A Technique of Strengthened Anterior Fusion of the Cervical Spine

Jiro SUZUKI and Yoshiharu SAKURAI

Division of Neurosurgery, Institute of Brain Diseases,
Tohoku University School of Medicine
5–13–1, Nagamachi, Sendai, Japan 982

Summary

Two cases of the severe fracture-dislocation of the cervical spine with tetraplegia have been treated successfully with a new technique. This technique consists of anterior vertebral body fusion with a tibia span added to the Cloward's method. This procedure permitted substantial removal of ruptured disks and bone fragments, effectivelly strengthened the spine weakened by fracture, and also enabled early start to a postoperative rehabilitation program. It seems that fracture-dislocation of the cervical spine should be treated operatively as early as possible.
Key words: Cervical spine, Neck injury, Anterior fusion

Introduction

In this report a new operative technique for a severe fracture-dislocation of the cervical spine is presented with two such cases treated successfully.

Operative Technique

The cervical fracture-dislocation are treated commonly with skull traction of Cratchfield's tangs, followed by surgical operation. By way of anterior approach of the Cloward's method, the ruptured disks and bone fragments are removed and anterior vertebral body fusions are performed between one or two intervertebral spaces. And then, a groove which extends between the upper and the lower healthy vertebrae including the injured vertebral bodies, which is 13 to 15 mm in width and about 3 mm in depth, is dug on the anterior surface of the spine. A tibia span is prepared so as to tightly fit the above mentioned groove. This span is fixed at its lower end with bone screw to the lower healthy vertebral body, while the upper end of this span is wedged to the adapted groove end (Fig. 1).

Case Presentation

Case 1. A 43 year-old female patient was admitted to a local hospital in August, 1969 with the complaints of severe neck pains, tetraplegia and slight dyspnea which had appeared soon after an automoble accident. Roentgenograms revealed fracture-dislocation of the 4th cervical vertebra (Fig. 2). Reposition of the cervical vertebra was performed by Glisson's neck traction (Fig. 3). Tetraplegia and dyspnea improved slightly. One month after the injury she recovered to the extent of being able

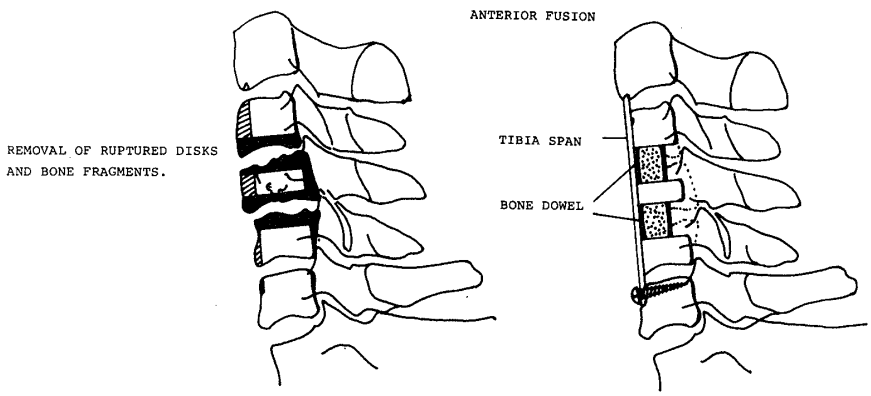


Fig. 1. Anterior fusion of the cervical spine strengthened with a tibia span.

Fig. 2. Case 1. Lateral view of cervical plain roentgenogram soon after the cervical injury.

