

Endoscopic release of internal snapping hip: a review of literature

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Summary

Background: Internal snapping hip is a common clinical condition, characterized by an audible or palpable snap of the medial compartment of the hip. In most cases it is asymptomatic, while in a few patients, mostly in athletes who participate in activities requiring extremes of hip range of motion, the snap may become painful (internal snapping hip syndrome - ISHS).

Materials and methods: This is a review of current literature, focused on the pathogenesis, diagnosis and treatment of ISHS.

Conclusion: The pathogenesis of ISHS is multifactorial, and it is traditionally believed to be caused by the tendon snapping over the anterior femoral head or the iliopectineal ridge. Most cases of ISHS resolve with conservative treatment, which includes avoidance of aggravating activities, stretching, and NSAIDs. In recalcitrant cases, surgery may be indicated. Better results have been reported with endoscopic iliopsoas tendon release compared

with open techniques, which may be related to the treatment of concomitant intra-articular pathologies. Furthermore, endoscopic treatment showed fewer complications, decreased failure rate and postoperative pain. It is important to remember that in most cases, a multiple iliopsoas tendon may exist, and that the incomplete release of the iliopsoas tendon can be a reason for refractory pain and poor results. Then, even if of not clinical relevance at long term follow-up, patients should be told about the inevitable loss of flexion strength after iliopsoas tenotomy.

Level of evidence: II.

KEY WORDS: endoscopy, hip arthroscopy, internal snapping hip, iliopsoas tendon, tendinopathy, tendon release.

Introduction

Hip arthroscopy has gained considerable popularity in the past decade. The most common indications for hip arthroscopy are intra-articular pathologies, but advances in imaging techniques and arthroscopic procedures allow for the diagnosis and treatment of extra-capsular diseases of the hip. The iliopsoas tendon has gained popularity in the last years for its role as a source of hip pain and its association with intra-articular pathologies. This review is written according to the ethical standards of the journal¹.

Internal snapping hip or *medial coxa saltans* is a clinical conditions which was first described by dr. Jones in 1920², and it is characterized by an audible or palpable snap of the medial compartment of the hip. It is a common asymptomatic condition which may occur in up to 10% of the general population³, while in a few cases the snap became painful, called Internal Snapping Hip Syndrome (ISHS). In a selected population the incidence of symptomatic medial snapping hip may be higher, in particular in those athletes who require extreme hip motion, as soccer players, weight lifters, and runners⁴. For example, a survey of elite ballet dancers reported that more than 90% of dancers reported snaps, cracks, clicks of their hip, and in 80% of cases the symptoms were bilateral, causing pain during hip external rotation and abduction near or beyond 90°⁵. Even if ISHS seems to be more frequent in women than in men, gender is not a statistically significant risk factor⁶.

Pathogenesis of internal snapping hip

The origin of ISHS is multifactorial. A complex anatomic relationship exists between the iliopsoas tendon at the musculotendinous junction and the anterior structures of the hip joint. The femoral head, the iliopectineal ridge, the iliopsoas bursa, and the iliofemoral ligament could be involved in the snapping phenomenon. ISHS is traditionally believed to be caused by the iliopsoas tendon snapping over the anterior femoral head or the iliopectineal ridge, which is the rounded elevation on the superior surface of the pelvis where the iliac and pubic bones join. The iliopsoas tendon is located lateral to the iliopectineal eminence when the hip is in full flexion, while during hip extension the tendon moves medially. However, this is not the only pathogenetic mechanism involved. Recent studies showed that the snap may be caused by the movement of the iliacus muscle itself, and not only by the iliopsoas tendon. A dynamic ultrasonographic study showed abnormal movement of the iliacus muscle between the pubic bone and the iliopsoas tendon resulting in snap⁷. Winston et al. observed that the iliopsoas tendon can be embedded within the iliacus muscle belly and produce a snap when returning to its normal position deep to the muscle⁵. Then, other structures may be involved in the development of the snap, as the lesser trochanter and paralabral cyst⁷. Some anatomic variant may also contribute to snapping. Recent investigations focused the attention on the presence of multiple iliopsoas tendon, which could cause snapping by the medial head flipping over the lateral head of the tendon^{7,8}. Fabricant et al. found that an excessive femoral anteversion was correlated with poor pre- and postoperative clinical scores⁹.

