



Alleviating Respiratory Malaise in Post-bariatric Surgery Patients: A Review of Current Approaches

Nasser Malekpour Alamdari  ¹, Maryam Abbasi  ², Iman Ansari  ², Amir Hossein Tajik ³, Seyed Hossein Hajimirzaei ⁴, Amin Aliakbarzadeh Sarookhani ⁵, Ali Reza Mehrabi ^{5,*}

¹ Critical Care Quality Improvement Research Center, Shahid Modarres Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran

² Department of General Surgery, Shahid Modarres Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran

³ Student Research Committee, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran

⁴ Department of Surgery, Tehran University of Medical Sciences, Tehran, Iran

⁵ Department of General Surgery, Modarres Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran

*Corresponding Author: Department of General Surgery, Modarres Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran. Email: dralirezamehrabi63@gmail.com

Received: 5 April, 2025; Revised: 18 May, 2025; Accepted: 19 May, 2025

Abstract

Context: Impairment of respiratory functions is an important side effect following bariatric surgeries, which can fortunately be managed through various approaches. These impairments can significantly affect the quality of life of patients, necessitating effective management strategies.

Evidence Acquisition: The databases examined for this narrative review were MEDLINE, Scopus, EMBASE, and Google Scholar. Only studies that included at least an abstract in English and employed clinical trial, cohort, or case-control methodologies were considered. Studies such as reviews, quasi-experimental, and cross-sectional designs lacking a control group were excluded from this review.

Results: The review identified several effective modalities for improving respiratory functions in patients post-bariatric surgery. These include enhancing the administration of medication, chest physiotherapy, alveolar recruitment maneuvers, and supplemental oxygen therapy. These modalities can help ease patients' respiratory malaise and facilitate faster recovery.

Conclusions: We conclude that with the correct choice of modality, the quality of life of patients undergoing bariatric surgery can be greatly increased. Implementing these strategies can significantly improve respiratory functions and overall patient outcomes.

Keywords: Respiratory Function, Bariatric Surgery, Postoperative Complication, Pain, Review

1. Context

Obesity is a significant health risk, posing numerous threats to individuals and societies, including type II diabetes, increased susceptibility to cardiovascular diseases, certain cancers, and musculoskeletal disorders. Moreover, obesity is a risk factor for many psychological disorders (1, 2). Given the grave concerns caused by obesity, and considering the rise in the number of obese and overweight patients (3), researchers have been studying different methods to help these patients lose weight. While substantial results are achieved with lifestyle changes, most obese

patients struggle to maintain a healthier lifestyle for long enough (4). Many medical solutions have been studied in the past, most of which led to little or no positive impact (4). Although a single approach isn't available right now, the effectiveness of some modalities is recognized. Arguably, the most successful treatments for obesity are bariatric surgeries, with a massive and still growing number of studies pointing to their high efficacy and manageable side effects (5). Surgical management can lead to significant improvements in health, substantial reductions in Body Mass Index (BMI), and greater decreases in mortality compared to medical therapy (4-6).

Because of the specific site of the operation in bariatric surgeries, a common issue with patients after the operation is difficulty in breathing (7, 8). Respiratory functions are weakened, mostly due to the restrictive effect of pain on breathing (9). The inflammation caused by tissue injury at the site of the surgery forces patients to take shorter breaths, thus challenging the quality of respiration. It must also be noted that obesity itself negatively affects respiratory functions, so obese patients are commonly affected by some degree of respiratory malaise even before bariatric surgery (9). The aim of the present study is to review the components that affect the respiratory functions of patients after bariatric surgeries.

2. Evidence Acquisition

This systematic review encompassed all studies published up to March 2025, focusing on the factors influencing the enhancement of respiratory function in patients who have undergone bariatric surgery. The keywords utilized in this review included “laparoscopy” [AND] “bariatric surgery” [OR] “sleeve gastrectomy” [OR] “gastric bypass” [OR] “Roux-en-Y” [OR] “gastric band” [OR] “duodenal switch” [AND] “respiratory function” [OR] “pulmonary function” [AND] “postoperative pain” [OR] [pain]. The databases examined were MEDLINE, Scopus, EMBASE, and Google Scholar. Only studies that included at least an abstract in English and employed clinical trial, cohort, or case-control methodologies were considered, while studies such as reviews, quasi-experimental, and cross-sectional designs lacking a control group were excluded from this review. The search strategy involved two researchers independently searching the databases for the specified keywords, with a third researcher overseeing and analyzing the search results. Ultimately, the data were synthesized and presented in the results section.

