

A Case Series of Acute Limb Ischemia and its Management-Institutional Experience at a Tertiary Care Center

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Abstract:

Acute limb ischemia (ALI) represents one of the toughest challenges encountered by the surgeons. It occurs because of sudden deterioration of blood supply to the limb. Acute limb ischemia is a spectrum of disease, it starts with Class 1 Ischemia and progresses to develop Gangrene. This is a retrospective study of patients who were diagnosed to have ALI and treated at our hospital from October 2022 to June 2023. A total of 17 patients were diagnosed to have acute limb ischemia. Out of 17 patients 9 were males 8 were females. Among them 8 patients (47%) had upper limb ischemia and 9 patients (53%) had lower limb ischemia. Among the 8 upper limb ischemia patients, 5 (62%) were males and 3 were (38%) females. 4 patients (50%) were diagnosed with Class 1 ischemia, 3 patients (38%) with Class 2B and 1 patient (12%) with Class 3. With regards to the etiology of ischemia, 1 patient (11%) had thrombotic cause, probably due to hypercoagulable status and 7 patients (77%) had an embolic cause. Out of 9 lower limb ischemia cases, 3 patients (33%) had saddle embolism and all of them underwent bilateral transfemoralembolotomy. Overall, out of the 17 patients who presented with acute limb ischemia, limb salvage rate was 76% (13 patients), Amputation rate was 11% (2 patients) and Mortality rate was 11% (2 patients). Earlier diagnosis and treatment are a must for limb salvage. The Rutherford Classification should be used to identify all ALI patients, and early intervention should be started for a better prognosis. Earlier the diagnosis, better the prognosis.

Keywords: Acute limb ischemia, Retrospective, Upper limb ischemia, Lower limb ischemia

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Introduction

Acute limb ischemia (ALI) is defined as a disruption of arterial blood flow to an extremity and is usually caused by thromboembolic pathology. It usually presents as sudden lower limb pain that can result in amputation, regardless of the underlying cause, unless appropriate treatment is administered. The incidence of ALI is approximately 1.5 cases out of 10,000 people per year.[1]

It has poor prognosis not only for the limb but also for survival. In general, ALI has a reported mortality rate of 15%–20% due to concurrent illness such as cardiovascular or cerebrovascular disease and ischemia–reperfusion injury.[2] There are different causes which can lead to ALI, like arterial embolism (30%), arterial thrombosis due to plaque progression and complication (40%), trauma(5%) or

graft thrombosis (20%). [3] The classical description of patients with ALI is grouped into a mnemonic known as the “6 Ps”: pain, pallor, paralysis, pulse deficit, paresthesia and poikilothermia. [4] ALI management has evolved over the last decade, with advances in diagnostic capabilities and less-invasive endovascular therapeutic options. By approaching and framing the clinical presentation using the Rutherford’s Acute Limb Ischemia classification, the surgeon can better articulate the diagnostic and therapeutic options.[5] In this study, we present the case series of 17 acute limb ischemia patients treated at our hospital along with its management.

The objective of the study was to know the prognosis of patients with various grades of acute limb

ischemia and to study the treatment modality used for various classes of acute limb ischemia.

Materials and Methods

This is a retrospective study of patients who were diagnosed to have acute limb ischemia and treated at our hospital from October 2022 to June 2023. The treatment given for the patients were according to the standard protocols. Fasciotomy was done for all patients who underwent Embolectomy.

Inclusion Criteria

Patients who present with acute onset of limb pain and diagnosed to have Acute Limb Ischemia.

Exclusion Criteria

Patients who have had acute limb pain attributed to other causes, Acute on chronic limb ischemia and chronic limb ischemia were excluded. The patients were classified according to Rutherford Acute Limb Ischemia classification. The symptoms and clinical examination findings at presentation and the treatment modality used (Thrombectomy, Thrombolytic or primary amputation) have been considered, Table 1.

Table 1: Rutherford classification of acute limb ischemia [6]

Grade	Category	Sensory loss	Motor deficit	Prognosis	Doppler Signals	
					Arterial	Venous
I	Viable	None	None	No immediate threat	Audible	Audible
IIA	Marginally threatened	None or minimal (toes)	None	Salvageable if promptly treated	Inaudible	Audible
IIB	Immediately threatened	More than toes	Mild/moderate	Salvageable if promptly revascularised	Inaudible	Audible
III	Irreversible	Profound, anaesthetic	Profound, paralysis (rigor*)	Major tissue loss amputation. Permanent nerve damage inevitable	Inaudible	Inaudible

Result

A total of 17 patients were diagnosed to have acute limb ischemia. Out of 17 patients 9 were males 8 were females. Among them 8 patients (47%) had upper limb ischemia and 9 patients (53%) had lower limb ischemia, Figure 1.

