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Technical Note

Mixed-type femoroacetabular impingement associated with subspine impingement: recognizing the trifocal femoropelvic impingement☆

Bruno Gonçalves Schröder e Souza[a,b,c,d,*], *Ranieri Monteiro Cardoso*[a], *Rodrigo Silva Loque*[a], *Luiz Fernando Ribeiro Monte*[c], *José Paulo Sabino*[d], *Valdeci Manoel de Oliveira*[a,b,c,d]

[a] *Universidade Federal de Juiz de Fora (UFJF), Juiz de Fora, MG, Brazil*
[b] *Faculdade de Ciência Médicas e da Saúde de Juiz de Fora (Suprema), Juiz de Fora, MG, Brazil*
[c] *Serviço de Residência Médica em Ortopedia e Traumatologia, Universidade Federal de Juiz de Fora (UFJF), Juiz de Fora, MG, Brazil*
[d] *Hospital Albert Sabin, Juiz de Fora, MG, Brazil*

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ABSTRACT

To describe the arthroscopic surgical technique for subspine impingement (SSI) of the anterior inferior iliac spine (AIIS) associated with mixed type femoroacetabular impingement (FAI), through two standard arthroscopic portals (anterolateral and distal mid-anterior) in two patients with trifocal impingement. The authors report the cases of two young male patients, aged 32 and 36 years old, with trifocal femoropelvic impingement (TFPI). The technique consists of segmental capsulectomy, arthroscopic dissection of the AIIS, partial release of the direct head of the rectus femoris, resection of the AIIS projection with a burr and with fluoroscopic aid, correction of the pincer deformity, repair of the labrum with bioabsorbable anchors, and femoral osteoplasty. Details of the diagnostic workup and of the surgical technique are provided and discussed. In these cases, full range of motion was regained after surgery, as well as complete relief of pain, which was sustained in the last follow-up, one year post-operatively. Radiographs show adequate correction of the deformities in all three impingement sites. Simultaneous correction of the three sites (cam, pincer, and subspinal) provided full relief of symptoms and allowed return to work and sports. The authors propose that when approaching the symptomatic SSI, the possibility of concomitant FAI should always be considered and, in those cases, the approach must be comprehensive.

☆ Study conducted at the Universidade Federal de Juiz de Fora, Juiz de Fora, MG, Brazil.

* *Corresponding author.*
E-mail: brunogss01@yahoo.com.br (B.G. Souza).

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Impacto femoroacetabular misto associado a impacto subespinhal: reconhecimento do impacto femoropelvico trifocal

Palavras-chave:
Impacto femoroacetabular
Articulação do quadril
Artroscopia
Lesões do quadril
Deformidades articulares adquiridas

RESUMO

O objetivo deste trabalho foi descrever a abordagem cirúrgica artroscópica do impacto subespinhal (ISE) da espinha ilíaca anteroinferior (EIAI) associado ao impacto femoroacetabular (IFA) misto, por meio de dois portais artroscópicos padrão (anterolateral e medioanterior distal) em pacientes com impacto trifocal. Os autores relatam os casos de dois pacientes do sexo masculino, de 32 e 36 anos, com impacto femoropelvico trifocal (IFPT). A técnica consiste na ressecção segmentar da cápsula, dissecção artroscópica da EIAI com liberação parcial do reto femoral, osteoplastia com ressecção da proeminência com lâmina óssea e auxílio radioscópico, correção do pincer, reparo da lesão condrolabial com âncoras e osteoplastia femoral. Detalhes sobre o diagnóstico e a técnica são apresentados e discutidos. Nos casos operados, foi observada recuperação do arco de movimento normal do quadril e ausência de dor, que se mantiveram por um ano pós-operatório. Radiografias demonstram boa correção dos três focos de impacto em ambos os pacientes. A simultânea correção do IFPT nos seus três componentes (came, pincer e subespinhal) promoveu alívio completo dos sintomas e o retorno ao trabalho e aos esportes. Propõe-se que, na abordagem do ISE sintomático, sempre seja considerada a possibilidade da presença de IFA associado; nesses casos, a abordagem deve ser completa.

