

THE OUTCOME OF ACUTE THROMBOEMBOLIC ARTERIAL OCCLUSION

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Abstract

The objective of this study was to evaluate the outcome of acute thromboembolic arterial occlusion of extremities regarding time, type of presentation and the management plane with subsequent complications after surgery.

A retrospective study done on 260 patients were admitted to Al-Sader teaching hospital with signs and symptoms of acute thromboembolic arterial occlusion from January 2005 to January 2012. Patient's age ranged from 20-85 years, 73% of them are above 50 years, males constitute (56%) and females (44%) of the patients. The onset of symptoms was sudden in 70% and gradual in (30%), only 78 patients had history of claudication. The upper limb involved in (26%) and lower limb (74%). Heart was the source of emboli in 70% while peripheral arterial atherosclerosis in 30%. One hundred eighty two patients presented with sudden onset occlusion, patients with clear source of embolism and those with no history of claudication were treated with embolectomy while patients with more gradual onset over 24 hours were treated with heparin and the limb status assessed regularly.

Of the patients, 46.7% were operated upon within 6 hours of the onset of symptoms, 28.6% were operated on later than 24 hours of onset of symptoms, and overall limb salvage was 83%. Amputations were necessary in 27 patients. Complications occurred in 50 patients. Twenty five patients had wound complications, most frequently wound infection. Hospital mortality was 8.2%. Over half of the total numbers of deaths were resulted from myocardial infarction (50%). Seventy eight patients with acute on chronic ischemia were treated conservatively with heparin, 60.3% responded to heparin therapy and showed a good result, 35.9% had amputation & 3.8% died during the course of treatment.

In conclusion, the time of presentation is important factor in determining the outcome after surgery regarding limb survival, functional state and even mortality. Late embolectomies, although associated with increased morbidity and mortality can be done as an effective method for saving the limbs providing that the limb is still viable. Patients with acute arterial thrombosis with a viable limb can be treated with anticoagulation alone and the surgical procedure can be deferred.

Introduction

Occlusion of the arterial circulation was first reported by Harvey in 1628. Labey had been credited with the first successful surgical removal of an arterial embolus in 1911. Heparin discovered in 1916 and made clinically available in 1936 when used by Best, provided surgeons with a mean of preventing thrombosis during the repair and

manipulation of blood vessels. The introduction of the balloon catheter technique in 1963 dramatically simplified the technical aspects of surgical therapy for acute arterial occlusion¹.

The heart is the most common source of distal emboli which account for more than 90%. Atrial fibrillation is the most common underlying pathology.

Atheroembolization is a condition in which microscopic cholesterol-laden debris travels from proximal arteries until it reaches the most distal arterial segments, typically in the skin of the lower extremities and in the end-organs usually present with focal toe ischemia the so called blue-toe syndrome². Native artery thrombosis is usually the end stage of a long-standing disease process of atheromatous plaque formation at specific sites in the arterial tree². Emboli usually lodge at the bifurcations of arteries and the leg being affected six times more often than the arm³. About 10% to 15% of large cardiogenic emboli lodge at the aortic bifurcation. Another 15% embolized to the iliac bifurcation. The femoral bifurcation, constituting more than 40% of cases. Smaller emboli lodge at the distal popliteal artery at the level of the tibio-peroneal arterial trunk in 10% to 15% of cases. The upper extremities are affected in about 10% of cases, in which the embolus most typically settled in the brachial artery⁴. The symptoms and signs of acute ischemia are often summarized as the "five Ps": pain, pallor, pulselessness, paresthesia, and paralysis. Besides examination being helpful for establishing diagnosis, careful evaluation of the "five Ps" is useful for assessing the severity of ischemia^{5,6}.

Acute arterial occlusion requires rapid and precise diagnosis in order to provide the appropriate treatment without delay. The diagnosis of acute arterial occlusion can be made from history and physical findings⁶. Arteriography remains the gold standard for diagnosis of acute limb ischemia and may even be a primary tool in its management, but should be reserved for patients with viable limbs who can tolerate the additional delay before revascularization.

In this study we evaluate the outcome of acute thromboembolic arterial occlusion of extremities regarding time, type of presentation and the management plane

with subsequent complications after surgery.

Patients & Methods

A retrospective study was carried out from Jan.2005 to Jan.2012, at AL-Sader Teaching Hospital in Basra. Two hundred sixty patients were admitted with signs and symptoms of acute arterial occlusion. Peripheral arterial occlusions of the thromboembolic variety were only studied and all other patients with other primary and secondary causes of acute arterial occlusion were excluded from the study. The patient's data were collected from the hospital records including emergency department case sheets, reception notes, operative notes and post-operative daily follow up notes. Arteriography and Doppler examination were not part of the immediate evaluations of the patient at time of presentation due to lack of such facility in our hospital at the time of study. There were 146 males (56%) and 114 females (44%), the age range of the patients is from 20 to 85 years and the majority (73%) were over 50 years. Table I shows the demographic features of the patients.

