Giant Cell Tumors of the Sphenoid Bone*

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Although giant cell tumors have been reported in different areas of the skull and paranasal sinuses, their occurrence in the sphenoid bone is rare. Since it may closely simulate other lesions about the dorsum sellae and parasellar region, the recognition of such lesions should be of special interest to the neurological surgeon.

Case Report

A 20-year-old housewife in the 34th week of pregnancy entered the hospital on February 19, 1969, with complaints of double vision and headache. She had been asymptomatic until early February, 1969, when she began to have mild frontal headaches. Two days later she became aware of double vision which was at first intermittent, but later became persistent. Several days thereafter she developed a drooping left eyelid. During the week prior to admission the pains became localized about the left eye and along the left side of the nose; she also complained of loss of appetite, restless sleep, and generalized weakness.

The remaining review of neurological, endocrine, and general medical systems was normal.

Examination. The patient was found to be alert, cooperative, and in no acute distress. The general physical examination was unremarkable except for the abdomen. The uterine fundus was palpable 3 cm above the umbilicus. A few weak, intermittent uterine contractions were discerned.

Neurological examination revealed moderate weakness of the left lateral rectus muscle. There was also a partial paresis of the left third cranial nerve characterized by partial ptosis and pupillary inequality, the left pupil being larger than the right. Both pupils reacted promptly to light, however. The visual acuity were 20/13 bilaterally corrected. The fundi and visual fields were normal. The remaining cranial nerves, tests of strength, reflexes, sensation, and cerebellar function were all normal. The plantar responses were flexor bilaterally.

Hospital Course. A few hours after hospitalization, the paralysis of the left lateral rectus muscle progressed and became complete. On the day preceding her admission this patient had been examined not only by an ophthalmologist but also by a neurologist. Neither physician was able to detect any weakness of the ocular muscles. Initially this rapid deterioration in the function of the left sixth cranial nerve was felt most likely to be secondary to a rapidly expanding lesion.

Examination of the blood revealed a hemoglobin of 11.1 gm%. The routine laboratory work was otherwise within normal limits. The fasting blood sugar was 90 mg%, and the blood urea nitrogen 9 mg%. Radiological examination of the chest was normal. Skull films revealed that although the anterior portion of the floor of the sella was normal, the posterior portion showed marked bony destruction. Only the upper portion of the dorsum sellae was visible (Fig. 1 left). These changes were better defined on lateral laminograms of the sella (Fig. 1 right). A left carotid arteriogram was interpreted as normal. A retrograde right brachial cerebral arteriogram showed questionable straightening and backward displacement of the terminal portion of the basilar artery. A technetium-99 brain scan was considered normal.

The clinical impression rested between a clivus chordoma and a sarcoma originating within the sphenoid sinus. In view of the being close to term, careful consideration was given as to the advisability of active therapy prior to the delivery. The clinical history suggested a rapidly progressing lesion in view of the abrupt onset of the 6th cranial

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nerve paralysis. It was felt that the risk of letting her strain during delivery plus effects of the analgesics required to allay her pain were greater than the prompt diagnosis and institution of therapy. The obstetrical service concurred with our opinion, and a biopsy of the lesion was planned.

**Operation.** On February 26, 1969, an attempt at biopsy through a transseptal sphenoïdotomy was made under local anesthesia, but satisfactory entry into the sphenoid sinus was not possible.

On March 3, under general anesthesia and with the use of the image intensifier, a translabial, transsphenoidal approach to the dorsum sellae was attained. There was no gross tumor visible within the sphenoid sinus. However, fragments of soft tissue were curetted from the region of the clivus and dorsum sellae for histological examination (Fig. 2). The patient tolerated the procedure well.

The biopsy specimen consisted of small irregular tan-gray to dark red-brown fragments of tissue. Microscopic examination (Fig. 3) revealed the presence of many multinucleated cells generally containing numerous nuclei. The nuclei were frequently centrally located, round to ovoid, moderately vesicular, and usually contained a single small nucleolus. The cytoplasm varied in amount and was finely granular. Amongst these giant cells, spindle as well as ovoid-shaped stromal cells were present. Many of the stromal cell nuclei were moderately vesicular, and resembled the nuclei noted within the giant cells. Other nuclei were noted which were spindle-shaped and hyperchromatic. Normal mitotic figures were rare. Masson trichrome stain revealed only isolated traces of collagen fibers. Increased vascularity was not present. The impression was that of a grade I benign giant cell tumor of bone.

