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Diagnosis and Management of Snapping Hip Syndrome: A Comprehensive Review of Literature

Alessio Giai Via[1*], Alberto Fioruzzi[2], Filippo Randelli[1]

[1]*Department of Orthopaedics and Traumatology, Hip Surgery Center, IRCCS Policlinico San Donato, Milano, Italy*

[2]*Department of Orthopaedics and Traumatology, IRCCS Policlinico San Matteo, Pavia, Italy*

[*]**Corresponding author:** Alessio Giai Via, Department of Orthopaedics and Traumatology, Hip Surgery Center, IRCCS Policlinico San Donato, Milano, Italy, Tel: +393396298768; E-mail: alberto.fioruzzi@gmail.com

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Abstract

Background: Snapping hip is a common clinical condition, characterized by an audible or palpable snap of the hip joint. The snap can be perceived at the lateral side of the hip (external snapping hip), or at the medial (internal snapping hip). It is usually asymptomatic, but in few cases, in particular in athletes, the snap become painful (snapping hip syndrome-SHS).

Materials and methods: This is a narrative review of current literature, which describes the pathogenesis, diagnosis and treatment of SHS.

Conclusion: The pathogenesis of SHS is multifactorial. Although external and internal SHS share some clinical features, they are different in etiology. In most cases, conservative treatment provides good results, while for patients who do not respond to conservative managements, surgery is indicated. Better results have been reported with endoscopic treatments compared with open surgery. Furthermore, endoscopic treatment showed fewer complications, failure rate and less post-operative pain. However, although the prevalence is high in general population, few articles are reported in the literature, and high evidence studies are needed.

Keywords: Coxa saltans; Endoscopy; Hip arthroscopy; Iliopsoas tendon; Snapping hip syndrome; Tendon release

Introduction

The snapping hip or "coxa saltans" is a clinical condition characterized by an audible or palpable snap of the hip. It is a common pathology, and it is frequently asymptomatic. In few cases the snap is painful, and this condition is known as Snapping Hip Syndrome (SHS). Three different types of SHS have been described, the external or lateral snapping hip syndrome (ESHS), the internal or medial snapping hip syndrome (ISHS), and the so-called "intra-articular snapping hip". This last condition was originally considered due to intra-articular pathologies causing mechanical symptoms. However, as great advances in understanding the biomechanics, diagnosis and treatment of the hip have been made in the past decade, some authors suggest avoiding the term intra-articular snapping hip. Although external and internal SHS share some similar clinical features, they are different in etiology and treatment [1]. This is a narrative review of the current knowledge on SHS, focused on the pathogenesis, diagnosis and treatment of this pathology.

Epidemiology and Pathogenesis of SHS

The prevalence of snapping hip is estimated to occur in up to 10% of the general population, but it may be higher in a selected population, in particular in athletes who require extreme hip ROM, as runners, soccer players, and weight lifters [2-4]. Winston et al. [5] found that more than 90% of ballet dancers report a snap, crack, or dislocation sensation during certain movements that involve hip abduction and external rotation. However, a true prevalence is likely underestimated partly due to the difficulty in the clinical diagnosis and the lack of a standard imaging work-up protocol. Some authors reported that SHS is more common in women than in men, and as early as adolescent years. A large case series showed a 62% prevalence of cases in women [6]. However, gender is not a risk factor statistically significant up today [6].

External snapping hip syndrome

ESHS was first reported by Perrin in 1859 and coined by Nunziata and Blumenfeld in 1951 [7]. It is caused by the iliotibial band sliding over the greater trochanter, and it may be enhanced by a thickening of the anterior border of the gluteus maximus or of the posterior part of the iliotibial tract [7,8].

