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Research Article

Variations in radiographic appearance of articular cartilage of knee joints in persons of 35 to 65 years of age

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ABSTRACT

Background: Osteoarthritis is a slowly progressive degenerative disease characterized by gradual loss of articular cartilage. Osteoarthritis is not a normal process of ageing processes. Age related changes are distinct from osteoarthritic changes but when coupled with certain precipitating factors like obesity, muscle weakness and neurological dysfunction may play an important role in the causation of osteoarthritis. Osteoarthritis occurrence appears to increase with patient's age in a non-linear fashion. The prevalence of disease increases dramatically after the age of 50 years, likely because of age related alterations in collagen and proteoglycan synthesis coupled with diminished nutrient supply to the cartilage.
Methods: In this paper presenting the naked eye assessment of radiographic appearance of articular cartilage of knee joints of 100 persons (both men and women) of 35 to 65 years of age with symptoms like pain and stiffness of the joint.
Results: Parameters like changes in the joint space width, the presence or absence of osteophytes and subchondral sclerosis and cysts were noted. The correlation between the patient's age, sex, symptoms and radiological appearance were observed.
Conclusion: Osteoarthritis has a higher prevalence and more often generalized in women than in men. Before the age of 50 years, the incidence of osteoarthritis is low and men have a slightly higher prevalence than women, but after the age of 50 years, the disease becomes more frequent and women have a much higher prevalence with a female to male ration of about 12:1. The reason for this is sex difference in cartilage volume.

Keywords: Articular cartilage, Joint space width, Osteophytes, Subchondral sclerosis, Cysts and osteoarthritis

INTRODUCTION

Articular hyaline cartilage covers articular surfaces in synovial joints, providing an extremely smooth, resistant surface bathed by synovial fluid, allowing almost friction less movement. Its elasticity, with that of other articular structures, dissipates effects of concussions, giving the whole articulation some flexibility, particularly near extremes of movement. Articular cartilage is admirably constructed to resist the large compressive forces generated by weight transmission especially during movement. It does not ossify and varies from 1 to 7 mm in thickness, it is moulded to the shape of the underlying bone. But its surface smoothes often accentuates and modifies the surface geometry. On convex surfaces it is thickest centrally, the reverse being true of concave surface; its thickness from maturity to old age.[1]

We need to know about osteoarthritis because it ranks with cancer and heart disease as a major cause of disability in the elderly. Approximately 30% of the persons over the age of 65 are affected worldwide. In the U.S. about 80 to 90% above 65 years of age are affected.[2]

It is not a single disease. It is the end result of a variety of patterns of joint failure. It is the slowly progressive degenerative joint disease. It is always characterised by both degeneration of articular cartilage presenting as narrowing of joint space width[3] which is non-uniform on roentgenogram and simultaneous proliferation of new bone, cartilage and connective tissue. Inflammatory changes in the synovium are usually minor and secondary.

All though the incidence of osteoarthritis increases with age the condition is not a normal part of ageing process. And the diagnosis of osteoarthritis is based primarily on the history and physical examination but radiographic findings including asymmetric joint space narrowing, subchondral sclerosis, osteophyte formation.[4] The cause of age related loss of chondrocyte function may be progressive senescence of articular cartilage.[5] For the diagnosis of osteoarthritis three symptoms namely persistent knee pain, limited morning stiffness, reduced function and three signs which are crepitus, restricted movement and bony enlargement.[6] Before the age of 50 years the incidence of osteoarthritis is low but the prevalence rate is high in men. After the age of 50 years the disease becomes more frequent and women have a much higher prevalence compared to men. The exact reason is not known but sex difference in cartilage volume is a potential explanation.[7]

Currently magnetic resonance is the best method for evaluating the articular cartilage lesions. Because of its non-invasive nature, high sensitivity, specificity, high contrast and multiplanar capability.[8]

METHODS

We have taken radiographs of knee joint of 100 persons (Men & women) of 35 to 65 years of age with symptoms like pain and stiffness of the joint (AP & lateral view) from outpatient department of OGH, Hyderabad, Telangana State. Parameters like normal or reduced joint space width, presence or absence of marginal osteophytes, subchondral sclerosis, subchondral cysts were noted (Table 1). The Parameters like normal or reduced joint space width, presence or absence of marginal osteophytes, subchondral scleorsis, subchondral cysts were noted in men aged between 35 and 65 years, exclusively (Table 2). The Parameters like normal or reduced joint space width, presence or absence of marginal osteophytes, subchondral scleorsis, subchondral cysts were noted in Women aged between 35 and 65 years, exclusively (Table 3).

