

A Comparative Study about the Effects of Anterior Nasal Packing for Epistaxis by Conventional Nasal Pack Versus Poly Vinyl Alcohol Sponge (Merocel)

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Abstract

Introduction: Epistaxis is more common in winter months and in northern climates because of decreased humidity and the consequent drying of the nasal mucosa. Other major etiologies include inhaled medications, mucosal breakdown caused by infiltration by malignancy or granulomatous disease, and nasal trauma.

Aims: To study the effects on Anterior Nasal Packing for Epistaxis by Conventional Nasal Pack versus Polyvinyl Alcohol Sponge (Merocel) on the hemodynamic parameters of the patients.

Materials & Methods: The present study was a Prospective Randomised Observational Study. This Study was conducted from April 2024 to March 2025 at Department of Otorhinolaryngology, (ENT) "Murshidabad Medical College & Hospital", Berhampore, WB. Total 100 patients were included in this study.

Result: In this study of 100 patients undergoing nasal packing, gender distribution was similar between the Conventional and Merocel groups, with no statistically significant difference ($p = 0.790$). Hemodynamic analysis revealed significantly higher increases in mean blood pressure and heart rate in the Conventional group at both 5 and 60 minutes post-packing, compared to the Merocel group. While oxygen saturation (SpO_2) changes were minimal, the Conventional group experienced a significantly greater drop. PCO_2 levels at 24 hours were notably higher in the Conventional group, indicating possible respiratory compromise. Pain assessment showed a stark contrast: most patients in the Conventional group reported severe pain (mean score 9.28), whereas those in the Merocel group reported only mild pain (mean score 2.44). Overall, the Merocel group demonstrated superior outcomes in terms of physiological stability and patient comfort.

Conclusion: This study found that Merocel nasal packing is significantly better tolerated than conventional packing. Patients with Merocel experienced fewer hemodynamic changes, lower PCO_2 levels, and reported much less pain. In contrast, conventional packing caused notable increases in blood pressure, heart rate, and pain, with a potential for respiratory compromise. Overall, Merocel proved to be the safer and more comfortable option for nasal packing.

Keywords: Anterior Nasal Packing, Epistaxis Management, Conventional Nasal Pack And Merocel Nasal Pack.

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Introduction

Epistaxis is a problem, which has been a part of human experience from the earliest time. The problem is extremely common and affects all age groups of both males and females. Epistaxis is more common in winter months and in northern climates because of decreased humidity and the consequent drying of the nasal mucosa. Other major etiologies include inhaled medications, mucosal breakdown caused by infiltration by

malignancy or granulomatous disease, and nasal trauma [1].

Hippocrates (fifth century BC) was probably the first to appreciate that pressure on the alaenasi was an effective method to control nasal bleeding [2].

Nearly 5-10% of the population experiences an episode of epistaxis in each year. 10 % of those will be taking advice of physician and about only 1

% of the patients seeks attention of medical health care specialists . [3]

Up to 60% of the population is estimated to have had at least 1 episode of epistaxis at some point in their lives. Of this group, 6% seek medical care to treat epistaxis, with 1.6 in 10,000 requiring hospitalization. [4]

Ninety percent of epistaxis are anterior, originating from the Kiesselbach plexus. Anterior epistaxis exhibit unilateral, steady, non-massive bleeding. Just 10% of epistaxis are posterior, exhibiting massive bleeding that is initially bilateral.

The lateral nasal wall is supplied by the sphenopalatine artery posteroinferiorly and by the anterior and posterior ethmoid arteries superiorly. The nasal septum also derives its blood supply from the sphenopalatine and the anterior and posterior ethmoid arteries with the added contribution of the superior labial artery (anteriorly) and the greater palatine artery (posteriorly).

The Kiesselbach plexus, or the Little's area, represents a region in the anteroinferior third of the nasal septum, where all 3 of the chief blood supplies to the internal nose converge.

Material and Methods

Study Design: Prospective Randomised Observational Study.

Centre of Study: Department of Otorhinolaryngology, (ENT) "Murshidabad Medical College & Hospital", Berhampore, WB

Study Population: The study was conducted on all patients who attended Dept of ENT, in Murshidabad Medical College, Berhampore & fulfilling the Inclusion Criteria.

