



## **Bilateral Femoral Head Insufficiency Fractures and Multiple Vertebral Fractures: A Case Report on Rare Presentations of Pregnancy and Lactation-associated Osteoporosis and Their Outcomes**

*Gebelik ve Emzirme İlişkili Osteoporozda Sekonder Gelişen ve Nadir Görülen Bilateral Femur Başı Yetmezlik Kırığı ve Çoklu Vertebra Kırıkları: Olgu Sunumu*

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### **Abstract**

Pregnancy and lactation-associated osteoporosis (PLO) is a rare condition seen in the last trimester of pregnancy and early puerperal period which can result in vertebral and femoral fractures. In this case report, two cases of fractures secondary to PLO, their management and clinical outcomes are presented. Case one describes a patient with vertebral fractures secondary to PLO who was treated with bisphosphonates. Case two describes a rare case of bilateral femoral head stress fractures secondary to PLO, treated with bed rest, a home exercise programme and calcium and vitamin D supplementations. Pharmacological treatment of PLO includes teriparatide and strontium ranelate and crossover treatments-all of which require the cessation of breastfeeding. The optimal PLO treatment remains to be determined. Further studies comparing the clinical and biological outcomes of these drugs are necessary so that clinicians can accurately advise women on the risks and benefits of each, for both themselves and their child and guide patients in making a suitably informed decision regarding treatment.

**Keywords:** Osteoporosis, osteoporotic fractures, lactation, thoracic vertebrae, femur head

### **Öz**

Gebelik ve emzirme ilişkili osteoporoz (GEİO), gebeliğin üçüncü trimesterinde ve erken puerperal dönemde görülen ve vertebra ve femur kırıklarına yol açabilen, nadir bir hastalıktır. Bu olgu raporunda, iki farklı vakada GEİO'ya sekonder gelişen kırıklar, uygulanan tedaviler ve klinik sonuçlar sunulmaktadır. Birinci olguda, GEİO'ya sekonder gelişen ve bifosfonat ile tedavi edilen vertebra kırıklı bir hasta sunulmaktadır. İkinci olguda ise GEİO'ya sekonder gelişen, nadir görülen bilateral femur başı yetmezlik kırığı olan bir hasta sunulmaktadır. Bu hasta yatak istirahati, ev egzersiz programı, kalsiyum ve D vitamini takviyesi ile tedavi edildi. GEİO'nun farmakolojik tedavisinde teriparatid, stronsiyum ranelat ve çapraz geçiş tedavileri yer almaktadır. Bunların tümü, emzirmeyi sonlandırma gerektiren tedavilerdir. GEİO'nun optimal tedavisi halen bilinmemektedir. Bu nedenle, farmakolojik tedavilerin klinik ve biyolojik sonuçlarını araştıran ve karşılaştıran çalışmalar gereklidir. Bu bilgileri kullanarak, hekim, farklı tedavilerin faydalarını ve anne ve bebeğe potansiyel zararlarını hastaya aktarabilecektir. Böylece hekim-hasta iş birliği ile en uygun tedavi planının yapılması da mümkün olabilecektir.

**Anahtar kelimeler:** Osteoporoz, osteoporotik kırıklar, laktasyon, torasik vertebra, femur başı

## Introduction

Pregnancy and lactation-associated osteoporosis (PLO) is a rare condition seen in the last trimester of pregnancy and in the early puerperal period. The incidence of PLO is approximately 0.4 in 100,000 women (1). It is believed that the number of undiagnosed cases are even more (2). PLO typically presents with back pain and fragility fractures of the vertebra, resulting in a change in posture, loss in height and disability (3). Due to the rarity of PLO, back and buttock pain occurring during this time may be misdiagnosed as ligamentous laxity induced by hormones of pregnancy.

Even though risk factors such as a positive family history, low body mass index (BMI), insufficient calcium intake, and smoking have been determined for the development of PLO (1,4), the etiology and pathophysiology remains unknown (5). Indeed, there are no clear criteria for its management and no consensus on the best treatment option. Here, we present two cases of PLO, their differing pharmacological treatments and outcomes.

## Case Reports

### Case 1

A previously healthy 29-year-old woman presented to the physical and rehabilitation medicine (PRM) outpatient clinic with a one month history of back pain. The patient had given birth to her second child via caesarean section, two and a half months previously. Her pregnancy had been uneventful. The back pain was mostly in the thoracic region and was exacerbated on movement and walking and when picking up and holding her child. The patient described her back pain as 10/10 on a visual analogue scale (VAS). There were no neurological symptoms in the extremities. There was no history of incontinence. She was not receiving any medical treatment. There was no history of smoking or alcohol consumption. The patient admitted to restricting her dietary intake, including cutting out dairy products, postpartum in order to lose weight.

