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Change of Bone Density with Treatments of Intravenous Zoledronic Acid in Patients with Osteoporotic Distal Radial Fractures

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Abstract : Purpose: Osteoporotic fractures are an important among postmenopausal women. When osteoporotic distal radial fractures occur, osteoporosis must be treated to prevent the hip and spine fractures. Intravenous injection of Zoledronic acid is expected to improve preventing osteoporotic fractures. Many articles reported the effect of intravenous Zoledronic acid to BMD of the hip and spine fracture or non-fracture patients with low BMD. However, that with distal radial fractures has rarely been reported. Therefore, the authors decided to study the effect of Zoledronic acid in BMD score, bone union, and bone turnover markers in the patients who underwent volar plating due to osteoporotic distal radial fractures. Materials: From April 2018 to May 2022, postmenopausal women aged 55 years or older who had osteoporotic distal radial fractures and who underwent surgical treatment using volar plate fixation were included. Zoledronic acid (5mg) was injected intravenously between 3 and 5 days after surgery. BMD scores after 1 year of operation were compared with the initial scores. Bone turnover markers were measured before surgery, after 3 months, and after 1 year. Radiological follow-up was performed every 2 weeks until the bone union and at 1 year postoperatively. Clinical outcome indicators were measured one year after surgery, and the occurrence of side effects was observed. Result: Total of 23 patients were included, with a lumbar BMD T score of -2.89±0.2 before surgery to -2.27±0.3 one year after surgery (p=0.012) and a femoral neck BMD T score of -2.45±0.3 before surgery to -2.36±0.3 (p=0.041) after one year, and all were statistically significant. Measured as bone resorption markers, serum CTX-1 was 337.43±10.4 pg/mL before surgery, 160.86±8.7 pg/mL (p=0.022) after three months, and 250.12±12.7 pg/mL (p=0.031) after one year. Urinary NTX-1 was 39.24±2.2 ng/mL before surgery, 24.46±1.2 ng/mL (p=0.014) after three months and 30.35±1.6 ng/mL (p=0.042) after one year. Measured as bone formation markers, serum osteocalcin was 13.04±1.1 ng/mL before surgery, 8.84±0.7 ng/mL (p=0.037) after 3 months and 11.1±0.4 ng/mL (p=0.026) after one year. Serum bone-specific ALP was 11.24±0.9 IU/L before surgery, 8.25±0.9 IU/L (p=0.036) after three months, and 10.2±0.9 IU/L (p=0.027) after one year. All were statistically significant. All cases showed bone union within an average of 6.91±0.3 weeks without any signs of failure. Complications were found in 5 out of 23 cases (21.7%), such as headache, nausea, muscle pain, and fever. Conclusion: When Zoledronic acid was used, BMD was improved in both the spine and femoral neck. This may reduce the likelihood and subsequent morbidity of additional osteoporotic fractures. This study is meaningful in that there was no difference in the duration of bone union and radiological characteristics in patients with distal radial fractures administrated with intravenous BP early after the fractures, and improvement in BMD and bone turnover indicators was measured.

Keywords : zeoldreonic acid, BMD, osteoporosis, distal radius
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