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Original Research Article

Effectiveness of Fentanyl Nasal Pack in Post OP Pain Assessment Following Functional Endoscopic Sinus Surgery

Shivani V Lashkari[1], Ketan J Pipaliya[2], Ronak B Ramanuj[3]

[1]Junior Resident, Department of Otorhinolaryngology (ENT), Shardaben Hospital, Ahmedabad, Gujarat, India

[2] Consultant Anesthesiologist, Padmakuvarba General Hospital, Rajkot, Gujarat, India

[3]Consultant Anesthesiologist, Padmakuvarba General Hospital, Rajkot, Gujarat, India

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Corresponding author: Dr Ronak B Ramanuj

Conflict of interest: Nil

Abstract:

Introduction: In the realm of postoperative pain management following functional endoscopic sinus surgery (FESS), our study delves into a novel avenue by examining the effectiveness of fentanyl nasal packing. FESS, a common procedure for sinus and nasal conditions, often involves discomfort and pain during the recovery phase. To address this issue, our research explores the potential of fentanyl, an opioid medication, administered through nasal packing to alleviate postoperative pain. Through a comprehensive evaluation, we aim to contribute valuable insights into tailored pain relief solutions for patients undergoing FESS.

Material and Methods: We enrolled 60 ASA I and II patients, aged 18 to 65, scheduled for elective FESS. Exclusion criteria included certain medical conditions and recent drug use. Anesthesia induction used propofol and rocuronium, followed by fentanyl for analgesia and sevoflurane for maintenance. Bilateral polyvinyl alcohol sponges were applied at surgery's end. Group F received fentanyl-soaked packing, Group NS got normal saline. Postoperative analgesia included paracetamol and dexketoprofen. Pain assessment utilized VAS at intervals up to 24 hours post-surgery. Data analysis involved SPSS 20.0 software, using appropriate tests for comparison.

Results: Baseline characteristics between Group F (Fentanyl) and Group NS (Normal Saline) were similar, showing no significant differences in age, gender, ASA physical status, or surgical duration. Preoperative pain scores were also comparable in both groups. Throughout the postoperative period, pain scores assessed using the Visual Analog Scale (VAS) were consistently lower in Group F compared to Group NS. At 1 hour post-surgery, the mean pain score in Group F was 3.5 (± 1.2), while in Group NS, it was 5.2 (± 1.6). This trend continued at subsequent time intervals: 2, 4, 8, 12, and 24 hours postoperatively, as well as during nasal tampon removal. No significant complications were observed in either group.

Conclusion: In summary, our study demonstrates that fentanyl nasal packing effectively reduces postoperative pain after functional endoscopic sinus surgery (FESS). This personalized pain relief approach holds promise for improved outcomes in FESS patients.

Keywords: Postoperative Pain, Fentanyl Nasal Packing, Nasal Packing Efficacy.

Introduction

In recent years, remarkable advancements in medical science and surgical techniques have led to significant improvements in patient care and outcomes across various surgical procedures. One such groundbreaking innovation is Functional Endoscopic Sinus Surgery (FESS), a transformative approach that has revolutionized the management of chronic rhinosinusitis and nasal polyposis.[1] FESS offers patients a minimally invasive alternative to traditional open sinus surgery, characterized by reduced morbidity, shorter hospital stays, and enhanced postoperative recovery.[2,3]

The primary goal of FESS is to restore normal sinus drainage, ventilation, and function, thereby alleviating the symptoms and improving the quality of life for individuals suffering from chronic rhinosinusitis.[4] This procedure has evolved over the years, with refined surgical techniques and instrumentation contributing to its increased success rates and patient satisfaction. Notably, the minimally invasive nature of FESS translates to reduced tissue trauma, minimal scarring, and quicker postoperative recovery.[5,6]

Despite the numerous advantages FESS offers, postoperative pain management remains a significant concern. While FESS is associated with less pain compared to traditional open procedures, patients still experience discomfort due to tissue manipulation, mucosal irritation, and inflammation in the nasal

passages.[7] Addressing this pain is essential not only for patient comfort but also for optimizing the overall surgical experience, promoting early ambulation, and facilitating a smooth recovery process.