Study Period: April 2024 to March 2025.

Sample Size: About 100 patients that needed Anterior Nasal Packing. 50 in each group of Conventional Nasal Pack & Polyvinyl alcohol sponge (Merocel pack).

Sample Design: After obtaining informed Consent from subject, eligible patients satisfying inclusion Criteria were included. Patients aged between 15 to 55 years, including both males and females with

Anterior Nasal Bleed, not conservatively controlled were taken up for study.

Method of Randomization: Alternative patients selected according to inclusion/exclusion criteria will be placed in each group (Conventional & Polyvinyl Alcohol Sponge).

Inclusion Criteria

- Patients aged 15-55 years coming with nasal bleed.
- Patients having diffuse & uncontrolled nasal bleed as seen in Diagnostic Nasal Endoscopy.

Exclusion Criteria

- H/O Cardiovascular or Respiratory disease.
- H/O any nasal mass in Nasal Cavity or Nasopharynx.
- Patients on Anticoagulants & Antiplatelets.
- Patients on Antihypertensives.
- Patients having definite site of bleeding detected by DNE & taken care of.

Study Parameters

- Mean BP (Pre & Post Pack) in both the groups.
- Mean Heart Rate (Pre & Post Pack) in both the groups.
- Mean SpO₂ (Pre & Post Pack) in both the groups.
- Mean PCO₂ (Pre & Post Pack) in both the groups.
- Pain Score (Pre & Post Pack) in both the groups.

Statistical Analysis: Data were entered into Excel and analysed using SPSS and Graph Pad Prism. Numerical variables were summarized using means and standard deviations, while categorical variables were described with counts and percentages.

Two-sample t-tests were used to compare independent groups, while paired t-tests accounted for correlations in paired data.

Chi-square tests (including Fisher's exact test for small sample sizes) were used for categorical data comparisons. P-values ≤ 0.05 were considered statistically significant.

Result

Table 1: Gender Distribution among Patients Receiving Different Types of Nasal Packing

Type of Packing	Male	Female	P value
Conventional pack (n=50)	41	9	0.7900
Merocel pack (n=50)	42	8	
Total (n=100)	83	17	

Table 2: Comparison of Hemodynamic Parameters, Oxygenation, and Pain Scores between Conventional and Merocel Nasal Packing Groups (n = 100)

Hemodynamic Parameters		Conventional pack (n = 50)	Merocel pack (n = 50)
MBP	Pre pack mean BP (mmHg)	101.82	97.38
	Post pack (5 mins)	115.24	100.4
	Post pack (60 mins)	106.12	98.7
Heart Rate	Pre-pack HR (bpm)	84.98	89.82
	Post-pack HR (5 mins)	138.26	92.8
	Post-pack HR (60 mins)	100.68	89.12
SpO ₂	Pre-pack SpO ₂	98.62	98.54
	Post-pack (5 mins)	98.42	98.46
	Post-pack (60 mins)	97.1	98.24
PCO ₂	Pre-pack PCO ₂	37.78	37.84
	Post-pack (24 hrs)	42.92	39.52
Pain Score (1-10)	Mild (1-3)	0	40
	Moderate (4-7)	5	10
	Severe (8-10)	45	0

Table 3: Comparative Analysis of Mean Changes in Vital Parameters Post Nasal Packing at 5 and 60 Minutes in Conventional and Merocel Groups (n = 100)

Mean difference		Post pack (5 mins)	SD (5 mins)	Post pack (60 mins)	SD (60 mins)
Blood Pressure (mmHg)	Conventional Pack (n = 50)	13.38	3.109	4.34	2.616
	Merocel Pack (n = 50)	2.58	1.864	0.88	1.686
	T Score	21.066		7.862	
	P value (CI – 95%)	<0.0001		<0.0001	
Heart Rate (beats/min)	Conventional Pack (n = 50)	53.28	146.202	15.7	6.112
	Merocel Pack (n = 50)	2.98	2.903	-0.7	3.025
	T Score	2.432		17.004	
	P value (CI – 95%)	0.017		<0.0001	
SpO ₂	Conventional Pack (n = 50)	0.2	0.606	1.52	1.607
	Merocel Pack (n = 50)	0.08	0.444	0.3	0.544
	T Score	-1.129		-5.086	
	P value (CI – 95%)	<0.0001		<0.0001	

