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ASYMPTOMATIC VERTICAL FRACTURE OF A CERVICAL VERTEBRA

By

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Vertical fractures through cervical vertebral bodies are rare lesions. This type of fracture is mentioned occasionally only or not at all in the common text-books. Hence, it is not mentioned by *Böhler*, and it is not particularly commented on by *Watson-Jones*. In the ninth edition of *Köhler*'s text-book it is stated that the air in the rima glottidis may create an illusion of a vertical fracture of the cervical column, but that such a type of fracture does not exist, a point of view which is corrected in the tenth edition. Since almost all cases previously published have had a fatal outcome or have resulted in severe neurologic symptoms with complete disability, it was deemed justified to publish one case of sagittal fracture through the body of the fourth cervical vertebra without any neurologic symptoms.

LITERATURE

Hoffa (1891) seems to be the first to describe the vertical fracture of the cervical column. In 1946, *Ellis* mentioned one case without complications. *Blumensaat* (1948) published 2 cases, both with severe lesions of the medulla and with fatal outcome. In 1951 *Bourmer* published one case with quadriplegia, ending fatally. In 1953, *Blumensaat* published another case, also with quadriplegia and fatal outcome. From a paraplegia centre *Richmann & Friedmann* (1954) reported 17 cases, all with quadriplegia, 2 patients died. In 1961 *Mansfield* mentioned one case without complications. *Brocher* (1962) and *Wegener* (1962) reported one case each, accompanied by slight neurologic symptoms. Hence, it is a very serious lesion with an extremely poor prognosis, both with regard to survival and to recovery.

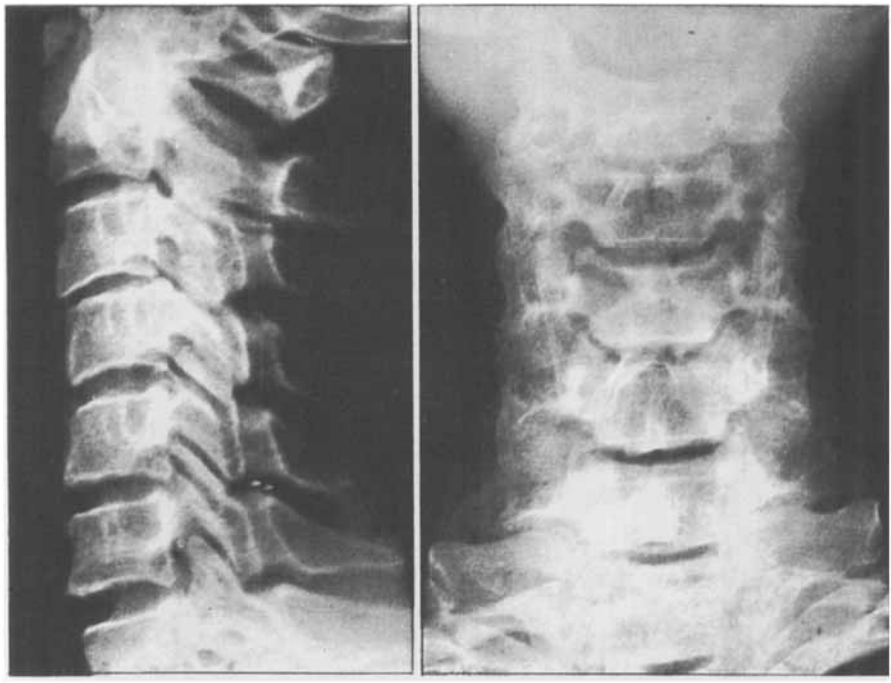

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Fig. 1.

a. Cervical column, lateral view: Third disc reduced in height. Fourth cervical vertebra slightly dislocated dorsally. Oblique fracture through the posterior part of the lamina of the fourth cervical vertebra.

b. Frontal view: Sagittal vertical fracture, widest cranially, through the body of the fourth cervical vertebra in the centre line.

