

The Non-Operative Management of Portomesenteric Venous Thromboembolism After Laparoscopic Sleeve Gastrectomy and the Importance of Long-Term Anticoagulant Prophylaxis, A University Hospital Experience

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ABSTRACT

Aim: Portomesenteric venous thrombosis (PMVT) is a rare and life-threatening complication of laparoscopic sleeve gastrectomy (LSG). Treatment is usually established with proper anticoagulant prophylaxis. In this study, we aimed to focus on the incidence, clinical characteristics, follow-up, and treatment of patients who have undergone LSG procedures and developed PMVT.

Material and Methods: Between the years of 2010 – 2019, we retrospectively screened 683 patients who had undergone LSG operation due to obesity. In all patients, the diagnosis was established with abdominal computerized tomography (CT). Age, gender, body mass index (BMI), thrombosis risk factors, surgical details, PMVT clinical characteristics, follow-up, and treatment features were analyzed in patients diagnosed with PMVT.

Results: LSG was performed on 683 patients and four patients (0.58%) developed PMVT. The average age of patients was 36.25±6.89 (29-45) years and only three patients were female. The average BMI was 36.42±0.95 (35.1-37.3) kg/m². Three patients had a smoking history. All patients received anticoagulant therapy and responded to conservative treatment. The average length of stay in the hospital was 2.75±0.5 days (2-3). The average length of stay on the second admission to the hospital was 8.75 days (5-8 days). One patient had the diagnosis of protein C deficiency. No mortality or morbidity was observed.

Conclusion: PMVT is a rare but serious complication following bariatric surgery. Conservative treatment is fundamental. Treatment is required based on any underlying disease if present. Surgical intervention is required for small bowel necrosis. The findings of our study support the information that long-term anticoagulant prophylaxis plays a role in preventing PMVT after LSG, as well as improving prognosis on patients who have already developed PMVT. To evaluate the long-term effects of PMVT on patients, a longer time of follow-up and a larger patient population is needed.

Key Words: *Laparoscopic sleeve gastrectomy, Portomesenteric venous thrombosis, Anticoagulant*

Laparoskopik Sleeve Gastrektomi Sonrası Portomezenterik Venöz Tromboembolinin Non-Operatif Yönetimi ve Uzun Dönem Anti Koagülan Proflaksinin Önemi

ÖZ

Amaç: Portomezenterik ven trombozu (PMVT), Laparoskopik sleeve gastrektominin (LSG) nadir ve potansiyel olarak hayatı tehdit eden bir komplikasyonudur. Etkin antikoagülan profilaksisi ile çoğu zaman tedaviye olumlu yanıt alınmaktadır. LSG sonrası PMVT gelişen hastaların insidans, klinik özellikler, takip ve tedavisini irdelemeyi amaçladık.

Gereç ve Yöntemler: 2010 - 2019 yılları arasında obezite nedeniyle LSG uygulanan 683 hasta retrospektif olarak tarandı. Tüm hastalarda tanı, abdominal bilgisayarlı tomografi (BT) taraması ile konuldu. PMVT tanısı konulan hastaların yaş, cinsiyet, vücut kitle indeksi (VKİ),

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tromboz risk faktörleri, ameliyat verileri, PMVT klinik özellikleri, tanı, takip ve tedavi bulguları ve görüntüleme verileri kaydedildi.

Bulgular: Toplam 683 hastaya LSG uygulandı ve four (%0.58) hastada PMVT gelişti. Tüm hastaların yaş ortalaması 36.25 ± 6.89 (29-45) yıl olup, 3 hasta kadındı. Ortalama VKİ 36.42 ± 0.95 (35.1-37.3) kg/m^2 idi. Üç hastada sigara öyküsü vardı. Tüm hastalara antikoagülan tedavi uygulandı ve konservatif tedaviye yanıt alındı. Ortalama yatış süresi 2.75 ± 0.5 gün (2-3). İkinci yatış süreleri ortalama 8.75 gün (5-8 gün) idi. Bir hastada protein C eksikliği tanısı konuldu. Herhangi mortalite veya morbidite izlenmedi.

Sonuç: PMVT, bariatrik cerrahiye takiben gelişen nadir fakat ciddi bir komplikasyondur. Konservatif tedavi esastır. Alta yatan nedene yönelik tedavi mutlaka gerektirmektedir. İnce bağırsak nekrozu için cerrahi müdahale şarttır. Çalışmamızın bulgularına uzun dönem antikoagülan profilaksisi LSG sonrası hastalar için PMVT'nin önlenmesinde ve PMVT gelişmesi durumunda iyi prognozlu seyretmesinde rol alabildiği bilgisini desteklemektedir. PMVT'nin uzun dönem hasta sonuçları üzerindeki etkisini değerlendirmek amacıyla daha uzun süreli takiple ve daha fazla hasta popülasyonu ihtiyaç vardır.

