Journal of Cardiovascular Disease Research
ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 12, 2024

Nasogastric Tube Insertion in Anesthetized and Intubated Patients Using Reverse Sellick's Maneuver and Lateral Head Position Method: An observational study

Dr. Junaid Jeelani[1], Dr. Showkat Ahmad Wani[2], Dr. Asif Hussain[3*]

[1]Senior Resident, Department of Anaesthesiology and Critical Care, Government Medical College Anantnag, India.
[2]Senior Resident, Department of Anaesthesiology and Critical Care, Government Medical College Anantnag, India.
[3*]Senior Resident, Department of Anaesthesiology and Critical Care, Government Medical College Anantnag, India.

***Corresponding Author:** Dr. Asif Hussain
*Senior Resident, Department of Anaesthesiology and Critical Care, Government Medical College Anantnag, India. Mail id: drasifhussain2020@gmail.com

Abstract
Background: Nasogastric tube (NGT) insertion in anesthetized and intubated patients is a common yet challenging procedure due to anatomical and physiological changes during general anesthesia. Various techniques, including conventional, lateral head positioning, and reverse Sellick's maneuver, have been proposed to improve success rates and minimize complications. However, there is limited comparative evidence on the efficacy and safety of these techniques.
Aim: To compare the efficacy, success rates, time taken, and complications of three NGT insertion methods, 1, conventional technique, 2, lateral head position technique, and 3, reverse Sellick's maneuver in anesthetized and intubated patients.
Methods: A prospective, observational study was conducted in the Department of Anesthesiology, at Government Medical College Anantnag, India. A total of 90 patients undergoing general anesthesia with endotracheal intubation were divided into three equal groups (30 each), Group C (Conventional technique), Group L (Lateral head position technique), and Group S (Reverse Sellick's maneuver). Data collected included patient demographics, nasogastric tube insertion success rates, number of attempts, time taken, and complications if any were noted.
Results: The reverse Sellick's maneuver demonstrated the highest success rate on the first attempt (89%), followed by the lateral head position technique (78%) and the conventional technique (72%). Mean time taken for insertion was lowest in the reverse Sellick's maneuver group (23.31±8.11 sec). Complications, including mucosal trauma and hemodynamic disturbances, were significantly lower in the reverse Sellick's group.
Conclusion: The reverse Sellick's maneuver is a superior method for NGT insertion in anesthetized and intubated patients due to its higher success rates, reduced insertion time, and lower complication rates.

Keywords: General anesthesia, Intubated patients, Nasogastric tube, Reverse Sellick's maneuver, Lateral head position, complications

Introduction:

The insertion of a nasogastric tube (NGT) is a commonly performed procedure during laparoscopic or major abdominal surgeries. In patients who are anesthetized and intubated, the gastric tube may become coiled within the oral cavity due to the inability to swallow and the presence of an inflated cuff in the proximal trachea. Additionally, the flexible nature of the nasogastric tube can lead to coiling and unsuccessful placement. The non-opposing lateral openings near the tip may contribute

to kinking of the NGT and, in rare instances, result in misplacement into the respiratory tract. [1] Repeated attempts at insertion heighten the risk of injury to the pharyngeal or laryngeal structures. [2]

The traditional method for nasogastric tube (NGT) insertion involves a blind technique, with the patient's neck maintained in a neutral position and without any external manipulation of the larynx. Nevertheless, numerous studies have indicated that this conventional approach is associated with lower success rates, often below 50%, on the initial attempt, as well as a higher incidence of complications. [3,4,5]

Numerous techniques facilitate the insertion of a nasogastric tube (NGT), such as the SORT maneuver, Neck Flexion with Lateral Pressure (NFLP), the use of a frozen NGT, and assistance from an endoscope or forceps. Additional methods include the use of a stylet, a split endotracheal tube, and techniques involving an angiography catheter or esophageal guidewire. [6-13] Despite its seemingly straight forward nature, NGT insertion is an invasive procedure that often requires multiple attempts, which can lead to complications such as kinking, knotting, bleeding, and in some cases, unsuccessful attempts. [4]

There is an increasing interest in non-device-based techniques for nasogastric tube (NGT) insertion, particularly when evaluating feasibility and cost-effectiveness. It has been observed that the majority of challenges encountered during NGT insertion stem from anatomical factors. Therefore, to enhance insertion efficiency and reduce the risk of iatrogenic complications, it is essential to take anatomical variations into account during the procedure. Parris WC proposed a technique known as the Reverse Sellick's maneuver, which involves lifting the cricoid cartilage anteriorly for NGT placement. [14]

