International Journal of Advances in Medicine
Nekkanti MK et al. Int J Adv Med. 2018 Aug;5(4):788-797
http://www.ijmedicine.com
pISSN 2349-3925 | eISSN 2349-3933
DOI: http://dx.doi.org/10.18203/2349-3933.ijam20182498

Original Research Article

Outcomes of limb and life in patients with acute lower limb ischemia presenting before and after the "golden six hours"

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Received: 28 May 2018
Accepted: 08 June 2018

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ABSTRACT

Background: Acute limb ischemia (ALI) is any sudden decrease in limb perfusion causing a potential threat to limb viability. It is generally accepted that in a patient without underlying arterial disease who develops an acute arterial blockage has approximately six hours for revascularisation before irreversible damage occurs. This study endeavoured to analyse and evaluate the causes and clinical outcome of acute lower limb ischemia.
Methods: :80 successive patients visiting Jain Institute of Vascular Sciences, Bangalore who were diagnosed to have ALI were included in this prospective study. Thromboembolectomy was performed in 48% of patients, 9% of patients were managed with anticoagulation alone, 8% of patients were treated by catheter directed thrombolysis and primary amputation was inevitable in 16 patients of class III ischemia.
Results: All the five patients who presented within the golden six hours survived and their limbs could be salvaged without any morbidity. Even in patients with delayed presentation but viable limb (47 patients) functional limb salvage was possible in 39 patients (82.9%). Overall there was 72.73% limb salvage and 27.27% patients underwent amputation. There was a mortality rate of 13.16% in the study.
Conclusions: Overall there was 72.73% limb salvage and 27.27% patients underwent amputation. Revascularization within six hours is ideal (only 6.25% of patients in our study); however, in delayed presentation (93.75%), physiological state of the limb, rather than elapsed time from onset of occlusion will determine the operability. Late revascularization may thus be indicated and is often successful if limb still exhibits signs of viability.

Keywords: Acute limb ischemia, Revascularization, Thromboembolectomy

INTRODUCTION

Acute Limb Ischemia (ALI) can be the simplest vascular condition to diagnose and the most perplexing to manage resulting in variable outcomes.

The main etiological factors of this disorder are thrombosis in situ, usually seen in patients with underlying Peripheral Arterial Disease, Embolism frequently from cardiac source lodging at arterial bifurcations or acute occlusion of a functioning bypass graft. Other less common causes include peripheral arterial aneurysm, trauma or an acute aortic dissection.[1]

The extent of severity of this condition depends on the preexisting collaterals. Abrupt and complete blockage of

main arterial supply leads to ischemia of distal tissue bed in the limb with energy metabolism shifting from aerobic to anaerobic process. Progressive ischemia leads to cell dysfunction and death.

Nerve tissue cells, skin, subcutaneous tissues are the most susceptible, followed by muscle cells in this condition which has no sexual predilection and constitutes a surgical emergency.

It is generally accepted that, in a patient without underlying vascular disease who develops an acute arterial blockage has approximately six hours for revascularization before irreversible damage occurs.

Clinical judgment is very important in the management of Acute Limb Ischemia. Although Rutherford's criteria is helpful in planning the treatment, Acute Limb Ischemia is challenging and taxing to the surgeon who may be required to employ various techniques ranging from a simple anticoagulation, thromboembolectomy to bypass and other endovascular procedures.

Although there is enough data is available about the morbidity and mortality of Acute Limb Ischemia from the west, Indian data is relatively scarce.

Hence this study envisages evaluating the causes and outcome of limb and life in patients with Acute Lower Limb Ischemia managed by different approaches specifically keeping in mind the golden six hours concept.

The primary objective of the study was to evaluate and compare, 'the outcomes of Limb and Life at the end of three months, in patients with acute lower limb ischemia presenting within and after the golden six hours.

The secondary objective of the study was to analyze the following factors; presentation from the time of acute event, evaluation of limb at the time of presentation with regard to its viability, the treatment plans and their variations, outcomes of intervention and systemic morbidity analysis.

METHODS

Present study is a prospective study conducted at Jain Institute Of Vascular Sciences, Bhagwan Mahaveer Jain hospital, Bangalore. 80 consecutive patients involving 88 limbs diagnosed to have acute lower limb ischemia, were included and a minimum follow up of the 3 months was carried out.

All patients with symptoms of acute lower limb ischemia from various causes excluding trauma, who presented to either our outpatient department or the emergency room were evaluated including the ankle brachial index and immediately appropriate heparin dose was given. Relevant blood investigations including Complete blood count, blood sugar, blood urea, serum creatinine, serum electrolytes, urine routine, chest X ray, and Electrocardiogram and Transthoracic echocardiogram were done.

