ISSN: 1607-8322, e-ISSN: 2220-5799 Anaesthesia, Pain & Intensive Care
Vol 29(4); July 2025 DOI: 10.35975/apic.v29i4.2820

ORIGINAL RESEARCH ANESTHESIA FOR EYE / ENT SURGERY

The effect of sphenopalatine ganglion block with 0.5% bupivacaine on postoperative pain after functional endoscopic sinus surgery (FESS) under general anesthesia

Yahia Abdelrahman Bakr Albadry [1], Sara Hossam El-din Taha Saleh [2], Amr Mohamed El-said [3], John Nader Naseef [4]

Author affiliations:

1. Yahia Abdelrahman Bakr Albadry, M.B.B.Ch., Faculty of Medicine, Ain Shams University, Cairo, Egypt; Email: YahiaAbdelrahman@med.asu.edu.eg
2. Sara Hossam El-din Taha Saleh, Lecturer, Department of Anesthesia, Intensive Care & Pain Management, Faculty of Medicine, Ain Shams University, Cairo, Egypt; Email: Sara_7oss@hotmail.com
3. Amr Mohamed El-said, Professor of anesthesia, Intensive Care & Pain Management department Faculty of Medicine, Ain Shams University, Cairo, Egypt; Email; amrsaid_9@hotmail.com
4. John Nader Naseef, Assistant Professor of anesthesia, Intensive Care & Pain Management department Faculty of Medicine, Ain Shams University, Cairo, Egypt; Email: jnnbasta@yahoo.com

Correspondence: Yahia Abdelrahman Bakr Albadry, **Email:** YahiaAbdelrahman@med.asu.edu.eg; **Phone:** 01096406813

ABSTRACT

Background & objective: Functional endoscopic sinus surgery (FESS) is a minimally invasive surgical technique used in some nasal conditions, refractory to medical treatment, for example chronic rhinosinusitis. The pain after the procedure is usually addressed with non-steroidal anti-inflammatory drugs (NDAIDs) or opioids, which are not without side effects. We conducted this study to assess the effect of bilateral sphenopalatine ganglion block with 0.5% bupivacaine injection at the end of the surgery in controlling postoperative pain.

Methodology: We performed a double blinded randomized clinical trial on 70 patients undergoing FESS under general anesthesia. Sample size was calculated using PASS software version 15. Based on the findings of a previous study, using a two-sided two- sample equal-variance t-test with the population effect size at 0.7, the significance level (alpha) at 0.05 and the power (1- β) at 0.8, a sample size of at least 70 patients (35 per group) was produced. The patients were randomly assigned to one of the two groups; a control group, where normal saline was injected in the greater palatine foramen transorally, and the study group (SPG block group), where 0.5% bupivacaine was injected. Pain was then assessed postoperatively by the visual analogue scale (VAS); and the time to first need of inj. fentanyl as rescue analgesia and the total amount used were recorded.

Results: Maximum intensity of the pain was at 2 hours post-operatively in the control group and 6 hours in the SPG block group, and pain intensity was lower in the SPG block group at 2, 6 and 12 hours post- operatively. In the SPG block group, less patients required rescue analgesia, time needed for the first dose of rescue analgesia was more, and the total 24-hour fentanyl consumption was lower.

Conclusions: Sphenopalatine ganglion block using 0.5% bupivacaine results in better postoperative pain management, and a reduced need for analgesics in patients undergoing functional endoscopic sinus surgery.

Keywords: Bupivacaine; Endoscopic Sinus Surgery; Fentanyl; Sphenopalatine Ganglion Block

Citation: Albadry YAB, Saleh SHET, El-said AM, Naseef JN. The effect of sphenopalatine ganglion block with 0.5% bupivacaine on postoperative pain after functional endoscopic sinus surgery (FESS) under general anesthesia. Anaesth. pain intensive care 2025;29(4):356-62. **DOI:** 10.35975/apic.v29i4.2820

Received: April 02, 2025; **Revised:** June 06/ June 12, 2025; **Accepted:** June 12, 2025

1. INTRODUCTION

Functional endoscopic sinus surgery (FESS) is an effective, minimally invasive procedure widely used for the treatment of chronic rhinosinusitis as well as nasal polyposis, especially when refractory to appropriate medical treatment. Using this approach to treat chronic inflammatory paranasal sinus illnesses has shown to be beneficial, with up to 86.3% of patients noticing improvement in postoperative symptoms.[1] However, many patients complain of postoperative pain after FESS.

