TRAUMATIC DISLOCATION OF THE HIP JOINT

Review of One Hundred and One Dislocations

J. R. ARMSTRONG, LONDON, ENGLAND

Formerly of the Orthopaedic Service, the Royal Air Force

The patients reviewed in this paper received all or part of their treatment in the orthopaedic centres of the Royal Air Force between June 1940 and June 1945. More than half of them were admitted to one of the centres directly after injury, and others were seen within the first few days. In many, however, initial treatment had been carried out elsewhere, often under circumstances of extreme difficulty, and several months had sometimes elapsed before the patient reached this country.

It must be stressed that one of the important problems in relation to traumatic dislocation of the hip joint, namely the exact incidence of late sequelae, is outside the scope of this review for the reason that it has not been possible to review all cases over a long enough time. The average period of follow-up is no more than three to four years, and this is far too short a time in which to estimate the frequency of traumatic arthritis due to avascular necrosis. This paper records only the early results of dislocation of the hip joint, and the complications developing during the first few years, in one hundred young and previously healthy adults.

INCIDENCE AND MECHANISM OF DISLOCATION OF THE HIP JOINT

During the period under review, approximately 52,000 patients with major and often multiple injuries were admitted to the orthopaedic centres of the Royal Air Force. The incidence of dislocation of the hip joint was therefore one in every 520 patients. This frequency, as compared with that of dislocation of other joints, is of some interest. Analysis of 123 dislocations of the larger joints treated in the orthopaedic centre at Ely during this five-year period shows that it included eighteen dislocations of the hip, six dislocations of the knee, forty-two dislocations of the shoulder, and fifty-seven dislocations of the elbow.

Before the introduction of the motor-car, dislocation of the hip joint was comparatively rare, and the classical cause was wide and forcible abduction of the lower limbs, the limb acting as a long lever to force the femoral head through the inferior aspect of the joint capsule. In this series, only eight dislocations were of this type, and ninety-three were due to considerable violence of high-velocity acting in the line of the shaft of the femur: fifty-three were due to crash landings and other aircraft accidents; thirty-six were due to motor-cycle and motor-car accidents on the road; one occurred in a railway accident; and two were due to crushing beneath falling masonry during air raids.

The exact nature of the dislocation depends upon the position of the limb when force is applied. If the hip joint is flexed and adducted, the head of the femur is driven out of the back of the joint where the capsule is weak and the acetabulum relatively shallow. With less flexion and less adduction the head is driven against the strong postero-superior buttress of the acetabulum which is fractured. If the hip is extended and abducted a central fracture-dislocation is produced.

The relationship between anterior and posterior dislocation of the hip joint depends also upon the mechanism of injury. Dislocation caused by violence of high velocity is essentially an injury with posterior displacement of the femur; on the other hand dislocation due to abduction may be anterior or posterior according to the degree of external or internal rotation of the limb at the moment that abduction force is applied. The only anterior dislocations in this series were due to excessive abduction.
It was surprising to find that four men sustained dislocation of the hip joint while playing rugby football—an injury which hitherto has been almost unknown in this game. The explanation lies in the fact that the organised games of a military service are not always characterised by great skill or experience. In all four cases the injury was due to one player jumping heavily on the shoulders of the patient while he was in a squatting position and endeavouring to pick up the ball—both these manoeuvres being highly unorthodox.

In dislocations due to aircraft accidents the high percentage of associated injuries is important. No less than thirty of the fifty-three dislocations were associated with other major fractures of the limbs or spine, and two were associated with severe burns as well as fractures. One of the serious problems in the management of aircraft injuries is the frequency in a single patient of multiple fractures, dislocations, wounds, and burns.

Classification of the various types of dislocation—Dislocations of the hip joint can be classified into four main types: simple dislocations, dislocations with fracture of the acetabular rim, dislocations with fracture of the acetabular floor, and dislocations with fracture of the femoral head (Table I). Such classification facilitates consideration of the treatment, incidence of complications, and estimation of end-results, which differ widely in the four groups.

