Prevalence of hand x-ray abnormalities in female patients with osteoarthritis

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ABSTRACT

Objective: This study was to determine the patho-anatomical features of oseoarthritis by means of hand radiographs.

Methods: Individual hand joint radiographs of 38 female patients (33 bilateral, 5 unilateral, aged 50-80 years) were utilized for grade, incidence and localization of osteophytes, joint space narrowing, subchondral sclerosis and erosion.

Results: Our findings revealed that the most frequent osteophytes were in the distal interphalangeal of ring (38%), the least frequent ones in the proximal interphalangeal of little (1%). In addition, the joint space narrowing was most frequent found in the distal interphalangeal of little (93%), the least frequently in the metacarpophalangeal of ring (25%). Subchondral sclerosis was most frequently seen in the distal interphalangeal of index (70%), the least in the metacarpophalangeal of little 35%). Erosion was most prevalent in the distal interphalangeal of index (65%), and least in the metacarpophalangeal of thumb (1%).

Conclusion: This study was carried out to determine the radiographic characteristics of osteoarthritis by means of hand radiographs.

Keywords: Osteoarthritis, hand radiography.

Saudi Med J 2001; Vol. 22 (5): 450-454

When osteoarthritis is compared with the normal anatomical formation on the hand (Figure 1), it occurs in movable joints and is inherently a non-inflammatory disorder, which can be recognized by examining the deterioration of articular cartilage and the formation of new bone at the joint surfaces and margins. In addition, some researchers have claimed that the relationship between cartilaginous and bony changes should be considered so as to explain the pathologic changes observed in osteoarthritis.[1] Other researchers have implicated osteophytes, joint space narrowing, subchondral sclerosis and erosion as significant pathological features of osteoarthritis in the plain radiographs. Furthermore, data obtained by some other investigators have indicated that the prevalence of such radiographic features in these joints could be explained in terms of the pinch and grasp actions of hands.[2-6] Joint pain is the dominant symptom of osteoarthritis. The prevalence of joint pain rises markedly with age.[1] The prevalence of functional impairment rises with age and is greater in women than in men. The purpose of this study was to determine the patho-anatomical features of osteoarthritis by means of hand radiographs.

Methods. Anteroposterior bilateral hand plain radiographs of 38 female (aged 50-80 years) patients with osteoarthritis participating in the unit of physical therapy and rehabilitation of Adana Numune Hospital (Turkey) were routinely taken without magnification for radiological assessment. The hand radiographs (33 bilateral, 5 unilateral, total 71 radiographs) were graded by using the modified

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Received 7th October 2000. Accepted for publication in final form 22nd January 2001.

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Figure 1 - Normal left hand radiograph.

Figure 2 - Left hand radiograph of a 70 year old female patient. a- Osteophytes, b - Joint space narrowing, c - Subchondral sclerosis, d - Erosion.

Kellgren-Lawrence scale.[2,7] On each hand radiograph, individual joints were graded for the presence and severity of selected individual features of osteoarhritis: osteophytes, joint space narrowing, subchondral sclerosis and erosion (Table 1). The individual features in the patients having been evaluated, the clinical grades of osteoarthritis were labelled as mild, moderate and severe. Clinical grades of osteoarthritis were based on the associated features of joint pain severity, degree of gross deformities and degree of hand movements impairment.

Results. Seventy one hand radiographs of female patients (33 bilateral, 5 unilateral, aged 50-80 years) were studied. Individual hand radiographs were utilized for graded, prevalence and localization of osteophytes, joint space narrowing, subchondral sclerosis and erosion (Table 2, 3, 4, 5, Figure 2). As seen in Table 2, the osteophytes were most frequent in the distal interphalangeal of ring (IV.DIP) (38%), the least frequent in the proximal interphalangeal of little (V.PIP) (1%). Additionally, Table 3 shows that the joint space narrowing appeared to be most frequent in the distal interphalangeal of little (V.DIP) (93%), and least frequent in the metacarpophalangeal of ring (IV.MCP) (25%). Furthermore, as seen in Table 4, the subchondral sclerosis was most frequent in the distal interphalangeal of index (II.DIP) (70%), and least frequent in the metacarpophalangeal of little (V.MCP) (35%). Finally, Table 5 indicates that the erosion was most frequently observed in the distal interphalangeal of index (II.DIP) (65%), and least frequently in the metacarpophalangeal of thumb (I.MCP) (1%). Analyzing all the tables together, it is obvious that the joint space narrowing is the common radiological

