

Meniscal Substitution Utilizing the Hamstring Autograft for Partial to Near Total Meniscal Loss: A Surgical Technique

Enrique Leonardo C Pasion¹, Wesson Pious A Espiritu^{1*} 

¹Department of Orthopaedics, Our Lady of Lourdes Hospital, Manila and Jose R. Reyes Memorial Medical Center, Manila Philippines

*Correspondence author: Wesson Pious A Espiritu, Department of Orthopaedics, Jose R. Reyes Memorial Medical Center, Manila Philippines;

E-mail: wessonspiritu@yahoo.com

Citation: Pasion ELC, et al. Meniscal Substitution Utilizing the Hamstring Autograft for Partial to Near Total Meniscal Loss: A Surgical Technique. *J Ortho Sci Res.* 2026;7(1):1-7.

<https://doi.org/10.46889/JOSR.2026.7111>

Received Date: 06-02-2026

Accepted Date: 24-02-2026

Published Date: 03-03-2026



Copyright: © 2026 The Authors. Published by Athenaeum Scientific Publishers.

This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

License URL:

<https://creativecommons.org/licenses/by/4.0/>

Abstract

The menisci play important roles in knee force transmission, load distribution, stability and proprioception. Nowadays, multiple repair techniques have been published to preserved the menisci highlighting how important this structure is. Nevertheless, depending on the meniscal tear pattern, the tear size, location, quality of the meniscal tissue and the stability of the meniscal tear and the knee joint, some meniscal tears are not reparable. Meniscal tears which are not a good candidate for repair or those with significant tissue loss and damage put the knee joint at risk of developing further injuries. This technical note describes a surgical technique on utilizing the hamstring autograft for meniscal substitution for patients with partial to near total meniscal loss. The technique was performed in one patient with favorable early postoperative outcome.

Keyword: Meniscal Transplantation; Meniscal Substitution; Hamstring Tendon Autograft

Introduction

Protecting the knee means protecting mobility, independence as well as quality of life and meniscus is a key structure in protecting this complex joint. Menisci are crescent-shaped, fibrocartilaginous structures with wedge-like cross sections that function to deepen the tibial plateau, transmit load through the joint, provide shock absorption and increase knee joint stability [1]. Their surface is smooth and slippery, it results from the vast majority of randomly oriented collagen fibers in their composition [2]. The lower part of the menisci is attached to the tibia, by the menisco-tibial ligament, which is a continuation of the joint capsule. According to vascularization, two main areas are present in the structure of meniscus: red-red zone - vascular/neural region and white-white zone - rather avascular/aneural region. Between these two areas is the red-white zone localized, which have properties like either one or the other zone [2].

This important structure of the knee joint is not spared from injuries. A meniscus tear is a common type of injury to the knee joint [3,4]. Biomechanically, evidence of the deleterious consequences of tears of the medial and lateral menisci are overwhelming [5]. When the meniscus is completely torn, its ability to convert axial load into circumferential stress weakens, leading to joint pain, instability and other problems [4]. Treatment options for meniscal tears are both non-operative and surgical. The surgical options include meniscectomy and suture repair [5,6]. With modern literature emphasizing the vital functions of the meniscus and possibility of early onset osteoarthritis in the absence of the meniscus, orthopedic surgeons have shifted their management goal from resection to preservation and repair [7].

Various surgical techniques have been described for meniscus repair, including open and arthroscopic approaches, inside-out and outside-in techniques, as well as modern all-inside implants [8]. But even with these various techniques that were developed to preserve the meniscus, there are tears not amenable for a good and stable repair leading to the possibility of doing

meniscectomy [9]. Multiple biomechanical and clinical investigations have since confirmed poor long-term outcomes and joint health in patients post-meniscectomy especially when involving the medial meniscus and its root [8,10]. Consequently, there's a trend toward meniscal preservation. In response to the limitations of traditional surgical approaches like Meniscal Allograft Transplantation (MAT), Collagen Meniscus Implants (CMI) and synthetic meniscal substitutes, which are hindered by availability, cost and potential complications; tendon autografts are emerging as a superior alternative [11].