Clinical examination and diagnosis

Patients with ISHS typically refer pain and an audible snap in the groin. They often report difficulty to get in and out of the car, standing up from a seated position and doing sports as running, dancing, and all physical activities that require a high hip range of motion⁶. Then, usually the patient is able to tell the examiner when the snap occurs and to reproduce it voluntarily. The reproduction of the audible snap is one of the most sensitive clinical test for the diagnose. To reproduce the snap, with the patient supine, the affected leg is moved from flexion, abduction, and external rotation to extension, adduction, and internal rotation. An audible and palpable snap is usually perceptible between 30 and 45° of hip flexion¹⁰. Even if the diagnosis of ISHS is a clinical one, imaging is important to rule out other pathologies. Antero-posterior X-ray of the pelvis and cross table view of the hip are important to study the anatomy of the hip. Acetabular anteversion, coxa vara and developmental dysplasia may contribute to the snapping of the iliopsoas tendon¹⁰. Ultrasound is commonly prescribed for the diagnosis. It is useful because dy-

namic ultrasound may document the snapping phenomenon as well as pathologic changes of the iliopsoas tendon and of the bursa⁵. However, as ISHS is frequently associated with intra-articular pathologies in a large number of cases, MRI is currently considered superior to ultrasound for decision making by most of the Authors¹⁰.

Management of internal snapping hip syndrome

Treatment of ISHS is primary conservative. Nonsurgical treatments are focused on relieving pain and lengthening the tendon through stretching exercises. Lifestyle modification, stretching of the iliopsoas tendon, shock waves, deep massage, myofascial release, neuromuscular reeducation, NSAIDs and steroid injections have been used with good results from 36 to 67% of cases^{6,11}.

When conservative management fails, surgical treatment is indicated. Two different endoscopic techniques for iliopsoas tendon release have been described, the lesser trochanter and the transcapsular release. The endoscopic release of the iliopsoas tendon at the lesser trochanter was described by Byrd et al.³ in 2005. In his study, 9 patients have been treated with good results and without any complications and recurrence. Good clinical results and low recurrence rate have been reported also by other Authors (Table I).

In the transcapsular release, the tendon release is performed across the hip joint through an anterior capsulotomy (Figure 1). The iliopsoas tendon can be released at the level of the labrum or at the femoral neck. Hwang et al.¹² recently reported good to excellent results in 22/25 patients treated with transcapsular release of iliopsoas tendon, with a mean improvement of the Harris Hip Score (HHS) from 65 to 84 points. Two patients experienced recurrent snap but only one had a revision surgery. No other complication have been reported. A statistical significant improvement in the clinical score was also reported by Ilizaliturri et al. at 2 years follow-up in 14 patients, with only one recurrence of snapping and no complications¹³.

El Bitar et al.¹⁴ recently proposed an arthroscopic iliopsoas fractional lengthening. In their study, the Authors reviewed retrospectively 55 patients at 2 years follow-up, and they reported good to excellent clinical result in 82% of cases. However the rate of recurrence of painful snap was somewhat higher than that reported in other studies, as 18% of patient reported a recurrence of symptoms.

Discussion

Even if internal snapping hip is a common condition, there is a limited number of articles published in the literature, with all being retrospective studies collected data. Most reports involved relatively small sam-

Table I. Clinical results of endoscopic ISHS treatment.

Author	Year	Technique	Patients	Follow-up (months)	Recurrence of symptoms	Score systems
Ilizaliturri et al. ³⁴	2005	Endoscopic release at the lesser trochanter	7	21	0	WOMAC
Flanum et al. ³⁵	2007	Endoscopic release at the lesser trochanter	6	12	0	HHS
Anderson and Keene ¹⁸	2008	Endoscopic release at the lesser trochanter	15	9	0	Byrd's hip score
Wettstein et al. ³⁶	2006	Endoscopic transcapsular release	9	3	0	Not evaluated
Contreras et al. ³⁷	2010	Endoscopic transcapsular release	7	24	0	mHHS, VAS
Ilizaliturri et al. ¹³	2014	Endoscopic transcapsular release	14	24	1	WOMAC
Ilizaliturri et al. ¹³	2014	Endoscopic release at the lesser trochanter	6	24	0	WOMAC
Hwang et al. ¹²	2015	Endoscopic transcapsular release	25	24	2	HHS, HOS-ADL, HOS-SSS, VAS
El Bitar et al. ¹⁴	2014	Fractional iliopsoas tendon lengthening	55	24	10	NAHS, HOS-ADL, HOS-SSS, mHHS, VAS