When the hip is in extension, the thickened band lies posterior to the trochanter and snaps forward over the greater trochanter with flexion. The iliotibial band has two musculotendinous insertions proximally, the tensor fascia lata anteriorly and the gluteus maximus posteriorly. Then, it also attaches to the gluteus medius through an overlying aponeurosis [9]. These muscles pull on the iliotibial band (ITB), making it taut whether the hip is flexed or extended. The iliotibial tract is firmly attached to the linea aspera on the posterior surface of the femur. So, the tensor fascia lata and the gluteus maximus gain an indirect insertion into the femur through this wide-ranging tendon attachment. Distally, the posterior border of the ITB crosses the anterolateral aspect of the knee and it inserts on the Gerdy's tubercle. The anterior portion of the band continues into the lateral retinaculum, giving some fibers to the lateral patella. The greater

trochanteric bursa lies between the ITB and the greater trochanter, and it may also be a source of pain when the snap occurs. A small femoral neck-shaft angle has been correlated with an increased incidence of ESHS because of a weaker abduction by gluteus medius and minimus, and an increase stress on iliotibial band [10].

Internal snapping hip syndrome

ISHS is commonly believed to be caused by the iliopsoas tendon snapping over the anterior femoral head or the iliopectineal eminence. The iliopsoas tendon is located lateral to the iliopectineal ridge when the hip is in full flexion, while during hip extension the tendon moves medially. However, this is not the only pathogenetic mechanism involved in ISHS, because the pathogenesis is currently considered multifactorial. This is because a complex anatomic relationship exists between the iliopsoas tendon and the hip joint, and many different structures are involved in the snap, as the femoral head, the iliopectineal ridge, the iliopsoas bursa, the iliacus muscle and the iliofemoral ligament. Deslandes et al. [11], in their study using dynamic sonography, showed that the snap may be caused by an abnormal movement of the iliacus muscle between the pubic bone and the iliopsoas tendon during hip flexion.

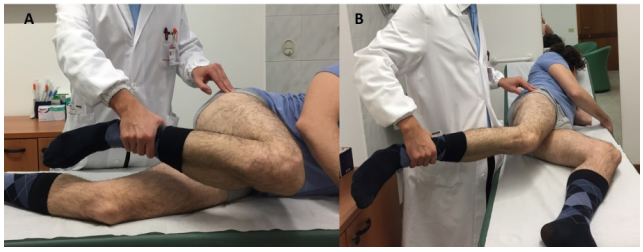

Figure 1: The patient is examined in lateral decubitus. The ITB may be reproduced by the active flexion (A) followed by passive extension and abduction of the hip (B).

In other cases, the iliopsoas tendon can be caught within the iliacus muscle belly and produces a snap when it returns to its original position deep to the muscle [5]. Furthermore, some anatomic variants, in particular multiple iliopsoas tendon, have been described and they may contribute to the snapping [12]. High femoral anteversion may also contribute to the syndrome, and it is associated to poorer results after iliopsoas tendon lengthening [13]. The ISHS has been reported to be frequently associated with femoroacetabular impingement (FAI).

Clinical Examination and Diagnosis

A careful history and physical examination are crucial to make a correct diagnosis of SHS. The patient is usually able to locate the site of the snap, to report to the physician when it occurs, and to reproduce it voluntary. The reproduction of the audible snap is one of the most sensitive clinical test. The evaluation of the gait and muscular strength gives an idea of the hip stability and muscle imbalance. The hip ROM should be also examined, and the FADIR (flexion, adduction and internal rotation or impingement) test is used to assess for intra-articular pathologies. The FABER (flexion, abduction and external rotation) test is less sensitive because may elicit both SHS and intra-articular symptoms.

If an ESHS is suspected, the patient is positioned on lateral decubitus on the examination table, with the affected hip upward, and the Ober test is used to evaluate iliotibial band tightness. The snap may be reproduced by the active flexion followed by passive extension and abduction of the hip (Figure 1). Yen et al. described the hula-hoop test [12]. With the patient is standing position, the hula-hoop test consists in adduction with circumduction of the affected hip. If the circumduction results in a snap over the greater trochanter, the test is positive for ESHS [14]. The modified FABER test usually cause discomfort to the patient (Figure 2).