After any operation, postoperative pain is a significant problem that can be difficult to manage. It is estimated that 86% of surgical patients feel pain, with 75% of them reporting moderate to severe pain.[2] When there is not enough pain control, some consequences may happen like delayed recovery, the need for rehospitalization, increasing the costs of healthcare, decreased patient satisfaction, increased risk for pulmonary and cardiovascular complications, decreased quality of life, developing chronic pain, and impaired physical function.[3]

To our knowledge, there is still no agreed upon protocol for postoperative pain control after FESS, and the side effects of the commonly used drugs are a hurdle to adequate acute pain control. For example, non-steroidal anti-inflammatory drugs (NSAIDs) have gastrointestinal, hematological, and even neurological side effects. Opioids also have some side effects that limit their use like nausea, vomiting, reduced gastrointestinal motility and respiratory depression. On the other hand, localized techniques have shown good safety profile and proven efficacy.[3,4]

Sphenopalatine ganglion (SPG) is a parasympathetic ganglion present bilaterally in the pterygopalatine fossae in the head and it is the largest of the four ganglions in the head region. The SPG has parasympathetic, sympathetic, and sensory nerve fibers. The sensory neurons innervate the lacrimal glands, the nasal cavity, the palate and the mucous membranes of the oropharynx and the nasopharynx. The SPG also innervates the cerebral and meningeal blood vessels.[5] There are multiple approaches to block the SPG including the intranasal, transoral and lateral approaches.[6]

Existing data is inadequate to recommend the routine use of SPG block for FESS. Recently, some studies investigated the analgesic effectiveness of SPG block for FESS, but the available data show inconsistent findings.[4]

The objective of this research was to assess the effectiveness of injecting 0.5% bupivacaine bilaterally in the SPG at the end of FESS to control postoperative pain and decrease rescue analgesic requirements.

2. METHODOLOGY

Approval of the research ethical committee of the Faculty of Medicine, Ain Shams University, was obtained before conducting the study. We performed a double blinded randomized clinical trial on 70 patients during March to August 2024, at Ain-Shams University Hospitals, Cairo, Egypt. The patients were randomly assigned to one of the two groups; a control group where saline was injected in the greater palatine foramen trans orally, and the second group where 0.5% bupivacaine was injected. Pain intensity and the need for rescue analgesic was then assessed postoperatively using the VAS.

Sample size was calculated using PASS software version 15. Reviewing results from a previous study[7] showed a moderate reduction of postoperative pain in the group receiving SPG block with 0.5% bupivacaine versus the control (saline) group, and reading the post-operative pain VAS score, an effect size difference of 0.7 between the two groups was assumed. Based on these findings, using a two-sided two- sample equal-variance t-test with the population effect size at 0.7, the significance level (alpha) at 0.05 and the power (1- β) at 0.8, a sample size of at least 70 patients (35 per group) was produced.

Patients with age between 18-80 years, ASA I-II physical status and willing to participate in the research were included in the study. While, patients who refused to continue participating in the study, or pregnant and breastfeeding females, patients with a history of allergy to 0.5% bupivacaine or other local anesthetics, uncontrolled hypertension, poorly controlled cardiovascular disease, or cerebrovascular disease, pre-existing neurological conditions, alcohol or drug abuse, history of surgical or anesthetic complications or change in the anesthesia protocol, history of uncontrolled renal, hepatic, or respiratory disease, chronic pain needing sedatives, major analgesics, , or corticosteroids or those who were unable to understand VAS score were excluded from the study.

All eligible patients were asked to sign an informed written consent after explaining the study goals and the purpose, the interventions used in the study; as well as the risks and the benefits of the study and interventions.