**Postoperative Course.** The patient's postoperative course was uncomplicated. Irradiation therapy was begun on March 7, 1969, and a projected plan of 4500 rads to the tumor through two lateral ports over 5 weeks was instituted. On March 8, 1969, she went on to an uncomplicated delivery of a normal 2268 gm baby boy. By the time of discharge from the hospital on March 14, 1969, she had an almost complete paralysis of the right sixth cranial nerve, but was otherwise doing well.

Subsequently she completed her course of
irradiation therapy. The patient was last seen and examined on October 28, 1969, 7 months after the operation. Examination was normal. Diplopia was no longer present. She had no complaints and was able to care for her baby and maintain her home.

**Review of Reported Cases**

There have been only 11 cases of giant cell tumors of the sphenoid bone previously reported in English. Our patient represents the 12th case. In view of the unusual nature of this lesion we felt an analysis of these cases worthwhile. A summary of the clinical material is found in Table 1. Of the 12 cases reported, detailed information is available on 11 patients.

*Age and Sex.* Eight of the 11 cases were females. The age ranged between 12 and 52 years, with seven patients in the 2nd and 3rd decades.

*Clinical History.* The initial presenting symptoms were rather characteristic. Eleven patients complained of headache, usually antedating other symptoms by several months. Visual complaints were second in frequency; seven experienced double vision and four had disturbances of visual acuity. Two patients noted protrusion of the eye, and three reported drooping of the upper eyelid. The ocular symptoms usually followed the headaches by weeks to months and were what prompted seeking medical attention.

Only one patient showed disturbed endocrine function (amenorrhea). This observation might be important in helping to rule out a pituitary tumor.

*Findings.* The predominant clinical findings involved the visual system. Seven patients had a paresis of the 3rd cranial nerve, five of the 6th. Five had either blurred disc margins, optic atrophy, decreased visual acuity, or visual field defects.

*Radiological Studies.* In this review the single most important laboratory study was that of the plain lateral skull x-ray film. In all instances in which this was done an abnormality was found and in all cases but one there was either bony destruction of the dorsum sellae or the floor of the sella or both. One might even speculate that the only exception (Case 6) involved a tumor which
was really primary in the ethmoid and merely extended posteriorly into the sphenoid sinus.

Angiography was performed in but a few instances, and the results were variable. Elevation and anterior displacement of the carotid siphon or posterior displacement of the basilar artery were the usual abnormalities. Angiography helped to rule out an intracranial aneurysm or other vascular lesion but otherwise did not contribute much more than what appeared in the plain skull film.

