Primary Hyperparathyroidism's Uncommon Presentation: Brown Tumours Mimicking Metastases

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ABSTRACT

Primary hyperparathyroidism (PHPT) is a disorder marked by the hyperfunction of the parathyroid glands, causing excessive secretion of parathyroid hormone (PTH). PTH is vital for calcium and phosphorus balance, but in PHPT, overproduction disrupts this equilibrium, elevating serum calcium and lowering serum phosphorus. Brown tumours, benign lesions, arise due to rapid osteoclastic turnover from hyperparathyroidism. A 14-year male presented with numbness, short stature, limb deformities, delayed dental development, and dental cavities. On investigations, he exhibited elevated calcium, low magnesium, increased intact PTH (iPTH), high vitamin D2, low phosphorus, and heightened alkaline phosphatase. Skeletal imaging revealed bone abnormalities, resembling brown tumours, fractures, and acro-osteolysis. Nephrocalcinosis was evident on abdominal imaging. Despite enlarged parathyroid glands, scintigraphy revealed no adenoma. Treatment involved bisphosphonates and surgical gland removal due to uncontrollable genetic factors in childhood PHPT, emphasising the critical role of timely intervention for this complex disorder.

Key Words: *Primary hyperparathyroidism, Parathyroid glands, Brown tumours, Nephrocalcinosis, Bisphosphonates.*

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INTRODUCTION

Hyperparathyroidism (HPT) rarely presents in childhood with an incidence of 2-5/100,000. It presents frequently after the age of 10 years. It can be primary, due to adenoma or hyperplasia, or secondary, in response to hypocalcemia. It is characterised by hypercalcemia, hypophosphatemia, and inappropriately elevated levels of parathyroid hormone (PTH).[1,2] It can be either asymptomatic or symptomatic. Longstanding disease causes nephrocalcinosis, osteitis fibrosa cystica, cardiovascular complications and an increased risk of fractures.[3,4]

Herein, we report a patient presenting with numbness and later diagnosed as primary HPT (PHPT) with multiple brown tumours. Brown tumours are rarely reported in peadiatric patients.[5] In this patient, the radiological investigations mimicked multiple tumor metastases which is rarely reported in the literature.

CASE REPORT

A 14-year male child presented to the endocrine clinic with the main complaint of recurrent fractures. He had history of 2 years of muscle weakness, bone pains, and recurrent bone fractures after minor trauma.

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There was history of fracture of the right humerus one year back, which was treated conservatively and ultimately resulted in malunion and limb deformity. He also had history of numbness of both upper and lower limbs for the past few years which were unresponsive to any pain medications. On further inquiry, history of generalised muscle weakness and limb deformities was found. On examination, his weight was below 5th centile and his height was at 10th centile. He had widening of distal phalanges of both hands (Figure 1). Additionally, the patient had gross bowing and multiple deformities in both upper and lower limbs (Figure 2). There was remarkable delayed dentition and dental caries (Figure 3).

Biochemical investigations on presentation are listed in Table I and showed marked hypercalcemia with increased iPTH level. The patient was initially managed with intravenous (IV) hydration and IV furosemide and repeat laboratory testing suggested a similar pattern of persistent hypercalcemia.

X-ray of the upper limb showed destructive bubbly lesion in the metaphysis of the right humerus with relatively narrow zone of transition, periosteal reaction, and cortical thinning. These findings were suggestive of “neoplastic lesions, i.e., brown tumours” (Figure 4).

Table I: Laboratory investigations of the patient.

Biochemical parameter	Patient result	Reference ranges
Calcium	15.59 mg/dl	8.5-10.5 mg/dl
Magnesium	1.15 mg/dl	1.5-2.2 mg/dl
Phosphorous	3.0 mg/dl	2.5-4.8 mg/dl
iPTH	127 pg/mL	16-87 pg/mL
ALP	944 U/l	35-125 U/l
Vitamin D2	99 pg/mL	20-40 ng/ml

iPTH, Intact Parathyroid Hormone; ALP, Alkaline Phosphatase.

Skeletal survey was done that showed markedly reduced bone density with multiple brown tumours (lytic lesions), pathological fractures, and acro-osteolysis and paper pot skull raising the concern of HPT.

