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FACTORS IMPACTING POST OP HEMORRHAGE IN ENDOSCOPY SINUS SURGERY

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Abstract

OBJECTIVE: *To determine the factors impacting post op hemorrhage in endoscopy sinus surgery*

STUDY DESIGN: *Prospective cohort study*

PLACE AND DURATION: *CMH Peshawar from June 2024-Nov 2024*

METHODOLOGY: *This Prospective cohort study collected demographic and clinical data, including age, gender, smoking status, anticoagulant use, Lund–Mackay score, and surgical details. All patients underwent ENT examination, nasal endoscopy, and CT imaging before endoscopic sinus surgery (ESS), performed under general anesthesia using the standard approach. Postoperative bleeding was defined as hemorrhage within 30 days requiring intervention. Data were analyzed using SPSS 21 with descriptive statistics and logistic regression. Variables significant in univariate analysis ($p < 0.10$) were included in multivariate analysis to identify independent predictors of postoperative bleeding ($p < 0.05$).*

RESULTS: *Among 234 patients, 142 (60.7%) were male and 92 (39.3%) female, with mean ages of 41.36±16.86 and 43.00±17.94 years, respectively. Postoperative bleeding was significantly associated with prior sinonasal surgery ($p=0.002$), anticoagulant use ($p=0.001$), hypertension ($p=0.015$), and Lund–Mackay CT score ≥15 ($p=0.003$). Other factors, including age, gender, diabetes, BMI, smoking, and allergic rhinitis, showed no significant associations.*

CONCLUSIONS: *In conclusion, postoperative hemorrhage remains one of the frequent complications following endoscopic sinus surgery. The major factors associated with increased bleeding risk include the use of antiplatelet or anticoagulant medications, elevated blood pressure, and higher Lund–Mackay CT scores.*

INTRODUCTION:

Endoscopic sinus surgery (ESS) is widely used to treat chronic rhinosinusitis, nasal polyps, and other sinus problems, including tumors.[1] Bleeding during ESS can be difficult to control because the nasal passages are narrow and surgeons work with one hand using endoscopic tools.[2,3] Although newer instruments and improved techniques have made ESS much safer and more effective,[4] the procedure still carries risks such as injury to the orbit or skull base, cerebrospinal fluid leak, and optic nerve damage. Too much bleeding during surgery can block

visibility and make the operation harder to perform safely.[5]

Several factors have been linked to a higher risk of bleeding after ESS. Patient-related variables such as hypertension, diabetes, and the use of antiplatelet or anticoagulant medications are consistently highlighted. The increasing use of aspirin, clopidogrel, and novel oral anticoagulants poses unique challenges for preoperative management.[6] Some studies suggest that failure to appropriately discontinue these drugs increases the likelihood of postoperative hemorrhage, whereas others indicate that bleeding risk may be lower than expected if meticulous surgical hemostasis is achieved. In addition, nonsteroidal anti-inflammatory drugs (NSAIDs), which are commonly prescribed for pain control, remain controversial. Recent database studies suggest NSAIDs may not significantly raise bleeding risk compared with opioids, although aspirin continues to be a concern.

Surgical and anesthetic factors also play a role. The extent of sinus dissection, the presence of polyps or advanced disease, and intra-operative blood loss all influence post-operative bleeding. Techniques to minimize bleeding—such as careful bipolar cautery, topical vasoconstrictors, and absorbable nasal packing—have been evaluated with mixed results.[7] Some randomized studies have explored tranexamic acid as an adjunct, though its effectiveness remains uncertain.[8] The type of anesthesia may also matter; recent evidence suggests total intravenous anesthesia may reduce intraoperative bleeding and improve visualization compared with inhalational methods.[9]

The timing of hemorrhage is also clinically significant. While some patients develop immediate postoperative bleeding, delayed hemorrhage commonly occurs within 1–3 weeks after surgery, a period when most patients have already been discharged. This can increase the risk of complications and the need for emergency readmission.[10]

Although numerous studies have investigated risk factors for hemorrhage after ESS, most are retrospective, single-center, or focus on selected variables in isolation. There is still a lack of comprehensive, prospective research that simultaneously evaluates patient comorbidities, preoperative medication use, surgical techniques, anesthesia type, and postoperative management strategies. This study aims to address this gap by systematically examining factors that impact postoperative hemorrhage in ESS, with the ultimate goal of improving preoperative protocols and reducing complications.

