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Variants of the popliteal artery terminal branches as detected by multidetector ct angiography

Abstract: Objective: To evaluate variants of the popliteal artery (PA) terminal branches with 64-multidetector computed tomographic angiography (64-MD CTA).

Materials and Methods: A total of 495 extremities (251 right, 244 left) of 253 patients undergoing a 64-MD CTA examination were included in the study. Of these, 242 extremities were evaluated bilaterally, whereas 11 were evaluated unilaterally. The terminal branching pattern of the PA was classified according to the classification scheme proposed by Kim; the distance between the medial tibial plateau and the origin of the anterior tibial artery (A) and the length of the tibioperoneal trunk (B) have been measured and recorded.

Results: In 459 cases (92.7%) branching of PA occurred distal to the knee joint (Type I); in 18 cases (2.8%) PA branching was superior to the knee joint (Type II); and hypoplasia of the PA branches was found in 27 cases (5.5%) (Type III). Among these types the most frequent branching patterns were Type IA (87.5%), Type IIIA (3.9%), and Type IB (3.8%). The ranges of A and B mean distances were 47.6 mm and 29.6 mm, respectively

Conclusion: Variations in popliteal artery terminal branching pattern occurred in 7.4% to 17.6% of patients. Pre-surgical detection of these variations with MD CTA may help to reduce the risk of iatrogenic arterial injury by enabling a better surgical treatment plan.

Keywords: Popliteal artery, branching patterns, vascular variations, multidetector CT angiography

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1 Introduction

A detailed knowledge on the anatomy of the popliteal artery terminal branches by the surgeons and radiologists is associated with increased success rates of percutaneous surgical procedures because it allows proper surgical planning [1-17]. Among the lower limb arteries, the popliteal artery terminal branches variants is not uncommon [1-4,10,12,13]. In the last decade, more frequent use of multidetector computed tomographic angiography (MD CTA) as compared with digital subtraction angiography (DSA) in diagnostic assessment of lower extremity of arterial disease has increased the awareness of popliteal artery variations. There are several studies involving the use of DSA in the assessment of popliteal artery variations [1- 10]. However, studies assessing the popliteal artery terminal branching variations with MD CTA are few [12,13]. In the current retrospective study, variants of the popliteal artery (PA) terminal branches have been assessed using 64-MD CTA.

2 Materials and Methods

2.1 Patient Selection

At our institution, between January 2009 and December 2013, 262 consecutive patients underwent lower extremity CTA because of suspected arterial occlusive disease. We reviewed the CTA data retrospectively for anatomic assessment of the popliteal artery and its branches. The study consisted of 495 extremities in 253 patients (57 female, 196 male, 27 to 87 years old). The study protocol was approved by the Institutional Ethics Committee. Informed consent has been obtained from all individuals included in this study.

2.2 Imaging Technique and Analyses

All CTA examinations were performed by a 64-slice CT scanner (Toshiba Aquilion, Toshiba Medical systems, Tokyo, Japan). Patients were placed in the supine position with feet first. The scans covered the area from the level of the coeliac axis to the tip of the foot. For adequate distal opacification, two CTA acquisitions were planned: The first covered the area from the abdominal aorta to the knee level, and the second included the area between below the knee to the tip of the foot. Scan parameters were set as follows: tube voltage 120 kv; effective tube flow 250 mAs; rotation time 0.4 sec; table speed 29 mm/s; pitch 0.844 mm; section thickness 0.5 mm; and reconstruction interval 0.5–1 mm. For venous access, the antecubital vein and an 18–20 gauge IV cannula was used. A total of 100–120 cc contrast material with high iodine concentration (≥350 mgI/ml) was injected at a 5 cc/sec injection rate. Following the contrast material, 20 to 30 cc saline flush was delivered with the same injection protocol. Scan timing was determined by automated bolus triggering; the region of interest was placed on the abdominal aorta; the threshold was set as 190 HU. The scan was started 8 seconds after reaching the threshold. The CT images were transferred to a remote workstation (Vitrea 2 workstation, Vital Images Inc., Plymouth, Minnesota, USA), and the data were processed by using maximum intensity projection (MIP), multiplanar reformatting (MPR), curved planar reformatting (CPR), and volume rendering (VR) techniques. All the arterial segments, particularly the coronal segments, were studied based on MPR images. CTA images were reviewed by two radiologists experienced in cardiovascular radiology.

