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INCIDENCE OF CERVICAL SPINE INJURY IN PATIENTS WITH GUNSHOT WOUNDS TO THE HEAD

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ABSTRACT: Cervical spine immobilization is standard during the early stages of prehospital and hospital care of patients with blunt head injury. However, the need for cervical spine immobilization in patients with gunshot wounds to the head has not been addressed. To determine the incidence and types of cervical spine injury in this group, we retrospectively examined the records of 308 consecutive patients who had computed tomographic (CT) scans of the head to evaluate brain injury after gunshot wounds. Of the 266 patients with data adequate for review, 157 (59%) had a complete lateral x-ray film of the cervical spine. Of these 157, 105 had wounds limited to the calvaria, and none had cervical spine injury. Of 52 patients with complete lateral x-ray films and wounds not limited to the calvaria, 5 (10%) had cervical spine or spinal cord injury. Of the 192 patients who had CT-proven intracranial injury, 86 (45%) required immediate intubation before x-ray films were obtained, and 67 (35%) died. We conclude that cervical spine immobilization may not be required during endotracheal intubation of brain-injured gunshot victims with wounds limited to the calvaria.

MUCH HAS BEEN WRITTEN about the need to protect the possibly injured cervical spine in patients with head trauma. This interest is fueled by the medicolegal implications when an injury to the cervical spine (CS) is not identified and treated. The fairly low incidence of spinal injury associated with head trauma has led to efforts to identify subsets of patients whose incidence of CS injury is so low that roentgenograms of the cervical spine are not useful in terms of cost and time.[n1]

Furthermore, the necessity to maintain cervical spine immobility in a patient with head injury makes endotracheal intubation more difficult. Cricothyroidotomy, nasotracheal intubation, and orotracheal intubation with in-line traction have all been used in this situation. The best way to intubate, however, is orotracheally, as in medical cardiac arrests. Intubating methods that maintain cervical spine immobility often require multiple attempts, subjecting the patient with head injury to longer hypoxia, hypercarbia, and gagging, all of which can exacerbate increased intracranial pressure.

Many patients with gunshot wounds to the head need immediate intubation. Theoretically, gunshot wounds may inflict cervical spine or spinal cord injury by (1) direct injury from the missile or (2) a flexion extension or rotational force transmitted to the head by the bullet, which would tend to cause an injury similar to that seen in blunt trauma.

The present study was done to ascertain the incidence of cervical spine injury in patients with a gunshot wound to the head and to determine whether these spinal injuries are the type that necessitate immobilizing the cervical spine during endotracheal intubation.

MATERIALS AND METHODS

From January 1, 1987, to June 30, 1990, 308 patients admitted to our institution had computed tomography (CT) of the head to rule out or evaluate intracranial injury from gunshot wounds. This group of patients was targeted because it represents those in whom intracranial injury had to be considered during initial resuscitation. Patients who did not have evidence or possibility of intracranial injury sufficient to warrant CT were excluded. In addition, patients dead on arrival or who died before CT could be done were excluded. This eliminated those who might have died of causes unrelated to intracranial injury.

Complete records were available for review for 266 of the 308 patients. Charts were reviewed for the presence or absence of intracranial injury, complete lateral x-ray film of the cervical spine, mortality, need for intubation before or after radiographic study of the CS, and score on the Glasgow Coma Scale.

RESULTS

Because there was no set policy for obtaining CS x-ray films in patients with penetrating head wounds, complete lateral CS films were obtained on 157 (59%) of the 266 patients (Figure). Of these 157, 105 had wounds limited to the calvaria, and none had CS or spinal cord injuries. Of the remaining 52 with wounds not limited to the calvaria, 5 (10%) had CS or spinal cord injury, which was caused by direct

injury from impact of the bullet or pellet in all 5 cases (Table). No injury was consistent with hyperflexion or hyperextension similar to that seen with blunt trauma.

In the 192 patients with CT-proven intracranial injury, the mortality was 35% (67 of 192). Eighty-six (45%) of these 192 patients required immediate intubation, without the benefit of having had the CS status determined. In contrast, the mortality was 0% for the 74 patients in whom the CT scan ruled out intracranial injury, and only 4 (5%) of these 74 required immediate intubation. Only 3 patients in the entire series were intubated in the field by paramedics; all others were intubated upon arrival in the emergency department. The majority of patients transported by paramedics had precautionary CS immobilization en route. Seventeen percent of all patients arrived by private automobile and obviously had not had CS precautions en route. None of the survivors who had no CS x-ray films on admission were later found to have spinal cord or CS injury.

DISCUSSION

Previous studies have shown that 20% of patients with a head injury have an associated CS injury.[n2] This is the basis for the widespread precaution of immobilizing the cervical spine until x-ray films have ruled out injury. Recommended use of such precaution subsequently has grown to include any patient with head trauma[2] or any patient with a gunshot wound to the head.[n3] However, many recent studies have shown the incidence of associated CS injury in blunt head trauma to be 1.7% to 4.0%[n4-7] and in patients with penetrating neck wounds, 1.4%.[n8] Our study shows a 0% incidence of CS injury in patients with isolated gunshot wounds to the calvaria. The fact that 45% of patients with intracranial injury needed intubation before roentgenograms of the CS could be obtained has profound implications. The question that arises is whether intubation should be done with CS immobilization. Hyperventilation and treatment of hypoxia are critical in controlling intracranial pressure and increasing survival in this high-mortality group. Currently, paramedics intubate only orotracheally and only if CS injury is not a concern. This may explain why only three patients in our series of 266 patients were intubated in the field. The data indicate it is safe to intubate orotracheally without CS precautions if the wounds are isolated to the calvaria. This could result in earlier intubation and decreased secondary brain injury both in the field and in the emergency department.

TABLE. Nature of Cervical Spine or Spinal Cord Injuries in Five Patients With Wounds Not Limited to the Calvaria

Location of Wound(s)	Cervical Spine or Spinal Cord Injury
Left zygoma	Nondisplaced fracture of C-1 arch
Left inferior eyelid	Bullet in canal at C-3; no obvious fracture
Right orbit and posterior aspect of neck at C-3 level	Bullet in canal at C-2; fractured right lamina of C-2
Diffuse shotgun blast to head and neck	Pellet in canal at C-1/C-2; no obvious fracture
Diffuse shotgun blast to head, neck, and face	Pellet in canal at C-5; no obvious fracture

DIAGRAM: Flow sheet for patients having CT evaluation of gunshot wounds to head. (CS=cervical spine).

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