

Parathyroid Adenoma in a Young Female Presenting Multiple Fractures and Postoperative Hungry Bone Syndrome

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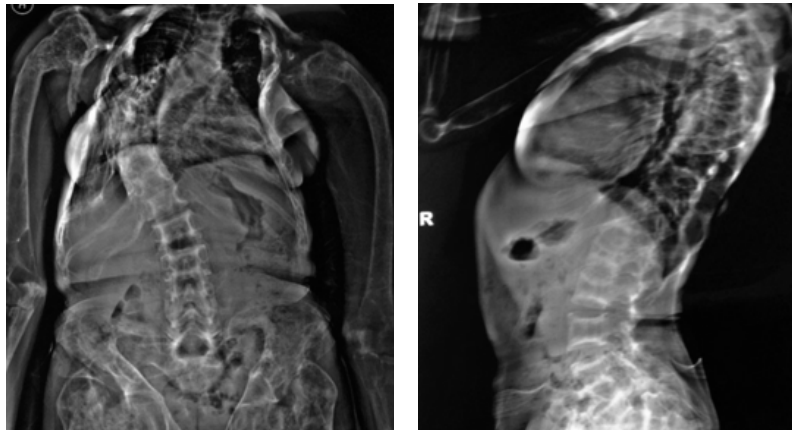


Figure 1. Multiple vertebrae compression deformities and severe scoliosis, with sclerotic and lytic lesions.



Figure 2. Bone erosions and bone resorption of the phalanges.



Figure 3. Pelvic radiograph of the patient shows demineralization.

The parathyroid glands produce parathyroid hormone (PTH), which helps to maintain an appropriate balance of calcium in the body. PTH increases the concentration of calcium by increasing the release of calcium and phosphate from the bone matrix, increasing calcium reabsorption by the kidney and increasing renal production of 1,25 dihydroxy vitamin D-3 (Calcitriol).¹ An enlargement of one or more of the parathyroid glands causes overproduction of PTH, resulting in high levels of calcium in the blood, which can cause numerous health problems. Hyperparathyroidism is the third most common endocrine disorder after diabetes mellitus and thyroid dysfunction, however, pathological fractures in young patient with parathyroid adenoma is extremely rare. We are presenting a medical illustration of a young 18 year old female with a single parathyroid adenoma who presented with multiple typical fractures history and severe scoliosis caused by multiple vertebrae compression deformities.

A young 18-year-old female admitted to the endocrinology outpatient polyclinic with primary complained of generalized bone pain and had multiple bone fractures since six years ago. The first fracture of her sacrum was diagnosed at 12 years of age, after a fall, but she received only conservative treatment. Since that time, she had

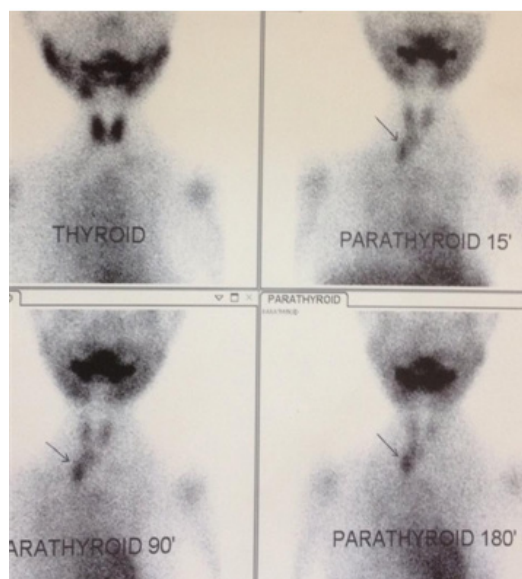


Figure 4. Sestamibi showed abnormal uptake active spot at the lower right parathyroid gland.

multiple different pathological fractures of either the femoral, humerus, or vertebrae. In addition, her parents reported that her growth was slowed. There was no unusual finding in obstetrics examination. There was no medication history of taking steroid or traditional medicine, alcohol drinking or smoking history. There are no family history for short stature, endocrine problem, bone disease, and other unusual findings.

When admitted to our outpatient hospital, her height was 126 cm, her weight was 24 kg, her blood pressure was 110/70 mmHg, her heart rate was 96 times/minute, her breathing was 20 times/minute, and her body temperature was 36°C. No cervical masses were palpable. The clinical examination revealed severe scoliosis, multiple old fractures, and also marked asymmetry between the lengths of the two legs. Laboratory work was performed to look for the underlying cause. Thyroid function tests and concentration of plasma 25-hydroxy vitamin D showed normal result. Abnormal biochemical parameters showed raised ionized Calcium: 1.71 mmol/L (normal: 1.01-1.31 mmol/L), low inorganic phosphorus: 2.9 mg/dL (normal: 3-4.5 mg/dL) and raised serum parathyroid hormone: 2.348 pg/mL (normal: 15-65 pg/dL). Abdominal ultrasonography shows no abnormality. A chest radiograph showed normal heart size and clear

lung fields but also revealed demineralization of the bones, with severe scoliosis caused by multiple vertebrae compression deformities (**Figure 1** and **Figure 2**). A radiograph of the hand was also obtained (**Figure 3**), which showed bone erosions and bone resorption of the phalanges. Ultrasonographic examination of kidneys revealed no abnormalities. Possibility of parathyroid adenoma was kept and parathyroid scintigraphy with sestamibi was advised. Result showed abnormal uptake active spot at the lower right parathyroid gland, consistent with parathyroid adenoma (**Figure 4**). In this case, sestamibi imaging also confirm localizing of parathyroid adenoma for the surgical therapy.

