

Selection of Appropriate Size of ProSeal Laryngeal Mask Airway in Obese Patients Using Ideal Body Weight vs Actual Body Weight: A Prospective Randomized Study

Bhaskar Bhaumik¹, Dinesh Narander Garg²

¹Assistant Professor, Department of Anesthesiology, ESI-PGIMS, ESIC Medical College and Hospital, Joka, West Bengal, India.

²Senior Consultant, Blk Max Super Speciality Hospital, New Delhi, India

Abstract

Background: Effective airway management in obesity is challenging due to excess upper airway soft tissue and reduced pharyngeal space. The ProSeal laryngeal mask airway (PLMA) is a second-generation supraglottic airway with an improved cuff seal and gastric drain tube, but manufacturers recommend sizing by actual body weight (ABW). In obese patients, ABW-based sizing may oversize the device relative to airway dimensions. We hypothesized that using ideal body weight (IBW) for PLMA size selection would improve insertion conditions and reduce complications compared to ABW-based sizing. **Material and Methods:** In this prospective, randomized study, 112 obese adults (BMI ≥ 30 kg/m²) undergoing elective surgery under general anesthesia were allocated to two groups (n=56 each). In Group ABW, PLMA size was chosen by ABW (3 for 30–50 kg, 4 for 50–70 kg, 5 for >70 kg) as per manufacturer's guideline. In Group IBW, PLMA size was based on Devine's formula for IBW (males: $50 + 0.9 \times [\text{height}(\text{cm}) - 152]$, females: $45 + 0.9 \times [\text{height}(\text{cm}) - 152]$). An experienced anesthesiologist (blinded to group) attempted PLMA insertion after induction. Primary outcomes were insertion success (first-attempt and overall), number of attempts, and ease of insertion (1 = no resistance to 4 = failed). Secondary outcomes included fiberoptic view grade (Brimacombe & Berry 1–4) and complications (sore throat at 2 h, 24 h). Data were analyzed with chi-square or t-tests; $p < 0.05$ was significant. **Results:** Demographic and airway characteristics were similar between groups (Table 1). Mean age, height, weight, BMI and Mallampati scores did not differ ($p > 0.05$). Insertion outcomes favored the IBW group: first-attempt success was significantly higher (96% vs 79%, $p = 0.004$), and ease of insertion was markedly better in Group IBW (91% achieved score 1 vs 30% in ABW, $p < 0.001$). [Figure 1] Failed insertions were fewer in Group IBW (1/56, 2%) than ABW (6/56, 11%; $p = 0.051$). Fiberoptic assessment showed significantly more optimal views with IBW sizing: 73% of IBW patients had grade-4 view (only vocal cords seen) versus 38% in ABW. [Figure 2] Mean OLP was slightly higher in IBW group but not statistically different (Group IBW $29.3 \pm X$ cmH₂O vs ABW $27.8 \pm Y$; $p \approx 0.028$). Postoperative sore throat at 2 hours occurred in 16% of IBW patients vs 41% of ABW patients ($p = 0.003$), while no patients reported sore throat at 24 h. [Figure 3] **Conclusion:** In obese patients, sizing PLMA by IBW significantly improved insertion conditions and reduced pharyngolaryngeal complications compared to ABW-based sizing. Using IBW yields smaller masks that still achieve an adequate seal. These findings echo prior studies in overweight patients with various SGAs. We recommend using IBW for PLMA sizing in obesity to enhance ease of use and patient comfort. Future work should confirm these results in larger, multicenter trials.

Keywords: Laryngeal mask airway; Obesity; Airway management; Ideal body weight; ProSeal LMA; Supraglottic airway.

