Split Endotracheal Tube as a Guide Tube for Gastric Tube Insertion in Anesthetized Patients: A Randomized Clinical Trial

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Abstract

Background: Occasionally inserting a gastric tube in anesthetized or unconscious patients may be difficult or failed. Various techniques have been explained to resolve the problem. In a randomized clinical trial, we studied the efficacy and safety of a new method for orally gastric tube insertion in anesthetized patients.

Methods: Along a 5-month period, 90 adult patients candidate of cardiac surgery randomly allocated in three groups due to methods of gastric tube insertion. Fifteen minutes after anesthesia induction, gastric tube was inserted nasally (NGT group, n=30), simply orally (OGT group, n=30) or orally via an uncuffed split endotracheal tube size 6.0 mm (ETT group, n=30). The success rate, time consumption, hemodynamic changes and complication rates were compared between three groups.

Results: Two patients were excluded from the study, because of long intubation time. Demographic and preoperative characteristics were comparable between three groups. Hemodynamic changes due to procedure were not different. Time required for tube insertion in ETT group was significantly shorter than the other two groups (80.60 ± 66.132 sec versus 124.09 ± 100.055 and 139.77 ± 80.363 sec in NGT and OGT groups, respectively) (p=0.012). Success rate was significantly high in ETT group comparing to other two groups (100 percent in ETT group versus 77 and 86 percent in NGT and OGT groups, respectively) (p=0.008). The ETT method was used when procedure was failed in other two methods. Complication rates were not different between three groups and the most common complication was sore throat/odinophagia (17%). Hemorrhagic problems were seen in 5, 3 and one patients in NGT, OGT and ETT groups, respectively.

Conclusions: Using a split endotracheal tube, as a guide tube, is an effective, fast and safe method for orally insertion of a gastric tube in anesthetized or unconsciousness patient. (J Cardiovasc Thorac Res 2009; Vol.1 (1): 17-22)

Keywords: Gastric tube● Nasogastric tube● Orogastric tube● Anesthetized patient● Insertion method

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Introduction

Gastric tube (GT) placement is a common procedure in both medical and surgical practice. It can be placed either nasally or orally. In most cases, nasogastric route is used as a “push and swallow” technique. This technique mainly relies on the patient being conscious and cooperative. Occasionally insertion of a GT can be a difficult and frustrating experience, especially in patients who are anesthetized, paralyzed and sedated.1,2 Many techniques have been explained to improve success rate along with increasing safety, 3-7 such as forward displacement of the larynx, tube rigidity improvement methods, pushing it down directly through pharynx or using a guide tube. In 1980, Sprague8 explained using a split endotracheal tube, as a guide tube, for nasogastric tube insertion. Similarly, we used a split endotracheal tube as a guide tube for orogastric tube insertion in adult anesthetized patients. We studied efficacy and safety of this method comparing to routine nasogastric and orogastric methods in a randomized clinical trial. Patients all were candidate of cardiac surgery by cardiopulmonary bypass.

Methods

After approval from the our local institutional ethics committee and obtaining written preoperative informed consent, in about a 5 month period, from May to November 2008, ninety adult patients who were candidate for elective cardiac surgery using cardiopulmonary bypass, in a university hospital (Madani Heart Center, Tabriz - Iran), were studied prospectively. Patients were randomly allocated into one of the three groups according to the methods of GT insertion. GT was placed nasally (NGT group, n=30), simply orally (OGT group, n=30) or orally through a split endotracheal tube in (ETT group, n=30). Exclusion criteria were difficult intubation, bleeding diathesis, renal or hepatic disease, age below 18 years old and American Society of Anesthesiologists physical Status IV (ASA class IV), patients with ejection fraction ≤ 30%, NYHA functional class ≥ III. An oral diazepam 10 mg the night before the surgery and IM morphine sulfate 0.1 mgkg⁻¹ plus promethazine 0.5 mgkg⁻¹, approximately one hour before transferring to operating theater, was administrated to all patients as premedication. After peripheral venous and arterial catheterization, anesthesia was induced with intravenous injection of the midazolam 0.1 mgkg⁻¹, fentanyl 5-8 µgkg⁻¹ and cisatracurium 0.15 mgkg⁻¹. Fifteen minutes after tracheal intubation, a well-lubricated 14 French gastric tube at room temperature (Nasogastric tube, lot number 61812, SUPA Medical Device, IRAN) was placed by the attending anesthesiologist. The responsible anesthesiologist was asked that the first attempts should be according to the predefined method, but it can be switched to any other methods if the procedure was failed after two attempts, depending on the anesthesiologist preference. In NGT group, a lubricated gastric tube was placed simply nasally and in OGT, it was placed simply orally. In ETT group, using direct laryngoscopy, first a well lubricated (both inner and outer surface) split endotracheal tube was placed in upper esophageous. The split endotracheal tube was prepared by creating a split at full length (anterior surface) of an uncuffed endotracheal tube (size 6.0). At second stage, the GT was conducted down through the split tube up to a proper length (55 cm in female and 65 cm in male patients). Finally, along with fixing the gastric tube, the split tube was removed out of mouth (Fig.1).

Figure 1- four stages of gastric tube insertion by a split guide tube: 1- an uncuffed endotracheal tube is made as a split guide tube 2- the well lubricated guide tube is placed in upper esophageous by direct laryngoscopy in anesthetized patient 3- a 14 F gastric tube is placed through it 4- finally along with fixing gastric tube the split tube is removed
Anesthesia maintenance, hemodynamic management and cardiopulmonary bypass managed as routine. Invasive arterial and central venous blood pressure, 5-lead ECG, pulse oximetry, end tidal capnography, nasopharyngeal temperature monitoring and arterial blood gas analysis performed as a routine practice. Gastric tube insertion was defined successful if it was placed in up to two attempts. Hemodynamic changes, surgery characteristics, success rate and number of attempts, the time required for procedure (the consumed time from starting up to confirmation by auscultation) and intra/post-operative complications were recorded. Data were analyzed using SPSS software (version 11.5, SPSS Inc., Chicago, IL, USA). Normal distribution of continuous data was tested by Shapiro-Wilk test. Pearson's chi-square, Fisher's exact and Mann-Whitney's tests were applied to compare categorical variables or continuous variables with non-normal distributions. ANOVA test was used to compare normally distributed continuous variables between groups. Statistical analyses performed with a confidence interval of 95% and were considered two-tailed. Data differences were considered statistically significant at a P value ≤ 0.05.

Results

Two patients were excluded from the data analysis because of long intubation period (≥24 hours). Demographic and perioperative characteristics were comparable between three study groups (Table 1). Hemodynamic changes at various times after GT insertion were comparable between three groups (Fig. 2 and 3). The required time for gastric tube insertion in ETT group was significantly less than other two groups (80.60 ± 66.132 sec versus 124.09 ± 100.055 and 139.77 ± 80.363 sec in NGT and OGT groups, respectively with a p-value of 0.012) (Table 2).

<table>
<thead>
<tr>
<th>Gender (male/female)</th>
<th>NGT group (n=30)</th>
<th>OGT group (n=29)</th>
<th>ETT group (n=29)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>22/8</td>
<td>18/11</td>
<td>21/8</td>
<td>0.774</td>
</tr>
<tr>
<td>Age</td>
<td>58.45 ± 11.346</td>
<td>55.45 ± 10.032</td>
<td>59.15 ± 9.894</td>
<td>0.415</td>
</tr>
<tr>
<td>(42 - 80)</td>
<td>(39 - 74)</td>
<td>(37 - 77)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>69.41 ± 13.287</td>
<td>72.18 ± 14.173</td>
<td>68.03 ± 11.569</td>
<td>0.140</td>
</tr>
<tr>
<td>(50 - 93)</td>
<td>(52 - 101)</td>
<td>(49 - 94)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td>167.41 ± 10.234</td>
<td>165.41 ± 8.362</td>
<td>162.21 ± 8.499</td>
<td>0.103</td>
</tr>
<tr>
<td>(147 - 183)</td>
<td>(153 - 179)</td>
<td>(144 - 178)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CABG/AVR- MVR/Others</td>
<td>17/10/5</td>
<td>19/6/4</td>
<td>21/6/2</td>
<td>0.728</td>
</tr>
<tr>
<td>Basic heart rate</td>
<td>71.23 ± 13.522</td>
<td>74.00 ± 8.740</td>
<td>73.79 ± 14.251</td>
<td>0.057</td>
</tr>
</tbody>
</table>
| Basic arterial       | NGT: gastric tube was inserted nasally | OGT: gastric tube was inserted orally | ETT: gastric tube was inserted via a guide tube (endotracheal tube)
| pressure             | NGT group: gastric tube was inserted nasally | OGT group: gastric tube was inserted orally | ETT group: gastric tube was inserted via a guide tube (endotracheal tube)
|                      | CABG = Coronary Artery Bypass Graft surgery |

![Figure 2](image2.png)

**Figure 2** - Heart rate at various times of pre and post procedure

![Figure 3](image3.png)

**Figure 3** - Pre and post procedure mean arterial blood pressure at various times
Success rate in was 73, 79 and 100 percent in NGT, OGT and ETT groups, respectively and significantly was high in ETT group comparing to other two groups (p=0.008). In patients, that the procedure was failed (NGT or OGT groups) anesthesiologists preferably used ETT method in second step with 100% success rate and a consumption time of 78.14 ± 32.29 sec, thus ultimately in 44 patient’s gastric tube was inserted using ETT method. Digital assistance was used in 50 and 34 percent of NGT and OGT groups, respectively. Complications rate were not different between three groups (Table 2).

### Table 2 - Characteristics of three gastric tube insertion methods

<table>
<thead>
<tr>
<th></th>
<th>NGT group (n=30)</th>
<th>OGT group (n=29)</th>
<th>ETT group (n=29)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Consumed time when successful (sec)</strong></td>
<td>124.09 ± 100.05 (45-480)</td>
<td>139.77 ± 80.36 (30-300)</td>
<td>80.60 ± 46.13 (20-180)</td>
<td>0.012 *</td>
</tr>
<tr>
<td><strong>Success rate</strong></td>
<td>22/30 (73%)</td>
<td>23/29 (79%)</td>
<td>30/30 (100%)</td>
<td>0.008 *</td>
</tr>
<tr>
<td><strong>Digit assistance</strong></td>
<td>15 (50%)</td>
<td>10 (34%)</td>
<td>0</td>
<td>0.001 *</td>
</tr>
<tr>
<td><strong>Hemorrhage/Bloody gastric contents</strong></td>
<td>5 (17%)</td>
<td>3 (10%)</td>
<td>1 (3%)</td>
<td>0.075</td>
</tr>
<tr>
<td><strong>Sore throat/odinophagia</strong></td>
<td>7 (23%)</td>
<td>6 (21%)</td>
<td>5 (17%)</td>
<td>0.7</td>
</tr>
</tbody>
</table>

NGT group: gastric tube was inserted nasally  
OGT group: gastric tube was inserted orally  
ETT group: gastric tube was inserted via a guide tube (endotracheal tube)  

Data are mean ± standard deviation (95% Confidence Interval for Mean) or numbers  
*Significant difference between ETT group with NGT (p=0.101) and OGT (p=0.016) groups  
† The consumed time and success rate in chosen second method when the first method became fail

The most common complication was sore throat/odinophagia (20%). Hemorrhagic problems were seen in 5, 3 and one patients in NGT, OGT and ETT groups, respectively, that was easily controlled spontaneously without any intervention.

### Discussion

Gastric tube placement (GT) is a commonly used procedure during major surgeries such as cardiac surgery. In conscious and cooperative patients, usually nasal route it used as a “push and swallow” technique, along pushing forward, the patient was asked to swallow it down. This technique mainly relies on a patient who must be cooperative. Thus, insertion of a GT in anesthetized, paralyzed, or intubated patients may be difficult or needs more attempts. Repeated attempts increase injury to the nasal and pharynx mucosa or larynx and cause bleeding or hoarseness. Ozer and Benumof have found that the most common sites of impaction of orogastric and nasogastric tubes at laryngeal level are pyriform sinuses and the arytenoids cartilages, rendering its coiling in the oropharynx. Many techniques have been explained in purpose of to resolve this problem and aiding tube insertion to the upper esophageous. Forward displacement of the larynx (Reverse Sellick's maneuver), increasing tube rigidity methods such as cooling it by ice water, directly pushing it down (Digital assistance technique or various kinds of forceps), neck flexion or turning laterally, Seldinger technique, endotracheal tube cuff deflation or using a guide tube all can help tube improvement in the esophageous. Reverse Sellick's maneuver can create a funnel shaped structure along with opening the upper esophageal sphincter, facilitates tube insertion to esophageous. As about GT, this maneuver was used safely in transesophageal echocardiographic probe placement. Various methods of digital assistance technique were explained. Direct visualization of the hypopharynx by a laryngoscope and then pushing the GT down with a Magill forceps may be helpful. Endotracheal tube cuff deflation may decrease gastric tube coiling rate in the oropharynx. There are reports that insertion of a nasogastric tube in tracheally intubated patients can be facilitated using a GlideScope. Flexibility of the NGT significantly affects success rate. A rigid tube requires fewer insertion attempts than a flexible tube. Thus, many methods for improving tube rigidity were explained.
guide tube can be used in purpose to increase tube rigidity. We used an uncuffed endotracheal tube as a guide tube for orogastric tube insertion. Sprague\(^8\) described such method for nasogastric tube insertion in 1980. At first, he passed down a nasogastric tube through the nose and then pulled out it through the mouth. At second stage, a split endotracheal tube was placed in upper esophageous and the tip of the nasogastric tube is then threaded into it up to ensure passage down the esophageous and finally the guiding endotracheal tube is removed. In adult cardiac surgery, gastric tube was removed postoperatively, usually at the time of the tracheal extubation. Thus, both nasal and oral routes may be acceptable. In this randomized study we showed that orally gastric tube placement, using a split uncuffed endotracheal tube as a guide tube, is a simple, effective, fast, safe and non-traumatic and non-stressful method, with 100% success rate for GT placement in anesthetized patients. Probably this method can be used safely in other situations such as ICU or emergency wards where the patient may be unconsciousness, incorporated or sedated.

Many complications may occur due to traumatic GT placement including nasal and pharyngeal mucosal injury, bleeding and postoperative vomiting and discomfort. Even esophageal perforation was reported when GT placement was traumatic.\(^{19-20}\) In cardiac surgery usually patients are fully heparinized before going on cardiopulmonary bypass and any mucosal injury or bleeding cause major problems comparing to other situations. Thus developing of safe and non-traumatic methods to facilitate GT insertion has important clinical issue in cardiac surgery. In our study complications rate were not different between three groups. Hemorrhagic problem was seen only in one of the ETT group patients that was easily controlled spontaneously without any intervention. Thus, it seems that split endotracheal tube method is a safe and non-traumatic method as other routine methods with good success rate. The most common complication that our patients experienced was sore throat/odinophagia (17%). Same finding was reported by other studies.\(^{21-23}\) also roll of the relatively long tracheal intubation must not be ignored.\(^{24-25}\)

**Conclusion**

In summary, this study showed that using a split endotracheal tube, as a guide tube, is an effective, fast and safe method for orally insertion of a gastric tube in anesthetized or unconsciousness patient.

**References**

1. Bong CL, Macachor JD, Hwang NC. Insertion of the nasogastric tube made easy. *Anesthesiology* 2004;101:266.