

*Ministry of Defence*

## **Synopsis of Causation**

### **Osteoarthritis of the Hip**

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## **Disclaimer**

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This synopsis has been completed by medical practitioners. It is based on a literature search at the standard of a textbook of medicine and generalist review articles. It is not intended to be a meta-analysis of the literature on the condition specified.

Every effort has been taken to ensure that the information contained in the synopsis is accurate and consistent with current knowledge and practice and to do this the synopsis has been subject to an external validation process by consultants in a relevant specialty nominated by the Royal Society of Medicine.

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# 1. Definition

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- 1.1 Osteoarthritis of the hip (syn: osteoarthrosis of the hip) is a common degenerative condition, which is often associated with pain, significant disability and functional impairment.
- 1.2 In common with osteoarthritis affecting other [synovial joints](#), it is generally believed that degenerative changes commence in the [articular cartilage](#), as a result of either excessive loading of a healthy joint or relatively normal loading of a previously disturbed joint. Loss of cartilage leads to narrowing of the joint space and, as progressive erosion of the cartilage continues, the underlying bone becomes exposed. Bone that has been thus deprived of its protective covering of cartilage then articulates with the opposing surface. The resultant increased stresses lead to changes within the bone on both sides of the joint space, manifested by [subchondral sclerosis](#) and [subchondral cyst](#) formation, with formation of [osteophytes](#) at the joint margins. These features provide the characteristic X-ray appearances of hip osteoarthritis.

## 2. Clinical Features

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- 2.1 Symptomatic osteoarthritis is usually defined as the presence of joint pain or other joint discomfort along with evidence of radiographic disease. It should be noted that many people with radiographic disease do not have any joint symptoms and, conversely, early painful osteoarthritis may be unaccompanied by radiographic change.<sup>1</sup>
- 2.2 Estimates of the extent of hip osteoarthritis in the community have varied according to the population studied and the precise criteria that have been adopted for establishing the diagnosis of osteoarthritis. The age- and sex-standardised incidence rate for osteoarthritis of the hip has been reported as approximately 88 cases per 100,000 person-years, a figure that is lower than that found for osteoarthritis of the knee. The incidence of osteoarthritis of the hip rises rapidly after the age of 50, before declining again slightly in the eighties.<sup>2</sup> The prevalence of osteoarthritis of the hip is about 3-6% in the white population, but is lower in Asian and black populations<sup>3</sup> and in the Chinese population.<sup>1</sup> Some studies have reported higher prevalence rates in men than women, although others have reported equivalent rates for older men and women.<sup>2</sup>
- 2.3 Symptomatic osteoarthritis of the hip is usually insidious in onset. The most common presenting complaint is pain, initially felt in the anterior hip, groin, or lateral hip area. This pain is characterised as deep and aching. Referred pain may occur, felt in the buttocks, medial thigh, [sciatic region](#), or knee.<sup>4</sup> In the early stages of the disease, pain is intermittent and mainly associated with weight-bearing activity. As the disease progresses, pain becomes more chronic, and may also be present at rest and during the night. The joint feels stiff, leading to pain and difficulty in initiating movement after a period of rest. Increasing difficulty is experienced with activities of daily living, especially strenuous prolonged physical activity involving standing, walking, climbing, and squatting. With advanced disease, the range of joint movement often becomes limited.<sup>5</sup> Unpredictable giving way of the hip may occur.
- 2.4 Examination most often reveals difficulty in rising from sitting, a reduced range of joint movement and an altered gait. Audible or palpable joint [crepitus](#) may be noted on joint movement. The particular gait associated with osteoarthritis of the hip is known as an antalgic gait, adopted so as to reduce pain on weight bearing. It is characterised by a shortened stance phase on the affected side, so that the individual is observed to lean towards the side of the painful hip and take a rapid, quite heavy step, followed by a slower step on the unaffected side. A cane is effective when held in the hand on the side opposite to the affected hip.
- 2.5 The loss of extension associated with osteoarthritis of the hip often goes unnoticed by the patient but may lead to an increased lumbar lordosis and give rise to low back discomfort. Loss of hip flexion/rotation is noticed because of the resultant difficulty in putting on socks or shoes. Significant osteoarthritis of the hip is associated with a loss of internal rotation and an attempt to reproduce this movement often provokes the characteristic pain. The severely involved hip is flexed, externally rotated and adducted. The leg is often shortened slightly. The Trendelenburg sign may be present i.e. standing on the involved extremity leads to a drop in the contralateral hip due to pain or weakening of the hip abductors on the affected side. An active straight leg raise often reproduces the arthritic pain.

