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ORIGINAL ARTICLE

MORPHOMETRIC ANALYSIS OF VERTICAL GROOVE ON ANTERIOR SURFACE OF TIBIAL LATERAL CONDYLE AND ITS RELATION WITH SQUATTING

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ABSTRACT: Seventy dry tibiae of adult and unknown sex were collected from the department of Anatomy Government Medical College Jammu. The region under the course of the ligamentum patellae of every tibia was carefully examined and studied for the presence or absence of a vertical groove and its characteristics like shape, length and depth were noted. In India, one of the commonest mode of sitting is squatting. Squatters are known to show certain adaptational features in the lower extremities like vertical groove on the anterior surface of lateral condyle of tibia. This groove is produced on the tibia by pressure of the tendon of quadriceps femoris (ligamentum patellae). The pressure of the tendon of quadriceps femoris occurs due to great deal of flexion of knee joint, occuring during squatting. Squatting is one of the frequently used exercise in the field of strength and conditioning. It is also an integral component in the sport of competitive weight lifting and power lifting and regarded as a supreme test of lower body strength.[1,2] **INTRODUCTION:** A vertical groove is present is present on the anterior surface of tibial lateral condyle in squatters. In India most of the people have a habit of sitting down by squatting. During squatting there is excessive flexion of the knee joint which exerts a great deal of pressure on the strong tendon of quadriceps femoris (ligamentum patellae) which is inserted on the tibial tuberosity. The pressure so exerted leads to the formation of a groove on the unattached part of the ligamentum patella. This vertical groove so formed is also called as quadracipital groove.[3] It is shallow but distinct with a prominent lateral lip and extends proximally in a vertical direction. It is inverted "J" shaped as described by Hughes and Sunderland 1946.[4] The lateral lip is prominent due to lateral angulation between femur and tibia. If the groove is absent then either the person is a non-squatter (eg Europeans) or is weak and flabby with poorly developed muscles which are unable to produce impressions on bones. This groove is of help in side determination of tibia when only a fragment of bone is available. Therefore it has got anthropological and medicolegal importance and so is appropriately called as quadricipital groove.[3]

KEYWORDS: Vertical groove, Squatting, Tibia, Ligamentum patellae.

INTRODUCTION: MATERIAL AND METHOD: Seventy dry adult tibiae were taken from the department of anatomy Government medical college Jammu. The bones which were complete in all the respects were included in the study. They were numbered from one to seventy. It was observed whether the vertical groove on the anterior surface of the lateral condyle of tibia was present or absent. The length of the groove was measured with a vernier calliper from upper end to lower end (Fig. 1). Its shape was observed i.e.whether it was inverted' J' shaped or not. The depth was measured by pushing the depth bar of the vernier calliper in the depth of the groove where it was maximum (Fig. 2) and the reading was taken from the main bar of the vernier calliper.

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OBSERVATION: Vertical groove on the anterior surface of the lateral condyle was present in all seventy tibiae. The mean value and range of the length of vertical groove on the anterior surface of lateral condyle on the right side was 22.88±2.21mm (Range=17.72-27.53mm).The corresponding values on left side were 23.19±1.74mm (Range=21.31-28.07mm).When compared between two sides it was more on left side. The range and mean value of the length of vertical groove was observed (Table1). On the right side it was 22.88±2.21mm (Range=17.72-27.53mm). The corresponding values on the left side were 23.19±1.74mm (Range=21.31-28.07mm).The length was slightly more on left side The shape of the vertical groove was found to be inverted 'J' shaped in all the seventy bones of the study. The depth of the vertical groove is shown in (Table 2). On the right side, it was found to be 1.32±0.15mm (Range=1.10-1.66mm).While on left side, it was 1.33±0.18mm (Range=1.03-1.74mm). When compared between two sides, the diameter was slightly more on left side.

