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Case Report

Does Spine Surgery in Patients with a History of Bariatric Gastrectomy Increase the Risk of Delayed Pulmonary Embolism?

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Abstract

Background: This is a novel observation report on patients undergoing spine surgery with a history of bariatric procedures. Acknowledgment of aggregated complications in such patients can prevent catastrophic outcomes.
Case Report: We report three patients with spinal disorders and a history of bariatric surgery who developed pulmonary embolism following spine surgery. None of the patients had a history of venous thromboembolism or deep vein thrombosis (DVT) before this event. All patients were given thromboprophylaxis after both bariatric and spine surgery, including intra- and post-operative mechanical and pharmacological thromboprophylaxis upon discharge.
Conclusion: Patients undergoing spine surgery with a history of bariatric procedures are at increased risk of developing venous thromboembolic complications, including pulmonary embolism. We recommend extensive venous thromboembolic evaluation and treating these patients as high-risk individuals even in the absence of active thromboembolic disease.

Keywords: Bariatric Surgery; Gastrectomy; Pulmonary Embolism; Spine; Venous Thromboembolism

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Background

Pulmonary embolism (PE) is a life-threatening complication of surgical intervention, which is mainly due to postoperative or intraoperative deep vein thrombosis (DVT) of the lower extremities (1). Patients who undergo spine surgery are further at risk of venous thromboembolism (VTE, including both DVT and PE) due to immobility caused by pain and neurological deficits. According to previous studies, the incidence of PE after anterior and posterior approach to lumbar spine has been reported 2.40 and 0.46%, respectively (2).

Obesity is a growing problem worldwide, and bariatric surgery is now accepted as a safe and effective procedure for morbid obesity. People in developed and also developing countries are increasingly turning towards intervention to help them lose weight. These patients are at higher risk of VTE, which is attributable to obesity and intra-operating factors (3). The incidence of VTE in bariatric surgery ranges from 0.2 to 2.6 percent, varying with the type of procedure (4, 5).

In this report, we present three cases of spinal disorder with a history of bariatric surgery in the past year who developed PE after spine surgery. We discuss the role of prophylactic VTE management and review relevant literature. Through this, we would like to examine whether a history of bariatric surgery dramatically increases the risk for VTE in patients undergoing spine surgery. To the best of our knowledge, current literature does not hold any correlation between these two surgeries regarding complications, and there is no report to refute our hypothesis. This publication could provide a cautionary note to spine surgeons and the basis of research on thromboembolic complications of combined bariatric and spine surgeries.

Case Report

Case 1: A 35-year-old man presented to our clinic and scheduled for surgery with the diagnosis of thoracic Scheuermann kyphosis (thoracic curve 85°). The patient had no significant past medical history except a history of laparoscopic sleeve gastrectomy (SG) 11 months ago. Bariatric surgery was performed due to morbid obesity [body mass index (BMI) = 41.8 kg/m^2] and failure of conservative methods for weight loss over two years. The BMI of the patient at the time of referral to our clinic was 27.8 kg/m^2 (Caprini VTE score: 3). The Caprini score is a risk assessment tool for the occurrence of venous thromboembolism among surgical patients (6). The score includes 20 variables and patients with a score of < 3, 4-8, and > 9 are considered low risk, moderate risk, and high risk patients, respectively.

The patient underwent thoracic spine correction surgery, which was uneventful. The patient's demographics and surgical data are shown in table 1. In the early postoperative period, while the patient was still in the post-anesthesia care unit (PACU) (recovery room), he developed tachycardia and was returned to his normal sinus rhythm with beta-blocker medications. The patient was transferred to the intensive care unit (ICU), and therapeutic anticoagulation was started after confirmation of DVT at the right lower extremity. Pulmonary computed tomography (CT) angiography showed filling defects and emboli in the middle lobe of the right lung (Figure 1). The patient was discharged after seven days with extended thromboprophylaxis by cardiologists.

Case 2: A 52-year-old woman with a history of laparoscopic SG (1 year before) was referred to our center due to lumbar canal stenosis.