Objective

The objective of this technical note is to describe a reproducible technique for meniscal substitution using a hamstring tendon Autograft in patients with partial to near total meniscal deficiency.

Surgical Technique

The overall decision-making process and surgical workflow for hamstring autograft meniscal substitution are summarized in Fig. 1. Routine diagnostic arthroscopy is done making sure that the lateral or medial compartment where the meniscal substitution will be done has good visualization and good exposure, just enough to allow passage and fixation of the graft. Pie crusting of the superficial Medial Collateral Ligament (MCL) can be done especially on a tight medial compartment. Once adequate visualization is obtained, arthroscopic debridement will be done to remove unstable or damaged meniscus beyond repair and measure the actual meniscal defect using an arthroscopic ruler.

Harvest either the gracilis or semitendinosus depending on the graft size needed after measurement of the meniscal defect. The graft then is prepared with the flatter side folded on top of the more tubular part of the tendon making the graft more flat than tubular (Fig. 2). Whip stitch suturing of the graft on both ends were done so that one side will serve as the meniscal root and the other side will be attached to the end of the remaining body of the meniscus.

Prepare to put on all the sutures needed to pass the graft. Two Ethibond 2.0 sutures will be placed using the FirstPass mini suture passer 8 to 10 mm from the end of the meniscus at the red - white zone 5 mm apart and this will act as a shuttling suture for the later placement of the graft (Fig. 3). Both free ends from above will be passed out to the anterolateral portal while the ones at the bottom will be passed outside the lateral joint line using suture passers (Fig. 4).

Meniscal root attachment site will be marked and bone surface was prepared by debriding it until a bleeding bed was achieved. Meniscal root tunnel is done transtibially. The meniscal root end of the graft will be shuttled thru the transtibial tunnel. The meniscal root end sutures are secured with a clamp.

The two suture ends of the graft will be tied to the sutures of the meniscus previously grasped outside through the anterolateral portal (Fig. 5). Bottom sutures of the meniscus passed previously out of the lateral joint line will be pulled gently while the whole meniscal graft is being inserted and properly placed at the periphery. Pull sutures to close the gap between graft and body of meniscus (Fig. 6). Use probe to push the graft in place.

Three inside out sutures will be placed to the body of the graft to stabilize it in place. Additional inside out repair sutures can be placed between the native meniscus and the graft for stabilization as needed. Suture ends of the root will be tightened and fixed with a button. All inside repairs are knotted respectively. Check the stability with a probe and knee range of motion and all wounds will be closed in a standard manner.

