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Original Research Article

Retrospective analysis of prevalence of discoid lateral meniscus in medial compartmental osteoarthritis knee lead to total knee arthroplasty: an observational study

Sreejith Thundathil, Naveen Madheswaran*, Nidhin Sarath, Nihal Suresh

Department of Orthopaedics, Starcare Hospital, Kozhikode, Kerala, India

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***Correspondence:**
Dr. Naveen Madheswaran,
E-mail: mnaveen102@gmail.com

ABSTRACT

Background: In Asia, the occurrence of the discoid lateral meniscus in the knee ranges from 9.1% to 10.5%. Nawata et al, found that among individuals with a discoid lateral meniscus, subchondral bone sclerosis was more frequently observed in the medial compartment and there was a higher prevalence of varus inclination. Our hypothesis was that individuals with a discoid lateral meniscus faced a significantly higher incidence of osteoarthritis and deformities. In our study, we assessed the prevalence of discoid lateral meniscus in individuals who underwent total knee arthroplasty for osteoarthritis knee.
Methods: In our study, we retrospectively reviewed 324 patients (364 knees) fulfilling the criteria who underwent Total knee replacement. We analyzed the prevalence of discoid lateral meniscus in osteoarthritis knee in our study.
Results: In our study involving 324 patients (364 knees) with Osteoarthritis knee, varus deformity was observed in 298 patients (312 knees). Among these 324 patients, 64 patients (72 knees) had discoid lateral meniscus. Our findings show that individuals with a discoid meniscus are likely to develop osteoarthritis approximately 5 years earlier than those with a normal meniscus. Furthermore, in our study, the prevalence of discoid lateral meniscus among individuals with osteoarthritis of the knee was found to be around 20 percent (19.75%).
Conclusions: A discoid lateral meniscus can lead to osteoarthritis in the knee with varus malalignment much earlier than people with a normal semilunar meniscus.

Keywords: Discoid lateral meniscus, Medial compartmental osteoarthritis, Total knee arthroplasty, Varus

INTRODUCTION

In Asia, the prevalence of the frequent morphologic variant known as discoid lateral meniscus in the knee is higher (9.1% to 10.5%).[1] Despite the widespread belief that discoid lateral meniscus symptoms appear at very young ages, some people do not experience any symptoms or complaints until middle life.[2,3]

Nawata et al discovered that in individuals with discoid lateral meniscus, subchondral bone sclerosis was more common in the medial compartment and varus inclination was more common than valgus inclination.[2] However, the connection between discoid lateral meniscus and osteoarthritis was not described in detail in that comparative study. The hypothesis was that individuals with a discoid lateral meniscus who were not treated until middle age experienced a notably higher prevalence of osteoarthritis and deformity. In our study, we assessed the prevalence of discoid lateral meniscus in individuals who underwent total knee arthroplasty for osteoarthritis knee.

METHODS

Authors retrospectively reviewed all 324 patients (364 knees) who underwent Total knee replacement from

March 2022 to March 2025 in Starcare Hospital, Kozhikode, Kerala (Figure 1 a and b). The criteria for inclusion in this study were osteoarthritis with an age of more than fifty years previously diagnosed asymptomatic discoid lateral meniscus undergone no procedure with newly developed osteoarthritis knee. Patients with previous surgery in knee concomitant knee injuries infection were excluded to reduce the number of variables.

An observational study of prevalence of discoid lateral meniscus in osteoarthritis knee who underwent total knee replacement surgery was performed (Figure 2, 3, 4 a and b). Authors classified osteoarthritis knee based on Kellgren-Lawrence Classification and Discoid lateral meniscus classified based on Watanabe and Ikeuchi classification. The institutional review board approved the study protocol.

Data were recorded with the use of Excel 2007 (Microsoft) and were analyzed with the use of SPSS software. We analyzed the outcome by calculating prevalence of discoid lateral meniscus in osteoarthritis knee.

RESULTS

Authors studied 324 patients (364 knees) with osteoarthritis knee underwent total knee replacement. Preoperative standing Anteroposterior view radiographs showed varus deformity present in 298 patients (312 knees) and Valgus deformity in 26 patients (52 knees). Out of 324 patients (364 knees) with osteoarthritis knee Discoid lateral meniscus found in 64 patients (72 knees) and normal meniscus in 260 patients (292 knees). In our study, no patient had discoid medial meniscus. In our study, the prevalence of discoid lateral meniscus in osteoarthritis knee individuals is around 20 percent (19.75%). The medial compartment showed significantly more articular changes in discoid lateral meniscus patients than in normal meniscus patients.

According to the Watanabe et al and Ikeuchi et al classification system, the discoid lateral meniscus was of the complete type in 36 patients (42 knees), was of the incomplete type in 25 patients (27 knees) and was of Wrisberg type in 3 patients (3 knees). According to the Kellgren-Lawrence classification system, 15 patients (18 knees) was of Grade 3 osteoarthritis with discoid lateral meniscus, 55 patients (66 knees) was of Grade 3 osteoarthritis with normal meniscus, 49 patients (54 knees) was of Grade 4 osteoarthritis with discoid lateral meniscus and 205 patients (226 knees) was of Grade 4 osteoarthritis with meniscus normal.

