Drug Design, Development and Therapy

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ORIGINAL RESEARCH

Inhalational Anesthesia is Noninferior to Total Intravenous Anesthesia in Terms of Surgical Field Visibility in Endoscopic Sinus Surgery: A Randomized, Double-Blind Study

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Purpose: Regarding the quality of surgical field visibility, previous studies and meta-analyses comparing total intravenous anesthesia (TIVA) and inhalational anesthesia (IA) in endoscopic sinus surgery (ESS) have presented inconsistent findings. Considering that IA has some advantages over TIVA, we aimed to test the hypothesis that IA with sevoflurane-remifentanil is noninferior to TIVA with propofol-remifentanil in terms of surgical field visibility quality during ESS.

Patients and Methods: In this randomized, double-blind, noninferiority clinical trial, 110 adult patients were recruited and randomly assigned to the IA (n = 55) or TIVA (n = 55) group. The primary outcome was the quality of surgical field visibility, as measured by the intraoperative mean Boezaart score (BS). Additionally, post hoc analysis was performed for patients with Lund-Mackay scores of ≤ 12 or > 12. Other secondary outcomes included total blood loss, bleeding rate, total fluid, mean arterial pressure, heart rate, dose of remifentanil for anesthesia maintenance, end-tidal CO_2, length of stay in the post anesthesia care unit, postoperative hypoxemia, sore throat, and nausea.

Results: The intraoperative mean BS of the IA group was noninferior to that of the TIVA group [medians with interquartile ranges (IQRs), 2.0 (1.7–2.2) vs 2.0 (1.8–2.1), $P = 0.923$]. Moreover, post hoc analysis confirmed no difference between IA and TIVA for patients with Lund-Mackay scores ≤ 12 ($P = 0.403$) or > 12 ($P = 0.226$). No differences in total blood loss, bleeding rate, or other intraoperative indicators or complications were observed between groups.

Conclusion: Regarding surgical field visibility during ESS, IA with sevoflurane-remifentanil is noninferior to TIVA with propofol-remifentanil anesthesia maintenance.

Keywords: sevoflurane, remifentanil, propofol, blood loss, bleeding rate, Boezaart score

Introduction

The sinonasal mucosa is a well-vascularized tissue located near the orbital wall at the base of the skull. As a result of this high vascularization, serious complications, including hemorrhage, orbital complications and cerebral spinal fluid leakage, are possible during endoscopic sinus surgery (ESS).[1] Because of its anatomical and pathological characteristics, excessive intraoperative bleeding is difficult to control, and this might be the main obstacle to good intraoperative visual field visibility during ESS. Poor surgical field visibility can increase the risk of serious complications[2] and often interrupts the surgery, which can greatly prolong the operation time.

Improving visibility quality during ESS is a common concern among anesthesiologists and surgeons. Different experts have proposed different interventions to improve visibility quality of ESS, including the application of local

Received: 16 December 2022
Accepted: 14 February 2023
Published: 9 March 2023

vasoconstrictors, reverse Trendelenburg positions,[3] and controlled hypotension techniques.[4] In general, both total intravenous anesthesia (TIVA) and inhalation anesthesia (IA) can be used for ESS. Some studies have reported that TIVA results in better surgical field visibility quality than IA,[5–7] whereas others have suggested that TIVA has no significant surgical field visibility advantages over IA.[8,9]

The choice of anesthetic drugs may also affect the amount of intraoperative blood loss and the quality of surgical field visibility. Some studies suggest that remifentanil is superior to fentanyl in terms of intraoperative blood loss and that it might reduce the difference in blood loss between IA and TIVA.[7,10] Moreover, different inhalation anesthetics may also affect the surgical field visibility quality. A meta-analysis study published in 2019 showed that TIVA resulted in better surgical field visibility than isoflurane and desflurane but not sevoflurane.[7]

Compared with TIVA, IA has unique advantages, such as ease of use, airway protective effect[11] and cardiac protection effect.[12] Some studies have indicated that there is no difference in surgical field visibility between IA and TIVA.[8,9] Moreover, if sevoflurane is selected for IA and if both IA and TIVA are combined with remifentanil, in theory, IA will not be inferior to TIVA in terms of surgical field visibility for ESS. Thus, we used a noninferiority test to verify whether IA is not inferior to TIVA in terms of surgical field quality during ESS or not.