Table 1: Study of radiographs of knee joints with symptoms.

Age group	Sex		Total	Joint space width				Marginal osteophytes				Subchondral sclerosis				Subchondral cyst			
				Normal		Reduced		Present		Absent		Present		Absent		Present		Absent	
	M	F		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
35-40 years	26	12	38	14	2	12	10	2	-	-	-	-	2	-	-	-	4	-	-
41-45 years	8	6	14	4	-	4	6	4	-	4	-	2	-	-	-	-	-	-	-
46-50 years	12	10	22	6	2	6	8	2	-	-	-	-	-	-	-	-	-	-	-
51-55 years	14	6	20	6	-	8	6	8	-	-	-	6	-	-	-	2	2	-	-
56-60 years	0	4	4	-	2	-	2	-	2	-	2	-	-	-	-	-	-	-	-
61-65 years	0	1	2	-	-	-	2	-	2	-	-	-	2	-	-	-	-	-	-
Total	60	40	100	30	6	30	34	16	4	4	4	8	8	-	-	2	6	-	-

Table 2: Men chart.

Age group		Total	Joint space width		Marginal osteophytes		Subchondral sclerosis		Subchondral cyst	
			Normal	Reduced	Present	Absent	Present	Absent	Present	Absent
35-40 years	M A L E	26	14	12	2	-	-	-	-	-
41-45 years		8	4	4	4	4	2	-	-	-
46-50 years		12	6	6	2	-	-	-	-	-
51-55 years		14	6	8	8	-	6	-	2	-
56-60 years		0	-	-	-	-	-	-	-	-
61-65 years		0	-	-	-	-	-	-	-	-
Total		60	30	30	16	4	8	-	2	-

Table 3: Women chart.

Age group		Total	Joint space width		Marginal osteophytes		Subchondral sclerosis		Subchondral cyst	
			Normal	Reduced	Present	Absent	Present	Absent	Present	Absent
35-40 years	FEMALE	12	2	-	-	-	2	-	4	-
41-45 years		6	-	-	-	-	-	-	-	-
46-50 years		10	2	-	-	-	-	-	-	-
51-55 years		6	-	-	-	-	-	-	2	-
56-60 years		4	-	-	2	2	-	-	-	-
61-65 years		1	2	-	2	-	2	-	-	-
Total		40	6	-	4	2	4	-	6	-

The marginal osteophytes were the most sensitive radiographic feature for the detection of osteoarthritis of the tibiofemoral joint. Joint space narrowing, subchondral sclerosis and subchondral cysts were less sensitive radiographic features of osteoarthritis and rarely occurred in the absence of associated osteophyte formation.[9]

RESULTS

Knee radiographs of a total of 100 persons with symptoms like pain and stiffness of the joint were studied of which 60 were those of men and 40 were those of women. The Radiographic hallmarks of osteoarthritis are 1] Non uniform joint space narrowing (Figure 1 and 5), 2] Osteophyte formation (Bony out growth) (Figure 2), 3] Subchondral sclerosis (Increased bone density) (Figure 3 and 4), 4] Subchondral cyst formation (Figure 3). Osteoarthritis is not a normal process of ageing, the radiograph of normal knee joint of 70 year old man (Figure 6).

Figure 1: Narrowing of joint space width in the medial compartment.

Figure 2: Radiograph showing osteophyte.

Figure 3: Radiograph showing subchondral sclerosis & cyst.

Figure 4: PA view in weight bearing full extension.

Figure 5: PA weight bearing radiograph of knee in full extension & 30 degree flexion.

Figure 6: Radiograph of normal knee joint of 70 years old man.

DISCUSSION

In general, the incidence of osteoarthritis is low below the age of 50 years and high after the age of 50 years (Figure 7).