<table>
<thead>
<tr>
<th>Simple dislocation</th>
<th>Dislocation with fracture of acetabular rim</th>
<th>Dislocation with fracture of acetabular floor</th>
<th>Dislocation with fracture of femoral head</th>
</tr>
</thead>
<tbody>
<tr>
<td>46 cases</td>
<td>43 cases</td>
<td>7 cases</td>
<td>5 cases</td>
</tr>
</tbody>
</table>

TREATMENT AND RESULTS IN SIMPLE DISLOCATIONS OF THE HIP JOINT

In simple dislocations of the hip joint management was relatively easy, and the results were much better than in any of the other types. The treatment of these cases soon became uniform throughout the R.A.F. Orthopaedic Service, namely: reduction by manipulation under general anaesthesia; immediate immobilisation in a hip spica for eight weeks; mobilisation with non-weight-bearing exercise for about four weeks; and finally, treatment at a rehabilitation centre for a month or six weeks with gradual return to full activity but without the more strenuous forms of rehabilitation. In early days, some surgeons delayed the application of a plaster spica for twenty-four to forty-eight hours after reduction of the dislocation; but patients were more comfortable if the joint was at once immobilised completely, and this practice soon became general. In a few centres the joint was immobilised in a Thomas’ knee splint with light traction, but no special advantage of such treatment was apparent. The period of complete immobilisation varied a little, but it was universal practice to defer weight-bearing for at least three months after injury.

The place of the rehabilitation centre in the treatment of these injuries was not, at first, quite clear. Many surgeons felt that it might not be desirable to permit strenuous rehabilitation. It became obvious, however, that patients who went to these centres were restored to full activity more quickly than those who did not, and rehabilitation did not cause any ill-effects. During the second half of the period under review the treatment of almost every patient was completed at one of the rehabilitation centres.

Early results of treatment in simple dislocations—The results are summarised in Table II. Patients were classified as normal if there was no muscle wasting, no limitation of movement, no radiographic evidence of abnormality, and no real discomfort after engaging
in full activity. Of the forty-six dislocations, thirty-five (76 per cent.) had no symptoms or disability remaining after a period of treatment ranging from four to seven months.

**TABLE II**

**Results in Forty-six Simple Dislocations of the Hip Joint**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal at the conclusion of treatment</td>
<td>35 cases</td>
</tr>
<tr>
<td>Calcification in capsule of joint (no disability)</td>
<td>2</td>
</tr>
<tr>
<td>Arthritic changes in the joint</td>
<td>6</td>
</tr>
<tr>
<td>Myositis ossificans</td>
<td>1</td>
</tr>
<tr>
<td>Avascular necrosis of the femoral head</td>
<td>1</td>
</tr>
<tr>
<td>Sciatic palsy</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>46 cases</strong></td>
</tr>
</tbody>
</table>

*Calcification of the capsule*—In two patients, radiographs taken at the conclusion of treatment showed a little calcification in the capsule of the hip joint, which, however, was not associated with disability.

*Arthritis*—Six patients developed clinical or radiographic evidence of arthritis of the hip joint. The clinical picture was fairly uniform: there was slight wasting of the thigh; movement of the joint was limited by one-quarter to one-third of the normal range; and there was discomfort or aching pain which was made worse by exercise. Radiographic changes were less definite. In two cases, the radiographs showed no abnormality; in four, there was narrowing of the joint space, this being associated with decalcification of the femoral head in two. In only one patient was the disability of such severity as to necessitate invaliding from the Service, the other five being able to continue duty in more sedentary branches.

*Myositis ossificans*—One patient developed myositis ossificans. Eight months after injury new-bone formation was obvious in the region of the muscles inserted round the hip;
there was limitation of movement and pain. This was one of the very few patients in
the series whose hip joint had not been immobilised after reduction. "Massage and
movements" had been ordered and this treatment was continued for ten weeks, after
which time the patient was allowed to begin weight-bearing.

*Avascular necrosis of bone*—Avascular bone necrosis of the femoral head developed in one
instance. Six months after injury, movement of the joint was limited to one-third of the
normal range; there was pain and disability; radiographic examination showed patchy
sclerosis of the femoral head.

*Sciatic palsy*—Sciatic paralysis occurred in one patient—a girl who was pinned under the
wreckage of a demolished building for three and a half hours. On being dug out she was
found to have a dislocation of the hip joint with sciatic paralysis. The dislocation was reduced
and treated in the usual manner, but there was no evidence of recovery of the paralysis
within ten months of injury.

**Late follow-up of simple dislocations**—After the war an attempt was made to secure
late reports on as many as possible of the hundred patients. This proved difficult. Six had
been killed in action while flying against the enemy; others had been demobilised, repatriated,

