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Grade II–III Burning 90% Area and Causa Electric Burn

[1]Matdhika Sakti*, [2]Mawaddah Mutia Amanda, [3]Vionica Elsa Dania Putri
[1] Bachelor of Medicine Study Program, Faculty of Medicine, Universitas Abdurrab, Indonesia*; email: saktidhika@gmail.com
[2] Medical Profession Study Program, Faculty of Medicine, Universitas Abdurrab, Indonesia
[3] Medical Profession Study Program, Faculty of Medicine, Universitas Abdurrab, Indonesia
*Correspondence

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Keyword: Burn Injuries; Electrical Combustion; General Anesthesia; Perioperative Management; Surgical Debridement; Occupational Safety Risk;

Abstract
Introduction: *Electrical burns are one of the most severe forms of burn injuries because they can cause extensive tissue damage and life-threatening systemic complications, thus requiring comprehensive perioperative anesthesia management.* ***Objective:*** *This case report aims to describe the anesthesia treatment of a 42-year-old female patient diagnosed with 90% of the second and third degree total surface body burns (TBSA) due to electrical injuries undergoing surgical debridement.* ***Methods:*** *This study used a case report design that aims to describe anesthesia management in patients with a diagnosis of second-degree combustio covering an area of 90% of the Total Body Surface Area (TBSA) due to electric shock undergoing debridement at the Central Surgical Installation (IBS) of Dumai Hospital.* ***Results and Discussion:*** *A comprehensive preoperative evaluation was performed, including airway assessment, hemodynamic evaluation, and laboratory investigation. General anesthesia is administered using intravenous midazolam, fentanyl, and ketamine, followed by continuous maintenance of sevoflurane and oxygen supplementation. Intraoperative monitoring includes blood pressure, heart rate, oxygen saturation, respiratory status, and fluid therapy to maintain adequate tissue perfusion and hemodynamic stability. Patients remained hemodynamically stable throughout the procedure without major anesthesia complications, including severe hypotension, respiratory distress, or significant oxygen desaturation. Careful airway evaluation, proper fluid resuscitation, and personalized anesthesia drug selection contribute to the success of perioperative management.* ***Conclusion:*** *This case emphasizes the importance of multidisciplinary collaboration and individualized anesthesia strategies to reduce perioperative complications and improve clinical outcomes in patients with extensive electrical burn injuries*

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Introduction

Burns (combustio) are tissue injuries caused by exposure to heat energy, electricity, chemicals, radiation, or friction that cause damage to the skin and tissues underneath (Mohd Reza Bahlia & M Bayu Rizaldy, 2024); (Saputra, 2023). The severity of the burn is determined by the cause, depth, and total body surface area or Total Body Surface Area/TBSA (Febrini, Evangelia, & Henny, 2025); (Arja & Mustofa, 2026). These injuries can cause local as well as systemic disturbances, depending on the extent and depth of the burn. In severe burns, especially involving more than 20% of TBSA, there is a systemic inflammatory response in the form of increased capillary permeability, loss of fluids and proteins, electrolyte disorders, hypermetabolism, and multiorgan dysfunction, which can develop into burn shock and increase morbidity and mortality if not treated quickly and appropriately, making burns one of the emergencies that require multidisciplinary treatment (Rongre, Sanjaya, Harimawan, & Herawati, 2022)

Electrical burns are a type of burns with a high severity because they have different characteristics than thermal burns: not only do they cause damage to the surface of the skin, but they can also cause injury to deeper tissues such as muscles, nerves, blood vessels, and bones, although the lesions on the surface of the skin appear limited (Muslim, Saputra, & Asri, 2021); (Oka, Hamid, & Samsarga, 2026); (Thendry & Lantang, 2023). Patients are at risk of serious complications in the form of cardiac arrhythmias, rhabdomyolysis, acute renal failure, as well as airway disorders and inhalation injuries if the wound hits the face and neck area (Brunicardi et al., 2014). These conditions increase the complexity of perioperative management, particularly in anesthesia management, so a thorough clinical assessment is required to determine an appropriate management strategy.