Anahtar Sözcükler: *Laparoskopik sleeve gastrektomi, Portomesenterik ven trombozu, Antikoagülan*

INTRODUCTION

Obesity and related diseases are a common multifactorial health problem that can be caused by environmental, hereditary, hormonal, behavioral, and cultural sources that are increasingly encountered worldwide (1-5). Increased body weight and obesity are defined as abnormal, excessive fat accumulation that poses a health risk. Body mass index (BMI) of 25 and higher are categorized as overweight, BMI over 30 as obese, and BMI over 40 are accepted as morbidly obese (6,7). According to World Health Organization statistics, in 2016, the percentage of obesity over 18 years of age is 11% in men and 15% in women (6).

Laparoscopic bariatric surgery is a popular treatment approach in obese patients and effective weight loss can lead to better obesity-related comorbidities and improve life quality (8). Until 2015, the most commonly performed bariatric surgical procedure in the world is laparoscopic sleeve gastrectomy (LSG) (2,9). After bariatric surgery, some rare complications may develop and these include pulmonary embolism, portomesenteric thromboembolism (PMVT), and mesenteric ischemia. The complication rate after bariatric surgery is reported as 10-17% (10). There are many data in the literature suggesting long-term anticoagulant prophylaxis to prevent thromboembolic complications that may develop after bariatric surgery (11,12).

In this study, we aimed to evaluate the PMVT development after LSG procedures in our hospital.

MATERIALS and METHODS

This study was performed on patients who have undergone LSG operation and also who developed PMVT as a complication. In the study, patient records were taken from the hospital system retrospectively between the dates of October 2010 – December 2019. In patients who have developed PMVT after LSG, age, gender, BMI, thrombosis risk factors, surgical details, PMVT clinical characteristics, diagnosis, follow-up, treatment, and imaging results were evaluated.

Laboratory results related to thrombosis were evaluated. All patients received thromboembolic prophylactic treatment before surgery. All patients have worn variceal socks on the morning of surgery and they have been recommended to wear them for 14 days after discharge from the hospital. Nearly 12 hours before surgery, 60 mg of low molecular weight heparin (LMWH)-enoxaparin (Clexane®; Sanofi-Aventis, Paris, France) was started and continued for 14 days. Patients were recommended to be mobilized about 4-6 hours after surgery with the help of someone.

For those patients who have been re-admitted to the hospital with symptoms of stomach pain, the diagnosis of portal vein thrombosis was established with abdominal computerized tomography (CT) with IV contrast.

Surgical Technique

With the trocar entrance to the abdomen, pneumoperitoneum was established. The pressure was set maximally as 15 mmHg. The liver retraction was established with an endoclinch that has entered into the abdominal space from a 5 mm trocar. Liver retractors were not used in any patient. Gastrosplenic ligament and gastrocolic omentum were cut with a vessel-sealing system (LigaSure Atlas®; Covidien Ltd., Norwalk, CT, USA). A 34Fr orogastric tube was inserted through the pylorus of the stomach for an appropriate gastrectomy. Gastric resection was performed with an endo-stapler (EndoGIA Roticulator®; Covidien Ltd., Norwalk, CT, USA). The resected portion of the stomach was removed from the port site along the left midclavicular line.

Statistical Analyses

Data were descriptively presented as mean \pm standart deviation. As the overall number of PMVT cases was relatively small, no inferential statistical analysis was undertaken.

RESULTS

In the hospital in which this study was performed, LSG was performed on 683 patients based on obesity between the

dates of October 2010 – December 2019. Detailed demographic information of 683 patients was given in Table 1. Only 4 (0.58%) of the patients developed PMVT. The average age of the patients was 36.25±6.89 (min-max 29-45), and 3 of the patients were female and 1 was male. The average BMI was 36.42±0.95 (min-max 35.1-37.3) kg/m². The average length of surgery time was 49.25±4.57 min (min-max 44-55 min). No complications were observed during the surgery or after the surgery. The demographic characteristics of patients and operative and postoperative data are summarized in Table 2.

Patients were re-admitted to the hospital on an average of 15.25±5.74 days (min-max 10-23 days). The main symptom was stomach pain. In all patients, the white blood cell count (WBC) and C-reactive protein (CRP) levels were increased. Also, lactate was found to be increased in these patients, which happens to be an arterial blood gas parameter. The admission symptoms, laboratory values, follow-up, and radiologic features of patients with PMVT are shown in Table 3. The diagnosis of all patients was established with an abdominal CT with IV contrast. Thromboembolic events in the portomesenteric system occurred in the portal vein (Figure 1,2).

