



Correlation of Histopathological Osteoarthritis Findings with the Clinical Severity in Osteoarthritic Patients

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Abstract

Objective: To determine Osteoarthritis Cartilage Histopathology (OACH) assessment system applied to the characterisation of the osteoarthritic human knee and hip and correlate it with clinical severity.

Keywords- Osteoarthritis, OACH grading, oxford score.

1. INTRODUCTION

Osteoarthritis (OA) is one of the most prevalent conditions resulting to chronic disability, particularly in elderly. Worldwide, OA is the most common articular disease of people aged 65 years and older. It represents a

major cause of disability in the United States. The prevalence of this disorder in certain elderly group is as high as 85%. The economic costs of OA are high, including those related to the treatment, for those individuals and their families who must adapt

their lives and homes to the disease, and those due to lost work productivity [1]. According to the estimates for the global burden of disease 2000 study published in world health report 2002, OA is the 4th leading cause of disability at global level [2].

In India 5.3% males and 4.8% females are aged more than 65 years old. Although the proportionate percentage of elderly people in developing countries is lesser but absolute number is more than the developed world [3]. The commonest obstacle for elderly to carry out activities of daily living is the problem of joint-pain and decreased mobility. The prevalence of OA in India is reported to be in range of 17-60.6% [3]. OA may be associated with decreased life span in view of threat on a person's physical function and the benefit of exercise on overall health. OA is currently defined by the America College of Rheumatology as a heterogeneous group of conditions that lead to joint signs and symptoms, which are associated with defective integrity of articular cartilage, in addition to related changes in the underlying bone at the joint margins [4]. In other words OA is considered as the cumulative result of mechanical and biological events that induce an imbalance between the degradation and synthesis within articular joint tissues. The diagnosis of OA is mainly based on physical examination and radiographs, which provide only a semi-quantitative assessment of the disease state. The current study intends to find out various cartilage changes in OA of knee and hip and

its clinical and radiological co-relations in a given patient.

2. MATERIAL AND METHODS-

Case Selection:

All consecutive patients who satisfied the inclusion criteria enumerated below, who had primary osteoarthritis of knee and hip of varying severity, were considered eligible for the enrolment in the study.

Inclusion Criteria:

Both sexes, Patients with primary osteoarthritis, Patients who satisfied the clinical criteria for knee and hip osteoarthritis, which is enumerated below

Clinical criteria:

The presence of the following were regarded as signs of osteoarthritis-

Joint line tenderness, Crepitus on active or passive knee motion, Limitation of range of motion, Varus or valgus deformity of any degree, These patients later underwent total knee replacement/ total hip replacement in Maharaja. Yeshwant Rao Hospital, Indore and other private hospitals during period of Sept 2010 to sept. 2013.

Exclusion criteria:

- All cases of clinical and radiological features of suggestive of inflammatory arthritis like RA and all cases of secondary osteoarthritis.

Majority of the samples collected were from the femoral and the tibial condyles especially from the medial compartment during total knee replacement done for primary OA from 23 patients. 2 samples were also collected

from the femoral head after hip replacement surgery .

These specimen were labelled and immediately fixed in 10% neutral buffered formalin and sent to us in the department of pathology, M.Y. hospital for tissue processing and assessment. All patients were informed about the aims of the study and the study protocol, and their informed consents were obtained prior to the study.

Of the various clinical scoring systems available (WOMAC score,Bristol Knee score, Hospital for Special Surgery score, Hungerford Knee score) the Oxford Knee/hip score was considered to assess the clinical disability in OA patients.[5,6]

The oxford knee score is a 12 point questionnaire, specifically designed for patient undergoing total knee replacement, hence most appropriate for this study. It is a short, practical, reliable, valid and sensitive to clinically important changes over time and is now widely applied and accepted model. The value for each answer is indicated to the left. Hence the total score obtained is of 48 points.

The Oxford Knee Score:

During the past 4 weeks,

1) Describe the pain you usually have from knees?

4) None, 3) Very mild, 2) Mild, 1) Moderate,0) Severe

2) Have any trouble washing and drying yourself all over because of your knee?

4) No trouble,3) Very little trouble, 2) Moderate difficulty,1) Extreme difficulty,0) Impossible

3) Have you had any trouble getting in and out of the car or using public transport,because of your knee?

