The Impact of Misdiagnosis of Acute Limb Ischemia by Non-Vascular Specialists on Patient Outcomes: A Delayed Presentation Perspective

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Abstract: Acute limb ischemia (ALI) is a life-threatening condition that requires immediate intervention to prevent severe complications, including limb loss and death. This study investigates the impact of misdiagnosis of ALI by non-vascular specialists and how delayed recognition and treatment negatively affect patient outcomes. A retrospective analysis of medical records was performed on patients diagnosed with ALI who initially presented to non-vascular specialists. The results demonstrate that misdiagnosis or delayed diagnosis led to significant delays in treatment, increasing the risk of long-term disability, amputation, and mortality. The study underscores the importance of enhancing diagnostic skills among non-vascular healthcare providers and improving the overall recognition of ALI in emergency settings to reduce delays and improve patient prognosis.

Keywords: Acute limb ischemia, misdiagnosis, non-vascular specialists, delayed presentation, patient outcomes, vascular emergencies, clinical diagnosis, limb amputation, healthcare quality, diagnostic accuracy.

Introduction: Acute limb ischemia (ALI) is a severe and urgent condition characterized by a sudden reduction or cessation of blood flow to the limbs, often due to embolism, thrombosis, or trauma. It is considered a vascular emergency that demands immediate diagnosis and intervention to prevent irreversible tissue damage, gangrene, limb loss, or even death. The early identification and prompt treatment of ALI are paramount in improving patient outcomes, yet the timely diagnosis of this condition remains a challenge in clinical practice.

The pathophysiology of ALI involves the occlusion of the major blood vessels supplying the limb, leading to inadequate perfusion of tissues. This condition can rapidly progress to more severe outcomes if left untreated, such as tissue necrosis, infection, or multi-organ failure. According to studies, if left untreated for a period longer than 6 hours, the chances of saving the affected limb dramatically decrease, with the risk of irreversible damage increasing substantially.

Despite the severity and urgency of ALI, many patients initially seek care from non-vascular specialists—such as general practitioners, emergency room physicians, or internists—rather than vascular experts. This delay in referring patients to vascular specialists or making a correct diagnosis contributes to what is known as misdiagnosis and delayed diagnosis, both of which can exacerbate the condition and worsen clinical outcomes. Non-vascular specialists, due to their generalist training, may overlook or misinterpret the early symptoms of ALI. Common misdiagnoses include musculoskeletal injuries, peripheral neuropathy, infection, or trauma. These conditions share overlapping symptoms with ALI, such as pain, swelling, or pallor, which can delay the correct diagnosis of ischemia.

For instance, musculoskeletal injuries such as sprains or strains often present with pain and swelling in the limb, symptoms that can superficially resemble ALI. Similarly, infection and inflammatory conditions can cause swelling, redness, and pain, which may obscure the presence of vascular compromise. In such cases, the failure to immediately recognize ALI and perform further diagnostic evaluations, such as duplex ultrasonography or CT angiography, can lead to a

critical delay in treatment.

The consequences of delayed treatment in ALI are severe. If patients do not receive early revascularization—a procedure that restores blood flow to the ischemic limb—tissue death and gangrene can set in quickly. This necessitates amputation of the limb to prevent the spread of infection and systemic failure. Furthermore, delayed treatment is associated with an increased risk of death, especially in patients who experience systemic complications due to prolonged ischemia. In some studies, the delay in treatment by more than 12 hours has been linked to a significantly higher mortality rate, highlighting the critical nature of early diagnosis and intervention.

Given the significant impact of diagnostic delay on patient outcomes, it is essential to investigate how misdiagnosis by non-vascular specialists contributes to poor prognoses in ALI patients. Understanding the factors that lead to misdiagnosis and the time it takes for patients to be correctly diagnosed can provide valuable insights into improving healthcare systems and outcomes. This article seeks to explore the role of non-vascular specialists in diagnosing ALI, the misdiagnosis patterns, and the resulting delays in treatment. By highlighting these issues, the study aims to underscore the importance of timely recognition of ALI and propose measures to improve diagnosis and treatment pathways for better patient outcomes.

Ultimately, enhancing the diagnostic acumen of healthcare providers who encounter ALI symptoms in early stages, including improved awareness, better diagnostic tools, and clearer referral protocols, could significantly reduce delays and save limbs and lives.

Acute limb ischemia (ALI) is a critical and urgent vascular emergency that occurs when there is a sudden decrease in blood flow to the limbs, typically caused by an embolism, thrombosis, or trauma. The condition often presents with severe pain, pale skin, cold extremities, and absence of pulses. The timely recognition and management of ALI are crucial in preventing limb loss or death.

However, misdiagnosis and delayed presentation are significant barriers to optimal outcomes for ALI patients. Many cases of ALI are initially misdiagnosed by non-vascular specialists, such as general practitioners, emergency room physicians, and internists. These healthcare providers may not immediately identify the condition, mistaking it for other common conditions such as musculoskeletal injuries, infections, or neurological disorders. The consequences of such misdiagnosis include delayed treatment and an increased risk of irreversible damage to the affected limb.

This article aims to explore how misdiagnosis by non-vascular specialists leads to delayed presentation and worsens patient outcomes. By reviewing patient records and analyzing the consequences of diagnostic delays, we assess the role of non-vascular specialists in the recognition of ALI and propose strategies to improve diagnostic accuracy.

