



The prognosis and the treatment of patients with a C3/4 spinal cord injury

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Twenty patients with a C3/4 spinal cord injury have been treated in our hospital since 1974. There were 15 new patients. The average follow up period was 68 months, ranging from 7 to 162 months. The 15 new cases were classified as Frankel A in nine cases, B in one, and C in five. Frankel A or B were usually accompanied by either an unstable spinal fracture or by spinal canal stenosis at the C3/4 level. Twelve patients received surgery. At the most recent follow up, eight of the 15 patients (53.3%) had improved according to Frankel's classification. Five, all Frankel A on remission, have died between 2 and 156 months after injury. Seven patients required tracheotomy on account of severe respiratory disturbance.

Keywords: C3/4 spinal cord injury; tracheotomy; unstable spinal fracture; spinal canal stenosis

Introduction

Many problems exist in the treatment of C3/4 spinal cord injury patients because the disability is very severe and the prognosis is poorer than in those with a lower cervical spinal cord injury. We report on 15 new patients.

Materials and methods

Twenty patients of C3/4 spinal cord injury have been treated in our hospital since 1974. The mean age of the patients was 58.3 years old ranging from 40 to 82 years old. There were 19 males and one female. The average follow up was 68 months ranging from 7 to 162 months. There were 15 new cases. We assessed the neurological deficit using Frankel's classification. Twelve patients received surgery, and may include patients during the spinal shock period.

The cause of the spinal cord injury

This was due to falling down onto the ground in nine patients, and falling from a height in six patients. Most had a head injury. Fifteen had a hyperextension type of injury, two a hyperflexion, and three were unknown. In the two patients who had a hyperflexion injury, we found ossification of the posterior longitudinal ligament (OPLL) at the C3/4 level in the X-ray films and CT studies.

Results of the new cases

The 15 new patients were classified as Frankel A in nine, B in one, and C in five. Those with a severe injury classified as Frankel A or B usually had an unstable spinal fracture or had spinal canal stenosis at the C3/4 level. Seven of the nine cases with either an unstable spinal fracture or with spinal canal stenosis were classified as Frankel A (Table 1 and 2).

Twelve patients received surgery, which included anterior decompression and fusion in five, posterior decompression and/or fusion in five; (three cases: spinous process splitting laminoplasty with hydroxyapatite spacers, one case: laminoplasty using Hattori's method, one case: conventional laminectomy), and simultaneous anterior and posterior fusion in two. Conservative treatment included Trippi-vest fixation in two, and skull traction in one.

Table 1 Frankel's classification of the new 15 patients

	At the most recent follow up				
	A	B	C	D	E
<i>On admission</i>					
A	5 (4)		1 (1)	3 (2)	
B		1 (1)			
C			2 (2)	3 (2)	
D					
E					

() The operated cases

Table 2 Treatment and the improvement of the paralysis

		Frankel's classification on admission	Improvement of the paralysis
Unstable spinal fracture (C3/4)	5 cases	A: 3 cases, B: 1 case, C: 1 case	50% (4 cases: 75%)
Spinal canal stenosis (C3/4)*	4 cases	A: 4 cases	25% (4 cases: 25%)
Cervical disc herniation (C3/4)	4 cases	A: 1 case, C: 3 cases	50% (3 cases: 33%)
Others	2 cases	A: 1 case, C: 1 case	100% (1 case: 100%)
Total	15 cases	A: 9 cases, B: 1 case, C: 5 cases	53% (12 cases: 50%)

() The operated cases; *Spinal canal stenosis includes ossification of posterior longitudinal ligament (OPLL)

At the most recent follow up, eight of the 15 patients (53.3%) had improved according to Frankel's classification. Six of the 12 patients (50.0%) with operative treatment and two of the three patients (66.7%) with conservative treatment have improved. The results of the operated cases with unstable spinal fractures were relatively good, but the results of those with spinal canal stenosis were poor (Table 2). The damage to the spinal cord was more severe in the latter patients. Conversely, more patients with an unstable spinal fracture may have the possibility of neurological recovery, even those classified as Frankel A.¹

Five of the 15 patients died, from 2 to 156 months after their accident. All were classified as Frankel A on admission. The cause of death was pneumonia in three (dying within a year of injury), and uraemia, and a gastric cancer in the other two.

Discussion

Patients with a severe cervical spinal cord injury have paralysis of the intercostal muscles and consequent respiratory disturbance. Patients with a severe C3/4 spinal cord injury have a more severe respiratory disturbance and disability because paralysis of the diaphragm may occur.^{2,3} In this series, the seven patients who were classified as Frankel A in six cases and B in one required a tracheotomy because of severe respiratory disturbance. It was possible to close the tracheotomy in only three of them, and they also had recovery of their paralysis. Another four patients who had no recovery of paralysis could not be weaned from the respirator; three of them died.

The reasons for the tracheotomy were hypercapnia and tracheobronchial secretions causing pulmonary atelectasis. It was easy to close the tracheotomy in the patients who had recovery of their paralysis. Therefore, if intubation is required for more than 1 week, tracheotomy should be performed. It is most important to control cardio-pulmonary function in

those with a C3/4 spinal cord injury,⁴ and also important to assess the injured level of spinal cord and its functional status exactly by MRI, and spinal cord evoked potentials especially if there is no fracture.⁵

It is controversial whether or not to operate on patients with cervical spinal cord injury without a fracture. It is presumed that swelling of the injured spinal cord gradually increases just after the accident⁴ and the spinal cord will be compressed especially if there is also spinal canal stenosis. However, the results of decompression surgery on the patients with spinal canal stenosis were poor. Thus we cannot recommend surgical treatment for patients with spinal canal stenosis who have severe paralysis.

Conclusion

The results of operation on patients with unstable spinal fractures were relatively good, compared with surgery on those with spinal canal stenosis, especially if accompanied by OPLL. The incidence of respiratory complications with patients classified as Frankel A was so high that this aspect of care must receive very high priority.

References

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