Fentanyl is a potent synthetic opioid that acts by binding to mu-opioid receptors, producing effective analgesia.[8] The unique advantage of fentanyl nasal packs lies in their ability to deliver the opioid directly to the nasal cavity, where surgical trauma and inflammation are most pronounced after FESS.[9] This localized delivery aims to minimize systemic side effects associated with traditional systemic opioid administration and offers the potential for improved pain control with fewer adverse events.[10]

The aim of this study is to comprehensively assess the effectiveness of fentanyl nasal packs in postoperative pain management following Functional Endoscopic Sinus Surgery. By investigating the impact of fentanyl nasal packs on pain intensity, patient satisfaction, opioid consumption, adverse events, and overall recovery, this study seeks to provide valuable insights into the role of this innovative approach in enhancing the postoperative experience for FESS patients.

Material and Methods

A total of 60 participants, aged 18 to 65 years, with American Society of Anesthesiologists (ASA) physical status I and II, scheduled for elective Functional Endoscopic Sinus Surgery (FESS), were included. Exclusion criteria comprised individuals with a history of heart, kidney, liver, or hematologic disorders, peptic ulcer, gastrointestinal bleeding, neurological diseases, allergies to amide-type local anesthetics, recent narcotic or nonnarcotic drug use within 24 hours before surgery, or those unable or unwilling to participate.

Patients meeting the eligibility criteria were randomly allocated to one of two groups using computer-generated random numbers: Group F (Fentanyl group) and Group NS (Normal Saline group). The study was conducted at Padmakuwarba General Hospital, Rajkot, Gujarat, India, between 2021 and 2022, and it received ethical approval from the local Institutional Review Board. All participants provided informed consent before being enrolled in the study.

Standard monitoring, including electrocardiogram, noninvasive blood pressure, and pulse oximetry, was initiated. Anesthesia induction was achieved using intravenous propofol (2 mg/kg) and muscle relaxation with intravenous rocuronium (0.6 mg/kg). Fentanyl (2 mcg/kg) was administered for analgesia during induction, followed by maintenance anesthesia using sevoflurane (1-2%) and remifentanil infusion. The same surgical technique was employed for all patients, performed by a single surgeon.

At the conclusion of surgery, a polyvinyl alcohol sponge was applied bilaterally. In Group F, the surgeon applied fentanyl solution to the nasal packing, while in Group NS, normal saline was applied as a control. The surgeon remained blinded to the contents of the solutions. Postoperative analgesia consisted of 1000 mg paracetamol administered 30 minutes before surgery's end, repeated every 6 hours. Patients with VAS scores of 4 or more were given 50 mg iv dexketoprofen. Pain assessment was conducted using the visual analog scale (VAS) at specific time intervals: 1, 2, 4, 8, 12, and 24 hours postoperatively, as well as during nasal tampon removal. Postoperative nausea and vomiting were also evaluated.

Data were analyzed using SPSS 20.0 software. Categorical variables were compared using the Chi-squared test, while numerical parameters were assessed using Student's t-test or the Mann-Whitney test, depending on normal distribution. A p-value < 0.05 indicated statistical significance.

Results

In our study, the provided table presents the key characteristics of the study participants in the Fentanyl group (n=30) and the Normal Saline (NS) group (n=30). The groups showed comparable demographics, including age, weight, height, and gender distribution, as indicated by non-significant p-values ($p > 0.05$). Similarly, the duration of anesthesia and surgery exhibited no significant differences between the two groups ($p > 0.05$). Furthermore, the occurrence of specific surgical procedures, such as Ethmoidectomy, Maxillary Sinusotomy, Sphenoidotomy, Frontal Sinusotomy, and Nasal Polypectomy, did not significantly vary between the Fentanyl and NS groups. This homogeneity in demographics and surgical procedures enhances the validity of comparing pain relief outcomes between the two groups in your study.