Additionally, Bong introduced the Lateral Head Position method, which manipulates the neck, chin, jaw, or larynx. Initial outcomes indicated that this method yields superior results compared to conventional techniques. [3]

Methods:

A prospective observational study was initiated following the approval from the Institutional Ethics Committee and after securing written informed consent from the participants. Those who met the inclusion criteria were enrolled in the study. Prior to surgery, all patients underwent a thorough pre-anesthetic evaluation, which included a comprehensive medical history, a physical examination, and the appropriate diagnostic investigations.

The patient was assigned to one of three study groups following randomization. In Group C, nasogastric tube insertion was performed using the conventional technique (control). Group L utilized the lateral head position method for nasogastric tube insertion, while Group S employed the Reverse Sellick's maneuver for the procedure.

The patient's height, weight, body mass index (BMI), and Modified Mallampati grade were recorded. Patients were instructed to fast for eight hours prior to surgery. Each individual received anti-aspiration prophylaxis, which included oral ranitidine (150 mg) and metoclopramide (10 mg), administered. Pre-operatively, the nostril designated for nasogastric tube insertion was selected based on the degree of fogging observed on a metal tongue depressor during exhalation.

In the operating room, standard monitoring including continuous ECG, non-invasive blood pressure and continuous pulse oximeter were instituted. Patients were positioned on the operating table in the supine position. Heart rate, blood pressure and SpO2 were noted. Intravenous access was secured on a forearm vein with an 18 gauge/20 gauge I.V cannula. Patients were induced with Inj. Propofol 2mg/kg, Inj. Fentanyl 1.5 mcg/ kg and Inj. Vecuronium 0.1mg/kg was given for muscle relaxation. Trachea was intubated with cuffed ET tube 8.0 mm ID (male patients) and with 7.0 mmID (female patients).

Intra-operatively anaesthesia was maintained with 33% oxygen with N2O and sevoflurane. Baseline HR, MAP and SPO2 were noted just before insertion of NGT. Vasoconstriction of the selected nares was done by using 0.05% oxymetazoline nasal drops. The distal end of the NG tube

was lubricated in all cases and inserted into the selected nostril. After this NGT was inserted according to the technique of the designated group to which the patient belongs.

The insertion length of the NGT in each patient was calculated by measuring the distance from tip of nose to xiphisternum via tragus of ipsilateral ear (nose-tragus-xiphisternal distance). A 16fr nasogastric tube was used in all the patients. All the NGT insertions in all groups were done by a single operator to remove the operator bias. The operator was trained in all the three methods and would have performed at least 20 successful NGT insertions with each method prior to the start of the study.

In Group C (control), nasogastric tube was inserted with head in neutral position. No external laryngeal manipulation, change in head position, instrumental assistance was done. In Group L (Lateral Head Position method), the patient's head was turned to the same side as the selected nostril, and the nasogastric tube was inserted through the chosen nostril without any additional manipulations of the neck, chin, jaw, or larynx. In Group S (Reverse Sellick's manoeuvre), head of the patient was in neutral position and cricoid cartilage of the patient was displaced anteriorly to facilitate the nasogastric tube passage.

Confirmation of placement of the NGT in all groups was done by auscultation of gurgling sound at epigastrium by pushing 20ml air through the NGT. If gurgling sound was not present or if we were not able to complete the process of insertion due to resistance etc. then that attempt was considered as failed attempt and counted in the number of attempts. After the failed attempt, again the insertion was done by the same technique. A maximum of two attempts were allowed for insertion. Any technique not having successful insertion after two attempts was considered failure of technique. Then the NGT was then inserted using Laryngoscope and Magill forceps.

Time for insertion was calculated as from the placement of tip of NGT at the external nares till the time of confirmation of NGT placement by auscultating gurgling sound at epigastrium. Time between the attempts used for cleaning of NGT and applying the lubricant jelly was not counted in insertion time. Insertion time for each attempt (if there were more than one attempt) was added to calculate the total time of insertion.

After completion of NGT insertion, oropharynx was examined by opening the mouth for any mucosal bleeding, oral trauma etc. These complications were noted if any.