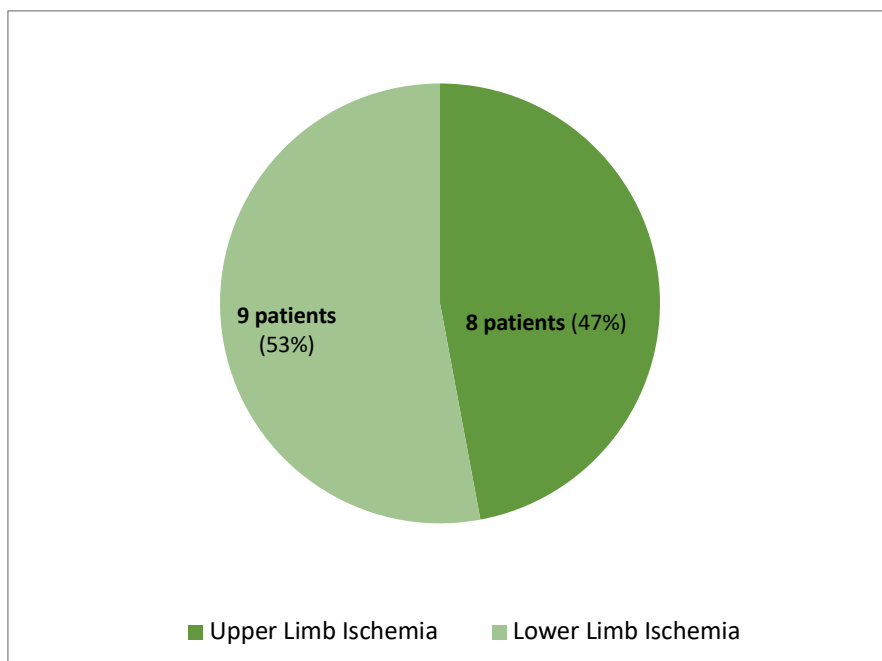


Figure 1: Limb wise category diagnosed to have acute limb ischemia

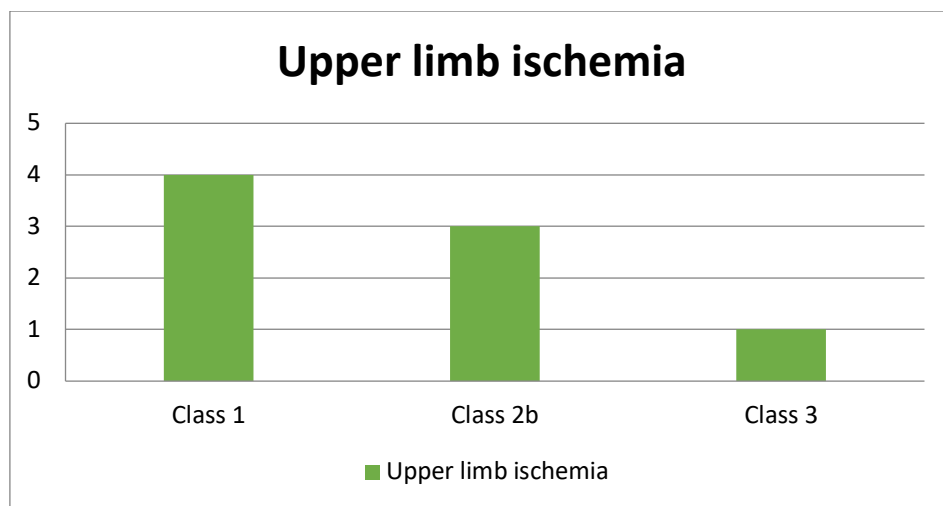


Figure 2: Category of Clinical class of upper limb ischemia

Upper limb ischemia

Among the 8 upper limb ischemia patients, 5 (62%) were males and 3 were (38%) females. 4 patients (50%) were diagnosed with Class 1 ischemia, 3 patients (38%) with Class 2b and 1 patient (12%) with Class 3, Figure 2. All the 4 patients with class 1 ischemia required only conservative management

with IV anticoagulation and were given oral anti-coagulant and antiplatelets at the time of discharge. The patients with class 2b and class 3 underwent Trans brachial embolectomy and among them limb was salvaged in 3 patients and 1 patient with class 3 ischemia ended up with amputation due to wound infection, post embolectomy, Figure 3.

