A NEW TECHNIQUE FOR GREATER TROCHANTERIC HIP ARTHROPLASTY

ANATOL AXER, ALAN ANER

From the Assaf Harofeh Hospital, Zerifin

This paper describes a new technique for greater trochanteric hip arthroplasty in which the femur is divided at the subtrochanteric level and the upper fragment rotated through 180° to place the greater trochanter deeply in the acetabulum; with the lower limb in the weight-bearing position the fragments are then fixed with a short intramedullary nail.

This operation was carried out in a boy aged 4 years 6 months in whom the femoral head and neck had been destroyed by septic arthritis. Ten years later leg-lengthening was performed. When reviewed at the age of 20, he had a stable hip, a satisfactory range of painless movement, and shortening of only 2.5 cm; he could walk and run for long distances with only a slight abductor lurch.

We describe what we believe to be a new technique of greater trochanteric hip arthroplasty in a child whose femoral head and neck had been destroyed by septic arthritis.

CASE REPORT

In 1965 a boy aged 3 years 6 months was brought to our outpatient clinic; six months earlier, in another hospital, he had undergone an operation on the right hip which had been destroyed by septic arthritis. Physical examination revealed 5 cm of shortening of the right femur and a marked limp. The hip had considerable limitation of movement in all directions, and the "push-pull" sign was positive. Radiographs revealed that the femoral head and neck were missing, but there was overgrowth and proximal displacement of the greater trochanter; the acetabular depth was satisfactory (Fig. 1).

One year later, in 1966, a greater trochanteric hip arthroplasty was attempted using Colonna’s technique (1935). The hip was exposed through a Smith-Petersen incision and the dense fibrous tissue removed from the acetabular fossa. No remnants of the femoral head or neck were encountered. All muscle attachments were removed by sharp dissection from the proximal end of the femoral shaft and from both trochanters; the greater trochanter could then be brought down to the level of the acetabulum by applying longitudinal traction to the limb. However, a stable reduction could not be achieved without abducting the limb to almost 90° at the hip. To place the limb in the weight-bearing position after reduction would then have required a 90° varus osteotomy of the femur, and this would have resulted in an

![Fig. 1](image1)

Tracing of the original radiograph after septic arthritis in the right hip of a boy aged 3 years 6 months; the femoral head and neck are absent.

![Fig. 2](image2)

Tracing of a radiograph taken soon after greater trochanteric arthroplasty with 180° rotational subtrochanteric osteotomy of the femur; the osteotomy was fixed with a short intramedullary nail. The neck-shaft angle appears almost normal.

A. Axer, MD, former Head of Department
Department of Orthopaedic Surgery and Traumatology, Medical Centre, Assaf Harofeh Hospital, Zerifin, Israel.
A. Aner, MD, Assistant Orthopaedic Surgeon
Orthopaedic Department, Wolfson Medical Centre, Holon, Israel.

Requests for reprints should be sent to Mr A. Axer.

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by bringing the limb into the weight-bearing position (without causing any appreciable additional shortening). The fragment was then fixed to the shaft with a short intramedullary nail (Fig. 2). The abductor muscles were secured to the lesser trochanter with silk sutures through holes made in the bone, and the wound was closed in layers. A plaster spica was applied with the limb in slight abduction.

Six weeks later there was radiographic evidence of union at the site of the osteotomy. The hip was stable and movements were limited but painless; shortening of the limb amounted to 7 cm. There was a flexion contracture at the hip of over 20° which was corrected by extracting the nail and excising a considerable amount of scar tissue from the anterolateral aspect of the joint. Partial weight-bearing was started and gradually increased until the crutches could be discarded. The boy walked with a limp and with the limb in mild lateral rotation.

Four years later, in 1970, the trochanteric apophysis was well contained but fragmented (Fig. 3). Shortening of 7 cm was still evident and movement was limited but painless. The boy walked with a limp, but could run and play soccer.

In 1973 the clinical picture was similar. Radiographs revealed a consolidated apophysis separated from the femoral shaft by a rather wide "growth plate", as well as appositional growth of new bone along the lateral shaft of the proximal femur (Fig. 4). This rather conspicuous newly-formed bone (whose width at one point amounted to about one-third of the total width of the femoral shaft) was connected proximally to a medially bent, fragmented piece of bone, 3 cm long and 1 cm wide.