<table>
<thead>
<tr>
<th>TABLE III</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Follow-up of Nineteen Patients with Simple Dislocation</strong></td>
</tr>
<tr>
<td>(Questionnaire completed by patient)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Five patients</th>
<th>Hips reported to be completely normal at periods ranging from 13 to 49 months after injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Six patients</td>
<td>Occasional trivial symptoms—aching and vague pains—reported 11 to 41 months after injury</td>
</tr>
<tr>
<td>Three patients</td>
<td>Slight symptoms after exertion but no great disability 19 to 36 months after injury</td>
<td></td>
</tr>
<tr>
<td>Arthritis</td>
<td>One patient—at the fourth month there had been limitation of movement and pain</td>
<td>No change, some pain and stiffness (44 months)</td>
</tr>
<tr>
<td></td>
<td>One patient—at the tenth month there was aching and limitation of movement</td>
<td>No change, slight aching and stiffness (41 months)</td>
</tr>
<tr>
<td></td>
<td>One patient—at 9 months there was limitation of movement and aching</td>
<td>Pain, stiffness, and considerable disability (36 months)</td>
</tr>
<tr>
<td></td>
<td>One patient—at 14 months there had been some pain and limitation of movement</td>
<td>Pain, stiffness, and increasing disability (24 months)</td>
</tr>
<tr>
<td>Avascular Necrosis</td>
<td>One patient—6 months, one-third normal range of movement with pain and disability</td>
<td>Painful stiff hip with considerable disability (41 months)</td>
</tr>
</tbody>
</table>

and scattered all over the Empire; and some were on service abroad. Strenuous efforts were
made by Squadron-Leader Vere-Hodge to trace all cases and many were reviewed successfully
by means of a printed questionnaire which was answered by the patient, a method which
although not altogether satisfactory was in the circumstances the only practicable plan.

Late radiographic examination was sometimes possible. The results of this investigation in
the case of simple dislocations are summarised in Table III. Of the nineteen patients who
were traced one to four years after injury, fourteen had been classified as normal at the
conclusion of treatment. Of these, five reported that their hips were still quite normal; six
complained of occasional trivial aching or vague pain; and three complained of vague symptoms related only to exertion and not associated with serious disability.

Of the six patients classified at the conclusion of treatment as having clinical or radiographic evidence of arthritis, four were traced. Two had not become worse; both had some stiffness and pain after exertion but without much disability. One had been force-marched as a prisoner-of-war over a distance of 100 miles during the third year after dislocation and sustained the ordeal without any great trouble. The other two had symptoms and slight disability remaining three years after injury. The one patient in this group with early evidence of avascular necrosis of the femoral head was also traced. Forty-one months after injury his joint was very stiff and he had considerable pain and disability.

**TREATMENT AND RESULTS IN DISLOCATION OF THE HIP JOINT WITH FRACTURE OF THE ACETABULAR RIM**

Effective treatment of dislocation of the hip joint with fracture of the acetabular rim must achieve not only reduction of the dislocation but also accurate replacement of the acetabular fragment. Moreover, reduction of the fragment must be maintained until it has united by bone. In many instances the acetabular fragment is replaced accurately when the dislocation is reduced. It is then necessary only to immobilise the joint until union has taken place, the plan of treatment being identical with that of simple dislocations. When complete reduction of the acetabular fragment was not secured by manipulation the usual practice was to immobilise the limb in traction, either in a Thomas’ knee splint or by the Russell technique. In most instances the fragment fell back accurately into place within a few days.

**Table IV**

<table>
<thead>
<tr>
<th>Results in Forty-three Patients in which Dislocation was associated with Fracture of the Acetabular Rim</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal after treatment (3 to 8 months)</td>
</tr>
<tr>
<td>Died</td>
</tr>
<tr>
<td>Calcification in joint capsule (no disability)</td>
</tr>
<tr>
<td>Persistent displacement of acetabular fragment (no disability)</td>
</tr>
<tr>
<td>Arthritic changes in joint</td>
</tr>
<tr>
<td>Avascular necrosis of femoral head</td>
</tr>
<tr>
<td>Open reduction and mould arthroplasty</td>
</tr>
<tr>
<td>Failure to reduce dislocation</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Sciatic paralysis</td>
</tr>
</tbody>
</table>

In these circumstances traction was discontinued after five or six weeks and immobilisation was maintained by means of a hip spica. In one case, after successful manipulative reduction of the dislocation, a large fragment remained widely displaced and Wing-Commander J. Crawford Adams undertook operative replacement and internal fixation of the displaced fragment. This case is of particular importance in relation to the associated sciatic nerve palsy, and it will be referred to later.

**Early results of treatment in dislocation with fracture of the acetabular rim**—The results are summarised in Table IV. Two patients died, one within forty-eight hours of crash-landing an aircraft in the course of which he received multiple severe injuries, and one from pneumonia which developed five weeks after injury.

**Calcification in the capsule**—In one instance there was calcification in the capsule of the joint but function was normal at the conclusion of treatment.