2.1. Pre-operative settings

Detailed preoperative history was taken, and preoperative thorough clinical examination and investigations were performed. The patient was fasting for at 8 hours before surgery. Participants were not

allowed any medications 24 hours pre-operatively and no preoperative medications were given. Preoperatively, patients were educated about how to use the Visual Analog Scale (VAS) for pain (0 = no pain, 10 = most severe pain). In the pre-anesthetic room, an 18-gauge peripheral intravenous cannula was inserted.

The eligible patients who fulfilled the inclusion and exclusion criteria were recruited in this double blinded study and randomly put into one of two groups by computer generated random number lists. The assigning was blinded using closed opaque envelopes. The solutions for the block were prepared by an anesthesiologist who did not have any further role in the study. Patients and investigators collecting the data were also blinded to the content of the preparations.

Group A (Control group) (n=35): Normal saline 1.5 mL was injected in the greater palatine foramen.

Group B (Bupivacaine group) (n=35): Bupivacaine 0.5% 1.5 mL was injected in the greater palatine foramen.

2.2. Intra-operative settings

In the operating room, hemodynamic parameters were monitored including non-invasive blood pressure, oxygen saturation, electrocardiogram, and capnography. General anesthesia was induced and maintained according to the institute guidelines. The SPG block was done at the end of the surgery with a transoral approach at the greater palatine foramen by the help of a Macintosh blade number 3 for good visualization of the hard and soft palate with a 25 G 1.5-inch curved needle at 45 degrees 25 mm from the tip, and a syringe filled with 1.5 mL of bupivacaine 0.5% or normal saline depending on the group the patient was assigned to. The greater palatine foramen is located posteromedial to the third maxillary molar and anteromedial to the pterygoid hamulus and maxillary tuberosity. The foramen was identified by digital palpation, and the needle was inserted until reaching the bone then redirected slightly until the foramen was localized and the needle easily got into the greater palatine canal. Aspiration was done to ensure that no blood vessels were punctured, and the solution was injected.

2.3. Post-operative settings

At the end of surgery, the patients were extubated and moved to the post-anesthesia care unit (PACU) for observation and vital signs monitoring. Patients were assessed using modified Aldrete score and patients were discharged to the surgical ward after meeting PACU discharge criteria. The length of stay in the PACU was recorded. Vital signs were monitored and noted every 4 hours unless the patients were asleep. Postoperative pain was evaluated with VAS (0 = no pain, 10 = worst imaginable pain) in the PACU, at 2, 6, 12, and 24 hours after surgery. Participants with VAS score ≥ 4 at any point of time and complaining of pain received fentanyl (25-50 µg) as a rescue analgesic and the time to request the first rescue analgesia was recorded. The primary outcome was mean VAS pain score over the first 24 hours postoperatively. While the secondary outcomes were mean time to first request for rescue analgesia, number of patients receiving rescue analgesia, total requirements of rescue analgesia, and the incidence and severity of adverse effects and complications during the first 24 hours.

Table 1: Comparative demographic characteristics in the study groups

Variables		SPG block group (n = 35)	Control group (n = 35)	P-value
Age (years)	Mean ± SD	32.6 ± 5.8	31.1 ± 5.6	^0.260
	Range	21.0–44.0	22.0–44.0	
Sex (n, %)	Male	22 (62.9%)	18 (51.4%)	#0.334
	Female	13 (37.1%)	17 (48.6%)	
BMI (kg/m^2)	Mean ± SD	27.5 ± 2.9	28.5 ± 2.2	^0.112
	Range	23.0–34.4	24.2–34.9	
ASA (n, %)	I	25 (71.4%)	23 (65.7%)	#0.607
	II	10 (28.6%)	12 (34.3%)	
Operation duration (min)	Mean ± SD	55.6 ± 10.8	58.7 ± 10.5	^0.237
	Range	35.0–84.0	43.0–86.0	

BMI: Body Mass Index *ASA: American Society of Anesthesiologists*
^ Independent t-test *# Chi square test*

