

Iliopsoas Syndrome in Dancers

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Background: Coxa saltans refers to a constellation of diagnoses that cause snapping of the hip and is a major cause of anterior hip pain in dancers. When the internal type is accompanied by weakness or pain, it is referred to as iliopsoas syndrome. Iliopsoas syndrome is the result of repetitive active hip flexion in abduction and can be confused with other hip pathology, most commonly of labral etiology.

Purpose: To report the incidence, clinical findings, treatment protocol, and results of treatment for iliopsoas syndrome in a population of dancers.

Study Design: Retrospective case series; Level of evidence, 4.

Methods: A retrospective database review of 653 consecutive patients evaluated for musculoskeletal complaints over a 3-year period was completed. The diagnosis of iliopsoas syndrome was made based on anterior hip or groin pain, weakness with resisted hip flexion in abduction, or symptomatic clicking or snapping with a positive iliopsoas test. Patients identified with iliopsoas syndrome were further stratified according to age at time of onset, insidious versus acute onset, duration of symptoms, side of injury, presence of rest pain, pain with activities of daily living, and associated lower back pain. All patients diagnosed with iliopsoas syndrome underwent physical therapy, including hip flexor stretching and strengthening, pelvic mobilization, and modification of dance technique or exposure as required.

Results: A total of 49 dancers were diagnosed and treated for iliopsoas syndrome. Within this injured population of 653 patients, the incidence in female dancers was 9.2%, significantly higher than that in male dancers (3.2%). The mean age at the time of injury was 24.6 years. The incidence of iliopsoas syndrome in dancers younger than 18 years was 12.8%, compared with 7% in dancers older than 18 years. Student dancers had the highest incidence (14%), followed by amateur dancers (7.5%), while professional dancers had the lowest incidence (4.6%). All patients responded to conservative treatment, and no patients required corticosteroid injections or surgical intervention.

Conclusion: This is the largest series reported to date of iliopsoas syndrome in the dance population, treated noninvasively. This study supports that conservative treatment with nonsteroidal anti-inflammatory medication, activity modification, and a physical therapy regimen specific to the iliopsoas should be the primary treatment for patients with iliopsoas syndrome.

Clinical Relevance: This study supports current literature and conservative treatment of iliopsoas syndrome diagnosis. Furthermore, this study gives specific information regarding incidence of iliopsoas syndrome in dance populations and provides a test for diagnosis and an algorithm for treatment.

Keywords: iliopsoas syndrome; hip pain; coxa saltans; snapping hip; dance injury

Dancers commonly complain of clicking and snapping of the hips. The snapping is often palpable, occasionally audible, and usually provoked during flexion or extension of the hip. More than 90% of dancers report this condition²⁷; however, not all snapping is accompanied by pain. These symptoms are likely attributable to the extreme range of motion dancers can attain with their hip joints.²³ Charbonnier et al⁶ used in vivo motion analysis to investigate how specific dance movements could lead to hip pathology. They

concluded that certain common dance positions, including plié and développé, were associated with diagnoses such as hip subluxation, impingement, and femoroacetabular translation.⁶

Coxa saltans, Latin for “dancer’s” or “jumper’s” hip, has been classified into 3 types: external, intra-articular, and internal. The external type is due to the iliotibial band or gluteus maximus tendon slipping over the greater trochanter.^{2,17} Intra-articular causes include loose bodies, labral tears, synovial chondromatosis, and subluxation of the hip in children.²⁶

The internal type is attributed to movement of the iliopsoas tendon over the anterior capsule of the femoral head,^{12,15} the iliopectineal eminence, or lesser trochanteric exostoses.²¹ Repetitive flexion of an externally rotated hip, as occurs during a dancer’s passé développé, often results in painless internal coxa saltans. When accompanied by weakness or pain, symptoms typically caused by tendonitis or bursitis, it is referred to as *iliopsoas syndrome*.

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Figure 1. Iliopsoas test: tests for pain and/or weakness of the iliopsoas with resisted hip flexion in the “turned out” position.

