The Natural History of Untreated Asymptomatic Hips in Patients Who Have Non-Traumatic Osteonecrosis*

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ABSTRACT: The aim of this study was to evaluate retrospectively the rate of disease progression in the asymptomatic hip of patients who had non-traumatic osteonecrosis and pain in the other hip. Of seventy-five consecutive patients with non-traumatic osteonecrosis who were initially evaluated between 1978 and 1987, forty-six (61 per cent) initially had pain in only one hip. Radiographs were made for all patients, but routine magnetic resonance images and computed tomography images were not. Twenty-two of the asymptomatic hips had radiographic evidence of involvement, but three of them were excluded because they were treated with elective prophylactic core-drilling; this left nineteen hips with radiographic evidence of involvement in the final study group. The other twenty-four asymptomatic hips had normal findings on the initial radiographs; one of these was treated with elective core-drilling, leaving twenty-three hips with normal radiographs in the final study group. All but one patient, who died at fifty-one months, were followed for at least five years or until symptoms developed in the asymptomatic hip.

Of the nineteen untreated asymptomatic hips with initial radiographic evidence of involvement, five were still asymptomatic at the most recent follow-up examination. The other fourteen hips had become painful: nine, within five years after presentation, and five, more than five years after presentation. Pain or radiographic changes developed only rarely in the twenty-three asymptomatic hips with normal findings on the initial radiographs, and only one hip had both pain and radiographic changes within five years after presentation. Nineteen (83 per cent) were still asymptomatic at the most recent follow-up examination.

The prolonged pain-free interval for many of the asymptomatic hips with radiographic evidence of involvement contrasts with the over-all rapid progression of disease reported for most hips with non-traumatic osteonecrosis. The present study draws attention to the fact that an adequate period of follow-up is needed for asymptomatic hips that are treated operatively in order to determine whether such intervention alters the natural history of the disease. Our results also showed that few asymptomatic hips with normal findings on initial radiographs are at risk for pain or radiographic abnormalities; when disease does develop, deterioration is slow and operative intervention is rarely indicated.

It is a well known fact that patients who have non-traumatic osteonecrosis of the femoral head may have pain in one or both hips. The reported rates of unilateral disease are 28 per cent (fourteen of fifty patients) to 50 per cent (sixty-two of 125 patients)[2,7,17,21,23]. A common clinical challenge is treatment of the asymptomatic hip, which sometimes has initial radiographic evidence of involvement and sometimes does not. There is little information in the literature about the rate and severity of progression of the disease in asymptomatic hips with radiographic evidence of involvement. In addition, most reports of operative treatment have not included the number of treated hips that had initial radiographic changes but no symptoms. It is not known how many asymptomatic hips with normal findings on initial radiographs will eventually manifest symptoms or radiographic changes. While magnetic resonance imaging has proved to be a sensitive tool in the diagnosis of disease that is not yet evident on radiographs[4,8,18], the diagnostic accuracy of the technique and the true clinical importance of early abnormalities in the magnetic resonance signal are only now being investigated fully[6,12,19,26]. These issues have clinical importance because most orthopaedic surgeons are reluctant to treat asymptomatic hips operatively unless the likelihood and time-course of progression of the disease are well understood. The goal of this retrospective study was to report the rate of progression of non-traumatic osteonecrosis in the asymptomatic hip of patients who were seen for pain in the contralateral hip. The underlying hypothesis is that the disease progresses more slowly in asymptomatic hips than has been reported for symptomatic hips[1,6,17].