The branching pattern of the popliteal artery has been classified based on the classification scheme proposed by Kim et al. [4] as follows. Type I: Branching of the popliteal artery (PA) at the normal, expected level, i.e., below the level of medial tibial plateau. This classification also proposes three subgroups for Type I: In Type IA (normal), the first branch of the popliteal artery is the anterior tibial artery (ATA) with the continuing segment of the main artery, known as tibioperoneal trunk, further divided into peroneal (PRA) and posterior tibial arteries (PTA). In Type IB (trifurcation, branching of ATA, PTA, and PRA is within a distance of 0.5 cm without formation of a true tibioperoneal trunk. In Type IC, PTA is the first branch, and ATA and PRA arise from the tibioperoneal trunk. In Type II, there is branching of PA above the normal level. Similar to the Type I variation, Type II has also three subgroups with further subgrouping. Type IIA denotes a popliteal artery that branches at or above the joint space. Its subdivisions are as follows: Type IIA1, normal proximal course of ATA, and Type IIA2, proximal and medial course of ATA. Type IIB is defined as the branching of PTA at or superior to the joint level, and branching of ATA and PRA from the tibioperoneal trunk. Type IIC is defined as branching of PRA at or superior to the joint level. In Type III, there is hypoplasia or agenesis in the branches of PA with an alteration in distal blood supply. The Type III pattern includes the following subgroups: Type IIIA shows distal substitution of PTA by PRA, along with hypoplastic or aplastic PTA. Type IIIB is defined as substitution of the dorsalis pedis artery (DPA) by PRA, along with hypoplastic or aplastic ATA. Type IIIC has distal substitution of PTA and DPA by PRA in conjunction with hypoplastic or aplastic ATA and PTA.

The distance between the medial tibial plateau and the origin of the anterior tibial artery (distance A), and in eligible patients, the distance between the origin of the anterior tibial artery and origin of the peroneal artery – i.e., the length of the subsequent segment of the main artery is known as tibioperoneal trunk (distance B) – have been measured and recorded.

2.3 Statistical Analysis

The statistical analyses were conducted using SPSS 11.5 for Windows (SPSS Incorporation, Chicago, IL, USA). To evaluate the agreement between two observers in determining the type of popliteal artery branching, Cohen kappa co-efficiency (very good [$\kappa > 0.8$], good [$\kappa = 0.61$–0.8], moderate [$\kappa = 0.41$–0.6], low [$\kappa = 0.21$–0.4], very low [$\kappa \leq 0.2$]) was calculated.

3 Results

A total of 262 patients (524 extremities) with a preliminary diagnosis of lower extremity arterial disease have been assessed with MD CTA. 29 extremities (both extremities in nine patients, unilateral extremity in 11 patients) were excluded from the study due to the significant narrowing or occlusion of the popliteal artery and/or its branches (22/29); amputation from below the knee (5/29); and total knee prosthesis (2/29), all of which would have prevented adequate assessment. Hence the study consisted of 495 extremities (251 right, 244 left) in 253 patients (57 female and 196 male, age ranging between 27 and 87 years [mean age 63.6 years]). 242 extremities were evaluated bilaterally, and 11 extremities were evaluated unilaterally.

The frequencies of various patterns of popliteal artery terminal branching, in our study population are summarized in Table 1.

The Type I branching pattern (normal level of PA branching) was present in 459 of the 495 extremities (92.7%) in our study. A total of 433 (87.5%) extremities have been found to have Type IA (normal) which was the most encountered pattern in the present study. The mean distance between the medial tibial plateau and the origin of the ATA (distance A) was 47.6 mm (range 5.4–74.6 mm), and the mean length of the subsequent segment (distance B) was measured as 29.6 mm (range 8.2–67.1 mm) (Figure 1). Distance A and distance B were less than 1 cm in one (0.1%) and nine extremities (1.8%). Distance A was longer than 60 mm in 23 (4.6%) extremities, and distance B was longer than 50 mm in 24 extremities (4.8%). A Type IB (trifurcation) pattern was observed in 19 extremities (3.8%). Eight extremities (1.6%) had a Type IC pattern (Figure 2).