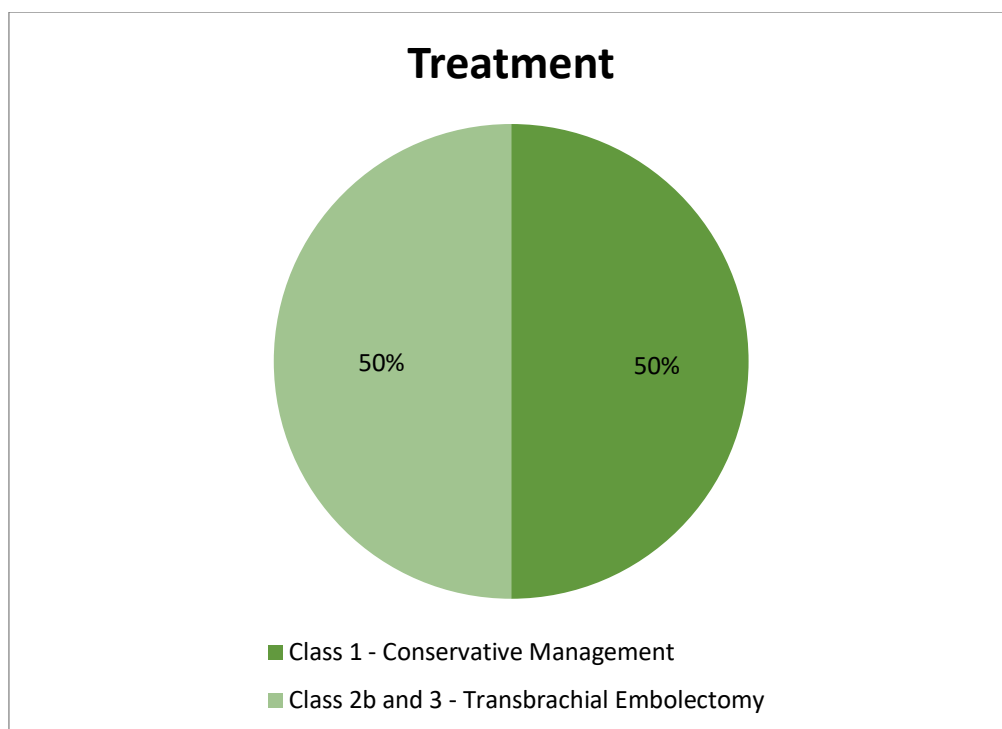


Figure 3: Treatment given for Upper Limb Ischemia

With regards to etiology of ischemia, 6 patients (75%) had thrombotic cause, probably due to hypercoagulable status and 2 patients (25%) had embolic cause, from cardiac source. Overall, among 8 patients who were diagnosed with upper limb ischemia limb salvage could be done in 7 patients (87%).

Lower limb ischemia

Out of 9 lower limb ischemia patients, 4 (44%) were male and 5 (55%) were female. Among them 1 patient (11%) had Class 1 ischemia, 2 patients (22%) had Class 2a, 4 patients (44%) had Class 2b, and 2 patients (22%) had Class 3 ischemia, Figure 4.

