

## Paper #15

# The Effect of Recombinant Human Parathyroid Hormone (rhPTH) on Tendon-to-Bone Healing in a Rat Rotator Cuff Model

Kyle R. Duchman, MD, USA  
Jessica E. Goetz, PhD, USA  
Bastian Uribe, MD, USA  
Andrew Amendola, BS, USA  
Allison Malandra, DVM, USA  
Joshua Barber, MD, USA  
**Carolyn Hettrich, MD, MPH, USA**

University of Iowa Hospitals and Clinics Department of Orthopaedics and Rehabilitation  
Iowa City, Iowa, USA

### Summary:

Administration of rhPTH significantly increases load-to-failure at 2 weeks postoperatively in a rat rotator cuff repair model.

### Abstract:

#### Introduction

Successful rotator cuff tendon repair is predicated upon secure tendon-to-bone healing. A recent study has shown that recombinant human parathyroid hormone (rhPTH) treatment results in improved tendon-to-bone healing at the latter stages of healing, but not at early time points. We hypothesized that delaying administration of rhPTH until after the acute inflammatory phase would improve tendon-to-bone healing at all time points in a rat rotator cuff repair model.

#### Methods

One hundred and eight male Sprague-Dawley rats underwent detachment and subsequent repair of the supraspinatus tendon based on an a priori power analysis. Fifty four rats underwent repair alone and 54 rats received repair plus daily subcutaneous injections of 10 µg/kg of rhPTH beginning on postoperative day 7 and continuing for 12 weeks. Rats were sacrificed at 2 and 16 weeks postoperatively for biomechanical testing or histologic and immunohistochemical analysis. Histologic slides were digitized, and the enthesis was evaluated quantitatively using NIH Image J and VisioMorph software.

#### Results

At 2 weeks postoperatively, the rhPTH group had significantly higher load to failure than the control group (10.85 versus 5.16 N;  $p = 0.003$ ). At 16 weeks, there was no significant difference in load to failure between the two groups. With respect to stiffness of the repair, there was no significant difference between the two groups at either time point, but there was a trend toward increased stiffness in the rhPTH group at 2 weeks postoperatively compared to the control group (5.09 vs. 3.77 N/mm;  $p = 0.12$ ). Histologically, there was no difference in the number of collagen producing cells, collagen fiber orientation, and fibrocartilage area between the control and rhPTH group.

#### Discussion

Administration of rhPTH significantly increased load to failure at 2 weeks postoperatively in a rat rotator cuff repair model. Delaying administration of rhPTH until postoperative day number 7, after the resolution of the acute inflammation from surgery had subsided, improved rotator cuff healing in the early postoperative period and maintained later-stage mechanical strength while decreasing the excessive vasculogenesis previously seen with immediate postoperative rhPTH administration.