

Presigmoid Sinus Approach to Petroclival Meningiomas

Abstract—Between August 1987 and May 1989 five patients with petroclival meningiomas were operated on at the Neurosurgical Clinic of the Krankenhaus Nordstadt, Hannover, Germany, using an original combined supra- and infratentorial presigmoid sinus approach. There were two men and three women, ranging in age from 34 to 61 years (mean, 48 years; median, 46 years). Follow-up ranged between 1 and 22 months. There was no death. Postoperatively, two patients had no useful hearing, one had a permanent facial palsy (the facial nerve had to be sacrificed intraoperatively due to its involvement with tumor), one had a permanent abducens palsy (the VI nerve was involved with tumor and had to be cut). Temporary lower (IX to XII) cranial nerve palsy was observed in all the patients; temporary VI, in two patients; temporary VII, in two patients, temporary hemiparesis, in one patient, temporary gait ataxia, in three patients; and persistent gait ataxia, in one patient. All patients had total tumor removal as assessed at surgery and with postoperative enhanced computed tomography. Four patients were independent and able to carry on normal activity, and one patient was independent at home but not outside due to severe ataxia 4 months after the operation. The presigmoid sinus avenue to the petroclival region shortens the distance to the clivus, permits a multiangled exposure of this difficult surgical area, minimizes the amount of temporal lobe retraction, preserves the integrity of the transverse sinus, and allows for better preservation of the neurovascular structures. These factors translate into a high percentage of total tumor removal and a low incidence of permanent morbidity. (*Skull Base Surgery, Volume 2, Number 3, 1992, p. 124*)

The removal of meningiomas involving the petroclival region was almost always accompanied by a very high mortality rate (50%) before the microsurgical era^{1,2} and consequently the surgical approach to these lesions was discouraged.² It has only been with the advent and refinements of microneurosurgical techniques and approaches that the removal of these tumors has become feasible with an acceptable mortality (less than 10%) and morbidity rate coupled with a significant percentage of “total” tumor removal.^{1,3,4}

Since 1987 we developed and perfected a combined supra- and infratentorial, presigmoid sinus approach (presigmoid approach) and used it in the treatment of lesions of this area.⁵ This report details the operative results obtained using this approach in five consecutive patients with petroclival meningiomas.

PATIENTS

Twenty-eight patients with petroclival meningiomas have been operated on in the Neurosurgical Clinic of the Krankenhaus Nordstadt, Hannover, Germany, between January 1978 and May 1989. The last five consecutive patients, representing all the patients with primary non-recurrent petroclival meningiomas operated on since August 1987, were operated on using the combined supra- and infratentorial presigmoid sinus approach. The details of this surgical technique have been described elsewhere.⁵ Briefly, this approach involves a posterior temporal craniotomy, a lateral suboccipital craniectomy with unroofing of the transverse and sigmoid sinus, a mastoidectomy and an extensive drilling of the petrous pyramid up to the inter-

nal auditory meatus. The supratentorial dura is opened horizontally above the transverse sinus and the infratentorial dura is opened vertically in front of the sigmoid sinus. After coagulation of the distal superior petrosal sinus, the tentorium is cut in a posteroanterior direction a few millimeters medial to the superior petrosal sinus as well as in a lateromedial direction to develop a medially based triangular tentorial flap. The temporo-occipital lobe covered by the tentorial flap is retracted superiorly. The cerebellum and sigmoid sinus are retracted medially (Fig. 1).

Five patients were operated on using this presigmoid sinus avenue. There were two males and three females. Their ages ranged from 34 to 61 years, with a mean age of 48 and a median age of 46 years. The interval between the onset of the symptoms and the diagnosis ranged between 1 and 16 years. The follow-up was between 1 and 22 months. Two patients presented with decreased hearing, one each with ataxia of the gait, trigeminal pain (present for 16 years), and headache. Gait ataxia or positive cerebellar findings were present in all the patients, decreased hearing was present in two, decreased trigeminal function in two, and nystagmus in one. One patient complained of intermittent diplopia with no extraocular movement impairment. All patients were preoperatively evaluated with enhanced computed tomography (Figs. 2 to 6) and cerebral angiography.

