Arthritis of the hip in the young adult can be a disabling condition. Recent years have witnessed extensive research related to the management of this condition. This article reviews the current status with regard to aetiology, diagnosis and treatment of arthritis of the hip in the young adult.

Arthritis of the hip has traditionally been perceived by the general population as a condition of the elderly, although the incidence in younger patients has been well documented.\(^1,2\) Over the past decade, the treatment of disorders of the hip in young patients (< 50 years of age) has advanced rapidly, with improvements in diagnosis as well as increased options in surgical treatment.\(^3\) Young patients present with a wide range of disorders of the hip and the diversity of surgical options allows the selection of the most suitable. This review examines the important factors in diagnosis and in selecting the appropriate treatment of arthritis of the hip in the young patient.

Aetiology and pathogenesis

Arthritis of the hip can refer to a number of different disorders of the joint and may arise from many causes. A detailed history, physical examination and imaging of the hip are essential in determining the origin and location of symptoms.\(^3\) The differential diagnosis of hip pain in young patients should include degenerative joint disease, femoroacetabular impingement and osteonecrosis. Developmental dysplasia, Perthes-like deformity and impingement comprise the most common hip conditions affecting young adults. In the young patient, arthritis of the hip is almost universally associated with an underlying mechanical disorder\(^4-6\) and is generally attributed to concentric or eccentric overload.\(^7\) This mechanical compromise predisposes the joint to dynamic instability, localised overload of the joint, impingement, or a combination thereof. More than 90% of patients with primary or idiopathic osteoarthritis of the hip show discernible abnormalities in the joint, with the most common being mild acetabular dysplasia and pistol grip deformity.\(^8\)

Femoroacetabular impingement refers to disorders in which irregular morphologic fea-

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**Fig. 1**

Anteroposterior radiograph of a 22-year-old female presenting with groin pain. Clinical examination confirmed femoroacetabular impingement. The radiograph reveals acetabular retroversion as determined by crossover of the anterior and posterior acetabular wall, as described by Reynolds et al.\(^11\)
tures of the hip result in abnormal contact between the femoral head and the acetabular rim.\textsuperscript{6,7} It can be divided into two categories; pincer and cam impingement. The former is caused by an acetabular abnormality, most often coxa profunda or acetabular retroversion, as determined by the crossover sign (Fig. 1),\textsuperscript{6,10,11} and is most common in middle-aged, athletic women. Cam impingement is caused by a femoral deformity, and is most common in young, athletic males in their 30’s.\textsuperscript{6} Since femoroacetabular impingement generally presents with normal radiological findings (Fig. 2), it had been labelled as idiopathic osteoarthritis prior to recent advances in diagnosis.\textsuperscript{4,6,9}

Osteonecrosis, also referred to as avascular or ischaemic necrosis, is a condition resulting in decreased blood flow to
the femoral head, leading to cellular death. It may arise from a variety of conditions, including corticosteroid intake, excessive alcohol use, haemoglobinopathies and dysbarisms. Trauma of the hip leading to dislocation or fracture of the femoral neck may also cause osteonecrosis. If untreated, osteonecrosis may lead to subchondral fracture and collapse of the femoral head (Fig. 3). The possibility of hip pathology of acute onset as fractures, infection and tumours, though not addressed in this review, should also be taken into account.

Clinical assessment
Hip pain in young patients is often characterised by non-specific symptoms, normal imaging studies and vague findings from the history and physical examination. A comprehensive knowledge of the presentation of disorders of the hip common in young patients is central to determining the cause of the symptoms.

Patients presenting with degenerative joint disease most commonly report groin or anterior thigh pain of gradual onset. Less commonly, patients may complain of pain in the lateral thigh, buttock or knee. Patients may walk with an antalgic gait. As the condition progresses, the range of movement becomes limited, with internal rotation and abduction affected first. The Thomas test may confirm the presence of a flexion contracture. With advanced arthritis, patients may have a positive Trendelenburg sign and a leg-length inequality.