METHODOLOGY

This Prospective cohort study took place at the *CMH Peshawar from June 2024-Nov 2024* having received approval from the Institutional Review Board (IRB) under reference number~~~~. To establish our study parameters, an extensive review of existing literature was performed. The sample size of 234 patients was calculated using the WHO sample size calculator, based on an odds ratio of 3.19 for Lund–Mackay CT score in relation to postoperative bleeding, with 5% margin of error and 95% confidence interval. A non-probability consecutive method of sampling was used for the sampling process.

INCLUSION CRITERIA

All the patients with nasal polyps of both genders having the age between 12 to 70 years were included in this study.

EXCLUSION CRITERA

Patients who had bleeding disorders, impaired coagulation function, autoimmune conditions requiring systemic immunosuppressive treatment, or liver and kidney dysfunction were not included in the study.

All patients provided written agreement before the enrolment, and their confidentiality was maintained at all levels. The institutional ethics committee's approval was also obtained prior to beginning the study. Demographic and clinical data were collected for each patient, including age, smoking history, gender, use of anticoagulant and/or antiplatelet medications, surgical details, Lund–Mackay score, postoperative course, and other relevant factors.

After obtaining a detailed medical history, each patient received a full physical examination, along with an ENT assessment, nasal endoscopy, and CT imaging of the nose and paranasal sinuses to evaluate structural variations and determine the severity of the disease. Endoscopic sinus surgery (ESS) was performed under general anesthesia using the standard anterior-to-posterior approach, with surgical steps adapted to disease severity in individual cases. At the completion of surgery, one or two pieces of polyvinyl alcohol (PVA) sponge (Merocel; Medtronic Inc., Mystic, CT) were carefully inserted into the nasal cavity and taken out on the second day after the operation. Postoperative management involved daily cleaning of the nasal passages and regular saline rinses.

Postoperative hemorrhage was defined as any bleeding occurring within 30 days after surgery that required nasal packing or surgical intervention for hemostasis. Hypertension was diagnosed based on either: (1) A known history of hypertension with ongoing antihypertensive medication use, or (2) A new clinical diagnosis during hospitalization. For all cases, antiplatelet and anticoagulant drugs were discontinued seven days prior to surgery in accordance with institutional protocol.

Data were analyzed using SPSS 21. The Shapiro wilk test was applied to check the normality of data. Descriptive statistics were used to summarize patient demographics, clinical characteristics, and types of endoscopic sinus surgery, with categorical variables presented as frequencies and percentages and continuous variables as mean with standard deviation. The primary outcome was postoperative bleeding. To identify potential risk factors, univariate logistic regression analysis was performed for each variable and odds ratios (OR) with 95% confidence intervals (CI) were calculated. Variables with $p < 0.10$ in univariate analysis were entered into a multivariate logistic regression model using the enter method to determine independent predictors of postoperative bleeding. Adjusted odds ratios with 95% CI were reported, and statistical significance was set at $p < 0.05$.

RESULTS:

A total of 234 patients were included in this study. Out of the total, 142 (60.7%) were male with the mean age of 41.36±16.86 years and 92 (39.3%) were female with the mean age of 43.00±17.94 years.

Gender and age were not significantly associated with bleeding risk. Similarly, diabetes, body mass index, smoking status, and allergic rhinitis showed no significant associations. In contrast, patients with a history of previous sinonasal surgery had a significantly increased risk of postoperative bleeding (OR = 13.43, 95% CI: 2.51–71.85, p = 0.002). Use of anticoagulation medication also markedly elevated the bleeding risk (OR = 12.28, 95% CI: 2.76–54.70, p = 0.001). Hypertension emerged as another significant predictor (OR = 6.22, 95% CI: 1.43–27.10, p = 0.015). Likewise, a Lund–Mackay CT score ≥15 was strongly associated with higher bleeding risk (OR = 11.36, 95% CI: 2.33–55.31, p = 0.003). Polyposis demonstrated an increased but statistically non-significant trend toward bleeding (OR = 2.79, 95% CI: 0.72–10.83, p = 0.138).

