ATLANTO-AXIAL FRACTURE-DISLOCATION

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A young adult Indian male had complained for two years of fleeting pain in many joints with more or less continuous pain in the cervical region but no limitation of movement. He had been treated for "rheumatism" by several doctors. In January 1947 manipulation of the neck was advised and carried out at another hospital under sodium pentothal anaesthesia. On recovering from the anaesthetic the patient complained of excruciating pain in the midline of the neck beneath the occiput, which was quite different from the pain he had suffered before the manipulation. The head was fixed in a position of flexion with rotation to the left and there was a tingling sensation over the ulnar aspects of the forearms and hands, the medial aspects of the thighs, and the abdomen. He was kept in bed. Five days later he left the hospital, consulted this writer, and was admitted to the Department of Surgery of the University Witwatersrand, Johannesburg.

It was observed that he walked cautiously and deliberately. The head was held in acute flexion with slight rotation to the left. There was spasm of the cervical muscles, especially the paravertebral group, and movement was very limited and painful. Neurological examination revealed no objective signs though he complained of paraesthesia in both forearms and hands. Radiographs showed forward dislocation of the atlas on the axis with a fracture of the odontoid process. The atlas was tilted 60 degrees; the posterior ramus lay on the antero-superior surface of the body of the axis and there was lateral displacement to the full width of the atlas. The odontoid process of the axis was fractured at its base and displaced forwards and downwards with the atlas (Figs. 1, 4, 5).

The displacement was reduced on January 27, 1947, under intratracheal anaesthesia. A skull calliper was applied, the patient being placed on the operating table in such a way that the neck was supported on a wooden board, six inches wide, projecting from the end of the table. The cervical spine was extended and a Böhler screw-traction apparatus (of the type designed for fractures of the lower limb) so placed that the patient's shoulders rested against the upright bars of the frame, the cord from the calliper being attached to the hook of the wing screw (Fig. 6). The dislocation was reduced very gradually by tightening the winged screw and manipulating the frame in the desired position of traction. This manoeuvre lasted one and a half hours, during which time four radiographs were taken to check progress of the reduction (Fig. 2). When a satisfactory position had been secured a plaster jacket was applied. The skull calliper was left in position and weight-traction was continued for four weeks. Subsequently the calliper was removed and a new plaster applied. At this time there were no neurological symptoms and the patient was able to walk without discomfort.

Because of the notorious instability of this type of dislocation, cervico-occipital fusion was performed sixteen weeks later. A window was cut in the back of the plaster, and the base of the occiput and upper four cervical vertebrae were exposed through a midline incision. A gutter was made in the occipital bone by removing a strip of the external table, and the spinous processes of the second, third and fourth cervical vertebrae were split to receive a bone graft cut from the iliac crest. The graft was held in position by sutures of tantalum wire.

Three months later, radiographs showed that although there had been some recurrence of forward tilting of the atlas the position was acceptable and there was satisfactory consolidation of the graft. The plaster was discarded and a wool collar of Schanz type was worn for a further six weeks. At this time the head could be moved through about half the normal range and there was no pain on movement. Eighteen months later the patient reported
Fracture-dislocation of the atlanto-axial joint occurring after manipulation for "rheumatism" of the neck. The odontoid process is fractured and displaced forwards with the atlas (see also Figs. 4-5).

Reduction was effected by screw-traction combined with hyperextension (Fig. 2). Cervico-occipital fusion was then performed with a bone graft and the condition fourteen weeks after operation is shown in Fig. 3. The graft is well consolidated.
that he had no symptoms and neurological examination showed no abnormal findings. Flexion movement was limited by approximately 15 per cent., extension by 30 per cent., and rotation by 50 per cent. Radiographs showed sound consolidation of the graft from the occiput to the third cervical vertebra.

