



## TO COMPARE EASE OF TRACHEAL INTUBATION FACILITATED BY GUM ELASTIC BOUGIE AND MALLEABLE STYLET

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### ABSTRACT

**INTRODUCTION:** The incidence of difficult intubation ranges from 1% to 4%. In these circumstances the gum elastic bougie is often successful.

**AIM:** To compare ease of tracheal intubation using the gum elastic bougie versus malleable stylet.

**MATERIAL AND METHODS:** A total of 100 adult patients undergoing elective surgery tracheal intubation was indicated were selected and divided randomly into, Gum elastic bougie group and Malleable stylet group equally.

**RESULTS:** The study groups were comparable on characteristics like age, sex, weight distribution, ASA grading, laryngoscopic view of larynx. In both the groups BURP improves laryngoscopic visualization of larynx highly significantly. The mean time taken for successful tracheal intubation in 'restricted' grade was significantly less in Gum elastic bougie group (30.92+0.49 sec) than Malleable stylet group (37.16 + 1.99 sec).

**CONCLUSION:** Gum elastic bougie is good option for successful endotracheal intubation in the difficult airway.

**KEYWORDS :** Difficult intubation, endotracheal, Gum elastic bougie

### INTRODUCTION:

The primary responsibility of the anaesthesiologist is to safeguard the airway; that is to preserve and protect it during induction, maintenance and recovery from the state of anaesthesia and in the event of airway related emergencies. The incidence of difficult intubation ranges from 1% to 4% and intubation failure from 0.13% to 0.30%<sup>1</sup>.

In some patients intubation may require several attempts and may result in airway trauma or may end up in failure to establish a secured airway. In these circumstances the technique of intubating with gum elastic bougie is often successful, which was first described by Macintosh in 1949<sup>2</sup>.

The airway assessment is one of the tools to anticipate difficult airway and manage accordingly. Therefore parameters like inter-incisor gap (mouth opening), temporomandibular joint function (subluxation), Mallampatti classification<sup>3</sup>, thyromental distance<sup>4</sup>, mentosternal distance<sup>5</sup>, assessment of atlanto-occipital joint extension<sup>6,7</sup> and neck flexion, receding mandible and buck teeth<sup>8</sup> are helpful in anticipating difficult intubation.

Our study is about to compare ease of tracheal intubation facilitated by gum elastic bougie and malleable stylet in regarding glottis view, placement success rate, mean time for successful tracheal intubation, BURP manoeuvre and postoperative complications.

**AIM:** To compare ease of tracheal intubation using the gum elastic bougie versus malleable stylet.

### Objectives:

1. To compare the mean time to intubate
2. To compare the placement success rate
3. To assess difficulty of tracheal intubation
4. To assess effect of BURP manoeuvre on view of larynx
5. To compare incidence of post operative complications, if any

### MATERIAL AND METHODS:

After the approval from institutional ethical committee the study was conducted in 2011 to 2013. A total of 100 adult patients of ASA I and II, undergoing elective surgery in whom tracheal intubation was indicated were selected. Informed written consent was obtained from each patient and the procedure was explained to the patient. A thorough pre-operative detailed history and examination was completed according to the proforma. Investigations included routine blood, urine analysis, chest X- ray and electrocardiogram in relevant cases. Preoperative preparation included a period of overnight fasting. These patients were divided randomly into two groups equally.

**Group B** – Gum elastic bougie group (50 patients)

**Group S** – Malleable stylet group (50 patients)

**Inclusion criteria:** 1. Age group: 18 – 70 years 2. Sex: both male and female 3. ASA Grade: I and II 4. Elective surgery in whom tracheal intubation is indicated 5. At preoperative visit, the Mallampatti Class was assessed

### Exclusion criteria:

1. Patients who have history of surgery on neck, pharynx and larynx.
2. Patients who are at high risk of pulmonary aspiration of gastric contents.

