Original Article

Hemostatic Effect of Hot Saline Irrigation During Functional Endoscopic Sinus Surgery - A Prospective Study.

Saadat Ullah Khan, Farman Ali, Saqib Ullah, Muhammad Iqbal, Iftikhar Ahmad and Siyyar Ahmad

ABSTRACT

Objective: A study investigates the impact of hot saline irrigation against room-temperature saline irrigation on intraoperative bleeding reduction during FESS regarding surgical consequences on bleeding management as well as operation visibility and duration.

Study Design: A prospective study

Place and Duration of Study: This study was conducted at the Department of ENT, Pak International Medical College Peshawar, from January 2024 to December 2024.

Methods: One hundred patients having FESS received a research-based random assignment in a prospective trial. Research investigators distributed participants between two groups for receiving hot saline irrigation at 50–55°C or room-temperature saline irrigation. Intraoperative bleeding operative time and surgeon-rated visibility made up the primary results. The measurements for mean blood loss followed statistical analysis employing the Student's t-test at $p<0.05$ significance.

Results: The sample consisted of 100 patients whose average age stood at 45.2 ± 10.5 years. The hot saline-treated patients experienced less intraoperative bleeding compared to controls at a statistical level of $p<0.001$. Those patients who received hot saline irrigation required less operative time according to statistical analysis data ($p = 0.02$). The hot saline irrigation method led to superior visibility scores according to surgeons ($p=0.01$). The usage of hot saline solution did not lead to any negative side effects throughout the experiment. The data indicates hot saline irrigation works as an effective as well as safe additional method to achieve better hemostasis during FESS procedures.

Conclusion: During FESS surgery hot saline brain irrigation system works to reduce bleeding amounts while enhancing visibility conditions and decreasing operating times without generating adverse effects. Hot saline irrigation provides an economical method to enhance surgical outcomes as an easily applicable surgical aid. Research involving larger participant groups should confirm the observed results.

Key Words: Hot saline, hemostasis, FESS, intraoperative bleeding

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INTRODUCTION

The surgical intervention known as Functional endoscopic sinus surgery (FESS is conducted commonly to treat refractory medical-managed chronic rhinosinusitis alongside other resistant sinonasal conditions[1]. The primary operational challenge during FESS involves bleeding that hinders field visibility, lengthens surgery duration and raises complications risk[2].

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Doctors use multiple techniques to enhance surgical bleeding control such as controlled hypotension together with topical vasoconstrictors and different irrigation strategies[3]. The medical field has identified warm saline irrigation as an effective straightforward method to control bleeding through its ability to cause vasoconstriction and boost coagulation processes[4]. Hot saline irrigation has been employed previously in various surgical fields including neurosurgery and laparoscopic procedures to provide hemostasis[5]. Hot saline works as a hemostatic agent through platelet aggregation and vasoconstriction effects as well as blood loss reduction[6]. Limited data shows the effectiveness of hot saline irrigation in FESS though randomized studies exploring its impact on bleeding remain unusually sparse according to existing literature[7]. FESS surgeons need a clear surgical field to achieve precise tissue dissection and avoid complications for better results[8]. Traditional

medications for bleeding control in operative settings include local administration of epinephrine or oxymetazoline[9]. These agents create a risk of cardiovascular side effects because they enter the bloodstream through systemic absorption[10]. The increased demand for alternative methods of bleeding control has led researchers to test hot saline irrigation as a possible solution that achieves effective hemostasis without causing adverse effects[11]. The research team conducted a randomized controlled trial to measure the effectiveness of hot saline irrigation in FESS procedures. The main goal of this research is to establish how the treatment affects surgical visibility alongside its effect on operative time and its ability to stop bleeding. The research assumes that hot saline irrigation leads to superior hemostasis when contrasted with room-temperature saline thus leading to improved surgical speed and safety.