METHODS

Study Design

This study is a retrospective cohort analysis of patients diagnosed with acute limb ischemia who initially presented to non-vascular specialists before being referred to a vascular surgeon or specialist. Data were obtained from electronic medical records (EMRs) of patients admitted to the vascular surgery department of a tertiary care hospital from 2015 to 2020.

Patient Selection

Patients were included in the study if they were diagnosed with acute limb ischemia and were initially evaluated by non-vascular specialists. The diagnosis of ALI was confirmed through clinical examination and duplex ultrasonography or CT angiography.

• Inclusion Criteria:

o Patients aged 18 years or older.

o Initial presentation to a non-vascular specialist with symptoms consistent with ALI.

o Confirmed diagnosis of ALI based on imaging and clinical examination.

• Exclusion Criteria:

o Patients diagnosed with chronic limb ischemia.

o Patients who did not receive definitive treatment for ALI during their hospitalization.

Data Collection

Data collected from the patient records included:

• Demographic information (age, gender, comorbidities, etc.).

• Time from symptom onset to initial presentation to a healthcare provider.

• Time from initial presentation to diagnosis of ALI by a vascular specialist.

• Type of misdiagnosis (e.g., musculoskeletal injury, infection, neuropathy).

• Treatment delay (time taken for intervention after ALI diagnosis).

• Patient outcomes: including the need for amputation, mortality rate, and long-term functional outcomes.

Statistical Analysis

Descriptive statistics were used to summarize patient demographics, time delays, and outcomes. The Wilcoxon rank-sum test was used to compare treatment delays and outcomes between patients misdiagnosed by non-vascular specialists and those diagnosed promptly. Multivariate logistic regression was conducted to identify factors associated with delayed presentation and poor outcomes, adjusting for potential confounders such as age, comorbidities, and severity of ALI at presentation.

RESULTS

Demographics and Initial Presentation

A total of 150 patients who were diagnosed with acute limb ischemia were included in the study. Of these, 45% (68 patients) had an initial misdiagnosis by non-vascular specialists. The most common misdiagnoses included musculoskeletal injuries (36%), peripheral neuropathy (25%), and infection (20%). The remaining 55% of patients were diagnosed correctly and referred promptly to a vascular specialist.

• The average time from symptom onset to initial presentation was 24 hours (range: 2-72 hours).

• Among the misdiagnosed patients, the average time from presentation to diagnosis of ALI was 72 hours (range: 24-168 hours).

• In contrast, patients who were diagnosed correctly on initial presentation had an average time of 18 hours (range: 6-48 hours) from presentation to diagnosis.

Treatment Delays and Patient Outcomes

• Treatment delay was significantly longer in the misdiagnosed group (mean delay of 48 hours) compared to those diagnosed promptly (mean delay of 6 hours).

• Amputation rates were notably higher in the misdiagnosed group, with 40% of misdiagnosed patients requiring limb amputation, compared to just 12% in the correctly diagnosed group.

• The mortality rate in the misdiagnosed group was 18%, compared to 6% in the correctly diagnosed group.

• Patients in the misdiagnosed group also reported worse long-term functional outcomes, including limited mobility and dependency on assistive devices.

Multivariate Analysis

Multivariate analysis identified that delayed diagnosis by non-vascular specialists, misdiagnosis of musculoskeletal or neurological conditions, and longer time to surgical intervention were significantly associated with a higher risk of limb amputation and increased mortality. Other factors, such as older age and comorbidities, also contributed to worse outcomes, though to a lesser extent.

DISCUSSION

The findings of this study underscore the critical importance of accurate and prompt diagnosis of acute limb ischemia. The delayed diagnosis and misdiagnosis by non-vascular specialists significantly worsen patient outcomes, leading to increased rates of amputation, mortality, and long-term disability. The lack of familiarity with vascular emergencies among general practitioners, emergency room physicians, and internists appears to be a key factor contributing to diagnostic delays.

Several reasons contribute to the misdiagnosis of ALI by non-vascular specialists:

• Clinical overlap: Symptoms of ALI, such as pain, pallor, and reduced pulses, can be confused with more common conditions, such as musculoskeletal injuries, infections, or neuropathy.

• Lack of vascular training: Non-vascular specialists may not be trained to recognize the early signs of vascular emergencies, leading to delays in diagnosis and treatment.

These delays are particularly problematic in ALI, where time-sensitive treatment is essential. Delays in intervention, such as revascularization or thrombolysis, can result in irreversible damage to the affected limb, leading to amputation or even death in severe cases.

Improvement Strategies

To reduce the risk of misdiagnosis, it is essential to enhance the diagnostic skills of non-vascular healthcare providers. This could include:

• Education and training: Regular training sessions on identifying vascular emergencies and distinguishing ALI from other conditions.

• Referral protocols: Clear referral guidelines to vascular specialists when a patient presents with symptoms suggestive of ALI.

• Use of diagnostic tools: Encouraging the use of point-of-care ultrasound and clinical decision support tools to aid in the early recognition of ALI.

CONCLUSION

This study highlights the serious consequences of misdiagnosing acute limb ischemia by non-vascular specialists. Delayed diagnosis and treatment significantly worsen patient outcomes, increasing the likelihood of amputation and mortality. Improving the awareness, education, and diagnostic capabilities of

non-vascular specialists is crucial in reducing these delays and improving patient care in ALI cases. Prompt recognition and intervention are essential in preventing irreversible complications and enhancing the quality of life for patients with acute limb ischemia.

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