

## Treatment of Cervical Cord Injury in Ankylosing Spondylitis

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Cervical cord injury in patient with ankylosing spondylitis frequently occurs despite of minor trauma, such as slip down injury in drunken state or minor motor-vehicle accident. The level of cord injury is usually at lower cervical and upper thoracic area. The treatments and combined complications in ankylosing spondylitis patients are quite different from other spinal cord injuries. We report four cases of cervical cord injuries in patients with ankylosing spondylitis. Two among 4 patients expired due to sepsis caused by chest problem, and the others recovered after surgery.

**KEY WORDS :** Ankylosing spondylitis · Cord injury · Cervical spine injury.

### Introduction

Ankylosing spondylitis is a rheumatic condition with progressive ossification of the ligaments and ankylosing of the facet joints eventually leading to a totally stiff spine. Stiff spine and osteoporosis as a result of diffuse atrophy are high risk factors of fracture in ankylosing spondylitis<sup>6)</sup>. Ankylosing spondylitis is an uncommon condition but those patients with this extensive disease are susceptible to fracture of the cervical spine following relatively minor trauma<sup>1,7,9,10)</sup>. The radiological features of these fractures differ from those of other cervical spine fractures and the incidence of neurologic deficit and mortality are high<sup>2)</sup>. The level of cervical injury is usually at lower cervical area<sup>7)</sup>. We experienced 4 cases of cervical cord injury in ankylosing spondylitis patients. We report the treatments and complications of cervical cord injury in ankylosing spondylitis patients (Table 1).

### Case Reports

#### Case 1

A 38-year-old man developed a fracture-dislocation at C4/5 segment followed by quadriplegia below C4 level. At



**Fig. 1.** Preoperative cervical X-ray. Fracture through intervertebral disc on C4/5 segment.

the time of the accident, his spine had been affected with ankylosing spondylitis for 17 years. He had cervical ossification of posterior longitudinal ligament at C4/5 segment and cervical stenosis.

First of all, he was applied with Graphite-tong reduction and high dose steroid therapy in our hospital. The cervical spine was maintained in kyphotic position with Graphite-tong reduction. After two weeks of reduction, the patient was operated cervical anterior interbody fusion at C4/5 segment with B.O.P. (Bicompatible Orthopedic Polymer). Intensive chest care was done due to post operative atelectasis until the post op 3rd day. The patient was able to walk independently after post operative 6 months (Fig. 1).

#### Case 2

A 48-year-old man had been transferred to this hospital via local hospital. He had been quadriplegic after traffic accident. When he arrived at this hospital, he could not

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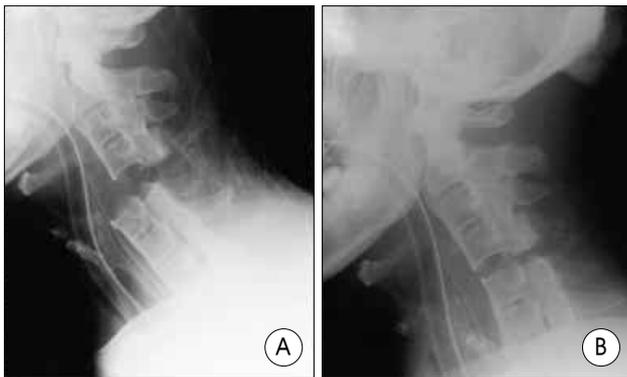
## Cord Injury in Ankylosing Spondylitis

**Table 1.** Clinical characteristics and outcomes

Case No.	Age /sex	Duration of *AS (years)	Cause of Injury	Injury level	Injury mechanism	Treatment	Motor(Grade)		Outcome
							Pre-Op	Post-Op	
1	38/M	17	Slip down	C4/5	Hyperextension	**C-AIF with ***BOP	1	4	Good
2	48/M	20	Motor vehicle accident	C5/6	Hyperextension	Conservative care	0	0	Expire
3	60/M	10	Slip down	C2-6 T1/2	Hyperextension	Decompressive laminectomy	3	4	Good
4	74/M	35	Slip down	C6/7	Hyperextension	Conservative care	2	2	Expire

\* AS : ankylosing spondylitis, \*\* C-AIF : cervical anterior interbody fusion, \*\*\* BOP : bicompatible orthopedic polymer

breathe by himself due to respiratory failure. We guessed that he was in a spinal shock state and aspiration pneumonia was suspected. We applied Graphite-tong reduction and injected high dose steroid intravenously. But pneumonia aggravated so that he expired due to sepsis caused by severe pneumonia on the 14th hospital day(Fig. 2A, B).



**Fig. 2.** A : Preoperative cervical X-ray. Extensive chalkstick fracture on C4/5 segment. Severe displacement and angulation showing at the site of cervical spine fracture. B : Cervical X-ray after the Graphite-tong reduction.