Table—I: Risk Factors Associated with Postoperative Bleeding after Endoscopic Sinus Surgery by Univariate Logistic Regression Analysis (n=356)

Variables		Number of patients n (%)	Postoperative Bleeding Rate n (%)	Univariate Odds Ratio (95% CI)	p-Value
Gender	Male	142 (60.7%)	11 (7.7%)	Ref	0.512
	Female	92 (39.3%)	4 (4.3%)	0.617 (0.146–2.611)	

Age	<65 years	199 (85.0%)	13 (6.5%)	Ref	0.752
	≥65 years	35 (15.0%)	2 (5.7%)	1.393 (0.178–10.885)	
Previous Sino nasal Surgery	No	204 (87.2%)	10 (4.9%)	Ref	0.002
	Yes	30 (12.8%)	5 (16.7%)	13.430 (2.510–71.850)	
Use of Anticoagulant	No	214 (91.5%)	9 (4.2%)	Ref	0.002
	Yes	20 (8.5%)	6 (30.0%)	12.282 (2.758–54.699)	
Diabetes	No	185 (79.1%)	10 (5.4%)	Ref	0.860
	Yes	49 (20.9%)	5 (10.2%)	1.159 (0.225–5.976)	
Hypertension	No	203 (86.8%)	8 (3.9%)	Ref	0.015
	Yes	31 (13.2%)	7 (22.6%)	6.223 (1.429–27.099)	
Body Mass Index	<25	166 (70.9%)	11 (6.6%)	Ref	0.972
	≥25	68 (29.1%)	4 (5.9%)	0.975 (0.234–4.055)	
Smoking Status	Non Smokers	165 (70.5%)	10 (6.1%)	Ref	1.000
	Smokers	69 (29.5%)	5 (7.2%)	1.000 (0.247–4.047)	
Allergic Rhinitis	No	176 (75.2%)	12 (6.8%)	Ref	0.546
	Yes	58 (24.8%)	3 (5.2%)	0.571 (0.093–3.519)	
Lund Mackay CT Score	<15	193 (82.5%)	8 (4.1%)	Ref	0.003
	≥15	41 (17.5%)	7 (17.1%)	11.362 (2.334–55.308)	
Polyposis	No	126 (53.8%)	5 (4.0%)	Ref	0.138
	Yes	108 (46.2%)	10 (9.3%)	2.790 (0.719–10.827)	

The distribution of patients and postoperative bleeding rates by type of endoscopic sinus surgery is shown in Figure 1.

