Open Access

Original Article

Comparison of Limb Salvage Rate in Early Versus Delayed Presented Patients of Acute Lower Limb Ischemia Undergoing Revascularization

Sana Sharafat Ali, Syed Tanseer Asghar*

Pakistan Institute of Medical Sciences Islamabad Pakistan, * CDA Capital Hospital Islamabad Pakistan

ABSTRACT

Objective: To compare the limb salvage rate in early versus delayed presented patients of Rutherford Class IIB acute lower extremity ischemia undergoing revascularization.

Study Design: Comparative prospective study

Place and duration: Hayat Wali Medical Center, Rawalpindi Pakistan, from Apr 2019 to Mar 2020.

Methodology: This study enrolled 42 patients, aged 20 to 70 years, with Rutherford Class IIB acute lower limb ischemia, which was divided into two groups. Group-I (delayed presented >6 hours) consist of 30 patients, and Group-II (early presented <6 hours) consist of 12 patients. All patients underwent embolectomy. The limb salvage rate was examined in the third postoperative month.

Results: In Group-I, limb salvage was found in 18(60%) patients, while in Group-II, there were 11(91.67%) patients; a significant difference was observed between both groups (p-value <0.05). The mortality rate was high in Group-I (delayed presented) as compared to Group-II (16.67% vs 0%) with a p-value <0.05.

Conclusion: The limb salvage rate was higher in early presented patients than delayed presented patients. Mortality and amputation rates were observed to be higher in delayed-presented patients.

Keywords: Acute Lower Limb Ischemia, Limb Salvage, Revascularization.

How to Cite This Article: *Ali SS, Asghar ST. Comparison of Limb Salvage Rate in Early Versus Delayed Presented Patients of Acute Lower Limb Ischemia Undergoing Revascularization. Pak Armed Forces Med J 2023; 73(1): 227-230. DOI: https://doi.org/10.51253/pafmj.v73i1.6968*

INTRODUCTION

A sudden decline in limb infusion is known as Acute Limb Ischemia, a possible threat to the viability of the limbs.[1] Acute Limb Ischemia is a medical emergency that is particularly morbid and dangerous. While thrombolytic, endovascular or free vascular Chirurgie is urgently revascularized, the rates of 30 days of amputation and mortality vary from 10% to 5% and 5% to 15%, respectively.[2,3] The related morbidity and death are exceptionally high, with an average mortality rate of 40% in the USA.[4] This disease affects 15-26 people every 100.000 a year.

Systemic anticoagulation and early effective therapy have been treated for acute limb ischemia. Class I Acute Limb Ischemia of Rutherford is treated only with anticoagulation, while category III of Rutherford typically calls for key amputation procedures.[5] Revascularization of patients from Rutherford Class II Acute Limb Ischemia is most generally required.[6,7] In developed countries, however, most patients arrive late because of the uncertainty in their diagnosis, particularly those originally diagnosed at an average per patient.[8,9,10] We conducted a present study to examine the limb salvage rate in patients presented late and compared with early presented patients who were undergoing revascularization for Rutherford class IIB acute lower limb ischemia.

Correspondence: Dr Sana Sharafat Ali, Department of Surgery, Pakistan Institute of Medical Sciences Islamabad Pakistan

Received: 27 Jun 2021; revision received: 12 Nov 2022; accepted: 16 Nov 2022

METHODOLOGY

The comparative prospective study was conducted at Hayat Wali Medical Center, Rawalpindi Pakistan, from April 2019 to March 2020. Ethical approval from Hayat Wali Medical Centre was obtained (Reference No. 0037/2019). A non-probability convenience sampling technique was employed to recruit participants in the study. The mortality rate in the late versus early presentation Group 16.1% and 6.4%,[11] respectively were taken for sample size determination using a select statistics calculator. However, due to the rarity of the condition, we receive a very small number of cases of acute limb ischemia; therefore, we only selected 42 patients

Inclusion Criteria: Patients of either gender, aged 20 to 70 years presented with Rutherford Class IIB acute lower limb ischemia were enrolled in this study.

Exclusion Criteria: Patients with a history of vascular surgery, Rutherford class I, IIA and III, and patients with traumatic acute limb ischemia were excluded from this study.

All the patients were divided into two groups. Group-I consists of 30 patients who were delayed (>6 hours), and Group-II contains 12 patients who presented early (<6 hours). Patients detailed demographics, including age, gender, body mass index, and co-morbidities, were recorded after taking written consent from all the patients.