2.6 The plain x-ray is the most commonly used investigative procedure for the diagnosis of osteoarthritis of the hip. Computed tomography (CT) is not often used but can be helpful in some situations including pre-operative planning for total hip [arthroplasty](#). Magnetic resonance imaging (MRI) has developed into a fairly sensitive tool for detecting articular cartilage abnormalities of the femoral head and [acetabulum](#) and is very effective for visualising [subchondral cysts](#). MRI is also useful in the detection of marrow-based abnormalities and is indicated in the evaluation of possible [avascular necrosis](#) (see section 3.5.3).<sup>6</sup>

### 3. Aetiology

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- 3.1 Osteoarthritis of the hip probably represents a culmination of many different events with a similar end result of cartilage destruction. As with osteoarthritis at other sites, the classification recognises primary and secondary forms. **Primary (or idiopathic) osteoarthritis** of the hip arises in a seemingly intact joint, unassociated with any apparent trauma, disease process, mechanical joint deformity or other initiating factor. **Secondary osteoarthritis** of the hip ensues from some predisposing condition. However, this distinction may become increasingly blurred, as many commentators believe that most cases of primary osteoarthritis of the hip may in fact result from unrecognised congenital or developmental defects. Moreover, where a predisposing cause exists, the risk of developing secondary osteoarthritis in the hip is greater for those individuals who also suffer from primary osteoarthritis with involvement of other joints.
- 3.2 **Primary osteoarthritis of the hip** has been linked with age, and with genetic, hormonal, and nutritional factors:
- 3.2.1 **Age.** Primary osteoarthritis is associated with ageing, but age alone does not cause the condition; rather the vulnerabilities of the joint that occur as part of ageing make the joint susceptible to disease.
- 3.2.2 **Genetic factors.** Significant generalised primary osteoarthritis is often associated with a positive family history for osteoarthritis, probably denoting a [polygenic](#) disorder. Heritability makes a greater contribution to osteoarthritis of the hip and hand than it does to osteoarthritis of the knee.<sup>1</sup> A study of osteoarthritis of the hip in female twins has found familial clustering attributable to genetic factors for joint space narrowing. The analysis indicated a significant heritability of 64% for joint space narrowing and a heritability of 58% for osteoarthritis overall at the hip joint.<sup>7</sup>
- 3.2.3 [Acetabular dysplasia](#) has also been linked with an increased risk of osteoarthritis of the hip (see section 3.4.1). A twin study has suggested that genetic factors account for most of the variation in acetabular anatomy at the hip joint.<sup>7</sup>
- 3.2.4 **Oestrogen deficiency** may be a risk factor in the development of primary osteoarthritis of the hip in postmenopausal women, although studies have been inconsistent as to whether oestrogen replacement reduces this risk.<sup>1</sup>
- 3.2.5 **Nutrition.** Preliminary data suggests that the occurrence or progression of osteoarthritis may be increased by nutritional deficiencies, including low-level intake of vitamin C, vitamin E, and vitamin D.<sup>1</sup>
- 3.2.6 **Osteoporosis.** There is a clear **negative** association between osteoarthritis of the hip and femoral neck osteoporosis. Women who have a higher bone mineral density of the femoral bone (i.e. non-osteoporotic) have an increased incidence of osteoarthritis of the hip.
- 3.3 Various **congenital, developmental** and **acquired** conditions may lead to **secondary osteoarthritis of the hip** because the resultant anatomical deformity causes loading on

an area of the joint in excess of that tolerated by normal [articular cartilage](#) and [subchondral](#) bone. The search for secondary causes has also focused on factors that have the potential to generate **excessive loading** on the joint.

