



## Case Report

# A Case Report of Post-Pregnancy Osteoporosis Monitoring by means of REMS Technology

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#Equal contribution

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## Abstract

Pregnancy and post-pregnancy osteoporosis is a rare syndrome, which induce fragility fractures and severe back pain in the last few months of pregnancy and during the early postpartum period. This case report presents a 33-year-old Caucasian woman showing multiple vertebral collapses and persistent back pain. The severity of the problem is often overstated because of the rarity of the disease, and the diagnosis is frequently missed due to the avoidance of radiographic and densitometric examination during pregnancy, as well as the frequent attribution of back pain to other causes. In this context, Radiofrequency Echographic Multi-Spectrometry (REMS) technology might be an efficient method for the evaluation and monitoring of bone health status early in pregnancy as well as during and after delivery.

**Keywords:** Bone health status; Vertebral Fragility Fractures; Osteoporosis; Post-pregnancy; Postpartum spinal osteoporosis

## Introduction

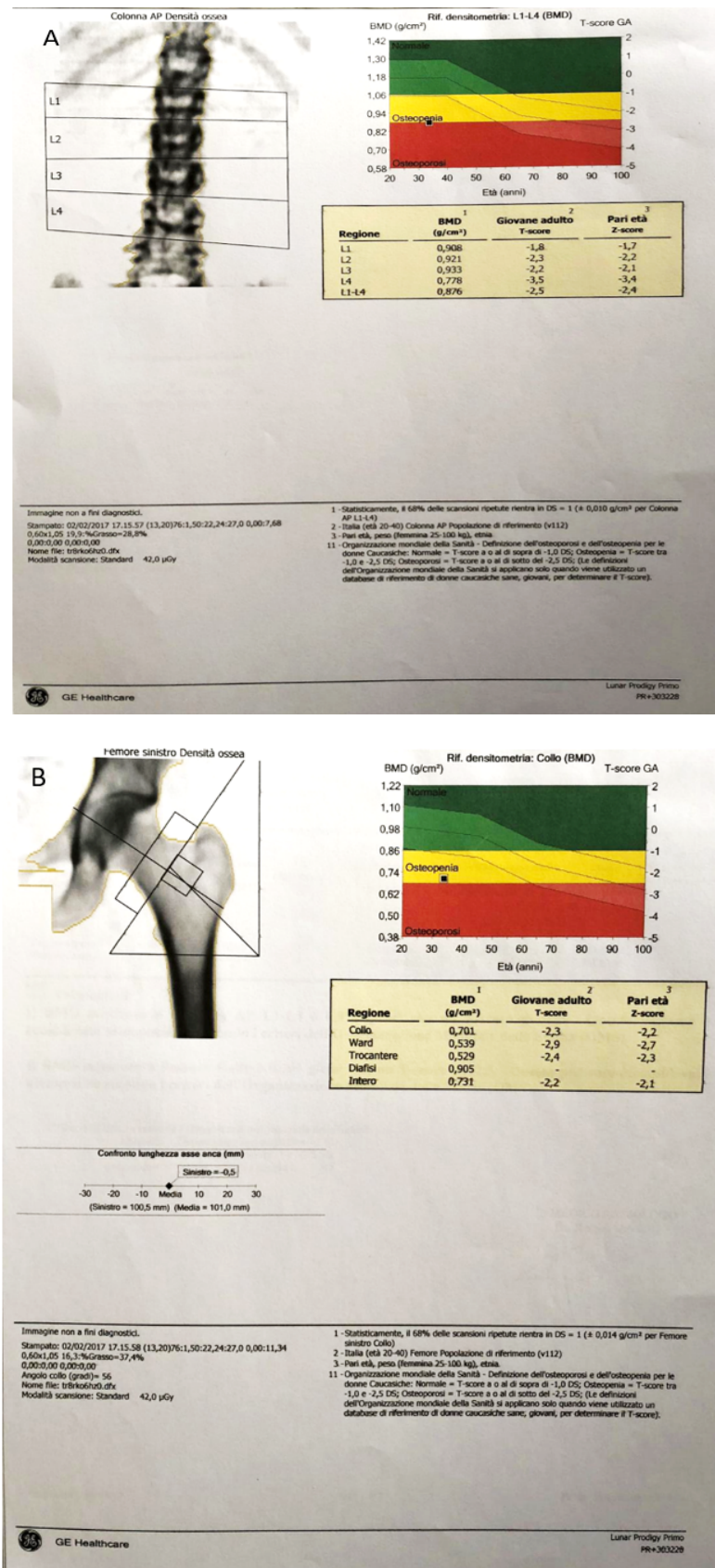
Pregnancy-associated osteoporosis (PAO) is a rare syndrome that affects women in the period between the last months of pregnancy and the early postpartum period [1]. In particular, the syndrome causes vertebral compression fractures and back pain, and leads to significant disability. The literature describes four types of osteoporosis attributed to pregnancy: idiopathic osteoporosis, transitory hip osteoporosis, [2] post-partum spinal osteoporosis (PPSO), [3] and lactation-related osteoporosis (PLO) [4]. The normal adaptive response during pregnancy and/or lactation allows adequate mineral transport to the fetus or newborn while protecting the maternal skeleton, however marked decreases in bone mineral density (BMD) are frequently observed [5]. Indeed, due to the increased fetal calcium needs during pregnancy, there is a high level of bone turnover throughout this time [6,7]. During pregnancy and especially in the third trimester, a woman must deliver an average of 30 g of calcium to her baby. During the third trimester about 80% or more of these amounts are delivered [6]. Although in these condition the loss of BMD is temporary

