Cartilage
Friday, October 14, 2011 • 10:00 - 11:00am
General Session

Should We Repair?
  
  *Marc Safran, MD USA*

Fibrin +/- FasTFix
  
  *Richard Villar, BSc (Hons), MA, MS, FRCS UNITED KINGDOM*

Repair
  
  *Nicolas Bonin, MD FRANCE*

Microfracture
  
  *John O'Donnell, MBBS, FRACS, FAOrthA AUSTRALIA*

MACI
  
  *Andrea Fontana, MD ITALY*

MACI
  
  *Hassan Sadri, MD SWITZERLAND*

PRP & Stem Cells
  
  *Rodrigo Mardones, MD CHILE*
Cartilage Injuries About the Hip...Should We Repair

Marc R. Safran, MD
Stanford University

1. Introduction
   a. Chondral Injuries Difficult To Treat
      i. Lack of Inherent Vascularity
      ii. Lack of Nerve Supply
   b. Often Identified When Too Late
      i. DJD
      ii. Seen earlier with FAI

2. Current Options
   a. Debridement
   b. Abrasion Arthroplasty
   c. Microfracture
   d. Repair
   e. ACI
   f. MACI
   g. Stem Cells

3. Why Repair
   a. Debridement
      i. Abrade vs opposing articular cartilage
         1. Progression
   b. Abrasion Arthroplasty
      i. Did not work well in knee
   c. Microfracture
      i. Develop fibrocartilage
         1. Not normal cartilage
            a. Structure
            b. Biomechanics
         2. ? Longevity
   d. Repair
      i. Maintain Normal Complex Architecture
   e. ACI / MACI / Stem Cells
      i. Replace Normal Cartilage

NOTES:
4. Is Repairing Viable
   a. Biochemical Assessment
      i. 21 acetabular chondral flap lesions from 20 patients
   ii. Biochemical Analysis
       1. Concentrations of DNA
          a. An indicator of chondrocyte content
       2. Concentration of Hydroxy-proline (OH-Pro)
          a. An indicator of collagen content
       3. Concentration of GAG
          a. An indicator of chondrocyte biosynthesis
   iv. Results
        a. Percentage of acetabular chondral flap specimens retrieved during hip arthroscopy that had concentrations above the minimal or within one standard deviation of the mean values reported in previous cartilage studies
           i. 38% for [DNA]
           ii. 43% for [OH-Pro]
           iii. 0% for [GAG].
        b. 20% of our samples exceeded the threshold for both [DNA] and [OH-Pro].
        c. The only significant correlation we found was between degenerative appearance of the surrounding cartilage and a higher [OH-Pro] when there was degenerative-appearing surrounding cartilage vs when there was normal-appearing surrounding cartilage
        d. No correlation of [DNA], [GAG], and [OH-Pro] with
           i. Gross appearance of the flap
              1. Thin vs. Thick
           ii. Gross appearance of the surrounding cartilage
              1. Normal vs. degenerative
           iii. Type of impingement
              1. Cam
              2. Pincer
              3. Combined
           iv. Age of the patient
           v. Gender of the patient
           vi. Duration of hip pain

NOTES:
b. Cell Viability
   i. Live – Dead Stain
   ii. 10 patients with 10 “viable” / “reparable” chondral flaps
      1. 9 / 10 w/ <50% Viability
         a. 2 Acellular
         b. 1 = 55%
         c. Average 32% viability

5. Conclusion
   a. None of chondral lesions had a biochemical profile suggesting repair of this cartilage is worth investigating based on [DNA], [OH-Pro], and [GAG]
      i. 20% met the threshold for just both [DNA] and [OH-Pro].
      ii. Did not find a correlation between any of the variables examined with favorable biochemical profile
         1. Gross appearance
         2. Type of impingement
         3. Patient age
         4. Gender
         5. Duration of symptoms
   b. Cellular viability
      i. Unknown how much is needed to have functioning cartilage
      ii. Only 1 specimen had cellular viability of > 50%
      iii. 2 were acellular
   c. These findings make determination of which chondral lesions to repair – if any – difficult.
Lecture: Fibrin +/- FasTFix

Richard N. Villar, BSc (Hons), MA, MS, FRCS
Chondral Delamination injury: Flap preservation after bone abrasion.
Follow up of 16 patients
Nicolas BONIN M.D.

