



POPLITEAL ARTERY DIAMETER MEASUREMENT IN CADAVER

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Conflicts of Interest: Nil

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Abstract:

INTRODUCTION: Femoral artery continue as popliteal artery from the fifth osseo-aponeurotic opening of adductor magnus. It descends laterally from the opening in adductor magnus muscle to the femoral inter-condylar fossa, going obliquely to the distal border of popliteus muscle, then it divides into the anterior and posterior tibial arteries. A popliteal aneurysm i.e. abnormal dilation of the popliteal artery, usually causes edema and pain in the popliteal fossa. An aneurysm in the popliteal artery may stretch the tibial nerve or compress its blood supply. Knowledge of the diameter of normal popliteal artery is essential to determine the relevance of popliteal dilatations as popliteal artery is one of the most common sites for aneurysm formation.

MATERIAL AND METHODS: 100 lower limbs of 50 cadavers embalmed with 10% formalin were included in the study. Out of 50 specimens 40 cadavers were males and 10 were female. All the cadavers were adult males and females ranging between the age group of 25-65 years. Popliteal artery was examined in each cadaver. Inner circumference of popliteal artery at its origin and at its termination. At the level of adductor hiatus, intact piece of popliteal artery was removed, incised and cut opened.

RESULTS: Mean diameter of popliteal artery at its origin on the right side was 4.8 ± 0.6 mm, range 3.7 mm -5.4 mm and 4.8 ± 0.4 mm on the left side, the range being 3.4 mm -5.3 mm. popliteal arteries of men are slightly larger than that of female right (4.8 ± 0.6 mm), (4.6 ± 0.5 mm) and left popliteal artery (4.8 ± 0.4 mm), (4.6 ± 0.2 mm) respectively. Mean diameter of popliteal artery at its termination in males were 4.6 ± 0.2 mm and 4.0 ± 0.6 mm of right and left respectively. Mean diameter of popliteal artery at its termination in female were 4.2 ± 0.6 mm and 3.7 ± 0.3 mm of right and left respectively

CONCLUSION: mean diameter in males was slightly larger than females. The variation of our study compare to other study may be due to the difference in live and cadaveric spacemen. The present study is useful for the vascular surgeons, radiologists. angiography, duplex ultrasound.

Introduction

Femoral artery continues as popliteal artery from the fifth osseo-aponeurotic opening of adductor magnus to the lower border of popliteus muscle. Its courses near the adductor canal and the adductor hiatus, distinctive open areas inside the thigh^{i,ii}. It descends laterally from the opening in adductor magnus muscle to the femoral inter-condylar fossa, going obliquely to the distal border of popliteus muscle, then it divides into the anterior and posterior tibial arteries. This division occurs at the proximal end of the asymmetrical crural interosseous space between the wide tibial metaphysis and the slender fibular metaphysis. The artery may divide into its terminal branches proximal to popliteus, in which case the anterior tibial artery sometimes descends anterior to the muscle^{iii,iv}. If the knees are slightly

flexed to about 45 degrees the pulse will be easier to locate. The pulsations are best felt in the inferior part of the fossa as in this fossa the popliteal artery is related to the tibia^v. Weak pulse or loss of the popliteal pulse can be a sign of a femoral artery obstruction. A popliteal aneurysm i.e. abnormal dilation of the popliteal artery, usually causes edema and pain in the popliteal fossa^{vi}. An aneurysm in the popliteal artery may stretch the tibial nerve or compress its blood supply. Pain from nerve compression is referred to the skin overlying the medial aspect of the calf, ankle or foot. Fractures of the distal femur or dislocations of the knee may rupture the artery, resulting in haemorrhage^{vii}. The artery may divide into its terminal branches proximal to popliteus the anterior tibial artery sometimes descends anterior to the muscle^{viii,ix}.

Knowledge of the diameter of normal popliteal artery is essential to determine the relevance of popliteal dilatations as popliteal artery is one of the most common sites for aneurysm formation. Considering the clinical importance of diameter of popliteal artery, this study was done to note the internal diameter of popliteal artery.

MATERIAL AND METHODS

100 lower limbs of 50 cadavers embalmed with 10% formalin from Dept. of Anatomy Madhubani Medical College Keshopur Bihar were included in the study. Out of 50 specimens 40 cadavers were males and 10 were female. All the cadavers were adult males and females ranging between the age group of 25-65 years.

