The glenohumeral joint can cause significant morbidity when it starts to become arthritic. More than any other joint in the body it relies on a significant range of motion to provide function and as arthritis progresses this range of motion is increasingly lost.

The glenohumeral joint is most commonly affected by osteoarthritis (OA) but it can also be affected by inflammatory arthritis such as rheumatoid arthritis (RA). Dysfunction of the rotator cuff is a common reason for degeneration and this makes the surgical options more complex as we shall see later in the chapter. Consideration must also be given when assessing the patient to the other joints which make up the shoulder girdle as these too can be causing symptoms, namely the acromioclavicular joint (ACJ) and the sternoclavicular joint (SCJ).

Etiology

Primary shoulder OA develops in much the same way as in other joints. One of the key things to remember is that the shoulder is a load bearing joint and because of a long lever arm even fairly trivial weights transmit significant pressure through the joint.

Early on in the disease process there is fibrillation of the articular cartilage which can be seen as narrowing of the joint space on x-ray. As the degeneration progresses subchondral sclerosis develops and osteophytes form, with eventual loss of bone.
The x-ray above shows a typical shoulder with advanced glenohumeral OA. There is joint space narrowing with marginal osteophytes and subchondral sclerosis present.

Patients who suffer trauma to the shoulder may develop secondary OA and this is often the cause in patients presenting earlier in life. A common example is patients with shoulder instability where abnormal joint loading leads to early degeneration. Fractures are another cause of secondary arthritis which accelerate degeneration in a number of ways. A comminuted fracture of the humeral head may damage the vascular supply and lead to avascular necrosis. Similarly, operative fixation may precipitate the condition as shown in the x-ray below. The radiological changes are striking, with marked bone loss or even complete collapse of the humeral head.

As mentioned previously degeneration of the rotator cuff may play a part in the development of arthritis.
The x-ray above shows a typical case of ‘cuff tear arthropathy’. This occurs when a large rotator cuff tear (usually degenerate) allows the humeral head to sublux superiorly. It then begins to articulate with the underside of the acromion leading to joint degeneration with poor function and pain. The management of these patients is particularly challenging as we shall discuss later.

Whereas OA is a proliferative disease (with osteophyte formation), RA is destructive in nature. In the initial stages of the disease there is an acute synovitis with release of inflammatory mediators and subsequent destruction of the articular cartilage. The x-rays below show the development of osteopaenia, erosions and a loss of joint space.
Epidemiology

Primary OA tends to be seen in patients over the age of sixty although patients with a history of heavy manual work may present earlier. Secondary OA is seen in all age groups. Its development and progression depends on the type and severity of the initial injury and how it has been treated.

Rheumatoid arthritis (RA) may affect younger patients than primary OA although effective medical management often delays the need for surgical intervention. It is typically seen in patients presenting for the first time between the ages of 35 - 50 years. After the small joints of the hand it is the most commonly affected joint in the upper limb.

History and Examination

Primary OA typically causes a gradual onset of pain and restriction in movement of the shoulder girdle. The pain is generally not well localised, with the patient complaining of diffuse discomfort around the shoulder. It may be present at rest when advanced but is usually worse on movement or with lifting. Night pain is a common feature, with the patient unable to lie on the affected side.

Examination will usually show a mild to moderate global restriction in movement. The presence of an associated rotator cuff tear should also be examined for by testing the rotator cuff as previously described. This can sometimes be confusing as pain from the arthritis itself may affect the special tests. Bear in mind a patient with severe cuff tear arthropathy may have massively restricted movement. Palpable or audible crepitus is often present as the disease progresses.

Patients who present young with the symptoms above should have a careful history taken to establish if there are previous injuries which could precipitate secondary OA. Remember the injury
is often not a fracture but a dislocation, which the patient may not associate with their present symptoms and so not volunteer the history unless specifically asked.

In RA the first presentation is usually with a warm, swollen, painful joint secondary to the underlying inflammatory process. An acute monoarthritis of the shoulder could herald the onset of the condition. More commonly however, patients will have had other joints affected previously.

Other inflammatory or crystal arthropathies including psoriatic arthritis, SLE and gout should also be considered as differential diagnoses. Examination findings are likely to be similar to those of OA and RA, with painful restriction in movement and crepitus in more advanced disease.

Patients presenting with a frozen shoulder may present in a similar way to those with arthritis. Particularly in the ‘freezing phase’ they will have globally restricted movements which are increasingly painful. The key differentiators are that movement is usually significantly restricted on both active and passive movement in a frozen shoulder whereas passive movements are usually greater in arthritis. The onset of symptoms is usually quicker in a frozen shoulder, occurring over the space of weeks rather than months to years.