RESULTS

There were no deaths. Postoperatively, two patients had no useful hearing. In one patient, the facial nerve had to be sacrificed intraoperatively due to its involvement with tumor. One patient had a permanent abducens palsy (the VI nerve was involved with tumor and had to be cut). Temporary lower cranial nerve (IX to XII) palsies were observed in all the patients, temporary VI in two patients, temporary VII in two patients, temporary hemiparesis in one patient, temporary gait ataxia in three patients, and persistent gait ataxia in one.

All patients had total tumor removal as assessed at surgery and with postoperative enhanced computerized tomography (Figs. 2 and 6). The permanent facial palsy was successfully treated with a XII to VII anastomosis a few months postoperatively. Four patients were independent and able to carry on normal activity, and one patient was independent at home but not outside because of a severe gait ataxia 4 months after the operation.

DISCUSSION

Even though the removal of petroclival meningiomas has become feasible in the microneurosurgical era, it still remains a formidable undertaking.⁴

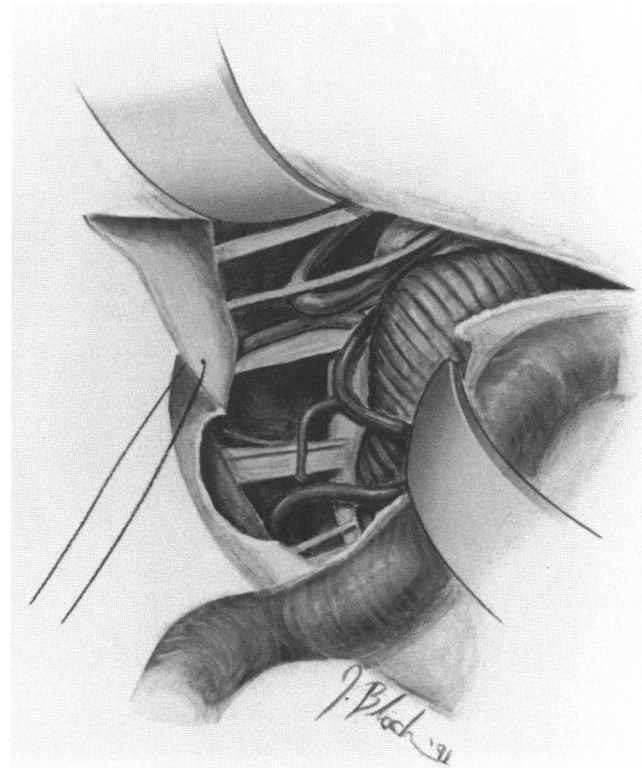
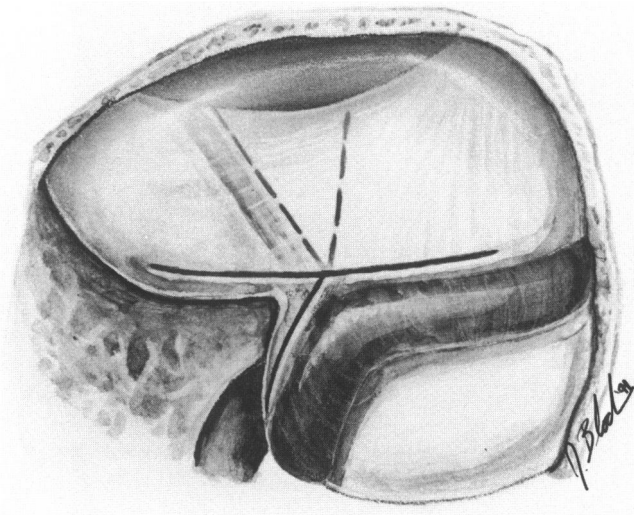


Figure 1. Drawings showing the dural incision lines (left) and the intradural exposure (right). The tentorial incisions are shown with dotted lines.

