Case Report

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Bilio-pancreatic diversion: report of a case involving bone metabolism complications

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Abstract

Prolonged vitamin D deficiency may result in lower calcium absorption and osteoporosis, leading to pathologic fractures. We report the case of a young woman with severe, complicated osteoporosis, which developed several years after biliopancreatic diversion that was performed to treat morbid obesity. Chronic low vitamin D levels provided a continuous stimulus for parathormone secretion, which resulted in parathyroid hyperplasia/adenoma and autonomous production of the hormone.

Keywords

Bilio-pancreatic diversion, malabsorption, parathyroid adenoma, hypovitaminosis D, quaternary hyperparathyroidism, osteoporosis

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Introduction

Bariatric surgery is the most effective means of weight reduction and maintaining weight loss in patients with morbid obesity. Biliopancreatic Diversion (BPD) is a restrictive/malabsorptive procedure, which consists of the removal of the lower two-thirds of the stomach and the creation of a pouch that is connected to the distal part of the small intestine, approximately 50 to 100 cm from the ileo-cecal valve. This type of surgery is more frequently associated with macro- and micronutrient malabsorption in the long term than

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other bariatric procedures, and therefore the patients require strict long-term monitoring.[1,2]

The present case report describes severe bone complications that developed as a consequence of malabsorption-related vitamin D deficiency.

Case report

A 45-year-old woman was admitted to our Department of Internal Medicine and Clinical Nutrition because of severe chronic diarrhea, asthenia, arthralgia, skin paleness, and progressive deterioration in ambulation, which had become serious in the preceding 3 months.

Her medical history included severe obesity that had been treated using BPD 13 years previously, at the age of 32 years, when she weighed 195 kg (body mass index, BMI, 71.9 kg/m^2). After the surgery, she had attended regular follow-up appointments, but not in the preceding 6 years. Subsequently, she had been hospitalized twice in the orthopedics department because of persistent back and pelvic pain, the cause of which was diagnosed to be spondyloarthrosis and bilateral coxarthrosis, resulting from her previous severe obesity.

On admission, her body mass was 76 kg, her BMI was 27.9 kg/m^2, and general physical examination revealed anasarca, hypotension (blood pressure 90/75 mmHg), skin paleness, and dehydration. Examination of her musculoskeletal system revealed hypotonia and hypotrophy, decubitus owing to severe pain, and poor function of both legs, but especially the left leg.

Despite hemoconcentration due to dehydration, the laboratory data (Table 1) showed normochromic normocytic anemia, low serum albumin, normal serum Ca concentration (8.64 mg/dL, corrected for albumin concentration), low P; and very low prealbumin, transferrin, and butyrylcholinesterase concentrations. An X-ray of her pelvis and lower limbs showed a sub-trochanteric fracture of the right femur (Figure 1) and signs of old fractures in the left femur, in addition to severe bone demineralization. An X-ray of the axial skeleton demonstrated multiple vertebral collapses that were responsible for the severe kyphosis found on physical examination.

Table 1. The patient's hematological and biochemical data on admission.

Parameter	Patient's value (mean)	Reference range
Hemoglobin (g/dL)	**10.6**	12.0–15.0
MCV (fl)	85.5	80.0–97.0
White blood cell count (/mL)	7,000	4,800–10,800
Lymphocyte count (/mL)	2,990	1,000–4,000
Na (mmol/L)	140	135–145
K (mmol/L)	4.7	3.5–5.1
Ca (mg/dL)	**7.2**	8.4–10.2
P (mg/dL)	**1.7**	2.3–4.7
Cl (mmol/dL)	102	93–113
Mg (mg/dL)	2.3	1.6–2.6
Fe (μg/dL)	**17**	**65–175**
Ferritin (ng/mL)	24	22–275
Transferrin (g/L)	**1.14**	**2.0–3.6**
Prealbumin (g/L)	**0.05**	**0.2–0.4**
Total Protein (g/dL)	**4.0**	**6.4–8.3**
Albumin (g/dL)	**2.2**	**3.2–4.6**
Butyrylcholinesterase (U/L)	**884**	**4,400 −11,000**
Glucose (mg/dL)	**55**	**70–110**
Urea (mg/dL)	24	18–55
Creatinine (mg/dL)	**0.2**	**0.7–1.2**
TSH (μU/ml)	1.25	0.4–4.3
PTH (pg/mL)	**489**	**15–85**
Vit D (ng/mL)	**7.8**	**30–100**
Vit A (μg/dl)	**2.4**	**30–80**
Vit E (μg/dl)	**388.3**	**500–1,800**
Vit B_{12} (pg/mL)	661.1	197–866
Folate (ng/mL)	5.65	3–16

MCV, mean corpuscular volume; TSH, thyroid-stimulating hormone; PTH, parathyroid hormone; Vit, vitamin. Data in bold represent values out of normal reference ranges with clinically significant relevance.

Very low concentrations of the lipid-soluble vitamins A, D and E, and a high serum parathyroid hormone (PTH) concentration (489 pg/mL) were identified. Computerized bone mineralometry-dual X-ray absorptiometry (MOC-DEXA) confirmed severe osteoporosis (T-score = −6.1 and z-score = 5.7).