3. Results

3.1. Laparoscopy Versus Open Bariatric Surgery

A study by Nguyen et al. (as cited by Elrazek et al.) found that patients who underwent laparoscopic gastric bypass experienced significantly less decline in pulmonary function during the first three days after surgery compared to those who had open gastric bypass. By the seventh day post-surgery, all pulmonary function metrics for the laparoscopic group had returned to preoperative levels, while only one metric (peak expiratory flow) had done so for the open gastric bypass group. On the first day after surgery, patients who had laparoscopic gastric bypass required less

morphine and reported lower pain levels at rest and during movement compared to those who had open gastric bypass. Additionally, fewer patients in the laparoscopic group developed hypoxemia and segmental atelectasis (10).

In a separate study, researchers demonstrated that the reduction in forced vital capacity, forced expiratory volume in 1 second, and peak expiratory flow rate was significantly less after laparoscopic gastroplasty compared to open gastroplasty. Specifically, on the first day, forced vital capacity decreased by 50% in the laparoscopic group versus 64% in the open group, forced expiratory volume in 1 second decreased by 50% compared to 66%, and peak expiratory flow rate decreased by 45% compared to 60%. Furthermore, oxygen saturation (SpO_2) levels were significantly higher in the laparoscopic group (11).

3.2. Supplemental Oxygen Therapy

In other studies it was revealed that delta end-expiratory lung volume was significantly greater at one hour in patients receiving high-flow nasal oxygen compared to those undergoing conventional oxygen therapy. However, at the six-hour mark, no significant differences were observed in the PaO_2/FiO_2 ratio or $PaCO_2$ levels (12).

In a separate investigation, it was demonstrated that after 120 minutes in the post-anesthesia care unit, the parameters of pH, pCO_2 , pO_2 , and SpO_2 were more favorable in the non-invasive ventilation (NIV) group compared to the control group. Notably, seventy-two hours postoperatively, only one patient (2%) in the NIV group developed acute respiratory failure, in contrast to seven patients (12.2%) in the control group. This indicates that conventional Venturi mask ventilation is significantly associated with an increased risk of postoperative acute respiratory failure. Consequently, it appears that short-term NIV during post-anesthesia care unit observation enhances the recovery of postoperative lung function and oxygenation in obese patients following bariatric surgery, thereby reducing the need for critical care in the days subsequent to the procedure. As day-case surgery becomes increasingly endorsed for individuals with morbid obesity, the implementation of NIV may be deemed essential (13).

Furthermore, it was observed that forced vital capacity (FVC) and forced expiratory volume in one second (FEV1.0) were significantly elevated on each of the three consecutive postoperative days in patients who received BiPAP therapy. In contrast, the SpO_2 levels significantly declined in the control group over the

same timeframe. Thus, prophylactic BiPAP during the initial 12 to 24 hours postoperatively resulted in markedly improved pulmonary function metrics in severely obese patients who underwent elective gastric bypass surgery (14).

Alveolar recruitment maneuvers have been the subject of investigation in various studies, which demonstrated that patients undergoing recruitment maneuvers exhibited a significantly reduced incidence of pulmonary dysfunction both in the recovery room and on postoperative day one. The study concluded that recruitment maneuvers are both safe and effective in mitigating early pulmonary dysfunction among obese patients (15).

Furthermore, another study indicated that the intensity of pain was markedly lower in the group that received pulmonary recruitment maneuvers compared to the control group 24 hours postoperatively. Additionally, the requirement for opioids was significantly diminished in the pulmonary recruitment maneuver group relative to the control group. Importantly, the implementation of the pulmonary recruitment maneuver did not influence the incidence or severity of nausea and vomiting, leading to the conclusion that a ventilator-guided pulmonary recruitment maneuver effectively reduces postoperative pain intensity and opioid consumption following laparoscopic bariatric surgery (16).

