FEMORAL HEAD DESTRUCTION IN RHEUMATOID ARTHRITIS AND OSTEO-ARTHRITIS

A CLINICAL REVIEW OF 27 CASES

BY

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Since 1951, intra-articular hydrocortisone has been used in the treatment of arthritis, particularly rheumatoid arthritis of the larger joints (Hollander, Brown, Jessar, and Brown, 1957). Most patients derive subjective improvement lasting a few days up to weeks, and, as this is frequently of value in the treatment programme, it has been used extensively. Only recently has the suggestion been made that this treatment may not be free from serious risk. Occasional transitory exacerbations of symptoms in injected joints has been seen by all physicians using intra-articular corticosteroids, both hydrocortisone acetate and hydrocortisone *tertiary*-butylacetate, and the risk of introduction of pathogenic organisms has been recognized as ever-present, though with aseptic precautions it has rarely been experienced. Less commonly, thrombophlebitis has been reported (Chandler, Wright, and Hartfall, 1958).

The more recent warnings have been prompted by the observation of apparently accelerated radiological deterioration in treated joints. Thus, Chandler and Wright (1958) noted that thirteen of 25 steroid-treated knee joints showed such changes over a 48-week treatment period, despite symptomatic improvement in most cases. In their view the major reason for this was the encouragement of a damaging level of performance by steroid interference with a normal locally protective mechanism. The patients in this trial were all cases of rheumatoid arthritis whose principal disability arose from knee involvement. A similar treatment trial (Wright, Chandler, Morison, and Hartfall, 1960) of 25 patients with osteo-arthritis of the knees did not show this radiological change and the clinical response was only transient.

Further reports have appeared from Chandler, Jones, Wright, and Hartfall (1959) at Leeds, and

from workers at the London Hospital (Sweetnam, Mason, and Murray, 1960; Sweetnam, 1960). Some of the cited examples occurred in patients who received steroids only by mouth and in every case the weight-bearing joints—that is the hips or knees—were implicated.

These authors have suggested that rapid destruction of such joints has been brought about by the administration of the steroids, and they state that this change is not seen to occur rapidly in arthritic patients who have not received steroids (Sweetnam and others, 1960).

In any unit using oral or intra-articular steroids it is of great importance to know the frequency and predisposing factors, even though only a minority of steroid-treated patients may show this type of arthropathy.

The case material at Queen Elizabeth Hospital, the New Zealand national hospital for rheumatic diseases, has therefore been examined with particular reference to the hip joint, and all cases showing femoral head destruction have been reviewed and the findings analysed.

Material and Methods

The cases surveyed were seen over a period of 5 years, during which time more than 2,500 patients were admitted to the Queen Elizabeth Hospital, including approximately 1,500 with rheumatoid arthritis. In addition, approximately 1,000 persons were seen as out-patients. During this time x-ray films were taken of the hip area of slightly more than 600 patients, about half of whom were rheumatoid arthritics.

These x-ray films have been reviewed and those showing destruction of the femoral head have been further examined in the light of the clinical details.

Various attempts to assess the severity of the destruction were made, and following criteria were adopted:

- (1) In those cases in which two or more films were taken over a period of time, superimposition

tracings were made showing the progress of destruction in the known interval between the films.

- (2) The area of the femoral head on the standard x-ray films was measured with a planimeter.

An examination of x-ray films of six normal hips showed that the area of the femoral head was not significantly altered by change in the degree of abduction, adduction, or rotation of the femur, though the shape and area of the neck varied considerably. This accords with the perfection of the spherical articulating surface of the femoral head; it was more surprising to find that this also applied in four hips (two osteo-arthritis and two rheumatoid arthritis) with poor function which were similarly examined. Thus, in taking measurements, as little as possible of the femoral neck was included in the planimeter estimations. Superimposition techniques were employed to ensure that such area included was constant in reading the x-ray films of each patient.

Particular attention was paid to the occurrence of pain, its severity and its temporal relation to destruction of the femoral head, and to the use of steroids, intra-articular or oral.

In two patients there was a possibility of pyogenic infection of the hip joint, and these were excluded, as were all cases in which there had been surgical interference or fracture. One male rheumatoid patient who had osteitis pubis and painful absorption of one femoral head after prostatectomy was also excluded, because the aetiology of the condition was uncertain. A report of this case has already been published (Milsom and Rose, 1957).

Results

In the survey period 27 examples of hip absorption were found in this hospital. Many of these were observed when the patient was first seen, which made it difficult to ascertain the date of the absorption, but a number had been under treatment at the hospital before the complication developed.

