EMBOLECTOMY FOR ACUTE LIMB ISCHEMIA: EXPERIENCE IN 84 CASES IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Objective: To highlight the presentation, outcome and the role of embolectomy in the management of acute limb ischemia.

Study design: A descriptive study.

Place and Duration of study: Department of Vascular Surgery, CMH Rawalpindi from Oct 2008 to Dec 2010.

Patients and Methods: All patients with acute limb ischemia presenting at CMH Rawalpindi during study period and managed by embolectomy were included. Embolectomy was performed through transfemoral or transbrachial approach, depending upon the limb involved under local anesthesia with Fogarty catheter.

Results: Eight four patients of acute limb ischemia were managed by embolectomy during study period. Lower limb was affected more frequently 51 (60.7%) than upper limb 33 (39.3%). Male to female ratio was 1.4: 1. Forty eight (57.1%) patients reported 12 hours after the onset of symptoms. Embolism was the most common cause present in 53 (63%) and most frequent site of obstruction was femoral bifurcation 23 (45%). Presence of paralysis and skin changes were bad prognostic signs. Eight patients (9.5%) had fasciotomy at the time of embolectomy. Nine major amputations were carried out in 8 patients (10.7%). Eleven patients (13.0%) died within 30 days. Limb salvage rate was 83.3%.

Conclusion: In the scenario of multiple new therapeutic techniques, embolectomy is still a simple, safe and effective surgical option for treatment of acute limb ischemia.

Keywords: Acute limb ischemia, Atrial fibrillation, Embolectomy.

INTRODUCTION

Acute limb ischemia (ALI) is a sudden onset of peripheral arterial occlusion. It threatens both life and limb if not treated in time. Incidence of acute limb ischemia is 14 per 100,000 populations per year[1]. Common cause of acute limb ischemia is arterial embolism and in 80% cases the source of embolism is from heart (atrial fibrillation, valvular heart disease, cardiomyopathy and acute MI). Acute thrombosis, iatrogenic injury during interventional vascular procedures and trauma are other causes of ALI[2]. Atrial fibrillation is associated with two third to three fourths of peripheral emboli. In 5-10% of cases the source of emboli remains unidentified despite thorough diagnostic interrogation[3]. The axial limb vasculature is involved in 70% to 80% of all embolic disease[4]. Lower extremities are involved more frequently than the upper extremities. The sudden onset of pain associated with loss of previously palpable pulse is the hallmark of arterial embolism[5]. Arterial thrombosis develops in the setting of an underlying native arterial stenosis due to atherosclerosis or a hypercoaguable state or as a result of occlusion of a bypass conduit. The severity of limb ischemia depends on the location and extent of arterial obstruction and capacity of the collaterals to perfuse the ischemic limb. Arterial embolism is more likely to cause sudden, severe and limb threatening ischemia than acute thrombosis. Before 1900s, the treatment of an arterial embolus was observational, which eventually terminated in limb loss or death. In the early 1900s the initial successful reports of surgical removal of embolic material were described[6]. Early in its evolution a variety of methods, including suction catheters, vigorous arterial flushing and external compression on the limbs were used with moderate success[7]. In 1963 Dr Thomas J Fogarty invented a balloon catheter that offered

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a significant advancment in the retrieval of thrombus, distal and proximal to the embolic site[8]. Intravascular thromboembolic material can be removed from a single, strategically placed arteriotomy, with relatively little trauma to the vessels. Introduction of heparin for use before, during and after surgical intervention was a great advancement in the treatment of acute limb ischemia. Different management options like embolectomy, pharmacologic thrombolysis, and mechanical thrombectomy and bypass operations are available[9]. Early routine heparinization to prevent propagation of proximal and distal thrombus in combination with early embolectomy remains the mainstay of treatment of peripheral arterial embolic disease[10]. Embolectomy is a simple, safe, effective procedure that can be performed under local anesthesia. Isolated embolectomy is not an ideal therapeutic option for acute thrombosis. Multiple therapeutic modalities should be used for the management of thrombosis. The mortality associated with acute arterial occlusion, due to advance age and associated medical problems remains high, averaging 10% to 25%[11]. This study was conducted to highlight the presentation and outcome in terms of limb salvage of acute limb ischemia managed by embolectomy.

