Hypoparathyroidism unmasked by alendronate

A S Kashyap, Surekha Kashyap

Abstract

The case of an elderly woman is reported in whom alendronate, given for osteoporosis, led to severe hypocalcaemia a few days after starting the drug treatment. This was caused by the unmasking of previously unrecognised hypoparathyroidism.

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Keywords: alendronate; hypocalcaemia; hypoparathyroidism

Alendronate is widely used in the prevention and treatment of osteoporosis. It is a bisphosphonate, which acts by inhibiting osteoclast mediated bone resorption. Gastrointestinal symptoms, oesophagitis, and oesophageal ulceration are the prominent side effects.

Case report

A 68 year old woman had undergone a total thyroidectomy for multinodular toxic goitre at the age of 32 years. She was on regular thyroid replacement therapy with L-thyroxine 150 µg daily. She was referred to the endocrine outpatient department in December 1998 when she complained of diffuse thoracolumbar pain aggravated by standing and on sudden movements of two months' duration. She had attained the menopause at 51 years of age. Clinically she had tenderness over the lower thoracic spine, and dorsal kyphosis. The rest of the examination was normal. Her blood count, erythrocyte sedimentation rate, serum calcium, phosphate, albumin, alkaline phosphatase, hepatic transaminase enzymes, serum protein immune electrophoresis, and 24 hour urinary calcium concentrations were normal. A thoracolumbar spine radiograph revealed osteoporotic “codfish” vertebral bodies with diffuse decrease in mineral density, an increase in the prominence of vertical striations, and prominence of the end plates. There were no vertebral fractures. The patient could not afford bone mineral density measurement. Her serum thyroid stimulating hormone, and 25-hydroxy vitamin D concentrations were normal. The patient was managed with intravenous calcium chloride infusion for hypocalcaemia. Alendronate was discontinued. Clinical symptoms and signs of hypocalcaemia and cardiac failure resolved when serum calcium concentrations reached 1.0 mmol/l. She was discharged on calcium carbonate 3 g/day and calcitriol 0.75 µg/day.

Box 1: Learning point

Alendronate (and other bisphosphonates) may lead to symptomatic hypocalcaemia in patients with pre-existing subclinical hypoparathyroidism.

Box 2: Drugs causing hypocalcaemia

Complexing anions
- Phosphate: oral, rectal, intravenous
- Citrate: blood transfusions, radiographic contrast
- Edetate: radiographic contrast
- Bicarbonate
- Foscarnet
- Fluoride

Inhibition of bone resorption
- Oestrogen
- Calcitonin
- Bisphosphonates
- Plicamycin
- Parathyroid related disorders
- Hypomagnesaemia: aminoglycosides, pentamidine, loop diuretics, cisplatin, amphotericin B
- Drugs: aluminium, asparaginase, doxorubicin, cytosine arabinoside, cimetidine

Vitamin D related disorders
- Vitamin D deficiency: lack of absorption cholestyramine
- Accelerated loss: phenytoin, phenobarbital
- Impaired 25-hydroxylation: isoniazid
- Target organ resistance: phenytoin
Discussion

Prolonged or permanent hypocalcaemia may result from removal of all four parathyroid glands or from disruption of the vascular supply to the remaining tissue. Hypocalcaemia after extensive thyroid surgery may be transient or permanent. Permanent hypoparathyroidism after total thyroidectomy is reported in 2%–13% of cases. Progressive dysfunction of the parathyroid gland may result in late manifestation of hypoparathyroidism.

In this patient the most likely explanation of hypocalcaemia is the masking of pre-existing subclinical hypocalcaemia caused by hypoparathyroidism, by alendronate therapy. The duration of hypoparathyroidism is difficult to date in this patient.

Alendronate therapy leads to short term transient asymptomatic reductions in serum calcium concentrations, which is restored towards normal by parathyroid hormone release. Patients who are unable to mount a compensatory response because of pre-existing parathyroid dysfunction may present with symptomatic hypocalcaemia. Other bisphosphonates are also likely to produce similar complication since the underlying mechanism of action is the same. Extensive literature search revealed only one other subsequent report of a similar patient.

Follow up

There has been no recurrence of hypocalcaemia over a follow up period of four months. The patient continues to be on regular L-thyroxine, calcium carbonate, and calcitriol.