and following weaning bone density values usually return within 6 to 12 months [8]. Nevertheless pregnancy and post-pregnancy osteoporosis is observed in some women. The prevalence, etiology and exact pathogenesis underlying osteoporosis gravidarum, understood as a reduction in bone mass associated with one or more fragility fractures, are still not entirely clear. Unfortunately, due to the rarity of the disease, the severity of the issue is frequently understated and diagnosis overlooked, especially related to the avoidance of radiographic and densitometric examination during pregnancy, and the frequent attribution of back pain to other causes [3]. On the base of these considerations, the use of a non-ionizing technique, such as the Radiofrequency Echographic Multi-Spectrometry (REMS) technology [5], could prevent bone damage and improve the psychophysics health status.

## Case Presentation

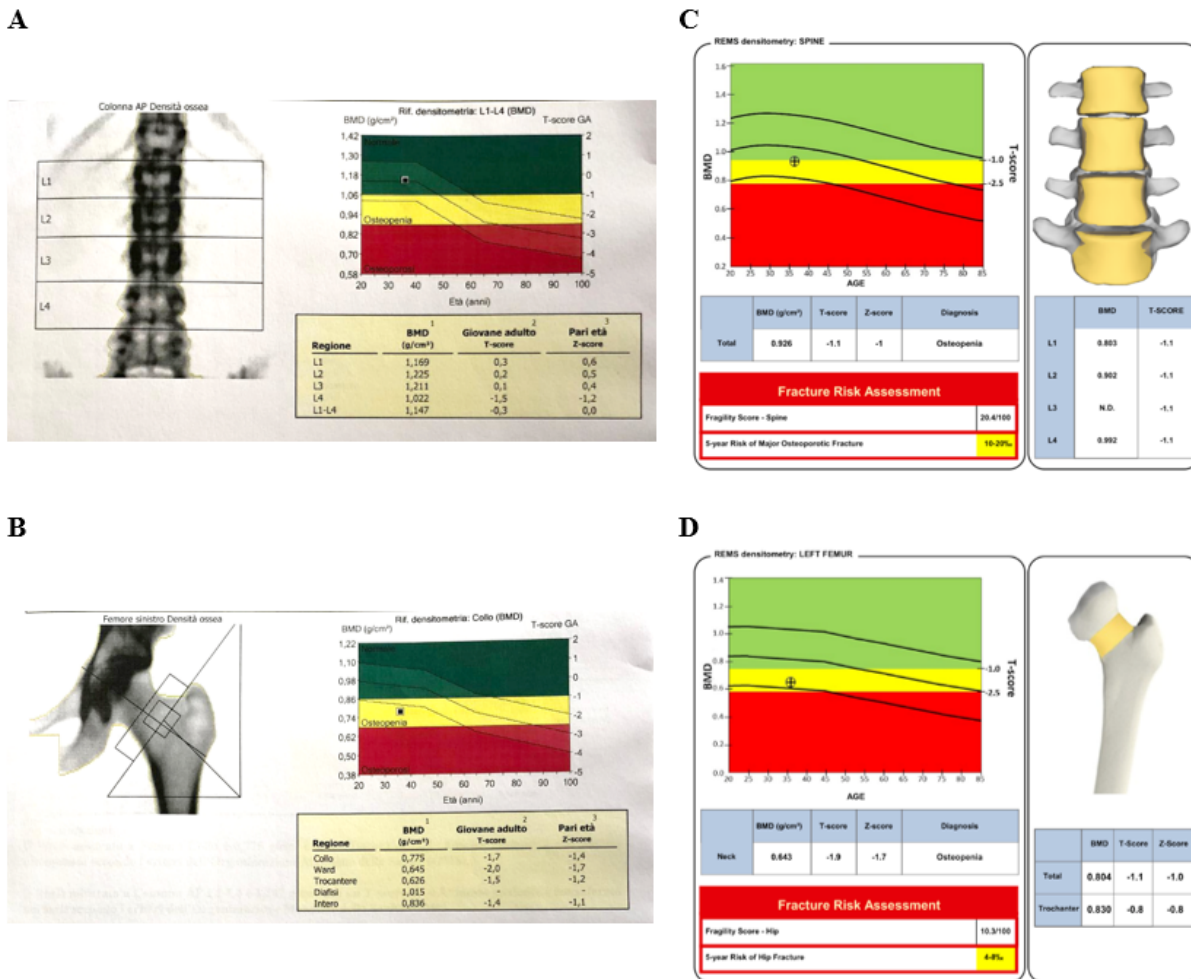
A 33-year-old Caucasian woman, who had previously been in good health and didn't have any conditions that were known to impair bone metabolism, started experiencing back pain after having her first baby. Due to persistent back pain, MRIs and X-rays of the spine were performed, which showed multiple vertebral collapses (D4, D7, from D9 to D12, from L1 to L5). The total blood count was within normal limits, blood calcium levels

