

## A randomized clinical trial of nasogastric tube insertion in intubated patient: comparison between finger method and reverse Sellick maneuver

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### ABSTRACT

**BACKGROUND** Finger method is a new simple technique of nasogastric tube (NGT) insertion for intubated patients which only requires the practitioner's own fingers. This study was aimed to compare the feasibility of finger method and the standard reverse Sellick maneuver in NGT insertion for intubated patients

**METHODS** This was a single-blinded, randomized clinical trial that included 210 patients aged 18–65 years old who were intubated under general anesthesia and needed NGT insertion. Initially, subjects were randomly allocated by the third party into two groups: subjects who had NGT insertion with finger method and those with reverse Sellick maneuver. Success rate of NGT insertion at the first attempt, duration of the procedure, and complication rate of blood spots were all recorded. Chi-square test and Mann–Whitney analysis were used to analyze the data.

**RESULTS** Success rate of NGT insertion at the first attempt in finger method group was higher in comparison with reverse Sellick maneuver group (81.6% versus 60%, respectively,  $p = 0.002$ ). Likewise, the median of NGT insertion duration was longer in finger group compared to reverse Sellick maneuver group (13 sec versus 12 sec, respectively,  $p < 0.001$ ) but it was not clinically significant. Moreover, the complication rate of blood spots found during the procedure was lower in subjects with finger method than with reverse Sellick maneuver (10.7% versus 28%, respectively,  $p = 0.003$ ).

**CONCLUSIONS** Using finger method was more feasible than reverse Sellick maneuvers in NGT insertion.

**KEYWORDS** finger, nasogastric, reverse Sellick

Insertion of nasogastric tube (NGT) in intubated patients under general anesthesia is a challenging procedure. Esophageal closure as a result of endotracheal tube compression and patient's inability to swallow make the procedure difficult to perform.<sup>1</sup> NGT during its advancement will most commonly be impacted in the piriform sinus or arytenoids cartilage and get twisted or flexed.<sup>2</sup>

Reverse Sellick maneuver is the most common NGT insertion technique in intubated patients. This method is easy to perform and has a fairly high success insertion rate (77.5%), short procedure time (13.05 ± 2.57 sec), and a low complication rate.<sup>3</sup> Reverse Sellick maneuvers, along with its limitation, is difficult to perform in patients with cervical collar-neck trauma, in patients with anterior cervical mass, and in patients

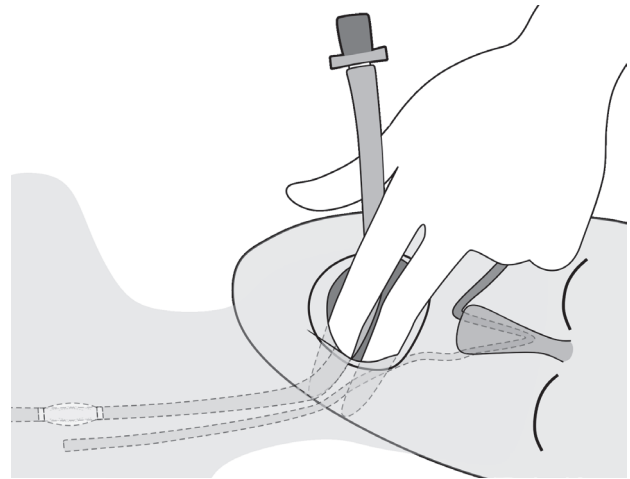
which there is difficulty in moving cricoid cartilage anteriorly.<sup>4-6</sup>

Finger method is a new NGT insertion technique in anesthetized intubated patients that had been found in Cipto Mangunkusumo Hospital. Finger method is simple and easy to perform as it only requires the practitioner's own fingers and has a fairly high success rate of 90%. This study was aimed to compare the feasibility of NGT insertion in the intubated patient, based on the success rate of insertion, the duration of procedure, and the complication rate of blood spots, between the finger method and reverse Sellick maneuver.

