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Laryngoscopy and Morbid Obesity: a Comparison of the "Sniff" and "Ramped" Positions

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Background: The effect of patient position on the view obtained during laryngoscopy was investigated.

Methods: 60 morbidly obese patients undergoing elective bariatric were studied. Patients were randomly assigned into one of two groups. In Group 1, a conventional "sniff" position was obtained by placing a firm 7-cm cushion underneath the patient's head, thus raising the occiput a standard distance from the operating-table while the patient remained supine. In Group 2, a "ramped" position was achieved by arranging blankets underneath the patient's upper body and head until horizontal alignment was achieved between the external auditory meatus and the sternal notch. Following induction of general anesthesia, tracheal intubation was performed using a Video MacIntosh® laryngoscope. The laryngoscopy and intubation sequences were recorded onto videotape. Three independent investigators, unaware as to which position the patient had been in at the time of tracheal intubation, then viewed the videotape and assigned a numerical grade to the best laryngeal view obtained.

Results: The "ramped" position improved the laryngeal view when compared to a standard "sniff" position, and this difference was statistically significant (*P*=0.037).

Conclusion: The "ramped" position is superior to the standard "sniff" position for direct laryngoscopy in morbidly obese patients.

Key words: Morbid obesity, anesthesia, airway, laryngoscopy, endotracheal intubation, patient positioning

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Introduction

Laryngoscopy and tracheal intubation have been stated to be more difficult in morbidly obese patients compared to normal weight individuals.[1-3] However, this has not been our clinical experience. We previously reported a low incidence of difficulty with laryngoscopy and tracheal intubation in morbidly obese patients.[4] When we compared our findings with other published series that had reported a higher incidence of problems,[5] we postulated that the elevated head and neck position of our patients may have optimized laryngoscopy. Although a "ramped" position with the patient's upper body and head elevated to create a horizontal alignment between the external auditory meatus and the sternal notch has been previously recommended to improve laryngeal exposure in obese patients,[6] no study has tested this hypothesis. We therefore performed a prospective, randomized, blinded study to compare the "ramped" position with the "sniff" position for laryngoscopy and tracheal intubation in morbidly obese patients.

Methods

With permission from our Human Subjects Committee, 60 consecutive patients undergoing elective bariatric surgery at Stanford University Hospital consented to be studied. Height and weight on the day of surgery were used to calculate the

body mass index (BMI), and only patients with a BMI ≥40kg/m^2 were included in the study.

A complete medical history was obtained, and significant medical co-morbidities, including a definitive diagnosis of obstructive sleep apnea (OSA), were recorded. Age and sex were noted. Neck circumference (cm) at the level of the thyroid cartilage, width of mouth opening (inter-incisor gap (cm)), thyromental distance (cm) and the sternomental distance (cm) were measured and recorded. The visibility of oropharyngeal structures was assessed with the patient sitting with his/her head neutral and with full protrusion of the tongue without phonation, according to the Mallampati classification[7] as modified by Samsoon and Young.[8]

Patients were then randomly assigned to either the "sniff" (Group 1) or the "ramped" (Group 2) position, using a computer-generated list. In order to prevent bias, each prospective position allocation was placed in a sealed envelope by an independent person and was opened only after the patient had been recruited to the study and after Mallampati score had been ascertained. In order to prevent an unequal number of patients with high Mallampati scores (III or IV) occurring in either of the two positions by chance, the Mallampati score was used as a stratification variable in the randomization.

In the operating room, patients in Group 1 had a 7-cm Shea headrest® (Gyrus ENT LLC, Bartlett, TN) placed underneath their occiput (Figure 1). For Group 2 patients, multiple folded blankets were placed under the patient's upper body, head and neck until horizontal alignment between the external auditory meatus and the sternal notch was achieved (Figure 2).

