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Bone remodeling and bone mineral density during pregnancy

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Abstract *Introduction:* The effect of pregnancy upon the maternal skeleton is not fully understood. The information that has been gathered by recent studies is conflicting with regard to overall loss or gain of bone during pregnancy. The aim of the present longitudinal, controlled study, therefore, was to investigate the effect of pregnancy on lumbar spine, wrist, and hip bone mineral density, and to describe bone remodeling during pregnancy as indicated by biochemical markers of both bone resorption and formation. *Materials and methods:* Thirty healthy women (15 subjects seeking pregnancy and 15 non-pregnant controls) were studied. Bone mineral density (BMD) was measured by dual-energy x-ray absorptiometry before conception and within 2 weeks after parturition. Markers of bone resorption (urinary cross-linked type I collagen N-telopeptides, serum type I collagen C-telopeptides) and bone formation (total and bone specific alkaline phosphatase, osteocalcin), and total serum calcium were analyzed before, during (once in each trimester), and after pregnancy. *Results:* During

pregnancy, BMD decreased significantly by $3.4 \pm 4.1\%$ at the lumbar spine and $4.3 \pm 3.9\%$ at the trochanter, while there was a slight but significant increase in BMD at the proximal 1/3 of the forearm ($1.3 \pm 1.9\%$). Total hip and femoral neck BMD did not change significantly, nor did total and ultradistal forearm BMD. Bone resorption increased during pregnancy with peak levels in the third trimester (N-telopeptides) or post partum (C-telopeptides), respectively. The increase in bone resorption was accompanied by a significant decrease in serum calcium in the third trimester. Markers of bone formation showed a biphasic pattern with decreases from baseline to the first (total and bone specific alkaline phosphatase) or second trimester (osteocalcin), respectively, followed by a significant increase in the third trimester and post partum. There was no change in any parameter in the control group throughout the study. *Conclusion:* In conclusion, pregnancy is characterized by high bone turnover with resorption preceding formation. During the first and second trimester bone remodeling is uncoupled. Serum calcium decreases as bone resorption peaks in late pregnancy. There are significant decreases in bone mineral density at sites rich in trabecular bone, such as the lumbar spine and the trochanter.

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Introduction

The effect of pregnancy upon the maternal skeleton has preoccupied the scientific medical community for some decades. The most important question in this regard is whether women lose bone during pregnancy, and if so whether numerous births predispose a woman to osteoporotic fractures. Earlier work suggested that the maternal skeleton stores calcium during pregnancy, perhaps to meet the calcium demands during nursing [7]. There are longitudinal studies that have looked at bone mass