### RESULTS AND OBSERVATIONS:

Table no. 1 shows the age distribution between two groups. The mean age was 49.44 + 9.02 in Group B and 49.38 + 9.09 in Group S. The difference was statistically insignificant, hence both the groups were comparable. Chart no. 1 shows weight distribution of the patients in both the groups. The difference between two groups was statistically insignificant. Table No. 2 shows that sex distribution of the patients in this study. The difference between two groups was statistically insignificant so both the groups are comparable. Chart No. 2 shows the distribution of patients as per ASA (American Society Association) grades. 56% and 52% of patients from group B and group S respectively were from ASA grade I. The difference between two groups was statistically not significant and the groups were comparable. Chart No. 3 shows laryngoscopic view of the larynx according to Cook' modified classification. In group B, there were 36 (72%) patients in easy class, 13 (26%) patients were in restricted class and only 1 (2%) patient was in difficult class. In group S, there were 38 (76%) patients in easy class, 12 (24%) patients were in restricted class and there was no patient in difficult class. Difference between two groups was statistically insignificant (p value >0.05) and they were comparable. Chart No. 4 shows the laryngoscopic view of larynx according to Cormack Lehane classification for assessment of difficult tracheal intubation in Grade III and Grade IV. In group B, 11 (22%) patients were in Cormack Lehane grade III and only 1 (2%) patient was in Cormack Lehane grade IV. In group S, 10 (20%) patients were in Cormack Lehane grade III, and no patient was in Cormack Lehane grade IV. By Fisher exact test the difference between two groups is statistically Insignificant (p value >0.05), so they were comparable.

**Table No. 1: Age distribution between two groups**

Age	Group B	Group S	P Value
	No. of patients	No. of patients	
18 – 30	2	1	>0.05 NS
31 – 40	8	10	
41 – 50	17	16	

51 – 60	20	19
61 – 70	3	4
Range	26 – 65	25 – 64
Mean + SD	49.44 + 9.02	49.38 + 9.09

Chart No. 1: Weight distribution between two groups

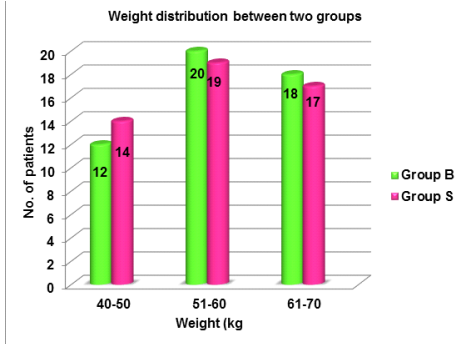


Table No. 2: Sex distribution between two groups

Sex	Group B	Group S	P value
Male	26 (52%)	27 (54%)	> 0.05 (Not significant)
Female	24 (48%)	23 (46%)	
Total	50 (100%)	50 (100%)	

Chart No. 2: American Society of Anaesthesiologist Grade

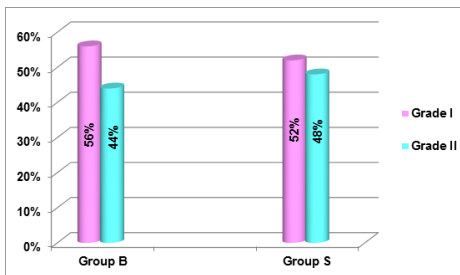


Chart No. 3: View of larynx after laryngoscopy according to Cook's modified classification

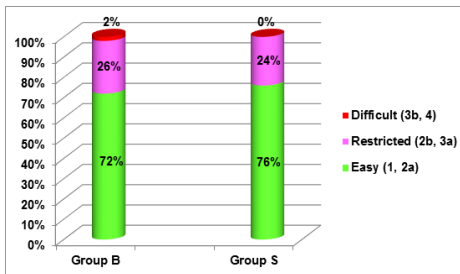


Chart No. 4: Assessment of difficult tracheal intubation

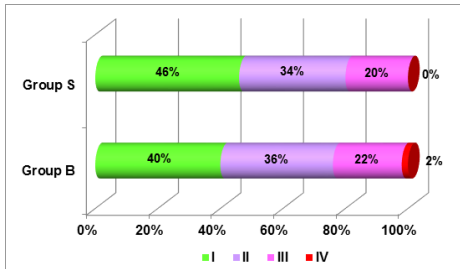


Table no. 3 shows the effect of BURP on view of larynx. In group B, the patients present in Grade I were not included, as there was no necessity of BURP. After applying the BURP manoeuvre in Grade II, III, IV, there was a significant improvement of the laryngoscopic visualization of larynx. All 18 cases of Grade II and 2 cases of Grade III upgraded in Grade I while 9 cases of Grade III upgraded in Grade II and 1 case of Grade IV to Grade III. Similar improvement was also seen in group S. In both the groups BURP improves the Cormack Lehane score highly significantly (p <0.0001) by Wilcoxon's test (paired). Chart No. 5 shows the placement success rate in terms of no. of attempts required for successful endotracheal intubation. In the first

attempt successful tracheal intubation rate was 98% in Group B and 84% in Group S. The difference was statistically significant (p <0.05). All the remaining patients of group B and group S were successfully intubated in second attempt.