Current literature recommends conservative methods as the primary treatment for iliopsoas syndrome. Limited series in the literature have included treatment with corticosteroid injections or surgery for the rare cases that have failed conservative treatment.^{15,18,19,21} As the largest series of iliopsoas syndrome reported to date in a dance population treated noninvasively, this study aims to report the incidence, clinical findings, treatment protocol, and results of treatment. This study also provides a test for diagnosis and an algorithm for treatment of iliopsoas syndrome.

MATERIALS AND METHODS

A retrospective chart review was performed on 653 consecutive dancers evaluated for musculoskeletal complaints over a 3-year period. Evaluations were performed by the senior author (D.J.R.) at the Harkness Center for Dance Injuries at the New York University Hospital for Joint Diseases, as well as at the senior author's private office. The dancers were categorized according to their age, sex, type of dance (ballet, modern, jazz, or mixed), and level of participation (professional, student, or amateur). A total of 49 patients were identified as having been diagnosed and treated for iliopsoas syndrome of the hip.

The diagnosis of iliopsoas syndrome was made on the basis of characteristic complaints, including anterior hip

or groin pain, and weakness or symptomatic snapping during *passé développé* or *grand battement*. Required for inclusion was the specific clinical finding of pain and/or weakness upon resisted hip flexion in an externally rotated position, referred to as a positive iliopsoas test (Figure 1), and compared with the contralateral side. The excursion of the iliopsoas was also tested (Figure 2). Dancers with internal coxa saltans in the absence of pain or weakness, external coxa saltans, or those conditions due to intra-articular causes were excluded. Patients with other hip pathology, such as osteoarthritis, were also excluded.

The 49 patients identified with iliopsoas syndrome were further stratified according to age at time of onset, insidious versus acute onset, duration of symptoms, side of injury, presence of rest pain, pain with activities of daily living, and associated lower back pain. Additional physical findings were recorded, including antalgic gait, reproducible snapping, and pain or tightness with passive stretching of the iliopsoas.

Patients were treated with activity-specific rest, nonsteroidal anti-inflammatory drugs, and a comprehensive physical therapy program that focused on iliopsoas stretches, progressive iliopsoas strengthening, pelvic mobilization, and antilordotic exercises. Long axis hip distraction and posterior femoral glide mobilization techniques were used for pain reduction. Antilordotic exercises focused on transversus abdominus control and lumbar stabilization using the Swiss ball and assorted pilates devices. Dance modifications were also implemented as required, such as limiting *passé développé* and *grand battement*. Success of treatment was determined as a negative iliopsoas test and return to dance activities without restriction.

RESULTS

Of the 653 dancers evaluated, 49 (7.5%) were diagnosed and treated for iliopsoas syndrome. Three dancers had bilateral iliopsoas syndrome. Forty-three of the 49 dancers treated were female. Within this population of injured dancers, the incidence in female dancers was 9.2% (43/465), significantly higher than that in male dancers (3.2%, 6/188). The mean age at time of injury was 24.6 years (range, 14-49 years). The incidence of iliopsoas syndrome in dancers younger than 18 years was 12.8%, and the incidence in dancers older than 18 years was 7%. Student dancers had the highest incidence (14%) followed by amateur dancers (7.5%), while professional dancers had the lowest incidence (4.6%). The type of dance was not a significant factor in the incidence of iliopsoas syndrome (Table 1).

On physical examination, 3 of the 49 patients with a positive iliopsoas test had weakness only without pain. Thirty-eight (78%) patients had clicking or snapping of the hip, 36 (74%) had pain and/or tightness with passive iliopsoas stretching, 22 (49%) had symptoms while performing activities of daily living, and 22 (45%) patients had associated ipsilateral lower back pain (Table 2).

All patients responded well to conservative treatment. No patients required corticosteroid injections or surgical intervention.



Figure 2. Iliopsoas excursion test: tests for tightness of the iliopsoas.

