ORIGINAL ARTICLE

Bilateral Infraorbital Nerve Block for Postoperative Analgesia after Functional Endoscopic Sinus Surgery: A Prospective Randomized Study

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Abstract

Functional endoscopic sinus surgery (FESS) is a common procedure performed in the ear, nose, and throat (ENT) operating room under general anesthesia (GA). Patients usually experience discomfort and pain postoperatively due to nasal packing.

Aims and objectives: Our study is aimed to evaluate the effect of a bilateral intraoral infraorbital block with bupivacaine on postoperative pain in patients undergoing FESS under GA.

Materials and methods: A total of 60 patients were randomly allocated to either the control group or study group of 30 each. After the establishment of the standard GA technique, bilateral intraoral infraorbital nerve block (IOB) was performed with 1 mL of either normal saline (control group) or 0.5% bupivacaine (study group). Fentanyl dose was repeated with a rise in mean arterial pressure of >10% of the baseline. Postoperative pain intensity, duration of analgesia, analgesic requirement, intraoperative hemodynamics, and patient satisfaction to pain were evaluated.

Results: Postoperative pain scores in the control group were 3 and 2 and the study group was 2 and 1 and were statistically significant ($p = 0.000$). Duration of analgesia and the total analgesic requirement (first 24-hour postoperative period) were 513.5 ± 151.14 and 236.00 ± 65.20 and 92.50 ± 30.19 and 167.50 ± 32.26 in the study group and control groups, respectively and were significant statistically ($p < 0.05$). The hemodynamic and patient satisfaction scales were also significantly better in the study group.

Conclusion: General anesthesia (GA) with bilateral intraoral infraorbital block provided stable hemodynamics, prolonged duration of analgesia, less pain scores, fewer analgesic need, and more patient satisfaction scores in the postoperative period.

Keywords: Functional endoscopic sinus surgery, Hemodynamic, Infraorbital block, Patient satisfaction scale, Postoperative analgesia.

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Introduction

Functional endoscopic sinus surgery (FESS) is the most common ENT procedure that has been developed as a minimally invasive technique for managing the symptoms and complications of chronic sinusitis. The primary objective is to restore ventilation of the paranasal sinuses so as to improve the function.[1] Endoscopic techniques have an extended application for the management of other pathological entities like excision of tumor lesions and lacrimal system obstruction.[2] A less invasive endoscopic procedure imparts significant postoperative discomfort and pain due to submucosal nasal dissection and nasal packing.[3]

Adequate postoperative analgesia is a vital part of perioperative care. Perioperative pain management is like a double-edged sword for an anesthesiologists, the use of opioids increases the incidence of respiratory depression whereas insufficient treatment leads to various metabolic, physiologic, and neurophysiological responses that

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may compromise surgical outcomes. Regional block in combination with GA provides good analgesia and reduces analgesic requirements in the perioperative period.[4] It is also associated with perioperative hemodynamic stability and rapid and complete recovery from anesthesia.[5]

We hypothesized that blocking nasal innervation through the infraorbital nerve with local anesthetic for FESS procedures may provide postoperative analgesia and patient satisfaction to pain and discomfort following FESS. This is a prospective, randomized, and double-blind study to evaluate the efficacy of IOB with bupivacaine by drawing compare with the control group.

Primary Objectives

Duration of postoperative analgesia (time to first request to analgesia).

Secondary Objectives

Hemodynamic stability during the intraoperative period, an analgesic requirement in the intraoperative period and in the postoperative 24-hour duration and patient satisfaction after the surgery.

Materials and Methods

After the approval of the study by the Hospital Ethics Committee, written informed consent was obtained from the patient. A total of 60 patients with American Society of Anaesthesiologists (ASA) grades I and II aged between 20–55 years. Patients with surgery duration of <1 hour were included in the present study. Patients with morbid obesity, significant endocrine dysfunction, the potential for airway obstruction like acromegaly or with cushingoid features, and other postoperative complications were excluded from the study. Local infection at the site of injection (inj), history of drug allergy or coagulation disorders were also not part of the study.

