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Sphenopalatine Ganglion Block as A Supplement to General Anesthesia in Functional Endoscopic Sinus Surgery

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ABSTRACT
Background: Functional endoscopic sinus surgery (FESS) is a widespread operation that allows good inspection, illumination and enhances surgical procedures. However, excessive bleeding has been notified for FESS done under general anesthesia (GA) resulting from reduced clarity. Controlled hypotension is usually used to constrict intraoperative blood loss, but it may cause varied dilemmas.
Objective: This study aimed to evaluate the safety and efficacy of trans-nasal sphenopalatine ganglion block (SPGB) in optimizing surgical conditions and reducing the anesthetics used during FESS.
Patients and methods: A prospective controlled randomized trial was conducted on one hundred adult patients with ASA physical status I & II. They aged from 18 to 60 years and were scheduled for FESS with or without septoplasty in Menoufia University Hospital. After induction of GA, patients were randomly allocated into two equal groups (50 patients each). In group 1 (block group) patients received bilateral SPGB with 1.5 ml of 0.5% bupivacaine. In group 2 (control group) patients received bilateral SPGB using 1.5 ml of normal saline. Both the anesthetist and the surgeon were blinded to the drug being administered. Hemodynamic parameters, surgical field visibility, anesthetic consumption, use of adjuvant drugs for hypotensive anesthesia, operative time, postoperative pain analgesic usages, and technique-related complications were observed. **Results:** The heart rate, mean arterial blood pressure, bleeding, surgical duration, and VAS were significantly improved in the SPGB group than in the control group.
Conclusion: In our study, SPBG block showed hemodynamic stability, less blood loss, lower anesthetic and analgesic consumptions, and improved surgical field visualization, as well as it reduced postoperative pain and complications.
Keywords: FESS, regional block, SPG block, ACS.

INTRODUCTION
Functional Endoscopic Sinus Surgery (FESS) is a widespread technique [(1)], but complications like excessive bleeding under general anesthesia (GA) can impair visibility. [(2)] Controlled hypotension improves the surgical field by reducing intraoperative blood loss, using agents like magnesium sulfate, vasodilators, high doses of potent inhaled anesthetics, and beta-blockers. However, side effects like delayed recovery or tachyphylaxis may occur [(3, 4)].

Combining regional blocks with GA, such as the sphenopalatine ganglion block (SPGB), optimizes surgical conditions. SPGB reduces anesthetic consumption, hemodynamic fluctuations, blood loss, recovery time, postoperative pain, and catecholamine response [(5)]. The transnasal endoscopic injection approach for SPGB is quick, minimally invasive, and safe [(6)]. This study aimed to evaluate its safety and efficacy in improving FESS outcomes.

PATIENTS AND METHODS
This prospective controlled randomized study was carried out on one hungered adult patient with ASA status I-II. They aged from 18 to 60 years of both sexes, planned for FESS with or without septoplasty in Menoufia University Hospital.

Exclusion criteria: patient refusal, ischemic heart disease, uncontrolled hypertension, cardiovascular, cerebrovascular, and chronic renal diseases, coagulopathy, patients receiving cardiovascular active drugs or anticoagulant therapy, patients who have an allergy to local anesthetics and anatomical or pathological abnormalities that may cause surgical difficulties. Preoperatively, all patients underwent clinical assessment and routine investigations (complete blood picture, liver/kidney function, fasting glucose, coagulation profile, and 12-lead ECG). They were also trained to use a 10-cm VAS to assess pain, where 0 indicated no pain and 10 represented the worst imaginable pain.

In the operation room, a crystalloid infusion of 4 ml/kg/hr was started, and all patients received midazolam 3 mg IV thirty minutes before induction. Then, standard monitoring of mean arterial blood pressure, heart rate, capnography, peripheral oxygen saturation, and electrocardiogram were conducted. GA was induced using IV propofol (2.5 mg/ kg), fentanyl (2 µg/ kg), and lidocaine (1 mg/ kg). Tracheal intubation was facilitated with atracurium (0.5 mg/ kg). Mechanical ventilation with mixture of 50% oxygen with air, tidal volume 7 mL/kg, and respiratory rate was regulated to maintain the end-tidal carbon dioxide level at 35:40 mmHg. Fentanyl (50 µg) boluses and isoflurane concentration were titrated to achieve the Bispectral Index (BIS) value between 40 and 50.

Patients were randomly allocated into two groups (n =50 each) via a computer-generated program, with allocation codes kept in opaque closed envelopes. **Group 1 (block group):** Patients received bilateral SPGB using 1.5 ml of 0.5% bupivacaine. **Group 2 (control group):** 1.5 ml of normal saline was bilaterally injected into the sphenopalatine ganglion area.