Patients were preoxygenated for a minimum of 3 minutes with 100% oxygen delivered via a close fitting facemask. After administration of fentanyl (100 - 150 mcg IV), all patients then underwent a rapid-sequence intravenous anesthetic induction with propofol (2.5 - 3.0 mg/kg ideal body weight) and succinylcholine (1.2 mg/kg lean body weight) while cricoid pressure was applied. The same anesthesiologist (JSC) performed all the laryngoscopies with the Video Macintosh Laryngoscope® System (VMS) (Karl Storz Endoscopy-America Inc),[9] using either a Macintosh 3- or 4-size laryngoscope blade. Although images during laryngoscopy were recorded onto tape for later review, each patient's trachea was intubated under direct vision only and the laryngoscopist was blinded from the monitor that displayed the recorded fiberoptic view. Tracheas were intubated with a styletted endotracheal tube (8.0-mm-inner-diameter for men, 7.0-mm-inner-diameter for women).

Three other investigators then reviewed the real-time video recordings of each intubation sequence, and independently assigned a grade to the best view obtained during each laryngoscopy. Grading was by

Figure 1. In the operating-room, patients in Group 1 were placed supine and had a 7-cm headrest placed underneath their occiput.

Figure 2. Patients in Group 2 had folded blankets placed under their upper body, head and neck until horizontal alignment between the sternal notch space and the external auditory meatus was achieved.

the Cormack-Lehane classification wherein grade 1 was complete visualization of the vocal cords, grade 2 was partial view of the vocal cords or arytenoids, grade 3 was with only the epiglottis visible and grade 4 was with no structures visible.[10] When a discrepancy in a score for a patient occurred between any of the observers, the lowest (best) grade assigned by any of the three scorers was used. The number of attempts at tracheal intubation was noted, as well as the time interval between the start of laryngoscopy and successful passage of the tracheal tube into the trachea.

A power analysis based on previously reported incidences of laryngoscopy views in morbidly obese patients in the "ramped"[4] and "sniff"[5] positions indicated that approximately 60 patients would result in an 80% chance of obtaining data of statistical significance. Continuous variables were compared by a two-sample t-test. Categorical variables were compared by using Fisher's exact test or Pearson's chi-square test. All analyses were performed with S-PLUS 6.2® (Insightful Corp, Seattle, WA). Data are reported as mean (±SD). $P<0.05$ was considered statistically significant.

Results

Eight males and 52 females were studied. There were no differences in demographic parameters between the two groups (Table 1). There was no statistical difference in thyromental distance and sternomental distance, but the inter-incisor gap was smaller in Group 1 patients and neck circumference was larger in the Group 2 patients (Table 1). All tracheas were successfully intubated on the first attempt. Mean intubation time was 21.1 sec ± 5.4 in Group 1 and 20.6 sec ± 7.6 in Group 2.

In Group 1, the view of the larynx was grade 1 in 18 patients and grade 2 in 9 patients. In Group 2, the view of the larynx was grade 1 in 29 patients, grade 2 in 3 patients, and grade 3 in 1 patient. There were no grade 4 views in either group (Table 2). The difference in view on laryngoscopy was significantly different (P=0.037) between the two groups.

Table 1. Patient characteristics are presented for group 1 (supine in a standard "sniff" position) and group 2 ("ramped" position with the head, neck and upper body elevated until a imaginary horizontal line can be drawn between the sternal notch space to the external ear)

		GROUP 1	GROUP 2
Gender			
	Male	2	6
	Female	25	27
Obstructive Sleep Apnea	No	18	21
	Yes	9	12
Mallampati Score			
	1	9	15
	2	9	11
	3	9	6
	4	0	1
Age (years±sd)		43.3±10.0	41.9±8.9
BMI (kg/m^2±sd)		46.9±7.1	49.9±6.9
Inter-incisor gap *		4.4±0.5	4.8±0.6
Thyromental distance		11.1±1.2	11.3±1.0
Sternomental distance		16.7±1.5	16.7±1.5
Neck Circumference *		43.4±6.7	47.9±5.3