4) No trouble,3) Very little trouble, 2) Moderate trouble,1) Extreme trouble 0) Impossible

4) For how long are you able to walk before the pain in your knee become severe?

4) No pain for >60min 3) Can walk for 16-60min 2) 5-15min 1) Around the house only 0) Not at all

5) After a meal (set on a table)how painful it has been for you to stand up from a chair because of your knee?

4) Not at all painful 3) Slightly painful 2) Moderately painful 1) Very painful 0) Unbearable

6) Have been limping because of your knee while walking?

4) Rarely/never 3) Sometimes, often at first 2) Often, not just at first 1) Most of the time 0) All the time

7) Can you kneel down and get up again upwards?

4) Yes, easily 3) With little difficulty 2) With moderate difficulty 1) With extreme difficulty 0) Impossible

8) Are you troubled by pain in the knee at night on the bed?

4) Not at all 3) For 1-2 nights 2) Some nights 1) Most nights 0) All nights

9) How much has the pain in your knees interfered with your usual work?

4) Not at all 3) A little bit 2) Mildly 1) Greatly 0) Totally

10) Have you felt that your knee may suddenly give away?

4) Rarely/never 3) Sometimes, at first 2) Often, not at first 1) Most of the time 0) All the time

11) Can you do household shopping on your own?

4) Easily 3) With little difficulty 2) With moderate difficulty 1) With extreme difficulty 0) Impossible

12) Can you walk down or up a flight of stairs?

4) Yes, easily 3) With little difficulty 2) With moderate difficulty 1) With extreme difficulty 0) Impossible.

Scores:

40-48 : Satisfactory joint function

30-39 : Mild to moderate knee OA

20-29 : Moderate to severe knee OA

0-19 : Severe knee OA.

Oxford Hip Score

The Oxford hip score is a 12 point questionnaire, specifically designed for patient undergoing total hip replacement. It is a short, practical, reliable, valid and sensitive to clinically important changes over time and is now widely applied and accepted model.

The value for each answer is indicated to the left. Hence the total score obtained is of 48 points.

During the past 4 weeks...

1. How would you describe the pain you usually have in your hip?

4) None 3) Very mild 2) Mild 1) Moderate 0) Severe

2. Have you been troubled by pain from your hip in bed at night?

4) No nights 3) Only 1 or 2 nights 2) Some nights 1) Most nights 0) Every night

3. Have you had any sudden, severe pain-'shooting', 'stabbing', or 'spasms' from your affected hip?

4) No days 3) Only 1 or 2 days 2) Some days 1) Most days 0) Every day

4. Have you been limping when walking because of your hip?

4) Rarely/never 3) Sometimes or just at first 2) Often, not just at first 1) Most of the time 0) All of the time

5. For how long have you been able to walk before the pain in your hip becomes severe (with or without a walking aid)?

4) No pain for 30 minutes or more. 3) 16 to 30 minutes 2) 5 to 15 minutes 1) Around the house only 0) Not at all

6. Have you been able to climb a flight of stairs?

4) Yes, easily 3) With little difficulty 2) With moderate difficulty 1) With extreme difficulty 0) No, impossible

7. Have you been able to put on a pair of socks, stockings or tights?

4) Yes, easily 3) With little difficulty 2) With moderate difficulty 1) With extreme difficulty 0) No, impossible

8. After a meal (sat at a table), how painful has it been for you to stand up from a chair because of your hip?

4) Not at all painful 3) Slightly painful 2) Moderately painful 1) Very painful 0) Unbearable

9. Have you had any trouble getting in and out of a car or using public transportation because of your hip?

4) No trouble at all 3) Very little trouble 2) Moderate trouble 1) Extreme difficulty 0) Impossible to do

10. Have you had any trouble with washing and drying yourself (all over) because of your hip?

4) No trouble at all 3) Very little trouble 2) Moderate trouble 1) Extreme difficulty 0) Impossible to do

11. Could you do the household shopping on your own?

4) Yes, easily 3) With little difficulty 2) With moderate difficulty 1) With extreme difficulty 0) No, impossible

12. How much has pain from your hip interfered with your usual work, including housework?

4) Not at all 3) A little bit 2) Moderately 1) Greatly 0) Totally

Scores:

40-48 : Satisfactory joint function

30-39 : Mild to moderate hip OA

20-29 : Moderate to severe hip OA

0-19 : Severe hip OA.

