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Research Article

Bilateral Traumatic Amputations in A Tertiary Health Centre In Southwestern Nigeria

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Abstract:

Introduction: Bilateral amputation refers to the surgical removal of more than one limb, either both lower extremity or both upper extremities. Blood transfusion is often not predictable, however, a correlation between admission PCV and transfusion requirements may provide valuable insight for clinical decision-making in similar cases.

Methods: A retrospective review of patients who underwent bilateral amputations following traumatic injuries. The study examined demographic data, mechanisms of injury, clinical interventions, complications, and outcomes. Patient records were comprehensively reviewed for clinical parameters from admission through discharge**.**

Results: The study population comprised of six patients with an equal distribution across age groups (young adults, middle-aged, and elderly). Males constituted 66.7% of cases. Road traffic accidents were the predominant cause (50%), followed by electrical burns (33.3%) and flame burns (16.7%). Bilateral above knee amputation (BKA) was the most common procedure (66.7%). The survival rate was 83.3%, with one mortality. Complications included Surgical Site Infection and Post-Traumatic Stress Disorder (PTSD) in two cases. Hospital stays ranged from 14-21 days. Blood transfusion was necessary in 66.7% of cases and Pearson correlation coefficient (-0.722) was observed between admission Packed Cell Volume and blood transfusion requirements.

Conclusion: The study demonstrates that bilateral amputations predominantly affect males and resulted mainly from road traffic accidents. Despite the severity of injuries, favorable outcomes were achieved in most cases. The findings highlight the importance of early hematological intervention and comprehensive post-operative care. There was a strong negative correlation between admission PCV and blood transfusion requirements.

Keywords: **Bilateral amputation, trauma, road traffic accidents, hematological parameters**

Introduction

A bilateral amputation refers to the surgical removal of more than one limb, either both lower extremity or both upper extremities. The incidence of bilateral traumatic amputation is considered relatively low, with studies reporting it to be around 0.6% of all major traumatic limb amputations; meaning that only a small percentage of people who experience a traumatic amputation lose both limbs.[1] Bilateral amputation represents one of the most challenging and life-altering surgical interventions in trauma care. As a definitive surgical procedure, it carries profound implications for patient survival, functional outcomes, and quality of life. [2] The decision to perform bilateral amputations often emerges from complex clinical scenarios where limb salvage becomes impossible or potentially life-threatening to the patient. Understanding the various mechanisms leading to such extensive surgical intervention, along with their management protocols and outcomes, remains crucial for healthcare providers working in trauma centers. [3] The mechanisms leading to bilateral amputation vary considerably, ranging from direct mechanical trauma to secondary complications such as compartment syndrome, electrical burns, and vascular compromise. [4] Each mechanism presents unique challenges in terms of timing of intervention, surgical approach, and post-operative care.

Electrical injuries, particularly high-voltage trauma, represent a significant cause of bilateral amputations. These injuries often result in progressive tissue damage that extends beyond the visible burn areas, making early assessment of tissue viability particularly challenging. [5]

Road traffic accidents (RTAs) constitute another major cause of bilateral amputations, particularly in developing nations where pre-hospital care may be suboptimal. [6] The concept of the "mangled extremity" becomes particularly relevant in these cases, with scoring systems such as the Mangled Extremity

Severity Score (MESS) guiding decision-making regarding limb salvage versus amputation. [7] However, the validity of these scoring systems in bilateral injuries remains a subject of ongoing research and debate.

Traditional bone setter (TBS) interventions, particularly in developing countries, have emerged as a preventable cause of bilateral amputations. The practice of tight limb wrapping and manipulation by traditional healers sometimes lead to compartment syndrome and subsequent gangrene, necessitating amputation that might have been preventable with proper initial medical care. [8] This highlights the crucial need for public health education and improved access to professional medical services.