- 3.4 **Congenital and developmental abnormalities.** Factors that affect joint shape may play an important role in the development of osteoarthritis of the hip. Congenital and developmental abnormalities can render the hip joint misshapen, increasing local stresses on the cartilage, and predisposing to hip osteoarthritis, often in early adulthood. However, in many cases, the progression to osteoarthritis of the hip may be prevented if the predisposing deformity can be corrected before the onset of degenerative changes. Although these developmental abnormalities are diagnosed relatively rarely, it has been postulated that milder forms may be more common, and may account for a significant proportion of osteoarthritis of the hip in adults.

Three separate conditions are involved:

- 3.4.1 **Congenital and developmental dysplasia of the hip.** The title “developmental dysplasia (or displacement) of the hip” (DDH) is replacing “congenital dislocation of the hip” in orthopaedic parlance. DDH encompasses congenital conditions and a wide spectrum of developmental disorders of the neonate and infant, with a range of underlying pathology that includes [acetabular dysplasia](#), subluxation (partial dislocation) of the femoral head, and complete dislocation of the femoral head from the true acetabulum. In a child born with acetabular dysplasia but without dislocation of the hip, the latter may develop weeks or months later. So-called “late” dislocations may occur at up to 9 months or so from birth although a proportion of these cases actually represent late (missed) diagnoses. A dysplastic hip will often continue to develop abnormally until the end of growth, frequently remaining completely asymptomatic.

A meta-analysis has estimated the incidence of DDH at 5 per 1000 live births. A number of risk factors have been associated with congenital dysplasia of the hip, including female gender (up to five times more common than in boys), breech delivery, firstborn status, and genetic factors. The condition is also more common in white children than in black children.<sup>8</sup> A systematic review involving 5 cohort studies and 4 case-control studies has found limited evidence for a positive association between hip dysplasia and the development of osteoarthritis of the hip at age 50-60 or older.<sup>9</sup> However, subluxation is invariably associated with the development of osteoarthritis, usually in the third and fourth decades, and an untreated high congenital hip dislocation commonly presents with arthritic pain in the fifth and sixth decades.

- 3.4.2 **Slipped capital femoral epiphysis.** The head of the femur becomes posteriorly and inferiorly displaced in relation to the femoral neck due to abnormal movement along the [epiphyseal](#) growth plate. The condition is two to three times more common in boys than girls, and most commonly presents during adolescence. Most cases are of unknown causation, but the condition may be associated with obesity, endocrine disorders (e.g., hypothyroidism and growth hormone abnormalities) and [renal osteodystrophy](#).
- 3.4.3 **Legg-Calvé-Perthes disease.** A condition of unknown cause in which the blood supply to the capital femoral epiphysis is interrupted, leading to [avascular](#)

[necrosis](#). The condition presents most commonly in boys aged between 4-10 years.