All airway measurements are in centimeters (mean±sd).
*P<0.05

Table 2. Comparison of views during laryngoscopy

GRADED VIEW*	GROUP 1 (n)	GROUP 2 (n)
1	18	29
2	9	3
3	0	1
4	0	0

Three anesthesiologists, unaware as to what position the patient had been in at the time of laryngoscopy, assigned grades for the best view obtained using the scale described by Cormack and Lehane. (Cormack RS, Lehane J. Difficult tracheal intubation in obstetrics. Anaesthesia 1984; 39: 1105-11).
n = number or patients
*P=0.037 (Fischer's exact test)

Discussion

Some reports have claimed that tracheal intubation may be more difficult in obese patients.[11-13] Distinctions between difficulty with mask ventilation, with laryngoscopy and with actual tracheal

intubation are usually not well defined in these studies. However, several studies have attempted to grade the view obtained by laryngoscopy. In one, 19 of 118 (16%) morbidly obese patients had Cormack grade 3 or 4 views during direct laryngoscopy,[14] and in another, 24 of 200 (12%) morbidly obese patients were classed as grade 3.[15] It is interesting to note that in both these reports, patients were positioned in a standard supine "sniff" position. We observed a much lower incidence of poor glottic visualization in the present study. In all our patients, the trachea was intubated after a single laryngoscopy and no patient could be described as a "difficult intubation".

These results differ from a previous report by our group.[4] In that study, anesthesia residents were randomly assigned to each case and performed all the laryngoscopies. For this study, all laryngoscopies and intubations were by the same faculty anesthesiologist (JSC) with 15 years of clinical experience. This may partially explain the differences between our two reports. The VMS provides a much brighter light source than a conventional battery-powered MacIntosh laryngoscope that in turn may improve visualization. In an attempt to simulate normal illumination of the larynx, the brightness setting of the VMS was reduced to 5% of its maximum value for the present study.

The fiberoptic image on the video monitor comes from a light source at the midpoint of the laryngoscope blade, so the view with the VMS is slightly different from the image seen by the laryngoscopist during direct laryngoscopy. The images on the monitor, which we used for grading, may give a view of the larynx that is not absolutely identical to the image obtained by a standard laryngoscope. Actual intubations were performed using the VMS as a regular laryngoscope, with the laryngoscopist unaware of the video view. We encountered no difficulties with laryngeal exposure or tracheal intubation. Even if using the VMS in this manner did provide a more optimal view than a conventional laryngoscope blade, this would not explain the difference we found, because the same intubation technique was used for both groups. The VMS also allowed us to use a MacIntosh laryngoscope blade, a blade that is familiar to all anesthesiologists.

Since the endoscopist could not be blinded from patient position during intubation, we used the VMS to record the laryngoscopy. This allowed investigators who were unaware of patient position to grade the images, thus eliminating observer bias. To our knowledge, this has not been done in any previous study of laryngoscopy in morbidly obese patients.

Patients in the "ramped" position had better laryngeal exposure than patients in the "sniff" position. Two previous studies of normal weight patients demonstrated improved laryngeal exposure in the same subject simply by increasing head and neck elevation.[16,17] In normal weight patients, the optimal sniff position is achieved by raising the occiput 7 cm. This produces approximately 35˚ of flexion of the lower cervical spine on the chest. This degree of neck flexion cannot be achieved by this maneuver in morbidly obese patients. Their anatomy requires ramping to achieve not only 35˚ of neck flexion on the chest, but also 90˚ of extension of the head on the neck at the atlantlo-occipital joint.[18] It is possible that ramping obese patients produces the same alignment of the axis of intubation that the sniff produces in normal weight patients.

In conclusion, using two different positions we encountered little difficulty with laryngeal exposure or tracheal intubation in 60 morbidly obese patients. However, the "ramped" position in which the upper body, neck and head are elevated to a point where an imaginary horizontal line can be drawn from the sternal notch to the external ear improved the view of the larynx during laryngoscopy. Placing morbidly obese patients in this position could contribute to an increased rate of successful tracheal intubation in these patients.

