

Femoral fracture and temporomandibular joint destruction following the use of bisphosphonates

Bisphosphonates are one of the most frequently used drugs in the treatment of osteoporosis. In recent years, adverse effects have been reported following long-term treatment. In this article we describe a patient who suffered atypical bilateral femoral fractures and temporomandibular joint destruction after long-term alendronic acid therapy. To our knowledge this has not been previously described in postmenopausal women following long-term use of bisphosphonates.

A woman in her seventies suffered a spontaneous periprosthetic fracture in both femoral diaphyses, five years and 1.5 years respectively after arthroplasty for hip joint arthrosis. Prior to the fractures she had experienced thigh pain for several months. An x-ray examination provided no evidence of direct causes related to the prostheses. There was a dislocated fracture on the right side and an incomplete fracture on the left side, both with features resembling stress fracture.

It emerged that for the past 14 years, the patient had received osteoporosis prophylaxis in the form of alendronic acid (Fosamax) 10 mg daily without breaks in treatment.

Fixation of both the fractures with a locking compression plate (LCP) was performed. Delayed healing initially required revision osteosynthesis of the right femur, supplemented by autologous bone transplantation (bone chips) from the iliac crest, and structural cortical transplants from the fibula. Alendronic acid was discontinued. Thirty-one months after the first procedure, the fracture had consolidated with incorporation of the structural transplants (Fig. 1). On the left side the osteosynthesis had failed, with increasing axial malalignment. The fracture healed only after two surgical revisions, the second with the addition of structural allografts. Twenty-two months after the first procedure, the fracture had consolidated.

The patient has spent long periods in a wheelchair. Now, five years after the first fracture surgery, she can generally move around without walking aids indoors, but is dependent on crutches outdoors.

The patient has also experienced an increasing jaw problem in the form of a change in bite, with lower jaw recession and development of an open bite in the frontal

and premolar regions. One year after discontinuation of alendronic acid, a bite opening with a distance of 2 mm between the incisal margins of 11 and 41 was apparent. 2.5 years later, this had increased to 5 mm. X-ray examination, orthopantomogram (OPG) of the mandible and computed tomography (CT) of the temporomandibular joints showed progressive degenerative changes in both of the temporomandibular joints with flattening of the condylar process and joint surface defects, most pronounced on the left side. 3.5 years after discontinuation of alendronic acid, the condylar process on the left side was virtually absent. The patient now has contact only on the rearmost molars on each side, resulting in considerable difficulties in eating and speaking. She has problems in taking a bite from a normal slice of bread and has acquired a lisp (Fig. 2).

Serious adverse effects

In the last decade, many researchers have examined a possible association between atypical fractures of the femoral shaft and use of alendronic acid and other bisphosphonates. Feldstein (1) believes that the association is uncertain or small, with a relative risk of 2, whereas Schilcher reports a relative risk of 47 (2).

Based on knowledge of biological chan-



Figure 1 Consolidated fracture of the right femur, 31 months after the injury



Figure 2 3.5 years after discontinuing alendronic acid. The patient now has contact only on her rearmost molars. Bite opening of 5 mm between the incisal margins of 11 and 41

ges in bone tissue under the influence of bisphosphonates, for example with reduced osteoclast activity and thereby reduced bone remodelling, it may be assumed that the fractures occur as a result of deficiency in the bone's process of continuous repair. Microfissures gradually form larger fissures and end as fractures, termed atypical fractures. Although the radiographic criteria for atypical fractures and stress fractures are similar, they are pathogenically quite different. Stress fractures occur when there is heavy strain on healthy bones over time, as in the case of athletes and military personnel.

It is widely agreed that the optimal treatment for periprosthetic femoral fractures following hip arthroplasty is internal fixation (3). The Swedish Hip Arthroplasty Register reports a 34% failure rate of osteosynthesis for this type of fracture. When, in addition, the fractures are atypical, the rate of complications may conceivably be even higher. Atypical femoral fracture that occurs periprosthetically has, to our knowledge, not been discussed previously. This further increases the uncertainty with regard to prognostic assessment and choice of treatment.

Specially designed plates that provide dynamic compression and permit angle-stable placement of the screws at different angles on the plate ensure structural stability and prevent the implant from coming into conflict with prosthetic components or the cement mantle. Alternatively, cerclage cable can replace one or more of the screws. In the last decade, a plate system has also been developed that makes it possible to connect small end plates to the main plate, proximally and/or distally, to cover the entire length of the femur. Adequate fixation of the fracture can be achieved using these implants combined with structural, cortical transplants shaped like plates, and use of cancellous bone transplants (bone chips).

This treatment strategy was first implemented in its entirety when the surgical revisions were performed on our patient, and eventually resulted in healing of the fractures.

Osteonecrosis of the jaw in patients using bisphosphonates was first described in 2003 (4, 5). There appears to be a clear association between long-term use of bisphosphonates and osteonecrosis of the jaw, particularly in cancer patients who have received bisphosphonates intravenously. Evidence

for this association is complicated by the fact that these patients usually have another comorbidity and take a number of other drugs such as analgesics, steroids and cytostatics. However, many cases of osteonecrosis of the jaw have also been reported in osteoporosis patients who have relied solely on peroral bisphosphonates (6). We have

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found no reports dealing with temporomandibular joint destruction combined with long-term use of bisphosphonates. Since bisphosphonates interfere with the metabolic mechanisms of bone, such as inhibition of osteoclast function and angiogenesis (7), this association is not improbable.

Treatment of the bite problems in our patient appears to represent a significant challenge, in that the bite opening is too large to be corrected by dental contouring and prosthetic crown therapy. Since this appears to be an ongoing process of destruction, there is also a high probability of recurrence after this type of treatment. The most appropriate treatment would presumably be surgical reconstruction of the temporomandibular joint with rib transplants, possibly with total prosthetic replacement of the joint.

Degenerative disorders of the temporomandibular joint with changes in bite as described in our patient are very rare in otherwise healthy patients. The patient has not been exposed to injury or received medication that could conceivably be of pathogenic significance, such as corticosteroids, other hormone treatment, radiotherapy or cytostatics. We therefore consider long-term medication with bisphosphonates to be a very probable cause of her jaw and femur problems.

Warnings of the adverse effects of bisphosphonate use in the form of osteonecrosis of the jaw and atypical femoral fractures were included in the Norwegian

National Drug Catalogue for the first time in the 2008 and 2010 editions, respectively. Our patient received no information about these rare, but very serious conditions.

This case history serves as a warning and a reminder that when drugs are prescribed that interfere with fundamental biological mechanisms, the patient must be monitored over time. It is not sufficient to reiterate prescriptions.

The patient has given her consent to the publication of this article.

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