OWN CASE

41-year-old female. Since adolescence she had hypoglycaemic episodes which she had taught herself to stop by ingestion of sugar. Over the last year the attacks had assumed the character of dreamy states, but they have never been accompanied by convulsions, loss of consciousness or fall. Four days before admission the patient lost consciousness for the first time during such an attack and fell backwards, whereby she knocked the back of her head and her shoulder against a table. She regained consciousness immediately, had pains in the back of her head and her shoulder, but no symptoms of concussion. On admission to the hospital she was unaffected, some tenderness was found of the fourth and fifth spinous processes, the head could be moved freely sideways, but hurt when lifted. Neurological examination, electroencephalography as well as opthalmologic and otologic examination including audiogram and differentiated caloric test were normal. Blood sugar test showed slightly lowered fasting values, but additional examinations including serum insulin like

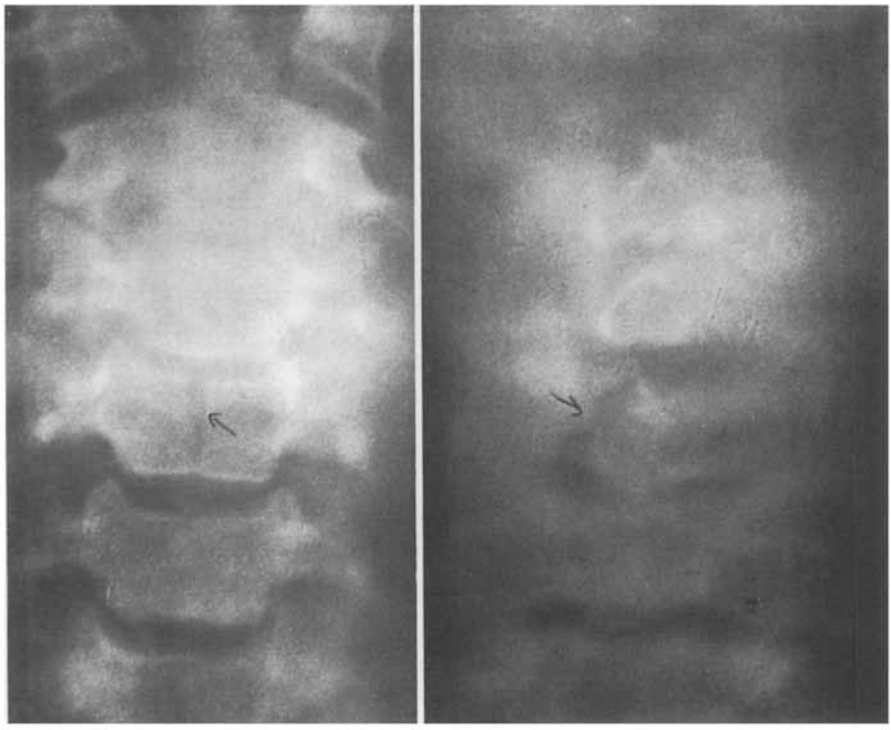

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Fig. 2.

a. Frontal tomography: Sagittal cleaving of the body of the fourth cervical vertebra.
b. Frontal tomography: Oblique fracture through the medial part of the lamina of the fourth cervical vertebra.

activity determinations during glucose loading afforded no proof of insulinoma. It was concluded that the patient suffered from a hypoglycaemic dysregulation, probably of hepatic nature.

Roentgenogram of the cervical column (Fig. 1 a–b) showed a vertical sagittal fracture of the fourth cervical vertebral body and a fracture in the arcus of the same vertebra without dislocation. The height of the third intervertebral space was slightly reduced and the back edge of the fourth cervical vertebra was displaced 2 mm dorsally. Tomography (Fig. 2 a–b) revealed a sagittal fracture, of a maximum width of 3 mm cranially, through the middle of the body of the fourth cervical vertebra and a fracture at the junction of the lamina and the spinous process in the right side without dislocation. Lateral tomography gave no further information. The intervertebral articulation were normal.