The patients who presented with a sudden onset of symptoms with no history of claudication who had a clear source of embolization were treated with an emergency embolectomy, and those patients with more gradual onset of symptoms, or presented after 24 hours, and those with history of claudication especially when the cause of embolization was uncertain, were managed them with anticoagulant (heparin) injection alone without emergency surgical intervention. If the ischemic limb did not improved or worsen, the appropriate surgical revascularization was undertaken, Systemic intravenous heparin was routinely administered for 5-7days post operatively in a dose of 5000 units 6 hourly intravenously, then switched to Warfarin tablet when limbs viability whether surgically or conservatively were ensured.

Table I: The demographic data and clinical features of 260 patients

	Features	Number	Percent	Total
Gender	Male	146	56%	
	Female	114	44%	
Age (years)	20-30	12	4.6%	
	31-40	18	7%	
	41-50	40	15.4%	
	51-60	100	38.5%	
	61-70	75	28.8%	
	above 71	15	5.7%	
Onset of symptoms	Sudden	182	70%	
	Gradual	78	30%	
	Clinical presentation			
	Pain	260	100%	
	cold extremities	260	100%	
	absent peripheral pulse	260	100%	
	color change	229	88%	
	Paresthesia	187	72%	
	Paralysis	104	40%	
	previous claudication	78	30%	
	Location of occlusion			
	upper limb	68	26%	
	lower limb	192	74%	
	Sources of embolism			182- 70%
	Cardiac	153	84%	
	atrial fibrillation	90	59%	
	myocardial infarction	20	13%	
	rheumatic heart disease	30	19.6%	
	Cardiomyopathy	8	5.2%	
	Arterioarterial embolism	5	3.2%	
	atherosclerotic vascular disease superadded by local thrombosis	29	16%	78-30%

Results

Out of the 260 patients who were diagnosed as acute thromboembolic occlusion of the peripheral arteries, 182

patients showed clinical features of embolization, required urgent surgical intervention. The operative procedures are shown in table (II).

Table II: Surgical procedures done in 182 patients

Procedure	No. of patients	Percentage
embolectomy	160	88%
embolectomy and fasciotomy	10	5.5%
embolectomy with reconstruction	12	6.5%
venous patch angioplasty	3	
endarterectomy	9	
Total	182	100%

Eighty five patients (46.7%) were operated on within 6hours of the onset of symptoms; only 5 patients of them required a subsequent amputation. Fifty two patients (28.6%) were operated on

later than 24 hours of onset of symptoms, 13 patients showed established gangrene that ended with amputation, over all limb salvage was 83%, Table (III).

Table III: Time interval to surgery vs. limb salvage in 182patients

Time interval (Hours)	Patients		Limb salvage		Amputation		Mortality (operative)	
	No.	%	No.	%	No.	%	No.	%
< 6	85	46.7	80	94	5	6	0	0
6-24	45	24.7	35	77.8	9	20	1	2.2
> 24	52	28.6	36	69.2	13	25	3	5.8
Total	182	100	151	83	27	14.8	4	2.2

Furthermore, 138 patients (75.8%), had functioning extremity at the time of discharge or on follow-up in outpatient or private clinic visits, although their distal

pulses were palpable in only 96patients post-operatively. Table IV shows the result of embolectomy and status of the limbs.

Table IV: Outcome after embolectomy

Limb status	Patients	percentage
viable, functioning, with +ve distal pulses	96	52.7%
viable, functioning, with - ve distal pulses	42	23.1%
viable, poorly functioning & absent distal pulses	13	7.2%
failure of embolectomy (attempted amputation)	27	21.9%
above knee	16	59.2%
below knee	7	26%
Forearm	4	14.8%
intraoperative death	4	2.2%
Total	182	100%

Postoperative complications occurred in 50 patients (27.5%), that shown in table (V). The hospital mortality was 5.7% (15patients, 4of them happened during surgery), and half of them were resulted from myocardial infarction.

Seventy eight patients with acute ischemia of the upper and lower extremities were treated conservatively, which were dealt with as an acute on chronic occlusions depending on history and clinical examination, so treated basically with intravenous administration of heparin, 67 patients with lower limb

and 11 patients have upper limb ischemia. The majority of those patients were presented 24hours after the onset of symptoms, 47 patients responded to heparin therapy and showed a good result permitting properly planed revascularization (if necessary) which done in 9 patients (bypass graft using saphenous vein) with good result, only one of those patients died due to myocardial infarction. In three patients we stopped heparin therapy because of severe upper GIT bleeding after 2 days of treatment and their limbs condition

deteriorated more that mandate above response to anticoagulant therapy and knee amputation, 28 patients showed no amputation was their outcome, Table (VI).

