

THE RELATIONSHIP BETWEEN VARUS MALALIGNMENT AND SEVERITY OF ARTICULAR CARTILAGE DAMAGE IN OSTEOARTHRITIS OF THE KNEE JOINT

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Introduction

Osteoarthritis (OA) is a disease of synovial joints, affecting the elderly population. Approximately 10% of the world's population over 60 years of age suffers from OA. The knee joint is known to be the most commonly affected. The characteristic feature of OA is focal areas of damage to the articular cartilage of synovial joints, which can be visualized macroscopically and microscopically. In case of OA of the knee joint, there is emerging evidence that the malalignment of the joint is a major contributing factor to its aetiology.

The alignment of the knee joint is described as the angle between the femoral shaft and the tibial shaft, known as the femoro-tibial angle (FT angle). This angle can be measured physically using a goniometer. Knees with a FT angle of 182° to 184° are considered to be in normal alignment. Any knee with an angle below 182° denotes a varus knee.

The objective of this study was to find the relationship between the degree of varus malalignment and severity of damage to the articular cartilages of osteoarthritic knees.

Materials and Methods

The study sample consisted of 39 consecutive patients with varus malalignment scheduled for total knee arthroplasty at the orthopedic unit, Teaching Hospital, Peradeniya during the period from May 2008 to June 2009. In the chosen patients the FT angle was measured using a goniometer according to the method described by Kraus, *et al.* (2005).

During surgery the tibial articular cartilage is removed as a whole with a thin layer of bone and the femoral articular cartilage is removed in six separate pieces. The articular cartilages thus removed were labelled as medial and lateral and stored separately to be used in this study. Patients whose cartilages were not removed completely or were damaged during surgery were excluded from the study. To assess the severity of damage to the cartilage macroscopically, the cartilage was examined intra operatively and later in the laboratory and graded on a scoring system for direct visual assessment of cartilage degeneration as described by Noyers and Stabler (1989). This scoring system takes into account the size and the depth of the lesion and assigns a numerical value to the severity of damage. The severity is expressed as a percentage for each

knee compartment. Next these specimens were decalcified in 10% Ethylene Diamine Tetra Acetic Acid Disodium salt (EDTA), stained with safranin-O-fast green-iron hematoxylin and examined under light microscopy and graded according to the histological and histochemical grading system described by Mankin *et al* (1971). This scoring system is a reputed system used world wide to assess the severity of damage to articular cartilage. It takes into account the structure of the cartilage layers, cellular features, staining properties and the tidemark integrity. It assigns a numerical value to the severity of damage. Normal cartilage is given a score of 0 and the most severely damaged cartilage is assigned a score of 14.

Results

Thirty six patients (2 males and 34 females) with an age range of 52 to 80 years were included in the study. The varus angles ranged from 165° to 176° with a mean of 170.6±3.4. Considering the cut off point of 182 the knees had a deformity of 4 to 17 degrees with a mean of 11.3±3.5.

Macroscopic damage to the medial compartment articular cartilage ranged from 55% to 100% (mean 80.4±15.36) and lateral compartment damage ranged from 0% to 40% (mean 14.3±11.5) according to the direct visual assessment score. In the histopathological analysis, the medial compartment had a score ranging from 8 to 14 and the lateral compartment had a score of 3 to 6.

From the macroscopic and microscopic assessment it was

observed that in these varus malaligned knees the medial compartment was more severely damaged. Therefore the Spearman's rank correlation method was applied to the degree of varus malalignment and the damage to the medial compartment. It was observed that there is a positive correlation between the degree of varus malalignment and the severity of damage to the articular cartilage of the medial compartment. This was statistically significant ($p < 0.05$).

Discussion

The age range of the sample is similar to that of Western and Asian published data (Brouwer *et al.*, 2007; Arun *et al.*, 2008). Degree of damage to the medial tibial cartilage was higher than values observed in Western studies (Harman *et al.*, 1998) both in the macroscopic and microscopic assessments, probably reflecting the late presentation for arthroplasty in Sri Lankans.

It was observed that in these varus knees medial compartment was more severely damaged than the lateral compartment as seen in Western and Asian studies (Harman *et al.*, 1998; Arun *et al.*, 2008).

A positive correlation between the degree of varus malalignment and the severity of damage to the cartilage has been shown in Western studies similar to this study (Harman *et al.*, 1998; Brouwer *et al.*, 2007). A study done in India (Arun *et al.*, 2008) has shown that there is no significant correlation between the angle and the severity of damage to cartilage. This study however has only taken into account the size of the lesion when calculating

the severity of damage. This may have been the reason for the negative result. The evidence is still conflicting and requires further studies.

Conclusion

Degree of damage to the tibial articular cartilage is more severe in this sample than Western values. There is a positive correlation between the degree of varus malalignment and the severity of damage to the medial articular cartilage. Further studies are ongoing to find out whether the increase in the degree of varus deformity increases the severity of damage to the medial articular cartilage.

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