References

1. Wilson ME, Spiegelhalter D, Robertson JA et al. Predicting difficult intubation. Br J Anaesth 1988; 61: 211-6.
2. Juvin P, Lavaut E, Dupont H et al. Difficult tracheal intubation is more common in obese than in lean patients. Anesth Analg 2003; 97: 595-600.
3. Dominguez-Cherit G, Gonzalez R, Borunda D et al. Anesthesia for morbidly obese patients. World J Surg 1998; 22: 969-73.
4. Brodsky JB, Lemmens HJM, Brock-Utne JG et al. Morbid obesity and tracheal intubation. Anesth Analg

2002; 94: 732-6.
5. Keller C, Brimacombe J, Kleinsasser A et al. The Laryngeal Mask Airway™ as a temporary ventilatory device in grossly and morbidly obese patients before laryngoscope-guided tracheal intubation. Anesth Analg 2002; 94: 737-40.
6. Levitan RM, Ochroch AE. Airway management and direct laryngoscopy: a review and update. Crit Care Clin North Am 2000; 16: 373-88.
7. Mallampati SR, Gatt SP, Gugino LD et al. A clinical sign to predict difficult tracheal intubation: a prospective study. Can Anaesth Soc J 1985; 32: 429-34.
8. Samsoon GL, Young JR. Difficult tracheal intubation: a retrospective study. Anaesthesia 1987; 42: 487 - 90.
9. Kaplan MB. A new video laryngoscope – an aid to intubation and teaching. J Clin Anesth 2002; 14: 620-6.
10. Cormack RS, Lehane J. Difficult tracheal intubation in obstetrics. Anaesthesia 1984; 39: 1105-11.
11. Benumof JL. Management of the difficult adult airway: with special emphasis on awake tracheal intubation. Anesthesiology 1991; 75: 1087-110.
12. Adams JP, Murphy PG. Obesity in anaesthesia and intensive care. Br J Anaesth 2000; 85: 91-108.
13. Fox GS, Whalley DG, Bevan DR. Anaesthesia for the morbidly obese: experience with 110 patients. Br J Anaesth 1981; 53: 811-6.
14. Frappier J, Guenoun T, Journois D et al. Airway management using the intubating Laryngeal Mask Airway for the morbidly obese patient. Anesth Analg 2003; 96: 1510-5.
15. Ezri T, Medalion B, Weisenberg M et al. Increased body mass index per se is not a predictor of difficult laryngoscopy. Can J Anesth 2003; 50: 179-83.
16. Levitan RM, Mechem CC, Ochroch EA et al. Head-elevated laryngoscopy position: improving laryngeal exposure during laryngoscopy by increasing head elevation. Ann Emerg Med 2003; 41: 322-30.
17. Schmitt HJ, Mang H. Head and neck elevation beyond the sniffing position improves laryngeal view in cases of difficult direct laryngoscopy. J Clin Anesth 2002; 14: 335-8.
18. Benumof JL. Comparison of intubating positions: the end point for position should be measured. Anesthesiology 2002; 97: 750

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publications comparing nerve stimulating versus nonstimulating catheters (4,5). These studies do not show any benefit of stimulating over nonstimulating catheters. The largest of these studies (419 patients), concluded, "a convincing argument has yet to be made for the routine use of the stimulating catheter . . ." (6).

Ultrasound has been a welcome relief for those of us who are seeking a better alternative to NS techniques. In 2005, Marhofer reported more than 4000 blocks performed using only ultrasound guidance with success rates approaching 100% (7). Since that time, his numbers have almost certainly increased. Regarding ultrasound techniques, Marhofer accurately states, "Nerves are not blocked by the needle but by the local anesthetic." Likewise, at the University of Utah, we stopped using the nerve stimulator over 2 years ago. We too, have performed over 3500 blocks (2000 catheters) using only ultrasound guidance. It should be no surprise that a technique successful for single injections would also work for catheter placement. The result has been a generation of residents from our program who have learned to "stay away from the nerve with the needle but reach the nerve with local anesthetic." A prospective study at our institution shows a success rate of 97% for single blocks and catheters placed using only ultrasound guidance (8). This same study shows the cost savings (by eliminating the cost of stimulating needles) to be more than $16,000/yr when performing more than five nerve blocks per day.