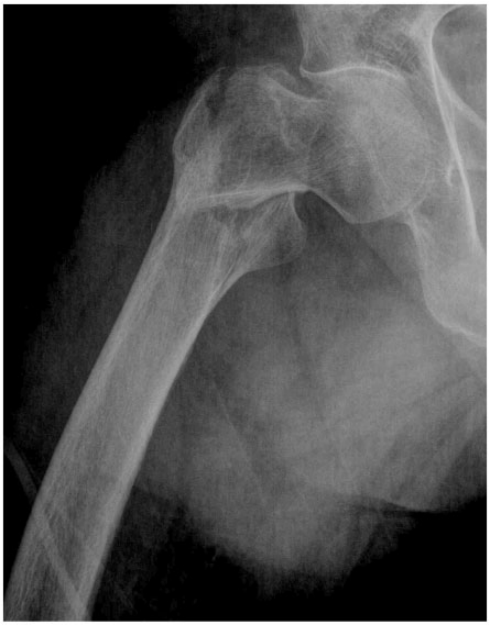

Figure 1. X-ray showing a sub-trochanteric fracture of the right femur.

The orthopedic consultant did not perform surgical osteosynthesis because of the high risk of bone fragmentation owing to the severe osteoporosis and osteomalacia, which was evidenced by very wide femoral canals and very thin cortices. Because of her high PTH concentration, parathyroid ultrasonography was performed, which revealed a nodule in the lower left side of the thyroid, suggesting the presence of an adenoma.[3] Hyperfunctional adenoma of the left inferior parathyroid was confirmed by 99-Tc-sestamibi scintigraphy (Figure 2).

The fractures were adequately stabilized and appropriate physiotherapy was instituted. At the follow-up visits, gradual restoration of the patient's vitamin D concentration and clinical nutritional state were confirmed, such that surgical removal of the adenoma became possible.

Discussion

A combination of high serum PTH and Ca concentrations suggests the presence of

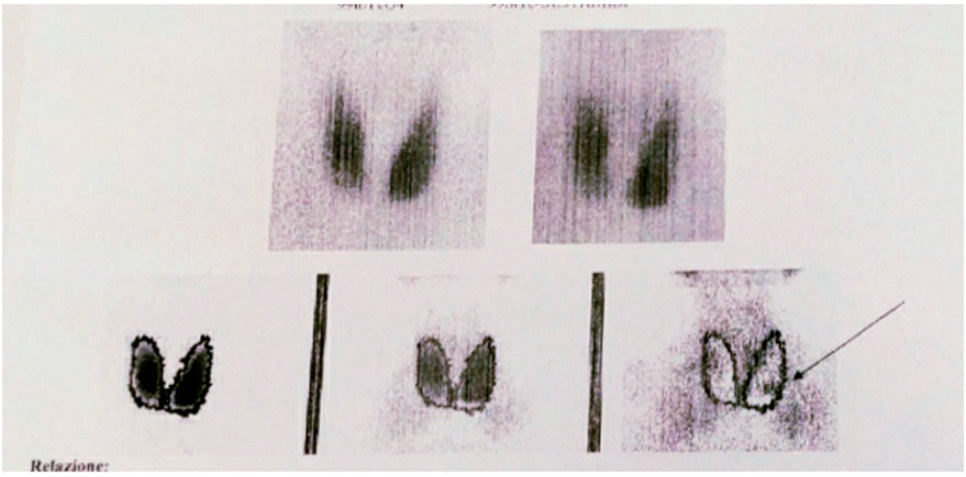

Figure 2. 99-Tc-sestamibi scintigraphy image, showing a hyperfunctioning adenoma of the left inferior parathyroid.

primary HP, caused by an idiopathic parathyroid adenoma. However, when a high serum PTH concentration is associated with a low or normal Ca concentration, secondary HP should be suspected.[4] In the latter situation, low Ca intake or absorption, which is generally linked to prolonged vitamin D deficiency, causes the compensatory secretion of PTH by parathyroid cells. However, very long-term, persistent vitamin D deficiency may lead to autonomous PTH secretion by parathyroid cells, which continues even after the correction of the vitamin D deficiency; this condition is termed tertiary HP. Finally, quaternary HP is defined as the presence of parathyroid cell hyperfunction in association with a parathyroid adenoma.[5,6]

Parathyroid ultrasonography is a low-cost, non-invasive means of evaluating the cause of high serum PTH concentration. Indeed, this simple technique permits the differentiation of the different forms of HP, such that the most appropriate therapeutic approach can be selected.[7]

Conclusions

The present case demonstrates that quaternary HP should be suspected in patients with severe malnutrition, vitamin D deficiency, and bone fractures. If a parathyroid adenoma is missed in such cases, inappropriate therapies may be selected, leading to irreversible complications, such as additional fractures, or renal or cardiac failure.

Declaration of conflicting interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethics statement

All the procedures performed in studies involving human participants were in accordance with the ethical standards of the Local Ethics Committee of Federico II University and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approval by the Ethics committee, with approval number 240/19. The patient provided their written informed consent for the publication of this report.

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