

Nasal Packing Using Merocel Pack and Merocel Pack with Tube to Study its Effects on Middle Ear Pressure and Hearing Threshold

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Abstract

Background: Nasal packs are frequently used after nasal surgery for hemostasis and internal stabilization of bony and cartilaginous structures. Nasal packing causes lymphatic stasis in nasopharynx and around the opening of Eustachian Tube, which ultimately results in middle ear dysfunction. **Objectives:** The aim of this study is to compare the effect on Middle Ear Pressure and Hearing Threshold of Anterior Nasal Packing using Merocel Pack and Merocel Pack with Sialistic Tube. **Methods:** This is a non-randomised comparative interventional study which was carried out in the Department of Otorhinolaryngology – Head & Neck surgery, Dr. Vasant Rao Pawar Medical College for the period of two years from February 2017 to October 2018. 66 patients were selected. **Results:** 66 patients were studied. Out of 66 patients two groups were compared one with Merocel Pack with Tube and Merocel Pack without Tube. Statistically significant difference observed between pre and post operative middle ear pressure of patients of Merocel Pack with and without Tube. Out of 33 post operative patients of Merocel Pack without tube had mean middle ear pressure -61.12 ± 23.56 daPa and -58.4 ± 29.23 daPa for Right and Left Ear respectively. Whereas out of 33 post operative patients of Merocel Pack with Tube had -49.72 ± 27.2 daPa and -43.48 ± 26.26 daPa for Right and Left ear. Statistically significant difference observed between them for post operative patients of Merocel Pack with or without Tube for both Right and Left ear. **Conclusion:** There is post operatively increase in middle ear pressure transiently for few days with nasal pack in situ which returns to normal after pack removal. In this comparative study, middle ear pressure was found to be more negative in patients using Merocel Pack without tube as there was complete blockage of the nostrils of the patients. However, in Merocel Pack with Tube patients patient was able to breathe by nose through ventilating tube so middle ear pressure did not increase as that of without Tube patients. Also, patient felt symptomatically better with the Tube packing because of no mouth breathing post operatively.

Keywords: Eustachian Tube Dysfunction, Merocel Nasal Pack, Middle Ear Pressure, Sialistic Tube

1. Introduction

Nasal packs are frequently used after nasal surgery for hemostasis and internal stabilization of bony and cartilaginous structures and are considered to have an impact on Eustachian tube function. It has been suggested that nasal packing following septal surgery is a frequent cause of short term Eustachian tube dysfunction such as ear fullness and mild pain. Nasal packing is required following nasal surgery. The present study will evaluate the effect of nasal packing by Merocel Nasal Pack and

Merocel Nasal Pack with Sialistic Tube on Middle Ear Pressure before surgery and during packs in situ after the surgery. The Eustachian tube has two main functions: To maintain the middle ear pressure at atmospheric pressure and to allow the normal secretion of the respiratory mucosa to pass on into the nasopharynx. The normal middle ear has a tendency to lose gas to maintain the middle ear air by diffusion into the surrounding tissues and circulation. The loss is compensated by Eustachian tube, which admits just enough gas to maintain the middle ear pressure. When this system fails to function

properly, a negative pressure develops in the middle ear¹⁻⁵. The lymphatics of the middle ear and eustachian tube course along the posterioinferior aspect of the eustachian tube, getting afferent from nasal cavity, paranasal sinuses, nasopharynx and adenoids. Efferent from plexus terminate in retropharyngeal lymph nodes. Inflammation and oedema in these areas cause obstruction to the flow, resulting in retrograde obstruction of tympanic and tubal lymphatics producing tubal dysfunction and middle ear effusion. Although tubal dysfunction and middle ear effusion may occur simultaneously but effusion can occur in absence of frank obstruction of eustachian tube lumen and development of middle ear vacuum⁶⁻⁹. Lymphatic stasis in the peritubal plexus of lymphatic channels and vein has been believed to be possible aetiological factors in eustachian tube dysfunction in case of nasal obstruction, which results in oedema of nose, nasopharynx and paranasal sinuses. Thus, nasal packing causes lymphatic stasis in nasopharynx and around the opening of Eustachian Tube, which ultimately results in middle ear dysfunction.

2. Aims and Objectives

The aim of this study is to compare the effect on middle ear pressure and hearing threshold of anterior nasal packing using merocel pack and merocel pack with sialistic tube.