Patients were classified as per Rutherford criteria, and emergency arterial duplex was done. In delayed presentation cases, fasciotomy was done in selected cases and viability of muscles was assessed by electrical stimulation and future course of action planned appropriately. If the muscles were found to be non-viable (class III), then primary amputation was recommended. If the muscles were viable, then based on risk factors, management was planned.

For class I ischemia, anticoagulation was continued, later imaging was performed, and revascularization was considered in case of worsening ischemia.

In case of class IIA ischemia, following options were considered

- Anticoagulation alone
- Catheter directed thrombolysis
- Thromboembolectomy or bypass surgery

Choice of therapy was decided based on patient's risk factors.

In class II B ischemia, emergency revascularization was done by either thromboembolectomy or arterial bypass surgery. Intraoperative angiogram was performed to assess the clearance of thrombus or embolus and if necessary intra operative thrombolysis was considered. Procedure was followed by fasciotomy of anterior, peroneal and superficial posterior compartment of the leg, for selected cases presented after golden 6 hours, so as to reduce the risk of compartment syndrome following reperfusion.

After thromboembolectomy, completion angiogram showing contrast flow across popliteal artery without any residual thrombus. Posterior tibial artery is seen patent throughout.

Figure 1: Angiogram before thromboembolectomy.

Intraoperative angiogram showing classical reversed meniscus sign. Abrupt cut off at second part of popliteal artery with no distal reformation.

After thromboembolectomy, angiogram showing contrast flow across popliteal artery without any residual thrombus. Posterior tibial artery is seen patent throughout.

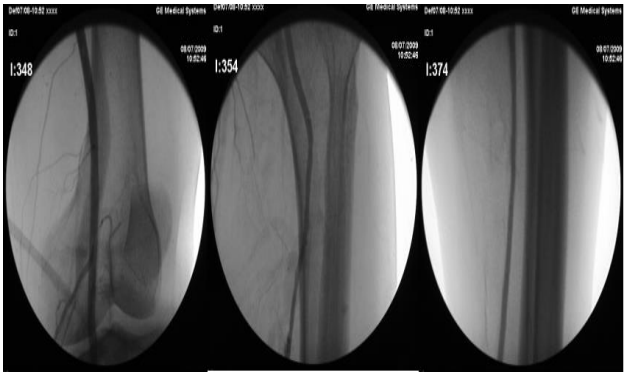


Figure 2: Angiogram after thromboembolectomy.

Post operatively all the patients were maintained on heparin infusion with a PTT being checked every six hours. The dose of heparin was titrated appropriately. Patients were closely observed for any reperfusion injury and other systemic morbidities. Oral anticoagulation was started at a suitable time.

When the patient attained therapeutic anticoagulation dose, they were discharged and were followed up on outpatient basis. Minimum follow up of 3 months was done and during follow up they were observed for their vascular status regarding any worsening ischemia and also for their recovery from systemic morbidities like renal failure. They were also monitored for their oral vitamin K antagonist's dosage, to maintain in therapeutic range and watch for any bleeding complications.

Statistical Package for Social Sciences software (SPSS) was used for statistical analysis of the data.

RESULTS

Present study is a prospective study of 80 patients involving 88 limbs, conducted during January 2007 to December 2008 with a minimum follow up of 3 months.

Table 1: Site of arterial occlusion.

Site of arterial occlusion	Frequency (%)
Aorta	3 (3.75)
Iliac artery	12 (15.0)
Femoral artery	48 (60.0)
Popliteal artery	10 (12.5)
Graft	7 (8.75)
Total	80 (100)

In the present study majority (62) were males as compared to females (18). More than 50% of them belong to the age group of 40 to 60 years.

Only 5 (6.25%) patients presented before the golden six hours. Around 54 (67%) patients presented between 6 hours and 7 days. 15 (18.75%) patients have even presented after 14 days. Most of the patients who presented late reside beyond 100 kilometers from our centre.

Of 44(54%) patients of class II ischemia, 17 (21%) patients came in class IIA ischemia and 27(34%) patients in class II B ischemia. 28(35%) patients presented to us with class III ischemia.

Femoral artery in 60% patients was the commonest site for occlusion. Of which Common femoral artery was involved in 26.25% and Superficial femoral artery in 33.75% of patients. Thrombosis of previous bypass graft noted in 7 (8.8%) of patients.

Table 2: Etiology.

Etiology	Frequency (%)
Native artery Thrombosis	50 (62.5)
Embolus	7 (8.75)
Iatrogenic	15 (18.8)
Graft thrombosis	7 (8.75)
Aneurysm	1(1.3)
Total	80 (100)

Native artery thrombosis 50(62.5%) was the commonest etiology.