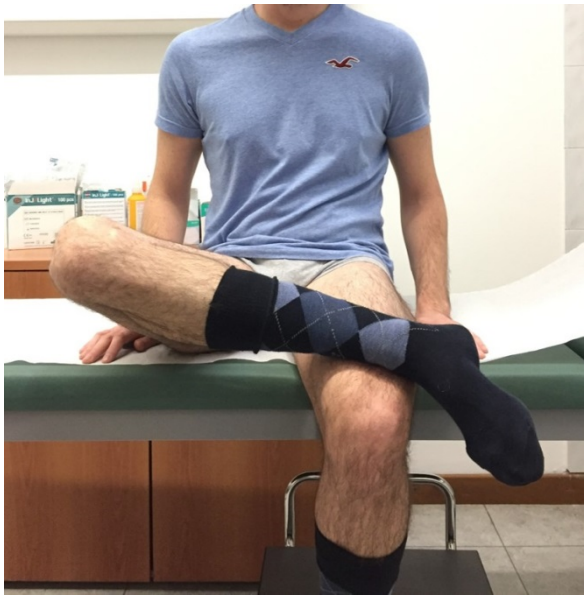

Figure 2: The modified FABER test is positive if it causes discomfort to the patient.

In case of ISHS, the patient is examined supine, and the affected leg is moved from flexion, abduction, and external rotation to extension, adduction, and internal rotation (Figure 3). An snap is usually audible between 30° and 45° of hip flexion [1]. Sometimes a simple and repetitive flexion extension movements from supine may elicit the snap of the iliopsoas tendon. In every case, clinical test for the iliopsoas should be evaluated, including the Thomas test, the Stinchfield test (Figure 4) and the iliopsoas stress test, to confirm the pain symptom (Table 1).

Figure 3: The iliopsoas snapping can be reproduced moving the hip from flexion-abduction-external rotation (A) to extension-adduction-internal rotation (B).

Figure 4: The Stinchfield test: The patient lies supine. With the hip flexed at 30°, ask the patient to fully flex the hip, while the examines apply a resistance force. Pain in the anterior groin indicate a positive test.

The diagnosis of SHS is usually clinical, but imaging is often useful to rule out other pathologies or confirm the diagnosis. Antero-posterior X-ray of the pelvis and cross table view of the hip are important to study the anatomy of the hip joint, as the snap may be associated with acetabular anterversion, coxa vara, femoro-acetabular impingement and developmental dysplasia [1,10] Ultrasound (US) is commonly prescribed. A dynamic US examination is usually successful in demonstrating the snapping phenomenon as well as pathologic changes of the ITB, of the iliopsoas tendon and of the bursae. At the MRI, T1 imaging may demonstrate hypointense thickening of the proximal ITB, while T2 imaging may show thickening and hyperintensity of the proximal ITB.

Clinical Diagnosis for Symptomatic Snapping Hip	
Type	**Test**
ESHS	Ober test
	FABER
	Hula-Hoop test
	Active flexion followed by passive extension and abduction in lateral decubitus
ISHS	Thomas test
	Modified Thomas test
	Stinchfield test
	Iliopsoas stress test
	Movement from flexion, abduction, and external rotation to extension, adduction, and internal rotation in supine decubitus

Table 1: The table resume the specific tests to explore the iliotibial band and iliopsoas tendon for diagnosis of ESHS and ISHS.

Hyperintense greater trochanteric bursal inflammation or a fluid collection may also be visualized on T2; however, these findings are non-specific and the correlation with the clinical examination is important. Post-contrast imaging can show peritendinous enhancement of involved structures. A small case series correlated atrophy of the gluteus maximus muscle on MRI with ESHS. The authors hypothesized that this finding could be due to gait changes to avoid pain [15]. Furthermore, ISHS is frequently associated with intra-articular pathologies, and MRI is useful to detect labral and cartilage injuries, and it is considered superior to ultrasound by many authors for decision making [16]