OA cartilage histo-pathology was done and grading, staging and scoring was done using

the OARSI system.[7,8] Table (1,2), and Fig (1,2,3,4,5)

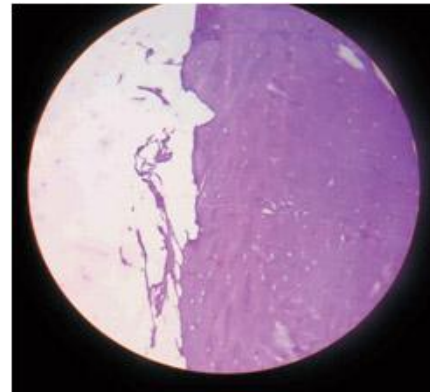


Fig.1 H & E stained section showing grade 3 osteoarthritis

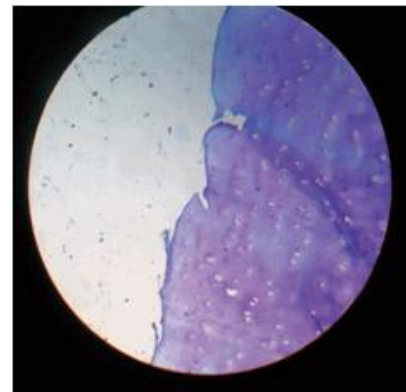


Fig. 2 Toluidine stained section showing grade 3 osteoarthritis



Fig. 3 H & E stained section showing grade 4 osteoarthritis

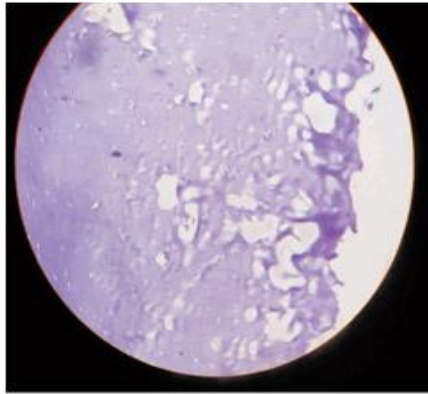


Fig 4 H & E stained section showing grade 4 osteoarthritis

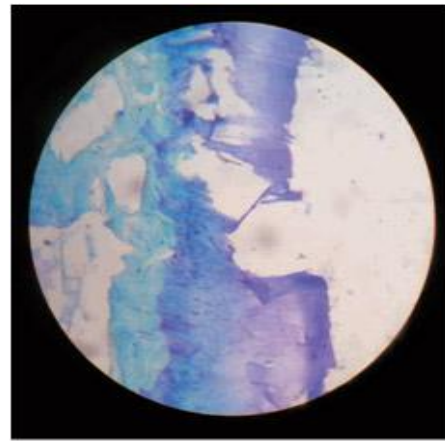


Fig.6 Toluidine stained section showing grade 5 osteoarthritis

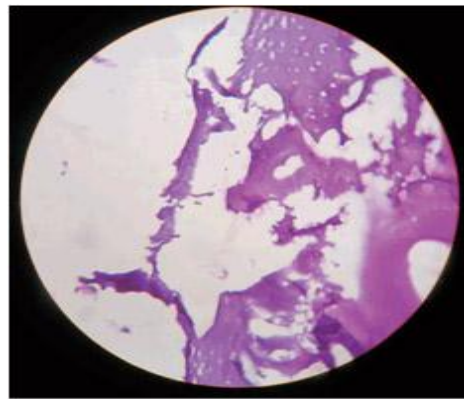


Fig.5 H & E stained section showing grade 5 osteoarthritis

OA SCORE:

OA cartilage score represents a combined assessment, based on both the severity (grade) and extent (stage) of OA in the articular cartilage. An OA cartilage score can be determined using either qualitative, semi-quantitative or quantitative methods. In considering scoring methodology, the method selected should be as simple as that required to obtain the information needed to separate

the OA from the controls or to compare one OA set with another.

To compare an OA test group to controls, qualitative or semi- quantitative methods are usually sufficient. To compare the extent of OA between the cartilage domains within a model, quantitative methods are recommended as a first choice.

