Pregnancy and Lactation Associated Bone osteoporosis(PLO)

(Case Presentation)

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Case Presentation

A 33-year-old woman presents with **acute mid-back pain** after lifting her 4-month-old son from his car seat . She tried rest and ibuprofen with some relief. She had an uneventful pregnancy, and her son was delivered vaginally at 39 weeks' gestation. She is solely breastfeeding, and her menses have not yet resumed.

Menarche occurred at age 13 years, and she has regular cycles. She did not have any issues with conception. She adheres to a vegetarian diet and tries to consume 2 servings of dairy products per day. She fractured her left humerus at age 8 years after a fall. She had asthma exacerbations in childhood; however, her asthma is currently well controlled. She does not smoke cigarettes or use recreational drugs. Before pregnancy and breastfeeding She drank wine 2 to 3 times a week.

Case Presentation

Her mother has osteopenia but no fractures. The patient intends to breastfeed for 1 year and desires future pregnancies. She currently takes elemental calcium citrate, 315 mg daily, and vitamin D, 1000 international units daily (25 mcg daily).

On physical examination, her blood pressure is 107/68 mm Hg, and pulse rate is 76 beats/min, (BMI = 20.2 kg/m2)

Her thyroid gland is palpable, nontender, and not enlarged. No nodules are appreciated. Reflexes are 2+ at the biceps and patella. Spinal and paraspinal tenderness is noted in the mid-back. The rest of her examination findings are normal. **Spine radiographs show an acute compression fracture with 30% height loss at the T6 vertebral body**.

Laboratory test results

- Hemoglobin = 13.8 g/dL (12.1-15.1 g/dL)
- Calcium = 9.5 mg/dL (8.2-10.2 mg/dL)
- Phosphate = 2.5 mg/dL (2.3-4.7 mg/dL)
- Creatinine = 0.8 mg/dL (0.6-1.1 mg/dL)
- Albumin = 4.0 g/dL (3.5-5.0 g/dL)
- Intact PTH = 20 pg/mL (10-65 pg/mL)
- 25-Hydroxyvitamin D = 32 ng/mL (30-80 ng/mL [optimal])
- Alkaline phosphatase = 115 U/L (50-120 U/L)
- TSH = 1.21 mIU/L (0.5-5.0 mIU/L)
- Urinary calcium = 125 mg/24 h (100-300 mg/24 h)
- Prolactin = 28 ng/mL (10-200 ng/mL

DXA documents the following values

- Lumbar spine Z score (L1-L4) = –3.0
- Femoral neck Z score = –1.8
- Total hip Z score = –1.3

Which of the following is the best management advice for this patient?

- A. Increase calcium intake to 1200-1500 mg daily
- B. Recommend use of a thoracolumbosacral orthosis
- C. Start alendronate, 70 mg weekly
- D. Start cabergoline, 0.5 mg twice weekly
- E. Stop breastfeeding

Epidemiology

- Pregnancy and lactation-associated osteoporosis (PLO) is a rare and heterogeneous entity that is characterized by low bone mineral density (BMD) and fractures, mostly involving the thoracolumbar vertebrae

- incidence is estimated at 4 to 8 cases per 1 000 000 women although it may be even higher, since many cases remain under diagnosed

Comparative Effectiveness of Therapeutic Interventions in Pregnancy and Lactation-Associated Osteoporosis: A Systematic Review and Meta-analysis, The Journal of Clinical Endocrinology & Metabolism, Volume 109, Issue 3, March 2024, Pages 879–901

Presentation of PLO

- The main symptoms include:

  severe back pain

  functional limitations

  height loss

- The most common affected sites are T12, L1, and L2. More than two-thirds of cases occur during the first pregnancy, mainly in the third trimester or the first weeks postpartum

