Original Article

Landmark for Percutaneous Transpopliteal Angioplasty on the Lower Extremity

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ABSTRACT

Background: The recognition of the popliteal artery and vein for transpopliteal angioplasty is difficult in some cases. The puncture site can be identified using arterial pulsation, Doppler guidance, fluoroscopy guidance, and anatomical landmarks. In this study, we aimed to evaluate the success rate of obtaining vascular access using an anatomical landmark.

Methods: Totally, 59 participants were included in this study between September 2016 and October 2017. Eighteen cases were scheduled for venous angioplasty, and the rest were scheduled for arterial angioplasty. The procedures were performed with the patients in the prone position. The patients' foot was rotated in the prone position so that the most distance between the external and internal tibial condyles could be found. Then, the popliteal vein was located on its medial side since lateral to this landmark passes the popliteal artery. This seems to be the most suitable approach to finding the best landmark. In these locations, 15 mL of Xylocaine was injected, and the needle was kept in place. For the prevention of septic arthritis, the injection was done 1 inch above the landmarks.

Results: The success rate was excellent, with failure reported in only 2 cases. The failure was attributed to the complete occlusion of the popliteal artery due to extensive atheroma in 1 patient and the total occlusion of the popliteal vein by thrombosis in the other case.

Conclusions: The transpopliteal approach using the anatomical landmarks of external and internal tibial condyles for arterial and venous access is a method with a high success rate for lower limb angioplasty. ***(Iranian Heart Journal 2021; 22(1): 6-9)***

KEYWORDS: Popliteal approach, Angioplasty, Anatomical landmark, Doppler sonography, Lower extremity

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Angiography is the gold-standard method for the diagnosis of the venous and arterial diseases of the lower extremity.[1] The most common approaches for lower extremity angioplasty are ipsilateral antegrade, contralateral

retrograde, and ipsilateral antegrade common femoral artery (CFA) access. In some instances, popliteal artery (PA) access is needed to perform thigh angioplasty.[2] Below the inguinal ligament, the external iliac artery and vein continue as CFA.[3] CFA and the common femoral vein bifurcate into superficial and deep branches.[4] Then, the superficial femoral artery and vein emerge as PA and popliteal vein (PV), respectively. PV is formed at the lower border of the popliteal muscle by the confluence of anterior and posterior tibial and peroneal veins as it passes between the gastrocnemius muscle and lies posterior to the artery. Further proximal, it lies posterolateral to the artery.[5]

The popliteal approach is associated with many difficulties in tracing a road map for the detection of PA and PV across the popliteal fossa. Indeed, PA and PV have major inter and intra- individual variations. Variations in the lower limb venous anatomy have been reported in 1 of 6 patients.[6] The importance of this venous variation is in the diagnosis and treatment of deep venous thrombosis.[7] The probability of anatomical variations in PA and its branches is also high. The implication of knowledge about this variation lies in better evaluations of lower extremity angiography for interventionists and its implication in the success of revascularization.[8] Thus, the aim of this study was to evaluate the efficacy of anatomical landmarks for transpopliteal angioplasty on the lower extremity.

METHODS

Totally, 59 patients were included in this study between September 2016 and October 2017. Eighteen cases were scheduled for venous angioplasty, and the rest were scheduled for arterial angioplasty. All the participants signed informed consent forms. The success rate was defined as the successful achievement of vascular access. All the procedures were performed with the patients in the prone position. The foot was rotated in the prone position so that the most distance between the external and internal tibial condyles could be found. Thereafter, PV was located on its medial side. Lateral to this landmark passes PA. This seems to be the most suitable way to determine the best landmark. In these locations, 15 mL of Xylocaine was injected, and the needle was kept in place. For the prevention of septic arthritis, the injection was done 1 inch above the landmarks. After a pigtail catheter was passed above the stenosis site and a Terumo Guidewire (0.034 inch) was negotiated, the dye was injected. Therefore, angioplasty through the femoral artery and even the external iliac artery could also be performed.

RESULTS

In this study, we evaluated the success rate of obtaining vascular access using anatomical landmarks. The success rate was excellent, with failure reported in only 2 cases. The failure was attributed to the complete occlusion of PA due to extensive atheroma in 1 patient and the total occlusion of PV by thrombosis in the other case.

DISCUSSION

The transpopliteal approach is the procedure of choice for antegrade popliteal angiography and angioplasty on femoral and iliac arteries either for ipsilateral or contralateral sides.[11] For PA puncturing, the achievement of the arterial side is necessary. Routinely, PA puncture is performed through arterial pulsation and Doppler ultrasound or fluoroscopy guidance.[12] The recognition of PV is also accessible through its anatomical location vis-à-vis PA. Obtaining vascular access under the guidance of Doppler ultrasonography is time-consuming and needs high clinical expertise on the part of the radiologist.

Finding appropriate vascular access under fluoroscopic guidance exposes the patient to a high radiation dose. It also requires that the interventionist seek a road map, which is a time-consuming procedure.

Our data demonstrate the applicability of anatomical landmarks in the achievement of popliteal access with a good result and a low failure rate. This could imply the usefulness of these anatomical landmarks for the performance of each kind of revascularization through popliteal access without the need for PA or PV pulsation or ultrasonography. This should be helpful, especially in the case of failed femoral access, for antegrade formal angioplasty as the most commonly used approach for lower extremity revascularization. Landmarks are used as the first option in the presence of anatomical variations in the femoral bifurcation or the severe stenosis of the superficial femoral artery ostium with subsequent difficult wire passage.[9, 10] In these cases, retrograde angioplasty through the popliteal approach based on anatomical landmarks is recommended.[10]

This method is applicable for angioplasty on cases suffering from significant venous stenosis with pressure on the venous system such as May–Thurner syndrome. Anatomical landmarks facilitate the procedure in the case of highly tortoise iliac arteries. The landmark introduced in this study is a new one with a high success rate. Furthermore, it obviates the need for Doppler ultrasound guidance and averts high radiation exposure to find a road map. This will accelerate the process of vascular access achievement.

CONCLUSIONS

The transpopliteal approach via the anatomical landmarks of the external and internal tibial condyles for arterial and venous access in angioplasty on the lower limb is a method with a high success rate.

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