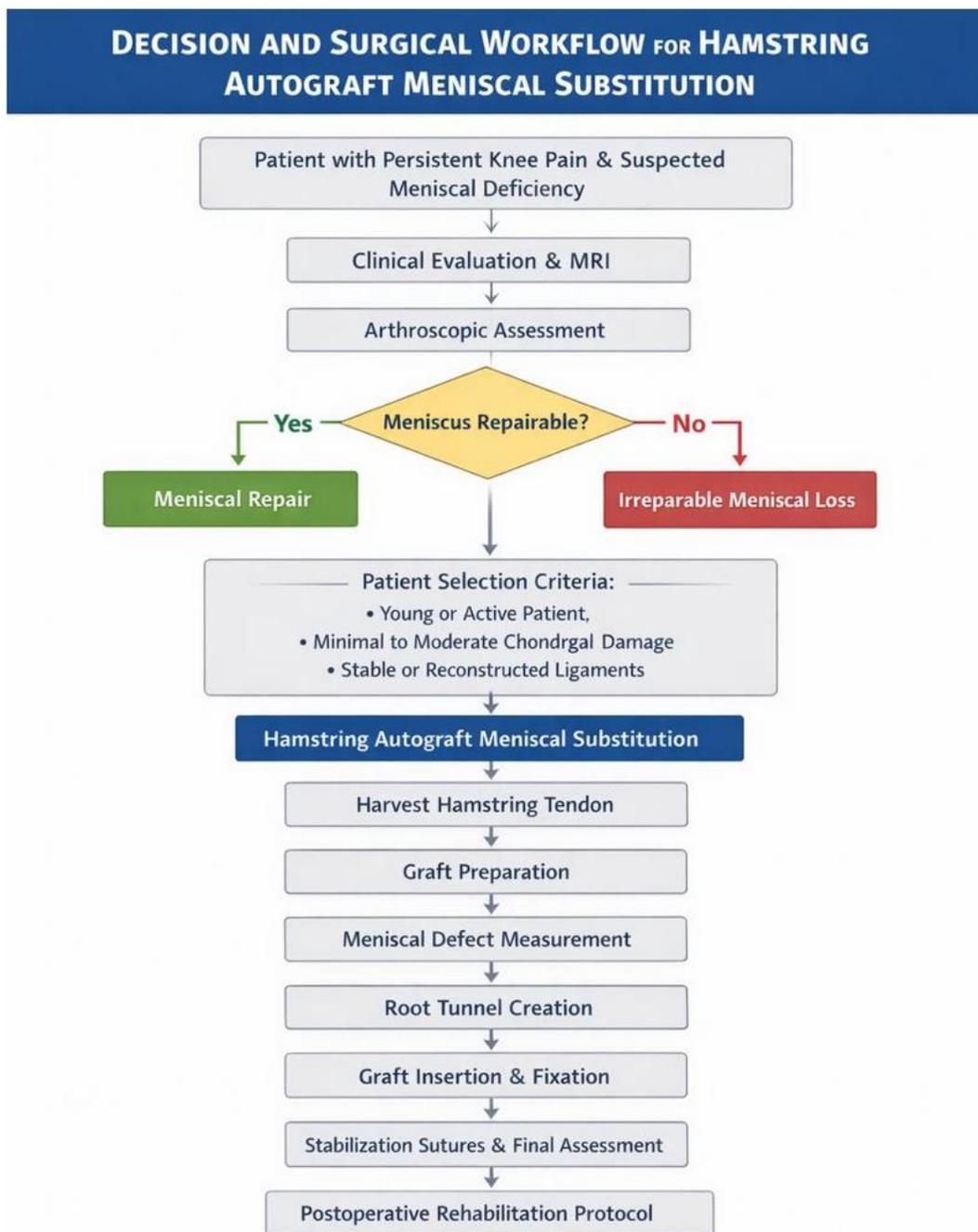


Figure 1: Surgical workflow.

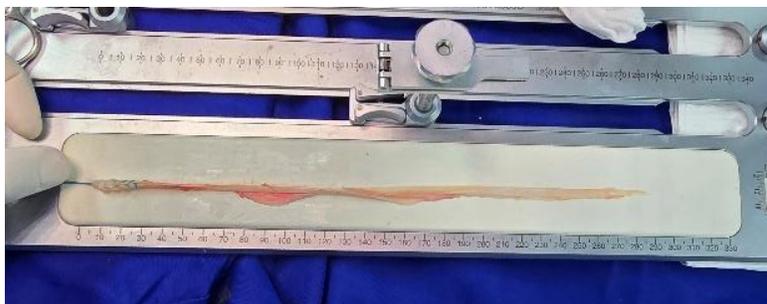


Figure 2: The flatter side folded on top of the more tubular part of the tendon making the graft more flat than tubular.

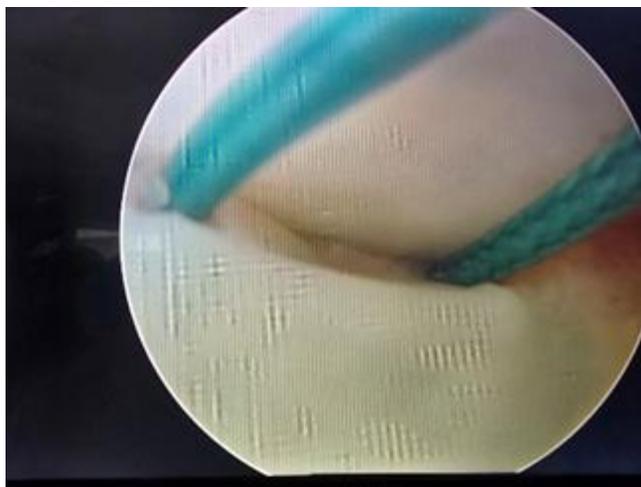


Figure 3: Two Ethibond 2.0 sutures will be placed using the FirstPass mini suture passer 8 to 10mm from the end of the meniscus at the red - white zone 5mm apart.