Materials and Methods

Ethical Approval

The study was a double-blind, randomized, controlled, noninferiority study. It was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of Beijing Tongren Hospital (TRECKY2021-006). This trial was registered prior to enrollment of the first patient at the Chinese clinical trial registry (ChiCTR2100052259, Principal investigator: He Li; Date of registration: 24/10/2021). The study required the written informed consent of each participant.

Study Design and Participants

From November 1, 2021, to December 10, 2021, 110 consecutive patients from Beijing Tongren Hospital over 18 years of age with chronic rhinosinusitis who were scheduled for elective ESS were recruited into the IA or TIVA group. The patients received either IA with sevoflurane-remifentanil (n = 55) or TIVA with propofol-remifentanil (n = 55) for anesthesia maintenance. Inclusion criteria were American Society of Anesthesiologists (ASA) physical status I or II and body mass index (BMI) of 18–35 kg/m^2. The exclusion criteria included refusal to participate in the study and severe heart disease, uncontrolled hypertension or asthma, hepatic or renal dysfunction, coagulopathy, or pregnancy.

Randomization and Blinding

Patients were randomly assigned to the TIVA group (propofol-remifentanil) or the IA group (sevoflurane-remifentanil). Statisticians used computer-generated lists of random numbers to generate random numbers and then placed them in closed envelopes. The envelope was opened by the chief anesthesiologists, and only they knew the grouping of the patients. The anesthesia providers were responsible for clinical anesthetic management; they chose TIVA or IA according to the randomization, but they did not participate in assessing, recording or analyzing the trial data. Propofol was administered by a syringe pump that was hidden by sterile towels from the surgeons' and assessors' views; the anesthesia machine and monitors were also turned away from the surgeons and assessors so that only the anesthesia providers knew the grouping for the patients. The patients, surgeons, and well-trained assessors who calculated the Boezaart score (BS) were blinded to the treatment allocation.

Anesthesia and Perioperative Care

The anesthesia induction method, rapid sequential induction, was consistent for all of the patients and included the following drugs: midazolam (0.04 mg/kg), sufentanil (0.3 μg/kg), propofol (2 mg/kg), and cisatracurium (0.2 mg/kg). After satisfactory muscle relaxation, a flexible laryngeal mask airway was placed. The tidal volume was set to 8 mL/kg,

and the frequency was 12/min. After a satisfactory test, the flexible laryngeal mask was properly fixed. The breathing rate was adjusted to maintain an end-tidal CO_2 ($EtCO_2$) of approximately 35 mmHg.

The TIVA group was continuously infused with propofol (4–6 mg/kg/h) and remifentanil (0.1–0.2 μg/kg/min) to maintain anesthesia; the IA group was given continuous inhaled anesthetic with a minimum alveolar concentration (MAC) of 0.8–1.2 of sevoflurane and was infused with remifentanil (0.1–0.2 μg/kg/min) to maintain anesthesia. During the operation, propofol and sevoflurane were adjusted to maintain a bispectral index (BIS) value of 40–60, the dosage of remifentanil was adjusted to control the mean arterial pressure (MAP) of 65–75 mmHg, and vasoactive drugs were used as needed. Sodium-lactated Ringer's solution was used as the main fluid to maintain hemodynamic balance, and colloidal solution was used when hemodynamic instability was caused by excessive blood loss.