Table 2: Comparative postoperative pain scores between the study groups

Time		SPG block group (Total = 35)	Control group (Total = 35)	^P-value	Relative effect Mean ± SE 95% CI
PACU	Mean ± SD	0.2 ± 0.4	0.4 ± 0.5	0.077	-0.2 ± 0.1
	Range	0.0–1.0	0.0–1.0		-4.0–0.1
Hour-2	Mean ± SD	1.6 ± 0.8	3.2 ± 0.7	**< 0.001***	-1.6 ± 0.2
	Range	1.0–3.0	2.0–4.0		-2.0−1.2
Hour-6	Mean ± SD	1.8 ± 0.6	3.5 ± 1.1	**< 0.001***	-1.7 ± 0.2
	Range	1.0–4.0	2.0–5.0		-2.1−1.3
Hour-12	Mean ± SD	2.0 ± 0.8	2.6 ± 0.6	**0.002***	-0.5 ± 0.2
	Range	1.0–4.0	1.0–3.0		-0.9−0.2
Hour-24	Mean ± SD	1.1 ± 0.3	1.2 ± 0.4	0.177	-0.1 ± 0.1
	Range	1.0–2.0	1.0–2.0		-0.3–0.1

P < 0.05 considered as significant.

Table 3: Comparative postoperative rescue analgesia in the study groups

Variables		SPG block group (Total = 35)	Control group (Total = 35)	P-value	Relative effect Relative risk 95% CI
Fentanyl request (n, %)		8 (22.9)	29 (82.9)	**#< 0.001***	0.28 0.15–0.52
		Total = 8	Total = 29		**Mean ± SE 95% CI**
Time to first dose (hours)	Mean ± SD	4.8 ± 0.9	2.1 ± 0.7	**^< 0.001***	2.7 ± 0.3
	Range	3.1–6.2	1.0–4.0		2.1–3.3
Total 24-hour dose (µg)	Mean ± SD	38.1 ± 15.8	62.1 ± 21.6	**^0.006***	-23.9 ± 8.2
	Range	25.0–70.0	25.0–100.0		-40.6–-7.3

 # Chi square test ^ Independent t-test SE: Standard error CI: Confidence interval Relative effect: Effect in SPG block group relative to that in control group

2.4. Statistical analysis

IBM SPSS statistics (Statistical Package for Social Sciences) software version 28.0, IBM Corp., Chicago,

USA, 2021 was used to code, tabulate, and statistically analyze the collected data. Quantitative data is shown as mean ± SD (standard deviation) and as minimum and maximum of the range. Independent t-test was used to compare the quantitative data. Numbers and percentages described Qualitative data. Chi square test and Fisher's Exact test were used to compare qualitative data. Log rank test was utilized to compare rate of requesting rescue analgesia. Significance was considered at $P \leq 0.05$.

3. RESULTS

Seventy patients, who met the criteria of inclusion, accepted to participate in the study and completed the study. The study population were older than 18 years of

age, ASA I and II patients, and the two groups were similar with respect to age, sex, weight, ASA classification and duration of surgery (Table 1).

The VAS score was assessed at PACU admission, as well as at 2, 6, 12 and 24 hrs. At PACU admission, there was no significant difference in the mean VAS scores between the groups. Table 2 shows that the pain reached its peak at 2 hours post-operatively in the control group

Table 4: Complications and adverse effects between the study groups

Variables	SPG block group (n = 35)	Control group (n = 35)	P-value	Relative effect Relative risk 95% CI
Dizziness	4 (11.4)	2 (5.7)	§ 0.673	2.00 (0.39–10.22)
Nausea and vomiting	2 (5.7)	8 (22.9)	**# 0.040***	0.25 (0.06–1.10)
Headache	1 (2.9)	6 (17.1)	§ 0.106	0.17 (0.02–1.31)
Visual disturbance	1 (2.9)	5 (14.3)	§ 0.198	0.20 (0.03–1.63)
Epistaxis	0 (0.0)	0 (0.0)	NA	NA

Data presented as number (%) *NA: Not applicable*
§ Fisher's Exact test *CI: Confidence interval*
Relative effect: Effect in SPG block group relative to that in control group

and at 6 hours post-operatively in the SPG block group. The pain intensity was significantly less in the SPG block group than in the control group at 2, 6 and 12 hours post-operatively. Nevertheless, the difference in pain was not significant at the end of 24 hours post-operatively. The number of patients in the SPG block

group requiring rescue analgesia was significantly lower than the control group, also the time to the first dose of rescue analgesia was significantly longer, and the total 24-hour fentanyl consumption was significantly lower in the SPG block group as shown in Table 3.