In the study, no patient with Valgus deformity had discoid meniscus. Out of 324 patients, 231 patients are females and 93 patients are male. Out of 93 males no patient had discoid lateral meniscus. Out of 231 Females, 167 females had normal meniscus and 64 females had discoid lateral meniscus. There was a significant difference with respect to age.

Figure 1 (a and b): Pre operative x-ray showing patient with Kellgren-Lawrence Lawrence Grade IV osteoarthritis knee a) Anteroposterior View b) Lateral view.

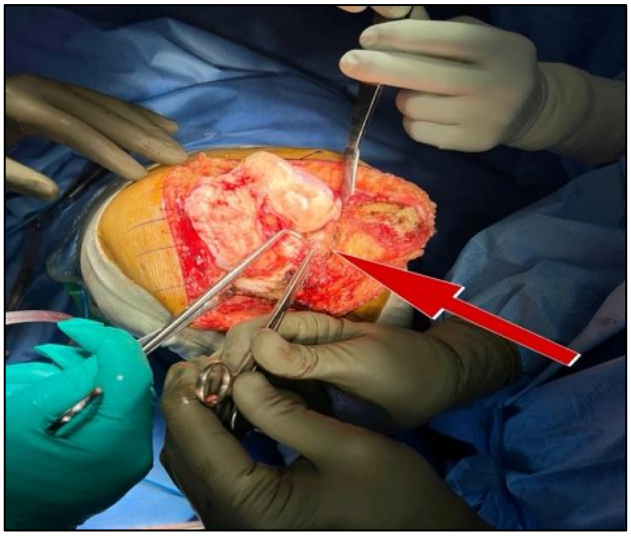

Figure 2: Intraoperative image of the patient showing discoid lateral meniscus with osteoarthritis knee (red arrow).

According to Age, the mean age of grade 3 osteoarthritis with normal meniscus in male is 67 years whereas the mean age of grade 4 osteoarthritis with normal meniscus in male is 73 years. The mean age of grade 3 osteoarthritis with normal meniscus in female is 57 years whereas the mean age of grade 3 osteoarthritis with discoid lateral meniscus in female is 53 years.

The mean age of grade 4 osteoarthritis with normal meniscus in female is 63 years whereas the mean age of grade 4 osteoarthritis with discoid lateral meniscus in female is 58 years (Table 1). Our study shows that individuals with discoid lateral meniscus develop osteoarthritis at least 5 years earlier than individuals with normal meniscus.

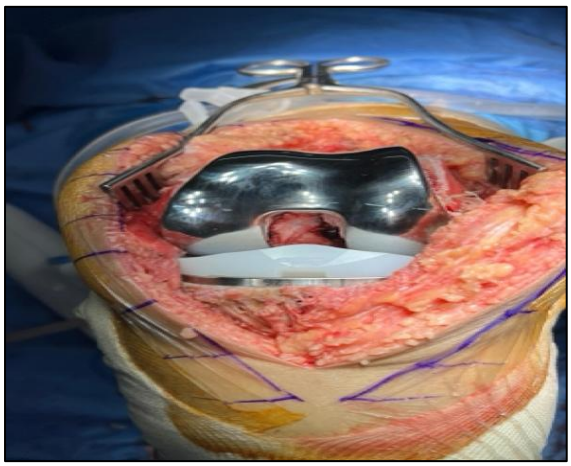

Figure 3: Intraoperative image of knee after total knee arthroplasty.

Figure 4 (a and b): Post operative X-ray of patient underwent total knee Arthroplasty for osteoarthritis knee of anteroposterior and lateral view.

Table 1: Study outcome.

Variables	Frequency	%
Total number of patients	324 patients (364 knees)	-
Total number of male patients	93 patients	28.70
Total number of female patients	231 patients	71.30
Total number of patients with varus knee	298 patients (312 knees)	91.98
Total number of patients with valgus knee	26 patients (52 knees)	8.02
Total number of patients with discoid lateral meniscus	64 patients (72 knees)	19.75
Total number of patients with discoid medial meniscus	0	0
Total number of patients with normal meniscus	260 patients (292 knees)	80.24
Total number of patients with complete type discoid lateral meniscus among total number of patients	36 patients (42 knees)	11.11
Total number of patients with incomplete type discoid lateral meniscus among total number of patients	25 patients (27 knees)	7.72
Total number of patients with Weisberg type discoid lateral meniscus among total number of patients	3 patients (3 knees)	0.93
Total number of patients with grade III osteoarthritis with normal meniscus among total number of patients	55 patients (66 knees)	16.98
Total number of patients with grade III osteoarthritis with discoid lateral meniscus among total number of patients	15 patients (18 knees)	4.63
Total number of patients with grade IV osteoarthritis with normal meniscus among total number of patients	205 patients (226 knees)	63.27
Total number of patients with grade IV osteoarthritis with discoid lateral meniscus among total number of patients	49 patients (54 knees)	15.12
Total number of male patients with normal meniscus among total number of patients	93 patients	28.70
Total number of male patients with discoid lateral meniscus among total number of patients	0	0

Continued.