Management of SHS

The management of SHS is first conservative. Many people experience benign, asymptomatic snapping and a specific treatment are not necessary. If the snap becomes symptomatic, a program of conservative treatments is prescribed first, which is focused on relieving pain and stretching exercises. Several treatments have been proposed and are currently used in clinical practice, as rest and lifestyle modification, reduction of the sporting activity, cryotherapy, hot packs (not in acute phase), NSAIDs, physiotherapy (exercises, stretching, deep massage, myofascial release, core stability and pelvic stabilizers exercises), local corticosteroids injections and physical therapies (lasertherapy, extracorporal shock wave therapy-ESWT). The results of these treatments are extremely different, and good results have been reported from 36% to 67% of cases. When conservative management fails, surgery may be indicated.

Treatment of ESHS

Conservative management of ESHS: The first approach to ESHS is conservative. It is important to identify the source of the muscle tightness that is responsible of the snap. Passive and active stretching is effective in most of cases to reduce the tightness of the ITB and to solve the snap [17]. However, sometimes the thigh ITB is due to an excessive muscle activation which increases the muscle tension. In these cases, the intervention is directed to modify neuromuscular control and neuromuscular re-education is indicated. Then, it is important to solve the imbalance between gluteus maximus activation and tensor fasciae latae activation which is often observed. It is important to not exacerbate symptoms during physical therapy. Good results have been reported after 6 to 12 months of physical therapy, with the resolution of the snap in most of the patients [17]. To prevent recurrences, modification of lifestyle and stretching exercises are advocated. A precise evaluation of leg lengths is mandatory and, in case of a real discrepancy, equalization with a shoe lift may be used to accompany the physical therapy period.

Corticosteroids injections are widely used in clinical practice for treatment of GTPS. However, literature is poor on this topic and there is not evidence they are effective. A recent systematic review of literature showed that corticosteroid injections improve pain and symptoms at short term follow-up, and they are superior to oral NSAIDs, but there is not statistically significant difference at 12 months follow-up [18]. Cohen et al. [19] in a RCT found no differences between the corticosteroids injection under fluoroscopy into the trochanteric bursa or not, while better long-term results in terms of pain and function have been reported with ECSWT and home exercises compared to corticosteroids injections [20].

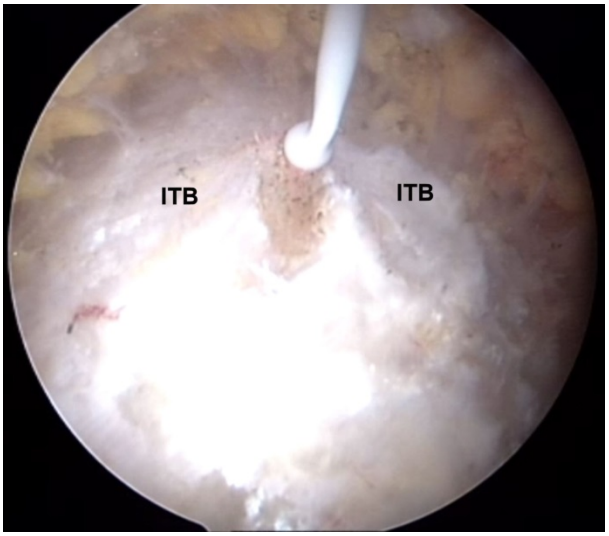

Figure 5: Endoscopic iliotibial band release as described by Ilizaliturri et al. ITB: Iliotibial band.

