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# ANAESTHETIC MANAGEMENT OF BURNS PATIENT – CASE REPORT

Anaesthesiology

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## ABSTRACT

Anaesthetic management of patients suffering from burn injury is complex, with special focus on airway management, hemodynamic support, intravascular access, thermoregulation, fluid resuscitation, and analgesia. This article deals with the management of difficult airway as the patient presented with thermal burn injury involving the anterior aspect of the neck, anterior chest, right and left upper limb accounts for approximately 30% TBSA, which is associated with pain coming for wound debridement procedure. Also focuses on the preparation of burns patients for operation theatre and peri-operative anaesthetic management.

## KEYWORDS

Total body surface area (TBSA), Fibreoptic bronchoscopy (FOB), Non-depolarising neuromuscular blocking agents (NMBAs)

## INTRODUCTION

The anaesthetist plays an important role in the multidisciplinary team management of patients with major burns which should occur in specialized regional units. All anaesthetists need to be familiar with the principles of anaesthesia for these patients as they may be required to care for a major burn in an emergency or to provide care for minor burns outside the regional centres. Intraoperative management of severe burn injuries should focus on specific airway management, restoration of intravascular volume, careful monitoring and judicious drug administration. Pain control in severe burn injuries is complex, often requiring high-dose opioids including methadone as well as multiple adjuncts such as ketamine, lignocaine, clonidine and other non-opioid analgesics.

## CASE REPORT

Pre-Anaesthetic evaluation was done. Airway examination- 2 finger breadth mouth opening, mallampati grade IV, restricted neck flexion (70%), extension (50%). Systemic examination is normal. Investigations-Hemoglobin- 11.6g% Platelet- 220000/mm .Serum electrolytes- sodium- 133mEq/L, potassium- 4.7mEq/L, chloride-99mEq/L. Renal function test- WNL ECG- NSR. Examination of difficult airway- Rapid airway assessment (1-2-3), LEMON law and Wilson's risk score was done.

35 year old male patient, residing at Hoskote, Bangalore with alleged history of thermal burn injury at his work place over the anterior aspect of the neck, anterior chest, right and left upper limb accounts for approximately 30% TBSA, which is associated with pain came to casualty at MVJMC&RH. On examination- Pulse rate- 116/minute good volume, Blood pressure- 106/64 mmHg, measured in the left lower limb. After the initial resuscitation and fluid management at the casualty patient was admitted to the ICU and posted for wound debridement procedure after 24 hours from the time of burns.

Anaesthetic management, PLAN A- Awake fibreoptic intubation (gold standard) PLAN B- Videolaryngoscopy PLAN C- supraglottic airway device were made. Anaesthetic challenges were 1.Difficult airway 2.Hemodynamics and dehydration 3.Intra-op hemorrhage 4. Hypothermia 5. Pain management 6.Succinylcholine administration. Pre-operative advise for NPO- 6 hours, consent- for fibreoptic bronchoscopy, surgical airway, Anti-aspiration prophylaxis, To arrange blood and blood products was given. Psychological preparation of the patient by counselling. Operation theater was prepared with Difficult airway cart, Surgical airway equipments, General Anaesthesia drugs, Drugs for anaesthetizing the airway, Crash cart. Patient preparation- Wide bore Intravenous access, inj Glycopyrolate 0.2mg iv 30 mins before procedure, 5mL of 4% lignocaine nebulization, Oxymetazoline nasal drops, Nasal packing with 2% lignocaine with adrenaline (1:2,00,000) was done.

Patient was shifted to operation theatre placed in supine position, ASA standard monitors were applied. As the patient had both upper limb burns BP cuff was applied to right calf and pulse oximetry was placed on right lower limb great toe. Cannulated with 18G cannula in lower limb (saphenous vein) and Started with IV Fluid [warm Ringers Lactate]. Core temperature, neuromuscular and urine output monitoring was done. Oxygen was administered through nasal cannula. Inj. Dexmedetomidine was given 60 mcg over 20 minutes. Airway blocks- 1.Glossopharyngeal nerve block 2.Trans-tracheal block 3.Superior laryngeal nerve blocks were performed. Pre-loaded FOB with 7mm ETT, 2 suction apparatus were kept ready. Spray and Go technique was used. FOB was advanced through the vocal cords, tracheal rings and carina were confirmed. ETT was advanced into trachea and position was confirmed. Inj Fentanyl 50 mcg IV, Inj Propofol 100 mcg IV, Inj Atracurium 30mg IV was given. Patient was maintained with Oxygen with air and isoflurane and Mechanical Ventilation. Warm blankets, warm IV fluids were used. Intra-op bleeding was monitored. Fluids-100mL maintenance was given. Inj. Ondandetron 4mg IV was given. Intra-operative period was uneventful. Patient was extubated after adequate reversal with Inj. Neostigmine 3.25mg and Inj. Glycopyrolate 0.5mg IV. Patient was shifted to post operative care unit.