Surgical Considerations

The operating table was adjusted to a 10-degree reverse Trendelenburg position according to our previous study.[3] Cotton pads soaked with a mixed solution of 1:10,000 epinephrine and 1% tetracaine were used for local nasal packing 5 minutes before the operation. A total of 30 cotton tablets were prepared, some of which were first used for local tamping; the rest were used for intraoperative compression for hemostasis. We reviewed the computed tomography (CT) scans of all the patients and used the Lund-Mackay scoring system to assess the severity of sinus disease.[3]

Primary Outcome and Definition

The primary outcome was surgical field visibility, which was measured by the intraoperative mean BS according to our previous research,[3] and BS assessments were performed every 15 minutes by two well-trained assessors (one anesthesia research assistant and one surgeon) who were blinded to the patient allocation and uninvolved in the treatment sessions. The BS is a classic scale used to estimate the quality of surgical field visibility in ESS, which ranges from 0 (no bleeding) to 5 (severe bleeding), where a lower score indicates a better-quality surgical field (Figure 1).[13]

Secondary Outcomes and Definitions

Secondary outcomes were bleeding rate, total blood loss, MAP, heart rate (HR), dose of remifentanil for anesthesia maintenance, $EtCO_2$, length of stay in the post anesthesia care unit (PACU), postoperative hypoxemia, sore throat, and nausea. The anesthesia research assistant, who was blinded to the grouping, calculated the exact amount of total blood loss using a weighing method. In our study, blood-soaked items and aspirator bottles with blood and irrigation fluid were weighed, and the dry weights of the items, aspirator bottles and irrigation fluid were subtracted to obtain the total blood loss volume. To make the total blood loss volume comparable among patients with different operating times, the bleeding rate was calculated by dividing the total blood loss by the operation time.[8] MAP, HR, BIS, and $EtCO_2$ were recorded at

BS	Description
0	**No bleeding.**
1	**Slight bleeding**—no suctioning is required.
2	**Slight bleeding**—occasional suctioning is required. The surgical field is not threatened.
3	**Slight bleeding**—frequent suctioning is required. Bleeding threatens the surgical field a few seconds after suction is removed.
4	**Moderate bleeding**—frequent suctioning is required. Bleeding threatens the surgical field immediately after suction is removed.
5	**Severe bleeding**—constant suctioning is required. Bleeding appears faster than can be removed by suction. The surgical field is severely threatened, and surgery not possible.

Figure 1 BS for surgical field visibility.
Abbreviation: BS, Boezaart score.

the beginning of the operation and every 15 minutes during the operation. Hypoxia, sore throat, and nausea were assessed 7 days after surgery or prior to discharge.

Sample Size

The primary outcome, the intraoperative mean BS, was used to calculate the sample size. According to our preliminary study, the intraoperative mean BS was 2.1 ± 0.4 when the 10-degree reverse Trendelenburg position was used for patients under TIVA anesthesia.[3] We assumed that the BS in the IA group would be noninferior to that in the TIVA group; at a noninferiority threshold of 0.2 and a power of 80% ($\beta = 0.2$) at a one-sided α level of 0.05, the calculated sample size for each group was 51, and 55 patients were ultimately included in the IA and TIVA groups after patient withdrawal was considered.

Statistical Analysis

Statistical analysis was performed using SPSS version 26.0 (IBM Corp, Armonk, USA). The data are expressed as numbers (%) for categorical data, medians with interquartile ranges (IQRs) for nonnormally distributed data or means with standard deviations (SDs) for normally distributed data. The Shapiro–Wilk and Levene tests were used to assess the normality and equal variances between groups, respectively. For the primary outcome, noninferiority was assessed by calculating the mean and 95% CI for the difference in intraoperative mean BS between groups. We compared the limits of the CI with the predefined noninferiority margin of 0.2. The decision to reject the null hypothesis was determined by visual inspection of whether the lower limit of the CI crossed the noninferiority margin. For continuous secondary outcomes, when normality and equal variance between sample groups were achieved, the unpaired *T* test was employed for comparisons between groups; for data with a non normal distribution, the Mann–Whitney *U*-test was used for comparisons between groups. For categorical secondary outcomes, the Pearson chi-square test or Fisher's exact test was used for comparisons between groups. All analyses were conducted following the intention-to-treat (ITT) principle. For secondary outcomes, a two-sided *P* value < 0.05 was considered statistically significant.

