Sellar-Parasellar Brown Tumor: Case Report and Review of Literature

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ABSTRACT

Brown tumors are the end stage of primary or secondary hyperparathyroidism. Such lesions are rare because hyperparathyroidism is now usually diagnosed and treated before they develop. Skeletal bone is most frequently involved, whereas sellar-parasellar involvement is extremely rare. We report a patient with a brown tumor involving the sellar-parasellar region associated with primary hyperparathyroidism. The patient's clinical history and biochemical and radiological tests were used for the diagnosis. Excision of the sellar-parasellar mass enabled histopathological confirmation and surgical decompression of neural structures. After the transsphenoidal surgery, excision of a parathyroid adenoma normalized the patient's metabolic status. Brown tumors are rarely associated with complications but occasionally may compress neural structures such as the optic nerve as they enlarge.

KEYWORDS: Hyperparathyroidism, brown tumor, sellar-parasellar region, transsphenoidal surgery

Elevated levels of parathyroid hormone are either primary or secondary. Primary hyperparathyroidism is caused by a solitary adenoma in 80% of the cases and by glandular hyperplasia in 20%. It is rarely caused by cancers of the parathyroid gland. Secondary hyperparathyroidism is a compensatory mechanism that may be related to rickets, osteomalacia, pregnancy, renal insufficiency, calcium deprivation, or maternal hypoparathyroidism.

Persistent hypocalcemia leads to excessive parathyroid hormone secretion.¹

The skeletal changes caused by primary or secondary hyperparathyroidism are identical. Classic skeletal lesions of brown tumor, which appear as subperiosteal cortical bone erosions, generalized deossification, calcification of soft tissue, and/or local destructive lesions, occur in fewer than 5% of the cases.² Brown tumors represent the end stage of bone

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erosion and the deossification process during primary hyperparathyroidism.³ Distinct calcification of the falx and tentorium and severe decalcification of the calvarium are probably specific for hyperparathyroidism. Soft-tissue calcification of vessel walls, which is common in secondary but infrequent in primary hyperparathyroidism, is the result of hypercalcemia and hyperphosphatemia of renal failure.⁴

Sellar-parasellar involvement is exceptional. We report a patient with a clinically and histologically confirmed brown tumor with elevated parathyroid hormone levels, review the related literature, and discuss management of the condition.

CASE REPORT

A 59-year-old woman had a 5-month history of severe headache, reduced vision in the right eye, and

diplopia. Reduced vision and ptosis on the left eye developed 1 month before she sought treatment. On initial examination, she exhibited bilateral sixth cranial nerve paralysis, ptosis on the left eyelid, and decreased visual acuity (4/10 on the right, 7/10 on the left). Fundoscopic examination showed blurring of the left optic disc and papilla stasis on the right.

Computed tomography (CT) and magnetic resonance imaging (MRI) showed a lesion in the sellar region spreading through the suprasellar region, clivus, and sphenoid sinus and compressing neighboring bone structures. On T1- and T2-weighted images, the lesion appeared as isointense and iso-hyperintense, respectively, and showed heterogeneous contrast enhancement. Another 1 × 2 cm lesion detected at the right parietal bone in the diploic space showed heterogeneous contrast enhancement (Fig. 1A–D). The patient was referred to our clinic with the suspected diagnosis of

Figure 1 (A) Axial CT scan showing a lesion in the sellar region spreading through the suprasellar region, clivus, and sphenoid sinus. The expansion of the bilateral cavernous sinus (arrows) and optic canals (*) is visible. (B) Axial MRI showing compression of the bilateral optic nerves (arrows) and carotid arteries (*). (C) Sagittal T1-weighted MRI showing a cystic lesion involving the posterior ethmoidal, sphenoid, and clival region. The pituitary gland is elevated and the stalk is distorted. (D) Coronal T1-weighted MRI of the brain showing a mass filling the sphenoid sinus.

fibrous dysplasia because of the location and expandable appearance of the lesions.

Her serum calcium level was 11.1 mg/dl (normal range, 8.5 to 10.5 mg/dl). Her serum phosphorus level was 2.7 mg/dl (normal range, 2.0 to 5.0 mg/dl). Her alkaline phosphate concentration was 225 IU/l (normal range, 37 to 147 IU/l), and her parathyroid hormone level was 557 pg/ml (normal range, 7.0 to 53.0). Other hormone levels were within their normal ranges. Renal functional tests showed a blood urea level of 126 mg/dl (normal range, 15 to 50 mg/dl), a creatine level of 2.9 mg/dl, a uric acid level of 9.5 mg/dl (normal range, 2.0 to 8.6 mg/dl), and a potassium level of 5.3 mEq/l (normal range, 3.2 to 5.2 mEq/l).

Abdominal radiography and ultrasonography showed medullar nefrocalcinosis on both kidneys (Fig. 2A). MRI of the neck region showed a

6 × 7 mm lesion on the left parathyroid with contrast enhancement. The lesion was hypointense on T1-weighted images and hyperintense on T2-weighted images (Fig. 2B). Parathyroid scintigraphy revealed a parathyroid adenoma in the inferior left lobe. Bone scintigraphy showed focally increased activity in the right parietooccipital region, proximal portion of the right radius, and middle third of the left tibia (Fig. 2C, D). Based on these results, the presumptive diagnosis was a brown tumor caused by primary hyperparathyroidism arising in the sphenoidal and ethmoidal bones and extending through the skull base.

