MORPHOMETRIC STUDY OF LATERAL MENISCI OF KNEEJOINTS &ITSCLINICAL APPLICATION:A CADAVERICSTUDY

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ABSTRACT

Background: Knee joint is the largest synovial joints in the body It is a compound joint that includes two condylar joints between the femur and the tibia, the former being partly divided by menisci. The menisci (formerly called semilunar cartilages) of the knee lie within the knee joint between the femur and tibia and somewhat adapt the tibial and femoral condyles to each other. The menisci performing important mechanical functions, such as supporting body weight, shock absorption, stabilization and rotational facilitation.[1] The meniscus plays an important role in load sharing, shock absorption, joint stability, joint nutrition and overall protection of articular cartilage.[2]

Objectives: To study the morphometric parameters of lateral menisci of both thekneejoints.

Materials and Methods: : Thestudywasconductedon30kneejointsof15formalin fixed cadavers of unknown sex and measured the Inner circumference , outer circumference and widthof the lateral meniscus of both the knee withthe helpof digital caliper

Result: Total mean length for both sides taken together was 4.38±0.9cm. the minimum and maximum length of the outer circumference in right lateral menisci 6.6and 6.9 cm, and in left lateral menisci was 6.6 and 6.9 cm and the total mean Length of both the sides taken together was also 6.6 and 6.9 cm respectively. The mean length of the outer circumference was 6.76±0.9

cm for right lateral meniscus, 6.76±0.9 cm for left lateral meniscus and the total mean length taken for both sides was 6.76±0.9 cm.
The total mean width (left and right) of lateral meniscus of anterior one third was 0.58; Middle one third was 0.82 and at Posterior one third was 0.91. The average mean width of all lateral menisci of anterior one third was 0.58±0.5, Middle one third was 0.82±0.9 and at posterior one third was 0.91±0.7 indicating that posterior part is widest segment followed by middle and anterior segments. However by using Student t-test, no significant difference in width between of three points discussed was observed

Conclusion: This study provides the valuable information at the time of totalkneereplacement andalsoprovides theguidanceto theorthopedicians.

KEY WORDS: Menisci, Knee joint, Articulation, Articular, Lateral meniscus

INRODUCION

The menisci increase the concavities of the tibial condyles for the better congruence with femoral condyles .They act as swabs to lubricate the joint cavity and act as shock absorber to protect the articular cartilage during weight transmission. There are marked differences in the contour and insertion between the medial and the lateral menisci which are important in relation to the injury mechanism.[3] Also, variation of form and in particular of thickness and width of menisci can determine the possibility and kind of injury.[4] The incongruity of the joint faces of femur and tibia within knee joint can be “corrected” by wedge shaped medial and lateral meniscus.[5] The meniscus plays an important role in load sharing, shock absorption, joint stability, joint nutrition and overall protection of articular cartilage.[6] The menisci consist of cells such as chondrocytes and fibroblasts; the extracellular matrix is composed of collagen, proteoglycans, glycoproteins and elastin.[7] Meniscus injury is common in day-to-day life as well as in sports; they are exposed to injury which may occur as part of a rotational trauma, bending, joint degenerative process or spontaneous injury.[8] Loss of a meniscus leads to a significant increase in the risk of developing arthritis in the knee. To reduce the process of knee degeneration after meniscectomy, meniscus allograft transplantation has been considered as a

preferred choice.[9] A body and two horns can be distinguished in the menisci (anterior and posterior); these wider regions serve as the basis for the insertion of the meniscus. The load bearing function of meniscus depends on the firm bony insertion of its anterior and posterior horns.[10] Contour and the insertion of the medial and lateral menisci are important in determining the mechanism of injury.[11] The outer edges of menisci are thick and attached to the fibrous capsule of the knee joint; the inner edges are non-fixed and sharp. Cuneiform in transversal cut, the menisci are firmly attached to the intercondylar area of tibia. The coronary ligaments are capsular fibers clinging to the margins of the menisci and tibial condyles.[12]

MATERIALSAND METHODS

The study was conducted on 30 knee joints (15 cadavers) of formalin fixed cadavers in theDepartmentofAnatomy,SBKSMIRC,SumandeepVidyapeethDeemedtobeUniversity, Vadodara, Gujarat. We used Simple Random Sampling on samplingtechnique for collection of data. Operative and traumatic knee were excluded fromthe study. The parameters were observed twice in this study. All the measurementsofMenisciweretakenbyDigitalcaliper.Length of meniscus from anterior horn to posterior horn was measured on its outer and inner circumference by thread**(Fig 1,& Fig 2)** .The width was measure at three points - the anterior one third, middle one third, and posterior one third **(Fig 3, Fig 4 & Fig 5)**and statistical analysis done by MS-Excel2010andstatisticaltools calculator.