Table 1 - Rating methods used in scales for grading individual features of osteoarthritis of the hand.

Feature	Grade
Osteophytes	0 = None 1 = Small (definite) osteophyte(s) 2 = Moderate osteophyte(s) 3 = Large osteophyte(s)
Joint space narrowing	0 = None 1 = Definitely narrowed 2 = Severely narrowed 3 = Joint fusion at a least 1 point
Subchondral sclerosis	0 = absent 1 = present
Erosion	0 = absent 1 = present

Table 2 - Osteophytes in 38 patients with osteoarthritis.

Localization of osteophytes	Total no. of radiographs with osteophytes	Grade				Prevalence %
		0	I	II	III	
I.IP	17/71	54	15	1	1	24
II.DIP	17/71	54	17	-	-	24
III.DIP	25/71	46	23	2	-	35
IV.DIP	27/71	44	24	3	-	38
V.DIP	19/71	52	18	1	-	27
II.PIP	0/71	71	-	-	-	-
III.PIP	0/71	71	-	-	-	-
IV.PIP	0/71	71	-	-	-	-
V.PIP	1/71	70	1	-	-	1
I.MCP	0/71	71	-	-	-	-
II.MCP	0/71	71	-	-	-	-
III.MCP	0/71	71	-	-	-	-
IV.MCP	0/71	71	-	-	-	-
V.MCP	0/71	71	-	-	-	-

No. = number
IP = interphalangeal
DIP = distal interphalangeal
PIP = proximal interphalangeal
MCP = metacarpophalangeal

Table 3 - Joint space narrowing in 38 patients with osteoarthritis.

Localization of joint space narrowing	Total no. of radiographs with joint space narrowing	Grade				Prevalence %
		0	I	II	III	
I.IP	61/71	10	32	20	9	86
II.DIP	56/71	15	35	8	13	79
III.DIP	53/71	18	29	14	10	75
IV.DIP	57/71	14	35	17	5	80
V.DIP	66/71	5	37	17	12	93
II.PIP	42/71	29	30	9	3	59
III.PIP	49/71	22	35	11	3	69
IV.PIP	50/71	21	34	12	4	70
V.PIP	51/71	20	39	8	4	72
I.MCP	33/71	38	25	5	3	46.5
II.MCP	23/71	48	15	6	2	32
III.MCP	26/71	45	20	3	3	37
IV.MCP	18/71	53	12	5	1	25
V.MCP	21/71	50	14	5	2	30

No. = number
IP = interphalangeal
DIP = distal interphalangeal
PIP = proximal interphalangeal
MCP = metacarpophalangeal

Table 4 - Subchondral sclerosis in 38 patients with osteoarthritis.

Localization of subchondral sclerosis	Total no. of radiographs with subchondral sclerosis	Grade		Prevalence %
		0	1	
I.IP	44/71	27	44	62
II.DIP	50/71	21	50	70
III.DIP	45/71	26	45	63
IV.DIP	46/71	25	46	65
V.DIP	48/71	23	48	68
II.PIP	45/71	26	45	63
III.PIP	46/71	25	46	65
IV.PIP	40/71	31	40	56
V.PIP	31/71	40	31	44
I.MCP	36/71	35	36	51
II.MCP	41/71	30	41	58
III.MCP	41/71	30	41	58
IV.MVP	30/71	41	30	42
V.MCP	25/71	46	25	35

No. = number
IP = interphalangeal
DIP = distal interphalangeal
PIP = proximal interphalangeal
MCP = metacarpophalangeal

Table 5 - Erosion in 38 patients with oseoarthritis.