The two groups had similar incidence of headache, visual disturbances and dizziness, in the first 24 hours, while the incidence of nausea and vomiting was significantly less in the block group as shown in Table 4.

4. DISCUSSION

We conducted this study to evaluate the pain postoperatively after FESS. We conducted the study with the hypothesis that using a long- acting anesthetic agent like 0.5% bupivacaine would result in less pain and less need for non-steroidal anti-inflammatory drugs and opioids in the 24-hour postoperative period. FESS is a common minimally invasive surgical procedure. However, moderate post-operative pain usually occurs postoperatively, and that pain reaches its maximum intensity in the first day of surgery.[9] The usual post-operative analgesia used after FESS are NSAIDs and opioids. But these medications have some serious side effects. However, localized techniques, like SPG blocks, have shown to be safe and effective.[3,4]

Our study results implied that, after the operation, in the first 24 hours, patients who had 0.5% bupivacaine injected into their SPG, had significantly less VAS scores compared to the control group. They also needed smaller amounts of analgesics compared to the group taking normal saline. Side effects like headache, dizziness or visual disturbances were comparable in both groups. However, the incidence of nausea and vomiting was significantly less in the intervention group.

During the recent past, the practice of anesthesia has undergone some dramatic developments; e.g., combining general anesthesia and regional nerve block in practice to improve postoperative analgesia, to reduce parenteral analgesics related complications and allow for more rapid recovery and early discharge.[10]

Few studies have assessed the efficacy of SPG block on pain after FESS or on reduction of the complications. Most of these studies support our findings that the use of this procedure might significantly diminish pain and decrease the need for rescue analgesia in patients undergoing FESS.

Cho et al.[7] in their prospective, double-blind, randomized, placebo-controlled study randomly assigned patients to have SPG block with either 2 mL of 0.25% bupivacaine with 1:100000 epinephrine or saline with 1:100000 epinephrine before the start of surgery. The mean VAS scores were lower in bupivacaine group as opposed to the saline group, but without statistical significance. This can be because of a small sample size of their study. A large clinically result in a small sample size might not be statistically significant, but with a large sample size, small differences can become statistically and clinically significant. Therefore, they recommended larger study sample size.

DeMaria et al.[8] using a randomized, double-blinded and placebo-controlled design assigned their patients to receive general anesthesia alone or with SPG block. Patients in the block group needed significantly less rescue analgesics with less discharge time and less hospital stay than the control group. They also found that after 24 hours there was not a significant difference in pain. Regarding the complications there was not

significant difference in postoperative nausea and vomiting between the two groups.

Another study compared same concentrations and volumes of levobupivacaine and bupivacaine in the SPG block. VAS scores were significantly less postoperatively in the block groups compared to a control group receiving saline ($P < 0.05$). In the block groups, less patients needed additional rescue analgesia in the 24 hours postoperatively ($P < 0.0001$). There was no significant difference between the groups in postoperative complications such as difficulty in swallowing and sore throat ($P > 0.05$).[10]

Another clinical trial divided the patients into 2 parallel groups, an intervention group having a volume of 1.5 mL of bupivacaine 0.5% injected into the SPG, and a control group where 1.5 mL of normal saline were injected at the same site. Pain intensity in the intervention group was significantly less ($P < 0.05$). Also, the rescue analgesic need was less in the intervention group ($P = 0.01$).[11]

5. LIMITATIONS

Our study has some limitations to be considered: First, the study was done at a single center and the sample size is relatively small. It may limit the generalization of the results to other populations. So, we recommend that large-scale multicenter studies to be done. Second, the block was performed post-operatively, so we did not evaluate the efficacy of the block for providing better operating conditions and decreasing intra-operative analgesic requirements and the consumption of volatile anesthetic agents during the surgery. Third, being performed post-operatively, we couldn't assess the effect of combining local anesthetics and general anesthesia in inducing hypotension, thereby stabilizing hemodynamics and minimizing the risk of surgical complications, especially bleeding loss.

