SJ IMPACT FACTOR: 2.912 CRDEEP Journals
Global Journal of Current Research Ragab et. al., Vol. 5 No. 4 ISSN: 2320-2920
Global Journal of Current Research Vol. 5 No. 4. 2017. Pp. 201-205

Full Length Research Paper

Role of Embolectomy in Delayed Presented Acute Lower Limb Ischemia

Al-Metwaly Ragab; Walied Khereba; Khaled M. Attia; Elgareeb O. Alshsfey; Abdelaziz A. Abdelhafez and Sameh E. Elimam
Vascular Surgery Department, Al-Azhar Faculty of Medicine, Egypt.

Article history
Received: 15-12-2017
Revised: 25-12-2017
Accepted: 30-12-2017

Corresponding Author:
Al-MetwallyRagab
Vascular Surgery Department, Al-Azhar Faculty of Medicine, Egypt.

Abstract
Delayed presentation of acute lower limb ischemia represented a challenge for vascular surgeons. Controversy exists about the intervention in such cases. Aim of the work was to evaluate the outcome of delayed arterial embolectomy in patients with diagnosis of late acute lower limb embolic arterial occlusion. 45 patients with diagnosis of delayed presented acute lower limb ischemia were included in the study. Diagnosis was established on the basis of clinical history, physical examination, with hand doppler and duplex ultrasound studies of limb vessels. All underwent embolectomy and outcome was documented. The occlusion level was mainly at the femoral level (64.4%), then popliteal (20.0%), and iliac in 15.6% the operation type was femoral in 66.7%, popliteal in 13.3% and both femoral plus popliteal in 20.0%. Fasciotomy was done for 21 patients (46.7%) and amputation was reported in 5 subjects (11.1%). Mortality was reported for 3 subjects (6.7%), 2 patients due to myocardial infarction and one patient due to multiple organ failure. Mortality was associated with older age, motor deficit, cyanosis, delay more than 7 days, ischemic heart disease and cerebrovascular disease. Embolectomy in patients with delayed presentation of acute lower limb ischemia carries tolerable morbidity and mortality, and referral system of such patients should be established and embolectomy should be considered regardless the time of presentation.

Keywords: *ischemia; embolectomy; revascularization; lower limb; amputation.*

Cite this article as: Ragab et. al (2017). Role of Embolectomy in Delayed Presented Acute Lower Limb Ischemia. *Global Journal of Current Research, 5*(4), 201-205. Retrieved from www.crdeepjournal.org/gjcr

Introduction

Acute limb ischemia (ALI) was defined as a sudden onset of decreased arterial blood flow to an extremity that occurred during the previous 14 days. The usual cause is thromboembolic pathology (Morrison, 2006). ALI is a highly morbid disorder with one-year mortality rate between 16-42% and amputation rates ranging between 11-37% (Tsang et al., 2011; Baril et al., 2013). Revascularization decisions for ALI comprise open revascularization (OR) and endovascular revascularization (ER) (Baril et al., 2014). The tolerance of tissue for anoxia varies with the tissue type and/or the condition of collateral circulation. ALI has been shown to be irreversible after 4 hours of ischemia in muscle, 8hours in nervous tissue, 13 hours in fat, 24 hours in skin and up to 4 days in bone (Ouriel et al., 2005) .Skeletal muscles are recognized to be most susceptible to ischemic injury. Thus, muscle injury is the critical aspect in lower limb ischemic and reperfusion injury Khan and Nadeem (2016). It is well-known that a delay of more than 8 hours increases complications of ischemia in patients with arterial emboli in lower limb. However, previous studies revealed a reduction in complications when the period of ischemic injury exceeds 7 days. Thus, it can be said that delayed surgical intervention after the patient has with stand the first week injury of ischemia with little extremity or tissue damage could be more beneficial (Iyem and Eren, 2009). In the light of this, the present study was designed to evaluate the outcome of delayed arterial embolectomy in patients with diagnosis of late acute lower limb embolic arterial occlusion.

