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Original Research Article

Success Rate and Complications of Nasotracheal Intubation by Conventional versus Finger-Guided Method in Patients Undergoing Maxillofacial Surgery: A Randomised Comparative Study

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Abstract:

Background: Nasotracheal intubation is essential in maxillofacial surgery but carries a high incidence of epistaxis, multiple attempts and an exaggerated pressor response, because the tube is advanced blindly through the nasopharynx. Guiding the tube with a finger placed behind the soft palate is a simple, equipment-free manoeuvre, but evidence for it rests largely on a single trial.

Objectives: To compare the success rate, complications and haemodynamic response of finger-guided versus conventional nasotracheal intubation.

Methods: Randomised comparative study of 70 adults (ASA I–II, aged 15–70 years) undergoing elective oral and maxillofacial surgery requiring nasotracheal intubation at S.M.S. Medical College and Attached Hospitals, Jaipur. Patients were allocated by sealed envelope to finger-guided intubation (Group A, n = 35) or conventional blind intubation (Group B, n = 35). The primary outcomes were first-attempt success and the incidence and severity of epistaxis (Sugiyama criteria) immediately and five minutes after intubation; secondary outcomes were heart rate, systolic and diastolic blood pressure, mean arterial pressure, oxygen saturation and time to intubation. Groups were compared using the independent-samples t-test and chi-square test.

Results: The groups were comparable at baseline (all $p > 0.05$). Epistaxis occurred in 3/35 (8.6%) in Group A versus 24/35 (68.6%) in Group B immediately after intubation (relative risk 0.12, 95% CI 0.04–0.38; $p < 0.001$), and in 20.0% versus 94.3% at five minutes ($p < 0.001$). First-attempt success was 97.1% versus 74.3% ($p = 0.017$), and intubation was 13.4 seconds faster in Group A ($p = 0.005$). Heart rate, systolic blood pressure and mean arterial pressure were significantly lower in Group A during and after intubation (all $p < 0.05$).

Conclusion: Finger-guided nasotracheal intubation reduced epistaxis significantly, improved first-attempt success, shortened intubation time and blunted the pressor response compared with the conventional blind technique. It requires no additional equipment or extra cost and merits routine consideration in maxillofacial surgery.

Keywords: Nasotracheal Intubation; Epistaxis; Maxillofacial Surgery; Airway Management; Finger-Guided Technique; Haemodynamic Response.

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Introduction

Nasotracheal intubation is the airway technique of choice for oral and maxillofacial surgery, because it leaves the oral cavity free and provides the surgeon with an unobstructed operative field. Its use, however, carries a price. The tube must negotiate the narrow, richly vascular nasal passage and then turn through the nasopharynx, and in the conventional technique this final and most hazardous part of the journey is performed blindly. [1]

Epistaxis is the commonest complication, with reported incidences ranging from 18% to 77% across studies. [1,2] Bleeding is usually minor, but it obscures the laryngoscope view and may be aspirated. Blind advancement can also drive the tube tip into the turbinates or posterior pharyngeal wall, producing mucosal laceration or submucosal tunnelling. Repeated failed attempts compound mucosal trauma and prolong the apnoeic period.

Superimposed on this is the sympathetic pressor response to airway instrumentation, which is proportional to the force and duration of manipulation. [3,4]

Many strategies have been tested to make the passage safer: thermosoftening the tube [5], styletted tubes with a posterior-facing bevel [6], endoscopic inspection of the nasopharynx before intubation [7], purpose-designed tubes such as the North Polar tube [8], topical vasoconstrictors [9] and covering the cuff with a modified glove finger. [10] Others have railroaded the tube over an intermediary device, as considered below. Most require additional equipment, expense or time, and their effectiveness is inconsistent.

A simple cost effective solution would be guiding the tube using finger. In the finger-guided technique, the index finger of the non-dominant hand is placed behind the soft palate in the nasopharynx; when the advancing tube tip is felt, the fingertip is engaged in the bevel and the tube is steered around the nasopharyngeal curve under direct tactile control. The manoeuvre requires no equipment and no additional cost. Hashemi et al. tested it in a double-blind randomised trial of 68 patients and reported a higher success rate and less epistaxis and submucosal intubation, although they found no consistent difference in haemodynamic response and no reduction in intubation time. [11] That trial appears to be the only randomised evaluation of the technique, and its authors themselves noted the need for confirmation in other populations.

We therefore conducted an independent randomised comparative study to test whether finger-guided nasotracheal intubation improves the success rate and reduces complications, in particular epistaxis, compared with the conventional blind technique in patients undergoing maxillofacial surgery, and to determine its effect on the haemodynamic response to intubation.