Fifteen of the 27 patients (ten female and five male) were suffering from rheumatoid arthritis (R.A.), ten "classical" and five "definite", according to the A.R.A. Criteria, and there were twelve patients (nine female and three male) with osteo-arthritis (O.A.), one of whom had marked senile osteoporosis associated with painful femoral head destruction.

Sex.—The sex distribution of the rheumatoid patients was in keeping with the hospital admissions, but the 9 : 3 ratio of the twelve osteo-arthritics was rather more than expected (Table I).

TABLE I
SEX OF PATIENTS BY DIAGNOSIS

Sex	Male	Female	Total
Rheumatoid Arthritis	5	10	15
Osteo-arthritis	3	9	12
Total	8	19	27

Steroid Therapy.—Only ten patients had received steroids in any form, and in some of these it seemed improbable, judging from the amount administered and the time that had since elapsed, that the treatment could have had much bearing on subsequent bone change.

Age and Duration of Disease.—The age when first seen is shown in Table II, and the duration of disease in Table III (opposite). The osteo-arthritics were on an average older than the rheumatoid patients, but the duration of disease was usually less.

Hip Involvement.—In eight cases both hips were involved, though not always to the same degree or at the same time. Thus, in one patient, this change occurred on one side more than a year before the other, but in the second hip it proceeded to a greater extent over the following 12 months. Of the nineteen cases with unilateral change, the right side was involved in twelve and the left in seven.

The time which has elapsed since hip symptoms were first observed is also shown in Table III. Six of the ten female rheumatoid patients showed hip absorption before the menopause, and seven of the total had had symptoms referable to the hip for less than 2 years.

It was not possible to estimate precisely the rate of absorption in most cases, but Case 13 is an exception, in that the patient was in hospital during the critical period.

TABLE II
AGE OF PATIENTS, BY DIAGNOSIS

Age when First Seen (yrs)	39 and Under	40-49	50-59	60-69	70 and Over	Total
Rheumatoid Arthritis	1	4	4	5	1	15
Osteo-arthritis	—	1	1	3	7	12
Total	1	5	5	8	8	27

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TABLE III
DURATION OF DISEASE AND OF HIP SYMPTOMS (YRS)

Duration (yrs)		Less than 1	1-	2-4	5-9	10-19	20 and Over	Total
Disease	Rheumatoid Arthritis	—	—	—	6	5	4	15
	Osteo-arthritis	—	—	4	4	2	2	12
	Total	—	—	4	10	7	6	27
Hip Symptoms	Rheumatoid Arthritis	2	5	2	2	2	2	15
	Osteo-arthritis	—	—	4	4	2	2	12
	Total	2	5	6	6	4	4	27

Fig. 1.—Case 13, male aged 47, suffering from rheumatoid arthritis treated with prednisone.

A. Feb., 1960
B. June, 1960
C. Sept., 1960

Case 13, a 47-year-old woman, had the onset of classical rheumatoid arthritis at the age of 21, which progressed intermittently, particularly during the 10 years before her admission to hospital in 1960. In childhood she had "osteomyelitis" of the left hip which had proceeded to ankylosis and growth arrest. The right hip joint became painful in April, 1960, after she had been taking oral prednisone for 2 years. Quickly the pain became

extreme and only short-lasting relief was afforded by intra-articular hydrocortisone. Within a month bone absorption was occurring, though at this stage the leg was in traction. The absorption subsequently continued, though the pain gradually became less.

The patient died 6 months later of active severe rheumatoid arthritis, but no autopsy was carried out (Fig. 1).

Degree of Absorption.—This varied considerably. In twelve cases (sixteen hips) it was not marked—*i.e.* only about one-tenth of the volume of the head was lost (this corresponds to a diminution of 0.5 sq. in. of the area of the femoral head on *x* ray). In twelve cases (sixteen hips) the loss was moderate (one-tenth to one-third of the head (0.5 to 1 sq. in. on *x* ray), and in three cases, all unilateral, the loss was greater than this (Tables IV and V).

MARKED CHANGE.—Of the three patients showing marked change (Cases 13, 19, and 23), two had received steroids. One of the latter (Case 13, above) had marked pain, and the other (Case 19) had an almost painless hip absorption.

Case 19, a 61-year-old unmarried woman, was referred from a geriatric hospital, where she had been treated with exercises, oral prednisone 5 to 15 mg. daily, and analgesics over a 3-year period. She was severely disabled with chronic rheumatoid arthritis of more than 30 years' duration. In addition to deformities of the peripheral joints, she had a unilateral hip lesion with a marked loss of the right femoral head; this absorption appeared, from previous *x* rays, to have developed insidiously and almost painlessly.

