations and increased involvement of the Spine Service decreased

radiation exposure without compromising the diagnosis of cervical spine injury or increasing the length of stay at a Level One Pediatric Trauma Center in this pilot study [3].

A PubMed search was conducted using keywords “paediatric cervical spine injuries” or “paediatric cervical spine trauma.” Six hundred and ninety two articles were available in total. Three hundred and forty three articles were considered for the review after eliminating unrelated and duplicate articles. Further screening was performed and 67 articles (original articles and review articles only) related to pediatric CSI were finally included. All articles were reviewed for details regarding epidemiology, injury patterns, anatomic considerations, clinical, and radiological evaluation protocols. CSIs are the most common level (60%-80%) for pediatric Spinal Injuries (SI). Children suffer from atlantoaxial injuries 2.5 times more often than adults. Children's unique anatomical features (large head size and highly flexible spine) predispose them to such a peculiar presentation. The role of NEXUS Criteria for C-Spine Imaging and Canadian Cervical Spine Rule criteria in excluding pediatric cervical injury is questionable but cannot be ruled out completely. The minimum radiological examination includes 2- or 3-view cervical X-rays (anteroposterior, lateral ± open-mouth odontoid views). Additional radiological evaluations, including computerized tomography (CT) and magnetic resonance imaging (MRI) are obtained in situations of abnormal physical examination, abnormal X-rays, inability to obtain adequate X-rays, or to assess cord/soft-tissue status. The clinical criteria for cervical spine injury clearance can generally be applied to children older than 2 years of age. Nevertheless, adequate caution should be exercised before applying these rules in younger children. Initial radiographic investigation should be always adequate plain radiographs of cervical spine. CT and MRI scans should only be performed in an appropriate group of pediatric patients [4].

References

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