Surgical management of ESHS: When the patient does not respond to conservative treatment, surgery is indicated. The aim of surgery is to release the tendon to resolve the snapping. Different surgical procedures have been reported for treatment of ESH, including Z-shaped ITB release, formal Z-lengthening, cross-shaped release, or the release of the gluteus maximus tendon insertion to the femur, which can be performed both open or endoscopically [21-25]. An open Z-lengthening procedure was performed by Provencher, et al. [21] they reported on 9 cases (8 patients) with a complete resolution of symptoms, and all but 1 returned back to active military duty. White et al. [24] described a less invasive ITB lengthening, by performing multiple step cuts through a 10-cm longitudinal incision through the ITB. At final follow-up, 14 patients were asymptomatic, while 2 patients required a revision surgery. Similar endoscopic cross shaped release was described by Ilizaliturri et al. [23] with the patient in lateral decubitus, a diamond-shaped resection and an outside-in release of the ITB was performed by the superior and inferior trochanteric portals starting the dissection from outside the fascia (Figure 5). The authors reported the resolution of the snap in 10 cases at 2 years follow up, and one non-painful snap which did not require revision surgery. A very interesting endoscopic technique, described by Voos, [21] is the inside-out ITB release entering at first in the peritrochanteric space between the fascia and the greater trochanter.

In order to preserve the shape of the lateral thigh and the biomechanics of the ITB (Figure 6), Polesello et al. [25] performed a gluteus maximus tenotomy to decrease tension on the ITB. With the patient in supine position on a traction table, the superior and inferior trochanteric portals are performed. The cannula is placed through the ITB in the peritrochanteric space, the gluteus maximus tendon is identified at the level of the linea aspera and released (Figure 7). The authors reported on 9 hips (8 patients), at a minimum of 22 months follow-up. The snap and pain were resolved in 7 hips, while one patient required a revision surgery with a complete relief of symptoms. At final follow-up, all patients returned back to their preoperative activity level, and no one complained weakness of the operated limb.

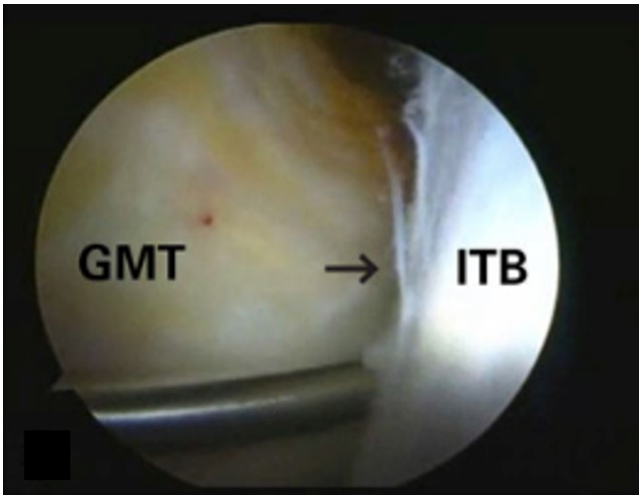

Figure 6: Arthroscopic view of the tensor fasciae latae (TFL) and gluteus maximus tendon (GMT) complex.

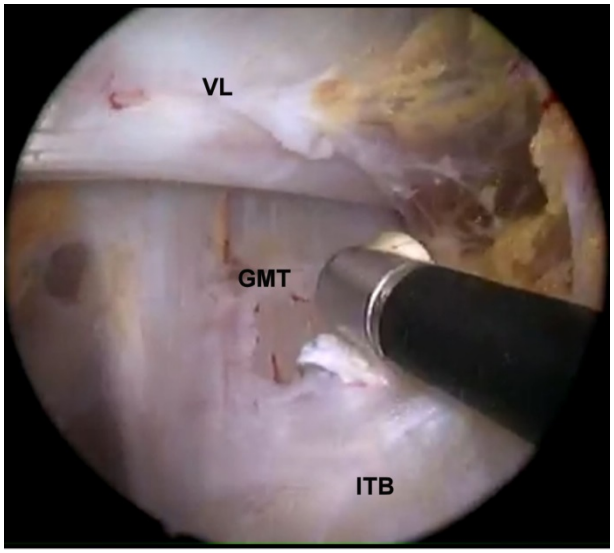

Figure 7: Endoscopic release of the gluteus maximus tendon (Polesello technique). GMT: gluteus maximus tendon. TFL: tensor fasciae latae. VL: Vastus lateralis muscle.