Table No. 3: Effect of BURP on view of larynx

Cormack Lehane Grade	GROUP B		GROUP S	
	Before BURP	After BURP	Before BURP	After BURP
I	20	20 (without BURP) 18 (from Grade II) 2 (from Grade III)	23	23 (without BURP) 17 (from Grade II) 2 (from Grade III)
II	18	9 (from Grade III)	17	8 (from Grade III)
III	11	1 (from Grade IV)	10	0
IV	1	0		
Total	50	50	50	50

P value <0.0001; Highly significant; Wilcoxon's test (paired)

Chart No. 5: Placement success rate in both groups

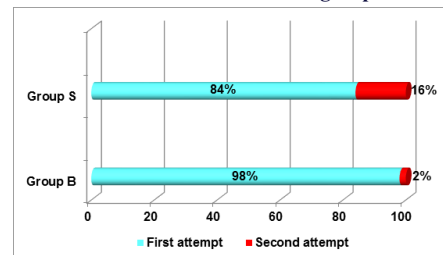


Table No. 4 shows mean time taken for successful tracheal intubation according to Cook's modified classification. In group B, t1 (sec) in easy grade was 15.37+0.76 and that of in restricted grade was 15.61+0.86 which is statistically insignificant (p>0.05). t2 (sec) in easy grade was 15.47+0.96 and that of in restricted grade was 15.30+0.85 which is statistically insignificant (p>0.05). T (sec) in easy grade was 30.61+0.54 and that of in restricted grade was 30.92+0.49 which is statistically insignificant. In group S, T (sec) in easy grade was 23.65 + 1.40 and that of in restricted grade was 37.16 + 1.99; which is statistically significant (p <0.01).

In group B, 'restricted' group T (sec) was 30.92+0.49, and in group S, 'restricted' group T (sec) was 37.16 + 1.99; so there is significant statistical difference (p value <0.001) between two groups.

Table No. 5 shows the postoperative complications between two groups. 14% of patients from group S and 10% of patients from group B suffered from sore throat which is statistically insignificant (p >0.05), while none of the patients were suffered from hoarseness of voice.

Table No. 4: Mean time taken for successful tracheal intubation according to Cook's modified classification

View of larynx	Group B		Group S	
	t 1 (sec)	t 2 (sec)	T (sec)	T (sec)
Easy (1,2a)	15.13+0.76	15.47+0.96	30.61+0.54	23.65+1.40
Restricted (2b,3a)	15.61+0.86	15.30+0.85	30.92+0.49	37.16+1.99
P Value	NS	NS	NS	Significant

t1 = time from removal of the face mask to insertion of gum elastic bougie into trachea.

t2 = time from endotracheal tube passed over the gum elastic bougie to confirming successful tracheal intubation by chest expansion, capnogram and auscultation.

T(t1+t2)= time from removal of the face mask to confirming successful tracheal intubation

Table No. 5: Postoperative complications

	Group B	Group S	P value
Sore throat	5 (10%)	7 (14%)	>0.05
Hoarseness of voice	0 (0%)	0 (0%)	NS

## DISCUSSION

Table no. 1 shows the age distribution between two groups. The mean age was 49.44 + 9.02 in Group B and 49.38 + 9.09 in Group S. The difference was statistically insignificant, hence both the groups were comparable. Chart no. 1 shows weight distribution of the patients in both the groups. The difference between two groups was statistically insignificant. Table No. 2 shows that sex distribution of the patients in this study. The difference between two groups was statistically insignificant so both the groups are comparable. Chart No. 2 shows the distribution of patients as per ASA (American Society Association) grades. 56% and 52% of patients from group B and group S respectively were from ASA grade I. The difference between two groups was statistically not significant and the groups were comparable. Chart No. 3 shows laryngoscopic view of the larynx according to Cook' modified classification. In group B, there were 36 (72%) patients in easy class, 13 (26%) patients were in restricted class and only 1 (2%) patient was in difficult class. In group S, there were 38 (76%) patients in easy class, 12 (24%) patients were in restricted class and there was no patient in difficult class. Difference between two groups was statistically insignificant (p value >0.05) and they were comparable.