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TABLE I

DATA ON THE PATIENTS WHO HAD AN ASYMPTOMATIC HIP WITH RADIOGRAPHIC EVIDENCE OF INVOLVEMENT

Case	Gender, Age (Yrs.)	Associated Condition	Ficat Stage at Onset	Time until Onset of Pain (Mos.)	Ficat Stage at Follow-up*	Comments
1	M, 46	Steroid use	II	6	III	Total hip arthroplasty, 8 mos.
2	M, 33	Steroid use, alcohol abuse	III	8	III	Total hip arthroplasty, 12 mos.
3	F, 32	Steroid use	II	79†	II (79 mos.)	Prophylactic core-drilling, 10 mos.
4	M, 39	Alcohol abuse	II	28†	III (28 mos.)	Prophylactic core-drilling, 14 mos.
5	M, 30	Steroid use	II	15	II	Lost to follow-up, 34 mos.
6	M, 36	Alcohol abuse	II	18	II	Core-drilling, 18 mos.
7	F, 58	Steroid use	II	22	IV	Total hip arthroplasty, 30 mos.
8	M, 61	Steroid use	II	30	II	Total hip arthroplasty, 84 mos.
9	F, 44	Idiopathic	II	83†	II	Prophylactic core-drilling, 35 mos.
10	F, 34	Steroid use	II	45	III	Core-drilling, 57 mos.
11	M, 34	Steroid use	II	51	II	Symptomatic, 87 mos.; no treatment
12	M, 45	Alcohol abuse	II	54	NA	Total hip arthroplasty, 57 mos.
13	M, 52	Steroid use, alcohol abuse	II	66	III	Total hip arthroplasty, 78 mos.
14	M, 25	Steroid use	II	—	II (66 mos.)	Asymptomatic; lost to follow-up, 71 mos.
15	M, 34	Steroid use	II	—	II (60 mos.)	Asymptomatic, 73 mos.
16	M, 28	Steroid use, alcohol abuse	II	84	III	Core-drilling, 84 mos.
17	F, 26	Steroid use	II	91	II	Core-drilling, 96 mos.
18	M, 43	Steroid use	III	97	IV	Total hip arthroplasty, 111 mos.
19	M, 44	Steroid use	II	—	II (40 mos.)	Asymptomatic; lost to follow-up, 99 mos.
20	F, 68	Idiopathic	III	100	IV	Symptomatic, 100 mos.; no treatment
21	F, 40	Steroid use	II	—	II (14 mos.)	Asymptomatic, 106 mos.
22	M, 49	Alcohol abuse	II	—	NA	Asymptomatic; died, 140 mos.

*The time at which the most recent radiographs were made is shown in parentheses. NA = not available.
†Time until onset of pain, despite interim prophylactic core-drilling. These patients were not included in the final study group.

Materials and Methods

One hundred and six consecutive patients were managed for osteonecrosis of the hip, between 1978 and 1987, by three orthopaedic surgeons in two university-affiliated hospitals. Thirty-one (29 per cent) were diagnosed with traumatic osteonecrosis and were excluded from the study. The records of the remaining seventy-five patients, who had non-traumatic osteonecrosis, were reviewed retrospectively. There were fifty-three male and twenty-two female patients, and the mean age was forty-two years (range, twelve to sixty-nine years). The osteonecrosis was associated with steroid therapy or alcohol abuse, or both, in sixty patients (80 per cent); was idiopathic in eleven (15 per cent); and was associated with some other condition in four (5 per cent). Twenty-nine (39 per cent) of the seventy-five patients had radiographic evidence of involvement and symptoms in both hips at the time of presentation, and they were excluded from the study. Forty-six patients (61 per cent) were seen for pain in only one hip: twenty-two had radiographic evidence of involvement of the asymptomatic hip and twenty-four did not.

Fifteen men and seven women, who were a mean of forty-one years old (range, twenty-five to sixty-eight years old), had radiographic evidence of involvement of the asymptomatic hip (Table I). Twenty (91 per cent) of these patients had a history of steroid therapy or alcohol abuse, or both. Three hips (Cases 3, 4, and 9) had elective prophylactic core-drilling and thus were excluded from the final study group. The outcome in the remaining nineteen asymptomatic hips with radiographic evidence of involvement was determined by a review of the records and the radiographs and was confirmed with an examination or a telephone interview. During the time-period of this study, magnetic resonance imaging and computed tomography were not done routinely and, for this reason, the evaluations were confined to clinical examinations and plain radiography. Radiographic abnormalities were classified according to the system described by Ficat and Arlet. Every patient was followed for at least five years or until symptoms appeared. The radiographic status of the hip at the time that symptoms appeared and at the time of the most recent follow-up examination was noted for all hips for which the radiographs were available.

The chi-square test was used to test the significance of differences in clinical data between hips in which symptoms developed early and those in which they developed late.

Seventeen men and seven women, who were a mean of forty-four years old (range, twenty-one to seventy years old), had radiographic evidence of involvement