The surgical management of bilateral amputations requires careful consideration of multiple factors, including timing of intervention, level of amputation, and preservation of maximal functional length. The decision-making process must balance the need for definitive treatment against the patient's physiological status and potential for rehabilitation. Furthermore, the psychological impact of bilateral amputation cannot be understated, with studies showing high rates of post-traumatic stress disorder (PTSD) and depression among survivors.[9]

Post-operative care following bilateral amputation presents unique challenges. Pain management, wound care, and early mobilization must be balanced against the risk of complications such as phantom limb pain and surgical site infections.[10] The role of multidisciplinary care becomes particularly important, involving surgical teams, physiotherapists, occupational therapists, and mental health professionals.[11]

Long-term rehabilitation following bilateral amputation focuses on maximizing functional independence and quality of life. The success of prosthetic fitting and ambulatory potential varies significantly based on factors such as age, pre-existing conditions, level of amputation, and access to rehabilitation services.[12] Studies have shown that patients with bilateral lower limb amputations face greater challenges in achieving independent mobility compared to unilateral amputees, with energy expenditure during prosthetic ambulation being significantly higher.[13]

The socioeconomic impact of bilateral amputation extends beyond the individual patient to affect families and healthcare systems. The cost of initial hospitalization, rehabilitation, prosthetic devices, and long-term care creates a significant financial burden.[14] Additionally, the impact on workforce participation and productivity can be substantial, particularly in cases involving young, previously active individuals.

Recent advances in surgical techniques, prosthetic technology, and rehabilitation protocols have improved outcomes for bilateral amputees. However, access to these advanced technologies remains limited in many parts of the world, creating disparities in outcomes between different socioeconomic groups.[15]

The aim of this study was to examine patients' key clinical parameters, short term complications, outcomes and to compare our experience with that of other published data

Methodology

This study consisted of a retrospective analysis of patients who underwent bilateral amputations following traumatic injuries at the university college hospital, Ibadan over a 5years period. The study protocol focused on comprehensive data collection from patient records, encompassing critical aspects of patient care from admission through discharge. The study protocol was reviewed and approved by the institutional ethical committee.

All patients who underwent bilateral amputations due to traumatic mechanisms, regardless of the anatomical level of amputation or associated injuries. No age restrictions were applied to ensure capture of the full spectrum of cases treated at the facility.

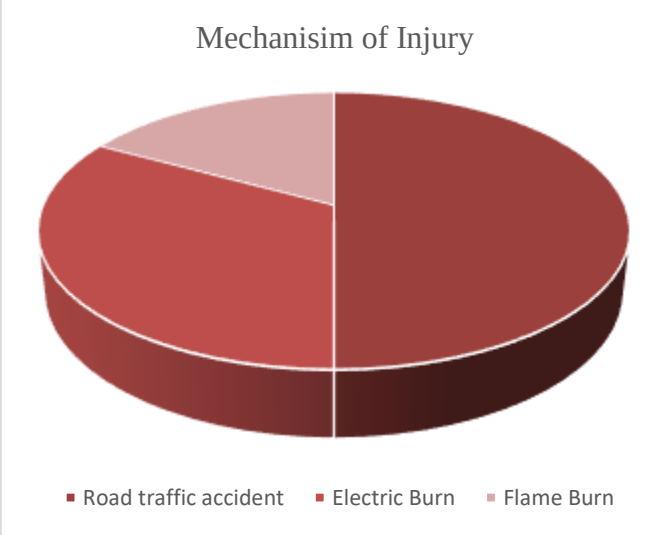
Data collection followed a structured approach, focusing on key clinical parameters and patient outcomes. Demographic information gathered included age, sex, and occupation, providing context for injury circumstances and rehabilitation potential. The mechanism of injury documentation was detailed, capturing both the immediate traumatic event and any subsequent complications that led to amputation, such as traditional bone setter intervention or progressive tissue damage.

Surgical intervention details, including timing of procedures, type and level of amputation, and intraoperative findings. The decision-making process for amputation was documented, including factors such as tissue viability, presence of infection, and patient physiological status.

