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CLINICAL REPORT

Severe post-burn neck contracture release and skin graft harvest using tumescent local anaesthesia as the sole anesthetic technique

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Abstract Severe post-burn contractures in the neck often cause anatomical distortion and restriction of neck movements, resulting in varying degrees of difficulty in airway management. Any mode of anesthesia that may obviate the need for imperative airway control may be desirable in such situations in which a difficult airway may be anticipated. Here we present one such situation where tumescent local anesthesia was employed to manage a case of severe post-burn neck contractures posted for contracture release and split-skin grafting. The other benefits of this method were minimal blood loss and excellent postoperative analgesia. In conclusion, it can be emphasized that the application of tumescent anesthesia is an important anesthetic tool in patients with predicted difficult airway management.

Keywords Tumescent local anesthesia · Severe post-burn neck contracture · Skin graft harvest

Introduction

Tumescent local anesthesia was first described by Klein in 1987 for liposuction [1]. This method involves the infiltration of skin and subcutaneous tissue over a large area with large volumes of diluted local anesthetic solution. The benefit of this technique lies in the fact it helps achieve anesthesia over a large area of skin and subcutaneous tissue without the need to resort to general anesthesia. This technique is known to be safe regarding absorption and toxicity of lidocaine.

Severe post-burn neck contracture often causes insufficient neck extension, incomplete oral occlusion, and insufficient mouth opening [2, 3]. All these restrictions of movement compromise access to the airway. Hence, any anesthetic technique that might obviate the need to control the airway during the procedure is relevant.

We report the successful use of tumescent anesthesia in the management of contracture release and split-skin grafting for severe post-neck burn contracture.

Case description

A 41-year-old woman weighing 54 kg presented with a history of having suffered second-degree thermal burns from a stove 6 months previously. The burn injuries extended over her neck, chest, and hands (Fig. 1a, b). Preoperative airway assessment revealed Mallampati classification grade IV with mouth opening only to the width of one finger because of the fixed flexion deformity. In view of the these changes, considerable difficulty in mask ventilation and intubation was anticipated. Cardiovascular and respiratory systems were normal. The patient was scheduled to receive tumescent local anesthesia for release of neck contracture and split-skin grafting. In anticipation of difficulty in mask ventilation and intubation owing to fixed flexion deformity, it was planned to release the neck contracture under local anesthesia. A large volume of local

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anesthetic agent was required to infiltrate the complete burnt area, which made tumescent local anesthesia the ideal choice. The patient was monitored using continuous ECG, pulse oximetry, noninvasive blood pressure, body temperature, respiratory rate, and urine output.

The patient received premedication with oral diazepam 10 mg the night before surgery and intravenous midazolam 2 mg and glycopyrrolate 0.2 mg a half-hour before being shifted to the operating room. A solution containing local anesthetic agent (for tumescent local anesthesia) was prepared immediately before surgery. The tumescent local solution was prepared by mixing 30 ml 2% lidocaine, 20 ml 7.5% sodium bicarbonate, 0.5 mg epinephrine, 1,500 IU hyaluronidase, and 450 ml Ringer's lactate solution. The resultant concentration of lidocaine was 0.12%. The local anesthetic solution was infiltrated in the skin and subcutaneous region using a 10-ml syringe and a 20 G 5-cm needle. The areas of the neck contracture and thigh area for the harvesting of the skin graft were infiltrated. In general, patients experienced more pain when the rate of infiltration of anesthetic solution was rapid, so the rate of infiltration was titrated to patient comfort. While injecting the anesthetic solution, pain was minimized by slow injection, using buffered anesthesia, and continual verbal distraction and reassurance to the patient. Additional needle pricks were minimized as the anesthetic solution readily diffused through the dermis. Further injections were made through already-anesthetized areas of skin to avoid pain during needle prick. It took about 15 min to infiltrate the whole area. Infiltration of tumescent local solution in graft harvest area was relatively easy as compared to the contracture site. The amount of tumescent local solution used and level of anesthetic effect achieved in both areas were comparable. A total of 270 ml tumescent local anesthetic solution was used. After 15 min of infiltration, the neck contracture was released and the skin graft was harvested simultaneously. The patient did not complain of any discomfort or pain. Hemodynamic status was stable during operation. Hemostasis was achieved in the raw area, and the split-skin graft was placed and sutured over the released contractures in the neck. Operative time was about 1 h. Blood loss was approximately 90 ml. Postoperative pain relief and patient satisfaction were excellent. The patient required an analgesic for the first time 16 h after the procedure was completed. Neither loss of skin graft nor any other complication occurred.