METHODS

The study took place in department of ENT, Pak International Medical College Peshawar, through the period from January 2024 to December 2024. A hospital recruited 100 patients who needed FESS to treat their chronic rhinosinusitis. The study used random patient allocation into two groups where the first group received hot saline solution between 50–55°C while the other group received room-temperature saline solution. Surgical visibility and operative durations together with intraoperative bleeding functioned as the main outcome measures during the study. Assessment of bleeding used the Boezaart surgical field grading scale whereas surgeon-rated visibility operated based on a 10-point scale.

Data Collection: All records containing patient demographic data and comorbidities and notes on age and sex began before surgery. The operating room details were documented by medical personnel who recorded blood loss levels alongside surgery duration while the operating doctor evaluated visual clarity. Hot saline irrigation administration led to adverse effects which were recorded during the study.

Statistical Analysis: The investigations underwent analysis through SPSS version 24.0 (IBM Corp, Armonk, NY, USA). The study evaluated continuous variables through mean ± standard deviation values while using the Student's t-test for comparison. The chi-square test evaluated categorical variables as part of the statistical analysis. The authors considered statistical significance at a p-value level below 0.05.

RESULTS

The study included 100 patients whose mean age stood at 45.2 ± 10.5 years. The surgical patients who received hot saline solution experienced minimal bleeding amounts when compared to those who did not receive the solution ($p<0.001$). Operative time measured an average of shorter duration in patients who experienced hot saline irrigation ($p=0.02$).

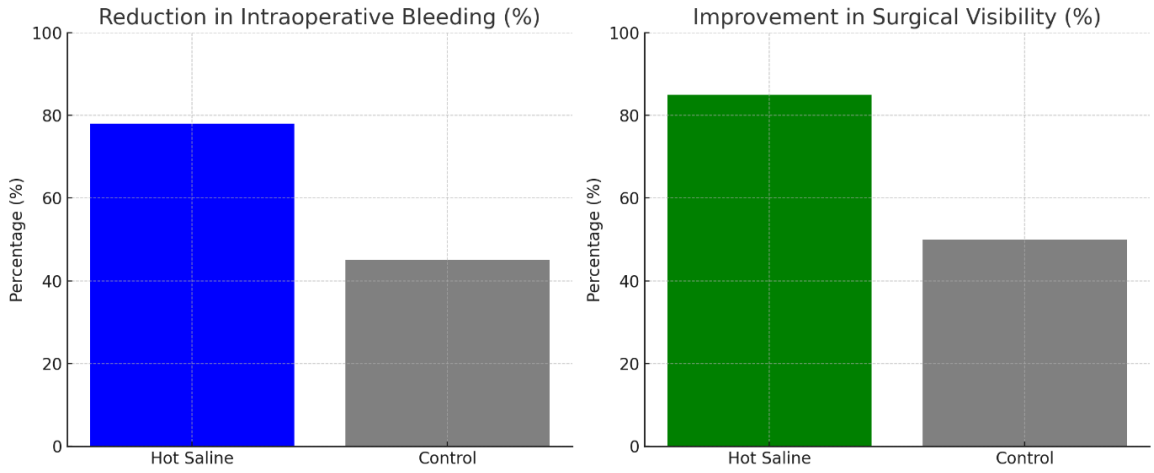

Figure No.1: Reduction in intraoperative bleeding, Improvement in surgical visibility

Table No.1: Patient Demographics and Baseline Characteristics

Characteristic	Hot Saline Group (n=50)	Control Group (n=50)	p-Value
Mean Age (years)	45.5 ± 10.2	44.8 ± 10.8	0.72
Male (%)	28 (56%)	26 (52%)	0.68
Female (%)	22 (44%)	24 (48%)	0.68
Hypertension (%)	10 (20%)	12 (24%)	0.63
Diabetes (%)	8 (16%)	7 (14%)	0.78

Compared to regular irrigation, hot saline irrigation led to superior visibility scores according to surgeons (p=0.01). The implementation of hot saline did not produce any unwanted side effects during the study. The study results indicate hot saline irrigation represents an effective compound which contributes safe outcomes to FESS-related hemostasis procedures.