**Unreduced acetabular fragment**—There was persistent displacement of a large acetabular fragment in one patient. The fragment did not fall into place when the joint was reduced; traction, which was applied nine weeks after injury, had no effect. Ten months later the joint was clinically and functionally normal despite a somewhat alarming radiographic appearance.

**Arthritis**—Nine patients developed clinical or radiographic evidence of arthritis. In one, the
hip joint appeared to be normal six months after injury but radiographs showed narrowing of the joint space and lipping of the acetabulum. Four patients had some pain and slight limitation of movement at the conclusion of treatment although radiographs were normal. Three, with incomplete reduction of the acetabular fragment, complained of pain and stiffness.

One patient who had been treated by massage and exercises immediately after reduction complained of pain and stiffness, and there was marked diminution of the joint space with lipping and new bone formation around the acetabulum.

*Avascular necrosis of bone*—Avascular necrosis of the femoral head occurred in one patient. This man was treated in a German prison camp. After repeated attempts to reduce the dislocation, various forms of skeletal traction were applied over a period of several weeks. Twenty-two months after injury the hip was fixed with 55 degrees of flexion and 20 degrees...
Dislocation of the hip joint in which a large acetabular fragment remained displaced after reduction (Fig. 4). There was sciatic palsy. Operative reduction and screw fixation was performed by Wing-Commander J. Crawford Adams. The nerve was impaled by the point of the fragment. The paralysis recovered.
of adduction deformity. Radiographs showed patchy necrosis of the femoral head, complete loss of the joint space, and destruction of the acetabular socket. 

Unreduced dislocation—In one patient who had sustained severe head injuries the dislocation was left incompletely reduced for three and a half months, at the end of which time there was fibrous ankylosis. Mould-arthroplasty was performed with a fairly satisfactory result. In one instance bilateral dislocations, sustained as the result of a railway accident, were left unreduced; one was central in type; the other was posterior and associated with fracture of the acetabular rim. Both lower limbs were immobilised in traction without any attempt at manipulative reduction. Although it became obvious as soon as traction was released that the dislocation was unreduced, the patient was encouraged to begin weight-bearing five months after injury, with consequent upward displacement of the femoral head. The opposite hip had ankylosed, and seven months after injury operative reduction of the dislocation was performed with some difficulty. Bilateral mould-arthroplasties were subsequently carried out, secondary revisions being required on both sides (one of these operations being performed in London by Dr Smith-Petersen).

Sciatic paralysis—Dislocation with fracture of the acetabular rim was associated with sciatic palsy of the external popliteal type in three instances. In each case a large acetabular fragment was widely displaced. In one, the fragment was reduced by operation five days after injury and the paralysis recovered almost fully within six months. In the second, the sciatic nerve was explored within seven months of injury and it was found to be compressed by the acetabular fragment. The nerve was freed but eight months later there was no evidence of recovery. In the third case, the acetabular fragment remained displaced; two years after injury there was still complete paralysis of the external popliteal division of the nerve.

**TABLE V**

<table>
<thead>
<tr>
<th>Normal</th>
<th>Five patients</th>
<th>Hips reported to be completely normal at periods ranging from 21 to 48 months after injury</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Two patients</td>
<td>Trivial symptoms reported 45 and 48 months after injury</td>
</tr>
<tr>
<td>Arthritis</td>
<td>Five patients with arthritic changes at conclusion of treatment</td>
<td>No change or deterioration in condition of hip at periods of 14 to 63 months after injury</td>
</tr>
<tr>
<td>Note—In two of these patients dislocation was associated with sciatic palsy: the nerve was explored 7 months after injury in one case. 15 and 24 months after injury there was no recovery in either.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcification in joint capsule</td>
<td>One patient—calcification in joint capsule but no disability</td>
<td>28 months after injury aching pain and slight but increasing disability</td>
</tr>
<tr>
<td>Avascular necrosis of femoral head</td>
<td>One patient—avascular necrosis of femoral head</td>
<td>30 months after injury severe disability, awaiting arthrodesis of hip</td>
</tr>
<tr>
<td>Mould-arthroplasty</td>
<td>One patient — mould-arthroplasty 34 months after injury</td>
<td>48 months after injury half normal range movement, 1/2 in. shortening, no great pain</td>
</tr>
</tbody>
</table>

Later follow-up of dislocations with fracture of the acetabular rim—Fifteen of the forty-three patients in which dislocation was associated with a fracture of the acetabular rim were traced. The findings in this group are recorded in Table V. Of seven patients who had previously been classified as normal, five reported that their hips were still normal, and two complained of slight aching and stiffness. In five patients with an early record of arthritic changes the condition of the hip had remained unchanged. One patient with early calcification in the capsule reported that he had slight aching and could not sleep on that side. The condition of the patient with avascular necrosis of the femoral head remained unchanged and he was awaiting arthrodesis. The patient in whom mould-arthroplasty had been performed had satisfactory function with about half the normal range of movement.
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Of the seven dislocations in this group, three were of the central type with tilting of the ischium, and inward displacement of the head of the femur through the acetabular floor. Four were posterior dislocations with fractures involving the floor of the acetabulum.

