OPEN ACCESS

Scholars International Journal of Traditional and Complementary Medicine
Abbreviated Key Title: Sch Int J Tradit Complement Med
ISSN 2616-8634 (Print) | ISSN 2617-3891 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Reconstruction of the Anterior Cruciate Ligament Using the Over-The-Top Technique Combined with a Lateral Plasty: A Case Report of 3 Patients

Jaouad YASSER[1*], Abdullah ZAHER[1], Imad MARZAK[1], Noureddine SEKKACH[1]

[1]Delafontaine Hospital - Saint-Denis - France

DOI: 10.36348/sijtcm.2024.v07i06.002 | **Received:** 19.04.2024 | **Accepted:** 25.05.2024 | **Published:** 03.06.2024

***Corresponding author:** Jaouad YASSER
Delafontaine Hospital - Saint-Denis - France

Abstract

The over-the-top technique with lateral plasty is a technique that allows anterior cruciate ligament reconstruction and lateral plasty using a graft consisting of semitendinosus and gracilis that remain attached at the tibial level. This technique uses only the tibial tunnel without the femoral tunnel. We report on a series of 3 patients operated on for anterior knee instability following an anterior cruciate ligament injury in the orthopaedic department of the Delafontaine Hospital in Saint Denis, France, and discuss the results with a review of the literature.

Keywords: Anterior Cruciate Ligament, Over-The-Top, Lateral Plasty, Semitendinosus, Gracilis.

INTRODUCTION

The anterior cruciate ligament (ACL) is the knee ligament most frequently injured in sports accidents such as skiing. Biomechanically, it plays a vital role in controlling translation in the anteroposterior direction. It is also a structure that plays a part in the rotational stability of the knee. Despite major advances in the management of anterior cruciate ligament injuries, there are still patients who remain unstable despite successful treatment. For this reason, lateral plasty is often recommended to correct these instabilities, especially in young athletes. The over-the-top technique combined with lateral plasty allows an anterior cruciate ligament ligamentoplasty and lateral plasty with a single graft.

MATERIALS AND METHODS

Patients

This is a series of 3 young, athletic patients with an average age of 26. On clinical examination, the 3 patients presented with a positive Lachman's test with a soft stop and a protrusion during the pivot shift test. The diagnosis of an anterior cruciate ligament injury was confirmed by magnetic resonance imaging (MRI). The 3 patients were operated on at the Hôpital Delafontaine in Saint Denis, France, using the over-the-top technique combined with a lateral plasty. Average follow-up was 15 months. All patients benefited from the same post-operative rehabilitation protocol. A return to sport was authorised from the 6th month. Patients were assessed clinically and functionally using the Lysholm score.

Surgical Technique

The surgery begins by harvesting the semitendinosus and gracilis, which must keep the two tendons attached at their distal insertion (Figure 1). The two harvested tendons are stitched together and looped proximally to facilitate passage through the tibial tunnel. Once both anteromedial and anterolateral arthroscopic approaches have been installed, arthroscopic exploration is performed to establish a complete lesion assessment. A tibial tunnel is then made under arthroscopic control, with the starting point slightly proximal to the insertion of the crow's-foot tendons and the exit point behind and medial to the insertion of the anterior cruciate ligament. A steel wire was passed through the tibial tunnel to the anteromedial arthroscopic approach (Figure 2). A 3 cm incision was then made over the lateral femoral condyle, through the iliotibial band and septum, to gain access to the posterior aspect of the joint capsule (Fig. 3). A curved Kelly forceps is passed from the anteromedial approach to the lateral femoral condyle, maintaining contact with the posterior surface of the lateral femoral condyle. This clamp is used to pass the relay wire from the lateral femoral condyle to the anteromedial approach and then to the tibial tunnel using the steel wire. The relay wire is then used to access the graft passage and, in the 90° flexion position, the graft is fixed to the lateral surface of the femoral condyle using two staples (Fig. 4). To

perform the lateral plasty, a 2 cm incision is made opposite Gerdy's tubercle. A Kelly forceps is passed under the fascia between this incision and the one opposite the lateral femoral condyle. This forceps will be used to pass the graft towards Gerdy's tubercle, where it will be fixed with a staple (Fig. 5, 6). At the end of the operation, the knee is examined to check its stability.

Figure 1: Harvesting the semitendinosus and gracilis tendons

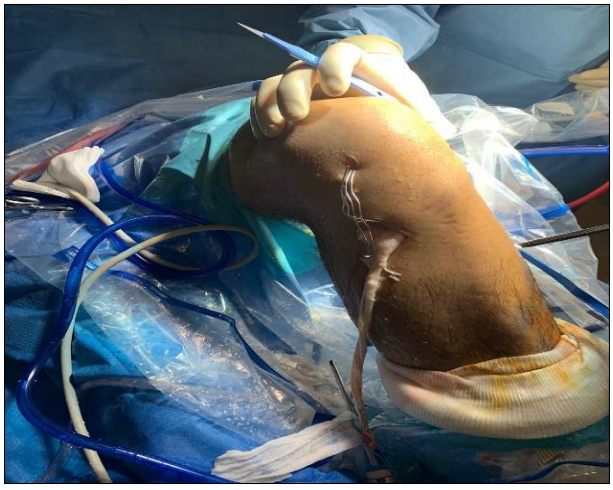

Figure 2: Passage of steel wire through the tibial tunnel to the anteromedial arthroscopic approach after graft preparation.

