Antegrade Vs cross over femoral artery access in the endovascular treatment of femoropopliteal lesions in patients with critical limb ischemia

Acceso anterógrado Vs cruzado a la arteria femoral en el tratamiento endovascular de lesiones femoropoplíteas en pacientes con isquemia crítica de miembros

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Abstract

Critical limb ischemia (CLI) is considered the "end-stage" of peripheral arterial disease. CLI is classically cured with revascularization due to lack of effective medical treatment for recover of threatened legs. The common femoral artery (CFA) access most commonly used for endovascular treatment of lower limb lesions, and antegrade CFA access used for interventional rather than diagnostic purposes. Security and efficiency of antegrade against cross over femoral entree in the endovascular management of superficial femoral artery and popliteal artery lesions. In this study, a total of (82) patients with critical limb ischemia studied between October 2018 and September 2019 and divided into two groups, Group one (G1) 54 patients underwent endovascular treatment for femoropopliteal lesion through antegrade femoral access, those compared with the group tow (G2) 28 patients where underwent endovascular treatment for femoropopliteal lesion through the cross over femoral access. The comparison includes crossing success, the incidence of complications, fluoroscopy time and contrast volume. In this study, 82 patients (62 male and 20 female) with a mean age (60.9 years), with a high prevalence of peripheral arterial disease risk factors: diabetes, hypertension, obesity and smoking. Antegrade femoral access used in 54 patients, cross over femoral access used in 28 patients. Overall, crossing success rate is higher in the antegrade femoral access than cross over femoral access (70.37% vs. 60.71% respectively). Fluoroscopy time and contrast volume used in the cross over technique was significantly higher compared to the antegrade femoral technique. (6.6% vs. 7.1%) patients suffered from access site hematoma (antegrade vs. cross over respectively). Only one patient suffered from wound infection at the access site in the antegrade group. Ante grade femoral access appears to be safe and can be used effectively for the crossing of the superficial femoral artery and popliteal artery lesions in patients with critical limb ischemia.

Keywords: Antegrade access, cross over access, critical limb ischemia, occlusion, superficial femoral artery, popliteal artery, vascular access.

Resumen

La isquemia crítica de miembros (CLI) se considera la "etapa final" de la enfermedad arterial periférica. La CLI se cura clásicamente con revascularización debido a la falta de un tratamiento médico eficaz para la recuperación de piernas amenazadas. El acceso a la arteria femoral común (AFC) más comúnmente utilizado para el tratamiento endovascular de las lesiones de las extremidades inferiores, y el acceso CFA ante grado que se usa con fines intervencionistas en lugar de diagnósticos. Seguridad y eficiencia del antegrado contra la entrada femoral cruzada en el manejo endovascular de las lesiones de la arteria femoral superficial y de la arteria poplítea. En este estudio, un total de (82) pacientes con isquemia crítica de miembros estudiados entre octubre de 2018 y septiembre de 2019 y divididos en dos grupos, Grupo uno (G1) 54 pacientes fueron sometidos a tratamiento endovascular por lesión femoropoplítea mediante acceso femoral ante grado, los comparados con el remolque grupal (G2) 28 pacientes en los que se realizó tratamiento endovascular por lesión femoropoplítea mediante acceso femoral cruzado. La comparación incluye el éxito del cruce, la incidencia de complicaciones, el tiempo de fluoroscopia y el volumen de contraste. En este estudio, 82 pacientes (62 hombres y 20 mujeres) con edad media (60,9 años), con alta prevalencia de factores de riesgo de enfermedad arterial periférica: diabetes, hipertensión, obesidad y tabaquismo. Acceso femoral anterógrado utilizado en 54 pacientes, acceso femoral cruzado utilizado en 28 pacientes. En general, la tasa de éxito del cruce es mayor en el acceso femoral ante grado que en el acceso femoral cruzado (70,37% frente a 60,71% respectivamente). El tiempo de fluoroscopia y el volumen de contraste utilizados en la técnica cruzada fueron significativamente mayores en comparación con la técnica femoral ante grado. (6,6% frente a 7,1%) los pacientes sufrieron hematoma en el sitio de acceso (ante grado frente a cruce, respectivamente). Solo un paciente sufrió de infección de la herida en el sitio de acceso en el grupo de grado anterior. El acceso femoral ante grado parece ser seguro y se puede utilizar eficazmente para el cruce de lesiones de la arteria femoral superficial y de la arteria poplítea en pacientes con isquemia crítica de la extremidad.