Elevated serum ionized calcium levels, together with an increased intact PTH level, confirmed the diagnosis of primary hyperparathyroidism. This patient underwent parathyroidectomy with complete neck exploration under general anesthesia. During the exploration, the right inferior gland was found to be large. There was a no evidence of local invasion and no lymphadenopathy, therefore diagnosis of adenoma was made. All three other parathyroid glands were examined during surgery and no abnormality was found. The right inferior parathyroid gland was excised. Histopathological study confirmed the diagnosis of parathyroid adenoma and with no other features suggestive of malignancy.

The patient recovered well postoperatively, with PTH levels falling from 2.348 pg/mL to 39 pg/mL in 24-hour post operatively. Serum calcium level also returned to normal level (1.31 mmol/L) within days, but two days following the surgery the patient developed hypocalcemic tetany due to the hungry bone syndrome, which resolved with parenteral calcium and later followed by oral calcium supplements. The patient was discharged in good condition with normal serum calcium and PTH level. Fractures were treated conservatively, as the bone quality was very poor. Three months after surgery, her serum calcium and PTH levels were stable normal, radiographs revealed her fracture was healing and showed improvement in bone density. Patient was no longer complaining muscle weakness and bone pain and now she is

taking medical care under the supervision of an orthopedic physician.

Primary hyperparathyroid diagnosed when elevated calcium and PTH levels is found in blood, results in symptoms related to hypercalcemia such as depression, myalgia, bone and joint pain, etc.² However, more than 80% of primary hyperparathyroid patients are considered “asymptomatic” at diagnosis, makes the disease presentation difficult to assess.³ Therefore, asymptomatic primary hyperparathyroid often detected by routine serum calcium and PTH measurement. The differential diagnosis includes all disorders that can cause hypercalcemia, for examples malignancy, sarcoidosis, lithium intake, diuretic use, tamoxifen, milk alkali syndrome, vitamin D deficiency, increased calcium intake, adrenal insufficiency, and thyrotoxicosis.³ Primary hyperparathyroid also causes phosphaturia, thereby decreasing serum phosphate level.¹

Adenoma of parathyroid, a benign tumor of the parathyroid glands is usually the main cause of primary hyperparathyroid.⁴ Adenoma of parathyroid usually involves a single gland, with incidence of multiple adenomas being six percent, most patients are between the age of 40 and 80, with a female predominance.⁵ Pathological fractures as a presenting feature of primary hyperparathyroidism in young patient with parathyroid adenoma is extremely rare.⁴ Pathological fractures can occurred by minimal trauma in young patients with abnormal bones structure, therefore, having the right diagnosis is important to prevent fractures. High level of PTH in primary hyperparathyroidism is also a common cause of hypercalciuri which can manifested by recurrent kidney stones, however, in our patient, ultrasonography showed no abnormality or stone in the urinary tract system. The precise pathogenesis of urinary stone formation in primary hyperparathyroidism patients, is unknown.⁶ Moreover, the precise relationship between serum calcium and PTH levels and the increased formation of renal stones is also not completely understood. Therefore, routine image diagnostics may be needed for the identification of these complications.⁷ Almost 40% of circulating calcium is bound

to albumin, therefore, if the serum albumin concentration is abnormal, the measured serum calcium concentration must be adjusted. Direct measurement of ionized calcium can be more useful for diagnosis primary hyperparathyroidism.⁸ The use of sestamibi scintigraphy for detecting a parathyroid adenoma before an operation has improved the success of surgery because of its accuracy. The sestamibi scan has 90% sensitivity and 98-100% specificity.²

In the U.S, the first parathyroidectomy was performed on sea captain Charles Martell.³ He was 22 years of age about 1.85 m tall, when disease became manifest with severe osteopathy, multiple fractures and nephrolithiasis. Seven years later, when Martell entered the Hospital for surgery, the patient had shrunk by about 18 cm, and was cured after they removed a parathyroid adenoma. In current practice, parathyroidectomy is the primary choice for hyperparathyroidism to remove enough abnormal parathyroid tissue to reduce the long-term destructive effects on bone and the negative effects of high serum calcium levels and keep the patient normocalcaemic.⁹ The standard operation is for a complete neck exploration with identification of all parathyroid glands and removal of all abnormal glands. Sudden decrease of PTH followed by recovery of skeletal manifestations is the consequence of successful parathyroidectomy. However, intraoperative PTH assay monitor is not routinely used at our unit and as such was not performed.

The hungry bone syndrome (HBS) is a unusual complication once skeleton released from PTH immediately after parathyroidectomy due to an excessive skeletal remineralization and can result in severe hypocalcemia that may lead to symptoms of tetany.⁸ Hypercalcaemia is mainly due to increased bone turnover with enhanced osteoclastic bone activity and increased reabsorption of calcium in the renal tubules. Following parathyroidectomy, PTH stimulus is removed and osteoclastic is replaced by osteoblastic activity, which can result in rapid increase in bone calcium uptake, predisposing the patient to inducing severe symptomatic hypocalcaemia.⁹ Treatment of HBS is basically the intravenous calcium administration immediately after the onset of

hypocalcaemia. Sometime require large doses of Calcium and active metabolites of vitamin D for weeks to month in supporting bone remineralization. The mechanisms for hungry bone syndrome are neither clear nor has a method for its prevention been established, thus it is imperative to carefully check for serum calcium and symptoms following an operation.¹⁰

In this medical illustration, a young female patient with general bone pain and history of multiple fractures brought her to our medical attention. Laboratory work showed hypercalcemia and high parathyroid hormone levels in the blood. Radiograph imaging revealed severe scoliosis with multiple vertebral fractures with decreased bone mineral density. Sestamibi showed parathyroid adenoma. This case emphasizes the importance of maintaining a primary hyperparathyroidism as a differential diagnosis when a young patient presents with a multiple pathologic fractures history.

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