CASE REPORT

Pathological pelvic fracture following long-term bisphosphonate use in a 63-year-old woman

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Accepted 23 September 2014

SUMMARY

A 63-year-old woman presented with a low energy pelvic fracture, which showed no signs of healing. Initial fractures were to the right hemipelvis, later followed by a right fractured neck of femur. We present a complicated patient journey, management dilemmas and highlight the growing concern with long-term bisphosphonate treatment.

BACKGROUND

Our general population is becoming increasingly elderly, this poses new challenges for all clinicians. Specifically for orthopaedic surgeons this is resulting in new fracture patterns that require surgical ingenuity to safely overcome. In relation to this case report, pelvic fractures are no longer a condition of young healthy people that sustain high-impact injuries. Elderly patients are increasingly experiencing these fractures incidentally or after low energy trauma. Often these patients may have multiple comorbidities, an array of polypharmacy and complicated social issues. This age discrepancy is now so evident that new fracture classifications are being devised to account for this shift in age presentation.¹

CASE PRESENTATION

Presented is the complicated 3-year medical and surgical history of a 63-year-old woman. She presented with worsening right hip pain and poor mobility, 8 weeks after a minor and possibly incidental fall in the bathtub. She had a known medical history of osteoporosis with no previous fracture history. The patient was on long-term alendronate therapy with no known drug allergies. Examination revealed inability to walk and a reduced tender range of movement of the right hip. Further systemic examination was unremarkable. An initial pelvic radiograph showed minimally displaced fractures to the right pubic ramus ([figure 1](#)). The patient was admitted to orthopaedics for non-operative management including appropriate analgesia, initial bed rest then mobilisation with walking aids and physiotherapy support. A repeat radiograph during this admission demonstrated further displacement ([figure 2](#)). An assisted discharge package was put in place for this patient so no formal follow-up was arranged at this time. However, a 3-month outpatient follow-up appointment was made at the request of the patient's husband, due to poor progress. The patient was now wheelchair bound. Repeat imaging

Figure 1 Initial anteroposterior (AP) pelvis radiograph demonstrating minimally displaced inferior and superior fractures to the right pelvic ramus. Eight weeks after low energy injury.

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To cite: Watson HI, Hopper GP, Gupta S, et al. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2014-206319

Figure 2 Repeat anteroposterior pelvis radiograph demonstrating displacement of the fractures. Nine weeks after low energy injury.

investigations showed further fracture displacement with no evidence of bony healing of the right pubic ramus ([figure 3](#)). Admission for bed rest and further investigation was advised, including, input from a metabolic bone specialist.

By 6 months postinitial presentation she had begun to experience shooting pains down her right buttock and right thigh indicative of sacral nerve entrapment. Repeat pelvic radiographs showed marked displacement of the hemipelvis indicating substantial instability requiring surgical intervention. This included internal

fixation of the iliac wing and anterior column of the pelvis by the senior authors ([figure 4](#)). Postoperatively the patient made an encouraging initial recovery and was immediately started on a rehabilitation regimen. Six months after the operation the patient was making good progress with partial weight-bearing and now minimal pain in the pelvis and right hip. On examination she was able to walk a few steps unaided although a fixed flexion deformity of both hips was apparent. Repeat pelvic radiographs showed no metalwork failure and there was still no evidence of bony healing.

Figure 3 Repeat anteroposterior pelvis radiograph demonstrating the initial fractures with further progression and displacement. There is no evidence of fracture union or callus formation. Twenty-four weeks after low energy injury.

Figure 4 Postoperative anteroposterior pelvis radiograph following elective internal fixation of the right hemipelvis. Note the spontaneous displacement of a left ramus screw. Thirty-five weeks after low energy injury.

Eighteen months after initial presentation a marked increase in pain was noted and mobility had reduced. Subsequent imaging showed the anterior pelvis fixation had failed and the pubic rami displaced further. Further surgical intervention was therefore undertaken including a double plating of the pubic symphysis and anterior column of the pelvis, again a good post-operative recovery was noted.

Unfortunately, 3 years after the initial presentation the patient presented to the fracture clinic with an acutely painful right hip. No trauma history was given. A radiograph demonstrated a displaced intracapsular right fractured neck of femur. She underwent emergent surgery including a long-stem bipolar hemiarthroplasty (figure 5) and was discharged home after making a good in-patient recovery.

Figure 5 Anteroposterior pelvis radiograph demonstrating right bipolar stem and further plating to reinforce the pubis fixation. Note that the errant left ramus screw subject to spontaneous displacement has relocated without further intervention. Three years after initial presentation.

To summarise, this patient required several surgical operations, multiple admissions, dozens of investigations and frequent outpatient fracture clinic appointments. The patient now appears to be recovering but remains under long-term follow-up for these insufficiency fractures.

INVESTIGATIONS

Over the course of 3 years of surgical and conservative management the patient underwent multiple radiological imaging procedures, including, 25 pelvic radiographs, three CT pelvic scans and four right hip/femur radiographs. The patient also required chest radiographs, lumbar spine radiographs, abdominal and parathyroid ultrasound scans which were normal, a dual energy X-ray (DEXA) scan confirming osteoporosis t score -2.7 and a pelvic bone biopsy which was normal. Throughout the duration, blood results showed only a moderate rise in parathyroid hormone (PTH) with normal calcium levels.