VAS: Visual Analogue Scale; HHS: Harris Hip Score; mHHS: modified Harris Hip Score; WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index; NAHS: Non-Arthritic Hip Score; HOS-ADL: Hip Outcome Score-Activity of Daily Living; HOS-SSS Sport-Specific Subscale.



Figure 1. Transcapsular release of the iliopsoas tendon at the level of the acetabular labrum.

ples and short-term follow-up. Then, different evaluation scales have been used to report the outcomes, and this makes comparison of results very difficult. Internal snapping hip is asymptomatic in most of peo-

ple, but when the snap becomes painful and conservative management fails, surgical treatment is indicated. Many articles have been reported in the literature about open surgical release or lengthening of the iliopsoas tendon. However the result of open surgery are moderate and an high complication's rate was reported, up to 40% of cases^{12,15}. It probably due to the impossibility to treat intra-articular pathologies. Femoro-acetabular impingement, labral tears and cartilage lesions can be associated with ISHS in more than 50% of the patients¹⁵. Sometimes, the iliopsoas tendon itself may cause a labral injury. Domb et al. described an anterior labral injury at the 3 o'clock position directly beneath the iliopsoas tendon, which lies in an extra-articular position immediately beyond the joint capsule¹⁶ (Figure 2). These patients had no evidence of FAI, bony abnormality, trauma, or any other known cause of labral injury. A complex anatomic relationship exists between the iliopsoas tendon and the anterior surface of the hip joint. The tension on the tendon and the pressure against the femoral head change during the hip range of motion. The pressure of iliopsoas tendon is higher with hip extension, while it decreases during hip flexion, but some anatomical



Figure 2. 25-year-old female patient, professional hockey player, affected by ISHS. A labral injury at 3 o'clock position was found.

features are related to an increased pressure. A large femoral head, a varus neck-shaft angle, an high femoral anteversion, a thin but wide tendon at the level of the femoral head, are all conditions associated with higher pressures on the femoral head during hip flexions which may cause a labral injury¹⁷. For these reasons, Domb et al. proposed the term iliopsoas impingement¹⁶.

Encouraging results have been reported with endoscopic release of the iliopsoas tendon. Higher success rate, less recurrence, fewer complications, and decreased postoperative pain compared to open surgery have been reported^{10,18,19}. Currently, there are more articles available in literature about the iliopsoas tendon release at the lesser trochanter than transcapsular release. One disadvantage of iliopsoas release at the lesser trochanter is that it requires fluoroscopic guide to access the tendon. Then, some Authors reported a greater loss of flexion strength compare to transcapsular release, probably because the muscular portion is preserved when the release is performed at the central compartment¹³. On the other hand, a possible risk of femoral nerve branches injury exists when a transcapsular release is performed, as the nerve runs directly over the iliopsoas muscle²⁰. Then, as the medial femoral circumflex artery is close to the psoas tendon, the risk of osteonecrosis of the femoral head also exists²¹. However, these complications have not been reported. Only one comparative study between the two techniques has been published. In this retrospective study by Ilizzaliturri et al.¹³, no significant differences have been found between the two techniques, suggesting that both methods are effective and safe for the treatment of ISHS. But, a cadaveric study showed changes in the anatomy of the iliopsoas tendon according the distance from the lesser trochanter²². At the level of the labrum, the muscle-tendineous junction consists of 60% muscle and 40% tendon. At the femoral neck it is about a 50-50%, whereas at its insertion on the

lesser trochanter, it consists of 40% muscle and 60% tendon. So, some Authors suggest that the intracapsular release should be the ideal site for tenotomy because the muscular portion of the iliopsoas muscle is preserved, while releasing the tendon at the lesser trochanter would be equivalent to releasing the entire iliopsoas muscle belly-tendon complex²³. However these conclusions are based on cadaveric anatomic studies, and we do not know if the level of the tenotomy may produce real differences in term of flexion strength.

