Multiple joint replacement in chronically neglected polyarthritic patients: Two case reports

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ABSTRACT

Multiple joint replacement is a viable option for rehabilitation of young polyarthritic patients with unsalvageable joints. Young polyarthritic patients in this part of the world suffer from chronic neglect because of ignorance, apathy and low socio-economic status. During the period of chronic neglect, these patients acquire extreme deformities of various joints either due to active disease (ankylosing spondylitis, rheumatoid arthritis) or irreversible changes in the joint configuration like ankylosis and soft-tissue contracture. Associated spine and thoracic cage affection create problems for anaesthesia and perioperative positioning. We report 2 cases of multiple joint replacements for young polyarthritic patients who were bedridden for 6 to 11 years. Surgeries were performed in a phased manner and after extensive rehabilitation both patients were able to walk unaided. Various problems and difficulties encountered have been addressed so as to serve as a guide to surgeons who may have to deal with such unusual situations of chronic neglect. We also report a modified exposure technique without trochanteric osteotomy for total hip replacement, which is valuable in extreme external rotation ankylosis.

Key words: ankylosing spondylitis, rheumatoid arthritis, extreme deformity, unsound ankylosis, multiple joint replacement, THR

INTRODUCTION

Total joint replacement (TJR) is a well accepted modality for the management of advanced arthritis in patients suffering from rheumatoid arthritis and ankylosing spondylitis and the results are usually gratifying, especially with respect to pain relief and enhanced mobility.

However, few reports are available in the literature regarding multiple joint replacement in polyarthritics, with regard to the technical difficulties and problems that are frequently encountered. Patients usually present late in the course of these crippling diseases with severe deformities involving several joints of the upper and lower limbs. Widespread ignorance and apathy, deprivation of a strong social support base, coupled with a poor public health awareness infrastructure in

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this part of the world, causes patients to present following years of neglect. Such patients generally become bedridden or wheelchair-bound for quite a long time and joint ankylosis in an unsound position make multiple joint replacement a forbidding task. Generalized systemic disease, extensive spine and upper limb involvement, prolonged steroid overuse and abuse, and poor patient motivation have caused these patients to be considered as poor risks for extensive surgical procedures. Technical difficulties in the execution of TJR, greater risk of postoperative infection due to use of immunosuppressive drugs and delicate skin, and the need for intensive postoperative rehabilitation have also served as deterrents.

We report 2 cases of multiple joint replacement in chronically neglected polyarthritic patients and attempt to define the problems and difficulties encountered. We also report a modified exposure technique for total hip replacement (THR) that we have found to be valuable in cases of hips ankylosed in extreme external rotation deformity, wherein the sciatic nerve and posterior acetabular wall are in jeopardy during the execution of femoral neck osteotomy.

CASE REPORTS

Case 1

A 35-year-old male suffering from ankylosing spondylitis (AS) for 16 years presented with severe lower limb and spinal deformities. He was bedridden for 7 years. Both hips were ankylosed in severe flexion-abduction-external rotation deformities, probably owing to the position of ease adopted by the patient in the acute, painful stage of the disease. The deformities which were present in the various joints are listed in Table 1. He also had a malunited fracture of the right femoral shaft due to a previous attempt at hip manipulation done in his village. This resulted in a significant mechanical axis deviation of the right lower limb. The cervical and dorsolumbar spine was fused in flexion and both feet had fused joints and severe midfoot cavus deformities. The right hip, right knee and left hip were operated in that sequence, spaced at intervals of 6 weeks. Cemented prostheses of the Charnley design were used for both hips. Hip replacement required anterior muscle release from the iliac crest, through a separate incision for correction of the deformity.

Positioning of the patient intra-operatively was a problem. Severe kyphotic deformity of the cervical and dorsolumbar spine precluded the use of the supine position due to inherent lack of stability and for fear of causing vertebral fracture and neurological deficit. The lateral position was chosen as it was safer and more stable. Induction of anaesthesia was also risky and an awake-intubation was performed using flexible laryngoscopy and 4% topical anaesthesia, taking care not to extend the rigidly fused cervical spine.

During the right hip replacement, an improvised exposure technique without trochanteric osteotomy was implemented, which has since proven to be extremely valuable in 6 subsequently performed cases of hips ankylosed in an unsound position of extreme external rotation.