Taking the mean and standard deviation (SD) of the duration of postoperative analgesia from the previous study[6] the effect size calculated was 0.8. The sample size was calculated with the effect size of 0.8, α error probability of 0.05, and power (1-β error probability) of 0.80 in G* power 3.1.9 software (Olshausenstr, Kiel, Germany)[7] and was total of 52, that is, 26 in each group. However, taking into consideration of the dropout of cases, we selected 30 cases in each group with a total of 60 patients.

A day prior to surgery, a preoperative visit was made for detailed history, clinical examination, and airway assessment with a modified Mallampati score. Standard GA technique was followed for both groups. Patients were allocated into two groups of 30 patients each as per the randomization list of a chart generated by PASS 13 Power Analysis software.[8]

Infraorbital nerve block (IOB) was performed by intraoral approach, with the patient in the supine position and the head fixed, the infraorbital foramen was located externally and a finger was placed over it to guide the needle and prevent it from penetrating the infraorbital foramen. The lip was retracted with a catspaw retractor and elevated to approach intraorally the infraorbital foramen with a 24 G needle and 2 mL syringe containing 0.5% of bupivacaine or normal saline, inj 1 mL on each side. The control group was given bilateral IOB with 1 mL of normal saline and the study group with 1 mL of 0.5% bupivacaine on each side.

Monitoring of the patients consisted of electrocardiogram (ECG), peripheral oxygen saturation (SPO_2), end tidal CO_2 ($ETCO_2$), and noninvasive blood pressure (NIBP). Heart rate (HR) and mean arterial blood pressure (MAP) were recorded at baseline, at the time of induction, during block and at 10, 20, 30, 40, 50, and 60 minutes after the start of the surgery and during extubation. Fentanyl was given in the dose of 2 μg/kg intravenous (IV) at the time of induction to GA and repeated if required in small doses whenever the HR increased by 20% above the baseline. The total intraoperative fentanyl consumption was noted. At the end of the surgery, the nostrils were packed. The patients were extubated after meeting the standard extubation criteria. After extubation, pain score and patient's satisfaction score were evaluated by an independent observer.

Postoperative pain was assessed with a visual analogue scale (VAS) 1–10 with 1 as no pain and 10 as worst or maximum pain. Postoperative pain VAS score and analgesic requirement were assessed at 4, 8, 12, 16, 20, and 24 hours. With a VAS score of >3 rescue analgesia was given with inj diclofenac 75 mg and the total requirement in 24 hours was recorded.

Statistical Analysis

The Kolmogorov–Smirnov test was performed to confirm the normal distribution of the data. Numerical data were presented as mean ± SD, ordinal data as median with interquartile range (IQR), and categorical data as frequency and percentage. Hemodynamic data of the two groups were compared by analysis of variance repeated measures. Comparisons of numerical data of the two groups were analyzed by students' *t*-test, of the categorical data by chi-squared test, and ordinal data by Mann-Whitney *U* test. *p*-values of <0.05 were considered statistically significant. The analysis was performed by Number Cruncher Statistical Systems[10] statistical software.[9]

Results

All 60 patients were included as there were no dropouts of the cases. Demographic data between the two groups were comparable (Table 1).

Intraoperative fentanyl demand was much lower in the study group (115 ± 18.91 μg) than the control group (126.67 ± 21.71 μg) and was statistically significant ($p = 0.0101$) (Table 2). The duration of analgesia was 513.5 ± 151.14 minutes in the study patients and 236.00 ± 65.20 minutes in the control group. This difference in the duration of analgesia was statistically significant ($p = 0.0001$). The total analgesic (inj.

Table 1: Demographic profile of both the groups

Demography	*Control*	*Study*	*p-value*
Age (mean ± SD)	31.47 ± 10.69	34.70 ± 12.60	0.1211
Height (mean ± SD)	161.43 ± 8.01	162.2 ± 10.51	0.751
Weight (mean ± SD)	56.90 ± 12.01	59.57 ± 9.84	0.351
Sex ratio (M:F)	16:14	17:13	0.796
ASA grade ratio (I:II)	17:13	14:16	0.796

