

Delivery of nasal drops to the middle meatus: which is the best head position ?*

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SUMMARY

Background: Chronic sinusitis and intranasal polyps require long-term topical drug therapy. The issue of drug delivery to the critical area of the middle meatus is rarely addressed.

Aim: The aim of this study was to compare the delivery of drops to the middle meatus using four different head positions (Mecca, Mygind, Ragan and Head back). The study also assessed the discomfort with each position whilst administering the nasal drops.

Methods: Nine nostrils in five healthy volunteers were studied to compare the delivery of drops to the middle meatus using the four different head positions. A neurosurgical patty was placed under direct vision in the middle meatus using a rigid nasendoscope. Six drops of dyed-saline were administered into each nostril. Upon removal, a quantitative assessment was made of the amount of dye absorbed and discomfort assessed. The direction of flow of the nasal drops in the nose was also demonstrated.

Results: The 'Mygind' and 'Ragan' positions were superior to the 'Mecca' and 'Head back' positions in delivery of drops to the middle meatus. The 'Mecca' position was the most uncomfortable.

Conclusion: We recommend that the 'Mygind' or 'Ragan' position should be used for nasal drop administration.

Key words: nasal drops, middle meatus, head position

INTRODUCTION

Topical nasal preparations play an important role both in the initial conservative and in the post-operative management of chronic sinusitis and intranasal polyps. The issue of drug delivery to the critical area of the middle meatus is rarely addressed. Most of the studies done referred mainly to the topical drug absorption in the nose and the general distribution of nasal drops in comparison to nasal spray (Hardy et al., 1985; Wilson et al., 1987; Moren et al., 1988; Homer et al., 1998).

In order to be most effective, the drug must reach and be deposited in the middle meatus and the primary site of the disease: the ostiometal complex (Homer et al., 1998; Kubba, 1999; Raghavan et al., 2000). In an attempt to achieve this, patients are usually advised to self administer nasal drops by adopting either the 'Mecca' (head down and forward) or 'Mygind' (head dangling back) position (Kubba, 1999). The manufacturers of some commonly prescribed preparations recommend the head back position, as described in the patient information leaflets dispensed with Betnesol (betamethasone 0.1 per cent, Evans) and Otrivine (0.1 per cent xylometazoline, Norvartis Consumer Health) (Kubba, 1999). Ragan position

(head side), has also been demonstrated using a cadaver head (Raghavan et al., 2000). The problem with the studies in a cadaver is the change in the contour of the nasal mucosa, which can give a false direction of flow of the drops. Apart from the inability of the drug to reach the middle meatus when adopting some of these positions, poor compliance due to discomfort is another set back (Kubba, 1999).

The effectiveness of drop distribution in the nasal cavity with different head positions has been studied previously (Wilson et al., 1987), however, the delivery of drops to the middle meatus has not been demonstrated. The amount of discomfort experienced with some head positions has also been assessed but not compared between the four positions (Kubba, 1999; Raghavan et al., 2000).

The aim of this study was to compare the delivery of nasal drops to the middle meatus using a method as described by Tsikoudas and Homer (2001), in the Mecca, Mygind, Ragan, and Head back positions (Figures 1a-d, respectively).

This study also assessed and compared the discomfort experienced whilst adopting these positions.

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Figure 1a. Mecca position
Kneeling with the neck flexed and vertex touching the floor.



Figure 1b. Mygind position
Lying supine with neck fully extended at the end of the bed.



Figure 1c. Ragan position
Lying on the side without pillow under the head and the nose turned towards the opposite shoulder. The lower nostril was used to administer the drops.



Figure 1d. Head back
Subject sat up with neck fully extended and head slightly turned to one side. The lower nostril was used to administer the drops.

MATERIALS AND METHODS

Study design:

Randomised prospective four - period crossover study.

Subjects

Seven healthy adult volunteers participated in the study. One volunteer dropped out after the Mygind position due to extreme discomfort. Another was excluded after the Ragan position due to difficulty in accessing the middle meatus. Only five volunteers were therefore suitable for the study. In one of these five, one nasal cavity was not studied due to inability to access the middle meatus as a result of gross septal deviation. Nine nasal cavities were therefore studied for each position.

