TRAUMATIC CERVICAL INJURIES and STABILITY

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ABSTRACT

Cervical region of the vertebral column is weak and can easily be injured during trauma. In United States, 40-50 per 1,000,000 new spinal trauma occurs, and 60% is located at cervical region. The most frequent reason is the traffic accidents.

Transporting the patients to the hospital, early reduction and surgical stabilization are important factors for mortality and morbity rate.

MATERIAL AND METHOD:

Retrospectively, 71 cases that treated for cervical trauma in Dokuz Eylül University, Department of Neurosurgery during the period of 1984-1992 is analyzed. Clinical grading is done according to Benzel and Larson's "Myelopathic Functional Grading" scale, which is prepared for analyzing the functional improvement after the de compressive surgery of thoracic and lumbar fractures.

Table 1. Myelopathic Functional Grading

Grade 1	Complete functional neuronal transsection.
Grade 2	Complete motor activity loss, some sensation is spared.
Grade 3	Nonfunctional movement under the lesion level.
Grade 4	Motor incomplete functional limited ambulation.
Grade 5	Motor incomplete functional unlimited ambulation.
Grade 6	Able to walk. But incoordination, urinary disturbances.
Grade 7	Minimal or no neurologic deficit.

After the patient attended to the emergency department, initially cervical region is immolibilized. If spinolaminal axis deformity, of spinal cord compression, due to spinal canal narrowing or instability has seen in plain radiographs, Glisson or Crutchfield traction was used.

Modified Cloward operation was done to perform anterior fusion with autolog bone screw to the patients with dislocation or traumatic disc disease. If there was burst fracture or compression fracture, vertebrectomy and anterior fusion with autolog bone graft were performed. Posterior instrumentation or wire stabilization with bone grafts was done to the patients with posterior column injuries.

If instability has occurred with upper cervical spinal column injuries; instrumentation of occipital bone C1 - C2 and posterior fusion with autolog bone, or, C1 - C2 interlaminal fixation with wire and posterior fusion with autolog bone had performed. If instability has not occurred, external fixation devices had used.

RESULTS :

Detailed results can be seen at the table 2. Neurological examination revealed, sphincter disturbances in 29 cases (40.8%), sensation loss in 29 cases (40.8%), quadriparesis in 25 cases (35.2%), abdominal breathing in 23 cases (32.2%), central cord syndrome in 4 cases (0.5%) and paraparesis in 3 cases (0.3%).

Before and after the treatment, grades were unchanged, Grade 7, in 6 Hangman fractures, 6 odontoid processus fractures and 5 atlanto-axial dislocation cases. Preoperative and postoperative grade was 3 in a type III odontoid processus fracture and atlanto-axial dislocation case.

Two cases could not be operated because of cardiovascular disturbances, and in one case, sterno-occipitomandibular immobilization (SOMI), and in the other, Minerva external fixation had used.

Five cases died because of respiratory arrest and one case because of disseminated intravascular coagulopathy.

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Table 2.

	Vertebra No	Preoperative grade	Treatment	Postoperative grade
Pure compression TOTAL 10 CASES	3 cases C4 2 cases C5 3 cases C6 2 cases C7	3 cases G1 4 cases G2 4 cases G6 1 case G7	9 vertebrectomy 1 Cloward	1 case ex 3 cases G2 2 CASES G3 4 cases G7
Pure dislocation TOTAL 29 CASES	1 case C3-4 10 cases C4-5 13 cases C5-6 4 cases C6-7 1 case C7-T1	7 cases G1 3 cases G2 4 cases G3 1 case G4 6 cases G6 8 cases G7	2 conservative 2 vertebrectomy 3 post.fix+fusion 20 Cloward 2 preop ex	5 cases ex 2 cases G2 5 cases G3 2 cases G4 6 cases G6 9 cases G7
Compression+ dislocation TOTAL 6 CASES	1 case C4 2 cases C5 3 cases C6	2 cases EX 2 cases G2 1 case G4 1 case G5	5 vertebrectomy 1 Minerva	2 cases ex 2 cases G2 1 case G6 1 case G7
Burst fracture TOTAL 11 CASES	2 cases C3 2 cases C5 4 cases C6 3 cases C7	2 cases G1 3 cases G2 1 case G5 1 case G6 3 cases G7	3 conservative 5 vertebrectomy	1 case ex 2 cases G2 2 cases G5 5 cases G7
Traumatic HNP TOTAL 7 CASES	6 cases C5-6 1 case C6-7	1 case G1 2 cases G2 2 cases G3 1 case G6 1 case G7	6 Cloward 1 Laser	1 case G1 4 cases G3 2 cases G7
Pure lamina fracture TOTAL 5 CASES	2 cases C3 1 case C5 1 case C6 1 case C7	1 case G2 1 case G3 1 case G4 2 cases G7	2 Laminectomy+ posterior fusion 1 Wire stabilization+ fusion 2 cervical collar	2 cases G3 1 case G4 1 case G6 1 case G7
jefferson fracture TOTAL 5 CASES		1 case G1 1 case G6 3 cases G7	3 cervical collar 20 cc-C1-C2 instr.	1 case G1 4 cases G7
Hangman fracture TOTAL 7 CASES		2 cases G6 5 cases G7	5 Minerva 1 cervical collor 1 wire stabilization	7 cases G7
Atlantoaxial dislocation			2 wire stb+post.fus. 2 cervical collar 1 Occ-C1-2 inst+fus.	
Odontoid fracture	Type II 7 Type III 2	2 cases G2 5 cases G7	In text	7 cases G7

DISCUSSION:

Instability or cord compression due to cervical spinal injury, initially must be treated with external fixation and by reduction with traction (5). If reduction can not be obtained with traction, surgical reduction must be used. In two cases with locked facets, this procedure had performed.

Seven of the odontoid fractured cases were type II, and the other two cases were type III odontoid fracture with atlanto-axial dislocation. Because of instability of the odontoid processus, four of the Type II fractures were treated by C1-2 wire fixation with fusion and in the postoperative period with Minerva external stabilization. One of the Type II fracture was treated by posterior fusion with instrumentatiton, and another one was by transoral odontoidectomy and posterior fusion with instrumentation. The other cases were treated by cervical collar in two and Minerva external stabilization in one patient. One of the atlanto-axial dislocated Type III odontoid fracture was treated by Minerva external stabilization and the other two cases were operated by instrumentation of occipital C1-C2 and fusion with autolog bone graft.

If odontoid fractures are Type II or if there is odontoid dislocation more than 4 mm, possibility of nonunion must be thought high and they should be treated by, occipital C1-C2 instrumentation or C1-C2 wire fixation, and posterior fusion with autolog bone graft (1, 4).

Five of the Hangman fractured cases were treated by Minerva external stabilization, one was by cervical collar, and the other one was treated by interlaminal wire stabilization and fusion with autolog bone graft. 97-100% of the Hangman fractures can be treated without surgical treatment. But in the presence of instability of C2-3, anterior discectomy with fusion or posterior interlaminar wire stabilization with bone fusion should be performed (2).

In one of the Jefferson fractures, occipito atlantal dislocation was present, and this case was treated by instrumentation of occipito C1-C2 and fusion. The other three cases were treated by cervical collar. In the presence of transverse ligament rupture causing instability, occipito-C1-C2 posterior instrumentation and posterior fusion with autolog bone graft should be used (6).

When pure compression, or burst vertebra causes spinal canal narrowing or angulation at the lower part of the cervical spine, vertebrectomy and anterior fusion are suitable. 19 cases are treated by this way. If there is no spinal cord compression or instability, we believe that the best choice for treatment is conservative. We treated 5 cases by Minerva external stabilization.

Seventeen of the pure dislocation cases were treated by modified Cloward technique. In three cases, because of associated insufficient posterior stabilizing elements, interlaminal wire fixation and bone fusion was performed. Two cases were treated by vertebrectomy and two were by conservative methods.

In 7 cases, traumatic disc protrusion was seen. Six of them were treated by modified Cloward technique and one of them was by laser nucleotomy.

If posterior stabilizing elements are intact in the cases of dislocation, modified Cloward technique with bone screw fusion is sufficient. In the presence of instability or graft slippage, instrumentation or wire fixation should be performed (3).

It is reported that recovery of the incomplete lesions is 70-80% after treatment. But for complete lesions, this ratio is maximum 15% (6). Most of the pathological changes occur initially after the trauma. Because of that, decompression and stabilization cause improvement just in the progressive cases (5). In this study, operation timing is 4,3 days for pure dislocation cases, 4 days for pure compression cases, 3 days for burst fractures, 2,5 days for compression fractures+dislocation cases.

In the 15 complete lesion cases, five of them had died, one improved, and 9 of them had no change in the neurologic status. In the 42 incomplete lesion cases, 19 of them had improved, 3 of them had died, and the others had not changed.

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