Cervical Spine Injury Complicating Facial Trauma: Incidence and Management

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Purpose: To review the impact of concomitant cervical spine injury on the management of facial fractures in a tertiary care institution via a retrospective chart review.

Patients and Methods: Within the past 10 years, 1,750 consecutive patients presented to our institution with facial fractures. Thirty-two had concomitant cervical spine injury. Five were transferred or died before treatment. The remaining 27 charts were reviewed in detail.

Results: The incidence of cervical spine injury among patients with facial fractures in our study was 1.8%. There were no treatment delays attributed to these injuries. Of note was the inaccuracy of lateral cervical spine films in 9 of 27 cases (33%).

Conclusion: Although uncommon, cervical spine injury must be thoroughly ruled out before evaluation and management of facial trauma. Concomitant cervical spine injury should not delay appropriate and timely treatment of facial fractures because adequate means of intraoperative stabilization are readily available.

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Initial management of trauma should be directed by qualified personnel in adherence to the time-honored ABC principles of resuscitation. Once stabilization is attained, specialists may be consulted as necessary to evaluate injuries in their areas of expertise. In cases of facial trauma, the occurrence of associated injuries is well documented. In a review by Lim et al., 95 of the 839 patients with facial injuries included in the study had other injuries requiring immediate attention. Extremity injuries were most common at 7.4%, followed by head injury (5.4%) and spinal injury (0.9%). Often these associated injuries can delay the appropriate treatment of facial fractures, thus creating significant therapeutic dilemmas.

Historically, head injuries have delayed surgical intervention on the basis of tenuous neurologic status and fluctuating intracranial pressures. Recent articles, however, suggest that a combined neurosurgical/facial plastic approach may allow for immediate operative fixation of facial fractures while still ensuring neurologic safety. Thus, by operating within the generally accepted 7- to 10-day window, malocclusion and other associated complications of delayed facial fracture repair may be minimized. Much less frequent but similarly challenging are concomitant cervical spine injuries. Our study attempts to confirm the incidence and further define the impact of cervical spine injury on the surgical repair of facial fractures.

PATIENTS AND METHODS

Using a retrospective review of the past 10 years, 1,750 patients were noted to have facial fractures of all types. Of these, 32 patients had concomitant cervical spine injuries. Five of these patients died or were transferred before treatment and therefore, omitted from our study. The remaining 27 patients were reviewed in detail. Data recorded included age, sex, race, mechanism of injury, imaging modality, facial fracture and therapy, cervical spine injury and therapy, treatment delays, and long-term follow-up.
RESULTS

Demographic information listed 16 male and 11 female patients with ages ranging from 15 to 79 years old. All patients studied were involved in blunt trauma, 24 (89%) resulting from motor vehicle accidents. Two injuries resulted from falls and one from assault. One patient died 30 days after his accident from multiple organ failure. All other patients are alive and well (mean follow-up, 7.4 years).

On presentation, patients were stabilized by trauma surgeons. In those suspected of having facial fractures, maxillofacial surgeons were consulted and appropriate imaging attained. Plain films provided adequate detail in isolated nasal and mandible fractures, whereas computed tomography (CT) scans delineated more complex injuries. Severity of injury ranged from an anterior maxillary sinus wall fracture to comminuted midface fractures (Table 1). Mandible fractures accounted for 10 of 27 patients (37%). Two fractures were diagnosed more than 24 hours after presentation based on persistent trismus. In one case, the requisite therapy was further delayed by medical factors resulting in a mild malocclusion. Two additional repairs were medically delayed but uncomplicated postoperatively. Ten patients did not require surgical intervention. In no instance was therapy delayed by cervical spine injuries. Infrequent positioning difficulties because of cervical immobility were overcome without sequel. Intraoperative neck fixation techniques included Philadelphia collars, Gardner-Wells tongs (GWT), halos, and sand bags, all accompanied by nasotracheal intubation under endoscopic control.

As per trauma protocol, all patients were initially subjected to lateral cervical spine radiographs. In 18 cases, injuries were positively identified in this fashion. However, 9 films (33%) failed to show an abnormality as read by the on-call radiologist. Diagnosis was made by further radiographic studies including flexion/extension series and CT scans. Two of these injuries were actually identified more than 24 hours later secondary to intratable neck pain. The overall incidence of cervical spine injury in patients with facial fractures was 1.8%. The most common level of injury was C2, present in 63% of cases (Table 2). Although an exact description of all 27 cervical fractures is beyond the scope of this study, the stability of the fractures was well reflected by subsequent intervention. Surgery or halo placement was required by 14 patients judged to have unstable fractures, whereas the remaining 13 were treated with short-term use of Philadelphia collars. Although no focal neurologic deficits were documented on admission, 3 patients developed neurologic impairments. Two of these had normal lateral cervical spine films at presentation whereas the third was treated and released by an outside hospital without evaluation of the cervical spine.