Results

Patient Characteristics

Of the initial 122 patients, 110 were eventually enrolled and followed up in the study. A total of 12 patients were excluded: 8 who refused participation, 2 who were excluded due to renal dysfunction, and 2 who had uncontrolled hypertension. Ultimately, 55 received IA with sevoflurane-remifentanil, and 55 received TIVA with propofol-remifentanil (Figure 2).

The patient baseline and intraoperative characteristics are presented in Table 1 and Table 2, respectively, and they did not differ significantly between the two groups. Because the severity of sinus disease as indicated by the Lund-Mackay score may affect surgical field visibility, we also assessed Lund-Mackay scores and found that they were not significantly different between the two groups ($P = 0.489$; Table 1). During anesthesia induction, the amount of sufentanil given to the IA group was comparable to that given to the TIVA group ($P = 0.416$; Table 2). For anesthesia maintenance, there was no difference in the amount of remifentanil used between the IA and TIVA groups ($P = 0.320$; Table 2).

Primary and Secondary Outcomes

The intraoperative mean BS was the primary clinical outcome. As shown in Table 3, the intraoperative mean BS of the IA group was noninferior to that of the TIVA group [2.0 (1.7–2.2) vs 2.0 (1.8–2.1), $P = 0.923$; Figure 3A]. Then, we compared the total blood loss ($P = 0.986$, Table 3), bleeding rate ($P = 0.359$, Table 3) and total fluid ($P = 0.686$, Table 2) in the IA and TIVA groups and found that they were not significantly different. The above results indicated that IA was noninferior to TIVA in terms of surgical field visibility during ESS.

Considering that the intraoperative mean MAP and HR may affect intraoperative bleeding, we also compared these two indicators. However, there were no significant differences in the HR [(61.4 ± 9.7) vs (63.1 ± 9.0); $P = 0.344$; Table 2] or MAP [(72.0 ± 5.0) vs (73.5 ± 7.4); $P = 0.214$; Table 2] between the two groups. Moreover, our results revealed that there were no significant differences in the BIS ($P = 0.732$), $EtCO_2$ ($P = 0.393$), operative time ($P = 0.238$), or length of

