International Journal Dental and Medical Sciences Research
Volume 3, Issue 2,Mar-Apr 2021 pp 237-242 www.ijdmsrjournal.com ISSN: 2582-6018

# A Prospective Study on Evaluation and Management Strategies in Cases of Acute Limb Ischemia in a Tertiary Care in Rural Hospital, India

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Submitted: 01-03-2021 Revised: 09-03-2021 Accepted: 12-03-2021

**ABSTRACT: Background**: Acute limb ischemia (ALI) is the most common vascular emergency with potential morbidity and mortality, which can be prevented by early appropriate treatment. Delayed presentation because of diagnostic delays and referrals continues to be a challenge for vascular surgeons. The purpose of study was to evaluate the managed the cases of acute limb ischemia in tertiary care in rural hospital.

**Materials and Methods**: Fourteen patients with Rutherford Class IIb acute lower limb ischemia, who underwent revascularization over a period of 2 years from November 2018 to May 2020 at Subharti medical college Meerut UP , were evaluated in this study. Patients were divided into early presenting (<24 h) (n = 9) and delayed presenting (>24 h–14 days) (n = 5), and both the groups were compared with respect to limb salvage at 1 year. Patients with gangrenous changes, posttraumatic ALI, and Rutherford Class I, IIa, and III were excluded.

**Results**: Both the groups were comparable with respect to demographics, lesion characteristics, and comorbidities. Majority of the patients were male. The most common level of occlusion was femoropopliteal segment. All patients underwent transpopliteal thrombectomy and angioplasty. Fasciotomy was performed in almost half of the patients based on clinical need. The limb salvage rate was 88.8% in the early presenting group.

**Conclusion**: In patients with Rutherford Class IIb ALI, good limb salvage rate can be achieved if revascularization done.

**Keywords:** Acute limb ischemia, delayed presentation, limb salvage rate, Rutherford Class IIb

## I. INTRODUCTION

A sudden decrease in limb perfusion that threatens limb viability defines acute limb ischemia (ALI) and represents a major vascular emergency. The incidence of ALI is approximately 1.5 cases out of 10,000 people per year[1]. This results in a reduction in blood flow to the affected limb. There are different causes which can lead to ALI, like arterial embolism (30%), arterial thrombosis due to plaque progression and complication (40%), thrombosis of a popliteal aneurysm (5%), trauma (5%) or graft thrombosis (20%)

### Symptoms and Signs

Symptoms develop in several minutes, to hours or days, and range from new or worsening intermittent claudication to severe rest pain, paresthesia, muscle weakness, paralysis, poikilothermia and even gangrene.

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| Stage | Prognosis | Findings | | Doppler Signal | |
|---|---|---|---|---|---|
| | | Sensory Loss | Muscle Weakness | Arterial | Venous |
| I | Limb viable, not immediately threatened | None | None | Audible | Audible |
| IIa | Limb marginally threatened, salvageable if promptly treated | Minimal (toes) | None | Often inaudible | Audible |
| IIb | Limb immediately threatened, salvageable with immediate revascularization | More than toes, pain at rest | Mild or moderate | Inaudible | Audible |
| III | Limb irreversibly damaged, major tissue loss or permanent nerve damage inevitable | Profound, anesthetic | Paralysis (rigor) | Inaudible | Inaudible |

**Figure 1: Rutherford Classification Of Acute Limb Ischemia**

In patients with viable (stage I) or marginally threatened (stage IIa) limbs, it may be reasonable to perform imaging (duplex ultrasonography, CT angiography, or MR angiography) to determine the nature and extent of the occlusion and to plan intervention. Immediately threatened limbs (stage IIb) were taken directly to the operating room. Hybrid operating rooms with angiographic capability and improved endovascular techniques for thromboembolectomy make it possible to perform imaging and revascularization in a single setting. Imaging and revascularization are not indicated if the limb is irreversibly damaged (stage III).[8]

**Investigation**

Doppler ultrasound: - Doppler ultrasound works by measuring sound waves that are reflected from moving objects, such as red blood cells. This is known as the Doppler Effect.Triphasic, biphasic and monophasic flow.

Triphasic flow is the normal pattern in healthy vessels, having three phases ,due to crossing the zero flow baseline twice in each cycle –1)Systolic forward flow, 2)Early diastolic flow reversal (below zero velocity baseline), 3)Late diastolic forward flow (slower than in systole).

Biphasic having two positive phases or variations having forward and reverse flow-1) Systolic forward flow 2) diastolic flow reversal without late diastolic forward flow.

Monophasic having one phase-systolic forward flow continuing into diastole, lacking reverse diastolic flow which can be divide by acceleration and deceleration time. Monophasic considered

as abnormal. Computed Tomography Angiography (figure-2) and Magnetic Resonance Angiography (MRA) CTA and MRA are high-resolution imaging tools, but much of the experience was gathered in patients with CLI or intermittent claudication. Invasive Angiogram:- Digital subtraction angiography (DSA) was considered for many years the "gold standard" for diagnosis. Because it is an invasive procedure, with a potential risk of complications, DSA should not be used as a first diagnostic tool and should not replace DUS for positive diagnosis of ALI[2, 3].