Ultrasound is ideal for catheter placement as a "stand alone" technique. We believe the nerve stimulation will soon take its place beside the copper kettle as a technique of only historical interest. In other words, yesterday's "gold standard" has become today's "old standard."

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REFERENCES

1. Chidiac EJ, Perov S. Outpatient continuous peripheral nerve catheters. Anesth Analg 2007;104:1303–4.
2. Hadzic A, Vloka J, Hadzic N, et al. Nerve stimulators used for peripheral nerve blocks vary in their electrical characteristics. Anesthesiology 2003;98:969–74.
3. Urmey WF, Stanton JS. Inability to consistently elicit a motor response following sensory paresthesia during interscalene block administration. Anesthesiology 2002; 96:552–4.
4. Hayek SM, Ritchey RM, Sessler D, et al. Continuous femoral nerve analgesia after unilateral total knee arthroplasty; stimulating versus nonstimulating catheters. Anesth Analg 2006;103:1565–70.
5. Morin AM, Eberhart LH, Behnke HK, et al. Does femoral nerve catheter placement with stimulating catheters improve effective placement? A randomized, controlled, and observer—blinded trial. Anesth Analg 2005;100:1503–10.
6. Jack NT, Liem EB, Vonhogen LH. Use of a stimulating catheter for total knee replacement surgery: preliminary results. Br J Anaesth 2005;95:250–4.
7. Marhofer P, Greher M, Kapral S. Ultrasound guidance in regional anesthesia. Br J Anaesth 2005;94:7–17.
8. Swenson J. Needle costs for ultrasound vs. nerve stimulator guided single injection and continuous nerve catheters. Cleveland, OH: S262, IARS Clinical and Scientific Congress, 2007.

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An Inflatable, Multichambered Upper Body Support for the Placement of the Obese Patient in the Head-Elevated Laryngoscopy Position

To the Editor:

Several articles have appeared in the anesthesia literature promoting the use of the head-elevated laryngoscopy position to facilitate intubation in the obese patient (1–3). However, there are several disadvantages with using blankets as the support device. If the initial ramp is not adequate, the patient must sit up again for readjustment. After the trachea is intubated, the OR staff must help the anesthesia personnel lift the patient to remove the blankets to reduce the likelihood of brachial plexus injury during the operation. It is almost impossible to replace the blankets in order to realign the patient for the best position for airway management after tracheal extubation.

We have successfully tested a patent pending inflatable support device on 30 patients undergoing laparoscopic gastric bypass surgery. The device is constructed of seven plastic cylinders connected to a controller that can inflate all cylinders at once or inflate three groups of cylinders individually. This allows for the patient's back, shoulder, and head to be precisely positioned to obtain the proper P–S relationship (See Fig. 1). Inflation pressure is provided by the medical air outlet available in every OR and is attenuated to 3 psi by a controller. Once the trachea is intubated, the air is gradually evacuated from the pillow with a vacuum suction device in the controller. No lifting of the patient is required, and the pillow is easily reinflated at the end

Figure 1. Pillow inflated to illustrate proper HELP position.

of the procedure to best manage the airway after extubation.

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Conflict of Interest Statement: Drs. Nissen and Gayes are the inventors of the pillow discussed in this *Letter to the Editor.* The pillow is not in production and therefore, not commercially available. There may be actual or potential financial benefit to either author in the future should the patent be purchased.