Post-operative Analgesia was given with Inj. Paracetamol 1g IV and Inj. Tramadol 50mg IVThermoregulation was maintained. Vitals were stable.

## DISCUSSION

### Anaesthetic Considerations

### 1. Monitoring

Depending on the site of burn injury, intraoperative monitoring of patients with burn injuries can be difficult. Pulse oximetry may not function on fingers or toes, with alternative sites such as the nose, ear or tongue often needing to be used instead. Rarely, arterial blood gases might have to be used to estimate oxygenation level. Temperature probes are essential. The monitoring site can include oral, axillary,

tympanic, rectal, bladder or oesophagus depending on the injured areas. Noninvasive blood pressure measurement is possible if the cuff can be applied to non burnt areas; otherwise, invasive blood pressure monitoring is required. Electrocardiograms may be difficult to obtain as the adhesive may not stick to burnt tissues. Options for electrocardiogram monitoring include needle electrodes or skin staples.

**2. Airway Considerations**

Patients with burns are often transferred intubated and ventilated from intensive care or high-dependency unit facilities, so care must be taken to transfer patients to theatre without incident and to maintain existing ventilation therapies (positive end-expiratory pressure, pressure control, lower fractional oxygen therapies). Patients who are not intubated may present all the challenges and may require strategies to manage difficult intubation scenarios. Airway management can be complicated by limitation in mouth opening, airway and facial oedema and difficulties interpreting airway anatomy. Techniques to consider include either direct or video laryngoscopy for intubation, awake fibre-optic intubation, laryngeal mask insertion (if required for transient airway control) and, less commonly, emergency cricothyroid puncture and tracheostomy. Videolaryngoscopy has an advantage of better view when mouth opening and neck movement is restricted, Generally higher success rate, especially in difficult situations, Less risk of trauma and oesophageal intubation, Less c-spine mobility. Supraglottic airway device has an advantage of Patent airway, even in patients with difficult airway, Rapid insertion, Reduced coughing and gagging on recovery, Maybe used during spontaneous or controlled ventilation . Disadvantages includes risk of aspiration of gastric contents, Risk of airway obstruction, Risk of ischaemia to soft tissues is misplaced.

Additional considerations may include securing airway devices with suturing, as tape or ties may not adhere to inflamed tissues or may interfere with burned areas that will require ongoing surgical management. The role of early intubation in patients with burn injury has been recently questioned. Current guidelines from the International Society for Burn Injury suggest the only indication for intubation or tracheostomy should be for cases of current or evolving impairment of airway patency. Clinical signs include airway swelling, soot contamination of airway secretions, increasing work of breathing, hoarseness, stridor, dysphagia or increased salivation. This emphasises the importance of continued clinical assessment and early intervention should airway signs show a clear pattern of deterioration.
Suxamethonium may be safely used in burn patients in the first 48 hours. After that, Suxamethonium Can be used in the first 24 hours to facilitate endotracheal intubation. Post thermal injury- 4-10 days: most dangerous period. Post burns avoid scholine upto 180 days. Rocuronium may be an alternative to suxamethonium. Problems associated with the use of NDMR in a burns patient includes - Resistance to the action of non-depolarizing muscle relaxants (NDMR). Develops by 1 week and usually persists for 8 weeks. Larger than normal doses of NDMR to achieve a desired effect and shorter duration of action. Neuromuscular junction monitoring required. however, its use may cause an exaggerated hyperkalaemic response in acutely burned patients.

**3. Vascular Access**

Since significant fluid shifts and volume losses occur in this patient population, vascular access is crucial but may also present special challenges. Invasive monitoring and large-bore venous lines are essential as burn patients have large, exposed surface areas leading to unexpectedly high losses, especially during first presentation and during surgical procedures. Such access can facilitate rapid fluid resuscitation, provide access and monitoring as well as facilitate inotropic support. Lines should be sited in areas that are not in the surgical field. Suturing and ties rather than standard vascular access adhesive dressings may be needed. The use of ultrasound to visualise arteries and veins may be required to guide placement.

**4. Fluid And Temperature Homeostasis**

A patient should only be taken to theatre when fluid resuscitation is adequate (as evidenced by haemodynamic parameters and urine output) and in the absence of hypothermia. Wound debridement involves significant blood loss. It has been estimated that for every 1% body surface excised, 3–4% of the circulating blood volume may be lost. There should be adequate availability of red cells and clotting factors. Due to damage of the natural skin barrier, evaporative losses are raised, further increasing fluid requirements. Good wide bore i.v. access is essential. Depending on the size and position of the burn, traditional i.v. access sites may be unavailable and unusual peripheral venous sites or central venous access are frequently required. Care of the available veins is a priority and all i.v. access should be performed by experienced personnel.