TABLE 1
Patient Demographics and Incidence of Iliopsoas Syndrome

Category	Number of Patients (N = 653)	Incidence of Iliopsoas Syndrome, %
Female	465	9.2
Male	188	3.2
Age		
<18 y	96	12.8
≥18 y	557	7.0
Professional dancers	370	4.6
Amateur dancers	186	14.0
Student dancers	67	7.5

DISCUSSION

Coxa saltans has been recognized as a cause of hip pain since the early 20th century. The first report of internal coxa saltans was in 1951, when Nunziata and Blumenfeld¹⁹ described painful hip snapping due to the iliopsoas tendon snapping over the iliopectineal eminence in 3 patients. Schaberg et al²² demonstrated in 1984 that internal coxa saltans could result from the iliopsoas tendon passing abruptly over multiple anatomic landmarks, including the iliopectineal eminence, the lesser trochanteric bony ridge, or the anterior inferior iliac spine (AIIS). Teitz²⁵ determined that the iliopsoas tendon is responsible for controlled flexion of the hip, and if too tight, can result in internal snapping.

With the hip in extension, adduction, and internal rotation, the iliopsoas tendon remains medial to the center of the femoral head in the groove between the iliopectineal eminence and the AIIS. As the hip flexes, abducts, and

TABLE 2
Clinical Indications of Patients With Iliopsoas Syndrome^a

Symptom/Indication	Incidence, %
Associated ipsilateral lower back pain	44.0
Clicking/snapping	78.0
Positive iliopsoas test	100.0
Pain/tightness upon hip extension	73.5
Positive response to conservative treatment	100.0
Need for corticosteroid injection	n/a
Need for surgical intervention	n/a

^an/a, not applicable.

externally rotates, the iliopsoas tendon moves over the anterior femoral head and capsule to become lateral to the center of the femoral head. Dancers attempting to achieve greater turnout assume a hyperlordotic pelvic posture, causing the femoral head to become increasingly prominent anteriorly and the iliopsoas tendon to snap over it.¹⁵

The diagnosis of iliopsoas syndrome can typically be made by physical examination. If symptoms are reproduced by actively extending the hip from a flexed position and pain is located at the pelvic brim, the diagnosis of internal coxa saltans is established. A reduction maneuver has also been described by applying manual pressure to the iliopsoas tendon over the pelvic brim, thereby reducing the subluxation and stopping the snapping.⁹ In addition, if the patient has a positive iliopsoas test, determined by weakness with or without pain with resisted hip flexion in an externally rotated position, iliopsoas syndrome is diagnosed.

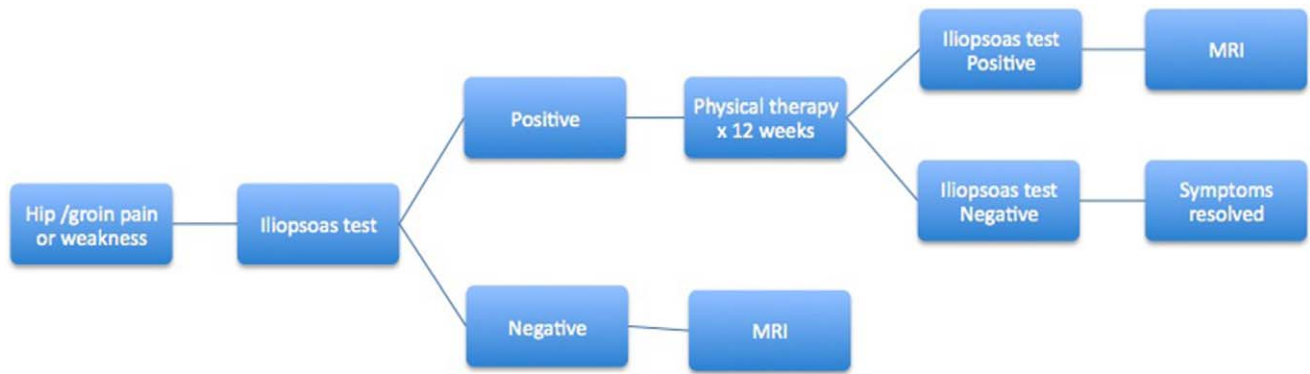


Figure 3. Treatment algorithm.

