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Scalding saline injuries: Preventing a rare but serious event in medical litigation

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Abstract

This study aimed to investigate the causes, outcomes, and compensation amounts of saline-induced perioperative burns, a rare but entirely preventable event. Saline-induced burns pose a significant risk to patients, and understanding the factors associated with such incidents is crucial for improving patient safety. Previous studies highlighted the use of hot saline bags and solution during medical procedures as a potential cause of these burns. A retrospective analysis of cases involving perioperative saline-induced burns was conducted using the Westlaw and Lexis Nexis legal databases. Eight relevant cases were identified and analyzed to determine the causes, outcomes, and compensation amounts. Hot saline bags used for positioning and hot saline solution were identified as the primary causes of saline-induced burns. Out of the eight cases analyzed, four resulted in a favorable verdict for the plaintiff, three cases were settled, and one case was in favor of the defense. Compensation amounts ranged from no monetary compensation to over one million dollars. This study highlights the need for increased awareness among medical professionals regarding the risks associated with saline-induced burns, and the importance of implementing guidelines for the safe use of hot saline bags and solution. Together these measures can hopefully mitigate the occurrence of these preventable incidents, improve patient safety, and reduce medicolegal exposure.

Keywords

Never events; Sentinel events; Saline bag; Intravenous bag; Burn

Saline-induced burns in the perioperative period are a rare, preventable medical error that cause significant harm to patients. The purpose of this article is to look into the causes,

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Anaïs Di Via Ioschpe: Conceptualization, Methodology, Data curation, Writing – original draft. **Martina Brozynski:** Conceptualization, Methodology, Data curation, Writing – original draft. **Olachi O. Oleru:** Methodology, Writing – review & editing. **Nargiz Seyidova:** Methodology, Writing – review & editing. **Curtis Rew:** Methodology, Resources, Data curation **Peter W. Henderson:** Conceptualization, Writing – review & editing.

outcomes, and compensation amounts of medical litigation involving perioperative saline-induced burns.

A retrospective analysis was conducted of cases involving saline-induced burns using the Westlaw and Lexis Nexis legal databases. The Boolean terms used in the search were *""hot warm heat! bag" & "saline & injury""* and *""hot warm heat! bag" & "saline & burn"* and *"(saline & burn OR injury) & intravenous OR IV."* Cases were included if the burn litigation specifically mentioned burn induced by saline solution, saline bag, intravenous bag, or intravenous (IV) bag. Duplicates, cases involving non-saline specific burn injuries, and irrelevant cases were excluded.

1. Case summaries

A total of 218 cases were identified in Westlaw and Lexis Nexis in the search period from 1987 to 2009. Following review, eight cases were ultimately included (Table 1). Seven of the eight cases occurred perioperatively, and one case occurred post-operatively. The defendants named in four litigations were surgeons (50%), in one was a surgical nurse (13%), and in three cases were of unspecified professions (37%). The plaintiffs included five females and three males with the average age of 40.7 years.

The outcome of the cases was mostly in favor of the plaintiff; four cases were ruled in favor of the plaintiff, three cases were settled, and one case ruled in favor of the defense. The compensatory damages ranged from $0 to $9,000,000 (mean: $1,505,981 +/− 1,083,162). Of note, the damages in two of the cases were over $1,000,000.

The mechanisms of injury were using hot saline bags for positioning in the operating room (n = 4, 50%), using hot saline bags directly on skin for other reasons (n = 2, 25%), and using hot saline for irrigation or injection (n = 2, 25%). In the latter two cases, one case involved the use of boiling hot saline solution within an arthroscopic procedure for unknown reasons leading to the destruction of the 20-year-old female's knee joint and third degree burns to her leg. This case was awarded $1,375,000 in favor of the plaintiff. In the other case in which hot saline solution was used, a 25-year-old female suffered second-degree burns on her arms approximately 21 cm in length around the IV site. This case was awarded $48,650 in favor of the plaintiff.

2. Learning points

The use of heated saline bags as positioning tools during surgical procedures was the most common cause of saline-induced burn litigation, highlighting the need for caution and adherence to their intended purpose. The operation mentioned in these cases utilized heated saline bags for positioning and hypothermia prevention. One case used an overheated saline bag to position a plaintiff's neck during a thyroidectomy which resulted in shoulder and back burns, another case used an overheated saline bag to support the plaintiff's chest during a laminectomy. Although heating saline bags is common practice under the supervision of the anesthesiologist [1,2] the findings of this study are supported by a case study that reports that saline bag-induced burns can occur when heated bags are used as bolstering devices on anesthetized patients who are unable to signal pain [3]. According to another study that

looked at burns caused by warming devices in anesthesia, hot fluid bags were the most common cause of burns, and long operations were more likely to result in such incidents [1]. The studies all identify that these injuries could have been avoided if the saline bags had been used solely for their intended purpose as liquid containers [1].

While it is generally safe to heat saline bags, this study highlights the risks associated with heating them to scalding temperatures and/or placing them directly on skin for prolonged periods. When using them for patient warming devices, there is little justification for using the small area of an intravenous bag to significantly contribute to the loss of body heat [4]. There are even less supporting arguments for utilizing warmed IV bags to maintain patient position [1]. To avoid preventable burns, there must be a focus on monitoring warming devices, implementing guidelines for their safe use, not placing them directly on skin, and forgoing their use entirely for indications of positioning or as warming devices. By integrating preventive measures into clinical practice, healthcare providers can mitigate the risk of scalding saline incidents and uphold the highest standard of care for patients.

3. Limitations

This review is not without limitations. First, the retrospective nature of the analysis relies on publicly available legal data, potentially excluding unreported incidents. A significant limitation of these databases is the amount of available information pertaining to each case. Some cases provide only a summary of outcomes and omit relevant case details. For example, the mechanism behind how saline solution was used in the two cases is not made explicitly clear whether it was through an intravenous route or if the solution was used intraoperatively, such as to wash out a joint during the arthroscopic procedure. Second, the small sample size limits its generalizability. Third, further research is needed to over-come these limitations and provide a more comprehensive understanding of this topic. Root cause analysis should be utilized as a crucial approach to investigate the underlying factors contributing to saline-induced burns in the perioperative period.

4. Conclusion

These findings illustrate the need for medical staff to be vigilant in their practices and implement measures to mitigate the risk of scalding never events due to improper practices with saline bags and solution. This study highlights the urgency of addressing this rare but entirely preventable medical error, and emphasizes the importance of training medical professionals on hot saline bag and solution indications and safety.

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Table 1 –

Descriptive statistics for study variables.

Variable	*n*
Sex	
Female	5
Male	3
Age (mean)	40.7
Year	
1987	1
1992	1
2000	1
2001	1
2002	1
2004	1
2006	1
2009	1
Specialty	
Plastic Surgeon	1
Orthopedic Surgeon	1
Urologist Surgeon	1
Surgeon Unspecified	1
Surgical nurse	1
Unknown	3
Chief Complaint	
Hot saline bag used for positioning	4
Hot saline solution	2
Hot saline bag	2
Court	
State	8
Federal	0
Case Outcome	
Plaintiff	4
Defense	1
Settlement	3
Monetary Compensation (USD)	
$0	1
$1–$100,000	1
$100,001– $200,000	2
$200,001– $1,000,000	2
$1,000,001– $5,000,000	1
$5,000,001+	1