A learning point and a list of drugs causing hypocalcaemia are shown in boxes 1 and 2.

Commentary—bisphosphonates and calcium homeostasis

M Pirmohamed

Bisphosphonates are synthetic analogues of pyrophosphate (antiscaling agents), and are mainly used in the treatment of hypercalcaemia, Paget’s disease of bone, and osteoporosis. The latter is by far their most important indication with latest figures indicating that one in three women and one in 12 men over the age of 50 years will have an osteoporotic fracture. Patients who are unable to mount a compensatory response because of pre-existing parathyroid dysfunction may present with symptomatic hypocalcaemia. Other bisphosphonates are also likely to produce similar effect on serum calcium concentrations in normocalcaemic conditions such as osteoporosis and Paget’s disease. In the case described by Kashyap and Kashyap, a 68 year old woman with osteoporosis developed clinically symptomatic hypocalcaemia after taking alendronate (5 mg/day) for 10 days. Intuitively, given the mode of action of bisphosphonates, this would not be considered to be an unexpected observation. Indeed, the serum calcium concentration is well known to decrease on initiation of therapy with bisphosphonates, particularly when they are used intravenously. However, this is short lasting and usually clinically asymptomatic. It is rapidly followed by restoration of serum calcium to normal.

The mechanism by which this occurs is through a negative feed-back loop which increases parathyroid hormone (PTH) secretion within minutes. PTH in turn increases serum calcium concentrations by increasing bone resorption, intestinal calcium absorption, and renal tubular reabsorption of calcium. It is important to note that the parathyroid response to a hypocalcaemic challenge is not affected by long term bisphosphonate therapy. This is a reassuring observation given that in conditions such as osteoporosis, these drugs will have to be used for many years. Thus, clinically significant hypocalcaemia is only likely to occur in patients with deficient parathyroid hormone secretion, as observed in the patient reported in this issue and in other recent case reports with alendronate and pamidronate.

In summary, although bisphosphonates lead to a decrease in serum calcium, in most patients rapidly acting homoeostatic mechanisms involving an increase in PTH secretion lead to a restoration in calcium concentrations. In patients with known or suspected hypoparathyroidism, for example after thyroid or parathyroid surgery, these compensatory mechanisms remain intact.

mechanisms will be absent, and bisphospho-
nate therapy can lead to symptomatic hypocal-
caemia. In such patients, alternative therapies
should be considered together with calcium
and vitamin D supplementation.

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IMAGES IN MEDICINE

Lingual thyroid

A 26 year old woman presented with a two year
history of palpitations, heat intolerance, fa-
tigue, tremors, and an increase in neck size.
Her physical examination revealed tachycardia,
id lag and an enlarged, non-tender thyroid
gland. Oral cavity examination was completely
normal. There was no proptosis. Her thyroid
function tests and iodine-123 scan and uptake
were consistent with Graves’ disease. Thyroid
stimulating antibody concentration was nega-
tive. Incidentally, a small area of uptake was
seen superior to the eutopic thyroid which cor-
responded to the area at the posterior aspect of
the tongue and was consistent with the
presence of lingual thyroid (see figs 1A and B).
There was no salivary gland uptake. The
patient underwent successful iodine-131 abla-
tion therapy.

Ectopic thyroid tissue results due to abnor-
mal migration of the thyroid gland from the
base of the tongue to its normal pre-tracheal
position. The prevalence of ectopic thyroid tis-
sue is between 7%–10% with lingual thyroid
accounting for 90% of such cases. Mutations in
thyroid transcription factors 1 and 2 have been
found in patients with thyroid agenesis and
ectopic thyroid tissue. Lingual thyroid lies on
the posterior aspect of the tongue and oral
examination is usually normal. Invasive fibre
optic laryngoscopy is generally needed to visu-
alise the ectopic tissue in such location. Our
patient refused any invasive procedure.

SHEHZAD BASARIA
Division of Endocrinology and Metabolism,
Johns Hopkins University, School of Medicine,
1830 E Monument Street, Suite 333,
Baltimore, MD 21287, USA

Figure 1  Iodine-123 uptake scan; arrows show presence of lingual thyroid; (A) anterior and (B) lateral views.
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