Other modalities have also been described in the diagnosis of internal coxa saltans. In 1985, Harper et al¹⁰ reported on the use of iliopsoas bursography to examine the iliopsoas tendon for potential abnormalities. The iliopsoas bursa is filled with contrast and combined with fluoroscopy to demonstrate the movement of the iliopsoas tendon. Although there have been no complications reported from bursography, it is an invasive procedure and therefore not considered a first-line modality for diagnosis.

Findings such as tendinitis and bursitis seen on magnetic resonance imaging (MRI) or ultrasound can assist in the diagnosis of internal coxa saltans; however, a static modality cannot show the iliopsoas tendon subluxing or snapping. Although these findings can be used to support the diagnosis, they are not always present. Pelsser et al²⁰ noted only 7 of 22 hips with internal coxa saltans had sonographic evidence of a thickened tendon or bursa. The recent application of dynamic ultrasound has been more successful, allowing for analysis of iliopsoas tendon movement.⁵ Further research is needed to substantiate the validity of these findings.

Intra-articular hip pathologies, most commonly labral pathology, can be mistaken for internal coxa saltans.²⁸ The physical examination can be similar, both presenting with groin pain, clicking, or snapping from repetitive pivoting movements and hip flexion.³ Hodler et al¹¹ reported that an intra-articular injection of local anesthetic can be helpful in distinguishing labral tears from other pathologic lesions, as labral tears are intra-articular and therefore respond to the injection while iliopsoas syndrome would not. The importance of distinguishing between intra-articular and extra-articular causes of hip pain or other symptoms prior to considering arthroscopic intervention based on MRI findings was recently highlighted in a study by Register et al,²¹ in which labral tears were identified in 69% of an asymptomatic population.

The FADIR test, consisting of hip flexion, adduction, and internal rotation, is typically used to diagnose labral pathology. In our patient population, this test was also found to be positive in approximately 50% of patients initially diagnosed with iliopsoas syndrome. With resolution of the iliopsoas syndrome, defined as a negative iliopsoas test, many of these patients also resolved the FADIR test,

therefore avoiding the need for advanced imaging and possibly unnecessary surgical intervention. Patients who continued to have symptoms and a positive FADIR test after 12 weeks of conservative intervention for presumed iliopsoas syndrome received further workup, including radiographs and an MRI to evaluate for labral pathology, femoroacetabular impingement, or other causes of hip pain (Figure 3).

Additional studies support the difficulty associated with diagnosing internal versus intra-articular coxa saltans. A retrospective chart review by Burnett et al³ found that approximately 17% of patients with labral tears were advised to undergo surgery at an alternative anatomic site to the hip joint, most notably the iliopsoas tendon. Of these patients, 1 underwent an iliopsoas tendon release; however, it was unsuccessful in symptom relief.³ Martin et al¹⁶ observed that 43% of patients with labral tears indicated for hip arthroscopy were eventually diagnosed with extra-articular sources of their pain.

The iliopsoas tendon is located directly anterior to the anterosuperior capsulolabral complex. Pathologic causes of tightness or iliopsoas tendon subluxation from internal coxa saltans can lead to labral tears in this location. Therefore, diagnosing and treating internal coxa saltans promptly can help prevent additional complications.¹

The sartorius muscle also lies anterior to the hip joint and can be confused as the source of hip pain. It originates from the anterosuperior iliac spine (ASIS) and runs obliquely across the thigh inferomedially. It acts in hip flexion, abduction, and external rotation, similar to the iliopsoas. Pain from the sartorius muscle is typically found during palpation over the muscle belly, as it lies superficial to the iliopsoas muscle. Because the sartorius crosses both the hip and knee joints, it is weak when both joints are flexed, and the position of the leg during the iliopsoas test better isolates the strength of the iliopsoas muscle.

