

# The Efficacy of the "BURP" Maneuver During a Difficult Laryngoscopy

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The displacement of the larynx in the three specific directions (a) posteriorly against the cervical vertebrae, (b) superiorly as possible, and (c) slightly laterally to the right have been reported and named the "BURP" maneuver. We evaluated the efficacy of the BURP maneuver in improving visualization of the larynx. Six hundred thirty patients without obvious malformation of the head and neck participated in this study. We divided the degree of visualization of the larynx using laryngoscopy into five grades and compared the

visualization of the larynx using the BURP maneuver with that of laryngoscopy with and without simple laryngeal pressure ("Back"). The maneuver of Back and BURP significantly improved the laryngoscopic visualization from initial inspection. The BURP maneuver also significantly improved the visualization compared with the Back maneuver. We concluded that the BURP maneuver improved the visualization of the larynx more easily than simple back pressure on the larynx.

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Unanticipated anatomic anomalies can cause serious problems for the anesthesiologist attempting laryngoscopy. In such cases, the anesthesiologist must take appropriate action; however, it is not always entirely certain what actions may be useful.

A common technique for managing difficult laryngoscopy is posterior displacement of the larynx by putting backward pressure on the thyroid or cricoid cartilage (i.e., "BACK" maneuver). Wilson et al. (1) reported that this maneuver reduces the incidence of failure to view any portion of the glottis from about 9.2% to 1.6%.

Displacement of the larynx in three specific directions, (a) posteriorly against the cervical vertebrae, (b) as far superior as possible, and (c) slightly laterally to the right, is well described by Knill (2). He coined the term "BURP" maneuver to describe this displacement and found it highly successful in two patients in whom traditional laryngoscopy was not successful. There has been no systematic evaluation of the efficacy of this maneuver.

The purpose of the present study was to determine the efficacy of the BURP maneuver in a large number of patients and to compare it with the Back maneuver, in which simple laryngeal pressure is used.

## Methods

This study was approved by our Human Investigations Committee, and informed consent was obtained from all patients preoperatively. Six hundred thirty patients were chosen randomly. Patients with obvious malformation of the neck and face and patients who required cricoid pressure for rapid-sequence intubation were excluded from this study. Usual monitoring was used. Positioning of the head, including elevation of the head in the sniffing position and extension of the neck, depended on the laryngoscopist's discretion in each case. After induction of anesthesia with 5 mg/kg of thiamylal and paralysis with muscle relaxant, anesthesia was maintained using isoflurane or sevoflurane with oxygen, and a series of 630 endotracheal intubations was performed. Five minutes after receiving either vecuronium 0.1 mg/kg or pancuronium 0.1 mg/kg, tracheal intubation was attempted. Laryngoscopy was performed using a Macintosh 3 or 4 blade.

Two members of the anesthesia team were present for each intubation. They were designated as (a) the assistant and (b) the laryngoscopist. Both were anesthesiologists trained for at least 3 yr. The role of the assistant was to perform the Back and BURP maneuvers, which were carried out by the assistant without any direction from the laryngoscopist. The Back maneuver is posterior displacement of the larynx by gentle backward pressure on the thyroid cartilages, approximately 0.5 cm dorsally. The BURP maneuver

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**Table 1.** Patients' Demographic Data

	Grade I <sup>a</sup>	Grade II	Grade III	Grade IV	Grade V
Number	357	181	80	12	0
Age (yr)	51.9 ± 17.4	52.3 ± 15.6	55.4 ± 14.0	53.4 ± 12.8	
Height (cm)	158.3 ± 9.2	159.0 ± 9.1	158.7 ± 8.4	161.1 ± 6.8	
Weight (kg)	57.5 ± 10.2	59.7 ± 10.9	59.0 ± 11.2	60.6 ± 6.7	
Sex (M/F)	166/191	94/87	46/34	7/5	

Values are expressed as mean ± sd.

<sup>a</sup> This grade was determined before using any maneuver.

consists of the displacement of the thyroid cartilage dorsally so as to abut the larynx against the bodies of the cervical vertebrae, 2 cm cephalad until mild resistance is met, and 0.5–2.0 cm laterally to the right. The role of the laryngoscopist was to evaluate the laryngoscopic views before and after each maneuver. The assistant was blinded to the results determined by the laryngoscopist while the data were being collected.

A modification of the original classification of laryngoscopic views by Cormak and Lehane (3) was used: Grade I = full view of glottis and no difficulty intubating; Grade II = only posterior commissure visible; Grade III = only arytenoids visible; Grade IV = only epiglottis visible; Grade V = no glottic structure visible. On initial inspection, all Grade I patients were excluded after analysis (357 patients). The Back and BURP maneuvers were performed on the remaining 273 patients to examine whether the maneuver improved the visualization of patients in Grades II–V.

On initial inspection, the laryngoscopist exposed the larynx as much as possible, and the laryngoscopic grade was evaluated. The blade of the laryngoscope was fixed in place, at which time the assistant performed the Back and BURP maneuvers. Again, the laryngoscopist determined the laryngoscopic grade at each maneuver.