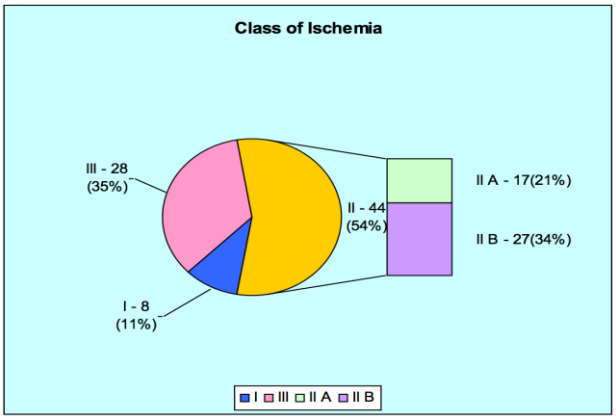


Figure 3: Distribution of class of ischemia.

Embolism was noted in only 7 (8.8%) patients. The cause is said to be embolism if the patient had any obvious source for emboli, like apical clot or vegetations in the heart. About 3 patients had left ventricular apical clot following acute myocardial infarction, 3 patients had Rheumatic heart disease with atrial fibrillation and one patient had dilated cardiomyopathy with ventricular apical clot.

Iatrogenic cause in 15(18.8%), following coronary intervention from femoral approach leading to thrombosis at the access site and distal limb ischemia. Its relatively high compared to TASC data, since ours is a referral hospital with high volume of coronary interventions.

Thrombosis of bypass graft was diagnosed in 7(8.8%) patients.

First patient in this group was a 50 year old male, who came with acute occlusion of Aorto right external iliac artery bypass graft, 2 weeks post procedure. He underwent left common femoral artery to right common femoral artery crossover bypass. Post operatively he developed hypoxia necessitating ventilatory support. He was recovered subsequently and had successful limb salvage at 3 months.

Second patient was an elderly male, presented in class I ischemia, secondary to occlusion of Aorto left common femoral artery bypass done 4 years earlier. He underwent catheter directed thrombolysis with urokinase. He also had successful limb salvage with palpable dorsalis pedis artery pulse.

Third patient in this group came in class IIB ischemia, secondary to occluded femoropopliteal bypass graft. Graft occluded 15 months post procedure. He underwent graft thrombectomy and intra operative angiogram revealed poor distal runoff. His limb could not be salvaged.

Fourth patient was 58 years old who presented in class IIB ischemia secondary to occluded left femoral artery to right femoral artery cross over bypass and occluded right superficial femoral artery to below knee popliteal artery bypass graft. These grafts were occluded 2 years after the procedure. Initially he underwent an unsuccessful crossover bypass graft thrombectomy; later Aorto right femoral artery bypass was done. He had successful limb salvage at 3 months.

Fifth patient had occlusion of common femoral artery to second part of popliteal artery bypass graft and presented in class IIB ischemia. He also had successful limb salvage after graft thrombectomy.

Sixth patient underwent graft thrombectomy for occluded Axillo bi femoral artery bypass graft. He died at home after 2 months. Cause of death was not known.

Last patient, who came with occluded 2 years old Aorto bi femoral artery bypass graft, presented 24 hours later to the emergency room, in class IIB ischemia. He underwent transperitoneal approach aortic graft and bilateral femoral approach graft thrombectomy; post operatively he developed reperfusion injury with acute renal failure needing hemodialysis for a period of 2 months. He had successful limb salvage and complete recovery from renal failure at 3 months follow up.

Thrombosed Popliteal aneurysm with acute limb ischemia was encountered in one patient.

Smoking as a risk factor was seen in 32(40%) of patients and about 31(38.8%) patients had some form of cardiac abnormality on echocardiogram. 6 (7.5%) patients had acute renal dysfunction, 5 of them at presentation and one patient after revascularization. 4 patients in renal failure group belonged to class III ischemia and 2 patients were in class IIB ischemia. 5 patients required dialysis and at 3 months all patients had recovered from renal failure.

3(3.8%) patients had both arterial and venous thrombosis; all of them came in class III ischemia. One patient in this group died post operatively (above knee amputation) possibly due to venous thrombo embolism.

Hyperkelemia was noted in 4 (5%) patients, 3 of them had associated renal dysfunction. Patients were labelled to have renal dysfunction if serum creatinine was more than 1.4 mg/dl. Altered hemoglobin, <10 gms and >15gms in 10 cases, 5 in each group. Platelet count < 1.5 lakhs and >4.5 lakhs were considered abnormal. 5 of them had thrombocytopenia and 3 had thrombocytosis. Albuminuria noted in 3 patients. Any abnormality in electrocardiogram and echocardiogram were also captured and included in altered cardiac status.

