

# Spinal compression fractures due to pregnancy-associated osteoporosis

## ABSTRACT

**Objectives:** To report on unique cases of spinal compression fractures due to pregnancy-associated osteoporosis (PAO) and to suggest a satisfactory treatment modality.

**Materials and Methods:** A single-center retrospective study. We reviewed the data of 535 patients with osteoporotic spinal compression fractures over a period of 5-year. Two patients who developed spinal compression fractures due to PAO were identified and treated.

**Results:** The clinical presentation and blood investigations ruled out other causes of osteoporosis. Dual-energy X-ray absorptiometry was used to confirm the diagnosis. All patients improved with medical management.

**Conclusion:** Vertebral fractures due to PAO should be considered as a differential diagnosis in patients with back pain who are in the third trimester of pregnancy or in postpartum. Early recognition and appropriate conservative management would be necessary to prevent complications such as new vertebral fractures and chronic back pain.

**Key words:** Bone mineral density; chronic back pain; dual-energy X-ray absorptiometry; pregnancy-associated osteoporosis; spinal compression fractures.

## Introduction

Osteoporosis commonly affects an older demographic and has a higher prevalence among females in postmenopausal age group. It is the most common cause of fractures among the elderly. The pathological mechanism may either be an increased loss of bone mass or a decreased density of the bone. Multiple etiological factors are related to osteoporosis such as genetic, hormonal, and nutritional. However, osteoporosis is not entirely a disease of the old age, and can, in relatively rare instances, manifest in pregnancy and postpartum, which was first described by Albright and Reifenstein in 1948.<sup>[1]</sup> The etiology and pathogenesis of this condition are still under evaluation. In pregnancy-induced osteoporosis, fragility fractures involving vertebrae were described by Nordin and Roper in 1955.<sup>[2]</sup> These compression fractures are seldom recognized because the clinical features commonly attributed mechanical back pain to pregnancy. An agreed guideline on the treatment of pregnancy-associated

osteoporosis (PAO) has not been found. This study was conducted with the aim to report on this phenomenon and demonstrate a likely treatment modality with satisfactory results.


## Materials and Methods

Retrospective analysis of single-center data of patients diagnosed to have thoracolumbar spine fractures due to PAO from January 2010 to December 2014. Of the 535 patients

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with osteoporotic spinal compression fractures, two patients had spinal compression fractures secondary to PAO.

**Case 1**

A 27-year-old primipara patient presented at the 3<sup>rd</sup> month of postpartum. She complained of low back pain since the 8<sup>th</sup> month of pregnancy. Following delivery, she also noticed the loss of height. She had left-sided radiculopathy with sensory blunting over L5 dermatome. Blood investigations revealed serum calcium 7.1 mg/dl, phosphorus 3.5 mg/dl, parathyroid hormone (PTH) 94.2 pg/ml, and Vitamin D3 18.01 ng/ml. Computed tomography (CT) scan shows D10 compression fracture [Figures 1 and 2]. Bone scan showed increased tracer uptake in D10 vertebra and rest of the skeleton shows with normal tracer distribution [Figure 3].

**Case 2**

A 31-year-old primipara known case of scoliosis presented at the 5<sup>th</sup> month of postpartum. She complains of low back pain since 1<sup>st</sup> month of postpartum with no radiculopathy. Blood investigations revealed serum calcium 8.3 mg/dl, phosphorus 3.7 mg/dl, PTH 61.6 pg/ml, and Vitamin D3 15.08 ng/ml. CT scan and magnetic resonance imaging showed compression fracture of D12, L1, and L2 vertebra.

Both the patients were treated conservatively with discontinuation of breastfeeding, oral calcium 100 mg/day, Vitamin D 800 IU/day, alendronate 70 mg/week, and thoracolumbar orthosis. Dual-energy X-ray absorptiometry (DEXA) scan was done before starting the therapy and at 2 years follow-up time [Table 1].

The second patient developed sternum-into-abdomen deformity. This patient appeared very thin due to inadequate

food intake with good appetite and refused surgery for correction of the deformity. The “Sternum into Abdomen” deformity was first reported by Krishnakumar and Lenke, referring to the presentation of severe kyphosis due to osteoporotic compression fractures of the spine, resulting in extrinsic gastric compression severe enough to cause weight loss.<sup>[3]</sup>

**Results**

Both the patients had a significant improvement in bone mineral density (BMD) with the treatment and did not develop any new compression fracture or complications during the 2 years follow-up period.

**Discussion**

Osteoporosis is a disorder of bone metabolism; it is characterized by decreased density of the mineral portion of the bone. Pregnancy and lactation-associated osteoporosis is a rare clinical condition. By the year 2006, there were 100 reported cases in the clinical literature.<sup>[4]</sup> The incidence of

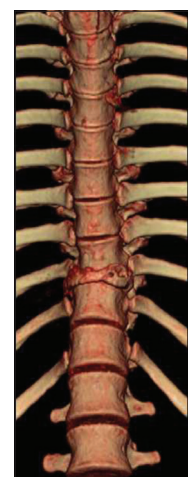
**Table 1: Dual-energy X-ray absorptiometry scan of both the patients**

Lumbar spine	Before treatment	2 years follow-up
Patient 1		
BMD	0.423	0.989
T-score	-4.1	-2.1
Z-score	-3.5	-0.9
Patient 2		
BMD	0.313	0.851
T-score	-6.5	-3.2
Z-score	-5.5	-3.0