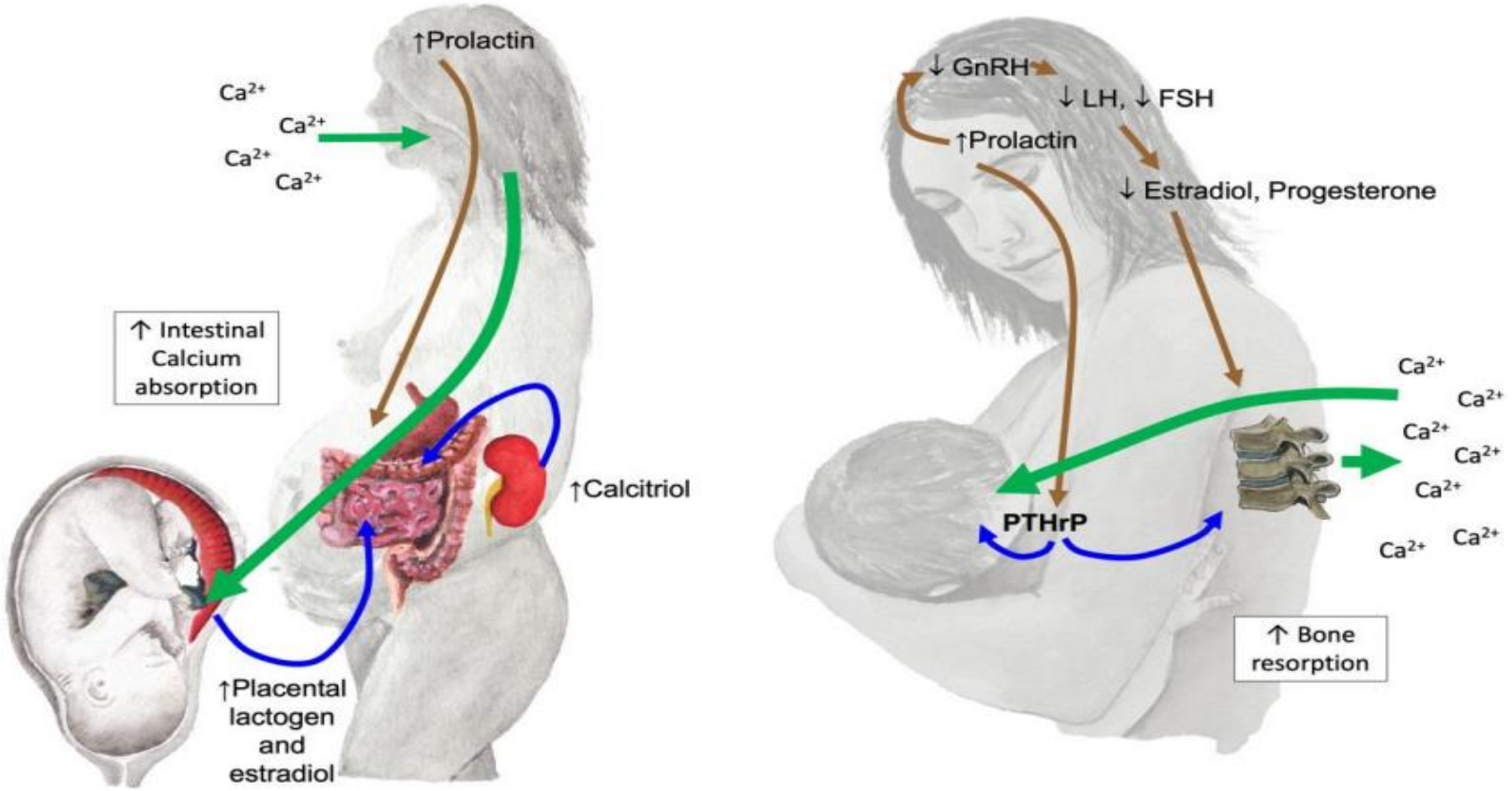
Christopher S Kovacs, Pregnancy and Lactation Associated Bone Fragility, *Journal of the Endocrine Society*, Volume 9, Issue 9, September 2025, bvaf126

Nutrition required by developing fetuses and neonate

- 30 g calcium /20 g phosphorus /0.80 g magnesium
- About 80% of calcium is accreted during the **third trimester**, accelerating from 60 mg daily at week 24 to a peak rate of 300 to 350 mg daily in the final 6 weeks An average breastfed baby consumes
- ~780 mL of milk daily during its first 6 months for a maternal output of ~200 mg of calcium daily Between 6 to and 12 months of age, milk consumption falls to ~600 mL per day, for a maternal output of ~120 mg of calcium daily

Christopher S Kovacs, Pregnancy and Lactation Associated Bone Fragility, *Journal of the Endocrine Society*, Volume 9, Issue 9, September 2025, bvaf126

Physiological adaptations that influence bone loss during pregnancy and lactation



Physiological adaptations that influence bone loss during pregnancy and lactation

Period of life	Adaptation mechanisms	Effect	Bone loss?
Pregnancy	1-25 OH Vitamin D increase	Doubled-up intestinal absorption of calcium	No
	PTHrp increase	Mild bone resorption increase	
Lactation	Suckling>> HyperPRL>>(-) GnRH>> HypoE2	Increased bone resorption	Yes.
	PTHrp increase		

Investigation

initial investigations

- **Anthropometric** (Height, weight, BMI)
- **Biochemical & Hormonal** (Complete blood count, ESR Electrolytes, eGFR, calcium, phosphate, magnesium, alkaline phosphatase, 25-hydroxyvitamin D, TTG, and anti-endomysial Antibodies PTH, PTHrP, TSH, prolactin, (LH, FSH, estradiol while off hormonal, Urine 24-hour urine calcium, creatinine, and sodium)
- **Radiological** BMD by DXA, plain radiographs of thoracic and lumbar spine