Patient and method

A total of 45 patients who were admitted to Al-Azhar university hospitals with diagnosis of delayed presented acute lower limb ischemia (presentation of patients occurred after 72 hours after initial patient complaint) were included in the study. They were recruited during the period between January 2015 and August 2017were included in the study.An informed consent was obtained from each patient for inclusion in the present study after full explanation about the study and its scope. In addition, the study protocol was approved by the local research and ethics committees of Al-Azhar University hospital. All patients were diagnosed on the basis of clinical history, physical examination, with hand Doppler limb vessels and duplex ultrasound studies of arterial system. During the examination, the viability of the limb presence or absence of irreversible changes in the limb fig. (1) and source of thromboembolism were documented.

Fig. (1): Preoperative foot with patches of skin change due to ischemia

Limb viability was assessed on Rutherford et al. (1997). It included 3 stages: stage I (viable), where there was no urgent threat, no sensory loss or functional failure in muscles, and both arterial and venous Doppler signals were present; Stage 2a (marginal threat): in which the limb can be saved, sensory loss for minimal toes, no functional failure in muscles, and both arterial and venous Doppler signals were preserved; Stage 2b (serious threat), where the limb can be save urgently, with extensive sensory loss, mild-moderate functional failure in muscles, lost arterial Doppler signal and preserved venous Doppler signal; and Stage 3 (irreversible), where tissue loss is inevitable, complete sensory loss, paralysis of muscles and absent arterial & venous Doppler signals.

Surgical technique

Embolectomy for lower extremities were performed under Spinal (44 patients), or local anesthesia (6 patients) by a transverse incision in the femoral region fig. (2) or infra genicular longitudinal incision for popliteal and distal embolectomy. After exposure of the artery (femoral or popliteal) with proximal and distal control an oblique longitudinal arteriotomy was done. Standard 3 F, 4 F and 5 F Fogarty embolectomy catheters were used, a 3 F and 4 F Fogarty catheters were used for distal embolectomy while 5 F Fogarty catheters were used for proximal embolectomy.

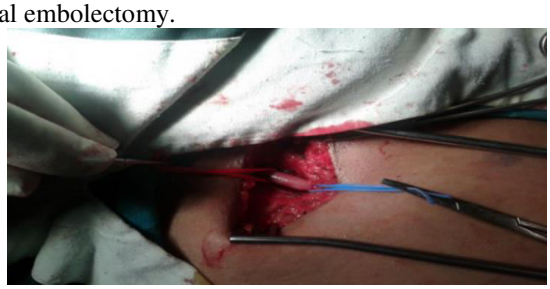

Fig. (2): Intraoperative transvers groin incision for exposure of femoral artery

The embolectomy was stopped when the thrombus fig. (3) was completely removed from proximal and distal approaches (confirmed by proximal flow and distal backflow was believed adequate).The embolectomy is followed by washing the distal and proximal bed with 5000 U of heparin diluted in 200 mL of 0.9% physiological saline solution. In all cases, arteriotomy was closed by interrupted mono filament (polypropylene) 5/0 or 6/0.

Fig. (3): Thrombus removed by fogarty cath.

For patients with ongoing ischemia despite embolectomy, confirmed with duplex U/S and or conventional angiography additional surgery was performed. Medical treatment: For all patients diagnosed with arterial occlusion, heparin-pentoxyphillin infusion was administered and continued for 3 days postoperatively. Conventional heparin was started as a bolus of 80 U/kg in patients planned for local approach. Then, heparin is continued in a dose of 18 U/kg. Heparin was assessed with aPTT (activated partial

thromboplastintime). Postoperative examination to study improvement in color changes fig. (4) were done. Duplex examination of the affected limbs was conducted post operatively as well.