The management of anesthesia in burn patients requires special attention due to the presence of physiological changes that affect the respiratory, cardiovascular, metabolic, and pharmacological systems of anesthesia drugs (Ali et al., 2025). Airway evaluation, fluid resuscitation, correction of electrolyte disorders, selection of appropriate anesthetic agents, as well as strict hemodynamic monitoring are essential components to prevent perioperative complications and maintain the stability of the patient's condition during surgical procedures (Bayuo et al., 2023). Patients with burns to the face and neck are particularly at risk of anticipated difficult airway due to tissue edema, so careful airway planning is required prior to anesthesia induction

This case reported the management of anesthesia in a 42-year-old female patient with a diagnosis of second-degree combusio covering an area of 90% of TBSA due to electric shock who underwent debridement procedures. The extent of the burn and the involvement of the face and neck increase the risk of anticipated difficult airway, large amounts of fluid loss, and hemodynamic instability so comprehensive anesthesia planning is required. Electrical burns that extend up to 90% of TBSA are rare; cases with TBSA exceeding 90% have historically been thought to have a very small chance of survival and remain one of the biggest challenges in both critical care and reconstructive surgery although advances in modern resuscitation have increased treatment success rates. The rarity and complexity of such cases make documenting the management of perioperative anesthesia in detail highly educational, considering that case reports act as a means of sharing clinical experience for rare conditions that are difficult to replicate through random clinical trials, as well as helping anesthesiologists recognize the right treatment pattern in similar cases in the future (Florek & Dellavalle, 2016).

This case report aims to describe the management of perioperative anesthesia in patients with extensive electrical burns and to provide an overview of the importance of preoperative evaluation, anesthesia technique selection, and intraoperative monitoring in supporting the success of surgery

Method

This study uses a case report design that aims to describe anesthesia management in patients with a diagnosis of *second-degree combustio* covering an area of 90% *of the Total Body Surface Area* (TBSA) due to electric shock undergoing debridement at the Central Surgical Installation (IBS) of Dumai Hospital. The subject of the study was a 42-year-old female patient who underwent surgery on May 12, 2026. Data were obtained retrospectively through the review of patients' medical records, pre-anesthesia assessment sheets, intraoperative records, post-anesthesia monitoring sheets, physical examination results, laboratory examinations, and documentation during treatment. The information collected included the patient's identity, diagnosis, preoperative clinical condition, anesthesia techniques used, anesthesia drug selection, intraoperative monitoring, fluid therapy, and the patient's condition in the postoperative period. The analysis was carried out descriptively by comparing clinical findings and management of anesthesia in patients against relevant theories, guidelines, and literature regarding anesthesia management in burn patients. The results of the analysis are presented in the form of a narrative to describe the process of perioperative management, clinical evaluation, and outputs during anesthesia and surgery.

Results and Discussion

This research was conducted at the Central Surgical Installation (IBS) of Dumai Hospital using medical record data of patients who underwent debridement on May 12, 2026. Data were obtained through medical record review, pre-anesthesia assessment sheet, intraoperative records, and post-anesthesia monitoring. The subject of the study was a 42-year-old female patient with a diagnosis *of second-degree combusio with an area of 90%* of the Total Body Surface Area *(TBSA) due to electric shock.*

Table 1
Clinical Characteristics of Patients

Variable	Results
Gender	Women
Age	42 years old
Diagnosis	Grade II–III combusio covers 90% of TBSA and causes electric combustion
Operational actions	debridement
Types of anesthesia	General anesthesia
Status ASA	IV
Specific risks	Difficult airway to anticipate

Source: Dumai Hospital patient medical record data (2026).

In the preoperative evaluation, the patient was in a conscious state (*compos mentis*) with a blood pressure of 125/80 mmHg, a pulse rate of 82 times/minute, a respiratory rate of 22 times/minute, a body temperature of 36.4°C, and an oxygen saturation of 98%. Physical examination showed edema of the face and limited opening of the mouth so that the patient was considered to have an *anticipated risk of difficult airway*. In addition, the burn area reaches about 90% of TBSA, so patients are at risk of massive fluid loss, electrolyte impairment, and hemodynamic instability.

Anesthesia Management

Anesthesia was performed using a general anesthesia technique with a combination of midazolam 2.5 mg, fentanyl 100 mcg, and ketamine 50 mg as an induction agent, while anesthesia maintenance used sevofluran. During the surgery, continuous monitoring of blood pressure, pulse frequency, oxygen saturation, respiration, and intravenous fluid therapy was carried out. During the procedure, the patient's hemodynamic condition remained stable without major complications such as severe hypotension, respiratory disorders, or significant desaturation.

Electrical burns are a form of severe burns that can cause extensive tissue damage, both on surfaces and deeper tissues. In this case, the burn area reached about 90% of TBSA, so the patient was theoretically at high risk of hypovolemic shock due to increased capillary permeability and loss of large amounts of fluid. Interestingly, the patient's blood pressure and pulse rate at the preoperative evaluation (125/80 mmHg; 82 times/minute) were within the normal range, showing no obvious signs of hypovolemia. These findings can be critically interpreted in two directions: on the one hand it suggests that fluid resuscitation prior to debridement procedures may have gone adequately so that patients arrive in the operating room in relatively stable hemodynamic conditions; On the other hand, this initial stability does not necessarily negate the risk of sudden decompensation during surgery, given that patients with burns of this magnitude remain susceptible to rapid intraoperative fluid shifts. Therefore, a comprehensive preoperative evaluation is an important step before anesthesia is performed. However, this case report does not include data on the volume and strategy of fluid resuscitation that has been administered prior to the procedure (e.g. based on the Parkland formula or its modifications), so the contribution of preoperative resuscitation to the observed hemodynamic stability cannot be critically assessed from the available data.

