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Giant cell lesion associated with secondary hyperparathyroidism: case report

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Abstract

A child with a giant cell lesion (brown tumor) associated with secondary hyperparathyroidism due to chronic renal failure was reported. The patient presented at age 6 years, 5 months with swelling in the right mandible that was biopsied and diagnosed histologically as a giant cell lesion. The patient received a successful kidney transplant 8 months later and the giant cell lesion resolved during the 17 months following the operation.

Hyperparathyroidism is a generalized disorder of calcium, phosphate, and bone metabolism that results from an increased secretion of parathyroid hormone (PTH). The primary function of PTH is to help maintain serum calcium within a range of 8.5-10.5 mg/100 ml and serum phosphate between 2.5 and 4.5 mg/100 ml. Prolonged or severe hyperparathyroidism causes progressive resorption and destruction of bone to maintain these levels. Decreased osteoblastic activity accompanied by increased mobilization of phosphate and calcium results in a variety of boney changes including osteitis fibrosa, osteomalacia, osteosclerosis, and growth failure in children. Included in these general terms are the salt-and-pepper appearance of the skull bones, subperiosteal resorption of phalangeal bones, absence of lamina dura, boney fractures, bone pain and giant cell lesion (brown tumor) formation.

The brown tumor consists of multinucleated giant cells, cellular fibrous stroma, macrophages filled with hemosiderin and newly formed vessels (Kissane 1985). The name arises from the fact that there is extravasation of blood into the mass which grossly gives it a brown appearance. Some authors (Friedman et al. 1974; Robbins et al. 1984) feel that tumor is an inappropriate designation since the giant cell lesion or brown tumor is not a neoplasm and does not enlarge following correction of the metabolic condition. Tumor, however, refers to an abnormal mass of tissue which serves no physiologic function; therefore, the term can be used in this condition.

Hyperparathyroidism is generally classified as either primary or secondary depending on the cause. Primary hyperparathyroidism is caused by hyperplasia or neoplasia of the parathyroid gland resulting in excessive production of PTH.

The secondary form of hyperparathyroidism is most commonly found in patients with chronic renal failure who exhibit hyperphosphatemia with reciprocal hypocalcemia. According to Braunwald (1987), the initial tendency to hypocalcemia in progressive kidney disease seems attributable to two causes: phosphate retention that develops because of the reduced renal capacity to excrete phosphate and reduced production of the active hormonal form of vitamin D by the diseased kidney. This leads to a reduction in serum calcium concentrations which may be out of proportion to the degree of hyperphosphatemia (Bricker et al. 1969). These two primary aspects of renal disease produce hypocalcemia which stimulates PTH production by the parathyroid glands and results in compensatory or secondary hyperparathyroidism.

Clinical symptoms of bone disease are uncommon and occur in less than 10% of predialysis patients with advanced renal failure (Braunwald et al. 1987). However, the skeletal changes described are seen now more frequently in patients with secondary rather than primary hyperparathyroidism (Rao et al. 1978) and are possibly the most frequently observed pathologic changes associated with secondary hyperparathyroidism (Fletcher et al. 1977).

While the giant cell lesion is not uncommon in the primary form of the disease, it is rare in cases of secondary hyperparathyroidism. Fordham and Williams (1963) were the first to report a brown tumor associated with secondary hyperparathyroidism. Studies by Katz et al. (1969) and Griffiths et al. (1974) noted an incidence of brown tumor associated with secondary hyperparathyroidism of 1.5 and 1.7%, respectively.

Van Ditzhuijsen and Go (1983) reviewed the literature concerning brown tumor in secondary hyperparathyroidism and found 11 patients whose ages ranged from 17 to 50 years with the average age at appearance of the tumor being 30.4 years. Additional cases of brown tumor associated with secondary hyperparathyroidism have been reported (Nathan et al. 1966; Fletcher et al. 1977; Gurumurthy et al. 1982; Erlich et al. 1983; Kattan and Campana 1983; Bohlman et al. 1986; Parrish and O'Day 1986).

The purpose of this paper is to report a case of giant cell lesion in the mandible of a 6-year, 5-month-old female with chronic renal disease.

