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Facilitation of Removal of a Hypervascularized Cervical Vertebral Body Tumour by Intraoperative Temporary Occlusion of the Tumour-Feeding Vertebral Artery, Using Intraarterial Catheterization*

By

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With 5 Figures

Summary

The surgical treatment of a highly vascularized tumour that destroyed the fourth cervical vertebral body in a young patient, without neurological deficits, is reported. After posterior stabilization an anterior approach was used in order to replace the affected vertebral body with an acrylic prosthesis. The tumour-feeding vessels originated largely from the right vertebral artery. In order to maintain optimal visibility, intraoperative haemorrhage was kept at a minimum by temporarily occluding the tumour-feeding vertebral artery with an intraarterial catheter.

Keywords: Vertebral body tumours; tumour vascularization; temporary vertebral artery occlusion.

Angiography has seldom, in the past, been employed as a diagnostic tool in the work-up of cervical vertebral body tumours (Vogelsang and Wiedemann 1969, Verbiest 1978). Nevertheless, it is of value not only in the determination of tumour type but it also helps the surgeon to judge the surgical risk associated with the extirpation of a highly vascular tumour. In addition, it provides important information concerning tumour localization, and its relationship with vital neighbouring structures. More important, angiography enables the selective demonstration of tumour-feeding vessels. In the following case, the main tumour-feeding vessels were found to originate

* Dedicated to Prof. Dr. P. Röttgen on the occasion of his 70th birthday.

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from the displaced right vertebral artery. This finding led to the development of a technique that proved helpful during the operative procedure.

Case Report

An 18-year-old patient (Hosp. Reg. No. 275/77) noted the onset of neck, right shoulder, and right arm pain three weeks before admission. Physical examination showed no neurological deficits. Plain X-rays of the cervical spine revealed com-

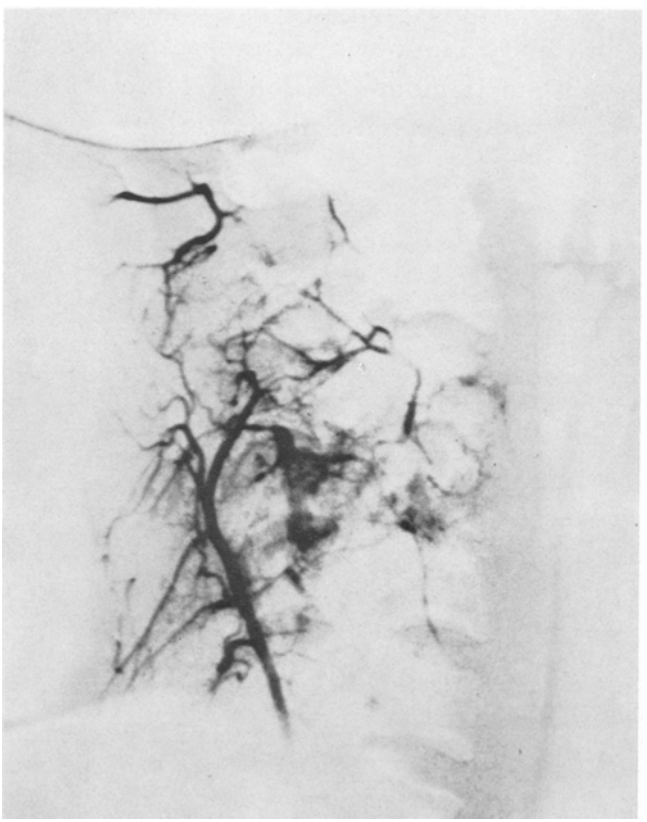

Fig. 1. Right deep cervical artery with partial subordinate vessel supply to the tumour of the fourth cervical vertebral body. Lateral subtraction radiogram

plete destruction of the fourth cervical vertebral body. Only remnants of the inferior articular processes and the vertebral arches remained identifiable. Despite complete destruction of the vertebral body, there was no remarkable loss in vertebral height. Paravertebral shadows and other osteolytic lesions were not found. A myelogram showed a posterior displacement of the contrast column at C 4 level, but no CSF block.