3. Material and Methods

This was non randomised comparative interventional study done during the period of two years from February 2017 to October 2018 in Department of Otorhinolaryngology – Head and Neck Surgery, Dr. Vasantrao Pawar Medical College, Nashik, Maharashtra. In all 66 cases of deviated nasal septum, nasal deformity or nasal polyposis undergoing nasal surgery followed by anterior nasal packing for 48 hours, data was collected in a predesigned data collection sheet and analyzed by using standard statistical methods.

4. Results

4.1 Comparison of Merocel Pack with Ttube and without Tube (Pre-operative)

We have compared pre operative patients of Merocel Pack with and without Tube out of 33 pre operative patients for merocel pack with tube all patients had normal pure

tone audiometry for Right and Left ear. And out of 33 pre operative patients for merocel pack without tube all patients had normal pure tone audiometry for Right and Left ear. No statistically significant difference observed between proportion of normal pure tone audiometry for pre-operative patients of merocel pack with or without tube.

4.2 Acoustic Reflex Threshold of Pre Operative Patients of Merocel Pack with and without Tube

Out of 33 pre operative patients, all patients of merocel pack without tube had acoustic reflex threshold present for both Right and Left ear. Whereas out of 33 pre operative patients of merocel pack with tube, all patients had acoustic reflex threshold present for Right ear and 32 patients had acoustic reflex threshold present for Left ear. No statistically significant difference observed between proportion of acoustic reflex threshold present for pre operative patients of merocel pack with or without tube.

4.3 Tympanogram of Pre Operative Patients of Merocel Pack with and without Tube

Out of 33 pre operative patients, all patients of merocel pack without tube had tympanogram Type A for both Right and Left ear. Whereas out of 33 pre operative patients of merocel pack with tube, all patients had tympanogram Type A for Right ear and 32 patients had tympanogram Type A for Left ear. No statistically significant difference observed between proportion of tympanogram Type A for pre operative patients of merocel pack with or without tube.

Table 1. Middle ear pressure of pre operative patients of Merocel Pack with and without Tube

Tympanometry (Middle Ear Pressure)	Merocel Pack With Tube	Merocel Pack Without Tube	p Value
	Mean $\pm$ SD (Difference)	Mean $\pm$ SD (Difference)	
Right	-38.21 $\pm$ 13.23	-39.19 $\pm$ 14.21	0.612
Left	-32.82 $\pm$ 21.86	-34.45 $\pm$ 19.11	0.627

Table 1 shows that there is no statistically significant difference between average pure tone audiometry for preoperative patient of merocel pack with tube and without tube for both Right and Left ear (Table 1)

4.4 Comparison of Merocel Pack with and without Tube (Post-operative)

Table 2. Pure tone audiometry of post operative patients of Merocel Pack with and without tube

Pure Tone Audiometry	Merocel Pack With Tube		Merocel Pack Without Tube		Total	P Value
	Normal	Mild Chl	Normal	Mild Chl		
Right	28 (84.85%)	5 (15.15%)	21 (63.64%)	12 (36.36%)	66	0.051
Left	29 (87.88%)	4 (12.12%)	22 (66.67%)	11 (33.33%)	66	0.0413

Out of 33 post operative patients of merocel pack with tube, 28 and 29 patients had normal pure tone audiometry for Right and Left ear respectively. Whereas out of 33 post operative patients of merocel pack without tube, 21 and 22 patients had normal pure tone audiometry for both Right and Left ear. Overall pure tone audiometry observed normal in more patients of merocel pack with tube than patients of merocel pack without tube. No any statistically significant difference observed between proportions of normal pure tone audiometry for post operative patients of merocel pack with or without tube for Right ear but it is observed significant for Left ear (Table 2).

Table 3. Acoustic reflex threshold of post operative patients of Merocel Pack with and without tube

Acoustic Reflex Threshold	Merocel With Tube		Merocel Without Tube		Total	P Value
	Present	Absent	Present	Absent		
Right	23 (69.70%)	10 (30.30%)	18 (54.55%)	15 (45.45%)	66	0.208
Left	24 (72.73%)	9 (27.27%)	18 (54.55%)	15 (45.45%)	66	0.127

Out of 33 post operative patients of merocel pack with tube, 23 and 24 patients had acoustic reflex threshold present for Right and Left ear respectively. Whereas out of 33 post operative patients of merocel pack without tube, 18 patients had acoustic reflex threshold present for Right ear and 18 patients had acoustic reflex threshold present for Left ear. Overall acoustic reflex threshold present was more for patients of merocel pack with tube than patients of merocel pack without tube. No any statistically significant difference observed between proportion of acoustic reflex threshold present for post operative patients of merocel pack with or without tube for both Right and Left ear (Table 3).

