Complications & Post Op. Issues

Saturday, October 15, 2011 • 17:05 – 17:50pm

General Session

Complications in Hip Arthroscopy

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Paper Presentation 42-46
Introduction

- The reported prevalence of complications in hip arthroscopy ranges from 0% to 13%.
- Initial articles up to 13% complications\(^1\).
- Recent reports 0,5-6,4%\(^2,3,4,5,6\).
- Most of the complications are minor without residual morbidity.
- These percentages are probably an underestimation because surgeons are usually reluctant to admit their failures.
- The nature of complications change with experience but the incidence can be similar with no significant variation over a period of experience with hip arthroscopy\(^7\).

Classification

- Musculoskeletal
- Neurologic
- Vascular/ischemic
- Soft tissue and perineum
- Procedure specific

Musculoskeletal complications

- Femoral neck fractures
- Instrument breakages and problems
- Condral damage
- Iatrogenic labral lesion
- Adhesions
- Joint Instability
- Infections
- Heterotopic ossifications

Femoral neck fractures

4 cases published related to FAI treatment

Sampson TG. 2 cases \(^8\)

- 57 male non compliant with activities postoperative. Treatment Cannulated screws 100 MHHS 3 years 6 months.
- 51 female twisted and fell 7 days after surgery. Treatment: Hip Screw and side plate. Developed avascular necrosis.

Ayeni et al: 1 case, 2011: 51 male. Against recommendations 3 weeks after surgery he walked for up 4.8 km a day. Treatment: Low profile proximal femoral locking plate and screws.

**Recommendations**

- **Warning sign:** New onset groin pain different from what the patient had experienced preoperatively.
- **Treatment:** Surgery and fixation to avoid the potential complication of displacement.
- **Iatrogenic fracture** can occur despite a modest resection well within the guidelines described in the study by Mardones.
- **30%** of the diameter of the femoral neck can be resected without substantially affecting its load-bearing capacity, however, a **30%** resection decreased the amount of energy required to produce a fracture by **20%**.
- **Care to not overresect** the cortical bone of the native femoral neck proximally or distally.
- **Image intensifier** to avoid >30% resection.
- **Protected weight-bearing** (4-6 weeks) on the operatively treated extremity after all surgical procedures for treatment of FAI.
- **Consider bone density testing** for patients over fifty years of age at risk for osteoporosis: Postmenopausal slender women, previous insufficiency fracture, patients with eating disorders and smokers.

**Instrument breakage**

- The overall incidence of instrument failure in arthroscopy is reported as 0.1%. However, the risk of instrument breakage in the hip is greater than with other joints.
- Incidence: **0.3%** and **0.4%**.
- **Complication reported by all of the authors**.
- **Guide wire breakage**, forceps breakage, shaver blade, RF tips.

**Recommendations**

- Use of guidewires made of nitinol (more difficult to break than other materials).
- Careful technique.
- Pulling back the guide wire, as the cannulated instrument is inserted.

**Condral damage**

- Cartilage injury secondary to instrument passage is probably underreported.
- Incidence: **1-18%**.
- Although nerve injuries are the most commonly reported complication after hip arthroscopy, most experience surgeons contends that the single most common complication is actually damage to the articular and labral surfaces secondary to “scope trauma”.
- **Scuffing of the femoral head** can occur to various extents with or without distraction.
- Mild scope trauma to the femoral head, did not affect outcomes.

**Recommendations**

- Adequate femoral head acetabular separation.
- Patient positioning and adequate distraction are crucial to avoid this injury.
- Be gentle with enough distraction.
- Blunt surface instruments.
- Access to the hip periphery first when the femoral head and the acetabulum cannot be separated at least 10 mm.
- Instrument or portal exchange should always be performed using a cannula.

**Iatrogenic labral lesion**

- **Definition**
  1. Iatrogenic Labral lesion (ILL): Inadvertent puncture of the labrum with an arthroscopic cannula that occurred during placement of the cannula into the hip joint: Size of the punctures ranged from 4.5 to 5.5 mm.
  2. Labral punctures (LP): Punctures of the labrum with the 18-gauge, pre-positioning spinal needle.

- Iatrogenic labral punctures are estimated to occur in up to 18% of hip arthroscopies.

- **Treatment**
  - ILL (iatrogenic labral lesion) adjacent to the patient’s labral tear: Remove the iatrogenic puncture during debridement of the labral tear.
  - ILL that had disrupted the free edge of the labrum, excise the remaining fibers along the edge and consider repair with an anchor.
  - ILL surrounded by normal labral tissue: No treatment or looping with suture.
  - LP (Labral punctures): No treatment

- ILL did not affect the 1- and 2-year clinical results of patients who sustained these injuries during hip arthroscopy.

**Recommendations**

- Image intensifier first portal and confirm sufficient distraction.
- Use of the Dienst method of arthroscopic entry (Peripheral compartment first) into the hip joint that minimizes the risk of labral perforation and cartilage scuffing.
- If the spinal needle has perforated the labrum, it will not move distally with the head when this saline solution–induced distraction occurs: “Byrd’s sign”.
- Look for the silhouette of the lateral labrum after the joint is entered.
- Don’t continue if high resistance feeling.
- Direct visualization of the needle.
- Arthroscopic view following portals and capsulotomy.

**Adhesions**

- Capsule-labral or Neck-capsule.
- Prevalence: Common reason for revision hip arthroscopy. 62 % adhesions in revision hip arthroscopy.
- Incidence of symptomatic adhesions after open surgery: 6%.
- Can cause pain: Arthroscopic release of adhesions after previous surgical dislocation for femoroacetabular impingement: 81 % less pain or pain free.
- Adhesions form between the joint capsule and the resected area on the femoral neck may lead to soft tissue impingement.
Remains unclear whether the adhesions between the labrum and joint capsule cause groin pain or whether they have an adverse mechanical effect on the function of the labrum or both.\textsuperscript{17}

Diagnosis is made by exclusion of all other possibilities and confirming the presence of adhesions with MR-arthrography.

Incidence of symptomatic adhesions after hip arthroscopy \textbf{4.4 \%} \textsuperscript{18}.

Risk factors: More complex arthroscopic surgical procedure and preoperative subjective sensation of stiffness \textsuperscript{18}.

Possible risk factors: Longer time on crutches and grade IV chondral lesions treated with microfractures\textsuperscript{18}.

\textbf{Treatment:} Arthroscopic resection

\textbf{Recommendation:} Rehabilitation program: Passive motion exercises after the initial surgery. Include hip circumduction. Patients without circumduction were \textbf{4.4 times more likely to have adhesions} \textsuperscript{19}.

\begin{itemize}
\item \textbf{Macroinstability:} 4 cases reported

\begin{itemize}
\item \textbf{Ranawat et al} \textsuperscript{20} : 2009
  -52 female. Ligamentous laxity. Labrum tear and cam FAI.
  -Surgery: Small (1 to 2 cm) capsulotomy and partial capsulectomy and labrum repair.
  -No acetabular rim resection was performed.
  -Two months postoperatively fell with the affected extremity in a position of extension: Anterior dislocation hip. Close reduction.
  -MRI arthrogram: Full-thickness tear (approximately 1 to 2 cm in length) of the iliofemoral ligament.
  -Treatment: Revision hip arthroscopy and capsule plication.

\item \textbf{Benali et al} \textsuperscript{21} : 2009
  -49 female labral tear (bucket-handle tear) and exostosis of the lateral acetabular rim and moderate hip dysplasia.
  -Labrum was resected and exostosis was removed.
  -Three weeks later increasing lower back pain subluxation of the left hip and osteoarthritis with no trauma.
  -Treatment: Cementless total hip replacement.

\item \textbf{Matsuda et al} \textsuperscript{22} : 2009
  -39 female cam-pincer femoroacetabular impingement with mild acetabular retroversion and no physical findings of hip capsular or generalized hyperlaxity and minimal posterior insufficiency.
  -20 minutes of supranormal distraction force for extraction of a metallic tip on a radiofrequency ablator inadvertently detached.
  -Anterior hip dislocation in the recovery room.
  -Treatment: Mini-open capsular repair.

\item \textbf{Souza et al} \textsuperscript{7} : 2010
  -Anterior hip dislocation on postoperative day 1 after excessive resection of the anterior acetabular rim in a patient with femoroacetabular pincer deformity and signs of moderate osteoarthritis (Tönnis grade II).
  -Treatment: Total hip replacement.
\end{itemize}
\end{itemize}
• **Microinstability:**
  - Inability to keep the femoral head centered within the acetabular fossa, without complete luxation or marked subluxation of the joint.
  - Apprehension with abduction and external rotation.
  - Probably underreported.
  - CTa and MRa have emerged as the modalities of choice for pre-operative and postoperative imaging of microinstability.

**Recommendations**

- Minimize Capsulotomies.
- Avoid Capsulectomy.
- Large capsular defect or ligamentous laxity should be considered for capsule repair and/or plication.
- Do not reduce too much the stabilizing structural factors (Bony containment, acetabular labrum and hip capsule especially in the dysplastic hip).
- Do not reduce below 20-25º the center Edge angle.
- Close capsule in high level athletes: The iliofemoral ligament had a significant role in limiting external rotation of the hip and the acetabular labrum and IF ligaments should be surgically repaired to restore the native rotational stability in the hip particularly in high level athletes.
- Consider arthroscopic labral reconstruction if ossified, not salvageable or ineffective.
- Close capsule in hips with a neck-shaft angle greater than 145º, acetabular index greater than cephalad 10º, increased femoral anteversion greater than 25º, increased acetabular anteversion greater than 30º, connective tissue disorders.
- Consider reconstruction of the iliopsoas tendon with an artificial ligament.
- Consider reverse periacetabular osteotomy if excessive resection of the anterior acetabular rim.

**Infections**

- Incidence (<1/1000) Articular/deep (1 case).

**Recommendations:**

- Routine use of preoperative broad-spectrum intravenous antibiotics for prophylaxis is well accepted.
- Meticulous technique in prepping and draping and in the surgical procedure.

**Heterotopic ossifications**

- Arthroscopic treatment of FAI is not exempt from potential development of HO.
- Byrd reported heterotopic bone formation along the tract of the anterior portal following hip arthroscopy (multiple loose bodies associated with synovial osteochondromatosis).
- Larson reported HO in 6% of his series with one case of significant limitation resulting from ossification of the iliopsoas tendon, but no prophylaxis was mentioned.
- NSAIDs after arthroscopic FAI treatment seem to be an effective prevention. HO occurred in a significantly higher percentage (33%) in patients who did not receive any prophylaxis compared with patients who received NSAIDs (0%) after arthroscopic femoroacetabular osteochondroplasties.
No cases were noted in our series: We use NSAIDs for 3 weeks
Symptomatic patients will need excision.
Recommendations:

- NSAID prophylaxis once a day on a regular basis for 3 weeks starting within 24h after surgery.
- Evacuation of bony debris.
- Minimization of portal trauma to peri-articular musculature.

**Neurological complications**

Most of the injuries reported consisted of a transient neuropraxia that resolved within a few days. The pudendal nerve was the most common neuropraxia reported, but transient neurapraxias of the femoral, sciatic, lateral femoral cutaneous and peroneal nerves have all been described.\(^2,11\)

1-Related to portal placement

- Femoral neurovascular structures, gluteus superior nerve and the sciatic nerve are safely away from the operative field but the LFCN is always vulnerable to injury from the anterior portal and permanent deficit can occur.\(^2\).
- Recommendation:
  - Nick and spread technique.
  - Accessory distal anterior or distal anterior oblique portal.\(^31\).

2-Related to articular distraction and compression.

Most neurologic and soft tissue lesions are secondary to traction forces or compression generated by the positioning systems.

**Recommendations**

1-The surgeon should be accustomed to performing the technique both with and without traction and not applying too much or too little.
2-The patient must be correctly positioned and padded.
3-The distraction force should be minimal, using only that required to maintain sufficient space to maneuver instruments. The traction time should be as short as possible. Intermittent traction (traction for 45 minutes and release for 10 minutes) is superior to continuous traction.
4-Use of oversized, heavily padded perineal post.
5-Detailed knowledge of the anatomy and landmarks of the hip.

**Vascular and ischemic complications**

- Related to venous stasis: Deep venous thrombosis.
- Related to Ischemic: Osteonecrosis of the femoral head.
- Related to fluid extravasations: Intraabdominal fluid extravasation.
- Related to bleeding: Vessels injuries and wound bleeding.
Deep venous thrombosis

- Most series do not report DVT as a complication of hip arthroscopy.
- McCarthy and Lee reported 1 case of DVT 30 days after surgery.
- Bushnell and Dahner reported the only case of fatal pulmonary embolism associated with hip arthroscopy in a poly-traumatized patient.
- Souza et al.: 1 case of DVT with no risk factors.
- Salvo et al.: Diagnostic arthroscopy in 81 patients, 3 (3.7%) developed a thrombosis.
- Recommendations: Early mobilization and mechanical or chemical prophylaxis to patients at high risk.

Osteonecrosis of the Femoral Head

- Although there have been no reports of AVN as a direct consequence of hip arthroscopy, there are at least two reports of the progression of AVN following arthroscopy. Whether this progression was secondary to the arthroscopic procedure or the natural history of the disease has not been determined.
- Sampson reported one case of avascular necrosis in a series of 1000 consecutive hip arthroscopies 7 months after a partial labral resection and debridement for osteoarthritis without treatment of FAI deformity.
- Avascular necrosis after treatment of FAI is a hypothetical but there have been no published reports.
- Recommendation: No capsular or bony resection must be performed posterior to the lateral synovial fold. Branches of the medial femoral circumflex artery are behind this landmark.

Intraabdominal fluid extravasation

- Glick was the first to report fluid extravasation into the abdominal cavity.
- Funke and Munzinger also noted a case that had to be terminated due to severe lower abdominal pain that they believed was caused by irritation of the peritoneum from fluid leakage.
- Barlett in 1998 published a case of abdominal compartment syndrome with cardiac arrest after undergoing hip arthroscopy to extract a loose body resulting of an acetabular fracture.
- Sampson reported in his series, 10 cases of intraabdominal fluid extravasation. All cases resolved without long-term sequelae. Arthroscopy was performed in the lateral decubitus position.
- Haupt (2008) published, a case of abdominal extravasation after hip arthroscopy in a 15-year-old girl for intra-articular adhesiolysis after previous surgical dislocation of the hip for the treatment of femoroacetabular impingement. Arthroscopy was performed in the lateral decubitus position. The clinical sign was hypothermia. Symtoms: Abdominal pain and neurologic symptoms, resembling absences seizures. Operation lasted 1 hour and 45 minutes. Intra- and retroperitoneal irrigation solution 2000 to 2500 mL was detected. Fluid in the recessus phrenicocostalis on both sides was present The patient only needed fluid management.
- Sharma (2009) reported a case of retroperitoneal and intraperitoneal extravasation during a similar hip arthroscopy with psoas tenotomy through a capsular window. Blood pressure decreased very quickly and the patient needed laparotomy to evacuate the liquid.
- Fowler (2010) published another case after HA for FAI with psoas release. 42-year-old man Arthroscopy was performed in the supine position. Total operating time was 95 minutes. Core body temperature remained steady throughout the procedure. The patient showed...
abdominal distension and inspiration pressure increase. The patient also needed additional surgery to relieve abdominal pressure: Laparotomy. 1,200 mL of serosanguinous fluid within the abdominal cavity.

- Also in 2010, Landner\textsuperscript{43} published a case after HA for CAM and PINCER femoral impingement. The patient, 42-year-old woman, suffered abdominal distension but he did not require a laparotomy. Paracentesis was performed, and no fluid was obtained. Intensive care unit for overnight observation. Core body temperature remained steady throughout the procedure.

- Verma\textsuperscript{44} published a case of intraperitoneal and retroperitoneal fluid collection and intrathoracic fluid extravasation after hip arthroscopy in a supine position for treatment of cam-type femoroacetabular impingement, snapping iliopectineus tendon, and capsular laxity in a 21-year-old woman. She developed hypothermia during the procedure. The patient only needed fluid management. Similar procedure on the contralateral hip 6 months later and again symptoms consistent with intraabdominal fluid extravasation.

- Perez Carro et al\textsuperscript{45} (2011) presented a case of abdominal extravasation after hip arthroscopy associated to symptoms not described previously: Severe abdominal pain, uterine contractions and vaginal fluid as a sign of abdominal extravasation. 42 y.o. woman with a CAM and focal PINCER FAI impingement. Arthroscopy was performed in the supine position. Total operating time was 110 minutes. The psoas tendon was not released. Hemodynamic data showed that the patient was stable and normothermia. Imaging studies showed interfascial spread of fluid (about 1500-2000 cc) in the anterior and posterior compartments of the thigh, and buttock region with extension into extraperitoneal pelvis, peritoneal cavity and retroperitoneum. No signs of visceral involvement or pleural effusion were noted. The patient’s cardiovascular status was monitored and IV furosemide was administered. The patient progressed very well and the abdominal fluid decreased. The patient was discharged after two days without any additional medical complications. Five months after the surgery, the patient was asymptomatic and she was able to do sports without any hip pain. It was possible also to determine the route of fluid extravasation in this case: CT findings suggested extravasation of fluid through the anterior hip capsulotomy and interfascial extension in the anterior and posterior thigh compartments and ipsilateral buttock region. Although there are several possible anatomic communications between the thigh and hip with the extraperitoneal pelvis, retroperitoneum and abdominal cavity, (greater sciatic foramen, lesser sciatic foramen, inguinal canal, femoral triangle, obturator canal, canal and genitourinary hiatuses of the pelvic floor, prevesical space, and iliopsoas compartment) the main communication demonstrated in our CT study were the iliopsoas compartment and the femoral triangle. To a lesser extent, fluid extension trough infrapiriformis component of the greater sciatic foramen and prevesical space was observed. We suppose that in this case the fluid reached the vagina through the Fallopian trumps, anatomical structures that connect intra-abdominal space with the uterus opening close to the ovaries. The positive abdominal pressure may have helped the fluid exit through this anatomical path. This is our first case of intraabdominal fluid extravasation after 356 hip arthroscopies for treatment of FAI.

**Treatment algorithm if intraabdominal fluid extravasation is suspected**\textsuperscript{43}

- Monitor body temperature.
- Periodic abdominal, urine, cardiac and pH examination.
- Administration of IV diuretic drugs.
- Paracentesis or laparotomy if abdominal compartment syndrome is suspected.

**Recommendations**

- If difficulties are encountered and extravasation becomes a problem, it is better to terminate the procedure.
- A high-flow fluid management system is recommended, allowing adequate flow without excessive pressure.
- Wait several weeks for hip arthroscopy after acetabular fractures.
- Avoid surgeries longer than 2h.
- Decrease fluid pressure as much as possible during surgery.
- Fluid intraoperative monitorization.
If psoas release do at the end of the surgery.

Periodical examination of the abdomen during surgery.

Periodical checking of the body temperature during surgery but many patients undergoing arthroscopic surgery may exhibit some degree of hypothermia, so this may be a less specific warning sign.

If intraabdominal fluid: Computed tomography of the chest, abdomen, and pelvis.

If elected to undergo a similar procedure on the contralateral hip: Pump pressure set to 70 mm or less but high possibility to develop the same complication.

Patients with fluid overload disorders (congestive heart failure, end-stage renal disease, liver failure, and so on) may be poor candidates for hip arthroscopy because their ability to compensate for extravasated pump fluid is compromised.

Warning Signs of Arthroscopic Fluid Extravasation.

- Inability to distend joint.
- Increasing fluid requirements to maintain joint distention.
- Frequent cut off of pump irrigation system.
- Abdominal and thigh distention.
- Acute hypothermia.

Related to bleeding

- Grand vessels injuries: 1 case: Severance of the inferior gluteal artery. The lesion induced a severe anemic condition and the formation of a large pseudoaneurysm, which compressed the sciatic nerve and left permanent neurologic sequelae.
- Bleeding around a portal site or local hematoma (0.3%).

Soft tissue and perineum

- Soft tissue pressure necrosis of the perineum has been reported by Eriksson et al.
- Souza et al.: Partial skin necrosis of the scrotum that required plastic surgery correction.
- Rodeo described a case of pressure necrosis to the foot.
- Funke and Munzinger reported a hematoma of the labia majora.
- Souza et al.: Transient vulva edema that subsided after 1 week.
- Griffin and Villar have also reported a small vaginal tear.

Procedure specific

Femoroacetabular impingement

- Failure to recognize and treat or incompletely reshape impingement deformities may be the most frequent cause for a second hip arthroscopy and redebridement of the deformity.

Anchor placement complications

- Malplacement or intraarticular penetration and chondral damage.
- Anchor pull-out: Above all in patients over fifty years of age at risk for osteoporosis: Posmenopausal slender women.
Reduce complication rate

- Visit experts and hip arthroscopy meetings.
- Training at adequate centers/courses.
- Learning curve.
  - Could be large
  - Could increase after initial improvement due to new treatment techniques

Be careful and ...................... !!! be patient !!!

REFERENCES

31- Philippon M. Advances in hip Arthroscopy Meeting, 2006.Warwick UK.
**Paper #: 41**

_Hip Arthroscopy for the Diagnosis and Treatment of Synovial Chondromatosis of the Hip_

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**Joseph C. McCarthy, MD, USA, Presenting Author**  
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**Summary:**  
This study aims to evaluate the use of arthroscopy in the diagnosis and treatment of hip synovial chondromatosis.

**Data:**  
**Introduction:**  
This study aims to evaluate the use of arthroscopy in the diagnosis and treatment of hip synovial chondromatosis.

**Materials and Methods:**  
Twenty-nine patients with hip synovial chondromatosis treated with arthroscopy between 1993 and 2006 were reviewed retrospectively. The mean age was 40.6 years. The mean duration of symptoms at arthroscopy was 52 months. All patients complained of pain and 62.5% had mechanical symptoms. There was limited ROM in 57.7% and a limp in 27.6% of patients. Twenty-three patients had a minimum follow up of 12 months or had a second procedure within 12 months.

**Results:**  
Synovial chondromatosis was detected in 62% of patients’ imaging studies but was seen at arthroscopy in all patients. Other findings include labral changes in 77.8%, femoral head changes in 82.7%, and acetabular changes in 88% of patients. Six patients had another arthroscopy at an average of 48 months with one requiring an arthrotomy 5 months later. Two of the six patients had a grade 3 cartilage lesion at the index procedure. One patient with a grade 3 lesion at the initial arthroscopy required an arthrotomy 14 months later. Five patients required a total hip replacement at an average of 52.4 months. Four of the five patients had a Grade 3 or 4 cartilage lesion at the initial surgery. Fifty percent of patients were doing well at an average of 64.2 months requiring no additional treatment. Only one of the 11 patients had a cartilage lesion of at least grade 3.

**Conclusion:**  
Radiographs, including MRI, are not sensitive enough to detect all cases of synovial chondromatosis especially if the loose bodies are not ossified. In addition, there are more extensive articular changes and more loose bodies seen intraoperatively than radiographically. The study also suggests that outcome is influenced by the extent of articular changes and ongoing synovial activity of the disease.

**Paper #: 42**

_Hip-Specific Functional Testing in Healthy Volunteers and in Pre- and Post-Operative Hip Patients Undergoing Hip Arthroscopy for Femoroacetabular Impingment_

University of Minnesota  
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**Patrick Morgan, MD, USA, Presenting Author**

**Summary:**  
We compared the functional testing data between 40 normal volunteers and 62 patients tested at preoperative and and 3 and 6 month post-operative time points and found significant improvement in all tests and normalization in three of the six tests administered.

**Data:**  
Return to high-level activity after hip arthroscopy has been documented in high-level athletes (1). In the community population, however, there is little evidence to guide the physician deciding when the average patient might be prepared to return to sport. We hypothesize that patients with femoroacetabular impingement (FAI) would perform poorly compared to individuals without hip pathology. We further hypothesized that patients treated with hip arthroscopy would, after appropriate rehabilitation, improve from their pre-operative performance and approach or reach a the performance of healthy volunteers.

**Methods:**  
Forty normal volunteers were screened for hip pathology through history, physical examination, and administration of the HOOS outcome score (2). Each normal volunteer then preformed the following tests: single leg hop, single leg timed hop, crossover triple hop, modified stand and reach, retro step-up, and a modified
shuttle run. Sixty-two patients undergoing hip arthroscopy for FAI correction and labral repair versus debridement were then tested pre-operatively and again at 3 and 6 months.

Results:
All six tests showed statistically significant poorer performance in pre-operative patients when compared to normal subjects (p<0.05). Patient performance improved significantly for all six tests during the first six post-operative months. Three tests—the modified stand and reach, timed single-leg hop, modified shuttle run, — showed improvement so as to be indistinguishable from the normal population (p= 0.387, 0.333, and 0.226). The entire battery of tests required 20-30 minutes to administer.

Discussion:
Return to sport and fitness activities is a major concern of patients undergoing a surgical procedure (3). Better post-operative functional testing has been associated with increased likelihood of returning to higher-level activities.(4). As post-operative rehabilitation protocols for arthroscopic hip procedures are refined, it is our hope that these tests may be used as metrics to evaluate our ability to prepare patients for return to sport.

Discussion
References:

Paper #: 43

Lumbar Plexus Block for Pain Control after Hip Arthroscopy. A Randomized Controlled Trial.

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Summary:
Lumbar plexus block (LPB) combined with a multimodal analgesic regimen reduced pain on the day of hip arthroscopy surgery and can be considered for reduction of short-term pain.

Data:
Introduction:
The indications for hip arthroscopy are rapidly increasing to include both intra- and extra-articular disorders such as femoro-acetabular impingement, synovial disorders, abductor pathology, etc. These large, complex cases are associated with moderate to severe postoperative pain, and treatment with opioids can result in nausea, vomiting and delayed discharge. Lumbar plexus blockade (LPB) has a low complication rate and is superior to opioids for pain control after total hip replacement. However, a dearth of literature exists on using LPB for hip arthroscopy. This study investigated whether the addition of LPB to neuraxial anesthesia reduced postoperative pain.

