

SURGICAL MANAGEMENT OF ACUTE EMBOLIC LIMB ISCHEMIA - AN EXPERIENCE OF 256 CASES

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ABSTRACT

OBJECTIVES: To highlight the importance of embolectomy in patients with acute embolic limb ischemia.

STUDY DESIGN: Descriptive analytic study.

PLACE AND DURATION OF STUDY: The Department of Vascular Surgery, Combined Military Hospital Lahore, from July 2008 to April 2015.

PATIENTS AND METHODS: 256 consecutive patients having acute limb ischemia who underwent embolectomy were included in this study. Embolectomy was done with Fogarty catheter under local anaesthesia; using femoral, popliteal and brachial approaches.

RESULTS: Two hundred and fifty six patients with acute embolic limb ischemia were treated surgically by embolectomy. The lower limbs were effected in 167 (65.2%) and upper limb in 89 (34.7%) cases. Male female ratio was 1.5: 1. Only 11 patients (4.2%) reported within 6 hours of onset of ischemic symptoms. 147 patients (57.4%) reported after 12 hours. Embolism was the commonest cause. Most frequent site for obstruction was femoral bifurcation (45.3%). Skin discoloration and presence of motor paralysis were poor prognostic signs. Only in 25 patients (9.8%) fasciotomy along with embolectomy was performed. 26 patients required amputations (9.9%). Limb salvage rate was 83.5% (214 patients).

CONCLUSION: Simple Embolectomy is time tested and safest surgical procedure in the management of acute embolic limb ischemia.

KEYWORDS: atrial fibrillation, embolic ischemia, embolectomy

INTRODUCTION

Acute limb ischemia is due to sudden occlusion of a peripheral artery. Acute limb ischemia is always limb threatening and may prove life threatening if left untreated or if treatment is started late. Incidence of acute limb ischemia in general population is 14 per 100000¹. Commonest cause of acute limb ischemia is arterial embolism and in 80% cases the embolus comes from heart (atrial fibrillation, valvular heart disease, cardiomyopathies and acute MI). Other causes are acute thrombosis,

iatrogenic injury during interventional vascular procedures and trauma². Atrial fibrillation is associated with two third to three fourth of peripheral emboli. In 5-10 % of cases the source of emboli remains unidentified despite thorough diagnostic investigations³. Arterial thrombosis develops in an already stenosed artery due to atherosclerosis, in

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hypercoagulable state or as a result of occlusion of a bypass conduit.

The axial limb vasculature is involved in 70-80 % of all embolic disease⁴. Lower limbs are involved more frequently than the upper limbs. Sudden severe pain associated with loss of previously palpable pulses is hall mark of acute embolism⁵. The severity of limb ischemia depends on the location and extent of arterial obstruction and presence of effective collaterals. Arterial embolism can cause more severe sudden and limb threatening ischemia than arterial thrombosis.

Before 20th century, the treatment was just observational which usually landed into limb and or life loss. But in 20th century, initial successful reports of surgical removal of arterial embolus were described⁶. Various methods (like use of suction catheters, arterial flushing and external compression on the limbs) were used with moderate success⁷. In 1963 Dr Thomas J Fogarty invented a balloon catheter that offered a significant advancement in the retrieval of thrombus, distal and proximal to the embolic site⁸. Intravascular thromboembolic material can be removed from a single strategically placed arteriotomy with very minor trauma to vessels. Use of heparin before during and after surgical intervention played a vital role in advancement of treatment of acute limb ischemia. These days various options like embolectomy, pharmacologic thrombolysis, mechanical thrombectomy and bypass operations are available⁹.

Early routine heparinization along with early embolectomy is the mainstay treatment of acute limb ischemia. Embolectomy is a safe, simple and effective procedure which can be easily done under local anaesthesia. However isolated embolectomy is not a good therapeutic option in acute thrombosis. Multiple therapeutic modalities should be used for management of acute arterial thrombosis¹⁰. The mortality associated with acute limb ischemia remains high (10-25%) due to patient's age and comorbidities¹¹.

PATIENTS AND METHODS:

This retrospective study was carried out in vascular surgery department of our hospital, in patients who were treated with embolectomy

for acute limb ischemia; between July 2008 and April 2015. Patients with acute limb ischemia, presenting too late with features of gangrene or irreversible ischemia were not included in this study.

