

Effect of infraorbital nerve block on postoperative pain and 30-day morbidity at the donor site in buccal mucosal graft urethroplasty

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Abstract

Background and Aims: Buccal mucosa harvest for substitution urethroplasty can be painful, and may be associated with long-term complications such as perioral numbness, persistent difficulty with mouth opening, and change in salivary function. This study was designed to evaluate the efficacy of infraorbital nerve block (IOB) in relieving postoperative pain at the donor site of the buccal mucosal graft (BMG) and its associated morbidity at 30 days.

Material and Methods: Thirty adults scheduled for BMG urethroplasty were enrolled in this study and were randomized to receive either no block group I (control) and IOB group II intraorally with 1 mL of 0.5% bupivacaine. Pain was assessed by visual analog scale, intraoral morbidity, and patient satisfaction in the immediate postoperative period. All patients were reviewed after 1 month for morbidity such as perioral numbness, pain on mastication, and tightness on mouth opening. Statistical analysis was done using Mann-Whitney's *U* and Chi-square tests.

Results: Median time to pain-free oral intake for liquids (group I: 2–5 days, group II: 1 day, $P < 0.001$) and solids (group I: 4 days, group II: 2 days, $P < 0.001$) was earlier in group II. At the follow-up after 1 month, one patient in group II and three patients in group I showed perioral numbness ($P = 0.026$), and five patients had pain on mastication in group I ($P = 0.016$).

Conclusion: IOB is associated with postoperative analgesia and facilitation of early food intake, mitigating the morbidity of the donor site and provides satisfaction.

Keywords: Analgesia, buccal mucosal graft, nerve block

Introduction

Reconstructive urethral surgeries using buccal mucosa as a material for graft is frequently performed for long urethral strictures. Buccal mucosal graft (BMG) harvesting is associated with significant early and late morbidity due to pain resulting in inability to open mouth, difficulty in drinking fluids and eating

solid diet, dribbling of saliva, and trismus. Adequate acute pain management not only reduces early complications and improves patient satisfaction but also reduces chronic pain.^[1,2] The use of pharmacological agents such as opioids and non-steroidal anti-inflammatory drugs (NSAIDs) for acute postoperative pain relief is known to be associated with adverse effects.^[3] Peripheral nerve blocks, offer advantages of better pain control, opioid-sparing effect, a higher degree of patient satisfaction, provide long-term benefits of reducing chronic pain.^[4]

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Infraorbital nerve block (IOB) has emerged as an excellent analgesic technique for postoperative pain relief following cleft lip surgery and superficial surgery on the mid-face and transnasal transsphenoidal pituitary surgery.^[5-7] The efficacy of this regional anesthetic technique on reducing the early and late morbidity associated with BMG harvesting has not been evaluated. As the innervation of buccal mucosa is by the branches of infraorbital nerve, we hypothesized that blocking the infraorbital nerve at its foramen by intraoral approach would provide good analgesia to the graft donor site. The primary aim of the study was to evaluate the role of IOB in relieving pain and 1 month morbidity at the donor site, the time taken to admit oral fluids and solid diet without pain. The secondary end points being the number of analgesic demands, amount of analgesia consumed, and its influence on overall patient satisfaction.

Material and Methods

This was a randomized prospective study approved by the institutional ethics committee with CTRI no. CTRI/2015/04/005731. Informed consent was obtained from 30 patients, aged between 20 and 50 years scheduled for BMG substitution urethroplasty for stricture urethra under general anesthesia. The patients were randomized into two groups by computer generated random numbers and allocation concealed by using serially numbered sealed envelopes. Group I patients received no IOB and acted as control, and group II patients received IOB and was the study group. Patients in whom IOB could not be administered such as local infection at the site of injection of nerve block, history suggestive of drug allergy, any systemic disease that compromise cardiovascular, respiratory and neurological function, coagulation disorders, visible submucosal fibrotic changes of buccal mucosa and graft harvested from lower lip, patients with complications such as hematoma or infection at BMG site and patients in whom lumbar epidural for management of pain at the urethroplasty site was not placed or was not effective were excluded from the study. Three days prior to surgery, the patients were given chlorhexidine mouth wash twice daily for oral cleansing and a day before surgery, the patients were administered intravenous (IV) ceftriaxone sulbactam as prophylactic antibiotic. In the preoperative assessment, all the patients were counseled about the IOB, epidural analgesia, and were trained about the use of visual analog scale (VAS) for postoperative pain assessment. On the day of surgery, all patients received lumbar epidural anesthesia at L2-L3/L3-L4 level and tested for analgesia. A standard general anesthesia with inj. propofol 1.5–2 mg/kg and 2 µg/kg of fentanyl was administered and was intubated nasally with Portex® endotracheal tube (Smiths Medical