### Case 3

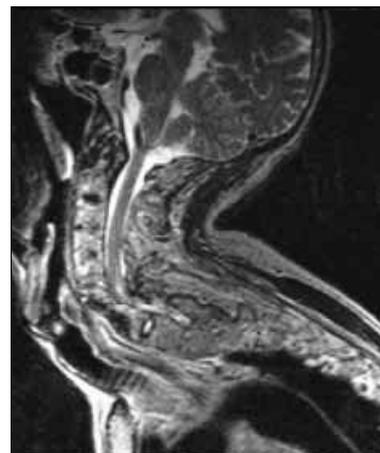
A 60-year-old man has suffered from ankylosing spondylitis for 10 years. He developed quadriplegia with right side dominant weakness since he had slipped down in drunken state 7 years ago. Quadriplegia was aggravated after repeated minor trauma, recently slip down injury 2 months ago. He had ossification of posterior longitudinal ligament on C3/4/5/6 segments and ossification of ligament flavum on T1/2 segment. After decompressive cervical and thoracic laminectomy, his motor weakness improved from grade 3 to grade 4, 2 months after operation(Fig. 3A, B).

### Case 4

A 74-year-old man had suffered from ankylosing spondylitis for 35 years. He had been transferred to this



**Fig. 3.** A : Preoperative sagittal magnetic resonance T2-weighted image, ossification of posterior longitudinal ligament from C2 to C6 and ossification of ligamentum flavum at T1/2 level. B : Postoperative cervical X-ray. Cervical stenosis is decompressed from C2 to T2 level except C7 level.



**Fig. 4.** Preoperative sagittal magnetic resonance T2-weighted image, cord signal change and fracture-dislocation at C6/7 segment.

hospital via local hospital. He had an abrasion on his forehead and quadriplegia. So we guessed that he had an extensive cervical cord injury due to slip down in drunken state. On cervical plain X-ray, it revealed a C6/7 fracture-dislocation. After Graphite-tong reduction, he maintained the previous stable position in

flexion state. Tracheostomy was done for bronchial toilet. But he expired due to sepsis caused by aspiration pneumonia at 3 months after injury (Fig. 4).

## Discussion

The tendency of ankylosing spondylitis patients to suffer major injury from minor trauma, particularly falls and slip down is very high. The occult fracture is more frequent to the hyperextension injury of ankylosed spine<sup>4,8)</sup>. The most common cervical spine injury mechanism in ankylosing spondylitis patients is hyperextension injury<sup>6)</sup>. All of our cases are hyperextension injury. Given the flexion deformity of the lower cervical spine, it seems probable that either extension or flexion may produce fracture-dislocation. The fracture of the ankylosed spine occurs like long bone fractures<sup>3)</sup>. The fused spine which have become osteoporotic is vulnerable to trauma<sup>11)</sup>. In our series, cervical displacement was associated with severe comminution of intervertebral disc level and marked instability leads to difficulty in obtaining and maintaining a closed reduction. In our series, most of the injured area was at the lower cervical level. This sudden hyperextension in lower cervical area is the most common injury mechanism. Hitchon suggested that in flexion injuries, comminuted vertebral body fracture occurred, while the hyperextension injuries tended to cause intervertebral space fractures.<sup>2,4)</sup> Most of our cases were intervertebral space fractures caused by hyperextension injuries.

We preferred reduction and traction prior to halo-vest application because it was required to keep the reduction position without cervical cord injury. Dewald and Ray recommended routine reduction by axial traction<sup>7)</sup>. There is a high risk of initial neurological injury after fracture, and the risk of secondary neurological deterioration is substantial. Reduction and traction prevent spinal cord from secondary neurological deterioration, such as ruptured disc and unstable fractured segment. Three cases of our series were kept in the axial traction, which prevented neurologic deterioration.

Previous reports recommended conservative management for these injury<sup>10)</sup>. Although surgical intervention has been the primary treatment, mortality rate is high and neurologic improvement is minimal. In spite of these facts, surgery was parallelly recommended in cervical cord injuries in ankylosing spondylitis patients. The maintenance of reduction was very difficult but important. If the injury is combined with

epidural hematoma and disc rupture, early surgical intervention is necessary.

Chest care is as important as in cervical cord injuries of the normal spine. The most common cause of death was pneumonia and sepsis. The effect of respiratory muscular paralysis due to cord injury and immobility superimposed on the rigid thoracic cage predisposes to the complication<sup>5,11)</sup>. We experienced 3 cases of chest problems. One case was the post operative atelectasis and the others were aspiration pneumonia. The mortality rate is commonly higher than that in cord injury in the normal spine<sup>1)</sup>. Elderly patients with cervical cord injuries and immobile chest walls can be expected to suffer a high incidence of atelectasis and pneumonia<sup>5)</sup>. A majority of ankylosing spondylitis patients with cervical cord injury require early tracheostomy.

## Conclusion

Severe neurologic deficits develop even by a relatively minor trauma in the ankylosed spine. The mortality and morbidity are higher than other spinal cord injuries. The most common injury mechanism is hyperextension injury. Initial evaluation and treatment are very important. According to our experience of cervical cord injuries in ankylosing spondylitis patients, the principal managements are. 1) keeping the respiratory tract and vital sign. 2) preventing further ongoing neurologic deficit by keeping the reduction position. 3) surgical approach or Halo-vest application depending on neurologic status.

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## Cord Injury in Ankylosing Spondylitis

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