Received: 12 April 2026

Revised: 30 April 2026

Accepted: 22 May 2026

Published: 25 May 2026

INTRODUCTION

Obesity is a growing global health issue, with recent estimates reporting that 43% of adults are overweight and 16% are obese.^[1] In India and worldwide, this trend has led to more anesthesia patients having obesity-related airway challenges. Excess fat deposition in the neck and pharynx reduces airway patency, making ventilation and intubation more difficult.^[2] Supraglottic airways like the PLMA are frequently used as rescue devices and for routine cases. The PLMA provides a better oropharyngeal seal than the classic LMA and includes a gastric drain channel to reduce aspiration risk.^[3,4]

Traditionally, LMA size is chosen by actual body weight (ABW). For the PLMA, manufacturer guidelines specify size 3 for 30–50 kg, size 4 for 50–70 kg, and size 5 for 70–100

kg. However, in obesity ABW-based sizing may select a larger mask than optimal, since airway cross-section shrinks with fat deposition. Prior work suggests that ideal body weight (IBW) might better predict airway dimensions in overweight patients. In

Address for correspondence: Dr. Bhaskar Bhaumik, Assistant Professor, Department of Anesthesiology, ESI-PGIMS, ESIC Medical College and Hospital, Joka, West Bengal, India. E-mail: bhaskarbhaumik.haur@gmail.com

DOI:
10.21276/amt.2026.v13.i2.688

How to cite this article: Bhaumik B, Garg DN. Selection of Appropriate Size of ProSeal Laryngeal Mask Airway in Obese Patients Using Ideal Body Weight vs Actual Body Weight: A Prospective Randomized Study. Acta Med Int. 2026;13(2):276-279.

a randomized study of PLMA sizing, Solanki et al.^[5] found that IBW-guided sizing produced significantly fewer complications (e.g. easier insertion, better fiberoptic view) than ABW sizing. Similarly, for other LMA types (e.g. i-gel, classic LMA), IBW-based sizing improved first-attempt success and ease of placement.^[6,7]

Given this evidence, we undertook a prospective randomized trial in obese patients (BMI ≥ 30) to compare PLMA performance when sized by IBW versus ABW. We measured insertion success, attempts, fiberoptic placement grade, and postoperative complications. We hypothesized that IBW sizing would yield smaller masks that fit better in the narrowed obese airway, improving insertion and reducing morbidity.

MATERIALS AND METHODS

After institutional ethics approval and written consent, 112 adult patients (age 18–70, BMI 30–40, ASA I–III) were enrolled. Exclusions were known difficult airway (Mallampati IV, Mallampati III with <3 cm mouth opening), cervical spine pathology, GERD, pregnancy, or risk of aspiration. Patients were randomized by computer into two groups (56 each): Group ABW (size by actual body weight) and Group IBW (size by ideal body weight). In Group ABW, PLMA sizes were assigned per manufacturer ABW chart (size 3: 30–50 kg; size 4: 50–70 kg; size 5: >70 kg). In Group IBW, the same chart was applied to the patient’s IBW, calculated by Devine’s formula (men: $IBW = 50 \text{ kg} + 0.9 \text{ kg per cm over } 152 \text{ cm}$; women: $45 \text{ kg} + 0.9 \text{ kg per cm over } 152 \text{ cm}$).

Standard monitoring was applied (ECG, NIBP, SpO_2). Anesthesia induction used fentanyl $2 \mu\text{g/kg}$ and propofol $2\text{--}2.5 \text{ mg/kg}$ (based on total body weight) followed by rocuronium 0.6 mg/kg . After mask ventilation, the chosen size PLMA (Medisys or similar) was lubricated and inserted by an experienced anesthesiologist blinded to group. Up to two insertion attempts were allowed; failure was recorded if ventilation could not be achieved on second attempt, at which point alternative airway management was instituted. The cuff was inflated to $60 \text{ cm H}_2\text{O}$. Oropharyngeal leak pressure (OLP) was measured at 3 L/min fresh gas flow by closing the adjustable pressure limiting valve until an audible leak or $30 \text{ cm H}_2\text{O}$. A 12-Fr gastric tube was passed to confirm drainage function.