Palabras clave: Acceso ante grado, acceso cruzado, isquemia crítica de miembros, oclusión, arteria femoral superficial, arteria poplítea, acceso vascular.s

Introduction

CLI is considered the "end-stage" of peripheral arterial disease[1]. International consensus on the definition of CLI is the following: any patient with chronic ischemic rest pain, ulcers, or gangrene attributable to objectively proved arterial occlusive disease[2]. Serious limb ischemia normally cured with revascularization to recover limb perfusion distal to the region of arterial stenosis or obstruction. For two current decades, the well-known acceptance of endovascular procedures has led to a high increase in their request to patients with profound limb ischemia. In contrast to operating bypass, endovascular treatment is related to reduced periprocedural morbidity and death[3]. The most common access site is in the common femoral artery, which is an ideal choice for cannulation. Both the antegrade approach from the ipsilateral common femoral artery, and cross over from the contralateral common femoral artery have been described[4]. However, the normal management plan has been to admittance the contralateral common femoral artery (CFA)[5]. In certain circumstances, antegrade CFA access may be preferred, most likely for interventional rather than diagnostic purposes. Ante grade access has the advantage of working in a single plane for distal extremity procedures, and the increased torque and force that can be generated for distal extremity interventional procedures may be well suited for this approach when no other proximal imaging is necessary[4]

Methods

A single centre retrospective comparative study was performed in Baghdad, medical city, Ghazi Al-Hariri Hospital, cardiothoracic and vascular department, 82 patients (62 male 20 female) with critical limb ischemia (CLI) divided into two groups underwent endovascular treatment for PAD between October 2018 and September 2019. Doppler study, Investigations (CBC, Biochemistry, bleeding profile, and ECG) were performed in all patients before the intervention and classified according to clinical presentation with Fontaine classification, also classified with CTA according to TASC II classification. All patients provided their agreement to the processes. All patients with CLI included in the study, patients with atypical symptoms or intermittent claudication excluded from the study. Under aseptic technique, access to the femoral artery done with the patient is in the supine position with arms to the side and administration of local anesthesia at the access site. The femoral artery was accessed by palpation and one of these two techniques was used according to the site of lesion and the need to intervention or imaging proximal to the CFA:

1. G1, 54 patients (Antegrade femoral artery access): If there is no need to intervention or imaging proximal to CFA, the needle was progressive through the subcutaneous tissues caudally at enough angle to cross the CFA overhead the bifurcation.

2. G2, 28 Patients (Crossover femoral artery access): If there is need to intervention or imaging proximal to CFA, involve obtaining access over the femoral head, with the needle pointing cranially. This permits the insertion of guidewires and subsequently catheters through the iliac system up into the aorta and then to the contralateral lower limb arteries.

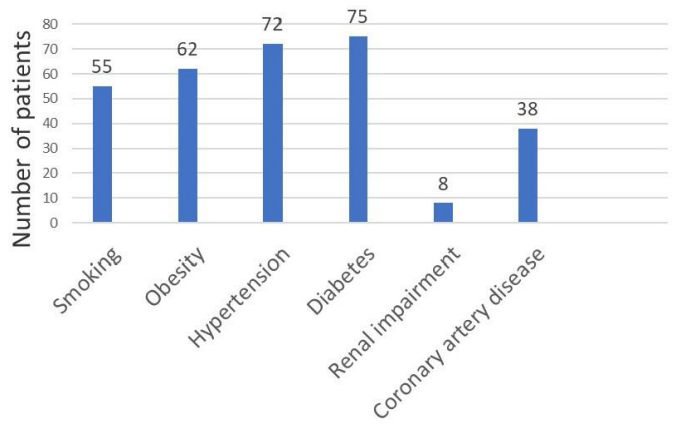
All patients were systemically anticoagulated with unfractionated heparin bolus at a dose of 100 IU/ kg after sheath placement. At the end of the procedure and sheath removed, on the femoral head compression manually of the artery should be sufficient to attain hemostasis. Twenty minutes reduction manually was the procedure usually used at our center. Outcome measures included [Crossing success, access site complications, Fluoroscopy time and contrast]. Statistical analysis was done by SPSS 22, Variations in results between the antegrade and crossover entree groups evaluated by using T-test. A P-value less than 0.05 considered significant.

Results

Of 82 patients with CLI, 62 male 76% and 20 female, 24% were included in this study.

The mean age of study groups was (60.9) range from 42 to 85 years.

Fig. (1): Patients risk factors.

