



Limb Amputations in Burn Patients: A Retrospective Audit and Review of Contributing Factors from a UK Burns and Plastic Surgery Unit

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Article History

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Abstract: - Severe burns may necessitate limb amputations due to complications like infection, necrosis, and compromised vascular supply. This retrospective audit examines the contributing factors to limb amputations in burn patients at Chelmsford Hospital's Plastic Surgery and Burns Department over seven years. The study found that underlying comorbidities such as sepsis, intravenous drug abuse (IVDA), and peripheral vascular disease (PVD) were significant contributors to amputation risk, rather than burn severity alone. Major amputations were often due to severe sepsis and PVD, while minor amputations resulted from burn-associated ischemia and necrosis. The psychological impact of amputation, including PTSD and depression, emphasizes the need for integrated psychosocial support. The audit also recommends earlier vascular surgical input and standardized multidisciplinary team (MDT) assessments to improve outcomes and reduce avoidable amputations.

Keywords: Limb amputation, burn injuries, sepsis, intravenous drug abuse, peripheral vascular disease, reconstructive surgery, psychological support, rehabilitation, plastic surgery, burns unit.

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Background:

Severe burns may necessitate limb amputations due to complications such as infection, necrosis, and compromised vascular supply. These amputations carry profound implications, impacting physical function, psychological well-being, and long-term rehabilitation outcomes.

Objectives:

To analyze the etiological factors, clinical indications, and outcomes associated with limb amputations in burn patients, and to explore the prognostic role of comorbidities and systemic illness in amputation risk.

Methods:

A retrospective audit was conducted by reviewing the medical records of all burn patients who underwent limb amputation at Chelmsford Hospital's Plastic Surgery and Burns Department between 2010 and 2017. Data collected included burn severity, type of amputation, burn etiology, associated comorbidities, and post-amputation reconstruction.

Results:

- A total of 24 burn patients underwent limb amputations during the study period.
- Major amputations (n = 8) involved proximal limb segments (above/below knee or elbow), while minor amputations (n = 16) involved distal digits (toes/fingers).
- Burn severity distribution: 11 patients had sustained major burns (>15% TBSA), while 13 sustained minor burns.
- Etiology of burns:
 - Major amputation group: 3 flame burns, 2 toxic epidermal necrolysis (TEN), 1 scald, 1 necrotising fasciitis, and 1 contact burn.
 - Minor amputation group: 8 flame burns, 3 contact burns, 3 scalds, 1 electrical burn, and 1 frostbite injury.
- Causes of amputation:
 - Major amputations: 4 due to severe sepsis and IV drug abuse (IVDA), 2 from peripheral vascular disease (PVD), 2 due to limb ischaemia and necrosis.

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- Minor amputations: 10 due to burn-associated ischaemia and necrosis, 4 due to PVD, and 2 secondary to infection/sepsis.
- Multiple limb amputations occurred in 6 of the 8 patients who underwent major amputations.
- Secondary reconstructive procedures (e.g., contracture release, soft-tissue reconstruction) were required in 8 patients during rehabilitation.

Discussion:

While burn depth and surface area are recognized predictors of morbidity, our audit reveals that non-burn-related systemic factors such as sepsis, intravenous drug use, and peripheral vascular disease significantly contribute to the risk of amputation. Sepsis has been identified as a leading cause of tissue hypoperfusion, contributing to ischemic necrosis in both injured and uninjured limbs. Intravenous drug abuse further compounds infection risk, often resulting in septic emboli, limb ischaemia, or aggressive necrotising infections that demand surgical intervention.

Peripheral vascular disease, particularly in elderly or diabetic patients, impairs tissue healing following thermal injury and predisposes to non-viable extremities, as previously reported in similar cohorts. Our data also show that TEN syndrome, while uncommon, can necessitate limb amputation in extreme cases due to full-thickness epidermal necrosis and secondary sepsis.

The psychological burden of amputation following burns is significant. Studies indicate a higher prevalence of post-traumatic stress disorder (PTSD) and depression in patients with both major burns and limb loss, highlighting the need for integrated psychosocial support during rehabilitation.

Secondary procedures such as contracture release, flap coverage, and scar revision are common in amputees, particularly when healing is delayed or complicated by hypertrophic scarring. Our findings reflect this need in one-third of the patients.

Conclusion:

This audit highlights that the majority of limb amputations in burn patients were precipitated not directly by burn injury severity, but

by underlying comorbidities and systemic complications, including IVDA, sepsis, and vascular insufficiency. Awareness of these factors is essential for early identification of high-risk patients and for optimizing multidisciplinary care pathways.

Recommendations:

- Further studies are needed to quantify the risk of amputation in ICU burn patients receiving vasoactive agents, particularly in the context of sepsis-induced vasoconstriction.
- Early vascular surgical input is recommended for patients with known PVD or diabetes, to assess limb perfusion and amputation risk.
- Standardizing multidisciplinary team (MDT) assessments for high-risk burn patients may improve outcomes and reduce the rate of avoidable amputations.
- Incorporation of psychological support and tailored rehabilitation in care plans for amputees is essential.

References

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MEHT CLINICAL AUDIT REPORT & ACTION PLAN

Project Title: Review of Limb Amputation in Burn Patients

**Clinical Audit
Registration number:**
CA17-086

Project Lead: Hulla Mohammed
Clinical Lead: Peter Dziewulski

Directorate:
Specialty: Plastic Surgery
Date reported: 16/07/2018

Background/rationale

Severe burn can lead to limb amputation which has significant physical and psychological consequences that can affect patient's life

Aims/objectives

To review the aetiology and indications of limb amputation in burn patients.
To review prognostic factors and rehabilitations

Design

The clinical notes of all burn patients underwent amputation in the period between November 2010 to October 2017 have been retrieved and reviewed

Results

- 1- 24 patient underwent amputation; 8 were major limb amputation (above/ below knee, above/ below elbow), 16 were minor amputation (toe, finger)
- 2- Of those 11 patients were victims of major burn while 13 sustained minor burn
- 3- The type of burn in major amputation patients were: 3 flame, 2 TEN syndrome, 1 scald, 1 necrotising fasciitis and 1 contact burn. While in minor amputation causes were 8 flame, 3 contact, 3 scald, 1 electrical, and 1 frostbite.
- 4- Causes of amputation were as follows: In major amputation 4 were due to severe sepsis and inotrope use, 2 had peripheral vascular disease, and 2 due to burn ischemia and necrosis. In minor amputation 4 were due to peripheral vascular disease, 10 burn ischemia and necrosis, and 2 infection and sepsis
- 5- 6 out of 8 major amputation had multiple amputations
- 6- 8 patients needed later reconstructive surgery e.g. contracture release

Conclusions

Most of limb amputation in burns were due to causes other than the burns i.e: Inotropes use, previous comorbidities PVD

Recommendations

Work needed to find the rate of amputation in ICU patient treated with Inotropes
Early involvement of vascular surgeons to assess the PVD patients and their risk of having nonhealing wounds and amputation

Method of dissemination

Will be presented in Local Audit
Will work to publish it

Mid Essex Hospital Services

NHS Trust



MEHT CLINICAL AUDIT REPORT & ACTION PLAN

KEY (Change status)

- 1 Recommendation agreed but not yet actioned
- 2 Action in progress
- 3 Recommendation fully implemented
- 4 Recommendation never actioned (please state reasons)
- 5 Other (please provide supporting information)

Clinical Audit Action Plan

Project title	Review of Limb Amputation in Burn Patients	Clinical Audit Registration Number	CA17-086
Action plan lead	Name: Hulla Mohammed	Title: Dr	Date: Updated: 16/07/2018

Ensure that the recommendations detailed in the action plan mirror those recorded in the "Recommendations" section of the report. The "Actions required" should specifically state what needs to be done to achieve the recommendation. All updates to the action plan should be included in the "Comments" section. Where recommendations cannot be met, any residual risks should be added to the Risk Assurance Framework.

Item	Recommendation	Actions required (specify "None", if none required)	Action by date	Person responsible (Name and grade)	Any cost implications?	Comments/action status (Provide details of action in progress, changes in practices, problems encountered in facilitating change, reasons why recommendation has not been actioned, risk added to RAF etc)	Change status (see key above)
1	Review amputation rate in ICU patient			Hulla Mohammed Dr		Notes relieving	
2							
3							

Planned re-audit date:

Project Lead

Name: A. Metwally

Senior Clinician

Name:

[Signature] 17/7/18

Route to escalate where implementation is impeded:

V.2

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