SURGICAL TREATMENT OF THE RHEUMATIC DISEASES*

W. ALEXANDER LAW, LONDON, ENGLAND

In this paper I propose to discuss the operative measures that may be of value in the treatment of deformities and disabilities resulting from rheumatoid arthritis and from allied conditions, such as Still's disease and ankylosing spondylitis.

The first great problem is to decide what is the correct time for surgery. In the past, surgical treatment has usually been deferred until the stage when the disease has become "burnt out." The result of this policy has been that the orthopaedic surgeon has been faced with the problem of reconstructive surgery in patients, often with gross deformity, whose muscles have been reduced to fibrous ribbons and whose ligaments and joint capsules have become mere masses of scar tissue. In addition, with the involvement of one or more principal joints, many secondary joints are put out of action and undergo degenerative changes, so that the limb as a whole is even more seriously handicapped than would be the case with single joint involvement. Only occasionally in rheumatoid arthritis do we have the good fortune to be able to treat a single large joint, as is so often the case in osteoarthritis.

It is well known that the disease pattern consists of a series of remissions alternating with periods of activity, during which the joints are painful and swollen, with muscle spasm and deformity, a constitutional upset, and rise of the blood sedimentation rate. During the periods of remission, though the resolution of the joint involvement is seldom complete, the general condition of the patient is much improved, there is less pain and therefore less muscle spasm and greater mobility. It would appear logical, therefore, to avoid operating during the active phase; but on the other hand it is harmful always to wait until the periods of remission have lengthened to such an extent that the disease is "burnt out," even if this does occur eventually after a number of years. Some of the major reconstructive operations, especially in the larger joints, are certainly better carried out at the "burnt out" stage, but there are many smaller operations that are useful during the earlier phases of the disease, and if carried out at the appropriate time they may prevent more widespread disability in the limb as a whole. Thus, it may be said that there are two groups of operations applicable to the treatment of the rheumatic diseases: 1) those that are permissible in the active phases of the disease; and 2) those that are best carried out when the active phases of the disease are infrequent and interspersed with long periods of remission. In the first group, the operation should be carried out when the sedimentation rate is beginning to fall and the active phase is past the peak, rather than at the height of the disease activity. Operation must, of course, be combined with appropriate conservative treatment under medical and physiotherapeutic supervision. It is not the intention to replace conservative treatment by surgery, but in some cases to invoke surgery at an earlier phase than has been the rule in the past.

Many of these cases of rheumatoid arthritis require a very complicated operative and rehabilitation programme. It is highly desirable that such cases be treated in special centres, where all the facilities are readily available, and that their treatment programme be supervised not by the surgeon alone but by a clinical team consisting of physician, specialist in physical medicine, radiotherapist in some cases, and orthopaedic surgeon. The haphazard management of these cases in busy city hospitals is doomed to failure without such team-work.

OPERATIONS APPLICABLE TO THE EARLY STAGES OF THE DISEASE

Rheumatoid arthritis in the upper extremity leads to a characteristic deformity of the limb as a whole—the result of muscle spasm. The shoulder is adducted and rotated medially,

* Paper read at the Annual Meeting of the British Orthopaedic Association in Edinburgh, October 1951.

vol. 34 B, no. 2, May 1952

D
the elbow is flexed, the wrist and fingers become flexed and deviate to the ulnar side. In selected cases, with certain lesions of the shoulder or elbow, operations in the early stages of the disease are of value. In the lower limb, the only joint which can be benefited by early operation is the knee, and that only in special circumstances.

**SHOULDER**

**Excision of acromion**—Bursitis in the subacromial and subdeltoid region is commonly associated with rheumatoid arthritis of the shoulder joint, and further restricts scapulo-humeral movement, in addition to causing severe pain. Excision of the acromion process frees the tendinous shoulder cuff and enables the congested villous bursa to be excised completely, in addition to allowing repair of any shoulder cuff lesion. The acromion process is best resected through the acromio-clavicular joint, and in closing the wound the central tendons of the deltoid must be firmly sutured to the periosteal attachment of the trapezius. Excision of the acromion is essentially a pain-relieving operation, but by alleviating muscle spasm, it may lead to improvement of scapulo-thoracic movement and of the function of the shoulder girdle as a whole. The function of elbow, wrist and finger joints can then be enhanced by ordinary physiotherapeutic measures and active use much more easily.

