# Tracheotomy Outcomes in Super-super Obese Patients, Are They Worse Compared to Other Obesity Subgroups?

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## Background

| Obesity Subclassification[1] | BMI kg/m^{2} |
|---|---|
| Class 1 Obesity | 30-34.9 |
| Class 2 Obesity | 35-39.9 |
| Class 3 or Morbid Obesity | 40-49.9 |
| Super Obese | 50-59.9 |
| Super-super Obese | >60 |

Global prevalence of obesity has been consistently increasing over the last few decades.[2] Not only has it been documented that patients transition from normal weight to obese, but once patients are classified as obese, there is a prevalent uptrend to increasingly severe classifications of obesity.[3] Once patients reach Class III obesity, there is significantly higher incidence of Obstructive Sleep Apnea (OSA), decreased respiratory compliance, increased airway resistance, and increasing difficulty to wean and extubate following Ventilatory-dependent Respiratory Failure (VDRF).[4,5] This presents a challenge for Otolaryngologists as these high risk patients become more prevalent tracheotomy candidates.[5] Class III obesity has been shown to have 30-day mortality rates as high as 29%.[4] This in part is due to challenging anatomy (excess cervical adipose tissue, lack of cervical extension) leading to poor surgical exposure and size as well as length and curvature mismatch of tracheotomy tube with stoma site.[4] The other component is the comorbidities that Class III and above obesity is associated with.

Marshall et. Al published a retrospective review exploring any difference in outcomes for patients stratified as Super obese compared to Class I-III obese patients. They found that their sample of Super obese patients had a higher rate of tracheotomy dependence compared to the control group.[6] However, there was no increase in overall complication rates or hospital mortality detected in the Super obese group.[6]

Although the group of BMI >50 has been studied for post-tracheotomy complications, an additional subclassification in literature known as the Super-super obese group, BMI >60, known to be at even greater risk of postoperative complications, has never been explored for trends in post-tracheotomy complications and hospital mortality.[7]

## References

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## Study Design

**Study objective:** Explore the trends in post-tracheotomy complications and hospital mortality in Super-super obese patients and compare rates with that of the Super obese group as well as obese group from a single institution.

This is a retrospective cohort review performed at a tertiary care medical center in New Jersey. The Medical Informatics at the institution was enlisted by the study team to search for patients above the age of 18 years who underwent tracheotomy between January 1, 2019 to January 1, 2023. Patients were initially classified into groups based on BMI: Obese (30-49.9), Super obese (50-59.9), and Super-super obese (>60).

Medical records were then reviewed and additional patient characteristics including race/ethnicity, sex, age, and comorbidities were documented. Past medical history of previous tracheotomy was noted if present. Post-tracheotomy outcomes including length of time for ventilator dependence, post-operative complications (pneumothorax, bleeding, accidental decannulation, fistula formation), and 30-day mortality rates were documented.

Chi-squared analysis was performed on categorical variables and ANOVA analysis was performed on continuous variables to detect any significant difference in post-tracheotomy outcomes between BMI groups.

## Results

A total of 58 patients were included in this study: 38 in the Class I-III obesity group, 8 in the Super obese group, and 12 in the Super-super obese group. Patient demographic data distribution is presented in **Table 1**. Length of hospital stay was documented for each patient, and each BMI group's median is plotted on **Figure 1**, p=0.3305. Length of time on mechanical ventilation was also documented for each patient, and each BMI group's median is plotted on **Figure 2**, p=0.8611. There was no significant difference found between each of the groups regarding both outcome variables.