**Treatment.** The therapy was variable. The modes of treatment were: excision (1), lim-

**TABLE 1**

Summary of 12 reported cases of giant cell tumor of the sphenoid bone

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Author, Year</th>
<th>Age, Sex</th>
<th>Signs &amp; Symptoms, Duration</th>
<th>X-Ray Findings</th>
<th>Treatment</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Geschickter &amp; Copeland 1936</td>
<td>NA*</td>
<td>NA</td>
<td>NA</td>
<td>excision</td>
<td>hemiplegia, 4 yrs post op</td>
</tr>
<tr>
<td>2</td>
<td>Geschickter &amp; Copeland 1936</td>
<td>F 52</td>
<td>headache (36 mos)</td>
<td>NA</td>
<td>excision of sellar tumor, x-ray therapy; fronto-temporal craniotomy and excision 8 mos later</td>
<td>died 24 hrs after 2nd operation</td>
</tr>
<tr>
<td>3</td>
<td>Eichols 1945</td>
<td>F 12</td>
<td>headache, vomiting, double vision, 6th nerve paralysis (2 wks)</td>
<td>destruction of sella</td>
<td>transfrontal excision, x-ray therapy</td>
<td>rhinorrhea 4 mos post op</td>
</tr>
<tr>
<td>4</td>
<td>McNerney 1949</td>
<td>F 30</td>
<td>headache, olfactory hallucinations, scotoma, diplopia, amennorrhea, rhinorrhea, papilledema, visual field defect, hypesthesia left cheek (15 mos)</td>
<td>destruction of sella</td>
<td>transfacial excision, radium therapy</td>
<td>&quot;cure&quot; (inadequate data)</td>
</tr>
<tr>
<td>5</td>
<td>Handousa 1951</td>
<td>F 40</td>
<td>visual disturbance, optic atrophy (24 mos)</td>
<td>opaque cyst-like shadow within the sphenoid extending into ethmoid and nasal septum</td>
<td>biopsy, x-ray therapy</td>
<td>progressive tumor 20 mos post x-ray</td>
</tr>
<tr>
<td>6</td>
<td>Peimer 1954</td>
<td>M 20</td>
<td>headache, blurred vision, diplopia, 3rd, 4th, 6th nerve paresis, visual field defect, proptosis (42 mos)</td>
<td>destruction of sella, continuous cavity with sphenoid sinus, destruction of sphenoid sinus on left near optic foramen, extension into both nasal fossae</td>
<td>transfrontal excision, x-ray therapy</td>
<td>progressive signs and symptoms, refused x-ray therapy</td>
</tr>
<tr>
<td>7</td>
<td>Ramamurthi, et al. 1955</td>
<td>M 35</td>
<td>headache, diminished vision paralysis right upper eyelid, blindness right, visual field defect left, right 3rd, 7th nerve paresis (3 mos)</td>
<td>enlargement and erosion of sella</td>
<td>transfrontal excision, x-ray therapy</td>
<td>sella calcification, 3rd, 4th nerve palsies, 4 yrs post op</td>
</tr>
<tr>
<td>8</td>
<td>Michael 1959</td>
<td>F 16</td>
<td>headache, proptosis right (24 mos)</td>
<td>bony destruction obliteration foraminae sphenosum, ovalearcerum</td>
<td>transfrontal excision, x-ray therapy</td>
<td>sella calcification, 3rd, 4th, 6th nerve palsies 3 yrs post op</td>
</tr>
<tr>
<td>9</td>
<td>Elller, et al. 1963</td>
<td>F 13</td>
<td>headache, diplopia, 3rd, 4th, 6th nerve paresis (36 mos)</td>
<td>soft tissue density in posterior sphenoid sinus, destruction of sella</td>
<td>craniotomy, partial excision of cavernous sinus tumor, x-ray therapy</td>
<td>no symptoms 2 yrs post op</td>
</tr>
<tr>
<td>10</td>
<td>Pitkethly &amp; Kempe 1969</td>
<td>F 13</td>
<td>headache, diplopia, 3rd, 4th, 6th nerve paralysis (36 mos)</td>
<td>destruction of sella</td>
<td>craniotomy, biopsy of cavernous sinus tumor, x-ray therapy</td>
<td>no symptoms 6 mos post op</td>
</tr>
<tr>
<td>11</td>
<td>Pitkethly &amp; Kempe 1969</td>
<td>M 23</td>
<td>headache, diplopia, visual loss right; 3rd, 4th nerve paralysis (2 mos)</td>
<td>destruction of sella</td>
<td>craniotomy, partial excision of cavernous sinus tumor, x-ray therapy</td>
<td>no symptoms 6 mos post op</td>
</tr>
<tr>
<td>12</td>
<td>Geissinger, et al. 1970</td>
<td>F 20</td>
<td>headache, diplopia, proptosis, 3rd, 6th nerve paresis (2 wks)</td>
<td>destruction of sella</td>
<td>transsphenoidal biopsy of tumor, x-ray therapy</td>
<td>right 6th nerve paresis for 2 mos post x-ray, occasional diplopia, neurologically normal 7 mos post op</td>
</tr>
</tbody>
</table>

* NA = not available.
Giant Cell Tumors of Sphenoid

limited resection (1), limited resection and radiation (1), limited resection and irradiation (5), and biopsy and irradiation (3).

Follow-up. Data were too incomplete and the follow-up period too short to justify any firm conclusions regarding arrest or regression of the disease process. Although there was no evidence of neurological progression in three cases, in two other cases x-ray films showed evidence of calcification and reformation of the previously destroyed sella. Of those showing calcification, one had received 5000 R, and the data on the second case were not provided.

Follow-up on our case is too short to make any statements regarding the definitive result of irradiation.

