

Clinical and functional recovery in a patient with pulmonary hypertension after bariatric surgery

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ABSTRACT

Severe pulmonary hypertension (PH) in obese patients pose a challenge to treat despite advances in medical therapeutics. Current treatment options are limited for patients who are not responding to maximal medical therapy. Here, we present a case of multifactorial PH, not responsive to ambrisentan, tadalafil, and treprostinil, even after optimization of cardiac and pulmonary function and had a poor prognosis. She demonstrated weight loss after bariatric surgery, improving her restrictive lung disease, obstructive sleep apnea and PH, and overall functionality. Bariatric surgery may offer a potential therapeutic option, in patients with morbid obesity and PH resistant to maximal medical therapy.

KEY WORDS: Bariatric surgery, obstructive sleep apnea, pulmonary hypertension

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INTRODUCTION

Pulmonary hypertension (PH) is defined as pulmonary artery pressure (PAP) ≥ 20 mm Hg, two standard deviations above the normal (14.0 ± 3.3).^[1] The management of PH preemptively requires optimization of their cardiac and pulmonary functions. Medical therapeutics are currently limited to only idiopathic pulmonary artery hypertension.^[2] Patients with PH due to chronic thromboembolism need surgical intervention either mechanical thrombectomy or percutaneous transluminal pulmonary angioplasty.^[3] There are no available therapeutic options for PH due to other causes and treatment is aimed at the management of underlying disease.

Here, we present a case of multifactorial PH in morbidly obese patient who exhibited dramatic clinical and functional recovery after bariatric surgery.

CASE REPORT

A 60-year-old African American female with a history of morbid obesity (body mass index: 39.06 kg/m^2), hypertension, chronic hypoxemic/hypercapnic respiratory failure, chronic obstructive pulmonary disease, PH on triple therapy of ambrisentan, tadalafil, and treprostinil for 2 years (likely Group 1, 2, and 3), heart failure with preserved ejection fraction on torsemide and spironolactone was evaluated in our clinic in 2018. Examination was significant for lower extremity edema and loud S2. She exhibited severe limitation on 6 min walk test and needed 6 L/min of oxygen supplementation for 298 m walk distance. Her ventilation-perfusion scan was consistent with mild-to-moderate chronic obstructive pulmonary disease. Her sleep study showed severe obstructive sleep apnea (OSA) with apnea-hypopnea index 7/h of sleep

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and total respiratory disturbance index of 40.9 obstructive events/hour of sleep. Transthoracic echocardiogram revealed abnormal left ventricular diastolic filling, left atrial index 49.3, ejection fraction 60%–65%, and moderately enlarged right ventricle. Despite attempts at weight reduction, her body mass index and mean PAP did not decrease and she continued to deteriorate further. Subsequently, despite high risk attributed to PH, gastric sleeve surgery was done to achieve long-term weight loss and subsequent improvement in OSA and PH. During the hospital course, we used continuous pump treprostinil, milrinone, and inhaled nitric oxide to stabilize mean PAP and right ventricular systolic pressures. General anesthesia was used during surgery and she was weaned off inhaled nitric oxide and milrinone within 24 h. She was discharged on postoperative day 2 on ambrisentan, tadalafil, and treprostinil.

She experienced dramatic weight loss and functional improvement over the next 6 months. During her clinic visit, she denied any lower extremity edema and was able to exercise 30 min a day without any limitations. Within 6 months, she was able to be weaned off daytime oxygen and was placed on continuous positive airway pressure of 10 cm H₂O for OSA. We have compiled her pre- and post-surgery pulmonary function test and right heart catheterization data for comparison as shown in Table 1.

Table 1: Comparing pulmonary function test and right heart catheterization data before and after surgery

	Before surgery	After surgery
BMI (kg/m ²)	39.06	25.2
PFT (%)		
FEV ₁	38	40
FVC	39	48
TLC	60	76
RV	109	122
RV/TLC	185	158
RHC		
RAP (mm Hg)	22	10
RVP (mm Hg)	110/19	61/6
PAP (mm Hg)	106/39	59/17
PVR (woods unit)	6.3	3.5
TPG (mm Hg)	39	21
DPG (mm Hg)	16	3
PCWP (mm Hg)	23	14
CO (LPM)	6.1	6
CI (LPM/M ²)	2.9	3.44
Oxygen requirements	AVAPS EPAP/IPAP 18/22-28 mm hg	CPAP 10 cm H ₂ O
Sleep	6 LPM	No additional O ₂
6MWT	6 LPM	
Functional capacity	WHO IV	WHO I

BMI: Body mass index, PFT: Pulmonary function tests, RVP: Right ventricular pressure, PAP: Pulmonary artery pressure, PVR: Pulmonary vascular resistance, FEV₁: Forced expiratory volume, FVC: Forced vital capacity, TLC: Total lung capacity, RV: Residual volume, RHC: Right heart catheterisation, RAP: Right atrial pressure, TPG: Trans-pulmonary gradient, DPG: Diastolic pressure gradient, PCWP: Pulmonary capillary wedge pressure, CO: Cardiac output, CI: Cardiac index, 6MWT: 6-minute walk test, LPM: Liters per minute, CPAP: Continuous positive airway pressure, AVAPS: Average volume assured pressure support, EPAP: Expiratory positive airway pressure, IPAP: Inspiratory positive airway pressure

DISCUSSION

Obese patients with PH should be advised hypocaloric diet and weight loss. Bariatric surgery is another well-established therapy for obesity, which also improves medical complications related to obesity. Conventionally, patients with PH were considered high risk for surgery. However, the improvement in medical therapy for PH now allows better hemodynamic control for such surgeries to be performed. Recently, some studies have suggested improvement in PH in obese patients after bariatric surgery.

In a study conducted among 29 morbidly obese patients who underwent bariatric surgery, Valencia-Flores *et al.* reported fall in systolic PAP in subgroup of patients with resolved OSA from mean of 61.4 ± 15.8 mmHg to 42.6 ± 9.2 mmHg.^[4] Sheu *et al.* reported improvement in PAP (46.6 vs. 24.0 mm Hg; $P = 0.03$), reduction in pulmonary vasodilator therapy, and diuretic requirement than the control group, among 10 patients with severe PH who underwent bariatric surgery.^[5] Furthermore, the test group reported decreased supplemental oxygen requirements in 75% of patients while the oxygen requirement increased in 50% of the control group.^[6]

Hanipah *et al.*, in a study with 61 obese patients with PH, reported improvement in right ventricular systolic pressures from 44 to 40 mm Hg ($P = 0.03$) after a median follow-up of 22 months.^[6] Improvement in PH after bariatric surgery points toward the role of insulin resistance, lipid metabolism, and leptin in the development of PH.^[7]

This is a very exciting avenue both for unraveling the role of metabolic syndrome in the pathology of PH and also for bariatric surgery as a potential therapeutic strategy for obese patients with PH. Though exciting, PH patients still present a high operative risk. In a study by Kaw *et al.*, there was a higher morbidity rate (26% vs. 3%, $P < 0.0001$), longer intensive care unit stays, and 30-day readmission rate in PH group as compared to the control group.^[8] Hence, large-scale prospective studies are required to evaluate bariatric surgery as a potential therapeutic tool, taking into consideration the high risks of taking these patients to surgery and risks due to perioperative morbidities.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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