Localization of erosion	Total no. of radiographs with erosion	Grade		Prevalence %
		0	1	
I.IP	9/71	62	9	13
II.DIP	46/71	25	46	65
III.DIP	45/71	26	45	63
IV.DIP	43/71	28	43	61
V.DIP	31/71	40	31	44
II.PIP	23/71	48	23	32
III.PIP	30/71	41	30	42
IV.PIP	24/71	47	24	34
V.PIP	12/71	59	12	17
I.MCP	1/71	70	1	1
II.MCP	18/71	53	18	25
III.MCP	15/71	56	15	21
IV.MCP	14/71	57	14	20
V.MCP	6/71	65	6	8.5

No. - number
IP - interphalangeal
DIP - distal interphalangeal
PIP - proximal interphalangeal
MCP - metacarpophalangeal

change observed in the examined sample, next is subchondral sclerosis, third is erosion and the last is osteophytes formation. In addition during the clinical grading osteoarthritis was observed as mild in 13 cases (18%), moderate in 25 (35%), and severe in 33 (46.5%). In all the patients, there are not significant gross deformities and a loss of function which will hinder their daily activities despite occasional complaints of pain.

Discussion. Plain radiography is generally used to identify the features of osteoarthritis of hands.[2,6] It is known that the prevalence of functional impairment rises with age and is greater in women than in men.[5] The increased prevalence of osteoarthritis in women after the age of 40 continues to widen over ensuing decades. The number of joints involved and disease severity is greater in women over age 55 than in men.[1,5] In addition, as previously reported radiographic findings can be utilized in order to define the grade and prevalence of osteoarthritis.[8,9] In this study, the anatomical distribution of osteophytes, subchondral sclerosis, erosion and joint space narrowing were characteristically seen in the DIP, PIP and MCP joints in women over the age of 50. The results are given in Tables 2-5. Wright et al reported that osteophytes are significantly more prevalent in the DIP and PIP joints of the hand.[3] Our results revealed that osteophytes were more prevalent in the IV.DIP joint of hand. These findings are in accordance with the results of other investigators.[2] Additionally, joint space narrowing and subchondral sclerosis are seen at all the joints. The prevalence, obtained in our study showed close relation with Buckland-Wright's results.[3,10-14] However, in our study, joint space narrowing was most frequently found in the V.DIP and subchondral sclerosis was most frequently found in the II.DIP. Altman et al identified erosion at the first CMC the most and at the fourth DIP the least,[2] whereas the erosions observed in our study were identified at the second DIP the most and at the first MCP the least. When all the results were analyzed together; joint space narrowing was seen as the most important, subchondral sclerosis as the second most important, erosions the third in importance and osteophytes the last important feature. However, Altman et al pointed out that osteophytes were observed first and erosions the second and joint space narrowing third. We think that this difference may result from the age and race differences of the patients. Although significant deformities, a loss of function and complaints of pain were not observed in the patients with osteoarthritis, radiological changes were identified.[15] The fact that there were not gross deformities, loss of function and complaints of severe pains although radiological patho-anatomical changes were observed in the patients in our study supports the results obtained by Wood. In the light of these findings, we think that radiological examination of the patient is essential for a definite diagnosis. According to, the present study showed that osteophytes, erosion, subchondral sclerosis and joint space narrowing were apparently advanced in women over the age of 50 suffering from osteoarthritis.

In conclusion, this study was conducted in order for the assessments of available hand radiographs of the osteoarthritis. The grading of these radiographs should provide an accurate account of the anatomical distributions such as of erosions, joint space narrowing, osteophytes, subchondral sclerosis in the hand. Additionally, the prevalence of these features observed at different regions, which were indicated by the present study, could be utilized to provide on index of osteoarthritis activity.

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