Material and Methods

This hospital-based randomised comparative study was conducted in the operation theatres associated with S.M.S. Medical College and Attached Hospitals, Jaipur. Approval was obtained from the Institutional Research Review Board and the Ethics Committee, and written informed consent was obtained from every participant before enrolment.

Adults of either sex aged 15–70 years, of American Society of Anesthesiologists (ASA) physical status I or II, scheduled for elective oral and maxillofacial surgery requiring nasotracheal intubation, and who gave written informed consent were eligible. Patients with a nasal mass, a bleeding disorder, current anticoagulant use, or who were participating in another study were excluded.

The sample size was calculated on the incidence of epistaxis, taking 72.7% for the conventional and 34.2% for the finger-guided method. At a 95% confidence level ($\alpha = 0.05$) and 80% power, 31 subjects per group were required; allowing for 10% attrition, 35 patients were enrolled in each group (total 70). Participants were allocated to the two groups by the sealed-envelope method.

Group A (n = 35) underwent finger-guided nasotracheal intubation and Group B (n = 35) underwent conventional nasotracheal intubation.

All patients were monitored with electrocardiography, pulse oximetry, capnography and non-invasive blood pressure. The more patent nostril was selected clinically and prepared with a topical vasoconstrictor and lubricating jelly. After a standardised induction and neuromuscular blockade, nasotracheal intubation was performed. In Group B (conventional), the tube was advanced blindly from the nostril through the nasopharynx into the oropharynx. In Group A (finger-guided), as the tube approached the nasopharynx the index finger of the non-dominant hand was introduced into the mouth and placed behind the soft palate; on contacting the tube tip, the fingertip was engaged in the bevel and the tube was guided forward under tactile control into the oropharynx. In both groups the tube was then advanced into trachea under Macintosh laryngoscopy, with Magill forceps if required.

The primary outcomes were the success rate of intubation (number of attempts required) and the incidence and severity of epistaxis, graded immediately after intubation and again five minutes later using the Sugiyama criteria [6] as none, mild (blood on the tube or posterior pharyngeal wall), moderate (accumulation of blood in the posterior pharynx) or severe (blood interfering with intubation and requiring conversion to the oral route). The secondary outcomes were heart rate, systolic and diastolic blood pressure, mean arterial pressure and peripheral oxygen saturation, each recorded at baseline, during intubation, immediately after intubation and five minutes after intubation, together with the time taken for intubation.

Data were analysed using SPSS. Continuous variables are presented as mean ± standard deviation and were compared between groups with the independent-samples t-test; categorical variables are presented as frequencies and percentages and were compared with the chi-square test. Relative risks and mean differences with 95% confidence intervals were computed for the primary outcomes. A two-sided p-value < 0.05 was considered statistically significant.

Results

Seventy patients were randomised, 35 to each group, and all 70 completed the study and were analysed;

there were no losses to follow-up and no exclusions after randomisation.

The two groups were well matched. The mean age was 38.77 ± 15.62 years in Group A and 35.49 ± 13.55 years in Group B ($p = 0.351$), and mean weight was 67.37 ± 8.97 kg versus 67.09 ± 10.23 kg ($p = 0.901$). The cohort was predominantly male (84.3% overall; 85.7% vs 82.9%, $p = 1.000$), and ASA grade was comparably distributed ($p = 0.811$). Baseline haemodynamic variables did not differ significantly between the groups.

Epistaxis was markedly less frequent with the finger-guided technique. Immediately after intubation, only 3 of 35 patients (8.6%) in Group A bled, all mild, compared with 24 of 35 (68.6%) in Group B (relative risk 0.12, 95% CI 0.04–0.38; absolute risk reduction 60.0%; number needed to treat 1.7; $p < 0.001$). At five minutes the difference widened: 7 of 35 (20.0%) in Group A had mild epistaxis, whereas 33 of 35 (94.3%) in Group B were bleeding — 28 mild (80.0%) and 5 moderate (14.3%) (relative risk 0.21, 95% CI 0.11–0.41; $p < 0.001$). Moderate epistaxis occurred exclusively in the conventional group, and no patient in either group developed severe epistaxis (Table 1).

Table 1: Incidence and severity of epistaxis (Sugiyama criteria)

Time and severity	Group A (n = 35)	Group B (n = 35)	Total	p
Immediately after intubation				
None	32 (91.4)	11 (31.4)	43 (61.4)	**<0.001**
Mild	3 (8.6)	24 (68.6)	27 (38.6)	
Moderate	0 (0)	0 (0)	0 (0)	
Severe	0 (0)	0 (0)	0 (0)	
Five minutes after intubation				
None	28 (80.0)	2 (5.7)	30 (42.9)	**<0.001**
Mild	7 (20.0)	28 (80.0)	35 (50.0)	
Moderate	0 (0)	5 (14.3)	5 (7.1)	
Severe	0 (0)	0 (0)	0 (0)	

Values are n (%). Chi-square test. Relative risk of any epistaxis (Group A vs Group B): 0.12 (95% CI 0.04–0.38) immediately after intubation and 0.21 (95% CI 0.11–0.41) at five minutes.

