Difference of the femoral morphology and bone mineral density between patients with hip OA and patients with hip fractures

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Introduction

An inverse association between the risk of osteoarthritis (OA) and osteoporosis has been described in several papers. Patients with OA of any joints had been reported to have a reduced risk of hip fracture. Others noted that elderly woman who reported a history of osteoporotic fracture had decreased scores for hand OA. The bone mineral density (BMD) in the upper femur was reported to be negatively associated with the presence and severity of hip OA. Increased bone mineral density with hip OA might protect against osteoporosis and fractures. Patients with hip OA, however, have an increased risk of fall which is one of the main causal factors for hip fractures in elderly people with osteoporosis. The causes of hip fractures are multi-factorial and various differences in morphology of the hip and patterns of osteoporosis in the femur between patients with hip OA and patients with hip fractures may affect the risk of hip fractures.

The purpose of this study was retrospectively to investigate differences in the femoral morphology and BMD between patients with hip OA and patients with proximal femoral fractures using computed tomography (CT).

Materials and methods

Twenty-two elderly patients with severe unilateral hip OA and twenty three elderly patients with a proximal femoral fracture and a normal contralateral hip were the subjects of this study. The patients with hip OA (OA group) were all females, with a mean age of 75.7 years (range; 71-91 years). The patients with fractures (Fx group) also comprised all females, with a mean age of 78.2 years (range; 70-84 years). There is no significant difference in age between the two groups. Body mass index (BMI) of OA group is 23.1±0.06 and 21.0±2.7 in Fx group.

CT images of the bilateral femora including the pelvis and the knee were taken in all of the subjects. A phantom for the density reference was used for twelve of the patients with hip OA and all patients with fractures. The phantom consisted of five chambers containing different concentrations of hydroxyapatite (0, 50, 100, 150, and 200 mg/cm³). The phantom was placed under the buttock to encompass the region from the femoral head to the lesser trochanter. BMD of the trabecular bone was measured on the reconstructed images perpendicular to the femoral neck axis through the center of the femoral head (Head) (Fig. 1A), the minimum femoral-neck cross-sectional area (Neck) (Fig. 1B), and the inter-trochanteric region (IT) (Fig. 1C). In Fx group, the images of the contra-lateral femur were used for measurements.

Results

BMD of the trabecular bone was not significantly different between the contralateral hips in Fx group and either the ipsi-lateral hips in OA group, or the contra-lateral side in OA group except BMD at the femoral head. (Table 1) The results of morphologic parameters are shown in Table 2. There were significant differences in NSA and medial offset between the hips in Fx group and either the ipsi-lateral hips in OA group, or the contra-lateral side in OA group.

Discussion

Severity of OA has been reported to correlate BMD. In our study, however, there were no differences in BMD at the femoral neck and intertrochanteric region between OA group and Fx group. On the other hand, the hip lever arm related parameters such as the medial offset and NSA in OA group were significantly smaller than those in Fx group. It has been reported that morphologic parameters that represent the hip lever arm are markers of the ability of the hip to absorb impact; a longer lever arm increases the risk of fracture on impact. Therefore, the morphologic factors may be more important in the risk of fractures than BMD. In conclusion, morphologic differences to affect the risk of fractures such as the medial offset and NSA were more apparent than BMD differences between patients with hip OA and patients with hip fractures.

References

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