Discussion

A discussion of the pathology of giant cell tumors in general may be of value in our study of this rarely encountered giant cell tumor of the sphenoid bone. The benign giant cell tumor of bone is believed to arise from non-osteogenic stromal cells of the bone marrow in the region of the epiphysis. About 70% of the benign giant cell tumors occur in that epiphyseal region of long bones, although involvement of smaller bones such as those of the hand and foot, ribs, mandible, and scapula have been reported. Hutter, et al., were impressed with the absence of this lesion in bones of the face and head. Although Hutter, et al., Jaffe, Lichtenstein, and others have also noted rarity of this tumor in the vertebrae, reports of giant cell tumors in this location do exist.

The benign form of giant cell tumor occurs most frequently in females about the age of 20. Hutter, et al., found in their series of 76 cases that the mean age was 23. Its occurrence before the age of 15 is most unusual. The malignant counterpart of this tumor occurs more frequently in males. Our analysis of the data of giant cell tumors of the sphenoid bone is thus in keeping with the age-sex distribution of giant cell tumors in general.

These insidiously growing, generally benign, solitary lesions are moderately well vascularized. They consist of mononuclear ovoid and spindle-shaped stromal cells resembling young connective tissue. The nuclei contain moderate amounts of chromatin with a centrally located nucleolus. Mitoses may be present. The cytoplasm may be diffusely granular or vacuolated. Characteristically, multinucleated giant cells having a similar granular or foamy cytoplasm are found amongst the stromal cells. In our case numerous giant cells were found having as many as 55 nuclei. These giant cells may reach 100 μ in diameter, but the average cell ranges between 50 and 60 μ. Hutter, et al., believe that the number of giant cells may be related to the rate of growth of the neoplasm. The size and number of the giant cells appear to be inversely proportioned to the rate of growth. In view of the similarity that can be found between the nuclei of the stromal and multinucleated cells, the stromal cells are regarded as the forerunner of the giant cells.

According to Jaffe, approximately 50% of all benign giant cell tumors have a good prognosis regardless of the type of treatment. Hutter, et al., noted a 62% recurrence rate among their 76 cases; almost all recurrences were seen within 4 years of initial treatment. On the basis of the histological appearance, it is not possible to predict which cases will recur and which will become malignant. About 10% to 15% of these neoplasms are malignant. In some cases the lesions apparently developed malignant differentiation, whereas in others, review of the initial biopsy revealed the lesion to be malignant from its very first examination. In Dahlin's study of 109 cases, sarcomatous alterations were noted in nine cases. These occurred in 1.5 to 14 years following the initial study. In two cases, review of the initial biopsy material revealed this to be originally malignant. Most cases of sarcomatous dedifferentiation is in the form of a fibrosarcoma, although more rarely one may encounter an osteogenic sarcoma.

Friedman and Pearlman recently reviewed the sensitivity of giant cell tumors of the long bones and jaw to irradiation, and gave encouraging statistics. They had no material on sphenoid tumors. They emphasized the radiosensitivity and curability of the giant cell tumor especially in children and adults. There was a low incidence of malignant transformation of the giant cell tumor after irradiation, comparable to that after surgery. The incidence of osteogenic sarcoma after irradiation therapy was reported as less than 1% after 5000 rads.
A giant cell tumor involving the dorsum sellae is not amenable to wide surgical excision. A tissue diagnosis should precede x-ray therapy; we found the transsphenoidal approach adequate for biopsy and one which caused minimal discomfort to the patient.

Once the histopathology has been established, irradiation becomes the treatment of choice. No single center has had enough experience with giant cell tumors in this region to state with any certainty the tumor dose necessary for eradication of the neoplasm. Walter described a 16-year-old girl with a giant cell tumor of the petro-mastoid area who was given 3700 R in 4 weeks and who was still well 2 years later.17

Summary

We have presented a case of giant cell tumor of the sphenoid bone and have reviewed 11 previously reported cases. Eight of the patients were female. Headaches and symptoms referable to the visual system were the most constant complaints. Endocrine disturbances were conspicuously absent. The plain skull x-ray film was the most valuable laboratory clue to the diagnosis.

We feel that a translabial transsphenoidal approach to this region is the best means of gaining the essential tissue diagnosis before planning therapy. Due to the inaccessibility of the lesion, complete surgical removal is not possible at the present time, while irradiation therapy seems promising in producing tumor regression and occasionally even cure.

A more general discussion of the pathology of all giant cell tumors of bone has been included as background for understanding the specific involvement of the sphenoid bone.

References