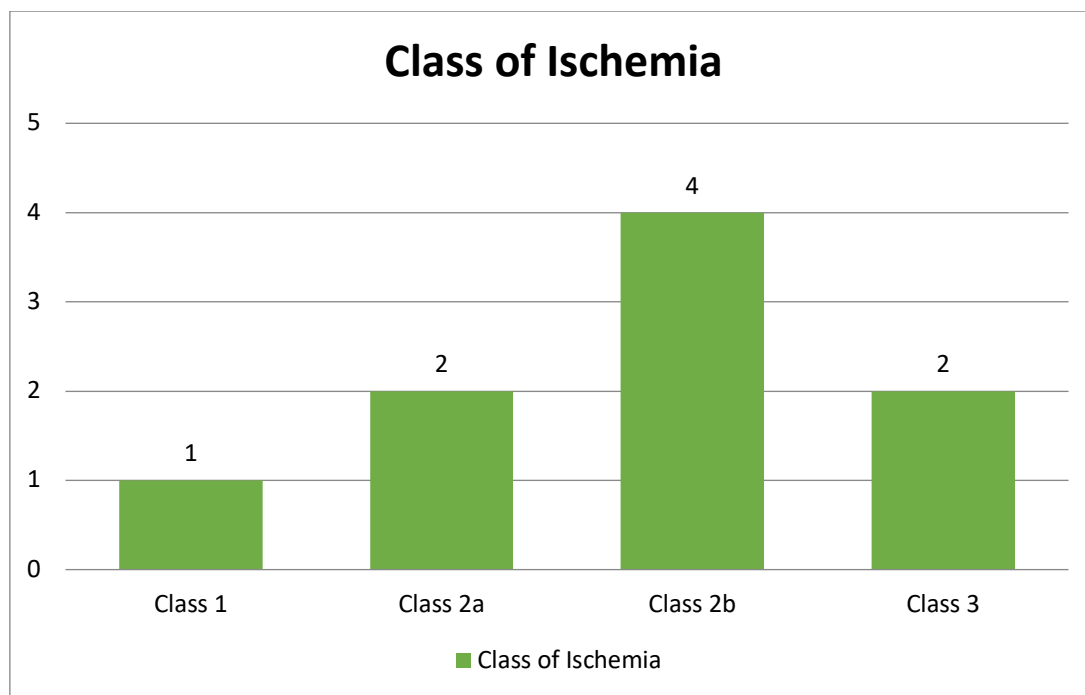


Figure 4: Category of Clinical class of Lower limb ischemia

Patients with Class 1 and Class 2 A ischemia (3 patients) required only conservative management with IV anticoagulation and other supportive measures. Among them 1 patient (Class 2A Ischemia) expired (33%) who was a case of stuck mitral valve with heart failure. The patients with class 2B (4 patients) and 1 patient with class 3 ischemia un-

derwent transfemoral embolectomy. Among them limb was salvaged in 3 patients, 1 patient still ended up with amputation due to non-viability of muscle and 1 patient expired postoperatively due to cardiac arrest. Primary amputation was done for 1 patient with class 3 ischemia who had extensive gangrene on presentation, Figure 5.

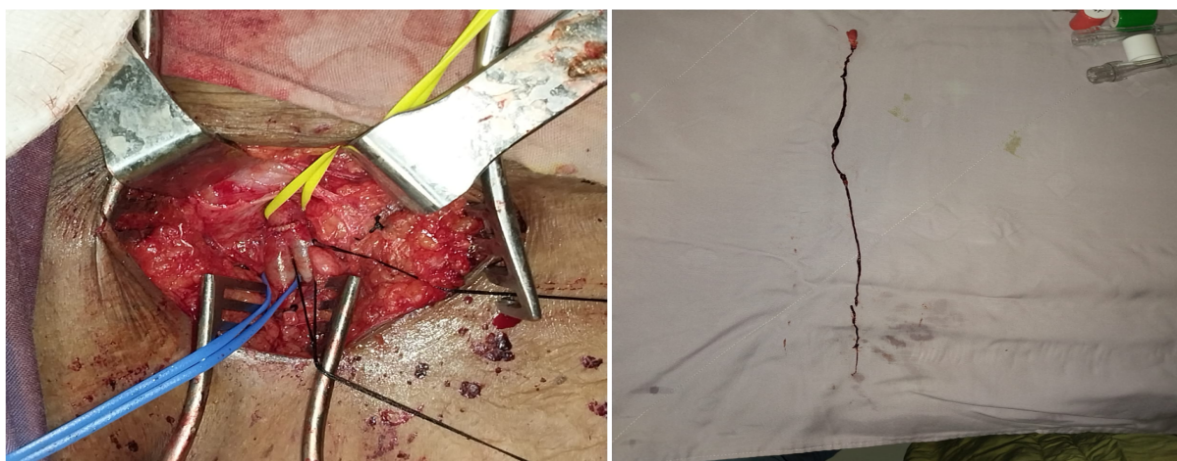


Figure 5: Transfemoral Embolectomy and the retrieved thrombus

With regards to the etiology of ischemia, 1 patient (11%) had thrombotic cause, probably due to hypercoagulable status and 7 patients (77%) had an embolic cause. Out of 9 lower limb ischemia cases, 3 patients (33%) had saddle embolism and all of them underwent bilateral transfemoral embolectomy.

Overall, out of the 17 patients who presented with acute limb ischemia, limb salvage rate was 76% (13 patients), Amputation rate was 11% (2 patients) and Mortality rate was 11% (2 patients), Figure 6.