Introduction

Femoropelvic impingement (FPI) is a clinical entity in which morphological abnormalities in the pelvis and/or femur combine in a pathological mechanical process with abnormal contact between the femur and the pelvis.[1] This impingement occurs in everyday movements or in situations that require extreme hip movement, such as in sports, creating repetitive collisions capable of damaging soft tissue and intra-articular structures.[1] Femoroacetabular impingement (FAI) was the first to be described. In FAI, the femoral neck collides against the acetabulum in certain positions during movement, causing lesions that can lead to osteoarthrosis. Recently, other FPI topographies have been identified: (1) psoas tendon impingement; (2) ischiotrochanteric impingement; and (3) subspine impingement (SSI).[2]

Anterior inferior iliac spine (AIIS) deformity may cause SSI. This deformity is usually secondary to repetitive traction on the direct head of the rectus femoris muscle; however, it may also result from fractures/avulsions in a mature or immature skeleton. It is common in soccer or other kicking sports.[3]

The association between mixed FAI and extra-articular FPI has been observed and termed trifocal FPI (TFPI). In it, three anatomical structures appear to contribute to the impingement and symptoms: the AIIS, the acetabular ridge, and the cam-type femoral neck deformity. This article is aimed at discussing technical details of the arthroscopic treatment of patients in whom these three lesion components were simultaneously treated.

Case reports

Two male patients were prospectively evaluated, aged 32 years (patient 1) and 36 years (patient 2), with symptoms of inguinal pain for over a year. Both patients were regular amateur soccer players, and both recalled sporadic inguinal pain episodes during adolescence. At the time of the examination, the pain presented variable intensity, getting worse after long periods of sitting or driving cars, and during sport activities. Patient 2 limped and was unable to work; he had been away from work for four months. Patient 1 had stopped playing soccer six months prior to the presentation at this medical facility, due to the presence of pain.

The clinical assessment showed no deformities. Palpation of the femoral triangle revealed painful bulging in the AIIS topography in both patients. Mechanical hip flexion limitation was observed in both patients (110° and 90° for patients 1 and 2, respectively). The impingement test was positive in both patients (Faduri), and pain and limitation of abduction were observed during Patrick's maneuver. The Ely test was negative, and no other abnormalities were observed.

The radiographs of both patients demonstrated bone excrescences in AIIS, suggestive of previous consolidated avulsions (Figs. 1 and 2). These excrescences were better visualized on iliac oblique radiographic images. However, signs of mixed IFA were observed in both patients (pincer + cam), with an increase in the alpha angle and crossover sign. TFPI (pincer + cam + AIIS) was evidenced by the presence of synovial herniations in different regions of the femoral neck, computed tomography with reconstruction (3D CT), and dynamic analysis of radioscopy (Fig. 3).

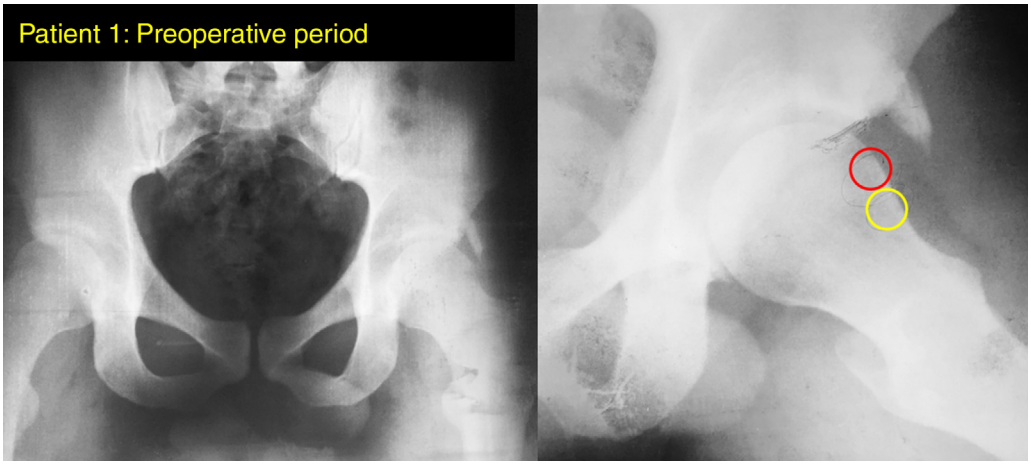

Fig. 1 – Hip radiographs of patient 1 on AP and iliac oblique views. The arrows point to AIIS deformity (Hetsroni Grade III),[6] and the circles indicate the presence of synovial herniations in different topographies of the femoral neck, with impingement in different portions of the pelvis.