## METHODS

This was a single-blinded, randomized clinical trial study, performed at the Integrated Surgery Unit of Cipto Mangunkusumo Hospital from February to April 2017. The study was done after approval from the Research Ethical Committee of the Faculty of Medicine Universitas Indonesia (No: 117/UN2.F1/ETIK/2017) and preoperative informed consent had been signed. Confidentiality of the subjects was respectfully kept and their data were used for the study only. In total, 210 subjects aged 18-65 years old who were anesthetized, intubated, and needed NGT insertion were included in this study. On the other hand, subjects with maxillofacial, esophageal, airway, and neck abnormalities, patients with contraindications to NGT insertion, and obese patients with BMI > 30 were excluded from this study. Similarly, subjects were dropped out from this study if there were traumatic endotracheal intubation and allergic reactions during induction. However, harmful effects were not found during the study. All subjects were recruited consecutively and randomly allocated by the third party into two groups: the finger method group and the reverse Sellick group. Concealment was done using a closed envelope, and all of the procedure were done by a senior anesthesiology resident, who has proven competency in NGT insertion for anesthetized intubated patients using both techniques, with successful insertion for each technique at least five times.

After all subjects were being anesthetized and intubated, NGT (Terumo®, size 14Fr) at room temperature were inserted. The length of the NGT inserted was measured before the procedure by



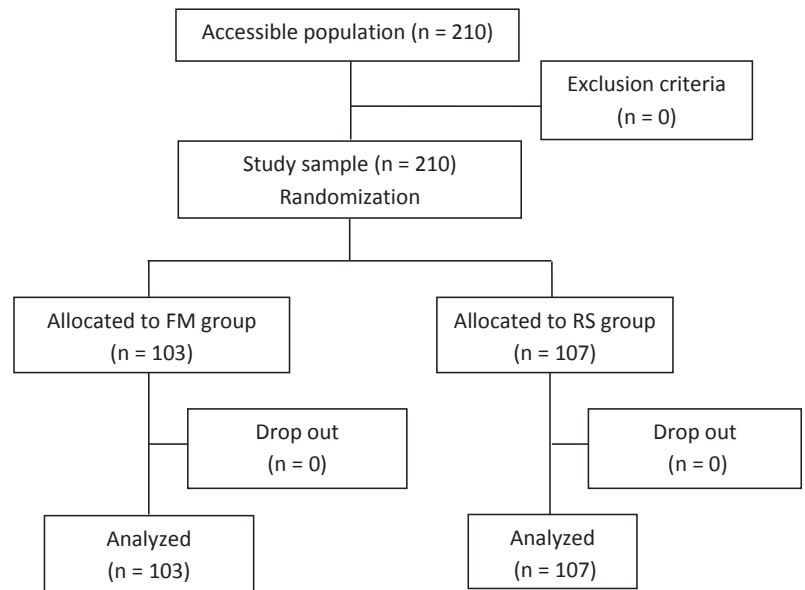
**Figure 1.** Finger method in supporting nasogastric tube (NGT) insertion for intubated patients under general anesthesia

adding the distance from the xiphoid process to the ear hole plus the distance from the ear hole to the tip of the nose plus 15 cm. In all subjects, before and during the NGT insertion procedure, endotracheal tube (ETT) cuff were deflated.

In the finger method group, on the one hand, the NGT was inserted through the predetermined nostrils perpendicularly using the dominant hand and was pushed slowly down to the oropharynx. Then, both the index and middle fingers of the nondominant hand were inserted into the oral cavity until the bottom of the oropharynx was reached and the tip of the NGT was palpable as shown in Figure 1. The NGT was then fixated in the center and at the bottom of the oropharynx, as close as possible to the esophageal opening, and pushed forward then to the esophageal opening, down to the esophagus until the desired depth was achieved. Subsequently, the endotracheal tube balloon was then reinflated.

In the reverse Sellick group, on the other hand, the NGT was inserted through the predetermined nostrils perpendicularly using the dominant hand and was pushed slowly down until it passes through the first resistance in the nasopharynx. The cricoid cartilage was then pulled upward so that the larynx would move anteriorly. The NGT was continuously pushed down the esophagus until the desired depth was achieved. Following that, endotracheal tube balloon was then reinflated.