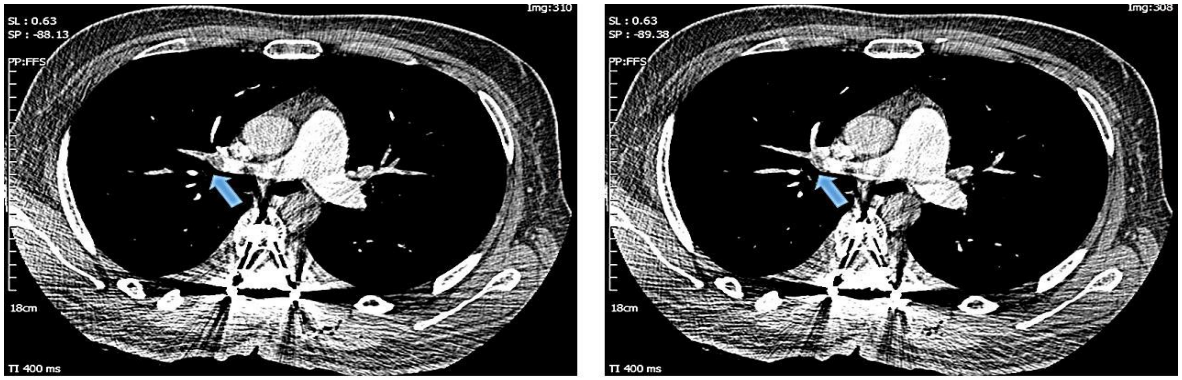

Figure 1. A and B, Chest computed tomography (CT) scan of Case 1 showing a filling defect in right middle lobe (blue arrow)

The pre-bariatric surgery BMI of the patient was 42.4 kg/m^2. The BMI of the patient before the spine surgery at the time of admission was 28.2 kg/m^2. The patient had a previous surgical history of two caesarian section deliveries, the latest of which was 15 years ago and she never reported signs of DVT or VTE (Caprini VTE score: 3) (6). Due to severe neurological claudication, back pain, and right radicular pain, laminectomy and instrumented fusion at L3, L4, and L5 were performed, and bilateral foraminotomy was performed. Intra-operative intermittent pneumatic compression (IPC) was used as per protocol. The surgery was uneventful, and after recovery, the patient was transferred to the surgery ward. At night, the patient developed chest pain and tachycardia. Heparin drip was started, and pulmonary CT angiography indicated pulmonary embolus. After five days, the patient was discharged and referred to a cardiology clinic for future treatments (Table 1).

Table 1. Demographics and surgical data of patients

Parameters	Case 1	Case 2	Case 3
Age	35	52	48
Gender	Man	Woman	Woman
Medical history	None	Hypertension	None
Drug history	None	Losartan 5 mg OD	Nil
Addiction	None	None	None
Family history	None	None	None
BMI (initial)	41.8	42.4	44.1
PSH except bariatric	None	Cesarean	Cesarean
Bariatric surgery	LSG	LSG	LSG
Thromboprophylaxis (bariatric)	In-hospital mechanical + pharmacological on discharge	In-hospital mechanical + pharmacological on discharge	In-hospital mechanical + pharmacological on discharge
BMI (at spine surgery)	27.8	28.2	29.4
Primary diagnosis (spine)	TSK	LCS	LCS
Time between surgeries	11 months	12 months	10 months
ASA score	I	II	I
Caprini VTE score	3	3	2
Approach to spine	Posterior	Posterior	Posterior
Spine procedures	Smith Peterson osteotomy from T6 to T9	Laminectomy L4, L5	Laminectomy L4 + discectomy of L4-5
Fusion	T2-L3	L3-L5	-
Operation time (minutes)	210	150	50
Blood loss	1100-1200 cc	800-900 cc	150-200 cc
Time to post-surgery clinical PE	1 hour	6 hours	1 week
Spine Thromboprophylaxis	Intra-operative mechanical	Intra-operative & In-hospital mechanical	Intra-operative & In-hospital mechanical + pharmacological on discharge
Mode of diagnosis	CT angiography	CT angiography	CT angiography

OD: Once daily; BMI: Body mass index; PSH: Past surgical history; LSG: Laparoscopic sleeve gastrectomy; TSK: Thoracic Scheuermann kyphosis; LCS: Lumbar canal stenosis; ASA: American Society of Anesthesiology; PE: Pulmonary embolism; VTE: Venous thromboembolism; Caprini VTE score: 3-moderate risk, 2-low risk; CT: Computed tomography

