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Management of delayed posttraumatic cervical kyphosis

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ABSTRACT

We describe three patients with misdiagnosed unstable fractures of the cervical spine, who were treated conservatively and developed kyphotic deformity, myelopathy, and radiculopathy. All three patients were then managed with closed reductions by crown halo traction, followed by instrumented fusions. Their neurologic function was regained without permanent disability in any patient. Unstable fractures of the cervical spine will progress to catastrophic neurologic injuries without surgical fixation. Posttraumatic kyphosis and the delayed reduction of partially healed fracture dislocations by preoperative traction are not well characterized in the subaxial cervical spine. The complete evaluation of any subaxial cervical spine fracture requires CT scanning to assess for bony fractures, and MRI to assess for ligamentous injury. This allows for assessment of the degree of instability and appropriate management. In patients with delayed posttraumatic cervical kyphosis, preoperative closed reduction provided adequate realignment, facilitating subsequent operative stabilization.

1. Introduction

Unstable spinal fractures require surgical fixation to prevent neurological injury [1]. Up to 29% of patients with a delayed diagnosis of an unstable cervical fracture will proceed to catastrophic neurologic deficit or mortality [2,3]. The incidence of delayed treatment of unstable cervical spine fractures has been reported to vary from 4.9–22.9% [4,3], depending on the institution [5].

In the past, the initial evaluation was performed by radiography. A three view radiograph series, consisting of lateral, open mouth, and anteroposterior views, was found to be sufficient for diagnosing greater than 99% of posttraumatic unstable cervical spine fractures [6]. However, inadequate evaluation of radiologic studies has contributed the largest percentage of delayed diagnoses [4]. An altered mental status of the patient may mask neurologic deficits and can contribute significantly to early diagnostic failures as well [4].

CT scanning is now considered the standard of care for evaluating traumatic spinal injury due to increased sensitivity and reduced reader error [7]. It also has the advantage of detecting upper cervical spine injuries, such as condylar fractures, and lower subaxial cervical spine injuries that often cannot be detected with plain radiography. In addition, an evaluation with MRI is crucial in order to assess for ligamentous injury, as the discoligamentous and posterior ligamentous complexes contribute to spinal stability [8–10].

Unlike the thoracolumbar spine, delayed posttraumatic instability and kyphosis of the subaxial spine is not well described in the literature as a separate entity, despite being encountered in clinical practice [11–14]. Few studies have examined the delayed management of these conditions, which often present with myelopathy and radiculopathy in a subacute or chronic fashion [15]. While closed cranial traction is common practice for reducing acute fracture dislocations of the spine [16–18], its role in partially healed fractures, as in patients with delayed posttraumatic cervical kyphosis, has not been described.

We report three patients who presented with myelopathy due to cervical kyphosis following the initial nonsurgical treatment of missed unstable subaxial cervical spine fractures. We detail the management of these patients, emphasizing the role of preoperative traction.

2. Materials and methods

A retrospective case series of three patients with delayed diagnoses of unstable cervical spine fractures was performed. The preoperative, postoperative, and follow-up reports were retrieved, including imaging studies. The course of disease and management of each patient were summarized, including outcome measures at presentation and follow-up.

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Table 1
Course of injury, diagnosis, management, and follow-up of three unstable cervical spine fractures with delayed diagnosis

Patient	Age (years), sex	Mechanism of injury	Neurological assessment at presentation	Fracture	Time from injury to treatment	Initial treatment	Definitive stabilization	Traction type	Complications	Neurological assessment at follow-up*	Latest follow-up
1	55 M	Motor vehicle accident	4+/5 bil deltoid, 3/5 bil tricep, 3/5 bil wrist extension, 2/5 left grip, 3/5 right grip; hyperreflexia of bil LE	C6 compression fracute with C5–C6 facet disruption; PLC and LF disruption	34 days to traction; 37 days to surgery	Conservative, Aspen collar	Anterior cervical corpectomy; cage with allograft bone; posterior fusion with fixation of C5–T2	Crown halo at 9.5 kg	None	5/5 str bil UE; DTR 1–2 and symmetrical	12 months
2	58 M	Rollover accident in convertible	4/5 right biceps, triceps, wrist extension, grip; decreased sensation of thumb and forearm; inverted brachioradialis; positive Hoffman	C6–C7 perched facet with 50% spondylolisthesis at C6 on C7	42 days	Conservative, soft collar	C3–T2 posterior fusion with instrumentation; anterior cervical discectomy and fusion at C5/6 and C6/7 with allograft	Crown halo traction 16 kg	None	Right triceps +4/5; paresthesia of fingertip	12 months
3	71 F	Fall of 2 meters	4+/5 bil UE, 1+ DTR bil brachioradialis, 1+ DTR left bicep; negative Hoffman; 1+ DTR bil LE	C5–C6 perched facet with anterolisthesis	75 days	Outpatient management, Philadelphia collar	C4–C7 posterior fusion with instrumentation	Crown halo at 18 kg	Revision surgery for retained ligamentum flavum causing cord compression and hematoma	5/5 bil strength in UE; minor anesthesia of hands	6 months

bil = bilateral, DTR = deep tendon reflexes, F = female, LE = lower extremity, LF = ligamentum flavum, M = male, PLC = posterior ligamentous complex, UE = upper extremity.