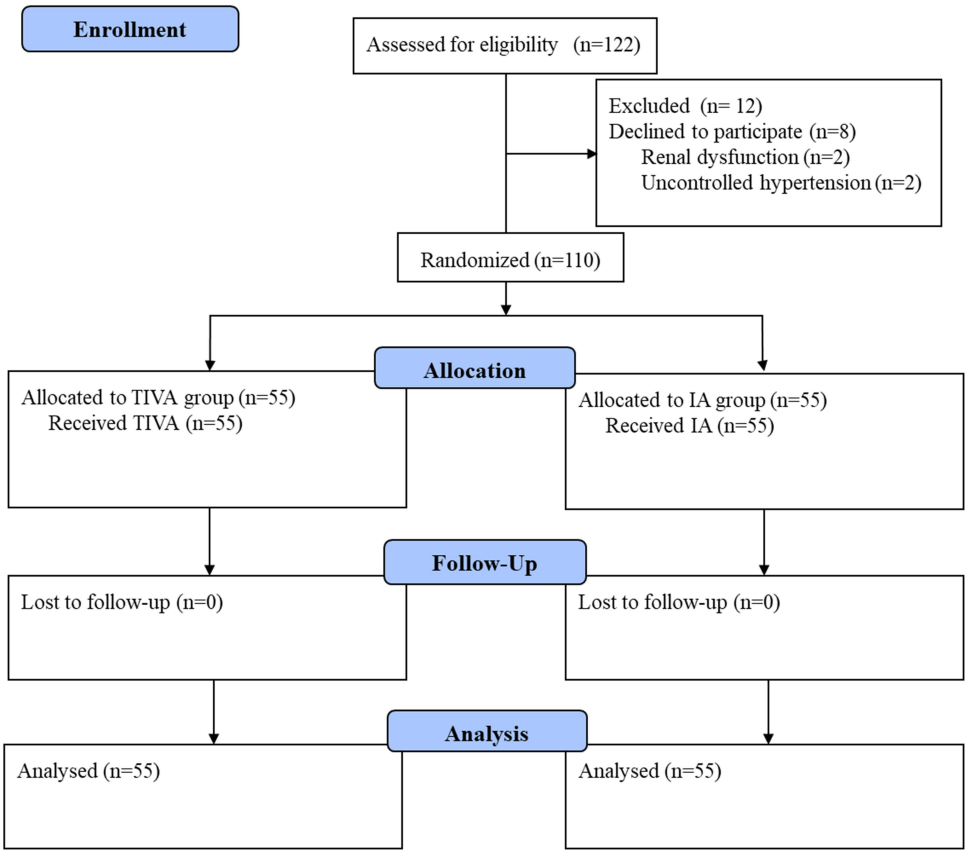

Figure 2 Flow chart of screened, excluded, and analyzed patients.
Abbreviations: IA, inhalational anesthesia; TIVA, total intravenous anesthesia.

stay in the PACU (P = 0.573) between the two groups (Table 2). We followed up with the patients regarding the occurrence of postoperative hypoxemia (P =1.000), sore throat (P = 0.618), and nausea (P = 1.000), and there were no differences between the IA group and TIVA group (Table 4).

Table 1 Baseline Characteristics

	IA (n=55)	TIVA (n=55)	*P* value
Male, n (%)	34 (61.8)	42 (76.3)	0.099[a]
Age, years	48.4±12.5	44.5±11.8	0.096[b]
BMI, kg/m^2	25.3±4.0	25.0±2.9	0.656[b]
ASA class, n (%)			0.688[a]
I	18 (32.7)	20 (36.4)	
II	37 (67.3)	35 (63.6)	
CRSwNP, n (%)	28 (50.9)	31 (56.4)	0.566[a]
Unilateral, n (%)	20 (36.4)	18 (32.7)	0.688[a]
Recrudesce, n (%)	18 (32.7)	15 (27.3)	0.533[a]
Smoking, n (%)	14 (25.5)	11 (20.0)	0.495[a]
Pulmonary disease, n (%)	2 (3.6)	1 (1.82)	1.000[c]
Asthma, n (%)	7 (12.7)	9 (16.4)	0.589[a]
Lund-Mackay score	9 (5–16)	10 (6–17)	0.489[d]

Notes: The results are presented as the mean ± SD or numbers (%). [a]Pearson chi-square test; [b]Unpaired *T* test; [c]Fisher's exact test; [d]Mann–Whitney *U*-test.
Abbreviations: ASA, American Society of Anesthesiologists; BMI, body mass index=weight/(height)^2; CRSwNP, chronic rhinosinusitis with nasal polyps; IA, inhalational anesthesia; SD, standard deviation; TIVA, total intravenous anesthesia.