Results of treatment in central fracture-dislocations—The three central dislocations were reduced with reasonable accuracy by traction. Nevertheless the results were uniformly unsatisfactory (Table VI). In two cases, ankylosis of the joint occurred: in one, the joint, though completely stiff, was stable and painless; in the other, the joint was unstable and arthrodesis was necessary. The third case showed clinical and radiographic evidence of arthritis six months after injury. If these results can be accepted as typical it seems clear that the most useful measure in the treatment of this injury is early arthrodesis of the joint. In selected cases, mould-arthroplasty may perhaps be indicated.

<table>
<thead>
<tr>
<th>Cases 1, 2, and 3</th>
<th>Posterior dislocations with fracture of acetabular floor. Dislocation reduced by manipulation</th>
<th>4 to 7 months after injury the dislocations remained reduced and the fractures were united. All had pain, limp, and stiffness. Radiographs showed irregularity of the acetabulum and narrowing of the joint space</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 4</td>
<td>Posterior dislocation with fracture of acetabular floor. Dislocation not reduced—treated by traction</td>
<td>Not reduced by traction; three inches shortening and flexion-adduction deformity. 2 years after injury unsuccessful attempt at operative reduction. 4 years after injury attempted ilio-femoral arthrodesis with bone graft, unsuccessful. Sciatic paralysis</td>
</tr>
<tr>
<td>Case 5</td>
<td>Central dislocation treated by traction</td>
<td>6 months after injury firm painless ankylosis with hip in good position</td>
</tr>
<tr>
<td>Case 6</td>
<td>Central dislocation treated by traction</td>
<td>Painful fibrous ankylosis of hip. Arthrodesis 14 months after injury. Sciatic paralysis</td>
</tr>
<tr>
<td>Case 7</td>
<td>Central dislocation treated by traction</td>
<td>6 months after injury pain, limp, and 30 per cent. limitation of hip movement. Narrowing of joint space and irregularity of acetabulum</td>
</tr>
</tbody>
</table>

Results of treatment in posterior dislocation with fracture of the acetabular floor—Three of the four posterior dislocations were reduced by manipulation and immobilised in traction. After treatment they all showed clinical and radiographic evidence of arthritis and, although two resumed sedentary duties and the other was repatriated, it seems probable that arthrodesis, or possibly arthroplasty, will be needed sooner or later. The fourth posterior dislocation was in a patient who had also sustained fifteen major fractures of the limbs and spine as well as severe head and facial injuries—many of the fractures being compound and infected. During the last few years he has submitted to no less than forty-two operations. The dislocation, which was complicated by disruption of the pelvis and paralysis of the sciatic nerve, was treated by traction alone and it remained unreduced; there was much shortening and deformity. Two years later, the femoral head was replaced by operation into the distorted acetabulum. Subsequent attempts to arthrodese the joint, first by means of a tinned nail, then by ischio-femoral fusion with tibial graft, and finally by means of iliac bone chips, all failed to secure sound fusion. Nevertheless stability has been gained and the patient is pursuing a reasonably active life.
First degree of central fracture-dislocation. Although there is quite minimal central displacement, the floor and roof of the acetabulum are so comminuted that arthritis will certainly develop.

Final degree of central fracture-dislocation. In such a case although the femoral head can easily be pulled out of the pelvis by skeletal traction, tilting of the ischium and displacement of the floor of the acetabulum remain uncorrected and arthrodesis or arthroplasty is inevitable (Mr Gallagher's case—not one of this series).
Two of these fracture-dislocations were complicated by paralysis of the sciatic nerve; in both there was commination of the acetabular rim. In one, with central dislocation which was arthrodesed fourteen months after injury, there was severe causalgia of the foot associated with external popliteal paralysis. The sciatic nerve was explored seven months after injury and found to be deeply indented by two bone spikes in the region of the sciatic notch. Recovery was slow, and at one time causalgia was so severe that amputation was considered, a course which the patient much favoured. Twenty-two months after injury (fifteen months after exploration of the nerve) there was still hyperaesthesia of the sole of the foot and almost complete external popliteal paralysis. Paralysis of the external popliteal division of the sciatic nerve also occurred in the unreduced posterior dislocation, with residual paralysis of the anterior tibial and peroneal muscle groups and persistent pain and hyperaesthesia of the foot.