Fig.(4): Post-operative after embolectomy

Statistical analysis of data: statistical package for social science (SPSS) for Windows 22.0 statistical software package (IBM® SPSS® Inc., USA, Chicago, Illinois), was used for statistical analysis of data. Numerical variables are presented as means ± standard deviation (SD), while qualitative data were presented as frequency and percent. For comparison between groups, student (t) test and fisher exact test were used for quantitative and qualitative data respectively. A p-value <0.05 wasconsidered as statistically significant.

Results

The present work included 45 patients who were presented by delayed lower limb ischemia. Their age ranged from 45 to 70 years; the mean age was 56.80±5.85 years. Out of them 27 patients (60.0%) were males and 18 (40.0%) were females (Table 1). The most common presenting symptom was severe pain (93.3%), followed by paleness (77.8%), coldness (73.3%), sensory deficit in 20.0%, and motor deficit in 13.3% and cyanosis in 13.3% of patients. The presentation was within 3-7 days after the initial symptom in the majority of studied patients (75.6%). However, 24.4% presented in more than 7 days after initial symptoms (Table 2). In studied subjects, all patients had one more other associated medical condition. The most common was atrial fibrillation (46.7%), followed by hypertension (31.1%), diabetes mellitus (22.2%), rheumatic heart disease (13.3%), ischemic heart disease (11.1%), congestive heart failure (6.7%) and cerebrovascular disease (2.2%) (Table 3). The operative and outcome data were presented in table (4). The occlusion level was mainly at the femoral level (64.4%), then popliteal (20.0%), and iliac in 15.6% The operation type was femoral in 66.7%, popliteal in 13.3% and both femoral plus popliteal in 20.0%. Fasciotomy was done for 21 patients (46.7%) and amputation was reported in 5 subjects (11.1%). Mortality was reported for 3 subjects (6.7%), 2 patients due to myocardial infarction and one patient due to multiple organ failure. In the present work, mortality was associated with older age, motor deficit, cyanosis delay more than 7 days, ischemic heart disease and cerebrovascular disease (Table 5)

Table (1): Patient demographic of studied populations

		Statistics
Age (year)		56.80±5.85; 45-70
Sex	Male	27(60.0%)
	Female	18(40.0%)

Table (2): Presenting complaints of studied populations

		n.	%
Severe pain		42	93.3
Pallor		35	77.8
Coldness		33	73.3
Sensory deficit		9	20.0
Motor deficit		6	13.3
Cyanosis		6	13.3
Delay	3-7 days	34	75.6
Duration	> 7 days	11	24.4

Table (3): Associated medical disease in studied populations

	n.	%
Atrial fibrillation	21	46.7
Hypertension	14	31.1
Diabetes	10	22.2
Rheumatic heart disease	6	13.3
Ischemic heart disease	5	11.1
Congestive heart failure	3	6.7
Cerebrovascular disease	1	2.2

Table (4): Operative details and mortality in studied populations

		n.	%
Occlusion level	Femoral	29	64.4
	Popliteal	9	20.0
	Iliac	7	15.6
Type of operation	Femoral	30	66.7
	Popliteal	6	13.3
	Femoral + popliteal	9	20.0
Fasciotomy		21	46.7
Amputation		5	11.1
Mortality		3	6.7
Cause of mortality	Myocardial infarction	2	66.7
	Multiple organ failure	1	33.3