international Ltd., Kent CT216JL, UK) facilitated with inj. atracurium 0.6 mg/kg IV. After intubation, all patients received paracetamol 1 g IV. Patients in group II received bilateral intraoral IOB using the technique as described below. The patients were placed supine with the head in the median position and well supported. Infraorbital foramen was palpated externally and a finger was placed over it, which would act as a guide and prevent the needle from penetrating into the infraorbital foramen. The lip was everted and 1 mL of 0.5% bupivacaine with 24G needle was injected; with the needle directed toward the infraorbital foramen. Pressure was applied for 2 min to prevent hematoma formation. The same procedure was repeated on the other side. Intraoperative analgesia at urethroplasty site was achieved with epidural infusion of 0.25% bupivacaine. The epidural bupivacaine infusion and volatile anesthetic agent were titrated to maintain the hemodynamic parameters within 20% from baseline. Buccal mucosa was harvested from one or both cheeks depending on the length of stricture and quilted to corpora at the site of stricture with interrupted 5-0 Vicryl sutures. After harvesting the buccal mucosa, the donor site was kept open in both groups. At the end of the procedure, the block was repeated on both sides to avoid bias of the surgical duration before extubating the trachea. Pain on mouth opening was assessed with VAS and noted immediately after extubation (V0) and at every 6 h for 24 h and once daily for 5 days or till discharge of the patient by a trained postoperative nurse who was unaware of the study group. Patients were allowed to drink orally 6 h after surgery and the postoperative day on which patient was able to take liquid and soft diet without pain was noted. Chlorhexidine mouth wash was continued postoperatively thrice daily for 3 days. Other complications such as pain on mastication, trismus, dribbling of saliva, and perioral numbness were noted during the hospital stay.

Postoperatively, pain at the urethroplasty site was managed with epidural analgesia with infusion of bupivacaine 0.125% and 1 µg fentanyl/mL for 48 h (6 mL/h) in both the groups. Patients with pain at urethroplasty site in the first 48 h, not relieved with epidural infusion were excluded from the study. Rescue analgesia was provided with inj. tramadol 50 mg IV when pain scored exceeded 4. Requirement of rescue analgesia in the first 48 h was noted.

Patients were asked to report after 1 month for follow-up and were asked about pain at harvest site, at rest, on opening mouth, and during mastication to assess for the chronic pain. A dichotomous response for patient satisfaction in terms of absence of discomfort at harvest site was sought.

Statistical analysis was done using SPSS version 17. Continuous variables and ordered categorical variables,

expressed as median values with interquartile range were compared between the groups using nonparametric Mann–Whitney’s *U*-test. Categorical variables, expressed as frequency of occurrence and their percentage, were compared using Chi-square test. *P* value of less than 0.05 was considered significant for all tests.

The sample size was determined based on the proportion of patients with pain on mastication at 1 month follow-up. The pilot study showed that it was 50% in group I and 0 in group II. Assuming the proportion in group II to be 1%, a sample size of 13 in each group would be required to achieve 82% power at the significance level of 0.05 to detect a difference of 49% in the proportion of patients with pain between the groups using the statistic two-sided Fisher’s exact test.

Results

Thirty patients were recruited for the study. Two patients were excluded from the study as the graft was harvested from the lower lip and the remaining 28 patients were analyzed. Demographic data were comparable between the groups [Table 1]. Pain scores measured using VAS [Figure 1] were significantly lower in group II (*P* = 0.002) at all points of time. The median time to pain-free liquid diet in group I was 2.5 days (2–3), whereas it was 1 day (1–1) in group II (*P* < 0.001). The median time to pain-free solid diet was 3.5 days (3–4) in group I patients and 2 days (2–2) in group II (*P* < 0.001). Nine patients in group I required rescue analgesia and the median dose of tramadol consumed was 50 mg (interquartile range 0–50) and none of the patients in group II required rescue analgesia. Follow-up consultation after 1 month revealed that three patients in group I and 1 patient in group II had perioral numbness (*P* = 0.026). Five patients had persisting pain on mastication and difficulty in mouth opening in group I and none of the patients had difficulty in opening mouth or pain in group II (*P* = 0.016). No patient had dribbling of saliva in both the groups. None of the patients in both the groups had pain at the urethroplasty site.

Table 1: Demographic data

Variable	Group I median [IQR]	Group II median [IQR]	<i>P</i> value
Age (years)	39.5 [36.7-45.2]	45 [34.7-51.2]	0.579
Weight (Kg)	51.5 [47.5-66.0]	58.8 [50-68.5]	0.143
Duration of Surgery (Hours)	4 [3.7-4.2]	4.5 [4-5]	0.796

All patients in group II were satisfied with the postoperative analgesia (*P* = 0.001) and there were no complications associated with the administration of block in any of the patients.

As the sample size was determined on late complications of pain, a *post hoc* power analysis was done to determine if the sample size was adequate to assess the early benefits of IOB such as for the time to accept solid food without pain. In this study, the mean time to accept solid diet was 3.75 ± 0.5 days in group I and 1.8 ± 0.1 days in group II. The study achieves a power of 100 with an alpha error of 0.001 to detect a difference of 1.9 days in time to accept solid food with a sample size of 14 in each group.