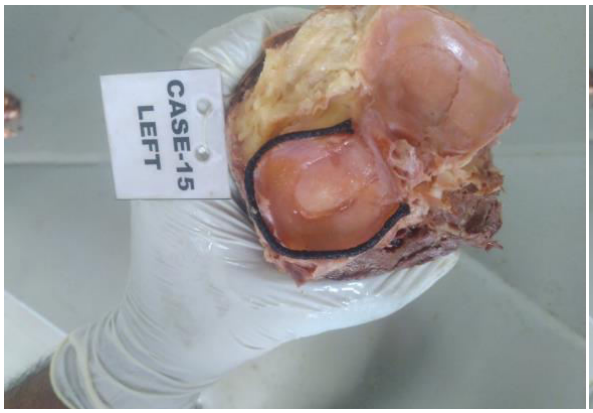

Fig. 1 Fig. 2

Fig: 1 & 2 showing outer and inner circumference of lateral meniscus.

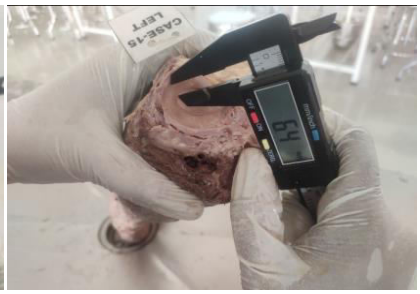

Fig. 3 Fig.4 Fig. 5

Fig: 3,4 & 5 showing width of lateral meniscus on its Anterior1/3 ,Middile1/3 & Posterior1/3.

Table and observation

The measurement obtained on these lateral menisci are presented as under-:

MEASUREMENTS OF CIRCUMFERNCE

Table 1: Length of Inner circumference (in cm).

Rt lateral meniscus		**Lt lateral meniscus**		**Total (Right & Left)**	
Range	**Mean±S.D**	**Range**	**Mean±S.D**	**Range**	**Mean±S.D**
4.2-4.5	4.36±0.9	4.2-4.6	4.39±0.9	4.2-4.6	4.38±0.9

Table 2: Length of outer circumference (in cm).

Rt lateral meniscus		Lt lateral meniscus		Total (Right & Left)	
Range	**Mean±S.D**	**Range**	**Mean±S.D**	**Range**	**Mean±S.D**
6.6-6.9	6.76±0.9	6.6-6.9	6.76±0.9	6.6-6.9	6.76±0.9

MEASUREMENTS OF WIDTH IN SEGMENTS

Table 3: Measurement of width of Anterior one third (in cm).

Rt lateral meniscus		Lt lateral meniscus		Total (Right & Left)	
Range	**Mean±S.D**	**Range**	**Mean±S.D**	**Range**	**Mean±S.D**
0.4-0.6	0.57±0.4	0.4-0.6	0.58±0.5	0.4-0.6	0.58±0.5

Table 4: Measurement of width of middle one third (in cm).

Rt lateral meniscus		Lt lateral meniscus		Total (Right & Left)	
Range	**Mean±S.D**	**Range**	**Mean±S.D**	**Range**	**Mean±S.D**
0.6-1.0	0.81±0.9	0.6-1.0	0.83±0.8	0.6-1.0	0.82±0.9

Table 5: Measurement of width of Posterior one third (in cm).

Rt lateral meniscus		Lt lateral meniscus		Total (Right & Left)	
Range	**Mean±S.D**	**Range**	**Mean±S.D**	**Range**	**Mean±S.D**
0.7-1.0	0.90±0.5	0.7-1.0	0.92±0.8	0.7-1.0	0.91±0.7

Table 6: Average width of menisci irrespective of segments (in cm)

Rt lateral meniscus		Lt lateral meniscus		Total (Right & Left)	
Range	**Mean±S.D**	**Range**	**Mean±S.D**	**Range**	**Mean±S.D**
0.4-1.0	0.76±1.5	0.4-1.0	0.77±1.6	0.4-1.0	0.77±1.5