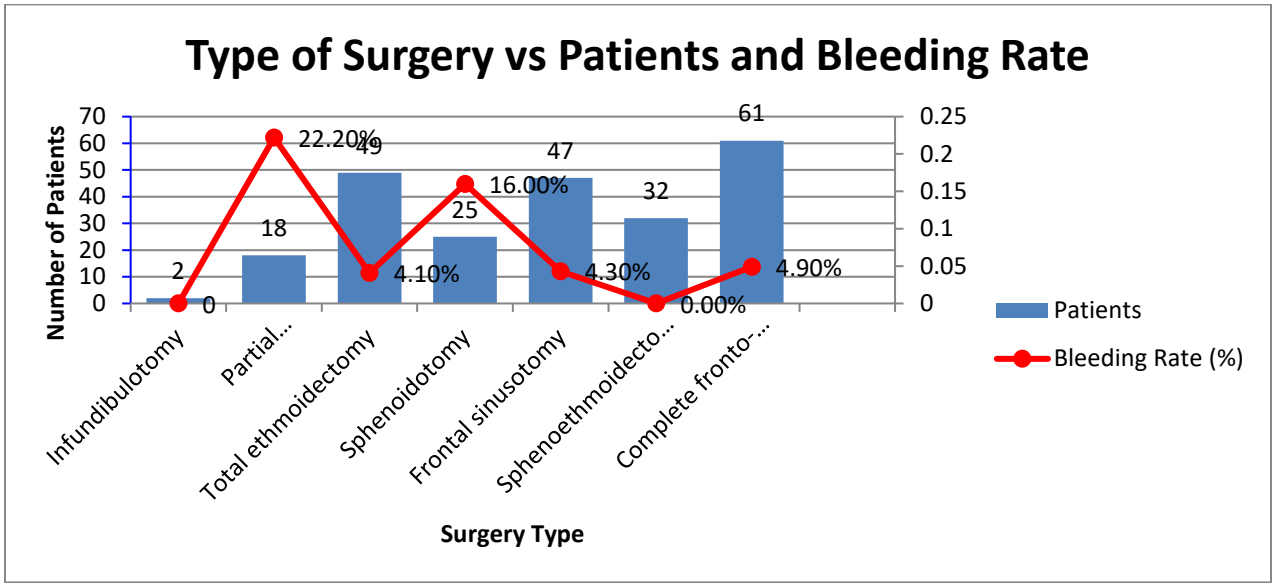

Figure 1: Distribution of Patients and Postoperative Bleeding Rates by Type of Endoscopic Sinus Surgery (n=356)

The Figure 2 illustrates the distribution of the timing of postoperative bleeding after endoscopic sinus surgery. The majority of bleeding events occurred within 0–24 hours (42.9%), followed by bleeding observed on day 2 at the time of nasal packing removal (33.3%). Less frequently, bleeding was observed between 25–48 hours (13.3%), 3–7 days (6.7%), and 8–30 days (6.7%) postoperatively.

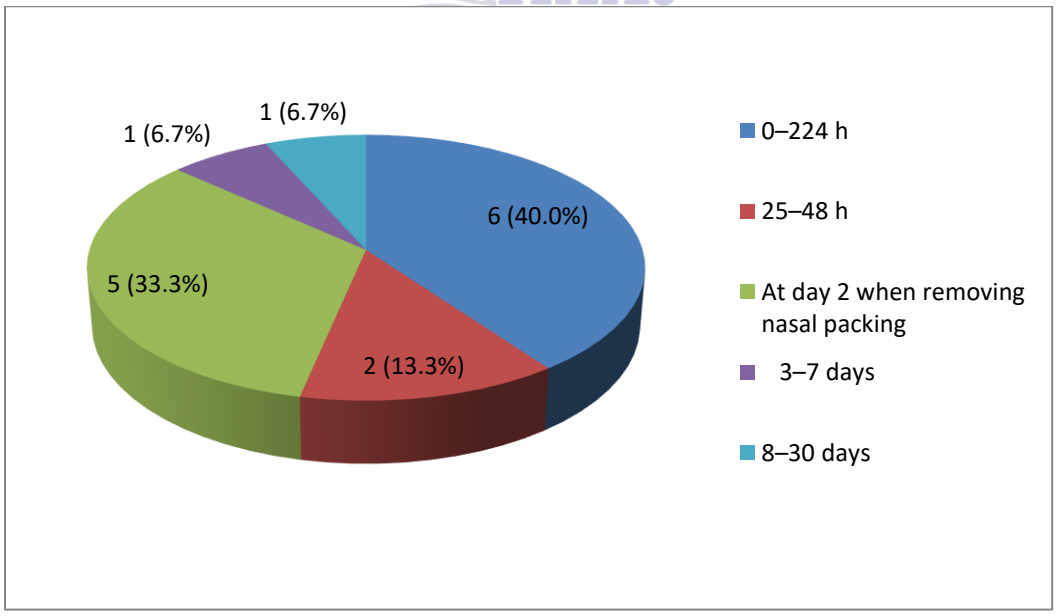

Figure 2: Timing of Postoperative Hemorrhage after Endoscopic Sinus Surgery(n=356)

Multivariate logistic regression analysis identified four independent predictors of postoperative bleeding as shown in Table II. The use of anticoagulants significantly increased the risk (OR = 12.260, 95% CI: 2.955–50.872, p=0.001). Similarly, hypertension was strongly associated

with bleeding (OR = 8.067, 95% CI: 2.188–29.744, p=0.001). In addition, patients with a Lund Mackay CT score ≥15 had a more than nine fold higher risk of bleeding (OR = 9.180, 95% CI: 2.139–39.408, p = 0.003).