Figure 3: Incision opposite lateral femoral condyle

Figure 4: Graft staple fixation at the lateral femoral condyle

Figure 5: Passage of kelly forceps under the fascia between Gerdy's tubercle and the lateral femoral condyle to recover the graft.

Figure 6: Lateral plasty after subfascial grafting

RESULTS

The functional results of our series were satisfactory, with an average Lysholm score of 95 points. Joint range of motion was complete. No cases of anterior knee pain were reported. All 3 patients resumed sporting activity after 6 months. The Lachman test was negative in all 3 patients, with no sensation of instability reported by the patients. Follow-up radiographs showed no evidence of staple migration or compression of the lateral compartment of the knee (Figure 7).

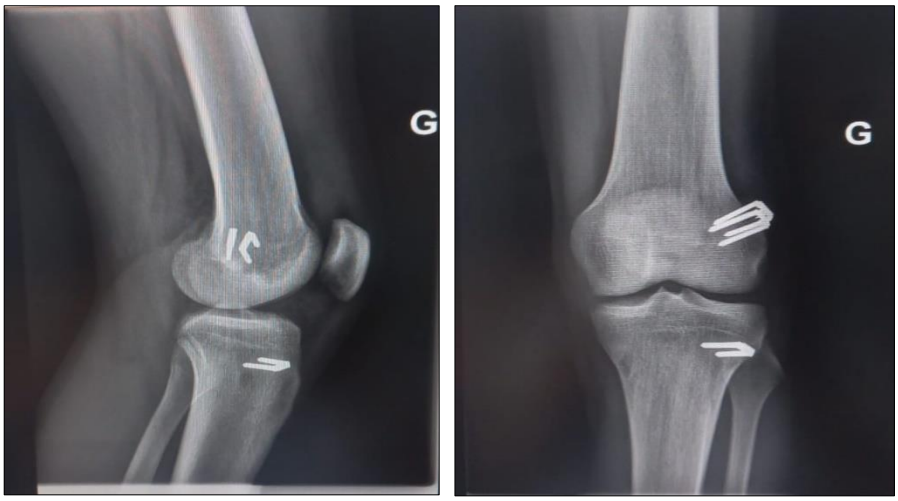

Figure 7: Standard front and side x-rays of the knee after ligamentoplasty

DISCUSSION

The rediscovery of the anterolateral knee ligament in 2013 and its biomechanical role in controlling internal rotation and anterior knee translation has motivated several authors to recommend combining lateral plasty with anterior cruciate ligament reconstruction. The over-the-top technique with lateral plasty meets these new recommendations. Several biomechanical studies have evaluated this technique. Bignozzi *et al*., found that over-the-top anterior cruciate ligamentoplasty combined with lateral plasty reduced anterior laxity compared with isolated anterior cruciate ligament reconstruction [1]. In their cadaveric study, Bonanzinga *et al*., found that this technique provided better control of internal rotation [2]. The study by Grassi *et al*., demonstrated that reconstruction of the anterior cruciate ligament of the knee associated with lateral plasty is an effective technique that provides better control of rotation and anteroposterior translation at 90° of flexion during the Lachman test [3]. From a biological point of view, several studies have sought to prove the superiority of the type of graft used in this technique compared with other techniques, especially those using free grafts. The histological study by Zaffagnini *et al*., showed that the tibial insertion of the Pes Anserinus tendons has a rich innervation and vascularisation, and also along the gracilis and semitendinosus tendons without any avascular region [4]. Similarly, an animal study on 64 rabbits showed that in anterior cruciate ligament reconstructions preserving the distal insertion of the semitendinosus, no necrosis or hypocellularity was found between 3 and 24 weeks after reconstruction [5]. In their study, Liu *et al*., demonstrated that preserving the graft insertion resulted in better maturation of the graft, with a stable, low-intensity signal during MRI follow-up for up to 24 months [5]. In functional and clinical terms, several studies have demonstrated the effectiveness of this technique. Marcacci *et al*., published their first series in 1998 on 40 patients. This study found a normal knee in 92.5% of patients, with an average Lysholm score of 95 points [6]. The same authors found similar results after evaluating a series of 60 patients with a follow-up of 60 patients [7]. This technique allows patients to return to sport more quickly than others who have undergone anterior cruciate ligament reconstruction using other techniques such as patellar grafts or 4-strand hamstring grafts. In addition, there have been no cases of femoral tunnel widening [8]. A series of 54 high-level sports patients operated on using the over-the-top technique with lateral plasty at 11 years' follow-up found very satisfactory results, with 90% of patients presenting with a normal or almost normal knee [9]. The revision rate for this technique is low, not exceeding 1.9% at 5 years and 3.7% at 10 years [10]. Even in the very long term, the clinical results remain encouraging. A 24-year follow-up of 29 patients showed a normal or almost normal knee in 86% of cases [11].

