To establish an incidence of cervical spine injuries in significant blunt head trauma and to evaluate the necessity of using cervical radiography, all consecutive cases of blunt head trauma admitted to the trauma service over a 7-month period were reviewed. Two hundred twenty-eight charts were reviewed for demographic information, circumstance of injury, complaints and physical findings referable to the cervical spine, presenting level of consciousness, severity of head injury, and cervical spine radiographic findings. Only three patients were found to have cervical spine injuries, for an incidence of 1.7%. Of the 122 alert and asymptomatic patients, none had cervical spine injury. The patient population was defined, yet the very low incidence of cervical spine injuries associated with blunt head trauma in this study precludes any identification of predictors. Nevertheless, the results suggest that alert and asymptomatic patients can be spared cervical spine radiography. (Am J Emerg Med 1989;7:139-142. © 1989 by W.B. Saunders Company.)

Recent attempts to define predictors of cervical spine injury have been unsuccessful. The subgroup of patients with blunt head trauma is ill-defined in the literature for true incidence of associated cervical spine injury. In addition, a universally accepted standard for using cervical spine radiography has yet to be established. This study was designed to investigate the incidence of radiographically determined cervical spine injuries associated with blunt head trauma and to evaluate the necessity of using cervical radiographic evaluation in this subgroup.

RESULTS

A total of 228 admissions were reviewed. Seventeen of these were excluded because of incomplete cervical spine radiographs. Thirty-five patients aged <12 years were excluded as a separate clinical entity because of the different patterns of pediatric cervical spine and skull injuries resulting from trauma. Of the 176 remaining patients, ages ranged from 12 to 94 years with a mean age of 29. One hundred thirty-five (77%) were...
male. The circumstances of injury are summarized in Table 1.

Of the 176 patients, 142 (80%) were alert with a history of documented loss of consciousness or unobserved loss of consciousness with retrograde amnesia on admission to the ED. Twenty of these complained of cervical spine pain and/or tenderness on palpation, two of whom had positive radiographic cervical spine findings. None of the alert patient group had any demonstrable neurologic deficit, including the two with cervical spine injury.

Data for the level of consciousness on presentation were not uniform or detailed due to the retrospective nature of this review. Level of consciousness as described on the chart could not be correlated to the Glasgow Coma Scale. Although 142/176 (80%) patients were classified as alert, these included patients with slurred speech, alcohol on breath, or other signs of possible intoxication. Fifty-four (38%) of this group of 142 alert patients had ethanol levels > 100 mg/dL. Only seven of the intoxicated group complained of neck pain and/or had pain on cervical palpation, and one of these had radiographic findings of cervical injury.

Of 176 study patients, 34 (19%) were admitted for depressed level of consciousness, presumably caused by blunt head injury. Twenty-four of these were responsive to verbal stimuli, eight were responsive to painful stimuli only, and two were flaccid and unresponsive to any stimuli. Fifteen of 34 (44%) had ethanol levels > 100 mg/dL.

Other than mild concussion, documented skull and intracranial lesions were found in 20 (11%) of the study patients. Their injuries included five brain contusions, five subdural/epidural hemorrhages, five intracerebral hemorrhages, and 16 skull fractures (linear, basilar, or depressed). One of these patients had a radiographically documented cervical spine injury.

Concurrent major injuries were present in 14 (8%) patients. None of these patients had radiographically documented cervical spine injury. The major injuries included were hemothoraces, pneumothoraces, femoral fractures, and multiple extremity fractures. Facial bone and mandibular fractures occurred in 15 (9%) patients. There were no subsequent deaths during hospital stay among the study group.

Of the 142 alert patients, two of 142 (1.4%) had radiographically documented cervical spine injury.

**DISCUSSION**

Recently, investigators have attempted to define the head injured patient population at high risk for cervical spine injury and to report the true incidence of such patients. Most previous investigations have been from the perspective of documented cervical spine injuries, with resultant high correlation to blunt head trauma. Compounding the issue, Walter et al. report that many patients may have significant cervical spine injuries with normal neurologic examinations do not spontaneously complain of cervical pain. Other authors have suggested that “painless” or occult cervical spine fractures may exist. However, their case reports do not clearly indicate any isolated cases of cervical spine injury in the complete absence of the complaint of neck pain or palpable tenderness.