Insertion parameters recorded included number of attempts, time to insertion, ease of insertion score (1=no resistance, 2=mild, 3=moderate, 4=unable to insert), and fiberoptic laryngeal view (Brimacombe grade 1–4: 4 = only cords visible). If intubation was needed (failed PLMA), this was noted. Complications recorded included desaturation events ($SpO_2 < 90\%$), regurgitation, and postoperative pharyngolaryngeal discomfort (sore throat, dysphagia) assessed at 2 h and 24 h post-op by an independent observer. Statistical analysis was performed using SPSS v25. Categorical data were compared by Chi-square or Fisher’s exact test, continuous data by t-test or Mann–Whitney U as appropriate. A p-value < 0.05 was considered significant.

RESULTS

The two groups were comparable in demographics and airway baseline data [Table 1]. The mean age was ~ 47 years in both groups ($p=0.628$). Sex distribution, Mallampati scores, mouth opening and neck mobility did not differ ($p > 0.1$ for all). Mean height, weight, BMI and calculated IBW were similar ($p > 0.3$ for each) [Table 1].

On PLMA insertion, Group IBW performed significantly better. First-attempt success occurred in 54/56 (96%) of IBW patients versus 44/56 (79%) of ABW patients ($p=0.004$). Correspondingly, more patients in Group IBW had an ease-of-insertion score of 1 (no resistance) compared to Group ABW (91% vs 30%, $p < 0.001$). Only 2% of IBW patients required two attempts, versus 21% in the ABW group. Overall PLMA insertion failure was 1/56 (2%) in IBW and 6/56 (11%) in ABW ($p=0.051$). These data are summarized in [Table 2].

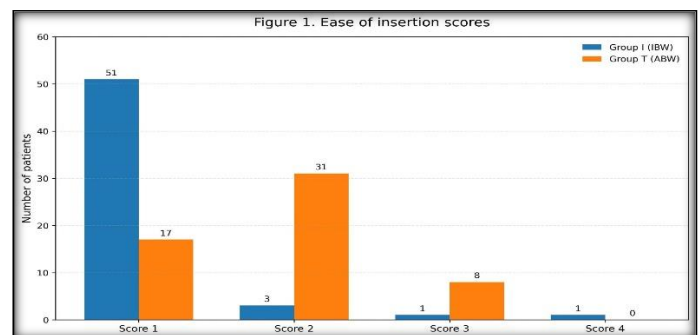


Figure 1: Comparison of ease of insertion scores between groups. Group IBW had significantly more “score 1” (no resistance) placements than Group ABW (91% vs 30%, $p < 0.001$).

Fiberoptic examination showed superior positioning in the IBW group. In Group IBW, 41 patients (73%) had a Brimacombe grade-4 view (only vocal cords visible) versus 21 patients (38%) in Group ABW ($p < 0.01$). Conversely, non-optimal views (grades 0–2) were more common when sizing by ABW [Figure 2]. The mean oropharyngeal leak pressure was slightly higher in the IBW group (≈ 29.3 vs $27.8 \text{ cmH}_2\text{O}$) but did not reach statistical significance ($p \approx 0.028$).

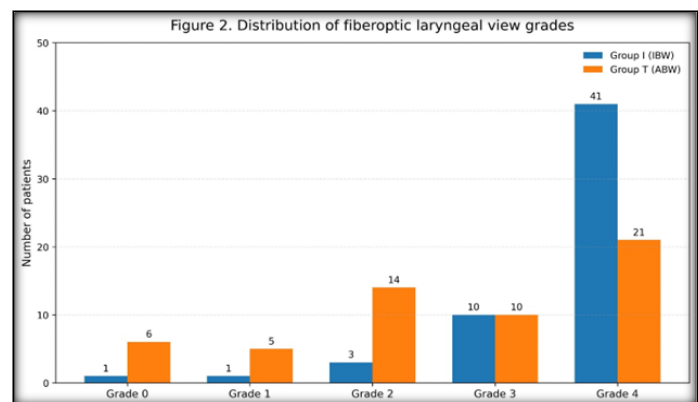


Figure 2: Distribution of fiberoptic laryngeal view grades. The IBW group had a significantly higher proportion of grade-4 (optimal) views than the ABW group, indicating better mask positioning.