Table 2 Intraoperative Characteristics

	IA (n=55)	TIVA (n=55)	*P* value
MAP, mmHg	72.0±5.0	73.5±7.4	0.214[a]
HR, beats/min	61.4±9.7	63.1±9.0	0.344[a]
BIS (0–100)	53.0 (50.0–58.0)	53.0 (50.0–58.0)	0.732[b]
$EtCO_2$, cmH_2O	35.5 (32.8–36.5)	34.5 (32.5–36.3)	0.393[b]
Sufentanil, μg	14.2±2.7	14.6±2.3	0.416[a]
Remifentanil, μg	480.0 (280.0–880.0)	580.0 (400.0–780.0)	0.320[b]
Operation time, min	70.0 (39.0–102.5)	75.0 (50.0–100.0)	0.238[b]
Total fluid, mL	1000 (1000–1000)	1000 (1000–1000)	0.686[b]
Length of PACU stay, min	28.0 (23.0–29.5)	26.0 (24.0–29.0)	0.573[b]

Notes: The results are presented as the mean ± SD or medians with IQRs. [a]Unpaired *T* test; [b]Mann–Whitney *U*-Test.
Abbreviations: BIS, bispectral index; $EtCO_2$, end-tidal CO_2; HR, heart rate; IA, inhalational anesthesia; interquartile ranges, IQRs; MAP, mean arterial pressure; PACU, post anesthesia care unit; SD, standard deviation; TIVA, total intravenous anesthesia.

Table 3 Surgical Field Scores and Blood Loss

	IA (n=55)	TIVA (n=55)	*P* value
BS (0–5)	2.0 (1.7–2.2)	2.0 (1.8–2.1)	0.923[a]
Total blood loss, mL	137.0 (61.5–239.0)	150.0 (37.5–337.0)	0.986[a]
Bleeding rate, mL/min	2.0 (1.1–3.1)	1.4 (0.8–3.7)	0.359[a]

Notes: The results are presented as medians with IQRs. [a]Mann–Whitney *U*-test.
Abbreviations: BS, Boezaart score; IA, inhalational anesthesia; interquartile ranges, IQRs; SD, standard deviation; TIVA, total intravenous anesthesia.

Post Hoc Analysis

Surgical field visibility may differ in patients with different severities of sinus disease as measured by the Lund-Mackay score; thus, we stratified the patients according to sinus disease severity using a cutoff Lund-Mackay score of 12[9]. The intraoperative mean BS showed no significant difference between the IA group and TIVA group in either the group of patients with Lund-Mackay scores of 12 or lower [2.0 (1.7–2.2) vs 1.8 (1.7–2.0), $P = 0.403$; Figure 3B] or the group of patients with Lund-Mackay scores above 12 [2.1 (1.8–2.2) vs 2.1 (2.0–2.3), $P = 0.226$; Figure 3C].

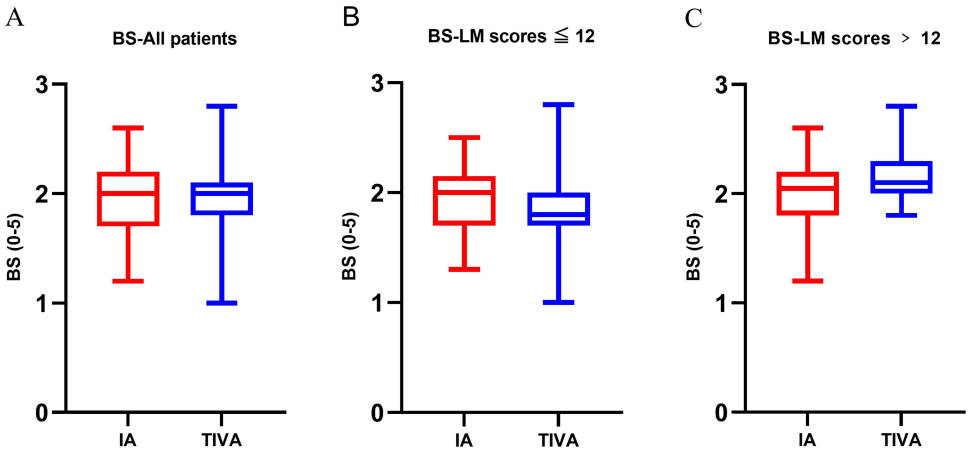

Figure 3 The BS of all the patients, patients with LM scores ≤ 12, and patients with LM scores > 12 in the IA group and TIVA group. (**A**) The BS of all the patients in the IA group (n = 55) and TIVA group (n = 55). (**B**) The BS of patients with LM scores ≤ 12 in the IA group (n = 37) and TIVA group (n = 36). (**C**) The BS of patients with LM scores > 12 in the IA group (n = 18) and TIVA group (n = 19).
Abbreviations: BS, Boezaart score; IA, inhalational anesthesia; LM, Lund-Mackay; TIVA, total intravenous anesthesia.