Percent of patients in each BMI group who suffered postoperative complications and/or 30-day postoperative mortality are presented in **Figure 3**, with p-values noted respectively. There was no significant difference between each of the BMI groups for postoperative outcomes as well.
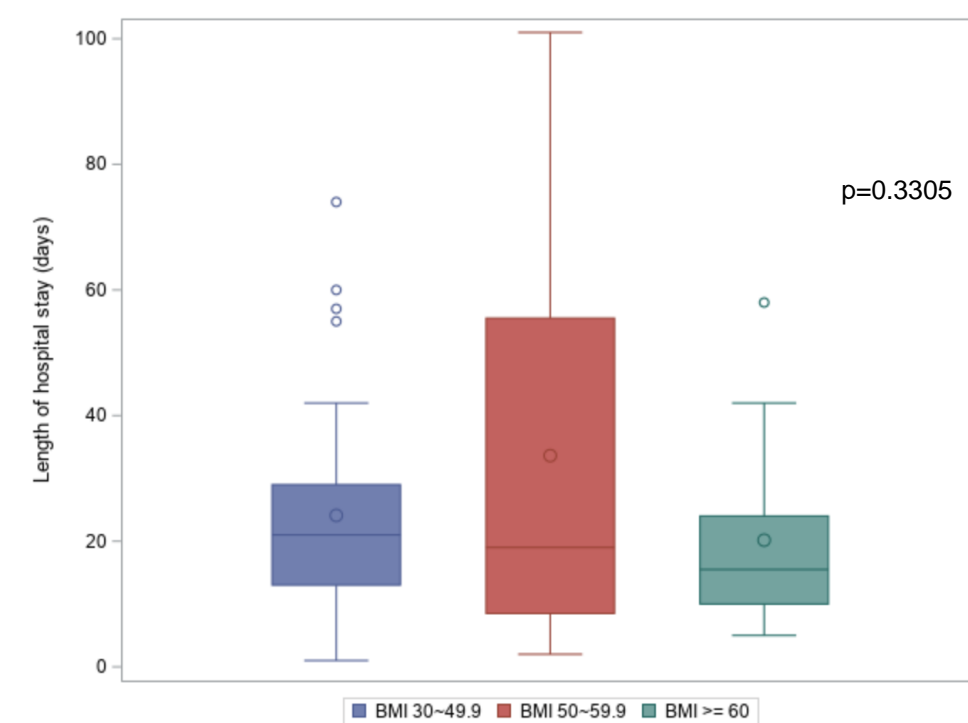


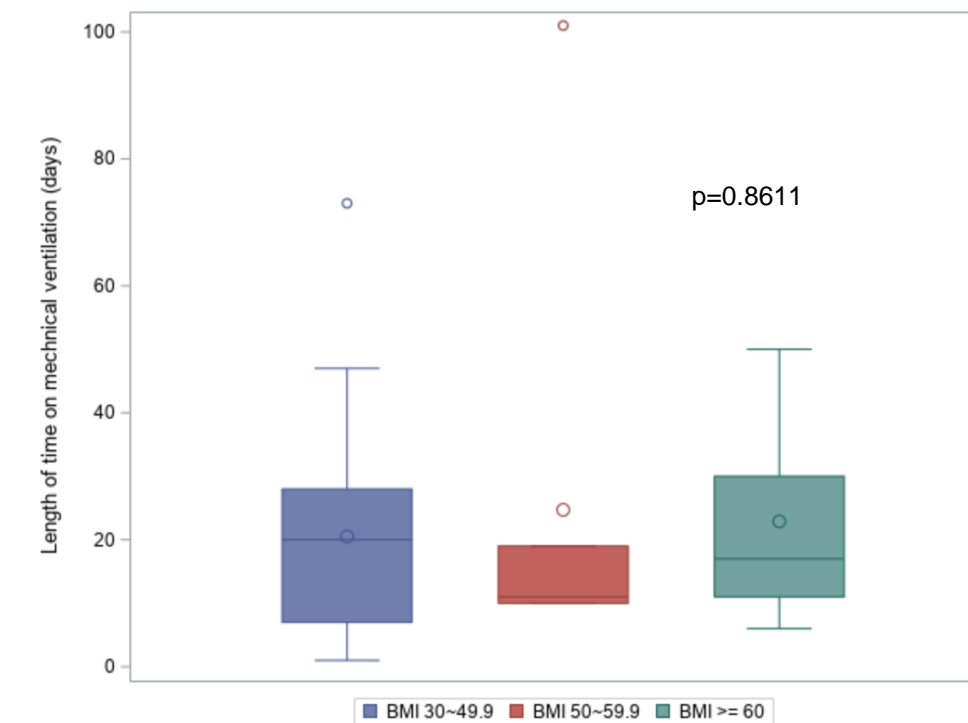**Figure 1.** Length of hospital stay post-tracheotomy for each BMI group.