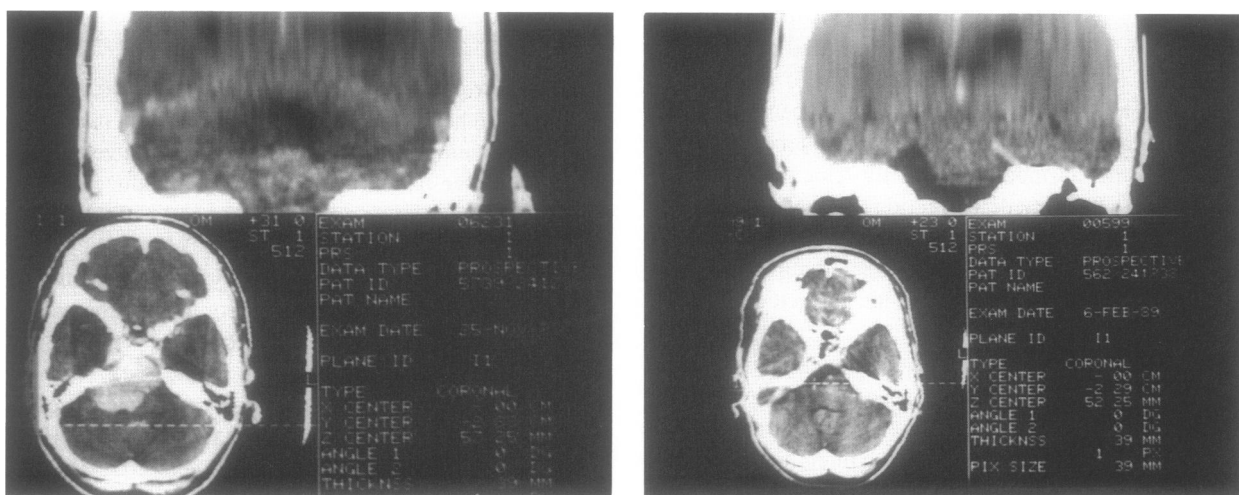


Figure 2. Preoperative (left) and postoperative (right) computed tomography of patient 1.

In an effort to improve the exposure of the petroclival area, various combined supra- and infratentorial approaches have been developed. Decker and Malis⁶ have described a combined approach requiring cutting of the transverse sinus distal to the vein of Labbé.⁶ In 1988, we first reported our presigmoid sinus avenue to the petroclival region.⁵ In the same year Al Mefty et al⁷ described a similar approach to the petroclival area, the petrosal approach in which the posterior fossa dura is cut in front and behind the sigmoid sinus. Hakuba et al^{8,9} have described a transpetrosal-transtentorial approach to the clivus requir-

ing an extensive anterior and posterior petrosectomy with sparing of the cochlea but sacrifice of the semicircular canals.

These combined approaches allow for a wider exposure of this area when compared with single approaches such as the suboccipital, the subtemporal or the pterional and are more effective in dealing with very large meningiomas that are so often found in this area.⁴

In approaching the petroclival region it is important to minimize the amount of cerebellar-brainstem and temporal lobe retraction while at the same time having a wide