**ELBOW**

**Excision of head of radius**—In the early stages of rheumatoid arthritis of the elbow, spasm of the biceps muscle is a prominent feature. Early cases have been reported (Smith-Petersen, Aufranc and Larsen 1943), in which the radial head has been drawn out of alignment and pressed up against the capitulum, with damage to the articular surface. Unusually rapid deterioration of the joint is likely to ensue, with destruction of the articular surfaces by the rheumatoid "pannus." If synovectomy with excision of the radial head is carried out at the appropriate stage, pain and muscle spasm are relieved, and elbow joint function is maintained. The difficulty is to detect these cases early enough, and far too frequently the joint involvement is such that a much more complete reconstruction is required.

**KNEE**

**Synovectomy**—In those relatively few cases characterised by recurrent "hydrops" of the joint, with periodic swelling due to gross effusion and synovial thickening lasting a few days at a time and then settling for a few weeks or months, subtotal synovectomy is well worth while. If the articular cartilage has been extensively eroded, synovectomy alone is useless and will result only in an unsound fibrous ankylosis, but if it is performed at the earlier stage, a useful range of painless movement can be maintained over some years at least. Two cases treated in this manner have a flexion-extension range of 90 to 180 degrees maintained over two years so far.

**INTERMEDIATE AND LATE OPERATIONS**

**ELBOW**

**Arthroplasty**—Arthroplasty of the elbow joint in rheumatoid arthritis is best effected by the "excision" type of operation. If insufficient bone is resected re-ankylosis is likely to occur. In the early stages after operation considerable instability is to be anticipated, but the periarticular fibrosis will counteract this quite efficiently in due course. Arthroplasty of the elbow is not likely to provide a sufficiently strong arm for crutch support; therefore if the use of crutches is likely to be necessary, arthroplasty should be deferred until the patient is independent of crutches or sticks for walking and standing.

**Arthrodesis**—Arthrodesis of the elbow in the best functional position, according to the patient's requirements, gives a painless and strong limb suitable for the heavier forms of activity, such as carrying and taking support, but is probably of less value than arthroplasty to patients who are taking up a lighter or sedentary type of occupation.
WRIST AND HAND

Radio-carpal fusion—Involvement of the wrist and hand in rheumatoid arthritis results in painful, stiff fingers and a useless hand. The wrist is flexed and deviated to the ulnar side, as also are the metacarpo-phalangeal and interphalangeal joints. This type of deformity places the hand in its most useless position. In order to restore function it is important in the first place to have the wrist in the so-called “grasp” position, in some 10 to 15 degrees of dorsiflexion, the thumb in mid-opposition, and the metacarpo-phalangeal and interphalangeal joints slightly flexed. All movement about this neutral position is useful, and the power of the hand as a whole is most easily maintained or restored with the wrist and fingers in that position. It is important, therefore, that the wrist and fingers be prevented from assuming the typical deformity, and conservative treatment is directed towards this end. However, only too frequently patients are seen when marked deformity is already established. It is desirable that operative measures be carried out before this stage is reached. Radio-carpal fusion, with an excision of the lower end of the ulna, places the wrist in the best functional position and at the same time enables a certain amount of pronation and supination to be maintained.

Technique—The technique employed is that of Smith-Petersen (1940). A bayonet incision is made over the lower end of the radius and ulnar margin of the hand, and the ulna is divided by an oblique osteotomy a little more than an inch above the tip of the styloid process. The radio-carpal joint is exposed by reflecting the capsule and ligaments from the radius by subperiosteal dissection, and articular cartilage is removed from the lower end of the radius and the proximal row of the carpus. Slots are made into the lower end of the radius and the carpus into which grafts from the lower end of the ulna are fitted. The remaining cavities are packed with bone chips, and the wrist is immobilised in 10 to 15 degrees of dorsiflexion. This operation should be carried out before deformity is extreme, and before there is gross destruction of the metacarpo-phalangeal and interphalangeal joints.