Table 2: Perioperative analgesic requirement in both the groups

Analgesic requirement	*Control*	*Study*	*p-value*
Intraoperative fentanyl (mean ± SD)	126.67 ± 21.71	115 ± 18.91	0.0101*
Duration of analgesia (rescue analgesic demand) (mean ± SD)	236.00 ± 65.20	513.5 ± 151.14	0.0001*
Postoperative diclofenac (mean ± SD)	167.50 ± 32.26	92.50 ± 30.19	0.0001*

*p-value < 0.05 is statistically significant

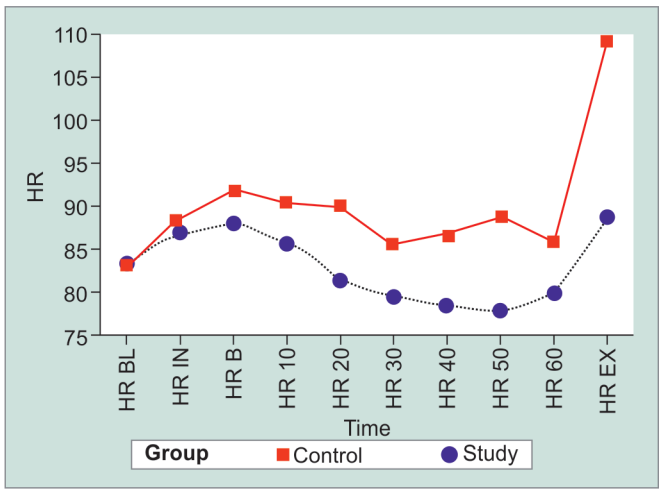

Fig. 1: HR variations in both the groups

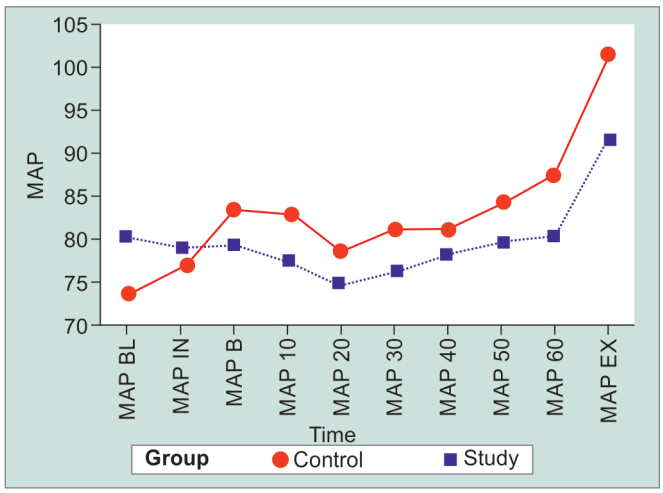

Fig. 2: MAP variations in both the groups

diclofenac) demand in the postoperative 24-hour period was significantly different (p 0.0001) between the two groups (study group = 92.50 ± 30.19 mg and control group = 167.50 ± 32.26 mg).

Heart rate (HR) (Fig. 1) and MAP (Fig. 2) were measured at various time intervals in the intraoperative period. Baseline values (MAP and HR) were comparable between the two groups. The hemodynamic observations were statistically significant at other intervals between the two groups ($p < 0.05$).

Postoperative VAS and postoperative satisfaction scale (PSS) showed significantly better scores in the study groups than the control groups (Table 3).

Discussion

Functional endoscopic sinus surgery (FESS) is an endoscopic procedure that includes submucosal dissection of the nasal mucosa and nasal packing at the end of the surgery. Nasal packing causes significant discomfort due to foreign body sensations and pain in the postoperative period.[10–12] This in turn can cause hemodynamic disturbances, which may not be acceptable in high-risk patients. Adequate analgesia is therefore essential in the perioperative period.