<table>
<thead>
<tr>
<th>Fracture Location</th>
<th>Repaired No.</th>
<th>Within 10 days</th>
<th>Repaired No.</th>
<th>&gt;10 days</th>
<th>Repair Necessary</th>
<th>Sequelae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandible</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td></td>
<td>malocclusion</td>
<td>(2)</td>
</tr>
<tr>
<td>Trimalar</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td></td>
<td>none</td>
<td></td>
</tr>
<tr>
<td>Complex midface</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td></td>
<td>malocclusion</td>
<td>(1)</td>
</tr>
<tr>
<td>Orbit</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>none</td>
<td></td>
</tr>
<tr>
<td>Nasal</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td></td>
<td>none</td>
<td></td>
</tr>
<tr>
<td>Maxillary sinus wall</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>none</td>
<td></td>
</tr>
</tbody>
</table>

NOTE. Two patients had malocclusion after mandible fracture repair, 1 from the within 10 days group and 1 from the more than 10 days group. There were no significant cosmetic defects attributable to the fractures.
DISCUSSION

The association of maxillofacial and cervical spine injuries resulting from blunt trauma is well documented. In 1985, Lewis et al. in a retrospective review of cervical fractures, reported an 8.6% incidence of facial fractures in his series. Conversely, in patients sustaining facial fractures, reported incidence of concomitant cervical fractures varies from 0% to 4%. Our results fell within this range at 1.8%. Despite this infrequency, the risk of potentially devastating sequelae mandates acute awareness of the cervical spine in all facial injuries.

In our review, the most common facial fractures were of the mandible. However, no attempts were made to examine the relative risk of cervical spine injuries for specific fracture types. Some investigators have linked mandibular trauma to high spinal injury and upper face injuries to low cervical damage. Our data did not corroborate these hypotheses in that half (5/10) the patients with mandible fractures had injuries between C5 and C7. Conversely, C1 and C2 injuries were seen commonly in midface trauma. No conclusions can be drawn from this portion of our review.

Regarding our main focus, we found the effect of cervical spine injury on the repair of facial fractures to be minimal. In rare instances, exposure may be limited by stabilization apparatus, particularly in cervical injuries requiring a halo. However, in our series, surgical technique was not altered by status of the cervical spine. In patients with unstable spinal injuries, GWT provide maximal stability while still allowing complete access to the face. In those cases with a stable cervical spine, sand bags and surgeon awareness are adequate.

A review of the literature offers some insight into the diagnostic and therapeutic dilemmas identified by this study. Statistics for delayed diagnosis of cervical spine injuries range from 23% to 33%, comparable to the 33% from our data. These delays most often result from failure to attain appropriate imaging, but radiographic misinterpretation can occur in the more subtle cases. We attribute a combination of the above to our delays in that most patients had lateral cervical films alone on initial evaluation, and, depending on time of presentation, the films attained were often read by resident radiologists. In 1983, Streitwieser et al. found lateral films, as read by fully trained radiologists, to be diagnostic 82% of the time with this accuracy improving to 93% after inclusion of anterior-posterior and odontoid views. No formal review of emergency room physician accuracy has been published. Streitwieser et al concluded that thin-cut CT was an important adjunct for patients whose results of clinical examinations or plain films suggest injury. This is particularly pertinent to injuries of the upper cervical spine. He also acknowledged the need for flexion/extension views to definitively rule out ligamentous damage.

In terms of practical application, most studies suggest that the standard three-view cervical spine series (lateral, anterior-posterior, and odontoid) is adequate in the absence of clinical findings. Further studies should be performed if midline neck tenderness is present or cannot be assessed secondary to a depressed level of consciousness. Persistent neurologic deficits, as studied by Reid et al. in 1987, developed in 10% of patients in which diagnosis of cervical fracture was delayed. This contrasted considerably with the 1.5% incidence of neurologic sequelae in patients diagnosed at initial evaluation. Our results, though small in number, reflect the abovementioned comparison.

Three patients in our series suffered neurologic sequelae diagnostic delays. The first injury was a C7/T1 subluxation identified on hospital day 4. This was reduced with GWT and, subsequently repaired, but not before the patient developed a right lower extremity paralysis. The second injury, a C5/C6 jumped facet, was again missed by lateral cervical spine film. Diagnosis was confirmed 3 days later when the patient continued to complain of neck pain. He had a resultant complete left C5 palsy despite surgical intervention. The second injury, a C5/C6 jumped facet, was again missed by lateral cervical spine film. Diagnosis was confirmed 3 days later when the patient continued to complain of neck pain. He had a resultant complete left C5 palsy despite surgical intervention. The third patient had multiple spinal injuries from C5 to C7, which were misdiagnosed in an outlying emergency room. On presentation to our institution, appropriate diagnostic and treatment modalities were implemented but not before the patient suffered permanent left arm weakness. Although
some neurologic damage may be irreversible after the initial trauma, the literature suggests the risk would be minimized with timely diagnosis and stabilization. This study is the first to address the impact of cervical spine injury on facial fracture repair. In the process, we have reviewed and confirmed a number of well-reported specifics concerning the concomitance of these injuries as well as the diagnostic pitfalls associated with cervical spine radiography. Although we emphasize awareness of potential spinal injury even after initial radiographic evaluation, presence of these fractures did not delay facial repair. Working in close consort with cervical spine specialists, varied means of stabilization were used as deemed appropriate. Positioning difficulties occur, but in our experience, reduction and fixation can be attained despite cervical immobilization. We therefore conclude that: 1) although uncommon, cervical spine injury must be thoroughly ruled out before evaluation and management of facial trauma, and 2) concomitant cervical spine injury should not inhibit appropriate and timely treatment of facial fractures because adequate means of intraoperative stabilization are readily available.

REFERENCES

1. American College of Surgeons: Advanced trauma life support manual. Chicago, IL, ACS, 1984