A Type II branching pattern (PA branching above the normal level) was present in 15 of the 495 extremities (2.8%). Nine extremities (1.8%) exhibited a Type IIA pattern, with seven extremities classified as Type IIA1 and two extremities classified as a Type IIA2 variation. Five extremities (1%) had a Type IIB pattern in our study group (Figure 3). Type IIC was not observed in our study group.

In our study, 27 (5.5%) of the PA divisions had a Type III branching pattern (hypoplastic or aplastic branching with altered distal supply). Among our participants, 19 extremities (3.9%) had a Type IIIA pattern, five extremities (1%) had a Type IIIB pattern, and three extremities (0.6%) had a Type IIIC pattern (Figure 4).

Among 242 cases that were assessed bilaterally, 10 had an identical variant pattern of branching in both extremities, whereas in four, a dissimilar type of branching variation was observed in two extremities. Three cases had two different types of branching patterns simultaneously, among which two had symmetrical variations in both extremities (one in bilaterally IIIB+IB, one in bilaterally IIIA+IC, one in unilaterally IIIA+IB). Among the 11 cases in whom only one extremity was assessed, two had a variant branching pattern (IIIC+IB). When cases that were assessed bilaterally are considered, 30% of the variations were bilateral and identical in both extremities, whereas in 12%, a bilateral but different type of branching variation was observed. The distribution of bilaterally variant patterns in 14 patients are summarized in Table 2. In cases that have a variant pattern of branching in one extremity, the rate of variation in the contralateral extremity was 21%, and the rate of having the same variant pattern in the contralateral extremity was 71%. In cases with one
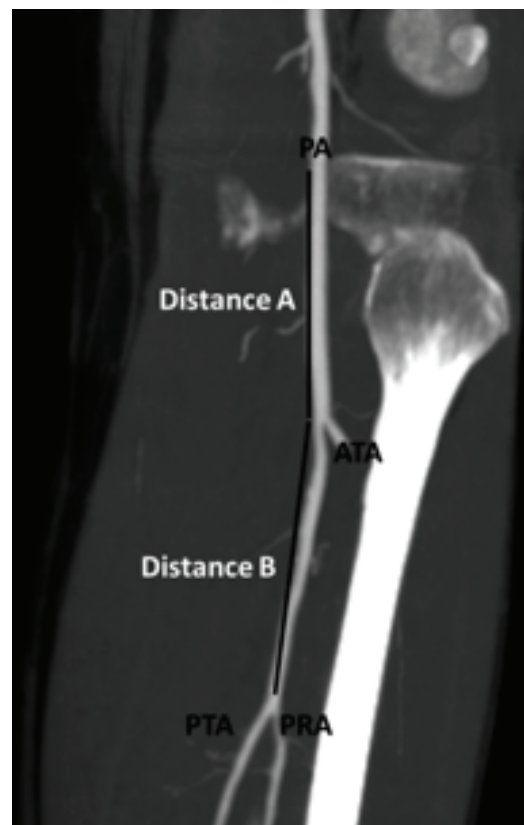
Table 1: Distribution of the popliteal artery terminal branching patterns

Branching type	Number of extremities
Type I A	433 (221R, 212L) (87.5%)
Type I B	15 (8R, 7L) (3%)
Type I C	6 (1R, 5L) (1.2%)
Type IIA1	7 (4R, 3L) (1.4%)
Type IIA2	2 (1R, 1L) (0.4%)
Type IIB	5 (2R, 3L) (1%)
Type IIC	0 (0%)
Type IIIA	16 (6R, 10L) (3.3%)
Type IIIB	3 (2R, 1L) (0.6%)
Type IIIC	2 (2R) (0.4%)
Type IIIA+1C	2 (1R, 1L) (0.4%)
Type IIIA+IB	1 (1R) (0.2%)
Type IIIB+IB	2 (1R, 1L) (0.4)
Type IIIC+IB	1 (1L) (0.2%)