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Technique: Patients were placed in a 15-degree reverse Trendelenburg position. The nasal cavity was topically anesthetized with lidocaine 2% with epinephrine 1:200,000 applied via cotton-tipped applicators. The same area was sterilized using an iodine-soaked applicator. Then, a 20-gauge, 5-inch spinal needle was prepared by bending the needle near the tip at a 45° angle using a sterile needle holder, aligning the hub's side port indicator and serving as a tip pointer. With the bevel facing laterally, the needle advanced until it encountered the nasopharynx's posterolateral wall, posterior to the inferior end of the middle turbinate. After negative aspiration, 1.5 ml of study solution was injected bilaterally. A dry cotton-tipped applicator was inserted after removing the needle to ensure no bleeding after removing the needle (Figure 1).

The surgeon is asked to rate the surgical bleeding using an average category scale (ACS) [7] (from 0 to 5): (0) No bleeding (1) minimal bleeding and no suction required, (2) mild bleeding, occasional suction required and surgical field unaffected, (3) mild bleeding with frequent suctioning and slight compromise of the surgical field (4) Moderate bleeding with frequent suction required and immediate compromise of the surgical field (5) Severe bleeding, requiring constant suction and bleeding overwhelms suction and prevent surgery. For optimal surgical condition (ACS value of 2 or 3), if the BIS was 40-50, and the target mean arterial blood pressure (MAP) of 60–65 mmHg was not maintained, a nitroglycerine infusion (0.5-10 µg/kg/min) was administered. If the heart rate (HR) exceeded 100 beats/min, IV increments of propranolol (0.2 mg) were used to control it.

After surgery, neuromuscular blockade was reversed using atropine (0.02 mg/kg) and neostigmine (0.05 mg/kg). Once patients achieved adequate spontaneous ventilation, they were extubated and transferred to the post-anesthesia care unit (PACU). If VAS was 3 or more, it was managed with iv pethidine 0.5 mg/kg to be repeated after 30 minutes if needed, maximally 2 mg/kg/12 h. Additional paracetamol 15 mg/kg infusion was given if needed. The anesthetist, the surgeon, the patients, and the observer were blinded to the drug being administered.

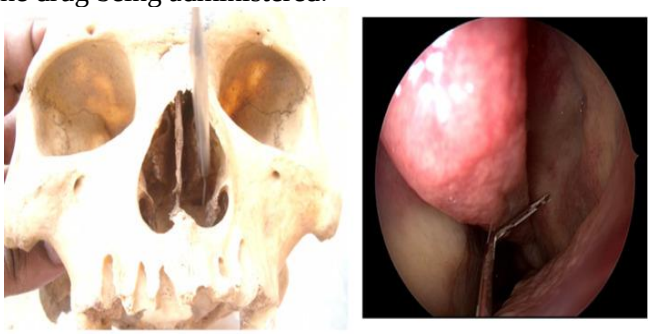


Figure (1): Sphenopalatine block, surface marking, and endoscopic view [8]

Measurements:

Intraoperative measurements: HR and MAP before induction, before block (baseline value), 15, 30, 45, 60, 75, and 90 min after block. Isoflurane, fentanyl, nitroglycerine, and propranolol consumption. The surgeon satisfaction, using the average category scale (ACS) every 15 minutes, Operative time as the time from injection of SPG (zero time) till recovery, and recovery time as the time from discontinuing inhalational anesthesia to extubation were recorded

Postoperative measurements: HR and MAP, and VAS were recorded at PACU admission, then at 2, 4, 8, 12, 18, and 24 hours. The time to first request analgesia, the number of cases received paracetamol and postoperative headache, visual disturbances and postoperative nausea, and vomiting (PONV) were recorded. Postoperative respiratory complications were evaluated by postoperative respiratory system evaluation scoring (PRSES) and recorded at 1st, 5th, and 10th min after extubation.

Respiratory System Evaluation Scoring (PRSES) [9]: PRSES-1: Normal pattern of respiration (respiratory rate below 16 breaths/minute, with sufficient depth). PRSES-2: Presence of a cough reflex, characterized by at least 3 consecutive coughs or 5 coughs/minute. PRSES-3: Spasmodic respiratory pattern involving prolonged expiration, often accompanied by retching sounds, physical strain, or brief episodes of apnea. PRSES-4: Partial laryngospasm with severe inspiratory stridor manageable with positive pressure ventilation and oxygen administration. PRSES-5: Complete laryngospasm with no air exchange and requiring muscle relaxation to facilitate ventilation.

Sample size estimation: The sample size was calculated by usage of PASS 11.0, based on the previous randomized controlled trial by assuming that a standard deviation of 5 (standard value of 1.96), to detect a mean difference (mean1¼3.4 and mean2¼1.6) of 1.8 in the pain score between the intervention group and control group. A sample size of 100 (50 each) would be required, using the study power test of 80% with a drop-out rate of 30%.