Moreover, other research revealed that the combination of a transversus abdominis plane block with a recruitment maneuver resulted in superior postoperative pulmonary function test outcomes, with intraoperative oxygenation levels being higher in the recruitment maneuver group (17).

3.3. Electroanalgesia

In another study it was demonstrated that transcutaneous electrical nerve stimulation (TENS) significantly alleviated pain in the intervention group compared to a placebo. However, the spirometry parameters indicative of pulmonary function remained comparable between the two groups. Notably, maximal inspiratory pressure was preserved in the intervention group while it exhibited a decline in the placebo group during the preoperative and postoperative periods. Additionally, the respiratory rate in the placebo group increased during the application of TENS, in contrast to the intervention group. The authors concluded that electroanalgesia effectively reduces pain in patients undergoing bariatric surgery and importantly, maintains maximal inspiratory pressure across the

surgical continuum. Nevertheless, it was noted that electroanalgesia does not enhance spirometric outcomes (18).

3.4. Chest Physiotherapy

A recent study by Duymaz et al. revealed that patients who received chest physiotherapy exhibited significantly improved dyspnea scores, oxygen saturation, vital capacity, tidal volume, peak expiratory flow (PEF), pulmonary arterial pressure, and overall quality of life when compared to a control group. Furthermore, intragroup comparisons indicated substantial enhancements across all measured parameters for those who underwent chest physiotherapy. The study concluded that postoperative chest physiotherapy in patients who had bariatric surgery resulted in improved respiratory function, regulation of arterial blood gases, increased oxygen saturation, enhanced functional capacity, improved quality of life, and reduced levels of dyspnea (18).

3.5. Medications

3.5.1. Narcotics

In a study conducted by De Baerdemaeker et al., it was found that cumulative morphine consumption was greater in the remifentanil group during the initial two hours postoperatively compared to the sufentanil group; however, the consumption levels equalized thereafter. The recovery profiles and spirometric assessments revealed no significant differences between the two groups. Notably, remifentanil was associated with superior hemodynamic stability during the maintenance phase (19).

4. Discussion

Surgeons and researchers have constantly sought ways to improve the outcomes of surgical procedures and alleviate their side effects. Postoperative pain, respiratory complications, and gastrointestinal side effects are among the most significant issues that patients experience after bariatric surgeries (10). Understanding the pathophysiological pathways occurring at the surgical site after the operation is necessary for effective postoperative management. Tissue injury caused by surgical procedures leads to a local inflammatory response at the surgical site (11). With the release of inflammatory mediators, the hallmarks of inflammation emerge, and pain is perceived by the patient, severely impacting their quality of life (7).

Respiratory problems are one of the most common complications in the early postoperative period following bariatric surgery (12). Postoperative pain can restrict thoracic movements, leading to shortness of breath after surgery. This limitation significantly reduces patients' quality of life in the immediate aftermath of bariatric surgery. Multiple methods of bariatric surgery are available, giving patients and surgeons different options to choose from based on specific circumstances. Laparoscopic bariatric surgeries, and laparoscopic surgeries in general, have gained more interest than other types of surgery in recent years. Studies suggest that these surgeries lead to fewer side effects, less postoperative pain, and faster recovery times. It is understood that, as a result of less severe pain and fewer restrictions on chest movement, the respiratory function of patients who have undergone laparoscopic surgery will recover sooner than others (13).

The modern, multidisciplinary approach in the postoperative management of patients after bariatric surgery consists of many modalities. Alveolar recruitment maneuvers, for instance, are proven to be safe and effective in helping patients develop fewer respiratory side effects. Likewise, supplemental oxygen therapy can lead to better respiratory functions in patients after bariatric surgery and reduce the need for critical care (12, 14, 15). Different pain medications, administered via multiple pathways, are used to manage postoperative pain and related side effects. Classically, opioids such as morphine are used to manage postoperative pain. However, recent approaches to pain management include administering amide anesthetics such as lidocaine and bupivacaine to lower the need for opioids. Replacing opioids with these medications helps reduce the pain perceived by patients, alleviating respiratory side effects. Moreover, given the respiratory depression caused by opioids, this reduction in opioid consumption could benefit these patients further (16, 17).

