The Biologic Holy Grail: Will It Ever Be Found?

Fred D. Cushner, MD

The problem is not new. A routine arthroscopic knee surgery is performed and an isolated Grade 4 cartilage is seen. So what is a surgeon to do? Certainly one could easily perform a microfracture but is the patient going to accept the often-prescribed 6 weeks of limited weight-bearing? Other options do exist, but once again, not all patients are accepting of a more invasive procedure with a prolonged rehabilitation period.

We thought we had an answer in the mid 1990s with the popularization of autologous chondrocyte transplantations (Carticel; Genzyme Corp, a Sanofi company, Cambridge, Massachusetts). There was a sense of excitement and the orthopedic community went biopsy crazy. Mandatory training was required, initially in Gothenburg, Sweden, and a new dawn of cartilage restoration was born. This excitement spilled over into other forms of cartilage treatments including Osteochondral Autograft Transfer Systems (OATS), with improved instrumentation and more options for the treatment of these cartilage lesions.

"While new attempts to restore cartilage remain in the pipeline, we must move away from pure animal studies, case reports, white papers, and small surgeon experience. Randomized controlled trials are needed..."

This time period was the Renaissance Period of cartilage restoration: a period of excitement that led to the establishment of the International Cartilage Repair Society.

But as cartilage restoration became more popular, so did the amount of obstacles surgeons would encounter to be able to perform these procedures. Because of a paucity of literature describing the efficacy of these procedures, insurance companies were quick to describe the procedures as experimental, often refusing to approve the procedures or denying claims once performed.

While good results were eventually reported, some limitations remained. The procedure was expensive, two procedures, including an open arthrotomy was required, rehabilitation was slow and a high reoperation rate was reported. In addition, while this procedure is still being performed, it falls short of being the ultimate answer to isolated cartilage lesions of the knee.

What is the ideal method of cartilage repair? In a perfect world, all patients would be consented to routine arthroscopy and cartilage procedures as indicated (**Figure 1**). If an isolated lesion is seen, then the method of repair should be not only efficacious but should be performed arthroscopically, an off the shelf option, that can be performed at the same time as the diagnostic arthroscopy.

Over the last several years, we have seen a resurgence in cartilage restoration biologic options. DeNovo juvenile cartilage (Zimmer Inc, Warsaw, Indiana) has been introduced but does have its limitations. It is juvenile allograft cartilage that is prepared with a fibrin glue and placed currently as a second procedure.

The lesion is seen at the time of diagnostic arthroscopy, lesion is sized, and how much of the cartilage to order is determined. Limits include not only the cost, but also the requirement of a second procedure, an arthrotomy, and lets not forget the need to bone graft the defect bed if significant subchondral bone loss has occurred.

Figure 1. Isolated cartilage seen at time of routine arthroscopy.

Dr. Cushner is Editorial Review Board member of the journal; Chief of Orthopedics, Southside Hospital, Bay Shore, New York; and Director, Insall Scott Kelly, New York, New York.

Author's Disclosure Statement: The author wishes to report that he will be a Speaker Bureau for Zimmer, Inc.

Am J Orthop. 2013;42(5):206-207.

Another recent advancement is the use of allograft cartilage plugs, Chondrofix, (Zimmer Inc) (**Figures 2A, 2B**). These are human allograft osteochondral plugs, irradiated for safety, have a long shelf life, and can be available as needed. Due to the radiation, the cartilage plugs may be disease-free, have been FDA approved, but there is a lack of long-term studies not only demonstrating efficacy but also long-term durability. Perhaps we are approaching the Holy Grail with biologic products such as this, but long-term acceptance will not occur until proper long-term studies are performed. Cost will remain an issue as well, since it is quite easy to place 3 to 4 plugs at one sitting and approach implant costs as high as a revision knee impla nt (**Figure 3**).

I am sad to say that the Holy Grail for biologic restoration of isolated cartilage lesions has yet to be found. We still do not have the perfect method for cartilage restoration at this time. While new attempts to restore cartilage remain in the pipeline, we must move away from pure animal studies, case reports, white papers, and small surgeon experience. Randomized controlled studies are needed to test these biologic advances, and finally find the ideal treatment for these isolated cartilage defects. We owe it to our patients to finally find the ideal treatment for these cartilage lesions. ■

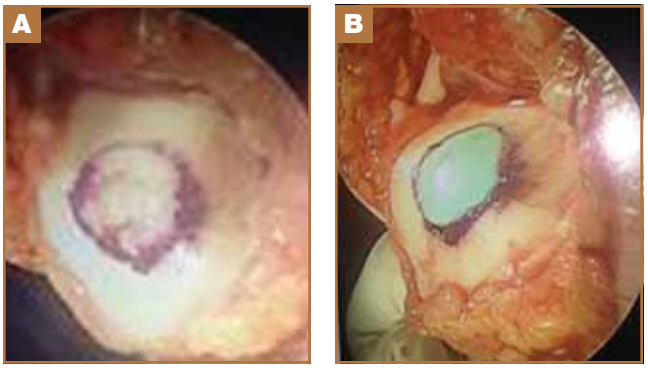

Figure 2. Isolated patella cartilage defect (A) and patella defect with Chondrofix plug in situ (Zimmer Inc, Warsaw, Indiana) (B).

Figure 3. Complex cartilage defect with 3 Chondrofix (Zimmer Inc) plugs in a "Mickey Mouse" repair pattern.