Ultrasound of the neck showed bilateral enlarged parathyroid glands raising the possibility of PHPT. An ultrasound examination of the kidneys, ureter, and bladder showed signs of medullary nephrocalcinosis. The spot urinary calcium/creatinine ratio was measured at 0.2 which was normal. Parathyroid scintigraphy was negative for any functioning adenoma in the neck or superior mediastinum (Figure 5).

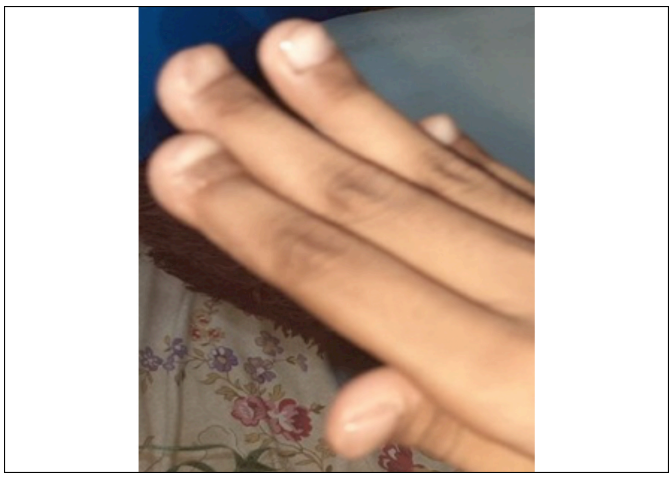

Figure 1: Widening of distal phalanges.

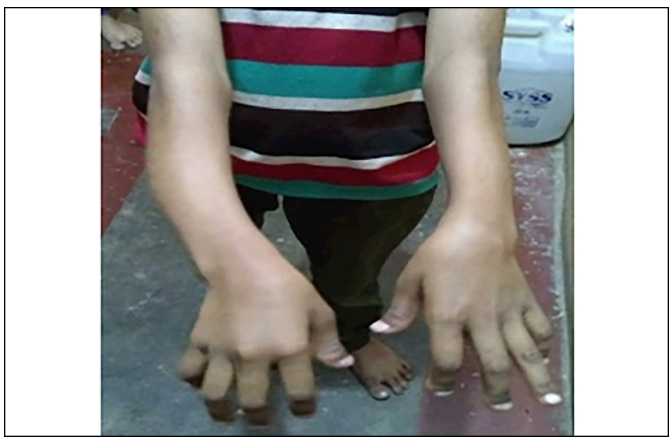

Figure 2: Gross bowing of both upper limbs.

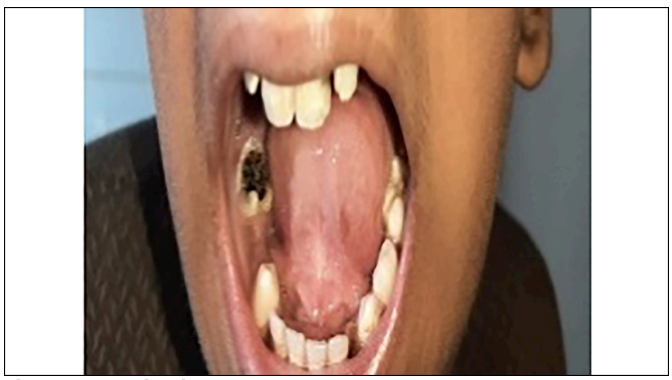

Figure 3: Dental caries.

A genetic cause for PHPT was strongly suspected but due to financial constraints, a genetic panel was not pursued. The patient's treatment plan included the administration of bisphosphonates, and surgical removal of the parathyroid glands was scheduled.