**Figure 2.** Length of time on mechanical ventilation post-tracheotomy for each BMI group.

## Discussion

In this study, Super-obese patients and Super-super obese patients were not shown to be at increased risk of postoperative complications, 30-day mortality, longer length of hospital stay, longer length of time on mechanical ventilation after having a tracheotomy when compared to the Class I-III obese group. This is consistent with what Marshall et. Al reported in their study which showed no increased post-tracheotomy complications in Super obese patients when compared to Class I-III obese patients. The data presented here supports that BMI >50 is not any more unsafe for patients to receive tracheotomy once the procedure is indicated, and additionally shows that BMI >60 follows the same trend of safety.

One major barrier potentially contributing to the lack of significant association is the the small sample size which results in decreased power to detect a true significant between group difference in outcomes measured, given that they are present. Additionally, data was pulled from a single institution which decreases the generalizability of results.

Further research is recommended in order to investigate if there truly is a relationship between increasing BMI and post-tracheotomy outcomes as there is already an established association between increasing BMI and poorer general postoperative outcomes.

| | BMI 30-49.9 (Class I-III Obesity) | BMI 50-59.9 (Super obese) | BMI >60 (Super-super obese) | p-value |
|---|---|---|---|---|
| Sample size | 38 | 8 | 12 | <0.001 |
| Median | 41.1 | 52.0 | 71.9 | |
| Age (years) | | | | 0.0876 |
| Median | 59.0 | 53.0 | 43.0 | |
| Sex | | | | 0.0715 |
| Male | 57.9% | 12.5% | 58.3% | |
| Female | 42.1% | 87.5% | 41.7% | |
| Race/Ethnicity | | | | 0.8583 |
| African American | 47.4% | 62.5% | 33.3% | |
| Asian | 2.6% | 0.0% | 0.0% | |
| Hispanic | 10.5% | 0.0% | 16.7% | |
| Non-Hispanic White | 36.8% | 37.5% | 41.7% | |
| Unknown | 2.6% | 0.0% | 8.3% | |
| History of previous tracheotomy (Y) | 29.7% | 0.0% | 25.0% | 0.2570 |