Treatment of ISHS

Conservative management of ISHS: Conservative management of ISHS is focused on iliopsoas tendon stretching and muscular balance. Many different protocols have been proposed, but evidence is still poor and there is not a gold standard treatment. As an high iliopsoas muscle activation and a weakness the gluteus medius have been found in many patients, Philippon et al. [26] proposed a rehabilitative protocol based on gluteus medius strengthening, which consists into 4 consecutive phases. Garala and Prasad [27] in a retrospective case-control study found better results, according NAHS, after corticosteroids injection

compared to iliopsoas tenotomy, and they indicate tenotomy in patients refractory to corticosteroids.

Surgical management of ISHS: The surgical treatment consists in the iliopsoas tendon lengthening or tenotomy, which can be performed both open or endoscopically. Formal contraindications for the iliopsoas release are patients with hyp dysplasia, increased femoral anteversion and hyperlaxitude, as in those patients the iliopsoas muscle is one the most important stabilizating structures in the joint biomechanics. The endoscopic release of the iliopsoas tendon can be performed at the lesser trochanter or by a transcapsular approach. The endoscopic release at the lesser trochanter was described by Byrd et al. [2] in 2006, who reported good results in 9 patients, without complications or recurrence of symptoms.

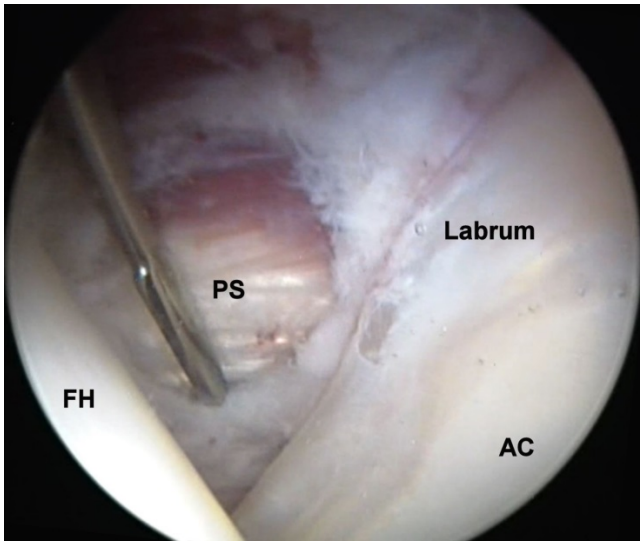

Figure 8: Transcapsular release of the Iliopsoas tendon. FH: Femoral Head; PS: Iliopsoas tendon; AC: Acetabulum.

Others authors also reported good clinical results and low recurrence rate with this technique [28,29]. The trascapsular release consists in the iliopsoas tenotomy across the hip joint through an anterior capsulotomy (Figure 8). The iliopsoas tendon can be released at the level of the labrum or at the femoral neck. Good to excellent results have been reported by Hwang et al. [30] in 22/25 patients. The mean Harris Hip Score (HHS) improved from 65 to 84 points, the recurrence of the snap was reported in two patients, but they did not require revision surgery, and no other complications were experienced. A statistical significant improvement in WOMAC score was reported by Ilizaliturri et al. [31] in 14 patients at 2 years follow-up. The authors reported no complications and only one recurrence. The arthroscopic iliopsoas lengthening was recently described by El Bitar et al. [32] in 55 patients. The authors reported good to excellent clinical results in 82% of patients, but the recurrence of painful snapping hip was higher compared to other studies (18%).

Discussion

Snapping hip is common condition, it is usually asymptomatic, but when the snap becomes painful and does not respond to conservative treatment, surgery is indicated. Although the prevalence is high in general population, there is a limited number of retrospective studies in the literature. Most reports involve relatively small samples and short-term follow-up. Furthermore, compare the results is difficult because patients have been evaluated with different scoring scales.