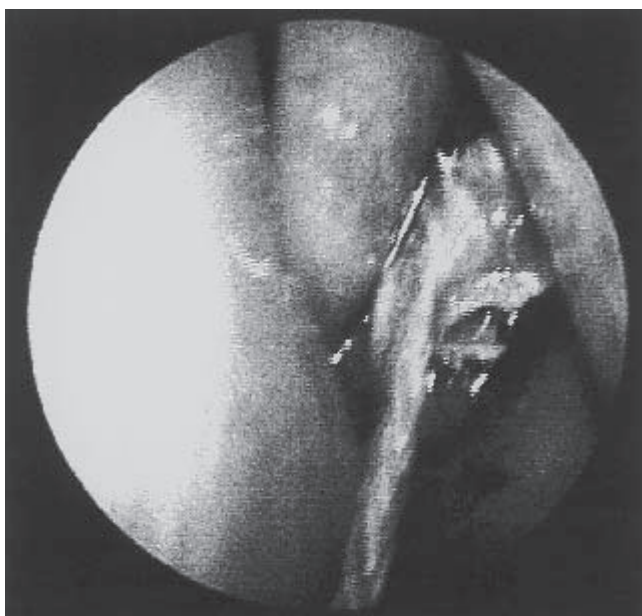
Exclusion criteria

- Inability to access the middle meatus either due to marked septal deviation, or turbinate hypertrophy
- Current URTI
- Subject's choice to drop out of the study

Study procedure

A neurosurgical patty (5x10mm, Codman, Johnson & Johnson) was placed under direct vision into the middle meatus (Figure 2) with the use of a 2.7mm 0° rigid nasendoscope (STORZ) after spraying the nasal cavity with a local anaesthetic agent (Lidocaine 5% and phenylephrine 0.5%). Five minutes later, methylene blue dyed saline drops (6 drops) was administered into the nasal cavity using a Flixonase Nasule™ (Allen & Hamburgs) container as the subject adopted one position. The subject remained in position for 1 minute before the patty was withdrawn via a sheath (a trimmed 1ml insulin syringe) to prevent the patty absorbing more dye from the nasal cavity walls

Figure 2. Endoscopic photograph to show position of neurosurgical patty in the left middle meatus.



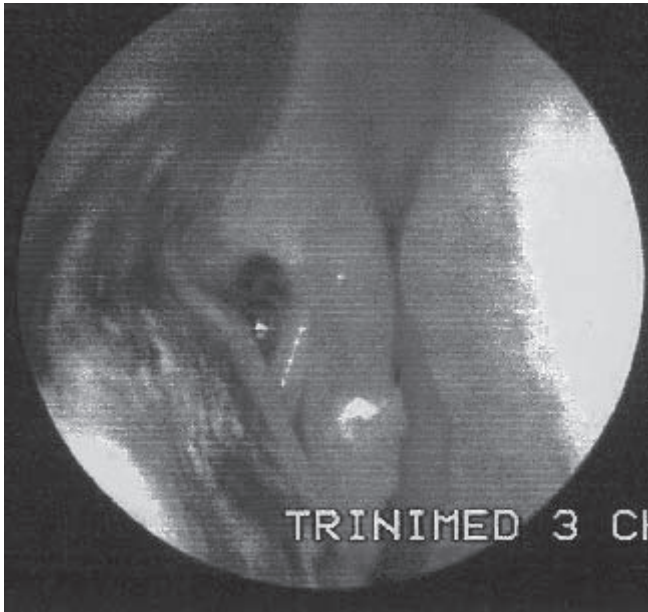


Figure 3a. Endoscopic photograph to show methylene blue dyed saline in the right middle meatus with Mygind position.