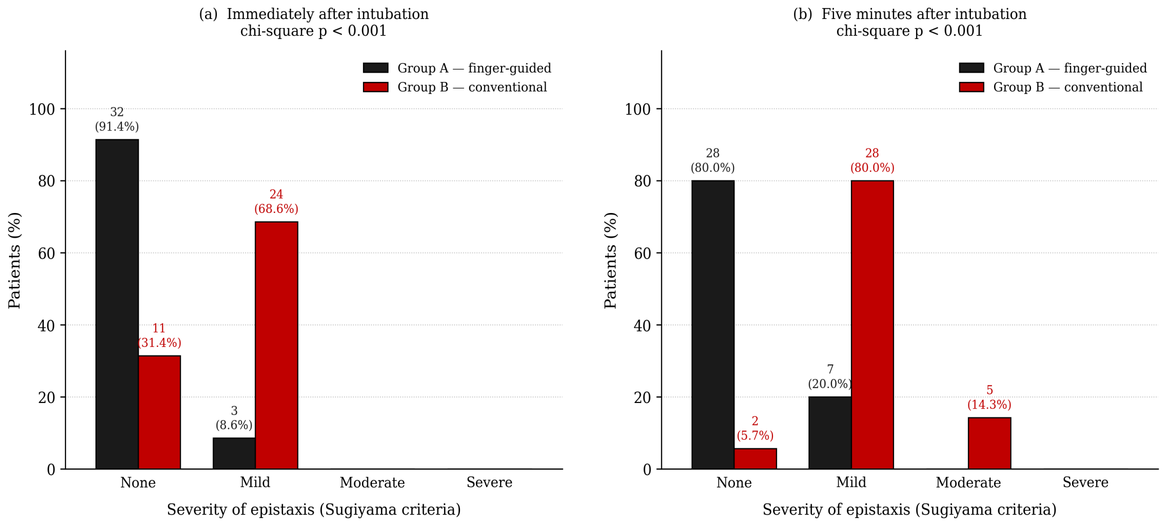

Figure 1: Severity of epistaxis by group. (a) Immediately after intubation. (b) Five minutes after intubation. Moderate epistaxis occurred only in the conventional group; no patient in either group had severe epistaxis.

First-attempt success was achieved in 34 of 35 patients (97.1%) in Group A but in only 26 of 35 (74.3%) in Group B, so that a second attempt was required in 2.9% versus 25.7% of patients ($p = 0.017$; relative risk of first-pass success 1.31, 95% CI 1.07–1.60). Intubation was also faster with the finger-guided technique, taking 83.46 ± 17.34 seconds versus 96.86 ± 20.70 seconds — a mean difference of 13.40 seconds (95% CI −22.51 to −4.29; $p = 0.005$) (Table 2).

Table 2: Intubation success and time taken (n = 70)

Variable	Group A — finger-guided	Group B — conventional	p
Number of attempts, n (%)			
One attempt (first-pass success)	34 (97.1)	26 (74.3)	**0.017**
Two attempts	1 (2.9)	9 (25.7)	
Time taken for intubation, s (mean ± SD)	83.46 ± 17.34	96.86 ± 20.70	**0.005**

SD = standard deviation. Chi-square test for attempts (χ^2 = 5.72, df = 1); independent-samples t-test for time (t = −2.94, df = 68). Mean difference in intubation time −13.40 s (95% CI −22.51 to −4.29).

