Microsurgical Resection of Tumors Involving the Cavernous Sinus: Possibilities and Limitations

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Introduction

Thanks to the deeper insight into the topography of the cavernous sinus (CS) and sellar region provided by modern diagnostic procedures [2,12,24,35,38], and on the basis of our growing experience in the operative management of pathological lesions in the region of the tentorial notch [6-9,31,33,39], we were encouraged to treat 28 tumors invading the CS more aggressively by a direct microsurgical approach from different sides, in some cases via combined approaches in two stages.

Patients, Operative Treatment, and Results

Since March 1983, 25 patients have undergone a direct surgical approach to the CS because of tumor pathology. Their age ranged from 28 to 56 years. There were 9 meningiomas (Fig. 1), 16 pituitary adenomas (Fig. 2), 2 malignant tumors (Fig. 3) of the skull base, and 1 fibrous dysplasia. Our cases are listed in Table 1 in respect to the type and extent of the tumor, the operative approaches, and the tumor removal. There was only one meningioma that originated primarily inside the CS (Fig. 1). Tumor invasion into the CS depended on tumor sites at the base, e.g., sellar and parasellar region, sphenoid ridge, petrous apex, and tentorial edge. Different operative approaches were chosen in this respect so as to avoid brain damage and injury to the neurovascular structures outside and inside the CS.

Pituitary adenomas with parasellar invasion of the CS were approached in cooperation with the ENT surgeon in one stage via the transnasal, transsphenoidal, transsellar route (Fig. 2), avoiding infrasellar lateral tumor resection in the inferior-anterior part of the CS because of limited space and view, or via the subfrontal and pterional route, as well as in two stages from inferior and superior.

In 6 cases of subtemporal approach to petrous apex meningiomas the tentorium was partially resected with preservation of the IVth cranial nerve in all but one case, where the recurrent meningioma had invaded the CS along the sheaths of the IIIrd and IVth nerves.

1 Dedicated to Prof. Dr. J. Lang on the occasion of his 65th birthday.
Fig. 1. Nuclear magnetic resonance image of intracavernous meningioma with tumor invasion into the hypophyseal region and suprasellar extension. Notice intracavernous ICA surrounded by tumor tissue 3 years after subtotal tumor removal via the subtemporal lateral approach and radiosurgery of residual intracavernous tumor 1 year later. Postoperative contrast CCT scan in coronary sections 4 weeks after the Dolenc approach demonstrates total removal of the tumor with preservation of the ICA and the IIIrd cranial nerves.

The opening of the CS followed microsurgical anatomy:

Inferior medial: seven adenomas, one ICA injury and secondary occlusion due to a false aneurysm after 10 days because of previous chronic parasellar inflammation of the paravascular area.

Anterior lateral after resection of the orbital roof and anterior clinoid process with control of extradural and subarachnoid ICA; two cases; one ICA injury, ICA patent after temporary clipping.

Fig. 2. Postoperative CCT scan of a giant invasive pituitary adenoma with parasellar extension into the left CS and middle cranial fossa as well as supra- and intrasellar tumor growth, which was treated first by the combined transethmoidal-transsphenoidal approach to deal with CSF leakage, and then by the left pterional medial approach with total removal of the tumor, as demonstrated by the postoperative CT scan.