Bhaumik B & Garg DN; Selection of ProSeal LMA Size in Obese Patients: Ideal vs Actual Body Weight – A Prospective Study

Postoperative airway morbidity was lower with IBW sizing. At 2 hours post-op, sore throat was reported in 9/56 (16%) of IBW patients versus 23/56 (41%) of ABW patients ($p=0.003$). By 24 hours, no patients in either group reported

sore throat. No significant differences were noted in other complications (no instances of regurgitation, hypoxia or blood staining). These findings are reflected in [Table 3 and Figure 3].

Table 1: Patient demographics and baseline characteristics

Characteristic	IBW group (n=56)	ABW group (n=56)	p-Value
Age (years, mean \pm SD)	47.7 \pm 12.4	46.7 \pm 10.1	0.628
Male sex, n (%)	20 (36%)	18 (32%)	0.690
Female sex, n (%)	36 (64%)	38 (68%)	—
Height (cm)	158.6 \pm 4.3	157.5 \pm 3.1	0.629
Weight (kg)	82.2 \pm 7.6	83.4 \pm 6.8	0.314
BMI (kg/m ²)	32.7 \pm 1.6	33.4 \pm 2.5	0.065
Ideal body weight (kg)	54.5 \pm 6.0	54.1 \pm 4.8	0.666

Table 2: Airway insertion outcomes

Outcome	IBW group (n=56)	ABW group (n=56)	p-Value
First-attempt success, n (%)	54 (96)	44 (79)	0.004
Two attempts required, n (%)	2 (4)	12 (21)	—
Failed insertion, n (%)	1 (2)	6 (11)	0.051

Table 3: Postoperative complications

Complication	IBW group (n=56)	ABW group (n=56)	p-Value
Sore throat at 2 h, n (%)	9 (16)	23 (41)	0.003
Sore throat at 24 h, n (%)	0 (0)	0 (0)	—

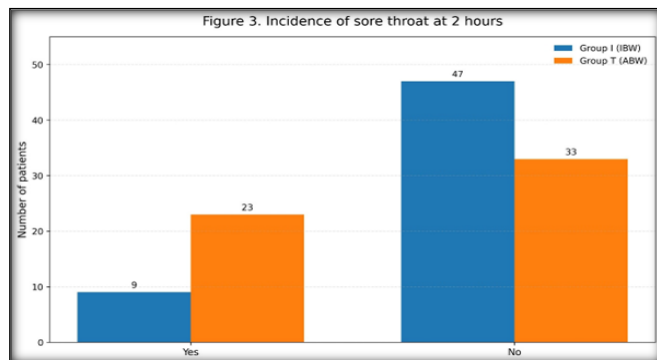


Figure 3: Incidence of sore throat at 2 hours postoperatively was significantly higher in the ABW group than the IBW group (41% vs 16%, $p=0.003$), indicating less pharyngolaryngeal trauma with IBW-based sizing.