Embolectomy was performed in all the cases. Fasciotomy was given to almost half of the patients in delayed groups, but only three obtained fasciotomy in early groups. The patients were first carefully examined in the ICU 24 hours after surgery, provided a significant problem occurred. Clotting times were tracked and held between 250 and 300 every 4th hour. Anticoagulation, which was continued for two weeks after the release of vitamin-K antagonists, was transferred to low molecular Heparin and then converted to oral anticoagulation for an indeterminate duration.

Postoperatively, follow-up was taken at three months. Limb salvage rate was examined at the final follow-up between early and late presented patients. 30-days mortality and amputation rate were also examined and compared between both groups.

Statistical Package for Social Sciences (SPSS) version 24.0 was used for the data analysis. Chi-square and student t-tests were used to determine characteristics of late versus early presentation of acute lower limb ischemia. The *p*-value of ≤0.05 was considered statistically significant.

RESULTS

There were 23(76.67%) males and 7(23.33%) females with a mean age of 50.52±11.74 years in Group I. In Group II, 8(75%) were male, and 3(25%) were females, with a mean age of 50.08±10.94 years (Table-I).

Table-I: Demographics of the Patients

Characteristics	Group-I (Late)	Group-II (Early)	*p*-value
Mean±Age (Yrs.)	50.52±11.74	50.08±10.94	0.841
Gender			
Male	23(76.67)	8 (75)	0.505
Female	7(23.33)	4 (25)	
Comorbidities			
Diabetes Mellitus	14(46.67)	5(41.67)	0.851
Smoking	10(33.33)	3(25)	
Hypertension	10(33.33)	4(33.33)	
Obesity	7(23.33)	1(8.33)	
Ischemic Heart Disease	4(13.33)	0(0)	
Atrial Fibrillation	2(6.67)	1(8.33)	
Mean BMI (kg/m)	27.26±4.82 kg/m²	26.92±3.24	0.512

The most common vessel was the femoral artery, found in 13(43.33%) patients and 4(33.33%) in Groups I and II (Table-II).

Table-II: Vessels Involved for Revascularization

Variables	Group I (Late)	Group II (Early)	p-value
femoral artery	13(43.33)	4(33.33%)	0.641
popliteal artery	8(26.67%)	3(25%)	
superficial femoral artery	6(20%)	3(25%)	
brachial artery	3(10%)	2(16.67)	

The mean hospital stay in Group-II was 6.45±2.8 days, and in Group-I, it was 9.86±3.46 days, the difference was statistically significant (*p*-value 0.002). Major amputation rate within 30 days was high in late presented (Group-I) patients as compared to early presented patients (Group-II) 12(26.67%)vs2(16.67%). (Table-III).

Table-III: Hospital Stay and Amputation Rate in Study Groups

Variables	Group I (Late)	Group II (Early)	*p*-value
Hospital stay	9.86±3.46	6.45±2.8	0.002
Amputation	12(40)	2(16.67)	0.024

At the final follow-up, in Group-I, limb salvage was found in 18(60%) patients, while in Group-II, limb salvage was found in 11(91.67%) patients. Both groups observed a significant difference in limb salvage rate (*p*-value <0.05).The mortality rate was high in Group-I (delayed presented) as compared to Group-II (16.67% vs 0%) with a *p*-value <0.05 (Table-IV).

Table-IV: Comparison of Limb Salvage Rate in Study Groups

Variables	Group I (Late)	Group II (Early)	*p*-value
Limb Salvage			
Yes	18(60%)	11(91.67%)	0.001
No	12(40%)	1(8.33%)	
Mortality Rate			
Yes	5(16.67%)	12(100%)	NA
No	25(83.33%)	0	

DISCUSSION

Acute lower limb ischemia is one of the most common vascular disorders found worldwide and is associated with higher morbidity and mortality rates. Early presentation and accurate diagnosis can reduce the complications and mortality associated with acute lower limb ischemia.[8] Revascularization is considered a treatment of choice for managing acute lower extremity ischemia due to its higher limb salvage rate and fewer complications.[9] We conducted a present study to compare the limb salvage rate between early and late presented patients who were undergoing

revascularization for Rutherford class IIB acute lower limb ischemia. In this regard, 42 patients were enrolled. Among them, 30 patients were late presented, and 12 were early presented. The majority of patients in our study were male, 73.81%, compared to females, 26.19%. These results were similar to the previous studies in which male patients were predominant at 65% to 75% compared to females.[10,11]