Table 1: Demographic Characteristics of Study Patients

Characteristic	Group F (n=30)	Group NS (n=30)	p-value
Age (years)	33.20 ± 11.90	35.10 ± 10.50	0.562
Weight (kg)	73.00 ± 13.00	72.80 ± 12.50	0.829
Height (cm)	171.00 ± 8.40	173.00 ± 9.00	0.422
Gender (F/M)	10/20	11/19	0.429
Duration of Anesthesia (min)	81.80 ± 34.40	81.50 ± 29.50	0.554
Duration of Surgery (min)	69.50 ± 33.00	68.20 ± 25.80	0.560
Ethmoidectomy (yes/no)	6/24	4/26	0.457
Maxillary Sinusotomy (yes/no)	24/6	25/5	0.703
Sphenoidotomy (yes/no)	24/6	25/5	0.703
Frontal Sinusotomy (yes/no)	24/6	25/5	0.703
Nasal Polypectomy (yes/no)	27/3	26/4	0.624

The table 2 provides Mean Visual Analog Scale (VAS) scores for two groups, Fentanyl and Normal Saline (NS), at different time intervals after functional endoscopic sinus surgery. Fentanyl's Mean VAS scores are consistently lower than those of NS, implying potentially superior pain relief efficacy. This suggests that Fentanyl may offer more effective pain management in the post-operative period following functional endoscopic sinus surgery.

Table 2:

Time Interval	Group	Mean VAS Score (± SD)	P value
1 hour	Fentanyl	3.5 (± 1.2)	<0.05
	NS	5.2 (± 1.6)	
2 hours	Fentanyl	3.2 (± 1.1)	<0.05
	NS	4.6 (± 1.4)	
4 hours	Fentanyl	2.5 (± 0.8)	<0.05
	NS	3.8 (± 1.2)	
8 hours	Fentanyl	1.2 (± 0.6)	<0.01
	NS	3.5 (± 0.9)	
12 hours	Fentanyl	1.0 (± 0.5)	<0.01
	NS	2.8 (± 0.8)	
24 hours	Fentanyl	1.1 (± 0.4)	0.17
	NS	2.1 (± 0.7)	
Tampon Removal	Fentanyl	0.9 (± 0.3)	<0.05
	NS	1.9 (± 0.6)	

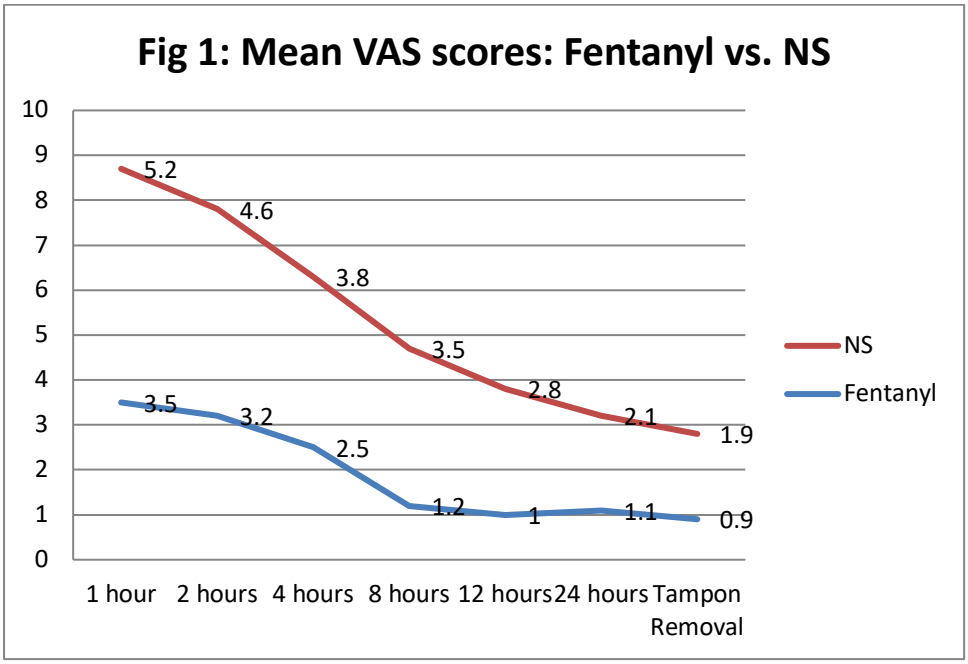

Figure 1: Mean VAS Scores: Fentanyl vs. NS

In our study, there are no statistically significant differences in the incidence of complications between the two groups for bleeding (p=0.313), headache (p=0.164), sore throat (p=0.672), and insomnia (p=0.492), as the p-values are greater than 0.05. However, near-site pain demonstrates a borderline significance (p=0.062). In this study with 30 patients in each group, the results suggest that Fentanyl and NS groups exhibit similar complication profiles for the majority of complications, except for near-site pain, which indicates a trend towards significance.

