Paediatric cervical spine injury but NEXUS negative

Melanie J Maxwell, Andrew D Jardine

Cervical spine injuries in paediatric patients following trauma are extremely rare. The National Emergency X-Radiography Utilization Study (NEXUS) guidelines are a set of clinical criteria used to guide physicians in identifying trauma patients requiring cervical spine imaging. It is validated for use in children. A case of a child who did not fulfil the NEXUS criteria for imaging but was found to have a cervical spine fracture is reported.

A 3-year-old girl was involved in a head-on collision between two cars at a speed of approximately 70 mph. The drivers of both cars were killed. She was a rear seat passenger and was found still secured in her child car seat.

Primary survey proved unremarkable, and her cervical spine was immobilised with sandbags alone as she would not tolerate a neck collar. Her Glasgow Coma Score was 15 and neurological examination normal. Bruising was noted over her left upper limb, shoulder and lower abdominal wall from the restraining car seat harness.

Computed tomographic scans of her head and neck were performed; however, the precise indication for the scans was difficult to interpret. They demonstrated a type II fracture of the odontoid with displacement and angulation. Cervical spine immobilisation with sandbags was continued and she was transferred urgently to the spinal unit at our hospital.

This injury was treated conservatively. The fracture was reduced under general anaesthesia using radiological imaging and her neck placed in extension by the use of traction. A carbon fibre halo attached to a special jacket was applied and remained in situ for 12 weeks. Subsequent to this she wore a soft collar to protect her neck for a further 2 weeks. Follow-up x rays have shown complete healing of her fracture.

DISCUSSION

Cervical spine injuries in children are a rare occurrence. The National Emergency X-Radiography Utilization Study (NEXUS) detected a prevalence of cervical spine injury of 0.98% when reviewing its subset of patients aged <18 years.¹

Guidelines have been produced to guide physicians in identifying trauma

patients who require cervical spine imaging. This is an attempt to reduce patients' exposure to radiation through unnecessary radiography. In the UK, the British Trauma Society has published guidelines.² NEXUS is used in the USA¹ and the Canadian Cervical Spine Radiography Rule is used in Canada.³ It is only the NEXUS criteria, however, that have been validated for use in children.

The NEXUS criteria are midline cervical tenderness, altered level of alertness, evidence of intoxication, neurological abnormality and the presence of a painful distracting injury. If any of these features exist, imaging of the cervical spine is indicated. Of the 34 069 patients enrolled in NEXUS, 3065 were children. Subsequent analysis of this subset showed that all cervical spine injuries were correctly identified (sensitivity 100%, 95% confidence interval (CI) 87.8% to 100%), and when all of the criteria were absent, a negative predictive value of 100% existed (95% CI 99.4% to 100%). NEXUS does stress, however, that although its criteria have been validated for use in the paediatric population, only four of the 30 children with cervical spine injury were younger than 9 years of age and none were younger than 2 years. Caution is therefore advised when attempting to apply the criteria to infants and toddlers.¹

There has also been considerable literature published on "seatbelt syndrome", the characteristic pattern of injury which results from the wearing of seatbelts in road traffic accidents. The wearing of four-point harnesses provides good restraint of young children's bodies but allows transmission of deceleration forces to the unrestrained cervical spine, permitting flexion to occur.⁴ When assessing for possible injuries it is therefore prudent to

consider the type of harness used to restrain the child.

We report a case of a young child with a cervical spine injury who did not fulfil the NEXUS criteria for cervical spine imaging when initially admitted. She did not complain of neck pain at all. In this case a high risk mechanism of injury, namely a high speed collision, existed. This would fulfil a criterion for imaging according to the Canadian Cervical Spine Radiography Rule for adults.³ In fact, the Canadian study identified a dangerous mechanism as being the most powerful factor in predicting adult cervical spine injury.

We agree that the NEXUS criteria should be used carefully in young children and suggest that cervical spine imaging should be considered, even in those who cooperate and are pain-free, if a high risk mechanism of injury exists. It is also important, as mentioned previously, to evaluate carefully children who display marking from seatbelt restraints as this may indicate that extreme flexion of the cervical spine has occurred. Furthermore, it should be stressed that the subsequent development of neck tenderness is an important diagnostic sign and parents should always be encouraged to return to hospital if pain develops later or the child is reluctant to move their neck.

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