MINI-SYMPOSIUM: SURGICAL RHEUMATOLOGY

(i) The surgical management of rheumatoid arthritis of the shoulder and elbow

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KEYWORDS
Management; Rheumatoid arthritis; Shoulder; Elbow

Summary
The management of the rheumatoid shoulder and elbow is a challenging problem. In this review we aim to summarise the main management options for shoulder and elbow disease placing particular emphasis on surgical treatment. We believe that by using the techniques available and with good patient selection excellent results can be achieved, reducing the patients pain and also providing independence for activities of daily living.

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Introduction
Rheumatoid arthritis (RA) is a systemic debilitating disease characterised by progressive joint destruction. It affects 1–3% of the population with a peak age of onset between 35 and 45 years.

Small joints are usually affected early in the disease but involvement of the elbow and shoulder are not uncommon.

In this review, we aim to summarise the main management options for shoulder and elbow disease placing particular emphasis on surgical treatment. Before doing this however it is important to stress the role of medical management in the overall care of the rheumatoid patient.

Medical management

The objective of treatment is to induce disease remission allowing the patient to lead as normal a life as possible. To achieve this aim the patient requires the care of a multidisciplinary team which as a minimum should include a rheumatologist, orthopaedic surgeon, physiotherapist and occupational therapist. In addition, further specialist input may be required to deal with particular problems.

Medical treatment of the disease process is important because it will minimise synovitis, reduce joint destruction and enable the surgeon to perform more limited procedures when surgical interventions are required. The specific medical therapy is dictated by the individual needs of the patient and may involve combinations of drugs from simple analgesics through to the newer disease modifying agents.

Shoulder

Shoulder symptomatology is a common finding in patients with long-standing RA. Studies have shown that more than 90% of patients who have had the disease for more than 5 years develop shoulder problems. Patients often present with symptoms that are indicative of the articular and periarticular nature of the condition, namely pain, swelling and a decreased range of motion. Rotator cuff insufficiency is
common affecting more than 70% with approximately 30%
developing full thickness tears.2

Classification

RA of the shoulder has been classified by Laine et al.,3 and
later by Neer4 into three stages that reflect the severity of
the condition with respect to clinical and radiological
findings. Neer’s dry, wet and resorptive stages approxi-
mately correlate with Laine’s stages.

<table>
<thead>
<tr>
<th>ROM</th>
<th>Pain</th>
<th>Radiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>Slight</td>
<td>Mild</td>
</tr>
<tr>
<td></td>
<td>decrease</td>
<td></td>
</tr>
<tr>
<td>Stage 2</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>decrease</td>
<td></td>
</tr>
</tbody>
</table>

Non-surgical management

In Stage 1 there are no significant osseous changes, and this
is the ideal time for non-operative treatment. The mainstay
of treatment is medical, and involves the use of NSAIDs,
disease modifying drugs, antimetabolics and oral steroids.

Activity modification, intra-articular or subacromial ster-
oid injections may also be helpful. Patients who have not
had significant benefit form oral medication often improve
with steroid injections. However, the improvement may only
be temporary and must be weighed against the potential
harmful effects injections have on rotator cuff healing and
articular cartilage.5

Physiotherapy is useful in maintaining and regaining range
of motion depending on the stage of the disease.

Surgical management

Surgical management is indicated when non-surgical treat-
ment has failed to control pain and maintain function. The
type of procedure performed is determined by the severity
of the disease, taking into consideration the level of
involvement of articular cartilage, bone and the peri-
articular soft tissues. If there is significant articular cartilage
preservation, procedures such as synovectomy and debride-
ment may be useful in relieving the patients’ symptoms.
However, once articular cartilage loss has occurred prosthetic
replacement using either a hemiarthroplasty or total
joint replacement is usually necessary.

Order of surgical procedures

RA is a disease that often affects multiple joints simulta-
neously. It is therefore useful to have a general strategy to
deal with these patients. The majority of surgeons agree
that the most symptomatic joint should be treated first. If
however the symptoms are similar, in the upper and lower
limb, then the lower limb surgery will normally take
precedence. Upper limb surgery should be deferred until
the use of ambulatory aids is no longer required.

