INTRODUCTION

The aim of this experimental study was to evaluate the development of biochemical resorption markers during the fracture healing in patients with osteoporotic fractures of the proximal femur. Biochemical bonemarkers have been known for several years now, but they were mainly used to diagnose and follow-up metabolic bone diseases. Recently, first attempts were made to evaluate the fracture healing with the help of biochemical bonemarkers, but a possible osteoporosis in the patient was never taken into account.

METHODS

This prospective, explorative follow-up study included 33 patients who sustained a fracture of the proximal femur and 25 control persons inpatients. In patients, we recruited individuals with a fracture of the distal forearm to compare two typical osteoporosis-associated fracture locations. The concentration of the biochemical resorption markers N-terminal telopeptide (NTx), Desoxypyridinoline (D-Pyr) and Pyridinoline (Pyr) were measured in the first urine spot preoperatively and at day 2, 4, 10 and 14 postoperatively. Further the Bone Mineral Density (BMD) of the lumbar spine was determined in all patients with the quantitative Computed Tomography (qCT) to diagnose osteoporosis. Significance was assigned where p<0.05. Data sets were analyzed using the MANOVA with repeated measurement, individual groups were compared with the U-Test of Mann-Whitney, and correlations were described with Pearson’s coefficient.

RESULTS

Among the 33 study patients with a proximal femur fracture were 60% women and 40% men, an osteoporosis was diagnosed in 90% of all the patients, while only 10% showed a normal bone density. We found a positive correlation between age and bone mineral density (BMD) in both sexes (female p=0.002; men p=0.01). It was noticed that pertochoaneric fractures were more common with 64% than femoral neck fractures with 36%. Looking at the fracture classification systems a preponderance of high-grade fractures was visible in females with femoral neck fractures.

A statistically significant increase was found in the three measured biochemical resorption markers NTx, D-Pyr and Pyr during the observing period of 14 days of fracture healing (p<0.001). Because of the small number of patients included in this study there was no significant difference between the subgroups found, but clear trends. Patients suffering from osteoporosis had higher concentrations of resorption markers (especially NTx) than non-osteoporotic patients during the first time of fracture healing, and female patients showed a higher increase of biochemical markers than men. Patients who sustained a pertochoaneric femur fracture had higher concentrations of biochemical markers than patients with a femoral neck fracture. Women with a fracture of the proximal femur showed higher concentrations of resorption markers than women who sustained a fracture of the distal forearm. Furthermore we found higher concentrations of the resorption markers in patients who underwent a cemented total hip replacement than in patients with an uncemented implantation of the prosthesis.

DISCUSSION

According to the literature, mainly women (60%) sustained a fracture of the proximal femur. Interestingly, 90% of the patients suffered from osteoporosis, again with a preponderance of females. In consequence, it was hard to verify a significant difference between patients with and without osteoporosis concerning biochemical bonemarkers. But since this was an explorative study, the main target was not to find significances but trends. And those were clearly found.

With only 10% of the patients with a normal Bone Mineral Density one can conclude that a fracture of the proximal femur is mostly associated with osteoporosis. Since in 85% of the male patients an osteoporosis was diagnosed its concludable that men suffer from reduced Bone Mineral density too and so sustain associated fractures. Due to the prevailing of bone resorption we found a negative correlation between age and Bone Mineral Density in both sexes.