Femoroacetabular impingement often presents with groin pain of slow onset as the primary complaint, sometimes beginning after an episode of minor trauma. The pain is often associated with prolonged sitting or standing and can be exacerbated by activity or motion. The anteroposterior radiograph may be normal and generally, does not reveal a noticeable deformity (Fig. 2). Lateral radiographs and occasionally cross-sectional studies are needed to confirm the diagnosis (Fig. 2). The impingement test, looking for pain with internal rotation and adduction of the hip while the knee and the hip are kept in 90˚ of flexion, is almost always positive. The impingement test may be indicative of chondral injury or a lateral tear.

The clinical presentation of osteonecrosis is widely varied. The most common presenting symptoms are pain in the groin, often radiating to the anteromedial thigh, or buttock pain. The pain may be either acute or chronic, and may range from mild discomfort to debilitating pain with an inability to bear weight. Often, patients with early osteonecrosis do not report any pain. Anteroposterior and lateral radiographs are important in determining the extent of disease progression. Factors that may be judged from radiological studies include the collapse of the femoral head (Fig. 3), the size of the lesion, amount of depression of the femoral head and involvement of the acetabulum.

Non-operative treatment
The conservative treatment of arthritis of the hip may involve both pharmacological and non-pharmacological options. Studies have indicated that drug therapy, such as non-steroidal anti-inflammatory drugs, is most effective for pain when combined with other forms of treatment, such as patient education, modification of activity and physiotherapy.

Surgical treatment
Two broad categories of surgical treatment are available; hip preservation surgery and joint replacement. An ideal candidate for hip preservation is one who is young (under 50 years of age) and active, with minimal degeneration of the articular surfaces. In such cases, the management aims to optimise joint stability, relieve impingement and reduce localised articular surface overload, as well as normalising the osseous anatomy and improving the biomechanics of
the hip.\textsuperscript{17,18} Unfortunately the arthritis may be too far advanced at presentation, thereby necessitating arthroplasty.

**Hip arthroscopy**

Hip arthroscopy has increased in popularity in recent years and as arthroscopic techniques have improved, the indications for this procedure have expanded. Arthroscopy can be effective in treating chondral lesions, which may be associated with degenerative joint disease. However, arthroscopic treatment for advanced arthritic change has a limited role.\textsuperscript{19} Arthroscopic debridement in degenerative joint disease has been shown to produce an improvement in only 34\% to 60\% of patients.\textsuperscript{20} Arthroscopy may also be useful as a diagnostic tool in the evaluation of degenerative joint disease. In one study, arthroscopic evaluation of the hip in patients with normal radiographs revealed evidence of arthritis in 32\% of those evaluated.\textsuperscript{21} The indications for hip arthroscopy in patients with degenerative joint disease include young age, early onset of symptoms, minimal radiological findings and failure of conservative treatment.\textsuperscript{20} Arthroscopy may be useful in the treatment of femoroacetabular impingement, particularly when used in conjunction with other surgical techniques. Combined arthroscopy and limited open head-neck osteoplasty has been described as an approach that adequately manages the anatomy and pathophysiology in a conservative manner, and is less invasive than other surgical alternatives for the treatment of impingement.\textsuperscript{22}

The benefits of arthroscopy in the treatment of osteonecrosis of the hip are limited, with arthroscopic treatment for advanced osteonecrosis showing poor results.\textsuperscript{23} The best indication for hip arthroscopy in patients with osteonecrosis is in determining the extent (stage) of the disease. Arthroscopic evaluation of osteonecrosis has been shown to be more accurate than imaging studies of the hip\textsuperscript{21} and to be useful in treating mechanical symptoms of osteonecrosis attributable to discrete lesions such as loose bodies, synovitis, chondral flaps and labral tears.\textsuperscript{24}