PATIENTS AND METHODS

This descriptive study was conducted at Combined Military Hospital Rawalpindi from Oct 2008 to Dec 2010. All the patients of acute limb ischemia (both upper and lower limbs) who underwent embolectomy with Fogarty catheter were included. Patients of acute arterial occlusion that had been managed by thromboendartrectomy and bypass surgery were excluded. Those cases that presented late with irreversible ischemia/ gangrene of distal limb were also excluded. Primary amputation was advised to these patients. Eighty four patients with acute limb ischemia presented during our study period. Patient's particulars, age, gender, presenting signs and symptoms like pain, coolness, sensory and motor deficit and colour change were recorded. Associated problems like atrial fibrillation, valvular heart disease, ischemic heart disease, hypertension and diabetes mellitus and previous history of anticoagulation therapy were also noted. Time interval between the onset of symptoms and presentation in hospital was recorded. Diagnosis was made on the basis of history and clinical assessment. Doppler study was done in 21 cases (25%) to ascertain the site of obstruction. Preoperative angiography was performed in only 4 patients with questionable diagnosis. Unfractionated Heparin 5000 Units intravenous bolus and 1000 Units/ hour infusion was started in all the patients on admission. Blood complete picture, grouping & cross match, coagulation profile, blood sugar, renal function tests, echocardiography, ECG and x-ray chest were advised before embolectomy. All the embolectomies were performed under local anaesthesia (1% lignocain) through transfemoral and transbrachial approach. In case of a saddle embolism bilateral transfemoral approach was used. Transverse arteriotomy was made in all cases. Embolectomy was performed with Fogarty catheter of appropriate size (4F/5F for lower limb and 3F for upper limb) and good ante grade and retrograde blood flow was established. Distal vessel was flushed with heparin solution (10units/ml). After the procedure, the arteriotomy was closed with continuous 6/0 prolene. A closed suction drain was placed in selective cases for 24 to 48 hours. Postoperatively the circulation of distal limb was assessed by palpation of distal pulses, capillary refill and with intraoperative probe of hand held Doppler. Adjuvant fasciotomies were performed in 8 cases of lower limb ischemia who presented after 12 hours and with motor deficit. Post operatively all the patients were closely monitored regarding the state of circulation of distal limb (presence of distal pulses, capillary refill and the temperature) wound haematoma, compartment syndrome, signs of secondary haemorrhage and reperfusion injury. Heparin infusion continued postoperatively for 3 to 4 days followed by oral anticoagulant therapy with Warfarin for 6 months or more depending upon the cause of ALI. Warfarin therapy was monitored by PT/INR. Hospital stay ranged from 1 to 24 days. At the time of discharge the patients were

advised to follow up in vascular outpatient department after two weeks. On follow up, the vascularity of the limb was assessed both clinically and by Doppler examination, any neurological deficits and other wound related complications were recorded and advised to continue follow up initially after one month and then after every three months. Data was analyzed using SPSS version 15. Descriptive statistics were used to describe the data.

RESULTS

Eighty four cases of acute limb ischemia were managed by embolectomy during this study period. Age of the patients ranged from 17 to 86 years. Acute ischemia occurred in lower limb 51(60.7%) cases while in 33(39.3%) cases in the upper limb. Fifty patients (59.5%) were males and 34 (40.5%) were females. Male to female ratio was (1.4: 1). Pain and coolness were the presenting symptoms in almost all patients. Numbness was present in 40(47.6%) patients and motor deficit in 19(22.6%) patients (Figure). Only 9(10.7%) patients reported within 6 hours and 48 (57.1%) presented after 12 hours. The most common cause of ALI was arterial embolism 53(63%) cases and out of these 53 in 48 (90.5%) cases the source of embolism was cardiac disease (Table-1). Femoral bifurcation was the commonest site of occlusion in lower limb (27.3%) and brachial artery in upper limb (25%) (Table-2). Eight patients (9.5%) presented late with lower limb ischemia and had fascitomies of leg along with embolectomy. Common complication was wound hematoma which occurred in 9(10.7%) cases, out of these 3 required explorations. Wound infection occurred in 5(5.9%) patients which were settled with antibiotic and wound dressing. Eleven (13.0%) patients died within 30 days of embolectomy due to associated diseases. Among the surviving patients 9 (12.3%) had major amputations, 7 in lower limb and 2 in upper limb. One patient of saddle embolism had bilateral above knee amputation and other six had below knee amputation. Surviving patients were followed up for six months with good functional limbs. Limbs salvage rate among surviving patients was 83.3%.

