Debate: Developmental Dysplasia of the Hip

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General Session

Hip Arthroscopy for DDH

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Acetabular Osteotomy for DDH

Michael Bellino, MD USA

Femoral Osteotomy for DDH

Manuel Ribas, MD SPAIN
What are the results of hip arthroscopy in adolescents and young adults with pediatric hip disease? What has been published?

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Introduction

- Hip arthroscopy is an established and reproducible procedure\(^1\).
- More frequent in adults.
- Most information comes from hip arthroscopy in adults.
  - Diagnosis.
  - Outcome.

Pediatric Indications\(^2\)

- Development Hip Dysplasia.
- Legg-Perthes.
- Slipped Capital Femoral Ephyisis (SCFE).
- Septic arthritis.
- Coxa Vara.
- Juvenile Rheumatoid Arthritis.
- Chondrolysis.

Central compartment pathology (Iliofemoral Joint)\(^3\).

Kocher, Orthop Clin N Am 2006\(^2\) (Review Article Indications):

- Labral tears associated with.
  - Development hip dysplasia.
  - Legg-Perthes.
  - SCFE.
  - Neuropathic sub-luxation.
  - Selective resection.
- Loose bodies.
  - Legg-perthes.
  - Spondyloepiphyseal Dysplasia.
  - Traumatic injuries.
  - Improve with resection.
- Septic Arthritis/Rheumatoid Arthritis.
  - Arthroscopic irrigation and lavage (Septic Arthritis).
    - Authors preference is open approach (small anterior).
      - Capsulotomy.
      - Femoral head drilling to rule out associated osteomyelitis.
      - Thorough debridment of infected tissue.
      - Placement of drain.
  - Arthroscopic synovectomy.
- Small series report improvement of un-responsive to medical treatment hip synovitis after arthroscopic synovectomy.

- "Other Indications":
  - The authors mention the possibility of arthroscopic treatment of femoroacetabular impingement (FAI).
  - Potentially used as adjunct for close reduction of hip dysplasia in infants.
    - Visualize impediments to reduction.
    - Transection of transverse acetabular ligament.
    - Assessment of reduction.

DeAngelis and Busconi, CORR 2003\textsuperscript{4} (Review Article Indications).

- Advantages over arthrotomy:
  - Diagnostic and therapeutic.
  - Less invasive, quicker recovery.
  - Avoids dislocation, reduced risk of avascular necrosis.
  - Technically complicated but easier than in adults because of "Shallow joint and compliant soft tissues"

- Indications:
  - Septic arthritis.
  - Labral disorders.
  - SCFE.
  - Legg-Perthes.
  - Juvenile Rheumatoid Arthritis.
  - Expanding indications.
  - Thorn Labrum in young athletes.

- Labral pathology.
  - Athletes in pediatric age.
- SCFE.
  - Synovitis.
  - Cartilage damage on the femoral head and acetabulum.
- Legg-Perthes.
  - Loose body removal.
  - Debridement of unstable cartilage flaps.
  - Debridement of anterior hip impingement due to secondary deformity.
- Septic Arthritis.
  - Excellent alternative to arthrotomy.
  - Allows to obtain cultures and sensitivity.
  - It is possible to perform a thorough debridement.
  - Placement of a drain.

Ilizaliurri Jr, Oper Tech Ortop 2005\textsuperscript{5} (Review of indications, surgical technique, case examples).

- Findings of hip arthroscopy in young adults with previous hip disease.

- Most common indications are:
  - Development Dysplasia of the Hip.
  - Legg-Perthes.
  - SCFE.
  - Septic Arthritis.

- At pediatric age the most common indications:
  - Septic Arthritis.
    - Effective.
    - Lower morbidity when compared to arthrotomy.
  - Legg-Perthes.
    - Removal of loose bodies and unstable cartilage flaps.

- In adolescents and young adults with previous pediatric hip disease.
Mild un-treated Development Dysplasia of the Hip.
Deformities and anatomic abnormalities secondary to treatment of Development hip dysplasia at pediatric age.
Deformities secondary to:
- SCFE.
- Legg-Perthes.
- Septic arthritis.
Anatomic abnormalities may increase difficulty for arthroscopic access to the hip.
- Preoperative planning.
- Fluoro navigation.
- Aiming instruments to assist portal placements mainly in acetabular deformities (Anterior portal aiming guide).

Information from review articles.
- Inconclusive.
- Presents indications.
- Refer mostly to central compartment pathology.
- No medium or long-term results are available.

Information on Specific Pathology.