TABLE II
DATA ON THE PATIENTS WHO HAD AN ASYMPTOMATIC HIP WITHOUT RADIOGRAPHIC EVIDENCE OF INVOLVEMENT

Case	Gender, Age (Yrs.)	Associated Condition	Duration of Clinical Follow-up (Mos.)	Comments
23	M, 36	Idiopathic	97	Asymptomatic
24	M, 31	Idiopathic	129	Asymptomatic
25	F, 70	Radiation therapy	63	Normal radiographs, 36 mos.; symptomatic, 63 mos.; no treatment
26	F, 28	Steroid use	86	Asymptomatic
27	M, 23	Systemic lupus erythematosus, steroid use	60	Asymptomatic; died
28	F, 68	Idiopathic	63	Asymptomatic
29	M, 42	Alcohol abuse	77	Asymptomatic
30	F, 21	Idiopathic	94	Asymptomatic
31	M, 54	Alcohol abuse	124	Asymptomatic
32	M, 52	Steroid use	130	Symptomatic, 78 mos.; Ficat stage I, 78 mos.; no treatment
33	M, 32	Steroid use, alcohol abuse	114	Asymptomatic
34	F, 59	Steroid use, radiation therapy	104	Asymptomatic
35	M, 53	Steroid use	134	Asymptomatic
36	M, 24	Idiopathic	178	Asymptomatic
37	F, 66	Ulcerative colitis	93	Asymptomatic
38	M, 31	Steroid use, alcohol abuse	72	Asymptomatic
39	M, 58	Idiopathic	136	Symptomatic, 42 mos.; Ficat stage III, 59 mos.; total hip arthroplasty, 78 mos.
40	M, 54	Alcohol abuse, gout	51	Asymptomatic; died
41	M, 36	Steroid use	129	Asymptomatic; Ficat stage II, 113 mos.; no treatment
42*	F, 41	Steroid use	4	Prophylactic core-drilling
43	M, 30	Alcohol abuse	133	Asymptomatic
44	M, 45	Steroid use	137	Symptomatic, 67 mos.; normal radiographs, 131 mos.; no treatment
45	M, 58	Alcohol abuse	173	Asymptomatic
46	M, 53	Alcohol abuse	181	Asymptomatic

*This patient was not included in the final study group.

of the symptomatic hip but had a radiographically normal asymptomatic hip (Table II). The osteonecrosis was associated with steroid therapy or alcohol abuse, or both, in sixteen patients (67 per cent); was idiopathic in six (25 per cent); and was associated with radiation therapy in one (4 per cent) and with ulcerative colitis in one (4 per cent). One (Case 42) of the twenty-four hips had elective prophylactic core-drilling and was excluded from the final study group. Follow-up of the remaining twenty-three hips was carried out as described for the first group of hips.

Results

Asymptomatic Hips with Radiographic Evidence of Involvement

Sixteen of the nineteen hips in the final study group initially had radiographic abnormalities without evidence of collapse (Ficat stage II), and three had evidence of early collapse without secondary degenerative changes (Ficat stage III). Five of the nineteen hips were still pain-free at the most recent follow-up examination, which was at seventy-three and 106 months for two patients who were seen at the time of the review, seventy-one and ninety-nine months for two who were then lost to follow-up, and 140 months for one who died. Fourteen hips became symptomatic at some point. The interval between the onset of the symptoms in the first hip and those in the second hip was within thirty-six months for six patients, thirty-six to sixty months for three, and more than sixty months for five. Follow-up radiographs were available for seventeen of the nineteen hips. Of the fourteen hips that were Ficat stage II initially, nine were unchanged at the time at which symptoms appeared, four had collapse (Ficat stage III), and one had collapse and degenerative changes (Ficat stage IV). Two of the three hips with initial evidence of collapse had progression to degenerative changes by the time that symptoms appeared. When the nine patients in whom pain developed in the asymptomatic hip within five years of the diagnosis were compared with the ten in whom the hip had remained pain-free for at least five years, there were no significant differences in age, gender, etiology of the disease, or radiographic stage at presentation.

Eleven of the hips in which pain developed were treated operatively: seven had a total hip arthroplasty and four had core-drilling. The operations were performed a mean of fifty-eight months after presentation of the disease. Of the three painful hips that were not treated, one was lost to follow-up at thirty-four months and two remained untreated after eighty-seven and 100 months.

Asymptomatic Hips without Radiographic Evidence of Involvement

The mean duration of clinical follow-up for the twenty-three hips in the final study group was 111 months (range, fifty-one to 181 months), and the mean duration of radiographic follow-up was fifty-five months (range, five to 131 months). Nineteen hips (83 per cent) were asymptomatic at the most recent follow-up examination, and twenty (87 per cent) had normal findings on follow-up radiographs. Eighteen (78 per cent) of the twenty-three hips remained both pain-free and radiographically normal. All but one asymptomatic hip, which was in a patient who died at fifty-one months, were followed for more than five years. Pain and radiographic evidence of osteonecrosis developed in two hips (Cases 32 and 39), at seventy-eight and forty-two months. Radiographic abnormalities became evident in one hip (Case 41) at 113 months; however, the hip was not painful and was not treated. Pain developed, at sixty-three and sixty-seven months, in two hips (Cases 25 and 44) that had normal findings on the most recent radiographs, made at thirty-six and 131 months. Only one hip (Case 39) of the five with pain or radiographic abnormalities, or both, was treated operatively. A total hip arthroplasty was done at seventy-eight months in that hip.