Table 4. Tympanogram of post-operative patients of Merocel Pack with and without tube

Tympanogram	Merocel Pack With Tube		Merocel Pack Without Tube		Total	P Value
	A	C	A	C		
Right	23 (69.70%)	10 (30.30%)	18 (54.55%)	15 (45.45%)	66	0.208
Left	24 (72.73%)	9 (27.27%)	18 (54.55%)	15 (45.45%)	66	0.127

Out of 33 post operative patients of merocel pack with tube, 23 and 24 patients had tympanogram Type A for Right and Left ear respectively. Whereas out of 33 post operative patients of merocel pack without tube, 18 patients had tympanogram Type A for Right ear and 18 patients had tympanogram Type A for Left ear. Overall tympanogram Type A was more for patients of merocel pack with tube than patients of merocel pack without tube. No any statistically significant difference observed between proportion of tympanogram Type A for post operative patients of merocel pack with or without tube for both Right and Left ear (Table 4).

Table 5. Middle ear pressure of post operative patients of Merocel pack with and without tube

Tympanometry (Middle ear pressure)	Merocoel with tube	Merocoel without tube	P value
	Mean $\pm$ SD (Difference)	Mean $\pm$ SD (difference)	
Right	-49.72 $\pm$ 27.2	-61.12 $\pm$ 23.56	0.036
Left	-43.48 $\pm$ 26.26	-58.45 $\pm$ 29.23	0.015

Table 5 shows that significance difference observed between patients of merocoel with and without tube in average middle ear pressure which shows that method of merocoel packing with tube is more effective than without tube (Table 5).

5. Discussion

5.1 Comparison of Merocel Pack with Tube and without Tube (Pre-operative)

We have compared pre operative patients of merocel pack with and without tube.

5.1.1 Pure Tone Audiometry

Before operating patients, for both the group of merocel pack with tube and without tube all patients had normal pure tone audiometry for Right and Left ear.

5.1.2 Acoustic Reflex Threshold

Before operating patients, all patients of merocel pack without tube had acoustic reflex threshold present for both Right and Left ear. Whereas patients of merocel pack with tube all patients had acoustic reflex threshold present for Right ear and 32 patients had acoustic reflex threshold present for Left ear.

5.1.3 Tympanogram

Before operating patients, all patients of merocel pack without tube had tympanogram Type A for both Right and Left ear. Whereas in patients of merocel pack with tube, all patients had tympanogram Type A for Right ear and 32 patients had tympanogram Type A for Left ear.

5.1.4 Tympanometry

There is no statistically significant difference between average tympanometry for preoperative patient of merocel pack with tube and without tube for both Right and Left ear.

In similar study¹⁰, measured middle ear pressure in 40 ears before surgery, after 48 hours of nasal pack, and 7 days after removal of nasal pack. They found that, preoperatively, there was normal middle ear pressure in all the ears, none of the ears had abnormal middle ear pressure.

5.2 Comparison of merocel pack with tube and without tube (Post Op)

5.2.1 Pure Tone Audiometry

After operating patients, out of 33 patients of merocel pack with tube 28 and 29 patients had normal pure tone audiometry for Right and Left ear respectively. Whereas out of 33 post operative patients of merocel pack without tube, 21 and 22 patients had normal pure tone audiometry for both Right and Left ear. Overall pure tone audiometry observed normal in more patients of merocel pack with tube than patients of merocel without tube.

In a study by Jasser H et al¹⁰, the authors found that pure tone audiometry (PTA) and Impedance Audiometry (IA) 48 hours after septal surgery with nasal packs in position, 14 ears had abnormal negative middle ear pressure of 100 to 300 mm H₂O. Seven days after pack removal, there was marked improvement in middle ear pressure. Nasal packing following septal surgery is a frequent cause of short-term eustachian tube dysfunction.

Egelund E¹¹ examined 47 patients for 1–3 months after septoplasty or septorhinoplasty with insertion of

nasal packing and left in place for 6 days. A ventilation tube was also inserted for the first 4 days. A control group without insertion of ventilation tubes consisted of 22 of the 47 patients. In the patients with ventilation tubes, significantly fewer symptoms indicating disturbed eustachian tube ventilation were reported. Tympanometry showed negative pressure in the middle ear in many cases. Normalization was significantly faster in patients with ventilation tubes.