Figure 4: Both free ends from above will be passed out to the anterolateral portal while the ones at the bottom will be passed outside the lateral joint line using suture passers.



Figure 5: The two suture ends of the graft will be tied to the sutures of the meniscus previously grasped outside through the anterolateral portal.



Figure 6: Closing the gap between graft and the native meniscus.

Discussion

A significant absence of meniscal tissue or deficient meniscus is associated with impaired rotatory knee stability as well as laxity in the sagittal plane on top of the loss of its shock absorbing capacity that can accelerates the onset of knee osteoarthritis [11]. Several studies have remarkably demonstrated the increased rate of knee Osteoarthritis (OA), requirement for total knee arthroplasty and the decreased clinical and functional outcomes after partial and total meniscectomy for up to 40 years follow-up [12]. Meniscal allograft transplantation remains a commonly described option; however, its availability is limited in many countries and cost remains a major concern. In addition, regulatory and tissue bank requirements may restrict its use. Tendon autograft meniscal substitution has recently gained interest as a potential alternative. Experimental studies, including animal models, have demonstrated that tendon grafts can undergo remodeling and fibrocartilaginous metaplasia, which may allow them to function similarly to native meniscal tissue. These findings support the biological plausibility of tendon graft use for meniscal reconstruction [13-15].

However, the current literature remains limited and clinical outcomes are still evolving. Some authors report promising biomechanical and clinical results, while others emphasize the need for further long-term studies to determine durability and functional outcomes [16].

Our initial clinical application of this technique in one patient demonstrated encouraging early results, including improvement in pain and knee function without early complications. While this observation is limited, it supports the feasibility of the described procedure. The technique described in this article aims to provide a practical and reproducible approach that can be performed arthroscopically using readily available autografts such as the gracilis or semitendinosus tendon.

Indications For the Procedure

The indications for hamstring autograft meniscal substitution include:

- Partial to near-total meniscal loss
- Symptomatic meniscal deficiency with persistent pain
- Young or active patients with joint line pain after meniscectomy
- Preserved joint space with minimal to moderate cartilage damage
- Patients in whom meniscal allograft transplantation is unavailable or not feasible

Relative contraindications include:

- Advanced osteoarthritis
- Severe malalignment not corrected
- Knee instability not addressed (e.g., untreated ACL deficiency)
- Infection or inflammatory joint disease

Strength and Limitations

Strengths of Technique

- Uses autograft tissue, avoiding immunologic reaction
- Widely available and cost-effective
- Arthroscopic and minimally invasive
- Potential to restore partial meniscal function
- Applicable in settings where allografts are unavailable

Limitations

- Limited long-term clinical outcome data
- Technical learning curve
- Possible graft remodeling variability
- Unknown long-term durability compared with MAT

Conclusion

In summary, this technique describes how to perform an arthroscopic meniscal substitution utilizing the hamstring Autograft for partial to near total meniscal loss. It is a reliable and reproducible technique that can greatly decrease the risk of complications in patients with partial to near loss of their meniscus.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding Statement

This research did not receive any specific grant from funding agencies in the public, commercial or non-profit sectors.

Acknowledgement

None.

Data Availability Statement

Not applicable.

Ethical Statement

The project did not meet the definition of human subject research under the purview of the IRB according to federal regulations and therefore, was exempt.

Informed Consent Statement

Informed consent was taken for this study.

Authors' Contributions

All authors contributed equally to this paper.