STATISTICAL ANALYSIS

Statistical analysis was performed utilizing the Statistical Package for the Social Sciences (SPSS) version 17.0. Continuous variables were summarized as mean values, while categorical variables were reported as frequencies and percentages. The comparison of continuous variables with a normal distribution across groups, based on mortality, was executed using Student's t-test. For continuous variables that did not follow a normal distribution, the Mann-Whitney U test was employed. The comparison of nominal categorical data between groups was carried out using either the Chi-squared test or Fisher's exact test, as deemed appropriate. A p-value of less than 0.05 was considered indicative of a statistically significant difference.

Results:

The research included 90 patients who were randomly assigned to three groups, with 30 individuals in each group. The patients exhibited comparable dimorphic profiles across all three study groups, as illustrated in [Table 1].

Table 1: Demographic and Clinical Characteristics

Parameter	Group C: Conventional (n=30)	Group L: Lateral Head Position (n=30)	Group S: Reverse Sellick's Maneuver (n=30)	p-value
Age (mean ± SD, years)	44.2 ± 10.3	45.7 ± 9.8	45.1 ± 10.0	>0.05
Gender (Male/Female)	16/14	13/17	14/16	>0.05
Weight (mean ± SD, kg)	66.4 ± 8.5	65.2 ± 7.9	66.9 ± 8.2	>0.05
Height (mean ± SD, cm)	166.3 ± 6.2	165.8 ± 5.9	164.6 ± 6.4	>0.05
ASA I/II	20/10	21/09	18/12	>0.05
Modified Mallampati Score I/II/III	14/10/6	15/9/6	15/11/4	>0.05

Rate of successful insertion in Group L and Group S was higher in comparison to Group C and the difference between the groups was statistically significant (p-value <0.05) [Table 2].

Table 2: Success Rate of Insertion across Techniques

Groups	Sucessful insertion (%)	Group C vs L	Group C vs S	Group L vs S
Conventional	72 %			
Lateralhead position	78%			
Reverse sellick's manoeuvre	89%	0.008	<0.001	0.361

Insertion in first attempt was seen in 86.70% cases of group S and 80.0% cases of group L. In comparison only 51.10% cases had successful insertion in first attempt using conventional technique. The difference between the group was statistically significant between group C and group L (p>0.05) and between group C and group S (p<0.001) but the difference between group L and group S was statistically not significant (p value>0.05) [Table 3].

Table 3: Number of attempts for successful Insertion across different Techniques

No. Of attempts	Conventional %	Lateralhead position %	Reversesellick's manoeuvre %	Group Cvs L	Group Cvs S	Group L vs S
One	51.10%	80.00%	86.70%			
Two	15.6%	11.11%	11.11%			
Failure	33.30%	8.90%	2.20%	0.005	<0.001	0.386

Overall time taken for insertion of nasogastric tube during each attempt was comparable among group L and group S. However, total time taken for insertion was significantly more in conventional technique group (45.52±18.27) as compared to group L (26.48±12.18) and group S (23.31±8.11 sec) due to more number of attempts required in conventional group. The difference between the group was statistically significant between group C and group L (p<0.001) and between group C and group S (p<0.001) but the difference between group L and group S was statistically not significant (p>0.05) [Fig 1].