CONCLUSION

The over-the-top technique combined with lateral plasty is a reliable operation which has proved its effectiveness and excellent results through several high-level clinical, biological and biomechanical studies. The absence of a femoral tunnel and the isometric placement of the graft mean that a number of complications, such as malpositioning of the femoral tunnel, can be avoided. In addition, this technique may be indicated in revision surgery and also in paediatric patients, given the absence of a femoral tunnel. Finally, it is a reliable and inexpensive technique that does not require expensive instrumentation.

Consent: Patient gives informed consent for publication.

Declaration of Competing Interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Acknowledgements: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

REFERENCES

1. Bignozzi, S., Zaffagnini, S., Lopomo, N., Martelli, S., Iacono, F., & Marcacci, M. (2009). Does a lateral plasty control coupled translation during antero-posterior stress in single-bundle ACL reconstruction? An in vivo study. *Knee Surgery, Sports Traumatology, Arthroscopy*, *17*, 65-70.
2. Zaffagnini, S., Marcheggiani Muccioli, G. M., Signorelli, C., Lopomo, N., Grassi, A., Bonanzinga, T., ... & Marcacci, M. (2014). Anatomic and nonanatomic double-bundle anterior cruciate ligament reconstruction: an in vivo kinematic analysis. *The American Journal of Sports Medicine*, *42*(3), 708-715.
3. Grassi, A., Signorelli, C., Lucidi, G. A., Raggi, F., Macchiarola, L., Di Sarsina, T. R., ... & Zaffagnini, S. (2019). ACL reconstruction with lateral plasty reduces translational and rotatory laxity compared to anatomical single bundle and non-anatomical double bundle surgery: an in vivo kinematic evaluation with navigation system. *Clinical Biomechanics*, *69*, 1-8.
4. Zaffagnini, S., Golanò, P., Farinas, O., Depasquale, V., Strocchi, R., Cortecchia, S., ... & Visani, A. (2003). Vascularity and neuroreceptors of the pes anserinus: anatomic study. *Clinical Anatomy*, *16*(1), 19-24.
5. Liu, S., Li, H., Tao, H., Sun, Y., Chen, S., & Chen, J. (2018). A randomized clinical trial to evaluate attached hamstring anterior cruciate ligament graft maturity with magnetic resonance imaging. *The American Journal of Sports Medicine*, *46*(5), 1143-1149.
6. Marcacci, M., Zaffagnini, S., Iacono, F., Neri, M. P., Loreti, I., & Petitto, A. (1998). Arthroscopic intra-and extra-articular anterior cruciate ligament reconstruction with gracilis and semitendinosus tendons. *Knee Surgery, Sports Traumatology, Arthroscopy*, *6*(2), 68-75.
7. Marcacci, M., Zaffagnini, S., Iacono, F., Vascellari, A., Loreti, I., Kon, E., & Presti, M. (2003). Intra-and extra-articular anterior cruciate ligament reconstruction utilizing autogeneous semitendinosus and gracilis tendons: 5-year clinical results. *Knee surgery, sports traumatology, arthroscopy*, *11*(1), 2-8.
8. Zaffagnini, S., Marcacci, M., Lo Presti, M., Giordano, G., Iacono, F., & Neri, M. P. (2006). Prospective and randomized evaluation of ACL reconstruction with three techniques: a clinical and radiographic evaluation at 5 years follow-up. *Knee Surgery, Sports Traumatology, Arthroscopy*, *14*, 1060-1069.
9. Marcacci, M., Zaffagnini, S., Giordano, G., Iacono, F., & Lo Presti, M. (2009). Anterior cruciate ligament reconstruction associated with extra-articular tenodesis: a prospective clinical and radiographic evaluation with 10-to 13-year follow-up. *The American journal of sports medicine*, *37*(4), 707-714.
10. Grassi, A., Macchiarola, L., Lucidi, G. A., Silvestri, A., Dal Fabbro, G., Marcacci, M., & Zaffagnini, S. (2021). Ten-year survivorship, patient-reported outcome measures, and patient acceptable symptom state after over-the-top hamstring anterior cruciate ligament reconstruction with a lateral extra-articular reconstruction: analysis of 267 consecutive cases. *The American Journal of Sports Medicine*, *49*(2), 374-383.
11. Zaffagnini, S., Marcheggiani Muccioli, G. M., Grassi, A., Roberti di Sarsina, T., Raggi, F., Signorelli, C., ... & Marcacci, M. (2017). Over-the-top ACL reconstruction plus extra-articular lateral tenodesis with hamstring tendon grafts: prospective evaluation with 20-year minimum follow-up. *The American Journal of Sports Medicine*, *45*(14), 3233-3242.