Positive auscultation of epigastric air churning after 20 cc aerial bolus through NGT would confirm the successful insertion of NGT. The NGT insertion



**Figure 2.** Diagram of subjects recruitment in finger method and reverse Sellick maneuver. FM=finger method; RS=reverse Sellick maneuver

procedural time was recorded from the moment the NGT tip passed the nostril until the NGT depth limit reached the nostril. If the first attempts failed, then further attempts were made, using the same technique. Complications of blood spots observed during the procedure were recorded.

The feasibility of NGT insertion was assessed based on the three criteria: (a) higher success rate of NGT insertion at the first attempt, (b) shorter duration of NGT insertion at the first attempt, and (c) lower complication of blood spots at the first attempt. Data were processed using SPSS software, version 20 (IBM Corp, USA). Chi-square test would be used for the success rate and complication rate analysis, while the *t*-test or Mann–Whitney test would be used for NGT insertion time analysis.

## RESULTS

A total of 210 subjects who met the inclusion criteria and signed the informed consent were recruited for this study and divided into two groups: 103 patients were in the finger method group and 107 patients were in the reverse Sellick group as shown in Figure 2.

The demographic characteristics of the subjects between the two groups were showed in Table 1. There was no difference in the subjects’ demographic characteristics between the finger method and the reverse Sellick groups; therefore, both groups were comparable.

Table 2 shows the success rate at the first, second, and cumulative attempt of NGT insertion was higher in

**Table 1.** Subject characteristics

Characteristics	Finger method (N = 103)	Reverse Sellick (N = 107)
Age (years), mean (SD)	43.51 (13.11)	44.64 (12.87)
Male sex, n (%)	36 (34.9)	37 (34.5)
BMI, mean (SD)	23.78 (3.30)	23.41 (3.01)

SD=standard deviation; BMI=body mass index

the finger method group compared with the reverse Sellick group. The median of NGT insertion procedural time at the first, second, and cumulative attempt was longer in the finger method group (13 sec) compared with the reverse Sellick group. The incidence of complications of blood spots on NGT insertion can be visualized immediately after insertion. Blood spots complication rate was lower in the finger method group (10.7%) compared with the reverse Sellick group (28%) as shown in Table 3.

## DISCUSSION

NGT insertion success rate on the first attempt in the finger method group (81.6%) was significantly higher than the reverse Sellick group (60.7%) as shown in Table 2. The high success rate in the finger method group might happen due to NGT fixation by the finger when being pushed forward down to the esophagus. Generally, the fixed NGT would be hard to kink during its advancement in the first attempt. Marsaban et al<sup>7</sup> in Cipto Mangunkusumo Hospital, Jakarta, Indonesia, found that reverse Sellick

**Table 2.** Comparison of success rate and duration of nasogastric tube insertion at the first, second, and cumulative attempt in intubated patients between FM and RS maneuver

Variables	Groups, n (%)		p	
	FM (N = 103)	RS (N = 107)		
First attempt	Success	84 (81.6)	65 (60.7)	<b>0.002*</b>
	Failure	19 (18.4)	42 (39.3)	
Duration (sec)	13 (10-15)	12 (9-15)	<b>&lt;0.001<sup>†</sup></b>	
Second attempt	Success	9 (47.4)	7 (16.7)	<b>0.027*</b>
	Failure	10 (52.6)	35 (83.3)	
Duration (sec)	15 (14-15)	13 (11-15)	<b>0.016<sup>†</sup></b>	
Cumulative attempt	Success	93 (90.3)	72 (67.3)	<b>&lt;0.001*</b>
	Failure	10 (9.7)	35 (32.7)	
Duration (sec)	13 (10-15)	12 (9-15)	<b>&lt;0.001<sup>†</sup></b>	

FM=finger method; RS=reverse Sellick maneuver

The duration value is expressed in median (min-max). \*Chi-square test with continuity correction; <sup>†</sup>Mann-Whitney test; p was significant if <0.05

maneuver could increase the success rate of NGT insertion in intubated patients in comparison with the standard technique (76.2% versus 44.6%). Thus, finger method in this study might have surpassed the success rate of reverse Sellick maneuver performed by Marsaban et al.<sup>7</sup>

