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# Management of C2-C3 fracture subluxation by anterior cervical approach and C2-C3 transcortical screw placement

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## Management of C2-C3 fracture subluxation by anterior cervical approach and C2-C3 trans-cortical screw placement

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**Abstract:** Cervical spine injuries are the major cause of morbidity and mortality in trauma victims. Upper cervical spine injuries account for about 24% of acute fractures and dislocations and one third of fractures occur at the level of C2, while one half of injuries occur at the C6 or C7 levels. In contrast to this approach we used the transverse cervical, platysma splitting incision at a lower (C3-C4 disc) to expose the upper cervical spine particularly lower border of C3 (entry point for the screw).

**Key words:** Cervical spine, dislocation fracture, trauma, upper cervical spine

### Introduction

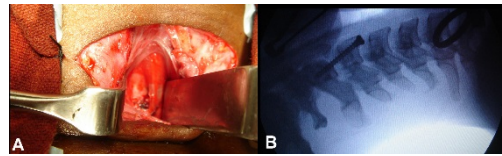
Cervical spine injuries are the major cause of morbidity and mortality in trauma victims. (1, 2) Upper cervical spine injuries account for about 24% of acute fractures and dislocations 3 and one third of fractures occur at the level of C2, while one half of injuries occur at the C6 or C7 levels (4-6). We discuss a case of C2 fracture with C2-3 subluxation and review the surgical approaches.

### Case report

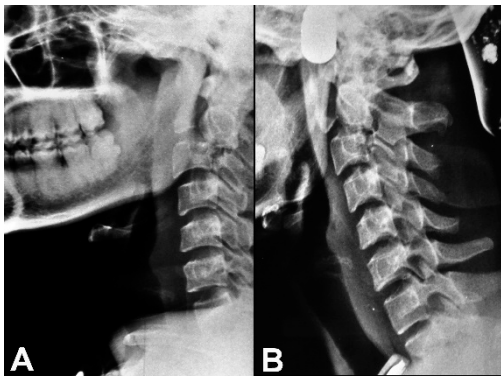
A 17 year old male presented with history of road traffic accident collision with Tata magic van while he was going on motor cycle. Since then he was altered in altered sensorium. At the time of presentation to emergency

room had Glasgow coma scale was E2V2M3. He had paucity of movements of all four limbs. Pupils were bilateral equal and reacting to light. General and systemic examination was unremarkable. CT scan brain showed subarachnoid hemorrhage and mild cerebral edema. X-ray cervical spine lateral view showed C2 body fracture and posterior subluxation over C3 (Figure 1). MRI cervical spine showed fracture subluxation of C2 over C3 with cord contusion at the same level (Figure 2). The patient was put on cervical traction and it resulted in reduction of the fracture and subluxation (Figure 1A). Once he was stabilized hemodynamically he underwent anterior cervical approach and fixation of C2 and C3 with screw (Figure 3). The patient

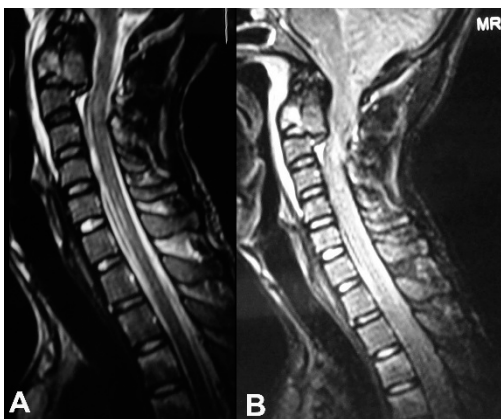
underwent right anterior cervical approach through transverse cervical platysma splitting incision. Radiographic imaging was used to help guide the pins and subsequent screw placement (Figure 3B). Follow up x-ray showed good alignment and position of the screw (Figure 4). The patient is gradually improving neurologically improving at follow up.



**Figure 3** - Intra-operative image showing (A) the screw entry point in the lower anterior edge of C3 and (B) intra-operative x-ray image showing restoration of the alignment of C2 and C3



**Figure 1** - X-ray cervical lateral view showing (A) C2 body fracture and posterior subluxation of C2 over C3 and (B) almost normal alignment of C2 and C3 after skull traction



**Figure 2** - MRI cervical spine showing in addition to fracture subluxation there is cord contusion at the level of C2 and C3



**Figure 4** - Post-operative x-ray showing almost normal alignment of C2 and C3 with good position of the screw, please note the fractured anterior half of the C2 body

## Discussion

Subluxation of the cervical spine in adults usually occurs at C4-C7 segments. (6, 7) The "hangman's fracture," or traumatic spondylolisthesis of C2 characterized by bilateral pars interarticularis fractures, most of

these fractures result from falls and motor vehicle crashes. 8 Based on the mechanism of injury and the characteristics of the displacement Effendi et al (8) classified these injuries into Type-I fractures: due to axial compression with hyperextension and are characterized by little or no displacement (C2-C3 disc is normal), Type-II fractures: result from initial hyperextension with axial compression followed by severe hyperflexion of the neck (C2-C3 disc is disrupted and the body of C2 is displaced in extension, flexion, or anterior listhesis) and Type-III fractures: due to a combination of flexion and compression leading to dislocation of the C2-C3 facet joints with anterior displacement of C2 in flexion. (8) C2-C3 fracture subluxation is uncommon and can be due to traumatic (9-14) and non-traumatic causes (i.e. pathological fracture (15) and Grisel's syndrome 16). Fracture/subluxation at the C2-C3 level is an uncommon injury. (9, 10, 13) These patients can present with severe neck pain (11, 13 12) with mild neurological symptoms (13) or even without neurological deficits. (11, 12) X-rays and CT of the cervical spine will demonstrated the amount of bony injury and extent of dislocation (13, 14, 16, 17) while MRI (as in present case) will help to demonstrate any injury to the spinal cord. Management of these fractures in neurologically intact patients with anatomical alignment and/or stable positioning is external stabilization. (14, 16, 18, 19) Fractures of C2/C3 with displacement and angulation need either anterior or posterior surgical approaches for fixation after applying skull traction to regain alignment. (8, 10-13, 20-22)

The options in anterior cervical approach include anterior C2/3 discectomy with locking plate-screw fixation and fusion 10 Surgical exposure of the upper cervical spine is challenging, and for fusion and instrumentation on the upper cervical spine the prevascular extraoral retropharyngeal approach has been described as it allows direct anterior access to C2 and C3 while allowing extension to the lower cervical spine. (10, 23, 24) Although this approach is safe, in rare instances there may be permanent dysphagia (due to the injury to the hypoglossal nerve) may be transient dysphagia. (10, 23) In contrast to this approach we used the transverse cervical, platysma splitting incision at a lower (C3-C4 disc) to expose the upper cervical spine particularly lower border of C3 (entry point for the screw).

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