TREATMENT AND RESULTS IN DISLOCATION OF THE HIP JOINT WITH FRACTURE OF THE FEMORAL HEAD

In the treatment of dislocation of the hip joint with fracture of the head of the femur three factors had a bearing on the prognosis: 1) the degree of damage to the femoral head; 2) the ease with which displacement could be reduced; and 3) the accuracy of replacement of the femoral fragment.

**Early results of treatment in dislocation with fracture of the femoral head**—In three of the five patients it was found possible to reduce the dislocation by manipulation. In one,

<table>
<thead>
<tr>
<th>Case 1</th>
<th>Dislocation with small fracture (approx.: one-sixth) of the femoral head</th>
<th>Dislocation reduced by manipulation; accurate reposition of femoral fragment. Spica 3 months. Joint normal in 8 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 2</td>
<td>Dislocation with small fracture of femoral head. Sciatic palsy</td>
<td>Dislocation reduced by manipulation; immobilised in traction. 7 months later hip normal but palsy (weak hamstrings, below-knee paralysis) still present</td>
</tr>
<tr>
<td>Case 3</td>
<td>Dislocation with fracture of larger fragment (approx.: one-quarter) of femoral head</td>
<td>Dislocation reduced by manipulation; hip immobilised in plaster. 10 months later 80 per cent. limitation movement, 10 degrees flexion contracture and pain with increasing disability</td>
</tr>
<tr>
<td>Case 4</td>
<td>Dislocation with comminution of femoral head</td>
<td>One month after injury open reduction attempted and fragments of head removed. Hip unstable and 3 months later reduced once more by traction; and finally arthrodesed</td>
</tr>
<tr>
<td>Case 5</td>
<td>Dislocation with fracture of large fragment (about one-half) of femoral head</td>
<td>Open reduction 4 months after injury; femoral fragment removed. Function poor; arthrodesis 5 months later</td>
</tr>
</tbody>
</table>

dislocation was associated with fracture of a fragment consisting of about one-sixth of the femoral head which was replaced accurately by manipulative reduction. The hip was immobilised for three months, and within eight months of injury it appeared normal. Another dislocation with a similar femoral fracture was complicated by sciatic paralysis. The dislocation was reduced by manipulation, and the hip was immobilised in traction, but the fragment did not fall back into place. Seven months later the joint appeared normal but there was residual weakness of the hamstrings and complete paralysis of all muscles below the knee. In the third case there was a fracture involving one-quarter of the femoral head. This was reduced by manipulation and immobilised for three months. Ten months after
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Injury the range of movement was half the normal range, and there was slight flexion contracture of the hip joint with increasing pain and disability.

In two dislocations with fracture of the femoral head manipulative reduction failed. In one the femoral head was comminuted. Operative reduction was attempted and a number of bone fragments were removed. Reduction proved unstable and some months later the femoral head was again replaced by gradual traction and the joint was arthrodesed. The other was associated with a fracture involving half the femoral head. Manipulative reduction proved impossible and four months after injury an open reduction was performed, the femoral
fragment being removed. Function of the hip was poor and five months later the joint was arthrodesed.

**Late follow-up of dislocation with fracture of the femoral head**—Four of five patients were traced subsequently and the findings are recorded in Table VIII. The one patient whose joint was normal eight months after injury was still normal eight months later. In the patient whose hip appeared normal seven months after injury, but who had sciatic paralysis, there was some pain and stiffness sixty-one months after injury and the paralysis remained unchanged. The patient who had 50 per cent. limitation of movement, 10 degrees flexion deformity and increasing disability ten months after injury had persistent pain and severe stiffness thirty-five months after injury, but he had not consented to the arthrodesis which had been advised. The patient whose hip had been arthrodesed eight months after injury was still comfortable twenty-one months later and reported that he could walk five miles without difficulty.