Table (5): Associated factors with mortality in studied populations

		Dead (n=3)	Live (n=42)	test	P
Age		***66.33±3.21***	***56.11±5.40***	***3.21***	***0.002****
Sex: male / female		3/0	24/18	2.09	0.26(ns)
Presentation	Pain	2(66.7%)	40(95.2%)	2.14	0.19(ns)
	Coldness	3(100.0%)	30(71.4%)	1.14	0.55(ns)
	Paleness	2(66.7%)	33(78.6%)	0.22	0.53(ns)
	Sensory deficit	1(33.3%)	8(19.0%)	0.34	0.49(ns)
	Motor deficit	***3(100.0%)***	***3(7.1%)***	***20.42***	***0.001****
	Cyanosis	***2(66.7%)***	***4(9.5%)***	***7.73***	***0.043****
	Delay >7days	***3(100.0%)***	***8(19.0%)***	***9.71***	***0.012****
Associated disease	Diabetes	2(66.7%)	8(19.0%)	3.59	0.12(ns)
	Hypertension	2(66.7%)	12(28.6%)	1.85	0.22(ns)
	Atrial fibrillation	1(33.3%)	20(47.6%)	0.22	0.55(ns)
	Congestive heart failure	1(33.3%)	2(4.8%)	3.59	0.19(ns)
	Rheumatic heart disease	0(0.0%)	6(14.3%)	0.48	0.64(ns)
	Ischemic heart disease	***2(66.7%)***	***3(7.1%)***	***9.82***	***0.029****
	Cerebrovascular disease	***1(33.3%)***	***0(0.0%)***	***5.77***	***0.016****

Discussion

Previous studies have established a relationship between the delay in intervention and outcome of patients presenting with acute limb arterial occlusion (Blecha, 2013). When patients present late after the onsetof an ischemic episode and the decision to intervention is not conclusive, clinical judgment based on experience and established guidelines with rapid imaging analysis is crucial for successful management (Ouriel and Veith, 1998). However, whether to attempt revascularization of an acutely ischemic limb when presented late remains controversial (Khan and Nadeem, 2016). When critical ischemia of the limb occurs, several clinical measures may be employed tosave the useful limb and prevent further morbidity. Anattempt at revascularization is currently considered clinically acceptable if (1) there is relatively little damage to the arterial intima; (2) thrombi not adhering to the intima are present with no secondary thrombus on the intima visible; (3) patent distal arterial tree has been documented, despite embolization; and (4) anticoagulation has been initiated prior to surgery (Iyem and Eren, 2009).When these conditions are maintained, adequate circulation can be achieved in the extremities of patients with the use of delayed embolectomy. However, mortality and morbidity risk persist even when the factors underlying acute ischemia are removed and perfusion to the limb is attained. Moreover, even when extremity reperfusion has been completely restored by removal of the underlying cause of acute ischemia, a pathogenic cascade may result in loss of the extremity, acute kidney and respiratory failure, or functional deterioration in tissues such as heart, intestine, brain, or spleen (Blecha, 2013).

In the present study, the mortality rate was 6.7% and amputation rate was 11.1%; and mortality was linked to older age, motor deficit, cyanosis delay more than 7 days, ischemic heart disease and cerebrovascular disease. These results are comparable to those reported by Khan and Nadeem (2016) who reported that, only 5.82% died in their study, most presenting with synchronous disease. In addition, Aune et al. (1998) reported that both serious cardiac disease and reperfusion damage increase mortality in cases of embolism. Furthermore, Iyem and Eren (2009) reported that, 11 patients died (9.01%) in their study, mostly older (average age, 64.3 ± 5.26 years) patients, mostly with cardiac problems. In addition, we think that postoperative heparin for at least 3 days is the reason for the lower morbidity and mortality rates observed in our study cohort

Reviewing literature, it was found that, the amputation rate following operations under taken during the first 12 hours is reported in the range of 2.1%to 5.9%; but the rate increases to 39.2% after 12 hours (Abir et al., 2004). Mortality rates have reported as 12.5% within 12 hours and 37.7% thereafter (Taviloglu et al., 1995). Hight et al. (1976) analyzed 11 different series between 1950s and 1970s and determined an amputation rate of 4% to 48% and a mortality rate of 14% to 50%.In a study by Yangni et al.

(2006) that included 24 patients, the amputation rate was reported as 29.2% and the mortality rate as 29.2%. In another study, the amputation rate of arterial embolectomy beyond 24 hours was reported to be 11.4% (Karapolat et al., 2006).

