

Technical Note





Meniscal allograft transplant with Hybrid technique using posterior bone plug and anterior soft tissue plug

Summary

Meniscus allograft transplantation is an area of active research, as the importance of the meniscus in the longevity of the native knee joint is increasingly recognized. This article describes a modified meniscus allograft transplant technique using a hybrid technique with 1 bone tunnel with fixation of the allograft through the use of a posterior bone plug and fixing it in the anterior part with the use of a soft tissue plug, which is applicable both for the lateral and medial meniscus.

Volume 16 Issue 1 - 2024

Guevara Rosales PC, Guzmán Guevara J, Torres Sánchez G Hospital Ángeles Puebla, Mexico

Correspondence: Guevara Rosales PC, Hospital Ángeles Puebla, Mexico, Email pauloguevar@hotmail.com

Received: February 05, 2024 | Published: February 21, 2024

Introduction

Meniscus tears are one of the most commonknee injuries, once treated with total eniscectomy previously, the current management is preservation of the meniscusas a Gold standard. They were recognized in the 1930s, and the treatment was an open total meniscectomy.

Fortunately, Fairbank discovered the adverse effects of total meniscectomy, where he demonstrated that the joint is exposed to greater contact pressures and progresses towards joint degeneration.

Currently, total meniscectomy is no longerperformed and meniscus repair, partial meniscectomy, and meniscal allograft transplantation are preferred.¹⁻⁵

Meniscus allograft transplantation decreases contact stress on the knee joint and provides pain relief. The ideal candidate is under 50 years of age, mass index less than 30, a stable and well- aligned knee, Outer bridge classification less than grade 3, Kellgren-Lawrence grade I or II, and symptoms of a previous subtotal or total meniscectomy. Common allograft preparation and fixation techniques include soft tissue fixation, bone plugs, or bone bridging. Initially, the proposed techniques required performing a small arthrotomy with the assistance of the arthroscope.

The end of the 80s, Keene demonstrated the possibility of performing this technique arthroscopically, which is a less invasive and beneficial way for the patient. In this work we explain our hybrid placement technique, which consists of the placement of a meniscal transplant with a posterior bone plug and an anterior soft tissue plug, which has the advantage of preserving bone stock, reducing the risk of confluence of anterior bone tunnels, reducing of surgical time, it is applicable to medial and lateral meniscus and is a less demanding technique.

Our technique has been developed by the main author and performed for more than 20 arthroscopic meniscus transplants with good results.⁶⁻⁹

it Manuscript | http://medcraveonline.co

Graft measurement

Surgical technique

Indications are patients under 50 years of age with a non-functional meniscus as a result of a previous partial or total meniscectomy, patients functionally limited by localized pain in the affected compartment, patients with a severity of the cartilage defect less than Outerbridge grade III, patients with normal or correctable knee alignment. Contraindications include patients over 50 years of age, patients with osteoarthritic changes or chondral lesions corresponding toan Outerbridge III classification or higher.

We determined the size by means of magnetic resonance imaging by measuring anteroposteriorly the distance between the tibial spine and the margin of the tibial metaphysis and laterally the distance between a line parallel to the anterior surface of the tibia above the tuberosity and another tangent to the posterior edge of the corresponding tibial plateau.^{10,11}

Allograft preparation

A meniscus with a bone block is obtained from the allograft bank, compatible with themeasurements made preoperatively. The allograft is thawed in a mixture of 1 g vancomycin and 200 ml normal saline for 30minutes.

Our preference is to use Arthrex instrumentation (Arthrex, Naples, FL) tosimplify the process.

The first step is to mark the anterior horn and posterior horn to maintain orientationduring preparation.

Subsequently, using a saw, the cuts of the posteriorbone plug are made. Ideally, it should have a trapezoidal shape, with a diameter of 7.0 mm to 8.0mm and a length of 10-15 mm. The anterior bone block is initially cut and all bone tissue is removed to preserve only soft tissue. Next, a 2 mm center hole is drilled in the posteriorbone block and a #2 FiberWire suture with a straight needle is used to suture 2 to 3 times through the center hole of the bone block incorporating

MOJ Orthop Rheumatol. 2024;16(1):36-39.



©2024 Guevara et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and build upon your work non-commercially.

meniscal tissue through the hole posterior insertion. The anterior soft tissue plug is prepared in the same way with modified or horizontal Kessler stitches.^{12,13}



Location of portals

Standard anterolateral and anteromedial portals are made and the joint is visualized with a 30-degree arthroscope while the knee is insufflated with normal saline. A transpatellar accessory portal of the knee is made to facilitate fixation of the posterior horn. With the camera facing the posterior compartment, a spinal needle is inserted to estimate the best trajectory forsoft tissue anchor insertion.