Non Surgical Management

Any patient in whom a diagnosis of arthritis is being considered should initially be investigated with x-ray. Firstly this will confirm the presence of arthritis. It will also indicate the stage of the disease process and give an indication of what type of arthritis is present. Patients with a frozen shoulder can be differentiated from those with arthritis as the x-ray is usually normal in the condition.

As most patients present with a gradual deterioration in symptoms over a lengthy period of time, a stepwise approach to management is appropriate. This means that a period of conservative management should almost always be undertaken.

Patients with primary and secondary OA should be managed initially with simple analgesia using the WHO pain ladder. As the disease progresses, oral analgesia alone may become inadequate to control the pain. One option at this point is to perform a glenohumeral steroid injection as described previously. This can be repeated every three to six months and is very useful in younger patients in whom a delay in surgical intervention is desirable. There is some research to show that both steroid and local anaesthetic is chondrotoxic and so this risk needs to be balanced against the benefit of pain relief in early disease.

Physiotherapy can also be useful to try and improve function in a degenerate shoulder. This is particularly true for patients with a degenerate rotator cuff as it is often the cuff which causes the greater functional restriction. A period of focussed shoulder physiotherapy may help improve what is left of the cuff function and help the deltoid muscle take on a greater degree of the function previously provided by the cuff.

Patients suffering from an inflammatory arthritis such as RA should be managed by a rheumatologist. They will initiate immunomodulatory therapy if necessary and monitor the disease progression. Referral to orthopaedics in these patients usually comes from the rheumatology team when it is felt appropriate.

Surgical Management

The surgical management of any arthritis will depend on the patients age and diagnosis. The basic principle of any surgical technique, is the replacement of the articular surface with a prosthesis. This has the intention of relieving pain, improving range of movement and thereby restoring a degree of function. Any type of shoulder replacement rarely restores normal function and patients should be clear that the primary aim of surgery is pain relief.
Younger patients and those with minimal bone loss can be managed with a resurfacing arthroplasty provided the rotator cuff is functioning normally. This is a bone conserving operation which is beneficial because it allows any subsequent revision to be performed with a primary prosthesis. The x-ray below shows a typical resurfacing hemiarthroplasty.

Treatment of more advanced disease depends on the involvement of the glenoid. In patients with a relatively normal glenoid a shoulder hemiarthroplasty can be performed. This involves replacing only the humeral head with a prosthesis. If the glenoid is damaged then it should also be replaced using a total shoulder replacement. The x-ray below shows a total shoulder replacement. The glenoid component is polyethylene with only the radio opaque markers visible.
Patients who have concurrent rotator cuff dysfunction present a particular problem when considering all of the above prostheses. These patients are likely to gain pain relief from a prosthesis but their functional recovery will be limited because without a normal rotator cuff the range of movement remains restricted.

Even with these prostheses, full functional recovery is very unlikely. They are designed to allow the deltoid to take on some of the functions of the rotator cuff, but this will never be a true replacement for cuff function. The x-ray below shows a reverse total shoulder replacement. This demonstrates where it gets its name from; the ball is fixed to the glenoid and the socket to the proximal humerus. This is intended to change the centre of rotation of the joint to give the deltoid a mechanical advantage with a longer lever arm.
When to Refer

The time to refer depends very much on the diagnosis and the level of disease progression. In any patient who has radiologically confirmed arthritis, referral should be considered when conservative management is no longer controlling the patient's symptoms.

In patients with primary or secondary OA, referral depends very much on their age. Older patients with radiologically advanced disease or severe symptoms are the most suitable for shoulder replacement as their functional demands are lower and the prosthesis is more likely to last the rest of their life. Patients with rotator cuff deficient shoulders present a significant problem and careful patient selection is needed to ensure they know functional recovery is limited before proceeding with surgery.

Young patients with severe symptoms are usually the hardest group to manage. Whilst early referral is appropriate, surgical intervention is really a last option as they will likely outlive their prosthesis making one or more revision surgeries inevitable with decreasing function and increasing risk being present each time an operation is performed. Younger patients in manual jobs
will almost always need to consider a change in career which can be particularly traumatic for them.

Patients with RA or another inflammatory arthritis are usually referred by their rheumatologist and surgical management will be coordinated with them. The small number of patients in whom a first presentation is in the shoulder should primarily be referred to the rheumatology team rather than orthopaedics. They are a risky group to operate on as both the disease and their medical treatment for RA put them at a significantly higher risk of infection.