

## Case Report

# Pelvic insufficiency fracture in an osteoporotic 47-year-old female: a case report

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## ABSTRACT

Insufficiency fractures (IFs) represent a form of stress fractures frequently linked to osteoporosis and a lack of vitamin D. These fractures, which are not caused by trauma, typically manifest in the pelvis and spine, although occurrences in atypical locations are also relatively frequent. The primary methods for diagnosing IF involve using plain radiographs and magnetic resonance imaging scans, which are commonly employed imaging techniques. The management involves both medical and surgical methods, tailored as per the needs of the patient. 47-year-old female patient presented to the outpatient department with complaints of low back ache with waddling gait, with pain not responding to analgesics. Laboratory and radiological assessment revealed osteoporotic Insufficiency fracture in the pelvis which was managed with both surgical and medical methods, with surgical management involving percutaneous screw fixation of the fractures. Diagnosis of the osteoporotic insufficiency fractures at atypical locations can be extremely challenging because of the inconclusive radiographs and the lack of a perceptible trauma history and hence, can be missed at the initial presentation. The management includes both operative and non-operative modalities, best tailored as per the patient needs and expectations.

**Keywords:** Pelvic insufficiency fracture, Osteoporosis, Percutaneous screw fixation, Bisphosphonates, Teriparatide

## INTRODUCTION

Pelvic insufficiency fractures (PIFs) are a significant clinical concern, particularly in populations with compromised bone health such as postmenopausal women, patients with osteoporosis, or those who have undergone radiation therapy for gynecologic cancers.<sup>1-4</sup> These fractures occur when normal stress is applied to weakened bone, leading to fracture without a significant trauma event.<sup>2</sup>

The most common sites of PIFs are the sacroiliac joint, the body of the sacrum, and the pubis, accounting for 39.7%, 33.9%, and 13% of fractures respectively.<sup>1</sup> Other less common sites include the lumbar vertebra, iliac bone, acetabulum, and femoral head/neck.<sup>1</sup> Uncommonly,

insufficiency fractures can occur in the supracetabular region, particularly in older women with conditions such as postmenopausal osteoporosis, steroid therapy, radiation therapy, and rheumatoid arthritis.<sup>5</sup>

Risk factors for PIFs include osteoporosis, hypertension, diabetes, vitamin D deficiency, hypocalcaemia, and nicotine abuse.<sup>2</sup> The outcome of conservative therapy for PIFs is often poor, with a high loss of social and physical independence and autonomy, and a high mortality rate.<sup>2</sup>

## CASE REPORT

A 47-year-old female patient reported to our outpatient department (OPD) expressing concerns related to persistent low back pain, coupled with a noticeable

bilateral waddling gait. The onset of this pain was subtle, tracing back about 1.5 years ago, showing a gradual intensification with occasional periods of respite. However, upon delving deeper, the patient recalled a fall she had taken 6 months prior, which seemed to exacerbate the pain substantially. Preliminary neurological assessments didn't pinpoint any discernible neurological deficits. However, the patient had tenderness on pelvic compression test. Initial radiographic evaluations highlighted fractures encompassing both the iliac wings, in addition to bilateral superior pubic rami fractures (Figure 1-4).



**Figure 1: X-ray PBH.**



**Figure 2: X-ray PBH (inlet view).**



**Figure 3: X-ray PBH (outlet view).**

Laboratory examinations were conducted to assess potential underlying causes, revealing the following: Sr. calcium: 9.1 mg/dl, Sr. phosphorus: 1.6 mg/dl, Sr. alkaline phosphatase: 554 IU/dl, Sr. vitamin D3: 24 nmol/l, and DEXA scan T-score: -2.1.

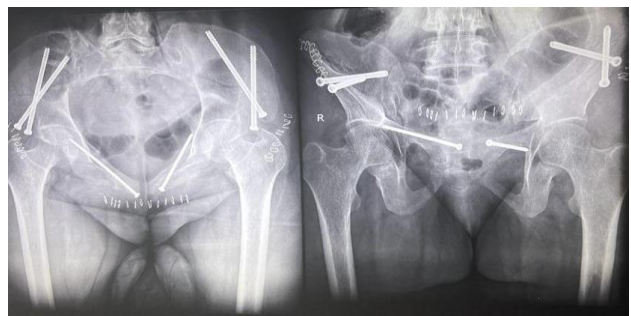
Since, the patient had significant pain, tenderness and limitation of daily activities, a surgical intervention was deemed necessary. The procedure involved the placement of percutaneous bilateral superior pubic ramus screws and iliac wing screws. Specifically, two 6.5 mm partially threaded cannulated cancellous screws were fixed in the iliac wings, and 3.5 mm cortical screws were placed in the superior pubic ramus. Intraoperatively, it was observed that there was significant mobility at the fracture site. The patient was mobilized post-operatively and had significant relief from pain even though the healing fracture line was still seen on the follow-up radiograph (Figures 5 and 6).



**Figure 4: 3D CT images.**



**Figure 5: Post-op X-ray PBH.**



**Figure 6: Post-op X-ray PBH (inlet and outlet views).**

Patient was followed up at regular intervals for up to 1 year. Clinical improvements were observed in her gait and

she was able to perform active SLR which wasn't possible earlier (Figures 7 and 8).



**Figure 7: Right limb SLR.**



**Figure 8: Left limb SLR.**

The 1 year post-operative radiographs are shown below, healing fracture can be seen (Figures 9).



**Figure 9: Post-op X-ray at 1-year follow-up show healing of fracture.**

Patient currently is pain free and is carrying out all her daily activities, walking comfortably without any aids.