Meniscal bed preparation

An arthroscopic razor is introduced through the posteromedial portal and the remnants of the meniscal tissue are debrided to a bleeding edge of approximately 1 mm. The residual meniscus should not be completely removed because it prevents radial displacement of the allograft and serves as a firm bed for meniscus fixation. We performed a limited plasty of the posterior femoral condyle for adequate visualization of the posterior horn of the meniscus. Both insertions of the meniscus roots must be identified. With the help of an arthroscopic shaverand a curette, the cartilage is decorticated until reaching the bone and observing a bleeding edge.

Posterior tunnel preparation

A tibial guide from the meniscus root or anterior cruciate ligament (ACL) is used with an angle of 65 through the anteromedial or anterolateral portal respectively, the posterior horn tunnel is made retrogradely through the most anterior portion of the pons residual of the point of attachment of themeniscus. The root of the posterior medial meniscus should be placed behind the medial tibialtubercle, in front of the tibial insertion site of the posterior cruciate ligament, and the root of the posterior lateral meniscus should be placed behind the lateral tibial eminence.



ACL guidance is used at 65 degrees

It is drilled with the FlipCutter bur in the center of the posterior remnant. Choose a FlipCutter® drill bit size 1 mm larger than the diameter of the posterior plug of the donor meniscus to facilitate passage. Remove the guide and tap the cannula into the bone. Rotate the FlipCutter II bit to its cutting position and drill retrograde to a depth of 10-15 mm. Then use the shaver to remove any foreign tissue around the top edge of the tunnel. Any pieceof soft tissue or cartilage will present difficulty in reducing the posterior plug.



Pass a FiberStickTM suture through the FlipCutter® Drill Guide and retrieve sutures passing through themedial portal or a #1 PDS suture using a knot pusher through the tibial tunnel for subsequent suture transfer from the definitive root threads of the posterior meniscus.



Passage of the graft through the portal

Pass the posterior bone plug suture with the previously placed posterior shuttle suture through the posterior cavity and down the tunnel, through the ipsilateral portal.

Begin inserting the allograft by guiding it with the posterior horn while pulling the posterior root meniscus sutures.^{14,15}



Continue to tighten the other sutures while the allograft is inserted. Use the probe to help guide the posterior bone plug into position while applying gentle traction on the posterior suture.

Citation: Guevara RPC, Guzmán GJ, Torres SG. Meniscal allograft transplant with Hybrid technique using posterior bone plug and anterior soft tissue plug. MOJ Orthop Rheumatol. 2024;16(1):36–39. DOI: 10.15406/mojor.2024.16.00660 Meniscal allograft transplant with Hybrid technique using posterior bone plug and anterior soft tissue plug

Peripheral fixation of the meniscus

Subsequently, the All-inside sutures begin to be placed. We prefer to use the Smith & Nephew Fast-Fix system. We start at the posterior horn and the middle part of the body and move towards the anterior part and anterior root. An average of 6 to 8 sutures with vertical mattressstitches are required to complement the fixation, placed 5 mm apart and distributed on both its upper and lower surface.



It is fixed peripherally with the use of 6 to 8 Fast-Fixanchors.

Fixation of the anterior soft tissue plug

Anterior root fixation is performed after insertion of the posterior meniscus root bone plug. This sequence allows you to have a more precise ideaabout the correct location. The imprint of the anterior horn of the medial meniscus is located in front of the tibial insertion of the ACL, behind the intermeniscal ligament.

The insertion of the lateral anterior meniscal horncan be found in front of the lateral eminence.

The insertion of the anterior horn of the meniscus is recreated with the knotless suture anchoring device, we prefer to use PEEK Swivelock type 4.75 mm (Arthrex), the anchor insertion angle is approximately $60-70^{\circ}$ in the sagittal plane (up to thetibial plateau).



The anterior horn is fixed with the use of a 4.75 mm Swivelock anchor.

Adequate stability and tension of the entire periphery is confirmed before fixing the posteriorbone plug.

Posterior bone plug fixation

Visualize to ensure that the plug and meniscus havebeen reduced correctly, once the proper position has been confirmed, the fixation of the bone plug sutures is carried out using a knotless anchor type PEEK Swivelock 4.75 mm (Arthrex) in the anterior tibial cortex, paying attention. Be careful to fix it with adequate tension.



Discussion

The preservation of the meniscus l has been one of the greatest evolutions in the last century. Although the incidence of meniscus repair is increasing, meniscal allograft transplantation is considered a salvage procedure.

Success rates vary widely in the literature. Early studies demonstrated lower success rates and outcome scores, however, as advances in instrumentation and techniques have evolved, morerecent studies have shown better results. Comparisons between different preparation and fixation techniques have been studied. Soft tissue fixation, bone plug fixation, and bone bridge fixation have been the main focus of the literature.^{16,17}

Once the allograft is reduced, the knee is cycled several times to ensure proper position and stability. Finally, a final inspection is carried out to avoidoverlooking any other added injuries.

Wound closure

The knee is drained and closed with 4-0 Monocrylsuture and 3-0 Nylon skin. Alhalki et al.17 compared fixation methods using bone plugs versus soft tissue plugs and evaluated contact pressure and contact area. The authors concluded that the use of bone plugs restores contact pressures and contact area near a native meniscus.