Case 3: A 48-year-old woman with a previous BMI of 44.1 kg/m^2 had undergone SG 10 months prior and was referred to our clinic (while her BMI was plunged to 29.4 kg/m^2) with the diagnosis of lumbar canal stenosis and protruded disk, which was unresponsive to conservative therapy. The patient had no other significant previous medical history (Caprini VTE score: 2) (6). Laminectomy of L4 vertebrae plus discectomy of L4-5 was performed. Intra-operative IPC was used. At the postoperative period, the following anticoagulation strategies were used: the patient was mobilized early (within 24 hours) after surgery, in-hospital IPC was used for lower limbs, and aspirin 325 mg daily for 14 days started upon discharge. One week after surgery, the patient presented to the emergency department with severe chest pain and tachycardia. Doppler ultrasound study confirmed DVT at left leg, and pulmonary CT angiography showed left lower lobe emboli. Appropriate treatment of PE was performed by a cardiologist (Table 1).

Discussion

Morbid obesity with BMI > 40 kg/m^2 or grade 3 overweight [World Health Organization (WHO) classification] is associated with higher rates of VTE (3, 7, 8). Obesity (BMI > 30 kg/m^2) is also a significant risk factor for lumbar disc disease, and studies have shown that patients with higher BMI report poor functional outcomes of both operative or conservative management of lumbar disc herniation (7, 9, 10). Spine deformity correction surgeries are also negatively affected by obesity and are linked to higher rates of complications, including DVT (11). Nonetheless, there exist few reports suggesting that obese patients have better treatment effects postoperatively than non-obese ones or with conservative management (12).

Spine surgeons recommend obese patients lose weight before undergoing any spinal procedures, especially those with BMI > 35 kg/m^2. The first systematic review on bariatric surgery and low back pain (LBP) concluded that in severely obese patients, bariatric procedures decrease the intensity of the LBP symptoms (13). It has been observed that patients report moderate improvement in pain and are not seeking spine surgery after reducing BMI (13, 14).

A retrospective longitudinal study analyzing data of 17,434 patients on bariatric surgery concluded that these patients are at risk of developing VTE up to 6 months after surgery, well beyond the initially predicted four-week risk

period (15). This study recommended prolonged thromboprophylaxis in patients with high risk. However, it is not forthright in identifying a high-risk individual who does not have any history of thrombosis. Few clinicians support a theory that reducing BMI is a predisposing risk factor to VTE; however, we did not find any evidence in the literature supporting this claim. It would be interesting to analyze the association between the rate of BMI reduction and VTE in future studies.

This observation has raised few questions regarding the association of VTE in patients undergoing spine surgery and the history of bariatric procedures:

a) Duration of prophylaxis: should prolonged thromboprophylaxis after bariatric surgery be given to patients about to undergo spinal procedures in the near future?
b) The time between surgeries: should be a minimum waiting time for the patient to undergo spine surgery after having a bariatric procedure?

Jain et al. reported lower complications in patients undergoing bariatric surgery before posterior lumbar spine fusion compared to obese counterparts; however, they reported significantly higher infection rates, revision, and readmission than non-obese patients. In their study, rates of DVT and PE were the same in all groups of patients (16).

Limitations: We acknowledge that a small number of patients do not represent a randomized clinical picture; however, this report serves as a cautionary note to spine surgeons, and we recommend following precautions.

Recommendations: For candidates of spine surgery with a history of bariatric procedures:

i. Should be subjected to extensive VTE evaluation; consider chest CT scan, D-dimer, and ultrasonography of lower limbs.
ii. Consider and treat such patients as high-risk individuals for VTE even when they have negative evaluations.

Patients undergoing spine surgery with a history of bariatric procedures are at increased risk of developing venous thromboembolic complications, including pulmonary embolism. We recommend extensive venous thromboembolic evaluation and treating these patients as high-risk individuals even in the absence of active thromboembolic disease.

Conclusion

In wake of observational findings of this study, patients undergoing spine surgery with a history of bariatric procedures are at increased risk of developing venous thromboembolic complications, including pulmonary embolism. We recommend extensive venous thromboembolic evaluation, and treating these patients as high-risk individuals, even in the absence of active thromboembolic disease.

Conflict of Interest

The authors declare no conflict of interest in this study.

Acknowledgments

Each patient was informed that the data concerning the case would be submitted for publication and they announced their consent.

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