**Cook TM et al (2000)**<sup>9</sup> In this study they classified the laryngoscopic view of larynx. The view is easy (E) when the laryngeal inlet is visible. The view is restricted (R) when the posterior glottis structures (posterior commissure or arytenoid cartilages) are visible or the epiglottis is visible and can be lifted. A difficult (D) view is present when the epiglottis cannot be lifted or when no laryngeal structures are visible.

**Latto IP et al (2002)**<sup>10</sup> They used Cook's modified classification for laryngoscopic view in their study.

**Noguchi T et al (2003)**<sup>11</sup> They performed laryngoscopy to grade the laryngeal view. In that study, Cook's modified laryngeal classification was used. These were categorized as 'easy' (grade I and 2a) 'restricted' (grade 2b and 3a) 'difficult' (grade 3b and 4). 38 cases were in 'easy' grade, 20 cases, and 1 case, were in 'restricted' and 'difficult' grade respectively.

So our study with respect to view of larynx according to Cook's modified classification is comparable to Cook TM (2000), Latto IP (2002), and Takashi Nouguchi, et al (2003).

Chart No. 4 shows the laryngoscopic view of larynx according to Cormack Lehane classification for assessment of difficult tracheal intubation in Grade III and Grade IV. In group B, 11 (22%) patients were in Cormack Lehane grade III and only 1 (2%) patient was in Cormack Lehane grade IV. In group S, 10 (20%) patients were in Cormack Lehane grade III, and no patient was in Cormack Lehane grade IV. By Fisher exact test the difference between two groups is statistically Insignificant (p value >0.05), so they were comparable.

**Benumof JL et al (1991)**<sup>12</sup> mentioned in his study that the degree of difficulty can range from zero which is extremely easy to infinity which is impossible. So our present study is comparable with Benumof JL (1991) in respect laryngoscopic view according to Cormack Lehane classification for assessment of difficult tracheal intubation.

Table no. 3 shows the effect of BURP on view of larynx. In group B, the patients present in Grade I were not included, as there were no necessity of BURP. After applying the BURP manoeuvre in Grade II, III, IV, there was a significant improvement of the laryngoscopic visualization of larynx. All 18 cases of Grade II and 2 cases of Grade III upgraded in Grade I while 9 cases of Grade III upgraded in Grade II and 1 case of Grade IV to Grade III. Similar improvement was also seen in group S. In both the groups BURP improves the Cormack Lehane score highly significantly (p <0.0001) by Wilconxon's test (paired).

**Richard L et al (1993)**<sup>13</sup> He studied that the displacement of the larynx by backward, upward and rightward pressure on the thyroid cartilage or "BURP" improved visualization of the glottis in some cases of difficult direct laryngoscopy.

**Benumof JL et al (1996)**<sup>14</sup> They studied the improvement in laryngoscopic view obtained using the both Macintosh and Miller blade by applying optimal external laryngeal manipulation (OELM). Total 181 patients were studied. They concluded that OELM can improve the laryngoscopic view by at least one whole grade.

**Takahata O et al (1997)**<sup>15</sup> evaluated the efficacy of the BURP manoeuvre in improving visualization of the larynx. On initial laryngoscopic inspection, the largest group of patients was classified as Grade I (357 of 630 cases) Grade II, III, and Grade IV accounted for 181, 80, and 12 patients respectively. The patients classified as Grade I at initial inspection did not participated in the study. All 181 cases of Grade II were upgraded to Grade I; 42 of 80 cases of Grade III were upgraded to Grade I, and 38 of 80 cases of Grade III were upgraded to Grade II; 8 of 12 cases of Grade IV were upgraded to Grade II, and remaining 4 of 12 cases of Grade IV were upgraded to Grade III of Cormack Lehane classification. They observed that BURP manoeuvre significantly improved the visualization of larynx (p<0.01).

**Randell T et al (1998)**<sup>16</sup> The best view obtained by levering the tip of the McCoy laryngoscope blade with or without modified cricoid pressure was studied in 100 patients presenting for general surgery. The vocal cords were visible at laryngoscopy with the blade in the neutral position in 32 cases. In the 68 remaining patients the vocal cords were partly visible in 48. The epiglottis only was seen in 18 patients and in two not even the epiglottis could be visualised. Elevation of the blade and modified cricoid pressure improved the view in 38/68 cases and 57/68 cases, respectively (p <0.001, Wilcoxon signed rank).

