Impact of Anti-Resorptive and Anabolic Therapies on Bone Mineral Density in Osteoporotic Patients: A Comparative Dual-Energy X-ray Absorptiometry Analysis

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INTRODUCTION: Osteoporosis-related bone quality can significantly influence surgical outcomes in spine procedures. While pharmacologic therapies such as anti-resorptive and anabolic agents are standard in osteoporosis management, their direct effects on bone mineral density (BMD) changes over time remain variably reported. This study aims to quantify the changes in BMD via serial dual-energy X-ray absorptiometry (DEXA) scans in patients with and without such treatment.

METHODS: We retrospectively reviewed 72 patients undergoing spinal fusion who had pre- and post-operative DEXA scans spaced ≥12 months apart. Patients were stratified using pharmacologic therapy (e.g., bisphosphonates, denosumab, teriparatide, etc.). T-scores at the hip, femoral neck, radius, and lumbar spine were collected. ΔDEXA (change from baseline) was the primary outcome. Between-group comparisons were made using t-tests, with $p<0.05$ considered significant.

RESULTS: Patients receiving pharmacologic therapy (n=38) had significantly lower baseline femoral neck T-scores ($p<0.001$) and hip T-scores ($p=0.002$) compared to controls (n=34). Postoperatively, femoral neck scores remained lower in the treatment group ($p=0.002$), and ΔDEXA at the femoral neck did not differ significantly between groups ($p=0.093$). However, treated patients showed significant improvement in ΔDEXA at the hip ($p=0.04$) and lumbar spine ($p=0.015$). No significant difference was found at the radius. There were no significant differences in intraoperative, postoperative complication and reoperation rates. BMI was lower in the treated group ($p=0.017$), and fewer patients received live cell biologics in the treatment group ($p=0.03$).

DISCUSSION AND CONCLUSION:

Although femoral neck T-scores improved modestly in the treated group, the difference was not statistically significant. However, significant gains in hip and lumbar spine BMD were observed. Interpretation of lumbar improvements should be approached with caution due to potential artifacts from spinal degeneration. These findings suggest pharmacologic therapy may aid in maintaining or improving bone quality, particularly at the hip, and should be considered as part of perioperative optimization in patients undergoing spinal fusion.