

Comparative Measurements Of Length Of Anterior And Posterior Cruciate Ligament Of Right Knee Joint - A Cadaveric Study

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ABSTRACT

Background : Anterior Cruciate Ligament (ACL) and Posterior Cruciate Ligaments (PCL) are band like structures which is tightly adhere with femur and tibia with collagen fibres. They are considered as extra-capsular because of lies in its own synovial sheath. The ACL acts as a passive restraint for the tibia in relation to the femur and stabilizes the knee joint. It is considered as an active and primary stabilizer of the knee joint and PCL act as the principal restrain against posterior tibial translation. The anatomical knowledge is necessary because of their attachment which will useful in surgical approaches. The understanding of ligament rebuilding and restoration is reviewed in this article.

Aim : To study the parameters of total length of Anterior Cruciate Ligament (ACL) and Posterior Cruciate Ligament (PCL) of right knee joint and their correlation.

Materials and Methods : The cross-sectional study was conducted on SBKSMIRC, Sumandeep Vidyapeeth Deemed to be University, Vadodara, Gujarat. The study was conducted on 20 embalmed knee joints of twenty cadavers and measured the length of both ACL and PCL with the help of digital caliper.

Result : Total length of ACL and PCL of right knee was 29.51 ± 3.99 mm and 33.19 ± 3.09 mm and ranges between 19.4 – 36.1 and 23.4 – 37.9 respectively. The p-value was obtained after using SPSS that $p=0.0011$. The Pearson's correlation (r) value was 0.2098 which denotes that there is positive correlation found between parametric distributions of both the ligaments.

Conclusion : In any type of avulsion, the precise knowledge is need for the restoration and grafting of the ligaments, which will better guide to the orthopaedic surgeons for the exact restoration of the ligament.

Keywords : Avulsion, Grafting, Restoration, Restrain, Surgery

INTRODUCTION

There are mainly two cruciate ligaments present inside the knee, are Anterior Cruciate Ligament (ACL) and Posterior Cruciate Ligament (PCL) [1, 2]. The PCL appears before the genesis of the ACL [3]. PCL acts as active and primary stabilizer of the knee joint and it is also the principal restrain against posterior tibial translation. This comes under the category of extra-capsular ligament due to enclosure the synovial sheath of its own [4] The measurements of ACL and PCL was reported around 32-38 mm long and 11 mm wide [2,5]. ACL consists of two bundles mainly Antero-medial (AM) bundle and Postero-lateral (PL) bundle according to their tibial attachments [6,7,8] similarly both types of bundles are also found in PCL [9]. The thickness of bundles are twice than ACL and tibial nerve innervated it and nourishment obtained from middle genicular artery [2]. The ACL acts as a passive restraint for the tibia in relation to the femur and stabilizes the knee joint [10, 11] and avoid the knee joint's hyperextension [12]. Consequently, there are more ACL injuries [13] compared to the other knee ligaments [14, 15, 16].

The orthopaedic surgeon performing the cruciate ligament surgery should be well-versed in the various cruciate ligament factors as this will help them determine the proper size for the allografting operation during surgical reconstruction [9].

Material and Methods

The cross-sectional observational type of study which was carried out on 20 knee joints of 20 embalmed cadavers obtained from the Department of Anatomy, SBKSMI & RC, Sumandeep Vidyapeeth Deemed to be University, Vadodara, Gujarat, India after prior institutional ethics committee (SVIEC) approval. Simple Random Sampling technique used for data collection. Knee joint with any injury or trauma were excluded. All the measurements were taken by Digital caliper (Oleander OL 68595, India). The length of ACL and PCL were measured by their point of attachments (**Fig. 1**).

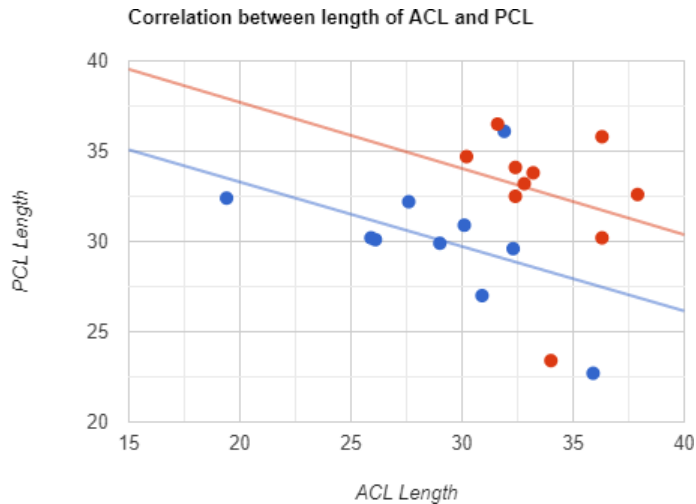
Fig 1: Showing the measurements of Length of ACL and PCL of Right Knee