On examination she was 1.64 cm in height and weighed 62 kg (BMI 23.05). She had a kyphotic posture with paravertebral spasm in the thoracolumbar region. On palpation there was diffuse tenderness of the lower thoracic spine. Thoracic vertebra range of motion was limited and painful. Full blood count, urea and electrolytes, liver function tests, serum calcium, C-reactive protein, erythrocyte sedimentation rate and thyroid function tests were within normal limits. The patient's vitamin D level was low at 9.8 ng/mL with a normal parathyroid hormone (PTH) level.

Magnetic resonance imaging (MRI) of the thoracic spine revealed multiple fractures at the level of T10-T12 vertebrae with a loss in height of 20-30%. Edema was present at the proximal end plates of T10 and T11 vertebrae and in the corpus of T12 consistent with acute fractures. Bone mineral density (BMD) measured using dual-energy X-ray absorptiometry (DEXA) showed osteoporosis with a L1-L4 total T-score of -3.9 (Table 1).

The patient was diagnosed with PLO related vertebral compression fractures. Breast feeding was terminated, the patient was advised on a suitable diet, the use of a thoracolumbar corset, given cholecalciferol supplements (800 u/day) and started on ibandronic acid 150 mg/month. Three months into the treatment the patient's back pain had markedly reduced, with a VAS for pain of 3. At the six month follow-up the patient's DEXA showed an improvement in BMD (Table 1). The patient continues to take her monthly dose of ibandronic acid as prescribed.

### Case 2

A previously healthy 42-year-old woman presented in the thirty fourth week of pregnancy with bilateral hip pain. The pain was exacerbated by weight bearing and movement and relieved by rest. Her current pregnancy so far and previous pregnancy eight years earlier had been uneventful. She had been taking multivitamins since the first trimester. She was a non-smoker and non-drinker. No radiological investigations were initially planned due to the risks to the fetus. The pain worsened as the pregnancy continued and three weeks later, by the time of delivery by caesarean section, she was unable to weight bear. On the third day postpartum an MRI of the hips revealed bilateral stress fractures of the femoral heads (Figure 1). The patient was referred to a PRM specialist. A DEXA revealed osteoporosis of the femoral neck. Routine blood tests were normal. The patient's vitamin D level was 39.2 ng/mL with a normal PTH (17.33 picogram/mL) and serum calcium level. Beta-CrossLaps (beta-CTx) was increased at 1.04 ng/mL indicating an increase in osteoclastic activity. The patient's thyroid stimulating hormone was reduced at 0.08 with a normal thyroxine (T4) level. The patient was counselled and encouraged to stop breast feeding with a view to start anti resorptive treatment, however she declined. The patient was advised not to weight bear for a three month period post diagnosis, given a home exercise program of lower extremity range of motion and strengthening exercises and started on calcium and vitamin D supplements. Three months later the patient's hip pain had reduced. A repeat bilateral

**Table 1. Changes in BMD values with treatment**

BMD value	Pre-treatment	6 months post-treatment
L1-4 T-score	-3.9	-3.3
L1-4 Z-score	-4.0	-3.2
L1-4 BMD (g/cm <sup>2</sup> )	0.706	0.786
L1-4 BMC (g)	33.42	35.47
Femur neck T-score	-2.2	-1.9
Femur neck Z-score	-2.1	-1.8
Femur neck BMD (g/cm <sup>2</sup> )	0.739	0.772

BMD: Bone mineral density, L1-4: Lumbar vertebra 1-4, BMC: Bone mineral content

hip MRI revealed a reduction in bone marrow edema of the femoral heads. She was initially advised to commence partial weight bearing with the aid of a walking frame and gradually progressed to fully weight bearing over a further two months. The patient currently continues to breast feed and take calcium and vitamin D supplementations six months postpartum. The hip pain has markedly reduced and only occurs on prolonged standing. The patient has been advised against partaking in high energy sports such as basketball and running; swimming and floor exercises have been recommended. A repeat DEXA has been planned at the end of the first year postpartum.

## Discussion

PLO, also known as transient osteoporosis of pregnancy, was first described by Nordin and Roper (6) in 1955 followed by Curtiss and Kincaid (7) in 1959. PLO is a rare condition with consequential compression fractures mostly occurring in the lower thoracic and lumbar spine (8). On the other hand, bilateral hip fractures or sacral fractures secondary to PLO are very rare (9-15).

During the final six weeks of pregnancy, fetal osteogenesis results in an increase in maternal calcium loss. This is further exacerbated by postpartum lactation (16). Many studies have reported loss of BMD in pregnancy, however this loss is variable. Although it has been suggested that PLO mostly occurs in those with an initial low BMD, it is impossible to know whether these women have a prior history of osteopenia or osteoporosis as in most cases the women have never had a DEXA (17). Furthermore, fracture recurrence secondary to PLO in subsequent pregnancies has been reported to be as high as 33% (1).

