Perioperative use of the modified nasal trumpet in 346 patients

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Background. The modified nasal trumpet (MNT) is a prepackaged nasopharyngeal airway modified with distal holes and fitted with a 15 mm adaptor allowing connection to an anaesthesia circuit. It may be useful for airway management during anaesthesia.

Methods. After applying a spray to constrict the nasal mucosa, we used the MNT in 346 spontaneously breathing patients for three indications: alone as an airway device during general anaesthesia, to provide supplemental oxygen immediately after extubation instead of by face-mask, and to facilitate fibreoptic intubation during general anaesthesia.

Results. The device was successful for giving supplemental oxygen after extubation (n=244) and facilitating fibreoptic intubation (n=28). When used as an airway for general anaesthesia, it was only successful without manipulation in 33 of 74 patients (45%). The MNT was easy to insert in awake patients. We encountered six complications: one MNT folded in the pharynx, and five patients (1.4%) experienced nosebleeds.

Conclusions. The MNT was disappointing as a primary airway device under general anaesthesia but was useful for giving oxygen after extubation and for facilitation of fibreoptic intubation. It can cause nosebleeds.

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The modified nasal trumpet (MNT) is a prepackaged nasopharyngeal airway that is modified by adding distal holes and fitting a 15 mm adaptor for connection to an anaesthesia system. The distal holes act like the Murphy eye of a tracheal tube, to allow free gas exchange if the distal orifice is occluded. Bipharyngeal nasal airways were reported in early literature. Beattie used the single-lumen MNT as a rescue device in 35 patients who could not be ventilated or intubated. The MNT is easy to construct, inexpensive, disposable and portable.

After successful use of the device for positive-pressure ventilation, we assessed the MNT over 2 yr in spontaneously breathing anaesthetized patients. We chose three perioperative indications: (i) as sole airway device for spontaneous ventilation during general anaesthesia; (ii) to provide supplemental oxygen after extubation instead of a facemask; (iii) to preserve spontaneous ventilation and optimal oxygenation during fibreoptic intubation. We have already reported our initial experience with the MNT during fibreoptic intubation, and those patients are not included in this series. If the MNT could be used for any of these indications with minimal complications, it would be a useful additional airway management device.

Methods

Our hospital’s institutional review board approved this review. MNTs were made using prepackaged nasopharyngeal airways (Kendall Argyle, Mansfield, MA, USA). This particular device is latex free. Fenestrations were added by cutting holes near the distal end. These airways were then fitted with tracheal tube adaptors. A range of size combinations was possible. A nasopharyngeal airway of 7.5–8.5 mm (30–34 French) would accept an adaptor from a 7.0–8.0 mm tracheal tube.

One anaesthesiologist supervised all the patients. An MNT was used if the perioperative plan included one of the three indications and the supervised anaesthetist or resident was comfortable to use the device for airway management. No patient had a known coagulopathy or specific indication for other airway management techniques.
All patients were treated with oxymetazoline 0.05% nasal spray to reduce the risk of haemorrhage. The device was lubricated with surgical lubricant, or with lidocaine 2% gel for awake patients. To reduce trauma to turbinates, we usually first attempted passage via the left nostril, placing the leading edge on the medial side of the nasal chamber away from the turbinates and with the preformed curve of the airway directed caudally. After insertion, the MNT was connected to the anaesthesia circuit to allow delivery of oxygen and anaesthetic vapour as indicated. Respiratory pattern was monitored by capnography, exhaled volume measurements or the movement of the reservoir bag. To prevent dislodgement or kinking, the anaesthesia tubing was suspended by a support. Most MNTs were made of an 8.5 mm nasopharyngeal airway (the largest in our stock) with an 8.0 mm adaptor.

During general anaesthesia with spontaneous ventilation, anaesthesia was induced by slow injection of an i.v. agent to preserve spontaneous ventilation, and then the MNT was inserted. The device was considered successful if \( S_\text{PO}_2 \) remained above 95% and tidal volume was greater than 3 ml kg\(^{-1}\) estimated lean body mass. We chose a liberal definition of success to determine if the MNT had any value for this purpose. Anaesthesia was maintained by spontaneous ventilation of volatile agents, usually sevoflurane. We noted if it was necessary to change to the opposite nostril or to a different size of MNT, and if it was necessary to close the mouth or opposite nostril ("supplemental manoeuvres") to prevent entrainment of room air.

When used to provide supplemental oxygen after extubation, the MNT was inserted immediately after tracheal intubation. At the end of surgery when spontaneous ventilation had resumed, patients were extubated and breathed 100% oxygen via the MNT until awake and responsive, when the MNT was removed. The device was considered successful if \( S_\text{PO}_2 \) remained greater than 95% without needing to use a facemask.

To facilitate fiberoptic intubation, the MNT was inserted either when the patient was awake or after slow induction of anaesthesia with maintenance of spontaneous ventilation. Fiberoptic intubations were planned after failed direct laryngoscopy or failed awake intubation. In several cases, awake intubation was indicated but was impractical because of patient refusal, inability to cooperate or failure of airway anaesthesia. In all cases, general anaesthesia was with sevoflurane in oxygen and spontaneous ventilation, while the patient was intubated using the fibrescope passed via the mouth or opposite nostril. The device was considered successful if \( S_\text{PO}_2 \) remained greater than 95% and the trachea was intubated without muscle relaxants.