The elbow takes precedence over the shoulder. In one
study, a superior functional result and a longer interval
between arthroplasties was gained when the elbow was
operated on before the shoulder.6 The exception to this is if
the shoulder is ankylosed. In this situation the shoulder is
addressed first to minimise increased rotational stresses that
might be put on the elbow due to absent shoulder motion.

Joint preserving procedures

Synovectomy produces the best results in patients with
Stage 1 disease. The procedure can be performed open or
arthroscopically with up to 80% gaining a painless range
of movement. Often the procedure involves a glenohumeral
joint synovectomy with a subacromial bursectomy. In the
presence of rotator cuff insufficiency, an acromioplasty and/or
release of the coracoacromial ligament is contraindicated
as this may lead to antero-superior instability.

Joint debridement may result in symptomatic relief; however, this is often transitory and is not usually related to
a significantly increased range of motion.8

Joint sacrificing procedures

When non-surgical and joint preserving procedures have
failed, joint replacement is indicated. This can be in the
form of a hemiarthroplasty or a total shoulder replacement,
with both procedures resulting in significant pain relief,
increased range of movement and function.9 The two types
of prosthesis in common use are either surface replacements (Figs. 1A and B) or traditional stemmed implants. Although,
this improvement is maintained over time10 the overall
results are not as good as in patients with osteoarthritis.9

In general, the results of total shoulder replacement are
superior to hemiarthroplasty with better functional results
and less pain.11 However, in situations associated with an
increased risk of glenoid failure such as an irreparable rotator
cuff tear or deficient glenoid bone preventing adequate
implant fixation, it is better to perform a hemiarthroplasty.

Up to 35% of patients who require a shoulder arthroplasty
have rotator cuff tears. These should be repaired at the
same time as the arthroplasty to achieve the best results.12
If this is not possible consideration should be given as to
whether a reverse polarity shoulder arthroplasty is indicated
(Figs. 2A and B). This device alters the biomechanics of
the shoulder allowing the deltoid to partly compensate for the
deficient rotator cuff.

Elbow

Elbow rheumatoid disease occurs more commonly than at
the shoulder with 50% of patients experiencing elbow
symptoms within 5 years.13 It is often associated with
shoulder or wrist involvement (around 90%).

Patients often present with pain and restricted range of
motion due to synovitis in the joint. Ten percent sponta-
eously resolve.13 However, if the synovitis continues fixed
flexion deformities, instability, compression neuropathies
and joint destruction may occur. Fixed deformities are often
due to the patient holding the arm in a flexed position to
minimise pain. Instability of the radial head occurs after
destruction of the annular ligament and the subsequent
anterior pull of the biceps. Instability of the elbow results
from destruction of the medial and lateral collateral ligament complexes. If the synovitis extends beyond the joint, compression of the ulnar or posterior interosseous nerve will produce neurological symptoms. Long-standing synovitis leads to articular cartilage destruction and degenerative changes.

**Classification**

Morrey has described four stages in the Mayo Clinic Classification of the rheumatoid elbow. \(^{15}\)

<table>
<thead>
<tr>
<th>Stage</th>
<th>Radiology</th>
<th>Synovitis</th>
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<tbody>
<tr>
<td>Stage I</td>
<td>Minimal, except soft tissue swelling and peri-articular osteopenia</td>
<td>Mild</td>
</tr>
<tr>
<td>Stage II</td>
<td>Joint space narrowing bony architecture preserved</td>
<td>Persistent synovitis</td>
</tr>
<tr>
<td>Stage IIIA</td>
<td>Moderate bony architecture changes</td>
<td>Synovitis variable</td>
</tr>
<tr>
<td>Stage IIIB</td>
<td>Severe bony architecture changes</td>
<td>Synovitis variable</td>
</tr>
<tr>
<td>Stage IV</td>
<td>Gross destruction of the joint gross instability</td>
<td>Minimal synovitis</td>
</tr>
</tbody>
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**Non-surgical management**

Early rheumatoid disease of the elbow should be managed non-operatively by a rheumatologist. As the disease progresses, the use of activity modification physiotherapy, steroid injections, and elbow braces may help alleviate symptoms.