About 54 patients who presented with acute ischemia had normal, complete blood count and biochemistry parameters done in the study.

Procedure

Primary amputation was done in 16 patients; all of them came with class III ischemia.

Secondary amputation was carried out in the remaining 4 patients. Of this, one patient came with femoropopliteal graft thrombosis, 15 months post procedure. He underwent graft thrombectomy; intraoperative angiogram showed distal anastomosis narrowing with poor distal run off. Finally, he underwent above knee amputation.

Second patient had earlier undergone Transfemoral distal thrombectomy with tibioperoneal trunk and posterior tibial artery angioplasty but had a poor distal runoff; later amputation was done for continued distal ischemia.

The third patient in this group had undergone catheter directed thrombolysis for acute on chronic ischemia but distally had chronic occlusion. Finally, he underwent amputation after 2 months, as revascularization was not possible.

The last patient in secondary amputation group was a 58 yrs old lady, in whom common femoral artery to distal popliteal artery bypass was done for acute on chronic occlusion of superficial femoral artery. However, in the postoperative period. she had worsening ischemia,

probably due to poor runoff, and the end point was above knee amputation.

Repair of femoral artery pseudoaneurysm and calf fasciotomy in one patient. This pseudoaneurysm was iatrogenic following coronary angiogram through femoral approach.

Bypass surgery was done in three patients on an emergency basis as thrombectomy alone was not successful.

First patient in this group had presented with occlusion of Aorto left iliac graft, underwent right femoral artery to left femoral artery cross over bypass.

Second patient in the bypass group was a 35 years old lady referred to us with acute thrombosis of iliac artery and femoral artery following intervention for intracranial aneurysm through femoral approach. She underwent proximal thrombectomy and short segment bypass from Common femoral artery to superficial femoral artery bypass as vessel was damaged after previous intervention.

The last patient in this group underwent Common femoral artery to Popliteal artery bypass using Great saphenous vein conduit for rethrombosis of superficial femoral artery but she continued to have persisted distal ischemia for which above knee amputation was done.

Catheter directed thrombolysis was done in 6 patients, using either Streptokinase 250000 IU intravenous bolus dose over 30 minutes followed by 5000 IU/ hour for 24 to 48 hours or Urokinase of 250000 IU intravenous bolus dose followed by 2000-4000 IU/minute for 24 to 36 hours. Check angiogram was performed once in 12 to 24 hours.

In one patient underlying Popliteal aneurysm was revealed for which covered stent was placed and aneurysm was excluded.

On analyzing the limb outcome in this group, 5 patients had successful limb salvage and but one patient underwent amputation for chronic distal occlusion.

Table 3: Site of arterial occlusion.

Class of Ischemia	Frequency (%)
Class I	4 (57.14)
Class II A	1 (14.29)
Class III	2 (28.57)

Table 4: Outcome of anticoagulation alone.

Limb and life at 3 months	Frequency (%)
Salvage	7 (100)
Alive	7 (100)

5 patients of class III ischemia refused admission and amputation, 4 of them died at home and one was lost to follow up.

Seven patients were managed with anticoagulation alone. Of which two patients of class III ischemia, underwent fasciotomy to assess viability of muscles.

The first patient was a 37 years old male who developed acute limb ischemia of class III, secondary to prolonged tourniquet application for an Orthopedic procedure. Initially, multiple fasciotomies were done and later multiple debridements for necrosed muscles were done. He also developed renal failure, which responded to hemodialysis. He gradually improved and underwent skin grafting for the raw areas. He had successful limb salvage and recovery from renal failure also.

Second patient in this group was a 51 years old female referred in early class III ischemia, post coronary intervention. Fasciotomy was carried out which revealed non-viable anterior and lateral compartment muscles and borderline viability of posterior compartment muscles. High risk was explained as the patient had acute coronary syndrome. Patient denied consent for further intervention, so she was observed for systemic morbidity and followed with anticoagulation. She developed flexion contractures of knee but had a viable limb at the end of 3 months.

Third patient in this group was a 42 years old male who presented in class IIA ischemia. He underwent thrombolysis for acute coronary syndrome, 2 days earlier to this acute ischemic event. He was managed with anticoagulation in view of high risk and planned for intervention if any worsening is noted. He made a steady recovery without any worsening and had limb salvage at 3 months.

Fourth patient was a 10 years old girl who underwent Patent ductus arteriosus closure by transfemoral approach. Post procedure she developed class I ischemia and had no palpable distal pulses, she was initiated on anticoagulation. She recovered within 24 hours and had palpable distal pulses.