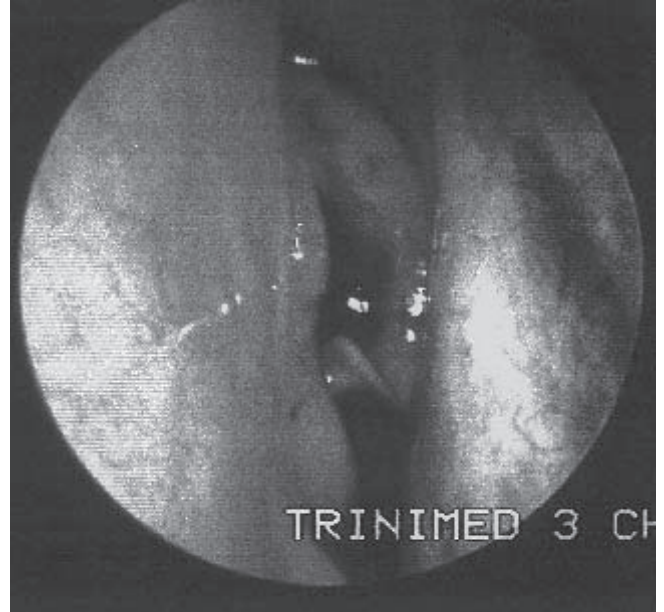


Figure 3b. Endoscopic photograph to show methylene blue dyed saline in the left middle meatus with Ragan position.

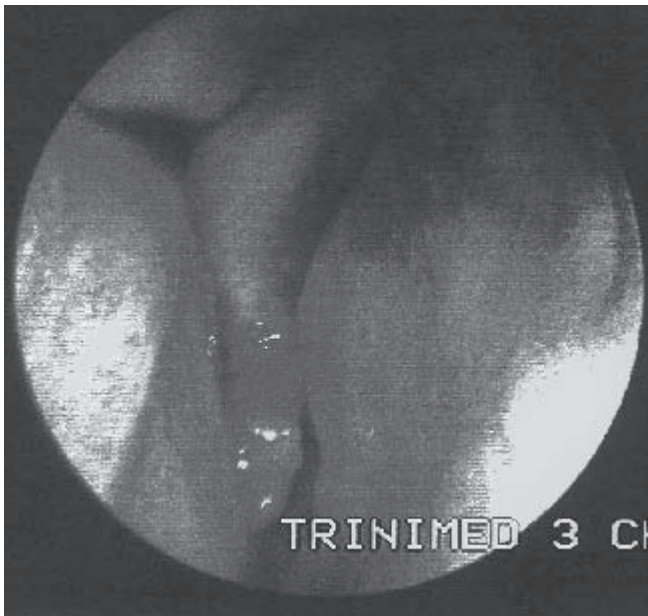


Figure 3c. Endoscopic photograph to show methylene blue dyed saline in the roof of right nostril with Mecca position.

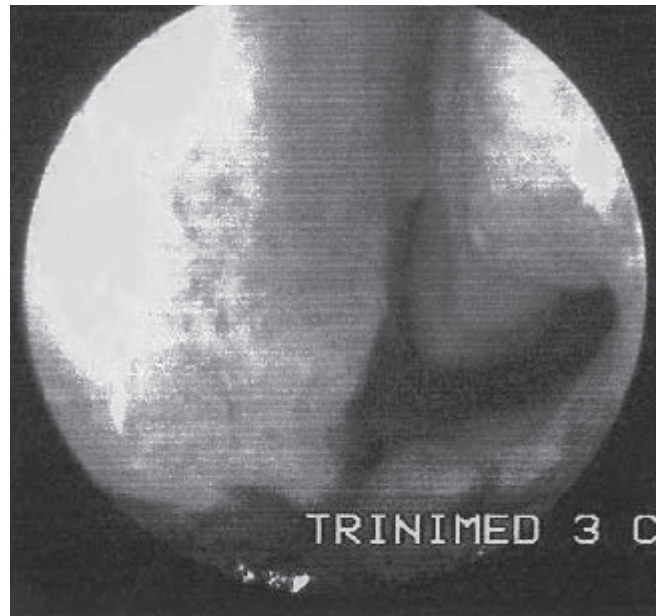


Figure 3d. Endoscopic photograph to show methylene blue dyed saline in the floor of left nostril with head back position.

and the vestibule. The direction of flow of the dye drops in the nasal cavity was also demonstrated. On a separate day, a different position was studied to avoid a carry over effect.