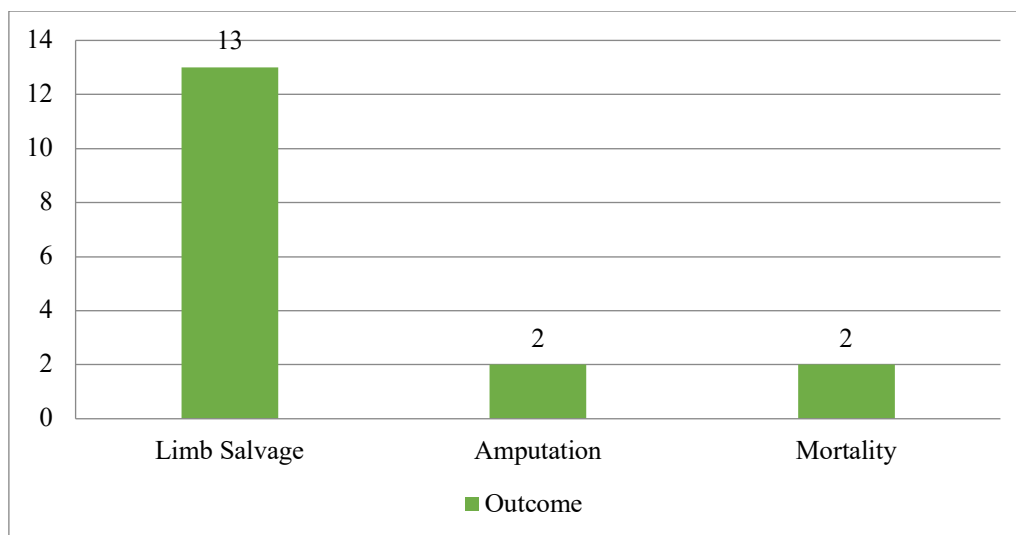


Figure 6: Outcome of the patients

Overall, limb salvage was achieved in all the patients with class 1 ischemia, 50% Limb salvage rate in Class 2A ischemia, 86 % Limb salvage rate in Class 2b Ischemia. All the patients with Class 3 ischemia eventually underwent amputation, Figure 7.

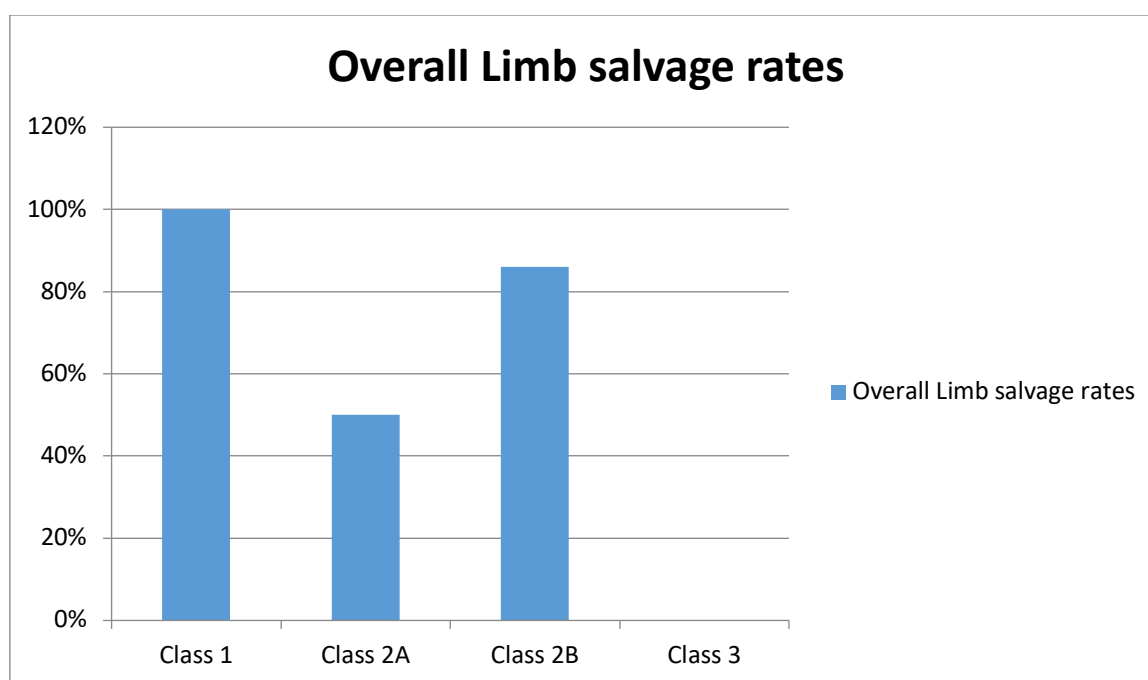


Figure 7: The limb salvage rates according to the class of ischemia

Discussion

Acute Limb Ischemia represents one of the toughest challenges encountered by the surgeons. It occurs due to sudden deterioration of blood supply to the limb. It is very important to diagnose ALI at the earliest which is largely done by clinical assessment and any error can result in loss of limb or life of the patient. Early clinical evaluation of acute limb ischemia is crucial to identify the etiology (Embolic or Thrombotic) of the ischemic limb also. Early intervention can lead to limb salvage,

