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Technical note

Non anatomic reinsertion after amputation of the anterior horn of the lateral meniscus

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ABSTRACT

Anatomical reinsertion is the optimal treatment for meniscal root injuries. However, in chronic settings, tissue fraying of the meniscal root may impede it. This study describes a salvage technical procedure performed in 3 cases of chronic anterior root avulsion of the lateral meniscus with profuse tissue degeneration in which remnant debridement resulted in amputation of the root. Reinsertion of the meniscus at the remaining healthy tissue was performed using an all-inside anchoring technique.

1. Introduction

Anterior roots of the menisci have been poorly studied compared to the posterior ones. They bear the highest loads in full extension [1], where they might have higher risk of tear. Anterior horn of the lateral meniscus (AHLM) accounts for a 27.9% of the lateral meniscus tears [2]. The injury to the anterolateral bony attachment significantly increases peak pressure in lateral and medial compartments. These findings bring up the need to preserve a bony insertion on the anterior end of the meniscus.

This study aims to describe a non-anatomical salvage technical procedure for 3 cases with complete chronic avulsion of the anterior root of the lateral meniscus (ARLM) with profuse tissue fraying in which remnant debridement resulted in amputation of such structure (Figs. 1 and 2).

2. Technique

The patient is positioned supine, with the limb in a leg holder with a tourniquet, and the knee flexed 90°. Anterolateral and anteromedial arthroscopic portals are employed. The torn frayedARLM is then debrided (Fig. 3, 3A and video), resulting in a disconnection of the ARLM from the remnant lateral meniscus (Fig. 3B). The bulk of the meniscal tissue being intact, a "salvage procedure" can be carried out: a non-anatomic tibial reinsertion of the AHLM is performed at the healthy end of the meniscus. An anchor (3.5 mm TwinLoop FLEX, Stryker, Mahwah, NJ, USA in 1 case; 2.3 mm Iconix, Stryker, Mahwah, NJ, USA in 2 cases [video]) are inserted in the tibial edge underlying the healthy end of the AHLM via the anterolateral portal (Fig. 3C). The AHLM is pierced with a nº 16 abbocath needle with a nº 1 nylon monofilament threaded (Fig. 3D), in cranio-caudal direction, 5 mm far from the edge of the healthy end of the meniscal tissue, via the anterolateral portal, forming a loop with the monofilament thread after abbocath removal (Fig. 3E). One of the ends of the anchor's threads is inserted through the monofilament loop (Fig. 3F) and is pulled until the anchor's thread comes out of the joint. The same procedure employed with the second end of the suture: both threads are embraced inside the joint with a finger-tip pincer and take out of the joint together, avoiding soft tissue impingement (Fig. 3G). Both threads are knotted using a knot pusher to fix the healthy end of the AHLM. A second anchor's thread is used in the same manner to obtain a double knot fixation. Finally, the stability is checked using a probe (Fig. 3H).

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Fig. 1. A schematic drawing shows the result of the technique, with reinsertion of the anterior horn of the lateral meniscus with two knots after amputation of the anterior root.

Immediate full range of motion is allowed. The patients are kept on crutches for 6 weeks, with a non-weight-bearing period of 2 weeks and partial weight-bearing during the following 4 weeks.

3. Patients and results

Three patients were enrolled retrospectively. They had tenderness in the lateral joint line and locking and instability sensation without clear traumatic history (only 1 of the patients had undergone previous AHLM meniscectomy. MRI findings concomitant chondral lesions and their treatment are summarized in Table 1.

One patient underwent a femoral varus osteotomy.

The patients underwent clinical review at a minimum of 2-year follow-up, showing pain release and abscense of knee instability nor locking sensation. Lysholm (mean increase of 46.33 points), KOOS (mean increase of 47 points) and Tegner (one patient increased his activity level and the 2 remaining mantained it) tests were used for evaluation (Table 2); weight-bearing X-rays and MRI were taken at follow-up: no increasing meniscal extrusion was found on MRI, nor arthritic progression (two patients had no arthritis and the remaining one had a Kellgren-Lawrence grade II).

4. Discussion

The main finding of this study was that a non-anatomic AHLM reinsertion resulted in good clinical outcomes in the short term.

Detachment of the ARLM increases the peak pressure in both knee compartments [3]; furthermore, it may contribute to the misfunction of the anterior intermeniscal ligament [4], changing knee biomechanics and damaging the cartilage (our 3 cases presented chondral lesions: 2 focal and 1, general arthritic changes).

Treatment options for ARLM tears include partial meniscectomy [5] or anatomical reinsertion [6]. In the 3 cases presented, a non-anatomic reinsertion was decided to try to keep the meniscal function; furthermore, it may also restore the anterior intermeniscal ligament function [4] and would avoid or delay degenerative changes [7] in both compartments [3].