DIFFERENTIAL DIAGNOSIS

Pelvic and hip fractures:

- ▶ Traumatic fractures
- ▶ Pathological fractures (eg, secondary to malignancy)
- ▶ Fragility/insufficiency fractures (related to osteoporosis)
- ▶ Hyperparathyroidism
- ▶ Metabolic bone disease
- ▶ Pathological related to bisphosphonate therapy (BT)

TREATMENT

Following the initial and subsequent injury to the pubic ramus, the patient was first managed with conservative therapy allowing mobilisation as able. This included input from the orthopaedic surgeons, general surgeons and the endocrinology team to enable full management of her pelvic fractures and necessary endocrine investigations. Following symptomatic progression of the pubic ramus fractures conservative management was still employed, however, the patient was advised on bed to chair transfers only. With the development of sacral nerve pain, pelvic fracture surgery was indicated. Postoperatively the patient was managed with physiotherapy, hydrotherapy and orthotic bracing to help with a lumbar flexion deformity. One year on from this initial pelvic surgery the patient underwent a second pelvic procedure. Then 3 years after the primary presentation, the patient required a third operation for a displaced intracapsular right neck of femur fracture.

DISCUSSION

Despite a minimal or absent trauma history this patient repeatedly presented with progressively worsening fractures to the right hemipelvis and right femur. Thorough investigation found no treatable cause to account for the lack of healing other than the long-term BT. Alendronate therapy was stopped 6 months after the initial presentation due to an increasingly high index of suspicion that the BT may be causal to the fracture history.

It is common knowledge that the population age is now skewed to the later stages of life. This is relevant for all practicing clinicians and within the confines of orthopaedics the age distinction is becoming evermore apparent. In previous years, pelvic fractures used to be almost exclusively associated with high-energy injuries in otherwise young healthy individuals. This trend is changing. Fragility fractures of the pelvis (FFPs) are becoming increasingly common. These injuries are occurring in the older population and are associated with low-energy impacts and even spontaneous fractures in those with severe osteoporosis. For most of these injuries, non-operative

management is adequate. However, the problems arise in those patients whose fractures are affected by progressive bone damage leading to increasing displacement and therefore instability.¹ Operative management requires adaptation to allow suitability and flexibility for this affected generation. Consequently, many FFPs do not fit with current classifications of pelvic fractures.² To deal with the increasing incidence of FFPs a new classification system has been devised for use in this specific patient population.¹

In this patient, blood results confirmed a moderate increase in PTH with normal calcium levels. So does this represent normocalcaemic primary hyperparathyroidism or secondary hyperparathyroidism (SHP)? In this instance, there were several risk factors for SHP with the greatest being prolonged treatment with BT. Furthermore, this patient had known osteoporosis and was in the postmenopausal age group.

Bisphosphonates remain the mainstay of treatment for osteoporosis. Despite their prominence in medical usage little is known around certain aspects of treatment, specifically related to optimum treatment practices. For example, what is the optimal duration of treatment? Evidence from a recent systematic review shows beneficial effects on bone mineral density and fracture reduction after 3 years of treatment. Importantly, after discontinuation of BT given for over 3 years, positive treatment effects were still exhibited.³ Interestingly, do patients given BT for over 5 years benefit? To date, the answer is no. Studies collating data for postmenopausal women with osteoporosis showed no difference in fracture risk between those who continued treatment after 5 years and those in whom it was discontinued.⁴

Similarly, clinicians are starting to correlate clinical with radiographic findings for patients presenting with subtrochanteric femoral fractures. In these patients, radiographic features include: lateral cortex focal thickening, transverse fracture orientation and superior displacement with varus angulation at the fracture point.⁵ Recent literature is beginning to demonstrate that atypical femoral fractures (AFFs) may have a higher incidence than previously expected with one retrospective study suggesting up to 5%.⁶ In addition, a cohort study has provided evidence that elderly women with AFFs have poor clinical outcomes and postulated that delays in diagnosis and therefore management may have a role in this.⁷ Historically it has been suggested that BT may alter bone microarchitecture so impacting on the aetiology of atypical fractures. Interesting data looking at the bone microarchitecture of women who have suffered AFFs related to BT has found no original features to account for the increased risk. Therefore, suggesting that other unknown independent factors may be predisposing this group of patients to AFFs.⁸

Recent years have also led to discussion over potential consequences of long-term BT. In particular, this has surrounded the diagnosis of atypical subtrochanteric fractures in those prescribed BT. However, there is very little documentation on bisphosphonate usage related to pelvic insufficiency fractures. Any evidence is anecdotal in nature.⁹ A recent analysis of Phase III trials has shown no concrete evidence of this association. However, the majority of reviewed randomised controlled trials were carried out before these atypical fractures came into clinical discussion. Equally, the incidence of atypical fractures is small compared with the BT patient numbers and so it is possible any studies are underpowered to adequately assess the correlation.¹⁰

This case report highlights the concerns regarding long duration of BT, of more than 5 years. Similarly it highlights the difficulty in managing these fractures due to the long half-life of

the drug and how orthopaedic surgeons will have to adapt surgical techniques for the increasingly elderly population and the conundrum they can represent.

Learning points

- ▶ Low-energy pelvic fractures need long-term follow-up in the elderly.
- ▶ Bisphosphonate therapy should be elicited from the clinical history.
- ▶ A high index of suspicion is required in managing these injuries and a multidisciplinary approach required.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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