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Review Article

Femoroacetabular impingement☆

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ABSTRACT

The femoroacetabular impingement (FAI) is as condition recently characterized that results from the abnormal anatomic and functional relation between the proximal femur and the acetabular border, associated with repetitive movements, which lead labrum and acetabular cartilage injuries. Such alterations result from anatomical variations such as acetabular retroversion or decrease of the femoroacetabular offset. In addition, FAI may result from acquired conditions as malunited femoral neck fractures, or retroverted acetabulum after pelvic osteotomies. These anomalies lead to pathological femoroacetabular contact, which in turn create impact and shear forces during hip movements. As a result, there is early labrum injury and acetabulum cartilage degeneration. The diagnosis is based on the typical clinical findings and images. Treatment is based on the correction of the anatomic anomalies, labrum debridement or repair, and degenerate articular cartilage removal. However, the natural evolution of the condition, as well as the outcome from long-term treatment, demand a better understanding, mainly in the asymptomatic individuals.

Impacto femoroacetabular

Palavras-chave:
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RESUMO

O impacto femoroacetabular (FAI) é condição de caracterização relativamente recente; decorre de relações anatômico-funcionais anormais entre a região proximal do fêmur e o acetábulo, associadas a movimentos de repetição, que acarretam lesões no *labrum* e na cartilagem acetabular. As alterações são representadas pela retroversão acetabular ou diminuição da altura entre a borda lateral da cabeça e o colo femoral. Além disso, o impacto femoroacetabular pode ser secundário a fraturas do colo do fêmur com consolidação viciosa ou decorrer de osteotomias pélvicas que provocam o retrodirecionamento do acetábulo. Essas anomalias levam ao contato femoroacetabular patológico que origina forças de impacto e cisalhamento durante os movimentos do quadril. Em consequência, há lesão labral e artrose precoce. O diagnóstico é feito pela sintomatologia típica, sinais

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radiográficos e ressonância magnética. O tratamento fundamenta-se na correção das anomalias anatômicas, reparo do *labrum* e remoção da cartilagem lesada. Entretanto, há necessidade de conhecer melhor a evolução natural da afecção, principalmente nos indivíduos assintomáticos, bem como resultados do tratamento em longo prazo.

Introduction

In the recent past, a group of young people, with or without history of previous affection of the hip, complained of pain in the inguinal region, during or after physical activities or after long sitting periods. Paradoxically, the physical examination was poor and the radiographs were interpreted as a normal aspect or, in some cases, presented alterations consistent with sequelae from previous illness, such as Legg-Perthes or slipped capital femoral epiphysis, but that did not explain the symptoms in the light of the knowledge at the time. As a result, there was no specific diagnosis and therapy; the recommendation was symptomatic treatment and restriction of physical activities. However, in some cases, there was long term evolution to articular degeneration,[1,2] which was diagnosed as primary (or idiopathic) osteoarthritis. Nowadays, it is known that many of these people had the condition now termed femoroacetabular impingement (FAI). At first, it was only described based on clinical examination, plain radiographs, and surgical findings; currently, diagnosis is also based on magnetic resonance imaging and arthroscopic findings.[3–6]

The current concept is that FAI is a condition that results from the abnormal contact between the femoral head and the acetabular rim, which leads to a mechanical conflict that causes microtrauma to the acetabular labrum and cartilage, which in turn injures these structures.[7] Usually, the impact is caused by changes in the head-neck junction and/or the acetabulum. However, it can occur in morphologically normal hips that are subjected to great physical demands associated with repeated flexion.[8,9]

However, the notion of hip impingement is not new. One of the earliest references to this condition is attributed to Smith-Petersen,[10] in 1936, who described it as a result of the femoral neck shock against the acetabulum and identified the causes as originating from femoral or acetabular changes. The observations that identified the cause of the pain as the mechanical conflict between the femoral neck and the edge of the acetabulum, which resulted in traumatic arthritis, are valid. That same author coined the term *impingement* to explain the pathophysiological mechanism; he presented a proposed treatment, whose foundations are still applied today.[10] In 1965, Murray[11] identified cases of primary osteoarthritis associated with abnormal relationship between femoral head and neck, which he termed tilt deformity. Subsequently, the condition was thoroughly described by Harris.[12]

However, interest in the disease was renewed in 1991 by Ganz et al.,[13] as a cause of hip pain and dysfunction. These authors showed that there was an association of pain and limited movement after viciously consolidated femoral neck fractures. The radiographs showed, in the vicinity of the femoral neck, a bone protrusion that clashed against the anterior (two cases) or posterior portion of the acetabulum (four cases) during hip movement. Later, Strehl and Ganz[14] added 11 cases with previous impingement, also due to fracture. Then, it was observed that the condition could occur in cases with no history of trauma, in people with overuse of the hip flexion movement due to sport or work.[9]

Currently, the concept of FAI is well established and its treatment has evolved significantly.[1,2,15–17] Since then, the number of articles on the subject has grown exponentially.[15,18] In recent years, the issue has been repeatedly addressed in the Brazilian Journal of Orthopedics.[4,8,19–23]

Pathophysiology

The hip is a ball-and-socket joint, and its movements require bearing of the femoral head in the acetabulum. Impingement arises when the harmony of this movement is altered, which results in mechanical interlocking of the last degrees of the femoral head movements, which in turn makes this structure strike the lateral edge of the acetabulum, causing regional microtraumas. The most affected structures are the labrum and the anterolateral area of the articular cartilage of the acetabulum; the detrimental forces are represented by compression and shear.

In a normal hip, in addition to an adequate coverage of the femoral head by the acetabulum, the presence of the cervicocephalic offset is also important, *i.e.*, the difference in height between the neck of the femur and the spherical edge of the femoral head (Fig. 1A). This gap is important, as it ensures the accommodation of the femoral neck to the periphery of the acetabulum, in order to provide the last degrees of movement (Fig. 1B). The reduction in the offset caused by loss of sphericity of the femoral head is caused by an anomalous extension of the proximal femoral epiphysis, mainly in the anterosuperior region (coxa recta).[15] This extension can be a phylogenetic vestige[24] or arise as a response to excessive sporting activity during skeletal maturation.[25] In other cases, the etiology of FAI may be evident, such as in cases of femoral neck fracture sequelae,[14] Perthes disease,[26] epiphysiolysis,[27] and coxa vara,[9] among others.

The impact may arise when the offset is reduced, or even reversed, by the presence of a protuberance of the femoral neck, which will strike the edge of the acetabulum during flexion and internal rotation of the hip (Fig. 2A). This is known as the cam effect, which originates from the pistol grip deformity.[9,22] In the case of small protrusions, the initial damage is primarily in the acetabular cartilage, causing abrasion