6. CONCLUSION

Blocking the sphenopalatine ganglion bilaterally with bupivacaine results in less postoperative pain and less need for rescue analgesics after functional endoscopic sinus surgery.

7. Data availability

The numerical data generated during this research is available with the authors.

8. Conflict of interest

The authors declare that there was no conflict of interest involved.

9. Funding

No external or industry funding was involved in this study.

10. Authors' contribution

YAB and AME, conceived the study and designed it. All authors contributed equally to data collection and data analysis. Manuscript was written by YAB and JNN. Statistical analysis done by SHE and YAB.

11. REFERENCES

1. Fetta M, Tsilis NS, Segas JV, Nikolopoulos TP, Vlastarakos PV. Functional endoscopic sinus surgery improves the quality of life in children suffering from chronic rhinosinusitis with nasal polyps. Int J Pediatr Otorhinolaryngol. 2017;100:145-8. [PubMed] DOI: 10.1016/j.ijporl.2017.06.007
2. Gan TJ, Habib AS, Miller TE, White W, Apfelbaum JL. Incidence, patient satisfaction, and perceptions of post-surgical pain: results from a US national survey. Curr Med Res Opin. 2014;30:149-60. [PubMed] DOI: 10.1185/03007995.2013.860019
3. Sinatra R. Causes and consequences of inadequate management of acute pain. Pain Med. 2010;11:1859-71. [PubMed] DOI: 10.1111/j.1526-4637.2010.00983.x
4. Wang P. The efficacy of sphenopalatine ganglion block for pain management after endoscopic sinus surgery: a meta-analysis of randomized controlled studies. Eur Arch Otorhinolaryngol. 2021;278:2681-7. [PubMed] DOI: 10.1007/s00405-020-06484-9
5. Lundy JA, McNary T. Neuroanatomy, pterygopalatine ganglion. StatPearls. Treasure Island (FL): StatPearls Publishing; 2023. [PubMed]
6. Waldman SD. Sphenopalatine ganglion block. Pain Rev. WB Saunders; 2009. p. 391-3.
7. Cho DY, Drover DR, Nekhendzy V, Butwick AJ, Collins J, Hwang PH. The effectiveness of preemptive sphenopalatine ganglion block on postoperative pain and functional outcomes after functional endoscopic sinus surgery. Int Forum Allergy Rhinol. 2011;1:212-8. [PubMed] DOI: 10.1002/alr.20040
8. DeMaria S Jr, Govindaraj S, Chinosorvatana N, Kang S, Levine AI. Bilateral sphenopalatine ganglion blockade improves postoperative analgesia after endoscopic sinus surgery. Am J Rhinol Allergy. 2012;26:e23-7. [PubMed] DOI: 10.2500/ajra.2012.26.3709
9. Friedman M, Venkatesan TK, Lang D, Caldarelli DD. Bupivacaine for postoperative analgesia following endoscopic sinus surgery. Laryngoscope. 1996;106:1382-5. [PubMed] DOI: 10.1097/00005537-199611000-00014
10. Kesimci E, Öztürk L, Bercin S, Kırış M, Eldem A, Kanbak O. Role of sphenopalatine ganglion block for postoperative analgesia after functional endoscopic sinus

surgery. Eur Arch Otorhinolaryngol. 2012;269:165-9. [PubMed] DOI: 10.1007/s00405-011-1702-z

11. Rezaeian A, Hashemi SM, Dokhanchi ZS. Effect of sphenopalatine ganglion block with bupivacaine on postoperative pain in patients undergoing endoscopic sinus surgery. Allergy Rhinol (Providence). 2019;10:2152656718821282. [PubMed] DOI: 10.1177/2152656718821282