- 3.5 **Acquired** conditions associated with secondary osteoarthritis of the hip include the following:
- 3.5.1 **Trauma.** Osteoarthritis may arise following localised trauma to the hip. One third of patients with a dislocation or fracture-dislocation of the hip or an [acetabular](#) fracture develop osteoarthritis of the hip within 1 to 20 years.<sup>10</sup> In dislocation and fracture-dislocation, a delay in recognition and reduction may increase the risk of developing subsequent osteoarthritis. The occurrence of [avascular necrosis](#) as a result of these injuries increases the likelihood of rapidly progressive degenerative arthritis in the hip and the incidence of avascular necrosis may be increased by surgical internal fixation of an acetabular fracture.
  - 3.5.2 **Inflammatory.** Secondary osteoarthritis of the hip may develop in a joint that has already been damaged by inflammatory arthritis (e.g. rheumatoid arthritis), septic arthritis, or tuberculosis of the hip.
  - 3.5.3 **[Avascular necrosis of the femoral head](#)** (also known as ischaemic necrosis or osteonecrosis) is a significant cause of hip disease. Collapse of the [subchondral](#) bone produces a painful [synovitis](#), and the incongruity that is created in the hip joint often leads to arthritis. In some instances, avascular necrosis is associated with an identifiable cause such as oral corticosteroid therapy, Cushing's disease, alcoholism, chronic renal failure and renal transplantation, decompression sickness, sickle cell disease (both sickle cell trait and sickle cell anaemia), and the chronic non-neuropathic form of [Gaucher disease](#). The condition may also present following a hip dislocation or femoral neck fracture and occasionally after radiotherapy to the hip region. However, in many patients with avascular necrosis of the femoral head, no underlying cause can be identified, and in these patients the condition is classified as idiopathic. Many of these patients are aged between 24 and 45 years.<sup>11</sup>
  - 3.5.4 **[Paget's disease](#)** of bone adjacent to a joint margin is thought to be a cause of accelerated osteoarthritis of the affected joint.<sup>12</sup>
- 3.6 Most daily activities, even if performed repeatedly over many years, do not produce sufficient injury to a joint to cause osteoarthritis, at least not if the joint is healthy.<sup>1</sup> The investigation of factors that could potentially generate **excessive** loading on the hip joint has focused on **occupational tasks, sporting/recreational activities** and **obesity**.
- 3.6.1 **Occupational tasks.** Studies that have set out to investigate a link between work tasks and osteoarthritis of the hip have produced conflicting results, giving rise to concerns about methodology. In particular there has been disparity in the criteria that have been used for diagnosing the condition and the way in which potential confounders (such as body mass index and family history) have been handled. In addition, measurements of exposure have tended to be very inexact.<sup>13</sup>

A systematic review has identified nearly 3000 references addressing the relationship between work and hip disorders. The authors considered that only



16 were of sufficient methodological quality to warrant analysis, of which 2 were retrospective cohort studies and 14 were case-control studies. Overall, moderate evidence was found for a positive association between **previous heavy physical workload** and osteoarthritis of the hip. The definition of a “heavy physical workload” varied between studies. In most, but not all of the studies, a clear dose-response relationship was shown between the heaviness of the workload and the occurrence of osteoarthritis of the hip. Moderate evidence was also found for a positive relationship for osteoarthritis of the hip in certain subcategories, i.e. **10 or more years farming or frequently lifting heavy weights of 25 kg or over**.<sup>14</sup> The following detail from three of the studies included in this review may provide further insight into the levels of exposure involved:

- A US study, which classified work as heavy, intermediate or light, based on responses to a questionnaire, found that subjects who had performed heavy work for at least 15 years had 2.4 times the odds of having osteoarthritis of the hip compared to subjects who had performed light work.<sup>15</sup>
- A UK study showed that men who had regularly lifted weights in excess of 50 kg for 10 years or longer had 3.2 times the odds of having osteoarthritis of the hip compared to those with low exposure. The risk increased progressively with the duration and heaviness of occupational lifting.<sup>16</sup>
- A Japanese study that included both women and men found a significantly increased risk of osteoarthritis of the hip associated with regular (defined as more than once in an average working week) lifting of 25 kg in the individual's first job or of 50 kg in their main job. The average duration of exposure was 11 years for the first job and 23 years for the main job. In contrast, those subjects who spent more than 2 hours each day sitting during their first job were significantly less likely to have the disorder.<sup>17</sup>

3.6.2 **Sporting/recreational activities.** Once again, conflicting evidence may be found within the many studies that have been published, and the quality of much of the work is open to criticism.<sup>13</sup> The following points are of interest:

- One large prospective study of nearly 17,000 patients reported that a high level of physical activity (running more than 20 miles per week) was associated with an increased incidence of osteoarthritis in men under age 50, but no such relationship was found for women or older men. However, this evidence is of limited value to an investigation into osteoarthritis of the hip, as in its analysis of the data, the study did not differentiate between osteoarthritis of the hip and knee.<sup>18</sup>
- With regard to sport played at the highest level, an increased risk of osteoarthritis of the hip has been reported among former elite soccer players (but not for players participating below this level)<sup>19</sup>, elite track and field athletes<sup>20</sup> and elite level javelin throwers and high jumpers.<sup>21</sup> Contrasting conclusions have been reached in another study in which former elite male endurance athletes and track and field athletes reported less hip disability than control subjects.<sup>22</sup>
- A systematic review identified nearly 3000 references addressing the influence of sporting activities on the development of osteoarthritis of the hip; only 22 of these studies (one cohort and 21 case-control studies) met predetermined selection criteria for methodological quality. Fourteen studies

showed a positive association between sporting activities and osteoarthritis (of which 5 were statistically significant), four reported a negative relationship (none was statistically significant), and four reported no association. Only four of the studies attempted to specify the amount of sporting activity involved, and in each of these cases, a clear dose-relationship was reported, with higher levels or frequency of sporting activity increasing the risk of hip osteoarthritis. The review's overall conclusion was that there is moderate evidence for a positive relationship between physical sporting activities and osteoarthritis of the hip. In the subgroups that were studied, the evidence for a link with osteoarthritis of the hip is moderate for running, limited for athletics, and conflicting for soccer playing and ballet dancing.<sup>23</sup>

- 3.6.3 **Obesity.** The relationship between obesity and osteoarthritis of the hip is not as strong as that found with osteoarthritis of the knee. Indeed, some studies have failed to detect any link. A systematic review has found moderate evidence for a positive association between obesity and the development of osteoarthritis of the hip.<sup>24</sup>

## 4. Prognosis

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- 4.1 There are no interventions known to prevent disease progression in patients who are suffering from mild to moderate osteoarthritis of the hip. Treatment programmes, aimed at relieving pain and maintaining or improving function, comprise both pharmacological and non-pharmacological modalities.<sup>25</sup>
- 4.2 Pharmacological interventions include analgesic medications and the older-style non-steroidal anti-inflammatory drugs (NSAIDs). The known complications of NSAID treatment include a chemically induced [avascular necrosis](#) of the bone with rapidly progressive disease, particularly in the middle-aged female. The underlying mechanism is presumed to be associated with the analgesic effect of the NSAIDs, which predisposes to microfractures of weight bearing joints, whilst inhibition of healing of these microfractures may also play a part.<sup>26</sup> Use of the newer COX-2 selective inhibitors has been restricted following reports of an increased risk of cardiovascular events (heart attack and stroke). Intra-articular local anaesthetic and steroid injections may provide temporary pain relief in the irritable but early osteoarthritic hip, as well as the inflammatory arthritic hip. There is limited scientific evidence, as yet, to support the use of the dietary supplements, glucosamine and chondroitin in early/moderate osteoarthritis of the knee and little or no evidence for their use in hip arthritis.
- 4.3 Non-pharmacological treatments for osteoarthritis that are supported by scientific evidence comprise education, exercise, appliances (e.g. cane) and weight reduction. However, there has as yet been insufficient study to allow an evaluation of the efficacy of land-based therapeutic exercise in people who are suffering from osteoarthritis of the hip.<sup>5</sup>
- 4.4 Most cases of osteoarthritis of the hip are slowly progressive. However, there is a subset of patients with a rapidly progressive form of the disease, which evolves over a few months.<sup>27</sup> Conversely, a few patients with hip osteoarthritis can experience clear cut radiological and symptomatic recovery.<sup>28</sup>
- 4.5 Severe pain and functional limitation are the most important indications for surgery, which most commonly involves hip replacement (total hip [arthroplasty](#) - THA). THA is very successful in the older patient population, providing excellent pain relief and an improved quality of life for patients with advanced osteoarthritis of the hip.<sup>27</sup> Resurfacing hip replacement is increasingly offered to the younger arthritic patient.
- 4.6 A variety of materials and designs are used in the manufacture of prosthetic joints. An 85% success rate has been reported at 20-year follow-up of the Charnley total hip [prosthesis](#).<sup>4</sup> Patients who have had one hip replacement for osteoarthritis have a 47% likelihood of needing the other hip replaced within 10 years.<sup>29</sup> In view of the potential for THA components to fail over time, alternative surgical procedures may be considered in younger patients, particularly those who are under 50 years of age. Pelvic or femoral [osteotomy](#) will redistribute joint weight bearing, which may thus postpone the need for THA. Hip [arthrodesis](#) is considered as an option in extreme cases of severe osteoarthritis in young individuals.

