

## TOTAL HIP REPLACEMENT IN JUVENILE RHEUMATOID ARTHRITIS

### *Analysis of 59 Hips*

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The results of 59 Charnley low friction arthroplasties in 41 patients with juvenile rheumatoid arthritis are presented. Mean follow-up was 30 months and mean age at operation 30.5 years. At review 90 per cent had an excellent result and 10 per cent a good result as regards pain relief. Mobility was significantly improved in all but two patients. These two patients developed severe ectopic bone formation. With few exceptions, the results remained constant after 6 months. Intraoperative complications were the most common. Careful selection of patients, advance planning of surgery and appreciation of the developmental abnormalities in these hips are essential features in avoiding complications and achieving a good result.

*Key words:* arthroplasty; hip juvenile; rheumatoid arthritis

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Rheumatoid arthritis affecting children in their growing years can lead to widespread multiple joint involvement. Large joints are most often attacked first in juvenile rheumatoid arthritis. Involvement of the hip joints in the earlier years may be responsible for valgus deformity of the femoral neck, persistent femoral anteversion, subluxation of the hip joint and dysplasia of both the acetabulum and upper femur. Protrusio acetabulae may also occur at a later stage.

Synovectomy of the hip joint has not been practised to any great extent and intertrochanteric osteotomy can only be expected to postpone for a short while the inevitable time when arthroplasty must be considered.

Various types of arthroplasty of the hip joint have been performed in the past but erratic or poor results have been reported (Aufranc 1964). Nevertheless, many young patients with juvenile rheumatoid arthritis sooner or later reach a clinical state when the

severity of the pain combined with a lack of mobility make it difficult for the surgeon to withhold total prosthetic replacement.

An additional factor to be considered is the overall prognosis in terms of survival. Barkin (1952) reported a mortality of 20 per cent over 10 years and others (Ansell & Bywaters 1959, Ansell 1965 and Edstrom & Gedda 1957) have reported similar mortality rates.

There are very few reports in the literature dealing with total hip arthroplasty in patients with juvenile rheumatoid arthritis and hence we present here our experience of this operation and the follow-up results.

### PATIENTS AND METHODS

During the years 1970–1975, 41 patients, diagnosed before the age of 15 years according to the criteria of the American Rheumatism Association (Ropes et al. 1956, 1958), as having definite rheumatoid arthritis, had 59 Charnley low fric-

*Table 1. Age distribution at the time of surgery*

| Age in years<br>at time of operation | Number of hips |
|--------------------------------------|----------------|
| < 20                                 | 4              |
| 21-25                                | 7              |
| 26-30                                | 26             |
| 31-40                                | 15             |
| >40                                  | 7              |
| Total                                | 59             |

tion arthroplasties performed at the Rheumatism Foundation Hospital, Heinola, Finland. There were 35 females and 6 males, a female-male ratio of almost six to one. Eighteen patients had bilateral hip replacements. The age distribution at the time of surgery is shown in Table 1; the ages ranged from 18 to 47 years, with a mean of 30.5 years.

Duration of the systemic disease ranged from 11 to 40 years, mean 20.8 years, and the average age at onset of the disease was 9 years, range 2 to 15 years.

Follow-up period was from 1 year to 4.5 years, mean 2.5 years. One patient has not been seen after the 12-month postoperative review, but when contacted by telephone she reported that she was mobile and free of pain. Pain, sufficiently severe to disturb the patient, combined with lack of mobility and a willingness on the part of the patient to co-operate fully, were the chief considerations in selecting patients for surgery.

All patients were receiving aspirin at the time of surgery and this was continued as part of the prophylactic regime against thromboembolic complications. Seventeen patients (30 per cent) were receiving steroids at time of surgery. Prophylactic antibiotics, beginning preoperatively, were given, penicillin being the drug of choice unless a proven sensitivity existed. All the operations were performed in a standard operating room, built in 1952, with no significant modifications since and no special measures such as ultra-violet light or sterile air enclosures were used.

General anaesthetic was not used in 26 cases on account of rheumatoid involvement of the

temporo-mandibular joints or cervical spine; in these cases epidural anaesthesia was used.

Seven hips had been operated upon previously, one patient having had bilateral synovectomy at the age of 9 years.

A standard lateral approach was used with detachment of the greater trochanter in all cases. In many cases a psoas and adductor tenotomy were carried out. Re-attachment of the trochanter in the earlier part of the series was by the Charnley method and later by the method of Ritter (1972).

In the early postoperative period attention was directed towards the prevention of thromboembolism, by elevating the end of the bed, wearing elastic stockings, and encouraging the patients to move the lower limbs in bed. The drains were removed after 48 hours.