HIPS

Choice of operation—In considering surgical treatment of fixed flexion-adduction deformities of the hip joints in rheumatoid arthritis and ankylosing spondylitis, the choice of treatment is often governed by the fact that both hips are involved, sometimes with the knee joints and spine. Thus, there is a strong indication for some type of arthroplasty or pseudarthrosis. The pseudarthrosis of the Girdlestone (1947) or Batchelor (1948) type undoubtedly frees the hip, and in virtue of the surrounding fibrosis in the soft tissues, is unlikely to be markedly unstable. Such an operation restores movement, enabling the patient to sit and take steps, allows deformity to be corrected, and enables the patient to regain some muscle elasticity and power. With the more formal arthroplasties, such as the Smith-Petersen (1939) vitallium mould arthroplasty, it is important to realise that one operation may be insufficient and that one or more revisions may be required to increase movement, relieve pain and overcome ankylosis from fibrous or bony proliferation. At these operative revisions, the effect of even limited function in the re-formation of the joint is seen to be most striking. The femoral head and the acetabulum are lined by smooth, glistening fibrocartilage, and the texture of the underlying bone is much more firm than the soft vascular bone which is present with the rheumatoid pannus. When a vitallium mould or cup is used, re-ankylosis occurs less frequently than was the case when fascia lata, fat or Baer’s membrane was interposed; but even so the risk of recurrence of stiffness and deformity is much greater in rheumatoid arthritis and ankylosing spondylitis than is the case in osteoarthritis treated by mould arthroplasty. Similarly the Judet type of operation, when employed for rheumatoid arthritis or ankylosing spondylitis, affords much less gain in movement and less complete relief from pain than it does in osteoarthritis. I have not myself performed a Judet operation for rheumatoid arthritis.
Bilateral rheumatoid arthritis of the hips before operation.

Fig. 2
Same case as Figure 1. Appearance of hips after bilateral mould arthroplasty.
and the last statement is based entirely on the experience of other surgeons, mainly on the
continent of Europe.

**Technical considerations**—The following technical points are important in mould
arthroplasty for rheumatoid arthritis and ankylosing spondylitis: 1) The acetabulum must
be made as large as possible consistent with the stability of the mould and the femoral head.
2) The joint capsule and synovial membrane are excised completely, together with the
rheumatoid pannus, which is creeping over the articular surfaces and margins of the acetabulum
and femoral head. 3) Because of the soft vascular nature of the bone, considerable haemorrhage
must be anticipated in the course of reshaping the joint surfaces, and therefore there must be
adequate facilities for blood transfusion. 4) Extensive coagulation of the raw bone margins
around the acetabulum and the new femoral head at the completion of the reshaping stage
of the operation aids in the prevention of excessive new bone formation. 5) The atrophic
nature of the bone, and the importance of gaining free mobility, may mean that the ordinary
arthroplasty operation has to be modified. Thus the modified Whitman type of operation
may sometimes be appropriate; in this technique most of the femoral head is sacrificed, the
stump of the neck is reshaped, the greater trochanter with its attached muscles is transplanted
down the femoral shaft to lengthen the femoral neck and place the important gluteal muscles
at a better mechanical advantage. As an alternative, the modified Colonna operation may be
used, in which the whole of the femoral head and neck is removed, and the great trochanter
itself is shaped and smoothed to form the articulating surface; the trochanteric muscles are
detached and resutured to the vastus lateralis expansion on the femoral shaft. If the new
joint lacks stability a vertical osteotomy cut may be made into the acetabular margin, the
outer fragment being wedged outwards and the gap packed with bone chips; this increases
the depth of the acetabulum and helps to prevent post-operative dislocation. This type of
reconstruction can be carried a stage further and the reshaping done at the level of the
inter-trochanteric region to form a ”proximal shaft arthroplasty.”

My own approach to the problem has been to undertake the ordinary type of mould
arthroplasty as a primary procedure in most cases (Figs. 1 and 2), being prepared to carry
out a revision at a later date, should this be indicated, and at this revision carrying out one
of the modifications, should the texture of the bone warrant it. It is possible that the wider
resection of bone in the modified Whitman and modified Colonna type of operation may be
advisable on account of the fibrosis in the periarticular structures, especially when there is
marked muscle spasm.

