MANAGING PATIENTS WITH CERVICAL SPINE INJURY

Nadine Montgomery and Debbie Goode offer a literature review of spinal immobilisation practices in emergency settings.

Abstract

Common measures to establish spinal immobilisation at the scene of an accident include keeping the patient’s head still, applying a rigid cervical collar and transporting the patient on a rigid spinal board to an emergency department. This article reviews the literature about spinal immobilisation practices in emergency settings, including best-practice guidance and papers on immobilisation, imaging, rapport with patients and complications.

Keywords

Spinal immobilisation, techniques, complications

ABOUT 75% of all spinal injuries are associated with road traffic or sporting accidents, or falls from a height (van den Berg et al 2010, Jia et al 2011), although such injuries can also be due to violence resulting in penetration by stabbing or shooting (Parizeł et al 2010).

Caution must be taken while moving trauma patients, especially those with head trauma who may have cervical spinal (c-spine) injuries (Crosby 2006). When emergency service providers arrive at accident scenes and find people with spinal trauma, they routinely apply rigid spinal boards, straps, rigid cervical collars and lateral neck supports to keep the patient’s spine in a neutral position during transport to an emergency department (ED) or trauma centre (Ahn et al 2011).

To minimise c-spine motion during patient transfer, they use the lift and slide manoeuvre rather than the log roll (Boissy et al 2011).

It is generally considered best practice to keep cervical collars in place until a patient’s c-spine has been cleared of injury (Hauswald and Braude 2002), but maintaining patients on spinal boards after their arrival at hospital is controversial and many authors state that the use of such boards should be limited to pre-hospital care. Abram and Bulstrode (2010), for example, claim that interventions to immobilise the c-spine have been developed largely without firm supporting evidence and, in some cases, are harmful.

In light of the high mortality rate among trauma patients, and differences of opinion about the use of cervical collars and spinal boards, the authors conducted a literature review to determine best practice and the complications that can arise from the immobilisation of patients with c-spine injuries. Using combinations of keywords and phrases, including ‘spinal immobilisation’, ‘spinal injuries’, ‘adverse effects’, ‘risk assessments’, ‘transportation of patients’, ‘criteria for removal’ and ‘nurses’ attitudes’, the authors searched the CINAHL, Cochrane Library, Embase and PubMed databases for relevant articles published in English between 2003 and 2013. Additional articles were identified from the reference lists or citations in papers, clinical guidance and legal documents.

The search yielded 35 articles, concerning one systematic review, nine literature reviews, one clinical review, two meta-analyses, two randomised crossover studies, two audits and one cohort study. The remainder concern a mixture of intervention studies, prospective trials, qualitative and quantitative studies and professional opinion.
Critical appraisal tools were used to analyse the articles systematically. This article describes the results, focusing mainly on findings from the systematic reviews, meta-analyses, randomised crossover studies and repeat audits, but supported by those from the qualitative papers.

**Results**

**Guidelines and best practice** In a systematic review of the management of trauma patients for the Cochrane Collaboration, Kwan *et al* (2009) found that the effects of spinal immobilisation on mortality, neurological injury and spinal stability are uncertain, and they highlight the need for randomised control trials in trauma patients to advance practice in the use of alternative strategies for spinal immobilisation.

Hauswald and Braude (2002) emphasise the need for a radical reassessment of policies and guidance on spinal immobilisation, which they characterise as a potentially painful and harmful treatment of little, if any, benefit to patients. Similarly, Benner *et al* (2006) and Armstrong *et al* (2007) recommend the development of an evidence-based algorithm or clinical guidelines to reduce the incidence of unnecessary c-spine immobilisation by paramedics.

Schmidt *et al* (2009) advocate the use of Advanced Trauma Life Support guidance, which recommends that the c-spine is treated as unstable until proven otherwise. They also advocate pluridirectional and computed tomography (CT) scanning to rule out injury when the results of plain radiographs are equivocal or when they are negative despite there being clinical evidence to suspect spinal injury.

