HIP ARTHROPATHY IN LONG-TERM (20 OR MORE YEARS) HEMODIALYSIS PATIENTS

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Introduction
Hemodialysis (HD) has improved the survival rate of patients with chronic renal failure in recent years, as a result of which HD-associated amyloidosis has become one of the most serious complications in these patients. Beta-2-microglobulin is major component of HD-associated amyloidosis. This insoluble proteinaceous material is not filtered by standard HD and is difficult to remove once deposited in tissue. The deposits of amyloid in the bone can lead to pathological fracture; this is especially true in the femoral neck. However, radiological assessment of the hip joint in long-term HD patients is scarce. In the current study we describe the hip joint radiographic findings in 18 patients who have been undergoing HD for 20 or more years.

Materials and Methods
We retrospectively reviewed 18 patients on HD for 240 or more months due to chronic renal failure in the outpatient clinic of our institution in 2003. There were 10 males and 8 females. Their mean age was 56.4±9.3 (mean±SD) years (range, 43-83 years) and the mean duration of HD was 285.9±45.6 months (range, 240-380 months). Patients’ underlying renal diseases causing uremia were glomerulonephritis (n=18). None of the patients had undergone corticosteroid treatment before or during HD and none had a history of parathyroidecetomy. Estrogen therapy and oophorectomy have not been performed in the female patients. HD treatment was performed three times weekly, 3-5 hours per treatment. Cuprophan membranes were used during hemodialysis for each patient. Dialysis fluid contained 2.5mEq/L calcium and 1.5mEq/L magnesium, without contamination by aluminum; however, heparin (2500-6500 units) was routinely administered during dialysis. In addition to cardiac and antihypertensive therapy, patients received oral calcitriol and CaCO3 adjusted to keep serum calcium concentration between 8.5 and 10.5 mg/dl and serum phosphorus concentration lower than 7.0mg/dl. All patients suffering from renal anemia were intravenously given erythropoietin (1500-3000 units) with every dialysis to maintain hematocrit at about 30%. The anteroposterior hip joint roentgenograms were evaluated for the presence of bone cysts and joint space narrowing (1). Cystic lesions were defined as lucent lesions larger than 3 mm in size with a surrounding sclerotic margin, and joint space narrowing was defined as concentric narrowing of more than 2 mm. Bone mineral density (BMD) of the distal 1/3 of the radius was measured by a technician using DXA (DCS 600 EX; ALOKA) (Osaka, Japan). The in vitro coefficient of variation of the DCS 600 EX was 0.89% at the distal 1/3 radius. Serum levels of total calcium (Ca), phosphorus (P), and alkaline phosphatase (Alp), intact parathyroid hormone (PTH), and beta-2-microglobulin (BMG) were measured. All blood samples were collected between 8 AM and 11 AM before HD.

In addition, a histological study was performed on 6 patients who underwent hip arthroplasty. Bone and soft-tissue specimens were sectioned and stained with hematoxylin and eosin and Congo red in order to detect amyloid deposits. Demographic parameters, BMD values, and biochemical variables were expressed as mean±SD. Demographic parameters included age at the time of the study, duration of HD, and BMI. Biochemical variables included serum levels of Ca, P, Alp, PTH, and BMG.

Results
Bone cysts were found in 12 patients (67%) and joint space narrowing was found in 4 patients (22%). The radiographic abnormalities were frequently bilateral in bone cysts (82%) and joint space narrowing (92%). The mean BMD and BMG values were 19.9g/m² and 0.462 g/cm³, respectively. The mean values of Ca, P, Alp, PTH, and BMG were 4.4mEq/L, 6.7mg/dl, 294.1IU/L, 12.9pg/ml, and 39.2 µg/ml, respectively. BMG was significantly high (normal range, 0.7-3.0µg/ml), with other values being within normal limits. Hip arthroplasties were performed in 6 patients (33%) suffering from femoral neck fracture associated with bone cysts (4 patients) and joint space narrowing (2 patients). At operation, their mean age was 56 years, with the mean duration of HD being 217 months. All of 4 femoral neck fracture patients showed marked bone loss (mean 0.371 g/cm²). Histological examination revealed that large amounts of amyloid were deposited in the capsule as masses of amorphous material. Amyloid deposition was also demonstrated in the bone cysts and the area of insertion of the capsule on the femoral neck and synovial membrane.

Discussion
In patients on HD due to end-stage chronic renal failure, the musculoskeletal structures are frequently implicated with major alterations, including affected joints, tendons, bones, and soft tissues. Amyloid arthropathy is one of the most significant complications. Little information, however, is available of the radiological assessment of hip joint in long-term HD patients. We previously reported a study in 56 consecutive patients from outpatient clinic of our institution (1). Of 36 patients on less than 10 years HD, 6 patients (17%) revealed bone cysts in hip joint and 6 patients (17%) revealed joint space narrowing. Of 20 patients on more than 10 years HD, 11 patients (55%) demonstrated bone cysts and 3 patients (15%) demonstrated joint space narrowing. In the current study, of 18 patients on 20 years or more HD, 12 patients (67%) demonstrated bone cysts and 4 patients (22%) demonstrated joint space narrowing. Bone cysts seem to increase on long-term HD (17% in less than 10 years vs 67% in 20 years or more). Regarding BMD, a significant bone loss (mean 0.462 g/cm³) was found in long-term HD patients in the current study, which was consistent with other reports. In this study, 4 patients with femoral neck fractures had large bone cysts. All of 4 femoral neck fracture patients evidenced significant BMD decrease (mean 0.371 g/cm³). In the current study, hip arthroplasties were performed in 6 patients suffering from femoral neck fracture due to bone cysts (4 patients) and joint space narrowing (2 patients). A high mortality rate and a high early complication rate of total hip arthroplasty in HD patients have been published. Thus, we should take care for preventive measures in order to avoid hip arthroplasty resulting from femoral neck fracture and joint space narrowing. Biochemical variables disclosed that mean values of serum BMG was significantly high, with mean values of serum Ca, P, ALP, and PTH being within normal limits. Histological findings revealed that amyloid deposition in the capsule and bone cysts, which was consistent with previous reports. In conclusion, 16 out of 18 patients (89%) on long-term HD showed hip joint alterations such as bone cysts, and joint space narrowing, which are resulting in hip arthroplasty. One of the major risk factors seems to be amyloid deposition, which was associated with significantly high level of BMG in serum.

Reference

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