Ethical approval: After obtaining approval from The Ethical Committee of Menoufia University, signed informed permission was obtained from each patient. All patients and controls underwent several assessments. The study adhered to the Helsinki Declaration throughout its execution.

Statistical analysis: Results were analyzed using MICROSOFT EXCEL 2019 and the SPSS V.25 for WINDOWS 10. The quantitative data were presented as mean ± standard deviation (SD), while qualitative data were expressed as frequency and proportion. Chi-squared ($\chi 2$) compared qualitative variables between two groups. Standard student-t test (t) compared two groups regarding normally distributed quantitative data. Mann-Whitney test (U) compared any significant difference for a not normally distributed quantitative variable. P value ≤ 0.05 was considered statistically significant.

RESULTS

A total of 119 patients were screened for eligibility to undergo transnasal SPG during FESS at Menoufia University Hospital. Of these, 19 patients were excluded; 8 patients refused to provide consent, and 11 patients did not occupy the inclusion criteria. The remaining 100 patients were enrolled and randomly allocated into two groups, the Sphenopalatine block (n=50) and the control group (n=50) (Figure 2).

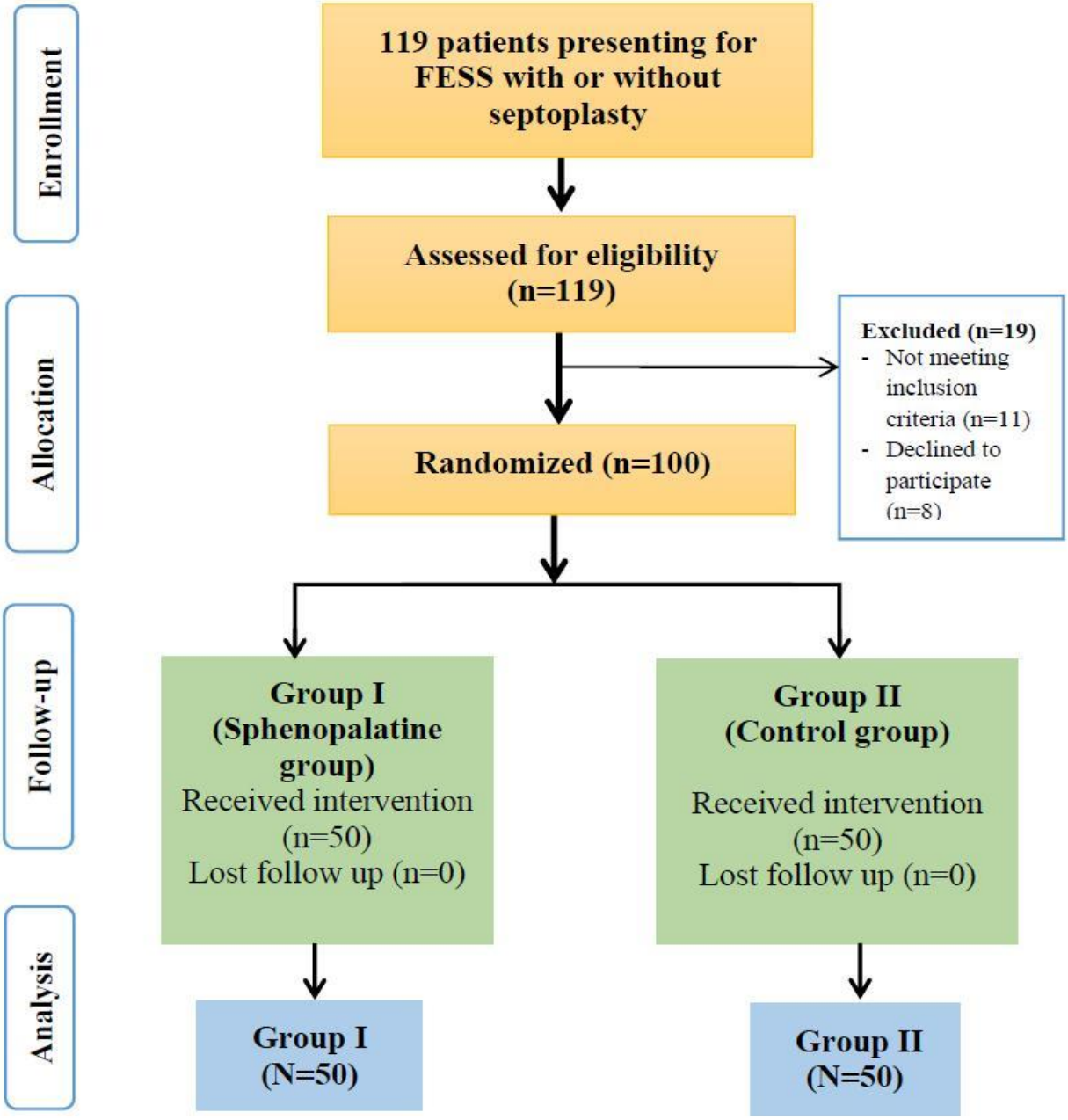


Figure (2): Flowchart of the studied patients.

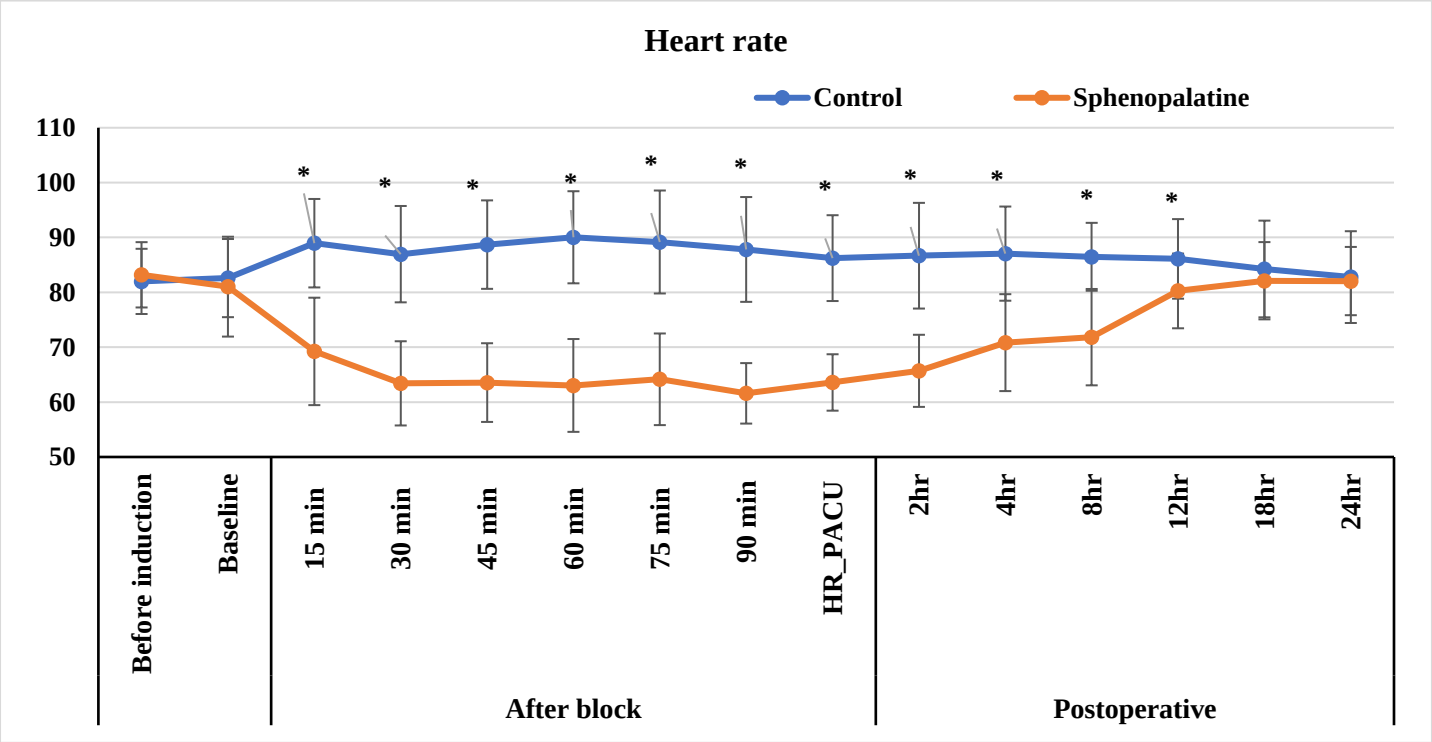
In the present study, there was no statistically significant difference between the two groups regarding the demographic data and type of operation (P > 0.05), **(Table 1).**

Table (1): Demographic data and patient clinical characteristics (n=100)

