

Retrospective analysis of the clinical outcomes following popliteal artery aneurysm repair.

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Abstract

Introduction

Popliteal artery aneurysms (PAA) have a low incidence (0.1%–2.8%) in the general population. The aim of this study was to assess the outcomes of popliteal aneurysm repair with respect to the type of presentation, size of the aneurysm, mural thrombus, and the number of run-off vessels.

Methodology

This is a retrospective study carried out in the Royal Preston Hospital, United Kingdom from January 2015 to January 2021. All for those patients who were intervened for PAA were included except who were managed conservatively.

Results

A total of 42 patients were treated for PAA during this study period. All the patients were male and the mean age at presentation was 75.2 years (± 9 years).

The mean diameters of symptomatic and asymptomatic patients with PAA were 4.11 cm (± 1.74 cm) and 3.3cm (± 0.79 cm) respectively ($p=0.08$). Considering the presence of a mural thrombus, 44% ($n=7$) of asymptomatic patients presented with a mural thrombus, and in symptomatic patients, 50% had symptoms of acute limb ischemia. Regarding management, all of the asymptomatic patients had undergone bypass surgery. Considering symptomatic patients, the majority (88%) had undergone bypass surgery, and only three patients had undergone endovascular stenting. In the 30-day follow-up, 5% ($n=2$) of the patients had undergone below knee amputation, both of them presented with mural thrombosis and had single run-off vessels

($p=0.03$). Stent occlusion occurred in one case in 30 days.

Conclusion

In our experience, symptomatic clinical presentation and poor run-off vessels were significantly associated with poor outcomes.

Introduction

Popliteal artery aneurysms (PAA) have a low incidence (0.1%–2.8%) in the general population [1]. However, PAA is the most common peripheral aneurysm other than the brain and aortoiliac system and accounts for approximately 70% of all cases (2). This may be due to the similarities seen in the popliteal artery wall with the central elastic artery rather than a muscular artery typical of the periphery [2].

In 50% of the cases, it is bilateral and in 38% of the cases, it can be associated with aorto-iliac aneurysms [3]. The Society of vascular surgery (SVS) recommended that patients diagnosed with PAA should be screened for PAA in the contralateral leg and abdominal aortic aneurysms [1]. It presents mainly in the 6-7 th decades and almost exclusively in men. Only 3-4% of women present with PAA. The most common underlying etiology is atherosclerosis [2].

Often, it can be asymptomatic, but if symptomatic, it represents a high risk of major amputation [4]. Approximately 60% of the patients can be symptomatic at the time of repair [5].

The most common acute symptoms include claudication or rest pain caused by thrombosis or distal embolization of the thrombus, and 25% of patients present with acute limb ischemia, which is associated with high rates (14%) of morbidity and major amputation within 30 days [6]. Alternatively, chronic symptoms can develop in the same manner but in the presence of adequate collateral vessels, uncommonly present with leg pain and swelling due to the compression of adjacent structures such as nerves and veins [7]. Rupture of popliteal artery aneurysm is rare, its presentation was less than 5% [8].

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The size threshold to intervene in the popliteal aneurysm is unclear. The main concern in PAA is thrombosis and embolism. Aneurysm diameter is one of the factors that can predict the onset of complications. Many vascular society guidelines have recommended 2 cm as a threshold to intervene [1]. The presence of symptoms, Mural thrombus, and poor runoff are also other parameters that can predict poor outcomes [7].

The aim of this study was to assess the outcomes of popliteal aneurysm repair with respect to the type of presentation, size of the aneurysm, mural thrombus, and the number of run-off vessels.

Materials and methods

This is a retrospective study carried out in the Royal Preston Hospital, United Kingdom from January 2015 to January 2021. All the patients with popliteal aneurysms who were intervened during this period were included. Data were extracted from the hospital's electronic database. It consists of the patient's demography, comorbidities (diabetes mellitus, hypertension, ischemic heart disease, atrial fibrillation, chronic obstructive pulmonary disease, chronic kidney disease, and cerebrovascular disease), the morphology of the popliteal aneurysm, clinical presentation (asymptomatic, claudication, acute limb ischemia, chronic limb ischemia, compression, mass effect, and rupture), number of runoff vessels, mode of intervention (open aneurysmorrhaphy or endovascular), and outcomes (major amputation and stent occlusion,). All the patients who were intervened for popliteal aneurysm during this period were included, and patients who were managed conservatively were excluded from this study. During this period, 42 patients underwent popliteal aneurysm interventions. Statistical analysis was performed using the SPSS v 21 package.