Table 4 Postoperative Complications

	IA (n=55)	TIVA (n=55)	*P* value
Hypoxemia, n (%)	4 (7.3)	5 (9.1)	1.000
Sore throat, n (%)	1 (1.8)	3 (5.5)	0.618
Nausea, n (%)	0 (0)	1 (1.8)	1.000

Notes: The results are presented as numbers (%), and all statistical analyses were performed using Fisher's exact test.
Abbreviations: IA, inhalational anesthesia; TIVA, total intravenous anesthesia.

Discussion

Our results suggested that the intraoperative mean BS of the IA group with sevoflurane-remifentanil was noninferior to that of the TIVA group with propofol-remifentanil during ESS. Moreover, post hoc analysis confirmed no difference between IA and TIVA for patients with Lund-Mackay scores of 12 or lower and patients with Lund-Mackay scores greater than 12. All the results suggest that IA with sevoflurane-remifentanil is noninferior to TIVA with propofol-remifentanil anesthesia maintenance with respect to surgical field visibility in ESS.

Compared with IA, TIVA is thought to improve surgical field visibility by suppressing the baroreflex and lowering the HR, resulting in reduced cardiac output and reduced blood flow into the surgical field. However, in clinical practice, multiple clinical trials and meta-analyses have found that IA and TIVA showed no significant differences in MAP or HR.[14,15] In our study, the MAP and HR of the IA and TIVA groups were similar.

Whether TIVA provides better surgical field visibility than IA during ESS is currently debated. Some studies have suggested that TIVA has more positive effects on surgical field visibility[5,16–18] and intraoperative blood loss[19] than IA. In contrast, other studies have demonstrated no difference in surgical field visibility[8,9,20–22] or blood loss[8,9,18,20,21,23] between the two methods, consistent with our study findings. Additionally, a recent meta-analysis showed no significant difference in BS between patients receiving IA and those with TIVA.[15] Chaaban et al stated that even with further studies, a significant difference in blood loss between patients with TIVA and those with IA during ESS was unlikely to be seen.[9]

We found that the majority of studies obtaining positive results compared TIVA with propofol to IA with isoflurane[17–19,23] or desflurane[5] but not sevoflurane, and one meta-analysis confirmed our hypothesis.[7] In addition to its short half-life, remifentanil provides excellent intraoperative hemodynamic stability during surgery; for ESS, remifentanil is associated with less blood loss than other analgesics, such as fentanyl, possibly because it has more hypotensive and bradycardic effects. Therefore, remifentanil may play a key role in closing the gap in surgical field visibility during ESS between IA and TIVA.[15] In some previous studies, TIVA was superior to IA, although most IA groups were not given remifentanil for anesthesia maintenance.[24] In other words, when remifentanil is infused during anesthesia maintenance, the choice of different methods for anesthesia maintenance—inhaled anesthetic, propofol, or their combination—may not be important.[9,20–22] In consideration of the effects of remifentanil and sevoflurane on surgical field visibility quality, remifentanil was used for both IA and TIVA in our study, and the inhalation anesthetic was sevoflurane. Our results are consistent with previous studies that used the same anesthesia maintenance protocols as ours, demonstrating that IA with sevoflurane-remifentanil is not noninferior to TIVA with propofol-remifentanil in terms of surgical field visibility.[22,25,26]