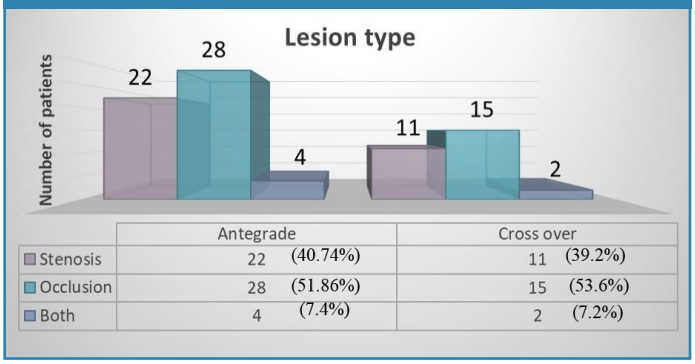


The associated risk factors were nearly similar in both groups with a high prevalence of diabetes, hypertension, smoking and obesity, like the other similar studies[4,5,7].

The most common site of lesion was SFA lesion counting 55patients (67%)of all lesions among patients, which associated with more significant functional impairment, while popliteal artery lesions were seen in 12 patients (15%) and combined lesion seen in 15 patients (18%).

Clinical presentation classified by Fontaine classification. The clinical presentation of the patients was classified according to Fontaine classification (45 patients stage III and 37 patient stage IV). Stage I and II excluded from the study.

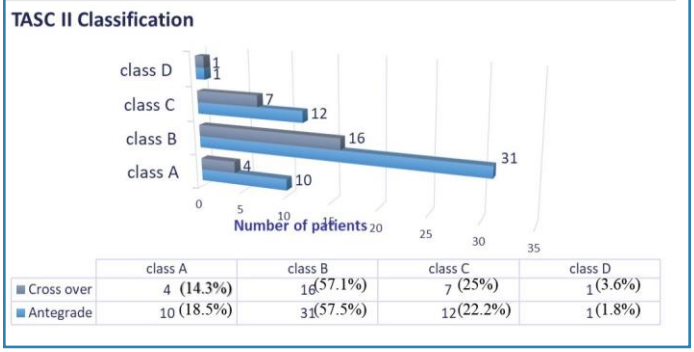
Figure (2): Lesion type



	Antegrade		Cross over	
Stenosis	22	(40.74%)	11	(39.2%)
Occlusion	28	(51.86%)	15	(53.6%)
Both	4	(7.4%)	2	(7.2%)

Diagnostic preoperative assessment revealed 33 patients with stenotic lesion, 43 patients with occlusive lesion and six patients with both stenotic and occlusive lesion.

Figure (3): Higher prevalence of TASC II B lesion in both groups, and there was no significant statistical difference between the two-treatment group.



	class A	class B	class C	class D
Cross over	4 (14.3%)	16 (57.1%)	7 (25%)	1 (3.6%)
Antegrade	10 (18.5%)	31 (57.5%)	12 (22.2%)	1 (1.8%)

The overall crossing success rate is higher in the antegrade femoral access 38 patients (70.37%) than cross over femoral access 17 patients (60.71%).

Table (1): Crossing success Vs. Crossing fail.

	Crossing success		Crossing fail	
	No.	%	No.	%
Ante grade	38	70.37	16	29.63
Cross over	17	60.71	11	39.29

Table 2: Procedural details [Fluoroscopy time, Contrast volume].

	Fluoroscopy time		Contrast volume	
	(Sec.)	mean	(ml)	mean
Ante grade	700-1100	883	60-90	75
Cross over	950-1300	1121	80-110	95
***P* value**		<0.001		<0.001

Fluoroscopy time (mean 1121 sec) in the cross over femoral cross over technique was significantly higher compared to the antegrade femoral technique (mean 883 sec), P < 0.001. The contrast volume (mean 95 ml) used in the cross over femoral cross over technique was significantly higher compared to the antegrade femoral approach (mean 75 mL), P <0.001.

Table 3: Complications

		Ante grade		Cross over	
		No.	%	No.	%
Access site	Hematoma	3	6.6	2	7.1
	Wound infection	1	1.85	0	0
Cath. Or guidewire related	Dissection	5	9.25	3	10.71
	Distal embolization	2	3.7	1	3.57

In G1 there were three patients (6.6%) suffered from access site hematoma, while G2 two patients (7.1%) suffered from access site hematoma, all of them treated conservatively without surgical exploration.

