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Original Article

Analysis of relationship between radiological morphometric measurements of knee joint and symptomatology of osteoarthritis – A pilot study

Shilpi Gupta Dixit[a,*], Vertika Kesarwani[a], Abhay Elhence[b], Surajit Ghatak[a]

[a] Department of Anatomy, All India Institute of Medical Sciences, Jodhpur, Rajasthan, India
[b] Department of Orthopaedics, All India Institute of Medical Sciences, Jodhpur, Rajasthan, India

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ABSTRACT

Introduction: Osteoarthritis (OA) is commonly viewed as a pathological outcome of a range of disorders resulting in structural degradation and functional failure of synovial joints. Osteoarthritis is the leading cause of pain and disability in the elderly affecting about 21 million people across the world out of which knee osteoarthritis occupies a major fraction. Despite this, osteoarthritis remains a condition that is poorly understood and for which very few therapeutic options are available.
Methods: The present cross sectional study comprised of 30 subjects suffering from osteoarthritis attending orthopaedics OPD and morphometric measurements (average joint space width, tibial anatomical axis, medial and lateral tibiofemoral joint space and articulate angle) were taken on X-Ray images.
Results: In our study, these measurements in patients of knee OA were significantly reduced when compared to controls but their correlation to pain symptoms was found to be non-significant may be because the study was on a very small scale.
Discussion: Further studies need to be done with inclusion of more factors or symptoms relating to morphometric measurements. Nevertheless the measurements done were relatively simple therefore easily reproducible and also independent of any observational error. This study assumes significance as few studies are available in North Indian population.

1. Introduction

Arthritis is a type of joint disorder featuring inflammation of joints. It may involve one or more joints depending upon which it can be classified as (a) monoarticular-involving one joint; (b) oligoarticular- involving a few joints or; (c)polyarticular- involving many joints. Inflammation is characterized by joint stiffness which may lead to either loss of function or limited function of the affected joints. The four characteristics of inflammation namely rubour (redness), calor(temperature), dolour (pain) and tumor (swelling) are found on examination. Inflammation is accompanied by joint pain which is commonly called as arthralgia. The pain is constant and localized in character. However, the pain pattern may differ depending on the type of arthritis and the location of pathology. Arthritis is of many types. Over 100 s of types have been identified by now and the number is still growing. It can be classified into various types depending on the criteria of classification.

Arthritis is a multifactorial disorder having causes which may include injury as in osteoarthritis, metabolic abnormalities as in gout and psuedogout, it may also be a result of direct or indirect effect of infection or overactive immune system as in rheumatoid arthritis. It may also be a result of genes inherited from ancestors which is one of the major causes of arthritis.

Osteoarthritis is a group of mechanical abnormalities involving degradation of joints including articular cartilage and subchondral bone. Varied sources of mechanical stress, which may include misalignment of bones caused by congenital or pathogenic causes, mechanical injury, overweight and loss of strength in muscles supporting the joint. Osteoblast cells from the exposed subchondral bone migrate into the joint capsule around the margins leading to development of bony projections called “spur” or “osteophytes” within the joint capsule. It is one of the major causes

* Corresponding author at: Department of Anatomy, All India Institute of Medical Sciences (AIIMS), Jodhpur, Rajasthan, 342005, India.
E-mail address: shilpidr@gmail.com (S.G. Dixit).

