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OSTEOARTHRITIS OF THE HIP AND FRACTURES OF THE PROXIMAL END OF THE FEMUR

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The purpose of this investigation was to verify a long-standing clinical observation that patients with fracture of the proximal end of the femur have less evidence of osteoarthritic changes in their hip joints than would have been expected in patients of similar age groups. The radiographs of 342 patients with fractures and those of 157 controls were examined. The statistical results gave uncontroversial evidence that the incidence of osteoarthritic joints was lower in the fracture group. The difference was even greater with severe osteoarthritic changes.
This suggests that patients with osteoarthritis have a "better quality" of bone. They are less likely to be suffering from osteoporosis and less liable to fractures of the proximal end of the femur.

Key words: femur; fracture; osteoarthritis

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Fractures of the proximal end of the femur and osteoarthritis of the hip joint affect patients of the same age groups. The purpose of the present investigation was to verify a long-standing clinical observation that patients with fracture of the proximal end of the femur have relatively less evidence of osteoarthritic changes in their hip joints than would have been expected in patients of similar age groups. Although this has very often been stated to be a "well-kown" fact, a careful review of the literature has failed to reveal any documented evidence substantiating this statement.

PATIENTS AND METHODS

The radiographs of 342 patients, aged 50 to 88 years (average 71 ± 15) suffering from fracture of the proximal end of the femur were carefully examined for signs of osteoarthritis. A consecutive series of radiographs of the pelvis of 157 patients (314 hips) of similar age, 55 to 83 years (average 70 ± 7) undergoing intravenous pyelography for urological purposes were similarly examined and used as controls. Hips showing evidence of osteoarthritic changes were divided into four grades according to the severity of the changes.

Grade 1: Localized narrowing of the joint space without osteophytes.
Grade 2: Definite narrowing of the joint space with small osteophytes.
Grade 3: Changes similar to grade 2 with additional cyst formation and sclerosis.
Grade 4: Deformity of the head and large osteophytes.

The results were analysed statistically using the following method: Student's t test for alternative variables, using φ function distribution. $\varphi = 2 \arcsin \sqrt{Pi}$, where Pi is percentage.

RESULTS

The most significant results are shown in Tables 1 and 2 and can be summarised as follows:

1. The incidence of osteoarthritic joints is significantly lower in the fracture group (140 in

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Table 1. A comparison between the incidence of osteoarthritis in the fracture group and the control group

	Total number of hips	Joints with osteoarthritis Absolute no.	Per cent	P
Fracture group	342	140	41%	<0.05
Control group	314	167	53.19%	

The incidence of osteoarthritic joints is significantly lower in the fracture group.

Table 2. A comparison between the incidence of osteoarthritic hips with osteophytes in the fracture group and the control group

	Total number of hips	Joints with osteophytes Absolute no.	Per cent	P
Fracture group	342	43	12.5%	<0.001
Control group	314	87	27.7%	

The incidence of osteoarthritic joints with osteophytes is very significantly lower in the fracture group.

Table 3. A comparison between the incidence of osteoarthritis in the fracture group and the control group in women only

Groups	Total number of hips	Joints with osteoarthritis Absolute no.	Per cent	P
Fracture	255	105	41.17	P>0.05
Control	150	74	49.3	

The incidence of osteoarthritic joints is lower in the fracture group. However the difference is not statistically significant.

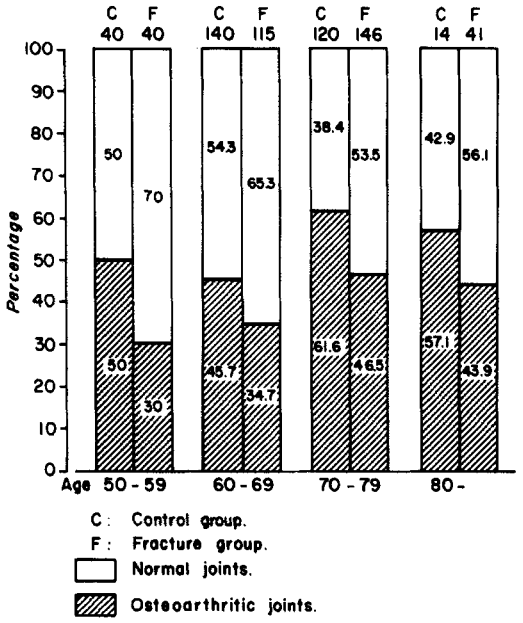

Figure 1. The incidence of osteoarthritic joints in various age groups.

342 hips – 41 per cent) than in the control group (167 in 314 hips – 53.2 per cent) P <0.05 (Table 1). The lower incidence of osteoarthritis in the fracture group is present in all age groups (Figure 1).

2. The incidence of osteoarthritic joints with osteophytes (grades 2, 3, 4) is very significantly lower in the fracture group (43 in 342 hips – 12.6 per cent) than in the control group (87 in 314 hips – 27.7 per cent) P <0.001 (Table 2).