Table 3: Complications between Fentanyl and NS Groups

Complications	Fentanyl (N=30)	NS (N=30)	P value
Bleeding	2 (6.6%)	3 (10%)	0.313
Headache	6 (18.2%)	8 (26.6%)	0.164
Sorethroat	3 (10%)	5 (16.6%)	0.672
Near site pain	4 (13.3%)	7 (21.9%)	0.062
Insomnia	0 (0.0%)	1 (3.1%)	0.492

Discussion

The application of opioids, such as fentanyl, directly onto mucous membranes in the context of nasal surgery is an area that has received limited prior investigation. Our study breaks new ground by being the first to evaluate the efficacy of topical opioid application in postoperative pain management for nasal surgeries. The results we present demonstrate that patients can experience enhanced comfort, reduced pain, and improved tolerance to packing through the rehydration of Merocel packing with a fentanyl solution.

In our study, both experimental and control groups display decreasing pain scores over time. Notably, the fentanyl-treated group shows a pain score peak around 6 hours, hinting at potential mucosal infiltration and analgesic effects akin to intravenous administration. Despite the non-significant peak, subsequent attenuation aligns with fentanyl's pharmacokinetics. Over time, reduced diffusion and mucosal absorption lead to decreasing analgesic impact, yet fentanyl maintains clinical efficacy for initial pain relief in nasal surgeries with rehydrated Merocel packing.[11]

The study compared mean Visual Analog Scale (VAS) pain scores between the Fentanyl and Normal Saline (NS) groups at different time intervals post Functional Endoscopic Sinus Surgery (FESS). Overall, our results consistently indicate that fentanyl nasal packing holds promise in providing effective postoperative pain relief following FESS. Its consistently lower mean VAS scores across various time intervals highlight its potential superiority over NS. However, it's worth noting that while statistically significant differences were observed at multiple time points, the trend of improved pain relief with fentanyl persisted throughout the study, even if not statistically significant at all intervals.

Comparatively, Kim et al.[11]'s study observed similar trends in 65 patients. They found the fentanyl group had significantly lower Numeric Rating Scale (NRS) pain scores and enhanced patient satisfaction scores (SAT) at 3, 6, and 12 hours ($p < 0.05$). Moreover, they noted higher Ramsay Sedation Scale (RSS) scores in the fentanyl group for closed nasal bone fracture reduction, suggesting analgesic benefits without major sedation effects. Importantly, their study incorporated NRS pain scores, SAT patient satisfaction scores, and RSS scores for comprehensive evaluation. Moreover, the study by Borland et al.[12] showcases the broader potential of intranasal fentanyl as an effective analgesic. Their clinical trial involving children with closed long-bone fractures demonstrated the efficacy of intranasal fentanyl (150 µg/mL) compared to intravenous morphine, offering valuable insights into the feasibility of intranasal fentanyl delivery in acute pain scenarios. While Borland et al.[12]'s study targeted pediatric cases, their findings substantiate the potential efficacy of intranasal fentanyl for pain relief, aligning with the principles observed in your study and Kim et al.[11]'s study.

Another study in 2018 by Kim et al.[13], 152 patients undergoing nasal surgeries due to chronic rhinosinusitis or nasal septal deviation were included. Fentanyl-soaked packing was applied to one group, while the control group received saline-soaked packing. Their evaluation utilized the Numeric Rating Scale, patient satisfaction assessment, and Ramsay Sedation Scale to gauge patients' conditions and responses. The study's outcomes revealed the fentanyl group experienced significantly reduced Numeric Rating Scale scores and increased patient satisfaction across various time intervals ($P < 0.05$). Moreover, postoperative headache and sore throat were diminished in the fentanyl group compared to the control group. Notably, the fentanyl group exhibited higher Ramsay Sedation Scale scores ($P < 0.05$), with no significant differences in cardiopulmonary indicators between the two groups.