**Results**—I have reviewed thirty-eight cases of rheumatoid arthritis and ankylosing spondylitis
in which I have performed single or bilateral vitallium mould arthroplasties. These are
consecutive cases, and all have been followed for at least two years after operation—the
first for four and a half years. The average range of movement after operation is shown in
Table I, which also shows for comparison the movement regained in a series of cases of
bilateral osteoarthritis treated at the same time. It is clear that the range of movement in
rheumatoid arthritis is less satisfactory than in osteoarthritis, but on the other hand it is a
useful range and enables a patient to walk with sticks and to sit at least on a high chair.
This range of movement is seldom sufficient to enable the patient to put on his own shoes
and socks, but in many cases this would be difficult on account of stiffness in the corresponding
knee joints. In the post-operative stages there is pain and stiffness in the surrounding muscle
groups, but this is of a very different kind from that of an active arthritis. Many of these
patients have, however, had exacerbations of pain suggesting reactivation of the disease, but
provided post-operative exercises were continued the loss of movement was only temporary.

Re-ankylosis has occurred in six cases. Further treatment has been either by operative
revision or by merely removing the mould, allowing the new joint surfaces to come into
contact. On the whole, in rheumatoid arthritis and ankylosing spondylitis, removal of the
mould has proved unsatisfactory, and has favoured re-ankylosis either by strong fibrous
tissue or bone. In other words, if an operative revision is to be undertaken it should include complete reshaping of the femoral head and acetabulum and fitting of a new mould, fulfilling the ordinary principles as laid down by Smith-Petersen. The other complications in this series of cases are listed in Table II.

**TABLE I**

**Range of Hip Movement after Vitallium Mould Arthroplasty**

<table>
<thead>
<tr>
<th></th>
<th>Number of cases</th>
<th>Number of hips</th>
<th>Average age (years)</th>
<th>Movement in degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rheumatoid arthritis</td>
<td>14</td>
<td>20</td>
<td>47</td>
<td>50 25 15</td>
</tr>
<tr>
<td>Ankylosing spondylitis</td>
<td>24</td>
<td>41</td>
<td>30</td>
<td>30 15 7.5</td>
</tr>
<tr>
<td>Bilateral osteoarthritis</td>
<td>56</td>
<td>112</td>
<td>48</td>
<td>50 35 15</td>
</tr>
</tbody>
</table>

**TABLE II**

**Complications of Mould Arthroplasty in Rheumatoid Arthritis**

<table>
<thead>
<tr>
<th></th>
<th>Early</th>
<th>Intermediate</th>
<th>Late</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical shock, possibly fat embolism</td>
<td>1 (death)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Superficial infection</td>
<td>2</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Dislocation</td>
<td>3</td>
<td>1 (revision)</td>
<td>—</td>
</tr>
<tr>
<td>Subtrochanteric fracture</td>
<td>1 (at operation)</td>
<td>—</td>
<td>1 (at manipulation)</td>
</tr>
<tr>
<td>Post-transfusion jaundice</td>
<td>2</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Arthritic flare</td>
<td>—</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td>Adhesions requiring manipulation</td>
<td>—</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Re-ankylosis necessitating revision</td>
<td>—</td>
<td>—</td>
<td>6</td>
</tr>
<tr>
<td>Amyloid disease</td>
<td>—</td>
<td>—</td>
<td>1 (death)</td>
</tr>
</tbody>
</table>

**Effect of cortisone**—Two of the cases in this series have recently had courses of cortisone, but this does not appear to have influenced the joints which had already been treated by mould arthroplasty, and I understand that this corresponds to the findings of the workers at the Mayo Clinic.

**Discussion**—After reviewing these cases, I feel that mould arthroplasty is of some real help in the treatment of rheumatoid arthritis of the hip joints, although the results are less gratifying than in osteoarthritis. Fixed deformity is considerably reduced, joint pain is alleviated, if not completely removed, and the limited range of movement is certainly of value to the patient. Walking unaided is achieved in only a few cases, and most require two sticks if walking for any distance out of doors. Sitting, at least on a high chair, is possible, and most patients can climb stairs with a certain amount of effort. Few, however, can tie their own shoes or put on their own stockings or socks. If re-ankylosis is going to occur, it will take
place during the first twelve to eighteen months after operation. During this time a certain amount of muscular redevelopment is possible, making revision worth while, whether by arthroplasty or pseudarthrosis.