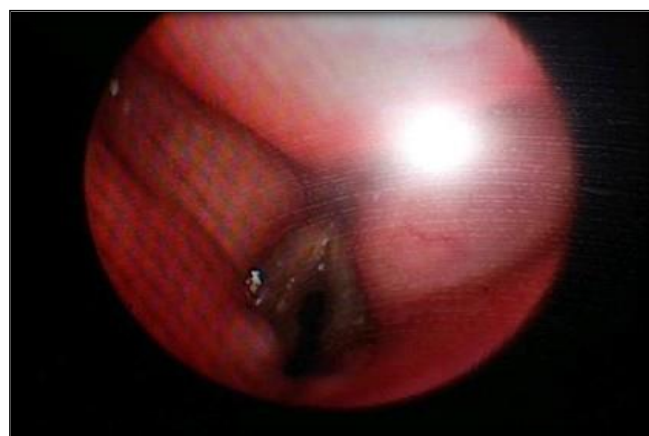


Figure 4: This image illustrates the fiber-optic view of vocal cord through the ventilation port (Brimacombe and Berry grade 4).

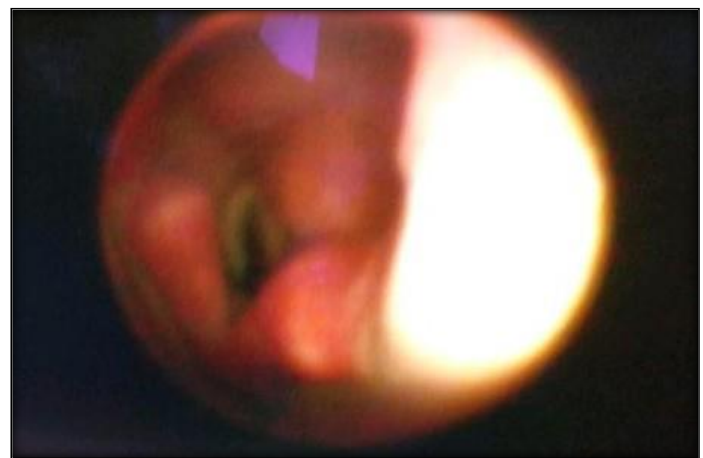


Figure 5: Brimacombe and Berry grade 3 fiber-optic view through ventilation port.

DISCUSSION

This study demonstrates that in obese patients, selecting PLMA size by ideal body weight significantly improves insertion success and reduces minor complications. The groups were similar at baseline, confirming that differences arose from the sizing method. When sizing by IBW, the mask tended to be one size smaller than the ABW-based choice. This smaller mask appeared to align better with the narrowed obese airway: IBW patients had a much higher first-attempt success rate (96% vs 79%) and vastly easier placement (91% vs 30% rated as no-resistance) [Figure 1]. These findings align with previous reports that using IBW for SGA sizing yields higher ease-of-insertion and first-pass rates.^[5-7] For example, Arif et al,^[7] found in obese patients that IBW-guided i-gel insertion significantly improved first-attempt success and reduced insertion time.

Better fiberoptic placement with IBW sizing was also evident: nearly three-quarters of IBW patients had optimal grade-4 views, compared to only 38% in the ABW group.^[8] [Figure 2]. A more appropriately sized mask likely fits the glottic opening more precisely, improving seal and reducing malposition. Prior work in overweight patients reported similar improvements in fiberoptic scores with IBW sizing. In contrast, ABW-based sizing may overshoot, causing excessive cuff folding or coiling in the pharynx.

Importantly, postoperative pharyngolaryngeal morbidity was reduced: sore throat at 2 h was significantly lower in the IBW group (16% vs 41%, $p=0.003$).^[9] This suggests that the smaller mask caused less mucosal pressure and trauma. Brain et al,^[10] observed that PLMA insertion is associated with <25% sore throat incidence; our ABW group exceeded this likely due to repeated attempts or oversizing. By 24 h no patient had sore throat, reflecting the mild nature of these injuries.

Our results support changing practice toward IBW-based sizing for PLMA in obesity. This is consistent with Solanki's PLMA study (IBW vs ABW in BMI>25) which concluded "IBW is preferable for the size selection of the PLMA in overweight and obese patients". It echoes Kim et al,^[6] findings with LMA Classic, where ideal-weight sizing yielded easier and faster insertion and fewer complications. The rationale is that IBW better approximates lean body mass and pharyngeal dimensions in obesity, avoiding the "one-size-fits-all" oversize that ABW implies.

