The later developed spinal cord swelling due to edematous changes and centrifugal pressure from an expanding central lesion enhanced the respiratory paralysis but a durotomy lessened this delayed respiratory paralysis. The same favorable effects of the decompressive procedures could be expected in recovery of the damaged motor function which was proved to be more vulnerable than the respiratory function.

B-49. Clinical Manifestations and Operative Procedure of Upper Cervical Lesions—$C_1 \cdot C_2$ Fracture Dislocation and Atlanto-Axial Dislocation

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Introduction: Anatomically upper cervical spine situates a special position where is at a junction of the skull and cervical spine. This space is formed by foramen magnum, atlas and axis, and includes respiratory center.

Thirteen cases of upper cervical lesions are analysed on the basis of following four points; 1) Neurological signs, 2) Pathogenesis of the neurological manifestations, 3) Application of operative procedure, 4) Operative procedure.

Clinical cases: (Table 2, 3.)

i) Atlanto-occipital dislocation ..... 1 case
ii) C1, C2, fracture dislocation ..... 5 cases
iii) Atlanto-axial dislocation ..... 7 cases
(separate odontoid 5 cases, without separate odontoid 2 cases)

1) Neurological signs (Table 1, 2, 3)

In the course of the development of neurological signs, eight cases showed transient signs of cord or nerve root involvement, however, ultimately 5 cases had residual neurological deficit.

(Tetraplegia 1 case, Brown-Sequard syndrome 4 cases)

Tetraparesis	1
tetraplegia ➡ tetraparesis	1
Brown-Sequard syndrome	4
none ➡ tetraplegia ➡ Brown-Sequard syndrome	1
tetraplegia ➡ Brown-Sequard syndrome	1
Brown-Sequard syndrome	2
None	8
tetraplegia · root signs ➡ none	1
root signs ➡ none	2
none	5

Table 1. Course of neurological signs

2) Pathogenesis of the development of neurological signs (Table 1, 2, 3).

According to the vertebral angiography, myelography, cervical sagittal tomography and the course of neurological signs, two cases of Brown-Sequard syndrome (Table 3-case 1, 3) may be caused by the posterior displacement of the odontoid process which is compressing the spinal cord ventrolaterally.

In a case of atlanto-occipital dislocation (Table 2-case 1), sudden obstruction of the unilateral vertebral artery may be responsible to the sudden tetraplegia and residual Brown-Sequard syndrome.

According to the developmental and healing process of neurological signs, one case is diagnosed as an acute central cervical spinal cord injury and the other one is a spinal cord contusion (Table 2-case 2, 5).

3) Application of operative procedure (Table 2, 3).

Three cases among 4 cases of atlanto-axial dislocation without any operative procedure are followed up for three to six years checking the cervical roentgenography, and all cases showed no improvement of the dislocation. And also the case 5 (Table 3) has once shown a complete improvement of atlanto-axial dislocation by having been applied collar corset for four months, but re-dislocation has been demonstrated by the plain cervical roentgenography 4 years later.

Consequently there are no case of natural healing of atlanto-axial dislocation.

Upper Cervical Spine

		X-Ray Findings	Neurolog. Signs	Cause of Neurolog. Signs	Therapy
1	S.H. 70. ♂	atl.-occip. dislocation	*none→tetraplegia→* Brown-Seqard synd.	vascular *(vertebral art.)*	occip.-verteb. fusion
2	A.Y. 26. ♂	C_1 laminal fracture C_2 tear drop fracture	*tetraplegia→* tetraparesis	vascular (*acute cent. cord inj.)*	collar-corset
3	M.H. 21. ♀	C_2 body fracture atl.-axial dislocation	none		collar-corset
4	G.I. 44. ♂	C_2 laminal fracture C_2 anterior disl.	none		collar-corset
5	F.T. 44. ♀	C_2 tear drop tracture C_2 posterior disl.	Brown-Sequard synd.	contusion	collar-corset
6	M.H. 19. ♀	C_2 laminal fracture	none		collar-corset

Table 2. The upper cervical lesion except atlanto-axial dislocation

Cases of fracture dislocation of the upper cervical spine (except atlanto-axial dislocation and atlanto-occipital dislocation) were achieved good stability by the collar corset and did not need for surgical decompressive procedure.

4) Operative procedure

(i) Atlanto-occipital dislocation

Occipito-vertebral fusion was performed, but Brown-Sequard syndrome remained.

Brief history; Pt. walked to the neurosurgical clinic complaining of nuchal pain immediately after the accident. He suddenly fell into tetraplegia and respiratory arrest while having taken the cervical roentgenography. Complete obstruction of left vertebral artery was demonstrated by the vertebral angiography.

