Meniscus transplantation; the Dutch experience

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Introduction

The functions of the menisci of the knee are well-known, and include shock absorption and load transmission within the joint. They are also secondary stabilizers and it has been proposed that in addition they have roles in proprioception, lubrication of the joint and nourishment of articular cartilage [1—4]. After (sub)total meniscectomy, there is an increased risk of osteoarthritis (OA) due to increased peak stresses and stress concentration on the articular cartilage [5,6]. The lateral meniscus has a more prominent role in shock absorption and load transmission as compared to the medial meniscus, and there is therefore a higher incidence of OA after lateral meniscectomy [7—9]. The degenerative changes seen are directly proportional to the amount of meniscal tissue removed.

There is a therapeutic problem in the younger patient with post-meniscectomy pain where significant degeneration has not yet fully developed. In such patients there is often no indication for a total or unicompartmental knee arthroplasty because they are too young, nor for high tibial osteotomy (HTO) when the alignment is normal. In these cases meniscal transplantation can be an option especially in the lateral compartment of the knee [10—14].

The European Meniscal Transplantation Group (EMTG) has reached a consensus on the indications for meniscal transplantation:

- disabling compartmental pain after a (sub)total meniscectomy;
- the patient is under the age of 50 years;
- the knee must have normal alignment;
- the joint must be stable or stabilized by concomitant anterior cruciate ligament (ACL) reconstruction;
- the articular cartilage should not be severely deteriorated.

At present, cryopreserved or fresh meniscal allografts are the most commonly used types of graft. It is likely that in the future an artificial meniscal prosthesis will become available for clinical use and basic research in this area is ongoing.

How should we fix the allograft?

Open and arthroscopically-assisted techniques using bone plugs, bone bridges and bone tunnels have all been described [10]. The technique with bone plugs is highly demanding. Bone bridges and tunnels have the advantage of being more straightforward, technically. In case of a concomitant ACL reconstruction having to be performed, a continuous donor bony bridge between the horns of a meniscal allograft would be in the way of the tibial tunnel for the ACL. Therefore, we use bone tunnels in all cases. We now perform all menis-
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Meniscal transplantation procedures arthroscopically and fix the anterior horn with a bone anchor in anatomical position, the posterior horn through a 4 mm bone tunnel, also fixed with a bone anchor in the tibia, and then the allograft is sutured inside-out peripherally to the capsule. With this technique both horns are securely fixed to the tibial bone in the way that the donor meniscus can perform its function and does not extrude over the tibial plateau.

Comparing my first series of open meniscal transplants [15] to the arthroscopic procedure [16], the latter show a slightly better result, although the patient follow-up is shorter, and articular cartilage damage in this group is less severe than in the first group. These results are comparable to the long-term series of Wirth et al. [17] and Verdonk et al. [18].

What are the results of meniscal transplantation?

1. Long-term follow-up studies [17–19] show a reduction of pain and improved function in the knee after meniscal transplantation;
2. a secure fixation of the anterior and posterior horns has to be achieved in order to prevent extrusion of the graft and to regain hoop stress configuration in the meniscal tissue [20];
3. when using a bone bridge graft sizing becomes of greater importance;
4. rejection of grafts does not occur;
5. the latest follow-up of our open series showed that meniscus transplantation reduces disabling pain in patients when HTO and arthroplasty is not indicated. It extends a knee prosthesis, and subsequently reduces costs for revision of total knee arthroplasty. A meniscal transplant can survive 10 to 15 years [19].

Is meniscal transplantation an evolving technique?

Yes, it is. In 2007, Pubmed showed 13 articles on this subject. And in 2008, 18 articles were published. However, there are still no level 1 or 2 studies performed yet.

What is the ultimate meniscal treatment?

Meniscal repair! Why? Because there is a trend towards better functional results after repair compared to partial meniscectomy, and there is a trend towards better radiological results and contact stresses on articular cartilage are reduced if tissue is preserved [21]. The problems concerning meniscal repair are that it is a difficult technique, it is time consuming, and articular cartilage damage can occur during the procedure. Other potential problems include the risks of nerve injury, re-tears and the need for longer rehabilitation.

Conclusion

Meniscal transplantation is no wide-scale surgery; the indications are few. As we perform more frequent meniscal repair, the requirement for meniscal transplantation should become even smaller. Logistically, in the Netherlands we have a shortage of donor material as well as problems with the insurance companies, which add to the difficulties in promoting the procedure. In the future, the use of meniscal allografts will probably be superseded by the development of artificial or tissue engineered meniscal replacements.

References