Brownlee (2005) suggests adherence to updated Eastern Association for the Surgery of Trauma guidelines for safe and effective c-spine clearance (Como *et al* 2009), which state that immobilisation in a cervical collar is necessary only if the trajectory of the patient’s fall suggests there has been a direct injury to the c-spine. Even in these cases, the guidelines recommend that alert patients without neurological deficit, neck pain or distracting injuries should not receive c-spine immobilisation, and in all cases cervical collars should be removed as soon as possible after trauma (Como *et al* 2009).

National Institute for Health and Care Excellence (2007) guidelines for the management of head injuries in adults and children recommend the maintenance of immobilisation pending full risk and clinical assessments, with imaging if necessary. The guidelines add that all ED nurses should follow Trauma Nurse Core Course guidance when managing patients with Glasgow Coma Scale scores of less than 15, neck pain or tenderness, focal neurological deficit or paraesthesia to extremities. Ahn *et al* (2011), meanwhile, advocate training for emergency providers to determine c-spine clearance.

**Immobilisation** According to Ahn *et al* (2011), when spinal injury is suspected in a trauma patient, a cervical collar should be applied between foam wedges. However, after testing a range of collars on cadaveric models Horodyski *et al* (2011) conclude that they do not stop movement completely and that a rigid brace, such as the Kendrick extrication device, or a spinal board should be used too.

Theron and Ford (2009) found soft cervical collars to be ineffective in providing stability and suggest the application of skull-traction tongs, such as Gardner-Wells forceps. Smyth and Cooke (2012) found the use of these forceps in pre-hospital settings or EDs to be inappropriate because it requires the adoption of the aseptic technique and the sedation of the patients concerned. Instead, Smyth and Cooke (2012) advise the use of rigid neck collars and head blocks to prevent movement.

Stagg and Lovell (2008) conducted a repeat audit of spinal board usage in the UK that had originally been carried out six years earlier. They found that 21% of patients remain on spinal boards routinely until radiological evidence provides clearance, down from 43% in 2002. Similarly, research by Yeung *et al* (2006) shows that 44% of UK hospitals remove spinal boards after primary survey.

**Imaging** Evidence-based guidance from the College of Emergency Medicine (2010) advocate risk-based assessments for all adults and children presenting with possible head or cervical spine injuries. Meanwhile, the Scottish Intercollegiate Guidelines Network (SIGN) (2009) proposes immediate CT for all patients with suspected c-spine injury either immediately or within eight hours depending on their presenting injuries, signs and symptoms.


According to these criteria, devices can be removed from patients who are not intoxicated and who have no focal neurological deficit, midline tenderness, altered levels of alertness or painful distracting injuries. Pitt *et al* (2006) in their prospective study and Yeung *et al* (2006) in their observational study suggest that triage nurses should follow the same criteria.
Stiell et al (2003), however, state that Canadian C-spine Rules (Michaelf et al 2012) are preferable to the NEXUS criteria due to the rules’ higher sensitivity and specificity, especially in the management of alert trauma patients in stable conditions.

Richards (2005) and Saltzherr et al (2009) conclude in their reviews that X-ray imaging is not sensitive enough to be used with high risk patients, such as those with abnormal alertness, midline sensitivity or focal neurological deficit, and suggest that CT scanning of the c-spine should be the first choice of imaging. The American College of Radiology (2010) agrees that, if thoracic and lumbar spine fractures are suspected, CT scans of the chest, abdomen and pelvis are a more sensitive form of imaging than X-rays while noting that CT scans also reduce the patients’ exposure to radiation and cost of treatment.

