Evaluation of intubating conditions using stylet by conventional through-tube technique and through Murphy’s eye in patients with high Mallampati scores

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ABSTRACT

Background: Difficult intubation is always a nightmare for an Anaesthetist. This study was planned to study the alternative method of stylet use during difficult oro-tracheal intubation. Outcome measures assessed were ease of intubation, hemodynamic stability and reducing complications. Materials and Methods: A cohort of 60 patients of Mallampati class III patients was formed and patients were divided into two groups. In group 1 patients, conventional through tube method was used for inserting stylet, whereas, in group 2 patients, Murphy’s eye was used for inserting malleable flexi tip stylet. Results: Hemodynamic stability in terms of mean arterial blood pressure and heart rate was observed in group 2. Intubating time, number of attempts of successful intubation and post operative pharyngo-laryngeal complications was also low in group 2 patients. Conclusion: The use of Murphy’s eye to pass stylet during difficult airway manoeuvre is a safe alternative over conventional rail-road technique.

Key words: Ease of intubation, endotracheal intubation, Murphy’s eye, stylet

INTRODUCTION

The Murphy’s eye is a side vent near the distal end of endotracheal tube. Using the Murphy’s eye to slide down the endotracheal tube through it on a stylet can be alternative methods to intubate in high Mallampati grade patients. High scores indicate poor visibility of the or pharyngeal structures.¹ We hypothesized that it would be easier to intubate with the use of stylet using Murphy’s eye of endotracheal tube than the conventional through tube method of intubation in patients with a high Mallampati score. To examine our hypothesis, we performed a prospective, cohort study comparing a stylet through Murphy’s eye with conventional through tube techniques of intubation in patient cohort with high Mallampati scores. Success rate, time required for intubation, hemodynamic changes, and complications were compared. We tested whether the use of stylet through Murphy’s has a higher success rate on the first intubation attempt and its effect on patient hemodynamic response as compared to the conventional stylet through-tube method of endotracheal intubation.

Securing the patent airway is still one of the most important skills in anesthesia as well as in emergency situations.² While tracheal intubation is considered the gold standard; it requires adequate skill to secure the airway. The reported incidence of difficult intubation
ranges from 0.05% to 18%. The American Society of Anaesthesiologists (ASA) task force on Management of the Difficult Airway points to the importance of alternative, less invasive devices to allow adequate oxygenation when tracheal intubation fails. However, the placement of a tracheal tube can be expectedly or unexpectedly difficult or even impossible. Difficult tracheal intubation still contributes to anesthesia-related morbidity and mortality.

**MATERIALS AND METHODS**

Mallampati Class III patients were enrolled and were randomly assigned to the Murphy’s group (Group 1) and the conventional through tube technique group (Group 2). Patients were intubated with the randomly selected intubation device after induction of general anesthesia. Heart rate (HR) and mean arterial blood pressure (MAP) were measured immediately before and every 30 seconds after intubation for next 3 minutes. The time to intubation and success rate were recorded using a stopwatch. Postoperative pharyngo-laryngeal complaints and complications were also noted.

Sixty patients (ASA I–II, aged above 16 yrs) were randomly allocated for endotracheal intubation using the stylet through Murphy’s eye and conventional through tube technique. Use of Murphy’s eye involved the introduction of plastic coated blunt tip stylet through the Murphy’s eye and sliding the tube over the stylet, [Figure 1](#) whereas, conventional through-tube technique involve the inserting the stylet through the tube over it [Figure 2](#). Unblinded data were collected about ease of insertion, number of attempts, and time taken to secure an airway by endotracheal tube, efficacy of seal, ease of gastric tube placement, and hemodynamic responses. Blinded data were collected about postoperative airway morbidity.

Statistical analysis

Data were summarized as Mean ± SD. The effect of groups and periods on each MAP and HR levels were compared separately by repeated measure analysis of variance (ANOVA) using general linear models and the significance of mean difference within and between the groups was done by Newman-Keuls post hoc test. The mean level of time to intubation and maximum fall in saturation of two independent groups were compared by independent Student’s t-test. Categorical (discrete) data (ease of intubation, number of attempts, and pharyngo-laryngeal complications) of two independent groups were compared by Chi-square ($\chi^2$) test. $P < 0.05$ was considered statistically significant.

