

## Anatomical Variations Of The Descending Genicular Artery.

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**Abstract:** An anatomical understanding is the basis for greater safety in surgical procedures especially in promising techniques. More recently the descending genicular artery has been used more extensively as a source of vascularised cortico periosteal grafts from the medial femoral condyle. In this article anatomical variations in the descending genicular artery such as variation in the pattern of origin of descending genicular artery, the distance between the origin of descending genicular artery and medial joint line of the knee joint and diameter of the descending genicular artery are tabulated and discussed. The purpose of this cadaveric study was to clarify the proximal limit for the sub vastus approach in total knee arthroplasty to decrease the potential vascular injury and to enlighten about the medial femoral condyle grafts.

**Keywords:** descending genicular artery; femoral artery; diameter

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### I. Introduction

The vascularised bone graft is the gold standard for reconstruction of bony defects, especially in case of chronic non union. An anatomical understanding is the basis for greater safety in surgical procedures especially in promising techniques. Anatomical studies and clinical applications for the use of vascularised corticoperiosteal flap from the medial femoral condyle have been performed and described previously. Selection of ideal recipient vessels is one of the most important factors in determining success in free flap reconstruction of the lower limb. More recently the descending genicular artery has been used more extensively as a source of vascularised cortico periosteal grafts from the medial femoral condyle. The medial femoral condyle graft is very useful in the treatment of chronic nonunion and small gap reconstruction. The purpose of this cadaveric study was to clarify the proximal limit for the sub vastus approach in total knee arthroplasty to decrease the potential vascular injury and to enlighten about the medial femoral condyle grafts.

### II. Aims And Objectives:

The aim of this study was

[i] To determine the pattern of origin of descending genicular artery

[ii] To find out the distance between the origin of descending genicular artery and medial joint line of the knee joint.

[iii] To find out the diameter of the descending genicular artery .

[iv] To help the surgeons, orthopedicians, plastic surgeons and clinicians to be familiar with the variations of descending genicular artery while performing total knee arthroplasty and while using vascularised cortico periosteal grafts from the medial femoral condyle.

### III. Material And Methods:

The study material consisted of 50 adult lower limb specimens from 25 adult human cadavers allotted for dissection to the I MBBS students in the Institute of Anatomy, Madras Medical College, Chennai. The method adopted for study was direct dissection method. A horizontal incision was made from the anterior superior iliac spine to the pubic tubercle. A vertical incision was put from the pubic tubercle to the medial femoral condyle. Another horizontal incision was put at the level of tibial tuberosity. The skin and the superficial fascia was reflected. The femoral artery was identified and then the descending genicular artery was identified and traced. Then the distance between the origin of descending genicular artery and the medial joint line of the knee joint was measured . Finally the diameter of the descending genicular artery was measured by using digital vernier callipers. All the measurements were taken to the nearest millimetre using the vernier

calipers which is accurate to 0.1 millimetre. Microsoft office excel 2007 computer program was used to calculate the mean value of the measurements.

#### **IV. Observation**

In the present study

[i] In all 50 adult specimens, the descending genicular artery arises from the femoral artery just proximal to the adductor opening.

[ii] The mean distance between the origin of descending genicular artery and medial joint line of the knee joint was 128 mm

[iii] The diameter of the descending genicular artery was 2.5 mm.



**Figure- 1** Origin of Descending Genicular Artery from Femoral Artery

FA-Femoral artery; DGA- Descending genicular artery

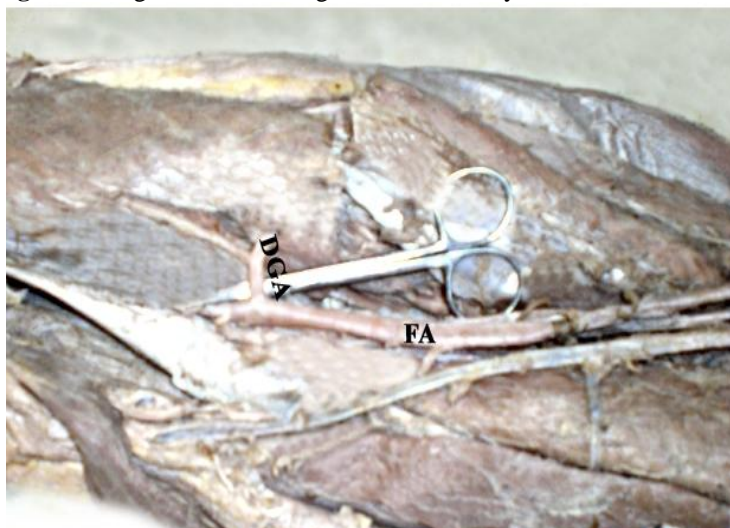
#### **V. Discussion**

##### **[i]Origin of Descending Genicular Artery**

Henry gray [1] quoted that the descending genicular artery the distal branch of the femoral artery, arises just proximal to the adductor opening. Buchanan's [2], George A .Piersol [3], quoted the descending genicular artery arises from the femoral artery, just before the femoral artery passes through the adductor hiatus. Russell T.Woodburne[4] said that the descending genicular artery arises from the femoral artery towards the distal end of the sub sartorial canal. W. Henry Hollinshed [5] said that just before the femoral artery penetrated the adductor magnus it gives off its last branch the descending genicular artery. Umar H. Choudry [6] quoted that the origin of the descending genicular artery is just proximal to the adductor hiatus. Martin.D et al [7] found that the descending genicular artery arises from the medial side of the superficial femoral artery just above or at the level where this passes through the opening in the adductor magnus. Garcia et al [8] found that the descending genicular artery was originating from the femoral artery. In the present study, in all the 50 adult specimens the descending genicular artery arises just proximal to the adductor hiatus in the sub sartorial canal.