	Control (N=50)	Sphenopalatine (N=50)	Test	P-value
Age (years)				
Mean ± SD	39.20 ± 11.81	37.24 ± 11.50	t=0.840	0.403
Median (Range)	39.5 (19-60)	36.50 (19-60)		
Sex				
Male	29 (58.0 %)	34 (68.0 %)	$\chi2$=1.073	0.300
Female	21 (42.0 %)	16 (32.0 %)		
Weight (Kg)				
Mean ± SD	66.12±8.98	65.32±7.61	t=0.480	0.632
Median (Range)	64 (50-88)	66.0 (50-80)		
Height (Cm)				
Mean ± SD	168.42±6.16	166.34±7.33	t=1.536	0.128
Median (Range)	168 (150-180)	169 (150-178)		
BMI (kg/m^2)				
Mean ± SD	22.84±2.76	23.31±2.56	t=0.874	0.384
Median (Range)	22.6 (16.90-29.38)	23.0 (19.7-29.14)		
ASA				
I	44 (88.0 %)	45 (90.0 %)	$\chi2$=0.102	0.749
II	6 (12.0 %)	5 (10.0 %)		
Type of operation				
FESS	22 (44.0 %)	17 (34. %)	$\chi2$=1.051	0.305
FESS & septoplasty	28 (56.0. %)	33 (66. %)		

SD: standard deviation, t: independent t-test, $\chi2$: Chi-square FESS: functional endoscopic surgery ASA: American Society of Anesthesiologists, BMI: Body mass index.

Intraoperative HR measurements showed a statistically insignificant difference between both groups before induction of GA and before the block (baseline value) ($p > 0.05$). After that, the HR measurements were significantly lower in the SPGB group compared to the control group in all intraoperative measure points ($P<0.001$), and remained significantly lower for 12 postoperative hours ($P<0.001$), By the 18th and 24th postoperative hours, no statistically significant difference in HR was observed between the two groups ($P>0.05$) (Figure 3). Similarly, intraoperative MBP measurements were statistically insignificantly different between both groups before induction of GA and before the block (baseline value) ($p > 0.05$). After that, the MBP measurements were significantly lower in the SPGB group compared to the control group in all intraoperative and all postoperative measurement points (Figure 4).



* Significant

Figure (3): Comparison of intraoperative and postoperative heart rate.

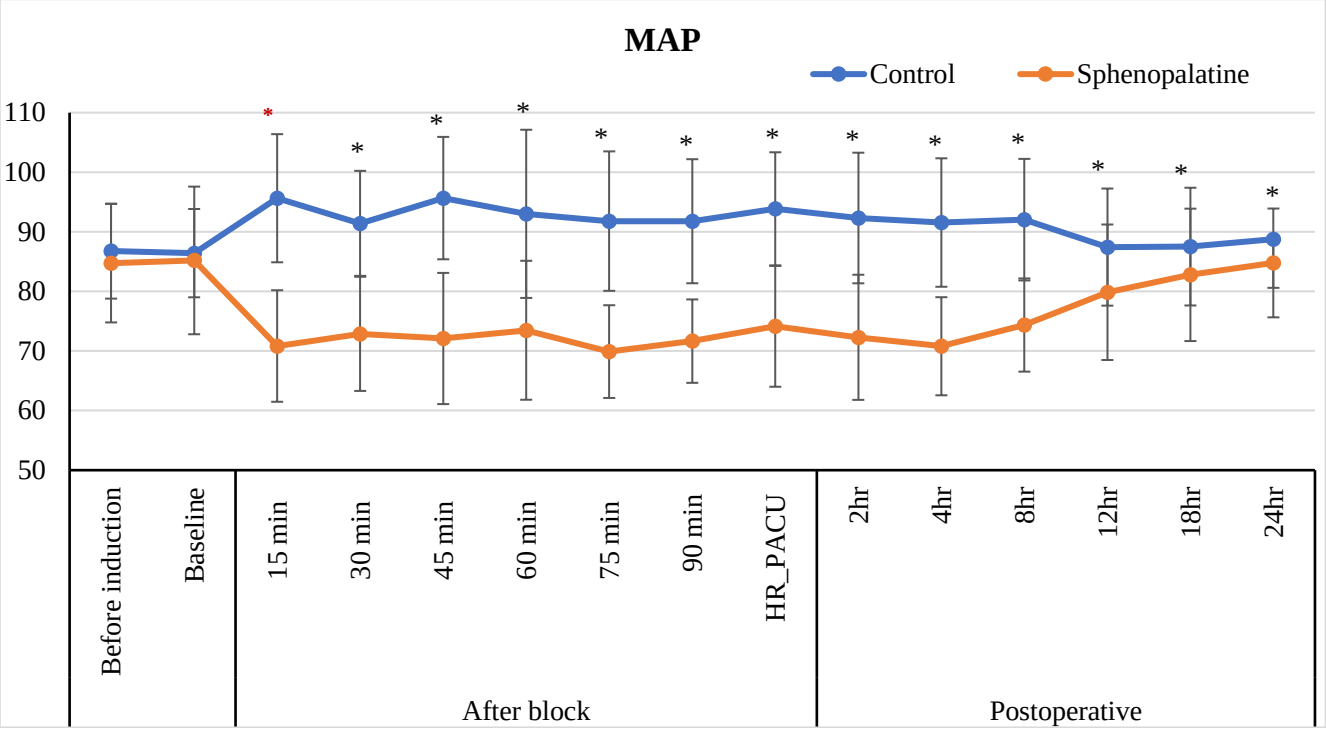


Figure (4): Comparison of intraoperative and postoperative MAP.