Regarding catheter or guidewire related complication there were five patients (9.25%) in G1 developed dissection of which three were flow-limiting, and a stent was implanted, while in G2 three patients (10.71%) developed dissection, one of them was flow-limiting and stent was implanted.

Two patients (3.7%) from G1 had distal embolization, and one patient (3.57%) from G2 had the same complication treated by embolectomy.

One patient (1.85%) in G1 suffered from wound infection at the access site.

There were no other periprocedural complications like active bleeding, pseudoaneurysm, arteriovenous fistula and arterial perforation in either group.

Discussion

The no. of endovascular techniques for management of peripheral arterial illness remains to increase, as slightly invasive techniques have developed to the initial methodology answer for arterials lesion in lower limbs. While the normal management plan has been to entree the contralateral common femoral artery (CFA), an ipsilateral, antegrade CFA method has definite benefits. The maximum benefits are the reduction in the access-to-lesion region, which in turn recovers the mechanical benefit and receptiveness of the tools used to achieve the interference[5]. Although there is limited literature comparing the antegrade and cross over femoral access in the endovascular treatment of femoropopliteal lesions, in this study we compare between these two techniques by evaluating the [crossing success, incidence of complications, fluoroscopy time and contrast volume] in each group. In this study more than 75% of the patients were male which indicates that PAD is more common in the male gender, which was comparable with the result obtained by Li Y, Esmail A et al. and Ahmed Eid, SigridNikol[6,7], that show PAD more common in male patients. The mean age in this study was 60.9, meaning that PAD more common in old age although our youngest patient was 42 years old, which was comparable with the results of Li Y, Esmail A et al. and Ahmed Eid, SigridNikol[6,7]. Regarding associated risk factors, the most common were diabetes and hypertension, and to less extent smoking and obesity, same

as the result of Li Y, Esmail A et al. and Yonas Akalu, Ambaye Birhan[6,8]. The preoperative diagnostic assessment revealed occlusive lesions were more common among our patients [43 patients with the occlusive lesion, 33 patients with stenotic lesion] which were comparable with Yukun Li et al. [6] where the occlusive lesions also were more common than stenotic lesions. Forty-five patients from 82 patients presented with stage III and 37 patients with stage IV Fontaine classification, patients with stage I and II excluded from the study because most of them asymptomatic or have intermittent claudication. The use of antegrade access was the preferred access in about 66% of patients in the study as the antegrade approach has the advantage of permitting the use of shorter tools and additional support for manipulating catheters and guide wires [9]. The most common site of lesion was SFA, which associated with greater functional impairment, this lesion counting 67% of all lesions among patients included in the study. When the patients angiographically classified according to TASC II classification, more 50% were class B, there was no significant statistical difference between the two treatment groups, which was comparable to. Vossen et al. study who had about 53% TASC II B class[10]. Our result disagrees with Li Y, Esmail et al.[6] were 88% of patients TASC II class D, and Caitlin W. Hicks et al. [11].

Crossing success rate is higher in the antegrade femoral access 38 patients (70.37%) than cross over femoral access 17 patients (60.71%). In 16 patients, where the antegrade access was unsuccessful. In 11 patients, where they cross over access was unsuccessful. The crossing failure can be explained that most of them were TASC II class C and D. The TASC working group advocated endovascular treatment for TASC type A lesions and open surgical treatment for TASC type D lesions. For TASC type B and C lesions, the authors concluded that there was insufficient evidence to recommend one modality over the other2 definitively. At the same time, fluoroscopy time and contrast volume in antegrade femoral technique were significantly lower compared to the cross over femoral cross over technique; this is important regarding the exposure to radiation and in patients with borderline renal function. Regarding access site complications, hematoma in both group (antegrade, cross over) were (6.6% vs 7.1% respectively), all of them treated conservatively without surgical exploration. Numerous current studies have established that hematoma rates with lower access site with 4-F vs 6-F sheath used in patients have PAD with SFA lesions. Bosiers et al stated that 3.3% non-operational access-site hematoma rate[12].

Catheter or guide wire related complication (9.25%) in the antegrade group developed dissection, while in cross over the group (10.71%) developed dissection, flow-limiting dissection treated by stent implantation which was comparable to dissection mentioned by Rianne J. Vossen et al. who had 15% of dissection which also treated by stent implantation [10]. There was no arterial perforation in either group, which was also insignificant 0.4% in Li Y, Esmail et al. [6].

Conclusion

Ante grade femoral access appears to be safe and can be used effectively for the crossing of the superficial femoral artery and popliteal artery lesions in patients with critical limb ischemia.

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