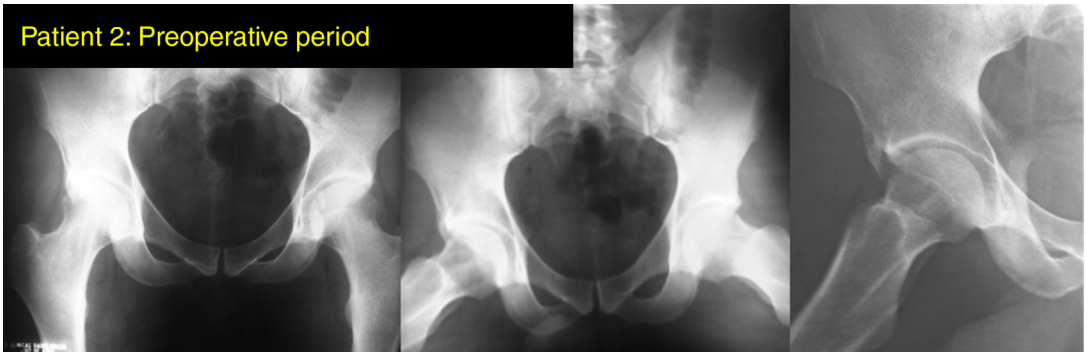

Fig. 2 – Hip radiographs of patient 2 on Dunn bilateral AP and lateral views. The prominence of AIIS in the right hip may be unnoticed in these views, but is evident in the iliac oblique view.

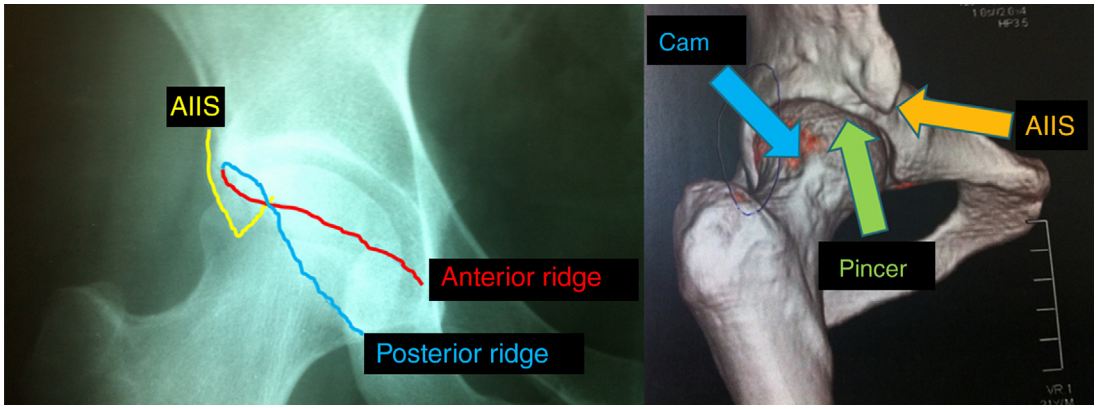

Fig. 3 – Enlargement of the radiographic image of Fig. 2, with a schematic representation of the bone contours and three-dimensional tomography reconstruction, which confirms the FPI.

Surgical technique

The arthroscopic surgical treatment included acetabular and femoral osteochondroplasty, together with resection of the AIIS excrescences. Arthroscopic surgery was performed in a supine recumbent position, on the traction table; two portals (anterolateral and distal mid-anterior) were used.