The SPGB group showed a statistically significant reduction in isoflurane MAC, total fentanyl consumption, and nitroglycerin use than that in the control group. However, there was no observed significant difference in total propranolol consumption (P > 0.05). Additionally, the number of cases requiring top-up doses of fentanyl, propranolol, or nitroglycerin infusions was significantly lower in the SPGB group (P < 0.05) (Table 2).

Table (2): Intraoperative anesthetic and adjuvant drug usage (n=100)

Anesthetic and Adjuvant drug consumption	Control (N=50)	Sphenopalatine (N=50)	test	P-value
Isoflurane (MAC %) Mean ± SD. Median (Range)	 1.97 ± 0.36 2 (1 -3)	 1.12 ± 0.35 1 (0.7 – 2)	U=183.0	<0.001**
Total Fentanyl consumption (µg) Mean ± SD.	147.24 ± 25.6	133.64 ± 19.17	t =3.006	0.003*
Total nitroglycerin dose (µg) Mean ± SD	459.50 ± 52.92	124.50 ± 28.12	U=994.0	0.008*
Total propranolol dose (µg) Mean ± SD.	22.3 ± 1	17 ± 1	U=25.5	0.386
Number (%) of cases received Top-up doses of fentanyl	15 (30%)	3 (6%)	X^2=9.756	0.002*
Number (%) of cases received Top-up doses of propranolol. Once Twice triple	19 (38%) 10 (20%) 5 (10%) 4 (8%)	6 (12%) 5 (10%) 1 (2%) 0 (0%)	X^2=10.587	0.014*
Number (%) of cases received nitroglycerin infusion	14 (28%)	4 (8%)	X^2=6.775	0.009*

µg: Microgram, mg: Milligram, MAC: Minimum alveolar concentration of anesthetic, t: independent t-test, U: Mann-Whitney U test, X^2: Chi square, *: Significant, **: highly significant.

Surgeon satisfaction assessed by average category scale (ACS) grades was statistically significantly higher in the SPGB group compared to the control group (p=0.001) **(Table 3).**

Table (3): Surgeon satisfaction with the surgical field by ACS

Grades	Groups				X^2	P-value
	Control (N=50)		Sphenopalatine (N=50)			
	N	%	N	%		
1	8	16	25	50	16.644	0.001**
2	22	44	19	38		
3	15	30	5	10		
4	5	10	1	2		
5	0	0	0	0		

ACS: Average Category Scale, X^2: Chi-square, **: highly significant.

The operative and recovery times were significantly longer in the control group than in the SPGB group. Additionally, the time to the first analgesic requirement was significantly longer in the SPGB group (8.10 ± 2.26 h) than in the control group (2.72 ± 0.83 h). Furthermore, significantly more patients in the control group received postoperative paracetamol than in the SPGB group (Table 4).

Table (4): Operative, recovery time (min), and analgesic duration (h)

	Control (N=50)	Sphenopalatine (N=50)	t	P-value
Operative time (min)				
Mean ±SD	86.16 ± 9.26	63.88 ± 9.08	12.086	<0.001**
Median (Range)	85.0 (70-105)	64.0 (40-80)		
Recovery time (min)				
Mean ±SD	12.40 ± 2.1	9.86 ± 1.99	6.038	<0.001**
Median (Range)	13.0 (8-16)	10.0 (5-15)		
1st rescue of analgesia (h)				
Mean ±SD	2.72 ± 0.83	8.10 ± 2.26	-15.799	<0.001**
Median (Range)	3.0 (2-5)	8.0 (3-15)		
Number (%) of cases received paracetamol infusion	13 (26.0%)	4 (8.0%)	FE=3.98	0.041*

t: independent t-test, *: Significant, **: Highly Significant

Postoperative VAS was statistically significantly low in the SPGB group in comparison with the control group in PACU and remained at 8th postoperative hours. Then they became insignificantly different (Table 5).