Incision was taken and the skin was reflected. Superficial fascia and deep fascia was removed to expose the popliteal fossa. Hamstring muscles were reflected for the exposure of the region of adductor hiatus which is the origin of popliteal artery and two heads of gastrocnemius were reflected to expose the popliteal vessels. Soleus muscle was incised vertically up to the termination of popliteal artery. After that popliteal artery was examined in each cadaver.. Inner circumference of popliteal artery at its origin and at its termination. At

the level of adductor hiatus, intact piece of popliteal artery was removed, incised and cut opened.

The following landmarks were exposed: 1. Adductor hiatus and 2. Termination of Popliteal artery
Parameters measured were: 1. Inner circumference of popliteal artery at its origin and at its termination.

At the level of adductor hiatus, piece of popliteal artery was removed, incised and cut opened. Inner circumference was measured after fixing the cut opened popliteal artery. The same procedure was followed for measuring circumference of popliteal artery at its termination.

Formula used for the calculation of internal diameters of these arteries: Circumference = $2 \pi r = \pi d$ ($d = 2r$) $d = \text{circumference} \div \pi$ Where, r-radius of artery, d- diameter of artery, $\pi = 3.14$.

RESULTS

Mean diameter of popliteal artery at its origin on the right side was 4.8 ± 0.6 mm, range 3.7 mm -5.4 mm and 4.8 ± 0.4 mm on the left side, the range being 3.4 mm -5.3 mm. popliteal arteries of men are slightly larger than that of female right (4.8 ± 0.6 mm), (4.6 ± 0.5 mm) and left popliteal artery (4.8 ± 0.4 mm), (4.6 ± 0.2 mm) respectively. Statistically the difference was not significant.

Table 1: Mean diameter of popliteal artery at origin

| | Total Specimen | Mean diameter of right popliteal artery | Mean diameter of left popliteal artery | P value |
|--------|----------------|---|--|---------|
| Male | 40 | 4.8 ± 0.6 mm | 4.6 ± 0.5 mm | 0.3364 |
| Female | 10 | 4.8 ± 0.4 mm | 4.6 ± 0.2 mm | 0.1337 |

Table 2: Mean diameter of popliteal artery at termination

| | Total Specimen | Mean diameter of right popliteal artery | Mean diameter of left popliteal artery | P value |
|--------|----------------|---|--|---------|
| Male | 40 | 4.6 ± 0.2 mm | 4.0 ± 0.6 mm | 0.0001 |
| Female | 10 | 4.2 ± 0.6 mm | 3.7 ± 0.3 mm | 0.0143 |

Mean diameter of popliteal artery at its termination in males were 4.6 ± 0.2 mm and 4.0 ± 0.6 mm of right and left respectively. Mean diameter of popliteal artery at its termination in female were 4.2 ± 0.6 mm and 3.7 ± 0.3 mm of right and left respectively

DISCUSSION AND CONCLUSION

Popliteal artery has been an artery of interest for researchers, doctors and scientists for a long time.

Accurate anatomical location of the popliteal artery and the region of popliteal fossa are of great importance in various diagnostic and therapeutic procedures in medical field. Knowledge of popliteal artery is important for infra-popliteal interventions such as bypass surgery, trans-luminal angioplasty and sub intimal angioplasty. Popliteal vascular injuries and popliteal aneurysms continue to be potentially

dangerous lesions with high percentage of leg amputations^{x, xi}.

Wolf YG et al. in their study on 204 healthy volunteers measured the external diameter of the popliteal artery at three levels using ultrasound scan and found that the external diameter of the popliteal artery in its upper part was 6.4 mm±0.7, in middle part was 6.4 mm±0.7 and in its distal part was 4.6 mm±0.6. so they concluded that the diameter of the normal popliteal artery was not uniform throughout its length also they concluded that mid popliteal artery diameter to superficial femoral artery diameter ratio is greater than normal in popliteal aneurysms^{xii}.

In our study the diameter of right popliteal arteries was slightly larger than left also in males diameter was greater as compared to females. studies on the popliteal artery was done by measuring the diameter of the popliteal artery at various points using B-mode ultrasound and Duplex ultrasound scanning methods. Thomas Sandgren et al. showed that the diameter of the popliteal artery in 121 healthy human volunteers (59 males and 62 females) with echo tracking Bmode ultrasonography mean diameter of the popliteal artery was 7.4 mm±0.9. which was higher than our study^{xiii}. Crawford et al. study on 200 volunteers without overt vascular disease showed that the mean diameter of the popliteal artery using duplex ultrasound was 6.7 mm. which was near about similar with our study. As this study was on cadaver the variation in the measurement may be due to the difference in live and cadaveric specimens or due to the method of measurement.

To conclude the data from the present study is useful for the vascular surgeons, radiologists. Angiography duplex ultrasound. The variation of our study compare to other study may be due to the difference in live and cadaveric specimens.

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