Patient's demographic characteristics like age and gender were noted. Presence of pain, motor paralysis, sensory loss, pulselessness and skin coldness were recorded. Comorbidity like atrial fibrillation, valvular heart disease, hypertension, diabetes mellitus, hyperlipidemia and poor compliance to antiplatelet or anticoagulant therapy were also noted. Time interval was also noted between onset of ischemia and presentation to hospital.

Diagnosis was based on history, clinical features and duplex scan. CT-angiography was required only when diagnosis was in doubt. Heparin bolus of 5000 IU was given intravenously immediately after admission to hospital followed by a continuous infusion of 1000 IU per hour. All patients had blood complete picture, coagulation profile, blood sugar, renal function tests, lipid profile, echocardiography, electrocardiogram and chest X-ray.

Embolectomy was performed in all cases under local anaesthesia with Fogarty catheter of appropriate size (4-5Fr in lower limb and 3-4Fr in upper limb). Transfemoral approach for lower limb and transbrachial approach for upper limb was used. Using magnification loupes of 3.0X, a transverse arteriotomy was made after taking proximal and distal vascular controls. In case of saddle embolism a bilateral transfemoral approach was used. Good antegrade and retrograde flow was attained. Distal artery was flushed with heparinised saline (25 units/ml). Arteriotomy was repaired with continuous 6/0 prolene suture. Two incision four compartment fasciotomy was performed only in those patients who had clinically tense leg compartments or having sensory or motor deficit.

Circulation was assessed post operatively by capillary refill, saturation of oxygen (sO₂) and distal pulses. Post operatively all patients were closely monitored for circulation and complications. Heparin infusion of 1000 units per hour was continued for 3-4 days post operatively. Coagulation profile was done every six hourly. Warfarin 5mg was also started on day one post op and continued for 3 to 6 months

depending upon cause of limb ischemia. INR was maintained between 2.0 and 3.5, depending upon the cause of thromboembolism. All patients were initially advised for follow up after one week, then after 2 weeks and then every month for six months.

RESULTS:

Embolectomy using Fogarty catheter was performed in 256 patients. Baseline characteristics of the patients are given in table 1. Patient age range was 24-82 years with a mean age of 55. Male to female ratio was 1.5:1. Lower limbs were involved in 64.9% (n=167) while upper limb was affected in 34.7% (n=89). The data was analysed using SPSS (statistical package for social sciences) version 22. Pain was the presenting symptom in all patients. Coldness of skin was reported in 82% (n=210) cases. Numbness was present in 45.3% (n=116) and motor paresis in 19.9% (n=51) patients. Pain as standalone symptom was present in only 16.4% (n=42) patients. Pain along with coldness of skin was noted in 39.5% (n=101) at the time of presentation. Pain, coldness and sensory loss was seen in 14.5% (n=37) cases; and pain, coolness, sensory and motor loss in 29.7% (n=76) patients. (Table 2) In terms of time of presentation, only 4.2 % (n=11) patients presented within six hours of onset of symptoms. 38.2% (n=98) patients presented in six to twelve hours while 57.4% (n=147) reported after twelve hours of embolic attack.

In 64% (n=164) patients the cause was arterial embolism and of these, 90.6% (n=232) the source was heart. Other causes are shown in Figure 1. In lower limb, the commonest site of embolic occlusion was femoral bifurcation (n=116, 45.3%) while brachial bifurcation was the commonest site in upper limb (23.8%). Other sites are shown in Figure 2. Fasciotomy was only performed in 9.8% (n=25) patients. Haematoma formation was the commonest postoperative complication occurring in 11% (n=28) patients and only 8 out of these required exploration and drainage. Surgical site infection occurred in 6.2% (n=16) patients which resolved with antibiotics and dressings. Amputations were performed in 11.2% patients (n=26). Of these, 23 amputations were in lower

limb and only 3 in upper limb. Patients who had amputation were followed up for 3 months with good functional limbs. Limb salvage rate was 83.5%.