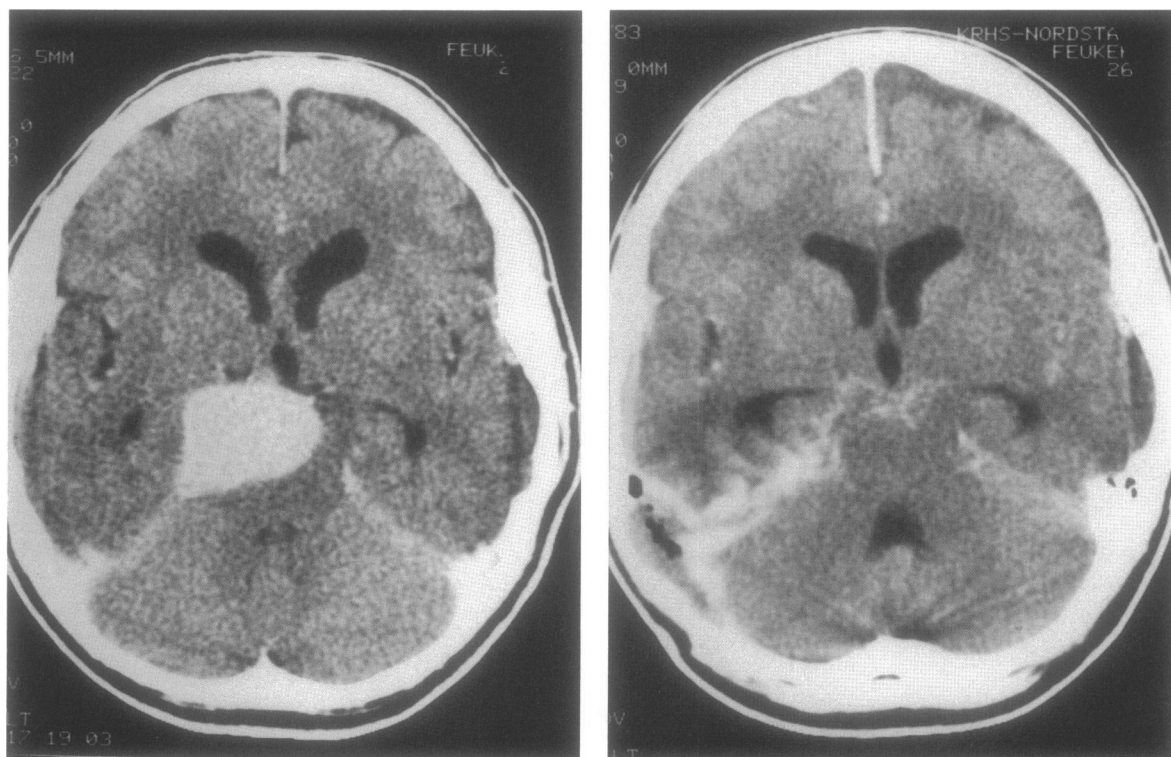


Figure 3. Preoperative (left) and postoperative (right) computed tomography of patient 2.