Relative contraindications to hip arthroscopy include lack of a clearly definable intra-articular disorder or mechanical hip symptoms, as well as significant osteoarthritis with narrowing of the joint space. Hip arthroscopy is generally considered to be a very safe procedure, with reported complication rates of 1.4\%.\textsuperscript{20,23,25} The most common complications are neuropraxia of the pudendal and sciatic nerve.\textsuperscript{25}

**Peri-acetabular osteotomy**

A wide variety of acetabular osteotomy techniques have been described. However, the Bernese peri-acetabular osteotomy first described by Ganz et al in 1988,\textsuperscript{26} has steadily gained popularity. This technique redirects the acetabulum into a more mechanically appropriate position, in order to decrease the shearing forces and load at the acetabular rim, without affecting the local blood supply (Fig. 4).\textsuperscript{27} Because peri-acetabular osteotomy has been shown to preserve the dimensions of the true pelvis, thereby preserving the potential for future vaginal delivery this osteotomy is advantageous in managing hip disorders in young women of child-bearing age.\textsuperscript{28}

Peri-acetabular osteotomy is indicated as a treatment for acetabular dysplasia with greatest benefit seen in those patients with very early stages of the disease. In the young patient, acetabular dysplasia may be the result of developmental dysplasia of the hip, or may arise secondary to a Perthes-like hip in conjunction with femoroacetabular impingement.\textsuperscript{28} Results of peri-acetabular osteotomy have been encouraging with one recent study\textsuperscript{29} reporting a 73\% good or excellent outcome.
The peri-acetabular osteotomy is appropriate in adults and in adolescents with closed physes (Fig. 4). Contraindications include complete joint dislocation, end-stage osteoarthritis, and a radius of the acetabulum smaller than that of the femoral head. The most difficult part of this procedure is the individual correction of the acetabulum, and overcorrection can cause impingement between the femoral neck and the acetabular rim. Adequate preoperative imaging as well as intra-operative computer-guided navigation may help to reduce the risk of overcorrection.

**Femoroacetabular impingement surgery**

As the diagnosis and treatment of femoroacetabular impingement has advanced in recent years, joint-preserving surgical techniques have been developed to treat the impingement and to slow the associated degenerative process. Good results have been reported with techniques which focus on improving the clearance for movement of the hip and alleviating femoral abutment against the acetabular rim. Surgical dislocation of the joint provides a clear view of both the femoral head and the acetabulum, without the risk of avascular necrosis. Resection osteoplasty of the acetabular rim addresses overcoverage. However, in patients with relatively intact articular cartilage and severe retroversion, reverse peri-acetabular osteotomy is preferred. Resection osteoplasty of the femoral head can recreate the normal contour of the femoral neck to improve the clearance of the femoral neck during flexion. These procedures are most successful in the early stages of disease. A study following young adults after surgery for impingement found the majority of hips were good to excellent at a mean of five years follow-up. This procedure has been less successful in patients with later stages of disease, who have often been misdiagnosed or subjected to conservative treatment for a prolonged period of time. In such cases, late-stage osteoarthritis resulting from femoroacetabular impingement may be a relative contraindication to surgery.

**Joint-preserving procedure for avascular necrosis**

Joint preservation may be appropriate for patients with early stages of avascular necrosis. Vascularised and non-vascularised bone grafting procedures have been studied as a treatment for avascular necrosis of the hip. In addition, core decompression is believed to have a role in the treatment of early avascular necrosis. During bone grafting the necrotic tissue is removed from the femoral head and the graft is then packed into the lesion through a ‘trap-window’ in the femoral head, or through the lateral cortex of the femur. The advantage of bone grafting over the use of core decompression is the effect of the bone graft in stimulating vascular ingrowth and new bone formation. A vascularised fibular graft may also be used, and results using this graft have been promising, with a reported success rate of 81% versus a success rate of only 21% with simple core decompression. This procedure is especially encouraging because of the reported success in patients with more advanced disease, but it does carry an increased risk of complication and is more technically challenging than nonvascularised bone grafting.