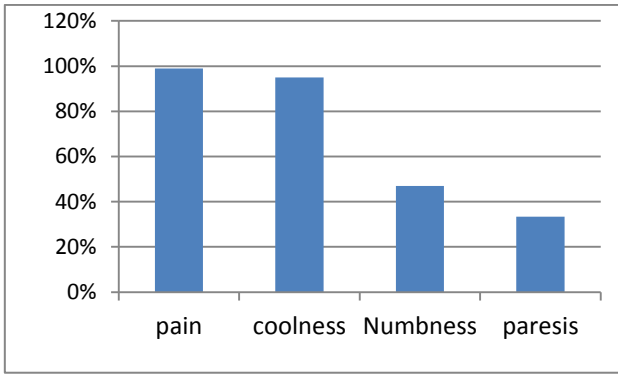

Figure: Presenting symptoms of patients (n=84)

Table-1: Etiology of acute limb ischemia (n=84)

Causes	No of cases	%
Embolism	**53**	**63%**
AF	20	
Acute MI	12	
Cardiomyopathy	8	
Valvular heart diseases	8	
Cryptogenic	5	
Acute Thrombosis	14	16.6%
Iatrogenic	10	11.9%
Unknown	7	8.3%

Table 2: Site of arterial occlusion (n=84)

Site of occlusion	No of cases	%
Lower limb	**51**	**60.7%**
Aortic bifurcation	6	11.7%
Common Iliac	8	15.6%
Femoral bifurcation	23	45.0%
Popliteal & tibial vessels	14	27.4%
Upper limb	**33**	**39.3%**
Axillary artery	11	33.3%
Brachial & forearm vessels	21	63.6%

DISCUSSION

Acute limb ischemia still has a high mortality and morbidity despite the availability of multiple new therapeutic modalities. Newer therapeutic methods are being used more frequently nowadays[12]. Emolectomy with Fogarty catheter is a safe and effective treatment option for acute limb ischemia caused by arterial embolism. Embolism is one of the common causes of acute limb ischemia. The heart is the primary source of peripheral emboli. Atrial fibrillation was present in more than half of cases in our study. In some studies atrial fibrillation was the cause in two third cases of acute limb ischemia[13,14]. Atherosclerosis is a common cause of

thrombosis which has replaced rheumatic heart disease[15]. Acute thrombosis occurs in the background of chronic limb ischemia and presentation is not as dramatic as in acute embolism. Management of thrombosis requires more aggressive approach. Embolectomy is usually not effective in thrombosis and insufficient thrombectomy is associated with higher mortality and morbidity. Like other series in our study the time interval between onset of symptoms and intervention, presence of sensory and motor deficit influence the outcome[16]. Presence of paralysis and colour changes were bad prognostic signs. Amputation rates correlate directly with the delay from onset of symptoms to the time of arterial embolectomy. High mortality with embolic disease is due to a combination of underlying intrinsic heart disease and the metabolic effects of peripheral ischemia[17]. Muscle ischemia and necrosis lead to oliguria, acidosis and myoglobinuria with resulting azotemia, hyperkalemia and renal failure. Mortality and amputation rate in our study were 13.1% and 12.3% respectively, which is comparable with other international studies conducted after the introduction of Fogarty catheter. Low amputation rate in our study was due to the exclusion of the patients presenting with advanced ischemia, who underwent primary amputation. In Abbott series[13], (1964-80), mortality rate was 19% and amputation rate was 13%. Dale[18] reported a mortality rate of 11% and amputation rate of 27%. Blaisdell[19] reported low mortality rate (7.5%) but high amputation rate (26%). It was due to the inclusion of patients of acute thrombosis in his series. In group B patients of Panetta[14] series the mortality and amputation rate was 10.4% and 10.0% respectively. Neuzil[20] reported 9.7% mortality and 7.4% amputation rates. Amputations were more with femoral and popliteal emboli than iliac and brachial. This is due to the anatomic configuration of the circulation of the leg, which does not have a network of collaterals as the pelvis and upper arm[21]. Complications associated with Fogarty embolectomy catheters includes endothelial injury, intimal flaps, and arterial rupture due to over distention and perforation. Compartment syndrome caused by reperfusion after embolectomy must be carefully assessed. Early fasciotomy is required to prevent ischemia and complications that may occur. In our study 8 (9.5%) fasciotomies were performed to prevent compartment syndrome and reperfusion injury[22,23]. The alternative method for dealing with retained distal tibial and small vessels thromboembolic material that is not removable through embolectomy catheter is the intraoperative use of fibrinolytic agents. It improves the blood flow and salvages the ischemic muscles with less reperfusion edema and cellular injury[24,25]. Catheter directed thrombolytic therapy dissolves the platelet-fibrin aggregates in microcirculation and collateral vessels. Potential hemorrhage, stroke, renal dysfunctions and delayed reperfusion injury are the major complications of thrombolysis. Percutaneous mechanical thrombectomy is a less invasive means of thrombectomy and with minimal risk of bleeding and delayed reperfusion injury[26].

