

# Ideal stabilisation of unstable fracture dislocation of cervical spine in the background of ankylosing spondylitis

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## INTRODUCTION

Kyphosis, stiffness, osteoporotic bone, muscular degeneration altered bio mechanics predisposes the long arm of the vertebral column, the cervical spine to additional stress after trivial injury. Compared to upper cervical spine, the lower cervical spine (C5-C6-C7) is more prone to injury. Usually the fracture involves all three columns and is highly unstable. The greater instability significantly increases the risk of iatrogenic spinal cord injury during the patient transportation and maneuvers aimed at reducing fracture dislocation. Both, conservative and surgical treatments, are advocated but the compromised skin quality, osteoporotic bone, highly unstable nature of fractures and pathological rigidity of chest often predisposes the Halo immobilization to high complication rates and high risk of non union. The primary aim of surgical of surgical treatment is the maintenance fracture realignment with adequate stabilisation measures until the bone has healed. Various procedures, anterior alone, anterior with iliac bone grafting, posterior alone and combined 360 degrees stabilization, have been advocated. However the ideal stabilisation is individualized after thorough investigation including 2mm thin cut spiral CT, as the fractures are often missed on routine radiography.

## CASE REPORT

A 52-year-old obese individual, a known case of ankylosing spondylitis and hypertension sustained fall from a chair. He sustained injury to his neck and became quadriparetic (MRC power 4/5, left side weaker than right). X-ray cervical spine revealed a fracture dislocation

C4-C5 involving all three column. At the time of admission, he had signs of aspiration pneumonia. Skull traction was attempted with 6 kilograms of weight.



Fig 1: Lateral view X-ray of cervical spine showing dislocation C4/C5 in a patient with ankylosing spondylitis

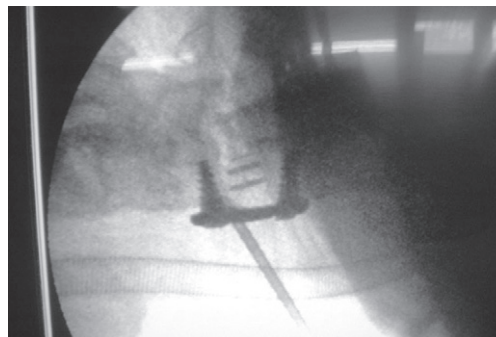


Fig 2: Intraoperative fluoroscopic view



Fig 3: Postoperative radiograph showing stabilization of the dislocation with spinal implants in situ

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Though the alignment was easily achieved it resulted in worsening of the quadriplegia requiring immediate removal of traction. MRI was done which showed minimal cord contusion along with fracture of all three columns. He was taken up for operation with NTG drip in view of hypertension (220-180 systolic). Intubation was difficult as he had short neck and neck flexion and extension was not permitted because of fear of worsening neurological deficit. Discectomy of C4-5, placement of large PEEK spacer (8mm) with plate fixation was done keeping the neck in neutral position. Patient was turned prone and lateral mass fixation was done between C3-C4-C5 as fracture line had gone through one of the lateral mass of C4. Though the radiological fixation was satisfactory, postoperatively the patient remained ventilator dependent. He developed septicemia, became hypotensive, and died after seven days.

## DISCUSSION

Two central events which occur in ankylosing spondylitis are chronic inflammation and new bone formation. The inflammation of is characterised by of calcification of ligamental attachments (enthesopathy) throughout the axial skeleton. The inflammatory process promotes ectopic bone formation with in the affected ligaments. The widespread enthesopathy results in ossification of ligaments of the spinal column, apophyseal structures and intervertebral discs. This extensive ectopic bone formation leads to formation of syndesmophytes. As the disease advances, syndesmophytes progressively span to occupy the most of the disc space giving the characteristic bamboo spine. Through the disease process, remodelling of the bone also occurs. Square vertebral bodies occur because of destruction and rebuilding of the cortex and spongiosa. The square vertebral bodies and syndesmophytes results in the characteristic hyperkyphotic bamboo spine.

Although new bone formation is central to the pathogenesis of ankylosing spondylitis, this pathological entity is associated with osteoporosis and low mineral density. This seemingly paradoxical finding is attributed to an uncoupling of bone formation and bone resorption process. Although ectopic bone formation occurs within in the inflamed vertebral enthesis, bone resorption through increased osteoclast activity also occurs at an unregulated rate within the vertebra resulting spongiotic bone, osteoporosis, muscular inactivity/muscular degeneration and promotes weakening of spinal column.

Biomechanically the fused spine is more akin to a long bone and acts as rigid lever that is incapable of appropriately dissipating energy of a traumatic event. These altered spinal biomechanics combined with the brittle quality of the osteoporotic bone increases the susceptibility to spinal fractures even with minor often trivial trauma. These patients also have impaired mobility directly related to peripheral joint arthritis their rigid kyphotic spinal deformity various degrees of peripheral joint involvement exacerbate the gait unsteadiness and susceptibility to falls. Cervical spine the most commonly involved segment, as it is the long arm of the fused spine. Flexion with hyperextension is the most frequently observed mechanism of injury to cervical spine. The weakest point of the spinal column is at the junction of vertebral body and the place where the new syndesmophytes are formed. The fracture dislocation usually runs through the IV disc space involving all three columns and generally involves the lower cervical spine (C5-6 or C6-7).

The fractures of the posterior elements are often missed owing to the curvature of spine, its bamboo characteristics and poor radiographic quality as shoulder often overrides the lower cervical vertebrae which are commonly injured. Thin slice spiral CT scan is essential investigation to plan the treatment strategy.

Transportation of injured patients requires individual care as these patients have short neck and attempts to keep it immobilized in neutral position may result in iatrogenic injury. Application of skull traction requires great care, sometimes the traction has to be applied in the recumbent position reconstructing the curvature which patient had before injury.

The primary goal of treatment is bony healing without significant loss of reduction. Both operative and nonoperative treatment has been recommended. Nonoperative treatment strategies are only successful if adequate stabilisation and realignment are achieved in all planes. Halo is conventionally used for this external arthrodesis and the expected duration of treatment is often between ten to sixteen weeks. Because of the high unstable nature of the fracture, associated osteoporosis, pathological chest rigidity and compromised quality of the skin, Halo treatment is often associated with high complication rate and high risk of non union.

Anterior alone, posterior alone or a combined one time or staged anterior and posterior procedures along

with decompression may be performed depending on the individual fracture pattern, bone quality, comorbidities and other associated fractures. Middle column is the pylon in the vertebral stability and anterior alone approach is bio mechanically inferior to posterior or combined approaches. Combined approaches provide high primary stability, early after care with cervical collar alone and early mobility. There has been no substantial difference between lateral mass fixation and pedicle screw fixation, however lateral mass screw fixation is easier compared to pedicle screw fixation in the background of squaring of vertebra, absence of distinct landmarks and demineralised bone.

### CONCLUSION

Various methods are available for stabilizing this highly unstable fracture. Conservative method is prolonged and non union is very common despite immobilisation for long time. Surgical correction offers more stabilisation and duration of treatment is short allowing the patient to be mobile at the earliest. 360 degree fusion is the preferable treatment as most of the patients fracture runs through all three columns.

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