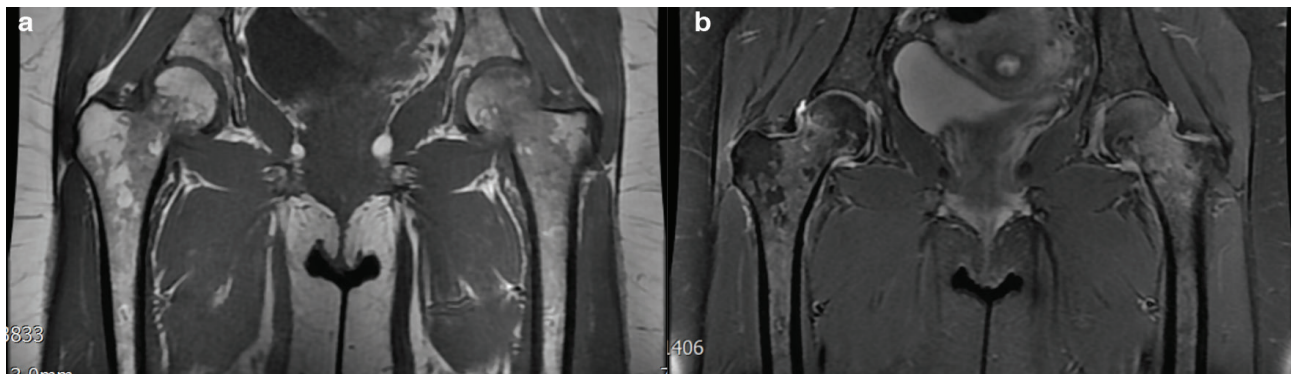
Primary prevention in the treatment of PLO is essential. The patient must be educated regarding a balanced diet and regular physical activity. An intake of calcium 600-1,500 mg/day and cholecalciferol 800 IU/day is recommended (18). Cessation of lactation is mostly recommended (19); studies have shown that these preventative measures alone have led to a 6% and 9.5% increase in lumbar BMD values at 8-18 and 24-48 months respectively (4,20).

Other pharmacological treatment includes bisphosphonates (BPs) (1), teriparatide (21,22) and strontium ranelate (23). Importantly, to date there is no consensus on the first line pharmacological treatment in PLO, nor any comparison of BMD values and clinical outcome in PLO patients according to the pharmacological treatment received. A case series of eleven women treated with BP for PLO whose follow up ranged from 1-19 years, revealed an increase in BMD up to 17% at one year and 23% at the end of two years (1). Concern about BPs use in women of childbearing age is related to the pharmacokinetic and pharmacodynamic properties of BPs that result in prolonged retention in the skeleton and suppression of bone turnover.

Another report of five cases of PLO with fractures found that the two patients treated with teriparatide showed more improvement in BMD than those treated with calcium and vitamin D alone. However, one of two patients was diagnosed with papillary thyroid cancer nine months after treatment with teriparatide was commenced (24). Another patient received six months of teriparatide followed by six months of denosumab in the belief that this sequential therapy may have benefits; it is known that antiresorptive medication after teriparatide therapy can prevent subsequent decline in BMD (25,26).

Vertebral and femoral fractures in PLO present a diagnostic challenge as the signs and symptoms can easily be confused with mechanical back, pelvic and ligamentous pain of pregnancy (27). Furthermore, safe investigative options during pregnancy are limited and so fractures secondary to PLO becomes a diagnosis of exclusion. A delay in diagnosis can result in a whole range of complications, some of the more serious ones including compression of the spinal cord and avascular necrosis.

There is still no clinical guideline on the pharmacological treatment of PLO; in the cases reported here both patients showed clinical improvement, which were confirmed by investigative findings, even though one was treated with BPs and the other with calcium and vitamin D. This may suggest that the more conservative approach to pharmacological treatment, in which cessation of breast feeding is not essential and side effects are few, may suffice in the treatment of a transient osteoporosis. Further studies comparing the clinical and



**Figure 1.** Coronal T1 fat spin echo (a) and proton density fat saturation imaging (b) showing widespread bone marrow edema from the level of the subchondral bone of the femoral heads proximally to the intertrochanteric region distally with bilateral synovitis consistent with subchondral stress fractures of the femoral heads

biological outcomes of the various drug regimens are necessary so that clinicians can accurately advise women on short and long term risks and benefits of each, for both themselves and their child, and guide the patient in making a suitably informed decision regarding treatment.

### Ethics

**Informed Consent:** Written informed consent was obtained from both patients prior to the drafting of the manuscript.

**Peer-review:** Externally and internally peer-reviewed.

### Authorship Contributions

Concept: S.Ö., O.Ü.Y., S.S., Data Collection or Processing: S.S., S.Ö., Analysis or Interpretation: S.Ö., O.Ü.Y., S.S., Literature Search: S.Ö., O.Ü.Y., Writing: S.Ö., O.Ü.Y.

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