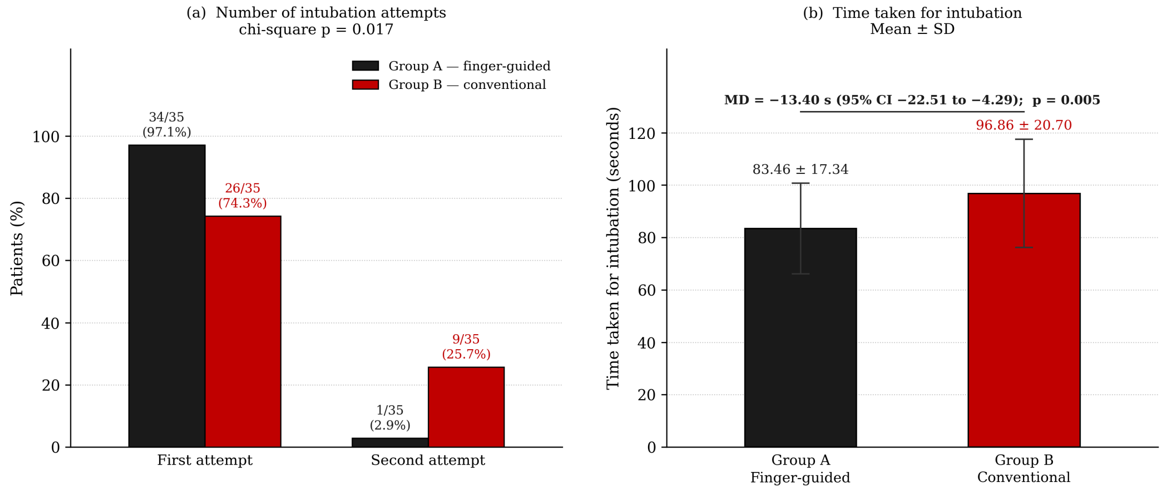

Figure 2: Intubation performance by group. (a) Number of attempts required. (b) Time taken for intubation (mean ± SD).

Discussion

In this randomised comparison of 70 patients, finger-guided nasotracheal intubation produced a substantial and consistent advantage over the conventional blind technique: epistaxis fell roughly eight-fold immediately after intubation (8.6% vs 68.6%), first-attempt success rose from 74.3% to 97.1%, intubation was 13 seconds faster, and the pressor response was blunted. The two groups were well matched at baseline, so these differences are attributable to the technique.

The magnitude of the reduction in epistaxis is the key finding. Our conventional-group incidence (68.6% immediately, 94.3% at five minutes) sits at the upper end of the literature range [1,2], while the finger-guided incidence (8.6%) is at the very bottom. The mechanism is straightforward: the fingertip steers the tube away from the turbinates and the posterior pharyngeal wall, where blind advancement causes mucosal laceration. Moderate epistaxis occurred only in the conventional group (14.3%), supporting this interpretation. Seo et al. achieved reduced epistaxis with an oesophageal-stethoscope obturator [12], Morimoto et al. with a suction catheter [13], and Lim et al. with a nasogastric tube [14] all sharing the same logic of controlling the tube tip, but each requiring additional equipment. Notably, the Parker Flex-Tip tube was found no better than a standard RAE tube for epistaxis [15], reinforcing the view that trajectory, not tip shape, determines nasal trauma.

Hashemi et al. are the only other group to have randomised this technique. [11] Our findings agree in direction less epistaxis and better success with finger guidance but differ in magnitude. Our effect on epistaxis was considerably larger (8.6% vs 68.6%) than theirs (36.4% vs 57.1%). More importantly, they found no difference in intubation time, whereas we found the finger-guided technique significantly faster (p = 0.005). Their haemodynamic findings were also inconsistent, whereas ours showed significant attenuation at multiple time points. This discrepancy likely reflect different definitions of the timed interval: Hashemi et al. report absolute times of 28–35 seconds [11] against our 83–97 seconds, suggesting a different start/end point rather than a difference in operator speed.

The pressor response to intubation tracks the intensity and duration of airway stimulation. [3,4] Our data fits that model: the group with fewer attempts, less trauma and shorter instrumentation had the smaller haemodynamic surge. The dissociation between systolic and diastolic pressure is consistent with the catecholamine-mediated character of the response [16].

The practical case for the finger-guided technique is strong because it requires no additional device and no extra expenditure, considerations that matter in resource-limited settings where fibreoptic guidance or specialised tubes may be unavailable. The argument for adopting it as the default approach in maxillofacial anaesthesia is compelling. The technique does require adequate neuromuscular blockade and attention to operator safety.

Several limitations qualify these findings. The trial was single-centre and modest in size (n = 70), powered for epistaxis alone, so haemodynamic comparisons should be regarded as exploratory. Operator familiarity with the finger-guided technique is a further concern. We studied ASA I–II patients with normal airways; the results cannot be extrapolated to the difficult airway, coagulopathy, or children. A larger multicentre trial with blinded outcome assessment would settle the question.

Conclusion

In patients undergoing maxillofacial surgery, finger-guided nasotracheal intubation reduced epistaxis significantly, raised first-attempt success from 74.3% to 97.1%, shortened intubation by 13 seconds and blunted the pressor response compared with the conventional blind technique. Because the manoeuvre requires no additional equipment and no extra cost, it offers a simple means of making nasotracheal intubation safer and merits routine consideration in maxillofacial anaesthesia.

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