The triple nature of the impingement was confirmed intraoperatively. In the acetabulum, the typical chondral mixed impingement lesion was identified (Konan type 3)[3] in association with labral injury in both cases. Acetabular osteochondroplasty was performed with the aid of radioscopy. In

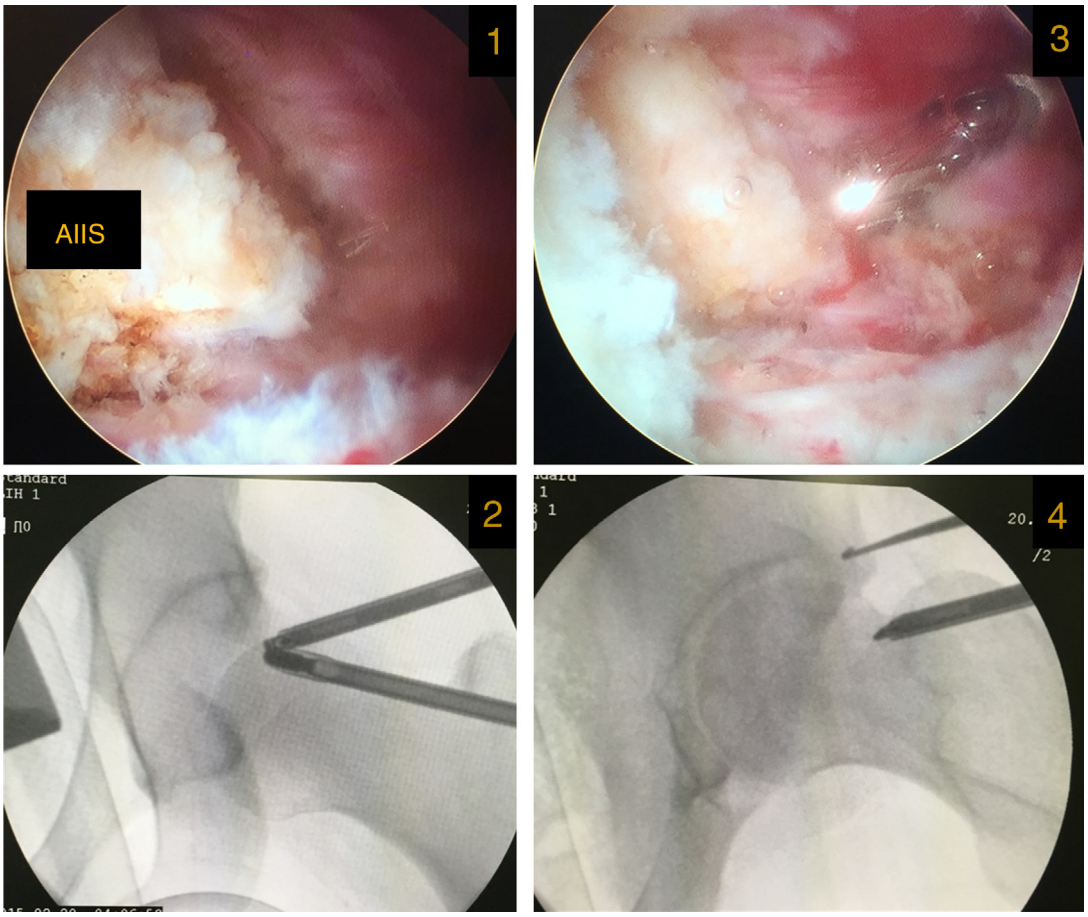

Fig. 4 – Intraoperative aspect of the AIIS (1), resection with osteoplasty blade (2-burr) under radioscopy control, arthroscopic view of progression of the resection (3), and end result of resection on radioscopy (04).

addition to the usual removal of the anterosuperior deformity of the acetabulum, the joint capsule was dissected by segmental removal; a tenotomy of the direct head of the rectus femoris was performed, and the bony excrescence of the AIIS was identified and confirmed by radioscopy (Fig. 4). The bony projection was dissected with the aid of radiofrequency and removed from the extremity toward its base with the use of a bone blade (burr). Care was taken to control aspiration, which was performed intermittently in order to avoid accumulation of periarticular bone fragments. The pump pressure was maintained at up to 60 mmHg; hemostasis was maintained using the radiofrequency tip. The acetabular labrum was repaired with biocomposite anchors; finally, femoral osteochondroplasty was performed for cam correction. In the postoperative period, early mobilization was recommended and celecoxib was prescribed for two weeks.