Beginning on the third postoperative day, the patients were helped out of bed for a short walk, the length of the walk then being increased daily. Physiotherapy in the swimming pool was started when the wound had healed, usually about 14 days after surgery.

During the first 2 weeks, an abduction pillow was strapped between the legs while the patient was in bed.

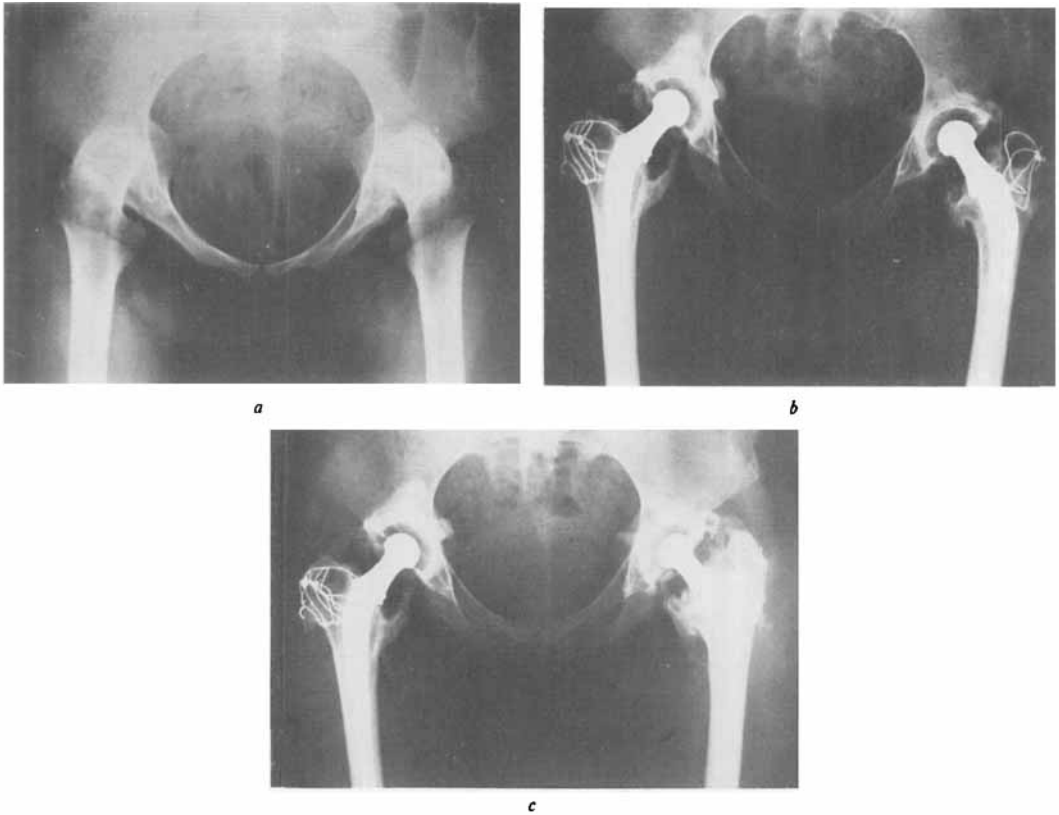
## RESULTS

Using the method of Merle d'Aubigné & Postel (1954) each hip was classified according to pain, mobility and function preoperatively and at each postoperative review, i.e., at 6 months, 1 year, 2 years and 4 years.

Using the above classification 56 hips (95 per cent) were in grades two, three or four and the remaining three hips in grade six preoperatively. Postoperatively 53 hips (90 per cent) were pain-free (grade six) and the other six hips (10 per cent) had pain only on beginning to walk (grade five).

*Table 2. Range of movement—extension-flexion*

| Movement in degrees | Number of hips (%) |     |                 |     |
|---------------------|--------------------|-----|-----------------|-----|
|                     | preoperatively     |     | postoperatively |     |
| < 30°               | 22                 | 37% | 1               | 2%  |
| 30°-60°             | 22                 | 37% | 6               | 10% |
| > 60°               | 15                 | 26% | 52              | 88% |
| Total               | 59                 |     | Total           | 59  |



*Figure 1. (a) Preoperative radiograph showing ankylosis of the right hip joint. (b) Radiograph to show replacement of the right hip joint, 1 year after surgery. (c) Radiograph showing severe ectopic bone formation around the right hip joint, 4 years after operation.*

Mobility, measured numerically as the composite range of three movements, extension-flexion, adduction and rotation is graded one to six preoperatively and postoperatively.