DISCUSSION:

Mortality and morbidity with acute limb ischemia is still quite high even though multiple new therapeutic modalities are now available. Latest therapeutic options are now being employed more frequently¹². Embolectomy with Fogarty catheter is safe and effective in embolic limb ischemia. Embolism is one of the commonest causes of acute limb ischemia with atrial fibrillation responsible for two third cases of acute limb ischemia^{13, 14}. The heart is the primary source of peripheral emboli. In our study also, atrial fibrillation of heart is the commonest cause of embolic limb ischemia. Atherosclerosis has replaced rheumatic heart disease as a cause of thromboembolism in developed countries¹⁵. Acute thrombosis is not as dangerous as acute embolism, as it occurs in already diseased vessels with chronic limb ischemia and developed collateral vasculature. Embolectomy alone in acute thrombosis is therefore not sufficient and even can be more dangerous.

Time interval between the onset of symptoms and surgical intervention is critical. Time lapse of more than six hours often results in higher morbidity¹⁶. Amputation rate was high in those who reported late from onset of ischemia. Cardiac disease and metabolic effects of ischemia often results in a high mortality¹⁷. In our study, 57.4% (n=147) patients presented more than 12 hours after the onset of symptoms. We had 26 amputations and of these, 76.9% (n=20) were those who presented 12 hours after the onset of symptoms. Mortality and amputation rate in our study were 8.2% and 11.2% respectively which are comparable to international studies. Amputations are more common in femoral and popliteal embolism due to lack of collaterals in leg¹⁸. In our study also, 88.4% (n=23) patients had lower limb amputations.

Fogarty associated injuries include endothelial injuries, intimal flaps and arterial rupture due to over distension and perforation. Compartment syndrome caused by reperfusion injury after

embolectomy should be carefully assessed. Early fasciotomy should be done to prevent ischemia and complications that may occur due to reperfusion^{19, 20}. We performed fasciotomies in 9.8% (n=25) patients to prevent compartment syndrome and reperfusion injury. Fibrinolytic agents are used intra operatively for retained thromboembolic material in smaller distal vessels. It improves blood flow and salvages the ischemic muscles^{21, 22}. Newer techniques such as catheter directed fibrinolytic therapy is used to dissolve platelets fibrin aggregates in small vessels. However it is associated with higher risk of haemorrhage, stroke and renal dysfunction. Percutaneous mechanical thrombectomy is another less invasive mean of thrombectomy with less chances of bleeding and delayed reperfusion injury²³.

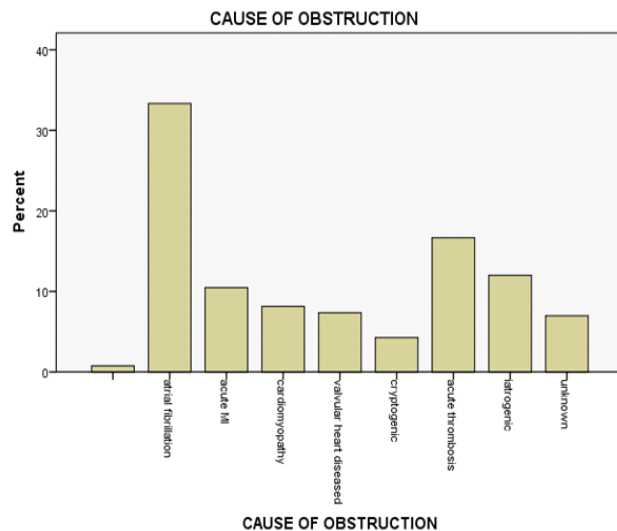


FIGURE 1: Causes of acute limb ischemia

CONCLUSION:

Every effort should be made to early diagnose and timely treat acute limb ischemia, hence decreasing the mortality and morbidity. Lower limb embolic ischemia is more common than that of upper limb. Embolectomy in acute limb ischemia is quite safe and effective treatment option with minimal complications.



FIGURE 2: Site of occlusion

Table 1 : Baseline characteristics of patients.

Total cases (n)	256
Age (in years)	24-82 (Mean 55)
Male gender	172 (67%)
Female gender	84 (33%)
Diabetes	200 (78%)
Hypertension	127 (49.6%)
Diabetes and Hypertension	71 (27.7%)
Coagulopathy	24 (9.3%)
Hyperlipidemia	97 (37.8%)

Table 2 : Presenting characteristics of acute limb ischemia

	Frequency	Percent	Valid Percent	Cumulative Percent
Pain	42	16.4	16.4	16.4
Pain, Coolness	101	39.5	39.5	55.9
Pain, Coolness, Numbness	37	14.5	14.5	70.3
Pain, Coolness, Numbness, Paresis	76	29.7	29.7	100.0
Total	256	100.0	100.0	

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