It should be noted that there was a greater proportion of women in the fracture group (255 in 342 hips – 74.5 per cent) than in the control group (150 in 314 hips – 47.8 per cent). The

Table 5. A comparison between the relevant

Fractures	Total number	Average age x±SE	Sex Women abs	%	Men abs	%
Subcapital	242	70.4±10.9	180	74.5	62	25.5
Trochanteric	100	73 ± 2.7	73	73	27	27

There is no significant difference between the two types of fracture as regards age, sex, side and severity of

Table 4. A comparison between the severity of osteoarthritis in the whole group and in women only

Group		Total number	Normal		Grade of osteoarthritis 1		2		3		4	
			abs	%	abs	%	abs	%	abs	%	abs	%
Fracture	Whole	342	202	59	91	26.6	42	12.8	4	1.2	3	0.3
	Women	255	150	58.8	65	25.5	35	13.7	4	1.6	1	0.4
Control	Whole	314	146	46.5	100	31.8	50	15.9	16	5.0	2	0.6
	Women	150	74	49.3	48	32.0	24	16.0	2	1.4	2	1.3

In the fracture and the control group there is no significant difference between the incidence and degree of osteoarthritis in women and in the whole group ($P>0.05$).

Table 6. A comparison of the incidence and grade of osteoarthritis in the fractured and the contralateral hips

Fractures	Number of hips	Side	Normal		Grade of osteoarthritis 1		2		3		4	
			abs	%	abs	%	abs	%	abs	%	abs	%
Subcapital	242	Fracture	138	57	67	26.6	34	14	2	2.8	1	0.4
		Contralateral	142	58.6	60	24.5	36	14.8	4	1.6	0	0
Trochanteric	100	Fracture	64	64	24	27.7	10	10	2	2	0	0
		Contralateral	65	65	24	24.9	10	10	1	1	0	0
Total	342	Fracture	202	59	91	24.0	44	12.8	4	1.16	3	0.9
		Contralateral	207	60.5	84	24	46	13.4	5	1.4	0	0

There is no significant difference between the incidence and degree of osteoarthritis in the fractured and the contralateral hips ($P>0.05$).

same analysis including only women was therefore repeated and similar results were obtained. The difference however was not statistically significant (Table 3). The relevant data for women only were therefore compared with the data for the whole group and were found to be very similar (Table 4).

There was no significant difference between the incidence of osteoarthritic joints or the degree of osteoarthritic changes in patients with trochanteric and those with subcapital fractures $P > 0.05$ (Table 5).

There was also no significant difference in the incidence or the degree of osteoarthritic changes in the fractured and contralateral hips $P > 0.05$ (Table 6).

ıta in trochanteric and subcapital fractures

Side of fracture				Normal		Grade of osteoarthritis 1		2		3		4	
Right		Left											
abs	%	abs	%	abs	%	abs	%	abs	%	abs	%	abs	%
115	47.5	127	52.5	138	57	67	27.7	34	14	2	0.8	1	0.4
54	54	46	46	64	64	24	24	10	10	2	2.0	0	0

osteoarthritis ($P>0.05$).

DISCUSSION

It is a common clinical observation that patients with primary osteoarthritis have "good" bone, whereas those with fractures of the femoral neck almost always have "poor" bone. This is quite evident when prosthetic replacement is performed for osteoarthritis and for fractures of the femoral neck.

Schnitzler (1970) used the technique of quantitative microradiography to study iliac crest biopsies in 19 patients with osteoarthritis and 19 with osteoporosis. Her results indicated that patients with osteoporosis formed less bone and resorbed more than those with osteoarthritis. Microradiographs of specimens from osteoarthritic patients were found to have a cortex of normal thickness and normal trabecular bone, whereas those from osteoporotic patients showed markedly thinned cortices and widespread disappearance of trabeculae. In comparison with normal control figures, her values in osteoarthritic patients were found to be normal, whereas those for osteoporosis were below normal.

Solomon (1979) examined the femoral trabecular pattern (the Singh index) in 63 patients with fractures of the femoral neck and in 48 with osteoarthritis. His results showed that the trabecular pattern by itself would have been a poor predictor of liability to fracture of the femoral neck in elderly patients. However, a clear distinction could be made between patients with osteoporotic fractures and those with osteoarthritis when the metacarpal cortical thickness and the femoral trabecular pattern were taken together.

These results suggest that patients with osteoarthritis seem to have a better "quality" of bone. They are less likely to be suffering from osteoporosis, which is considered as the most important factor responsible for fragility of bone, and therefore less liable to fractures of the proximal end of the femur.

This is confirmed by our present findings which provide evidence that in patients with osteoarthritic changes in the hip the incidence of fracture of the proximal end of the femur is relatively low. It is even lower when osteoarthritic changes are severe. This applies equally well to both subcapital and trochanteric fractures and is not quite in accordance with the general clinical impression that in the presence of osteoarthritic changes there are less subcapital fractures only. It suggests therefore that the changes in the bone structure involve the whole proximal end of the femur, not only the juxta-articular bone.

It is also quite likely that the difference in the quality of bone is even more widespread and is not a localized phenomenon restricted to the bony components of the osteoarthritic joints since: 1) The biopsies examined by Schnitzler were taken from the iliac crests not from the hip joints; 2) The metacarpal cortical thickness confirmed the femoral trabecular pattern of the neck of the femur in Solomon's investigation; and 3) There was no difference in the findings in the fractured and contralateral hips in our study.

These conclusions also seem to be true for both sexes since analysis of the data in women only gave similar results as for the whole group. Although the difference was not statistically significant, the similarity of the relevant data for women only to those of the whole group suggests that the absence of statistical significance was only due to the smaller number of hips involved (405 in women as against 656 in the whole group) and that analysis of a greater number of women would have confirmed statistically that the incidence of osteoarthritic joints is significantly lower in the fracture group in women as well as in men.

To summarize, the evidence in this study confirms the long-standing clinical observation that there are less patients with fractures of the proximal end of the femur and osteoarthritic changes in their hip joints and seems to indicate that patients with osteoarthritis have a "better quality" of bone.

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