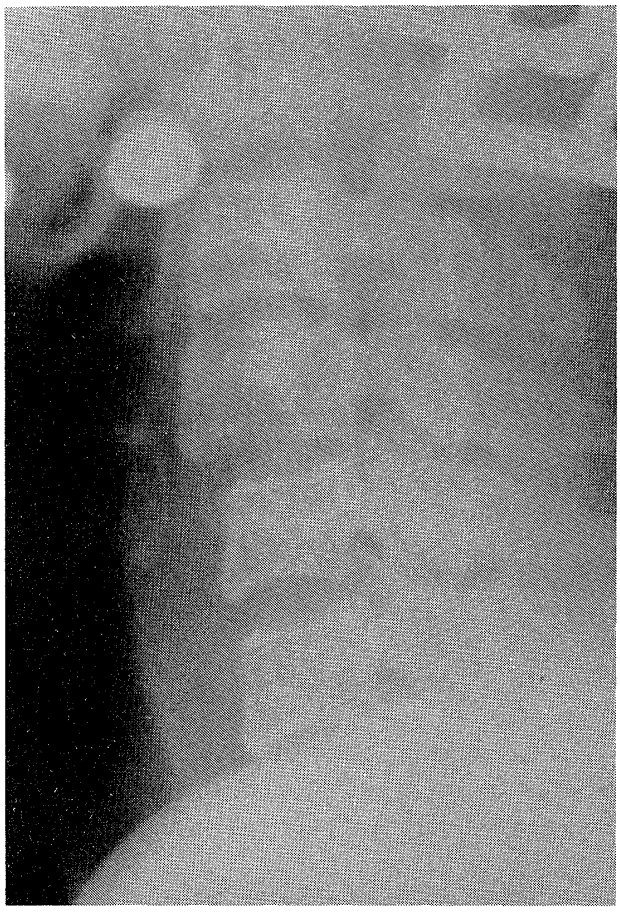
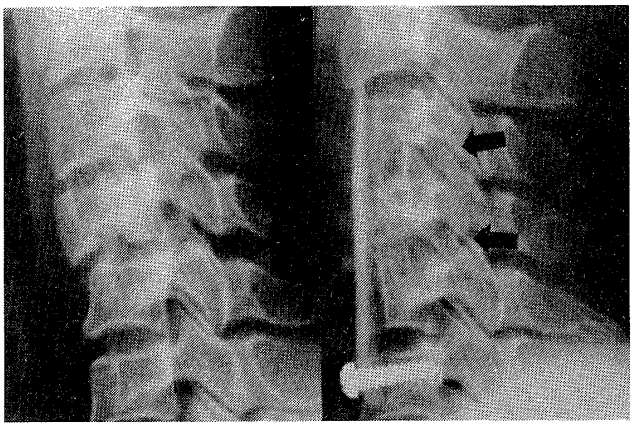


Fig. 3. Case 1. Reposition of cervical dislocation by Glisson's traction.

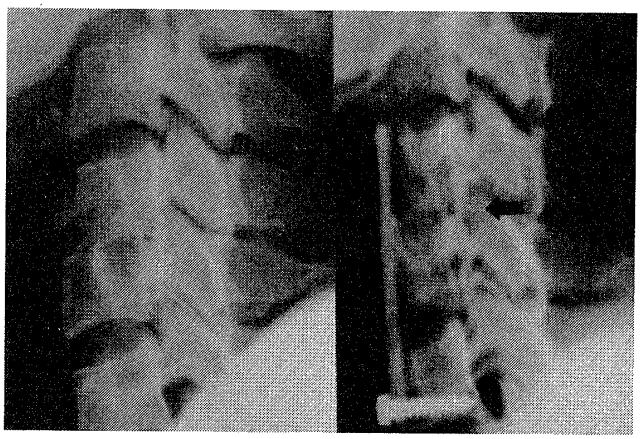
to walk by herself. But she still had complaints of hemihypesthesia and hemihypalgesia on the right side of her body and of weakness of her right arm. Six months after the injury she was admitted to our clinic. A lateral view of cervical roentgenogram revealed the fracture and anterior subluxation of the 4th cervical vertebra (Fig. 4 left). Anterior fusion was performed successfully with the above mentioned method (Fig. 4 right). When she was discharged from our clinic one month after the operation her motor and sensory disturbances had improved remarkably and she now enjoys a healthy life.



Pre-op. Post-op.

Fig. 4. Case 1. Comparison of preoperative and postoperative cervical roentgenogram. Left: preoperative roentgenogram. Right: postoperative roentgenogram.

Case 2. A 21 year-old male patient was admitted to a local hospital with complaints of severe neck pains and tetraplegia just after an automobile accident. As the tetraplegia did not improve even by Glisson's neck traction, three days after the injury he was transfered to our clinic. He had complaints of dyspnea, difficulty in urination and complete tetraplegia. Neurological examination reveealed the loss of sensation below the level of the 3rd thoracic dermatome bilaterally. A lateral view of roentgenogram of cervical spine showed fracture of the 3rd and 4th vertebral bodies and the narrowing of the intervertebral space (Fig. 5 left). After removal of ruptured disks and bone fragments, anterior fusion between the 3rd and 4th cervical vertebra



Pre-op. Post-op.

Fig. 5. Case 2. Comparison of preoperative and postoperative cervical roentgenogram. Left: preoperative roentgenogram. Right: postoperative roentgenogram.

was carried out with Cloward's method and was followed-up by additional transplantation of tibia span. Lateral view of postoperative roentgenogram revealed that the cervical spine was restored and fixed successfully (Fig. 5 right). Rehabilitaion program was started three weeks after the operation and within the following two months he improved to the extent of being able to walk with some assistance.

Discussion

For lesions of cervical disk and vertebral body with symptoms of radiculomyelopathy, posterior approaches, for example laminectomy or hemilaminectomy, had been surgically indicated as well as for lesions of lumbar disk in early years. But operative effects had been poor. In the 1950's anterior approaches were developed by Cloward,[1] Smith and Robinson[5] and Baily and Badgley,[2] and recently Cloward's[3] anterior fusion considered the most common surgical procedure for cervical lesions.

But for such severe lesions as fracture-dislocation, the cervical vertebral body fusion with cylindrical dowel alone might not be satisfactory. Cloward[1] recommended an extensive surgical procedure for severe fracture or fracture-dislocation: the crushed vertebra along with the upper and lower adherent disks are to be removed, leaving its posterior cortex and a rectanglar bone block is inserted into the defect of the spine and fixed with wire. Ishikawa[4] reported a similar surgical procedure of complete removal of ruptured upper and lower disks with a crushed vertebra, and then inserting a little larger bone block than the defect of the spine. There may be many other similar surgical procedures for cervical lesions. In any case, if our above-mentioned procedure were properly performed, substantial removal of ruptured disks and bone fragments at the posterior margins of vertebral bodies is possible and a strong anterior fusion with a tibia span added to the bone dowel inevitably will protect the weakened vertebral bodies to satisfy internal extention and thus fixation of the spine will be successful. As this technique is relatively easy, it seems to be recommendable for severe fracture-dislocation of the cervical spine.

Cervical fracture-dislocation should be treated surgically, as soon as the patient's condition permits. In almost all of these cases the ruptured disks or bone fragments might compress cervical nerve roots or spinal cord to some extent. From this point of view, it is recommended that early decompression of nerve roots or spinal cord be affected to minimize circulatory disturbance or edema and enable firm fusion of the spine in order to initiate early start of a postoperative rehabilitation program that leads to a good final outcome.

Fixation of a tibia span with its upper end wedged and with its lower end fixed to the vertebral body with a bone screw was satisfactory on roentgenograms as well as on clinical course in the follow-up study of these two cases.

References

1) Bailey, R. W. and Badgley, C. E.: Stabilization of the cervical spine by anterior fusion. *J. Bone and Joint Surg.*, 42-A: 565–594, 1960.
2) Cloward, R. B.: The anterior approach for removal of ruptured cervical disks. *J. Neurosurg.*, 15: 602–617, 1958.
3) Cloward, R. B.: Lesions of the intervertebral disks and their treatment by interbody fusion methods. *Clin. Orthop.*, 27: 51–77, 1963.
4) Ishikawa, Y.: Spinal cord injury (acute phase), 4th annual meeting of Japanese society of brain and nerve traumatology, Tokyo, 1970.
5) Smith, G. W. and Robinson, R. A.: The treatment of certain cervical spine disorders by anterior removal of the intervertebral disc and interbody fusion. *J. Bone and Joint Surg.*, 40-A: 607–624, 1958.