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VARIANT ORIGIN AND COURSE OF ANTERIOR TIBIAL ARTERY

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ABSTRACT: During routine dissection for first MBBS students on a 65 year donated embalmed male cadaver in the Department of Anatomy, K.J.Somaiya Medical College, we observed that the anterior tibial artery had a high origin from the popliteal artery proximal to the popliteus muscle. It then ran downwards on the posterior surface of the popliteus muscle. Distal to the tendinous arch of soleus muscle the posterior peroneotibial trunk divided into posterior tibial and the peroneal arteries. The further course of anterior tibial, posterior tibial and peroneal arteries was normal. The photographs of the variations were taken for proper documentation and ready reference. There were no associated neuromuscular variations found in same specimen. The right lower limb of the same cadaver was normal.
Conclusion: The arthroscopic knee surgery is a common and preferred surgical procedure. The knowledge of branching pattern of popliteal artery is important for surgical interventions in the popliteal region in order to minimize the surgical complications due to anatomical variations. The origin of anterior tibial artery from the popliteal artery proximal to the popliteus muscle is an important anatomical variation which should be kept in mind by the orthopaedicians doing knee joint surgery and total knee arthroplasty, as well as by surgeons operating on aneurysms of popliteal artery and by radiologists performing angiographic study.
Key words: Popliteal Artery, Anterior Tibial Artery, Popliteus Muscle, Posterior Peroneotibial Trunk, Posterior Tibial Artery, Peroneal Artery, Tendinous Arch of Soleus, Orthopaedicians, Arthroscopic Knee Surgery, Radiologist, Angiographic Study.

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INTRODUCTION

The popliteal artery begins at the level of hiatus magnus as a continuation of the femoral artery and ends at the lower border of popliteus muscle by dividing into anterior tibial and posterior tibial arteries. The anterior tibial artery runs downwards on the posterior surface of the popliteus muscle and enters the anterior compartment of the leg through a space located near the superior border of the interosseous membrane. It then travels on the anterior surface of the interosseous membrane along with the deep peroneal nerve. If the popliteal artery divides anywhere proximal to the lower border of the popliteus muscle, into anterior and posterior tibial arteries, it is termed as 'high division of the popliteal artery'. The anterior tibial artery may descend downward either anterior or posterior to the popliteus muscle. The popliteal artery may also terminate distal to the lower border of popliteus muscle which may interfere with the reconstruction surgeries [1].

Case Report

During routine dissection for first MBBS students on a 65 year donated embalmed male cadaver in the Department of Anatomy, K.J.Somaiya Medical College, we observed that the anterior tibial artery had a high origin from the popliteal artery proximal to the popliteus muscle. It then ran downwards on the posterior surface of the popliteus muscle. Distal to the tendinous arch of soleus muscle the posterior peroneotibial trunk divided into posterior tibial and the peroneal arteries. The further course of anterior tibial, posterior tibial and peroneal arteries was normal. The photographs of the variations were taken for proper documentation and ready reference. There were no associated neuromuscular variations found in same specimen. The right lower limb of the same cadaver was normal.

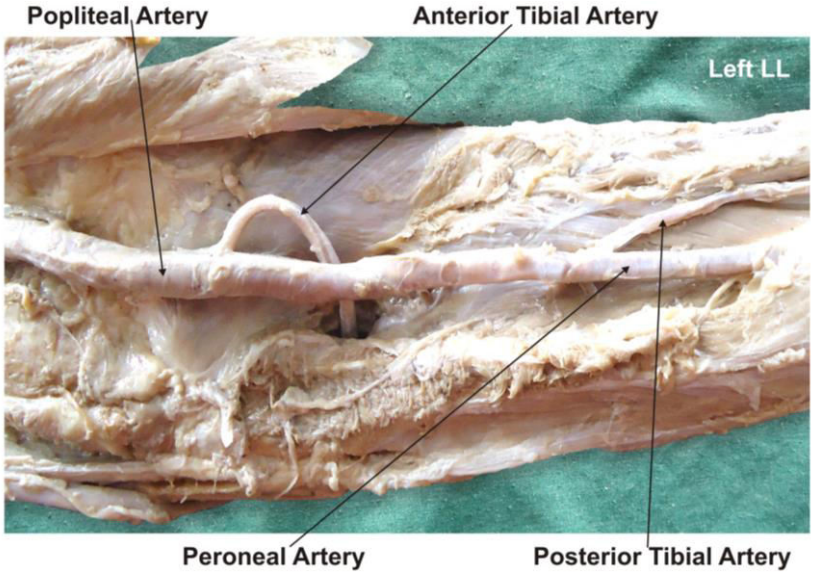

Figure-1: Photographic presentation of the right popliteal artery terminating into anterior tibial artery and peroneotibial trunk below the hiatus magnus.

