Primary ACL repair (femoral sided tear – Suture anchor repair with internal bracing)

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Abstract: A 30-year-old male patient presented with injured right knee 1 week prior to presentation. Patient Injured his knee while playing football. He was diagnosed with femoral sided tear (Sharman’s type 2) in the MRI. He was taken up arthroscopic ACL repair with internal bracing. The technique, and review of literature is being discussed in this report.

Introduction: Recently, there has been a renewed interest in primary repair due to several factors. Firstly, recent research has shown that primary repair is most commonly performed in proximal tears due to better vascularity [1] and good healing potential [2] and outcomes of primary repair are better in proximal tears compared to midsubstance tears in both historical [3] and modern-day studies [4]. Secondly, minimal invasive arthroscopy techniques are available nowadays with early rehabilitation that were both not available or commonly used during the open repair era [5]. surgeons have been pursuing the concept of primary repair because of the (potential) advantages: the ligament is preserved with its proprioception, graft side morbidity can be prevented [6], revision surgery is similar to primary reconstruction which is not the case with reconstruction surgery [7], and it may potentially decrease the incidence of osteoarthritis.

Case: A 30-year-old male patient presented with injured right knee 1 week prior to presentation. Patient Injured his knee while playing football. He immediate developed swelling and ice was applied as the first aid measure. He noticed giving away on brisk walking and with pivoting movement. He was able to walk normally, but was associated with pain. There was no locking symptoms/ click sounds from the knee. There was no other joint involvement.

On examination, Patient had moderate effusion with fullness in the suprapatellar pouch. His range of movement (ROM) was 0- 100°, Lachman test and Anterior Drawer was positive. MacMurray test was painful. Patient was further evaluated with MRI scan and revealed femoral side tear of ACL in mid-sagittal sections of the MRI. It was identified to be Sherman’s type 1 tear. (Classification in the figure 1).
Figure 1: Type 1 tears were true soft-tissue avulsions with minimal ligament tissue left on the femur. Type 2 tears had up to 20% of the tissue left on the femur. Type 3 tears had up to 33% of the ligament tissue left on the femur. Type 4 tears were true midsubstance tears with up to 50% of the ligament tissue left on the femur.

Figure 2: MRI scan showing femoral side tear of ACL in mid-sagittal sections.

The patient was taken up for surgery, and ACL tear was identified from the femoral attachment. This patient was the ideal case for primary ACL repair – Sherman type 1, young patient, acute injury and good ACL stump. 2 fiber wires were taken and with the help of knee scorpion multiple bites were taken in the ACL stump from distal to proximal in both
AM and PL bundle of ACL. Then the fiber wires were loaded onto the 4mm suture-less anchors and they were inserted into the foot print area. The AM bundle suture anchor was also loaded with fiber tape before its insertion. Then the fiber tape was draped anteriorly over the ACL stump and was shuttled out through the tunnel in the proximal tibia and taken out of the anterior cortex of tibia. (figure 3) Then the another 4mm knot-less anchor was used to fix the fiber tape in 30-40 degrees of flexion of the knee. Arthroscopically knee was taken into knee range of movement and tight was checked.

Figure 3: Arthroscopic picture of the primary ACL repair steps.

Postoperatively knee was immobilized for 3 weeks then the passive knee ROM was started. Progressed to full weighing walking and full ROM by 6-8 weeks.

• The advantage of ACL repair is potential to preserve the native insertion site and proprioceptive function, lead to more normal joint mechanics and decreased risk of posttraumatic osteoarthritis [8].
• Rationale to use fiber tape: Was the 2 mm high strength tape provides stability and could act as a scaffold,
• together with the looped sutures they help to keep the clot between the ruptured ends.
• And combined with microfracture provides an environment in which the ACL can heal around the fibre tape.
• Further it reinforces the ligament as a secondary stabilizer.

Recently, Van Heusden et al. [9] reported excellent outcomes of primary repair with additional internal bracing in 42 patients with 4.8% failures at 2-year follow-up. Heitmann et al. [10] tested different types of suture augmentation and showed higher load-to-failure of augmented ACL repairs (464–624 N) compared with ACL repairs without augmentation (177 N) and with ACL reconstructions with hamstring tendons (362 N). Seitz et al. showed significantly higher stiffness, tensile strength, and less anteroposterior laxity of augmented ACLs. Similarly, Murray et al. reported that additional stabilization between the tibia and femur improves structural properties of ACL repairs. Implementation of an internal brace is safe and no failures were related to the hardware, were reported. Most of the surgeons
now selectively performs additional internal bracing in patients at high-risk for failure, including those of young age, with generalized hyperlaxity, of younger female patients or those competing in high-level pivoting sports. It could be argued that internal bracing should be included on all repairs in light of the minimal complications that have been encountered, while not factoring in costs. When comparing outcomes of ACL repair with ACL reconstruction in the literature, the failure rates of ACL repair in most of the studies are similar to slightly higher than ACL reconstruction outcomes. However, ACL reconstruction can be associated with significant postoperative quadriceps muscle weakness and knee stiffness, which require a strenuous and time-consuming rehabilitation program. There are preclinical data that suggests that ACL repair results in a lower risk of osteoarthritis than both reconstruction and conservative treatment.

Take home message:

• Primary ACL repair should be reserved and proper patient selection is necessary and should be cautiously adopted.
• Young patients and acute injuries are the ideal indications for the repair.
• Proximal injuries (Sherman type 1 and 2) tears and good candidates for repair.
• Good quality of remnant ACL tissue (no fraying) is need for good outcome.

References: