Introduction

Elderly patients who sustain complex, comminuted distal femur fractures frequently experience prolonged healing because osteoporosis compromises both bone strength and the biological capacity for repair. Standard postoperative supplementation with calcium and vitamin D provides only modest benefit in promoting callus formation in this setting. Interest has therefore grown in therapeutic strategies that directly influence bone remodeling. Teriparatide (PTH 1-34) is anabolic in nature and stimulates bone formation, while denosumab is anti-resorptive in nature and prevents osteoclast-mediated bone resorption. When administered sequentially, these two agents may work in a complementary fashion, potentially improving the pace and quality of fracture healing. This study was designed to examine whether adding denosumab (anti-resorption) followed by PTH (anabolic) to conventional postoperative care results in better radiological union and functional outcomes in osteoporotic patients with comminuted distal femoral fractures.

Methods

This prospective comparative study was carried out in the Orthopedics Department. Forty patients over the age of sixty who presented with AO type C2 or C3 comminuted distal femur fractures were enrolled from January 2021 to May 2022. All fractures were stabilized using locking compression plates. The patients were divided equally into two groups. Group A received standard postoperative care, which included calcium and vitamin D supplementation. Group B received the same routine therapy, but an additional protocol was implemented: a 60 mg subcutaneous dose of denosumab administered two weeks after surgery, followed by daily injections of teriparatide (PTH 1-34) at a dose of 20 micrograms for twelve consecutive weeks. Radiographic evaluation was performed at four-week intervals, and healing was graded using the modified Radiographic Union Score for Tibial fractures (RUST). Functional recovery was assessed at six months postoperatively using the Neer knee scoring system.

Results

Patients who received the sequential pharmacological therapy demonstrated noticeably quicker radiological healing. The mean time to union in Group B was 14.1 ± 2.2 weeks, compared with 18.3 ± 3.2 weeks in Group A. By twelve weeks, higher modified RUST scores were found in group B, indicating more callus formation and cortical bridging. These radiological findings were reflected in functional performance. At the six-month evaluation, Group B achieved greater functional ability, including higher mean Neer scores with better pain control and improved range of knee No significant adverse effects attributable to denosumab or PTH were documented.

Conclusion

Sequential administration of denosumab followed by PTH substantially accelerates fracture healing and enhances functional outcomes in elderly osteoporotic patients with comminuted distal femur fractures. The combined antiresorptive and anabolic effect causes timely callus development. Incorporating this therapeutic approach along with standard surgical management may help overcome the common challenges of delayed union or nonunion in comminuted distal femoral fractures, thereby enhancing postoperative recovery and long-term functional results.