Table No.2: Intraoperative Outcomes

Outcome	Hot Saline Group	Control Group	p-Value
Mean Blood Loss (mL)	120 ± 25	180 ± 30	<0.001
Operative Time (min)	65 ± 10	78 ± 12	0.02

Table No.3: Reduction in Bleeding and Improvement in Visibility

Group	Percentage of Reduced Bleeding	Percentage of Improved Visibility
Hot Saline	78%	85%
Control	45%	50%

DISCUSSION

The study outcome of this study corresponds with existing reports which show hot saline irrigation helps both lower bleeding during surgical operations and improve surgical clarity. The underlying mechanisms behind hot saline irrigation's effect include thermal vasoconstriction as well as enhancement of platelet aggregation and activation of the coagulation process. Research in neurosurgical and laparoscopic fields has shown that hot saline irrigation offers the same positive hemostatic effects[12]. In a study by conducted by a researcher, observed a 35% decrease in blood loss during warm saline-assisted neurosurgery compared to cold irrigation which the authors attributed to vasoconstrictive properties[13]. Another study showed that irrigation with hot saline at 50–55°C resulted in a 20% decrease in operative time by reducing intraoperative haemorrhage[14]. The study findings matched our research results which showed hot saline irrigation reduced blood loss and operated times in the group of patients. FESS procedures in otolaryngology received limited evaluation concerning hot saline irrigation. Expert investigators verified that warm saline irrigation delivers enhanced clearness to surgical fields during sinonasal procedures while requiring less usage of additional hemostatic materials[15]. Our supports this evaluation because surgeons reported better surgical visibility results in the hot saline treatment group. Epinephrine along with additional topical vasoconstrictors functions extensively in FESS but medical organizations continue to monitor their potential systemic absorption and heart-related side effects[16]. The use of epinephrine leads to temporary hypertension tachycardia and arrhythmogenic events that mostly affect patients with cardiovascular coexisting conditions[17]. Hot saline irrigation functions as a safe bleeding-control method because it does not cause systemic adverse effects in susceptible patients. The findings of previous investigations demonstrate that lower intraoperative bleeding durations lower surgical operation time. A research study about functional endoscopic sinus surgery showed that optimized hemostasis both sped up operations and decreased medical issues[18].

CONCLUSION

The surgical procedure benefits from hot saline irrigation through reduced bleeding during surgery improved visualization and shorter operating time without complications emerging from the treatment. Hot saline irrigation serves as an affordable method which offers important support for better surgical results. The improved blood control through hot saline irrigation enables better surgical precision along with efficiency that may lead to reduced complications and shorter recovery periods.

Limitations: Considered limitations include the lack of multi-centre analysis and insufficient testing subjects because they decrease result generalizability. The observed outcomes could be affected by differences in surgical practices along with distinct patient characteristics. Metrics regarding temperature regulation along with standardized practices for hot saline use must become mandatory to eliminate mucosal injuries and achieve equivalent clinical results among various practice facilities.

Future Directions: The validation of these findings needs larger multi-center trials which must also evaluate long-term safety performance. Research should compare the efficacy of hot saline irrigation against other hemostatic methods including tranexamic acid and contemporary topical compounds. Examining both temperature parameters and administration protocols will enhance both the safety and effectiveness of hot saline irrigation when used in FESS.

Abbreviation

1. **FESS** – Functional Endoscopic Sinus Surgery
2. **RCT** – Randomized Controlled Trial
3. **SPSS** – Statistical Package for the Social Sciences
4. **NY** – New York
5. **USA** – United States of America

Author's Contribution:

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Final Approval of version:	All the above authors
Agreement to accountable	All the above authors

for all aspects of work:	

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