"JEFFERSON" CERVICAL FRACTURE (CASE REPORT)

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Keywords: *axial compression, posterior wiring, iliac bone graft*

Abstract: *Jefferson fracture is classically described as a four part burst fracture of the atlas – first cervical vertebra – which combined anterior and posterior arch fractures. This type of fracture is caused by hyperextension combined with axial compression. This type of unstable fracture is treated with posterior wiring and grafting (iliac bone graft). Traction is contraindicated because of this severe instability and potential for injury to vertebral arteries and spinal cord. Rigid immobilization of the cervical area in cervical orthosis after operation is necessary.*

Cuvinte cheie: *compresiune axială, cerclaj posterior, grefon iliac*

Rezumat: *Fractura „Jefferson" este descrisă în mod clasic ca o fractură combinată a arcului anterior şi a celui posterior a atlasului – prima vertebră cervicală. Acest tip de fractură se produce prin hiperextensia coloanei cervicale asociată cu compresie axială. Tratamentul acestui tip instabil de fractură se realizează prin cerclaj posterior combinat eventual cu adaos de grefon iliac. Tracțiunea coloanei cervicale este contraindicată deoarece instabilitatea mare a fracturii riscă să producă leziuni ale arterelor spinale şi ale măduvei spinării. Postoperator imobilizarea rigidă a coloanei cervicale cu orteză este necesară.*

CASE REPORT

Spine, overall, is a functional unit that performs three roles:

1. role of protection for spinal cord.
2. static role - standing column is an axis that supports head, torso and upper limbs, and then transmits weight to the pelvis and lower limbs.
3. dynamic role - through its mobility it ensures the mobility of the body (1).

The spine trauma affecting these three functions has more or less serious consequences. The injuries affect bones, ligaments, joints and the motor segment, producing a degree of segmental instability with neurological consequences.

When the trauma force applies to cervical spine axis (fall in the head), it can produce a particular type of fracture - Jefferson fracture, "burst" type fracture of C_1 vertebra – the occipital condyles pressing on lateral masses of C_1 vertebra thus producing their fracture. (2) In terms of clinical signs, patients may range from a simple neck pain accompanied by stiffness of the neck, to neurological syndromes of complete or incomplete spinal section type. Treatment of this type of fracture, due to the high degree of instability must be strictly surgery – arthrtodesis C_1 - C_2 by posterior approach, combined with external immobilization of cervical regions by orthesis during the first 2-3 weeks post-surgery (3).

M.N., a man aged 34, suffered an accident, by falling from the motorcycle. The primary mechanism of head-cervical lesions production seemed to be falling in the head with sudden deceleration and hyperextension because of the impact with the ground.

On initial examination in the Emergency Room, he showed a minor head trauma associated with neck pain and motor deficit in the limbs (crurally emphasized tetraparesis).

On neurological examination, lack of sensitivity was found separately, meaning that the patient had a reduction in pain and thermal sensitivity of the trunk and limbs, and cervical hyperesthesia - clinical features that indicates an incomplete spinal cord syndrome called anterior-cord syndrome. Neurological status had altered in the next two days (although the cervical spine was immobilized by cervical collar and the patient started cortisone therapy), the patient became tetraplegic (only anal sphincter motor activity was preserved - however, creating hope for possible neurological recovery of the patient).

The patient was transferred to and operated in the Neurosurgery Clinic of Cluj-Napoca four days after the trauma, achieving a posterior stabilization by wire cerclage at C_1-C_2 spinous apophyses level with interposing of the iliac graft. An external immobilization by cervical orthosis was performed to strengthen the cervical region, during the first two months.

Postoperatively, the patient's condition became slowly favorable, but neurological recovery was only partial, at 6 months postoperatively persisting motor deficit, emphasized in the upper limbs, the patient being able to sit alone, but being unable to mobilize alone. Also, the sensorial recovery was partial, hypoesthesia and a proprioceptive sensitivity disorder persisted; he was able to regain primary functions of the hands, but not to make fine movements.

These results can be seen very well on the patient's neurological evaluation record, taken by ASIA / IMSOP criteria:

Neurological Examination Record

First name ... .N Last name: ...M Age...34 Nr. FO....217/2008

Radiological diagnosis: burst fracture of the anterior and posterior arch of atlas with dislocation of fragments

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(Jefferson type). Axis of normal appearance (fig. 1)

Neurological assessment:

Table no. 1. MS motor score (0-5)

Level	Day 1	Day 3	preoperatively	postoperatively	14 days	3 months	6 months
C_5	4	2	2	2	2	3	4
C_6	3	2	2	2	2	3	4
C_7	3	2	1	2	2	2	4
C_8	3	1	1	1	1	2	3
T_1	3	1	1	1	1	2	3
L_2	2	1	1	1	1	2	2
L_3	2	1	1	1	1	2	3
L_4	2	1	1	1	2	2	3
L_5	2	1	1	1	2	2	3
S_1	3	1	1	1	2	2	3

Table no. 2. Sensitive score SS (0-2)