Table 1: Demographic information of 683 patients who underwent LSG

Patients who underwent LSG	Male	Female	Total
Cases n (%)	323 (47.3)	360 (52.7)	683 (100)
Age (mean±SD)	35.3±11.5	35.5±11.7	35.4±11.6
BMI (mean±SD)	40.6±4.3	40.2±4.1	40.4±4.2
Comorbidity % (n)	96.3 (311)	78.8 (284)	87.1 (595)

Table 2: Demographic, operative, and postoperative data

Case	Age (years)	Gender	BMI	Comorbidity	Smoking	History of thrombosis	Length of operation (mins)	Time to oral feeding (hours)	Length of hospital stay (days)
Case 1	45	Female	36.4	HT	+	-	50	24	3
Case 2	38	Female	37.3	NASH	+	-	55	18	3
Case 3	33	Female	35.1	HT	-	-	44	40	2
Case 4	29	Male	36.9	OUA	+	-	48	24	3

BMI: Body mass index, HT: Hypertension, OUA: Obstructive sleep apnea, NASH: Non-alcoholic steatohepatitis

Table 3: Symptoms, laboratory, and radiologic data related to PMVT.

Case	Symptom	Time between discharge and re-admission (days)	WBC (× 10 ³ /mm ³)	C-reactive protein (mg / L)	Hematocrit (%)	AST/ALT (IU/L)	Lactate (mmol/L)	Time to oral feeding (days)	Length of hospital stay (days)	Localization of thromboembolism
Case 1	Stomach pain in the epigastric region	10	10.4	90.1	37.1	43/40	2.7	8	10	RPV, SMV
Case 2	Stomach pain in the epigastric region, fever	16	12.5	100.6	39.3	96/128	3.6	6	7	PV, SMV
Case 3	Nausea, vomiting	23	14.6	126.5	42.1	66/76	3.8	6	9	PV, SMV
Case 4	Stomach pain all around the stomach, fever	12	18.1	133.6	40.2	117/146	2.1	5	9	PV, SV

RPV: Right portal vein, PV: Main portal vein, SMV: Superior mesenteric vein, SV: Splenic vein



Figure 1. Axial CT sections of right portal venous thrombosis (arrow).

In all patients, LMWH and low level of oxygen (2L/min) were started along with high volume hydration. Oral feeding was halted. Patients were daily evaluated based on infarct of the bowel and these parameters included daily physical examination, blood laboratory values, and arterial blood gas analysis. No patient required surgical treatment. All patients continued on warfarin treatment for 6 months after discharge. All patients were directed to the hematology department for further evaluation of thrombosis laboratory analysis. Protein C deficiency was observed in Patient 1.

DISCUSSION

Obesity is an independent risk factor for the development of venous thrombosis (10). The risk of development of venous thrombosis in obese patients without surgery is 3%, therefore, bariatric surgeons must be extra careful in terms of the development of thromboembolic events (13). The incidence of development of deep venous thrombosis (DVT) in patients undergoing bariatric surgery is 1.2-1.6% (1).

Portomesenteric venous thrombosis (PMVT) is caused by partial or complete obstruction of the portal, splenic, and/or mesenteric vein thrombosis (14). PMVT can be seen after any surgery involving the gastrointestinal tract and may lead to life-threatening conditions such as mesenteric ischemia, intestinal infarct, and liver failure (13). PMVT is a rare and serious complication following bariatric surgery, and the management of it is possible although it is associated with high morbidity and mortality (1,8,10,15-18). In the last 10 years, PMVT is seen more often in the postoperative period due to higher numbers of bariatric surgery being performed (13). The incidence of PMVT after bariatric surgery is between 0.3-1% and when compared to other

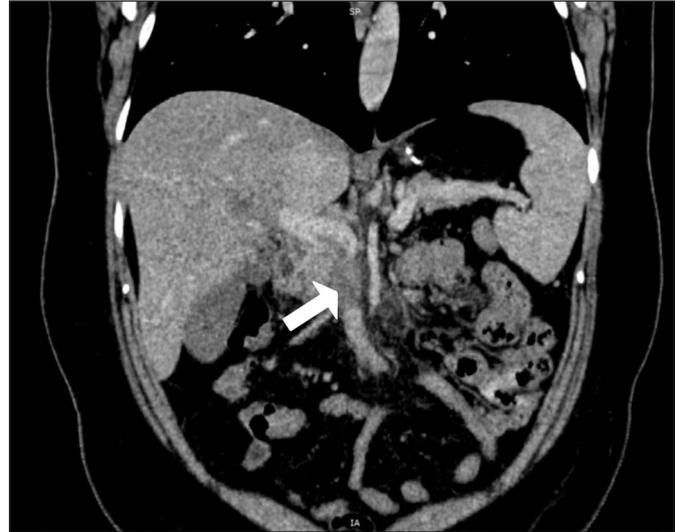


Figure 2. Coronal CT sections of SMV and main portal venous thrombosis (arrow).