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A multitude of factors may contribute to osteoarthritis of the hip. Significant recent advances in our understanding of hip pathology have led to the hypothesis that small alterations in hip morphology can cause motion-induced mechanical damage over time. The term femoroacetabular impingement (FAI) has been coined to describe these morphologic alterations. There are two described subtypes of hip impingement: cam and pincer. In cam effect, the nonspherical portion of the femoral head increases pressure against the acetabular rim during hip flexion, leading to chondral delamination and labral detachment. If we know how to treat the labral lesions, there remains questions on how to manage chondral flap lesions. Some have proposed to take it down, while others try to preserve it by suture, glue with fibrin collagen…

The author describe a simple method to preserve stable chondral flap lesions by subchondral bone abrasion with microfracture under the delamination. The early clinical results (6 – 24 months) of 16 patients are presented with one patient having had a second look arthroscopy.
• Marrow stimulating technique
• Subchondral bone penetrated with an awl
• Leads to fibrin clot formation
• Clot contains marrow-derived mesenchymal stem cells
• Fibrocartilage repair

- single stage procedure.
- ideally suited for “small” isolated chondral defects.
- cheap.
Indications

- Chondral defects <200-400 sq mm
- ? Early degenerative change
- Consider age, activity level, comply with rehab protocol

Contraindications

- Partial thickness defects
- Bony defects
- Inability to comply with the protocol
Microfracture Protocol

- Debride unstable articular cartilage and calcified cartilage
- Create a smooth, perpendicular edge
- Perforate the subchondral bone plate with awls
- 3-4mm gaps, 2-4 mm depth
Rehabilitation

- 8 weeks toe touching weight bearing only.
- 8 weeks CPM
- Return to sport 6-8 months.

Results

- 9 patients- size 40-240 sq mm (ave 163)
- 2nd look scope 10-36 mons later (ave 20)
- 8/9 had 95-100% fill (One OA), with high quality appearance of fibrocartilage

Results

- Most refer to the knee
- The hip may be better—may be more stem cells in hip/pelvis bone marrow than the knee.
Our “Protocol”

- Ignore the microfracture.
- Immediate weight bearing as tolerated—generally full WB by day 2-4.
- Most return to sport by 8-10 weeks depending on other pathologies—most have cams.

Additional treatments

18 yo footballer

Fibrin glue
Microfracture

Wave  Microfracture  Glue

Healed microfracture

1 2 3

Microfracture

Geistlich membrane

Microfracture

Nil  Poor  Fair

480 sq mm @ 11 months
Microfracture

MACI

Template
Graft

4 years later

Ist Australian International Hip Arthroscopy Meeting

19-20th Jan 2012
Melbourne, Australia

International Speakers including-
Ricky Villar, Marc Philippon, Tom Sampson,
Michael Dienst, Martin Beck, Hassan Sadri,
Frederic Laude, Richard Field, Damian Griffin,
Jay Parvisti, Fabian Kalberer, Claudio Dora,

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THANK YOU

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INTRODUCTION

Chondropathies of the acetabulum and the femoral head are a frequent cause of pain and functional limitation.

The incidence of acetabular cartilage damage is estimated to be of 74% in a total of 736 hip arthroscopies. Furthermore there is an association between cartilage damage and lesions of the acetabular labrum in 81% of the cases.

Currently, treatment of hip cartilage pathologies is based exclusively on arthroscopic debridement, microfractures, multiple femoral head perforations or fibrine glue injection for chondral delamination.

The purpose of this study was to report the results obtained in treating hip chondropathies using the arthroscopic ACT or AMIC technique.

A comparison between the two techniques and results was made to evaluate advantages and disadvantages of these two procedures,

MATERIALS AND METHODS

A controlled retrospective randomized study was carried out on 182 patients affected by a hip chondropathy of 3rd and 4th degree, according to the Outerbridge classification, extended 2cm^2 or more.

120 of these patients underwent arthroscopic autologous chondrocyte transplantation (ACT), while the other 62 underwent arthroscopic autologous matrix induced chondroplasty (MAIC).

The surgical treatment, in those cases treated by ACT, was always carried out in two steps. The first was a diagnostic arthroscopy used to evaluate the chondral damage and
to take a cartilage biopsy from the area surrounding the pulvinar. In the second step the transplant was implanted by arthroscopy.

On the contrary the AMIC procedure was carried out as a one step procedure. Once the chondral defect was located, the area was cleaned and microfractures were performed. Than the collagen membrane was applied to cover the defect.

In that cases treated with the ACT procedure, the chondrocyte culture was carried out on a polymer scaffold, which is a reabsorbable composite material of polyglactin 910 and poly-p-dioxanone, in 65 cases and on a Hyaluronic acid scaffold in 55 cases.