## DISCUSSION

Osteoporosis is both a qualitative and quantitative defect of bone that usually affects all the bones of the body. It can be more precisely defined as a “progressive (often), systemic and skeletal disease characterized by overall low bone mass (quantitative) predominated by microarchitectural (qualitative) deterioration of bone

tissue that results in increased bone fragility, and hence susceptibility to fracture”.<sup>1</sup>

Primary undesirable consequence of osteoporosis is osteoporotic or fragility or insufficiency fractures. Fracture would occur only if a failing force is applied to bone. The magnitude of failing force required is inversely proportional to bone strength. Weaker the bone, hence higher will be chance of fracture. Common fractures that occur in osteoporosis are: fractures of distal radius (occurs in younger age group i.e., 5th decade); fracture of proximal femur—femoral neck and intertrochanteric (more common in the later age groups i.e., 6th-7th decade); fracture of vertebral bodies; and less commonly the fractures may be seen in the metatarsals, proximal humerus, ribs, toes, leg, pelvis, hand and clavicle.<sup>1</sup>

Pelvic insufficiency fractures (PIFs) often emerge in patients without preceding trauma or from minimal energy trauma in the backdrop of an osteoporotic bone. There's an array of conditions that predispose individuals to such fractures. Predominantly, osteoporosis reigns as the principal condition. Yet, several other factors ranging from vitamin D deficiency, secondary hyperparathyroidism, to autoimmune diseases such as rheumatoid arthritis also play pivotal roles.<sup>2,3</sup> The aftermath of pelvic irradiation, commonly employed in oncological treatments, can't be overlooked as a risk factor.<sup>4,5</sup> Such irradiation perturbs local circulation, curtailing bone regeneration and remodeling processes. Recent literature also pinpoints total hip arthroplasty as a potential precursor to PIFs. The postulation is that protracted immobility prior to the procedure paves the way for disuse osteopenia.<sup>6,7</sup>

Diagnosis, however, is an intricate endeavor. A patient's clinical presentation can be deceptively insidious. Common manifestations range from persistent low back or pelvic pain to a drastic dip in mobility. The symptoms are exaggerated usually by weight bearing and are relieved with rest.<sup>9</sup> The diagnostic journey is often protracted, sometimes spanning up to 2 months. This is majorly attributed to the absence of perceptible trauma, which generally diverts clinical suspicion away from pelvic injuries. Plain radiographs, albeit essential, can sometimes mislead due to their intricate interpretations. If high suspicion looms despite inconclusive X-rays, clinicians should not hesitate to escalate to more definitive imaging modalities such as MRI or CT, with the latter particularly revered for its intricate bony detailing.<sup>10,11</sup> Laboratory Investigations such as Sr. calcium, Sr. phosphorus, Sr. 25-OH vitamin D levels, urinary calcium and phosphorus excretion and other investigations to rule out the secondary causes of the osteoporosis serve as an adjuvant.

Treatment landscapes for PIFs span both non-operative and operative paradigms. A sizeable patient cohort finds solace in non-operative strategies. The overarching objectives here hinge on pain mitigation and ensuring patient mobility. Alas, the specter of immobility-related complications looms large, necessitating focused

interventions. Pain often fetters patients, hampering weight-bearing, hence the imperative of assistive devices like walkers becomes paramount as this helps in offloading the weight-bearing axis through the pelvis. As with all medical interventions, patient counseling, setting realistic expectations, and charting out goals is the cornerstone.

Non-operative management is aimed at using the drugs and various techniques such as TENS, Localized nerve blocks, and other physiotherapy techniques to control the pain. NSAID's have particularly found their role as pain relieving agents. Another drug which has gained popularity is calcitonin administered subcutaneously or intranasally (as a spray) has both anti-resorptive and analgesic action, though it is more famous for the latter action.<sup>9</sup> Calcium and vitamin D supplementation is often added.

Antiresorptive agents, such as bisphosphonates, are mainstays in the treatment of osteoporosis. Randomized trials have demonstrated a reduction in the risk of hip and spine fractures in osteoporotic women.<sup>12</sup> Another example is Denosumab - is a recombinant human immunoglobulin G2 (IgG2) antibody functionally similar to osteoprotegerin with affinity and specificity for RANKL. Denosumab inhibits the RANKL/RANK formation on the osteoblast, and hence preventing the osteoblast-osteoclast interaction decreasing bone resorption. It is given as an injection subcutaneously in a dose of 60 mg/6 months.

Anabolic agents include teriparatide—the N-terminal segment rhPTH (1-34). Exogenously administered intermittent PTH in a dose of 20 mcg/day is a potent anabolic agent that stimulates skeletal remodeling and improves BMD.<sup>13,14</sup> The effect of teriparatide are mediated in a multifactorial manner possibly involving Wnt pathway (stimulating Wnt10b and inhibiting sclerostin), and IGF I mediated anabolic effect.

In patients who fail medical and nonoperative therapy, operative intervention may be considered with sacroplasty, internal fixation, or a combination of the two.<sup>15,16</sup> Higher level of evidence on surgical technique is lacking. Further, the opinion is varied regarding the optimal technique. An appropriate plan should be formulated depending upon the region of the fracture. Priority should be given to the fixation of the posterior lumbopelvic region as this is the major weight-bearing region. Therefore, posterior internal fixation is preferred, however once stabilized, anterior rami fractures can be fixed with retrograde or antegrade ramus screws or via open reduction internal fixation directly. Appropriate surgical approaches should be undertaken for the fixation of the fractures.

## CONCLUSION

Diagnosis of the osteoporotic insufficiency fractures at atypical locations can be extremely challenging because of the inconclusive radiographs and the lack of a perceptible trauma history and hence, can be missed at the initial

presentation. The management includes both operative and non-operative modalities, best tailored as per the patient needs and expectations.

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