**RESULTS**

Primary outcome measures

The primary outcome measures MAP and HR levels of two groups were at six different periods were summarized in Table 1 and also shown graphically in Figure 3. The mean MAP and HR levels in both the groups lowered at baseline as compared to at pre induction. Further, the mean MAP and HR levels in both the groups increase linearly from baseline after 90 sec and thereafter decreases after 120 sec. The increase in both MAP and HR from baseline after 90 sec was evident higher in Group 1 than Group B [Table 1 and Figure 3].

Comparing the effect of both groups and periods together on MAP levels, ANOVA revealed significant effect of both groups ($F = 601.98; P < 0.001$) and periods ($1475.21; P < 0.001$) on MAP levels. The interaction effect of both periods and groups on MAP levels was also found to be significant ($F = 83.34; P < 0.001$). On comparing the mean MAP levels within the groups, Newman-Keuls test showed that the MAP levels in all periods differed significantly ($P < 0.05$ or $P < 0.001$) in both Group 1 and Group 2 except at pre induction and at after...
120 sec in Group 2. Similarly, comparing the mean MAP levels between the groups, the MAP levels did not differ ($P > 0.05$) between the two groups at pre induction, at baseline and at after 30 sec while in rest of the periods (after 60 sec to after 120 sec) it differed and found significantly ($P < 0.001$) higher in Group 1 as compared to respective Group 2 [Table 1].

Similarly, comparing the effect of both groups and periods together on HR levels, ANOVA revealed significant effect of both groups ($F = 324.69; P < 0.001$) and periods ($736.41; P < 0.001$) on HR levels. The interaction effect of both periods and groups on HR levels was also found to be significant ($F = 63.77; P < 0.001$). On comparing the mean HR levels within the groups, Newman–Keuls test showed that the HR levels in all periods differed significantly ($F = 63.77; P < 0.001$) except after 60 sec and after 120 sec in Group 1; and at pre induction and at baseline, after 30 sec and after 30 sec and after 90 sec, and after 60 sec and after 90 sec, in Group 2. Similarly, comparing the mean HR levels between the groups, the HR levels did not differ ($P > 0.05$) between the two groups at pre induction while in rest of the periods (at baseline to after 120 sec) it differed and found significantly ($P < 0.001$) higher in Group 1 as compared to respective Group 2 [Table 1].

**Secondary outcome measures**

The secondary outcome measures time to intubation and maximum fall in saturation were summarized in Table 2 while ease of intubation, number of attempts, and pharyngo–laryngeal complications in Table 3.

The time to intubation levels in Group 1 ranged from 13 sec to 27 sec with mean ($±SD$) 18.43 $±$ 3.17 sec, while in Group 2, it ranged from 7 sec to 16 sec with mean ($±SD$) 11.97 $±$ 2.34 sec. The mean time to intubation level of Group 1 was comparatively higher than Group 2. On comparing the mean time to intubation levels of two groups by independent Student’s $t$-test, $t$-test revealed significantly ($P < 0.001$) different and higher time to intubation of Group 1 as compared to Group 2 [Table 2].

Similarly, the scores of maximum fall in saturation in Group 1 ranged from 92% to 100% with mean ($±SD$) 97.30 $±$ 1.97%, while in Group 2, it ranged from 90% to 100% with mean ($±SD$) 98.67 $±$ 1.77%. The mean maximum fall in saturation score of Group 2 was slightly higher than Group 1. On comparing the mean scores of maximum fall in saturation of two groups, $t$-test revealed significantly ($P < 0.01$) different and lower score of maximum fall in saturation of Group 1 as compared to Group 2 [Table 2].

Comparing the proportion of characteristics of ease of intubation, number of attempts and pharyngo–laryngeal complications between the two groups, $χ^2$ revealed similar number of attempts ($χ^2 = 1.41; P = 0.495$) and pharyngo–laryngeal complications ($χ^2 = 0.58; P = 0.448$) while significantly different ease of intubation ($χ^2 = 61.9; P = 0.045$) between the two groups [Table 3]. In other words, subjects of Group 2 had significantly easier intubation than Group 1.