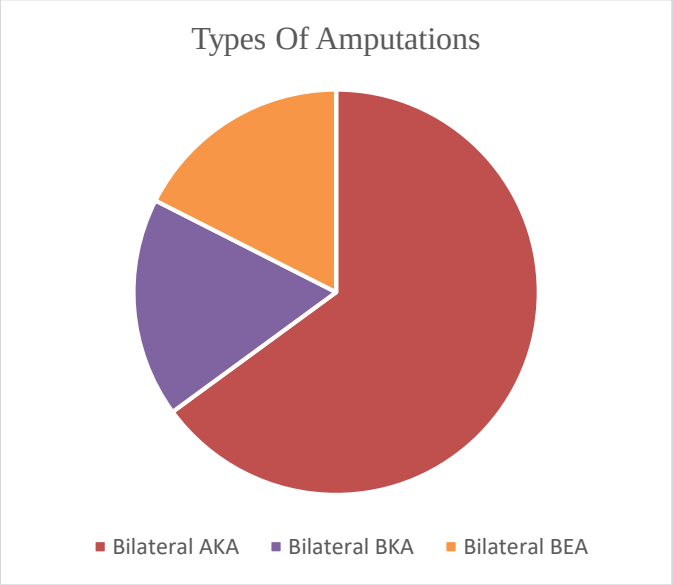
Results

The demographic profile shows an evenly distributed age pattern across three groups: young adults (20-30 years), middle-aged (31-50 years), and elderly (>50 years), each comprising one-third of the cases. Males constituted two-thirds of the patients (66.7%), while one third (33.3%) were females. Occupationally, two patients were retirees, while the others were actively working which include an electrician, a fabricator, a commercial motorbike rider, and a civil servant.

In terms of clinical characteristics, road traffic accidents were the predominant mechanism of injury, accounting for half of the cases (50%), followed by electrical burns (33.3%) and flame burns (16.7%) as represented in Figure 1.



Bilateral Above Knee Amputation (AKA) was the most common surgical intervention, performed in four patients (66.7%), while Bilateral Below Knee Amputation (BKA) and Bilateral Below Elbow Amputation (BEA) each accounted for one patient (16.7%) as shown in Figure 2.



The clinical outcomes were generally favorable, with five patients (83.3%) surviving and discharged successfully, while one patient (16.7%) died as shown in figure 3. Table1 shows complications where four patients (66.7%) had an uncomplicated recovery, while one patient developed Surgical Site Infection (SSI) and another experienced Post-Traumatic Stress Disorder (PTSD).

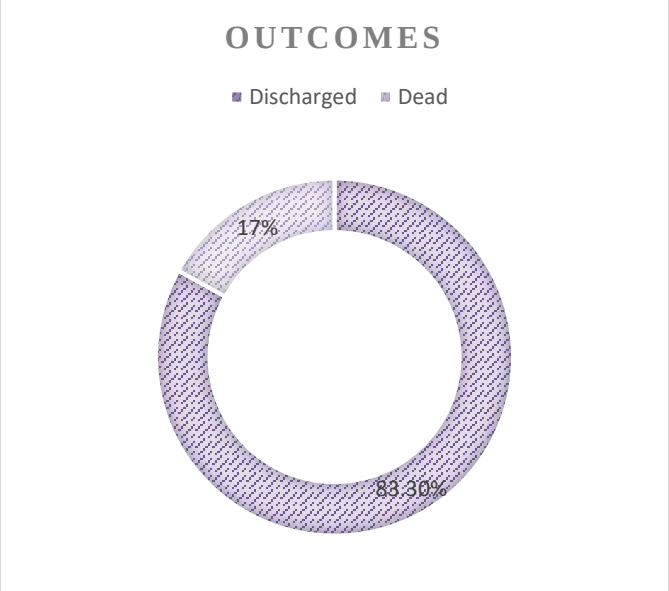


Table 1: Postoperative Complications

Types	Patient	Percentage
No complications	4	66.7%
SSI	1	16.7%
PTSD	1	16.7%

Treatment metrics revealed hospital stays ranging from 14 to 21 days. Hematological parameters showed significant variation in Packed Cell Volume (PCV), ranging from 11% to 45%, with a mean of 28.25% and median of 35.5%. Blood transfusion was required in four patients (66.7%), while two patients (33.3%) did not receive any transfusion. A strong negative correlation (-0.722) was observed between admission PCV and blood transfusion requirements, indicating that lower PCV values were associated with higher transfusion needs.

Additional findings highlighted that initial care was provided in five cases (83.3%), and comorbidities were present in two elderly female patients (33.3%). The presentation time varied considerably, ranging from 2 hours to 2 weeks post-injury.