Fifth patient in this group was a 37 years old female, presented in class I ischemia. She was managed with anticoagulation alone, as she had post-partum cardiomyopathy and was very high risk for any intervention. There was no worsening noted and she also had successful limb salvage.

Two patients in anticoagulation alone group were in class I ischemia and did not warrant any intervention.

Interestingly all seven patients belonging to three different stages of ischemia in this group had successful limb salvage.

Table 5: Outcomes of 'limb' after thromboembolectomy (n=41).

Outcomes of limb at 3 months (n=36) in pts who are alive and have completed 3 months of follow up.	Frequency (%)
Salvage	33 (91.67)
Amputated	3 (8.33)

The total numbers of thromboembolectomy procedures done were 41. This is because 3 patients had unsuccessful thrombectomy and finally secondary amputation was done, and those 3 were included in amputation group.

Also, the limb outcome analysis was done in patients who were alive and should have completed their 3 months of follow up. So, 3 patients who died and 2 patients who were lost for follow up were excluded from this analysis.

Of 41 patients who underwent thromboembolectomy, 28 belong to class IIB, 9 in class II A, 2 in class I and two patients in early class III.

Two patients belonging to class IIB presented late, had persistent forefoot ischemia in spite of revascularization and were lost for follow up also. Total of three patients died. One of them had hypoxia in the immediate post-operative period and acute coronary syndrome. The other two patients had successful limb salvage but died, one because of carcinoma lung and cause of death in another patient was not known.

On analyzing systemic morbidity in thromboembolectomy group, it was noted that, hypoxia - reperfusion injury occurred in 3 cases. One patient died, but other two patients recovered with mechanical ventilatory support.

Groin infection occurred in two patients.

First patient was a 58 years old obese lady, who presented with acute bilateral lower limb ischemia of class IIB. She underwent bilateral thromboembolectomy and calf fasciotomy. Post operatively she had haematoma of around 600 ml in the anterior abdominal wall, requiring 3 units of fresh frozen plasma, six units of packed red cells and extended hospitalization for 3 days. She also developed bilateral groin infection, which later healed by secondary intention. She had successful limb salvage with palpable distal pulses at 3 months.

Second patient with groin infection was a 78 years old male, who was referred to us in class IIB ischemia, post coronary intervention. He underwent left groin exploration, thrombectomy and endarterectomy of common femoral artery and external iliac artery. Post operatively he also developed groin infection, which gradually healed by secondary intention. Foot drop noted in two patients preoperatively, both presented after 3 days to hospital and were in class IIB limb ischemia.

Bleeding complication occurred in four patients. Two of them had operative site bleeding and other two had remote bleeding.

It was classified as major bleeding, if the event has necessitated blood transfusion or prolonged the hospital stay or warranted an intervention to stop bleeding.

First patient in this group was a 35 years old male, who presented with acute limb ischemia of class IIB. At admission itself, he had deranged liver function tests with altered coagulation profile and acute renal failure. He underwent high risk emergency thromboembolectomy, but in post-operative period he developed thigh haematoma, which was resolved by 5 days.

Second patient was 55 years old male who underwent transpopliteal distal thrombectomy for acutely ischemic limb. On 2nd post-operative day he developed lower thigh haematoma, for which surgical evacuation was done. He had successful limb salvage at 3 months.

Third patient details already explained under groin infection heading, as she had associated infection also.

Fourth patient in this group was a 63 years old male who underwent Transfemoral thromboembolectomy for acute ischemia; post operatively he had mild groin bleeding. It was secondary to over anticoagulation and responded to temporary cessation of anticoagulation. Bleeding was minor, as it did not warrant any blood transfusion or prolonged his hospital stay.

Post-operative reperfusion induced acute renal failure developed in one patient, who presented late with acutely ischemic both lower limbs, secondary to occluded Aorto bifemoral artery bypass graft. He underwent emergency transperitoneal aortic graft thrombectomy and bilateral femoral approach thrombectomy. Post operatively he developed acute renal failure, requiring dialysis for 8 weeks, after which his kidney function has improved, and he was taken off from dialysis.

Table 6: Morbidity analysis.

Morbidity analysis	Frequency (%)
Bleeding	4 (5.1)
Cardiac event (Post op)	3 (3.8)
Foot drop-persisting	3 (3.8)
Groin Infection	2 (2.6)
Renal dysfunction	6 (7.5)
Respiratory failure	4 (5.0)
Uneventful	51 (63.75)
Worsening ischemia	3 (3.8)
Refused admission	5 (6.25)

6 patients had acute renal dysfunction (s.creatinine >1.4 mg/dl), 5 of them at presentation and one patient after revascularization. 4 patients came in class III ischemia

and the other two were in class IIB ischemia. 5 patients required dialysis. At 3 months all patients had recovered from renal failure.