So our study with respect to effect of BURP manoeuvre is comparable with Richard L (1993), Benumof JL. (1996), Takahata O (1997), and Randell T. et al (1998).

Chart No. 5 shows the placement success rate in terms of no. of attempts required for successful endotracheal intubation. In the first attempt successful tracheal intubation rate was 98% in Group B and 84% in Group S. The difference was statistically significant (p <0.05). All the remaining patients of group B and group S were successfully intubated in second attempt.

**Gataure PS et al (1996)**<sup>17</sup> conducted a randomised study to compare the efficacy of the gum elastic bougie and the stylet in a simulated difficult intubation. The success rate on first attempt 82% in the Bougie First Group and 48% in the Stylet First Group (p<0.001). The success rates after two attempts in the two groups were 96% and 66% respectively (p<0.001).

**Latto IP et al (2002)**<sup>10</sup> prospectively collected data on the use of the gum elastic bougie in 200 patients. The bougie was successfully inserted into the trachea and tracheal intubation was accomplished in 199 cases. The bougie was inserted into the trachea at the first attempt in 178 cases. In nine cases (4.5%) a second, more experienced, clinician was required.

So our study, with respect to placement success rate in terms of no. of attempts for successful tracheal intubation is comparable to P.S. Gataure et al (1996) and Latto IP (2002).

Table No. 4 shows mean time taken for successful tracheal intubation according to Cook's modified classification. In group B, t1 (sec) in easy grade was 15.37+0.76 and that of in restricted grade was 15.61+0.86 which is statistically insignificant (p>0.05). t2 (sec) in easy grade was 15.47+0.96 and that of in restricted grade was 15.30+0.85 which is statistically insignificant (p>0.05). T (sec) in easy grade was 30.61+0.54 and that of in restricted grade was 30.92+0.49 which is statistically insignificant. In group S, T (sec) in easy grade was 23.65 + 1.40 and that of in restricted grade was 37.16 + 1.99; which is statistically significant (p <0.01).

In group B, 'restricted' group T (sec) was 30.92+0.49, and in group S, 'restricted' group T (sec) was 37.16 + 1.99; so there is significant statistical difference (p value <0.001) between two groups.

**Gataure PS et al (1996)**<sup>17</sup> In this study, mean time taken for intubation in bogie group in first attempt was 14.4 sec and in second attempt it was 30.1 sec. It was 15.1 sec in first attempt and 36.6 sec in second attempt in stylet group. So difference between two groups was statistically significant (p<0.05).

**Noguchi T et al (2003)**<sup>11</sup> In this study, T1 i.e. time from removal of face mask to insertion of gum elastic bougie in trachea was 14+ 2 seconds and T2 i.e. time taken insertion of gum elastic bougie to confirming successful tracheal intubation was 19 + 3 seconds, for bougie group. Mean time taken for intubation (T1+T2) was 33+ 4 sec for bougie

group and 33+ 8 sec for stylet group. When a bougie was used, there were no statistical differences in T1 and T2 and total time for intubation between the 'easy' and 'restricted' group. When a stylet was used, the duration of intubation in the patient with 'restricted' view was six seconds longer than that of easy patients. In the 'restricted' groups, the difficulty of tracheal intubation is significantly greater when using stylet compared with a bougie.

So our study is comparable with Gataure PS. et, al. (1996) and Noguchi T. (2003) in respect of mean time for successful tracheal intubation.

Table No. 5 shows the postoperative complications between two groups. 14% of patients from group S and 10% of patients from group B suffered from sore throat which is statistically insignificant ( $p > 0.05$ ), while none of the patients were suffered from hoarseness of voice.

**Christensen AM et al (1994)<sup>18</sup>** The highest incidence of sore throat and other airway related symptoms tends to occur in patients who have undergone tracheal intubation. In a series of 1325 patients, there was an incidence of sore throat of 14.4%.

### CONCLUSION:

Even though the stylet is readily available, simple, cheap instrument for endotracheal intubation, gum elastic bougie is an atraumatic option for successful endotracheal intubation in terms of duration, ease of insertion especially when we come across the difficult airway or restricted laryngoscopic view. So gum elastic bougie is an essential tool for routine and emergency cases with difficult intubation.

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