The patient was treated with plaster collar for nine weeks. Apart from a slight stiffness of the neck in the morning there were no complaints after the removal of the collar. Roentgenogram taken 6 months after the trauma (Fig. 3 a-b) revealed

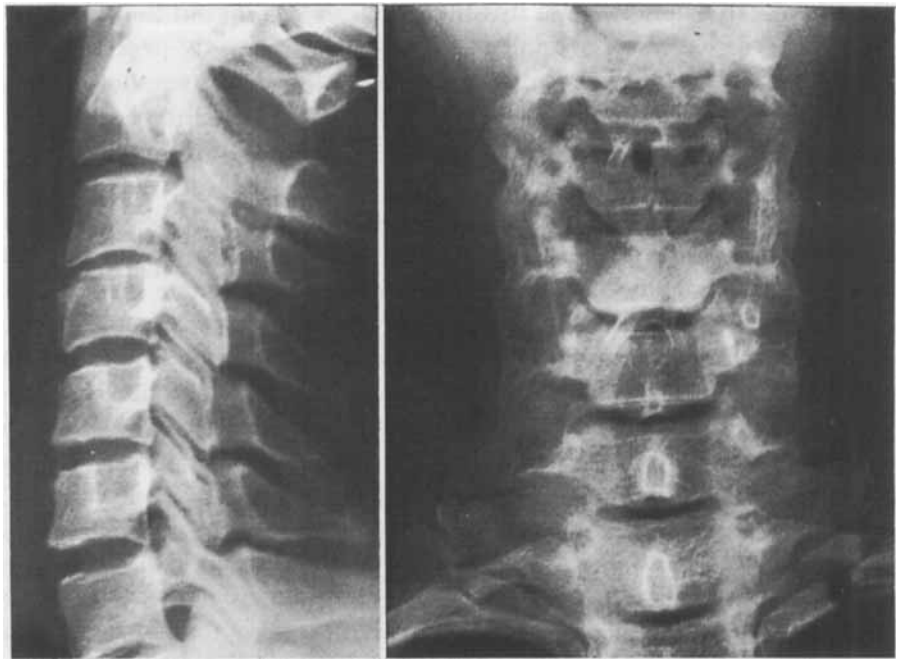

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Fig. 3.

a. Lateral view 6 months after trauma: Slight reduction of height of the third cervical disc. Insignificant dorsal displacement of the fourth cervical vertebra with callus formation on its anterior part.

b. Frontal view: Like Fig. 2 b, the fracture still visible.

only a minimal dorsal displacement of the fourth cervical vertebra, the third intervertebral space was unchanged. Some callus formation was seen on the ventral side of the fourth cervical vertebra, the fracture was still visible. One year after the trauma the patient states that she is completely free of symptoms.

DISCUSSION

The literature regarding fractures of the cervical column, the mechanism of their aetiology and their distribution is extremely copious (cf. inter alia *Pendergrass et al., Watson-Jones, Brocher Barnes, Taylor & Blackwood, Lob* and *Glorieux)*. As regards the aetiology of the vertical fracture of the cervical vertebral bodies, *Blumensaat* is of the opinion that it is a question of an axial action of force through the cervical column, through which the edge of the superjacent body exerts a chisel action on the subjacent vertebra, whereby the latter is split when the column is in such a position that there is no possibility of