## 5. Summary

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- 5.1 Osteoarthritis of the hip is a common degenerative condition, often associated with pain, significant disability and functional impairment.
- 5.2 Primary osteoarthritis of the hip has been linked with age, genetic, hormonal, and nutritional factors.
- 5.3 Secondary osteoarthritis of the hip has been linked with anatomical deformity occurring as a consequence of certain congenital and developmental abnormalities, trauma, joint inflammation, and a number of other specific conditions. Factors that may generate excessive loading on the hip joint have also been extensively investigated, but often with conflicting outcomes. Systematic reviews have found moderate evidence linking osteoarthritis of the hip with:
  - a previous heavy physical workload (frequently lifting heavy weights of 25 kg or over);
  - physical sporting activities; and
  - obesity
- 5.4 Initial treatment of osteoarthritis of the hip involves pharmacological and non-pharmacological interventions. In advanced osteoarthritis of the hip, total hip [arthroplasty](#) is very successful in the older patient population, providing excellent pain relief and an improved quality of life.

## **6. Related synopses**

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Osteoarthritis

Osteoarthritis of the Knee

## 7. Glossary

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acetabulum	The cup-like hollow in the pelvis into which fits the head of the thigh bone (femur). Hence: <i>acetabular</i> .
arthrodesis	The surgical immobilisation (fusion) of a joint.
arthroplasty	The surgical repair or replacement of a joint.
articular	Of, or pertaining to, a joint.
avascular necrosis	Death of tissue due to a depletion of blood supply.
cartilage	Connective tissue that is more flexible and compressible than bone.
crepitus	A sensation of grating, indicating a roughened joint surface.
dysplasia	Abnormal development of organs or cells, or an abnormal structure resulting from such growth.
epiphysis	The part of a long bone from which bone growth occurs. Hence: <i>epiphyseal</i> .
Gaucher disease	A chronic disease of lipid metabolism caused by a congenital enzyme deficiency.
osteophyte	A bony outgrowth or protuberance.
osteotomy	Surgical cutting of a bone.
Paget's disease	A condition that occurs mainly in the middle aged and elderly and is characterised by excessive and disorganised bone turnover (destruction), sometimes leading to bone pain, fractures, and skeletal deformities.
polygenic	Relating to an inheritable characteristic that is controlled by several genes at once.
prosthesis (-es)	An artificial substitute for a missing body part. Hence: <i>prosthetic</i> .
renal osteodystrophy	Generalised bone changes that occur in patients with chronic renal failure.
sciatic region	The area covered by the distribution of the sciatic nerve, radiating over the buttock and back of thigh and down the outside of the lower leg.
sclerosis	Hardening.
subchondral	Beneath the cartilage.

subchondral cyst	A cystic formation in the bone underlying the cartilage of a joint.
synovial joint	A joint in which the opposing bony surfaces are covered with cartilage, there is a joint cavity containing lubricating (synovial) fluid, and a degree of free movement is possible.
synovitis	Inflammation of the synovial membrane that lines a synovial joint ( <i>q.v.</i> ).

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