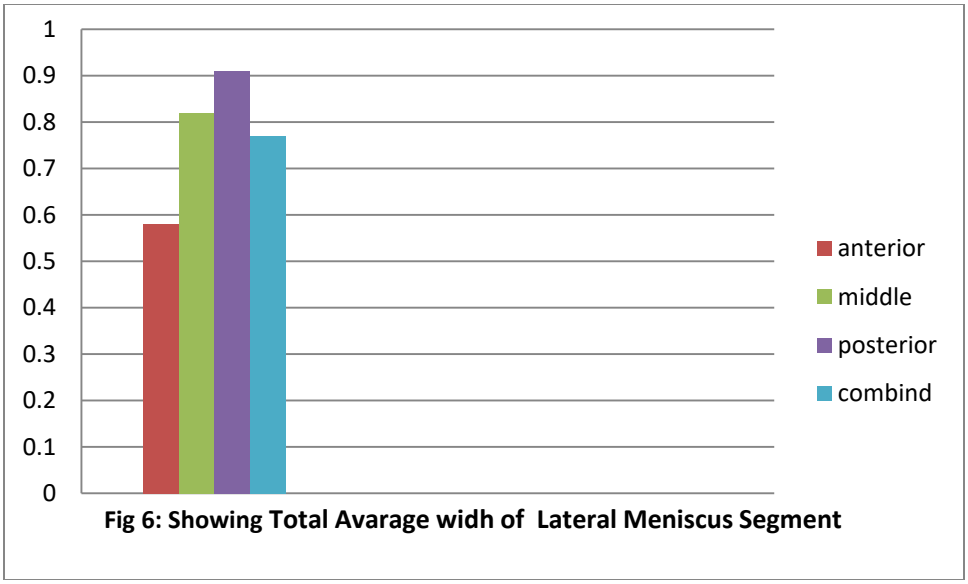

Fig 6: Showing Total Avarage widh of Lateral Meniscus Segment

Fig:6 Graph showing the posterior segment is widest segment of the lateral meniscus followed by middle and anterior segment.

RESULT

The parametric distribution of Minimum and maximum length of inner circumference in right lateral meniscus was and 4.2, and 4.5 cm and in left lateral meniscus was 4.2 and 4.6 cm and for both sides taken together was 4.2 and 4.6cm. The mean length of inner circumference was 4.36±0.9cm for right lateral meniscus and 4.39±0.9cm for left lateral meniscus. There was no statisticaly significant difference observed between the two sides. Total mean length for both sides taken together was 4.38±0.9cm. the minimum and maximum length of the outer circumference in right lateral menisci 6.6and 6.9 cm, and in left lateral menisci was 6.6 and 6.9 cm and the total mean Length of both the sides taken together was also 6.6 and 6.9 cm respectively. The mean length of the outer circumference was 6.76±0.9 cm for right lateral meniscus, 6.76±0.9 cm for left lateral meniscus and the total mean length taken for both sides was 6.76±0.9 cm.

The total mean width (left and right) of lateral meniscus of anterior one third was 0.58; Middle one third was 0.82 and at Posterior one third was 0.91. The average mean width of all lateral menisci of anterior one third was 0.58±0.5, Middle one third was 0.82±0.9 and at posterior one third was 0.91±0.7 indicating that posterior part is widest segment followed by middle and anterior segments. However by using Student t-test, no significant difference in width between of three points discussed was observed.

Table 7: Comparison of inner and outer circumference of lateral meniscus with previous studies

Authors	INNER CIRCUMFERENCE (in cm)	OUTER CIRCUMFERENCE (in cm)
Present study	4.38±0.9	6.76±0.9
Goyal nisha et.al[13](2016)	5.37 ± 0.7	9.74 ± 0.8
Chintan et al. (2014) [14]	-	9.53±0.8
Murlimanju et al.(2012) [15]	5.06±0.5	9.02±0.9
Braz et al. (2010) [4][16]	-	9.28±0.7

Table 8: Comparison of width of three segments (in cm).