Case Report

In November, 1981, AB, a 6 1/2-year-old female, presented with a chief complaint of swelling of the right side of her mandible. Her mother stated that she had first noticed the swelling 2 weeks earlier. A review of her medical history revealed a heart murmur and chronic renal failure with secondary hyperparathyroidism and rickets. At that time her medications were dihydrotachysterol, neocalglucon, and nephrox. The patient's hospital chart disclosed that the renal failure was thought to be due to renal dysplasia manifested during the first year of life when she presented with severe hypocalcemia, slow growth and severe genu valgum (a condition where the knees are close together and the ankles are farther apart than normal).

Clinical examination showed a swelling of her right mandible near the angle. Panoramic radiography revealed a radiolucent lesion 2.5 x 3.0 cm (Fig 1). The patient was referred to an oral surgeon for biopsy which produced a specimen consisting of five irregularly shaped pieces of firm, reddish-tan soft tissue. Microscopically, the lesion consisted of fusiform cells and multinucleated giant cells associated with hemorrhage. An examination of boney spicules included in the specimen revealed increased osteoclastic activity. The microscopic features were compatible with a brown tumor secondary to hyperparathyroidism.

One week later the dihydrotachysterol was changed to 25 hydroxy vitamin D for suppression of the parathyroids. Over the the next 2 months her status changed little with the exceptions of slightly more swelling of the right mandible and a slight decrease in PTH level at the expense of hypercalcemia. The neocalglucon was omitted and amphogel substituted.

By March, 1982, she had improved physically and the swelling of her jaw was slightly smaller. Two months later a series of 3 transfusions was begun to prepare her for a renal transplant. She received a successful transplant from her mother in July. A panoramic radiograph taken 8 months following the transplant revealed that the forming tooth #31 had moved distally into the ramus and communicated with the surface. A panoramic radiograph taken in August, 1983, 14 months post-transplant revealed near complete resolution of the giant cell lesion (Fig 2). In December, 1983, 17 months post-transplant, hospital charts reported radiographs that showed the giant cell lesion had resolved.

The kidney transplant did not immediately correct the patient's electrolyte problems as expected and she continued to be followed by a nephrologist. The electrolytes were normal by May, 1984, and at that time AB underwent surgery for correction of the progressive genu valgum.

The patient was last seen in the hospital dental clinic in September, 1986. Clinical examination revealed that all teeth were present except third molars. The second premolars exhibited enamel deformities to an extent that will require full crowns for restoration. Other teeth throughout the mouth had enamel opacities and poorly calcified enamel although they were not carious. A panoramic radiograph taken at that time revealed no recurrence of the giant cell lesion (Fig 3).

Discussion

The giant cell lesion that occurs in hyperparathyroidism is a vascular, intraosseous soft tissue mass which represents a focus of hemorrhage, accumulation of macrophages, fibroblasts, and osteoclast-like giant

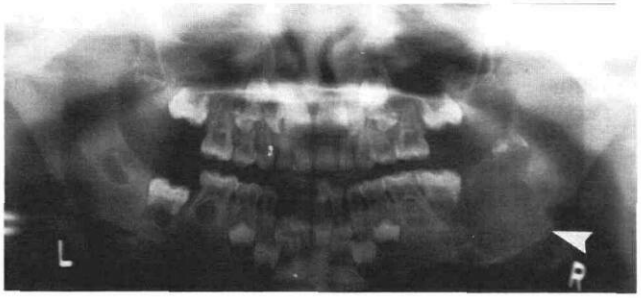

FIG 1. Radiograph taken November, 1981, reveals a 2.5 x 3.0 cm radiolucent lesion of the right mandible.

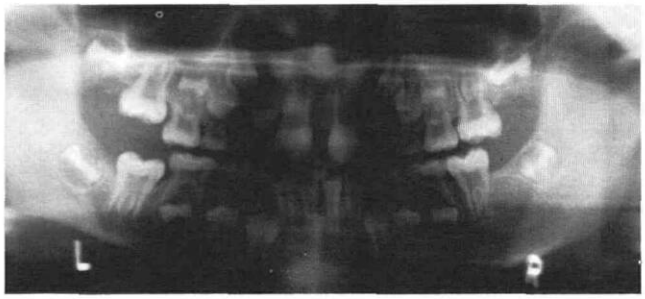

FIG 2. Radiograph taken 14 months post-transplant reveals near complete resolution of the giant cell lesion.