In all the cases treated with the AMIC procedure a suine collagen membrane, added with autologous growth factors, was applied to cover the chondral defect.

The two groups were similar in age, gender, degree and location of the pathology. The mean follow-up was 23.8 months (36 to 12) in the group of patients treated with the ACT procedure and 22.6 (36 to 12) in the group of patients treated with the AMIC procedure. The mean size of the defects was 2.6 cm² (2.0 – 4.8) in the ACT group and 2.8 cm² (2.0 – 5.0) in the AMIC group.

All the patients were assessed before and after the procedure with the Harris Hip Score (HHS).

Postoperatively all the patients underwent physiokinesitherapy. Exercises began from the 1st postoperative day. Patients were discharged on the 2nd day and were subject to both active and passive physiotherapy to regain complete range of motion without putting any weight on the articulation for 4 weeks. Partial load was allowed after 4 weeks, when exercises on a gym bike and swimming were recommended. After 7 weeks, crutches were no longer required and the patients were allowed to return to normal work activity. Jogging was allowed only after 6 months, while a complete return to sports activities was recommended only one year after the surgical procedure.
RESULTS
The mean preoperative HHS in the group of patients treated with the ACT procedure was 52 (32 – 60), similar to that of the patients treated with the AMIC procedure that was 48 (28 – 56).
Mean post operative HHS results in both groups were also similar: ACT = 86 (58 – 92); AMIC = 88 (56 – 98), showing no significant difference.
In both groups, unsatisfactory results were recorded in those patients suffering from a cartilage defect on the femoral head or where standard x-rays showed a reduced or compromised articular space.

DISCUSSION
Knee arthroscopy has for some time now been able to show the present of chondral lesions and has allowed for the development of the current surgical techniques used for treating these lesions.
Even hip arthroscopy, although considerably less common, has allowed for chondropathies in this area to be detected. The therapeutic approach is different, however, since the hip is a deep articulation surrounded by large muscular masses that make surgical access difficult.
Hip arthrotomy exposes the articulation to the serious risk of aseptic necrosis of the femoral head, along with being a significantly invasive procedure.
The arthroscopic approach to the treating hip chondropathies, therefore, solves the serious problem regarding arthrotomy.
The AMIC procedure have several advantages compared to the ACT. Fist of all it is a one step procedure, with no need to expose the patient to a second operation. The other advantage is that there is no need for a logistic support to the procedure, having no external laboratory support.
Considering that the post operative results obtained with the two procedures showed no significant differences, the AMIC appears to be much less invasive and more cost effective compared to the ACT.

The cartilage defects located on the acetabulum can be treated with arthroscopic ACT or AMIC procedure. This study shows the effectiveness of the AMIC procedure respect to the ACT.
Lecture: MACI

Hassan Sadri, MD
Biologic hip surgery had experienced a great development during last decade due to hip arthroscopy. Preservation of the native joint is a major objective and the use of Platelet Rich Plasma (PRP) and Stem Cells Autologous Concentrate enhance the healing process and hip biologic environment.

In hip surgery, PRP is useful in the management of periarticular tendinopaties, chondral lesions and postoperative pain and inflammation. Giordano et al showed that the use of PRP in hip arthroscopy lead to less pain and ecchymosis in postoperative period. Subjective scores were higher with the use of PRP at 1 month postoperative, although there were no differences between the groups at longer follow up.

Chondral lesions of the hip represent a diagnostic challenge and can be an elusive source of pain. Treatment may present difficulties due to localization and spherical form of the joint and is most commonly limited to excision (rim trimming and femoral neck osteoplasty), debridement, thermal chondroplasty and microfractures. Rim trimming and femoral neck osteoplasty can lead to excise the chondral lesion if located in the overcoverage area. When full thickness chondral damage extends beyond resection area microfractures are the treatment of choice. The indications for microfracture of the hip are similar to the knee and include focal and contained lesions, typically less than 2 to 4 cm$^2$ in size.

Microfracture is a marrowsstimulating procedure that brings undifferentiated stem cells from a subchondral perforation into the chondral defect. A clot formed in the microfractured area provides an environment for both pluripotent marrow cells and mesenchymal stem cells to differentiate into stable fibrocartilaginous tissue. Several studies had shown good midterm results with this technique; however we know that this fibrocartilaginous tissue does not have the required mechanical properties and eventually will fail, leading to advanced chondral damage and osteoarthritis. Animal and clinical studies had demonstrated that the use of a PRP clot or bone marrow
mesenchymal stem cells over the microfractured area can lead to a better quality
hyaline-like fibrocartilage with better mechanical properties.