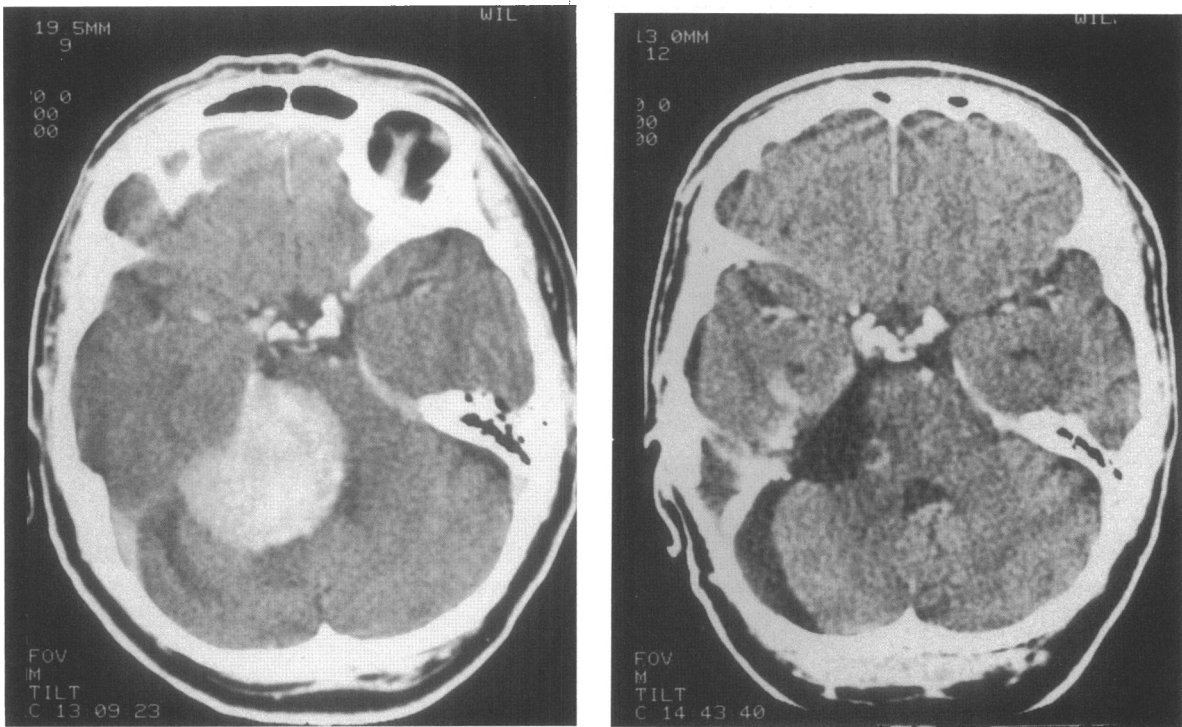


Figure 4. Preoperative (left) and postoperative (right) computed tomography of patient 3.

multiangled exposure without sacrifice of cerebellar tissue or of major dural sinuses. A combined supra- and infratentorial, presigmoid approach shortens the distance to the clivus by extensive temporal bone removal. This reduces the amount of cerebellar-brainstem retraction needed. The only series using exclusively a combined supra- and infratentorial presigmoid sinus approach for the removal of petroclival meningiomas has been reported by Hakuba

et al.^{8,9} In their most recent series Hakuba et al,⁹ using a somewhat more involved, combined supra- and infratentorial presigmoid sinus approach, reported on six cases of total tumor removal with one operative death due to cerebral infarction. Of the five survivors with a follow-up ranging between 1 and 2 years, three were independent and two needed some degree of assistance.⁹ Using our version of the combined supra- and infratentorial presigmoid sinus

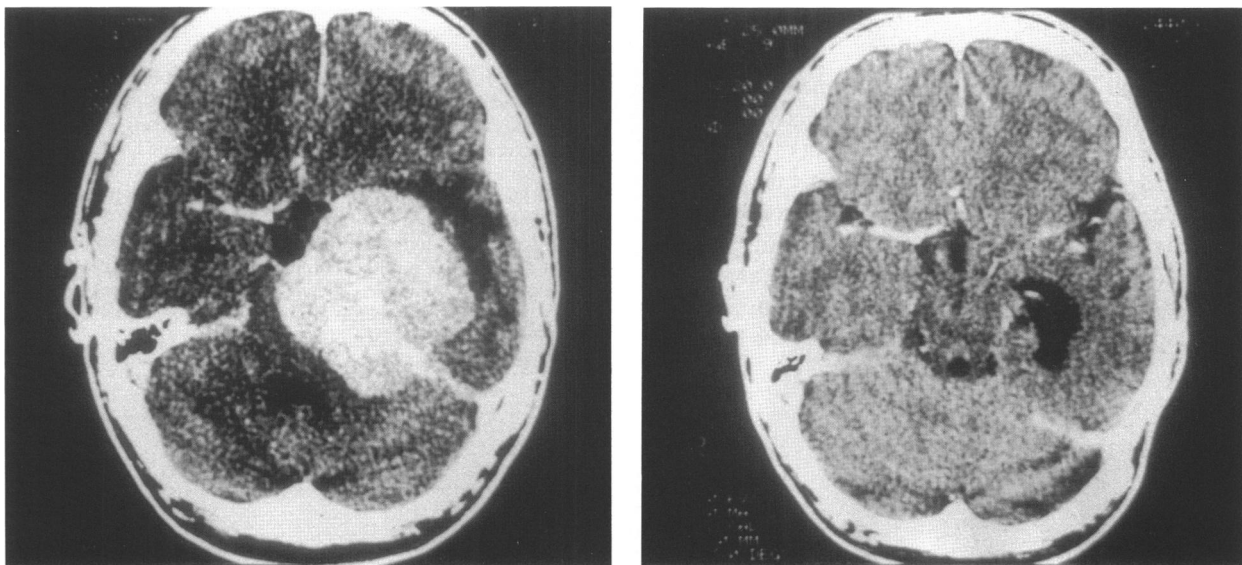


Figure 5. Preoperative (left) and postoperative (right) computed tomography of patient 4.