Symptom improvement was observed in the immediate postoperative period, with recovery of normal range of motion of the hip and absence of pain, which were maintained postoperatively for one year. No deformities or loss of strength in the thigh were observed. For both patients, radiographs demonstrated a good correction of the three impingement foci (Fig. 5). In the last follow-up, both were asymptomatic; patient 1 had returned to sport practice (amateur soccer), and patient 2 was able to return to work.

Discussion

FAI is currently recognized as a cause of hip arthrosis, and has received special attention from surgeons and researchers in recent years. The surgical treatment appears to be the most indicated in symptomatic patients, and can be performed through different access routes. In a recent systematic review, of the 7713 patients included, 5059 were treated by arthroscopy.[1] The current preference for this approach appears to be related to the fact that it is less invasive, effective, and presents a low risk of complications.[4]

However, complications such as heterotopic ossification (HO), in which there is ectopic bone formation in soft tissue topography, can be observed in 6–74% of cases of arthroscopy.[4,5] The prophylactic use of non-steroidal anti-inflammatory drugs (NSAIDs) and a correct management of the evacuation flow of bone debris originating from decompression may be effective in OH prophylaxis.[5] Patients not undergoing prophylaxis with NSAIDs are 13.6 times more likely to develop OH.[5] Regarding the management of debris efflux, it is believed that it is preferable to make multiple aspirations, intermittently to bony decompression, rather than just one aspiration at the end of the decompression process.[5] The authors are concerned about the possibility