DISCUSSION

The high level termination of the popliteal artery in relation to the popliteus muscle was grouped into 3 types by Adachi. In type I, popliteal artery descended on the posterior surface of the popliteus muscle and divided into the posterior peroneotibial trunk and the anterior tibial artery. The posterior peroneotibial trunk further divided into the peroneal artery and the posterior tibial artery. The diameter of the anterior tibial artery was equal to the popliteal artery and smaller than the posterior peroneotibial trunk. In type II the popliteal artery descended on the posterior surface of the popliteus muscle and divided into posterior tibial artery and the anterior peroneotibial trunk. The diameter of the anterior peroneotibial trunk was observed to be larger. The anterior peroneotibial trunk divided into the peroneal artery and anterior tibial artery at the lower border of the popliteus muscle. In type III the popliteal artery terminated into the anterior tibial artery and posterior peroneotibial trunk at the upper border of the popliteus muscle. The anterior tibial artery ran downward in between the anterior surface of the popliteus muscle and the posterior surface of the tibia. The posterior peroneotibial trunk ran on the posterior surface of the popliteus muscle. The posterior peroneotibial trunk divided into the peroneal artery and posterior tibial artery distal to the tendinous arch of soleus muscle [2]. The variation in the termination of popliteal artery observed in the present case is of Adachi's type III. Normally the diameter of the posterior tibial artery is more than the diameter of the peroneal artery, but in present case the diameter of the peroneal artery was more than the diameter of the posterior tibial artery which is similar to the study of Ozgur et al [3]. The variations in the branching pattern of the popliteal artery are common. It was reported in previous studies that the course of anterior tibial artery could either be from the anterior or posterior surface of the popliteus muscle. The course of anterior tibial artery on the anterior surface of the popliteus muscle has also been observed in 1-2.1% of the cases [4,5] while the course of anterior tibial artery on the posterior surface of the popliteus muscle was observed in 40% of the cases [6,7]. In present case the course of anterior tibial artery on the posterior surface of the popliteus muscle was observed.

Clinical Significance

Clinicians and radiologists define the anterior tibial artery as the tibial-fibular trunk as soon as it branches from the popliteal artery. The tibial arteries are referred to as anterior or posterior peroneotibial trunk depending upon the origin of the peroneal artery. In the present case the peroneal artery arises from the posterior tibial artery and hence the posterior tibial artery is defined as the posterior peroneotibial trunk.

The arthroscopic knee surgery is a common surgical procedure. The knowledge of branching pattern of the popliteal artery is important for surgical interventions in the popliteal region in order to minimize the surgical complications. Therefore the origin of the anterior tibial artery from the popliteal artery proximal to the popliteus muscle is an important anatomical variation which should be kept in mind by the orthopaedicians doing knee joint surgery and total knee arthroplasty [8]. The variations in the branching pattern of the popliteal artery increase the risk of vascular trauma and unnecessary hemorrhage during arthroscopic surgery of knee joint. The knowledge of variations in the branching pattern of the limb arteries is important for the success of the arthroscopic surgeries. It is also important for the surgeons operating on aneurysms of popliteal artery and by the radiologists performing angiographic study. Preoperative diagnosis of variations in the branching pattern of the popliteal artery may help to avoid excessive unwanted hemorrhage and unnecessary complications during surgery [9].

CONCLUSION

The arthroscopic knee surgery is a convenient and preferred surgical procedure. The knowledge of branching pattern of the popliteal artery is important for surgical interventions in the popliteal region in order to minimize the surgical complications due to anatomical variations. Therefore the origin of the anterior tibial artery from the popliteal artery proximal to the popliteus muscle is an important anatomical variation which should be kept in mind by the orthopaedicians doing knee joint surgery and total knee arthroplasty, by the surgeons operating on aneurysms of popliteal artery and by the radiologists performing angiographic study. These variations are compared with the earlier data & it is concluded that variations in branching pattern of cords of the popliteal artery are a rule rather than an exception.

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Conflict of Interest

The authors declare that they have no conflict of interest.

Statement of Human and Animal Rights

All procedures performed in human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

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