Discussion

The most striking finding in our study is that pain developed within five years after the onset of symptoms in the contralateral hip in less than one-half of the asymptomatic hips with initial radiographic evidence of involvement. This finding suggests that clinical progression of the disease in such hips is slower than has been widely reported for non-traumatic osteonecrosis[11,16,17]. Such results cannot be explained by an unusual demographic makeup of our patient population, as the age and gender distribution as well as the etiologies are very similar to those in most published series.

Approximately one-third of the asymptomatic hips that had initial radiographic involvement had a total hip arthroplasty by the time of the most recent follow-up examination. The extended survival of some hips of this type may be explained by factors such as a more favorable location and limited extent of involvement of the femoral head[1,7,13,20,24,25]. Because magnetic resonance imaging and computed tomography were not performed routinely for our patients, association of the outcome with an accurate analysis of anatomical involvement was not possible. It is clear that factors such as the level of pain at presentation as well as the pattern and extent of involvement of the femoral head may vary from one group of patients to another and explain differences in the reported outcomes of joint-preserving treatments. Given the extended time-course for the onset of symptoms in most of the asymptomatic hips, a long postoperative follow-up (at least five years) seems appropriate to define with certainty whether intervention truly alters the natural history of the disease.

The finding that symptoms developed relatively soon — within thirty-six months after the diagnosis — in nearly one-third of the asymptomatic, radiographically involved hips in this study suggests that there is a subgroup of such hips for which the prognosis is worse than for others. Modern imaging techniques might be of benefit for the identification of such hips. High-resolution computed tomography may reveal occult fractures that are not apparent on plain radiographs, thereby permitting more accurate initial staging[9,15]. Magnetic resonance imaging, which is capable of detecting the volume and location of dead and repairing bone, may yield additional information of prognostic importance[10]. The development of reproducible methods for identifying progression-prone asymptomatic hips early in the course of the disease may lead to the elucidation of specific factors in the pathophysiology of non-traumatic osteonecrosis that predispose to deterioration. More importantly, intensive operative procedures may be instituted early with the assurance that, despite the absence of symptoms, they are justified to prevent a poor outcome.

A clinical dilemma that commonly arises in the assessment of an asymptomatic, radiographically normal hip at the time that the contralateral hip is evaluated for pain is whether all such hips are truly free of disease or whether some, in fact, contain occult lesions that are not yet apparent on radiographs. In the present study, pain or radiographic changes, or both, subsequently developed in only five asymptomatic hips that had had normal findings on the initial radiographs; this suggests that most of these hips were free of disease from the start. The radiographic or clinical findings that developed in these five hips did so over a wide time-interval (range, forty-two to 113 months) after the symptoms appeared in the first hip. It is unknown whether magnetic resonance imaging, which has been shown to be capable of detecting disease that is not yet evident on radiographs[4,8,18], could have initially revealed diagnostic abnormalities in these few hips. Limitations of magnetic resonance imaging with regard to early diagnosis include its inability to detect necrosis until a reparative response has been initiated[14,22] and the finding that early signal abnormalities in some at-risk hips may be reversible and of no clinical importance[19,26].

The favorable outcome for most of the asymptomatic hips with normal findings on the initial radiographs in the present study is not in agreement with the findings reported by Bradway and Morrey. In a similar series, they found that twelve of fifteen hips had progression to painful collapse within thirty-six months. An explanation for this difference in outcome may be that the patients in the study by those authors were older on average and a larger proportion had steroid or alcohol-related disease. There were also differences in their technique of follow-up; Bradway and Morrey began following their patients from the time at which the first radiograph of the asymptomatic hip was available. The interval between the onset of symptoms in the primary hip and the time at which this radiograph was made was not specified. If follow-up of the asymptomatic hip is deferred until later in the course of the disease, such as until after treatment is instituted for the symptomatic hip, the time until the appearance of pain in the previously asymptomatic hip will seem shorter.

Our finding that only a few asymptomatic hips with normal findings on initial radiographs eventually manifested the disease is an argument against both the routine use of invasive diagnostic tests, such as intraosseous manometry, and the need for operative treatment of such hips. Whether early detection of signal abnormalities on magnetic resonance images of asymptomatic hips with normal radiographic findings will lead to improved outcomes remains to be determined.

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