Technique

In the lateral position, a conventional posterolateral approach to the hip is carried out. A modified skin incision is required in view of the severity of the hip ankylosis in flexion. The proximal extent of the skin incision should parallel the degree of hip flexion deformity till the tip of the greater trochanter and then extend along the femoral shaft distally. The incision is thus centred over the direction of the fibres of the gluteus medius which makes it convenient to dissect on either side of this muscle. This curvilinear incision converts into an ‘S’ shaped incision, once the deformity is corrected and the hip is straightened out. A plane is developed between the gluteus maximus and minimus after incising the fascia lata and gluteofemoral fascia.

Due to severe external rotation deformity, the posterior border of the greater trochanter is almost in contact with the posterior wall of the acetabulum and the posterior aspect of the femoral neck cannot be visualized. An anterior plane is now developed between the gluteus medius and tensor fascia lata muscle proximally and between the gluteus medius and reflected head of the rectus femoris and vastus lateralis in the deeper layer and distally. The reflected head of the rectus is elevated to expose the anterior, superior and inferior aspects of the femoral neck. A finger is inserted in the narrow gap between the acetabulum and posterior aspect of the femoral neck, thus permitting a global orientation of the femoral neck.

The neck osteotomy is started anteriorly but halted half-way for fear of damaging the posterior acetabular wall if continued all the way through. A second osteotome guided by the palpating finger, is inserted posteriorly in the gap between the posterior acetabular wall and the posterior aspect of the femoral neck and carried forwards to meet the anterior osteotomy in the form of an inverted ‘V’ (Fig. 1). A safe neck osteotomy can thus be executed by this technique, without risk of damage to the sciatic nerve or posterior acetabular wall.
<table>
<thead>
<tr>
<th>Case No.</th>
<th>Diagnosis</th>
<th>Age (years)</th>
<th>Duration of disease (years)</th>
<th>Preop ambulatory status</th>
<th>Preop deformities</th>
<th>Order of replacement</th>
<th>Other Orthopaedic/systemic affection</th>
<th>Score Preop</th>
<th>Score Postop</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Ankylosing spondylitis</td>
<td>35</td>
<td>16</td>
<td>Bedridden for 7 years</td>
<td>Rt hip 90° FFD, 10° FadD, 35° ER Malunited fracture shaft femur Rt knee 90° FFD Lt hip 75° FFD, 20° FadD, 45° ER Lt knee 90° FFD</td>
<td>Right hip Right knee Left hip</td>
<td>Fused cervical &amp; dorsolumbar spine Bilateral cavus deformities of feet</td>
<td>Rt hip : 3-1-1,C Rt knee : 30,C Fn score : 0 Lt hip : 3-1-1,C</td>
<td>6-3-3,C 88,C 60 6-4-3,C</td>
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<td>2</td>
<td>Rheumatoid arthritis</td>
<td>38</td>
<td>11</td>
<td>Wheelchair bound / steroid dependent, cushingoid features</td>
<td>Rt hip 30° FFD, 20° FadD Lt hip 20° FFD, 20° FadD Rt knee 30° FFD Lt knee 40° FFD</td>
<td>Right hip Left hip Right knee Left knee</td>
<td>Elbow FFD 20° Swan neck &amp; boutonniere deformities of both hands</td>
<td>Rt hip : 3-1-1,C Lt hip : 3-3-1,C Rt Knee : 45,C Fn score : 0 Lt knee : 45,C Fn score : 0 Lt knee : 40,C Fn score : 0</td>
<td>6-4-3,C 6-4-3,C 90,C 50 90,C 50</td>
</tr>
</tbody>
</table>

ER — External rotation  
FadD — Fixed adduction deformity  
FFD — Fixed flexion deformity  
FN — Function score
Case 2

A 38-year-old female suffering from rheumatoid arthritis was bedridden for the last 11 years. She presented with burnt-out disease and deformities of various joints which are listed in Table 1. The patient was wheelchair bound and barely able to carry out activities of daily living (American Rheumatism Association Class IV). The patient had severe upper limb deformities involving both hands, wrists and elbows. She had been on prolonged unsupervised steroid therapy for the past 8 years and intermittently had also received gold injection and chloroquine. She presented with typical cushingoid features of truncal obesity, hirsutism, striae and amenorrhoea, despite steroid therapy being terminated 6 months earlier.

