

## Subfrontal Neurilemmoma: A Case Report and Review of the Literature

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**= Abstract = A subfrontal neurilemmoma in a 22-year-old man is reported and the relevant literature is reviewed. Neurilommoma in the subfrontal location is very rare and the precise origin of this tumor still remains uncertain in spite of several suggestions such as the olfactory bulb, the perivascular nerve plexus, the mesodermal pial cell, the meningeal branch of the trigeminal nerve, and the anterior ethmoidal nerve. In our case, the olfactory bulb or tract could be excluded as an origin because the tumor was not attached to those structures and olfactory function was entirely restored after operation. The meningeal branch of the trigeminal nerve is considered as the origin in our case.**

**Key Words:** Brain tumor, Neurilemmoma, Olfactory, Subfrontal

### INTRODUCTION

Neurilemmoma is not rare in the cranial cavity, and mainly arises from the eighth cranial nerve. The tumor on the subfrontal location is rare and 12 cases have been described in the literature (Harano *et al.* 1974 ; Husain *et al.* 1992 ; Mauro *et al.* 1983 ; Nagao *et al.* 1991 ; Sato *et al.* 1985 ; Strum *et al.* 1968 ; Ulrich *et al.* 1978 ; Vassilouthis and Richardson 1980 ; Viale *et al.* 1973). As in our case, total removal was possible and postoperative course was satisfactory in almost all reported cases. The site of origin of

subfrontal neurilommoma is uncertain, but several theories have been presented. Olfactory tract or bulb, perivascular nerve plexus, mesodermal pial cell, meningeal branch of the trigeminal nerve, and anterior ethmoidal nerve all have been suggested as origins of the tumor (Gibson *et al.* 1966 ; New 1972 ; Russel and Rubinstein 1989 ; Strum *et al.* 1968 ; Viale *et al.* 1973). A magnetic resonance images (MRI) of the subfrontal neurilemmoma is presented, something which has so far been lacking in the previous reports. The pertinent literature concerning subfrontal neurilemmoma is also reviewed.

### CASE REPORT

This 22-year-old man had generalized seizures four times during the 5 months before admission. There was no family history or physical stigmata of von Recklinghausen's disease. Neurological examination was normal except for bilateral anosmia. Electroencephalogram (EEG) was moderately abnormal over the an-

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terior half of the brain. Computed tomographic (CT) scan demonstrated a large isodense mass with hemorrhagic spot which was widely at-

tached to the base of the right anterior cranial fossa. Contrast-enhanced CT scan showed strong homogeneous enhancement other than





**Fig. 1.** A, B, and C, Magnetic resonance images, T2-weighted axial image (TR: 2500msec, TE: 90 msec) showing relatively well defined heterogeneous mass in the anterior frontal area without surrounding edema. The mass has multiple cysts with a fluid level (A). T1-weighted midsagittal image (TR:500 msec, TE: 30 msec) showing well demarcated low signal intensity mass in the anterior frontal base (B). Post-contrast T1-weighted coronal image (TR: 500msec, TE: 30 msec) showing a strong homogeneous enhancement except the central cystic area (C).

the central cystic area in which fluid levels (probably supernatant and blood clot) was seen. MRI revealed a large enhancing extraaxial mass, with cystic or hemorrhagic necrosis in the anterior cranial fossa (Fig. 1). Both carotid angiograms showed a large avascular mass in the base of the anterior cranial fossa.

### Operation

A right frontal craniotomy revealed tense dura, with a palpable mass beneath the dura. When the dura was opened, a yellowish gray lobulated mass which was well demarcated from the normal parenchyme was found in the right subfrontal area. The frontal cortex was spared from tumor infiltration, and the tumor did not show any evidence of attachment to, or vascular supply from, the falx. But the dura of the anterior frontal convexity area was tightly attached and blended to the lateral surface of the mass. The right olfactory bulb and tract could be seen and there was no connection to the mass. The tumor was totally excised with the attached dura.

### Pathological examination.

The removed specimen was a well encapsulated pale whitish soft mass which weighed 45gm. On cut sections, it was generally solid with a focally myxoid appearance. Also noted were areas of cystic change and hemorrhage in a small portion. Histologically, the tumor was composed of elongated tumor cells often arranged in fasciculating or palisading pattern. Numerous Verocay bodies were seen (Fig. 2). In areas, the vessels showed hyaline change of the wall, where either fresh or old hemorrhage was occasionally seen. Antoni B areas were also noted particularly in areas of grossly cystic appearance. Masson trichrome and van Gieson stain showed a mixed pattern of collagen and nerve fibers. Immunostain was negative for vimentin but positive for S-100 protein.

### Postoperative course.

The postoperative course was uneventful. One week after the surgery, there was an improvement in the olfactory dysfunction and after another week, olfactory function was fully recovered. He has now been observed for a postoperative period of 24 months. Clinical examinations have revealed no neurologic deficits, and CT scans correspondingly showed no recurrence.

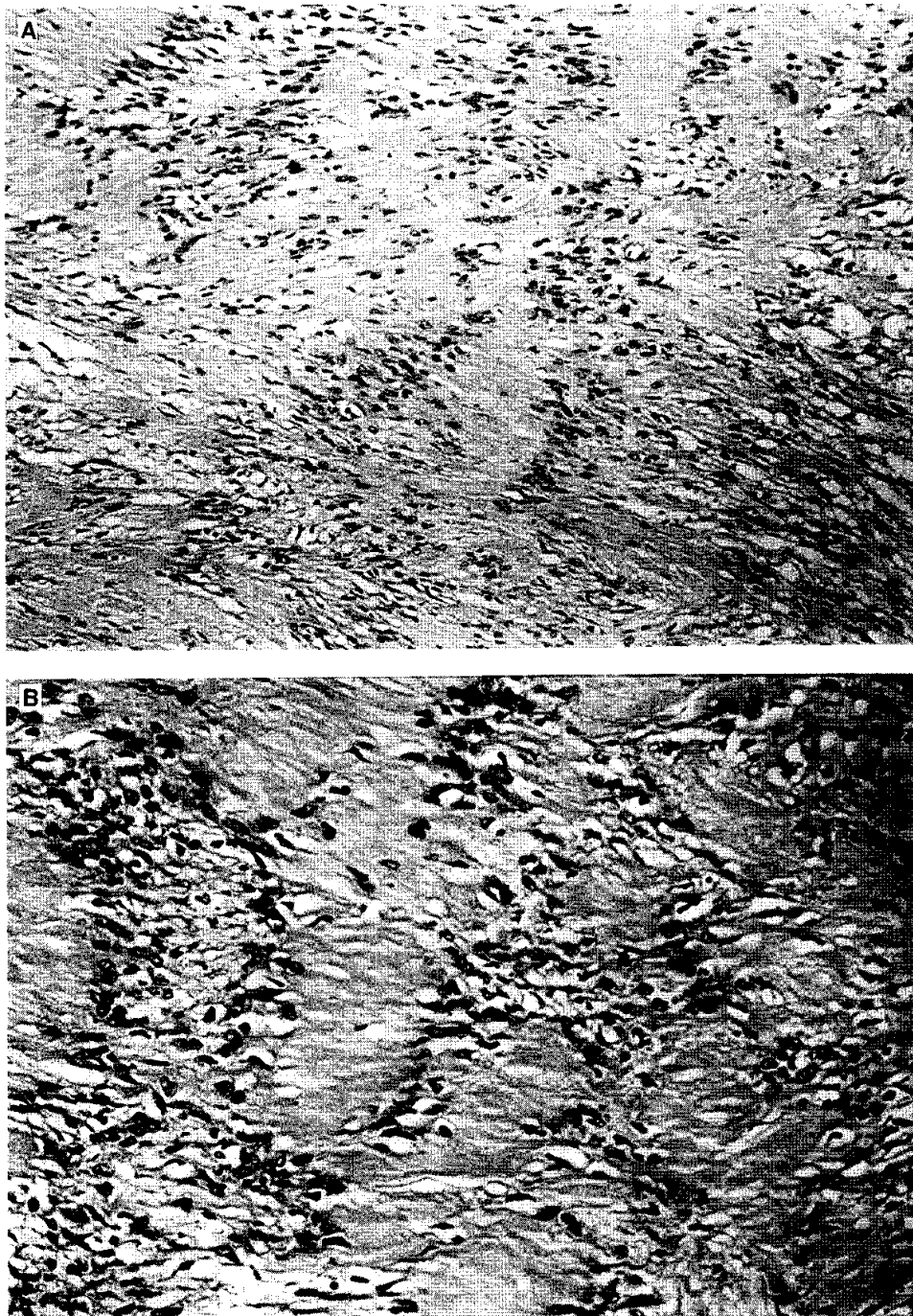


Fig. 2. A and B, Photomicrograph of neurilemmoma showing palisading pattern of tumor cells H & E x 40 (A). Enlarged view of A. H & E x 100 (B).

