BioBrace augmentation in revision quadriceps tendon repair

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Background: Quadriceps tendon rupture is a relatively uncommon injury, typically occurring in middle-aged males and is often associated with systemic comorbidities or trauma. While primary repair techniques provide excellent outcomes when performed acutely, revision surgery presents unique challenges due to poor tissue quality and compromised vascularity.

Indications: Revision quadriceps tendon repair is indicated for failed index surgery with recurrent extensor mechanism deficit including patella baja, extensor lag, and/or palpable quadriceps defect and re-tear confirmed on advanced imaging. Biologic augmentation is indicated for poor tissue quality and reduced vascularity, especially in the context of patient comorbidities or chronicity

Technique Description: Patient positioning is supine with a lateral padded thigh post and Kirschenbaum foot positioner. A bump can be placed under the operative hip to facilitate neutral leg rotation. A thigh tourniquet is applied but not routinely inflated. The midline incision is recreated extending roughly 4 cm proximal to the superior pole of the patella to the tibial tubercle. Soft tissue flaps are mobilized to expose the extensor mechanism. Hematoma is evacuated. The extensor mechanism and retinaculum are investigated. Foreign bodies are removed from the repair site and the wound is copiously irrigated. Two #2 FiberWire sutures are passed up and down the medial and lateral aspects of the quadriceps tendon in a modified Krackow fashion. With the knee flexed 45 degrees, Beath pins facilitate creation of 3 parallel tunnels 1 cm apart in an anterograde fashion through the center, medial, and lateral aspects of the patella. These pins then shuttle the previously placed FiberWire suture tails with 1 medial, 1 lateral, and 2 central. The central suture tails are retrieved beneath the patellar tendon to their respective medial and lateral complements. On the back table, a BioBrace shoelace is prepared by placing shuttling sutures at both ends in a modified Krackow fashion. Thereafter, the BioBrace shoelace is soaked in vancomycin and a BioBrace patch is soaked in PRP. #5 FiberWire is used to create a circumferential suture cerclage around the patella and extending proximal to the repair of the quadriceps tendon utilizing the “Wisconsin technique.” The BioBrace shoelace is weaved around the patella, starting proximally, beneath the quadriceps tendon but proximal to the previously placed Krackow sutures. This is then weaved distally on both the medial and lateral margins adjacent to the tendon and patella. The quadriceps tendon is reduced by placing the knee in hyperextension and applying tension to the BioBrace shoelace. The transosseous Fiberwire sutures are tied over the inferior pole of the patella. The suture cerclage is tied on the lateral aspect. The torn medial and lateral retinaculum is repaired with 0 Vicryl figure of 8 sutures. Both ends of the previously weaved BioBrace shoelace are retrieved underneath the patellar tendon. With the knee maintained in hyperextension, the shoelace is tensioned, then secured with a series of Vicryl figure of 8 sutures on the medial and lateral sides of the patella. The PRP-soaked BioBrace patch is laid over the repair construct and secured with simple Vicryl sutures. The knee is gently ranged to show restoration of the extensor mechanism. The wound is copiously irrigated and closed in a layered fashion. A hinged knee brace is applied locked in full extension.

Rehabilitation begins with weight bearing as tolerated with a hinged knee brace locked in extension at all times for the first week. Thereafter, the knee brace can be unlocked from 0-70 degrees while at rest. From 6-12 weeks, ROM is incrementally increased in an unlocked hinged knee brace, with the goal of full ROM by 3 months postoperatively. From 3 months onwards, the precedent is placed on strengthening, specifically eccentric quadriceps exercises, followed by progression of activities as tolerated

Results: Outcomes are sparse for revision quadriceps repair, especially utilizing this novel technique. However, following primary repairs, re-rupture rates are 2-8%. Best outcomes, in terms of ROM, strength, and satisfaction, are seen with early repair (<3 weeks) in the primary setting. This can be extrapolated to risk factors of patients presenting for revision repair in addition to expediency of re-operation for best outcomes. Index suture anchor fixation also has slightly higher risk of complication and re-tear compared to transosseous tunnels.

Discussion/Conclusion: In revision settings, conventional repair techniques may not provide sufficient fixation or healing potential. Incorporating BioBrace augmentation provides structural and cellular support to the repair, while transosseous fixation and suture cerclage ensure robust mechanical stability. This multimodal approach addresses the limitations of previous revision repair methods and provides a reproducible technique for challenging revision cases.