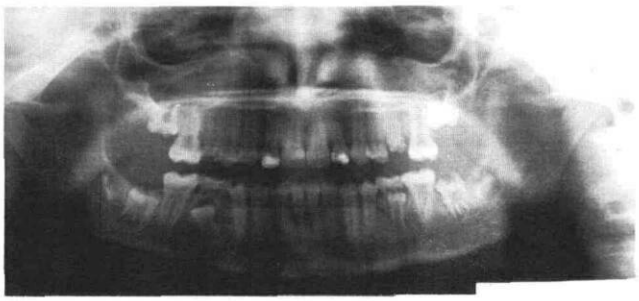

Fig 3. Radiograph taken September, 1986, reveals complete resolution of the giant cell lesion with no recurrence.

cells. The lesion is localized to an area of exaggerated bone resorption (Friedman et al. 1974). Microscopically, the lesion is composed of a cellular, hemorrhagic stroma with a moderate number of small, irregularly distributed multinucleated giant cells as seen in this case. Radiographically, it usually appears as a well circumscribed, often expansile, solitary or multifocal lytic lesion and may occur in any part of the skeleton, but is most often observed in the mandible, clavicle, ribs, pelvic girdle, and femur (Friedman et al. 1974; Rao et al. 1978; Van Ditzhuijsen and Go 1983; Erlich et al. 1983). The panoramic radiograph taken in November, 1981, demonstrates the lesion of the right mandible.

In a study by Spolnik et al. (1981), it was reported that 22 of 30 (73%) dialysis patients examined radiographically demonstrated dental abnormalities. The most common finding was altered bone density. Decreased density was compatible with the nonspecific demineralization of osteomalacia while increased density was more common in the mandibular molar area and was compatible with osteosclerosis. Other dental findings were loss of lamina dura, destructive bone lesions, and extraosseous calcifications.

From an examination of children with chronic renal failure, Woodhead et al. (1982) reported that enamel hypoplasia was the most common dental abnormality found. He reported an incidence of hypoplasia of 65% as opposed to an incidence of 3-15% for the general population reported by Pindborg (1970). Woodhead reports that the teeth are affected during formation and the onset of advanced renal disease can be determined by the position of the hypoplastic defects on the tooth if the condition had an early onset prior to the age of 8. The specific cause of the defect cannot be determined, but disturbed mineral metabolism may have an etiologic role. Woodhead also states that these patients have a lower caries incidence.

According to Wolff et al. (1985), patients with chronic renal failure possibly exhibit a lower caries incidence than the general population for several reasons.

1. Most suffer from anorexia and do not eat as much between meals.
2. Their recommended diet is high in fat, which possibly reduces the surface tension of enamel, therefore decreasing plaque formation.
3. The high salivary phosphate levels may facilitate remineralization of the tooth surface.
4. There is a high concentration of urea and its degradation products are bactericidal.

At last examination, AB demonstrated both of these dental findings associated with chronic renal disease: premolars that were hypoplastic and no caries.

Even though there has been a report of a case of brown tumor in the maxilla of a 14-month-old child with secondary hyperparathyroidism due to chronic renal failure (Gurumurthy et al. 1982) and Parrish and O'Day (1986) report a case of a 7-year-old female with a brown tumor of the orbit, the giant cell lesion is not a common finding in the young patient. However, as more children with chronic renal disease are maintained on hemodialysis, the bony changes formerly seen in primary hyperparathyroidism are being seen in these patients. This report describes a lesion of the mandible in a child who was maintained on dialysis until the renal problems were corrected by transplant and is evidence of the fact that the skeletal changes of hyperparathyroidism are being seen in younger patients. AB was 6 1/2 years old at the time the giant cell lesion was diagnosed.

Giant cell lesions that have not undergone cystic degeneration heal after removal of the parathyroid tumor (in the primary form of the disease), correction of the chronic renal condition, or local currettage. In some instances, however, the lesion itself must be removed because of the functional problems it causes (Rao et al. 1978). This case demonstrates the complete resolution of a giant cell lesion following correction of the hyperparathyroid condition through successful kidney transplantation.

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Bohlman ME et al: Brown tumor in secondary hyperparathyroidism causing acute paraplegia. Am J Med 81:545-47, 1986.