**Discussion**

The Murphy’s eye first reported by Murphy in 1941, it is a side vent for ventilation in case the tip of the tube get hugged to the walls of the trachea and get blocked.[5] The use of Murphy’s eye has earlier been described in a case of retrograde intubation by threading the guide wire through the Murphy’s eye and thus intubation was successfully done.[6,7] Though the use of Murphy’s eye with the bougie has been described in a case of difficult intubation but the use of stylet through Murphy’s eye in difficult airway and its efficacy in cases of difficult...
Table 1: MAP and HR levels summary (Mean±SD, n=30) of two groups at six different periods

| Periods          | MAP  | HR  |
|------------------|------|-----|
|                  | Group 1 | Group 2 | P value | Group 1 | Group 2 | P value |
| At pre induction | 87.47±2.78 | 87.17±1.95 | 0.659   | 74.00±2.53 | 74.53±3.03 | 0.498   |
| At baseline      | 68.63±1.85 | 68.37±1.79 | 0.695   | 70.57±2.46 | 72.97±2.63 | 0.002   |
| After 30 sec     | 79.23±2.13 | 78.50±1.46 | 0.281   | 94.53±4.65 | 90.70±2.20 | <0.001  |
| After 60 sec     | 107.30±3.97 | 94.00±2.25 | <0.001  | 104.30±4.09 | 90.70±2.27 | <0.001  |
| After 90 sec     | 109.00±3.87 | 97.87±3.32 | <0.001  | 97.23±2.84 | 91.20±2.22 | <0.001  |
| After 120 sec    | 98.13±2.58 | 86.40±2.18 | <0.001  | 94.73±2.60 | 83.67±3.59 | <0.001  |

MAP: Mean arterial blood pressure, HR: Heart rate

Table 2: Maximum fall in saturation level and maximum fall in saturation score summary (Mean±SD, n=30) of two groups

| Variable                  | Group 1     | Group 2     | t value (DF=58) | P value |
|---------------------------|-------------|-------------|-----------------|--------|
| Maximum fall in saturation | 18.43±3.17 (13-27) | 11.97±2.34 (7-16) | 8.99   | <0.001 |
| Maximum fall in saturation | 97.30±1.97 (92-100) | 98.67±1.77 (90-100) | 2.83 | 0.006 |

Numbers in parenthesis represents the range (min-max)

Table 3: Frequency distribution of ease of intubation, number of attempts and pharyngo‑laryngeal complications of two groups

| Variable                  | Characteristics | Group 1 (n=30) (%) | Group 2 (n=30) (%) | \( \chi^2 \) value | P value |
|---------------------------|-----------------|--------------------|--------------------|-------------------|--------|
| Ease of intubation        | Easy            | 17 (56.7)          | 25 (80.0)          | 6.19              | 0.045  |
|                           | Intermediate    | 10 (33.3)          | 5 (20.0)           |                   |        |
|                           | Difficult       | 3 (10.0)           | 0 (0.0)            |                   |        |
| Number of attempts        | 1               | 27 (90.0)          | 29 (96.7)          | 1.41              | 0.495  |
|                           | 2               | 2 (6.7)            | 1 (3.3)            |                   |        |
|                           | 3               | 1 (3.3)            | 0 (0.0)            |                   |        |
| Pharyngo‑laryngeal        | No              | 23 (76.7)          | 25 (83.3)          | 0.58              | 0.448  |
| complications             | Yes             | 7 (23.3)           | 5 (16.7)           |                   |        |

intubation has not been tested in literature till date.[8] In this study, the use of the Murphy’s eye for passing stylet during difficult airway maneuver was done in 30 patients with Mallampatti class III. We observed in the study that it is less time taking and preparation for its use is minimal, which is helpful during unanticipated difficult intubation. It is simple to use, it helps in maintaining oxygenation during multiple intubation attempt, as oxygen flow can be maintained by the help of flow meter or anesthesia circuit attached at distal end of tube. It also provides a better visualization of airway than in the conventional technique.

While passing the stylet through Murphy’s eye, anesthetist has an advantage of manipulating tube over the stylet in full 360° rotation, as the stylet is free to rotate within Murphy’s eye and once the blunt tip stylet is passed through the glottis, the endotracheal tube can be easily guided over it to secure the airway; this rotation is not possible in the conventional through tube technique.

Sharma et al., reported endotracheal tube obstruction by broken stylet while using the conventional technique of stylet through the tube for intubation.[9] Schaffranetz et al. reported accidental dislodgement, trauma to the airway, and shearing off the stylet in endotracheal tube during difficult intubation.[10] While using Murphy’s eye for introducing stylet helps us better visualization of airway, maneuvering endotracheal tube over 360° and also prevent tube dislodgement and shearing of stylet in cases of difficult airway.

**Conclusion**

Use of stylet through Murphy’s eye showed a higher success rate on the first intubation attempt, produced an attenuated hemodynamic response, better oxygenation during the procedure, and produced less pharyngo-laryngeal complications as compared to the conventional methods of endotracheal intubation in patients with high Mallampati score. Thus, using Murphy’s eye to slide endotracheal tube over stylet is an effective alternative to conventional rail-road method in these patients.

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