Table—II: Multivariate Logistic Regression Analysis of Factors Associated with Postoperative Bleeding 9n=356)

Variables	B	DF	Wald	p Value	Exp (B)	95% CI
Use of Anticoagulant	2.506	1	11.917	0.001	12.260	2.955-50.872
Previous Sino nasal Surgery	2.363	1	9.248	0.002	10.625	2.317-48.732
Hypertension	2.088	1	9.833	0.001	8.067	2.188-29.744
Lund Mackay CT Score	2.217	1	8.896	0.003	9.180	2.139-39.408

DISCUSSION

In our study, prior sinonasal surgery was found to be a major predictor of postoperative hemorrhage following ESS (OR = 13.43, p = 0.002). This is consistent with the clinical view that repeated surgeries are technically more challenging due to scar tissue and changed anatomy. Qin *et al.*,[2] similarly reported that patients with previous surgery had a higher risk of hemorrhage after ESS. Hemmi *et al.*,[5] (2023) also emphasized that revision cases carried more bleeding risk than primary surgeries. Earlier studies by Stankiewicz *et al.*,[11] described revision ESS as more challenging, with increased complications, including hemorrhage. However, Bhattacharyya *et al.*,[12] in a large database study suggested that revision status alone may not independently predict hemorrhage when adjusted for comorbidities. These findings suggest that revision surgery increases bleeding risk, but its impact may be modulated by other factors.

Anticoagulant use was another significant risk factor in our study (OR = 12.28, p = 0.001). Patients using anticoagulants are at a higher risk of postoperative bleeding. Qin et al.,[2] similarly highlighted anticoagulants as one of the strongest predictors of postoperative hemorrhage. However, Sargi *et al.*,[13] conducted a research and discovered that ESS is a safe operation when performed in patients using anticoagulants and may be categorized as moderate bleeding risk surgery. The medication must be stopped before to surgery. Collectively, these results reinforce the need for careful preoperative planning in anticoagulated patients.

Several investigations have explored the link between hypertension and the occurrence of epistaxis.[14, 15] One study highlighted hypertension as an important cardiovascular risk factor contributing to postoperative hemorrhage following transsphenoidal procedures.[16] Nevertheless, the exact relationship between hypertension and epistaxis remains debated in the literature.[17] In our study, hypertension emerged as a significant factor increasing the likelihood of postoperative bleeding after ESS. Elevated blood pressure is known to weaken vascular walls, making them more prone to rupture and bleeding during the healing phase.[18] Additionally, postoperative pain and discomfort can further elevate blood pressure, increasing the risk. Hence, strict control of blood pressure, especially in the early recovery period, is essential to minimize postoperative bleeding complications.

We also observed that a Lund–Mackay CT score ≥15 significantly increased postoperative bleeding risk (OR = 11.36, p = 0.003). Patients with more extensive disease likely require broader surgical dissection and encounter higher vascular exposure. Qin *et al.*,[2] observed a similar trend, reporting higher bleeding risk in patients with

extensive CT findings. This highlights the need for careful preoperative evaluation of CT scans to guide risk assessment.

In our research, the majority of postoperative hemorrhages were observed within the first 24 hours after surgery and on the second day during nasal packing removal. Certain measurable factors can assist in identifying patients at a higher risk of bleeding after ESS. When such risk is anticipated, thorough preoperative assessment, vigilant postoperative observation, and proper patient counseling are crucial to minimize the likelihood of postoperative hemorrhage.[20]

LIMITATIONS OF THE STUDY

This study has some limitation as it is a single center study. The sample size, though adequate, may not represent wider populations. Additionally, variations in surgical technique, anesthesia methods, and postoperative care were not fully standardized. Long-term follow-up data regarding delayed bleeding or recurrence were also unavailable. Future multicenter, prospective studies with larger cohorts and standardized protocols are needed to confirm these findings and improve generalizability.

CONCLUSIONS:

In conclusion, postoperative hemorrhage remains one of the frequent complications following endoscopic sinus surgery. The major factors associated with increased bleeding risk include the use of antiplatelet or anticoagulant medications, elevated blood pressure, and higher Lund–Mackay CT scores. These findings offer valuable insight for clinicians to identify vulnerable patients and implement effective strategies to minimize the likelihood of bleeding after ESS.

CONFLICT OF INTEREST

None

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