Of 5 patients who refused admission, 4 died at home and one was lost to follow up.

Bleeding complication encountered in four patients. It was classified as major bleeding, if the event has necessitated blood transfusion or prolonged the hospital stay or warranted an intervention to stop bleeding.

Four patients developed Respiratory failure and warranted ventilatory support. Two deaths occurred in this group, one had associated DVT and venous thromboembolism, also diagnosed to have acute coronary syndrome and other patient had reperfusion injury leading to multiorgan failure.

Three patients developed acute coronary syndrome in post-operative period with one mortality.

Three patients presented with foot drop. All three were delayed presentation cases.

Three patients had worsening foot ischemia despite revascularization. One of them underwent above knee amputation and follow up was lost in other two patients.

Table 7: Outcome analysis of limb at 3 months.

Limb at 3 months (n=66 alive patients with 3 months of follow up)	Frequency (%)
Salvage	48 (72.73)
Amputated	18 (27.27)
Total	66 (100)

Limb viability analysis was done in 66 patients who were alive at 3 months. Limb salvage was obtained in 48(72.73%) of patients. Of which 7 patients were managed by anticoagulation alone with or without additional fasciotomy, 3 patients underwent bypass, 5 patients were managed by catheter directed thrombolysis and 33 patients underwent thromboembolectomy.

Amputation was carried out in 20 patients. Details of these amputated patients have been explained in page 75 and 76, under the procedures.

Total of 10 patients who have died and 4 patients who were lost for follow up were not included in limb viability analysis.

On analyzing outcome of life at 3 months, it was noted that 66 (86.84%) patients were alive at 3 months.

Death occurred in ten patients. Five of them who presented in class III ischemia were advised to undergo amputation, but they refused for intervention and died at home. Two patients died in the hospital, due to post-operative acute coronary event. One of them post revascularization and other patient after primary amputation. One patient had a pre existing end stage of carcinoma lung. He had successful limb salvage but died due to carcinoma lung. Cause of death could not be determined in two patients. Four patients lost to follow up were excluded from this analysis.

Table 8: Outcome analysis of patients presented within the golden 6 hours (n=5).

Limb and Life at 3 months	Frequency (%)
Salvage	5 (100)
Alive	5 (100)

Only 5 patients presented within the golden six hours, all of them were alive and had viable limb.

Lost to follow up- 4 patients of total 75 who came after the golden 6 hours.

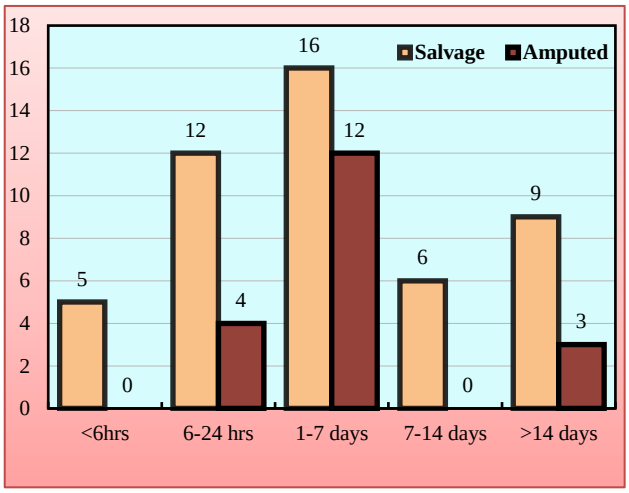


Figure 4: Time of presentation and outcomes of 'limb' at 3 months.

