Anterior stabilization of pathologic dens fractures

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By an anterior approach, six pathologic dens fractures were stabilized with screws and methyl methacrylate cement. All the patients had immediate pain relief and could be mobilized without external support. Using the anterior approach, the tumor can be removed and the instability neutralized at the site of the lesion.

Tumorous infiltration of the body of the second cervical vertebra may lead to a pathologic fracture of the dens. With a modification of the technique for screw fixation of traumatic dens fractures described by Böhler (1982), pathologic dens fractures can be stabilized with an anterior approach (Olerud 1982).

We report our experience in six consecutive cases.

Patients and methods

From 1981 to 1986, 6 patients with a pathologic dens fracture were operated on (Table 1). In Cases 2–4, the onset of symptoms was associated with minor trauma.

Preoperatively, a halo ring was fixed to the skull. The operation was performed under general anesthesia with the patient in the halo traction. Radiographic image-intensifier control is mandatory for reduction and exact screw positioning.

The anterior approach of Southwick-Robinson (1957) was used to provide a sufficient access to the anterior aspect of the bodies of C2 and C3. This approach made it possible to remove the metastatic deposit and also gave access to the inferior aspect of the dens. The inferior endplate of C2 and the adjacent disc were removed. Under fluoroscopic control, two 3.5-mm, fully threaded, cancellous bone screws were inserted into the dens. The screws were deliberately chosen 1 cm too long to ensure that the head and adjacent few threads remained in the cavity created by the removal of the metastatic

Table 1. Six cases of pathologic dens fracture

Case	Age	Sex	First symptom of malignancy	Primary tumor	Displacement	Radiotherapy [a]	Postoperative survival (months)
1	70	F	–	Thyroid	Anterior	1	51
2	54	M	+	Plasmocytoma	Posterior	2	> 84
3	63	M	+	Lung	–	2	1
4	62	M	+	Myeloma	–	3	27
5	71	M	+	Myeloma	Posterior	2	5
6	41	F	–	Breast	–	3	12

[a] 1 before (radioactive iodine) and after operation, 2 before, 3 after.

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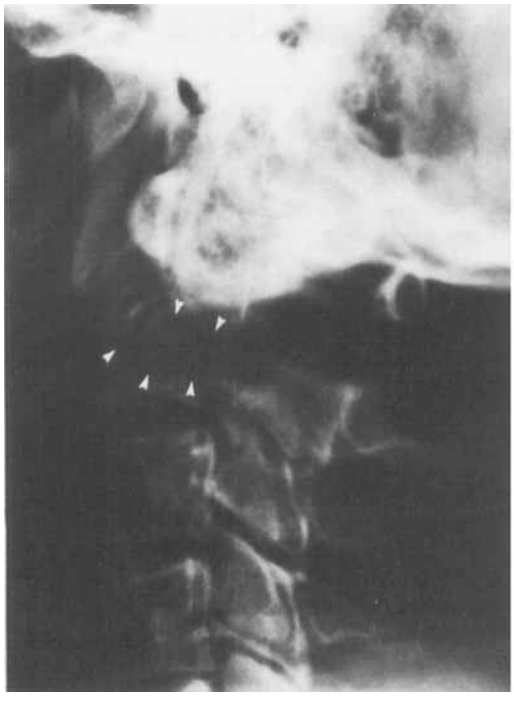


