Idiopathic Osteoarthritis of the Hip: Incidence, Classification, and Natural History of 272 cases

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Abstract

Long-term clinical and radiographic data of 210 patients (272 hips) with idiopathic hip osteoarthritis were reviewed. Of the 272 hips, 218 (80%) were eccentric and 54 (20%) were concentric. In eccentric hips, the femoral head migrated superolaterally or superomedially, because of the eccentric development of the degenerative changes, which had deteriorated rapidly. Hips with eccentric idiopathic osteoarthritis underwent total hip arthroplasty (THA) at an average of 4 years after symptom onset. In concentric hips, the femoral head migrated medially, causing progressive thinning of the medial wall of the acetabulum, and degenerative changes progressed slowly. Hips with concentric idiopathic osteoarthritis underwent THA at an average of 10 years after symptom onset.

Osteoarthritis is the most common disease of the hip in adults.1–5 The reported incidence, however, of hip osteoarthritis in the general population varies considerably, depending on the different methods used for the selection of the sample, the diagnostic criteria applied, and the race and age of the patients participating in the different studies.1,4–6

Two types of recognized hip osteoarthritis occur: primary or idiopathic, in which the underlying cause cannot be determined; and secondary, in which the predisposing cause is well defined. The exact incidence of each type is a subject of controversy,3,5,7–13 with idiopathic osteoarthritis rarely found in Asians3,4,9,10 (this race presents a high incidence of secondary osteoarthritis due to congenital hip disease), and in patients aged <40 years.1,2

When classifying idiopathic osteoarthritis, many authors have described different systems using the direction of migration of the femoral head and the evolution of the destructive changes within the joint as criteria.12,14–21 These authors agree that two main types of head migration occur: superior and medial (Table 1). Superior migration (or eccentric) can be superolateral or superomedial whereas medial migration (or concentric) also is referred to as axial or global. Altman's classification is used14; eccentric and concentric osteoarthritis, in our opinion, is easier, convenient, and eliminates the need to quantify the migration of the femoral head.

This study presents the incidence, classification, natural history of the degenerative process, and the prognosis of idiopathic osteoarthritis to support the view that this type of arthritis is a separate clinical entity with a biological pathogenesis.

Materials and Methods

From 1970-1996, 566 patients (803 hips) with hip problems were examined by the senior author (G.H.) and admitted for treatment. All patients were white with proportional age distribution (range: 22–82 years). The underlying pathology was osteoarthritis in 660 (82%) hips, rheumatoid arthritis in 77 (10%) hips, previous trauma in 42 (5%) hips, and avascular necrosis of the femoral head in 24 (3%) hips.

Of the 660 hips with osteoarthritis, 356 (54%) presented with secondary osteoarthritis due to congenital hip disease (dysplasia, low dislocation, and high dislocation).22–26 The mean age of patients with secondary osteoarthritis due to congenital hip disease, at the onset of symptoms, was 35 years (range: 17–65 years). Idiopathic osteoarthritis was diagnosed in 272 (41%)

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hips. The mean age of patients with idiopathic osteoarthritis, at the onset of symptoms, was 61 years (range: 33-80 years). In 32 (5%) hips, the underlying pathology was osteoarthritis of uncertain origin. This minority group of osteoarthritic hips may have included previously undiagnosed Perthes disease or slipped capital epiphysis (Table 2). However, none of these hips presented a history of hip complaints in childhood or radiographic signs indicating Perthes disease or slipped capital epiphysis.8,13,27-29

Two hundred ten patients (272 hips) with idiopathic osteoarthritis were studied. Patients with bilateral involvement who had surgery only in the hip with more severe symptoms, following discharge, were followed prospectively at regular intervals (1 year) and the data from the other hip were registered as well.

Serial previous follow-up radiographs were available for study in 156 patients: 32 had >10-year, 45 had 5- to 9-year, and 79 had 2- to 4-year follow-up. In 50 patients, the initial hip radiograph available for study was normal. A hip was radiographically characterized as normal when the weight-bearing surface of the acetabulum was horizontal, the acetabular angle of Sharp was <40°, and the center-edge angle of Wiberg was >20°.30-34

The criteria used to define idiopathic osteoarthritis were clinical and radiographic. Clinical criteria included the age of symptom onset (>45-50 years), normal laboratory tests, and the clinical evolution of symptoms (rapid aggravation in the eccentric type, slow in the concentric). Radiographic criteria included no previous pathology (established in cases with previous radiographs) and patterns of migration of the femoral head and the progression of the degenerative process. To define the natural history of the degenerative process, the 157 cases in which serial previous radiographs were available were used.