**Surgical management**

Satisfactory management of the rheumatoid elbow is sometimes not possible with non-surgical treatment. Synovectomy and total joint replacement are the main surgical options, however resection arthroplasty and interposition arthroplasty may occasionally have a role.

**Joint preserving procedures**

Synovectomy can be performed open or arthroscopically, and is normally indicated after 6 months of painful synovitis that has not resolved after appropriate medical treatment.

Open synovectomy with or without radial head excision has been shown to produce satisfactory results in patients...
with Stages II, III and IV disease; however, the results are best in those with Stage II disease. A satisfactory outcome is achieved in 70–90%. When performed early the results can last over 10 years in 80% of patients.

Radial head excision is controversial, with no clear distinction in the literature between the results reported with or without excision. Removing the radial head will improve forearm rotation and decrease impingement; however, the loss of its role in stability in the rheumatoid elbow may lead to instability and ulnar nerve irritation.

Arthroscopic synovectomy, although demanding technically and associated with an increased risk to the neurovascular structures, has various theoretical advantages over the open procedure. It can be performed as a day-case, is associated with a rapid return to normal motion, and a more complete synovectomy is technically possible. The early results have been promising, but longer term studies are required. Lee and Morrey reported a 93% success rate at 6 months, but only 57% were rated as good or excellent using the Mayo Elbow Index at 3.5 years. Horiuchi et al. reported an increase in the Mayo Elbow Index from 48.3 to 77.5 at a mean follow-up of 97 months, but only patients with mild radiographic changes had good long-term results.

The most common complication after synovectomy is recurrence of pain. Although some authors have advocated a repeat procedure, the results have been less predictable with 95% still having pain following the second procedure. The best results occur if there has been a favourable response to the first procedure. Other complications are instability (15%) and nerve damage.

Although synovectomy may give good results it should be borne in mind that patients who subsequently undergo total elbow arthroplasty have technically more difficult operations and poorer clinical results at 2 years follow-up.

Joint sacrificing procedures
Interposition arthroplasty has been shown to produce satisfactory results in young patients with Stage II or IIIA disease. The procedure involves limited bone resection in order to preserve normal architecture and stability. The graft (fascia, skin or synthetic material) is then placed and secured over the distal humerus. An external fixator is used to distract the joint surfaces and allow elbow movement whilst the soft tissues heal. Around 75–80% benefit from surgery and pain relief can be maintained for up to 20 years. Conversion to a total elbow replacement is possible but the results are inferior to a primary total joint arthroplasty.

Excision arthroplasty is now normally used as a salvage procedure mainly for infection. Pain relief is often gained in 80%, but extensor weakness and instability can be a problem.

Total joint arthroplasty is the treatment of choice for patients with Stages III and IV disease. Historically, early designs of elbow replacement were rigid hinged devices, which suffered from an unacceptable rate of loosening. The most common types of replacements used today are either unlinked or linked implants. These are associated with decreased rates of loosening due to reduced stress transfer to the prosthesis–bone interface compared to the rigid hinged devices.

Linked arthroplasties (Figs. 3A and B) have a sloppy-hinge design that allows 5–10 degrees of motion in varus/valgus and axial rotation. This allows the soft tissues to absorb some of the stresses that would normally transfer to the prosthesis–bone interface. Excellent results have been obtained, with Morrey reporting 85% good or excellent results and overall survivorship of 92% at 10–15-year follow-up using the Coonrad–Morrey elbow replacement (Fig. 4). Unlinked implants rely on bone and ligamentous structures for their stability; they have less stress transfer to the prosthesis–bone interface but have increased instability compared with linked implants.

In general, most studies show that superior results are achieved when a linked device is used rather than an unlinked device in the rheumatoid elbow.

Conclusions
The management of the rheumatoid upper limb is a challenging problem, with various techniques available to the surgeon. Using these techniques and with good patient complications.
selection excellent results can be achieved, reducing the patients, pain and also providing independence for activities of daily living.

References