**TABLE VIII**

**Follow-up in Four Dislocations with Fractures of the Femoral Head**

(Questionnaire completed by patient)

<table>
<thead>
<tr>
<th>Case 1</th>
<th>8 months—normal</th>
<th>16 months—normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 2</td>
<td>7 months—hip normal; complete sciatic palsy</td>
<td>61 months—pain and stiffness after exertion; sciatic paralysis complete</td>
</tr>
<tr>
<td>Case 3</td>
<td>10 months—50 per cent. limitation of movement, 10 degrees flexion contracture and increasing disability</td>
<td>35 months—severe stiffness, pain, and disability</td>
</tr>
<tr>
<td>Case 4</td>
<td>14 months—sound arthrodesis</td>
<td>29 months—hip painless; walks five miles easily</td>
</tr>
</tbody>
</table>

**ANALYSIS OF THE RESULTS OF TREATMENT IN ONE HUNDRED AND ONE DISLOCATIONS**

**Complete functional recovery**—Analysis of results at the conclusion of treatment shows that in this series of 100 patients with 101 dislocations, sixty-three were clinically, functionally, and radiographically normal. This perfect result was achieved in 76 per cent. of simple dislocations, 63 per cent. of dislocations with fracture of the acetabular rim, and 40 per cent. of dislocations with fracture of the femoral head; it was achieved in none of the central
Dislocations with fracture of the acetabular floor. Just under 50 per cent. of the patients in this group who were traced after an interval varying from two to four years reported that they were still free from all symptoms; just over 50 per cent. complained of minor symptoms which were not associated with any disability. It must be emphasized once more, however, that these are relatively short-term results and that they do not take into account the possibility of late complications such as arthritis developing after many years.

Capsular calcification and myositis ossificans—Three patients showed radiographic evidence of calcification in the capsule of the joint, but in none was there disability. Such capsular calcification, which is seen very often after dislocation of any joint, appears to be of no clinical significance. In one case, however, there was definite myositis ossificans with extensive subperiosteal ossification round the joint. Movements were limited and there was pain. This was the only patient in the whole series who was treated by early mobilisation and weight-bearing and by ‘massage and movements’ throughout the first ten weeks after injury. The inference is obvious. Myositis ossificans is an avoidable complication; it arises only when dislocations associated with capsular avulsion and haematoma formation are massaged, exercised, and mobilised before there is time for reattachment of the capsule and reabsorption of the haematoma.

Displacement of marginal acetabular fragments—Fractures of the acetabular margin are often replaced by simple manipulative reduction of the dislocation. When such replacement is not achieved by the initial manipulation, it is advisable to apply traction for a few days because in these circumstances the fragment often falls back accurately into place. Even when this is not so, replacement may be relatively unimportant because, in at least one case, persistent upward displacement of a large fragment of the acetabulum gave rise to no disability, and in several others there was persistent backward displacement, which was difficult to demonstrate in radiographs, but which gave rise to no symptoms. The position is very different, however, when such a marginal fracture of the acetabulum is associated with sciatic paralysis. Accurate replacement of the fragment is then important (see next page).

Displacement of the floor of the acetabulum—When the floor of the acetabulum is comminuted and displaced by central fracture-dislocation, and by posterior dislocation with fracture of the acetabular floor, the prognosis, so far as function of the hip joint is concerned, is grave. In not one of the seven such cases in this series was good function regained. Although the possibilities of arthroplasty must still be kept in mind, it would appear that early arthrodesis is the most useful measure.

Unreduced dislocations—The lesson to be learned from the two cases in this series in which the dislocation remained unreduced is that the subsequent management of such cases presents difficulties so great that an unsatisfactory result is inevitable. Operative reduction of a dislocated hip, after many months or years, is a procedure of surprising difficulty. Dissection of the displaced femoral head, and replacement of the head in the remnants of the acetabulum, may cause grave haemorrhage and serious shock. The results of arthroplasty are uncertain; arthrodesis cannot be relied upon; no matter what operative procedure is pursued the results are imperfect. It is the more important therefore to avoid the initial mistakes which account for this failure, namely, attempts to reduce posterior dislocation by traction alone, and reliance upon antero-posterior radiographs (without lateral projections) as evidence that reduction has been achieved.

Avascular necrosis and arthritis of the joint—In very few patients in this series was there clear radiographic evidence of avascular necrosis of the femoral head. One showed areas of relative sclerosis within six months of injury. Another, treated in a German prison camp, soon developed stiffness and pain which steadily increased, and there were radiographic changes in the head of the femur. But the incidence of this complication was less than had been expected. Nevertheless there can be little doubt that in many cases the bone underwent
necrosis although radiographic evidence was lacking. One patient, not included in this series, sustained a dislocation of the hip joint which was accurately reduced and treated without weight-bearing for three months; his recovery appeared to be complete; he trained and served as a Commando; and only after an interval of five and a half years did stiffness and pain develop with radiographic evidence of complete crumbling of the femoral head. The fact that follow-up review is limited in this series to no more than a period of two to five years means that the estimated incidence of avascular necrosis cannot be relied upon. In any series of cases in which an attempt is made to estimate the frequency of avascular necrosis after injury to the hip joint, a follow-up period of not less than five to ten years is essential.