The absorption of dyed saline by the neurosurgical patty in the middle meatus was visually assessed and compared for the different head positions. The assessment was based on the area of neurosurgical patty that had absorbed the dyed saline and this was classified as; none, <50%, >50%, 100%. The subject was also assessed for the degree of discomfort experienced with each of the positions using the visual analogue scale, 0-10 cm (VAS). A VAS score of 10cm was interpreted as worse discomfort.

RESULTS

The results showed that more drops reaches the middle meatus with Mygind and Ragan positions as compared to Mecca and head back positions (Table 1). The drops reached the middle meatus through the lateral nasal cavity by gravitation whilst the subject was in the Mygind and Ragan positions as shown in Figures 3a, b. In the Mecca position, drops pooled in the roof of the nose and trickled out again as the subjects sat up while in the head back position, the drops were seen to only flow along the floor of the nose (Figures 3c, d). Mecca position was the most uncomfortable, followed by the Mygind and then Head back. The Ragan position was the most comfortable (Table 2).

Table 1. Results of absorption of dyed saline by the neurosurgical patty in the middle meatus in the four different head positions.

Head position	None	<50%	>50%	100%
Mygind	0	3	2	4
Ragan	1	1	6	1
Mecca	8	1	0	0
Head back	9	0	0	0

Table 2. Results of discomfort with each head positions on a visual analogue scale (VAS) of 0-10cm.

Subjects	Ragan	Head back	Mygind	Mecca
1	2	2	8	6
2	4	5	2	6
3	3	2	5	8
4	0	0	2	9
5	0	3	0	6
Total	9	12	17	35

DISCUSSION

The common areas involved in chronic sinusitis and nasal polypi are the maxillary sinus and the anterior ethmoidal sinus (Kubba, 1999). These sinuses drain through the ostiometal complex, which opens into the middle meatus. In the presence of nasal inflammation the mucosa becomes oedematous and obstructs the ostiometal complex and middle meatus (Kubba, 1999).

Otolaryngologists and drug manufacturers therefore frequently recommend nasal preparations as initial treatment using one of the different head positions with the aim of delivery of medication to the middle meatus. Effective delivery therefore depends on the correct head position and further compliance is related to the ease and comfort to the patients while self administering the drops.

The three standard head positions and the new 'Ragan' position have not been compared for the ease of administration, comfort and maximum delivery to the middle meatus. This study has therefore clearly shown that the Mygind and the Ragan positions are the most effective head position in delivery of nasal drops into the middle meatus. While the head-back was more comfortable than the Mecca and the Mygind positions, there was no delivery of dye to the middle meatus whatsoever. The 'head down and forward' (Mecca) position was the most uncomfortable but there was no delivery of drops into the middle meatus except in one nostril out of 9 where only less than 50% of the patty absorbed the dye. Although the Mygind position was slightly superior to the Ragan position in the delivery of drops to middle meatus, the Ragan was more comfortable during drop administration. Therefore, it will be likely that patients will be more compliant to the Ragan position than the Mygind.

There are two reasons why the results of this study may not extrapolate to patients with chronic sinusitis. Firstly, we used normal subjects rather than patients with sinusitis. Secondly, the assumption that the absorption of dye by patty in terms of area covered correlates with the volume absorbed cannot be

automatically made. Initially, we attempted to quantify this by weighing the patty before and after drop instillation but the results were erroneous due to further absorption of nasal secretion. However, we believe the photographic evidence showing the direction of flow of dye associated with the results of neurosurgical patty staining demonstrated well the differences of drop penetration into the middle meatus with the four different head positions, all be it only semi-quantitatively.

Many Otolaryngologists and drug manufacturers recommend the Mecca position based on limited evidence that drops will be better distributed along the lateral nasal wall with the assumption that drops are likely to reach the middle meatus and be more clinically effective than drops administered with headback position (Lund, 1997; Raghavan et al., 2000). Our results however would contradict this. Pooling of drops in the roof of the nose with Mecca position may however be beneficial when the primary intention is the treatment of anosmia/hyposmia or polyps in the roof of the nose. We recommend that the Mygind or the Ragan position be used while self administering nasal drops when delivery of drops to the middle meatus is desired. A clinical trial comparing the clinical effect between these two positions is needed.

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