Most patients show good results with conservative treatments [1,22] Corticosteroid injection are widely used in clinical practice, whereas the mechanisms of efficacy and safety, especially in repeated use, is poorly understood. Level I studies published in literature, showed that corticosteroids improve pain at short-term follow-up, but not at 1 year after injection [18]. These result may reinforce the idea that the pathogenesis of SHS is not inflammatory, but multifactorial. Even if in the last years great interest arise in the use of PRP and ialuronic acid for treatment of tendinopathies, their use in the management of SHS has been not investigated yet. ESWT have been reported to be superior to corticosteroid injections in treatment of ESHS, in particular when associated to a home exercise program, while there is no evidence for treatment of ISHS. Then, the effectiveness of and eccentric exercises (EE) program has been reported for Achilles, patellar and hamstring tendinopathies, but no level I studies investigate EE for the management of SHS [18,20].

Surgical treatment is indicated when patients do not respond to conservative treatments. Many surgical techniques have been reported in literature for the treatment both for ESHS and ISHS (Table 2), which prove that a gold standard procedure is still not available. Open techniques are the most commonly performed, but recently endoscopic techniques have been described. There are no prospective comparative studies in the literature comparing open versus endoscopic ITB release for the treatment of ESHS. The results obtained by Ilizaliturri et al. [23] compare well with those reported in literature of open release or open Z-plasty, with a success rate of 90.9% for the endoscopic technique versus 88% for the open techniques. But, arthroscopy techniques are more expensive compared to open surgery because of the hardware and instruments. On the other hand, the minimal invasiveness is an attractive option for patient. Ilizaliturri et al. [23] reported in 2006 on 11 hips with excellent results in 10 cases, and only 1 patient with non-painful snapping at 2 years follow-up.

Arthroscopic Treatment		
Type	**Technique**	**Characteristics**
ESHS	Z-lengthening	Open and arthroscopic
	Diamond Shaped release	Lateral decubitus endoscopic technique
	Polesello technique	Gluteus maximus tenotomy
ISHS	Transcapsular iliopsoas release	Muscle-tendineous junction 60% muscle, 40% tendon
	Iliopsoas tendon release at the lesser trochanter	Muscle-tendineous junction 40% muscle, 60% tendon

Table 2: the table resume the endoscopic techniques for the treatment of SHS.

In order to preserve the abductor complex, Polesello et al. [25] proposed the release of the gluteus maximum tendon (GMT), based on the hypothesis that the ITB, the gluteus maximum (GM) and the tensor fascia late (TFL) muscle work as a single complex. In fact, the ITB is pulled by the TFL anteriorly, and by the GM posteriorly, which work in synergy, and they are currently considered the main responsible of ESH [33]. Therefore, the selective release of the GMT is

the main act to solve the functional abnormality without compromising the all complex. The Polesello technique has been used by authors also for the treatment of greater trocanther pain syndrome with promising results. However, no studies are published in literature on this surgical indication up today. Although surgical management of ESHS showed relatively favorable results, residual pain or snapping has been reported by different authors, the majority of cases not requiring a second intervention [22-24].

ISHS is a common condition, and some risk factors have been identified as hypertrophic psoas muscle (dancer, gymnasts, fitness practitioners, high BMI), wider pelvic anatomy, chronic snapper, and non-iliopsoas protective postoperative rehabilitation. The current surgical procedure for treatment of recalcitrant ISHS is iliopsoas tenotomy, which can be performed both open and endoscopically. However, the results of open surgery are moderate, probably due to the impossibility to treat intra-articular pathologies. Furthermore, the complication rate is high, up to 40% of cases [16]. A complex anatomic relationship exists between the iliopsoas tendon and the anterior surface of the hip, and many intra-articular hip pathologies as femoroacetabular impingement syndrome, labral tears (Figure 9) and cartilage lesions can be associated with ISHS in more than 50% of the patients [34]. Endoscopic iliopsoas release may be performed at the level of the lesser trochanter by and additional portal, or by a transcapsular approach [2]. In this case, the iliopsoas tendon release is performed across the hip joint, and it is usually identify behind the anterior capsule at 3 o'clock. The release can be performed at the level of the labrum, where the muscle-tendineous junction consists of 60% muscle and 40% tendon, or at the femoral neck (muscle-tendon 50%-50%) [35]. Distally, at the level of the lesser trochanter, muscle-tendineous junction consist in 40% of muscle and 60% of tendon. That is why some authors suggest a transcapsular release of the psoas tendon to preserve as much as possible the muscular portion. However, no significant differences have been found in clinical scores at long term follow-up between lesser trochanter of capsular iliopsoas tenotomy [31].