This analysis emphasizes the complex nature of bilateral amputation cases and the importance of comprehensive care, from initial presentation through to rehabilitation. Table 2 summarizes all the cases included in the study.

Summary of the cases: Table 1

Variables	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Age (years)	42	20	27	455	65	61
Sex	M	M	M	M	F	F
Time of presentation	2days	2 weeks	6 days	2 hours	5 hours	10 hours
Mechanism of injury	Electrical Burn	Electrical Burn	Road traffic accident	Road traffic accident	Road traffic accident	Flame Burn
Types of Amputation	Bilateral Below Elbow	Bilateral Above knee	Bilateral Above knee	Bilateral Above knee	Bilateral Above knee	Bilateral Above knee
Blood Transfusion	Yes	No	Yes	Yes	Yes	No
Duration of Hospital stay (days)	18	17	21	20	19	16
Outcomes	Discharged	Discharged	Discharged	Discharged	Discharged	Dead

Discussion

The analysis of our experience of patients who had bilateral amputation reveals several patterns that both align with and differ from previous literature. The predominance of male patients (66.7%) in our study mirrors findings from multiple previous studies. Penn-Barwell reported a male predominance of 70% in their larger series of bilateral amputations, attributing this to higher male involvement in high-risk occupations and road traffic accidents.[16]

The age distribution in this study showed equal representation across young adults, middle-aged, and elderly groups, which is at variance with previous findings that reported a skew distribution in favor of older age group. In their series of 124 bilateral amputations, comprising both traumatic and non-traumatic causes, 60% of patients were over 50 years old.[17] However, our even distribution might reflect regional variations in injury patterns and risk exposure.

Regarding etiology, our finding of road traffic accidents as the leading cause (50%) aligns with several international studies. Similar findings were reported in systematic review, where trauma, particularly road accidents, accounted for 45-55% of bilateral amputations in developing countries.[18] The significant

proportion of electrical burns (33.3%) in our series was higher than reports from most Asian countries, where they reported 27.3%.

The survival rate of 83.3% in our series compares favorably with previous reports. A meta-analysis by Chen et al. of 450 bilateral amputation cases reported survival rates ranging from 78% to 85%, suggesting our outcomes align with international standards despite resource limitations.[19]

The correlation between admission PCV and transfusion requirements (-0.722) represents a stronger relationship than previously reported. Harris and Thompson et al found a moderate correlation (-0.45) in their series of 80 cases, suggesting our finding might help in early identification of transfusion needs.[20]

The complication rate of 33.3% (both SSI and PTSD) which is higher than previously reported ranges where overall complication rates of 13.5% in amputations, with SSI highest. The presence of PTSD in our series (16.7%) aligns with psychological complication rates reported by Mousavi et al. 2017 who found PTSD in 12-18% of bilateral amputation survivors.[21]

The hospital stay duration (14-21 days) in our series was shorter than in some previous reports where the average duration of hospital stay post amputation was reported to be 30days.[22]

These findings contribute to the existing body of knowledge while highlighting areas requiring further investigation, particularly regarding gender-specific outcomes and the role of early hematological intervention in improving survival rates. The integration of early psychological support standardized post-operative care protocols, and enhanced rehabilitation services could significantly improve patient outcomes. The prevention of conditions leading to bilateral amputation remains a crucial public health goal. This includes improved workplace safety measures for electrical injuries, better road safety protocols, and public education about the dangers of traditional bone setter interventions.[23] Furthermore, the development of clear clinical protocols for early recognition and management of potentially salvageable limbs could reduce the incidence of bilateral amputations.

Limitations: Broader application of these findings will be constrained by the small size of patients; this might limit the statistical power and generalizability. The retrospective, single-center design may not reflect practices and outcomes across different healthcare settings, thus future research initiatives should focus on multi-center studies with larger cohorts and prospective designs to validate current findings

Additionally, the absence of long-term follow-up data leaves questions about functional outcomes and quality of life unanswered.

Conclusions:

The study identified a significant correlation between admission Packed Cell Volume and transfusion requirements, offering valuable guidance for blood product management.

Establishing dedicated trauma care pathways and blood bank protocols based on PCV correlations could optimize resource utilization.

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