5.2.2 Acoustic Reflex Threshold

After operating patients, out of 33 patients of merocel pack with tube, 23 and 24 patients had acoustic reflex threshold present for Right and Left ear respectively. Whereas out of 33 post operative patients of merocel pack without tube, 18 patients had acoustic reflex threshold present for Right ear and 18 patients had acoustic reflex threshold present for Left ear. Overall acoustic reflex threshold present was more for patients of merocel pack with tube than patients of merocel pack without tube.

Similar findings were seen in a study by Mohan C et al¹², on “Effect of Nasal Packing on Middle Ear Pressure”. They used nasal packing without tube. Out of the 50 patients (100 ears), after 48 hours of nasal packing, 77 ears (77%) had normal hearing threshold, and 23 ears (23%) had conductive hearing loss. Seven days after removal of nasal pack, 83 ears (83%) were normal and 17 ears (17%) had hearing loss.

Also, Huang XK et al¹³ measured hearing threshold in 55 patients who had chronic sinusitis and nasal obstruction. The hearing threshold was increased in 33.9% cases that had nasal obstruction. These results were similar to our study.

5.2.3 Tympanogram

Post-operatively, it was found that, out of 33 patients, 23 and 24 patients had tympanogram type A for right and left ear respectively. Out of 33 post-operative patients of merocel pack without tube, 18 patients had tympanogram Type A for Right ear and 18 patients had tympanogram Type A for Left ear. Overall tympanogram Type A was more for patients of merocel pack with tube than patients of merocel pack without tube. There was statistically significant difference observed between pre and postoperative patients of merocel pack with tube which shows that method of merocel packing with tube was effective.

5.2.4 Tympanometry

There was statistically significant difference observed between patients of merocel pack with and without tube in average tympanometry which shows that method of

merocel packing with tube is more effective than without tube.

The possible mechanism for eustachian tube dysfunction is that the nasal packing may lead to peritubal inflammation or stasis of peritubal lymphatics. There may be deficiency of surfactant, which facilitates opening of eustachian tubes. This material is inactivated by inflammation, which occurs following nasal packing. Reduced swallowing in the postoperative period due to pain, leads to restrictive opening of the Eustachian tube¹⁰.

In a study¹⁴ on “Comparison of the Effect of Nasal Packing with and without Airway on Eustachian Tube Dysfunction” found that in group with nasal packing with airway, decreased middle ear pressure was detected in 16 years (28.5%). On the other hand in group with nasal packing without airway, decreased middle ear pressure was detected in 27 years (48.2%).

Similarly, in a study by Hüseyin Dere et al¹⁵ on “Comparative study of complete nasal packing with and without airways” found that postoperatively in the group which had bilateral complete nasal packing without an airway the negative middle ear pressure was found in 5 (17%) patients as compared to other groups with an airway placed on one or both sides of the nasal cavity, middle ear pressure was normal.

In a study by Thompson AC et al¹⁶, on “Effect of nasal packing on Eustachian tube function” post-operative tympanometry was done among 63 patients (126 ears) with bilateral packing without tube, in order to determine the effect on eustachian tube function. 46% of ears developed a reduction in middle ear pressure of at least 50 dePa. Nasal packing following septal surgery is a frequent cause of short-lasting eustachian tube dysfunction.

Similarly, Bonding P¹⁷ investigated middle ear ventilation by repeated tympanometry. Patients with bilateral nasal packing had negative middle ear pressure, which returned to normal level after removal of nasal packing.

6. Conclusion

Anterior nasal packing causes reversible negative middle ear pressure which return to normal after pack removal. Chronic nasal obstruction seems to have a detrimental effect on middle ear pressure, which may not return to normal even after removal of chronic obstruction. It appears from this study that there might be some permanent change in peritubal nasopharyngeal mucosa due to chronic nasal obstruction, which needs to be proved histopathologically. Lymphatic stasis at peritubal plexus of lymphatic channels and veins appears to be

the causes of lymphoedema following nasal packing causing mild rise in middle ear pressure post operatively compared to patients using merocel nasal pack with tube. Above study shows the merocel nasal packing with tube is effective than without tube.

7. References

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