Table (5): Postoperative VAS

VAS	Control (N=50)		Sphenopalatine (N=50)		U	P-value
PACU		P-value		P-value	200.0	<0.001**
Mean ±SD	3.62 ± 1.25	----	2.56 ± 1.07	-----		
Median (Range)	3.4 (2.0 – 7.0)		2.0 (1.0 – 5.0)			
Postoperative 2hr						
Mean ±SD	4.96 ± 1.52	0.829	3.06 ± 1.28	0.031*	443.5	<0.001**
Median (Range)	5.0 (2.0 – 8.0)		3.0 (0.0 – 6.0)			
Postoperative 4hr						
Mean ±SD	4.80 ± 1.01	0.273	3.10 ± 1.16	0.016*	362.0	<0.001**
Median (Range)	5.0 (3.0 – 7.0)		3.0 (1.0 – 6.0)			
Postoperative 8hr						
Mean ±SD	5.16 ± 1.13	0.533	3.34 ± 1.67	0.010*	498.5	<0.001**
Median (Range)	5.0 (3.0 – 8.0)		3.0 (0.0 – 6.0)			
Postoperative 12hr						
Mean ±SD	5.56 ± 1.17	0.282	4.76 ± 1.44	<0.001*	1.026	0.107
Median (Range)	5.5 (2.0 – 8.00)		5.0 (1.0 – 7.0)			
Postoperative 18hr						
Mean ±SD	4.78 ± 1.30	0.297	4.10 ± 1.81	<0.001*	1.042	0.140
Median (Range)	5.0 (3.0 – 8.0)		4.0 (0.0 – 6.0)			
Postoperative 24hr						
Mean ±SD	4.82 ± 1.22	0.386	4.44 ± 1.66	<0.001*	1.110	0.325
Median (Range)	5.0 (2.0 – 7.0)		4.0 (1.0 – 7.0)			

Data expressed as Mean ±SD and range, VAS: Visual Analogue Scale, U: Mann Whitney U test, * *: Highly Significant, Comparison between control and sphenopalatine groups using Mann-Whitney U test.

Finally, postoperative respiratory system evaluation scoring (PRSES) was statistically significantly impaired in the SPGB group in comparison with the control group at 1, 5, and 10 min postoperatively ($p<0.05$) (Table 6). The frequency of postoperative nausea, vomiting, and headache was statistically significantly lower in the SPGB group compared to the control group (3, 5, and 4 versus 12, 13, and 13, respectively). No patients complained of visual disturbance or allergic reaction in any group.

Table (6): Postoperative respiratory system evaluation scoring (PRSES)

Complications	Groups				X^2	P-value
	Control (N=50)		Sphenopalatine (N=50)			
	N	%	N	%		
1 min						
1	17	34	29	58		
2	18	36	15	30	87.672	0.053*
3	10	20	3	6		
4	5	10	3	6		
5 min						
1	14	28	28	56		
2	21	42	16	32	9.276	0.026*
3	11	22	4	8		
4	4	8	2	4		
10 min						
1	16	32	39	78		
2	17	34	8	16	22.66	<0.001*
3	1	2	2	4		
4	6	12	1	2		

X^2: Chi-square, *: Significant, ** Highly significant.

DISCUSSION

FESS is a reliable and effective approach for treating conditions such as nasal polyps and rhinosinusitis. Ensuring a clear, blood-free surgical field is crucial for optimal visualization and minimizing the risk of significant complications [10]. SPGB is frequently utilized during FESS under the effect of GA to control surgical field conditions and alleviate postoperative pain. Additionally, it is an efficient, comfortable, and safe technique for managing craniofacial pain [11]. In the current study, intraoperative heart rate measurements declared no significant variation between the two groups before the block (baseline value). After that, the heart rate measurements were significantly dropped in the sphenopalatine group compared to the control group in the remaining intraoperative measure points ($P<0.001$). Postoperatively, the heart rate measurements significantly remained lower in the sphenopalatine group for 12 hours ($P<0.001$), but there was no significant variation at 18 and 24 hours ($P>0.05$).

Intraoperative Mean arterial blood pressure (mean ABP) measurements were insignificantly different between the groups before the block (baseline value) ($p>0.05$). Afterward, the sphenopalatine group had significantly lower ABP than the control group at all intraoperative time points and at all postoperative time points. Also, the surgical field was significantly improved in the sphenopalatine ganglion block group. The SPG group's heart rate response to surgical stimulation was more efficiently blunted with significantly decreased blood loss and stabilized fluctuating hemodynamics. Our findings align with those of **Bhattacharyya *et al.*** [7] and **Sarhan *et al.*** [12] who investigated the effects of bilateral SPGB during FESS under GA. They concluded that hemodynamic outcomes, including heart rate, arterial pressure, and bleeding amount, were significantly reduced in the intervention group than in the control group.