flexion or extension. Against this theory *Stimpfl* point out that the discs of the cervical column are tall and project peripherally over the edge of the bodies. He suggests that the nucleus pulposus causes the cleaving of the body, provided that the trauma is directed absolutely axially so that the nucleus cannot escape in the peripheral direction (*Lob*: „Sprengwirkung des Gallertkerns"). This happens very seldom and should explain why this type of fracture is so rare. Against *Stimpfl*'s theory *Blumensaat* (1953) reports one case where autopsy did not reveal intraspongious prolapse of the disc. Also *Bourmer* reports one case where autopsy revealed rupture of the annulus fibrosus, but no nucleus tissue was found in the vertebral body. It may be supposed that the action of force is exactly strong enough to make the nucleus pulposus cleave the body of the vertebra, so that the pressure decreases and the nucleus does not penetrate into the body itself. However, it is a fact that the vertical cervical fracture is a very rare type of fracture. So far 25 cases are reported in the literature, all of them single cases apart from *Blumensaat* (2 cases in 1948 and 1 in 1953) and *Richmann & Friedmann* who found 17 cases among 80 patients with fractures of the cervical column over a period of 5 years. However, their series comes from a paraplegia centre and consequently, it is a selected material. In most of the published cases the fracture was of the diving type—13 cases—(bathing or fall on the head), 7 occurred after motorcar accidents, 3 after blows on the neck, 1 after squeezing and in 1 case the mode or origin is not mentioned. Most often the vertical fracture is localized to the fourth, fifth or sixth cervical vertebra. In *Richmann & Friedmann*'s series 7 fractures were localized to the fifth cervical vertebra, 6 to the sixth and 4 to the fifth and sixth cervical vertebrae. Generally the lesions are complex, so that apart from the cleaving fracture of the body other fractures or luxation are found simultaneously. Thus, among their 17 patients *Richmann & Friedmann* found only one case where vertical fracture was the only finding. In 6 cases vertical fracture with compression was found, while vertical fracture associated with compression, dislocation and fracture of the lamina of various combinations was found in 10 cases. The published cases show clearly that it is an extremely serious lesion. Out of the 25 known cases, 21 resulted in quadriplegia, 6 of these 21 patients died. Only 2 cases with slight neurologic symptoms have been published (*Wegener* and *Brocher*), while fracture without neurologic complications has been published only twice previously by *Ellis* and *Mansfield*, each reporting one case.

The roentgenologic diagnosis presents no greater difficulty, when the incidence of this type of fracture is known. The preferred location of the fracture, however, makes it an insidious type of fracture, since the vertical line of the fracture can be overprojected by the air in the rima glottidis and thus escape notice. Another differential diagnosis is spina bifida anterior and posterior. In cases of doubt a tomography will reveal the diagnosis. *Richmann & Friedmann* point out that when the vertical fracture is localized to the centre of the vertebral body, there is often no coexistent fracture of the vertebral arch, which on the other hand generally is found when the fracture is localized laterally in the vertebral body. In the present case, however, the vertical central fracture was accompanied by fracture through the lamina.

The extent of the lesion is elucidated by tomography and if possible by radiological function test, and is often much more extensive than suggested by ordinary survey films.

SUMMARY

One case of vertical fracture through the centre line of the body of the fourth cervical vertebra without neurologic symptoms is described. The patient was treated conservatively by means of a plaster collar and was asymptomatic at control examination one year after the accident. The previous literature comprising 25 cases is reviewed. In 21 of these cases there was quadriplegia with 6 deaths, in 2 cases relatively slight neurologic symptoms, while vertical fracture without any neurologic symptoms seems to be described only twice previously.

RESUME

Un cas de fracture verticale à travers la ligne centrale du corps de la 4ème vertèbre cervicale sans symptôme neurologique est décrit. Le malade a été soumis à un traitement conservateur au moyen d'un collier de plâtre et ne présentait aucun symptôme à l'examen de contrôle un an après l'accident. La littérature antérieurement publiée comprenant 25 cas est passée en revue. Dans 21 de ces cas, il y avait quadriplégie avec 6 décès, dans 2 cas des symptômes neuroliques relativement faibles, alors que la fracture verticale sans symptôme neurologique ne semble avoir été décrite que deux fois auparavant.

ZUSAMMENFASSUNG

Ein Fall von vertikalen Bruch durch die Mittellinie des Körpers des 4. Halswirbels ohne neurologische Symptome wird beschrieben. Der Patient wurde konservativ mittels eines Gipskragens behandelt und war bei der Nachuntersuchung ein Jahr nach dem Unfall symptomfrei. Die vorangehende Literatur, die 25 Fälle aufweist, wird besprochen. In 21 dieser Fälle war Quadriplegie vorhanden, 6 davon starben, in 2 Fällen waren nur verhältnismässig leichte neurologische Symptome nachweisbar, während Vertikalbrüche ohne neurologische Symptome anscheinend nur zweimal früher beschrieben worden sind.

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