The combination of large fluid requirements and extensive patient exposure predisposes to intra-operative hypothermia which has undesirable effects on coagulation, cardiorespiratory function and drug handling. It has been shown to be associated with worse outcome in burns patients and should, therefore, be avoided. Central temperature should be measured and maintained and there should be adequate provision of warmed rapid infusion systems. If possible, forced warm air blankets should be used but these may be of limited efficacy due to the degree of patient exposure required. It is important that the theatre environment is at a thermoneutral temperature (about 30°C for these patients), although this may be uncomfortable for theatre staff.In the reconstructive phase of surgery, the viability of skin grafts and tissue flaps is improved if the patient is warm and hyperdynamic. Careful attention should be paid to fluid status and maintenance of temperature.

**5. Pharmacologic Considerations**

Patients with significant burn injuries have altered pharmacodynamic responses as well as alterations in pharmacokinetic parameters such as volume of distribution, levels of protein binding and hepatic and renal clearance. These pathophysio-logical changes mean that careful titration and monitoring of commonly used anaesthetic drugs may be required. Burn injury–related changes cause proliferation of extrajunctional acetylcholine receptors that release more potassium into the extracellular space, predisposing to life-threatening hyperkalaemia when suxamethonium is used. This risk appears to be greatest in patients more than 48 hours after and for up to 1 year post injury.

Nondepolarising neuromuscular blocking agents (NMBAs) may also have altered pharmacodynamics in burn patients, and this is thought to be multifactorial. An increased dose of rocuronium 1.2 to 1.5 mg/kg for rapid sequence induction is recommended, with effective paralysis time being approximately 90 seconds compared with 60 seconds in the nonburn population. This is thought to be due, at least in part, to the presence of extrajunctional acetylcholine receptors, which bind nondepolarising NMBAs and will compete with junctional receptors. Plasma protein concentration and binding capabilities may be drastically altered after severe burn injury. Significant hypoalbuminemia can occur due to protein-rich fluid loss and decreased hepatic synthesis. In addition, alpha 1-acid glycoprotein (AAG) concentrations can increase as part of the inflammatory response following significant burn injury. These can affect protein-bound anaesthetic and analgesic drugs. Drugs bound to albumin may be present in a higher free concentration. Conversely, drugs, such as local anaesthetics and analgesic agents, such as alfentanil, which are primarily bound to AAG, will have lower free concentrations than in the nonburn population. Pharmacodynamic changes may also arise as a result of continued exposure to opioid therapy for relief of sustained pain, resulting in opioid tolerance.

**6. Analgesia**

Analgesia for severe burn injuries can be challenging to manage. Opioid requirements in these patients can be significant and remain the mainstay of analgesia in severe burn injury. In many cases, high-dose infusions of opioids and sedatives are commenced to aid endotracheal tube insertion. This may create opioid tolerance, leading to higher opioid requirement. Specialist pain management is desirable in these patients, with strategies such as opioid rotation, introduction of opioid-sparing analgesic strategies and careful opioid de-escalation. Opioid-sparing agents include ketamine and lignocaine infusion. As a patient with burn injury progresses in their care from major graft surgery to ward-based dressings changes, ketamine as well as non-opioid analgesia is often added to existing opioid therapy to facilitate conscious sedation. Nonpharmacologic therapies such as virtual reality devices and music therapy have shown some promise in recent years to aid dressing changes, particularly in the paediatric burn population.

**7. Infection control**

Strict infection control measures, constant wound surveillance with

regular sampling of tissues for quantitative culture, and early excision and wound closure remain the principal adjuncts to control invasive infection in burn patients. Developments in critical care and surgical approaches to treating burn wounds together with antimicrobial treatments have reduced significantly the morbidity and mortality rates associated with this injury. However, several resistant organisms have emerged as the maleficent cause of invasive infection, including MRSA, VRE, *Pseudomona*s, *Acinetobacter*, non-*albicans Candida* species, and *Aspergillus*. Advances in antimicrobial therapies and the release of new classes of antibiotics have certainly added to the armamentarium of resources.

## CONCLUSION

Successful anaesthetic management when the airway is inaccessible and distorted and fibrosis mandates planned approach for securing airway, including use of FOB aided by a suitable oral intubating airway customized to the need of individual patients. Anaesthetic and resuscitative strategies need to be adapted specifically for this patient population due to airway dangers, haemodynamic perturbations, direct effects of injuries, acute and chronic pain and altered responses to drug therapy. Rigid protocols may not be the best choice in view of variations in extent and severity of burns.

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