Discussion

Anesthetic management of patients suffering from post-burn neck contracture with resultant restrictions in neck movements and mouth opening is challenging for the anaesthesiologist, as the access to the airway is invariably compromised in such situations. Commonly post-burn neck contracture release is performed under local anesthesia or total intravenous anesthesia followed by intubation of the patient. Alternative techniques include awake blind nasal intubation, fiberoptic intubation, and laryngeal mask airway [4]. Although awake blind nasal intubation is a reasonably good option, giving regional airway blocks would have been difficult because of scars. General anesthesia definitely would have given us the advantage of a secured airway, but securing the airway was difficult in our case. Classical local anesthesia has the limitation of using local anesthetics to the recommended dose, and volume was insufficient to infiltrate such a large area as in our case. Tumescent local anesthesia has various advantages and is of proven efficacy in the release of post-burn neck contractures and harvest of split-skin graft. The most important aspect of tumescent local anesthesia in post-burn neck contracture release is that it allows us to avoid tracheal intubation for patients with a difficult airway.

The intense vasoconstrictive effect of epinephrine provides a nearly bloodless surgical field, and consequently

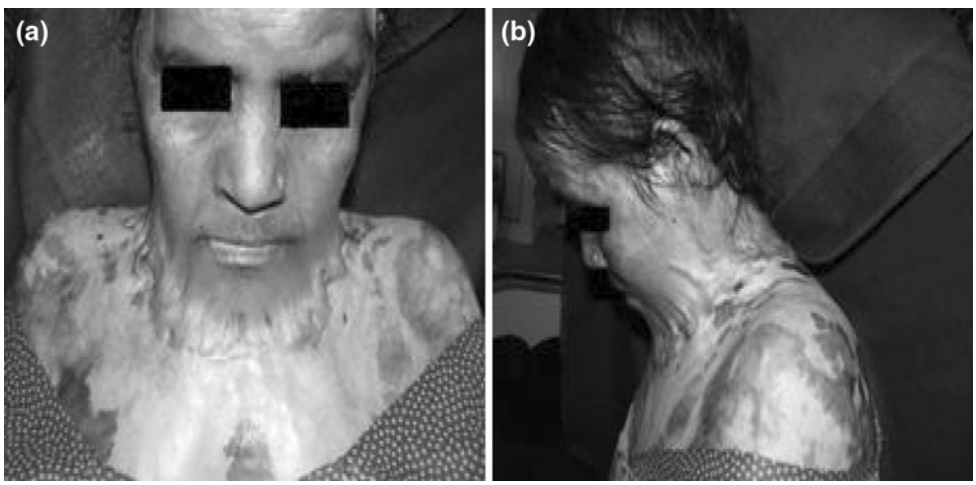

Fig. 1 **a**, **b** Post-burn neck contracture leading to severe degree of fixed flexion deformity (front and lateral view)

the blood loss also was virtually insignificant. Occurrence of lidocaine toxicity is rare even when used in higher doses [5]. The dose of lidocaine used in this case was 6 mg/kg body weight and never exceeded 500 mg, which is well within the normal recommended range of 7 mg/kg when lidocaine is used with epinephrine. In tumescent local anesthesia, lidocaine has been used safely in doses ranging from 35 mg/kg [6] to 55 mg/kg [7] for liposuction. With respect to tumescent local anesthesia, lidocaine when used in concentration between 0.05% and 0.4%, peak plasma level was achieved between 4 and 14 h after infiltration, and it never exceeded the toxic level of 5 μg/kg. Exposure of nerve fibers to a constant concentration of lidocaine results in longer duration of action when compared to conventional infiltration [8]. The low perfusion of skin and subcutaneous tissue and the slow infiltration rate used in tumescent local anesthesia technique, besides the vasoconstrictive effect of epinephrine, adds to a slower absorption of the drug.

The reason why tumescent local anesthesia can provide longer duration of analgesia is explained not only by the slow absorption of lidocaine but also by the duration and length of the nerve segment exposed to lidocaine [8, 9]. Postoperative analgesia of 18 h has been reported by Klein [6] and up to 24 h by Bussolin et al. [10] in pediatric patients. Buffering of the tumescent local anesthetic solution with sodium bicarbonate decreases pain on injection [11] and enhances the bacteriostatic properties of lidocaine [12]. The washout effect of the tumescent solution also leads to antibacterial effects. Addition of hyaluronidase to local anesthetic offers the benefit of minimizing loss of surface contour and enhanced ease of dissection through subcutaneous tissue planes [13]. In addition to various advantages, a few disadvantages were associated with tumescent local anesthesia in our case, namely, wet surgical field, time-consuming infiltration, and multiple injections.

We presented a case of difficult airway caused by post-burn neck contracture successfully managed using tumescent local anesthesia. To conclude, we can say that tumescent local anesthesia can be used as the sole anesthetic technique for release of post-burn neck contractures as well as harvest of split-skin graft, obviating the need for intubation and general anesthesia.

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