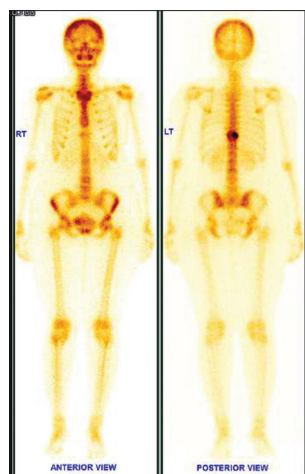
BMD - Bone mineral density



**Figure 1: Magnetic resonance imaging of the first patient showing compression fracture D10**



**Figure 2: Computed tomography image of the first patient showing compression fracture D10**



**Figure 3: Bone scan of the first patient showing increased tracer uptake in D10**

this condition is 0.4 in 1,00,000 pregnant women. Risk factors include first-degree relatives, low body mass index, insufficient calcium intake, poor nutrition, and physical inactivity.<sup>[5]</sup> Pregnancy is a calcium-intensive process, with the fetal skeleton harboring approximately 30 g of calcium. The increased demand peaks in the third trimester where most of the skeletal growth occurs, amounts to 200–250 g a day and is met primarily through raised intestinal absorption, thought to be aided by increased concentrations of 1,25-dihydrocholecalciferol along with placental lactogen. However, during lactation, when the demand is higher at 300 g of calcium a day, there is a shift in this mechanism to increased bone resorption caused by raised PTH-related protein.<sup>[6]</sup> The absorption of calcium returns to prepregnancy levels and estrogen level reduces, along with reduced excretion of calcium in urine. The exact etiology and pathogenesis of pregnancy and lactation-associated osteoporosis still remains unknown; however, a few proposed factors are hypoenestrogenemia during breastfeeding, fetal calcium intake from the mother,<sup>[7]</sup> excessive parathyroid hormone-related peptide released from the lactating breast into the maternal circulation,<sup>[8,9]</sup> and calcitonin deficiency which exacerbates the normal loss of calcium during lactation.<sup>[10]</sup> There could be a loss in BMD in the range of 5%–14%<sup>[11,12]</sup>

Clinically patients present with the following features: females in late pregnancy and early postpartum present with low back pain developing shortly during the third trimester or early postpartum and even height loss. The most common presentation is a vertebral fracture or fractures that occur suddenly in late pregnancy or during lactation<sup>[6]</sup> It is associated with a marked reduction of BMD in DEXA, marked impairment of intestinal calcium absorption, and no evidence of any secondary cause of osteoporosis. Another interesting phenomenon is that POA is generally associated with only

the first pregnancy though its presentation with subsequent pregnancies has been documented too.<sup>[10,13]</sup>

The aim of the treatment includes to decrease the risk of new vertebral fractures, to increase the BMD, and to prevent the development of chronic back pain. There is no consensus on PAO treatment guidelines to date. There have been conflicting opinions on the efficacy of calcium supplementation to alter the rate or extent of the mineral loss in osteoporosis during pregnancy.<sup>[14]</sup> The efficacy of calcium supplementation to reduce bone loss during lactation even in populations with very low calcium intake (mean of 280 mg/day) has been brought to question.<sup>[15]</sup> Regarding Vitamin D, the Institute of Medicine (IOM) in the USA had set up a task team to review literature and come up with a report on the recommendations on dietary calcium and Vitamin D throughout the life cycle. The panel had concluded that a serum 25 OH D of 20 ng/ml (which is the metabolized prehormone form of Vitamin D3) is sufficient, however, the panel went on to suggest that pregnancy and lactation do not require additional Vitamin D supplementation.<sup>[16]</sup> However, earlier studies done in Europe and Middle East suggested the contrary and expressed a high prevalence of Vitamin D deficiency, especially among dark-skinned women.<sup>[17,18]</sup> In light of this, a general consensus can be made as to the importance of calcium and Vitamin D homeostasis during pregnancy and postpartum. Although IOM recommends 600 IU/day of Vitamin D for women of childbearing age, irrespective of their pregnancy status, the National Osteoporosis Foundation of South Africa recommends a higher intake of 800–1000 IU/day, owing to the reduced availability of Vitamin D fortified foods as compared to the USA.<sup>[6]</sup> Hence, the mainstays of current treatment are calcium and Vitamin D supplementation and discontinuation of breastfeeding.<sup>[13,19]</sup>

Antiresorptive therapy with bisphosphonates results in rapid improvement even in younger patients.<sup>[20]</sup> The gain in BMD was greater when bisphosphonate therapy was initiated early, and a significant gain occurs at the lumbar spine.<sup>[4]</sup> Combined use of bisphosphonates with osteoanabolic agents like teriparatide gives better results and fewer complications rather than bisphosphonates alone.<sup>[21]</sup> PAO is not a contraindication for subsequent pregnancy<sup>[22]</sup> and in fact, subsequent pregnancies may not give rise to PAO.<sup>[10,13]</sup> Bisphosphonates are agents which accumulate in bone for years and can cross the placenta.<sup>[23]</sup> Long-term prenatal side effects of bisphosphonates are not known, so women who wish to have subsequent pregnancy is better treated with teriparatide. Strontium ranelate, which is a newer treatment option for postmenopausal osteoporosis, has the dual effect of reducing the bone resorption and increasing the new bone

formation, and it is not stored in bone. A few studies support the use of strontium ranelate in PAO, however long-term results are not available.

## Conclusion

Spinal compression fracture due to PAO is a rare clinical condition; it should be considered as a differential diagnosis when thoracic or lumbar pain occurs during pregnancy or in the postpartum period. Early recognition and adequate treatment prevent the complications such as new fractures and chronic back pain.

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## Conflicts of interest

There are no conflicts of interest.

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