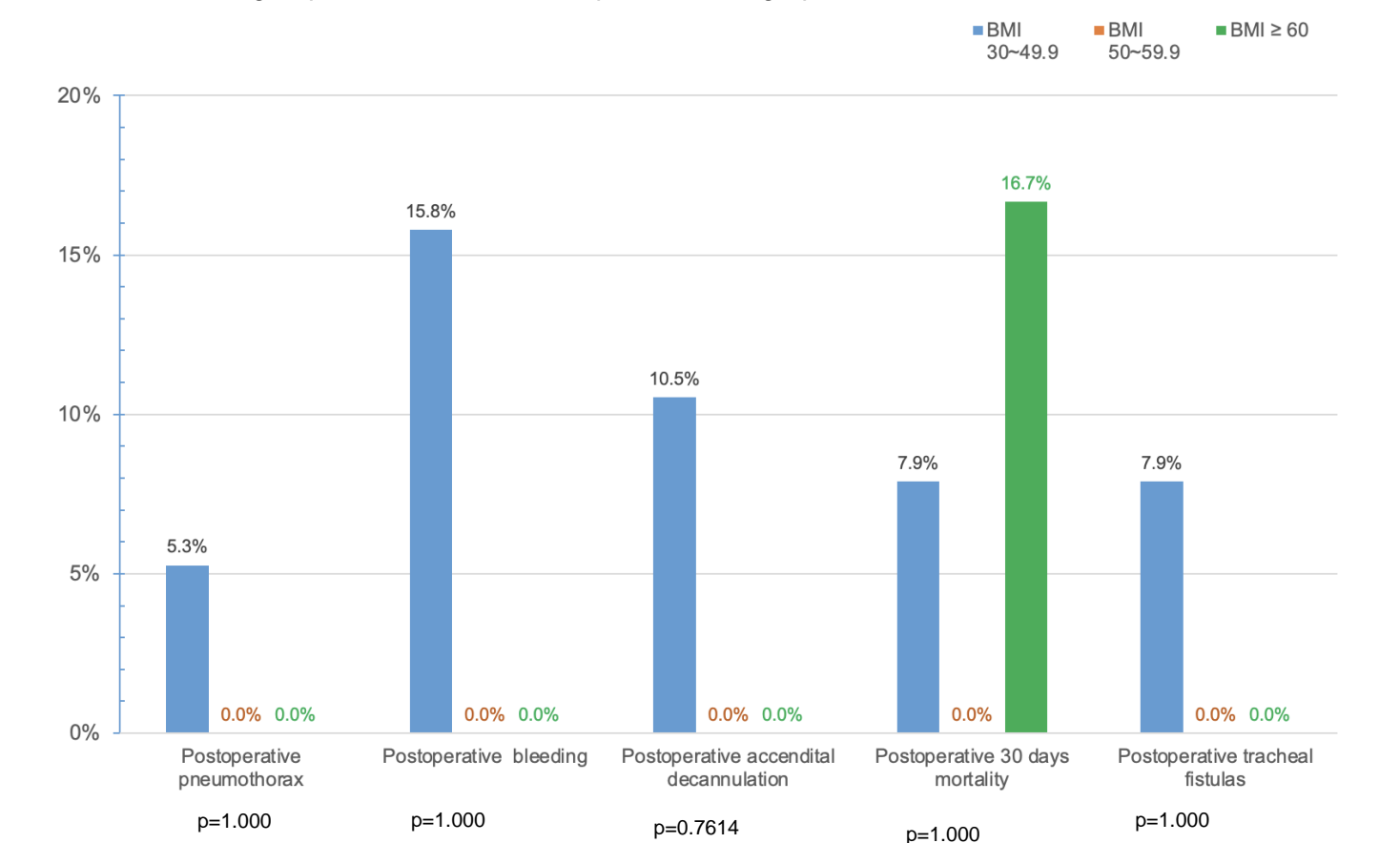**Table 1.** BMI groups and chart reviewed patient demographic data.



**Figure 3.** Prevalence of postoperative complications and 30-day mortality for each BMI group.

| | BMI 30-49.9 (Class I-III Obesity) | BMI 50-59.9 (Super obese) | BMI >60 (Super-super obese) | p-value |
|---|---|---|---|---|
| Length of time on mechanical ventilation (days) | | | | 0.8611 |
| Median | 21.0 | 11.0 | 17.0 | |
| Length of hospital stay (days) | | | | 0.3305 |
| Median | 22.0 | 10.0 | 15.5 | |
| Postoperative pneumothorax | 5.3% | 0.0% | 0.0% | 1.000 |
| Postoperative bleeding | 15.8% | 0.0% | 0.0% | 1.000 |
| Postoperative accidental decannulation | 10.5% | 0.0% | 0.0% | 0.7614 |
| Postoperative tracheal fistulas | 7.9% | 0.0% | 0.0% | 1.000 |
| Postoperative 30-day mortality | 7.9% | 0.0% | 16.7% | 0.5011 |

**Table 2.** BMI groups and post-tracheostomy outcomes

| | BMI 30-49.9 (Class I-III Obesity) | BMI 50-59.9 (Super obese) | BMI >60 (Super-super obese) | *p-value* |
|---|---|---|---|---|
| **Length of time on mechanical ventilation (days)** | | | | *0.8611* |
| **Median** | 21.0 | 11.0 | 17.0 | |
| **Length of hospital stay (days)** | | | | *0.3305* |
| **Median** | 22.0 | 10.0 | 15.5 | |
| **Postoperative pneumothorax** | 5.3% | 0.0% | 0.0% | *1.000* |
| **Postoperative bleeding** | 15.8% | 0.0% | 0.0% | *1.000* |
| **Postoperative accidental decannulation** | 10.5% | 0.0% | 0.0% | *0.7614* |
| **Postoperative tracheal fistulas** | 7.9% | 0.0% | 0.0% | *1.000* |
| **Postoperative 30-day mortality** | 7.9% | 0.0% | 16.7% | *0.5011* |