Osteoarthritis is characterised by deterioration of articular cartilage and formation of new bone at the joint surfaces and margins. The development of bone tissue changes in osteoarthritis indicates differences in local bone remodeling. The advanced stage of hip osteoarthritis may be surgically treated by hip replacement.

The aim of this study was assessment of bone turnover by histomorphometric analysis of the three areas from the osteoarthritic femoral head removed during hip replacement: preserved articular cartilage, exposed subchondral bone and osteophyte.

This study comprised 23 patients (10 males, 13 females) aged 55-65 years undergoing hip replacement surgery. Bone specimens (approx. 1 cm$^3$) were removed from the femoral head, embedded in resin (methyl methacrylate compound) and sections stained with toluidine blue for static histomorphometric parameters. Histomorphometry was performed by semi-automated method using Vamstec (Zagreb) software under magnification x100. Measurements were performed and parameters calculated according to the recommendations of the American society for bone and mineral research: bone volume (BV/TV, %), osteoblast surface (Ob.S/BS, %), osteoid thickness (O.Th, um), osteoclast surface (Oc.S/BS, %), trabecular thickness (TbTh, um), trabecular separation (TbS, um), trabecular number (TbN, n/mm$^2$) and number of osteoclasts (NOC, n/mm). As the reference data for histomorphometric measurements exist only for biopsies obtained at the iliac crest, the obtained results were compared between sexes and locations.

Higher values in men than in women were found for bone volume (BV/TV; p<0.04) and osteoclast number (NOC; p<0.002) in the preserved cartilage area, and also for osteoblast surface (ObS/BS; p<0.006) in the osteophyte area. Difference in histomorphometric parameters between sampling locations indicated better bone structure in areas of preserved cartilage in comparison to osteophytic bone: higher BV/TV (p<0.001), TbTh (p<0.02), TbN (p<0.008), ObS (p<0.02) and less TbS (p<0.0005).

Bone structure as assessed by histomorphometry differs in the femoral head osteoarthritis depending on local degenerative processes. Better bone tissue traits, mostly structural indices, were related to less advanced osteoarthritic changes i.e. located in areas of preserved articular cartilage, and reduced bone characteristics were found in the osteophyte area. Sex differences were observed for bone volume and some cellular indices, but not in all examined areas. In conclusion, variations of bone structural and cellular indices of advanced osteoarthritis of the femoral head are related to differences of bone degenerative processes in this disease.

References:


