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Complications of Hip Arthroscopy
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Introduction

- The reported prevalence of complications in hip arthroscopy ranges from 0% to 13%.
- Initial articles up to 13% complications¹.
- 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 arthroscopy⁷.

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 cases⁸

- 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.

Souza et al⁷: 1 case . 2010: No data about sex or age. Excessive removal of bone. Conservative treatment without sequela.

Aveni et al⁹: 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 Mardones⁹.
- 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%¹⁰.
- 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 smokers⁹.

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 joints².
- Incidence:0.3% and 0.4%^{3,4}.
- Complication reported by all of the authors^{2,3,4,5,6,7,8,11}.
- 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 underreported¹¹.
- Incidence: 1-18%^{4,5}.
- 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 mm¹².

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 arthroscopies¹³.
- 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 arthroscopy¹².

Recommendations

- Image intensifier first portal and confirm sufficient distraction.
- Use of the Dienst¹⁴ 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 arthroscopy¹⁵.
- Incidence of symptomatic adhesions after open surgery: 6%¹⁶.
- Can cause pain : Arthroscopic release of adhesions after previous surgical dislocation for femoroacetabular impingement: 81 % less pain or pain free¹⁶.
- Adhesions form between the joint capsule and the resected area on the femoral neck may lead to soft tissue impingement¹⁷.

- 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 both¹⁷.
- 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 4.4 %¹⁸.
- Risk factors: More complex arthroscopic surgical procedure and preoperative subjective sensation of stiffness¹⁸.
- Possible risk factors: Longer time on crutches and grade IV chondral lesions treated with microfractures¹⁸.
- **Treatment:** Arthroscopic resection
- **Recommendation:** Rehabilitation program: Passive motion exercises after the initial surgery. Include hip circumduction. Patients without circumduction were 4.4 times more likely to have adhesions¹⁹.

Joint Instability

- **Macroinstability** : 4 cases reported
 - Ranawat et al²⁰ : 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 capsular plication.
 - Benali et al²¹ : 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.
 - Matsuda et al²² : 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.
 - Souza et al⁷ : 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.

- **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 microinstability²³.

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 hip²¹).
- Do not reduce below 20-25° the center Edgde 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 athletes²⁴.
- Consider arthroscopic labral reconstruction if ossified, not salvageable or ineffective²⁵⁻²⁶.
- Close capsule in hips with a neck-shaft angle greater than 145°, acetabular index greater than cephalad 10°, increased femoral anteversion greater than 25°, increased acetabular anteversion greater than 30°, connective tissue disorders²⁷.
- Consider reconstruction of the iliofemoral ligament with an artificial ligament²⁸.
- Consider reverse periacetabular osteotomy if excessive resection of the anterior acetabular rim¹¹.

Infections

- Incidence(<1/1000) Articular /deep (1 case)⁵.

Recommendations:

- Routine use of preoperative broad-spectrum intravenous antibiotics for prophylaxis is well accepted².
- 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)².
- 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 mentioned²⁹.
- 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 osteochondroplasties³⁰.

- 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 neuropraxias 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 Lee³² reported 1 case of DVT 30 days after surgery.
- Bushnell and Dahner³³ reported the only case of fatal pulmonary embolism associated with hip arthroscopy in a poly-traumatized patient.
- Souza et al⁷: 1 case of DVT with no risk factors.
- Salvo et al³⁴: 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^{35,36}. Whether this progression was secondary to the arthroscopic procedure or the natural history of the disease has not been determined.
- Sampson⁴ 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 deformities.
- 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

- Glick³⁵ was the first to report fluid extravasation into the abdominal cavity.
- Funke and Munzinger³⁷ 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.
- Barlett³⁸ 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.
- Sampson³⁹ 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.
- Haupt⁴⁰ (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. Symptoms: 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.
- Sharma⁴¹ (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.
- Fowler⁴² (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, Landner⁴³ 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.
- Verma⁴⁴ 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 iliopsoas 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 al⁴⁵ (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, anal 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 through 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 tubes, 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 suspected⁴³.

- 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 ⁴⁴.
- 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 ⁴⁴.
- 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 compromised⁴⁴.
- Warning Signs of Arthroscopic Fluid Extravasation ⁴⁴.
 - ✓ 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 ⁴⁶.
- Bleeding around a portal site or local hematoma (0.3%)⁴⁷.

Soft tissue and perineum

- Soft tissue pressure necrosis of the perineum has been reported by Eriksson et al ⁴⁸.
- Souza et al³.: Partial skin necrosis of the scrotum that required plastic surgery correction.
- Rodeo described a case of pressure necrosis to the foot¹.
- Funke and Munzinger reported a hematoma of the labia majora³⁷.
- Souza et al⁷.: Transient vulva edema that subsided after 1 week.
- Perez Carro: Isha Paris 2011. 1 case of vulva edema.
- Griffin and Villar have also reported a small vaginal tear⁴⁷.

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 re debridement of the deformity ¹¹.

✚ 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: Postmenopausal slender women.

-Breakage.

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 !!!

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