CONCLUSIONS

Acute limb ischemia if not treated in time has high mortality and morbidity. Lower limb involvement is more frequent and embolism is still a common cause. Inspite of modern endovascular technique embolectomy is still an effective surgical option in the management of ALI in our setup with good limb salvage rate and acceptable complications.

REFERENCES

1. Dormandy J, Heeck L, Vig S. Acute limb ischemia. Eur J Vasc Surg 1994; 8 (5): 578-83.
2. O'Connell JB, Quinones WJ. Proper evaluation and management of acute embolic versus thrombotic limb ischemia. Seminar in vascular surgery 2009; 22(1): 10-6.
3. Gossage JA, Ali T, Chambers J, Burnand KB. Peripheral arterial embolism; prevalence, outcome and roll of Echocardiography in management. Vascular and endovascular surgery 2006; 40(4): 280-86
4. Elliott J, Hagman J, Szilogyi D. Arterial embolization; problem of source, multiplicity, recurrance and delayed treatment. Surgery 1980; 88: 833.
5. Rutherford R. Acute limb ischemia; Clinical assessment and standard for reporting. Semin vasc surg 1992; 5:4.
6. Moynihan B. An operation for embolus. Br Med J 1907; 2: 826.
7. Crawford E, DeBakey M. The retrograde flush procedure in embolectomy and thrombcetomy. Surgery 1956; 40: 737.
8. Fogarty T, Cranley J, Krause R. A method for extraction of arterial emboli and thrombi. Surg Gynecol Obstet 1963; 116: 241.

9. Jason HR, John RL. New drugs and technologies- overview of new technologies for lower extremity revascularization. Circulation 2007; 116: 2072-85.
10. Holam J, Schersten T. Anticoagulant treatment during and after embolectomy. Acta Chir, Scand 1972; 138:683.
11. Becquemin j, Kovarsky s. Arterial Emboli of the lower limbs; Analysis of risk factors for mortality and amputation. 1995; 9: 832.
12. Hopfner W, vicol C, Bohndorf Leoprecht H: Shredding embolectomy thrombectomy catheter for the treatment of acute lower limb ischemia. Ann vasc surg 1999; 13: 426-35.
13. Abbott W, Maloney R, McCabe C. Arterial embolism; A 44 years perspective. Am J surg 1982; 143: 460.
14. Panetta T, Thompson J, Talkington C. Arterial emolectomy; A 34 years experience with 400 cases. Surg Clin Noth Am 1986; 66: 339.
15. Green R, DeWeese J, Rob C. Arterial Embolectomy before and after the Fogarty catheter. Surgery 1975; 77: 24.
16. Karapolat S, Dag O, Abanoz M, Aslan M. Arterial embolectomy- A retrospective evaluation of 730 cases over 20 years. Surgery Today 2006; 36(5): 416-9.
17. Stiff GM, Souza JD, Raman S, Paulvannan MH. Update experience of surgery for acute limb ischemia in a district general hospital- Are we getting any better? Ann R Coll surg Eng 2009; 91(8) 637-40.
18. Dale WA. Differential management of acute peripheral arterial ischemia. J Vasc surg 1984; 1: 269-78.
19. Blaisdell FW, Steele M, Allen RE. Management of acute lower extremity arterial ischemia due to embolism and thrombosis. Surgery 1978; 84: 822-34.
20. Neuzil DF, Edwards WH Jr, Mulherin JL, Martin RS, Bonau R, Eskind SJ,et al. Limb ischemia: surgical therapy in acute arterial occlusion. Surg Today 1998; 2:156-61.
21. Seheinin TM, Wegelius U, Inberg MV. The role of embolectomy and angiography in arterial occlusion of the arm.Vasc surg 1968; 2:12-20.
22. Guler A, Sahin MA, Karabacak K, Kucukaslan N, Yokusogju M, Tatar H. Accompanying embolectomy and closed fasciotomy in the same session for the delayed arterial thromboembolic occlusion in lower extremity. Anadolu Kardiyol Derg 2009; 9(5): 407-10.
23. EnderTopal A, Nesimi Eren M, Celik Y. Management of non traumatic acute limb ischemia and predictors of outcome in 270 thromboembolectomy cases. Int Angiol 2011;30(2): 172-80.
24. Belkin M, Veleri R, Hobson R. Intraoperative urokinase increases skeletal muscles viability after acute ischemia. J vasc surg 1989; 9:161.
25. Van den Berg JC. Thrombolysis for acute arterial occlusion. J Vasc Surg 2010; 52(2): 512-15.
26. Kashyap VS, Gilani R, Bena JF, Bannazadeh M, Sarac TP. Endovascular therapy for acute limb ischemia. J Vasc Surg 2011; 53(2): 340-46.