Endoscopic release of iliopsoas tendon is not without troubles. Some researchers recently focused the attention on the presence of multiple iliopsoas tendons. In an anatomical cadaveric study of 53 specimens by Philippon et al., two tendons were identified in 64.2% of cases, three tendons in 7.5% of cases, while a single tendon was found only in 28.3% of cases²⁴. Crompton et al. found a prevalence of a bifid iliopsoas tendon of 26% on MR imaging in 87 hips in children²⁵. More recently, an incidence of multiple iliopsoas tendons of 18% during endoscopic transcapsular release have been reported²⁶. These studies suggest that, once thought to be a rare anatomic variant, the finding of 2 or multiple iliopsoas tendons is very common, and that it is important to be aware of the possibility that more than 1 tendon may exist. An incomplete release of the iliopsoas tendon should be considered as a differential diagnosis for refractory pain and internal snapping. Therefore, these Authors suggest that if a tendon smaller than 10 mm of diameter is encountered, an additional tendon should be sought, because it likely represents only one portion of the tendon. The presence of a bifid psoas tendon and an incomplete release may be the cause of recurrence of ISHS and may require a revision surgery. A significant loss of flexion strength is experienced by all patients after surgery. An interesting MRI study recently evaluate the changes of the hip muscles in patients after arthroscopic iliopsoas tenotomy²⁷. The Authors found that 85% of patients showed atrophy of the iliacus muscle, 75% of them of the psoas muscle, and that the severity of the atrophy was statistically significant greater in the psoas than in the iliacus muscle. According to the grade²⁸, 55% of patients had a grade 4 atrophy, 10% a grade 3 and 20% a grade 2, and 2/20 patients showed no signs of atrophy at the MRI study. Muscle atrophy was observed also in the omolateral gluteus maximus (25%), quadratus femoris (10%) and vastus lateralis 5%. Surprisingly a high percentage of patients developed an atrophy of the ipsilateral gluteus maximus, probably consequently to the loss of strength of the antagonistic muscles. Another interesting finding was that the atrophy was not associated with a significant decrease in hip function. In fact, there was no significant difference in the modified HHS of the patients with no atrophy, mild to moderate atrophy, and severe iliacus or psoas muscle atrophy at two years follow-up, and the majority of the patient's with grade 4 atrophy showed good clinical outcomes²⁷. According to this this study, other Authors reported a significant clinical

loss of flexion strength after surgery in all patients but they improved in a period lasting from 6 to 10 weeks^{26,29}.

A potential risk of hip instability after iliopsoas tenotomy has been reported. Iliopsoas tendon is an important active stabilizer of the hip joint. As the pressure of iliopsoas tendon against the femoral head increases with hip extension, it plays an important role in hip stability together with the anterior capsule-ligaments complex. Some cases of micro-instability, early joint degeneration, subluxation and hip dislocation have been reported after labral repair, acetabular rim trimming and iliopsoas tenotomy³⁰⁻³³. However, most of these cases have concomitant factors of instability, like a decreased Center-Edge angle (CE angle), labral hypertrophy and hip dysplasia. Hip dysplasia, excessive acetabular rim trimming, excessive capsulotomy, iliopsoas tenotomy, ligamentum teres resection, ligamentous laxity, and long distraction time resulting in ligament elongation, have been all recognized as potential risk factors for post-operative hip instability. Iliopsoas tenotomy is of course not the only responsible of hip instability, however, many Authors suggest a careful selection of the patient and caution in performing large capsulotomy and excessive acetabular rim trimming in presence of risk factors of instability^{30, 31}.

Conclusion

The iliopsoas tendon is a recognized source of extra-articular hip pain. Careful clinical examination and accurate diagnosis is important in patients with ISHS, because the iliopsoas tendon may not be the only responsible of the symptoms. Endoscopic release provides better outcomes, better cosmetic result and less complications than open management. It is important to remind that two or more tendons may exist, and that a partial tendon release may results in recurrence of symptoms. Finally, iliopsoas atrophy is expected in all patients after tenotomy, however it does not seem to be predictive of clinical function. High evidence with long term follow-up are still lacking in literature, in order to define the best treatment for patients affected by ISHS.

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