RESULTS

Of the 272 hips (210 patients) with idiopathic osteoarthritis, 218 (80%) had eccentric and 54 (20%) had concentric osteoarthritis (Table 3).

Of the 218 hips (173 patients) with eccentric osteoarthritis, 189 (87%) were found in women and 29 (13%) in men (Table 3). Average patient age at symptom onset was 61 years (range: 36-80 years), with only 15 patients aged <50 years and 19 patients aged >70 years. One hundred twelve right hips and 106 left hips were affected (Table 3). Of the 173 patients in this group, 45 (26%) had bilateral eccentric osteoarthritis, and in 93 (54%) patients the contralateral hip was normal, whereas the contralateral hip had concentric osteoarthritis in 6 patients, dysplasia in 10, low dislocation in 5, high dislocation in 4, avascular necrosis in 2, and hip tuberculosis in 1. In 7 patients, the contralateral hip had osteoarthritis of uncertain origin.

Of the 54 hips (37 patients) with concentric osteoarthritis, 43 (80%) were found in women and 11 (20%) in men (Table 3). Average patient age at symptom onset was 59 years (range: 33-76 years), with only 6 patients aged <50 years and 3 aged >70 years. Twenty-five right hips and 29 left hips were affected (Table 3). Of the 37 patients in this group, 17 (46%) had bilateral concentric osteoarthritis, in 11 (30%) the contralateral hip was normal, whereas the contralateral hip had eccentric osteoarthritis in 6 patients, dysplasia in 1, and high dislocation in 1. One patient had a contralateral hip with osteoarthritis of uncertain origin.

Hips with eccentric osteoarthritis showed rapid deterioration. One hundred ninety-six (90%) underwent total hip arthroplasty (THA) within an average of 4 years (range: 1-16 years) after symptom onset. The decision for THA was made on clinical criteria: pain severity, limp, and joint stiffness. Average patient age at surgery was 65 years (range: 45-82 years). The remaining 22 hips had not undergone surgery at final follow-up of this study.


<table>
<thead>
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<th>TABLE 3</th>
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**Demographic Data of Idiopathic Hip Osteoarthritis**

<table>
<thead>
<tr>
<th></th>
<th>Eccentric</th>
<th>Concentric</th>
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</thead>
<tbody>
<tr>
<td>No. cases (%)</td>
<td>218 (80)</td>
<td>54 (20)</td>
</tr>
<tr>
<td>Females</td>
<td>189 (67)</td>
<td>43 (80)</td>
</tr>
<tr>
<td>Males</td>
<td>29 (13)</td>
<td>11 (20)</td>
</tr>
<tr>
<td>Left hip</td>
<td>106 (49)</td>
<td>29 (54)</td>
</tr>
<tr>
<td>Right hip</td>
<td>112 (51)</td>
<td>25 (45)</td>
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</tbody>
</table>

Hips with concentric osteoarthritis revealed a slow deterioration. Thirty-seven (69%) underwent THA within an average of 10 years (range: 2-20 years) after symptom onset. Average patient age at surgery was 68 years (range: 48-79 years). The remaining 17 hips had not undergone surgery at final follow-up of this study.

In 50 hips (35 with eccentric and 15 with concentric osteoarthritis) for which radiographic data were available before the development of osteoarthritis for an average 4.4 years (range: 1-18 years), no hip anatomical abnormality was observed. All hips presented a similar clinical course when compared to the remaining hips of the study. Thirty-one of 35 hips with eccentric osteoarthritis underwent THA within an average of 4 years (range: 1-11 years) and 8 of 15 hips with concentric osteoarthritis underwent THA within 10 years (range: 7-14 years) after the appearance of the initial osteoarthritis changes. The remaining hips had not undergone surgery at final follow-up of this study.