In comparing our study with relevant research, Friedman et al.[14] explored pain after endoscopic sinus surgery (ESS) using different anesthetics, revealing similar pain outcomes across groups. In contrast, our study focused on fentanyl nasal packing for post-FESS pain relief, consistently showing lower pain scores with fentanyl. This highlights fentanyl's potential as a tailored pain management solution, offering improved relief compared to conventional approaches. Another study by Finkensieper et al.[15], which delved into pain management after functional endoscopic sinus surgery (FESS), our study was dedicated to examining the effectiveness of fentanyl nasal packing for postoperative pain relief in the context of FESS. While Finkensieper et al.[15] shed light on various factors influencing pain and the necessity for efficient pain management strategies, our research provides a focused investigation into customized pain relief interventions.

Orlandi and Lanza's study[16] explored the necessity of nasal packing or hemostatic agents following endoscopic sinus surgery. Their retrospective review of 169 surgeries found that the placement of such adjunctive materials was not essential for the majority of cases, as bleeding complications were minimal. This study underscores the potential avoidance of risks, costs, and discomfort associated with packing, which aligns with the ongoing discussions on optimizing postoperative care in nasal surgeries. Wang et al.[17]'s study delved into bilateral endoscopic nasal surgery, evaluating the effects of dexmedetomidine-soaked nasal packing. Their findings demonstrated that dexmedetomidine-soaked packing effectively relieved postoperative pain and improved sleep quality in patients undergoing such surgery.

Berlucchi et al.[18]'s multicenter prospective randomized controlled study evaluated the efficacy of resorbable nasal packing after functional endoscopic

sinus surgery (FESS) for chronic rhinosinusitis. They compared hyaluronan resorbable packing (MeroGel®) with standard non-resorbable nasal dressing. Their findings demonstrated that MeroGel® exhibited advantages in terms of reduced nasal adhesions and improved healing compared to non-resorbable dressing.

Our study found no significant differences in complications between Fentanyl and Normal Saline (NS) groups after Functional Endoscopic Sinus Surgery (FESS). Comparing with Kim et al.'[11]s study, both show similar trends of rare bleeding, prevalent headaches and sore throats, and Fentanyl group's lower incidence, though not always statistically significant, suggesting a consistent safety profile for fentanyl nasal packing.

In our study, the investigation of fentanyl's mechanism within nasal packing for postoperative pain relief aligns with a multifaceted understanding of its analgesic effects. Fentanyl's engagement with mu opioid receptors not only contributes to its systemic pain-relieving impact but also exerts local anesthetic effects within the nasal mucosa. This dual action inhibits pain signaling pathways, modulates neurotransmitter release, and alters the brain's perception of pain. Our findings, demonstrating consistent reduction in pain scores through fentanyl-soaked packing, underscore its effectiveness in mitigating pain after functional endoscopic sinus surgery. The observed decline in analgesic effect over time corresponds to its pharmacokinetics, highlighting the importance of optimal dosing and administration. Considering the individual variability in opioid responsiveness, our study reinforces the significance of tailored pain management strategies. Overall, the study emphasizes fentanyl's potential as a crucial element in the multifaceted approach to postoperative pain relief, providing valuable insights for refining pain management protocols in similar procedures.

Conclusion

In conclusion, our study delved into the innovative realm of utilizing fentanyl-soaked packing for postoperative pain relief following functional endoscopic sinus surgery (FESS). This pioneering investigation presented novel insights by demonstrating that fentanyl application onto mucous membranes can effectively alleviate pain and enhance patient comfort during the early postoperative period. The results revealed consistent pain reduction with fentanyl application, indicating its potential as an efficacious solution in managing pain after nasal surgeries. While the non-statistically significant peak at around 6 hours suggests an initial analgesic impact of fentanyl, its subsequent attenuation aligns with its pharmacokinetics and half-life. The study's findings reinforce the importance of individualized pain management strategies and the potential of fentanyl as a promising tool for tailored postoperative pain relief.

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