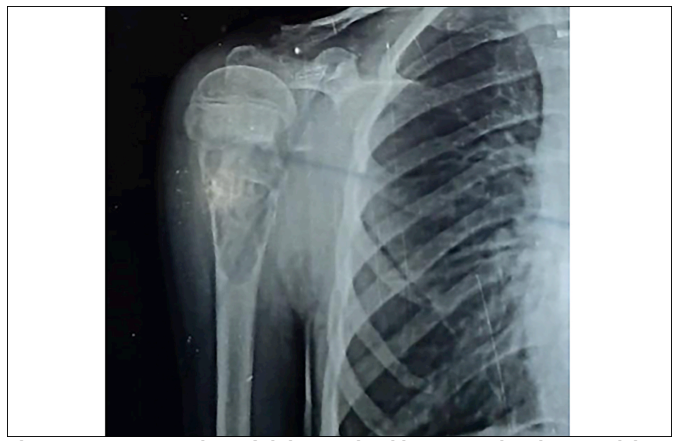

Figure 4: X-Ray AP View of right proximal humerus showing suspicious neoplastic changes.

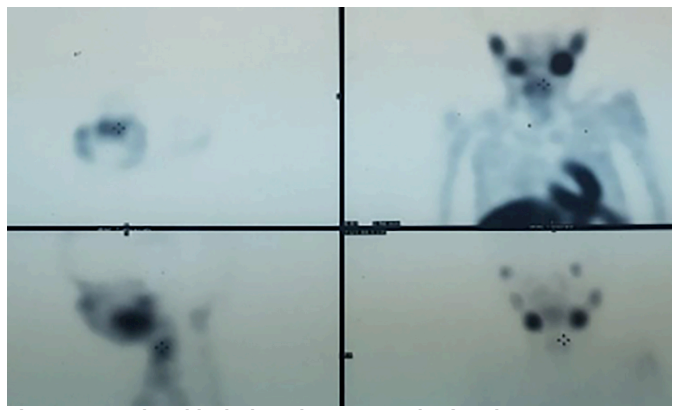

Figure 5: Parathyroid scintigraphy was negative for adenoma.

DISCUSSION

Hypercalcemia has a rare clinical presentation in children. Mostly, it is asymptomatic and diagnosed as an incidental finding or it can present with end organ damage. In neonates and infancy, it can be due to genetic causes while in children it can be due to malignancy, HPT or immobilisation. This patient presented with numbness and skeletal deformities, initially giving an impression of rickets due to widening of distal phalanges, gross bowing, and deformity of both upper limbs. Initially, on X-ray, it mimicked a neoplastic lesion misleading the diagnosis but when blood investigations were done it showed raised calcium level, decreased phosphate and raised iPTH levels and vitamin D, raising the suspicion of PHPT. Skeletal survey showed brown tumours consistent with findings of PHPT.

The clinical presentation of HPT in children is nonspecific, featuring vague signs and symptoms such as fatigue, anorexia, nausea, vomiting, constipation, irritability, and lack of concentration, all of which result from hypercalcemia.[5,6] Polyuria and polydipsia are observed in approximately 50% of cases, while bone involvement is reported in 33-58% of children with HPT. Brown

tumours, unique giant cell-rich lesions, arise due to abnormal bone metabolism in HPT. Elevated levels of circulating PTH intensify bone absorption by osteoclasts, leading to diffuse bone loss, fractures, or the development of multiple well-defined lytic lesions.[7,8] These lesions exhibit a distinctively dark, reddish-brown colouration due to prominent intralesional haemorrhage and the accumulation of hemosiderin, which is responsible for their name.[9]Although these bone-resorbing lesions can manifest in various parts of the skeletal system, they are rarely among the initial indicators of HPT. Surgical removal of the parathyroid gland is generally expected to gradually resolve these lesions. These lesions typically present as bone pain, tenderness, gait disturbances, fractures, decreased height due to vertebral compression, and bone deformities resembling the skeletal findings of rickets (as observed in this case). Renal lesions are present in about 25-78% of children, with nephrocalcinosis being a rare finding in childhood HPT.[10]

Initial management for all patients with severe symptomatic hypercalcemia must commence with IV fluid administration. Additional therapeutic options encompass bisphosphonates, calcitonin, forced calciuresis, and steroids. The definitive treatment for PHT and brown tumours is surgical parathyroidectomy.

PATIENT'S CONSENT:
Informed consent was taken from parents of the patient for the publication of pictures and case.

COMPETING INTEREST:
All authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:
VRR: Manuscript writing.
MNI: Writing and compiling.
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MR, HR: Formatting and final revision.
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