were 9.57 mg/dl; parathormone levels were 34.9 pg/ml, all of which were within normal ranges, with the exception of the somewhat low level of 25-OH vitamin D (22.9 ng/ml) which was related to calcium metabolism. Nonetheless, high serum levels of erythrocyte sedimentation rate (ESR 56 mm/h) and alkaline phosphatase (ALP 349 U/l) were found, which indicated an inflammatory state and the presence of a disease that stimulates bone cell activity. Subsequently, an evaluation of the calcium content by Dual-energy X-ray absorptiometry (DXA) examination was recommended. Indeed, the BMD of the lumbar spine and the femoral neck measured with DXA (GE Lunar Prodigy) was markedly reduced (T-scores were -2.5 and -2.3, respectively) (Figure 1).



**Figure 1:** Initial DXA densitometry, which demonstrated a marked reduction in BMD at the (A) lumbar spine and (B) proximal femur in relation to the patient's age.

Subsequently, the rheumatology unit of the “A. Galateo” Hospital in San Cesario di Lecce (Lecce, Italy) was consulted and an in-depth clinical history evaluation was conducted to rule out potential causes for the numerous pathological fractures. Considering the symptoms and exam results the patient was diagnosed like case of PPSO. Therefore, the woman was advised to undergo drug therapy with teriparatide. The patient received treatment for 2 years and she returned to follow-up to evaluate the possibility of a second pregnancy. After two years follow-up, the patient had no symptoms and a BMD assessment was performed by means of two densitometry techniques, DXA and REMS. The scans were performed at the anatomical reference sites for bone health evaluation, lumbar spine and femoral neck. Both techniques showed an increase in BMD on either investigated anatomical sites due to the effect of the drug treatment administered: lumbar spine T-score was -0.3 and -1.1; while the femoral neck T-score was -1.7 and -1.9 for DXA and REMS, respectively (Figure 2). REMS detected a significantly lower BMD value at the lumbar spine in comparison to DXA, probably due to the known influence of vertebral fractures on BMD-DXA measurements [9-11].



**Figure 2:** follow-up densitometry by DXA (A-B) and REMS (C-D) after two years of teriparatide treatment.

## Discussion

The osteoporosis is widespread in adults over 50 years, though it can also affect younger age groups. Osteoporosis in young women induced by pregnancy and lactation is a relatively uncommon condition that Nordin and Roper originally identified as a clinical syndrome [12]. In this work, we describe a case report of a young mother with significant BMD decreased and multiple vertebral collapses, diagnosed during the postpartum period. PPSO is frequently observed during the first three months of the postpartum period, particularly after the first delivery; about 40% of the women affected by PPSO experience the symptoms in their last trimester. Back pain is one of the symptoms and it can lead to spinal compression fractures and deformity [3]. Lower thoracic and lumbar vertebrae

are the most frequently affected [13]. The main pathological cause of such substantial bone loss during the postpartum and lactation phase is still not well understood. Nevertheless, there are other risk factors, including inadequate nutrition, low calcium intake, family history, smoking, and corticosteroid use, which significantly raise the risk of PPSO [3,14]. The recommended course of treatment for PPSO entails abrupt cessation of nursing, calcium and vitamin D supplements, [4] calcitonin, bisphosphonates [15,16], strontium ranelate and teriparatide [17-19]. The importance of a more rigorous follow-up of back pain, BMD changes and risk of fracture during and after pregnancy is crucial in order to early detect pregnancy-related osteoporosis in young women. The early osteoporosis detection is crucial, as a significant correlation between the number of fractures at the time of diagnosis and the subsequent risk of further fractures is well documented [20,21]. In this context, REMS technology may represent an effective approach for both early pregnancy and post-partum evaluation and monitoring of the bone health status. In fact, in a previous study conducted on healthy pregnant women by REMS, a marked decline in BMD (8.1%) have been demonstrated compared to the non-pregnant counterpart [5]. In this specific situation, continuous monitoring during pregnancy and particularly in the last trimester with REMS would probably have protected the patient from suffering multiple vertebral collapses.

### Ethical Publication Statement

We attest that we have studied the Journal's position on issues involved in ethical publication and declare that our report complies with those guidelines.

### Authors Disclosure

Conceptualization, Validation, Data curation, Investigation and Writing – original draft: **Fiorella Anna Lombardi**, Data curation, Validation, Writing – review & editing: **Paola Pisani**, Writing – review & editing: **Francesco Conversano**, Data curation, Validation, Writing – review & editing: **Maurizio Muratore**, Writing – review & editing: **Marco Di Paola**, Conceptualization, Supervision, Writing – review & editing: **Sergio Casciaro**.

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