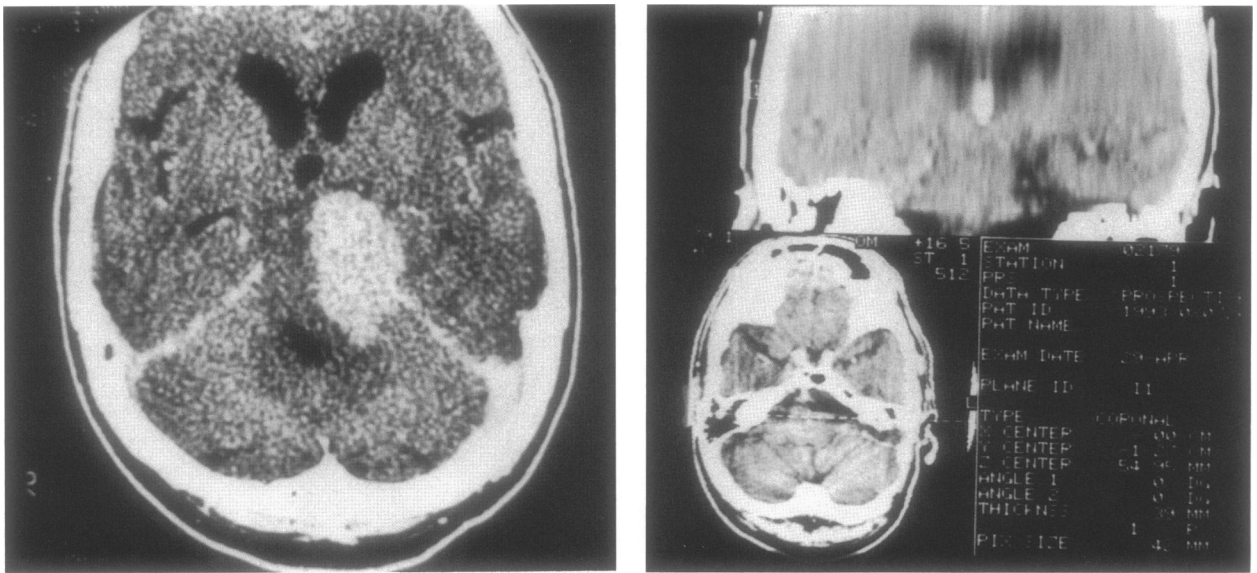


Figure 6. Preoperative (left) and postoperative (right) computed tomography of patient 5.

approach, we were able to achieve a complete total tumor removal in all five patients with no mortality and with four patients being fully independent.

The primary morbidity in our series was cranial nerve palsies. This is the result of the inevitable cranial nerve manipulation at the time of surgery; it is mainly an axonotmesis type of injury as demonstrated by the usual recovery of function with time. The postoperative absence of VIIIth nerve function in two patients was not due to intraoperative sacrifice of the acoustic nerve; rather, it was the result of the extensive drilling of the petrous pyramid causing opening of the semicircular canals.

The almost invariable presence of postoperative transient lower cranial nerve palsies requires aggressive prevention and management of related problems, such as aspiration pneumonia.

Most patients improve their cranial nerve function and ataxia during the first postoperative year. The same observation has been made by Hakuba et al,⁹ who observed improvement of the early follow-up functional status in four of five patients with nonrecurrent clival meningiomas. Therefore a meaningful assessment of the patient's functional status is best obtained 1 year after the operation.

The presigmoid sinus avenue to the petroclival region shortens the distance to the clivus, permits a multi-triangular exposure of this difficult surgical area, minimizes the amount of temporal lobe retraction, preserves the integrity of the transverse sinus and of the cerebellar

parenchyma, and allows for better preservation of the neurovascular structures. These factors translate into a high percentage of total tumor removal and a low incidence of permanent morbidity and make this approach highly recommended in the treatment of these treacherous lesions.

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