OSTEOARTHRITIS OF THE HIP DUE TO CONGENITAL HIP DISEASE – THEORETICAL FRAMEWORK

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Abstract: *Hip osteoarthritis is an important public health issue and has a global age-standardised prevalence of 0.85% and more prevalent in females. The leading cause of secondary hip osteoarthrosis is the congenital hip disease. If promptly detected, the chances of the congenital hip disease developing into osteoarthritis are lower with the correct management. Various classification systems exist, while Crowe's system is one of the most frequently used. Groin pain is the most common symptom, accompanied or not by limping, while range-of-motion is usually preserved. Radiology findings are typically enough for diagnostic purposes, although alternative diagnostic procedures are available. The management of the disease include osteotomies and total hip replacements.*

INTRODUCTION

The osteoarthritis (OA) of the hip is the second-most frequent type of osteoarthritis in the world, behind knee OA, with a global age-standardized prevalence of 0.85 %, slightly higher in females than males and increasing with age.(1) There are two types of hip osteoarthritis – primary or idiopathic and secondary. The leading cause of secondary hip OA is congenital hip disease (CHD).(2,3) There needs to be a consensus in terms of etymology regarding CHD, as orthopedic surgeons worldwide use the term "developmental dysplasia of the hip", which does not illustrate the congenital background of the disease. The supported term is congenital hip disease, one of the reasons being the fact that the word "dysplasia" does not reflect the constellation of the underlying causes. The advent of ultrasound (US) as screening around the birth has led to prompt detection and earlier treatment, most of the times with better prognosis.(4) If detected on time, the risk of CHD developing into OA is certainly lower with the correct surgical treatment.(5)

Classification

Several classification systems have been proposed and are in use, although the most frequently used system for the congenital hip disease is the one developed by Crowe.(6-8) Crowe's classification system relies on three anatomic landmarks, the first one being the height of the pelvis, the second one – the medial head-neck junction in the affected hip, and the last one – the inferior margin of the acetabulum (the teardrop).

There are four types of dislocation described, based on the severity of the displacement and the femoral head's migration: Type 1, < 50% subluxation; Type 2, 50%–75% subluxation; Type 3, 75%–100%, and Type 4, >100% subluxation.(8)

Another reliable classification system is the one presented by Hartofilakidis, which addresses some of the limitations of Crowe's system.(9,10) However, it does not replace Crowe's system, but it is rather used in combination with the previous one.

Radiology studies have found that the types of CHD mainly fall into three categories in infants.(11) These categories – dysplasia (bad acetabular and femoral head development, intact Shenton's line), subluxation (Shenton's line is broken, result of the proximal migration of the femoral head, but lacking subsequent overpassing the upper edge of the acetabulum) and complete dislocation (femoral head completely out of the acetabulum) – have a correspondent in the adult patient, as follows: dysplasia corresponds to adult dysplasia, subluxation to low dislocation and dislocation to high dislocation.(12) The last category has been further subdivided into two subcategories, based on whether the false acetabulum is present or not.(13)

Pathomechanics and evolution

The indicators of a normal hip are the lateral center-edge angle with a normal value between 20 and 40 degrees, the acetabular angle between 25 and 40 degrees, the neck-shaft angle ranging usually from 128 to 135 degrees and the inclination of weight bearing surface which normally is about 8 degrees.(11,14,15) In a patient with hip dysplasia, there is an increased mechanical stress on the cartilage matrix derived from the fact that the acetabulum is abnormal and shallow, mixed with inconsistencies of the proximal femur.(14) In time, the course of the disease is to arthritis, and studies published in the literature concluded that around one quarter to one half of the patients will develop arthritis by the age of 50-60.(14,16,17)

Another study reported that hip dysplasia was the cause of osteoarthritis in approximatively one third of the cases.(18)