Development Dysplasia of the Hip
- Most reported.
- Young adults with mild dysplasia un-treated at pediatric age.
- Young adults with treatment of dysplasia at pediatric age.
  - Byrd, Arthroscopy 20037 (Arthroscopy for hip dysplasia).
    - 48 patients, 100% follow-up at least 1 year (Most between 3rd and 6th decade of life, no patients at pediatric age).
    - CE angle >20° 16 patients.
    - CE angle in 32 between 20 and 25°.
    - All improved in Harris Hip Score, no difference between groups.
    - Ligamentum teres ruptures and loose bodies better results.
    - “Average” results with labral tears and chondral injuries.
    - Worse results with osteoarthritis.
    - Better in younger patients.
    - Labral tears managed with very conservative resection because the dysplastic labrum can be a weight bearing structure (The same criteria is applied to Ligamentum Teres resection).
    - Dysplasia is not a contraindication for hip arthroscopy.
    - Arthroscopy could complement other treatments for dysplasia.
    - 170 hips in 163 patients (average age 35 years).
    - Mild dysplasia CE angle between 22 and 28° (144 hips).
    - Moderate dysplasia CE angle between 16 and 22° (26 hips).
    - 122 labral tears, 113 anterior, 8 posterior and 1 lateral.
    - 100 hips anterior acetabular chondral lesions (13 Outerbridge grade I, 23 grade II, 21 grade III and 43 grade IV)
    - 44 hips anterior femoral chondral lesions (13 Outerbridge grade I, 16 grade II, 14 hips grade III and 6 grade IV.
    - 17 patients converted to Total Hip Replacement (THR) between 1 and 6 years after arthroscopy.
    - THR was more frequent in the moderate hip dysplasia group (54%). Only 3% in mild dysplastics.
Ilizaliturri, Arthroscopy 2005^9 (Hip arthroscopy after acetabular osteotomy).
- 7 patients with a previous Chiari procedure (Average 11.6 years before arthroscopy)
- Average age 23 years.
- Mechanical hip symptoms.
- 25.3° average CE angle after osteotomy.
- The load bearing surface was divided in 2 different areas arthroscopically identified:
  - Medial acetabulum (Original acetabulum medialized by the osteotomy).
  - Lateral acetabulum (Area of bony coverage from the iliac bone produced by the osteotomy and medialization of the true acetabulum)
  - A step-off indicated the transition between the two and described as the transition line.
- Labral remanents were debrided from the central compartment.
- Fibrous tissue resected.
- 23 points of average WOMAC improvement at 32mo average F/U.
- No Patients needed THR.
- Mechanical symptoms improved.

Kocher, JPO 2005^10 (Consecutive series of patients 18 years old and younger treate with hip arthroscopy)
- Mean age 15.2 years.
- Mean follow-up 17.4 months.
- 17 previous operations.
  - 11 patients with previous pelvic osteotomy.
  - Femoral osteotomy 5 patients.
  - In situ pinning (SCFE) 1 patient.
- Indications for surgery.
  - Labral tears 30 patients.
  - Legg-Perthes 8 patients.
  - Development Dysplasia of the hip:
    - Following periacetabular osteotomy 8 patients.
    - Inflammatory arthritis 3 patients.
  - Spondyloepiphyseal dysplasia 2 patients.
  - Avascular necrosis 1 patient.
  - SCFE 1 patient.
- Specific procedures:
  - Debridment of labral tears 41 patients.
  - Chondroplasty of acetabulum or femoral head 10 patients.
  - Loose body removal 8 patients.
  - Synovectomy 3 patients.
  - Debridment for arthritic changes 2 patients.
- Overall Harris Hip Score Improved 53.1 to 82.9 points.
- Conclusion:
  - Hip arthroscopy is safe and reproducible in adolescents and children.
  - It is efficacious at short-term for:
    - Labral tear debridment.
    - Removal of loose bodies associated to Legg-Perthes.
    - Inflammatory arthritis.
  - The authors did not mention or treat impingement.

Roy D, JPO B 2005^11 (Perthes patients with late onset of pain treated with hip arthroscopy)
- 9 patients average age 15 years.
- Average age of diagnosis of Legg-Perthes 7 years.
- Pain free interval before late pain onset 5 years.
- 8 previous surgery:
  - 5 Chiari.
  - 1 shelf procedure.
  - 1 medial release. And shelf procedure.
  - 1 greater trochanter apophyseodesis.
- Arthroscopic debridment of labral tears, loose bodies and ligamentum teres tears.
- 2 Patients re-scope after new sports-related hip injury.
- 1 Patient THR at 3 years.
- No Management of Impingement.

Ilizaliturri Jr, AAOS 2007 (Arthroscopic management of femoroacetabular impingement secondary to pediatric hip disease).
- Hip deformity secondary to pediatric hip disease represents the clearest form of femoroacetabular impingement.
- 13 patients 14 hips Agerage age 31 years.
  - 8 SCFE (one bilateral).
  - 4 Legg-Perthes.
  - 2 Development hip dysplasia.
- 14 cam impingement.
- 1 was combined with pincer impingement.
- Arthroscopic remodeling of cam and pincer impingement.
- Cam Impingement:
  - Central compartment pathology every case,
    - Marginal labral tears treated with resection.
    - Anterior chondral flaps treated with microfractures.
    - Debridment of chondral flaps in Perthes cases.
  - Peripheral compartment cam deformity remodeling through anterior capsulectomy.
    - 13 complete remodeling.
    - 1 Incomplete cam remodeling.
  - Pincer Femoroacetabular impingement.
    - 1 patient presented combined can and pincer.
    - Pincer was remodeled from central compartment with traction and labral resection.
- Average WOMAC improvement 9.6 points.
- No patients with further surgery.