Table V: Post-operative morbidity

Post-operative complications	patients	percentage
wound complications	25	50%
-infection	15	
-bleeding	7	
-dehiscence	3	
re-exploration	13	26%
leg oedema	5	10%
renal impairment	5	10%
foot drop	2	4%
Total	50	100%

Table VI: Outcome of the patients treated with heparin therapy

Limb affected	No.	Time of onset			Results					
					Recovery		Amputation		Death	
		<6hrs	6-24	>24hrs	No.	percent	No.	percent	No.	Percent
Lower	67	12	20	35	38	56.7%	26	38.8%	3	4.5%
upper	11	2	4	5	9	81.8%	2	2.5%	-	-
total	78	14	24	40	47	60.3%	28	35.9%	3	3.8%

The overall limb salvage was 76.2% (198patients), amputation done in 55 patients (21.1%), and the operative mortality was 2.7%.

Discussion

Acute arterial occlusion resulting in limb ischemia may be caused by a diverse array of conditions, but most often is the result of an arterial embolism or secondary thrombosis of previously diseased vessel⁷. In this retrospective study on 260 patients with acute arterial occlusion, males are affected more than females with male: female ratio of 1:0.78 and this goes with other similar studies^{7,8}. The majority of patients (73%) were above 50 years of age, this may be attributed to that atherosclerotic plaque may leads to an in situ thrombosis and also assists in lodgment of an embolus by reducing luminal diameter⁹. The diagnoses in almost all patients were made depending

basically on history and physical examination⁹⁻¹².

Most of the thromboembolization affecting the lower extremities more than the upper one and that is due to the mode of the direction of blood flow and the bigger size of descending thoracic aorta¹³. The overall limb salvage after embolectomies in different time interval from the onset of ischemia was 83%. It is obvious that the earlier the presentation the better chance of limb survival. Bhagwan et al (1978)¹⁴, treated 122patients with arterial embolectomy, limb salvage was 90%for those patients operated on within 12hours of onset of symptoms. In another studies^{10,15,16}, the limb salvage rates were comparable to our study.

Embolectomies were performed in all limbs regardless the time of presentation if the limb still viable. Balsa et al (1985)¹⁷, consider that the only critical criterion for

operability must be the viability of the ischemic limb. Scott et al (1989)¹⁸, recommended that femoral embolectomy should be performed in those patients with a short history of ischemia (less than 72 hours) with a risk factor suggesting an embolic source and no history of claudication. Another study recommended that late embolectomies of acute leg ischemia increase blood flow in the extremity and reduce the number of amputations required and it is advantageous to give the patient a chance by performing embolectomy, even as late as a week after diagnosis of ischemia an embolic source and no history of claudication.

Dale et al (1985)²⁰, treated 13 patients with a diagnosis of acute arterial thrombosis with intravenous heparin. All their extremities remained viable and there was no loss of limb or life due to anticoagulant therapy, in our study 78 patients were diagnosed as acute arterial thrombosis treated by heparin, 47 patients (60.3%) had good results which was the same in other studies^{12,20}, 28 patients did not respond to heparin therapy and were poor candidate for revascularization and hence ended with amputation.

Conclusion

1. The time interval of presentation is important factor in determining the outcome after surgery regarding limb survival, functional state and even mortality.
2. Late embolectomies, although associated with increased morbidity and mortality can be done as an effective method for saving the limbs providing that the limb is still viable.
3. Patients with acute arterial occlusion with a viable limb can be treated with

anticoagulation alone and the surgical procedure can be deferred, but emergency surgical intervention will be necessary if the condition of the limb deteriorated despite heparin therapy providing that the patient is a good candidate for the proposed surgical procedure.

4. Acute thromboembolic occlusion of peripheral arteries is a medical and surgical emergency since the patients usually have co-morbidities making the surgical intervention challenging.

Recommendations

1. Modalities for diagnosis of the cause of acute limb ischemia as duplex sonography and angiography should be available in the acute setting to accurately directing the subsequent management of this challenging condition.
2. Thrombolytic therapy and mechanical suction devices are another valuable method in treating limb ischemia in properly selected patients and to some extent can decrease the surgical morbidity and mortality if they were available.
3. The basic management of vascular emergencies including acute limb ischemia, and the presence of vascular surgeons dealing with such problems should be available in places far away from known tertiary vascular centers to limit the time that those patients need to save their limbs and life.
4. Completion angiography at the end of embolectomy procedure is very important method to decrease the chance of re-exploration due to incomplete thrombus removal.
5. A much attention should be paid toward the prevention of recurrent embolization by controlling the underlying medical cause parallel with considering long term anticoagulation.

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