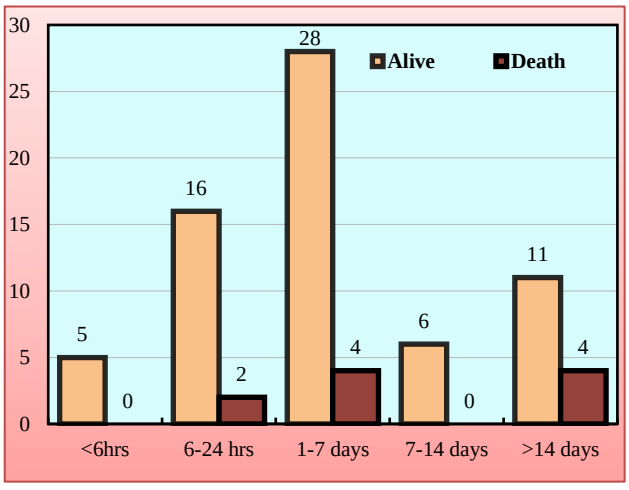
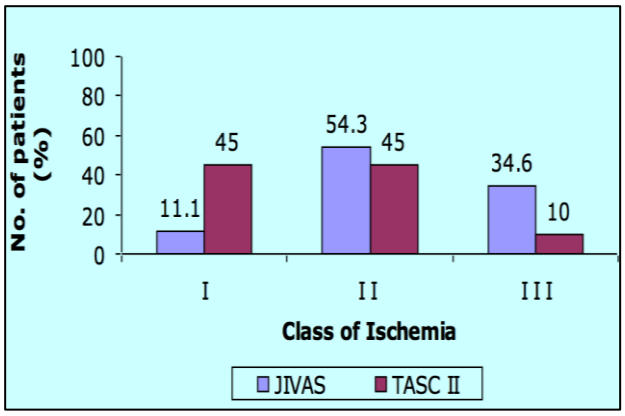


Figure 5: Time of presentation and outcomes of 'life' at 3 months.

DISCUSSION

Acute limb ischemia from varied causes is a catastrophic event in any age group. It is well established that the duration of ischemia is directly related to the outcome of the patient. The complications progressively increase when the patient's presents after the golden six hours.

All the patients in this study, diagnosis was made as per Rutherford criteria.



(JIVAS – Jain Institute of Vascular Science, institute where present study was done)

Figure 6: Comparison of JIVAS and TASC II data.

When compared to TASC II data, present study has only 11% in class I as against 45% in TASC II but 34% in class III, as against only 10% in TASCII. This difference is probably because of lack of awareness regarding symptoms among both patients and medical professionals and non-availability of vascular specialist at all the places. Majority of patients in our study who presented in class III ischemia reside beyond 100 kilometers from our centre.

Only 5 patients presented before the golden six hours, all of them had limb salvage and were alive at 3 months.

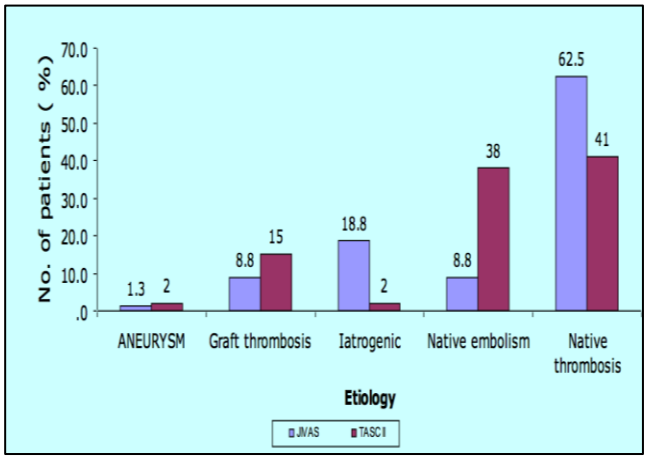
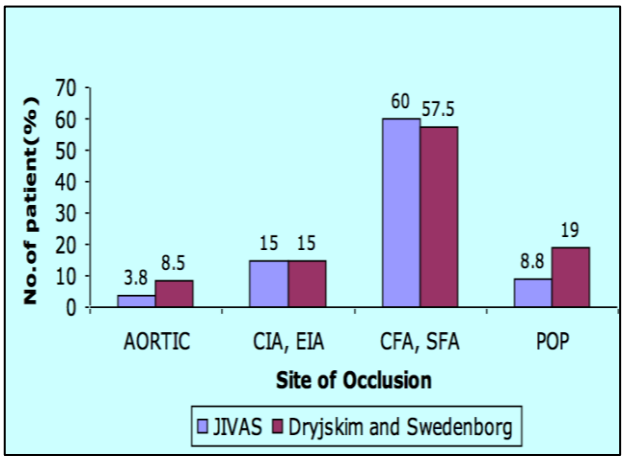


Figure 7: Comparison of treatment data of JIVAS and TASC II data.

Although embolic occlusions continue to occur, only 8.8% of patients in our study had embolism and 62.5% had ALI secondary to thrombosis of native artery. The limitation of this study was that patients grouped into thrombosis category were by exclusion. Those patients who did not hae any evidence of embolic source in heart were included in thrombosis group.

Also, source of embolus from arch of aorta and thoracic aora were not investigated in the present study. Thrombosis of previously bypassed grafts noted in 8.8% of patients, but strikingly high incidence of iatrogenic cases 18.8% in our series, as our centre is a tertiary care centre with high volume of coronary interventions.[2,3]



(JIVAS – Jain Institute of Vascular Science, institute where present study was done)

Figure 8: Comparison of JIVAS and Dryjskim and Swedenborg.