Case 23, a hard-working 81-year-old woman, had had osteo-arthritis confined to the left hip for 20 years, and throughout all that time had had little pain but much stiffness.

MODERATE CHANGE.—Of the twelve patients showing moderate joint destruction, six had rheumatoid arthritis and six osteo-arthritis. Four had had steroid treatment, two combined oral and intra-articular and two intra-articular only.

(a) *Combined Therapy* (2 cases).

Case 15, a 54-year-old man with classical rheumatoid arthritis of 15 years' duration, had a 3-month course of oral cortisone 2 years before hip destruction occurred and 50 mg. intra-articular hydrocortisone while the process was proceeding. The hip was severely painful.

Case 7, a 51-year-old woman with classical rheumatoid arthritis of 9 years' duration, had had a 9-month course of cortisone 4 years before the hip symptoms first developed. Because of pain she had two intra-articular injections with short-lasting benefit in the 9 months before she was seen at Queen Elizabeth Hospital.

(b) *Intra-articular Therapy Only* (2 cases).

Case 10, a 64-year-old man with bilateral painful osteo-arthritis of the hips of 3 years' duration, had had

TABLE IV
CORRELATION OF STEROID THERAPY WITH DEGREE OF HIP ABSORPTION

Steroid Therapy	Degree of Absorption						Total	
	Mild		Moderate		Severe			
	Patients	Hips	Patients	Hips	Patients	Hips	Patients	Hips
Oral + Intra-articular	1	2	2	2	1	1	4	5
Oral only	2	2	—	—	1	1	3	3
Intra-articular only	1	2	2	3	—	—	3	5
None	8	10	8	11	1	1	17	22
Total	12	16	12	16	3	3	27	35

TABLE V
CORRELATION OF SEVERITY OF PAIN WITH DEGREE OF HIP ABSORPTION

Pain	Degree of Absorption						Total	
	Mild		Moderate		Severe			
	Patients	Hips	Patients	Hips	Patients	Hips	Patients	Hips
Severe	2	3	6	7	1	1	9	11
Moderate	4	4	4	6	—	—	8	10
Little or None	6	9	2	3	2	2	10	14
Total	12	16	12	16	3	3	27	35

one hydrocortisone injection in each hip one year before admission, when moderate bilateral absorption was found.

Case 1, a 62-year-old woman with classical rheumatoid arthritis, had had bilateral injections for painful hips. One hip, painfully involved for 12 years, had already shown moderate destruction, the other, involved for less than one year, was still radiologically intact. No further loss occurred in the damaged hip in the next 12 months, while moderate loss occurred in the other (Fig. 2).

(c) *No Steroid Therapy* (8 cases).—Two of these patients experienced little pain, three moderate pain, and three severe pain; one of the last group (Case 8) required osteotomy for relief.

Case 8, a woman first seen in 1955, at the age of 44, gave a history of bilateral hip pain and some aching in the right knee of 4 years' duration. At that time x rays showed mild degenerative change in both hips. During a 6-month period in 1957, the left hip deteriorated rapidly with much pain and limitation of movement; there was shortening of the leg and x rays showed destructive changes in the femoral head. Because of this pain a McMurray osteotomy was performed in October, 1957, and the pain was relieved but the hip remained stiff. In 1960 she had increasing symptoms in the right hip, and x rays showed that left femoral head destruction had continued mildly since the operation (Fig. 3, overleaf).

MILD CHANGE.—Of the twelve patients in this group, seven had rheumatoid arthritis and five osteo-arthritis. Four of those with rheumatoid arthritis had had steroid therapy (Cases 15, 14, 4, 17).

Case 15, a 54-year-old man, who had had rheumatoid arthritis for 15 years, had a 12-week course of prednisone in 1954. He first experienced hip symptoms about a year later and then received 50 mg. intra-articular hydrocortisone. In the ensuing 2 years a slight degree of almost painless femoral head absorption was seen.

Case 4, a 44-year-old woman, and Case 14, a 49-year-old man, both with severe classical rheumatoid arthritis, had received oral steroids in moderate doses; within 2 years x-ray changes had occurred in the hips, which were only slightly painful.

Case 17, a 44-year-old woman, with rheumatoid arthritis, had repeated local injections of hydrocortisone for moderately painful hips with slight relief. Bilateral hip absorptions seemed to occur during periods of more marked pain, but at no stage was the pain very severe.