Our study revealed a significant reduction in isoflurane MAC, total fentanyl consumption, and nitroglycerin usage in the sphenopalatine group. At the same time, there was no significant difference in the total propranolol dose ($P>0.05$). In the control group, 30% required fentanyl top-up doses compared to only 6% in the sphenopalatine group. Similarly, 28% of the control group required nitroglycerin top-up doses, whereas only 8% of the sphenopalatine group needed them. Regarding propranolol top-up doses, 5 cases in the control group required 2 doses, 4 cases required 3 doses, and only one in the sphenopalatine group required 2 doses. These findings coincide with previous researches [13-15], which reported that the block group consumed significantly less sevoflurane, nitroglycerin, and propranolol than the control group to maintain the target MAP. This effect is likely due to the preemptive blockade of the nociceptive impulses passed through the sensory afferent branches of the maxillary nerve as they pass via the ganglion.

Furthermore, the present study showed significantly higher surgeon satisfaction with the

surgical field using the ACS grades in the sphenopalatine group than in the control group. This may be clarified by low HR permitting proper drainage time for the veins, thus reducing venue oozing in the surgical area. Additionally, injecting local anesthetic into the sphenopalatine ganglion may reduce mucosal blood flow in the nasal sinuses and turbinates. That may be explained by the blockade of the vasodilatory parasympathetic effect of the SPG on the nasal mucosa, resulting in mucosal vasoconstriction and a clearer surgical field. Our findings align with those of **Gaafar *et al.*** [16] who compared bilateral sphenopalatine ganglion block versus IV clonidine premedication for improving the surgical area condition and relieving postoperative pain in endoscopic sinonasal surgery. They observed statistically significantly lower intraoperative blood loss in the SPGB group in comparison with the non-block group. Similarly, the operative duration and recovery time were significantly prolonged in the control group than in the sphenopalatine group in our study. Also, the analgesic duration (time to the 1st rescue for analgesia) was notably longer in the sphenopalatine group (8.10±2.26) than in the control group (2.72± 0.83). These results could be due to a mixture of reduced blood loss and better surgical field visibility during surgery, stabilized non-fluctuating hemodynamics, and reduced doses of anesthetic and hypotensive drugs.

Post-operative pain management is a critical aspect of all surgeries, including FESS. Maintaining adequate analgesia after FESS is essential, as agitation or distress in a patient can lead to secondary bleeding due to rise in venous and arterial pressures. Conversely, over-sedation poses the risk of dangerous upper airway obstruction. Our study demonstrated improved recovery outcomes and prolonged postoperative analgesia in the SPGB group. In the control group, the VAS remained high in PACU and throughout all postoperative time points. While, in the SPGB group, VAS scores gradually increased from the PACU level at later postoperative intervals. Furthermore, paracetamol usage was significantly more frequent in the control group (n=13, 26%) compared to the Sphenopalatine group (n=4, 8%), (p=0.04). **Kumar *et al.*** [17] concedes our study. However, **Friedman *et al.*** [9] studied bupivacaine and lidocaine in SPGB for FESS. They noted that postoperative pain was less severe than anticipated. They found no significant impact of the local anesthetic on pain as pain score and total analgesics consumption were similar between their groups. This discrepancy may be because they assessed the postoperative pain every 6 to 12 hours (wider time intervals for postoperative pain assessment than in our study).

Our study showed that Postoperative Respiratory System Evaluation Scoring (PRSES) was significantly reduced in the sphenopalatine group in comparison with the control group at 1, 5, and 10 min ($p<0.05$). Moreover, our study coincides with the findings of **Kim *et al.*** [18] as the frequency of postoperative nausea, vomiting, and headache were significantly reduced in the sphenopalatine group than that in the control group. No patients complained of visual disturbance or allergic reaction in any group. This can be explained by less blood loss and anesthetic consumption, use of hypotensive agents, and better postoperative analgesia. Furthermore, our study supports **Kesimci *et al.*** [19] as they encouraged transnasal sphenopalatine ganglion block during endoscopic sinus surgery for a proper clinical outcome. Hypotensive anesthesia in FESS enhances the surgical field by reducing blood loss but is contraindicated in conditions like cerebrovascular disorders, ischemic cardiac disease, and severe anemia. It requires advanced monitoring, and excessive bleeding may still occur. Opioid-based anesthesia achieves good conditions, but it has side effects like respiratory depression and nausea. SPGB, combined with general anesthesia, avoids these issues, controls bleeding, and provides effective postoperative analgesia.

CONCLUSION

SPGB during FESS under GA was a simple, effective and valuable technique to avoid hemodynamic fluctuation and intra-operative bleeding, reduce operation time, post-operative pain, analgesic use, and optimum operative field conditions. Moreover, its drawbacks were minimal and can be used safely instead of hypotensive anesthesia that carries the risk of hypoperfusion to vital organs and can be applied safely to all patients. However, to provide preoperative guidelines, more research with bigger study groups is advised in order to duplicate and validate the findings of this investigation.

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No conflict of interest.

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