Several factors that can improve the success rate of NGT insertion in intubated patients are the NGT's size adjustment, rigidity, and temperature.<sup>8-10</sup> Notedly, the larger the NGT size, the more rigid the nasogastric tube will be. Concurrently, this will increase the success rate of NGT insertion.<sup>10</sup> Likewise, a cooled NGT will increase its rigidity and thus will also increase the success rate of the NGT insertion.<sup>8</sup> Besides, the use of lubrication in NGT insertion might provide higher success rate with reduced pain. Moreover, the additional use of topical anesthetics could provide fewer complications.<sup>11</sup> In this study, the NGT that had been used had the same rigidity (Terumo®, size 14Fr, room temperature with adequate lubrication). All factors, except the two maneuvers being compared,

**Table 3.** Comparison of complication of blood spots of nasogastric tube insertion in intubated patients between finger method and reverse Sellick maneuver

Groups (N = 210)	Complication of blood spots		p*
	Positive	Negative	
Finger method, n (%)	11 (10.7)	92 (89.3)	<b>0.003</b>
Reverse Sellick, n (%)	30 (28.0)	77 (72.0)	

\*Chi-square test with continuity correction; p is significant if <0.05

that might contribute to the success rate of NGT insertion have been applied to both groups.

In the second attempt, the success rate of NGT insertion with finger method was 47.4% higher in comparison with the reverse Sellick maneuver which was 16.7%. The lower success rate of NGT insertion in the second attempt for both groups might be due to the NGT memory effect.<sup>9</sup> The NGT had a hole at one side of the tip, causing weakness of the NGT tip so that the NGT end would tend to kink easily if impacted.<sup>8</sup> Likewise, the kinked section of the NGT, due to the first attempt fail insertion, would tend to kink back in the same section on the second NGT insertion attempt. The finger method, however, could be considered to have the ability to resolve the memory effect in the second NGT insertion attempt, as it had a higher success rate of NGT insertion at the second attempt compared with the reverse Sellick method. The NGT was fixated well at the esophageal opening by the practitioner's fingers and move slowly forward down into the esophagus with the fingers' guidance so that kinking of the tip could be avoided. In the cumulative attempt, by adding the first and second attempts, a corresponding result was founded. The success rate of NGT insertion using the finger method (90.3%) was significantly higher than the reverse Sellick maneuver (67.3%).

The median NGT insertion procedural time in the first attempt of the finger method was longer than the reverse Sellick maneuver ( $p < 0.001$ ). Though there

was a significant difference between the duration of insertion in both techniques, clinically the duration difference for about 1–2 sec could be considered not significant. Hence, it can be said that the duration of NGT insertion in intubated patients using the finger method compared to the reverse Sellick maneuver was equivalent. The median NGT insertion procedural time in the second attempt of the finger method was longer than the reverse Sellick maneuver ( $p = 0.016$ ), but also clinically there was no significant difference (15 sec versus 13 sec). The longer time needed in the finger method group might be due the longer time needed to insert the finger into the mouth and fix the tip of the NGT right at the entrance of the esophagus. During fixation, kinking and coiling could also be immediately felt by the finger at the time of insertion; therefore, there was additional time needed for pulling it slightly and re-pushing it back.

The finger method had a lower blood spot complication rate compared with the reverse Sellick maneuvers. This might be due to the lower rate of NGT coiling or kinking in the finger method. Coiling or kinking of the NGT would result in nasopharyngeal or oropharyngeal lining trauma, characterized by the presence of blood spots.<sup>5,6</sup>

However, there are several limitations in this study. There was no subject classification based on prediction difficulty of NGT insertion preoperatively, i.e., opening oral cavity, the distance between mentohyoid and thyrohyoid, and others. Also, the finger length of the practitioners was not measured in which short fingers would be more difficult to reach the oropharynx base.

In conclusion, NGT insertion in intubated patient using the finger method was more feasible than the reverse Sellick maneuver because it has a higher success rate and lower blood spots complication, although not clinically difference in the duration of insertion.

#### Conflicts of Interest

The authors affirm no conflict of interest in this study.

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