In each patient we noted the age, sex, height, weight, the size of the nasal trumpet, size of adaptor, number of added distal holes, side of insertion, changes of side or size, use of lidocaine gel, patient state during insertion (awake or anaesthetized), operation, the anaesthetic or sedatives given, any bleeding (shown by blood around the MNT or after succion of the pharynx) and failure or success of MNT for the particular indication.

### Results

From February 2000 to February 2003, the MNT was used in 76 patients breathing spontaneously during general anaesthesia, for giving supplemental oxygen in 244 patients after extubation and in 28 patients during fiberoptic intubation (Table 1).

Two of the MNTs were inserted for general anaesthesia but were not used because of change of anaesthetic plan, and in one patient the MNT would not pass through either nostril. Of the remaining 73 patients, 39 received the MNT for planned general anaesthesia, eight for failed regional anaesthesia, 13 for failed sedation and three for poor pulse oximeter values during sedation.

The MNT was successfully inserted on first attempt without supplemental manoeuvres in 34 patients (45%). In 32 additional patients, change of size or side (12 patients), supplemental manoeuvres (16 patients), or both (four patients), allowed success. The overall success rate was therefore 66 of 73 patients (90%). Failures were because of entrainment of room air from either a leak around the MNT or persistent mouth breathing.

One patient had nasal bleeding and was managed by tracheal intubation to avoid blood aspiration. Propofol, methohexital and thiopental were used for anaesthesia, in doses from 50 mg of propofol or methohexital to 200 mg of propofol. No patient developed apnoea.

The MNT was inserted in 277 patients to give supplemental oxygen after extubation. In 33 patients, the MNT was not used because of rapid awakening, change of anaesthesia personnel or if extubation was not appropriate. In 15 patients the MNT would not pass through the left nostril and the right was used. In one patient, an 8.5 mm MNT would not pass and a 7.5 mm MNT was used. In four patients, both side and size were changed. In one patient, the smallest MNT would not pass through either nostril. The MNT provided adequate oxygenation in 243 of the 244 patients, the one failure being the patient in whom an MNT could not be passed. No patient required a facemask.
In four patients blood was seen at the nostril or aspirated from the mouth. In these patients an 8.5 mm MNT was used. No intervention was needed and all bleeding had stopped at extubation. The shortest time to extubation after bleeding was 1 h. Including those patients in whom the MNT was inserted but not used, none of whom had nosebleeds, the rate of nosebleed was 1.5%. In a fifth patient the MNT folded in the pharynx. This was suspected when no gas was inspired from the anaesthesia circuit when the tracheal tube was removed. Partial withdrawal and reinsertion of the MNT resolved the problem.

The MNT successfully facilitated fibreoptic intubation in all 28 patients. Fifteen (54%) patients received the MNT while awake without discomfort after intranasal lidocaine 2% gel. Others were anaesthetized with propofol. No patient developed apnoea. In 17 patients, fibreoptic intubation was planned after induction of anaesthesia; eight other patients had indications for awake intubation but would not cooperate; awake intubation failed in three patients because the topical anaesthesia was insufficient. Nasal intubation was used in 17 patients and oral intubation in 11 patients. No nosebleeds occurred. In six patients the MNT would not pass through the left nostril and the right was used. In four patients an 8.5 mm airway would not pass and a smaller device was used.

Discussion
The MNT facilitated fibreoptic intubation and provided supplemental oxygen after extubation, but it was less successful as an airway device for spontaneous ventilation during general anaesthesia. In these patients, the success rate after initial insertion was 45%. Even after change of side, change of size or supplemental manoeuvres, the overall success rate was 89%. As this experience with the MNT for general anaesthesia became evident, even with our liberal definition of success, fewer staff were happy with the device and usage decreased during the survey. In contrast, the MNT was successful for the other applications, with no failures in use after extubation or facilitating fibreoptic intubation.

The MNT was useful for oxygen administration after extubation and was tolerated with less agitation than the facemask. The MNT avoided the difficulty of fitting a facemask around a nasogastric tube. Pharyngeal suction could be used with minimal discomfort by passing a suction catheter through the MNT or applying a Yankauer suction tip directly to the MNT. The MNT seemed to allow smoother emergence than awakening with a tracheal tube. However, we made no formal comparisons with conventional extubation practice so these observations remain anecdotal. A prospective study could support these clinical impressions.

The MNT successfully facilitated fibreoptic intubation in 28 patients by maintaining spontaneous ventilation, general anaesthesia and good arterial saturation during the intubation. Fifteen patients received MNTs without discomfort while awake.

In awake fibreoptic intubation the MNT may provide greater inspired concentrations of oxygen than nasal cannulae. Respiratory pattern can be monitored by using an exhaled volume sensor and a capnograph, and positive-pressure ventilation is possible.

Nosebleed was noted in five patients (1.2%). In four, the time between insertion and extubation was sufficient to permit spontaneous resolution, because a tracheal tube was used at the same time. However, in the one patient who was not intubated at the time of nosebleed, we decided to use a tracheal tube. Nasal vasoconstrictor, surgical lubricant and gentle insertion may reduce, but does not eliminate, bleeding.

In summary, our experience indicates that the MNT may provide supplemental oxygenation after extubation and facilitates fibreoptic intubation. The device is inexpensive and easy to insert in the awake patient with appropriate nasal anaesthesia. Like any device passed through the nose, the MNT can cause nosebleed.

References