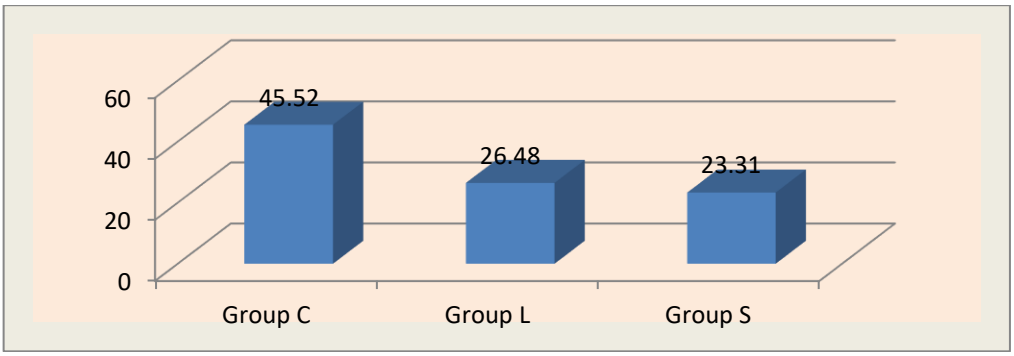

Fig 1. Time taken for successful insertion across different techniques

Kinking was observed in Group C, Group L, and Group S at rates of 15.60%, 0%, and 4.40% respectively. Mucosal bleeding occurred in Group C, Group L, and Group S at rates of 15.60%, 13.30%, and 4.40% respectively. Coiling was noted in Group C, Group L, and Group S at rates of 17.80%, 8.90%, and 4.40% respectively. The complications were similar across the groups and did not reach statistical significance ($p>0.05$), with the exception of the comparison between Group C and Group L, where the difference in kinking was statistically significant (p-value<0.05) [Fig 2].

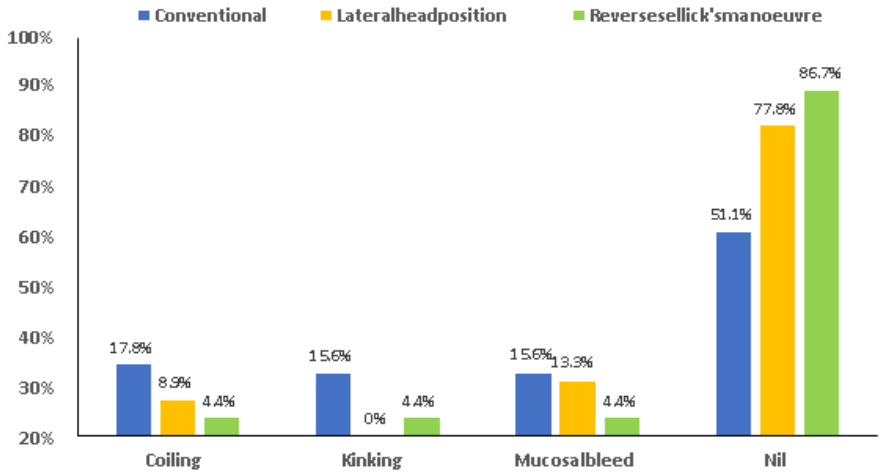

Fig 2. Complications Associated with Different NGT insertion Techniques

Discussion:

The placement of a nasogastric tube is commonly conducted in anesthetized patients undergoing laparoscopic or significant abdominal surgeries, as well as in emergency situations. [15] The traditional approach to nasogastric tube insertion involves a blind technique, with the patient's neck maintained in a neutral position and without any external manipulation of the larynx. When under anesthesia, patients are sedated and affected by muscle relaxants, which impairs their ability to swallow and complicates the insertion process. [16] Reports indicate that the success rate for this conventional technique during the initial attempt is less than 50%. [3-5]

While the insertion of a nasogastric tube (NGT) is generally regarded as a safe procedure, it may be accompanied by complications such as mucosal bleeding, [4] knotting, kinking, [17] and coiling [13] of the tube. In rare instances, severe complications can occur, including hemothorax, [18] pneumothorax, subcutaneous emphysema, pulmonary hemorrhage, intracranial placement,[19] or esophageal perforation. [18]

Numerous techniques can assist in the insertion of a nasogastric tube (NGT). These include various maneuvers such as the Reverse Sellick's maneuver, [20,21,14] Neck Flexion with Lateral Pressure, [22,13,23] Lateral Head Positioning, [3,15] and the use of a Frozen NGT. [9,20] Additionally, adjuncts like video laryngoscopes, [15] endotracheal tube assistance, stylets, and guide-wires may

also be employed. [11, 7,13] There is an increasing interest in assessing non-device-based methods for NGT insertion, focusing on their feasibility and cost-effectiveness.

In our research, the successful placement of nasogastric tubes was recorded in 66.70% of patients in Group C, 91.10% in Group L, and 97.80% in Group S. Both Group L and Group S demonstrated a significantly higher success rate in comparison to Group C, with the difference being statistically significant ($p<0.05$). However, the success rates between Group L and Group S were comparable, and the difference was not statistically significant ($p>0.05$). Similar findings were reported by Kavakli AS et al., [15] who investigated the efficacy of nasogastric tube insertion in anesthetized intubated adult patients, comparing the lateral head position with the conventional blind method. They found a successful intubation rate of 88% using the lateral head position, compared to 66% in the conventional group ($p<0.05$). Additionally, Mandal MC et al. [29] conducted a study comparing three techniques for nasogastric tube insertion (Conventional, Frozen NGT, Reverse Sellick's maneuver) and found that the conventional method achieved a success rate of 69.2%, while the Reverse Sellick's maneuver resulted in a success rate of 95.2% ($p<0.001$).