Surgical resection was undertaken because of the bilateral mass effect on the optic tracts. An extended transnasal-transsphenoidal approach was used for the operation. A vascular mass containing necrotic fragments, which involved the sphenoidal sinus, dura, and destroyed clivus anteriorly, was

Figure 2 (A) Abdominal radiograph showing calcifications on both kidneys (arrowheads). (B) T-2 weighted MRI of the neck region with contrast showing a 6 × 7 mm enhancing, hyperintense lesion (arrow) on the left parathyroid. (C, D) Technetium-99-MDP (methylene diphosphonate) of skeleton. Activity in sellar-parasellar region (arrow), right parietal bone (arrowhead), right radius (*), and left tibia is increased.

totally dissected. A middle concha resection was necessary to remove the tumor that had invaded the posterior ethmoidal sinuses. Removal of the sellar base revealed that the cortical bone was very thin. The cancellous bone has been replaced by soft, dark brown, and lobulated fibrous tissue. This bone was easily removed using an aspirator with a curette and dissector. The surgical site was filled with autologous fat tissue.

Postoperatively the patient's vision improved dramatically. One month after the operation, she underwent a parathyroid adenomectomy. Histopathologically, the center of the tumor was characterized by osteoclasts, mononuclear cells, and fibroblasts with focal hemorrhages (Fig. 3A). Histopathological examination of the excised parathyroid gland revealed an adenoma (Fig. 3B). Her postoperative course was uneventful and her visual loss gradually improved to normal 9 months after surgery. Excision of the parathyroid adenoma normalized her metabolic status. Postoperatively, her plasma parathyroid hormone level was 33 pg/ml. At her follow-up examination, her disease was under control and she was independent in her daily activities.

DISCUSSION

Involvement of the skull base by brown tumor with subsequent optic nerve compression is extremely rare and usually occurs in the setting of primary hyperparathyroidism. Only four cases of brown tumors with hyperparathyroidism around the sellar region and only two optic nerve involvements have been reported in the English literature.⁵⁻⁸ The incidence of brown tumors in patients with primary hyperparathyroidism is 1.5% to 1.7%.⁷

On radiographs, widespread subperiosteal bone resorption is the most helpful diagnostic clue for hyperparathyroidism. Focal areas of subperiosteal resorption may be seen adjacent to a variety of soft-tissue processes, including tumor, infection, and even articular disorders such as xanthomatosis and gout. Some degree of subchondral bone resorption may accompany osteoporosis. The differential diagnosis of an expansive and erosive sellar-parasellar mass with optic nerve involvement includes several pituitary pathologies, metastatic carcinoma, sarcoidosis, fibrous dysplasia, giant cell reparative granuloma, chordoma, chondrosarcoma, plasma cell tumor, or osteosarcoma. In the case

Figure 3 (A) Photomicrograph of a histological section of brown tumor showing multinucleated, numerous giant cells (arrow), spindle-shaped stromal cells, irregular bone resorption with hemorrhage, macrophage proliferation, and fibrous connective tissue proliferation (hematoxylin and eosin, $\times 200$ magnification). (B) The parathyroid adenoma is composed of round cells with round nuclei and pink (color not shown) cytoplasm (hematoxylin and eosin, $\times 400$).

of sellar-parasellar tumor with subperiosteal bone resorption, hyperparathyroidism should be considered in the differential diagnosis.

Because hyperparathyroidism is treated before such lesions develop, they are now uncommon. Clinically, brown tumors most often manifest as slowly growing, painful masses. These tumors can behave aggressively and be destructive. They are rarely associated with complications but occasionally may compress neural structures as they enlarge.

Histologically, brown tumors are characterized with numerous giant cells, diffused or arranged in clusters, in a background of mononuclear oval-to-spindle stromal cells. They appear highly vascular and hemosiderin deposition may be abundant. Histologically, brown tumors may be indistinguishable from giant cell tumors of the bone, and correlation with clinical and radiographic studies is essential in making the correct diagnosis. The presence of "tunneling" bone resorption, which is not involved with the tumor, strongly favors the diagnosis of brown tumor over giant cell tumor of the bone.

Because these lesions are exceedingly rare, no therapeutic guidelines have been established for their treatment. Surgical decompression of neural structures is favored in the literature,⁹⁻¹¹ but treatment of the hyperparathyroidism with biopsy only of the diagnosed brown tumor has also yielded good outcomes. For this reason, only compressive brown tumors associated with neural impairment may require surgical removal. Removal of the parathyroid adenoma eliminates excessive activation of the parathyroid hormone and usually leads to significant regression of small and medium-sized brown tumors.¹²⁻¹⁴

CONCLUSION

Our patient had both symptomatic sellar-parasellar bone changes and nephrocalcinosis. All physicians must be alert for these types of bone lesions in

patients with hyperparathyroidism. Management of primary hyperparathyroidism aims to control the levels of serum phosphate, calcium, and parathyroid hormone. In the case of progressing neurological symptoms, surgical decompression appears to be a reasonable option as well as simple biopsy and surgical resection of the parathyroid adenoma.

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Commentary

Yilmazlar et al report a patient with a brown tumor in the sellar and parasellar region related to primary hyperparathyroidism. Concomitant progressive visual deficits and oculoparesis were detected at presentation. Their treatment management included aggressive surgical decompression and resection of the offending lesion, with pathological confirmation of the brown tumor. This patient's short- and intermediate-term outcome was good, with resolution of visual deficits at 9 months. Although surgical decompression is a reasonable option when neurological symptoms are progressing, so too is simple biopsy of the tumor

with surgical resection of the parathyroid adenoma. The rationale for biopsy is to confirm the pathological diagnosis because other lesions can mimic the appearance of brown tumors, as reviewed by Al-Gahtany et al.¹ In this case, we agree with the authors' strategy, particularly because the patient's vision was affected significantly. Because these lesions are so rare, their optimal treatment paradigm is unknown. Nonetheless, it is important for surgeons to be aware of both options for the treatment of brown tumors of the skull base.

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