Table 1 : Showing the parameters of Length of ACL and PCL of right knee joint

No. of Cadavers	Parameters	Min-Max	Mean ± SD	p-value	Perason's correlation (r-value)
20	Total Length ACL Rt. knee	19.4 - 36.1	29.51 ± 3.99	0.0011	0.2098
	Total Length PCL Rt. knee	23.4 - 37.9	33.19 ± 3.09		

*Independent T-test (p<0.05)

Fig 2 : Showing the correlation between length of ACL and PCL of right knee joint

Statistical Analysis

MS-Excel and trial version of Statistical Package for Social Sciences (Ver. 21.0, SPSS Inc.) used for statistical analysis.

Result

The parametric distribution of Total length of ACL of right knee in which the Mean \pm SD are 29.51 ± 3.99 and 33.19 ± 3.09 whereas it lies in the range between min-max are 19.4 - 36.1 Whereas the distribution of length of PCL of right knee in which the Mean \pm SD are 23.4-37.9 and 23.8-38.0 respectively. After calculating the p-value it was comes out to be significant at the level of 5 % significance which was $p = 0.001$. After evaluating the Pearson's correlation coefficient (r), it was found to be positive correlation but the relationship is weak which was $r = 0.2098$ (Table 1 & Fig 2).

Discussion

This study gives a valuable data which represent the correlation between the length and width of the ligament for finding out the interrelationship between their different widths.

Table 2 : Comparison of parameters of total length of ACL and PCL of Right Knee with previous studies

S.No.	Authors (Years)	Parameters	
		Total Length ACL (Mean \pm SD) in mm	Total Length PCL (Mean \pm SD) in mm
1.	Yelicherla AK et al (2014) ¹⁷	43.5 \pm 4.1	36.90 \pm 3.90
2.	Minh DV et al (2019) ¹⁸	-	35.57 \pm 2.78
3.	Geetha Rani BG et al (2019) ¹⁹	37.14 \pm 3.91	35.39 \pm 3.73
4.	A.D. Sampath et al (2019) ²⁰	28.06 \pm 1.57	-
5.	Sakkarai Jayagandhi et al (2018) ²¹	32.25 \pm 2.25	-
6.	Rajarshi D et. al (2017) ²²	20.06 \pm 1.41	20.08 \pm 1.130
7.	Present study	29.51 \pm 3.99	33.19 \pm 3.09

In the present study the mean of total length of ACL was 29.51 mm in right knee joint which shows similarity with the study done by AD Sampath et al was 28.06 mm [20]. The study done by Sakkarai Jayagandhi was 32.25 mm [21] in Pondicherry region was slightly higher than present study but some similar with B.G. Rani Geetha et al was 37.14 mm [19] while the study done by Rajarshi Dutta [22] was 20.06 mm which was frequently lowers than all the above studies. The parameters are noted higher from all above studies done by Yelicharla AK et al was 43.5 mm [17]. The present study reveals that the mean of total length of PCL of right knee joint was 33.19 mm which was almost similar with the study done by Minh DV et al [18] in Vietnam population and Geetha Rani BG et al [19] in Karnataka region. In the study of Yelicharla AK et al was 36.90 mm in Maharashtra region the parameters were slightly in higher range which was noted. In this study we have included both the ligaments. They lies in the range between 19.4 – 36.1 in ACL and 23.4 – 37.9 in right knee joint. Additionally, we attempted to measure the precise attachment point where the ligament originates. In this study we have included the total length of both the ligaments.

Limitations of this study

Limitations brought on by tissue deterioration and a scarcity of cadavers. Thus, depending on the availability, the results might be more accurate.

Conclusion

In the event of any type of avulsion, the precise knowledge is necessary for the grafting and restoration of the ACL and PCL, which will better direct the orthopaedic surgeons for the correct restoration of the ligament.

Conflicts of Interests: None

Ethical Clearance: Yes

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