Site of occlusion of our study is comparable to the above-mentioned series.[4]

Despite the signs and symptoms of acute arterial occlusion, irreversible ischemia may not have occurred. In these patients delayed thromboembolectomy is a practical concept. Most reports or large series of embolectomies have documented an increased amputation rate when the revascularization is delayed.

In review of literature of delayed revascularization, Ammann and associates achieved a 61% limb salvage rate, Mac-Gowan and Mooneram noted a 50% limb salvage rates and 16% mortality and Hammarsten and colleagues indicated an 80% limb salvage rate.[5-7] Thomson and co-workers reported 88% limb salvage.[8]

Results obtained in a review of literature of 241 patients reported upon in 12 articles underwent an embolectomy from 2 days to seven weeks following acute arterial occlusion.

Delayed embolectomy resulted in 172 viable limbs with or without palpable pulses; 48 amputations of the limb

were reported upon. Thirty deaths were reported upon in ten series.[9]

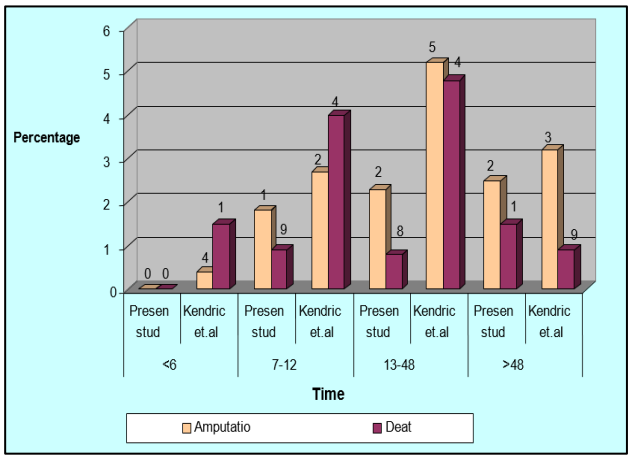


Figure 9: Comparison of outcomes with Kendrick et al.

In the present study even in patients with delayed presentation but viable limb (47 patients), functional limb salvage was possible in 39 patients (82.9%). This was achieved with an increased risk (38.2%) of morbidity and acceptable risk of mortality (6.38% in delayed presentation but viable cases).

Overall there was 72.73% limb salvage and 27.27% patients underwent amputation. There was a mortality rate of 13.16% in the study and no data is available about 4 patients who were lost for follow up.

The primary clinical outcomes were comparable to the TASC II data.

CONCLUSION

Notwithstanding the fact that the sample size of 80 patients is relatively small, this study threw up some significant findings.

More than 50% of the patients belonged to the age group of 40-60 years, most of whom had thrombotic etiology (>90%) when compared to embolism (8.8%).

Timing of presentation is related to severity of ischemia and access to health care. Except five patients, the remaining (75 pts) presented well beyond the golden six hours and delayed presentation has a significant risk of amputation (>27% in our study).

Treatment modality has to be individualized based on class of ischemia and associated risk factors. Although few patients were treated with conservative procedures like anticoagulation alone (7 pts) and catheter directed thrombolysis (6 pts), Open surgical thromboembolectomy is the best approach to salvage the limb (91.6% of 41 pts who underwent the procedure).

Revascularization within six hours is ideal (only 6.25% of patients in our study); however, in delayed presentation (93.75%), physiological state of the limb, rather than elapsed time from onset of occlusion will determine the operability. Late revascularization may thus be indicated and is often successful if limb still exhibits signs of viability.

Even in patients with delayed presentation but viable limb (47 patients), functional limb salvage was possible in 39 patients (82.9%). This was significant, but achieved with an increased risk of morbidity (38.2%) and acceptable risk of mortality (6.38%).

Limitation of the study is that the sample size of patients who came before the golden six hours was small (only 5 patients); hence this cannot be compared with patients who presented after six hours (75 pts) and draw any statistically significant conclusions. Considering the Indian scenario of very few vascular specialists within the reach for early intervention, the importance must be given to the limb viability status rather than the criteria of golden six hours when considering the revascularization.

Finally, delayed presentation in this study warrants more awareness programmes not only for the general population but also for medical personnel in its prompt diagnosis and management.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Nekkanti MK, Vivekanand, Kalkunte SR, Motukuru V, Kolalu S, Kabra A. Outcomes of limb and life in patients with acute lower limb ischemia presenting before and after the "golden six hours". Int J Adv Med 2018;5:788-97.