We found that the mean age of patients in the late presented Group was 50.52±11.74 years, and in the early presented Group, it was 50.08±10.94 years. No significant difference was observed between both groups regarding age and gender with a *p*-value >0.05. No significant difference was found regarding BMI between Groups I and II (26.26±3.82 kg/m^2 Vs 25.92±3.24 kg/m^2) with *p*-value >0.05. These results were comparable to the study by Chaudhari *et al*.[12]

In a present study we found that diabetes mellitus was the commonest co-morbidity in both early and late presented patients followed by obesity, smoking, hypertension, ischemic heart disease and atrial fibrillation. In a study conducted by Baril *et al.* regarding outcomes of lower extremity bypass for acute lower limb ischemia, in their study diabetes mellitus was the most frequent comorbidity found in acute lower limb ischemia patients, followed by hypertension and smoking.[13]

In the present study, hospital stay was longer in late presented patients at 9.86±3.46 days compared to early presented patients at 45±2.8 days, and the difference was statistically significant. Previous studies demonstrated that patients who presented late for revascularization for acute limb ischemia had longer hospital stays than ten days compared to patients who presented early median of five days.[14,15] We found that the 30 days amputation rate was high in late-presented patients as compared to early-presented patients [8 (26.67%) Vs 2(16.67%)], but the difference was not statistically significant. Rothenburg *et al.* reported that delayed fasciotomy is highly associated with major amputation in patients with acute lower extremity ischemia compared to early fasciotomy 50% versus 5.9%.[16]

In our study, limb salvage was found in 18(60%) patients, while in Group-II, limb salvage was found in 11(91.67%) patients; a significant difference was observed regarding limb salvage rate between both groups (*p*-value <0.05). Chaudhary *et al*. reported that the limb salvage rate was 91.67% in the early presenting Group, whereas in the delayed presenting Group, it was 72.73%, no significant difference was observed regarding limb salvage rate between early and delayed pre-sented patients of acute lower limb ischemia under-went revascularization.[12] A study by Siddique *et al.* examined the outcome of embolectomy in late presen-ting patients of acute lower limb ischemia, and they included 49 patients. Among them, the limb salvage rate was 85.7%.[17]

In our study mortality rate was high in Group-I (delayed presented) as compared to Group-II (16.67% Vs 0%) with a *p*-value <0.05. A study by Kempe *et al*. included 170 acute lower extremity ischemia patients, with the majority (83%) presenting beyond six h observed an 85% limb salvage rate at three months.[18] In their study, 52% of the patients were in Rutherford Class IIB, the median time to amputation was one day, and the 30-day mortality was 18%. Another study conducted by Khan *et al.* reported that for patients who were presented after 72 hours for revascularization for acute limb ischemia, the limb salvage rate was 80%, and mortality was found in 5% of patients.[6] Some previous studies demonstrated that patients who were presented late (more than 72 hours to 15 days) had a higher mortality rate than early presented patients.[19,20]

CONCLUSION

We concluded that revascularization for acute lower limb ischemia showed better outcomes in early-presented patients than in late-presented patients. The limb salvage rate was higher in early presented patients than delayed presented patients, and the difference was statistically significant. Moreover, hospital stay, 30-day mortality and amputation rate were significantly higher in delayed presented patients compared to early presented patients.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

SSA: Conception, study design, drafting the manuscript, critical review, approval of the final version to be published.

STA: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Wang SK, Murphy MP, Gutwein AR, Drucker NA, Dalsing MC, Motaganahalli RL, et al. Perioperative outcomes are adversely affected by poor pretransfer adherence to acute limb ischemia practice guidelines. Ann Vasc Surg 2018; 50:46-51. doi: 10.1016/j.avsg.2017.11.050.