Variables	Frequency	%
Total number of female patients with normal meniscus among total number of patients	167 patients	51.54
Total number of female patients with discoid lateral meniscus among total number of patients	64 females	19.75
Total number of patients with varus deformity had discoid lateral meniscus	64 patients (72 knees)	-
Total number of patients with valgus deformity had discoid lateral meniscus	0	
The mean age of grade III osteoarthritis with normal meniscus in male	67 years	-
The mean age of grade IV osteoarthritis with normal meniscus in male	73 years	-
The mean age of grade III osteoarthritis with normal meniscus in female	57 years	-
The mean age of grade III osteoarthritis with discoid lateral meniscus in female	53 years	-
The mean age of grade IV osteoarthritis with normal meniscus in female	63 years	-
The mean age of grade IV osteoarthritis with discoid lateral meniscus in female	58 years	-

DISCUSSION

To the best of our understanding, this is presently the largest Study conducted on the occurrence of discoid lateral meniscus in patients with osteoarthritis of the knee who underwent total knee replacement. The meniscus plays a vital role in supporting loads, providing stability and distributing pressure while walking. Our findings indicate that individuals with a discoid lateral meniscus are more prone to have osteoarthritis predominantly affecting the medial compartment compared to the lateral compartment, accompanied by Varus deformity.

Previous research has shown that reduced mechanical loading correlates with diminished thickness of articular cartilage surfaces. In this scenario, it is probable that the larger and/or thicker discoid lateral meniscus protects the lateral tibial plateau during weight-bearing activities, leading to the formation of thinner hyaline cartilage in that region.[4-6] Another study investigated the connection between the thickness of articular cartilage and meniscal coverage, revealing no significant differences in the femoral and tibial articular cartilage thickness between patients with normal and discoid lateral menisci when assessed in both the sagittal and coronal planes.[7] However, that study was smaller.

In the study conducted by Kim et al the key discovery was that individuals with a discoid lateral meniscus who remained asymptomatic until reaching middle age exhibited a greater occurrence of varus knee deformity and osteoarthritis.[8] Our study shows that individuals with discoid lateral meniscus develop osteoarthritis at least 5 years earlier than individuals with normal meniscus. Nawata et al found that out of twenty-three knees affected by a discoid lateral meniscus, seven exhibited arthrosis with related symptoms exclusively in the medial compartment and of those seven knees, two underwent treatment with proximal tibial osteotomy due to varus deformity.[2]

Nawata et al found that subchondral bone sclerosis occurred more often in the medial compartment among individuals with a discoid lateral meniscus.[2] Similar to malalignment, a wedge-shaped meniscus can cause an uneven distribution of load, potentially resulting in joint deterioration.[9] In knees that feature a discoid lateral meniscus, the entire lateral compartment is fully covered, resulting in a different mechanical balance between the medial and lateral compartments of the femorotibial joint compared to knees with a normal, semilunar-shaped lateral meniscus. The inclination toward varus alignment in knees with a discoid lateral meniscus may cause increased stress on the medial compartment, which could explain why middle-aged patients with a discoid lateral meniscus often experience osteoarthritic changes in the medial compartment more frequently later.[2,10] In our study, the prevalence of discoid lateral meniscus in osteoarthritis knee individuals is around 20 percent (19.75%) and more in the medial than the lateral compartment. In our study, prevalence of discoid lateral meniscus in osteoarthritis knee is more common in females than male.

Future research could focus on investigating the differences in the composition and mechanical characteristics of articular cartilage between individuals with discoid lateral menisci and those without, along with the articular cartilage's ability to adjust to heightened contact pressure in both the medial and lateral compartments. This could enhance our understanding of how arthritic changes develop in these patients.

The study has several limitations. Firstly, we were unable to identify the prevalence of discoid lateral meniscus in patients with Kellgren-Lawrence Grade≤2 osteoarthritis of the knee who received conservative treatment. Secondly, we were unable to ascertain whether individuals with a discoid lateral meniscus had experienced varus deformity throughout their entire lives. Next, we did not conduct MRI scans on the osteoarthritis knee patients to determine the preoperative presence of a discoid lateral meniscus. Additionally, given that the discoid lateral meniscus is more prevalent in Asia compared to the Western world, the global relevance of this study may be somewhat restricted.

So, Knees that have developed a loss of valgus alignment with a discoid lateral meniscus which was previously diagnosed in any situation during young and middle age should be closely observed with ongoing long-term follow-up. A discoid lateral meniscus can increase the likelihood of developing degenerative osteoarthritis in the knees. It is advisable to recommend maintaining a healthy body weight, engaging in regular physical activity, protecting the joints and avoiding repetitive stress, particularly for young and middle-aged individuals with a discoid lateral meniscus.

CONCLUSION

Discoid lateral meniscus may cause osteoarthritis knee with varus malalignment much earlier than individuals with normal semilunar meniscus. In the future, further biomechanical study and large volume clinical comparative study needed to evaluate its prevalence.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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