AUTHOR	MEAN WIDTH OF TOTAL SEGMENTS TAKEN TOGETHER(in cm)		
	Anterior one third	middle one third	Posterior one third
Present study	0.58	0.82	0.91
Goyal Nisha et.al[13](2016)	1.05	1.05	1.13
Chintan et al [14](2014)	1.13	1.16	1.15
Dhanjaya et al.[17] (2013)	1.18	0.86	1.24
Braz et al. (2010) [16]	1.13	1.11	1.16
Almedia et al[18] (2004)	1.18	1.19	1.14
Erbagci et al[19] (2004)	0.88	0.83	0.97

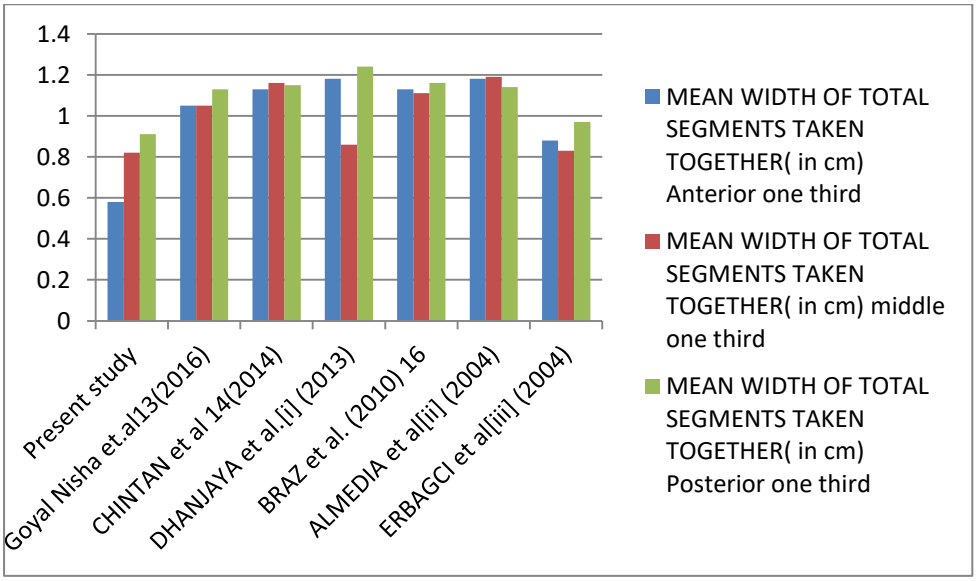

Fig7:ShowingComparison of width of three segments (in cm).

DISCUSSION

The results obtained from the present study were compared with the result obtained from earlier studies. All the parameters taken by the authors who have worked on lateral meniscus were not same as of present study, but where ever possible we have tried to compare the result with data obtained earlier.

In the present study minimum and maximum length of inner circumference in right lateral meniscus was and 4.2 , and 4.5 cm and in left lateral meniscus was 4.2 and 4.6 cm and for both sides taken together was 4.2 and 4.6cm. The mean length of inner circumference was 4.36±0.9cm for right lateral meniscus and 4.39±0.9cm for left lateral meniscus. There was no statisticaly significant difference observed between the two sides. Total mean length for both sides taken together was 4.38±0.9cm. Goyal Nisha et.al[13](2016) mentioned that the total mean length of inner circumference of lateral meniscus was 5.37 ± 0.7cm which is almost similar to present study. In the present study minimum and maximum length of the outer circumference in right lateral menisci 6.6and 6.9 cm, and in left lateral menisci was 6.6 and 6.9 cm and the total mean Length of both the sides taken together was also 6.6 and 6.9 cm respectively. The mean length of the outer circumference was 6.76±0.9 cm for right lateral meniscus, 6.76±0.9 cm for left lateral meniscus and the total mean length taken for both sides was 6.76±0.9 cm. The measurements obtained from present study are almost similar to the those by Murlimanju et al.(2012) [15]and are slightly less than those obtained by Chintan et al. (2014) [14]and Braz et al[16]. (2010).

In the present study, width of lateral meniscus were measured in three different points i.e anterior one third, middie one third and posterior one third. The total mean width (left and right) of lateral meniscus of anterior one third was 0.58; Middle one third was 0.82 and at Posterior one third was 0.91. The average mean width of all lateral menisci of anterior one third was 0.58±0.5; Middle one third was 0.82±0.9 and at posterior one third was 0.91±0.7 indicating that posterior part is widest segment followed by middle and anterior segments. However by using Student t-test, no significant difference in width between of three points discussed was observed. The results of present study are in accordance with earlier studies done by Goyal Nisha et.al[13], Dhanjaya et al[17], Braz et al [16] and Erbaggi et al[19].similar to As in present study these studies that also showed that the posterior one third was the widest part of lateral meniscus but While CHINTAN et al [14]and ALMEDIA et al[18]mentioned that middle segment was the widest part.

ConflictofInterest: None

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

Conclusion: In present showed that the posterior one third was the widest part of lateral meniscus among all three segments. The study is useful in meniscal replacement during the totalkneereplacementwhileperformingtheorthopedicsurgery.

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