These only moderate results have required a great deal of hard work in the post-operative management, both on the part of the patients themselves and the nurses, physiotherapists and medical staff concerned. However, an important secondary effect of this surgical treatment is seen in the great improvement in morale of all these patients, who before operation were often doomed to a chair or bed existence.

**KNEE**

**Arthrodesis**—When the knee joint is grossly disorganised, arthrodesis is the most effective operation for providing stability and freedom from pain.

**Arthroplasty**—It would, of course, be an advantage if movement could also be retained, but up to the present I can only report failure in my attempts to obtain an adequate result with arthroplasty in rheumatoid arthritis. Two main methods have been tried. In the first, a single lower femoral condyle is shaped to articulate with a deepened saucer-like surface on the upper end of the tibia through an interposed vitallium mould (Figs. 3 and 4). This reconstruction has proved too unstable in spite of leaving the lateral ligaments intact, and has not given more than 30 degrees of flexion movement. In the second method, the femoral and tibial condyles were reconstructed along anatomical lines, again leaving the lateral ligaments intact, and without using any interposition substance. Despite continuous limbtraction for some weeks in order to try to establish a joint space and to allow the new joint surfaces to organise, bony ankylosis has occurred.

**FEET AND TOES**

Occasionally the small joints of the feet require operative correction on account of a severe rigid claw toe deformity, with or without an associated hallux valgus. The standard operations for these deformities are of use, including the Keller type of operation for hallux valgus, resection of the proximal phalanx or interphalangeal arthrodesis for hammer toe.
When the metatarsal heads have dropped markedly, excision of the heads of the second, third and fourth metatarsals may give considerable relief in weight-bearing. In very severe deformities amputation of the toes is worth consideration.

**SPINE**

**Correction of flexion deformity by osteotomy**—A rigid thoracic kyphosis is a common sequel to ankylosing spondylitis and is sometimes seen in ordinary cases of rheumatoid arthritis (Fig. 5). The deformity is the result of fibrosis and contracture in the long and short spinal ligaments, these changes being followed by calcification and, at a later stage, ossification, both in the ligaments and in the capsules of the intervertebral joints. In severe cases the spine becomes a solid mass of bone from the occiput to the sacrum, with loss of the normal cervical and lumbar lordoses and a marked increase in the thoracic kyphosis. Thus, the patient, in addition to finding it difficult to see ahead, also experiences difficulty with respiration and may have gastro-intestinal symptoms from pressure of the costal margin on the upper abdominal contents. Respiration is almost entirely diaphragmatic, the costo-vertebral joints being involved in the bony ankylosis, and therefore any restriction of this diaphragmatic movement is of danger to the patient. Severe deformity can often be avoided by correct conservative treatment, but rigid kyphosis may develop despite sound conservative treatment with plaster jackets or plaster-shell immobilisation or the use of spinal supports.

Osteotomy of the spine should not be undertaken lightly. On the other hand, the patient should not be left until the deformity is extreme. In the earlier stages an easy correction can be made which brings the main thrust into the vertical axis of the spine in a single stage (Fig. 6), whereas, if the deformity is left to become extreme, the correction must be carried out in two or more stages, because of the contracture of the soft tissues and the risk of
damage important structures such as the aorta, the inferior vena cava and the nerve trunks to the lower extremity. It is safer and easier to carry out the osteotomy in the lumbar region, where the spinal canal is relatively large and below the level of the cord proper there is less danger of causing neurological damage.

**Technique**—The operation consists in making a lumbar lordosis to compensate for the rigid thoracic kyphosis (Figs. 7 and 8), and this will even benefit the cases in which most of the kyphosis is in the cervico-thoracic region. Spinal movement of course is not restored nor is the deformity directly corrected. The bone is divided in a V or "butterfly-shaped" manner across the line of the articular processes, from the interlaminar space to the intervertebral foramina, and correction is achieved by hyperextension, using the operating table if possible for this purpose, and carrying out the manoeuvre under complete and absolute control. In the course of the hyperextension, the anterior longitudinal ligament will snap. If it is osseous

![Fig. 7](image1.jpg)

**Fig. 7**
Ankylosing spondylitis. Figure 7 shows condition before operation. There was bony fusion of the posterior structures.