Limitations of our study include its single-center design and relatively homogeneous BMI range (30–40 kg/m²). Extremely high obesity (BMI>40) or difficult airway features were not included. We did not measure peak airway pressures or ventilation quality in detail; however, PLMA seal pressures were comparable. Future studies could examine outcomes like ventilation parameters, mask leak under surgical conditions, or patient subgroups (e.g. super-obesity). Cost-effectiveness of needing one size smaller (potentially leaving room for downsizing) also merits exploration.

CONCLUSION

In obese surgical patients, selecting ProSeal LMA size by ideal body weight, rather than actual body weight, significantly improves insertion success, ease of placement, and patient comfort. IBW-guided sizing yields smaller, better-fitting masks that maintain an adequate seal with fewer insertion attempts and lower incidence of sore throat. We recommend anesthesiologists consider using IBW-based charts for PLMA sizing in obesity. This strategy aligns with

emerging evidence and may enhance airway management safety in this challenging population.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. World Health Organization. (2025, December 8). Obesity and overweight. World Health Organization. <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>
2. Loder W. A. (2010). Airway management in the obese patient. *Critical care clinics*, 26(4), 641–646. <https://doi.org/10.1016/j.ccc.2010.08.002>
3. Patel, A. S., & Jain, N. (2019). Comparison of ProSeal laryngeal mask airway, classical laryngeal mask airway with endotracheal tube in gynecological laparoscopy under controlled ventilation. *International Journal of Advances in Medicine*, 6(1), 81–85. <https://doi.org/10.18203/2349-3933.ijam20185108>
4. G. Natalini, M.E. Franceschetti, M.T. Pantelidi, A. Rosano, G. Lanza, A. Bernardini. (2003). Comparison of the standard laryngeal mask airway and the ProSeal laryngeal mask airway in obese patients. *British Journal of Anaesthesia*. 90(3). 323-326. <https://doi.org/10.1093/bja/aeg060>
5. Solanki, S. L., Doctor, J. R., Shekhawat, K. K., Myatra, S. N., Joshi, M., & Divatia, J. V. (2017). Comparison of actual and ideal body weight for selection of appropriate size of ProSeal™ laryngeal mask airway in overweight and obese patients: A prospective, randomised study. *Indian journal of anaesthesia*, 61(5), 398–403. https://doi.org/10.4103/ija.IJA_69_17
6. Kim, M. S., Lee, J. S., Nam, S. B., Kang, H. J., & Kim, J. E. (2015). Randomized Comparison of Actual and Ideal Body Weight for Size Selection of the Laryngeal Mask Airway Classic in Overweight Patients. *Journal of Korean medical science*, 30(8), 1197–1202. <https://doi.org/10.3346/jkms.2015.30.8.1197>
7. Arif SK. Comparison of Actual and Ideal Body Weight for Size Selection of i-gel™ Laryngeal Mask Airway in Obese Patients. *J Surg Anesth*. 2019;3(1):121. <https://doi.org/10.4172/2684-1606.1000121>
8. Brimacombe, J., & Berry, A. (1993). A proposed fiber-optic scoring system to standardize the assessment of laryngeal mask airway position. *Anesthesia and analgesia*, 76(2), 457.
9. Brimacombe, J.; Hill, K.; Keller, C.. Comparing Laryngeal Mask Airway ProSeal and Laryngeal Tube: In Response:. *Anesthesia & Analgesia* 96(5):p 1535-1536, May 2003. | DOI: 10.1213/01.ANE.0000057765.66559.18
10. Brain, A. I., Verghese, C., & Strube, P. J. (2000). The LMA 'ProSeal'--a laryngeal mask with an oesophageal vent. *British journal of anaesthesia*, 84(5), 650–654. <https://doi.org/10.1093/bja/84.5.650>