All demographic data between each grade at initial inspection of laryngoscopy were examined by analysis of variance or  $\chi^2$  analysis. The effects of each maneuver on visualization of larynx were evaluated by Friedman's test and Wilcoxon's signed rank test with Bonferroni correction. A *P* value of less than 0.05 was considered significant.

## Results

At the initial inspection, the largest group of patients was classified as Grade I (357 of 630 cases [56.7%]), Grades II, III, and IV accounted for 181, 80, and 12 patients, respectively. There were no patients in Grade V, and all other 630 patients were successfully intubated. Patients' demographic data were similar among all grades (Table 1). The patients classified as Grade I at initial inspection did not participate in the following analysis.

The Back and BURP maneuvers significantly improved the laryngoscopic visualization from initial inspection (*P* < 0.01). The BURP maneuver also significantly improved the visualization compared with that of the Back maneuver (*P* < 0.01; Table 2). It should be noted that there were no Grade IV patients after using the BURP maneuver.

There was no evidence of bradycardia or tachycardia during the application of these maneuvers. Postoperatively, the patients were followed up with respect to hoarseness, dysphagia, dyspnea, or sore throat. No evidence of these complications was noted that could be attributed to these maneuvers.

## Discussion

Our results demonstrate that the degree of visualization of the larynx is improved by the Back and BURP maneuvers. The BURP maneuver was more effective than the Back maneuver with respect to visualization of the larynx.

There have been many reports about the anatomical characteristics for predicting a difficult laryngoscopy (4–8), but no single anatomical factor can be used to predict one precisely (9). Some studies have combined several variables, but even in these, there was relatively little success in predicting the problematic cases (10,11). For these reasons, a successful technique for dealing with unpredictably difficult intubation is desirable.

The conventional technique for managing difficult laryngoscopy is posterior displacement of the larynx by backward pressure on the thyroid or cricoid cartilage. Wilson et al. (1) reported that this maneuver reduced the incidence of failure to view any part of the glottis by about 9.2%–1.6%. Krantz et al. (12) reported that the effect of the laryngeal lift was to improve laryngoscopic visualization. This maneuver involved gentle displacement of the cricoid cartilage approximately 0.5 cm dorsally and 2.5 cm cephalad and it improved the visualization of the larynx, while the rate of difficult laryngoscopy in Grades IV and V decreased from 8.0% to 3.0%. These two methods might be useful for difficult laryngoscopy, but some incidences of Grades IV and V still occur.

**Table 2.** Effect of Each Maneuver on Visualization of Larynx

	Initial inspection	After Back	After BURP
Grade I	<sup>a</sup>	185	231
Grade II	181	75	38
Grade III	80	10	4
Grade IV	12	3	0
Grade V	0		

Back = simple laryngeal pressure; BURP = the displacement of the larynx in three specific directions (a) posteriorly against the cervical vertebrae, (b) superiorly as possible, and (c) slightly laterally to the right.

<sup>a</sup> In 357 patients, the entire glottis was visible at the initial inspection; and therefore, the anesthesiologist would not benefit from using any maneuver. These patients were excluded after data analysis.

Knill (2) reported that the BURP maneuver was useful in improving visibility of the glottis in two cases of difficult direct laryngoscopy. This maneuver involves displacement of the thyroid cartilage dorsally so as to abut the larynx against the bodies of the cervical vertebrae 2 cm cephalad until mild resistance is met and 0.5–2.0 cm laterally to the right.

The mechanism whereby the BURP technique improves visibility may be that the maneuver moves the glottis directly into laryngoscopic line of vision (2). Laryngeal position can be manipulated so that the longitudinal axis of the larynx forms a smaller angle with the line of vision, approaching a straight line, than that achievable with a laryngoscopic blade. Thereby direct laryngoscopy is performed with relative ease.

The visual pathway produced by the laryngoscopic blade pushing the tongue toward the left is to the right side of the oral cavity. Therefore, the rightward displacement produced by BURP may improve visualization of the glottis by moving the larynx more into the line of vision.

The difference of usefulness between laryngeal lift and the BURP maneuver might depend on the following. The degree of movement of the larynx dorsally and cephalad is different between the two maneuvers. The laryngeal lift consists of gentle displacement of cricoid cartilage, whereas the BURP maneuver moves the larynx until resistance is met. The BURP maneuver displaces the larynx more dorsally and more cephalad

and decreases the angle between the longitudinal axis of the larynx and the line of vision achievable with a laryngoscopy more than that produced by laryngeal lift. Additionally, the rightward displacement produced by BURP may result in better visualization of the glottis. These factors might be responsible for decreasing the incidence of Grades IV and V from 3.0% to 0%.

In conclusion, the BURP maneuver improved visualization of the larynx more effectively than simple back pressure on the larynx. The BURP maneuver should be included in the routine methods used by anesthesiologists for improving visualization of the larynx.

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