

HIGHER EXPRESSION OF RANKL IN OSTEOPOROSIS THAN IN OSTEOARTHRISIS

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BACKGROUND AND OBJECTIVES

Receptor activator of nuclear factor- κ B ligand (RANKL) is a recently discovered key regulator of osteoclast formation and bone resorption. RANKL is expressed by osteoblast/stromal cells and acts by binding to receptor activator nuclear factor- κ B (RANK), which is expressed on osteoclast precursors and mature osteoclasts. Deletion of RANKL gene in mice resulted in severe osteopetrosis and a complete lack of osteoclasts, while parenteral administration of RANKL resulted in severe osteoporosis.

The aim of the present study was to compare the expression of RANKL mRNA in bone tissue from patients with osteoporosis and osteoarthritis and examine its association with bone mineral density (BMD).

PATIENTS AND METHODS

Patients

84 male and female patients undergoing total hip arthroplasty due to osteoarthritis (56 patients, aged 34-80 years) or osteoporotic femur fracture (28 patients, aged 53-90 years).

Measurement of bone mineral density (BMD)

BMDs at femoral neck and total hip were measured by dual X-ray absorptiometry (DEXA) (Lunar alpha).

RNA extraction and quantification of RANKL mRNA

Total RNA was extracted from bone samples obtained from clinical waste generated during routine surgery for arthroplasty using Trizol reagent (Life Technologies).

10 ng of total RNA was reverse transcribed with High-Capacity cDNA Archive Kit (Applied Biosystems).

mRNA for RANKL was quantified with TaqMan real-time PCR assay (Assay on Demand, Applied Biosystems) on ABI Prism 7000 (Applied Biosystems). Levels of RANKL were normalised to glyceraldehyde-3-phosphate dehydrogenase (TaqMan GAPDH control reagents, Applied Biosystems).

RESULTS

Patients with osteoarthritis had higher BMD of the total hip and femoral neck than those with osteoporosis (Figure 1).

Expression of RANKL was higher in patients with osteoporosis than in those with osteoarthritis (Figure 2).

However, no association of RANKL expression with BMD of either the total hip or femoral neck in the whole group of patients could be demonstrated (Figures 3a and 3b).

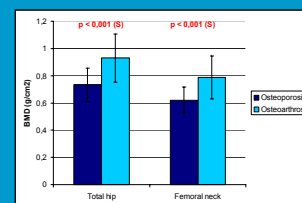


Figure 1: Comparison of bone mineral density (BMD) values between patients with osteoporosis and patients with osteoarthritis.

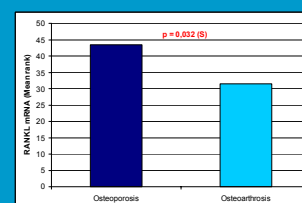


Figure 2: Expression of RANKL mRNA in patients with osteoporosis and in patients with osteoarthritis.

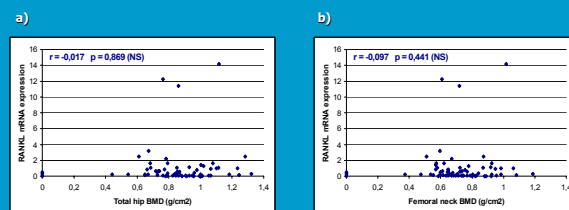


Figure 3: Correlation of RANKL mRNA expression with bone mineral density (BMD) values in the whole group of patients a) total hip BMD, b) femoral neck BMD.

CONCLUSIONS

Higher expression of RANKL in the bone tissue of patients with osteoporosis compared with those with osteoarthritis confirms the important role of RANKL in the control of bone resorption.

Lack of association of RANKL expression with BMD could be the consequence of other factors, contributing to the regulation of bone remodelling, especially osteoprotegerin (OPG), which is the natural RANKL antagonist.

It would be interesting to determine the expression of OPG and to examine the association of the RANKL/OPG ratio with BMD.