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Paper #226

Into-Tunnel Repair vs. Onto-Surface Repair for Rotator Cuff Tears in a Rabbit Model

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Summary:
The into-tunnel repair technique transforms the process of the tendon after rotator cuff repair, which in turn results in a better biomechanical construct.

Abstract:

Background

Clinically, onto-surface repair is commonly used for rotator cuff tears. The retear rate after rotator cuff repair (RCR) is relatively high, with failure occurring mostly at the tendon-bone connection site. For anterior cruciate ligament (ACL) reconstruc- tion, into-tunnel reconstruction is commonly employed. The retear rate after ACL reconstruction is relatively low, with retears sel- dom occurring at the tendon-bone interface. No study on into-tunnel RCR has been conducted.

Hypothesis

Into-tunnel RCR could promote fibrocartilage regeneration at the tendon-bone interface and has biomechanical advantage over onto-surface repair in a rabbit rotator cuff tear model.
Study Design: Controlled laboratory study.

Methods

Thirty-six New Zealand White rabbits were used in this study. The supraspinatus tendons were cut from the footprint to create a rotator cuff tear on both shoulders. On one side, the supraspinatus was cut longitudinally into 2 halves, sutured, and pulled into 2 tunnels through the greater tuberosity (into-tunnel repair). On the other side, the tendon was reattached to the sur- face of the footprint with transosseous sutures (onto-surface repair). Twelve animals were sacrificed, of which 6 were used for a histological examination and the other 6 for biomechanical testing, at 4, 8, and 12 weeks, respectively.

Results

The tendon-bone interface in the into-tunnel group showed a different healing pattern from that in the onto-surface group. In the former, most of the tendon tissue in the tunnel was replaced with newly generated fibrocartilage; the rest of the tendon fibers appeared in large bundles with direct connection to the bone. In the latter, fibrocartilage regeneration was seldom found at the tendon-bone interface; the tendon near the bone surface appeared as small fibrils. The biomechanical evaluation revealed a higher ultimate load ($P < .001$) and stiffness ($P < .001$) at the tendon-bone junction in the into-tunnel group than those in the onto-surface group at 12 weeks.

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Conclusion

In a rabbit rotator cuff tear model, into-tunnel RCR could result in a different tendon-bone healing pattern, with obvi- ous fibrocartilage regeneration at the interface and higher tendon-bone healing strength than that in onto-surface repair.

Clinical Relevance: New RCR patterns may be developed to improve the tendon-bone healing pattern and obtain better tendon- bone healing strength.