**Figure 2.** Acute Ischemia of Left leg-

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A - Digital subtraction angiogram of the proximal left thigh shows occlusion of the proximal superficial femoral artery, with reconstitution in the mid-thigh (arrows) an acute thrombus.
B-Obtained after the infusion, shows that the thrombus has largely resolved, revealing the underlying stenosis (arrow).
C-Obtained after angioplasty and placement of a self-expanding stent, shows a widely patent artery. After this treatment, the patient's symptoms resolved

## II. MATERIALS AND METHODS

This is a prospective study conducted between September 2018 to august 2020 in the department of surgery in tertiary care center Chhatrapati Shivaji Subharti Medical College Meerut. Data was taken in a pre formed Performa and the results were tabulated and analyzed.

**Treatment** -Acute limb ischemia is treated by means of endovascular or open surgical revascularization along with medical treatment.Surgical approaches to the treatment of acute limb ischemia include thromboembolectomy with a balloon catheter, bypass surgery, and adjuncts such as endarterectomy, patch angioplasty, and intraoperative thrombolysis. Frequently, a combination of these techniques is required.Anticoagulation is continued after thrombolysis or surgical hemostasis has been ensured. UFH, LMWH, warfarin, dabigatran or rivaroxaban, antiplatelet agents are used to preserve patency.

## III. MATERIALS AND METHODS

This is prospective study was conducted in the Department Of General Surgery at N.S.C.B. Subharti Medical College, S.V. Subharti University, Meerut (U.P.) During From November 2018 To May 2020 admitted in surgical wards with symptoms and signs of limb ischemia.

**Inclusion Criteria**: The study includes:
1) Patients with acute who appear in Subharti hospital during From November 2018 To May 2020.
2) Co- morbid factors responsible for acute limb ischemia.
3) Patients with any age and sex who presented to Subharti hospital with acute limb ischemia.
4) Patients who were treated in Subharti hospital during 2018 to2020.

**Exclusion Criteria:The study excludes:-**
**1)** Patient those are critically ill and not able to comprehensive.
2) Patients that is not willing to participate.
3) Patients who didn't gave consent for surgery.
4) Patients that lost during follow up.

## IV. RESULTS:-

Among acute limb ischaemia cases, majority of the patients were diagnosed with vascular injury by RTA (75%) and thrombus (25%). Mostly young (Figure 3), male are predominantly affected (92.5%). Ischemic changes were presented in 75% of cases, Gangrene was present during admission in (14.5%), and line of demarcation was present in 28.5% patients (table 1 and 2).

In study 14 cases of Acute Limb Ischemia were seen, according to clinical presentation , Doppler signal and prognosis patients were categorized under Rutherford classification in to stages (figure 1).Out of which 2 were due to Thrombus, and categorized under Rutherford classification as Stage 2a which was underwent popliteal vessels repair as blockage was at level of popliteal artery, and one case in which blockage was below popliteal artery and irreversibly damaged were noted, categorized under Rutherford classification as Stage 3 and below knee amputation was done. Study population underwent surgical procedures (100%). In our study 35% cases underwent for amputation and in 65% cases vascular repair were done.Cases presented to hospital within 24 hours (60%) were underwent vascular repair and those who were presented after 24 hours(40%) of onset of injury developed irreversible ischemic changes hence amputation has been done in those cases.

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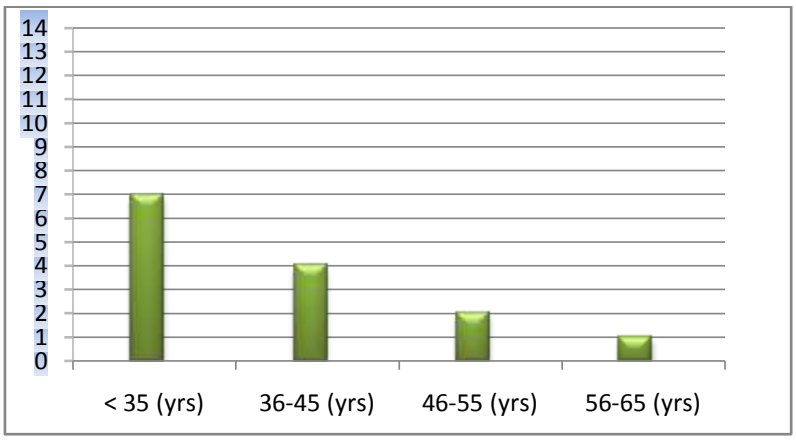


**Figure 3: Bar chart for age group distribution in the study population (N=14)**

| S.N. | MRN | AGE/SEX | Clinical profile | Etiology | Blockage level | Intervention | Outcome |
|---|---|---|---|---|---|---|---|
| 1 | 20045471 | 38/M | Skin changes, resting pain | Thrombus | Popliteal | Thrombectomy with popliteal repair | REHABLITATE AND FOLLOWED UP NO TISSUE LOSS |
| 2 | 20056249 | 57/M | Gangrene | Thrombus | Popliteal | Below knee amputation | REHABLITATE AND FOLLOWED |