Discussion

The principal finding of our study was that the administration of IOB reduced early postoperative pain and provided surrogate benefits such as early oral intake of both liquid and solid diet and also reduced late complications of persisting pain and trismus at the donor site.

Management of intractable strictures by reconstruction of the urethra is a challenging urological surgery. Urethral reconstruction is performed using BMG as it forms an excellent material for graft. While the improved surgical expertise has significantly reduced major complications, minor oral complications of BMG harvest continue to be high.^[8-11]

As evidenced from the literature, the peripheral nerve block provides not only excellent analgesia but also mitigates the morbidity and prevents long-term complications following a painful surgical procedure.^[1,12,13]

The infraorbital nerve, after emerging from the infraorbital foramen, divides into four branches: the inferior palpebral, external nasal, internal nasal, and superior labial nerves.

Infraorbital nerve provides sensory innervations to the upper lip, buccal mucosa, side of nose, mucous membrane lining the cheek, the nasal vestibule, and the skin of the lower eyelids and has crossover innervation.^[14] As the donor site of BMG is well within the sensory innervation of the infraorbital nerve, blocking this nerve at the infraorbital foramen, that is, the exit point of the nerve intraorally is a good option for providing the analgesia thereby preventing the morbidity. The block can also be given extra orally; however, the intraoral approach carries the advantage of being cosmetically more acceptable.^[15]

In our study, patients who received IOB had low pain scores throughout the study period. The median time to oral liquid

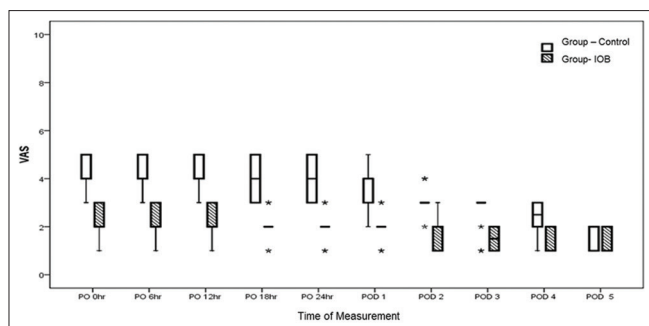


Figure 1: Box plot graph showing pain scores at different intervals of time

and solid intake was significantly less compared with patients in group I. The administration of preoperative nerve block for pre-emptive analgesia and an additional postoperative nerve block resulted in better pain relief, lower analgesic consumption, and early restoration of oral intake without pain as compared with conventional parenteral analgesia. Late complications following BMG harvesting such as tightness on opening mouth, trismus, dribbling of saliva, and persistent pain at 1 month seen in patients without block were absent in patients who received IOB. In the follow-up after 1 month, all patients in group II were contented and were fully satisfied with the administration of IOB for the graft and further were enthusiastic to receive the block again if needed in future.

In this study, the block was administered twice; initially, before the graft harvest, for possible pre-emptive effects, and then repeated after the completion of the procedure to avoid the surgical time bias. The literature supports the use of pre-emptive analgesia in mitigating the long-term complications of pain. The main contention here was to block the pain signals well before they were initiated. Pre-emptive analgesia prevents establishment of altered central processing of afferent input from injuries, thus prevents central sensitization and consequent morbidity.^[16] There is increasing evidence of an association between the severity of the acute pain and the risk of developing chronic postsurgical pain.^[17] It has been shown that the long-term outcome can be influenced positively by the use of regional anesthesia technique postoperatively.^[18,19] Persistent chronic pain after surgery has been the main factor interfering with the individual's return to daily life activities, which can affect their lifestyle and productivity. IOB provides safe and effective postoperative analgesia without the side effects of opioid or NSAIDs. There are some inconsequential limitations to this study. The success of the block was not evaluated as it was given after administration of anesthesia. The use of ultrasound imaging might have confirmed the injection at the nerve site. However, the success rate of intraoral approach for IOB by landmark technique is also associated with high success as seen in our previous study.^[5]

Therefore, it was presumed that the success was 100%. The blinding was not complete as the control group did not receive IOB with saline placebo. It has been shown that saline was not a placebo as it also produces some block which induces a bias.^[20,21] The use of intraoral approach as opposed to extraoral approach does not leave any cutaneous marks, thus avoiding observer bias.

The possible contribution of epidural fentanyl on pain relief at donor site cannot be ruled out as absorbed fentanyl may also potentiate block-induced analgesia at the graft harvest site. However, as both groups received epidural fentanyl, this may not influence the inference from the study. The possibility of pre-emptive analgesia is only presumptive and evaluation of its true importance will have to await further research.

Conclusion

In conclusion, IOB is a promising adjunct to management of BMG urethroplasty. It is effective in relieving acute postoperative pain at donor site with facilitation of early food intake and mitigation of late morbidity thereby providing good patient satisfaction.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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