Holmes and Akkinepalli (2005) challenge the routine screening of possible c-spine injuries using plain radiography, and conclude that CT scanning out-performs plain radiography in patients at high risk of c-spine injury, such as those aged over 65 or under two years who have fallen more than one metre or five stairs, received a blow to the head or have been in a high speed collision (College of Emergency Medicine 2010). Holmes and Akkinepalli (2005) advise plain radiography screening, however, for patients judged to be at low risk, such as those who have normal alertness, no intoxication, low level or no neck pain and no focal neurological deficit. A more recent meta-analysis study by Panczykowski et al (2011), which involved 14,327 patients, found that CT alone is sufficient to detect unstable cervical injuries in trauma patients. Its results demonstrate that cervical collars can be removed from patients in whom c-spine injury is not indicated by CT scans and who have been intubated or who are not fully alert.

Complications One of the main complications arising from prolonged spinal immobilisation is pressure necrosis, which can occur within between 48 and 72 hours depending on risk factors such as abnormal patient body mass index (BMI), the presence of comorbidities such as diabetes (Morris et al 2004) and whether risk assessments have been carried out (Naccarto and Kelechi 2011).

In a randomised crossover study, Hemmes et al (2010) immobilised 30 volunteers on a rigid spine board, a vacuum mattress or a soft-layered, long-spine board for 15 minutes each. Using standardised assessment tools to measure peak pressure indices and a visual analogue scale to rate volunteer discomfort, the researchers found that people on the soft-layered, long-spine board experienced least tissue-interface pressure. The findings may not be a generalisable, however, because the sample was small and the volunteers were healthy.

Keller et al (2005), and Sheerin and de Frein (2007), conducted similar studies of tissue-interface pressure, each involving convenience samples of between two and 20 healthy volunteers immobilised on three surfaces. Both groups of researchers found that volunteers on inflatable raft devices experienced the least pressure on their occipital and sacral areas. Sheerin and de Frein’s (2007) study is limited, however, by a flawed sampling process, inconsistent placement of pressure sensors, and a failure to take into account risk factors such as abnormal BMI and conditions such as diabetes.

Supine positioning on a spinal board for more than two hours while wearing a cervical collar is also associated with respiratory compromise, aspiration, iatrogenic pain and poor quality radiography (Brownlee 2005), as well as pneumonia, sepsis and venous thromboembolism (Kwan et al 2009).

Rapport with patients After conducting semi-structured interviews with 23 ED nurses, Wiman et al (2007) found that such nurses understand the importance of developing a rapport with vulnerable and frightened trauma patients, although they admit they sometimes fail to do so. Although these findings cannot be generalised because of the small sample size involved, they call into question the ability of nurses to build relationships in fast-paced environments. Samuriwo (2010) also conducted semi-structured interviews with nurses, who said that their attempts to enforce evidence-based practice are often impeded by their workload and the failure of doctors to take their concerns about trauma patients seriously.

McCarthy et al (2013) conducted a quantitative study involving the distribution of 403 questionnaires to a convenience sample of 11 EDs across the Republic of Ireland. When asked to score the frequency of procedures undertaken and competence in undertaking them, ED nurses reported that they perform activities associated with diagnostic function most frequently and competently. McCarthy et al (2013) conclude that there is a positive relationship between nurses’ frequency of practice and level of perceived competence. The study’s sample size is large enough for its results to be generalisable. However, according to Hulsenboom et al’s (2007) cross-sectional, observational study, most hands-on nursing care of immobilised patients is delivered by unregistered staff, such as nursing auxiliaries, healthcare support staff and students.
Conclusion
As the authors' literature review shows, immobilising vulnerable trauma patients can increase the likelihood that will stay in hospital longer. Ideally, such patients should be removed from spinal boards on their arrival at EDs, and other devices should be removed as soon as is feasible after radiological clearance.

Clinical assessments of the patients should be carried out regularly, and the NEXUS screen and the SIGN (2009) guidelines should be incorporated as evidence-based assessment tools.

There is, however, a tremendous variation in spinal-immobilisation technique and more research is required to determine best practice in this area for nurses, healthcare assistants, doctors, consultants and pharmacists. In light of this research, clinical guideline should be updated and included in local and national policies to ensure good care for all trauma patients.

References


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