A suppression of the hypothalamo-pituitary-adrenal axis was anticipated and both hips, followed by both knees, were replaced sequentially but not simultaneously, under perioperative steroid cover to avert the risk of precipitating an Addisonian crisis. Cemented prostheses were used for both hips and both knees.

RESULTS

Each hip and knee arthroplasty was assessed individually, using for the hip the numerical classification of Merle d’Aubigné and Postel (1954) modified by Charnley (1979)3 and for the knees, the Knee Society Score. The status of the patients before and after surgery is shown in Table 1.

PROBLEMS AND COMPLICATIONS

Case 1

Problems of anaesthesia and patient positioning for surgery are common in cases of ankylosing spondylitis and risks of iatrogenic injury to the fused cervical and dorsolumbar spine are real. Intra-operative positioning of a patient with multiple contractures and a fused spine is difficult and adequate precautions must be taken in order to avoid inadvertent injury. Adequate head rings should be placed below the head in the supine position during intubation and surgery to avoid hyperextension of the fused cervical spine. Positioning of the patient in the ward, in the interim period between surgeries is also problematic and unconventional methods are occasionally employed.

The preoperative malunited fracture of the right femoral shaft caused a significant shift in the mechanical axis and careful preoperative planning before the right knee replacement was essential to avoid a malalignment problem.

The marked and long-standing hip contracture required an extensive soft tissue release of the muscles (gluteus medius and minimus, tensor fascia lata, rectus femoris) from the iliac crest. A tenotomy of the iliopsoas tendon was also required to correct the severe flexion deformity. This resulted in poor muscle control of the right replaced hip which subsequently dislocated in the first postoperative week. The hip was relocated and the patient placed in a double hip spica for a duration of 6 weeks to allow soft tissue contracture in an optimal and stable position.

At the end of a 3-year follow-up, both hip joints are stable and have a functional range of motion (Table 2). No evidence of heterotopic bone ossification is seen in either of the hips.

A bilateral midfoot osteotomy was performed to correct the cavus deformities and allow the patient to stand. The left knee contracture required a posterior soft tissue release with a ‘Z’ lengthening of the hamstrings and a Yount’s release. Postoperatively, the patient is able to ambulate for long distances with the help of bilateral elbow crutches and is able to perform most functional activities.

Case 2

Preoperative suppression of hypothalamo-pituitary-adrenal axis was managed by perioperative steroid cover to avert an Addisonian crisis. Following the left knee replacement, the patient developed a mild wound soaking on the fourth postoperative day which was managed by suppressive antibiotics. No organisms or pus cells were detected on the primary smear nor were any organisms grown on culture.

Figure 1 Line diagram showing inverted V osteotomy of the femoral neck.
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<th></th>
<th>PREOP ROM</th>
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<td>Int. rotn</td>
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Add —Adduction
ER def —External rotation deformity
FadD —Fixed adduction deformity
FF —Further flexion
FFD —Fixed flexion deformity
Both knees developed mild flexion contractures in the late postoperative period which interfered with the rehabilitation protocol. These deformities were resistant to conservative techniques, such as plaster wedgings and push-knee splints, and ultimately required a ‘Z’ lengthening of the hamstring tendons. At the 2-year follow-up, the patient is able to ambulate with a walker and perform all activities of daily living (Table 2).

DISCUSSION

This report is unique from the point of view that the patients were neglected and bedridden for variable lengths of time and present late with severe deformities of the limbs. Difficulties and problems are many in such cases, and an attempt has been made to address some of these. Most of these patients had been bedridden for a long length of time and present late with multiple joint deformities. Although the main aims of surgery in these crippled patients are relief of pain and improvement of function, the correction of deformity is also important as a means of restoring normal mechanics. Quadruple joint replacement in polyarthritic patients is a well accepted, though daunting task. Few recommendations are available in the literature regarding the technical details of execution of total joint replacement in difficult situations, rehabilitation protocol, the muscle releases required, or sequence of joint replacement. These are not universal but are required to be individually tailored to each patient. Replacing all 4 joints in a patient disabled by a severe systemic disease, in addition to polyarthritis, requires careful preoperative planning and assessment.