*R, right extremity L, left extremity

Figure 1: The MIP MDCT image of the right lower extremity shows measurements of distance A and distance B.
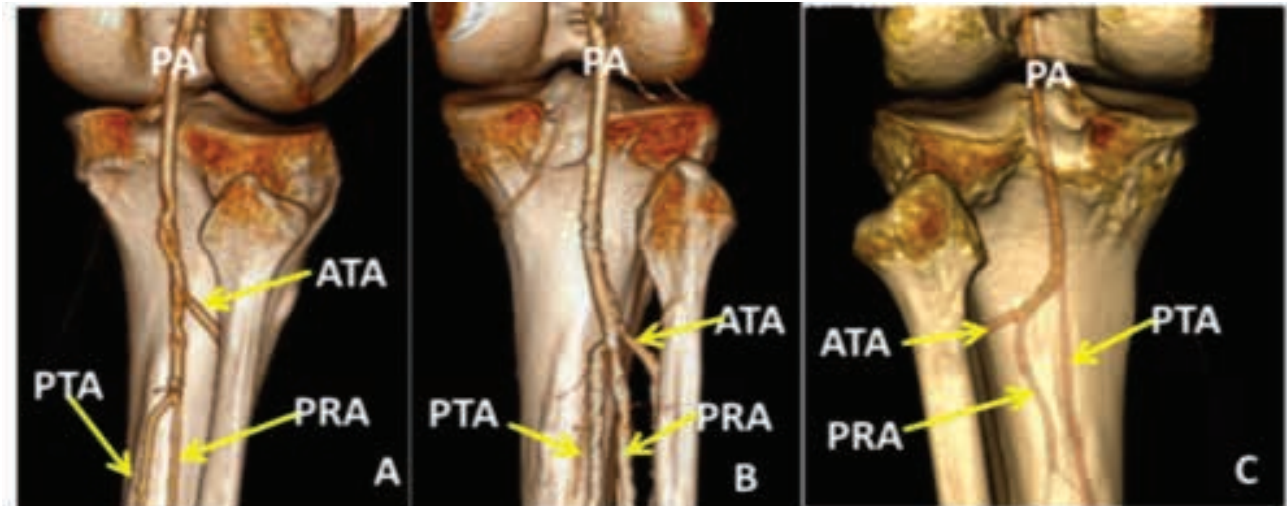
Figure 2.A-C: The volume-rendered (VR) MDCT images show the Type I branching pattern of the popliteal artery (PA). Type IA pattern (A) in the right lower extremity; the first branch of the PA is the anterior tibial artery (ATA), peroneal (PRA), and posterior tibial arteries (PTA) arise from tibioperoneal trunk. Type IB pattern (B) in the right lower extremity; branching of ATA, PTA, and PRA within a distance of 0.5 cm without formation of a true tibioperoneal trunk. Type 1C pattern (C) in the left lower extremity; PTA is the first branch, and ATA, and PRA arise from the tibioperoneal trunk.
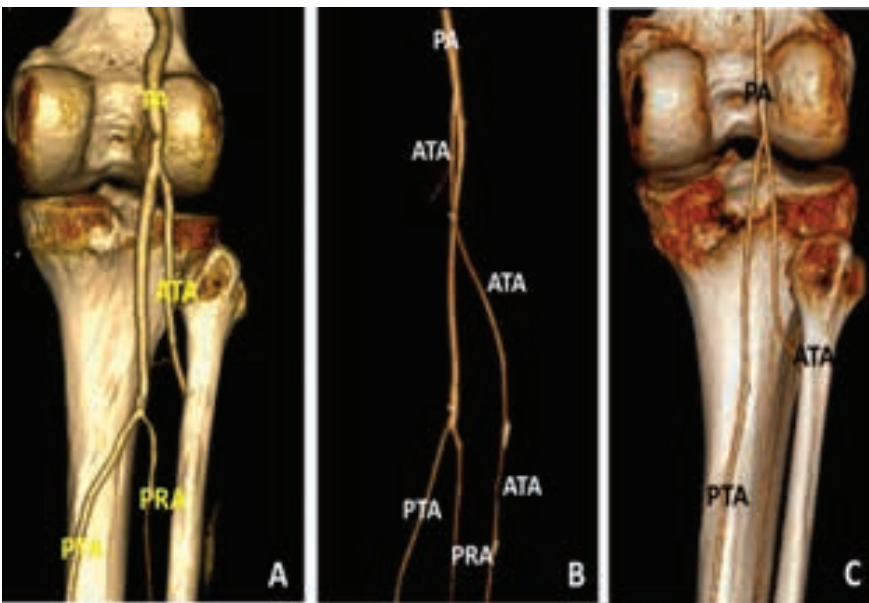