Preoperatively 15 hips (25.5 per cent) had less than 30 degrees of movement, 16 hips (27 per cent) had between 30 and 60 degrees and 19 hips (32 per cent) between 60 and 100 degrees. The remaining nine hips (15 per cent) had more than 100 degrees of movement. Postoperatively 42 hips (73 per cent) had greater than 160 degrees of movement; 14 (24 per cent) had between 100 and 160 degrees. One hip with ectopic bone formation has 60 degrees of movement and the other hip for the same reason is completely ankylosed and is classified as grade one.

Twenty-two hips (37 per cent) had a preoperative range of movement, extension-flexion, less than 30 degrees (Table 2) and the same number of hips had a range of movement, extension-flexion, of between 30 and 60 degrees. The remaining 15 hips (26 per cent) had more than 60 degrees extension-flexion.

Postoperatively only one patient had a range of movement, extension-flexion, less than 40 degrees. This patient (Figure 1, a,b,c) had a flexion contracture of 75 degrees preoperatively and an ankylosed hip. Six months postoperatively 90 degrees of flexion was possible but over the next 2 years the range of flexion steadily decreased due to severe ectopic bone formation and the hip is again ankylosed. Six hips (10 per cent) had a range of flexion at review of 60 degrees, but five of

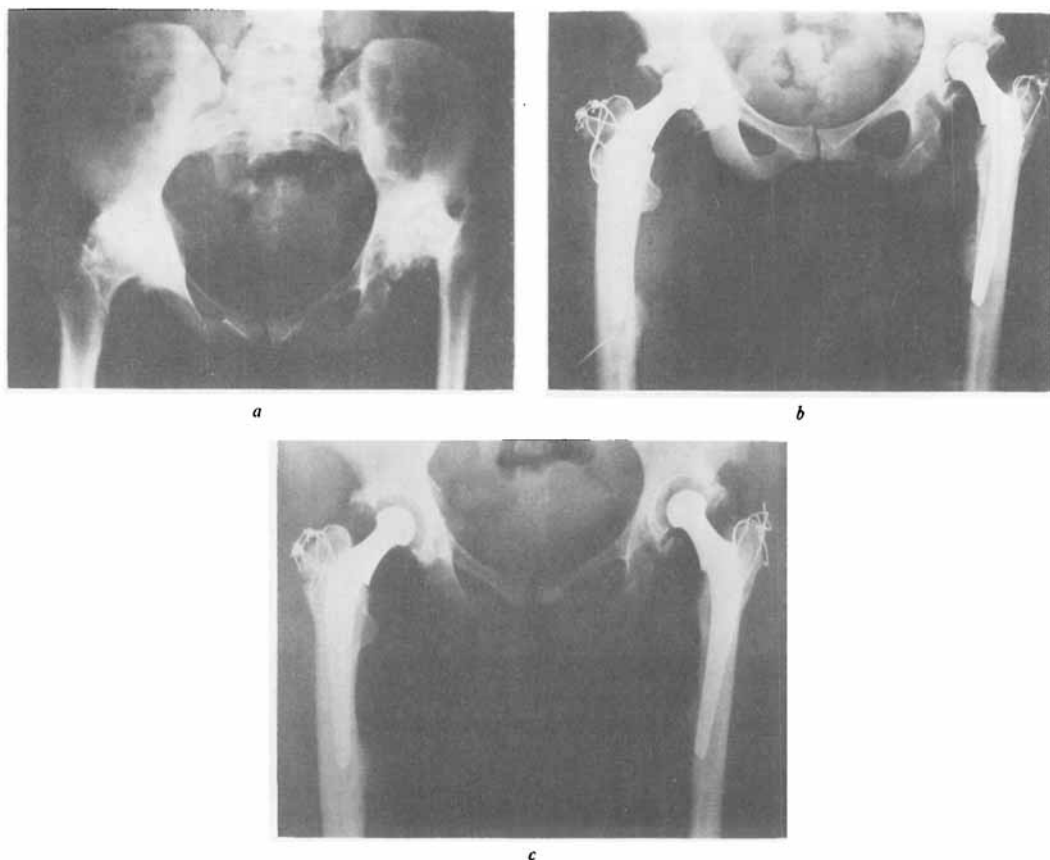


Figure 2. (a) Preoperative radiograph. (b) Radiograph, 2 years after bilateral hip replacement showing perforation of the medial femoral cortex bilaterally with new bone formation. (c) Radiograph 3 years after bilateral hip replacement shows no significant change.

them had less than 30 degrees extension-flexion preoperatively. The remaining 52 (88 per cent) had a postoperative range of movement, extension-flexion, of more than 60 degrees. Thus overall only one patient, the one described above (Figure 1, a,b,c), did not obtain any lasting improvement in range of movement, extension-flexion.