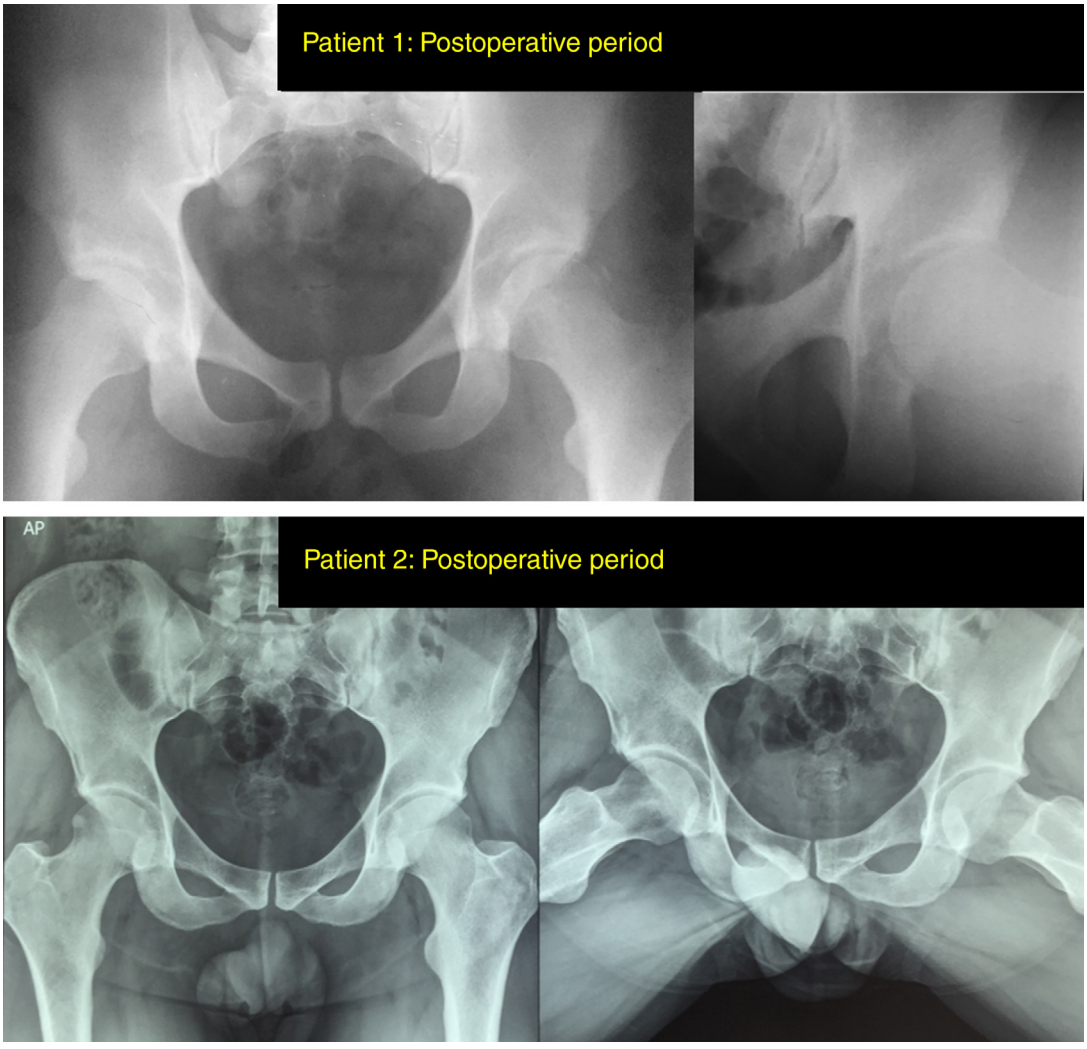

Fig. 5 – Postoperative control radiographs show a complete correction of deformities.

of this complication in TFPI correction, which requires large bone resection; they adopt these two strategies and have not observed this complication.

SSI was recently described as a cause of hip pain and movement restriction; an arthroscopic approach was described.[2] A morphological classification of AISS was proposed[6]: type I, when the AIIS is proximal to the acetabular border; type II, when the AIIS extends to the level of the ridge; and type III, when the AIIS extends distally to the acetabular ridge. There is a direct correlation between the type of deformity and the loss of range of hip flexion, which raises the diagnostic suspicion.[2,6] The impingement can occur: on the ridge of the acetabulum in type I (typical FAI); exclusively in the AIIS in type III (typical SSI); and at one or other site in patients with type II morphology.[6] Given the present findings, the authors speculate that the femoral neck impingement occurs both against the acetabular ridge and the AIIS, in the same patient, depending on the type of movement made. The finding of synovial herniations in different areas of the femoral neck appears to reinforce this understanding.

The AIIS bone excrescence in SSI can be detected on an anteroposterior view pelvis radiograph. However, the best radiographic view to visualize the deformity is the iliac oblique view.[2,6] The Dunn view can be used to assess the sphericity of the cervicocephalic junction, the acetabular femoral head coverage, and the alpha angle, which makes this view important for the assessment of cam-type impingement; however, the fact that this view does not mobilize the pelvis can hinder the diagnosis of SSI. A better understanding of these anatomical relationships is possible with 3D CT.[7]

Only seven studies on the arthroscopic treatment of SSI were retrieved.[2] In the largest of these,[8] AIIS decompression was performed in symptomatic patients with subspine impingement along with osteoplasty for correction of cam and/or pincer FAI. Symptom improvement was significant. The literature also features reports of successful open surgical procedures of this condition; this treatment is attractive due to the simple and direct surgical technique and reduced surgical time.[2] However, this technique is limited, as it hinders the intraoperative diagnosis of associated lesions and the treatment of chondrolabral lesions.[2,6,8]

In coining the term “trifocal impingement”, the authors aim in raising the attention to the synchronous existence of more than one problem in the articulation. In both of the

patients described, flexion limitation and important chondrolabral lesion associated with the labral lesion were observed. Acetabular chondral lesions are not expected in isolated SSI, and limitation of hip flexion is not expected in isolated FAI.[1,2,8] Thus, the presence of an important chondral lesion reinforces the hypothesis that the FAI was partly responsible for the symptoms.[3] Therefore, it is prudent to carry out joint inspection in similar cases. Although the authors consider that isolated treatment of the lesions may partially improve a patient's symptoms, a complete treatment requires a broader approach of the three lesions. This strategy has allowed the complete recovery of the present patients and encourages the authors to recommend this type of strategy.

Conflicts of interest

The authors declare no conflicts of interest.

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