The earliest radiographic sign seen in eccentric idiopathic osteoarthritis was limited wear of the articular cartilage at the superolateral part of the joint space and, as a result, narrowing of the joint (stage one). At stage two, due to further wear of the articular cartilage, narrowing of the joint space was more pronounced, and subchondral bone cysts and osteophytes had formed in the non-weight-bearing areas of the joint. At stage three, collapse and flattening of the femoral head in combination with large cysts and osteophytes were apparent. Finally, at stage four of osteoarthritis progression, the acetabular subchondral bone collapsed and the joint presented advanced arthrosis with widespread structural changes. During this rapid deterioration, the femoral head migrates superolaterally or superomedially. This migration lasts 1-4 years in the majority of cases. The joint presents subluxation, while in the increased medial articular space, large osteophytes develop (Figure 1).

In concentric osteoarthritis, the earliest radiographic sign consisted of symmetrical joint space narrowing. Subchondral bone cysts of the femoral head were limited and the osteophytes were small or occasionally absent. The femoral head progressively migrated medially and a thinning of the medial wall of the acetabulum was observed (Figure 2). The pathological process is slow, lasting 8-12 years in the majority of cases.

**DISCUSSION**

Hip osteoarthritis is of interest among orthopedic surgeons. Most patients with discomfort, pain, limping, or stiffness of the hip are suffering from osteoarthritis and less commonly from other pathological causes such as rheumatoid arthritis, avascular necrosis, trauma, etc.

Limited information exists concerning the epidemiology of hip osteoarthritis in the general population. Kellgren and Lawrence found hip osteoarthritis in 13.5% of a random sample of 1500 citizens aged >55 years in a particular area of Great Britain. Haaglund et al. found hip osteoarthritis in 13.5% of a random sample of 1855 citizens aged >55 years, reported a 1% incidence of hip osteoarthritis. Danielson reported that among 3903 patients in Malmo, Sweden, who were subjected to colon radiographs, the incidence of primary hip osteoarthritis was 3.4% in patients aged >55 years. Jorring reported that among 6321 patients in Copenhagen who had undergone colon radiographs, 4.7% had hip osteoarthritis. The majority of patients in this study were aged >50 years.

More information is found in the literature concerning the incidence of osteoarthritis, particularly idiopathic, among patients who had sought medical advice due to hip complaints. Lloyd-Roberts, in an analysis of 124 hips requiring surgery, found a 58.8% incidence of idiopathic osteoarthritis. The age of symptom onset showed a peak between 50 and 55 years, and women were affected twice as com-
commonly as men. He concluded that the cause of idiopathic osteoarthritis remains obscure but the evidence suggests that constitutional rather than local conditions in the joint account for many cases. Other publications raise the incidence of idiopathic osteoarthritis to 65%,37 and 59.5%.38

In 1965, Murray9 stated that in the majority of cases, which had been reported as idiopathic by previous authors, minimal anatomical variations exist, sometimes so slight that the radiographic appearance may be regarded as being within normal limits. He also observed that minor degrees of slipped capital epiphysis with no symptoms in adolescence may be the cause of idiopathic osteoarthritis. He insisted that the radiographic finding “tilt deformity” is an indication of pre-existing slipped capital epiphysis.

In 1975, Stulberg et al13 confirmed Murray’s observations and concluded that an underlying developmental abnormality is associated with most cases of so-called idiopathic osteoarthritis. However, Resnick,11 in 1976, pointed out that tilt deformity results not from epiphysiodesis but from a remodeling process in the osteoarthritic hip. In 1986, Harris8 suggested that idiopathic osteoarthritis of the hip, if it exists, is rare and he opposed Resnick’s suggestion that the tilt deformity (which is termed by Harris “pistol grip deformity”) is the result rather than the cause of osteoarthritis.

Wedge et al39 further supported the biomechanical theory for the etiology of idiopathic osteoarthritis. However, Cooke,40 in his comments on the article by Wedge et al,39 suggested that other predisposing factors also exist, such as biological, family related, and genetically endowed. Furthermore, Laforgia et al,32 after a thorough biomechanical study and a complicated radiographic analysis, concluded that a direct correlation exists between anatomical variables and the development of hip osteoarthritis.

Some authors41,42 have suggested increased anteverision of the femoral neck may contribute to the development of hip osteoarthritis whereas others33,34 disagree. Other etiological factors also have been discussed in the literature such as occupational heavy load, obesity, and sports.9,21,27,45-47 In our opinion, such relation can not be proven easily unless a large sample of heavy workers, obese individuals, and athletes are followed prospectively for a considerable number of years and it is found that they show a higher incidence of osteoarthritis in comparison to the general population.