In this case, edema on the face and limitations in opening the mouth were found so that the patient was categorized as having an anticipated risk of anticipated difficult airway. This condition is in accordance with the characteristics of burn patients in the face and neck area who are prone to progressive edema so that it can make intubation difficult. At the risk of anticipated difficult airway, the literature generally places awake fiberoptic intubation (AFOI) as the technique of choice because it maintains the patient's spontaneous ventilation during the intubation process; however, the application of AFOI specifically to the burn patient population has not been widely evaluated and a number of case reports have shown the success of alternative approaches, such as videolaryngoscopy, in patients with anatomical distortion of the airway due to burns (Mishra, Chakole, & Dev, 2022). This case report does not explain the specific intubation techniques actually used on the patient whether intubation is performed in a state of consciousness (awake), with videolaryngoscopy, or conventional laryngoscopy after induction even though it is precisely at this point that the educational value of the case with the risk of anticipated difficult airway is most needed by the reader. Without this clarity, the reported intubation success cannot be fully used as a practical lesson on which techniques have proven effective in the patient's condition. Therefore, airway preparation and anesthesia planning should be done carefully to reduce the risk of complications during anesthesia induction.

The selection of ketamine as an induction agent is an appropriate decision considering that patients have a risk of hemodynamic instability due to extensive burns. Ketamine is known to have a strong analgesic effect and is able to maintain blood pressure through stimulation of the sympathetic nervous system, making it safer than propofol in

patients with possible hypovolemia. The dose of ketamine used in this case (50 mg) is classified as an induction dose range that tends to be conservative, in line with the principle of caution in ASA IV patients with limited physiological reserves, although the case report does not list the patient's weight so the dose per kilogram cannot be calculated with certainty to assess its suitability. It should also be noted that the hemodynamic stabilizing effect of ketamine depends on the stimulation of the release of endogenous catecholamines; In patients who have experienced severe and prolonged physiological stress due to extensive burn injuries, catecholamine reserves have the potential to decrease (catecholamine depletion), so that the direct myocardial depressant effect of ketamine, which under normal conditions is masked by its sympathomimetic effects, is at risk of being more dominant and can actually cause hypotension, not prevent it. The observed hemodynamic stability in this case suggests that the risk is not clinical, but it should still be anticipated in similar cases with a wider degree of burn or a longer post-injury time interval. The combination of midazolam and fentanyl provides adequate sedation, amnesia, and analgesia effects, while sevofluran is used as a maintenance agent because it is easy to titrate and has a relatively fast recovery time.

The results of monitoring during the procedure showed that the patient's hemodynamic condition remained stable without major anesthesia complications. It should be underlined that the success in this one case cannot be generalized as evidence of the superiority of the anesthesia regimen used, but rather simply shows that the combination is consistent with good results in this particular patient. Some aspects that are not documented in this report such as definitive intubation techniques, intraoperative fluid volume and resuscitation strategies, as well as postoperative patient conditions limit the reader's ability to draw a more thorough practical learning from these cases. These successes show that good preoperative evaluation, selection of appropriate anesthesia techniques, and continuous intraoperative monitoring are important factors in supporting successful anesthesia management in patients with extensive burns. This approach is also in line with the recommendations of various guidelines regarding the management of anesthesia in burn patients which emphasize the importance of individualizing therapy based on the patient's clinical condition

Conclusion

Anesthesia management in patients with grade II–III combustio covering an area of 90% of the Total Body Surface Area (TBSA) due to electric shock requires a comprehensive preoperative evaluation, especially on airway conditions, hemodynamic status, and fluid and electrolyte balance. In this case, the application of general anesthesia using a combination of midazolam, fentanyl, ketamine, and sevofluran, accompanied by strict intraoperative monitoring, was able to maintain hemodynamic and respiratory stability during debridement without major anesthesia complications. These findings suggest that proper anesthesia planning and an integrated perioperative approach play an important role in supporting the success of surgical procedures in patients with extensive electrical burns. This case report has limitations because it only describes the management of one patient so that the results cannot be generalized to all burn cases. Therefore, case reports and studies with a larger number of subjects are needed to evaluate the effectiveness of various anesthesia techniques and clinical outcomes in patients with severe burns.

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