By the time the boy had reached the age of 14, his right limb was still 7 cm short and he had an operation to lengthen the femoral shaft; after operation the leg-length discrepancy was reduced by almost 5 cm. The postoperative course was uneventful and the hip remained stable. Radiographs revealed attachment of the trochanteric apophysis to the acetabular floor by what appeared to be fibrous union (Fig. 5); a roundish shadow, that looked like a femoral head, could be seen above the (rotated) lesser trochanter.

In 1978, when the boy was 16, he walked with a mild abductor lurch, but was able to run and play soccer and basketball. Shortening amounted to 2.5 cm. Flexion at the hip was 90°, abduction 40°, and adduction 30°. Medial rotation in flexion was nil and in extension 10°; lateral rotation in flexion and in extension was 10°. Radiographs revealed that the trochanteric apophysis was reduced in height (Fig. 6). The extra-articular "femoral head" had undergone adaptive changes and resembled a greater trochanter separated from the femoral shaft by a thin translucent area which apparently represented the remnants of the original epiphyseal growth plate.

In 1982, when the patient was 20 and on active service with the Israel Defence Forces, he had no pain, only a slight limp, could walk for long distances and move freely, with no alteration to his pattern of activity.

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unacceptable degree of additional shortening. The original plan was therefore abandoned and the operation terminated until a different technique could be worked out. The wound was closed in layers and a plaster spica applied with the greater trochanter in the reduced position.

Three weeks later the hip was re-opened and a transverse subtrochanteric osteotomy was performed. The proximal fragment was lifted out of the acetabulum and rotated through 180° so that the greater trochanter could be placed deeply into the acetabular fossa. The femoral shaft was realigned with the proximal fragment
could run. The clinical findings were identical with those at the previous examination. Radiographs showed that the extra-articular "femoral head" had reshaped into a "greater trochanter" and was attached by bone to the femoral shaft (Figs 7 and 8); the epiphysial growth plate was closed. There was no evidence of bony ankylosis between the apophysis and the acetabular floor. Movement at the hip occurred between the proximal end of the femur and the apophysis, as demonstrated on abduction (Fig. 7) and adduction (Fig. 8). These findings were confirmed by fluoroscopy.

DISCUSSION

Greater trochanteric hip arthroplasty has often been performed in children in whom the femoral head and neck are absent as a result of septic arthritis (Weissman 1967; Freeland, Sullivan and Westin 1980). In the majority of instances Colonna's technique has been employed, frequently supplemented by a varus osteotomy of the proximal femoral shaft (Colonna 1935). The results were often marred either by ankylosis of the hip (Weissman 1967) or by recurrence of the subluxation (Freeland et al. 1980). Neither of these complications occurred in our patient during the 16 years that we followed him to skeletal maturity.

The operative technique described in this report seems to offer several advantages: reduction of the greater trochanter is stable, since the neck-shaft angle does not straighten as it nearly always does after varus osteotomy of the proximal femoral shaft in children (Mirowski, Axer and Hendel 1984); shortening of the femoral shaft, which is always present and usually marked, is not increased appreciably, if at all; the newly-created abductor lever arm resembles a normal one; and the severe abductor lurch is substantially reduced. In our patient highly satisfactory, painless movement was achieved and sustained over a period of 16 years. No clinical or radiographic evidence of osteoarthritis was noted. The apophysial (trochanteric) growth plate seems to have remained active, since no additional shortening of the femur occurred after either the arthroplasty or the subsequent lengthening operation. Because of the excellent stability of the reconstructed hip, it was possible to reduce the leg-length discrepancy by lengthening the affected femur rather than shortening the opposite healthy limb.

Interestingly, some 10 years after the arthroplasty, during which time no remnants of the femoral head and neck had been observed, radiographs revealed a roundish shadow bearing a striking resemblance to the femoral head in its new outwardly rotated position (Fig. 5). This poorly mineralised structure subsequently underwent adaptive changes over a period of several years, and when last examined radiographically bore a striking resemblance to the greater trochanter (Fig. 6).

The fragmentation and subsequent consolidation of the trochanteric apophysis reflects the seriousness of the circulatory deficiency caused by the complete, even if only temporary, separation of the proximal fragment of the femur from its blood supply at operation. In fact, this operation can be viewed as a successful autotransplantation of an apophysis using the trochanteric segment of the proximal femoral epiphysial growth plate.

REFERENCES


