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Surgical Techniques

Anterior Cruciate Ligament (ACL) Using “Primary Graft”. A Viable Alternative in Selected Cases.

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KEY WORDS

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BACKGROUND

The gold standard in anterior cruciate ligament (ACL) revision surgery is the use of autografts or allografts to replace the failed graft. This entails removing the primary graft and implanting a new one¹.

In some instances, the procedure is performed in two stages: the first involves removing the graft and filling the enlarged bone tunnels with cancellous bone (either from the patient or a bone bank) then, after 4 to 6 months, the formal revision surgery is performed to implant a new graft and address any associated injuries.

In some cases, MRI imaging shows the graft in a correct or acceptable position with signal intensity indicating proper healing, vascularization, and maturation; however, the patient experiences instability, and objective examination confirms knee instability^{2,3,4}.

These findings are confirmed during arthroscopy, which reveals a lax, tensionless graft that is vascularized but detached from the femur while remaining attached to the tibia.

RATIONALITY OF THE PROCEDURE

In this scenario, tensioning the graft by reinserting it into the femur restores its tension and, consequently, knee stability.

This avoids removing a graft that is already biologically active and well into the "ligamentization" process, only to implant a new graft that would have to start its healing and maturation process from zero, thereby increasing the procedure's morbidity.

ADVANTAGES OF THE PROCEDURE

1. Avoiding the harvest or use of an autograft or allograft tendon.
2. No need to create tunnels, eliminating the risk of further bone damage from excessive widening.
3. The ability to correct the femoral tunnel position (re-orientation), if necessary.
4. Avoiding the need to restart the "ligamentization" process already underway in the primary graft.
5. Ensuring immediate joint stability.
6. Significantly reducing the procedure's morbidity.

INDICATIONS

Symptomatic patient with subjective and objective anterior instability, presenting a graft that appears correctly or acceptably positioned on MRI, with signal intensity indicating adequate healing, vascularization, and maturation.

CONTRAINDICATIONS

A frayed, ruptured (discontinuous), avascular, and lax graft.

Potential Complications

1. Residual instability
2. Re-rupture

Surgical technique. Step-by-step.

1. No tourniquet used.
2. Knee flexed over the operating table.
3. Arthroscopy using conventional portals: anterolateral, anteromedial, and trans-patellar.

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4. Placement of a plastic cannula through the anteromedial portal.
 5. Graft evaluation, including vascularization, fiber continuity, tibial and femoral insertions, and degree of laxity.
 6. Debridement of proximal fibrosis using a motorized shaver blade
 7. Abrasion of the anterior and superior aspects of the femoral tunnel opening using a motorized burr.
 8. Visualization from the trans-patellar portal. From the anterolateral portal, grasping the proximal part of the posterolateral bundle of the ACL graft using high-tension sutures in a double-cinch configuration (two stitches total) with the aid of an automatic grasper.
 9. Grasping the anteromedial bundle in the same manner as the previous step, using two double-cinch sutures.
 10. Creation of a tunnel opening above the center of the anteromedial bundle using a punch-tap instrument.
 11. Threading the anteromedial bundle sutures into the knotless implant; insertion through the anteromedial portal and alignment with the tunnel opening. Tensioning sutures, impacting the PEEK component, and screwing in the knotless implant. Trimming excess sutures.
 12. Retrieving the posterolateral bundle sutures through the anteromedial portal.
 13. Repeat step 11.
 14. Final step: tensioning both bundles of the ACL graft.

REHABILITATION

1. Immediate weight-bearing support with crutches.
2. Initiation of early range of motion.
3. Muscle strengthening using isometric and isotonic exercises.
4. Full range of motion achieved by week 8.
5. Treadmill, stationary bike, and swimming between weeks 8 and 20.

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6. Jogging after week 20.
 7. Resumption of sport-specific movements after week 24.
 8. Return to sport (non-contact) between months 9 and 12.

LITERATURE

There is only one published article in the literature by Lombardo et al, describing a series of 5 patients who had undergone primary transtibial reconstruction but continued to experience rotational instability. All patients underwent proximal graft reorientation combined with anterolateral tenodesis, achieving good results by the end of the follow-up period⁵.

The corresponding author (MMA) has a series of 17 patients, 12 of whom have a mean follow-up of 2 years. Eleven of these patients returned to sports and/or work activities without restrictions.

DISCUSSION

ACL revision surgery is a complex procedure requiring a critical preoperative analysis to primarily determine the cause(s) of failure and thereby guide the best treatment for the patient. Failure of the primary surgery is multifactorial, implying that several factors must be corrected and addressed to achieve a successful outcome. Revision is indicated only for symptomatic patients, as it is common to find objective instability confirmed by various clinical tests in patients who remain asymptomatic. When investigating a failure, magnetic resonance imaging (MRI) is the primary tool for assessing the presence of the graft and its state of "ligamentization" in order to decide on the appropriate course of action. Although specific MRI parameters for graft maturation have been defined, this maturation often does not correlate with joint stability; for instance, many patients exhibit graft signal intensity indicative of vascularization and maturation yet remain both subjectively and objectively unstable. In this scenario, graft tensioning by reinserting its fibers offers advantages over the alternative of removing the graft and

implanting a new one: it capitalizes on the graft's ongoing "ligamentization" process and avoids the need for a new implant. An additional advantage is the ability to reorient the femoral insertion to an anatomical position in cases where the original femoral insertion lay outside the anatomical footprint. This approach significantly reduces the morbidity associated with revision surgery a procedure that, in itself, often entails additional interventions such as meniscal repair or transplantation, reconstruction of ligaments for associated injuries, or osteotomy. In a case series, Lombardo et al. reported successful outcomes in five patients who underwent reorientation of a primary graft originally placed using a transtibial technique due to residual rotational instability. Regarding the senior author's (MMA) series of 17 operated patients, 12 have a follow-up of 1 to 3 years: 11 achieved an excellent outcome—returning to sports or work activities without restrictions—while one case failed due to trauma sustained in a motorcycle accident.

CONCLUSIONS

1. Using the primary graft in ACL revision surgery is a viable alternative in selected cases.
2. It offers advantages compared to using a new graft:
 - The “ligamentization” process is preserved.
 - The tibial insertion is maintained.
 - In cases of femoral malposition, the graft can be rerouted.
 - The creation of tunnels is avoided.
 - Harvesting and implanting a new graft is avoided.
3. Morbidity is significantly reduced.
4. Joint stability is restored.

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