Table 4: Comparison of Post-Pack (24 Hours) PCO₂ Changes Between Conventional and Merocel Packs

Mean difference of PCO ₂	Post pack (24 hrs.)	Standard deviation
Conventional Pack (n = 50)	5.14	2.01
Merocel Pack (n = 50)	1.68	1.236
T Score	10.367	
p value (CI – 95%)	<0.0001	

Table 5: Comparison of Average Pain Scores Between Conventional and Merocel Packs

Conventional Pack(Average Pain Score out of 10)	9.28 / 10
Merocel Pack(Average Pain Score out of 10)	2.44 / 10

In our study comprising 100 patients undergoing nasal packing, the gender distribution was analyzed between the two packing groups. Among the 50 patients who received conventional packing, 41 were male and 9 were female. Similarly, in the Merocel packing group, 42 were male and 8 were female. The overall distribution showed a male predominance, with 83 males and 17 females in the

total study population. Statistical analysis using the chi-square test revealed no significant difference in gender distribution between the two groups ($p = 0.790$). In our comparative study of nasal packing techniques, we assessed hemodynamic parameters including mean blood pressure (MBP), heart rate (HR), SpO₂, PCO₂, and pain scores across the Conventional pack and Merocel pack groups ($n =$

50 each). A notable rise in MBP was observed 5 minutes post-packing in both groups, with the conventional group increasing from a pre-pack value of 101.82 mmHg to 115.24 mmHg, compared to a more modest rise from 97.38 mmHg to 100.4 mmHg in the Merocel group. By 60 minutes, MBP values trended downward but remained elevated in the conventional group (106.12 mmHg) compared to the Merocel group (98.7 mmHg).

Heart rate followed a similar pattern, with a significant spike at 5 minutes in the conventional group (from 84.98 bpm to 138.26 bpm), while the Merocel group showed a much milder increase (from 89.82 bpm to 92.8 bpm). At 60 minutes post-pack, heart rate reduced to 100.68 bpm in the conventional group and 89.12 bpm in the Merocel group. SpO₂ levels remained relatively stable across both groups, with minimal variation post-packing. However, PCO₂ levels at 24 hours post-pack were higher in the conventional group (42.92 mmHg) compared to the Merocel group (39.52 mmHg), suggesting potential respiratory compromise with conventional packing.

Pain assessment revealed a stark contrast between groups. In the conventional pack group, 90% (45 patients) reported severe pain (score 8–10), whereas none in the Merocel group experienced severe pain. Conversely, 80% (40 patients) in the Merocel group reported only mild pain (score 1–3), highlighting significantly better tolerability.

Statistical evaluation of hemodynamic changes following nasal packing revealed significant differences between the Conventional and Merocel pack groups. Regarding blood pressure, the mean rise at 5 minutes post-packing was substantially greater in the Conventional group (13.38 ± 3.109 mmHg) compared to the Merocel group (2.58 ± 1.864 mmHg), with a highly significant T score of 21.066 and $p < 0.0001$. At 60 minutes post-packing, the difference persisted (4.34 ± 2.616 mmHg vs. 0.88 ± 1.686 mmHg), again showing statistical significance (T score = 7.862, $p < 0.0001$).

Similarly, heart rate changes were markedly more pronounced in the Conventional group, which showed a mean increase of 53.28 bpm at 5 minutes (SD = 146.202) compared to just 2.98 bpm (SD = 2.903) in the Merocel group (T score = 2.432, $p = 0.017$). At 60 minutes, the Conventional group had a mean HR increase of 15.7 bpm, whereas the Merocel group showed a slight reduction (-0.7 bpm), with the difference being highly significant (T score = 17.004, $p < 0.0001$). Oxygen saturation (SpO₂) changes were minimal but statistically significant. At 60 minutes post-pack, the Conventional group showed a greater drop in SpO₂ (mean difference of $1.52 \pm 1.607\%$) compared to the Merocel group ($0.3 \pm 0.544\%$), yielding a T

score of -5.086 and $p < 0.0001$. Although the early 5-minute change in SpO₂ was minor in both groups, the difference was statistically significant (T score = -1.129, $p < 0.0001$).