**Resurfacing arthroplasty**

Resurfacing arthroplasty is an attractive proposition for young patients with osteonecrosis of the femoral head because of the ability to preserve bone. Ideal candidates for isolated resurfacing arthroplasty of the femoral head are patients less than 40 years of age with Ficat stage III or early stage IV osteonecrosis or those who have had a failed free-vascularised fibular graft. However, pain relief with femoral resurfacing arthroplasty has been reported to be less reliable than with total hip replacement, with a mean Harris hip score of 88 for the hemi-resurfacing arthroplasty versus a mean Harris hip score of 93 for the total hip replacement. One author reports the most important factor in selection of femoral resurfacing arthroplasty over total joint replacement is the age of the patient; suggesting the younger the patient, the more strongly a resurfacing procedure should be considered, based on the increased likelihood that these patients will require another operative procedure later in life. However, an increased rate of failure has been positively correlated with a longer duration of symptoms prior to hemi-resurfacing as well as with increased acetabular cartilage involvement. No underlying pathogenesis of the osteonecrosis has been shown to be a contraindication to hemi-resurfacing arthroplasty. However, reported rates of failure for patients with sickle-cell disease are high when compared with failure rates for other underlying aetiologies.

Other authors have found the results of hemi-resurfacing to be generally disappointing, with more than half their patients requiring revision for pain within two years.

Although hemi-resurfacing of the hip is being abandoned, total hip resurfacing is gaining popularity. The reason for the resurgence of hip resurfacing in the recent years relates to the higher expectation of the young patients who present with arthritis of the hip. Recent studies have also shown excellent survivorship of hip resurfacing arthroplasty in young patients. It has a few advantages compared with total hip replacement (THR). First, resurfacing allows preservation of more femoral bone. Secondly, because of the use of metal-on-metal bearing surfaces, a larger femoral head can be used, minimising the chance of dislocation, and allowing the patients to engage in vigorous physical activities. There are some drawbacks related to hip resurfacing. Fracture of the femoral neck is reported to occur in some patients following hip resurfacing arthroplasty, a complication that does not occur after THR. In addition, the release of metal wear debris and the potential for toxicity prevents some surgeons from using this procedure in women of child-bearing age. Despite preserving bone on the proximal femur, resurfacing...
arthroplasty is thought to result in more bone loss on the acetabular side.  

**Total hip replacement**

Because of the anticipated longer lifetime of the young patient, joint-preserving procedures are preferable to total joint replacement. Occasionally, THR may be entertained for young patients with advanced intra-articular disorders that are not amenable to treatment with joint-preserving surgeries.  

The preferred method of fixation of THR remains controversial. Reported rates of cemented and uncemented THR show rates of wear of 0.12 mm/year for both cemented and uncemented components. Patients under 40 years of age have shown slightly inferior outcomes with uncemented components when compared with patients older than 40 years in the same study.  

Since young patients have anticipated higher wear, as well as higher rates of aseptic loosening, the type of bearing surface selected is also an important consideration. Alternative bearing surfaces for THR include highly cross-linked polyethylene, metal-on-metal, and ceramic-on-ceramic. Highly cross-linked polyethylene is resistant to wear, but the process of gamma and electron beam radiation used to induce cross-linking can subject the material to fatigue fracture if levels of radiation are too high. Metal-on-metal bearing surfaces have a very low rate of wear (a few microns per year), which is an important issue in young patients. However, accumulation of metal debris in serum, lymph and urine has been reported, the consequences of which are unknown. Ceramic-on-ceramic bearing surfaces have reported rates of wear similar to that of metal-on-metal components, without the accumulation of potentially carcinogenic particles. However, because of the brittle nature of the material, rates of failure as high as 13% have been reported.  

**Conclusion**

Arthritis of the hip in young patients differs greatly from the clinical picture seen with the older patient population and presents a multi-faceted clinical challenge. Practitioners should be aware of the unique factors that can influence treatment decisions when dealing with a young patient population, and not overlook hip-preserving treatments.  

**References**