Results

A total of 42 patients were operated on during the study period, including symptomatic and asymptomatic patients with a PAA diameter of >2 cm, as recommended in the recent SVS guidelines.

All the patients were male and the mean age at presentation was 75.2 years (55-89, SD 9.3).

The proportion who had concomitant aortic artery aneurysm was 50% (AAA); one-third of patients had bilateral PAA, whereas femoral artery aneurysm was associated with 11% of patients. Unilateral PAA (71%, n=15) associated with AAA was more than twice as common in patients with bilateral PAA

(28%, n=6)

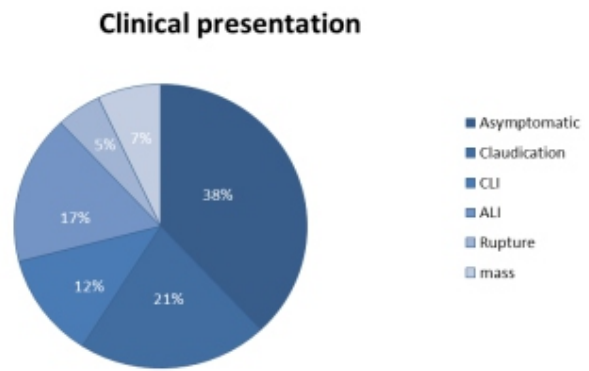


Figure 1: Spectrum of the Clinical presentation of PAA

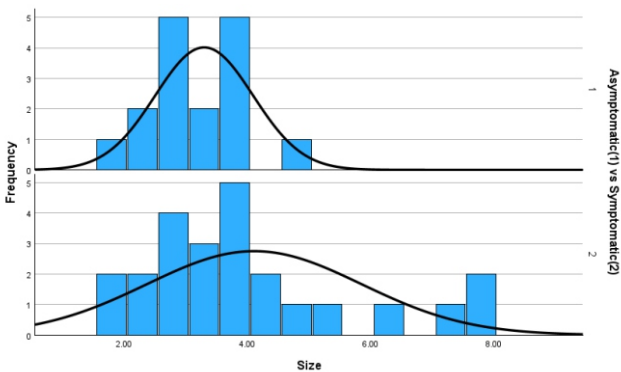


Figure 2: Distribution of PAA diameters among asymptomatic and symptomatic patients

The mean diameters of the symptomatic and asymptomatic patients with PAA were 4.11 cm (S± 1.74 cm) and 3.3cm (± 0.79 cm) respectively (p=0.08).

Co-morbidities	Number of patients (percentage %)
Hypertension	22(52%)
DM	4(10%)
IHD	8(19%)
COPD	5(12%)
AF	3(7 %)
CKD	3(7%)
CVD	3(7%)

Table 1: Pattern of comorbidities among the study population

In the above table 1, describe the patterns of comorbidities among patients.

Considering the presence of a mural thrombus, 44% (n=7) of

asymptomatic patients presented with a mural thrombus. In symptomatic patients, although 38% (n= 10) presented with mural thrombosis, 50% (n=5) had symptoms of ALI. In symptomatic patients, the mean diameter of PAA with the presence of the mural thrombus was smaller than that of the non-thrombotic PAA (3.4 cm vs. 4.5cm). (Figure 3).

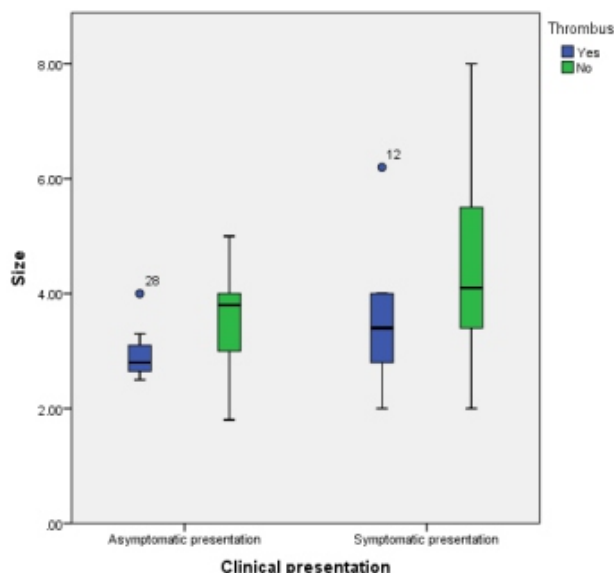


Figure 3: Association of clinical presentation with the size of PAA and presence of mural thrombus

All of the asymptomatic patients (n=16) had undergone bypass surgery. Most of the cases (88%) were approached posteriorly, while 2 patients were approached medially. In 80% of cases, negative vein grafts were used, while only 3 cases used a prosthetic graft.