Table 2 .OA CARTILAGE HISTOPATHOLOGY- STAGE ASSESMEN

Stage	% involvement (surface, area, volume)
STAGE 0	No OA activity seen
STAGE 1	<10%
STAGE 2	10-25%
STAGE 3	25-50%
STAGE 4	>50%

RECOMMENDED OA SCORE METHOD

The recommended score is an index of combined grade and stage. The simple formula : score=grade x stage is recommended. This method produces an OA score with a range of 0-24 based on the most advanced grade and extensive stage present. This method provides equal ordinal number weight to severity(grade) and extent(stage). This method continues to bias OA assessment towards the most advanced disease observed.

RESULTS-

Table 3. shows a comparison between clinical severity (as assessed by the oxford scoring) and subsequently done histopathology OARSI histopathological grading. We found that maximum patients who had severe functional disability (0-19 score) also had severe cartilage changes on histopathology(as assessed by higher grades- grade 4 & 5). There were 18 patients with severe clinical disability out of which 10 had grade 4 i.e.55.55% and 7 patients had grade 5 changes. i.e.38%.

Oxford Knee/hip Score	Histopathology OARSI grading				
	Grade 0	Grade 1	Grade 2	Grade 3	Grade 4
0-19	-	-	-	1	10
20-29	-	-	-	1	5
30-39	-	-	-	-	-
40-48	-	-	-	-	-

Table 3.Comparison between oxford scoring and histopathology grading

4. DISCUSSION

A total number of 25 cases from different age groups of elderly patients were thoroughly studied. Histopathological examination was done and interpretation was made considering the clinical findings of the cases.

1. Age and sex distribution-

This study has been undertaken on patients of osteoarthritis of knee and hip.

- In our study of 25 cases, where 18 patients(72%) were females while 7 (28%,n=25) were males , maximum number of patients suffering from osteoarthritis belonged to the age group of 61-70 years. Maximum number of patients in our study were females.

- Similar finding was noted in a study conducted by S. Avasthi, D. Sanghi et al [9] in department of orthopaedic surgery, CSMMU, Lucknow between 2006-2008. Patients of primary osteoarthritis knee were included in the study. 120 patients were enrolled out of which 46(38.3%) were males and 61.7% were females. So here also the incidence of osteoarthritis was higher in females than males.

- Another study was conducted by F.A. Okanlawon [10] , in University of Ibadan, Nigeria where study population consisted of 486 patients diagnosed with osteoarthritis

knee, lumbar and cervical spine between July 2007 and June 2008. It consisted of 209 males and 277 females. Here the incidence in females was only slightly higher than males. In this study In the females, the incidence of osteoarthritis of the knee joint was the highest, and found to be more common within the age groups of 56–60, followed by 45–50, 61–65, 81–85 and 71–75.

- In our study the incidence of osteoarthritis of the knee joint in females was found to be more common within the age group of 61-70 followed by 71-80 and 50-60.

- In our study, we found that maximum patients who had severe functional disability (0-19 score) also had severe cartilage changes on histopathology.

The articular cartilage had undergone progressive grade changes already at the time of presentation and when patients opted for TKR/THR. This was may be because of the long standing condition and financial constraints.

5. CONCLUSION

The grading system implemented provided useful measures in the characterisation of knee and hip osteoarthritis and correlated with the clinical severity in osteoarthritic patients..

Table 1. Grade= Depth progression into cartilage

Grade	Key features	Associated criteria (tissue reaction)
Grade 0	Surface intact, cartilage morphology intact.	Matrix: normal architecture Cells: intact, appropriate orientation
Grade 1	Surface intact	Matrix: superficial zone intact, oedema/ superficial fibrillation, focal superficial condensation. Cells: death, proliferation (clusters), hypertrophy
Grade 2	Surface discontinuity	As above +matrix discontinuity at superficial zone (deep fibrillation) Cells: death, proliferation (clusters), hypertrophy
Grade 3	Vertical cleft (fissures)	As above +matrix vertical fissures into mid zone, branched fissures Cells: death, regeneration (clusters), hypertrophy, cartilage domains adjacent to fissures.
Grade 4	Erosion	Cartilage matrix loss; delamination of superficial layer, mid-layer cyst formation, excavation; matrix loss superficial and mid-zone
Grade 5	Denudation	Surface: sclerotic bone or reparative tissue including fibrocartilage within denuded surface, micro-fractures with repair limited to bone surface
Grade 6	Deformation	Bone remodelling (more than osteophyte formation only); includes micro-fractures with fibro-cartilagenous and osseous repair extending above the previous surface

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