In general and with few exceptions, the results obtained at 6 months remained unchanged.

Flexion contracture preoperatively (Table 3) greater than 60 degrees was present in eight hips (13.5 per cent) and nine hips (15 per cent) had a flexion contracture between 30 and 60 degrees. The remaining 42 hips (71 per cent) had a flexion contracture

between 0 and 30 degrees. Postoperatively no patient had a flexion contracture greater than 30 degrees, the only hip now ankylosed is in a position of 20 degrees of flexion.

### Complications

One patient, aged 37 years developed deep venous thrombosis requiring anticoagulation. There were no wound healing problems or superficial wound infections and all patients had their sutures removed on the 14th postoperative day.

There have been no deep infections in this series.

Intraoperative complications occurred, however, on three occasions, the femoral

*Table 3. Flexion contracture in degrees*

| Degrees | Number of hips<br>preoperative (%) |        | Number of hips<br>postoperative (%) |       |
|---------|------------------------------------|--------|-------------------------------------|-------|
| < 30    | 42                                 | (71)   | 59                                  | (100) |
| 30-60   | 9                                  | (15.5) |                                     |       |
| >60     | 8                                  | (13.5) |                                     |       |
| Total   | 59                                 |        | Total                               | 59    |

cortex being perforated by the tip of the prosthesis at time of insertion (Figure 2, a,b,c). Perforation of the acetabular floor occurred on two occasions also and two femoral components were placed in excessive varus.

There were no dislocations, subluxations or intraoperative fractures.

Postoperative ectopic calcification has developed (Figure 1c) to a severe degree in two patients. One patient, female aged 36 years, has no movement of the hip joint at all and the other, female aged 22 years, has only 60 degrees composite range of movement.

## DISCUSSION

Few reports deal with total hip replacement in juvenile rheumatoid arthritis. Arden (1974), Halley & Charnley (1975) and Bisla et al. (1976) have all reported series which include a number of rheumatoid patients less than 30 years old at the time of operation. All patients in this series, however, developed rheumatoid arthritis while still in the growing years, resulting in growth deformities which caused problems at surgery.

Selection of patients for total hip replacement is very difficult and it is not possible to give anything more than guide lines. The first and most important indication for total hip replacement is motivation on the part of the patient. Fortunately, in this age group, lack of motivation is seldom a problem. Secondly, the general condition of the patient with respect to the systemic and local disease in other joints has to be considered, and a plan of treatment worked out. Thirdly, in the case of bilateral hip involvement, occasionally the

contralateral hip can be left unoperated, even if stiff, provided it is in a good position. Many patients in this series required surgery of other lower limb joints soon after becoming more mobile on account of the improvement in the hip function following arthroplasty. Therefore the possibility of multiple operations has to be considered at the outset.

In this series, severe pain was seldom the sole indication for surgery; however, moderately severe pain (41 hips, 69 per cent in this series) combined with lack of mobility (50 hips, 85 per cent in this series) does indicate the need for surgery. Those patients with a bed to chair existence or those who can walk only with support (31 hips, 52 per cent in this series) are in need of hip replacement even in the absence of severe pain. Halley & Charnley (1975) pointed out that due to the built-in restraints in these patients, they expect 25 to 30 years of use before revision and replacement may be necessary. If in doubt about the need to operate, then the pseudarthrosis test advocated by Halley & Charnley (1975) should provide the answer.

The results for pain relief, 90 per cent excellent, 10 per cent good, in this series are comparable to the results of Halley & Charnley (1975) and Bisla et al. (1976).

In many cases the patient would consider this benefit alone justified the operation. Mobility in our series was significantly improved with the exception of the two patients who developed severe ectopic bone formation.

The correction of flexion contracture is important especially when, as is often the case, other joints will require replacement.

Although the overall measured improvement in mobility is not so noticeable as in adult rheumatoid arthritic patients with total hip replacement, it is sufficient to make most patients independent again. Although many do not walk far, most are free from all external supports and a few have become employable. The maintenance of the overall good results is particularly encouraging.

Halley & Charnley (1975) and Bisla et al. (1976) each report one case of infection in a comparable sized series; however, the numbers are small as in our series and therefore few conclusions can be drawn.

Ectopic bone formation occurred in three hips in two patients in this series resulting in a poor result for one patient and a less than satisfactory result in the other. Bisla et al. (1976) found 14 cases in a series of 67 hips. We feel that this is more likely to occur in juvenile rather than adult rheumatoid arthritics and to be related to the degree of ankylosis and subsequent surgery.

