Shoulder Joint Replacements

Patients with shoulder joint disease may have shoulder pain accompanied by functional limitation and a reduced quality of life. The humeral head may degenerate as a result of a range of conditions, particularly osteoarthritis, rheumatoid arthritis or avascular necrosis. The whole or only part of the articular surface of the humeral head may be affected.[1]

Conservative treatments for shoulder joint problems include physiotherapy, drug treatments (eg, pain relief and topical or oral non-steroidal anti-inflammatory drugs) and corticosteroid injections. Patients not responding to conservative treatments may require surgery, which may be either shoulder arthroplasty using a stemmed humeral head prosthesis, or fusion of the joint.[1]

The surgical replacement of the shoulder joint is the third most common joint replacement after replacement of the hip and knee joints. Like the hip, the shoulder is a ball and socket joint. However, the shoulder 'socket' is much more shallow to allow a greater range of movement at the cost of bony stability.

Shoulder joint replacement can be:[2, 3]

- Shoulder resurfacing arthroplasty (replacement of only the damaged joint surfaces, with minimal bone resection) is recommended by the National Institute of Health and Care Excellence (NICE) as an appropriate treatment option.[1]
- Partial: one articular surface is replaced, the humeral head; also known as shoulder hemiarthroplasty.
- Total: both articular surfaces are replaced by prostheses; also known as shoulder arthroplasty. Improved long-term results have increased the use of total shoulder prostheses.[4]
- Reverse: both articular surfaces are replaced but with the 'ball' on the glenoid and the 'cup', or 'socket', on the humerus. This is to medialise the joint centre of rotation in order to maximise the lever arm of the deltoid muscle in rotator cuff deficiency.

Indications

- Severe pain and disability associated with radiological changes not responsive to non-surgical treatment.
- Shoulder joint replacement is usually performed for osteoarthritis, rheumatoid arthritis or where there has been damage due to trauma. It may sometimes be used in recurrent shoulder instability.[5]
- Hemiarthroplasty is a satisfactory treatment for a fractured proximal end of humerus.[6] However, total joint replacement may lead to better outcome in most other situations.[7, 8]

Epidemiology

- Only about 5,000 operations a year are performed in the UK.
- It is the third most common joint replacement.

Pre-operative assessment

- The patient may have rheumatoid arthritis and this can complicate operative risk and postoperative rehabilitation.
- The patient is also likely to be elderly and so may have other health problems.
- Any potential source of infection should be dealt with prior to arthroplasty, with special care given to dentition.
- Good pre-operative assessment is needed to assess surgical risk and is usually carried out in secondary care.
Patients should be advised that the outcome of surgery should be pain reduction and improved movement. However, movement of the shoulder may still be restricted.

The range of movement of the shoulder commonly achieved allows the arm to be raised to a height where the elbow is level with the shoulder but not above this.\cite{9}

The anaesthetic

- The anaesthetist should discuss the options with the patient at the pre-operative assessment.
- The procedure can be done under either a general anaesthetic or using a regional block. These can also be combined, as the regional block provides excellent postoperative analgesia.

The surgical procedure

- The shoulder is approached from either the front (deltopectoral), or from the side (deltoid split).
- The choice of prosthesis depends on the condition of the joint surfaces and on the anatomy and functional condition of the rotator cuff.
- The damaged humeral head is removed, or is sometimes just resurfaced. In this case, a 'cap' is placed over the humeral head and not all of the bone is removed.\cite{9}
- The component that replaces the head of the humerus is made of an alloy based on cobalt and chromium. It comes in various sizes and can be a single piece or a modular unit.\cite{10}
- The component that replaces the glenoid depression is made of ultra-high-density polyethylene. Some varieties have a metal tray but totally plastic versions are more common.
- The surgeon may replace just the humeral head in a hemiarthroplasty, or both the humeral head and the glenoid in a total shoulder replacement.
- The use of bone cement is dictated by the quality of the patient's bone stock but is routinely used when a fracture is being treated.\cite{9}
- The glenoid component is held in place by either acrylic bone cement (cemented) or bone ingrowth (cementless).
- The surrounding muscles and tendons provide stability for the prosthesis as with the normal shoulder.