**Table 1.** Clinical data of subfrontal neurilemmoma

| Series                  | Sex/Age | C.C   | Symptom duration | Neurofibromatosis | Computed precontrast                 | Tomography postcontrast | Vascularity on CAG | Operation | F/U (mos) | Outcome (KPS) |
|-------------------------|---------|---|------------------|-------------------|--------------------------------------|-------------------------|--------------------|-----------|-----------|---------------|
| 1. Spiller (1903)       | M/42    |   |                  | (+)               | -                                    | -                       | -                  |           |           |               |
| 2. Molter (1920)        | M/25    |   |                  | (+)               | -                                    | -                       | -                  |           |           |               |
| 3. Christin (1920)      | M/39    |   |                  | (+)               | -                                    | -                       | -                  |           |           |               |
| 4. Strum (1968)         | M/27    | frontal swelling<br>exophthalmos<br>unconsciousness | 5 yrs            | (-)               | -                                    | -                       | (-)                | GTR       | 24 ↑      | Good          |
| 5. Viale (1973)         | M/22    | visual acuity ↓                                     | 3 mos            | (-)               | -                                    | -                       | (-)                | GTR       | 36        | 100           |
| 6. Harano (1974)        | M/26    | seizure   | 1 day            | (-)               | -                                    | -                       | (-)                | GTR       | 6         | 100           |
| 7. Ulrich (1978)        | M/19    | seizure   | 5 yrs            | (-)               | -                                    | -                       | (-)                | GTR       | 36        | 80            |
| 8. Vassiliouthis (1980) | M/17    | school performance ↓<br>headache, drowsiness        | 2 yrs            | (-)               | isodense<br>cyst (+)                 | (++)                    | (-)                | GTR       | ?         | Good          |
| 9. Mauro (1983)         | F/44    | sudden amaurosis                                    | 2 yrs            | (-)               | hypodense                            | (++)                    | (-)                | GTR       | 12        | 80            |
| 10. Sato (1985)         | M/22    | seizure   | 1 mos            | (-)               | hypodense                            | (++)                    | (+)                | GTR       | 52        | 100           |
| 11. Nagao (1991)        | F/63    | memory & gait<br>disturbance                        | 2 mos            | (-)               | isodense<br>cyst (+)                 | (++)                    | (-)                | GTR       | 56        | 90            |
| 12. Husain (1992)       | M/30    | headache<br>vomiting                                | 18 mos           | (-)               | -                                    | -                       | (+)                | GTR       | 12        | 90            |
| 13. Kim (1993)          | M/22    | seizure   | 5 mos            | (-)               | isodense<br>cyst (+)<br>bleeding (+) | (++)                    | (-)                | GTR       | 24        | 100           |

C.C. : Chief Complaint, yrs. : years, mos. : months

CAG : Carotid angiograph, F/U : follow-up, GTR : gross total removal

KPS : Karnofski performance scale

## DISCUSSION

### Literature Review

Subfrontal neurilemmoma is very rare. We can find 12 previously reported cases of neurilemmoma in the subfrontal region regardless of the terminology, whether it is subfrontal or olfactory groove neurilemmoma (Harano *et al.* 1974 ; Husain *et al.* 1992 ; Mauro *et al.* 1983 ; Nagao *et al.* 1991 ; Sato *et al.* 1985 ; Strum *et al.* 1968 ; Ulrich *et al.* 1978 ; Vassilouthis and Richardson 1980 ; Viale *et al.* 1973). The clinical data of 13 cases, including our case, are summarized on Table 1. Ten were men and three were women. Their ages ranged from 17

years to 63 years of age, with a mean of 30.2 years. Nine of the 13 patients were under thirty. The demographic data are different from those of solitary neurilemmoma of the eighth cranial nerve or meningioma. Three cases have been reported in association with von Recklinghausen's disease. Patients had a combination of symptoms and signs, including seizure, headache, visual disturbance, memory and gait disturbance, frontal swelling, exophthalmos, and anosmia. Follow-up period ranged from 12 to 56 months, with a mean of 25 months. Ten patients had preoperative imaging, either CT scans with intravenously administered contrast material or cerebral angiography. Ten patients underwent cerebral angiography and two of

them were vascular. A CT scan was done in 5 of the 13 patients. Precontrast CT scan showed isodense or hypodense mass and contrast-enhanced CT scan showed strong enhancement. Cystic change was present within the tumor in 4 patients on CT scan. All patients underwent craniotomy and total removal was possible in every case. There was no previous report of recurrence during the follow-up period. The age, symptoms, and signs of our case were very similar to those of the previous reports, but the evidence of intratumoral bleeding was a very unusual finding, which was identified on CT scan, MRI, and by operation. According to the results of the follow-up, the prognosis should be favorable.

#### Site of Origin

Even now the site of subfrontal neurilemmoma remains in controversy. Several sites such as the olfactory bulb, the perivascular nerve plexus, the mesodermal pial cell, the meningeal branch of the trigeminal nerve, and the anterior ethmoidal nerve have been suggested (Gibson *et al.* 1966 ; Harano *et al.* 1974 ; New 1972 ; Russel and Rubinstein 1989 ; Strum *et al.* 1968 ; Viale *et al.* 1973). As the tumor did not reveal relation to the olfactory bulb or tract, we do not consider the olfactory bulb or tract to be the origin in our case. The fact that the dura of the anterior frontal convexity was tightly attached and blending to the lateral surface of the mass indicates the meningeal branch of the trigeminal nerve to be the origin in our case. There have been a lot of theories concerning the origin of subfrontal neurilemmoma and this could mean there are several different origins for these tumors.

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