Operative complications proved to be the most troublesome but with experience we have learned to minimize them. Depending upon the age at which the disease began, juvenile rheumatoid arthritic patients have a variable degree of hypoplasia of the acetabulum, narrowing of the femoral medullary canal, and anteversion of the femoral neck. It was often difficult to prepare a good socket to suit even the smallest acetabular prosthesis and so custom made, smaller cups should be available.

Fracture of the acetabular floor can only be avoided by gentle reaming or in some cases curetting instead of reaming.

Failure to appreciate completely the narrowing of the upper femoral medullary canal led to perforation by the prosthesis on three occasions and though these patients are now trouble-free, two of them at 3 years postoperation and one at 2 years postoperation, they are nevertheless a potential source of trouble in the future. A custom-made prosthesis should be made prior to surgery if it is doubtful that the straight narrow stem prosthesis will be adequate. A Nippon type pros-

thesis is a suitable alternative. At operation, if in doubt about perforation of the stem a lateral radiograph should be taken. In all cases, both prosthetic sites should be prepared before fitting the acetabular component.

Bisla et al. (1976), from their experience with 26 rheumatoid arthritic patients, recommend that the femoral prosthesis always be aligned in relation to the plane of the knee joint, which in some cases requires the prosthesis to be placed anteroposteriorly. This view fails to appreciate the fact that the muscles acting on the hip joint will, over the years, have adapted to the femoral anteversion and so stability is more likely to be achieved and maintained if both parts of the prosthesis are inserted in a position most closely resembling the joint being replaced. In this series no attempt was made to correct the anteversion, and at 30 months mean follow-up (range 1 to 4.5 years) there have been no dislocations or loosening.

Positioning of the femoral component in excessive varus is an additional problem to be anticipated; both our cases were attributed to inadequate reaming of the femoral canal and so insertion of the prosthesis in a neutral position was not possible.

### *Conclusions*

Hip replacement in juvenile rheumatoid arthritic patients can be rewarding if great care is taken in selection of patients and their enthusiastic co-operation is obtained.

Surgery must be planned well in advance and a full range of prostheses made available. In certain cases custom-made prostheses are essential.

At operation, hypoplasia of the joint and excessive anteversion of the femoral neck must be appreciated.

Operative complications are avoidable and general complications in young patients, even with rheumatoid arthritis, should be few. Hence a good result for pain relief, increased mobility and independence can be anticipated.

## REFERENCES

- Ansell, B. M. (1965) Still's disease. *Progress in clinical rheumatology*, Ed. Dixon, A. St. J. p. 95 J. A. Churchill, London.
- Ansell, B. H. & Bywaters, E. (1959) Prognosis in Still's disease. *Bull. Rheum. Dis.* **9**, 189–192.
- Arden, G. P. (1974) Total hip replacement in juvenile chronic polyarthritis and ankylosing spondylitis. *Orthop. Digest* Dec., 14–22.
- Aufranc, O. E. (1964) Surgery of the hip in rheumatoid arthritis and osteoarthritis. *Bull. Rheum. Dis.* **14**, 335–338.
- Barkin, R. E. (1952) Juvenile rheumatoid arthritis, a long term follow up. *Ann. Rheum. Dis.* **2**, 316–317.
- Bisla, R. S., Inglis, A. E. & Ranawat, C. S. (1976) Joint replacement surgery in patients under thirty. *J. Bone Jt Surg.* **59-A**, 1098–1104.
- D'Aubigné, R. M. & Postel, M. (1954) Functional results of hip arthroplasty with acrylic prosthesis. *J. Bone Jt Surg.* **36-A**, 451–475.
- Edström, G. & Gedda, P. O. (1957) Clinical prognosis of rheumatoid arthritis in children. *Acta. rheum. scand.* **3**, 129–153.
- Halley, D. K. & Charnley, J. (1975) Results of low friction arthroplasty in patients thirty years of age or younger. *Clin. Orthop.* **112**, 180–191.
- Ritter, M. A. (1972) Transposition of the greater trochanter: A new method of attachment. *J. Bone Jt Surg.* **54-A**, 179–180.
- Ropes, M. W., Bennet, G., Cobb, S., Jacox, R. & Jessar, R. A. (1956) Proposed diagnostic criteria for rheumatoid arthritis. *Bull. Rheum. Dis.* **7**, 121–124.
- Ropes, M. W., Bennet, G., Cobb, S., Jacox, R. & Jessar, R. A. (1958) 1958 revision of diagnostic criteria for rheumatoid arthritis. *Bull. Rheum. Dis.* **9**, 175–176.

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