Considering the whole group, little correlation between steroid therapy and destruction was found, even in the more severe cases (Table IV). Nor was there any correlation between lack of pain and destruction, but cases with little pain tended to have only mild absorption (Table V). Hip pain showed little correlation with steroid therapy, even that given by local intra-articular injection.

Bone changes in the adjacent pelvic area were usually present (Table VI, overleaf). There was a high incidence of protrusio acetabulae (Otto pelvis); ten out of fifteen in the rheumatoid arthritis group, and three out of twelve in the osteo-arthritis group. The degree of protrusion was very marked in five patients, and was observed to increase with femoral head destruction in four cases. Shifting upwards of the acetabulum was seen in three rheumatoid patients and nine osteo-arthritis patients. Two patients showed neither of these features; in one

Fig. 2.—Case 1, male aged 62, suffering from rheumatoid arthritis, showing bilateral change after intra-articular hydrocortisone in the right hip joint only.

TABLE VI
DEGREE OF PELVIC BONE CHANGE, BY DIAGNOSIS

Diagnosis	Bone Change												Total	
	Protrusio Acetabulae						Acetabulum Shift				None			
	+		++		+++		½ in.		1 in.					
	Patients	Hips	Patients	Hips	Patients	Hips	Patients	Hips	Patients	Hips	Patients	Hips		
Rheumatoid Arthritis	2	2	4	6	4	6	3	3	—	—	2	2	15	19
Osteo-arthritis	1	2	1	1	1	2	9	12	1	1	—	—	13	18
Total	3	4	5	7	5	8	12	15	1	1	2	2	28	37

Notes: One osteo-arthritis patient had both mild protrusion and a ½-in. shift.
One rheumatoid patient had unilateral absorption, but bilateral protrusion.

Fig. 3.—Case 8, female aged 42 in 1961, suffering from osteo-arthritis
A. In 1954
B. In 1957
C. In 1961 after 50 mg. hydrocortisone

of them the degree of absorption was moderate, and in the other slight. One osteo-arthritic patient showed both acetabular shift and mild protrusio acetabulae. Osteoporosis was moderate in most cases, and not usually different from the osteoporosis elsewhere. Striking localized osteoporosis

was not seen in cases showing early stages of hip absorption.

Discussion

That radiological deterioration may continue in steroid-treated arthritic joints, despite satisfactory clinical control, has been demonstrated by several

authors (Chandler and Wright, 1958; Sweetnam and others, 1960). Such changes in patients who have not received steroids is ill-documented, and they are more gradual and less extensive, though pain is a prominent feature. Some patients show instability (Kellgren, 1961) and tend to show more marked progressive destruction. The present study was therefore confined to the hip joint, where such instability is infrequent.

These changes in the hip-joint may occur whether oral or intra-articular steroids are given or not; only ten of the 27 patients reviewed in the present study had received steroid therapy, and one of the three showing severe destruction, and eight of the twelve showing moderate destruction had not received steroids. Dubois (1960) mentioned this type of change in the hip joint in cases of disseminated lupus erythematosus both treated and untreated. Nevertheless, the steroids may act as an accelerating agent, and if this be so, the total oral and/or intra-articular dosage should be an important factor. The amount and frequency of intra-articular steroids in the two Leeds trials (Chandler and Wright, 1958) was not high (Wright and others, 1960), but one reported case (Chandler and others, 1959) was given what seemed to be unusually extensive therapy. This patient was reported under the heading of Charcot's arthropathy because the hip became painlessly disorganized. This absence of pain was emphasized by Sweetnam and others (1960), and Chandler and Wright speculated that the relief of pain and stiffness might have led to a damaging level of performance. In the series reported here, ten of the 27 patients had little or no pain in the affected joints, and there was little correlation between the degree of pain and the amount of destruction. One patient showing severe and rapid destruction of the femoral head

had so much pain that weight-bearing was not feasible, but despite immobilization the absorption continued.

Comparison of the two Leeds trials indicates that the disease process present was of major importance, for though the intra-articular therapy was identical, no deterioration was seen in the osteo-arthritis group in contrast to the frequent radiological progression in the rheumatoid group. In the present survey both rheumatoid and osteo-arthritis hips were involved.

Kellgren, Ball, Fairbrother, and Barnes (1958) reported suppurative arthritis in a small percentage of cases of rheumatoid arthritis. Only four of their thirteen cases had received steroids, and all were obviously ill with fever and rigors. The source of the infective organisms was uncertain as the condition was not recognized early, but those incriminated were *Staphylococcus aureus* and *Bacillus coli*, and in none of these cases was there infection of low pathogenicity. The absence of positive evidence of low-grade infection does not completely remove the possibility, though it is not suggested that infection was of aetiological importance in the reported cases of steroid arthropathy nor in those here analysed.