As far as posterior root tears are concerned, it is known a non-anatomic reinsertion of the posterior meniscal roots alters meniscal function [8,9]. However, it is still better than meniscectomy so reinsertion of the AHLM would be justified as a salvage procedure, and can provide short-term good outcomes as with the present technique.

As a limitation, few patients were enrolled. One of the patients underwent a femoral varus osteotomy, which may be enough to relief pain; however, locking and instability sensations might be difficult to control with the osteotomy alone.

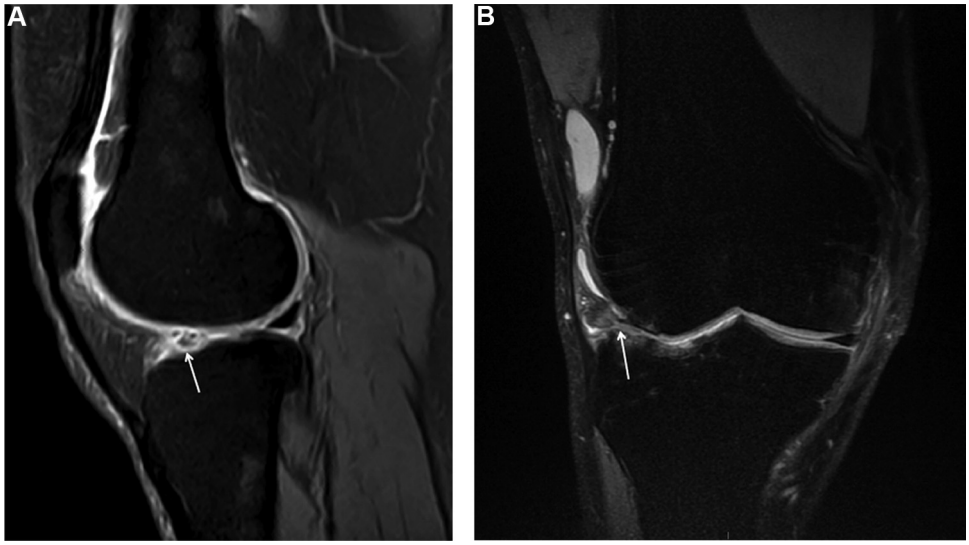

Fig. 2. T2 weighted MRI. A. Sagital view of case 1: rarefaction of the anterior horn of the lateral meniscus of the right knee (arrow). B. Coronal view of case 3: extrusion of the meniscus (arrow).