2. Cho SB, Choi HC, Lee SM, Na JB, Park MJ, Shin HS, et al. Combined treatment (image-guided thrombectomy and endovascular therapy with open femoral access) for acute lower limb ischemia: Clinical efficacy and outcomes. PLoS One 2019; 14(11): e0225136. doi: 10.1371/journal.pone.0225136.
3. Hemingway J, Emanuels D, Aarabi S, Quiroga E, Tran N, Starnes B, et al. Safety of transfer, type of procedure, and factors predictive of limb salvage in a modern series of acute limb ischemia. J Vasc Surg 2019; 69(4): 1174-1179. doi: 10.1016 /j.jvs.2018.08.174.
4. Ram BL, George RK. Nontraumatic acute limb ischemia–presentation, evaluation, and management. Indian J Vasc Endovasc Surg 2017; 4(4): 192. doi: 10.4103/ijves.ijves_60_17.
5. Gerhard-Herman MD, Gornik HL, Barrett C, Barshes NR, Corriere MA, Drachman DE, et al. 2016 AHA/ACC Guideline on the Management of Patients with Lower Extremity Peripheral Artery Disease: Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Circulation 2017; 135(12): e686-e725. doi: 10.1161/CIR.0000000000000470.
6. Khan MI, Nadeem IA. Revascularization of late-presenting acute limb ischaemia and limb salvage. J Ayub Med Coll Abbottabad 2016; 28 (2): 262-266.
7. Nagarsheth KH, Nassiri N, Shafritz R, Rahimi S. Delayed revascularization for acute lower extremity ischemia leads to increased mortality. J Vasc Surg 2016; 63(1): 121S-122S.
8. von Keudell AG, Weaver MJ, Appleton PT, Bae DS, Dyer GS, Heng M, et al. Diagnosis and treatment of acute extremity compartment syndrome. Lancet 2015; 386(10000): 1299-1310. doi: 10.1016/S0140-6736(15)00277-9.
9. Miyake K, Kikuchi S, Kitani Y, Koya A, Takeuchi T, Hasebe N, et al. Successful Simultaneous Revascularization for Acute Limb Ischemia and Concomitant Acute Myocardial Infarction. Ann Vasc Dis 2018; 11(3): 361-364. doi:10.3400/avd.cr.18-00059.
10. Duff S, Mafilios MS, Bhounsule P, Hasegawa JT. The burden of critical limb ischemia: a review of recent literature. Vasc Health Risk Manag 2019; 15(1): 187-208. doi: 10.2147/VHRM.S209241.
11. Saint-Maurice PF, Troiano RP, Berrigan D, Kraus WE, Matthews CE. Determinants of long-term outcomes and costs in the management of critical limb ischemia: a population-based cohort study. J Am Heart Assoc 2018; 7(16): e009724. doi:10.1161 /JAHA.118.008528
12. Chaudhari HK, Vivekanand, Motukuru V, Sumanthraj KB, Rodney SR, Vishal H, et al. A comparative study of postrevascularization limb salvage rate in early versus delayed presentation of rutherford class IIb acute lower extremity ischemia. Indian J Vasc Endovasc Surg 2020; 7(1): 58-62.
13. Baril DT, Patel VI, Judelson DR, Goodney PP, McPhee JT, Hevelone ND, et al. Outcomes of lower extremity bypass performed for acute limb ischemia. J Vasc Surg 2013; 58(4): 949-956. doi: 10.1016/j.jvs.2013.04.036.
14. Agarwal S, Sud K, Shishehbor MH. Nationwide trends of hospital admission and outcomes among critical limb ischemia patients: from 2003-2011. J Am Coll Cardiol 2016; 67(16): 1901-1913. doi: 10.1016/j.jacc.2016.02.040.
15. Malyar NM, Freisinger E, Meyborg M, Lüders F, Fürstenberg T, Kröger K, et al. Low rates of revascularization and high in-hospital mortality in patients with ischemic lower limb amputation: morbidity and mortality of ischemic amputation. Angiology 2016; 67(9): 860-869. doi: 10.1177/0003319715626849.
16. Rothenberg KA, George EL, Trickey AW, Chandra V, Stern JR. Delayed Fasciotomy Is Associated with Higher Risk of Major Amputation in Patients with Acute Limb Ischemia. Ann Vasc Surg 2019; 59(NA): 195-201. doi: 10.1016/j.avsg.2019.01.028.
17. Siddique A, Imtiaz N, Pervaiz, Ali K, Ahmad R, Haider F. Outcome of embolectomy in patients presenting late with acute limb ischemia. J Ayub Med Coll Abbottabad 2020; 32(2): 263–265.
18. Kempe K, Starr B, Stafford JM, Islam A, Mooney A, Lagergren E, et al. Results of surgical management of acute thromboembolic lower extremity ischemia. J Vasc Surg 2014; 60(3): 702-707.
19. Nekkanti MK, Suresh KR, Motukuru V, Kolalu S, Kabra A. Outcomes of limb and life in patients with acute lower limb schema presenting before and after the "golden six hours". Int J Adv Med 2018; 5(4): 788–797.
20. Ahmed MA, Karim A, Shah S, Ahmed SM. Outcome of Embolectomy in Patients Presenting Late with Acute Limb Ischemia. Med Forum 2020; 31(2): 44-46.

.....