Taking into account the already deficient respiratory function in most obese and overweight patients, their lungs are more susceptible to malfunctioning than those of other patients after the operation. Today, an important part of managing respiratory side effects is chest physiotherapy. Significant improvements were reported in studies examining the relationship between chest physiotherapy and the speed of recovery after surgery (18). Weakened respiratory functions reduce the quality of life of patients after surgery. Multiple methods can be used to alleviate respiratory side effects after bariatric surgery. However, when used together,

the efficacy of these methods hasn't been evaluated. Achieving a comprehensive approach in managing the side effects of bariatric surgeries requires more research.

4.1. Conclusions

With the rise of obesity, the need for countermeasures is growing, and surgical treatment of obesity has become a necessity for many patients. New methods for managing the relatively minor side effects of these surgeries are constantly being introduced, and researchers study them to evaluate their efficacy and safety. Impairment of respiratory functions is an important side effect, which can fortunately be managed through an array of different approaches. Enhancing the administration of medication, chest physiotherapy, alveolar recruitment maneuvers, and supplemental oxygen therapy are some of the modalities that healthcare providers can offer to ease patients' respiratory malaise and help them recover faster. These approaches, alongside other postoperative care measures, have made bariatric surgery an even more effective and straightforward choice for obese patients.

Footnotes

Authors' Contribution: N. M. A.: Conceptualization, methodology, project administration, writing-review and editing; M. A.: Data curation, project administration, writing-original draft, writing-review and editing; I. A.: Formal analysis, funding acquisition, methodology, validation, writing-original draft writing-review and editing; A. H. T.: Writing-review and editing; S. H. H.: Data curation; A. A. S.: Writing-review and editing; A. R. M.: Writing-original draft, writing-review and editing.

Conflict of Interests Statement: The authors declared no conflict of interests.

Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after publication.

Funding/Support: The authors declared no funding for the study.

References

1. Kinlen D, Cody D, O'Shea D. Complications of obesity. *QJM*. 2018;111(7):437-43. [PubMed] ID: 29025162. <https://doi.org/10.1093/qjmed/hcx152>.

2. Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet*. 2014;384(9945):766-81. [PubMed ID: 2488030]. [PubMed Central ID: PMC4624264]. [https://doi.org/10.1016/S0140-6736\(14\)60460-8](https://doi.org/10.1016/S0140-6736(14)60460-8).
3. World Obesity Federation. *World Obesity Atlas 2024*. London, United Kingdom: World Obesity Federation; 2024. Available from: https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.worldobesity.org/news/world-obesity-atlas-2024&ved=2ahUKEwj5uKJrMGNAXVIVKQEHUhIGvgQFnoECCAQAAQ&usg=AQvVaw306QN3t_VoW7RkNvHIZRaE
4. Bray GA, Fruhbeck G, Ryan DH, Wilding JP. Management of obesity. *Lancet*. 2016;387(10031):1947-56. [PubMed ID: 26868660]. [https://doi.org/10.1016/S0140-6736\(16\)00271-3](https://doi.org/10.1016/S0140-6736(16)00271-3).
5. Cosentino C, Marchetti C, Monami M, Mannucci E, Cresci B. Efficacy and effects of bariatric surgery in the treatment of obesity: Network meta-analysis of randomized controlled trials. *Nutr Metab Cardiovasc Dis*. 2021;31(10):2815-24. [PubMed ID: 34348877]. <https://doi.org/10.1016/j.numecd.2021.06.018>.
6. Mingrone G, Panunzi S, De Gaetano A, Guidone C, Iaconelli A, Nanni G, et al. Bariatric-metabolic surgery versus conventional medical treatment in obese patients with type 2 diabetes: 5 year follow-up of an open-label, single-centre, randomised controlled trial. *Lancet*. 2015;386(9997):964-73. [PubMed ID: 26369473]. [https://doi.org/10.1016/S0140-6736\(15\)00075-6](https://doi.org/10.1016/S0140-6736(15)00075-6).
7. Chou R, Gordon DB, de Leon-Casasola OA, Rosenberg JM, Bickler S, Brennan T, et al. Management of Postoperative Pain: A Clinical Practice Guideline From the American Pain Society, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists' Committee on Regional Anesthesia, Executive Committee, and Administrative Council. *J Pain*. 2016;17(2):131-57. <https://doi.org/10.1016/j.jpain.2015.12.008>.
8. Schug SA, Raymann A. Postoperative pain management of the obese patient. *Best Pract Res Clin Anaesthesiol*. 2011;25(1):73-81. [PubMed ID: 21516915]. <https://doi.org/10.1016/j.bpa.2010.12.001>.
9. Labib MM, Farag HM, Ibrahim AI. The Effect of Anesthesia and Analgesia on Control of Breathing after Bariatric Surgery: A Systematic Review and Meta-Analysis of Randomized Control Trials. *QJM: An Int J Med*. 2020;113(Supplement_1). <https://doi.org/10.1093/qjmed/hcaa039.036>.
10. Elrazek AE, Elbanna AE, Bilasy SE. Medical management of patients after bariatric surgery: Principles and guidelines. *World J Gastrointest Surg*. 2014;6(11):220-8. [PubMed ID: 25429323]. [PubMed Central ID: PMC4241489]. <https://doi.org/10.4240/wjgs.v6.i11.220>.
11. Sinha A, Sinha AC, editor. *Oxford Textbook of Anaesthesia for the Obese Patient*. Oxford, England: Oxford University Press; 2021. <https://doi.org/10.1093/med/9780198757146.001.0001>.
12. Karlnoski RA, B.S CS, Puri S, Chen R, Mangar D, Murr MM, et al. Reduced Postoperative Pain and Complications after a Modified Multidisciplinary Approach for Bariatric Surgery. *Open Obesity J*. 2013;5(1):60-4. <https://doi.org/10.2174/1876823720130508009>.
13. Nguyen NT, Lee SL, Goldman C, Fleming N, Arango A, McFall R, et al. Comparison of pulmonary function and postoperative pain after laparoscopic versus open gastric bypass: a randomized trial. *J Am Coll Surg*. 2001;192(4):469-76. discussion 476-7. [PubMed ID: 11294404]. [https://doi.org/10.1016/s1072-7515\(01\)00822-5](https://doi.org/10.1016/s1072-7515(01)00822-5).
14. Pasquier EK, Andersson E. Pulmonary recruitment maneuver reduces pain after laparoscopic bariatric surgery: a randomized controlled clinical trial. *Surg Obes Relat Dis*. 2018;14(3):386-92. [PubMed ID: 29290563]. <https://doi.org/10.1016/j.sj.soard.2017.11.017>.
15. Imperatore F, Gritti F, Esposito R, Giudice CD, Cafora C, Pennacchio F, et al. Non-Invasive Ventilation Reduces Postoperative Respiratory Failure in Patients Undergoing Bariatric Surgery: A Retrospective Analysis. *Medicina (Kaunas)*. 2023;59(8). [PubMed ID: 37629747]. [PubMed Central ID: PMC10456476]. <https://doi.org/10.3390/medicina59081457>.
16. Safari S, Rokhtabnak F, Djalali Motlagh S, Ghanbari Garkani M, Pournajafian A. Effect of intraperitoneal bupivacaine on postoperative pain in laparoscopic bariatric surgeries. *Surg Obes Relat Dis*. 2020;16(2):299-305. [PubMed ID: 31836291]. <https://doi.org/10.1016/j.sj.soard.2019.10.028>.
17. Rathnayak B. Optimizing Pain Management in Bariatric Surgery A Low-Opioid Approach. *Uva Clin Anaesth Intensive Care*. 2025;Preprint.
18. Duymaz T, Karabay O, Ural IH. The Effect of Chest Physiotherapy After Bariatric Surgery on Pulmonary Functions, Functional Capacity, and Quality of Life. *Obes Surg*. 2020;30(1):189-94. [PubMed ID: 31512160]. <https://doi.org/10.1007/s11695-019-04165-z>.
19. De Baerdemaecker LE, Jacobs S, Pattyn P, Mortier EP, Struys MM. Influence of intraoperative opioid on postoperative pain and pulmonary function after laparoscopic gastric banding: remifentanil TCI vs sufentanil TCI in morbid obesity. *Br J Anaesth*. 2007;99(3):404-11. [PubMed ID: 17606479]. <https://doi.org/10.1093/bja/aem164>.