Regional analgesia as a component of multimodal analgesia has the advantage of providing dense intraoperative analgesia that continues into the postoperative period,[13,14] without the risk of respiratory depression.[15] In this study, we have observed the effect of bilateral infraorbital block in patients undergoing FESS under GA. Among the study group patients with bilateral IOB with 0.5% bupivacaine, significant prolongation of the duration of analgesia, and better pain relief were observed. There was also hemodynamic stability in the intraoperative period and lower analgesic requirement in the perioperative period. Postoperative patient satisfaction scale scores were better in patients of IOB with bupivacaine

Systemic analgesics and peripheral nerve blocks are recommended whenever possible for pain management for nasal surgery under GA.[16–19] Nirmala et al.[5] conducted a study to evaluate the effect of bilateral IOB following

Table 3: VAS and patient satisfaction scale in both the groups

			IQR		
	Groups	*Median*	*Lower*	*Upper*	*p-value*
VAS	Control	3	2	4	0.00
	Study	2	1	2	
PSS	Control	2	2	2	0.00
	Study	4	3	4	

*IQR, interquartile range; **p-value < 0.05 is statistically significant

transsphenoidal pituitary surgery and concluded that IOB provides adequate analgesia and less demand for intraoperative analgesia. Our study observed a significant reduction in the intraoperative analgesic requirement in the study patients (126.67 ± 21.71 µg) than the control patients (115 ± 18.91 µg) ($p = 0.010$). Similar results were observed in another study where the intraoperative analgesic demand was less in patients with IOB than the control group (0.074 ± 0.014 vs 0.093 ± 0.013 µg/kg/minute respectively, $p = 0.0001$).[16]

There was no difference in the baseline MAP and HR between the control and study groups. However, intraoperatively, both MAP and HR were much lower and more stable in the study group as compared to the control group. Similar results were observed with Bhattacharya et al.[20] in their study with sphenopalatine block for FESS under GA with lower MAP and HR throughout the intraoperative period. However, in another study, no significant change in hemodynamics (MAP and HR) was reported in patients with IOB in comparison to the control group under GA.[21]

A significant level of pain was observed in patients postoperatively due to different methods of nasal packing in the previous studies.[10,12,22] In our study, postoperative pain and discomfort as measured with VAS were observed due to nasal packing in the control group and this is consistent with the above studies. The pain relief was better in the study group patients and these observations are consistent with the results of IOB patients after endonasal trans septal trans-sphenoidal pituitary surgery.[5,19] Various studies on nasal surgeries[16,21,23–25] reported having lower pain scores in patients with IOB.

In the literature, studies were performed in children for cleft lip surgery with bilateral infraorbital block and proved to be very effective for postoperative analgesia and the less need for opioids or nonsteroidal anti-inflammatory drugs (NSAIDs) in the postoperative period.[26–28] Mariano et al.[21] and Cekic et al.[29] have observed fewer analgesic requirements in the first 24 hours of surgery in block patients than the control group patients in their study on outpatient nasal surgery. Our study demonstrated a significant reduction in the requirement of total analgesic dose in the first 24-hour postoperative period.

The duration from the time of administration of the block to the first supplementation of rescue analgesia in the postoperative period was used as the duration of analgesia. The results here showed a significantly prolonged duration of analgesia in the study group (513.5 ± 151.14) with bilateral IOB with bupivacaine than that of the control group (236.00 ± 65.20). Concurrent to our study results Nirmala et al.[5] had a longer time for the first demand to rescue analgesia in the block patients in comparison to the non-block patients. Various other studies also mentioned prolonged duration of analgesia in patients with bilateral IOB for cleft lip surgery.[26–28] Sphenopalatine ganglion block with bupivacaine exhibited lower pain scores in the postoperative period after FESS surgery under GA.[30,31]

Postoperative satisfaction scale (PSS) was considered excellent as 4, good as 3, fair as 2, and poor as 1. In our study PSS scores were higher in the study patients than in the control group and also had smooth awakening from GA. Similar effects on patient satisfaction scores on pain were observed by Nirmala et al. who required nasal packing after the surgery.[5] In contrast, statistically insignificant changes were reported in regard to satisfaction scores in the study group as with the control group in another article.[21]

Conclusion

Bilateral IOB with 0.5% bupivacaine as an adjuvant to GA provides stable hemodynamic, postoperative analgesia, and patient satisfaction in patients undergoing FESS. At the same time, the analgesic requirement was less in both the intraoperative and postoperative periods with good patient satisfaction in patients with IOB. For patients undergoing FESS under GA, bilateral IOB as an adjuvant provides extended postoperative analgesia and is hence recommended.

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