References

1. Mameri ES, Dasari SP, Fortier LM, Verdejo FG, GURSOY S, Yanke AB, et al. Review of meniscus anatomy and biomechanics. *Curr Rev Musculoskelet Med.* 2022;15(5):323-35.
2. Pasiński M, Zabrzynska M, Adamczyk M, Sokołowski M, Głós T, Ziejka M, et al. A current insight into human knee menisci. *Transl Res Anat.* 2023;32:100259.
3. Ahmed I, Dhaif F, Khatri C, Parsons N, Hutchinson C, Staniszewska S, et al. The meniscal tear outcome (METRO) review: A systematic review summarising the clinical course and outcomes of patients with a meniscal tear. *Knee.* 2022;38:117-31.
4. Mao Z, Yang Q, Meng X, Jiang D, Zhao F. Dynamic biomechanical effects of medial meniscus tears on the knee joint: A finite element analysis. *J Orthop Surg Res.* 2025;20(1):26.

5. Garcia JR, Ayala SG, Allende F, Mameri E, Haynes M, Familiari F, et al. Diagnosis and treatment strategies of meniscus root tears: A scoping review. *Orthop J Sports Med.* 2024;12(11):23259671241283962.
6. Screpis D, Qordja F, De Berardinis L, Piovan G, Magnanelli S, Amarossi A, et al. Saving the meniscus: A retrospective observational study of the incidence, treatment and failure rate of the main meniscal tear types at 24-month follow-up. *J Clin Med.* 2025;14(10):3350.
7. Bhan K. Meniscal tears: Current understanding, diagnosis and management. *Cureus.* 2020;12(6):e8590.
8. Cabarcas B, Peairs E, Iyer S, Ina J, Hevesi M, Tagliero AJ, et al. Long-term results for meniscus repair. *Curr Rev Musculoskelet Med.* 2025;18(7):229-45.
9. Noyes FR, Heckmann TP, Barber-Westin SD. Meniscus repair and transplantation: A comprehensive update. *J Orthop Sports Phys Ther.* 2012;42(3):274-90.
10. Jiang D, Luo X, Ao Y, Gong X, Wang YJ, Wang HJ, et al. Risk of total/subtotal meniscectomy for respective medial and lateral meniscus injury: correlation with tear type, duration of complaint, age, gender and ACL rupture in 6034 Asian patients. *BMC Surg.* 2017;17(1):127.
11. Kim Y, Karl E, Ishijima M, Guy S, Jacquet C, Ollivier M. The potential of tendon autograft as meniscus substitution: Current concepts. *J ISAKOS.* 2024;9(6):100353.
12. Winkler PW, Rothrauff BB, Buerba RA, Shah N, Zaffagnini S, Alexander P, et al. Meniscal substitution, a developing and long-awaited demand. *J Exp Orthop.* 2020;7(1):55.
13. Li H, Nie S, Lan M. Medial meniscus posterior root tear reconstructed with gracilis autograft improve healing rate and patient-reported outcome measures. *BMC Musculoskelet Disord.* 2022;23(1):1094.
14. Holmes SW Jr, Huff LW, Barnes AJ, Baier AJ. Anatomic reinforced medial meniscal root reconstruction with gracilis autograft. *Arthrosc Tech.* 2019;8(3):e209-13.
15. Li C, Hu X, Meng Q, Zhang X, Zhu J, Dai L, et al. The potential of using semitendinosus tendon as autograft in rabbit meniscus reconstruction. *Sci Rep.* 2017;7(1):7033.
16. Milenin O, Strafun S, Sergienko R, Baranov K. Lateral meniscus replacement using peroneus longus tendon autograft. *Arthrosc Tech.* 2020;9(8):e1163-9.

About the journal



Journal of Orthopaedic Science and Research is an international, peer-reviewed, open-access journal published by Athenaeum Scientific Publishers. The journal publishes original research articles, case reports, editorials, reviews, and commentaries relevant to its scope. It aims to disseminate high-quality scholarly work that contributes to research, clinical practice, and academic knowledge in the field.

All submissions are evaluated through a structured peer-review process in accordance with established editorial and ethical standards. Manuscripts are submitted and processed through the journal's online submission system.

Manuscript submission: <https://athenaeumpub.com/submit-manuscript/>