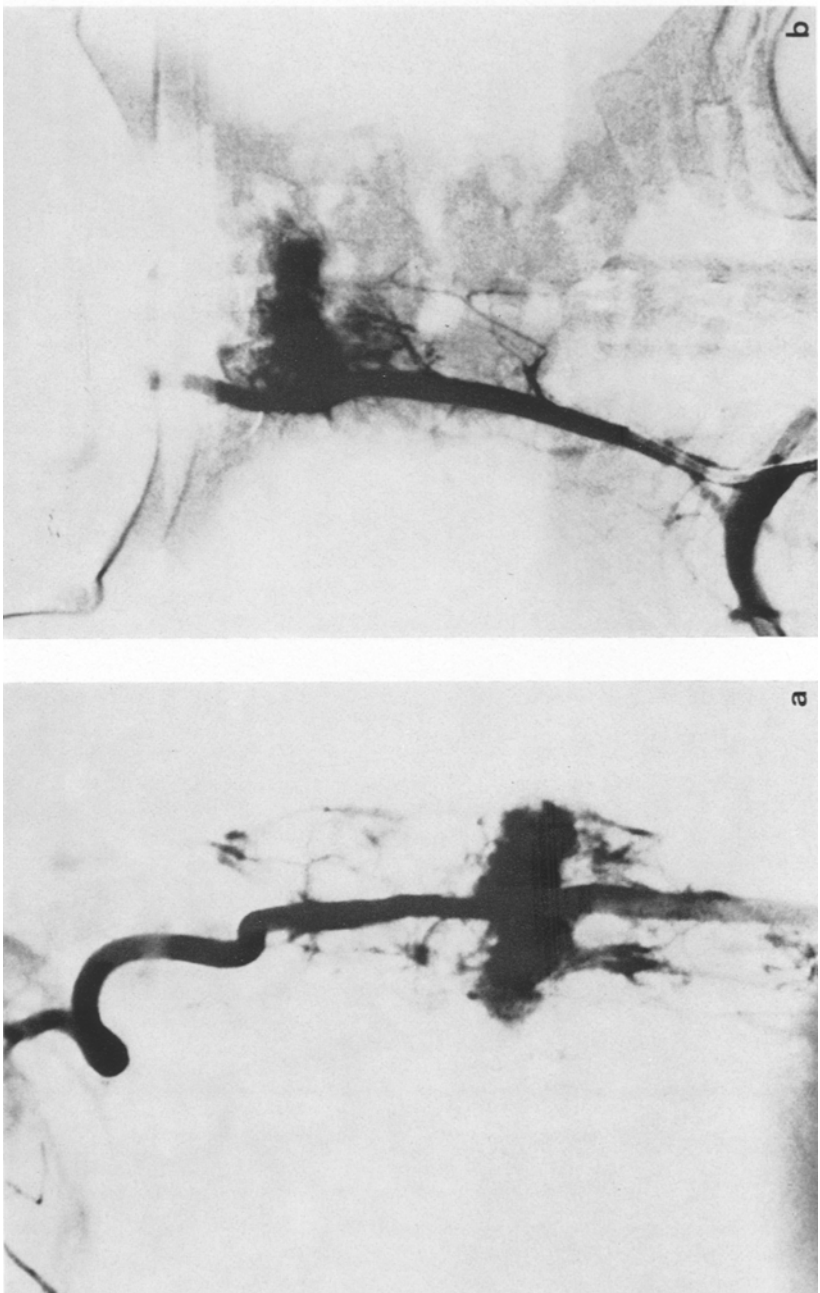

Fig. 2. Preoperative vertebral angiography on the right. Subtraction radiograms. *a* Lateral, *b* anteroposterior. The substantial vascularization in the affected fourth cervical vertebral body confirms the preponderant involvement of the right vertebral artery in the vascular supply of the tumour