No bone biopsies were performed in these 27 cases and metabolic bone disease was not conclusively excluded. One elderly patient had generalized osteoporosis as well as osteo-arthritis of the hip, and one (Case 3; Fig. 4) had arthritis mutilans. Nearly all the fifteen cases of rheumatoid arthritis were of the chronic classical type. Most of the patients were ambulant, but in some the hip pain was so severe that little or no weight-bearing was possible, and they certainly did not have "a damaging level of performance".

It was hoped that this investigation would show

Fig. 4.—Case 3, female aged 57, suffering from rheumatoid arthritis not treated with steroids.

why and in which patients this type of destruction occurred, but this aim was not fulfilled. It has, however, been shown that steroid therapy is not essential to its development, that pain may or may not be present, and that it may occur both in patients with rheumatoid arthritis and in those with osteoarthritis.

This change is not common, and its possibility need not lead to the discontinuance of intra-articular steroids in treating rheumatoid arthritis.

Summary

A radiological survey of patients seen in the Queen Elizabeth Hospital was made to ascertain the incidence of femoral head absorption in arthritic hip joints, excluding those in which there had been fracture, operation, or infection.

In a 5-year period, 27 patients showed such absorption, bilateral in eight cases. Rheumatoid arthritis was the underlying condition in fifteen patients, while the remaining twelve had osteoarthritis.

The cases were analysed as regards the occurrence of pain and the administration of oral or intra-articular steroids. It was shown that such therapy was not an essential factor and that there was little correlation between pain and femoral head destruction. Nearly all the patients showed associated bone changes in the adjacent pelvis, either protrusio acetabulae (Otto pelvis) or destruction of the superior aspect of the acetabulum.

It was concluded that this change is so rare that it does not necessitate the general discontinuation of intra-articular steroids in the treatment of arthritic joints.

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Destruction de la tête fémorale dans l'arthrite rhumatismale et dans l'ostéo-arthrite Revue clinique de 27 cas

RÉSUMÉ

On étudia radiologiquement les malades traités à l'hôpital de *Queen Elizabeth* pour trouver la fréquence d'absorption de la tête fémorale dans les coxarthroses, à l'exclusion des cas avec des antécédents de fracture, d'opération ou d'infection. Sur une période de 5 ans on trouva 27 malades ayant souffert une telle absorption, qui fut bilatérale dans 8 cas. Quinze d'entre eux furent atteints d'arthrite rhumatismale et les douze restants d'ostéo-arthrite.

On analysa tous ces cas du point de vue de la fréquence de la douleur et de l'administration buccale ou intra-articulaire de stéroïdes. On observa que ce traitement ne constituait pas un facteur essentiel et qu'il y avait peu de corrélation entre la douleur et la destruction de la tête fémorale. Presque tous les malades accusèrent des altérations osseuses associées dans la partie pelvienne adjacente, sous forme d'une protrusion acétabulaire (bassin d'Otto) ou bien d'une destruction de la face acétabulaire supérieure.

On conclut que ce désordre est si rare, que l'interruption habituelle des stéroïdes intra-articulaires dans le traitement des articulations arthritiques n'est pas nécessaire.

Destrucción de la cabeza femoral en la artritis reumatoide y osteoartritis Estudio clínico de 27 casos

SUMARIO

Se investigaron radiológicamente los enfermos tratados en el Hospital de *Queen Elizabeth* para hallar la frecuencia de absorción de la cabeza femoral en articulaciones artríticas de la cadera, con exclusión de casos con antecedentes de fractura, operación o infección. En el curso de 5 años 27 enfermos acusaron tal absorción, bilateral en ocho casos. Quince de estos enfermos sufrieron de artritis reumatoide y los demás doce de osteoartritis.

Se analizaron los casos respecto a la incidencia del dolor y de la administración por vía oral o intra-articular de esteroides. Se vio que este tratamiento no fué un factor esencial y que hubo poca correlación entre el dolor y la destrucción de la cabeza femoral. Casi todos los enfermos acusaron alteraciones óseas asociadas en la parte pélvica correspondiente, sea una protrusión acetabular (pelvis de Otto), sea una destrucción de la cara acetabular superior.

Se concluye que este trastorno es tan raro, que no necesita interrupción habitual de esteroides intra-articulares en el tratamiento de la articulaciones artríticas.