The relationship between race and hip osteoarthritis has also been discussed. Hoaglund et al1 reported that when pelvic radiographs of 200 consecutive Japanese patients were compared to those of 199 consecutive white American patients, an incidence of primary or secondary osteoarthritis of 77% in the Japanese and 79% in the white American population was found. However, the type of osteoarthritis differed between the two populations. Primary osteoarthritis was found in 18% of Japanese patients and 90% of white American patients. In contrast, secondary osteoarthritis, mainly due to congenital hip disease was found in 82% of Japanese patients and 10% of white American patients. Furthermore, the mean patient age in this study showed a discrepancy of 13 years between groups, with the Japanese being younger (36 years on average).

Nakamura et al10 also reported that among 2000 osteoarthritis cases in Japan only 13 (0.65%) met the diagnostic criteria for primary osteoarthritis. Patient age ranged from 49-81 years (mean age: 60 years). The above findings indicate that the incidence of each type of osteoarthritis varies considerably according to the characteristics of the population included in each study.

In a previous publication,276 Charnley low friction THAs with 12- to 24-year follow-up, in a group of 93 patients (113 hips) with a mean age of 45 years (range: 24-55 years) and in another group of 144 patients (163 hips) with a mean age of 66 years (range: 56-82 years) at surgery were reviewed. In the first group of young patients, the incidence of idiopathic osteoarthritis was 12%, whereas in the older group it was 53%. These findings suggest that idiopathic osteoarthritis is a separate clinical entity with a biological rather than a pathogenic origin due to anatomical variations and abnormal loading of the hip joint.

In the present study, further information concerning the incidence, classification, and natural history of the degenerative process and the prognosis of idiopathic osteoarthritis of the hip are provided. Eccentric idiopathic osteoarthritis can be confused with osteoarthritis secondary to dysplasia, due to the fact that as the degenerative
process progresses, a subluxation of the femoral head becomes apparent, as is seen in dysplasia, and the acetabular index and the center-edge angle become abnormal (Figure 3). This is the reason, we believe, that the reported ratio between idiopathic osteoarthritis and secondary osteoarthritis due to dysplastic acetabulum varies.

Cases of idiopathic osteoarthritis can be classified as secondary osteoarthritis and vice versa. These, however, are two distinct osteoarthritic disorders of the hip in which the pathology of the joint and the clinical manifestation of osteoarthritis are different. In eccentric idiopathic osteoarthritis, symptoms appear at an average age of 60 years in a previously anatomically normal hip and show a rapid deterioration, while in dysplasia, symptoms appear earlier at an average age of 30 years in a previously dysplastic acetabulum and show a slow deterioration (Figure 4). In our series of patients, 196 hips with eccentric idiopathic osteoarthritis underwent THA at an average of 4 years after the onset of symptoms whereas 144 hips with osteoarthritis secondary to dysplasia underwent THA at an average of 20 years after symptom onset.

It has been suggested that intertrochanteric osteotomies of the femur and corresponding pelvic osteotomies inhibit or decelerate the progress of osteoarthritis. However, variations in indications for these surgical techniques exist and the clinical mid- and long-term results are inconsistent. This is probably due to the fact that clinicians rarely take into consideration different types of osteoarthritis when the decision for treatment is made. Although at an advanced stage of eccentric idiopathic osteoarthritis, the radiographic appearance and mechanical destruction of the joint are similar to those of dysplasia, it is uncertain whether eccentric osteoarthritis can benefit from the performance of intertrochanteric osteotomies. Furthermore, as idiopathic osteoarthritis is seen in the sixth decade of life and the exact cause of the articular cartilage and subchondral bone degeneration is unknown, we believe treatment with intertrochanteric osteotomies must be avoided in this type of osteoarthritis.

The term “idiopathic” is preferable to the term “primary.” It is a temporary term that can be used until basic biological, genetic, and biomechanical sciences throw light on the pathomechanics of these hip disorders. The two distinct types of idiopathic osteoarthritis, eccentric and concentric, show different radiographic patterns and follow different natural courses, with concentric osteoarthritis having a better prognosis.

It is important that the classification of the different types of hip osteoarthritides be agreed, that the natural course of these diseases is determined, and that a common terminology is widely used. Similarly, a reliable estimation of prognosis will be possible and the evaluation of the clinical results of different types of treatment will be facilitated.

REFERENCES

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