	Day 1	Day 3	Postop.	3 months	6 months	Level	Day 1	Day 3	Postop.	3 months	6 months
C_2	1	1	1	1	1	T_8	1	0	1	1	1
C_3	1	1	1	1	1	T_9	1	0	1	1	1
C_4	1	1	1	1	1	T_{10}	1	0	1	1	1
C_5	1	1	1	1	1	T_{11}	1	0	1	1	1
C_6	1	0	1	1	1	T_{12}	1	0	1	1	1
C_7	1	0	1	1	1	L_1	1	0	0	1	1
C_8	1	0	1	1	1	L_2	1	0	0	1	1
T_1	1	0	1	1	1	L_3	1	0	0	1	1
T_2	1	0	1	1	1	L_4	1	0	0	1	1
T_3	1	0	1	1	1	L_5	1	0	0	1	1
T_4	1	0	1	1	1	S_1	1	0	0	1	1
T_5	1	0	1	1	1	S_2	2	1	1	1	2
T_6	1	0	1	1	1	S_3	2	1	1	2	2
T_7	1	0	1	1	1	S_{4-5}	2	1	1	2	2

Neurological	Day1	Day3	Postop.	14 days	3 months	6 months
SM	27	13	12	16	22	32
SS	31	7	22	24	30	31
ASIA/IMSOP	C	C	C	C	C	D

The surgery succeeded to stabilize the fracture´s site posteriously, maintaining postoperatively external immobilization with a cervical orthosis for 8 weeks.

The operating protocol in posterior approach of C_1 - C_2 segment can be summarized as follows: it starts with the skin incision from the great occipital eminence to the C_3 spinous process level. After incision with the electric scalpel in nuchal ligament and removing paravertebral muscle, the C_1 and C_2 spinous processes are highlighted and these can be strengthened by cerclage, achieving arthrodesis C_1 - C_2 with posterior blocking. (4) To stabilize this we used a graft harvested from the patient's iliac crest of about 2/2 cm, which was fixed by cerclage to the spinous apophysis. An effectively blocking of the rotational movement on the fracture level is realised, favorably influencing the healing process. (Fig. 2, a - c)

Figure no. 1. C1 "Jefferson"Type fracture - M. N. aged 34

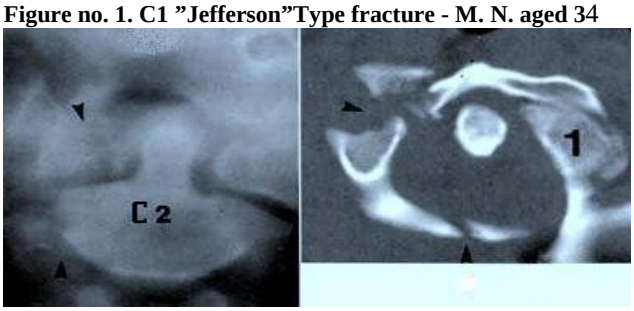


Figure no. 2. a. Upper occipito-cervical incision for highlighting the spinal apophysis

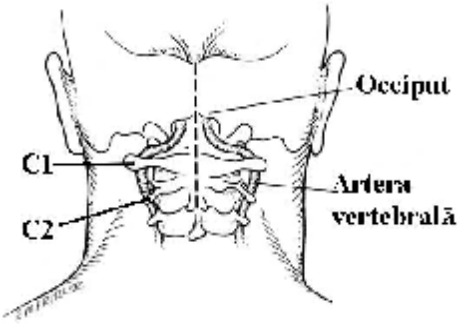


Figure no. 2. b. Incision view of nuchal ligament

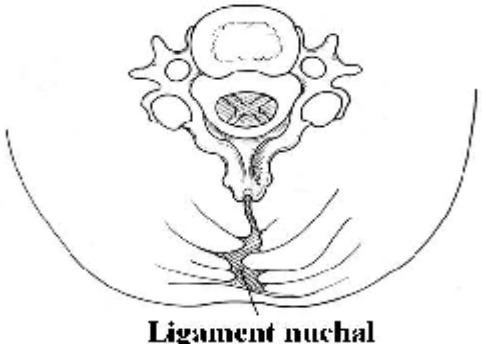
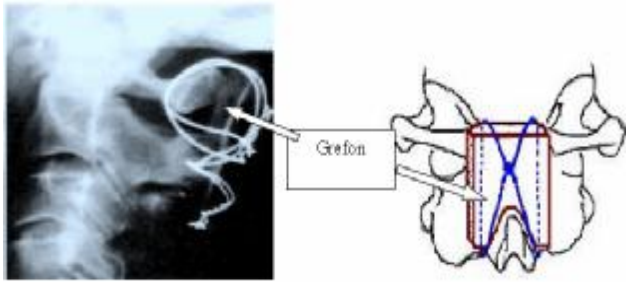


Figure no. 2. c. Postoperating aspect – the scheme



CONCLUSIONS

1. A head injury (especially by motorcycle accident) can hide a severe neck injury, which makes the examination of the cervical spine mandatory.
2. Radiological detection of an atlas fracture on the anterior and posterior arches (common in "Jefferson" fracture) makes it necessary to immediately achieve stabilization of

the fracture through posterior approach, as any delay could jeopardize the chances of recovery from neurological damage.

3. The immobilization of C_1 - C_2 segment can be done by posterior cerclage. If an iliac crest graft is added, it increases the stiffness of the upper cervical spine immobilization, because it cancels the possibility of motion in the sagittal plane, thus reducing the risk of worsening of the neurological lesions and increasing the chances of the neurological recovery.

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