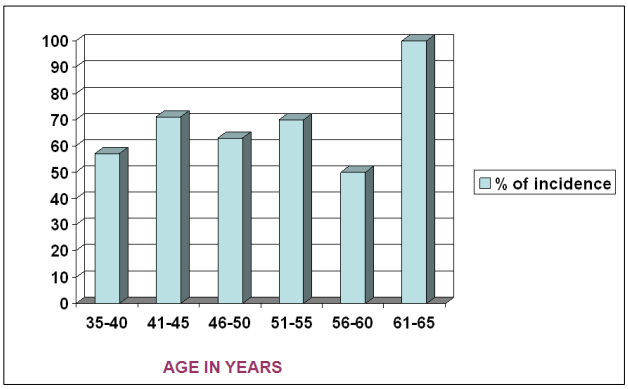

Figure 7: % of incidence of osteoarthritis in different age groups.

Before the age of 50 years the incidence of osteoarthritis is more prevalent in men. After the age of 50 years the incidence is more prevalent in women compare to men (Figure 8). The sex difference in cartilage volumes is a potential explanation for sex variation in incidence.

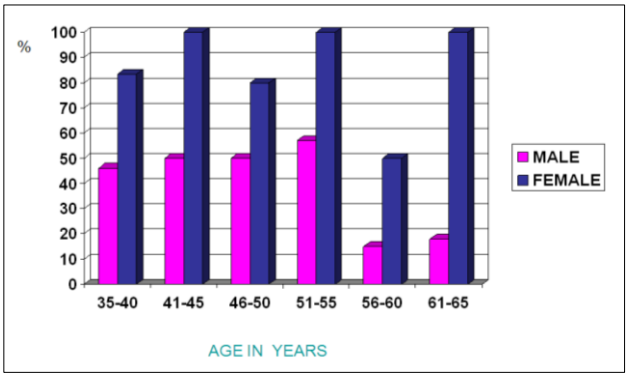

Figure 8: Sex variation in the incidence of osteoarthritis in different age groups.

Although the incidence of osteoarthritis appears to increase with age, the condition is not a normal part of ageing process. In ageing, the articular cartilage shows localized fibrillation, matrix with decreased water content and with no secondary bone remodelling, resulting in loss of cartilage shock absorbing property. Where as in osteoarthritis the articular cartilage shows fibrillation, fragmentation and loss of cartilage thickness along with bone remodelling such as osteophytes subchondral sclerosis, subchondral cysts and formation of fibrocartilagenous tissue repair.

Thus age related changes are distinct from osteoarthritic changes but only when associated with certain precipitating factors like abnormal stresses, abnormal shape of the bones of the joint, muscle weakness or neurological deficit or dysfunction may play an important role in the causation[10] (Figure 9).

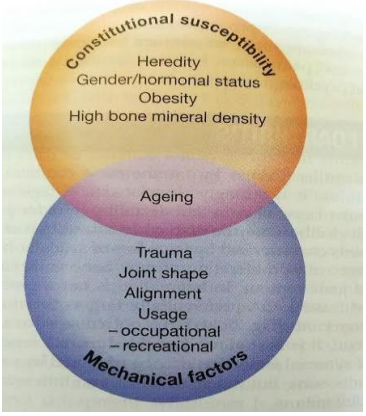

Figure 9: Risk factors for the development of osteoarthritis. (Figure courtesy Davidson's principles and practice of medicine, 21st edition, page no. 1087).

In the present study, our findings are correlated with the previous authors M. Sengupta, Y. Q. Zhang, J. B. Nill, A. Guermazi, M. Gringorian, D. Gale et al., osteoarthritis cartilage and D. J. Hunter, Y. Q. Zhang, J. B. Niu, X. Tu, S. Amin, M. Clancy et al., in the year 2006 Feb.

In addition to that, we have concluded that incidence and prevalence of the disease differ in men and women before and after the age of 50 years.

CONCLUSION

Osteoarthritis appears to increase with age in a non-linear fashion. Before the age of 50 years, the incidence is low but the prevalence rate is high in men compare to women. But after the age of 50 years the disease is more frequent in general and both prevalence and incidence rates are high in women.

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