At 24 hours post-packing, the mean increase in PCO₂ levels was significantly higher in the Conventional Pack group (5.14 ± 2.01 mmHg) compared to the Merocel Pack group (1.68 ± 1.236 mmHg). Statistical analysis demonstrated a T score of 10.367 with a p -value < 0.0001 , indicating a highly significant difference between the two groups.

Pain perception differed markedly between the two groups. The average pain score in the Conventional Pack group was 9.28 out of 10, indicating severe discomfort experienced by most patients. In contrast, the Merocel Pack group reported a significantly lower average pain score of 2.44, reflecting only mild pain levels.

Discussion

The present study highlights significant differences in patient tolerance and physiological response between conventional and Merocel nasal packing techniques. Our results showed a marked hemodynamic disturbance, including significantly elevated mean blood pressure and heart rate, in the conventional pack group within 5 minutes of packing, which persisted—albeit to a lesser extent—at 60 minutes. These findings align with those of Kumar et al. (2019), who reported a substantial cardiovascular response to conventional nasal packing, attributed to vagal stimulation and increased sympathetic tone due to mucosal pressure[5]. The Merocel group demonstrated superior hemodynamic stability, which is consistent with the findings of Patel and Chauhan (2020), who observed lower cardiovascular stress with polyvinyl acetal nasal packs[6].

Oxygen saturation levels remained relatively unchanged but showed a statistically significant drop in the conventional group. This agrees with observations by Singh et al. (2018), who reported transient hypoxia associated with nasal obstruction from traditional packs[7]. Our study also reported significantly higher PCO₂ levels at 24 hours in the conventional group, suggesting potential for subclinical respiratory compromise. Similar outcomes were noted by Yadav et al. (2017), who highlighted increased end-tidal CO₂ in conventionally packed patients[8].

Pain perception was another critical differentiator. Patients in the conventional pack group reported significantly higher pain scores, with 90% rating their pain as severe (score 8–10). In contrast, 80% of Merocel recipients reported only mild pain. This corroborates with the study by Thomas et al. (2016), who found that patients treated with

Merocel experienced significantly less discomfort during the early postoperative period [9]. Gupta and Sharma (2020) similarly reported better patient compliance and pain scores with Merocel packs [10].

Our gender distribution analysis showed a male predominance in both groups but without statistically significant intergroup variation. This demographic trend reflects findings from Rao et al. (2015), whose study population undergoing nasal packing also had male preponderance without significant gender-based response differences [11].

Overall, our study substantiates the growing body of evidence suggesting that Merocel nasal packing offers superior tolerability and safety profile compared to conventional gauze packing. Not only does Merocel lead to less hemodynamic instability, but it also results in reduced respiratory compromise and significantly lower pain perception, enhancing overall patient satisfaction.

These findings reinforce earlier reports by Ahmed et al. (2014) and Mitra et al. (2019), who advocated for Merocel as the preferred packing material in anterior nasal bleeding due to its patient-friendly properties[12][13]. Additionally, Das et al. (2021) emphasized the cost-effectiveness of Merocel in reducing hospital stay and need for sedation, further supporting its routine use[14].

Conclusion

The findings of this comparative study underscore the significant physiological and subjective differences between conventional and Merocel nasal packing methods. While both techniques are effective for nasal packing, the conventional pack was associated with considerably greater hemodynamic fluctuations, including marked increases in mean blood pressure and heart rate shortly after application, as well as higher PCO₂ levels after 24 hours—indicating potential for respiratory compromise.

Moreover, patients who received conventional packing reported significantly higher pain scores, with the vast majority experiencing severe discomfort. In contrast, the Merocel group demonstrated superior patient tolerability, minimal cardiovascular and respiratory disturbances, and significantly lower pain perception. These results advocate for the preferential use of Merocel nasal packing in clinical settings, especially in patients where minimizing systemic stress and ensuring comfort are critical.

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