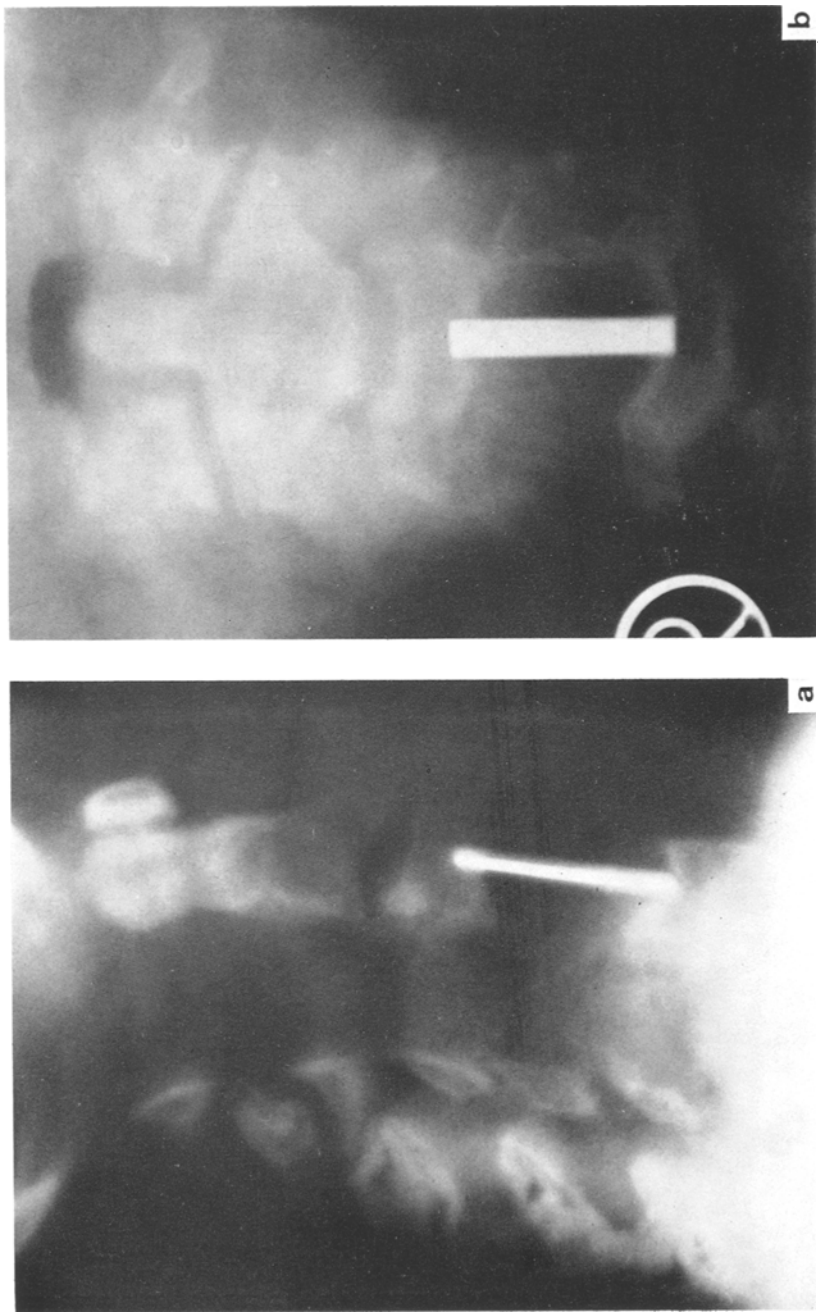

Fig. 3. Tomography of the cervical spine. *a* Lateral, *b* anteroposterior. Condition after tumour extirpation and replacement of the vertebral body with an acrylate prosthesis anchored by means of a small metal plate

