

Relation Between Bone characteristics and Hip Osteoarthritis in a Cohort of Post-menopausal Women: The QUALYOR Study

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Background: Hip osteoarthritis (OA) is a major public health concern. The determinants of hip OA, however, are not as well understood as those of other OA sites, such as the knee. In recent years, the role of subchondral bone in the pathogenesis of OA has been emphasized but data are lacking in hip OA. Therefore, we aimed to determine what bone characteristics were associated to hip OA.

Methods: We have made a cross-sectional analysis of 1537 post-menopausal women included in the QUALYOR prospective cohort. At baseline, we measured areal BMD by DXA at the lumbar spine and the hip, hip volumetric BMD and geometry by quantitative computerized tomography (QCT) scan using the Bone Investigational Toolkit (BIT) software, as well as microarchitecture at the distal radius and tibia by high resolution peripheral quantitative tomography (HRpQCT). We built a hip OA score (CT OA score) with images from the hip CT, based on the depiction of the four major signs of osteoarthritis: subchondral bone sclerosis, joint space narrowing, osteophytes and subchondral cysts. The severity of each of these four signs was graded as absent, mild, moderate or severe (semi-quantitative score ranging from 0 to 3 for each sign) in three different regions of the hip, leading to a total score ranging from 0 to 36. Women were followed-up during five years and we have prospectively assessed the onset of osteoporotic fractures. Women with and without hip OA were compared using t tests and multivariable modeling.

Results: The mean age was 65.9 and the mean body mass index was 24.6. Among these 1537 women, 601 had an OA score of 0; 756 between 1 and 4 (mild OA); and 180 greater than 4 (severe OA). Women with hip osteoarthritis had lower trabecular hip BMD (125 vs 129, $p < 0.01$). Cortical hip BMD did not differ between women with and without hip OA (966.5 vs 963.5, p n.s). Patients with hip OA also had larger femoral neck volume (11.55 vs 11.27, $p < 0.001$). Only small differences in trabecular bone were observed in peripheral bone microarchitecture between hip OA patients and non-OA individuals. The BIT analysis showed greater bone resistance to bending (CSMI min with 6.03 vs 5.6 and Z polar with 7.98 vs 7.59, $p < 0.05$) at the femoral neck in patients with hip OA. These differences were greater in patients with higher OA CT scores compared to patients without hip OA. Of note, during the five years of follow-up, women with hip OA compared to those without had higher osteoporotic fracture risk, with OR = 1.47 CI95% [1.03-2.09] $p < 0.05$ and for hip fracture specifically OR = 0.32 CI95% [0.06-1.6] p n.s ($n=6$).

Conclusion: Women with hip OA have larger femoral neck and lower trabecular bone parameters, suggesting a sizeable role of bone geometry and remodeling in the pathophysiology of hip OA.

Keywords : Hip osteoarthritis, subchondral bone, micro-architecture, QCT