DISCUSSION: Vertical groove on the anterior surface of the lateral condyle is found in Indians, but the percentage varies in different populations. It was found in 96% of Nagpur population, and 93.3% of Malwa population of Madhya Pradesh.[5] However this parameter was absent in Europeans.[3] In the present study this groove was seen in all the tibiae. This groove was attributed to increased range of flexion in squatters that lead to increased pressure of quadriceps tendon against tibia resulting in groove formation This was further strengthened by the fact that it was absent in Europeans who are mostly non-squatters. The mean value and range of the length and depth of vertical groove on the anterior surface of lateral condyle was more on left side, which is in accordance with the study of Bose et al 1981 in Malwa population.[5] The shape of vertical groove was found to be inverted 'J' shaped in all bones of the current study. The same was found in Australian population by Hughes and Sunderland 1946.[4]

SUMMARY: Morphometric analysis of vertical groove on the anterior surface of the tibia has been studied by many authors like Humphrey G et al,[6] Fick R[7] The present study was done in seventy adult human tibiae (Right: Left 35:35).The presence of the groove was noted and its length and depth were measured with a vernier calliper. Also the shape of the groove was noted. It was summarised that the vertical groove or quadricipital groove was present in all the seventy tibiae. The groove was longer on the left side. Shape of the groove was found to be inverted 'J' shaped. It was attributed to palthi posture in which there is acute flexion of knee joint, leading to close contact of lateral condyle to the lateral edge of ligamentum patellae. As far as depth of the groove was concerned, it was deeper on the left side. This groove helps in squat bio mechanics which is important to achieve optimal muscular development and also reduces the prospects of training related injuries. Squatting is also included as a core exercise in many sport routines to increase atheletic performance.[8] The vertical groove also has morphological and medicolegal importance as by studying its morphometry we can determine whether the tibia belongs to a squatter or a nonsquatter (Indian or European).Also we can determine the side to which tibia belongs from a small fragment of bone in medicolegal cases.

BIBLIOGRAPHY:

1. Escamilla, R F Knee biomechanics of the dynamic squat exercise Med Sci Sports Exerc 2001; 33; 127-141.

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2. Escamilla,R F,Fleisig, G S Lowry T M Barrentine S W,and Andrews J R, A three dimensional biochemical analysis of the squat during varying stance widths,Med Sci Sports Exerc 2001b, 33: 984-998.
3. Kate B R and Robert S L.Some observations on the upper end of the tibia in squatters.J Anat 1965; 99(1): 137-141.
4. Hughes E.S.R. & Sunderland, S. The tibial tuberosity and the insertion of ligamentum patellae, Anat Rec, 1946; 96 (4): 439-444.
5. Bose S,Joshi S, Joshi S D and Sharan G K.A study of quadricipital groove of tibia in Malwa region of Madhya Pradesh.J Anat Soc Ind 1981; 30(2): 70-71.
6. Humphrey G, A1.A treatise on the human skeleton 1858; pg 487.
7. Fick R. Handbuch der Anatomie und Mechanik der Gelenke 1904; vol 2,div 1, pg 364.
8. Senter, C and Hame, S L. Biomechanical analysis of tibial torque and knee flexion angle. Implications for understanding knee injury Sports Med 2006; 36: 635-641.

Author	Race	Side	Length (mm)	
			Mean +SD(n)	Range
Present study	North Indian	Rt.	22.88+2.21(35)	17.72-27.53
		Lt.	23.19+1.74(35)	21.31-28.07

Table 1: Comparison of Length of Vertical Groove

Side	Mean +SD(n)	Range
Rt.	1.32+0.15(35)	1.1-1.66
Lt.	1.33+0.18(35)	1.03-1.74

Table 2: Depth of vertical groove

Fig. 1A-B: Length of vertical groove on ant. Surface of lateral condyle

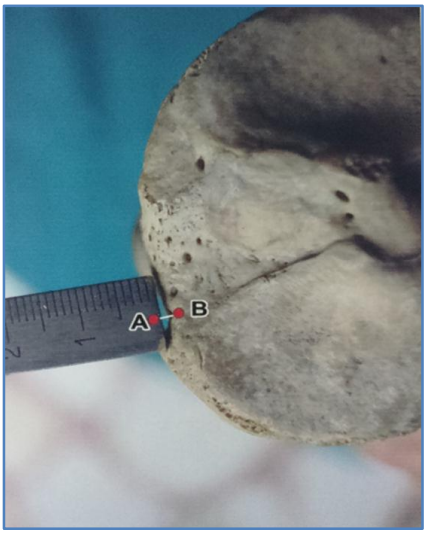

Fig. 2A-B: Depth of vertical groove on tibial lateral condyle

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