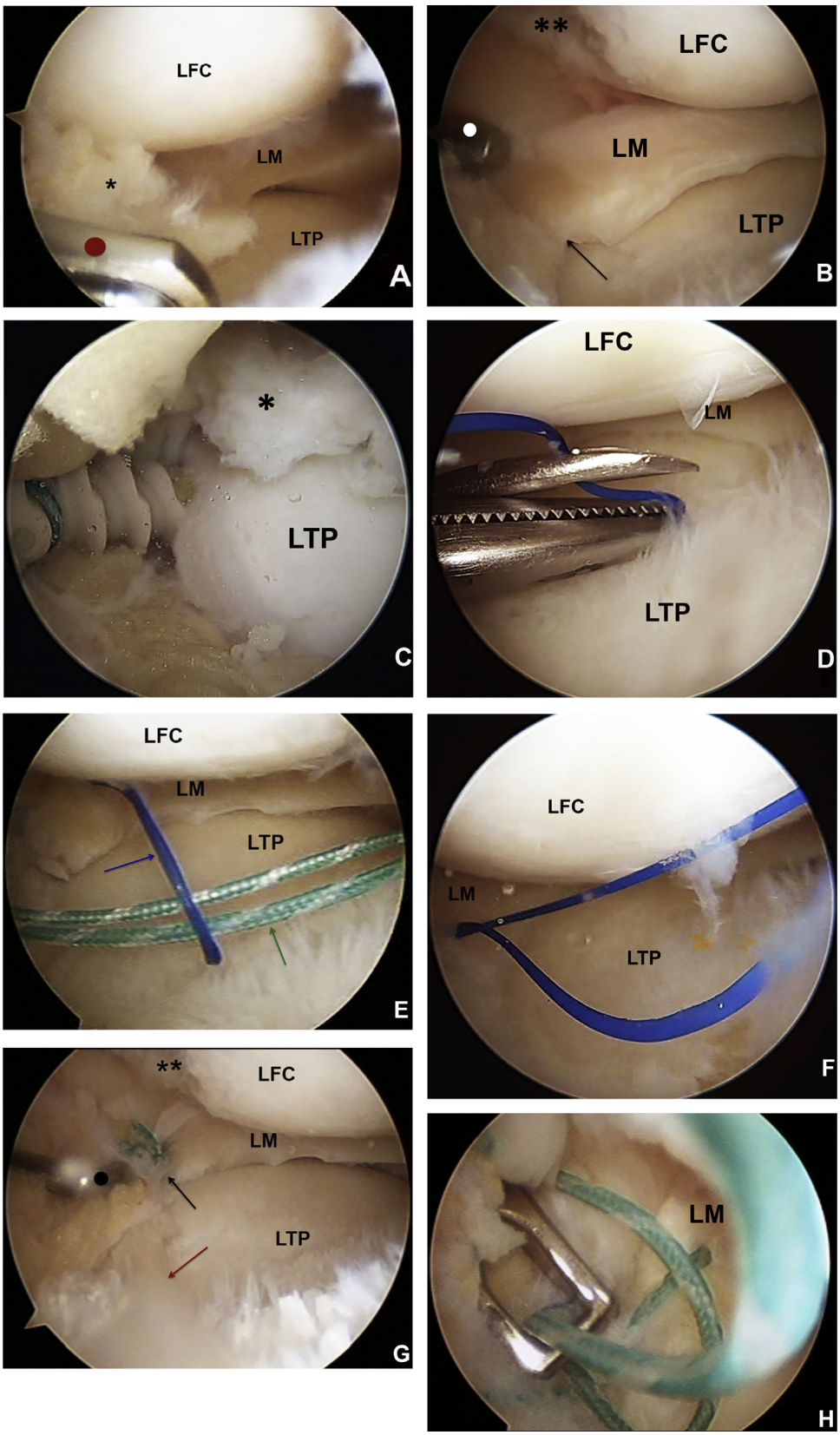

Fig. 3. Arthroscopic view of the reinsertion of the anterior horn of the lateral meniscus (AHLM) (right knee; arthroscope through the anteromedial portal). A. Debridement of the degenerated meniscus with a shaver (red dot). B. Reduction of the remnant meniscus after tissue debridement, using a grasper (white dot), at the healthy end of the menicus (black arrow). C. Insertion of the anchor through the anterolateral portal (3.5 mm TwinLoop FLEX, Stryker, Mahwah, NJ, USA). D. Monofilament traction thread passed through the AHLM. A pincer retrieves the suture. E. Resultant loop of the monofilament traction thread passed through the AHLM. F. One end of the suture thread of the anchor (green arrow) is inserted through the monofilament traction thread (blue arrow). G. Both ends are retrieved together through the anterolateral portal to avoid soft tissue impingement. H. Both threads are sutured at the healthy end of the meniscus (black arrow), which is pointed out with a probe (black dot). Red arrow: anatomical insertion site of the anterior root of the lateral meniscus. LFC: lateral femoral condyle; LM: lateral meniscus; LTP: lateral tibial plateau. *: Healthy end of the AHLM. **: Chondral lesion on the lateral femoral condyle.

Table 1
Demographic and associated lesions data.

	Age	Gender	MRI findings in ARLM	Associated lesions	Treatment of associated lesions
Patient 1	47	Female	Rarefaction of the ARLM	Grade IV chondral lesion in the femoral condyle (1.5 cm^2)	Microfractures
Patient 2	48	Female	Rarefaction of the ARLM	Grade IV chondral lesion in the lateral tibial plateau (1 cm^2)	Microfractures
Patient 3	32	Male	Abscense of the ARLM Meniscal extrusion	Kellgren-Lawrence's grade 2 arthritic changes Meniscectomy of the ARLM 7 years earlier Genu valgus	Femoral varus osteotomy

ARLM: anterior root of the lateral meniscus.

Table 2
Clinical results: Lysholm, Tegner and KOOS tests.

	Tegner		Lysholm		KOOS	
	Preop	Postop	Preop	Postop	Preop	Postop
Case 1	4	5	38	90	42.9	97
Case 2	5	5	43	90	50.6	95.2
Case 3	5	5	46	86	48.8	91.1

5. Conclusions

The non-anatomic reinsertion of the AHLM is a simple salvage procedure for cases of ARLM amputation that provides satisfactory clinical outcomes after 2-year follow-up preserving the meniscal remnant.

Disclosure of interest

The authors declare that they have no competing interest.

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None.

Authors' contribution

A.E.R. participated in the analysis and interpretation of data, drafting the article and final approval of the version to be submitted.

M.P.N. participated in the conception and design of the study, revising it critically for important intellectual content, and final approval of the version to be submitted.

M.J.E.R. participated in acquisition of data, revising the article critically for important intellectual content, and final approval of the version to be submitted.

A.G.C. participated in acquisition of data, revising the article critically for important intellectual content, and final approval of the version to be submitted.

J.D.R.N. participated in acquisition of data, revising the article critically for important intellectual content, and final approval of the version to be submitted.

A.E.B. participated in the conception and design of the study, revising it critically for important intellectual content and final approval of the version to be submitted.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.otsr.2019.04.007.

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