![Fig. 8](image2.jpg)

**Fig. 8**
After spinal osteotomy at L.3-4 vertebral level, showing final correction.

there is a loud and palpable rupture; if the ligament is still fibrous it is felt to give with a soft thud, and after the correction the base of the spinous process above the osteotomy level must rest firmly on the shelf of bone below. Fusion at the osteotomy site is usually obtained easily with a modified Hibbs type of procedure, with or without internal fixation.

**Post-operative treatment**—Plaster immobilisation should be continued until fusion is solid, usually a matter of about three to six months, and for the first part of this period the patient can be nursed either on a plaster shell or with one thigh incorporated in the plaster so as to make nursing easier. Spinal exercises and breathing exercises play an important part in the post-operative treatment, and after the plaster has been removed, a spinal support should be worn until the musculature has regained its tone and power.

I have not undertaken spinal osteotomy in the cervical spine because of the relative narrowness of the spinal canal and the danger of injury to the spinal cord. In the thoracic
region, in rheumatoid arthritis or ankylosing spondylitis, involvement of the costo-vertebral joints would make correction difficult, if not impossible. I have never found it necessary to divide the anterior longitudinal ligament through an anterior approach, as is described by Herbert (1950) and La Chapelle (1946).

Complications—In a series of over thirty cases there have been four deaths. The first was the result of an error of nursing, in which the patient, after being turned prone, was allowed to slip down the bed, and because of the rigid deformity of the cervical spine he could not save himself from suffocation in the pillows. These patients should never be left unattended when they are prone, and they should never be left prone at night when vision may not be clear.

The second death occurred from fracture-dislocation at the cervico-thoracic junction with injury to the spinal cord. At post-mortem the osteotomy site in the lumbar region was found to be clear of any haemorrhage or injury to the cord, but the cause of the disaster was found to be at this higher level. It is impossible to say at what stage in the operation this occurred; it may have been during intubation of the patient for anaesthesia, or while lifting the patient on or off the operating table, or at the time of effecting the hyperextension, or while applying the plaster, and of course it is one of the dangers when dealing with this soft vascular type of bone.
The third death was the result of a perforation of a large gastric ulcer into the lesser sac of the peritoneum (Fig. 9). Again, the osteotomy site was found to be perfectly clear, the large vessels being intact in spite of the longitudinal ligament being snapped across quite cleanly, and the adjacent psoas muscles being stretched, but not lacerated.

The fourth death was from renal failure two months after operation, at a stage when the patient had been placed in an ambulatory jacket. The cause for this kidney failure could not be determined; there were no renal calculi, and there had been no previous history of renal insufficiency.

There has been no case of injury to the spinal cord, or of undue haemorrhage into the cord or thecal space, and the only other complications have been temporary foot-drop, probably the result of overstretching of the nerve root in a case in which correction of 90 degrees was obtained, and delayed fusion, in a patient whose spine was still unfused at the osteotomy site five months after operation.

In four cases correction was undertaken in two stages in order to gain sufficient hyperextension. Correction of between 45 and 50 degrees is usually maintained without difficulty.

Spinal osteotomy is sometimes required in conjunction with correction of severe flexion deformity of the hip joints, and it may be carried out either before or after operation on the hips. It must be pointed out, however, that in many cases correction of a severe flexion deformity of the hips may be all that is required to bring the patient more erect.

**TEMPORO-MANDEBULAR JOINTS**

In some cases of Marie Strumpell arthritis the temporo-mandibular joints undergo bony ankylosis which interferes with nutrition and speech. Arthroplasty of the temporo-mandibular joints by resection of the mandibular condyle restores mobility of the jaw; this may be a necessary preliminary to improving the nutrition of the patient in preparation for other operations, or for purposes of anaesthetic intubation. It is important to note that after a bilateral temporo-mandibular arthroplasty, when the second side is operated upon within two to three weeks after the first, great care must be taken to prevent the tongue from slipping backwards and asphyxiating the patient during the first few days, when there is considerable loss of muscular control.

**REFERENCES**