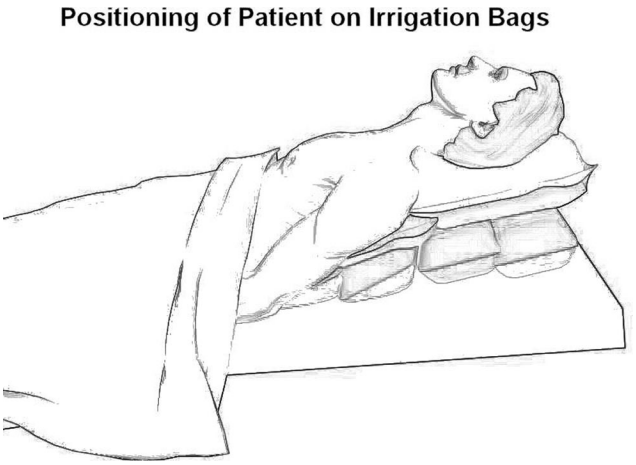

Figure 1. Arrangement of irrigation bags and pillows.

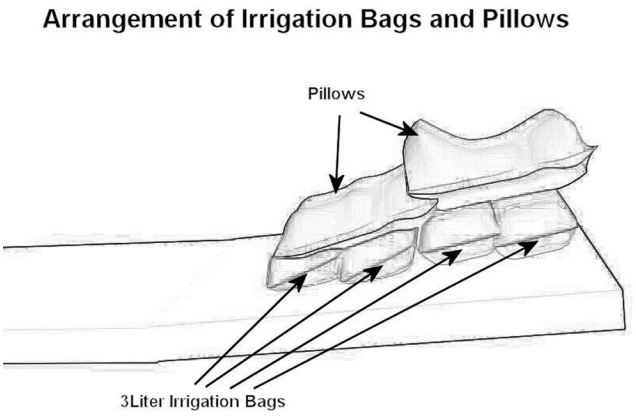

Figure 2. Positioning of patient on irrigation bags.

REFERENCES

1. Brodsky JB, Lemmens HJ, Brock, Utne JG. Anesthetic considerations for bariatric surgery:proper positioning is important for laryngoscopy. Anesth Analg 2002;95:4793.
2. Levitan RM, Mechem CC, Ochroch EA, et al. Head elevated laryngoscopy position: improving laryngeal exposure during laryngoscopy by increasing head elevation. Ann Emerg Med 2003;41:322–30.
3. Collins JS, Lemmons HJ, Brodsky JB, et al. Laryngoscopy and morbid obesity: a comparison of the "sniff" and "ramped" positions. Obes Surg 2004;14:1171–5.

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Positioning of Obese Patients in Out-of-Operating Room Locations

To the Editor:

For the ever-increasing number of anesthetizing sites out-of-the-operating room (OR), e.g., electroconvulsive therapy or colonoscopies, etc., an OR table is not readily available and a transport gurney is often used instead. We have been using 3-L bags of irrigation solution (Baxter) to achieve the same 25° head-up position as described by Dixon et al. (1). We may use three to four solution bags, depending on the size of the patient (Fig. 1). Two to three solution bags will be placed behind the shoulder, and one under the head. A pillow will be placed over the solution bags under the patient's shoulder and another one placed over the solution bag under the head (Fig. 2).

A commercially available Pi's Pillow for positioning patients optimally for intubation costs about $28.00 in the largest size. It is generally not suitable for patients with a Body Mass Index (BMI) in excess of about 35 and is also typically not available in out-of-OR locations. Irrigation solution bags are available in most hospitals. They help to pad pressure points, and conform readily to an individual's body shape. In addition, we do not remove them from their external wrappings and thus are available for use later for their intended function.

One patient with a BMI of 41 was referred to our psychiatric department from an outside facility for electroconvulsive therapy. He was positioned easily on a gurney and successfully underwent tracheal intubation 12 times using this positioning technique.

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REFERENCE

1. Dixon BJ, Dixon JB, Carden JR, et al. Pre-oxygenation is more effective in the 25 degree head-up position than in the supine position in severely obese patients. Anesthesiology 2005;102:1110–5.

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Preoperative Antibiotic Administration and the Surgical "Time Out"

To the Editor:

Recently, O'Reilly et al. (1) described the use of an electronic medical record to track the incidence of preoperative antibiotic administration. Our similar experience is that