bariatric techniques it is more commonly seen after LSG (13,19). In our study, the incidence of PMVT is 0.58% and is consistent with the literature.

After LSG, PMVT was first reported in 2009 in a thrombophilic patient by Berthet et al. (20). The pathophysiologic relationship between PMVT and sleeve gastrectomy is still not known (14,15). Thermal injury due to surgical instruments with energy, prolonged liver retraction, intervention to the intraoperative splanchnic vascular region, venous stasis due to high intraabdominal pressure, hypercapnia, prolonged work during reverse Trendelenburg position, dehydration, hypovolemia, obesity, smoking, oral contraceptive use, hypercoagulopathy, recent surgical history are all risk factors during the postoperative period that increase the risk of developing PMVT (1,8,10,17). In our series, the main risk factors were BMI and smoking. In one of the patients, protein C deficiency was present. We believe that the shortened duration of the operation and the absence of the use of liver retractors prevent the development of PMVT.

Patients may present with abdominal pain, nausea, vomiting, fatigue, fever, and tachycardia (1). It is difficult to diagnose PMVT during the postoperative period due to its nonspecific symptoms; clinical suspicion is important in diagnosis and awareness of bariatric surgery complications makes it easier to diagnose and treat (7,8,13-16,21). Symptoms are usually observed on average between 12-15 days postoperatively (13). In the study, the time to re-admission to our hospital after discharge was on average 15-25 days. Early diagnosis is essential to prevent ischemia and to begin anticoagulant therapy (9). Abdominal CT with contrast, Doppler ultrasonography, and abdominal angiography are

effective in the diagnosis of PMVT (1,14). CT with contrast is the best non-invasive diagnostic technique of PMVT and other related pathologies (8,20). In a meta-analysis studied by Shoar et al. (18), thromboembolic events in the portomesenteric system most commonly occur in the portal vein. In our study, the diagnosis of all patients was established with an abdominal CT with IV contrast.

Nowadays, conservative treatment includes anticoagulant or antithrombotic therapy (8,18). Systemic anticoagulant therapy should be continued for at least 3-6 months after discharge (13,19,20). If there is any underlying thrombophilic disease, anticoagulant therapy is advised to be used lifelong (9,13,21). In the literature, partial and/or total recanalization is established in acute PMVT with anticoagulant treatment (14). Other conservative treatments on top of anticoagulant therapy include bowel rest, sufficient intravascular hydration, nasogastric decompression.

Venous thromboembolic complications are a still matter of problem despite advancements in laparoscopic bariatric surgical techniques and newly produced follow-up protocols. Long-term prophylaxis (more than 10 days) after the operation has been shown to decrease the development of PMVT (1,9). Non-pharmacologic preventive techniques include early mobilization and pneumatic compression.

In a study performed by Amitrano et al., 87.5% of splanchnic venous thrombosis-related deaths are related to intestinal infarction on the first hospital admission (22). For this reason, the development of intestinal ischemia is a factor that increases morbidity and mortality. In our study, none of the patients developed intestinal ischemia.

In conclusion, PMVT is a rare but serious complication following bariatric surgery. In bariatric procedures, the awareness of this complication is increasing worldwide, especially with the increasing numbers of LSG being performed. Because the patient presentation can include nonspecific symptoms upon admission, diagnosis can be established with abdominal CT with IV contrast. Conservative therapy is fundamental, and treatment is necessary for the underlying disease. Surgical intervention is necessary for small bowel necrosis. Long-term use of anticoagulant prophylaxis is effective in the prevention of PMVT and improves the prognosis of patients who have undergone LSG operation. To evaluate the long-term effects of PMVT on patients, longer follow-up periods and a larger patient population are necessary.

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Author Contributions

S.S.U. contributed to the design and implementation of the research, to the analysis of the results and the writing of the manuscript.

Conflict of Interests

The author declares that there is no conflict of interest.

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Ethical Approval

This study was approved by the ethical committee (Date: 07/08/2020, number:2581)

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Extremely peer-reviewed.

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