McDermott et al.18 also studied tibial contact pressures and concluded that bone plug fixation showed lower contact pressure compared to soft tissue plug fixation. Although some studies have shown similar results between bone fixation and soft tissue fixation, there is currently controversy as to which technique is better. The technique presented in this article is an evolution of the original technique. We have discovered that it is simple, effective, reproducible and has certain advantages compared to the other techniques described.

Further clinical studies are currently being conducted to examine outcomes and patient satisfaction with our technique for comparison withother established techniques (Table 1).

Citation: Guevara RPC, Guzmán GJ, Torres SG. Meniscal allograft transplant with Hybrid technique using posterior bone plug and anterior soft tissue plug. MOJ Orthop Rheumatol. 2024;16(1):36–39. DOI: 10.15406/mojor.2024.16.00660 Table I Advantages and disadvantages of our technique

Advantages	Disadvantages
-Reproducible and simple technique, with a short learning curve.	-High cost
-Decrease in surgical time	-Use of posteromedial portal and risk of nerve injury
-Preservation of bone stock using only I bone tunnel	-We do not have long-term results studies
-Reduced risks of confluence of bone tunnels	
-Completely arthroscopic technique, v arthrotomy.	without the need to perform
-lt is reproducible for medial and lateral meniscus	

Conclusion

This is an alternative meniscus transplant technique, which we have found provides secure fixation of the meniscus horns, with a low percentage of extrusion and has the benefits of being less surgically invasive, with alearning curve simpler as well as fewer adverse effects.

Acknowledgments

None.

Conflicts of interest

The authors declare no conflicts of interest.

References

- Kester CR, Caldwell PE, Pearson SE. Lateral meniscal allograft transplant: dovetail bone bridge preparation. *Atrthroscopy techniques*. 2021;10(4):E969–E973.
- Bobby Y, Michael D, David JT. Meniscal allograft transplantation. Sports Med Arthroscopy review. 2021;29(3):168–172.
- Southworth TM, Naveen NB, Tauro TM, et al. Meniscal allograft transplants. *Clinics in Sport Medicine*. 2020;39(1):93–123.
- Kani KK, Porrino JA, Chew FS. Meniscal allograft transplantation: a pictorial review. *Current Problems in Diagnostic Radiology*. 2022;51(5):779–786.

- DeFrance M, Ford E, McMillan S. Arthroscopic medial meniscal transplant using multiple fixation techniques. *Clinics in Sport Medicine*. 2019;8(9):E1025–E1029.
- Pereira H, Cengiz IF, Gomes S, et al. Meniscal allograft transplants and new scaffolding techniques. *EFFORT open reviews*. 2019;4(6):279–295.
- Cavendish PA, DiBartola AC, Everhart JS, et al. Meniscal allograft transplantation: a review of indications, techniques, and outcomes. *Knee* Surgery, Sports Traumatology, Arthroscopy. 2020;28:3539–3550.
- Gilat R, Cole BJ. Meniscal allograft transplantation: indications, techniques, outcomes. *Arthroscopy Techniques*. 2020;36(4):P938–P939.
- Dave Lee YH, Caborn DNM. A new technique for arthroscopic meniscus transplant using soft tissue fixation and anatomical meniscal root reinsertion. *Knee Surgery, Sports Traumatology, Arthroscopy.* 2012;20:904–908.
- Seiter MN, Haber DB, Ruzbarsky JJ, et al. Segmental meniscus allograft transplantation. *Arthroscopy Techniques*. 2021;10(3):E697–E703.
- Stone KR, Walgenbach AW. Meniscal allografting: The three-tunnel technique. Arthroscopy. 2003;19(4):P426–430.
- 12. Hergan D, Thut D, Sherman O, et al. Meniscal allograft transplantation. *Arthroscopy*. 2011;27(1):P101–112.
- Bhattacharyya R, Krishnan H, Bausch N, et al. Bone bridge technique for lateral meniscal allograft transplantation: no difference in clinical outcome compared to the soft tissue technique. *Knee Surgery, Sports Traumatology, Arthroscopy.* 2023;31(10):4162–4170.
- Spalding T, Damasena I, Lawton R, et al. Meniscal repair techniques. *Clinics in Sport Medicine*. 2016;39(1):37–56.
- Dean CS, Olivetto J, Chahla J, et al. Medial meniscal allograft transplantation: the bone plug technique. *Arthroscopy Techniques*. 2016;5(2):E329–E335.
- Kaplan DJ, Glait SA, Ryan Jr WE, et al. Meniscal allograft transplantation made simple: bridge and slot technique. *Arthroscopy Techniques*. 2017;6(6):E2129–E2135.
- 17. Lee DW, Park JH, Chung KS, et al. Arthroscopic lateral meniscal allograft transplantation with the key-hole technique. *Arthroscopy Techniques*. 2017;6(5):E1815–E1820.