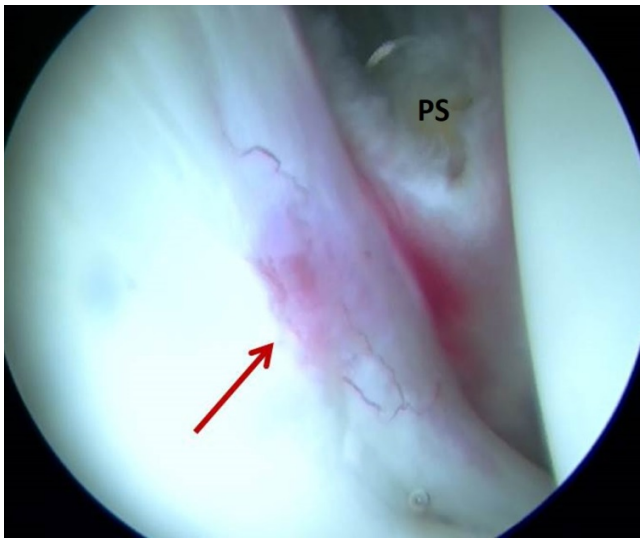

Figure 9: Tipycal Labral lesion at 3 O'Clock position in patients affected by FAI and Iiopsoas tendinopathy. PS: Iliopsoas tendon.

Surgeons should pay attention to some possibilities while and after performing iliopsoas tendon release. First to the possibility to find two or more iliopsoas tendons. Philippon et al. [36] in a cadaveric study found that the iliopsoas tendon was composed by two tendons in 64.2% of cadavers, by three tendons in 7.5% of cases and a single tendon in only in 28.3% of cases. Rather than rare anatomic variants, multiple iliopsoas tendons are common. If a tendon smaller than 10 mm of diameter is found, an additional tendon should be carefully looked for because the incomplete release has been associated with recurrence of pain, and it may require a revision surgery. Second, a significant loss of flexion strength is experienced by all patients immediately after surgery, and an MRI study showed that atrophy of the iliacus and psoas muscle were found in the 85% and 75% of patients respectively, with a muscular volume of 25% less than the contralateral side after the release [37]. Even if atrophy was not associated with a significant decrease in hip function at long-term follow-up and no significant differences in clinical outcomes were found between the operated hip and the contralateral healthy limb, patients should be informed of the immediate loss of flexion strength after surgery, which normally improves from 6 to 10 months [30].

Finally, the iliopsoas tendon is an important active stabilizer of the hip joint, and caution should be paid in performing iliopsoas tenotomy in presence of risk factors of hip instability [38]. Micro-instability, early joint degeneration, subluxation and hip dislocation have been reported in patients submitted to hip arthroscopy and iliopsoas tenotomy, in particular when an excessive acetabular rim trimming, a large capsulotomy, a ligamentum teres resection have been performed, and in patients with hip dysplasia [39,40]. Contraindication for iliopsoas tenotomy are hip dysplasia, increased femoral anteversion and hyperlaxitude.

Conclusions

Snapping hip is a common condition, but only few cases are symptomatic and require specific treatments. Careful clinical examination and accurate diagnosis are mandatory. Most of cases resolve with conservative treatments, while patients refractory to conservative treatment are candidates to surgery. Endoscopic techniques provide better outcomes, less complications, and better cosmetic result than open surgery. However, there are no level I studies published in literature up today and the best treatment for SHS is still to be defined.

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