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of disability affecting about 27 million people in USA. It begins in the cartilage and eventually causes the opposing bones to erode each other exposing the underlying bone surface. It starts with minor pain initially which occurs only during activities but soon the pain may become continuous and even occur in state of rest. The pain can be debilitating and prevent one from doing routine activities which eventually leads to disability and handicap of lower extremity.[1–4]Other symptoms may include pain in the associated muscles and tendons, inflammation of the joint capsule, development of hard bony enlargement, accumulation of fluid in joints etc. A characteristic feature of osteoarthritis distinguishing it from rheumatoid arthritis is that it feels better with gentle use but worsens with prolonged use. Also, contrary to rheumatoid arthritis which is a disease of the young and children and affects mainly small joints such as fingers, wrist, elbow etc., OA is a disease of the elderly and mainly affects larger joints including hand, feet, back, hip and knee.[5] Age, obesity, injury and genetic factors predispose to OA and are its major risk factors. Warning signs may include soreness after periods of overuse and inactivity, morning stiffness, pain due to muscle weakening and worsening of pain in the morning. Diagnosis can be made using X-Ray radiographs, MRI or CT scans. Radiological findings in the X-Ray may show narrow joint space, osteophytes, osteosclerosis and subchondral cyst.[6] For this project we preferred X-Ray studies over MRI accounting to its cost effectiveness and accuracy in measurements. We did some morphometric measurements on X-ray films of knee joint and correlated with severity of symptoms of the patients. We restricted our study to the osteoarthritis of knee joint because according to statistics the number of hip and knee replacements due to severe OA has increased rapidly over the past decade.

2. Methods

The cross sectional study comprised of 30 subjects suffering from osteoarthritis attending orthopaedics OPD of the Institute. Knee joint roentgenograms (both AP and lateral views) (Figs. 1–3) of these patients and 30 age and sex matched subjects attending the OPD for other ailments to serve as controls were taken.

Fig. 2. Representative Lateral view of Knee joint of controls.
B- Articulate angle—Angle between femoral joint surface and tibial joint surface

Exclusion criteria – All patients who had hip or ankle joint involvement or other diseases of bone(like hemiplegia, gout etc.) that effect lower limb functions were excluded from the study.

Written informed consent for participation was obtained from each subject before enrolling them for the study.

A detailed history was obtained from the patients which included age, socioeconomic and educational status, duration of symptoms and treatment modalities, if any, used by them. A Questionnaire about pain was included in our study. The patients were asked to grade pain from 0–4 in:

- Squatting
- Getting up from sitting position
- Sitting cross-legged

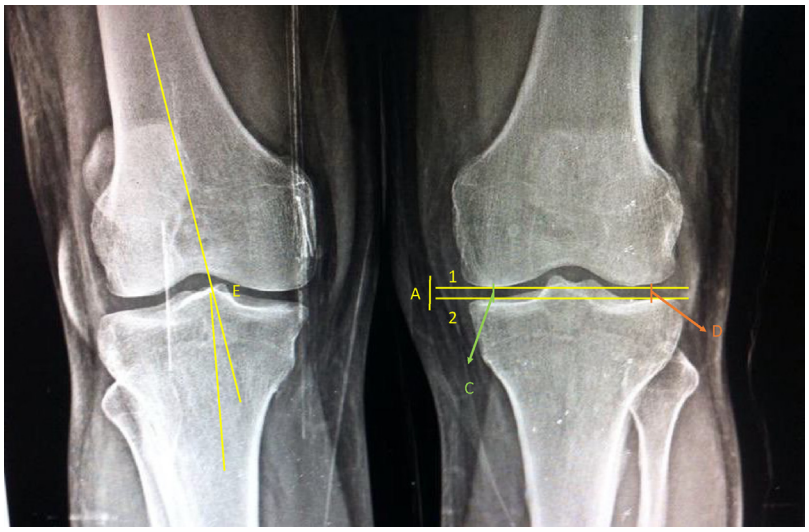

Fig. 1. Representative AP view of Knee joint of controls.
A- Average joint space width—distance between tangent drawn to the lowest curvature of medial and lateral femoral condyles (1) and the tangent drawn to medial and lateral tibial plateau (2)
C- Medial tibiofemoral space—minimum joint space height between medial tibial and femoral condyles
D- Lateral tibiofemoral space—minimum joint space height between lateral tibial and femoral condyles
E- Tibial anatomical axis—Varus or valgus in the knee was estimated