Methods:
Following IRB approval, 82 patients undergoing ambulatory hip arthroscopy were enrolled in this randomized controlled trial. All patients received intravenous sedation, combined spinal-epidural and postoperative hydrocodone/acetaminophen and oral NSAIDs. Study patients additionally received LPB using 30 mL 0.25% bupivacaine (with 5 mcg/ml epinephrine) following quadriceps stimulation. A blinded investigator
interviewed patients at 0.5, 1, 2, 3 and 4 hours postoperatively, and via telephone the following day.

Results:
Demographics were uniform between groups. Using the General Estimating Equations method, the LPB was shown to reduce pain at rest in the PACU (mean NRS 3.3±2.2 for LPB versus 4.2±1.8 for CSE-only patients). Non-significant trends in analgesic usage (21mg oral morphine equivalents vs. 29mg), pain with movement (NRS of 4.0 vs. 5.0), and patient satisfaction (8.6/10 vs. 7.9/10) also favored the intervention. There were no associated neurovascular complications from the LPB but there were two falls in the LPB group, without injury.

Discussion & Conclusion: LPB combined with a multimodal analgesic regimen reduced pain on the day of hip arthroscopy surgery and can be considered for reduction of short-term pain. The absence of significant improvement in secondary outcomes suggests that risk-benefit assessment of LPB for hip arthroscopy patients should be individualized.

**Paper #: 44**
*Femoral Nerve Blocks are Effective for Post-Operative Pain Control after Hip Arthroscopy*

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James Ward, MD, USA
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Robert Altman, MD, USA
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Rachel Goldstein, MD, MPH, USA

**Summary:**
By all criteria studied (quality of pain relief, length of stay in the PACU, side effects and patient satisfaction), a femoral nerve block is an excellent alternative to routine narcotic pain medication in patients undergoing hip arthroscopy.

**Data:**
Purpose:
To evaluate the utility of femoral nerve blocks in post-operative pain control after hip arthroscopy.

Methods:
Forty consecutive patients scheduled for hip arthroscopy were randomized into two groups for post-operative pain control. Half were to receive routine intravenous narcotics for pain scores of seven or above in the PACU, the other half were to receive a femoral nerve block in the PACU for the same pain scores. Data was compared with respect to patient sex, age, nausea, overall satisfaction with analgesia, and duration of time in the PACU.

Results:
Thirty-six patients had initial pain scores of seven or greater. Sixteen were randomized to receive post-operative morphine, and twenty to receive a femoral nerve block. There were no significant differences between the two groups with respect to sex or age of the patients. Patients who received morphine had a significantly longer time to discharge from the PACU (216 mins) than the femoral nerve block group(177 mins). The morphine group was also significantly more likely to report post-operative nausea (75%) than the femoral nerve block group (10%). Patients receiving femoral nerve blocks were significantly more likely to be satisfied with their post-operative pain control (90%) than those who had received morphine (25%). All of the patients receiving femoral nerve block stated that they would have the block again if they needed another hip arthroscopy.

**Paper #: 45**
*Effects of Platelet-Rich Plasma (PRP) on the Management of Early Postoperative Pain and Inflammation Following Hip Arthroscopy in Patients with Femoroacetabular Impingement: A Prospective, Double Blinded, Randomized, Placebo Controlled, Clinical Trial*

Clinica Las Condes
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Summary:
A prospective, randomized and double blinded placebo controlled clinical trial was conducted to evaluate early postoperative pain management and inflammation in patients with FAI treated arthroscopically with or without the use of PRP delivered as a clot or spray.

Data:
Introduction:
Hip arthroscopy is a surgical technique that has developed greatly in the last decade. The perioperative management has not been defined and varies among the different centers. Previous studies performed in our center suggest that a lumbar plexus block associated to a morphine PCA provides an optimal pain management, although side effects associated to the PCA generate the need to search for other alternatives.
Platelet-rich plasma is a great source of growth factors and multiple studies have shown promising results when applied to bone, tendon and muscle lesions. PRP provides an anti-inflammatory and clotting effect which should benefit the postoperative pain management. An in situ PRP clot releases growth factors for 7 days and if it is previously activated, growth factor release might be extended up to 21 days.