**DISCUSSION**

The classical account of "rotatory dislocations of the atlas" by Corner (1907) included a review of twenty cases, eighteen from the literature and two of his own. This paper led to fuller understanding of the mechanism of these dislocations. Corner emphasised the laxity of the atlanto-axial joint which allowed considerable movement without dislocation, and the fact that the muscles of the neck provided considerable protection against injury. If these muscles are relaxed, the very lax atlanto-axial joint is susceptible to injury. Lambotte (quoted by Mixter and Osgood 1910) reported the case of a young woman who sustained complete dislocation of the atlas, with fracture of the odontoid due to a sudden movement of the head while sewing. Wilson (1907) described a case of atlanto-axial injury in which it was believed that the displacement was caused by an osteopath who manipulated the patient's neck in the erect position.

Atlanto-axial dislocation may cause cervical cord injury and death, either immediately or after a delay of hours, days, months or even years. Broca (1863) reported a case proved at autopsy; the patient was an old man who died of urinary disorder and during life had carried his head obliquely. Bernstein (1903) reported a fracture-dislocation between the atlas and axis in which evidence of cord damage was delayed until the seventy-first day. Paralysis began in the right upper and right lower limb and spread slowly to involve the limbs of the left side and the bladder, rectum and diaphragm; the patient died after one hundred and one days. At autopsy there was evidence of unilateral forward displacement of the atlas with callus formation at the site of the fractured base of the odontoid process, compressing the cord. Costes (1855) described a similar case. The patient was progressing well until the ninth week when paralysis began; death occurred in the eleventh week. Gibson (1885) reported a patient with dislocation between the atlas and axis with fracture of the odontoid process and clinical features similar to those of the case reported in this paper. The head was set...
forward with the chin resting rigidly on the sternum, and there was a prominence at the back of the neck below the occiput. There were no abnormal neurological signs. The dislocation was reduced by steady traction. One week later, against advice, the patient sat up and immediately fell back dead. Autopsy showed separation between the axis and atlas with the cord tightly stretched and pulled against the anterior wall of the canal. The odontoid process was broken off at its base and displaced forwards with the atlas. Another case was described by Elliot and Sachs in 1912; their patient died from paralysis after thirty-two years, “a long earthly existence with a broken neck.” Watson-Jones (1943) considered that dislocation alone was more serious than fracture-dislocation, “because if the odontoid process is intact the spinal cord is in danger of being crushed against it.”

From these references it is evident that atlanto-axial fracture-dislocation is not necessarily fatal and may even occur without cord-symptoms. Nevertheless, in view of the extreme degree of displacement in the case here reported it seems almost miraculous that the patient suffered only minimal and temporary cord-symptoms and that apart from some limitation of movement in the upper cervical spine he is now entirely free from disability. **Treatment**—Reduction of the displacement may be secured slowly by continuous weight-traction with a skull calliper, or by a one-stage manoeuvre. The latter method was preferred in this case. Immobilisation may be maintained by plaster but there is danger of recurrence of the deformity. Cone and Turner (1937) described both immediate and late re-displacements, causing delayed nerve-root or spinal-cord symptoms. Re-displacement and death have been reported after prolonged immobilisation in plaster either suddenly, as for example when the patient sneezed, or gradually by increasing recurrence of deformity.

This instability of the reduction of fracture-dislocations can be overcome by cervico-occipital fusion. Several successful cases have been described (Cone and Turner 1937). In the case now reported a graft from the iliac crest was used and the difficulty of maintaining contact of the graft with the occiput was overcome by the use of wire sutures of tantalum wire.

**SUMMARY**

1. A case of fracture-dislocation of the atlas on the axis is presented in which the neck had been manipulated under anaesthesia for “rheumatism.”
2. Despite marked displacement there were no important neurological complications.
3. One-stage reduction by traction was carried out very slowly and with radiographic control. It is believed that this is less distressing to the patient, and safer, than gradual reduction by prolonged traction.
4. Because of the instability of the atlanto-axial joint after reduction surgical fusion of the upper cervical spine to the occipital bone is advisable.
5. In the case now reported recovery was complete.

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**REFERENCES**