Moreover, IA has many advantages over TIVA. First, the use of IA decreases the risk of IV infiltration. The improper use of micropumps for TIVA may result in an unexpectedly decreased depth of anesthesia; that is, compared with TIVA, IA can decrease the risk of intraoperative awareness.[27] Second, IA may be more suitable for patients with sinus disease, which is often associated with airway hyperresponsiveness, because IA may dilate the bronchi and reduce the incidence of airway spasm.[11] Third, for some patients with poor heart function, sevoflurane IA can reduce the release of postoperative markers of myocardial injury, shorten the length of hospital stay, and provide myocardial protection.[12]

Our prospective randomized controlled trial was a highly rigorous study. First, after a detailed search of the relevant literature, we found that the maximum sample size from previous studies was ninety cases (TIVA group plus IA group);[17] in contrast, the sample size calculation in our study was more rigorous, with 110 patients included (with the TIVA and IA groups each containing 55 patients). Second, the bleeding rate may be a better variable than the estimated amount of

blood loss.[15] Some studies only compared total blood loss and did not calculate the bleeding rate.[15] We compared not only the total blood loss between IA and TIVA but also the bleeding rates of the two groups. We found some studies that supported our findings, and they showed that there was no difference in total blood loss or the bleeding rate between the IA and TIVA groups.[8,19,20] Third, the severity of chronic rhinosinusitis was also not consistently evaluated in prior studies and is a potential confounding factor for intraoperative visibility.[7,15] Thus, the Lund-Mackay score was used to evaluate the severity of sinus disease in our study, and there was no significant difference between the IA and TIVA groups for those with greater sinus disease severity.

In our research, blood loss in both the IA and TIVA groups was less than 200 mL, less than that in some previous studies.[24,28] The reason may be that we adopted comprehensive measures to improve surgical field visibility. First, based on our team's previous research,[3] all of our patients were placed in the 10-degree reverse Trendelenburg position, which improved surgical field visibility during ESS. Second, in our hospital, flexible laryngeal masks, as opposed to endotracheal intubation, are used for all ESS patients.[29] Airway management with a flexible reinforced laryngeal mask can provide better surgical field visibility and less blood loss,[30] perhaps due to reduced intraoperative hemodynamic fluctuation. Third, intraoperative bleeding is primarily influenced by the MAP and HR. When the HR is maintained at approximately 60 beats/min, in most cases, no additional measures are required to achieve optimal surgical conditions.[31] In our study, the intraoperative HR of both the TIVA group and IA group was maintained at approximately 60 beats/min.

There are also limitations to our research. First, it was a single-center trial, and only ASA 1 and 2 patients were included in our study, which limits the generalizability of the results. Second, the BS is a subjective measure that has been shown to be efficient in the evaluation of ESS.

Conclusion

In conclusion, our research suggests that IA with sevoflurane-remifentanil is noninferior to TIVA with propofol-remifentanil anesthesia maintenance regarding surgical field visibility during ESS.

Data Sharing Statement

The datasets generated from the current study are available from the corresponding author, Guyan Wang, upon reasonable request.

Ethics Statement

This trial was approved by the Ethics Committee of Beijing Tongren Hospital (TRECKY2021-006) before beginning the study. The trial was registered in the Chinese Clinical Trial Registry (https://www.chictr.org.cn, He Li) on October 24, 2021 (registration no. ChiCTR2100052259), before patient recruitment. Written informed consent was obtained from each patient before enrollment. The research protocol complied with the Consolidated Standards of Reporting Trials (CONSORT) statement and the Helsinki Declaration.

Acknowledgments

The authors appreciate the suggestions, support and cooperation from colleagues in the Department of Otorhinolaryngology, Beijing Tongren Hospital, Capital Medical University.

Funding

This work was supported by Beijing Hospitals Authority Clinical Medicine Development of Special Funding Support (ZYLX202103) and the Beijing Hospitals Authority's Ascent Plan (DFL20220203).

Disclosure

The authors declare that they have no competing interests.

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