The systemic nature of the disease is an important consideration. Extensive involvement of the upper limbs and spine is not a contraindication to surgery, but significantly compromises the overall functional result. Though relief of pain and range of motion were affected dramatically in both our patients following quadruple joint replacement, their functional scores improved much less. Both patients required orthotic support to ambulate in the rehabilitation period postoperatively. Frequently, walking aids need to be individualized or appropriately customized to each patient’s requirement, especially in rheumatoids with upper limb involvement. Associated surgical procedures are often required, either singly or in combination, in order to bring these neglected patients to their full ambulatory potential, as for example, the midfoot osteotomies required in case 1.

Every patient needs to be questioned in detail regarding prolonged steroid use and due precautions need to be taken to avoid precipitating an Addisonian crisis in the peri-operative period. Early and late complications are higher in this group of patients especially with respect to greater risk of infection, pathological fractures, heterotopic bone ossification and postoperative dislocation.

Technical difficulties during surgery are frequently encountered in patients with ankylosing spondylitis and need to be addressed. Positioning during surgery is difficult and severe spinal and limb deformities usually preclude the use of the supine position for fear of causing iatrogenic spinal fractures and neurological deficit. The posterolateral approach in lateral position is generally the safest and most stable position. Severe external rotation ankylosis prevents a global orientation of the femoral neck and is fraught with the problems of sciatic nerve injury or damage to the posterior acetabular wall. The exact incidence of nerve injury during THR is not known, but subclinical nerve injury was detected in 70% of patients on EMG in a study by Weber et al. 57% of these injuries were thought to be due to direct injury, stretching or retraction.

We have devised a technique of ‘V’ shaped femoral neck osteotomy through the posterolateral approach for hips ankylosed in extreme external rotation. The ‘V’ shape prevents inadvertent extension of the osteotomy into the postacetabular wall and prevents sciatic nerve injury while ensuring reatiment of maximum neck length. This technique obviates the need for a trochanteric osteotomy which has several disadvantages, such as increased operative time, increased blood loss, greater risk of heterotopic bone ossification in addition to the problems of trochanteric nonunion and wire breakage. We have utilized this technique for 6 more hips ankylosed in extreme external rotation, with a follow-up of 2 to 4 years, and have been convinced about the need to incorporate this technique into the arthroplasty surgeons’ armamentarium.

A few technical tips are also worth considering during execution of THR in ankylosing spondylitis where the hips may be fused in an extreme position of flexion and external rotation.

Occasionally, a complete soft tissue release of muscles arising from the iliac crest may be required to correct the severe flexion-abduction deformities. The origin of the tensor fascia lata, gluteus medius and minimus are erased from the iliac crest. A psoas tenotomy is frequently required to achieve full correction of a long standing deformity. Such extensive soft tissue release may severely compromise the stability of the prosthetic joint and put it at serious risk.
of postoperative dislocation, as occurred in our case. A similar observation was made by other authors.\textsuperscript{5,7,8} Thus, the need for postoperative immobilisation and guarded rehabilitation cannot be over-emphasised in such neglected cases.

On the acetabular side, it is often difficult to assess the exact depth of the acetabular floor in an ankylosed hip. A useful technical tip is to create a drill hole using a 3.2 mm drill bit and to measure the depth of the acetabular floor with the help of a depth gauge. Power reaming can then be performed in small increments till an adequate thickness of the acetabular floor is retained, as read off on the depth gauge.

The inferior limit of the true acetabulum is defined by the transverse acetabular ligament which is often obscured by the inferior osteophyte. Removal of this osteophyte will permit a global orientation of the true acetabulum.

A final contentious issue in multiple joint replacements, is the sequence in which the joints should be replaced. In our opinion, in such neglected cases presenting with extreme deformities of hips and knees especially where the hips are ankylosed, hip replacement should precede knee replacement for the reasons enumerated by McElwain and Sheehan.\textsuperscript{5} In view of the fact that the technical execution of total knee replacement requires a mobile and neutral position of the hip to ascertain limb alignment, the authors endorse Sheehan’s view that even in an extreme ankylosed position, doing hip replacement first has the advantage of superior technical execution of the total knee replacement. In replacing the hip first, however, positioning of the patient postoperatively especially when the replacements are performed sequentially, requires due consideration.

REFERENCES