Yuya et al [9] investigated 70 embalmed knees underwent a modified subvastus approach and found that the descending genicular artery was identified in 62 knees, while it was absent in 8 knees. Trung hau le thua et al [10] studied 40 cases and found that descending genicular artery originated from superficial femoral artery in 33 out of 40 cases[82.5%]. The descending genicular artery was absent in 7 cases[17.5%]. In 3 other cases descending genicular artery appeared together with the superior medial genicular artery. In the present study in all 50 specimens descending genicular artery was found originating from the superficial femoral artery just proximal to adductor hiatus.

**Figure-2** Origin of Descending Genicular Artery from Femoral Artery



FA-Femoral artery; DGA- Descending genicular artery

According to Trung hau le thua et al descending genicular artery was absent in 17.5% of cases and Yuya et al dissected 70 knees and found that descending genicular artery was absent in 8 knees. In the present study the absence of descending genicular artery was not found. So this study differs with the findings of Trung hau le thua and Yuya.

P.Mergu et al [11] found that profunda femoris artery gave rise to an additional descending genicular artery in a adult male cadaver. In the present study additional descending genicular artery was not found.

**Table-1.** Comparison of the Distance between the origin of descending genicular artery and medial joint line of the knee joint by various authors with the present study.

s.no	Authors	Distance between the origin of descending genicular artery and medial joint line of the knee joint
1	Trung hau le thua et al [10]	119mm
2	Yuya kawarai et al[9]	12.6 / 1.6 cm
3	Romulo et al [12]	12.63 cm
4	Garcia-pumarino et al[8]	12.83 cm
5	Kanit sananpanich et al [13]	128.3 / 12.2 mm
6	Van dijick et al [14]	137 / 18.9 mm
7	Rahmanian Schwarz et al [15]	147mm
8	Present study	128 mm

**[ii] Distance between the origin of descending genicular artery and medial joint line of the knee joint-**

According to Trung hau le thua et al [10] ; Yuya kawarai et al [9]; Romulo et al [12]; Garcia-pumarino et al [8]; Kanit sananpanich et al [13]; Van dijick et al [14] ; Rahmanian Schwarz et al [15] the mean distance between origin of descending genicular artery and medial joint line of the knee joint was 199 mm; 12.6 +/-1.6 cm; 12.63 cm; 12.83 cm +/-12.2 ; 128.3 mm and 137 +/-18.8 mm and 147 mm respectively. In the present study , the mean distance between the origin of descending genicular artery and medial joint line of the knee joint was 128 mm. So the present study coincides with the findings of Garcia pumarino et al and Kanit Sananpanich et al and close to the findings of Romulo et al and Yuya Kawarai et al but differs with the findings of Trung hau thua et al ; Van dijick et al and Rahmanian Schwarz et al. [Table-1]

**Table-2.**Comparison of the diameters of descending genicular artery by various authors with the present study

	Authors	Diameters of descending genicular artery
1	D.Martin [7]	1.5 mm
2	Garcia pumario[8]	1.77 mm
3	Trung hau le thua [10]	2.16 mm
4.	Van dijick et al [14]	2.43 +/-0.88 mm
5	Romulo et al [12]	2.5 mm
6	Kanit sananpanich [13]	2.7 +/- 0.6 mm
7	Rahmaian Schwarz et al [15]	2.9mm
8	Present study	2.5mm

**[iii] Diameter of Descending Genicular Artery-** According to D.Martin et al [7]; Garcia pumario et al [8]; Trung hau le thau et al [10]; Van dijick et al [14]; Romulo et al [12]; Kanit sananpanich et al[13] ; Rahmaian Schwarz et al [15]; the diameter of the descending genicular artery was 1.5mm ; 1.77 mm; 2.16 mm; 2.43 +/- 0.88mm; 2.5mm; 2.7 +/- 0.6mm; and 2.9mm respectively. Table-2 gives the comparison of the diameters of descending genicular artery by various authors. The diameter of the descending genicular artery in the present study is 2.5 mm. So the present study coincides with the finding of Romulo et al and Van dijick et al but differs with the findings of D.Martin et al; Garcia pumario et al ; Trung hau le thua et al ; Kanit sananpanich et al and Rahmaian Schwarz et al..

## VI. Conclusion

The blood supply of the medial femoral condyle is plentiful and consistent making it a useful source for free vascularised bone graft. Thus the use of the descending genicular artery as recipient vessel has various advantages including [i] constant in location,[ii] excellent size match for end to end anastomosis..Although many studies have reported the viability of osteomyocutaneous flap from the medial femoral condyle, a careful preoperative vascular assessment is essential secondary to considerable anatomical variations in the descending genicular artery. Further clinical studies will be required to clearly define the success of the composite osteomyocutaneous flap using descending genicular artery.

Conflict of interest: none

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