SAT0061 THE APPEARANCE TIME OF PERIPROSTHETIC BONE FORMATIONS AROUND A CEMENTLESS TITANIUM STEM IN TOTAL HIP ARTHROPLASTY IS DEPENDENT ON INTRAMEDULLARY CANAL FILL AND SHAPE OF PROXIMAL FEMUR

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Background After insertion of cementless stem, new bone formation arise around stem. This bone formation is classified as follows, proximal endosteal bone bridging (spot welds: SW), increased cortical thickness (cortical hypertrophy: CH) and distal intramedullary new bone formation (pedestal: PD) in radiographically. These osteogenesis patterns depend on implant design, material, and mode of porous coating. However, there are no reports concerning about the influence of stem intramedullary canal fill, canal shape, and bone structure of proximal femur on periprosthetic bone remodelling.

Objectives The purpose of this study was to clarify whether there are relationships between sequential changes of periprosthetic bone remodelling and radiographic variables such as intramedullary canal fill, femoral canal shape, and bone structure.

Methods Between 1993 and 1998, 57 primary cementless total hip arthroplasties (THAs) were performed with Mallory-Head titanium femoral component in 50 patients of osteoarthritis. The average age at the time of operation was 58 years old. The mean duration of follow-up was 5.2 years. Anteroposterior radiographs of the hip were made at 6 weeks, 3 months, 6 months, 1 year and every year after the operation. We evaluated the frequency and time of new bone remodelling around the stem. Canal shape was converted to numerical value by using calcar to canal isthmus ratio (CC ratio) of Dorr. The large CC ratio indicates a cylindrical shape and the small value reveals funnel shape of proximal femur. Also intramedullary canal fill was measured. Radiographic signs of stem instability were defined as progressive subsidence and radiolucent or radiodense line around the porous coating surface.

Results SW appeared in all case within a year. At the time of 3 months, proximal canal fill in 40 cases with spot welds was 77% and it was significantly larger than 72% in 17 cases without SW. CH began to appear after 6 months and it was found in 30 cases (53%) after 1 year. PD appeared in 52 cases (91%) after 1 year. The presence rate of SW, CH, and PD at final follow up period did not depend on proximal and distal canal fill. After 6 months, CC ratio of 16 cases with CH was 54% and it was significantly larger than 46% of 41 cases without CH. The appearance of SW and PD did not depend on CC ratio. Radiographic signs of stem instability were not found during follow up period in all cases.

Conclusion The time of spot welds appearance is earlier in cases with large proximal canal fill. Cortical hypertrophy appeared earlier in cases with cylindrical canal shape rather than funnel shape. However, the appearance rates of new bone formations around cementless stem are not dependent on intramedullary canal fill, shape of proximal femur, and bone structure.

SAT0062 THE ROLE OF OSTEOCLAST FORMATION IN THE PATHOGENESIS OF OSTEOPOROSIS IN RHEUMATOID ARTHRITIS

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Background Rheumatoid arthritis (RA) is a systemic inflammatory disorder in which there is destruction of articular cartilage and bone. RA may be complicated by osteoporosis, but the cause of this generalised bone loss is not known. Bone resorption is carried out by osteoclasts which are formed from mononuclear precursors that circulate in the monocyte fraction.

Objectives Our aims are to determine whether there is an increase in the number of circulating osteoclast precursors in RA patients relative to age/sex matched osteoarthritis (OA) controls. We also examined the sensitivity of these precursors to known factors required for osteoclastogenesis.

Methods Peripheral blood mononuclear cells (PBMCs) from 10 RA patients and 10 age/sex matched OA controls were cultured on dentine slices and glass coverslips for up to 21 days in the presence of various concentrations of soluble RANKL (sRANKL) and M-CSF, or in the presence of RANKL-expressing UMR106 cells with various concentrations of M-CSF and 1,25(OH)₂ vitamin D₃. Cells were cultured with and without dexamethasone (Dex) at 10⁻⁸M.

Results As assessed by expression of the osteoclast markers, TRAP and lacunar resorption, PBMC serial dilution studies showed no difference in the number of circulating osteoclast precursors in RA patients and OA controls. However, osteoclasts formed from PBMCs of RA patients were capable of substantially more resorption than osteoclasts formed in OA patients ($p = 0.008$). PBMCs from RA patients exhibited increased sensitivity to the osteoclastogenic effect of M-CSF when cultured with sRANKL ($p = 0.004$) or with UMR106 cells ($p = 0.05$). When cultured with UMR106 cells, an increase in sensitivity to 1,25(OH)₂D₃ ($p = 0.02$) was noted in RA patients compared to OA controls. PBMCs from RA patients also showed increased sensitivity to the effect of sRANKL. PBMCs from both RA ($p = 0.001$) and OA ($p = 0.001$) patients cultured in the presence of Dex exhibited significantly more lacunar resorption than cultures to which no Dex was added.

Conclusion These findings suggest that the increase in generalised bone loss seen in RA results not from an increase in the absolute number of circulating osteoclast precursors but to an increase in the sensitivity of these precursors to local/systemic factors (i.e. M-CSF, RANKL, 1,25(OH)₂D₃ and corticosteroids) that influence osteoclast formation and bone resorbing activity.

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