**Table 1 Clinical profile, Etiology, Treatment and outcome of patients with acute limb ischemia**

| S.N. | MRN | AGE/SEX | Clinical profile | Cause and time lag | Artery injured | Intervention | Outcome |
|---|---|---|---|---|---|---|---|
| 1 | 20056724 | 30/M | Gangrene lower limb | RTA (36 HRS) | Popliteal | Amputation below knee | REHABLITATE AND FOLLOWED UP |
| 2 | 20037437 | 53/M | Gangrene lower limb | RTA (48HRS) | Popliteal | Amputation below knee | REHABLITATE AND FOLLOWED UP |
| 3 | 20040485 | 20/M | Gangrene foot | RTA(4 D) | Ant.tibial and post.tibial | Amputation below knee | REHABLITATE AND FOLLOWED UP |
| 4 | 19393832 | 45/M | Gangrene upper limb | Machine trauma (5 D) | Below brachial | Amputation of hand | REHABLITATE AND FOLLOWED U P |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 | 19399411 | 55/F | Ischemia upper limb | Machine trauma(6 HRS) | Brachial artery | Brachial vascular repair with RSVG | REHABLITATE AND FOLLOWED UP |
| 6 | 19174953 | 20/M | Ischemia in upper limb, resting pain, swelling, fracture | RTA(12 HRS) | Brachial artery | Brachial vascular repair with RSVG | REHABLITATE AND FOLLOWED UP COMPLETE RECOVERY |
| 7 | 19404256 | 44/M | Ischemia in upper limb, resting pain, swelling, fracture | RTA(10 hrs) | Brachial artery | Brachial vascular repair with RSVG | REHABLITATE AND FOLLOWED UP COMPLETE RECOVERY |
| 8 | 19125670 | 20/M | Ischemia in lower limb, resting pain, swelling, fracture | RTA(8hrs) | Popliteal artery | Popliteal vascular repair with RSVG | REHABLITATE AND FOLLOWED UP COMPLETE RECOVERY |
| 9 | 20069825 | 18/M | Ischemia in lower limb, resting pain, swelling, fracture | RTA(10hrs) | Popliteal artery | Popliteal vascular repair with end to end repair | REHABLITATE AND FOLLOWED UP COMPLETE RECOVERY |
| 10 | 19231418 | 45/M | Ischemia in lower limb, resting pain, swelling, | RTA(8hrs) | Popliteal artery | Popliteal vascular repair with RSVG | REHABLITATE AND FOLLOWED UP COMPLETE RECOVERY |
| 11 | 19358795 | 20/M | Ischemia in lower limb, resting pain, swelling, | RTA(6hrs) | Popliteal artery | Popliteal vascular repair with end to end repair | REHABLITATE AND FOLLOWED UP COMPLETE RECOVERY |
| 12 | 19327701 | 30/M | Ischemia in lower limb, resting pain, swelling, | RTA(12hrs) | Popliteal artery | Popliteal vascular repair with RSVG | REHABLITATE AND FOLLOWED UP COMPLETE RECOVERY |

**Table 2 Clinical profile, Etiology, Treatment and outcome of patients with vascular injury (N=12)**

## V. DISCUSSION:

This prospective study was conducted in 14 cases, in the Department Of General Surgery at. Subharti Medical College, S.V. Subharti University, Meerut (U.P.) from November 2018 To May 2020 admitted in surgical wards with symptoms and signs of limb ischemia.

In present study Acute limb ischemia affecting predominantly male (92.5%) of young age (Figure 1). This is in accordance with the study

conducted by Shabeeh Nasar[4], in which it was reported that the majority (97%) of their study population were males. Major etiological factor responsible for acute limb ischemia is RTA (85%) (table2). Sriharan, et al[5] reported that Trap gun and RTAs are the main causes for major lower limb arterial injuries (RTA and trap gun causing 54.2% and 33.3% of injuries in this study) in the North Central Province of Sri Lanka another study was done by Howard et al[6] who reported the incidence of etiologies for ALI is 46% for arterial embolism, 24% for in situ thrombosis, 20% for complex factors and 10% for stent- or graft-related thrombosis.

In our study Cases presented to hospital within 12 hours (60%) were underwent vascular repair and those who were presented after 12 hours(40%) of onset of injury developed irreversible ischemic changes hence amputation has been done in those cases. A similar retrospective study by Kempe et al[7] included 170 acute lower extremity ischemia patients with majority (83%) presenting beyond 6 h observed 85% limb salvage rate at 3 months.

## VI. CONCLUSION

Clinical examination is done to reach presumptive diagnosis, To determine the anatomical level of the disease which is confirmed with imaging studies. Once the patient develops limb-threatening ischemia (rest pain, wound and gangrene), there are no effective medical therapies, and patients need revascularization as soon as possible and If there is tissue loss present then amputation according to the level of tissue loss with continue medical management and regular follow up is required.

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