Meniscal allograft transplantation has become a viable option for patients who develop pain following total or near total meniscectomy.

In 1989, Milachowski et al.⁴ was the first to evaluate a series of MATs; in this series, transplantation was performed using medial or lateral arthrotomy with collateral ligament detachment or splitting. Later, the application of joint distractors was proposed to preserve the collateral ligaments. However, the arthroscopically assisted MAT technique is now the most commonly used technique.⁷

Several techniques have been described for meniscal allograft transplantation. The main differences between the techniques include open versus arthroscopically assisted, soft tissue fixation versus bony fixation, and bone plug versus bone-bridge.⁸ Regardless of the technique used, the most important factor in successful meniscal transplantation is appropriate sizing and anatomic placement of the transplanted meniscus.²

There remains debate whether bone fixation (bone-bridge, bone-plugs) or soft tissue fixation is the optimal method for meniscal transplantation. An analysis of the literature on MAT is difficult because of the lack of high-level evidence and the variability of surgical techniques, concomitant procedures, and clinical scores. For these reasons, a meta-analysis of the data is not feasible.⁶ Some authors reported that anatomic and solid fixation of the graft with bone plugs restored normal contact mechanics in both medial and lateral MATs.⁵ A few studies compared the clinical results of the different fixation techniques. Abat et al¹ reported the results of 88 MATs: 33 fixed with the suture-only technique (group A) and 55 with bone plugs (group B). The authors found no significant differences in terms of clinical outcomes between the 2 groups. However, a significantly higher complication rate was found in group A compared with group B (33.3% vs 16.4%, respectively), together with a higher failure rate (9% vs 3.6%, respectively), although this difference was not significant. In addition, a higher percentage of extruded menisci was found in group A compared with group B (36.3% vs 28.13%, respectively; P = .001).

It is technically easier to anchor the meniscus with soft tissue alone, bone promotes improved load transmission and provides more normal biomechanics of the transplanted meniscus. Bin et al.³ reported the result of MATs using bone fixation methods that favorable clinical outcomes should rely on sound structure and long-term benefits. They found that the failure rate was 10.9% if failure was defined as poor overall results or 18.2% if failure was defined as nonsatisfactory overall results. These findings were not inferior to previous results, despite their use of objective (MRI and second-look arthroscopy) evaluation.

Our preferred lateral MAT technique is to utilize a bone bridge to secure the meniscal graft to the tibial plateau. Under C-arm fluoroscopy intensification, a guide wire was inserted in the AP direction just under the lateral tibial eminence. The inserted guide wire was positioned approximately 8 mm under the highest portion of the
articular surface of the lateral tibial plateau. Because the ideal entry point was partially covered by the patellar tendon, it was retracted medially to avoid inadvertently selecting an excessively lateral entry point. In addition, maintaining the knee in extension made it easier to retract the patellar tendon medially by loosening it, allowing a relatively central entry point for the guide wire. After the correct guide wire position was confirmed, a 10 mm–diameter core reamer was used to create a tibial slot without breaching the posterior cortex. The roof of the tibial slot was removed with a narrow rongeur, and a keyhole-shaped tunnel was created with a pituitary rongeur. After the tibial slot was prepared, the lateral meniscal allograft was introduced through an anterior mini-arthrotomy. After the allograft was optimally positioned and seated in the joint, next step is the full-thickness all-inside suture of posterior horn. In addition, full-thickness modified outside-in sutures at the midportion and anterior horn.

Medial MAT technique is to utilize a bone plug. After a 9-mm-diameter and 5-mm-depth posterior bone plug and a 10-mm-diameter and 10-mm-depth anterior bone plug were prepared, No. 2 Ethibond (Ethicon) was placed with a whipstitch at each horn, and the posteromedial side of the allograft was sutured with 2 leading sutures. The space of the intercondylar notch was widened to allow easy passage of the bone plug attached to the posterior horn. This procedure was performed by viewing the intercondylar notch with an arthroscope through the anterolateral portal and inserting an osteotome or arthroscopic burr through the anteromedial portal. The osteotome or arthroscopic bur was used to partially remove the medial intercondylar eminence of the tibia and the intercondylar notch of the medial femoral condyle for easy passage of bone plugs. While looking at the posteromedial capsule, we inserted a spinal needle, and after confirming the exact location, we created a posteromedial portal. After confirming the attachment of the posterior horn by inserting the arthroscope through the posteromedial portal, we used a tibial guide for ACL reconstruction to create an tunnel. Then, to allow the sutures of the posterior horn of the allograft to pass through the tunnel to the outside, we passed a looped wire through the posterior tunnel. Next, anterior arthrotomy was performed along the medial margin of the patella and patellar tendon to remove the remaining anterior horn of the medial meniscus as well as bony spurs. Through the anterior incision, the looped wire for the leading sutures that were already sutured to the posteromedial side of the allograft was passed to the posteromedial compartment. By use of the looped wires that had been already passed through, the locking sutures linked to the posterior horn of the allograft were pulled out through the posterior horn tunnel. The meniscal allograft was inserted into the knee joint through the widened intercondylar notch by pulling the locking sutures of the posterior horn. At this time, valgus force was applied to the knee for easy passage of the allograft. An arthroscope was used to confirm that the meniscal allograft was situated properly, and a probe was used to confirm that the posterior bone plug was inserted in the correct location. The meniscal allograft was attached to the capsule with full-thickness all-inside and modified outside-in meniscal repair technique. A location for the anterior bone plug was determined under arthroscopy, and a 10-mm reamer was used to create a tunnel for the anterior bone plug. From the anterior surface of the tibia, a hole was drilled to the inside of the tunnel of the anterior bone plug for passage of the locking sutures linked to the anterior horn. The locking sutures of the anterior horn were pulled out of the anterior tunnel through the hole.

Summary of slide contents

1. Preoperative issues
   - Patient position
   - Estimate narrow joint space in advance

2. Issues during MAT surgery
-Graft fixation methods

a) Soft tissue technique (soft tissue–only technique, bone tunnel fixation)

b) Bone-bridge technique (key-hole technique)

c) Bone plug technique

d) Dove-tail technique, Trough technique

-Consensus or controversial

3. My technique, tips and pearls

[Reference]