Treatment

- Supplementation with 1500 mg of calcium daily from 20 weeks of gestation caused aBMD losses of ~7% in the lumbar spine and ~11% in the total hip vs placebo by 1 year postpartum
- For vitamin D, it remains arguable as to whether one should target a 25-hydroxyvitamin D (25OHD) level of >50 nmol/L or intake of 1200 IU of vitamin D without measuring the 25OHD level

Recovery From PLO With Calcium and Vitamin D Optimization

- In women with PLO a **spontaneous recovery** of aBMD also occurs, with the documented magnitude ranging **10% to 30%** in several series and as much as 70% in an individual case

- These observational data suggest the rationale to wait and assess the magnitude of spontaneous recovery after an interval of 12 to 18 months before deciding whether to use pharmacotherapy

Recovery of PLO With Pharmacotherapy

- Immediate use of pharmacotherapy for PLO may be justified for more severe or recalcitrant cases, such as multiple severe vertebral fractures or persistent disabling pain
- **Teriparatide** was the most commonly used anabolic agent and led to increases in aBMD of 8% to 37%, depending on the site and the timepoint of assessment

Why shouldn’t pharmacotherapy be used immediately?

- **First:** spontaneous recovery (calcium and vitamin alone) may return the aBMD to a level consistent with low risk of fracture, thereby obviating the need for pharmacotherapy
- **Second:** antiresorptive treatments, such as bisphosphonates and denosumab, reduce osteoclast activity and osteoblast activity, thereby blunt the anabolic phase of spontaneous postweaning skeletal recovery

Why shouldn’t pharmacotherapy be used immediately?

- **Third:** many women with PLO have not completed their reproductive plans, but the use of pharmacotherapy introduces concerns about teratogenic effects if a pregnancy occurs during treatment, or later in a woman whose skeleton is replete with bisphosphonates.
- **Fourth:** in reproductive age women, fracture risk should otherwise be low and bone mass stable despite prior fractures
- **Fifth:** all use of osteoporosis pharmacotherapy is off-label; none are approved for premenopausal women or during pregnancy and lactation

Comparing Pharmacotherapy to Spontaneous Recovery

- There are no randomized trials comparing osteoporosis pharmacotherapy to spontaneous recovery in women with PLO
- The recent meta-analysis analyzed all reports that included women who received pharmacotherapy or calcium and vitamin D alone. Recurrent fractures occurred in **12.9% of 428 women** with no differences among those who received calcium and vitamin D vs bisphosphonates or teriparatide
- Overall, it remains uncertain whether pharmacotherapy is superior to calcium and vitamin D alone to permit spontaneous post-weaning recovery

Orhadje E, Makaram N, Berg K, Hauser B, Ralston SH. Clinical presentation, risk factors and management of pregnancy- associated osteoporosis: a systematic review and meta-analysis. *Osteoporos Int*. 2025;36(6):981-993.

Surgical Therapy

- Vertebroplasty and kyphoplasty have been used to treat painful vertebral fractures from PLO; their efficacy is uncertain.
- Blinded randomized trials have found no superiority over sham surgery or medical approaches in older subjects.
- Consequently, these surgical approaches are not recommended.

Other Nonpharmacological Treatment

- Weight-bearing physical activity should be encouraged,
- any nutritional deficiencies should be corrected,
- other reversible causes of bone loss or fragility discovered during the workup should be treated wherever possible.
- Lifting and bending maneuvers should be temporarily avoided because these may precipitate more compression fractures or worsen prevalent fractures.

Other Non pharmacological Treatment

- Whether to **continue or stop breastfeeding** is a **personal decision** for the woman to make.
- Dogmatic approaches such as ordering that the woman wean her baby should be avoided.
- Breastfeeding may be encouraged to **at least 12 weeks postpartum** to optimize neonatal immunity through the transfer of maternal immunoglobulins.
- Women should be advised that further loss of aBMD and skeletal strength can be expected with continued exclusive or near-exclusive breastfeeding **over the first 6 to 12 months postpartum**.
- Some women choose to stop breastfeeding immediately whereas many others continue breastfeeding as originally planned for the sake of their baby’s health and other benefits of bonding.

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Management Suggestions

- optimize calcium and vitamin D intake
- correct reversible factors for bone loss
- encourage sensible weight-bearing activity
- provide facts so that women can make an informed decision about whether to wean the baby or not

Management Suggestions

- **DXA** should be repeated at **12 to 18 months** post-weaning to determine the extent of spontaneous recovery.
- If the response is considered insufficient, then pharmacotherapy may be given with a preference for **anabolic agents**.
- Immediate use of pharmacotherapy for PLO may be justified for more severe or recalcitrant cases, such as multiple severe vertebral fractures or persistent disabling pain. Again, the preference is for anabolic treatment over antiresorptive medications

Take Home Messages

- A final message is a reminder that although PLO can be severe, it is quite rare. The possibility of it developing should not scare women into avoidance of breastfeeding

- Parity and lactation do not increase the long-term risk of low bone mineral density, fractures, or osteoporosis.


THANK YOU
FOR YOUR
ATTENTION