According to current literature,^{4,7,15} the recommended primary treatment of iliopsoas syndrome is a noninvasive approach consisting of activity-specific rest, physical therapy, and nonsteroidal anti-inflammatory medication. This treatment protocol has been highly successful in returning dancers to their previous level of activity, as no patients in our study required additional intervention.

The goal of physical therapy is to strengthen the surrounding musculature, improve flexibility, restore function, and prevent reinjury. The success of our rehabilitation protocol is achieved by movement reeducation and progressive resistance training. Patients undergo iliopsoas-specific dynamic stretching and strengthening, range of motion exercises, pelvic mobilization, and antilordotic exercises. Only therapists with specific training with dancers and familiarity with iliopsoas treatment protocols worked with our patients at the Harkness Center at the New York University Hospital for Joint Diseases, so these results may not be generalizable.

In the uncommon event that the patient does not respond to conservative treatment, more invasive procedures may be required. These therapies include corticosteroid injections, and in rare cases, surgical intervention.

Micheli and Solomon¹⁸ treated patients with iliopsoas tendonitis using corticosteroid injections under fluoroscopy. They administered the injection to a group of 17 patients consisting of 53% dancers—all of whom had failed conservative treatment. Thirteen of 17 patients had good to excellent results. No specific methods or duration of treatment regarding physical therapy were documented. There were no complications in this series, but 2 patients who returned to full level of activity reported poor results when returning to dance or other athletic activity.¹⁸

For those cases that fail early conservative treatment and do not respond to corticosteroid injections, literature does exist regarding surgical management for iliopsoas syndrome. Early surgical techniques designed to treat painful internal coxa saltans were open procedures. Nunziata and Blumenfeld¹⁹ were the first to treat internal snapping of the hip by surgical release of the iliopsoas tendon in 1951. Since the technique was first described, there has been a significant amount of research on the subject, and tendon lengthening procedures as well as recent literature on arthroscopic release now exists. Open procedures have been associated with a high rate of complications, and this has been well described in the literature. Taylor et al performed a medial tendon release on 16 hips; 13 had complications (5 had persistent pain, 6 had recurrent snapping, 2 had flexor weakness).⁹ Gruen et al⁹ performed tendon lengthening via an ilioinguinal incision on 12 hips with 10 complications (5 had persistent pain, 5 had flexor weakness). Complication rates for open procedures range from 6% to 31% for persistent hip pain, 9% to 38% for recurrent snapping, 3% to 42% for persistent hip flexor weakness, and 12% to 18% for wound problems.⁸ Results have been better with arthroscopic release^{8,13,14}; however, few patients in these other studies were dancers.

CONCLUSION

To our knowledge, this is the largest reported series of patients with iliopsoas syndrome in a dance-specific population, treated conservatively. The incidence of iliopsoas syndrome in dancers presenting with musculoskeletal complaints is significant, totaling 7.5% in our study. The incidence is highest in females, dancers younger than 18 years, and student dancers. Iliopsoas syndrome has a characteristic

clinical presentation, and the iliopsoas test was positive in all patients. The test, which involves pain with or without weakness with resisted hip flexion in an externally rotated leg, was the most reliable method of diagnosis. Should pain persist following conservative treatment for presumed iliopsoas syndrome, it is appropriate to obtain an MRI of the hip at that time to evaluate for other causes of hip pain.

Our study shows that this uncommon diagnosis is frequent in the population of dancers who present for evaluation of anterior hip pain. Iliopsoas syndrome should therefore be considered when treating a member of the dance population presenting with this complaint. Dancers are prone to developing iliopsoas syndrome because of the repetitive hip flexion movements that are performed with lower extremities externally rotated, positions commonly found in many styles of dance. Based on our findings and current literature, conservative treatment with nonsteroidal anti-inflammatory medications, activity modification, and a comprehensive physical therapy regimen specific to the iliopsoas should be the primary treatment for these patients. Some of our patients had already had prior physical therapy without improvement. Despite these previous failures of therapy, neither corticosteroid injections nor surgical interventions were required. We believe a specific protocol of exercises and technique modification is extremely effective as the primary treatment for iliopsoas syndrome.

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