Braunwald E et al: Harrison's Principles of Internal Medicine, llth ed. New York; McGraw-Hill Co, 1987 pp 1159, 1870-78.

Bricker NS et al: Calcium, phosphorus, and bone in renal disease and transplantation. Arch Int Med 123:543-53, 1969.

Ehrlich GW et al: Secondary hyperparathyroidism and brown tumors in a patient with gluten enteropathy. Am J Roentgenol 141:381-83, 1983.

Fletcher PD et al: Oral manifestations of secondary hyperparathyroidism related to long-term hemodialysis therapy. Oral Surg 43:218-26, 1977.

Fordham CC, Williams TF: Brown tumor and secondary hyperparathyroidism. N Engl J Med 269:129-31, 1963.

Friedman WH et al: Brown tumor of the maxilla in secondary hyperparathyroidism. Arch Otolaryngol 100:157-59, 1974.

Griffiths HJ et al: Skeletal changes following renal transplantation. Radiology 113:621-26, 1974.

Gurumurthy MD et al: Maxillary brown tumor caused by secondary hyperparathyroidism in an infant. J Pediatr 100:245-47, 1982.

Kattan KR, Campana HA: Case report 232. Skeletal Radiol 10:47-52, 1983.

Katz AI et al: Secondary hyperparathyroidism and renal osteodystrophy in chronic renal failure. Medicine 48:333-74, 1969.

Kissane JM: Anderson's Pathology, 8th ed. St Louis; CV Mosby Co, 1985 p 1426.

Nathan AS et al: Secondary hyperparathyroidism as a cause of generalized enlargement of the maxilla and mandible. Oral Surg 21:724-31. 1966.

Parrish CM, O'Day DM: Brown tumor of the orbit. Arch Ophthalmol 104:1199-1202, 1986.

Pindborg JD: Pathology of the Dental Hard Tissues. Philadelphia; WB Saunders Co, 1970 pp 88-99.

Rao P et al: Brown tumors associated with secondary hyperparathyroidism of chronic renal failure. J Oral Surg 36:154-59, 1978.

Robbins SL et al: Pathologic Basis of Disease, 3rd ed. Philadelphia; WB Saunders Co, 1984 pp 1329-30.

Spolnik KJ et al: Dental radiographic manifestations of end-stage renal disease. Dent Radiogr Photogr 54:21-31, 1981.

Van Ditzhuijsen JM, Go IH: Brown tumor in secondary hyperparathyroidism. Neth J Med 26:48-53, 1983.

Wolff A et al: The dental status of children with chronic renal failure. Int J Pediatr Nephrol 6:127-32, 1985.

Woodhead JC, Nowak AJ, Crall JJ, Robillard JE: Dental abnormalities in children with chronic renal failure. Pediatr Dent 4:281-85, 1982.

100th Congress health bills

The 100th Congress left a major health legacy, with many bills passed relating to dentistry.

The Health and Human Services appropriation includes $131 million for the National Institute of Dental Research for the current 1989 fiscal year, a 3.5 million for AIDS research and almost $2 million fo the Dentist Scientist Program to encourage research careers.

President Reagan signed an omnibus health bill with new dental training and AIDS testing programs. The bill authorizes government funds for geriatric and AIDS training for dentists and provides money to help dental school clinics and hospitals with "unreimbursed costs" of oral health care for AIDS patients. The law provides $100 million to states for counseling and testing for HIV. To get the bill through Congress, supporters had to eliminate anti-discrimination and confidentiality language.

The health bill also provides a new funding mechanism for dental general practice residencies (GPR's), requires a state-by-state assessment of health manpower shortages and creates another national AIDS commission. Reagan also signed the Medical Waste Tracking Act, which sets up a 10-state experiment to test federal management of wastes from health care facilities. The bill gives the Environmental Protection Agency authority to exempt generators of less than 50 pounds of wastes, including blood and blood disposal of wastes, including blood and blood products, needles and other sharps.

Another law Congress passed and President Reagan signed created the Department of Veterans Affairs, effective March 15, as the 14th cabinet agency, replacing the Veterans Administration. The VA employs more than 900 dentists in a dental care system with over 3,000 employees, 202 clinics, four laboratories, two dental education centers and two research centers.

The Congress also approved a bill to limit children's TV program commercials, which often promote sweet and snack foods.