

LATE EMBOLECTOMY FOR LIMB OR KNEE SALVAGE IN ACUTE LOWER LIMB ISCHEMIA: A NEW PROTOCOL

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ABSTRACT

Embolectomy has long been the gold standard for treating limbs acutely threatened by arterial occlusion. Delayed embolectomy has not been investigated adequately due to the belief that accompanying mortality and morbidity render the case futile. Following our previous experience with late arterial repair for leg or knee salvage¹ we applied the same principle to limbs threatened with prolonged ischemia as a result of missed emboli. In this study the response of patients with delayed embolectomy in a 2-year interval is evaluated.

All of the patients who presented to Shohada Tajrish Medical Center, Tehran, Iran between 2001 to 2003 with prolonged ischemia of the lower limb (more than 12 hours) were selected for this study. All underwent embolectomy and prior to reinstatement of blood to the ischemic leg, all those with calf rigor underwent simultaneous venotomy and irrigation of the arterial tree with heparinized solution and were studied accordingly.

Of the total 76 patients 20% had muscle rigor on admission who underwent simultaneous venotomy and irrigation. The limb was salvaged in 45% of patients with above knee sensory deficit and 40% of those with above knee motor deficit. The salvage rates of the limb for below knee sensory and motor deficits were 79% and 85% respectively. We were able to save the knee in 20% of our patients. The short term mortality rate in the whole was 9.2%.

We had only one operative mortality in this high risk group of patients & our figures are lower than those reported in the literature, while at the same time we were able to salvage their limbs or knees.

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INTRODUCTION

One of the most common causes of lower limb arterial occlusion is embolus. Delayed and inappropriate interventions result in high mortalities and morbidity.^{2,3}

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Late Embolectomy for Limb or Knee Salvage

Reviewing the literature, prolonged duration of ischemia prior to surgical intervention (around 24 hours), presence of calf tenderness, sensory and motor disturbances, all were associated with poor outcomes.⁴ The short term mortality and amputation rate has been between 10-20% in some series.⁵ Many studies have reported improved limb salvage using anticoagulants in prolonged ischemia. So far, the common approach for ischemic limbs after the golden time has elapsed, has been anticoagulation and amputation.^{2,6,7} There are sporadic successful results with late embolectomy (70.9% salvage rate) but they have not been reviewed enthusiastically in the literature.⁸

PATIENTS AND METHODS

In this descriptive prospective investigation, all of the patients who presented to Shohada Tajrish Medical Center between October 2001 and October 2003 with more than 12 hours lower limb ischemia were studied. The demographic characteristics of the patients were recorded along with signs and symptoms on admission. The patients underwent embolectomy via a femoral approach. Those with simultaneous calf rigor underwent concurrent venotomy and heparin solution irrigation, prior to reinstatement of blood flow to the ischemic limb.

Surgical Technique

After infiltrating the skin with 0.5% lidocaine and exploring the femoral arteries with the standard technique-controlling common, superficial and deep femoral arteries separately - a No. 4 Fogarty catheter was introduced via a longitudinal arteriotomy. After extraction of the clots, in cases of simultaneous rigor, a longitudinal venotomy was performed before closing the arterial wall; using heparinized saline which was injected through a catheter placed in the superficial femoral artery, the whole arterial tree of the limb was irrigated while allowing the effluent to flush out of the venotomy site. This was continued until the effluent became clear, then both the arteriotomy and venotomy sites were closed using continuous 6-0 monofilament material. In patients in whom a Fogarty could not be passed beyond the popliteal artery angiography was done and accordingly the popliteal artery was explored. Embolectomy of tibial arteries was accomplished and in some cases revascularization was performed. Those cases requiring revascularization were excluded from the study.

In all cases we used close-suction drainage and antibiotics were continued while having the drain in place.

All the patients received heparin post-operatively, at least till further workups for the source of emboli were completed and treated accordingly. Some of the patients underwent fasciotomy before the completion of operation and those who were not were closely observed for developing compartment syndrome.

RESULTS

A total number of 90 patients entered the study. 93% of them were referred from other centers. Forty - nine percent of our patients were females and 51% were males. The mean age was 64±16, and 72% of our patients were older than 60 years. 28% of our patients had AF (atrial fibrillation), 29% were diabetic and 29% were smokers. Fourteen patients were excluded from the study because they needed revascularization.

Of the remaining 76 patients, 15 (20%) had calf rigor on admission who underwent simultaneous venotomy and heparinized saline irrigation.

Twenty (26%) of the total population had above knee sensory deficits on admission. 39 (51%) had below knee sensory deficits and 17 patients had normal sensory findings. According to the outcome of the operation shown in Tables I & II, even in those with above knee sensory and motor deficits, we had 40% limb salvage and 20% knee salvage rates. In those with below knee sensory and motor deficits, we had only one above knee (AK) amputation and more than 75% of the limbs were salvaged. Of the sensory deficient group, 30% needed fasciotomy during the course. All of the patients with motor deficits had similar sensory problems, but the contrary was not true.

In patients with calf rigor (20%), 7% of the limbs were salvaged, BK amputation rate was 53% and the rate of AK amputation was 40%.