There are two factors that have big consequences on the evolution of the disease. First off, unilateral affection typically has a deeper impact, as limping is worse and thoraco-lumbar scoliosis can coexist. In patients with a false acetabulum, the pain can be felt around the age of 30, whereas in those without false acetabulum, this pain usually appears later.(11)

Diagnosis

Clinical features

The onset of the symptoms usually occur in the sixth

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decade of life.(19) Moderate limp pain of moderate intensity in the groin area and dysfunction are usually mentioned.(11,20) When examining the patient, the range of motion (ROM) is usually within normal range, but in some cases there may be stiffness regarding abduction and extension due to important subluxation of the hip or tight muscles (adductor and hip flexor).(21,22) Younger patients can relate pain located in the lateral hip, which can intensify with the crossing of the affected limb while hip abductors are stretched.(22) A "click" sound can be observed, and results from the iliopsoas tendon snapping above the anterior femoral head, but without being in relation with pain.(23)

Imaging

To assess the lateral center-edge angle of Wiberg, the inclination of weight bearing surface, and the break in Shenton's line, lateral x-ray of the hip and standing anteroposterior x-ray of the pelvis should be performed.(24,25) In order to measure the anterior encasing of the femoral head, the anterior center-edge angle of Lequesne is estimated from a false-profile x-ray.(26) An angle of Wiberg <20 degrees and an angle of Lequesne <20 degrees are diagnostic for dysplasia.

Additional imaging modalities, such as computed tomography (CT) of the hip, may be helpful in complex hip arthroplasty and to diagnose associated deformities of the femur given the fact that the prevalence of these deformities is high.(21) Advanced imaging such as three-dimensional reconstruction CTs can be used to a better planning of the surgery and can determine the grade of acetabular dysplasia.(27,28)

Certain biochemical MRI techniques as delayed gadolinium-enhanced MRI of cartilage (dGEMRIC) offer the possibility of finding biochemical alterations of the articular cartilage, thus potentially allowing detection of incipient chondral lesions.(29)

Management

Nonoperative measures for CHD include nonsteroidal anti-inflammatory drugs (NSAIDs), that gain cumulative efficacy in combination with other measures as patient education and physiotherapy.(30)

The management of young adults with CHD by surgical means is adequate and efficient, although it comes with technical challenges such as reconstruction of the acetabulum if the patient presents high and low dislocation and implanting the femoral parts in a narrow diaphysis.(31,32) The purpose of the total hip replacement is to adequately restore hip rotation and correct the proximal femoral anatomy in order to obtain the best abductor function. Bone grafting, certain osteotomies and implants are techniques included in the THR for CHD.(33,34) When it comes to the surgical management of the CHD, total hip replacement (THR) is not the standard of care of the osteoarthritis secondary to congenital hip disease. By the contrary, because of factors such as young age, changed morphology of the hip, and also a paucity of bone content leading to higher rate of failure, THR is the last therapeutic resource.(31,32,35)

Regarding surgical options, osteotomies are valid, as their principle is to improve the congruity of the joints. Pelvic osteotomies are more frequent, as the underlying pathology, the acetabular dysplasia is the main abnormality.(36) Various pelvic osteotomies have been proposed and used in the practice for years, such as Salter osteotomy, the double innominate osteotomy, spherical osteotomies, pericapsular – Pemberton and Chiari osteotomy.(37-41)

Femoral osteotomies are also used in the management of CHD, typically in addition to a pelvic osteotomy in order to obtain a good correction and to reduce the stress on the surface of the cartilage. In mild cases, varus osteotomies are preferred, while valgus osteotomies are the choice in advanced disease.(42)

CONCLUSIONS

Congenital hip disease in an important health problem with complications leading to osteoarthritis if not diagnosed early and/or remains untreated. Consensus among the medical world regarding the terminology leads to a better management of the disease. Correct diagnosis and classification of the CHD are important and help choose the best treatment plan. THR is a viable surgical option, although as a last resort.

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