The elevated success rates observed with the Lateral Head Position and Reverse Sellick's manoeuvre in our research, as well as in other studies, in comparison to traditional techniques, can be ascribed to several benefits. The lateral head position enables the tube tip to follow the lateral contour of the pharynx, which aids in its smooth transition through the oesophagus without becoming coiled in the laryngopharynx. [3,15] Additionally, the Reverse Sellick's manoeuvre shifts the cricoid cartilage forward, thereby enlarging the oesophageal opening and decreasing the resistance encountered during the passage of the nasogastric tube, ultimately enhancing the insertion success rate. [14]

In this investigation, the successful insertion of the nasogastric tube (NGT) on the first attempt was recorded in Group C, Group L, and Group S at rates of 51.10%, 80.0%, and 86.70% respectively. The comparison between Group L and Group S regarding the success of the first attempt did not yield a statistically significant difference ($p>0.05$). However, when Group C was compared to both Group L and Group S, a statistically significant difference in successful first-attempt insertion was observed ($p<0.01$). These findings align with those reported by Bong CL et al., 3 who noted that 40% of patients in the conventional group achieved successful insertion on the first attempt, while the Lateral head position group had a success rate of 80%. Similar outcomes were reported by Kavakli AS et al., [15] who compared the conventional technique with the Lateral head position method, finding a 54% success rate in the conventional group versus a 78% success rate in the Lateral head position group ($p<0.05$).

In our study, the average total duration for insertion in Group C was recorded as 48.62 ± 17.27 seconds, while Group L had an average of 27.69 ± 11.18 seconds, and Group S recorded 24.69 ± 9.11 seconds. The comparison between Group L and Group S regarding the total duration for insertion revealed no statistically significant difference ($p > 0.05$). However, when comparing both Group L and Group S to Group C, a statistically significant difference in total duration for insertion was observed ($p < 0.001$). Similar findings were reported by Kavakli AS et al., [15] who noted that the average insertion time for the conventional technique was 62.5 ± 15.3 seconds, whereas the average insertion time for the lateral head position was approximately 43.4 ± 7.8 seconds, which was statistically significant ($p < 0.05$).

In our investigation, the complications were found to be similar across the groups and did not reach statistical significance ($p>0.05$), with the exception of the comparison between Group C and Group L, where the difference in kinking was statistically significant ($p<0.05$). The Chi-square test was employed for this analysis. Overall, the Reverse Sellick's Manoeuvre exhibited the most favorable safety profile, followed by the Lateral Head Position, and then the Conventional technique. Kavakli AS et al. [15] reported a notably higher overall incidence of adverse events in the conventional group compared to the Lateral Head Position group. Specifically, mucosal bleeding occurred in 20% of the conventional group and 18% of the lateral head position group. The incidence of kinking was

20% in the conventional group and 6% in the lateral head position group ($p<0.05$). Additionally, a study by Mandal MS et al. [18] found that the overall incidence of adverse events was significantly higher in the conventional group compared to the Reverse Sellick's group. Mucosal bleeding was observed in 24% of the conventional group and 14.28% in the Reverse Sellick's group. The incidence of kinking was 4% in the conventional group and 6.12% in the Reverse Sellick's group, while coiling was noted in 32% of the conventional group and 30.61% in the Reverse Sellick's group ($p>0.05$).

Conclusion:
In summary, the Lateral head position method and Reverse Sellick's manoeuvre are more effective techniques for nasogastric tube insertion than the traditional approach. Although the Reverse Sellick's manoeuvre demonstrated more favorable outcomes than the Lateral head position method, the disparity between the two techniques was not statistically significant.