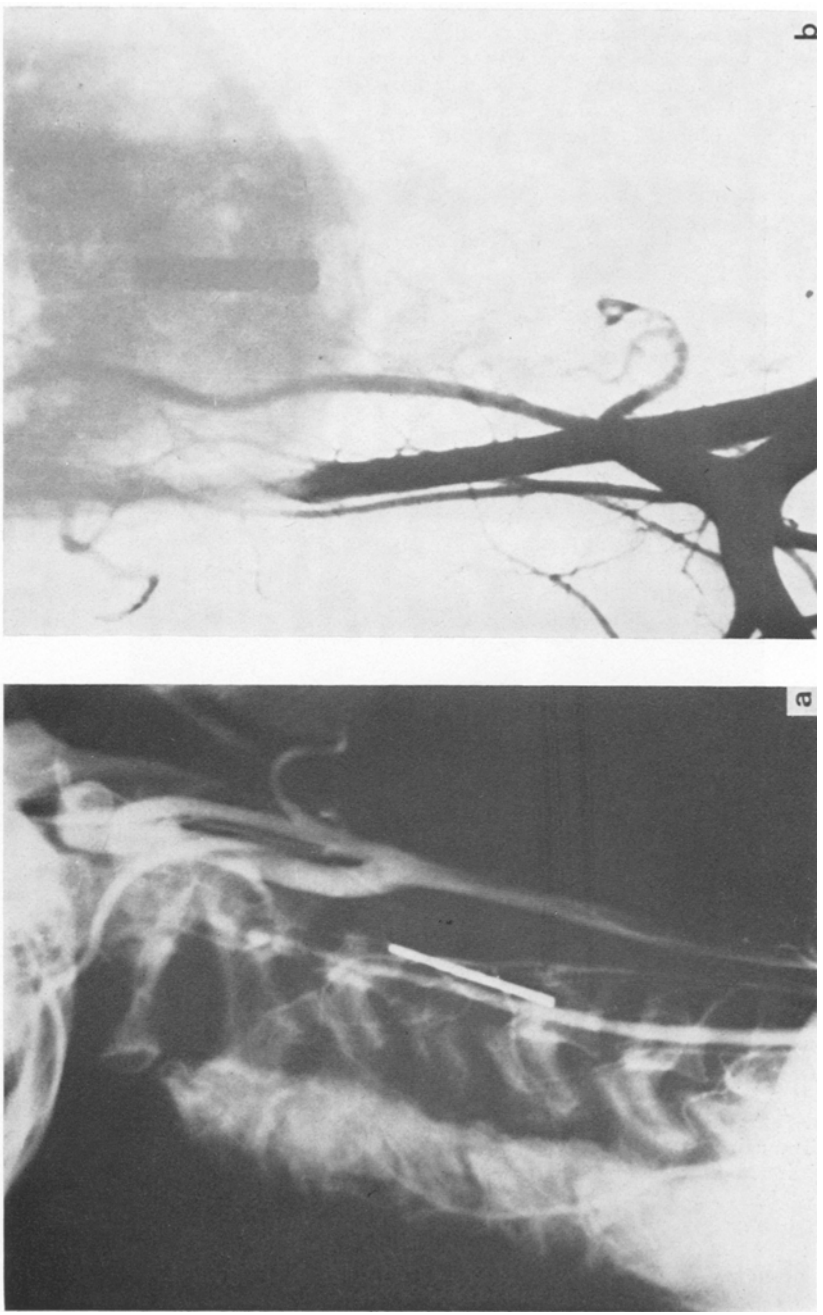

Fig. 4. Postoperative right brachial angiography. *a* Lateral, *b* anteroposterior subtraction radiogram. Tumour vessels are no longer visible. The right vertebral artery is intact

Arteriography was performed in order to assess the status of the laterally ascending vertebral arteries. This revealed a highly vascular tumour (differential diagnosis: vertebral body haemangioma, haemangiopericytoma, giant-cell tumour, benign osteoblastoma), that extended anteriorly, posteriorly, and laterally to the right beyond the destroyed vertebral body. The right vertebral artery was, in addition, found to be displaced and compromised. Except for tumour-feeding

Fig. 5. Oblique summation radiogram of the cervical spine 2½ years after surgical treatment. The acrylate prosthesis has been penetrated in places by bone

vessels originating from the right deep cervical artery (Fig. 1), the main blood supply to the tumour was provided by the right vertebral artery (Fig. 2).

