Effect of Parathyroid Hormone on Microarchitecture and Biomechanical Properties of the Bone-to-Suture Anchor Interface in a Rabbit Model of Disuse Osteoporosis

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INTRODUCTION:
Suture anchor loosening due to poor bone quality compromises surgical outcomes after arthroscopic rotator cuff repair. This study evaluates the effect of systemic recombinant human parathyroid hormone (rhPTH) on the bone-to-suture anchor interface in a rabbit model of disuse osteoporosis.
METHODS: Twenty-four rabbits were assigned into the three groups: osteoporosis (A), control group (B), and osteoporosis treated with rhPTH (C). Disuse osteoporosis was induced by forelimb immobilization for six weeks. Biocomposite suture anchors were inserted into the greater tuberosity in all groups. Group C received daily rhPTH (10ug/kg) for 8 weeks following anchor insertion. Outcomes assessed 8 weeks after surgery included microarchitecture parameters (bone volume [BV], percent bone volume [PBV] and bone mineral density [BMD]) using micro-CT, and biomechanical properties (load-to-failure) using a universal testing machine.
RESULTS: Group C showed the highest BV (27.87±3.33 for group A, 37.45±3.81 for group B, and 41.72±6.43 for group C, $p<0.001$), PCV (29.92±3.49 for group A, 40.12±4.34 for group B, and 45.96±6.94 for group C, $p<0.001$), and BMD (0.10±0.02 for group A, 0.13±0.03 for group B, and 0.15±0.04 for group C, $p=0.041$) at 8 weeks after surgery. Biomechanical testing showed the highest load-to-failure in group C (29.0±4.0 for group A, 36.9±3.5 for group B, and 38.6±3.7 for group C, $p=0.008$).
DISCUSSION AND CONCLUSION: Systemic administration of rhPTH significantly improved bone ingrowth and biomechanical integrity at the suture anchor interface. These findings demonstrate that rhPTH effectively mitigates anchor loosening and enhances pullout strength in cases of arthroscopic rotator cuff repair, particularly in osteoporotic proximal humerus.