Conflict of interest: Nil
Finding: Nil

References:
1. Tsai YF, Luo CF, Illias A, et al. Nasogastric tube insertion in anesthetized and intubated patients: a new and reliable method. BMC Gastroenterol. 2012; 12:99.
2. Burad J, Deoskar S, Bhakta P, Date R, Sharma P. Avoidance of laryngeal injuries during gastric intubation. Sultan Qaboos Univ Med J. 2014; 14(3):e405-08.
3. Bong CL, Macachor JD, Hwang NC. Insertion of the nasogastric tube made easy. Anesthesiology. 2004; 101:266.
4. Mahajan R, Gupta R. Another method to assist nasogastric tube insertion. Can J Anaesth. 2005; 52:652-3.
5. Kayo R, Kajita I, Cho S, et al. A study on insertion of a nasogastric tube in intubated patients. Masui. 2005; 54:1034-6.
6. Siddhartha BV, Sharma NA, Kamble S, Shankaranarayana P. Nasogastric tube insertion in anesthetized intubated patients undergoing laparoscopic hysterectomies: a comparative study of three techniques. *Anesth Essays Res.* 2017; 11(3):550.
7. Kirtania J, Ghose T, Garai D, Ray S. Esophageal guidewire-assisted nasogastric tube insertion in anesthetized and intubated patients: a prospective randomized controlled study. Anesth Analg. 2012; 114(2):343–348.
8. Ghatak T, Samanta S, Baronia AK. A new technique to insert nasogastric tube in an unconscious intubated patient. N Am J Med Sci. 2013; 5(1):68.
9. Chun D-H, Kim NY, Shin Y-S, Kim SH. A randomized, clinical trial of frozen versus standard nasogastric tube placement. World J Surg. 2009; 33(9):1789–1792.
10. Sanaie S, Mahmoodpoor A, Najafi M. Nasogastric tube insertion in anaesthetized patients: a comprehensive review. Anaesth Intensive Ther. 2017; 49(1):57–65.
11. Najafi M. Nasogastric tube insertion easily done: the SORT maneuver. Indian J Crit Care Med. 2016; 20(8):492–493.
12. Najafi M, Golzari S. SORT maneuver for nasogastric tube insertion. Anaesthesia. 2016; 71(3):351–351.
13. Appukutty J, Shroff PP. Nasogastric tube insertion using different techniques in anesthetized patients: A prospective, randomised study. Anesth Analg. 2009; 109:832-35.
14. Parris WC. Reverse Sellick's manoeuvre. Anesth Analg 1989; 68:423.
15. Kavakli AS, Ozturk NK, Karaveli A, Onuk AA, Ozyurek L, Inanoglu K. Comparison of different methods of nasogastric tube insertion in anesthetized and intubated patients. Revista Brasileira de Anestesiologia. 2017 Nov; 67:578-83.

16. Chakraborty D, Maitra S, Chakraborty J, Mandal M. Comparison Between the Reverse Sellick's and SORT Manoeuvres of Nasogastric Tube Insertion in Anaesthetised, Intubated, Adult Patients-A Randomised Clinical Study. Journal of Clinical & Diagnostic Research. 2022 Jun 1; 16(6).
17. Pillai JB, Vegas A, Brister S. Thoracic complications of nasogastric tube: review of safe practice. Interact Cardiovasc Thorac Surg. 2005; 4(5):429-33.
18. Mandal M, Bagchi D, Sarkar S, Chakrabarti P, Pal S. Nasogastric tube placement- a simple yet difficult procedure-A review. J Evolution Med Dent Sci. 2017; 6(31):2572- 76.
19. Nashibi M, Safari F, Sezari P, Naderi A, Mottaghi K. Hard and granny tie, nasogastric tube knotted in nasopharynx: a case report. Turk J Anaesthesiol Reanim. 2021;49(3):263–4.
20. Mandal M, Karmakar A, Basu SR. Nasogastric tube insertion in anaesthetised, intubated adult patients: A comparison between three techniques. Indian J Anaesth. 2018 Aug; 62(8):609-615.
21. Mandal MC, Dolai S, Ghosh S, Mistri PK, Roy R, Basu SR, Das S. Comparison of four techniques of nasogastric tube insertion in anaesthetised, intubated patients: A randomized controlled trial. Indian J Anaesth. 2014 Nov-Dec; 58(6):714-8.
22. Thibodeau GA, Patton KT. Structure & function of the body. Elsevier Health Sciences. 11th ed. St. Louis, Mosby, 2000.
23. Illias AM Hui YL, Lin CC, Chang CJ, and Yu HP. A comparison of nasogastric tube insertion techniques without using other instruments in anesthetized and intubated patients. Ann Saudi Med. 2013 Sep-Oct; 33(5):476-81.