Through a posterior approach, an internal stabilization from C 2–C 6 was carried out, using a laminated endoprosthesis (see Umbach, Oppel and Janusch 1976). The tumour was then totally extirpated through an anterior approach. The destroyed vertebral body was subsequently replaced by an acrylic prosthesis (Fig. 3). Histological tissue examination revealed a typical giant-cell tumour without malignant potential (No. 236/77). In order to avoid loss of intraoperative visibility of anatomical relationships through haemorrhage, to minimize blood loss, to tie off feeding vessels in a controlled and organized fashion, and

to avoid endangering the right vertebral artery, the following technique was used. It consisted of the temporary introduction of a catheter into the tumour-feeding vertebral artery. Under fluoroscopic control, a 7. F Cordis catheter, of which the external diameter matched the luminal diameter of the vertebral artery, was passed transfemorally into the right vertebral artery. The catheter was passed cranially beyond the tumour until the tip of the catheter rested at the C 2/3 level. In this fashion, the vertebral artery was occluded and tumour extirpation could be carried out with minimal blood loss. Residual haemorrhage was due to bleeding from the unoccluded right deep cervical artery and several other small feeding vessels. Surgical dissection on and about the vertebral artery was made considerably easier by this technique. To prevent thrombosis at or above the tip of the catheter and to maintain haemodynamic equilibrium in the remaining vertebrobasilar circulation, the catheter was continuously flushed, under pressure, with normal saline. In this manner, the catheter was kept in place for 90 minutes without complication. The catheter maintained its form and stability despite the influence of body temperature. It was taken out after the tumour had been removed.

The patient was postoperatively free of his preoperative complaints and remained neurologically unchanged. Plain X-rays of the cervical spine confirmed the almost complete resection of the fourth cervical vertebral body. Small non-pathological remnants of the left lateral mass could still be identified (Fig. 3). Postoperative angiograms revealed an intact vertebral artery and a lack of pathological vessels (Fig. 4). The mobility of the cervical spine has remained subjectively satisfactory and objectively only slightly restricted. The implanted acrylic prosthesis has been penetrated by bone (Fig. 5).

Discussion

Direct and indirect vertebral artery damage as a result of bothersome haemorrhage into the operative field during the removal of the hypervascular cervical spinal tumour was prevented by occluding the vertebral artery with an intraarterial catheter according to Seldinger. The use of this method has reduced blood loss, improved surgical technique and enabled meticulous tumour extirpation. In addition, it has allowed a more reliable, gentle exposure of the vertebral artery.

The success rate of selective catheterization of the vertebral artery is between 85% and 100% (Porstmann, Wierny, and Münster 1964, Mani 1970, Kim, De Boer-Unger, and Kilcoyne 1971, Vitek 1973, Mathias 1976). Contraindicated in the use of the catheter technique are atherosclerosis, thrombotic stenosis, and vascular spasm anywhere along the catheter pathway. The transaxillary route may also be employed if the transfemoral approach can not be used, especially in cases with distal aorta pathology and non-palpable femoral pulses (Westcott and Taylor 1972).

Temporary occlusion of the vertebral artery should not be attempted if the contralateral vertebral artery is severely hypoplastic, because of the threat of vertebrobasilar insufficiency. Although the right vertebral artery is small in approximately 80% of the population (Mathias 1976), bilateral vertebral artery hypoplasia, with vessel

diameters less than 1.5 mm is seen in only 4–6% of the population. Unilateral vertebral artery aplasia occurs in only 1% (Piepgras 1977). It is therefore necessary, prior to the operative procedure, to demonstrate angiographically both vertebral arteries and identify possible vascular variations. The origin of the anterior spinal artery must also be demonstrated in order to prevent its obstruction during catheterization. The added risk that this technique confers on the surgical procedure is no higher than that of routine arterial catheterization as described by Seldinger (Zeitler 1970, Wishart 1971, Heber 1976, Djindjian and Merland 1978). The complication rate for vertebral angiography is about 6.5% (according to Wishart 1971).

Finally, each case must be individually evaluated by means of angiography. It must be determined to what extent temporary vascular occlusion adds to the success of the operative procedure.

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