Both mortality and amputation rates in the present work, although lies within the reported values in literature, they appear lower when considering the delay time. This can be attributed to the shorter duration of the study with shorted duration of follow up when compared to studies reported higher rates. To explain morbidity irrespective of revascularization of ischemic limb, it was reported that, when the limb is re-vascularized after a prolonged ischemic insult, free oxygen radicals generated by the ischemic tissue interact with vascular endothelium and neutrophils, causing a rapid increase in lipid peroxidation leading to several local and systemic events. Cellular edema and myoglobulin release associated with free oxygen radical release may cause systemic damage such as acute renal failure, pulmonary edema and adult respiratory distress syndrome (ARDS) damage to liver and other organs (Yangni et al., 2006). It has been established that prolonged free oxygen radical release and its pathologic sequelae represents a major cause of mortality and morbidity associated with late presenting acute limb ischemia. Moreover, persistent systemic and local damage may occur if the compartmental pressure in the leg remains high following revascularization (Morris-Stiff et al., 2009). In summary, results of the present study revealed that, embolectomy of delayed acute ischemic limb shouldbe done even in patients who presentedafter one week following onset. Delayed embolectomy in such patients carries tolerable morbidity and mortality . Rapid referral system of such patients should be established and revascularization (embolectomy) should be considered regardless the time of presentation. It can markedly enhance blood flow to the limb and decrease the number of amputations.

References

Abir F, Barkhordorian B, Sumpio BE. Non-cardiac vascular complications of coronary bypass procedures: A review. Int J Angiol. 2004; 13:1–6.
Annue S, Trippestad A. Operative mortality and Long-term survival of patients operated on for acute lower limb ischemia. Eur J Endovasc Surg. 1998; 15:143–146.
Baril DT, Ghosh K, Rosen AB. Trends in the incidence, treatment, and outcomes of acute lower extremity ischemia in the United States Medicare population. Journal of vascular surgery. Sep; 2014 60(3):669–677. e662.
Baril DT, Patel VI, Judelson DR, et al. Outcomes of lower extremity bypass performed for acute limb ischemia. Journal of vascular surgery. Oct; 2013 58(4):949–956.
Blecha MJ. Critical Limb Ischemia. SurgClin North Am 2013; 93(4):789–812.
Hight DW, Tilney NL, Couch NP: Changing clinical trends with arterial emboli. Surgery. 1976; 79:172–176.
Iyem H, Eren MN. Should embolectomy be performed in late acute lower extremity arterial occlusions? Vascular Health and Risk Management 2009:5 621–626
Karapolat S, Dag O, Abanoz M, Aslan M. Arterial embolectomy: a retrospective evaluation of 730 cases over 20 years. Surg Today. 2006; 36:416–419.
Khan MI, Nadeem IA. Revascularization of Late-Presenting Acute Limb Ischaemia And Limb Salvage. J Ayub Med Coll Abbottabad2016 Apr-Jun;28(2):262-266.
Morrison HL. Catheter-directed thrombolysis for acute limb ischemia. Semin Intervent Radiol2006; 23:258–69.
Morris-Stiff G, D'Souza J, Raman S, Paulvannan S, Lewis MH. Update experience of surgery for acute limb ischemia in a district general hospital - are we getting any better? Ann R Coll Surg Engl 2009;91(8):637–40.
Ouriel K, Veith FJ. Acute lower limb ischemia: determinants of outcome. Surgery 1998;124(2):336–41.
Ouriel K. Acute limb ischemia. In: Rutherfort RB, editor. Vascular surgery. 6th ed. Philadelphia: Elsevier; 2005; 959–86.
Taviloglu K, Günay K, Asaoglu O, Güloglu R, Kurtoglu M. Is primary amputation required in peripheral arterial occlusion cases that are admitted to the clinic with 12-hour delay? Turkish J Vasc Surg. 1995; 4:91–96.
Tsang JS, Naughton PA, O'Donnell J, et al. Acute limb ischemia in cancer patients: should we surgically intervene? Annals of vascular surgery. Oct; 2011 25(7):954–960.
Yangni AH, Adoubi A, Adoh M, Yapobi Y, Coulibaly AO. Acute non traumatic limb ischemia. West Afr J Med. 2006; 25:101–104.