![Fig. 11](image)

**Dislocation of hip joint with avascular necrosis.** Symptoms first developed after three years and radiographic changes after five years. For the first three years the joint appeared to be normal. The incidence of avascular necrosis cannot be estimated in any series with shorter follow-up than five years.

**Early traumatic arthritis of the joint**—Evidence of traumatic arthritis of the hip joint developed within a few years in 26 per cent. of patients. In some there was obvious mechanical distortion of the articular surfaces with destruction and degeneration of articular cartilage. This was true in every case of central dislocation with fracture of the acetabular floor; it was true in many cases of dislocation with fracture of the acetabular margin. But there were cases of simple dislocation and fracture-dislocation in which there was no evidence of mechanical derangement and yet the joint remained irritable, and there was muscle spasm, wasting, pain, and stiffness. Although radiographic evidence was lacking these were probably examples of avascular necrotic change. The total incidence of arthritis within four years of dislocation was 15 per cent. in simple dislocations of the joint, 25 per cent. in dislocation with fracture of the acetabular margin, 60 per cent. in dislocations with fracture of the femoral head, and 100 per cent. in dislocations with fracture of the acetabular floor.

**Sciatic paralysis**—In seven patients, dislocation of the hip joint was associated with paralysis of the sciatic nerve. In two the paralysis was complete, and in the other five there
was paralysis of the lateral popliteal division of the nerve. In six of these seven cases there
was displacement of a bone fragment from the margin of the acetabulum into the region of
the sciatic notch. The seventh was unusual in that the patient was pinned beneath the
wreckage of a demolished building for three hours, with a degree of pressure which might
well have been expected to cause nerve lesions even if there had been no dislocation. The
significant finding is that six dislocations of the hip joint with posterior displacement of a
large acetabular fragment into the sciatic notch were all associated with sciatic paralysis.

In only one of these seven cases was there complete recovery from the sciatic nerve
lesion and that was the one in which an early operation was performed by Wing-Commander
Crawford Adams five days after injury; the fragment was removed from the sciatic notch
and replaced accurately in position. Two other cases were operated upon seven months after
injury and in both the findings were described as "dramatic." In one the nerve was obviously
compressed by the large acetabular fragment; in the other the nerve was deeply indented by
two bone spikes in the region of the sciatic notch. After these late operations recovery was
incomplete. The other four cases with displacement of acetabular fragments were not
operated upon and they did not recover.

If these results, in the case of seven cases of sciatic paralysis in one hundred dislocations
of the hip joint, can be accepted as typical the lesson is clear. Dislocation of the hip with
fracture of the acetabular rim, and complicated by sciatic paralysis, should be explored at
the earliest possible time after reduction of the dislocation. If pressure on the nerve is relieved
in the early stages the outlook is good; if it is not relieved the chances of recovery are poor.

SUMMARY

1. One hundred patients with dislocation of the hip joint have been reviewed, many having
been re-examined at intervals ranging from two to five years after injury.
2. There were forty-six simple dislocations, forty-three dislocations with fracture of the
acetabular rim, seven dislocations with fracture of the acetabular floor, and five dislocations
with fracture of the femoral head.
3. Complete recovery, as judged by clinical and radiographic examination, was observed in
76 per cent. of simple dislocations, 63 per cent. of dislocations with fracture of the acetabular
rim, and 40 per cent. of dislocations with fracture of the femoral head; in no case of dislocation
with fracture of the acetabular floor was recovery complete.
4. Only in one case did myositis ossificans develop, and that was the only case treated by
"massage and movements" throughout the first ten weeks after injury.
5. Avascular necrosis of the femoral head was recognised in a smaller proportion of patients
than had been expected, but since the follow-up review extended only to four years after
injury the results, in this respect, are unreliable. The incidence of this complication after
injury to the hip joint cannot be assessed unless the follow-up period is at least five to ten years.
6. Early traumatic arthritis developed in 26 per cent. of patients—in 15 per cent. of simple
dislocations, 25 per cent. of dislocations with fracture of the acetabular margin, 60 per cent.
of dislocations with fracture of the femoral head, and 100 per cent. of dislocations with
fracture of the acetabular floor.
7. When central or posterior dislocations are accompanied by fracture of the acetabular
floor, early arthrodesis is the treatment of choice.
8. Displacement of marginal acetabular fragments is usually corrected by manipulative
reduction or by traction.
9. Sciatic paralysis in dislocation of the hip joint is nearly always due to damage of the
nerve by a displaced acetabular fragment. In such cases, if the fragment is not replaced
accurately by manipulation or traction, operative reduction is urgently indicated.

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