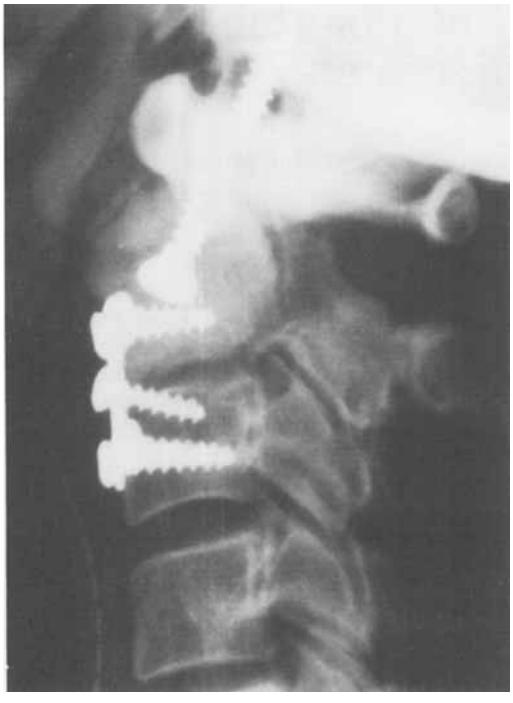
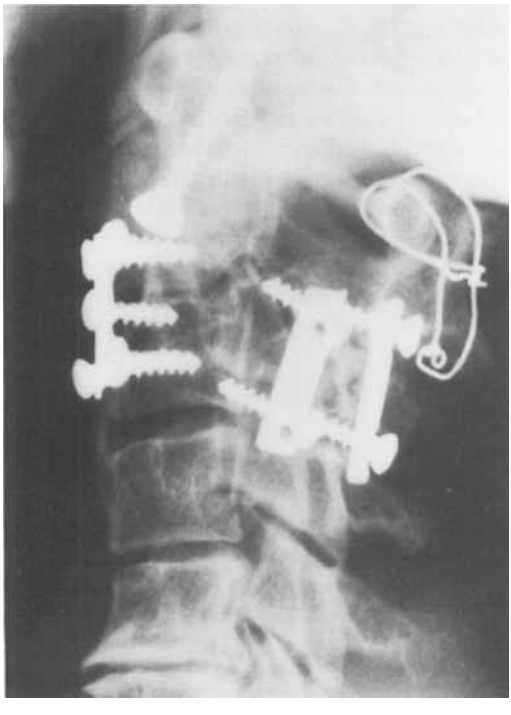


Figure 1. Case 2. Pathologic dens fracture with some posterior displacement and kyphosis. There is an osteolytic tumor in the body of C2. Only one screw was inserted into the dens. After the radiotherapy was completed, a posterior fusion between C1 and C3 was performed with bone grafts, cerclage wires, plates, and screws.



deposit. This cavity was then filled with methyl methacrylate cement. It is important that the recipient bed is dry when the cement is injected. The methyl methacrylate cement encompasses the protruding parts of the screws and thus fixes the dens to the cement body. The cement implant was then fixed to the body of the third cervical vertebra by an anteriorly placed five-hole plate and five fully threaded cancellous bone screws. Two of the screws were fixed into the cement and three to the body of C3. The lower screws should penetrate the posterior cortex of the third cervical vertebra to get an optimal screw grip. The wound was closed over a suction drainage. The halo ring was removed and the patient mobilized without external support. Postoperative radiography showed correct alignment and positions of the screws, plate, and acrylic cement in all the cases.

In 2 patients (Case 4 with myeloma and Case 2 with plasmocytoma), a posterior fusion using cerclage wires and bone grafts was done after radiation therapy was completed.

Peroperative biopsy diagnosed the tumor in the 4 cases where the fracture was the first symptom of malignant disease.

Results

One patient had to be ventilated in a respirator for 1 week because of swelling in the subglottis area. No other complications were seen. All the patients obtained immediate pain relief.

No recurrence of symptoms or instability was seen. Five patients have died, with a median survival of 27 (1–51) months. One patient, still alive after more than 7 years, is asymptomatic.

Discussion

Instability between C1 and C2 is common in rheumatoid arthritis and after trauma, but there are only a few reports on instabilities caused by metastatic infiltration and osteolysis in this vertebral segment (Hastings and McNab 1968, Fidler 1985, Onimus et al. 1986). The stabilization in these reports has been posterior. However, McAfee et al. (1987) reported five pathologic C2 fractures treated by anterior excision, bone grafting, and immobilization in a halo vest followed by posterior fusion.

Stabilization through an anterior approach has obvious advantages in treating instabilities due to tumor osteolysis of the vertebral body (Onimus et al. 1986, McAfee et al. 1987, Harrington 1988). An anterior approach gives direct access with a possibility to evacuate the tumor for diagnostic and decompressive purposes. It also makes it possible to restore the weight-bearing ability of the vertebral body with acrylic cement or bone grafts. Further, it allows for stabilization in the unstable horizontal plane through screw placement in the intact dens. A posterior fusion with cerclage wires and a bone graft between C1 and C2 would probably not give full stability in the horizontal plane.

Our technique does not provide biological fusion. Even though we saw no failures, we share the opinion of McAfee and Bohlman (1986) that for patients with long expected survival a posterior fusion with bone grafting should be performed after radiation therapy is completed.

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