In practice, the emergency physician must continue to make decisions regarding priority and care of patients presumed to be at high risk for cervical spine injury. Most clinicians follow the algorithm designed by Wales et al. and the recommendations of the Advanced Trauma Life Support (ATLS) course sponsored by the American College of Surgeons. The ATLS manual states: “Assume a cervical spine fracture in any patient with an injury above the clavicle.” In addition, the radiographic views necessary to exclude cervical spine injury remain controversial, with some authors suggesting oblique as well as flexion-extension views. It remains to be seen just how integration of computed tomography will alter this schema.

Fischer reviewed the incidence of cervical spine injuries in 333 alert patients following blunt head trauma. The criterion for entrance into his study was Ranoshoff’s class I level of consciousness after head injury: “alert, responds immediately to questions, may be disoriented and confused, and follows complex commands.” In this study, 79% of patients had suffered loss of consciousness. Of those 226 (68%) patients who received cervical spine radiologic evaluation, no patient without signs and/or symptoms of cervical injury had a cervical spine injury. Therefore, he
implies that radiologic examination in the alert patient without signs or symptoms of cervical injury is unwarranted. Our data tend to support this conclusion. Of the 142 alert patients in our study group, none of the patients without signs or symptoms of cervical spine injury was found to have such an injury. Indeed, if one practiced most conservatively and radiographed only the intoxicated or symptomatic of this group of alert patients, then 75 (43%) of 176 radiograph series could have been safely avoided.

Conversely, two (10%) of the 20 patients in our study who complained of neck pain on examination were found to have cervical spine injury. It should be emphasized that in the alert patient any finding of pain to palpation or complaint of neck pain may indicate a much higher risk of cervical spine injury. In cases of seemingly trivial findings, it is important to emphasize that the emergency physician should be liberal in the diagnostic workup.

For patients with depressed levels of consciousness, it was not possible from this study to identify high-yield criteria for obtaining cervical spine radiographs. Other authors who have studied cervical spine injuries have noted a poor correlation with obvious head trauma. One author noted that <40% of patients had documented or suspected loss of consciousness and almost half of the patients had no documented evidence of craniofacial trauma. In other studies of the association of craniofacial trauma with cervical spine injuries, the authors noted that a large percentage of patients with significant cervical disruptions did not have obvious head or facial injury. No mention was made in the latter three papers of level of consciousness, and only partial reference was made to the mechanism of injury, clinical presentations, and complaints of neck pain or pain to palpation. In reviewing the literature, we question that anyone will ever develop meaningful high-yield criteria for cervical spine radiographs in patients with depressed mental status.

The standard of care for these patients will probably continue to be presumptive of cervical spine injury.

The presence of other major chest, abdomen, or skeletal injuries may obscure the reporting and recognition of cervical spine injury by the patient and the physician. However, in the management of multi-system-injured patients who by mechanism of injury or evidence of head trauma could be suspected of having cervical spine injury, cervical radiographs do not take precedence over the ABCs of resuscitation. Those patients can be safely managed with cervical immobilization and advanced airway skills in both prehospital and in-hospital care situations. Perhaps future studies will more carefully define the role of cervical spine radiography for this group of patients.

It is impossible to establish high-yield predictors of cervical spine injuries from previous perspectives. Our data suggest that cervical spine injuries occur <2% of the time in association with significant blunt head trauma. Because of the low incidence of this association, it is not possible from this study to establish statistically valid predictors of cervical spine injury associated with blunt head trauma. Indeed, authors of more recent attempts to identify predictors have concluded that a prospective multicenter study involving at least 5,000 cases will be necessary.

**CONCLUSION**

Our results indicate that, as a subgroup, blunt head trauma patients have a much lower incidence of cervical spine injury than previously assumed. These data lend credence to more recent reports of a low incidence. Furthermore, our results suggest that the alert and neurologically intact patient without complaint of neck pain or tenderness to palpation of the cervical spine can be spared cervical spine radiography.
REFERENCES

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