In patients without rigor (80%), the limbs of 91% were salvaged and the rate of AK and BK amputation was 2% and 7% respectively.

The total rate of amputation was 25% (16% BK and 9% AK). Fasciotomy was required in 29% of the patients. We had only one operative mortality who died prior to 8 hours (due to massive anteroseptal MI) and total mortality rate was 9.2%.

DISCUSSION

In this study we selected only those patients admitted

Table I. Outcome of late embolectomy regarding sensory findings.

	AK amputation	BK amputation	Salvaged limb	Total
Above knee sensory deficit	7(35%)	4(20%)	9(45%)	20
Below knee sensory deficit	-	7(21%)	32(79%)	39
Normal sensory findings	-	1(6%)	16(94%)	17
				76(100%)

Table II. Outcome of late embolectomy regarding motor findings.

	AK amputation	BK amputation	Salvaged limb	Total
Above knee motor deficit	6(40%)	3(20%)	6(40%)	15
Below knee motor deficit	1(3%)	4(12%)	29(85%)	34
Normal motor findings	-	3(11%)	24(89%)	27
				76(100%)

after the elapse of golden time (12 hours). Most authorities advocate no surgical intervention due to the high risk of reperfusion syndrome, its consequences and more importantly not a favorable outcome. They believe that after passage of 6-8 hours and detection of stiffness in calf muscles, ischemia is irreversible and the prognosis had not been favourable.⁹ In our series of prolonged ischemia, the rate of limb salvage in those with above and below knee sensory deficits were 45% and 79% respectively and motor deficits had figures of 40% and 85% in that order.

Even in those with calf rigor on admission, the knee was salvaged in more than half. In the absence of rigor the findings were more favorable, with 91% limb salvage and 7% knee salvage rates.

On the other hand, most of the mortalities had occurred more than 8 hours after surgical intervention. We had only one case of death before 8 hours, who had a massive anteroseptal MI, refractory to medical therapies. Except in rapid response AF or those with frequent PVCs who required digitalization and/or antiarrhythmics, we did not encounter refractory arrhythmias. We tried to maintain an acceptable urine output and alkalized the urine in most cases to prevent renal problems. The mortality rate

reported in the literature, even though those with muscle stiffness were excluded from surgical intervention, has been between 10- 17%,¹⁰ while in our series the mortality rate was only 9.2%.

It is required to have patient consent prior to performing late embolectomy, as many of these limbs will not regain a normal degree of sensory and motor function. Most of the patients prefer to have a limb, even one which has sensory and motor deficits; of course good postoperative care is essential to prevent ulcers and regain acceptable movement.

Having lower mortality rates in comparison with previous studies and the valuable salvage of the limb or the knee in a significant number of patients, it seems that the protocol of venotomy and heparinized saline irrigation is quite effective, and we could save the limbs without increasing the mortality rate in those who had developed muscle rigor.

CONCLUSION

According to our results of late embolectomy, it is worth trying the protocol of venotomy and arterial tree irrigation with heparinized saline in patients with

Late Embolectomy for Limb or Knee Salvage

prolonged ischemia to save the limb or at least the knee, even after calf muscle rigor has developed.

Long term follow-up of these limbs is useful to determine any later complication or morbidity.

REFERENCES

1. Kalantar Motamedi MR, et al: Late arterial repair for lower limb or knee salvage. *Med J Islam Rep Iran* 1(1): 7-12, 1987.
2. Ouriel K, et al: Acute Limb Ischemia. In: Rutherford RB, (ed), *Vascular Surgery*, W.B. Saunders, pp. 813-821, 2000.
3. Rilinger N, Gorich J, Scharrer PR, et al: Mechanical thrombectomy of embolic occlusion in both the profunda femoris and superficial femoral arteries in critical limb ischemia. *Br J Radiol* Jan. 70:80-4, 1997.
4. Wolosker N, Kuzniec S, Gaudencio A, et al: Arterial embolectomy in lower limbs. *Rev Paul Med*, Jul-Aug 114(4): 1226-30, 1996.
5. Johnson JA, Cogbill TH, Strutt PJ: Late results after femoral artery embolectomy. *Surgery* 103(3): 289-93, 1998.
6. Panetta T, Thompson J, Talkington C, et al: Arterial embolectomy: A 34 year experience with 400 cases. *Surg Clin North Am* 66: 339, 1986.
7. Dale W: Differential management of acute peripheral arterial ischemia. *J Vasc Surg* 1: 269, 1984.
8. Shifrin EG, Anner H, Eid A, et al: Practice and theory of delayed embolectomy. A 22 year perspective. *J Cardiovasc Surg (Torino)*, Sep-Oct 27(5): 553-6, 1986.
9. Ouriel K, Green RM: Arterial Disease, In: Schwartz SI, et al. (eds), *Principles of Surgery*, 7th Edition, McGraw-Hill, pp. 950-6, 1999.
10. Belkin M, Whittmore AD, et al: Peripheral Arterial Occlusive Disease, In: Townsend, Beauchamp, et al (eds), *Sabiston Textbook of Surgery*, 16th edition, W.B. Saunders, pp. 1386-7, 2001.