whereas delayed recognition can place the patient at high risk of significant morbidity, including limb loss and, potentially, mortality. [7, 8]

The classical description of patients with acute limb ischemia is represented by the “six Ps”: pain, pallor, paralysis, pulse deficit, paraesthesia, and poikilothermia. [9]History should include the duration, location, intensity, and suddenness of the onset of pain and changes over time. Embolic occlusions are usually very sudden and of great intensity, such that patients often present within a

few hours of onset. Details about the history of intermittent claudication, previous leg bypass or other vascular procedures, and history suggestive of embolic sources, such as cardiac arrhythmias should also be taken into account. General cardiac risk factors (smoking, hypertension, diabetes, hyperlipidemia, amputations, other vascular procedures, family history of cardiac or vascular events, age of parents at time of death) should be recorded, as these can be predictors of periprocedural mortality.[10-12] The duration of symptoms is of prime importance in the planning of therapy.

Clinically acute limb ischemia is evaluated by pulse examination, neurological status examination which includes sensory and motor systems and finally by the doppler signals. Based on the clinical findings the degree of ischemia is determined by the Rutherford Acute Limb Ischemia classification which is given in Table 1.

In this case series, a total of 17 patients were diagnosed to have acute limb ischemia. Out of 17 patients 9 were males 8 were females. Among them 8 patients (47%) had upper limb ischemia and 9 patients (53%) had lower limb ischemia.

In a study by Miju Bae et al, 19 patients (54.3%) had acute limb ischemia. The mean age of patients with acute upper limb ischemia was 60.42 years, and female patients comprised 42.10% of the study population. [13]

In our study, among the 8 upper limb ischemia patients, 5 (62%) were males and 3 were (38%) females. Out of 9 lower limb ischemia patients, 4 (44%) were male and 5 (55%) were female. In our study, 6 patients (75%) had thrombotic cause, probably due to hypercoagulable status and 2 patients (25%) had embolic cause, from cardiac source. In our study, primary amputation was done for 1 patient with class 3 ischemia who had extensive gangrene. As per study Klapheke S et al, most common indication for primary amputation was extensive gangrene or non-reconstructable arteries (67%), progression wound/extensive gangrene (30%). [14]

The goal of therapy for both acute embolic or thrombotic occlusion is reperfusion of the ischemic limb. The first step is anticoagulation with intravenous heparin. Heparin prevents propagation of the embolus or thrombus both proximally and distally and maintains patency of collateral vessels; therefore, it will help to reduce the extent of the ischemic injury.[15]

Reestablishment of arterial blood flow can be accomplished using two main approaches: surgical intervention, endovascular thrombolysis. The decision between the two is based upon several considerations, including the degree of limb

ischemia, location of occlusion, cause of the occlusion (Embolic vs Thrombotic), and overall medical condition of the patient.

A third option is to do direct amputation in cases where the gangrene is established. In some cases, where a patient is unstable and cannot be anticoagulated, watchful waiting with optimization of the medical condition until such time as anticoagulation or surgical or endovascular intervention can be initiated is prudent. [16, 17]

Though there are various options available for acute limb ischemia, the prognosis majorly depends on the class of ischemia at the time of diagnosis. Early diagnosis will have good outcomes whereas patients with class 3 ischemia will require amputation eventually. In this study, the data depicted in Figure 7 shows the limb salvage rates according to the class of ischemia. Limb was salvaged in all patients with class 1 ischemia, whereas all the patients with class 3 ischemia had to undergo amputation.

Conclusion

ALI worsens as the time progresses. Initially it starts with Class 1 Ischemia and progresses to develop Gangrene. All patients with ALI should be categorized according to the Rutherford Classification and early intervention should be initiated for the better prognosis. Clinical suspicion of the disease, in any patient who complains of sudden onset of Limb pain, should be kept in mind. Earlier the diagnosis, better the prognosis.

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