Purpose:
Determine if employment of Platelet-Rich Plasma in patients subject to hip arthroscopy diminishes postoperative pain, morphine requirements, edema and ecchymosis.

Methods:
A randomized, prospective, double blinded, placebo controlled clinical trial was conducted. Patients with clinically and radiographically confirmed FAI, who were scheduled to undergo arthroscopic treatment including rim trimming, labral repair and femoral neck osteoplasty were offered participation in this study. Exclusion criteria were: full-thickness chondral lesion, wiberg angle >50° and <23°, alpha angle >100°, labrum resection or reconstruction with iliobial graft and psoas tenotomy or bursectomy. All the patients received the same anesthetic protocol with a lumbar plexus block plus general anesthesia.

60 patients were randomly assigned to receive PRP clot (PRP-C), PRP spray (PRP-S) or saline control (C), wich was located or instilled over the femoral neck osteoplasty at the conclusion of their arthroscopic procedure. Platelet concentrations of each PRP sample were measured. The postoperative (PO) management was standardized with the use of a morphine shift pump (0-1-10). Pain was measured with Visual Analogue Scale (VAS) at 12, 24 hours and 7 days PO. Morphine requirements were registered in the period between 0-12 and 12-24 hours. Edema within the operative extremity was assessed preoperatively and at 7 and 14 days PO at 10, 20 and 25 cm from the patella. Ecchymosis at 7 and 14 days PO was graded as no ecchymosis, grade 1 (<10% of the anterolateral thigh or spotting), grade 2 (10-50% of the anterolateral thigh) and grade 3 (>50% of the anterolateral thigh or when it passed distal half of the thigh).

Results:
Pain: At 12, 24 hrs and 7 days there was no difference between the groups according to VAS. Morphine requirements were similar in the three groups (p>0,05).

Edema: Operative thigh diameter at 10, 20 and 25 cm from the patella measured at 7 and 14 days PO were similar to preoperative values (p>0,05).

Ecchymosis: At 7 days in the control group we found that 33% had no ecchymosis, 11% had grade 1, 44% had grade 2 and 11% had grade 3. In the PRP-S group 42% had no ecchymosis, 33% had grade 1 and 25% had Grade 2. In the PRP-C group 78% had no ecchymosis and 22% had grade 1. At 14 days 44% in the Control, 75% in the PRP-S and 100% in the PRP-C group had no ecchymosis (p=0,025).

Conclusions:
The use of PRP clot may have some advantages in the postoperative management of patients who undergo hip arthroscopy. The lower ecchymosis suggests an anti-inflammatory effect that may reflect on long term results. Further study is currently underway to identify medium and long term effects in outcomes.
Intra-Articular Hyaluronic Acid and Recovery following Hip Arthroscopy

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Summary:
Prospective observational case-control study showing reduced pain in the early post-operative period following the administration of intra-articular hyaluronic acid.

Data:
Introduction:
This study has become most significant in light of the possible chondrotoxic effects of intra-articular local anaesthetics. An alternative intra-articular agent is urgently required for post-operative pain control. Hyaluronic acid has been shown to be beneficial in the recovery following various arthroscopic procedures on the knee. This includes groups without significant osteoarthritis. Basic science studies have clearly shown it can reduce acute pain transmission. We were interested in exploring if these benefits might also be seen in patients following hip arthroscopy.

Methods:
Twenty-five consecutive patients received hyaluronic acid at the end of their hip arthroscopy. These were compared with a control group made up of a subsequent twenty-five consecutive patients who did not receive hyaluronic acid. Neither group was given intra-articular local anaesthetic.

Results:
Post-operative discomfort, as measured by Visual Analogue Scores, was significantly lower in the hyaluronic acid group on the evening following surgery (Mann-Whitney U = 112, p = 0.0001) and one week later (Mann-Whitney U = 127.5, p = 0.0003). No significant difference was evident between the two groups at either six weeks, six months or one year post-operatively as measured using the modified Harris Hip Score pain

subscore. A statistically significant difference in the function subscore was identified at one year with the hyaluronic acid group performing worse (Mann-Whitney U = 373.50, p =0.0005).

Discussion:
The longer term benefits of hyaluronic acid seen in the knee were surprisingly not replicated in our hip arthroscopy patients. However, these data clearly show reduced pain in the early post-operative period following the administration of intra-articular hyaluronic acid. This finding is both unexpected and previously unreported and may be of significant value to those who consider that the use of intra-articular local anaesthetics for post-operative analgesia places articular cartilage at risk of chondrolysis.