(ii) Non reducible atlanto-axial dislocation (Fig. 1)

Occipito-vertebral fusion was performed after widening of foramen magnum and laminectomy of C_1 on the purpose of decompression.

Postoperatively severe Brown-Sequard syndrome was highly improved.

(iii) Atlanto-axial dislocation (separate odontoid) (Fig. 2).

Occipito-vertebral fusion, that is, posterior fixation of the occipital bone and C_1, C_2, C_3 with iliac bone and wire was performed.

		X-Ray Findings	Neurolog. Signs	Past History & *Cause*	Therapy
1	S.S 20. ♂	non-reducible disl.	Brown-Sequard synd.	Recklinghausen *compression*	decompression occip.-verteb. fusion
2	M.K. 31. ♂	reducible disl.	none *(occupital neuralgia)*	non-traumatcc *(before 6yrs.)*	
3	K.I. 43. ♂	separate odontoid	*tetraplegia→* Brown-Sequard synd.	trauma (*befor 5 yrs.*) *compression*	
4	M.I. 46. ♀	separate odontoid	*root signs→* none	trauma (*before 5 yrs.*)	occip.-verteb. fusion
5	K.U. 16. ♂	separate odontoid	*tetrapleg. root signs→* none	trauma (*before 5 yrs.*)	*coller corset→* occip.-verteb. fusion
6	M.T. 39. ♂	separate odontoid	none	trauma (*immediate*)	
7	M.K. 39. ♂	separate odontoid	*root signs→* none	trauma (*before 1 yr.*)	

Table 3. Atlanto-axial dislocation

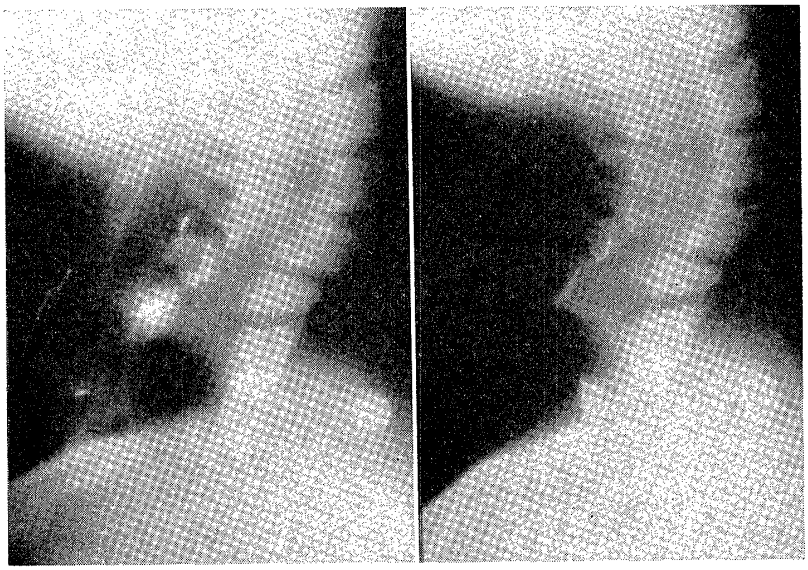

Fig. 1 Non reducible Atlanto-Axial dislocation.
Lt.; Preoperative cervical tomography.
Rt.; Postoperative cervical tomography.

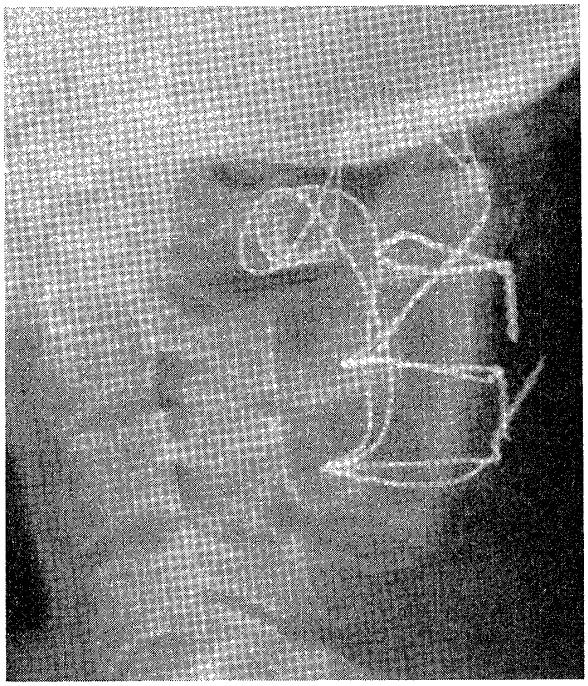

Fig. 2 Occipito-Vertebral Fusion; Postoperative plain cervical roentgenography.