NICE guidelines and joint arthroplasty\cite{11}

- Ensure that the person has been offered at least the core (non-surgical) treatment options before consideration of surgery.
- Consider referral for joint surgery for people with osteoarthritis who experience joint symptoms (pain, stiffness and reduced function) that have a substantial impact on their quality of life and are refractory to non-surgical treatment.
- Refer for consideration of joint surgery before there is prolonged and established functional limitation and severe pain.
- A patient's age, gender, smoking status, weight and comorbidities should not be barriers to referral.

Postoperative care and rehabilitation

- A well-planned rehabilitation programme is essential for success.
- Therapy should begin very soon after surgery. A physiotherapist will start gentle, passive and active assisted range of movement exercises. The safe range of movement will depend on the type of surgical approach. In the deltopectoral approach, the subscapularis tendon is either surgically divided or elevated with a lesser tuberosity osteotomy. Range of movement allowed will depend on the adequacy of fixation.
- Hospital stay varies from two to five days and is dependent on patient comorbidities.
- Advice following discharge usually includes:
  - Wear the sling every night for at least the first month.
  - Do not use the arm to push up in bed or from a chair.
  - Follow the exercise programme diligently.
  - Do not overdo it. Early overuse of the shoulder may result in restricted movement later.
  - Do not lift anything heavier than a cup of tea or coffee for the first six weeks after surgery.
  - Do not do any contact sports or heavy lifting for at least six months.
Complications

Complications after shoulder replacement surgery are less frequent than with other joint replacements. Complications can include:

- Anaesthetic complications.
- Damage to nearby nerves or blood vessels intra-operatively.
- Intra-operative fracture of the upper humerus.
- Rotator cuff tears.\[12\]
- Wound infection.
- Thromboembolic complications (thromboembolic complications were less common than after prosthesis of the lower limb in one study but the percentage of pulmonary embolism was higher).\[13\]
- Infection of the implant (this usually requires revision).\[14, 15\]
- Postoperative fractures of the upper humerus.
- Postoperative shoulder instability (dislocation, subluxation).\[16\]
- Loosening of the glenoid component/glenoid component failure.\[16, 17\]

Advances in surgical techniques and prosthetic innovations are helping to reduce the occurrence of complications. Complications are fewer in the hands of the more experienced surgeons and those who do the most cases.\[18, 19\]

Prognosis

- The best results are in older patients who had surgery for osteoarthritis, as they give the joints less stress. Younger patients tend to fare worse and may develop loosening of the joint.
- One study found that of patients who underwent hemiarthroplasty, 82% were still functional after 10 years and 75% after 20 years. For total shoulder arthroplasty the figures were 97% at 10 years and 84% at 20 years.\[20\]
- Outcome is best for an experienced surgeon who performs high volumes of shoulder arthroplasty or hemiarthroplasty operations.\[18, 19\]
- Pre-operative planning, attention to anatomy, and an optimum rehabilitation programme are the keys to success.
- Improvement in function can continue for up to 18 months postoperatively.\[5\]

Revision arthroplasty

- It is a general rule that revision arthroplasty is significantly more complex than the original operation and this holds for shoulder replacement as much as any other joint.
- The outcome of the revision tends to depend on the indication for the procedure.\[21\]
- In one study in the UK, the most common cause for revision in hemiarthroplasty was glenoid pain and, in arthroplasty, glenoid loosening.\[22\]

Further reading & references

- Shoulder pain; NICE CKS, April 2015 (UK access only)
- Shoulder resurfacing arthroplasty; NICE Interventional Procedure Guidance, July 2010
- Arthroplasty of the Shoulder; Wheeless’ Textbook of Orthopaedics
9. Shoulder and elbow replacement; Arthritis Research UK
10. Hemiarthroplasty of the Shoulder; Wheeless' Textbook of Orthopaedics
11. Osteoarthritis: care and management in adults; NICE Clinical Guideline (February 2014)
16. Complications of Shoulder Arthroplasty; Wheeless' Textbook of Orthopaedics

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