Figure 3: The VR MDCT images in the right lower extremities show the Type II branching pattern of the PA above the normal level. Type IIA (1) pattern with normal proximal course of ATA is depicted in (A); (B) shows Type IIA (2) pattern with proximal and medial course of ATA. Type IIB pattern is seen (C); branching of PTA is at the joint level, and branching of ATA and PRA from the tibioperoneal trunk.

normal extremity, the rate of variant branching pattern in the contralateral extremity was 9%. The most frequent asymmetrical (two extremities having different types of branching pattern) pattern observed in the present study were Type IC (one in right, five in left extremity), Type IB (two in right, three in left extremity) and Type IIB (two in right, three in left extremity) respectively. Among all the variations observed in 495 extremities, 32 were in the right limb while 36 were in the left limb.

In our study, inter-observer agreement was evaluated. The kappa value was 0.72, reflecting good inter-observer agreement.

4 Discussion

The results of the present study show that the variants of popliteal artery occur with an incidence of 12.5% in our
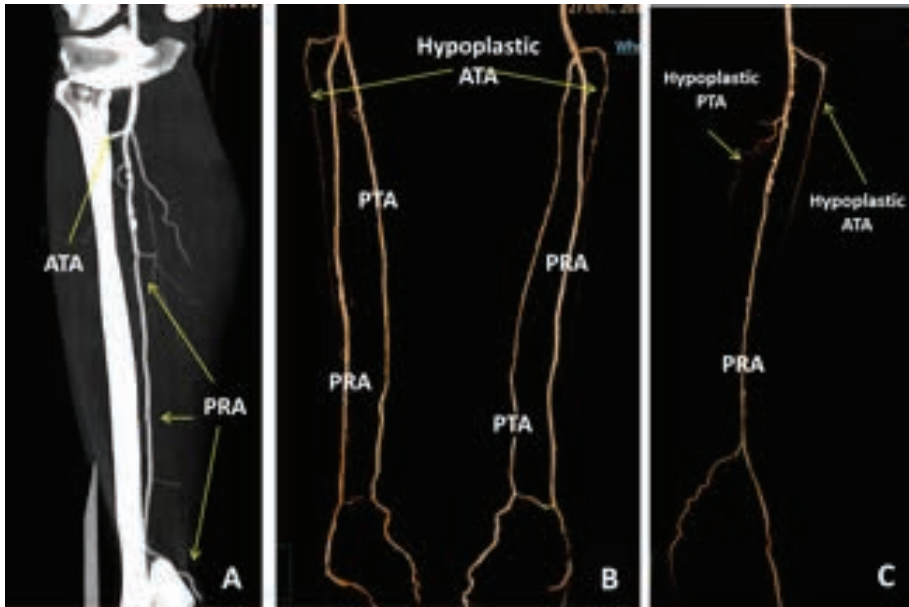
Figure 4: On the maximum intensity projection, (MIP) (A), and VR (B-C) MDCT images show the Type III branching pattern of the PA. Type IIIA pattern (A) in the right lower extremity; distal substitution of PTA by PRA, along with aplastic PTA. Type IIIB pattern (B) is seen bilaterally; hypoplastic ATA, and the distal ATA replaced by the PRA and concomitant Type IB pattern (B). Type IIIC pattern (C) in the left lower extremities; distal substitution of PTA and DPA by PRA in conjunction with hypoplastic ATA and PTA.

Table 2: Distribution of variant patterns in 14 patients with bilateral involvement

Pattern type	Pattern found in extremity		No.of patient (n=14)
	Right	**Left**	
Same pattern	Trifurcation	Trifurcation	3
	Branching of PA above the usual level	Branching of PA above the usual level	1
	Hypoplastic-aplastic PTA	Hypoplastic-aplastic PTA	3
	Hypoplastic-aplastic PTA + first branching PTA	Hypoplastic-aplastic PTA+ first branching PTA	1
	Hyplastic-aplastic ATA+trifurcation	Hyplastic-aplastic ATA+trifurcation	1
	Hyplastic-aplastic ATA and PTA	Hyplastic-aplastic ATA and PTA	1
Different pattern	Branching of PA above the usual level	First branching PTA	1
	Branching of PA above the usual level	Hypoplastic- aplastic ATA	1
	Hypoplastic-aplastic PTA + trifurcation	Hypoplastic-aplastic PTA	1
	First branching PTA	Branching of PA above the usual level	1

*PA popliteal artery, PTA posterior tibial artery, ATA anterior tibial artery

study population; thus, they are not uncommon. In line with our findings, reported ranges of these variations in various other studies are 7.4% to 17.6% [1-4,10,12,13].

Taking their frequency into account, a good knowledge of the variants of the lower extremity arteries during radiologic examination is important to prevent misinterpretation of imaging findings [7,12,13]. Also, recognizing these variations is necessary for planning radiological and surgical interventions [7,12,13]. The awareness of these variants by vascular surgeons and interventional

radiologists is a prerequisite for the success of a number of procedures, including vascular grafting, primary vascular repair, embolectomy, transluminal angioplasty, vascular injury repair, and diagnosis-surgery of popliteal artery entrapment syndrome [3,5,7,12,13,18]. In addition, anatomical variants determine the type of appropriate surgical approach to be implemented [3].

The requirement for a good anatomical knowledge of the arterial structures in the donor area before surgery does not solely pertain to vascular surgery, but also to reconstructive surgery of the lower extremities involving flaps, with arterial variants causing alterations in surgical planning in up 20% to 25% of such cases [15]. In the study by Klecker et al. that examined the clinical significance of the aberrant anterior tibial artery using magnetic resonance angiography (MRA) in 1116 patients, the authors concluded that a good knowledge of the aberrant anterior tibial artery may reduce arterial complications in a variety of orthopedic interventions such as high tibial osteotomy, revision total knee arthroplasty, lateral meniscal repair, posterior cruciate ligament reconstruction, and tibial tubercle osteotomy of the knee joint, including arthroscopy [16]. Tindall et al. observed that in all patients with high origin of the anterior tibial artery, the artery was in direct contact with the posterior cortex of the tibia; in this variation using sharp instruments when a transverse tibial cortex was performed in knee procedures—particularly high tibial osteotomy and total knee replacement— may be vulnerable [19].

Balloon catheter technology, used to treat lower extremity ischemia in diabetic patients, allows percutaneous transluminal angioplasty of small arteries, which could be impeded by different ATA variations in the leg [12,20]. Additionally, if a Type III branching pattern is detected, it may be necessary to change the angioplasty technique [7,12,15]. In addition, harvesting of the PA for the fibular free flap transfer procedure is contraindicated if a Type III C pattern is present. Because PA is the only artery that feeds the distal parts of the limb in the Type III C branching pattern, this procedure could result in a catastrophic ischemia of the foot [12,15].

DSA, color Doppler ultrasonography (CDUS), MRA, and CTA can be used for radiologic evaluation of lower extremity arteries. Although DSA remains the gold standard method for the assessment of the arteries of the lower extremity, particularly in cases undergoing interventional procedures, its invasive character along with the risk of complications that include hematoma, pseudo-aneurysms, dissection, and arterial occlusion may explain some of the reluctance to its routine preoperative use [21]. CDUS is widely available, but this modality is operator dependent, and significant limitations occur with obese patients and in heavily calcified arterial segments [15]. Magnetic resonance angiography (MRA) has a high diagnostic accuracy, but is costly, time-consuming, and not widely available. On the other hand, MD CTA allowed us to obtain excellent images of the lower extremity vascular tree. Compared with DSA, MD CTA is noninvasive, faster, and more comfortable for patients. Moreover, MD CTA provides availability of 3-dimensional reformatted images from source images for assessment of the variants of the popliteal artery. Advantages of CTA over MRA include better patient acceptance, speed of examination, and better spatial resolution [22]. There are several studies that involve the use of digital subtraction angiography (DSA) to investigate popliteal arterial variations in the literature [1-10]. However, to our knowledge, our study represents only the third report on the use of MD CTA in the assessment of the popliteal artery terminal branches variants. Both Yanik et al. and Calisir et al. have recently evaluated the popliteal artery and its branches and classified its branching patterns using MD CTA; they concluded that MD CTA could become the preferred method for evaluating arterial variations of the lower limb. Our study and these studies were carried out in a retrospective manner using a 64-MD CTA. The sample size of our study was larger (495 extremities) than that of the Yanik et al. study (126 extremities), and the present study was the first report on the use of MD CTA in the assessment of distance A and distance B measurements.

Lippert and Pabst have classified the branching patterns of the popliteal artery according to the level and sequence of branching of the ATA, PTA, and PRA, and whether these structures were aplastic, hypoplastic, or neither [1,4,11,14]. Kim et al. have proposed a new classification of branching pattern of the popliteal artery by modifying Lippert's system [4]. According to the Kim study, the branching pattern is classified into three categories and each into three subtypes. The difference between this new classification and others is the third category, which has a normal branching pattern and sequence but the proximal segments of the ATA and/or PTA are congenitally absent or hypoplastic. The PA normally terminates at the level of ankle joint, dividing into an anterior perforating branch, which joins the ATA, and a posterior communicating branch, which joins the PTA. In cases with aplastic or hypoplastic ATA or PTA, the PA will hypertrophy and the respective branch of the PA will supply the distal territory of the ATA or PTA [3,4].

The most common variant of the popliteal artery detected by angiography is a Type I variation, with a frequency between 89% and 96% [1,3,5,7,8,14]. Among these

cases, normal arterial branching classified as Type IA represents the most common. In the studies by Yanik et al. and Calisir et al. examining the variations of the popliteal artery branching using with MD CTA, the authors found the frequency of a Type I pattern as 88.8% and 87%, and a Type IA pattern as 83.6% and 87%, respectively [12,13]. Our results are similar to these data, with the incidence of Type I and Type 1A at 92.7% and 87.5%, respectively. Similar to previous DSA studies and Calisir et al. in an MD CTA study, we observed that the incidence of a type IB branching pattern was higher than the incidence of type IC [1,3,4,13].

The reported frequency for the Type II pattern varies between 1.6% and 7.8% [1,3,4,7,12,13], and this pattern occurred at a relatively lower frequency (2.8%) in our cases. Type IIC, reported in only three cases in the literature, was not present in any of our patients. Also, another pattern classified as Type IID and reported in a single case by Mavili et al., which exhibits a high trifurcation of PA and medial course of ATA proximally and lateral course of ATA distally, has not occurred in any of our cases [7]. A possible advantage of MD CTA in this group may result from its ability to image the popliteus muscle, which affects the subgrouping of Type IIA.

The Type III variation pattern has been reported to occur in the range 1–7.6% [1,3,4,7,12,13], and carries a particular importance, as its assessment presents certain technical challenges in atherosclerotic patients. Gradual decrease in the dimensions of the hypoplastic artery, absence of collateral circulation, a straight course of the distal PRA in PTA and dorsalis pedis artery (DPA) tracings, and its not reducing in size at the level of the division should suggest a variation [1]. Particularly in such cases, MD CTA not only provides luminal information, but also enables evaluation of the vessel wall, potentially facilitating the process. Yanik et al. and Calisir et al. reported the frequency of the Type III pattern to be 3.4% and 3.6%, respectively, whereas Type IIIB was not observed by Yanik et al. and Type IIIC was not observed in either of these studies. In our study, a Type III pattern occurred in 5.5% of our cases (Type IIIA 3.9%, Type IIIB 1%, Type IIIC 0.6%). Distribution of variations in the branching pattern of popliteal artery among various studies are summarized in Table 3.

In patients with a surgery scheduled, it is important to be well informed about the distance between ATA and the joint before surgery. For instance, a shorter distance between ATA and the knee joint has been reported to be associated with an increased risk of vascular injury during arthroscopic surgery [17]. Similarly, a good knowledge on the length of the tibioperoneal trunk may be especially important for surgical procedures to be implemented below the knee [8]. Bardsley et al. reported the range of distance between the tibial plateau and the origin of the ATA as 34–69 mm, that between the tibial plateau and the origin of the PRA as 52–134 mm [9]. They found no correlation between the length of the tibia and the level of branching of the popliteal artery [9]. Sanders et al. determined that the anterior tibial artery arose 6 to 8 cm below the knee joint in 91% of the limbs. The tibioperoneal trunk was 2 to 5 cm in length in 87% of the limbs [10]. Kim et al. determined that the mean distance between the medial tibial plateau and the origin of the ATA was 6 cm. In our study, the mean distance between the medial tibial plateau and the origin of the ATA was 47.6 mm (5.4–74.6 mm), and length of the tibioperoneal trunk was measured to be 29.6 mm (8.2–67.1). These results were similar to previous DSA studies. Cross et al. and Ozgur et al. determined that the length of the tibioperoneal trunk was 1 cm or less in 8% and 5.3% of cadaveric specimens, respectively, whereas we observed this variation in 1.8% of cases [14,23].

In one series, Kil et al., wherein 1242 lower limbs of 626 cases were evaluated with DSA, the incidence of popliteal artery branching variations in one extremity with a normal branching pattern in the contralateral extremity was reported to be 13%, the incidence of variation in the extremity with a contralateral variant anatomy was 28%, and the rate of presence of an identical variant pattern of branching in both extremities was 76% [3]. In the Çalışır et al. study, 742 limbs in 342 patients with 64-MD CTA, the authors observed that 36% of their patients with infrapopliteal artery variation displayed a bilateral variation pattern; among them, 63.6% had identical patterns in both extremities [13]. Those authors concluded that bilateral infrapopliteal imaging could potentially be of great help for achieving a better understanding of variant anatomy [13]. In the present study, the incidences were similar to those reported in previous studies: the incidence of popliteal artery branching variations in one extremity was 9%; the incidence of variation in the extremity with a contralateral variant anatomy was 21%; and the incidence of the same variant branching pattern in both extremities was 71%.

In the present study, we found good inter-observer agreement between the two observers, in line with the similar previous studies done by CTA [24,25,26].

One of the potential limitations of the present study is that our study population consisted of cases with severe atherosclerotic disease, which may cause false interpretation of an occluded or stenotic artery as aplasia or hypoplasia, respectively. However, we believe detailed visualization of the vessel anatomy with anatomical

Table 3: Distribution of variations in the branching pattern of the popliteal artery among various studies

Branching pattern	Dissection	Digital subtraction angiography				Peripheral CT angiography	
	Ozgur et al.	Kim et al.	Day et al.	Kil et al.	Mavili et al.	Yanik et al.	Calisir et al.
Type I Normal branching							
IA (%)	90.0	92.2	90.7	89.2	82.4	83.6	87.0
IB (%)	0.0	2.0	3.2	1.5	5.4	0.8	4.2
IC (%)	2.5	1.2	0.3	0.1	0.4	4.4	1.0
Type II High division of popliteal artery							
IIA(%)	5.0	3.7	4.5	1.2	3.9	5.2	3.6
IIB(%)	2.5	0.8	1.1	0.4	1.5	2.6	1.4
IIC(%)	0.0	0.16	0.2	0.0	0.0	0.0	0.0
Type III Hypoplastic or aplastic branching with altered distal supply							
III A(%)	0.0	3.8	0.8	5.1	3.7	3.4	2.7
III B(%)	0.0	1.6	0.1	1.7	2.2	0.0	0.9
III C(%)	0.0	0.2	0.1	0.8	0.2	0.0	0.0

relations, the vessel wall as well as the lumen, decreases the probability of false interpretation. In addition, the potential hazards of X-ray use prevent investigating vascular anatomy by CTA in otherwise totally healthy young adults. A second limitation is that CTA findings were not compared with DSA, MRA, US or surgical findings. Such a comparison would be useful for further evaluation of the performance of CTA in delineating lower extremity arterial anatomy.

In conclusion, proper characterization of the anatomical properties of the popliteal artery requires an adequate knowledge of its terminal branching variants. In the present study, the incidence of variation in branching pattern of the popliteal artery was observed in 12.5% of cases. This result shows that variations in popliteal terminal branching are not uncommon. The increasing rate of surgical reconstruction and vascular surgical procedures of the lower extremity places more significance on having detailed anatomical information. In this regard, awareness of the terminal branching pattern of popliteal artery before intervention with MD CTA is important, both in the planning of appropriate surgery and to reduce unexpected arterial injury.

Conflict of interest statement: Authors state no conflict of interest.

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