Following the Flame: Amputations in Burn Victims

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Abstract

Infection, sepsis, tissue necrosis and decreased blood volume are just some of the life-threatening factors to consider when treating severely burned patients.[1] Electrical Burns are much more common in young men but overall are a relatively rare pathology.[2] For so many patients, amputations are a measure used to remove gangrenous and infected tissue thereby increasing the patients' chance of survival.[1]

Background

A 14 y.o. Caucasian male (aka patient X) with no PMH presents to the emergency department after suffering a fall resulting in partial and full thickness electrical burns covering >75% of his body. Upon admission, it was determined the majority of 3rd degree burns covered the distal extremities.

Methodology

A number of life-saving amputations were performed on patient X. Minor amputations include digits and major amputations comprise the loss of a limb or extremity as designated in Table I. Sections of the amputations were evaluated histologically to determine viability of the margin and confirm surgical rationale for limb removal. In this patient, minor amputations were often followed by removal of the entire extremity as the primary care team tried to preserve patient X's functionality.

Extremity Amputated	Cause of Amputations	Number of Amputations
Hand and Forearm	Necrosis	2
Foot and ankle	Infection	1
Toes	Necrosis; Trauma	3

Table I: Amputations for patient X

Hypothesis

Utilizing amputations for severely burned patients can significantly *decrease* the overall surface area that is burned and therefore *increase* the survival rate of victims whose injuries can be removed rather than treated traditionally.

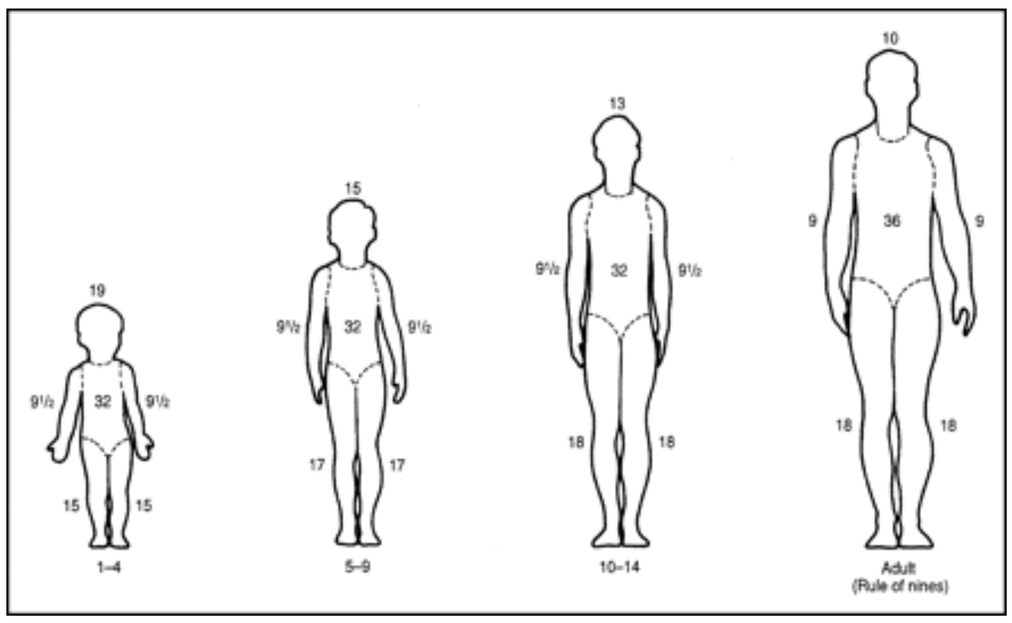

Figure I: The 'rule of 9s' is a quick way to assess the extent of burns on a patient based on body location. This figure from Herndon is adapted for pediatric cases.[4]

Gross and Microscopic Data

Grossly the PA should…

- Measure the resection margin to the most distal portion of the amputation and the boney margin to the soft tissue margin
- Describe any disturbances in the skin and underlying bone
- Show areas of interest in relation to normal tissue – to demonstrate a clear margin

Microscopically…

- Look for areas of inflammation and necrosis
- Assess the vasculature for occlusion and margin for signs of necrosis or infection

Discussion

Although a relatively rare occurrence, encompassing only about 5% of hospital burn admissions a year[3], these injuries require a multidisciplined approach during treatment for the best outcome. What becomes of increasing importance throughout the process is the patient's pain level and considering their quality of life following treatment.

- Pediatric patients contribute the highest percentage of electrical burn victims per year.[5]
- Electrical burns have the highest amputation rate and result in the most major amputations.[2]
- Amputations can result in stump sensitivity and muscle atrophy which can prevent successful prosthetic use.
- In pediatric patients, major amputations can significantly change the total surface area of the body and the burn.[5]

Figure II: Below the elbow amputation for necrosis

Figure III: Foot amputation due to infection

Important Sections

- <u>Bone, soft tissue & skin margin</u>: ensure the surgical margin is clear of necrosis microscopically
- <u>Vascular margin:</u> assess patency to prevent further damage to the limb
- <u>Ulceration with underlying bone</u>: show depth of invasion and damage to the limb – try to show relationship to normal tissue
- <u>Photographs</u>: demonstrate areas of interest, skin slippage and overall appearance in a concise manner

Results

In an effort to reduce irreversible damage, the necrotic limbs were removed shortly after admission to the emergency department as demonstrated in Figure II. A skin flap and fat pad was left for a prosthetic attachment during later recovery. The removal of these extremities awards the patient a higher probability of survival even though it resulted in permanent disability. The open wounds left patient X at risk for an infection and his foot was removed to prevent sepsis (figure III). Continued debridement of the wounds proved to be an effective treatment following the amputations. Patient X is anticipated to make a full recovery and is working with physical therapy to be fitted for numerous prosthetics.

Conclusion

- Amputations decrease the surface area of a patient, in burn victims this can change the percentage of the body that is damaged as demonstrated in figure I.
- Although a radical approach, amputations improve the survival odds of burn victims and can reduce recovery time.[2]

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