


A case of bowel perforation secondary to burn conversion

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Summary

Burn conversion is a process by which superficial partial-thickness burns spontaneously progress into deep partial-thickness or full-thickness wounds. Factors that influence this process centre around poor perfusion which can be related to either too much or too little fluid resuscitation, infection, free radical damage, and metabolic or nutritional derangements. Therein lies the role of preventative strategies, i.e., adequate fluid resuscitation, prompt identification and management of sepsis, correction of electrolyte derangements and early institution of feeds. Prevention of burn conversion could prevent the need for surgical intervention and improve the morbidity and mortality of burns patients.

Keywords: burns, burn conversion, fluid resuscitation, bowel perforation

Background

The depth and total body surface area (TBSA) of a burn wound influence morbidity and mortality. Depth of the wound determines wound management principles. Wounds that are deep partial-thickness or full-thickness will require skin grafting and carry an increased morbidity, increased length of hospital stay, and scar formation compared to superficial partial-thickness burns that heal spontaneously. Inappropriate initial resuscitation of a burn could compromise the recovery process by means of burn conversion. Poor wound care and the development of wound infection is another common cause of burn wound conversion. The case below exhibits an extreme case of burn conversion, where the superficial partial-thickness burn developed into full-thickness and essentially eroded through the anterior abdominal wall and into the peritoneal cavity. The risk factors are presented below to highlight preventative strategies of burn conversion.

Case presentation

The patient was a previously healthy seven-month-old who sustained a superficial partial-thickness scald to the abdomen and thighs. He was admitted and managed at the district hospital and was not referred to the local burn service for advice or transfer. On day ten, the baby was referred to the paediatric surgery department. The child now presented with bowel evisceration through a pre-existing umbilical hernia that had perforated. The burn wound was overlying the umbilical hernia and now appeared as a deep burn wound. The patient was taken to theatre, where the perforation was repaired, and the umbilical hernia repaired through an infra-umbilical incision. The burn wounds were cleaned and dressed, and skin grafted a week later.

The initial insult was a partial-thickness burn that was complicated by poor wound care and local sepsis, which



resulted in conversion to a deep burn wound. We suspect that poor burn management and local sepsis then led to conversion over the pre-existing umbilical hernia that led to evisceration and perforation of the intestine.

Discussion

Burns cause not only significant injury at the local burn site but also a systemic response throughout the body. Over the first 24 hours, inflammatory and vasoactive mediators cause a systemic capillary leak, intravascular fluid loss, and large fluid shifts. This response, along with decreased cardiac output and increased vascular resistance, can lead to marked hypovolaemia and hypoperfusion.¹

Burn wound progression is a process by which superficial partial-thickness burns spontaneously advance into deep partial-thickness or full-thickness wounds. Burn conversion is a complex process and is caused by a combination of inadequate tissue perfusion, free radical damage, and cytokine release, leading to protein denaturation and necrosis.

Infection, oedema, circumferential eschar, impaired wound perfusion, metabolic derangements, advanced age, and poor general health are also risk factors for burn conversion. Progression of depth is a morbidity as there is now a need for surgical intervention where none existed before. Prevention lies in adequate fluid resuscitation, nutritional support, and local wound care.¹⁻³

Adequate assessment of the burn injury will allow adequate resuscitative efforts. This includes cleaning the burn wound under procedural analgesia to identify burn depth and accurately assess TBSA. This informs the fluid replacement plan. Ongoing reassessment and titration of fluid resuscitation according to urine output and vitals is needed to prevent under or over resuscitation, both of which can lead to burn depth conversion. Early initiation of feeds, wound care with topical antimicrobial dressings and adequate analgesia are a priority.

Some research has been done in more advanced methods of burn depth progression prevention. Schmauss et al. have investigated agents that maintain or increase local perfusion, as well as agents that exhibit anti-coagulatory, anti-inflammatory, or anti-apoptotic property. Warm water, simvastatin, erythropoietin and cerium nitrate are promising interventions that may help to prevent burn wound conversion but clinical trials are still required to confirm this theory.^{4,5}

Teaching points

- Identification of factors that promote burn conversion will assist in the prevention of burn conversion.
- Appropriate fluid resuscitation, prompt identification and management of sepsis, and early institution of feeds aid in preventing burn progression.
- Burns over pre-existing hernia sites can pose a risk for evisceration if conversion is not prevented.
- There are deficits in care of burn injuries locally and education and outreach on the management of burns is important so that assessment and initial resuscitation are adequate and appropriate to prevent complications.

Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

Ethical approval was obtained from the University of KwaZulu-Natal Biomedical Research Ethics Committee. BCA 106/14. Consent from the patient's family was obtained.

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REFERENCES

1. Schaefer TJ, Nunez Lopez O. Burn resuscitation and management. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021.
2. Singh V, Devgan L, Bhat S, Milner SM. The pathogenesis of burn wound conversion. *Ann Plast Surg.* 2007;59(1):109-15. <https://doi.org/10.1097/01.sap.0000252065.90759.e6>.
3. Salibian AA, Rosario ATD, Severo LAM, et al. Current concepts on burn wound conversion - a review of recent advances in understanding the secondary progressions of burns. *Burns.* 2016;42(5):1025-35. <https://doi.org/10.1016/j.burns.2015.11.007>.
4. Schmauss D, Rezaeian F, Finck T, et al. Treatment of secondary burn wound progression in contact burns-a systematic review of experimental approaches. *J Burn Care Res.* 2015;36(3):e176-89. <https://doi.org/10.1097/BCR.000000000000131>.
5. Boyko T, Marin C, Furnari G, Flynn W, Lukan JK. Safety profile of atorvastatin in the role of burn wound injury conversion. *Am J Surg.* 2020;220(5):1323-6. <https://doi.org/10.1016/j.amjsurg.2020.06.047>.