Considering symptomatic patients (n=26), the majority (88%) had undergone bypass surgery (19 posterior approach, medial approach 4). The vein was used as a conduit in 86% of the cases. Only three patients had undergone endovascular stents due to concerns about their comorbidities and life expectancy. Considering runoff vessels, 19%, 7%, and 71% had single, two, and three vessels runoff vessels respectively.

Regarding 30day follow-up, 5% (n=2) patients had undergone below knee amputation, both of them, presented with mural thrombosis and had single run-off vessels (p=0.03), the remaining limbs were salvaged, including those who presented with ruptured aneurysm (n=38) and stent occlusion occurred in only one case.

Discussion

In our study, we retrospectively analyzed 42 patients with PAA in 5 year period. We aimed to access the clinical outcomes following popliteal artery aneurysm repair.

Though some studies documented the prevalence of PAA is 0.1% to 1% in the general population, as the current study was a hospital-based study we couldn't provide an incidence or prevalence of PAA in the UK [2] [4].

A Systematic Review of 2445 PAA documented concomitant contralateral PAA and AAA were 50% and 30% respectively. But the present study indicated that 50% of patients had concomitant AAA; one-third of patients had bilateral PAA which is comparable to the range (contralateral PAA (16-80%) and AAA (10-80%)) provided by the study was done among data were published regarding PAA for last 25 years. [5][6]

The nationwide study conducted in Sweden and a hospital-based study in Italy documented that bilateral PAAs associated with AAA were twice as common in patients with unilateral PAA but in our study results were vice versa. It may be attributed to the small study population [9][10]. Considering the comorbidities, most (52.38%) of the popliteal aneurysm patients had Hypertension (HT) while only 9.52% of them had Diabetes Mellitus (DM). These results were compared with the retrospective study which was done among 14 countries in the Vascunet collaboration. [11] Even though SVS recommended diameter for intervention in asymptomatic patients is >2cm, in our study, the mean diameter of the asymptomatic patients who underwent intervention is 3.3cm (1.8-5cm). It may be due to associated co-morbidities and clinical presentation [1].

Open and endovascular approaches are available to treat PAAs. Even though the gold standard treatment is open operative management [5], optimal treatment depends on the patient's comorbidities and life expectancy as endovascular popliteal aneurysm repair has an advantage in selected high-risk patients though it hasn't been demonstrated clinical equipoise to standard surgery. In open surgery, most studies have found no overall difference between the medial and posterior approaches, while some cases demonstrated decreased incidence of aneurysm sac expansion and improvement in patency with the posterior approach [7].

Single runoff vessels were significantly associated with poor outcomes than others (p=0.027). Asymptomatic patients had better runoff vessels than symptomatic patients (p=0.03). These results were comparable with the study which was done in Switzerland and Italy [12][13].

In our study, patients who had undergone below knee amputation were 5%, and all of them were with single run-off

vessels. These results were comparable with the previous study which was done in Switzerland [13]. Patients with ruptured PAA had a mean diameter twice larger than the patients with non-ruptured PA diameter. (6.00cm and 3.67cm $p=0.028$), this similar finding documented in the study which was done in Denmark [8].

Limitations of the study

Even though the data were collected retrospectively for the five years, it ended up with only a few numbers of observations (42 patients), as mentioned above popliteal aneurysm has a low incidence.

Though one of the common risk factors for atherosclerosis is smoking [5], we couldn't analyze the variable as some of the details regarding smoking were missing. The study was conducted among the patients in a single center; this may be attributed to selection bias. We couldn't able to compare the open and endovascular interventions as endovascular interventions were performed on a limited number of patients in our study period.

Conclusion

In our experience, symptomatic clinical presentation and poor run-off vessels were significantly associated with poor outcomes.

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