Conclusions
- Evidence suggests that it is safe to perform hip arthroscopy in children older than 10 years and adolescents.
- There is no evidence at a younger age group where it seems to be restricted to arthroscopic lavage and synovectomy.
- Most common are debridment procedures for labral tears, ligamentum teres tears and chondral flaps or loose body removal.
- Has great value in young adults with deformity secondary to pediatric hip disease.
- It is no substitute for re-orientation procedures in dysplastic young adults but may be valuable in the treatment of central pathology in these patients that present mild dysplasia.
- Can be an alternative to re-orientation procedures at older age groups (after 45 years) that have moderate dysplasia with mechanical hip symptoms.
- Remodeling of impinging deformities (femoroacetabular impingement) secondary to pediatric hip disease may improve results.
- More follow-up is needed.

References
Debate: Acetabular Osteotomy for DDH

Michael Joseph Bellino, MD
FEMORAL OSTEOTOMY FOR DDH

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Any osteotomy around a given weightbearing joint in lower extremities has three different effects:

1. Decompression, with forces redistribution.
2. Congruence maintenance.
3. Stabilization

Femoral osteotomy has been advocated in hip preserving surgery for many decades, specially in the 60’s and 70’s, in the treatment of different conditions and still it is a method of choice in different hip pathologies, specially in pediatric orthopaedics, posttraumatic sequelae, SCFE and some cases of DDH. Considering hip replacement as endpoint survivorship for femoral osteotomy, when properly indicated in initial degenerative stages Tönnis 0 and 1, in young adults (<50y.) is higher than hip arthroplasties. This fact has been correlated in meta-analysis with different arthroplasty registers.

This surgical technique is in many cases of DDH associated to acetabular osteotomies and cannot be considered as a single procedure. High Acetabular indexes (veritable inclination angle), low center-edge angles are a clear example of this. In such cases only femoral correction should lead to persisting instability and thus persisting degenerative development.

Berner group analyzed several paramethers that influenced decision making in periacetabular osteotomy combined with femoral osteotomy. After using statistically significant variables, a discriminant analysis predicted the correct group (periacetabular osteotomy with femoral osteotomy, or periacetabular osteotomy without femoral osteotomy) for 89% of the cases considering the following variables:

- femoral head extrusion index
- acetabular index after periacetabular osteotomy outside the normal limits,
- neck shaft angle outside the limits when compared to a given control group,
- a deformed femoral head,
- an osteoarthritic hip and a joint space height and congruency dependent on position of the proximal femur.
- a secondary acetabulum.

There are many different osteotomies for each given condition, the most common are:
• intracapital to regain sphericity in postraumatic cases - Pipkin fractures, Perthes disease,
• cervical to relocate femoral head specialy in SCFE sequel.la, 
• trochanteric to advance, lengthen, pelvitrocantheric muscles retention,
• intertrochanteric: rotation-valguization, rotation-varization, flexion–extension, shortening-lengthening, femoral neck lengthening with trochanter major retention, always according to preoperative planning of each given case. When less than 30% of whole femoral head perimeter has been affected by AVN some authors advocate for femoral osteotomy.
• subtrochanteric osteotomies or even intertrochanteric, specially to correct postraumatic fractures according to Pauwels principles or high hip centers combining shortening femoral osteotomy and acetabular centering osteotomy.

The most common indication for femoral osteotomy in DDH is high riding coxa valga antetorsa. Usually an intertrochanteric rotation-varus normocorrecting osteotomy is performed in those cases. Depending on limb length this procedure can be performed by means of closing, opening or mid-closing-opening wedge osteotomy.

The success of a femoral osteotomy will rely on indication, planning and execution. Primary stability is of paramount importance for rapid postoperative recovery and consolidation so far.

In osteoarthritic DDH with high hip centers (Crowe G.III-IV or Hartofilakidis G.III) different techniques have been advocated for stem implantation combining either femoral shortening or trochanter descending osteotomy with proximal metaphyseal ostectomy.

In relationship with this topic some cases will be presented. Nevertheless if a femoral osteotomy in a dysplastic hip is decided to undertake, - as any other hip preserving procedure- , possible future hip replacement has to be assured. Many authors have reported difficulties, tips and tricks as well as diminished survivorship of femoral shaft implant in a pre-osteotomized femur.

References:


