



# Portomesenteric Vein Thrombosis after Sleeve Gastrectomy

Results from Multiple Chinese Bariatric  
Centers with 40000 Cases

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- **Disclosure:**

No potential conflict of interest



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Bariatric Surgery

Portal venous system thrombosis after bariatric surgery: A systematic review and meta-analysis



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Meta-analysis : 100,964 patients bariatric surgery,  
300 portal venous system thrombosis.  
overall incidence **0.419%** . **Death rate 1.33%**

Case series : 102896 cases from Michigan Bariatric Surgery  
Collaborative 2016-2021  
PMVT 117 (**0.11%**) , 109/117 (93.2%) SG.  
**Death rate 5.1%**

*Independent Predictors and Timing of Portomesenteric Vein Thrombosis  
after Bariatric Surgery* SOARD. 2022 Arthur M. Carlin, MD



# DVT : Asia vs Western ?

**Table 3** Incidence of deep vein thrombosis and pulmonary embolism reported in different population.

Author	Year of publication	Study site	Study type	Incidence of DVT	Incidence of PE
Present study		Hong Kong	Retrospective study of 7,100,000 residents based on regional hospital database	30.0 per 100,000 population	11.7 per 100,000 population
Cheuk et al <sup>8</sup>	2004	Hong Kong	Retrospective study of 6,700,000 residents based on regional hospital database	17.1 per 100,000 population	3.9 per 100,000 population
Chau et al <sup>10</sup>	1997	Hong Kong	Autopsy review included 12,421 death	—	4.7%
Jang et al <sup>9</sup>	2011	Korea	Retrospective analysis of a national health	5.3 per 100,000 population	7.0 per 100,000 population
Lee et al <sup>30</sup>	2010				m incidence 15.9
Yusuf et al <sup>3</sup>	2012				1 per 100,000 population
Wiener et al <sup>7</sup>	2011	United States	database 2007–2009 Retrospective analysis of Nationwide Inpatient Sample (NIS) of Healthcare cost & Utilization Project (HCUP) 1998–2006	—	112 per 100,000 population
Tagalakis et al <sup>4</sup>	2013	Canada	Retrospective analysis of a provincial healthcare database	78 per 100,000 population	45 per 100,000 population
Hald et al <sup>31</sup>	2013	Norway	Prospective study of 29,967 patients	Venous thromboembolism incidence 148 per 100,000 population	
Holst et al <sup>32</sup>	2010	Denmark	Prospective study of 18,954 patients	Venous thromboembolism incidence 269 per 100,000 population	
Severinsen et al <sup>3</sup>	2010	Denmark	Prospective study of 56,014 patients aged 50–64 y	65 per 100,000 population	51 per 100,000 population
Moretti et al <sup>23</sup>	2010	Italy	Retrospective analysis of regional hospital	—	189 per 100,000 population

11.7 VS 152 (per 100000)



GUIDELINES

Asian venous thromboembolism guidelines:  
updated recommendations for the prevention  
of venous thromboembolism

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- ❖ Data on VTE (also PVMT) in bariatric surgery **is lacking** in Asia.
- ❖ Until an Asian risk assessment model has been validated, we recommended using ASMBS advisory and the ACCP risk assessment model;



# Question ?

- How is PVMT in Chinese patients with bariatric surgery ?
- Do we need routine using heparin to all bariatric surgical patients perioperatively ?
- How about posoperative anticoagulation ?



# Material and Method

- 29 large bariatric centers
- Retrospective review PMVT in past 10 years
- Total number of procedures 43732 ( Bypass, Sleeve , others )
- Select patients with clear diagnosis for PMVT.



# Hospitals included (29 Hospitals)

江苏省人民医院

连云港市第一人民医院

南京鼓楼医院

复旦大学附属华山医院

上海市第十医院

上海市第六人民医院

新乡市第二人民医院

哈尔滨市第一医院

中南大学湘雅三医院

复旦大学附属华东医院

暨南大学附属第一医院

上海交通大学医学院附属第九人民医院

天津医科大学总医院

宁医大总医院

安徽医科大学第二附属医院

郑州大学附属郑州中心医院

首都医科大学附属北京友谊医院

山东大学齐鲁医院

中日友好医院

苏州大学附属第一医院

徐州医科大学附属医院

广州中医药大学金沙洲医院

中山市小榄人民医院

中国医大四院

成都市第三人民医院

苏州明基医院

河南省人民医院

联勤保障部队第九八八医院

武汉大学中南医院





## Patient's preoperative assessments

General information	
Incidence (Number of total cases)	24/43732 (0.05%)
Incidence (Number of SG cases)	All
Age (yrs): mean (range)	38.1±18.6(25-51)
Sex: male: female	9/15
BMI (kg/m <sup>2</sup> ): mean (range)	43.6±22.0(33-72)
Active smoking	2/24(8.3%)
Alcohol	3/24(12.5%)
Thrombosis history	3/24(12.50%)
Cirrhosis	1/24(4.1%)
Hormonal contraception	1/24 (4.1%)
Preoperative Obe-related comorbidities	
T2DM	<u>7/24 (29.1%)</u>
HTN	8/24(33.3%)
OSAHS	10/24(41.6%)
PCOS	2/24(8.3%)



## Medical and intraoperative characteristics

CHARACTERISTICS	VALUES
Pre-op D-dimer at admission	13.0±11.9(0.2-49)
Surgical procedure	SG: 23/24 (95.8%) SG+JJB:1/23(4.2%)
Time of surgery (min)	90.3±23.8(55-130)
Intra-abdominal pressure (mmHg)	13.3±2.9(4-15)
Discharge after surgery(days)	4.8± 5.2 (3-35)
Anticoagulant (prophylactic)	7/23 (30.4%)



# Time and Clinical Symptoms

- Readmission days after first surgery:  
**16.8 ± 10.0 (7-40)**
- Abdominal pain and distention: 24/24(100%)
- Nausea and vomiting: 14/24(58.3%)
- Bowel necrosis: 5/24 (20.8%)
- Bloody stool: 4/24 (16.6%)



# Diagnosis methods

- Enhanced CT,CTA : 20/24(83.3%)
- Venous ultrasound: 2/24(8.3%)
- Symptom diagnosis: 1/24 (4.2%)
- Surgery: 1/24 (4.2%)



## Treatment selection

- Drug anticoagulant therapy: 17/24 (70.8%)
- Interventional therapy: 7/24(29.2%)
- Surgical therapy: 5/24 (20..8%)

Duration of treatment (Days):  $111.8 \pm 169.5(5-730)$



## Outcomes

CHARACTERISTICS	VALUES
Days after surgery (diagnosis PMVT)	16.8 ± 10.0 (7-40)
Hospital stays (d)	18.3 ± 12.6 (5-60)
Duration of treatment (d)	111.8 ± 169.5 (5-730)
Treatment outcome	<ol style="list-style-type: none"><li>1. Uneventful: 17/24 (70.8 %)</li><li>2. part of thrombosis still exist: 4/24 (16.7%)</li><li>3. Cavernous transformation (2/24 8.3%)</li><li>4. Death 1/24 (4.2%)</li></ol>



## Our PMVT Case

- Patient: female, 51 years old, BMI: 37.3
- The patient had a history of cirrhosis for 5 years, psoriasis for several years, hormone therapy, cholecystectomy for 6 years, and thyroid surgery for 5 years
- Personal history, family history is not special.



2021-5-24. SG biopsy on cirrhosis liver





## Postoperative situation

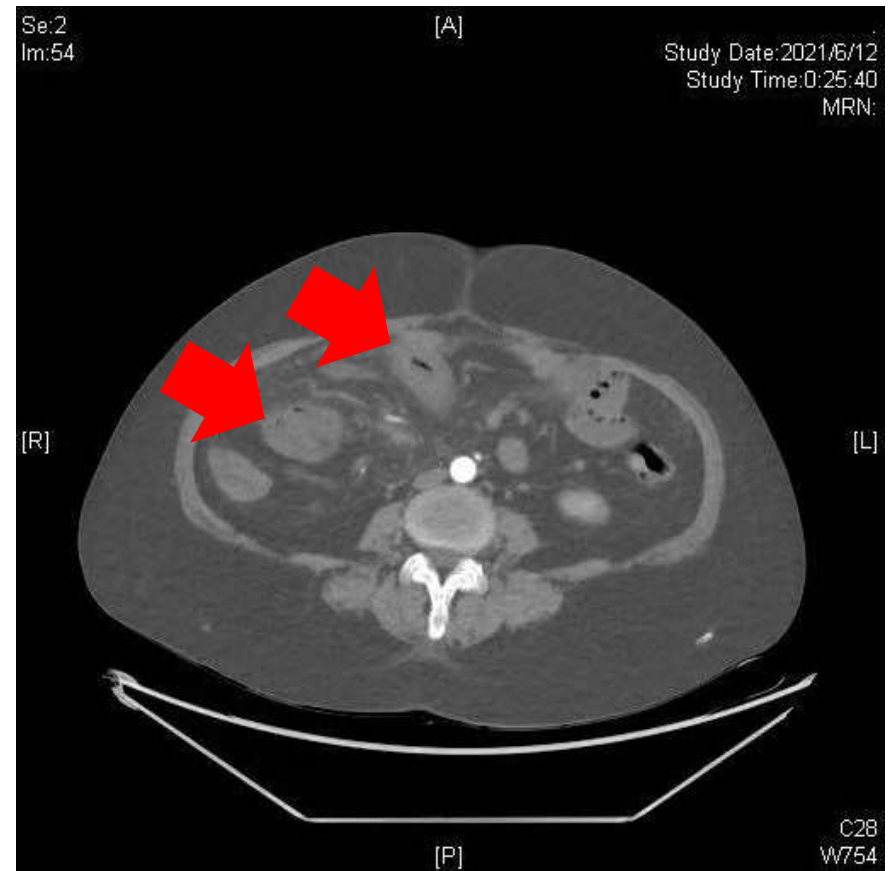
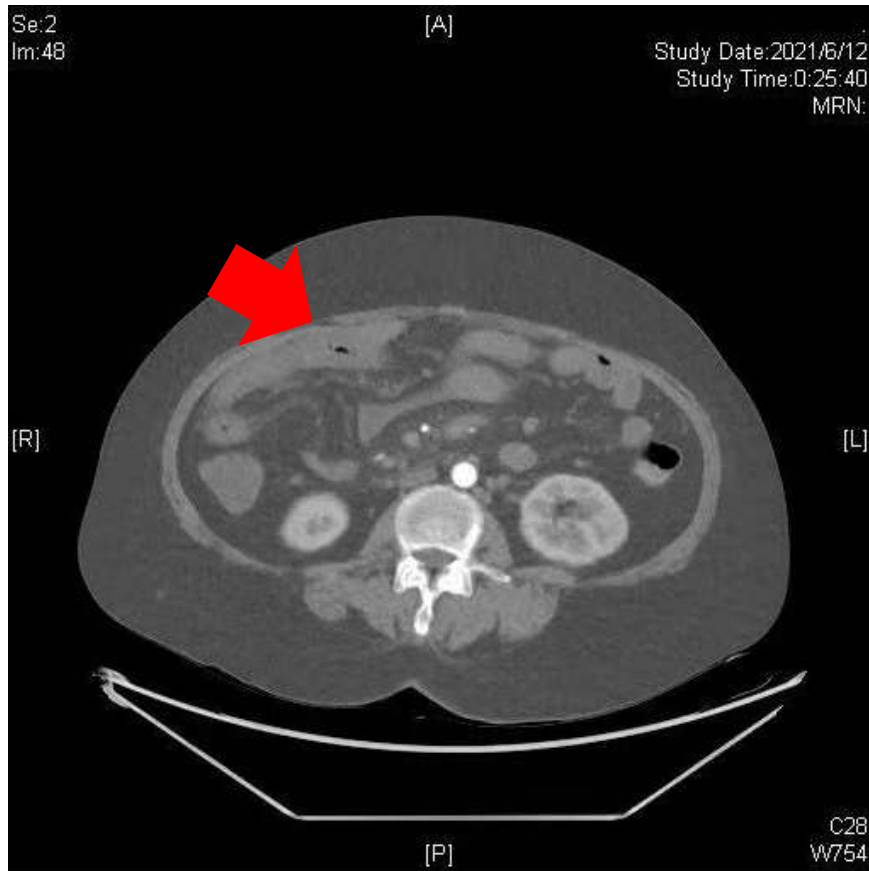
### POD3 Discharge with good condition

No anticoagulation medication

- **Readmission POD 16**
- abdominal pain and distension, nausea and vomiting, no fever, soft abdomen, upper abdominal tenderness, bowel sound 2-3 /min
- WBC 14.6

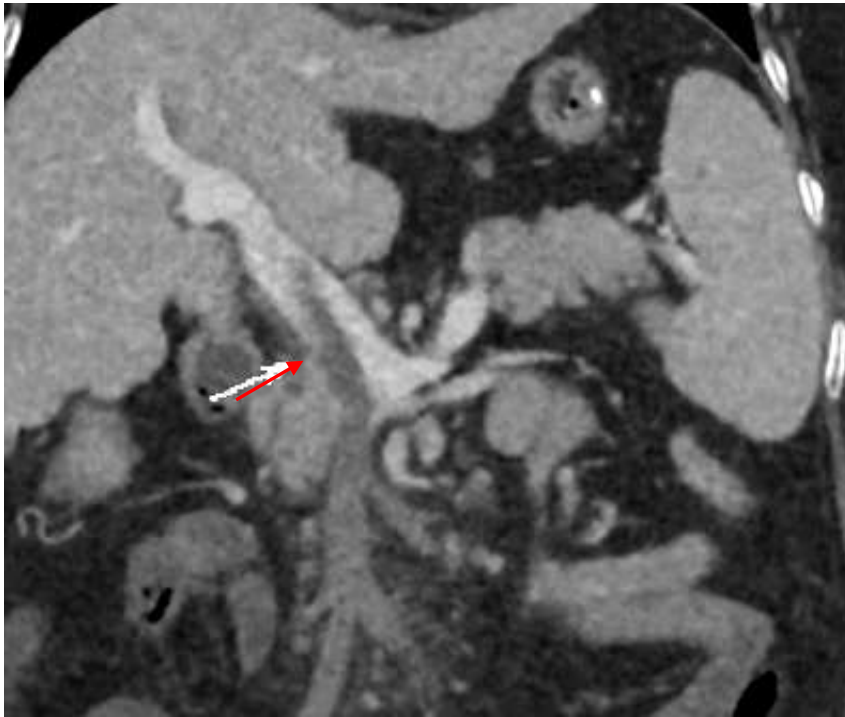


## Local hospital CT scan

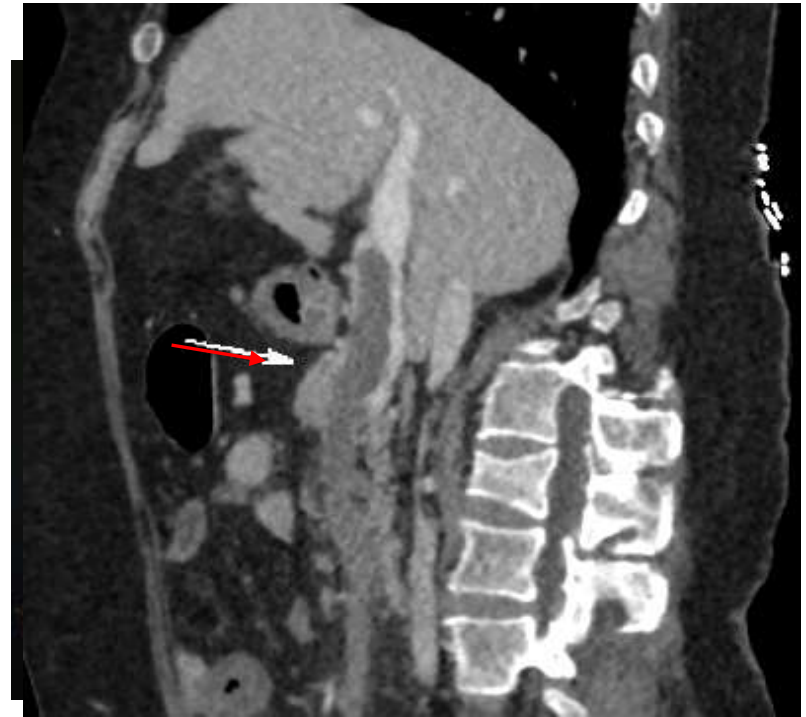




## Superior mesenteric vascular CTA (POD 16)



A



B



# Treatment strategy

- (1) Fasting, nutritional support and anti-infection treatment;
- (2) The patient was indirect hemolysis with superior mesenteric artery catheterization, and was given enoxparin anticoagulation (6000u ih q12h) and urokinase thrombolytic (100,000u iv q6h) after surgery.;
- (3) 6 month Rivaroxaban



## 6 days after interventional intervention

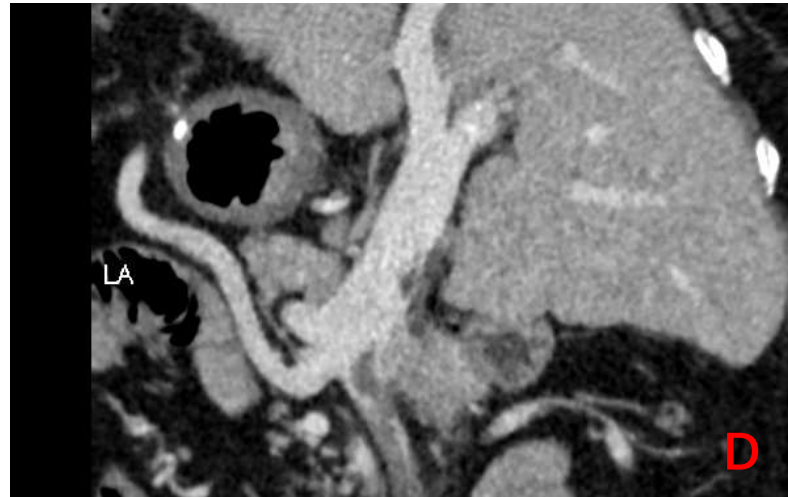
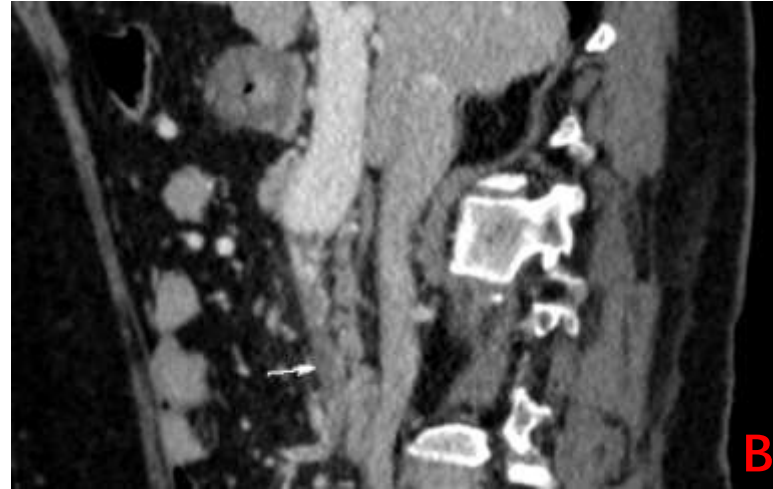
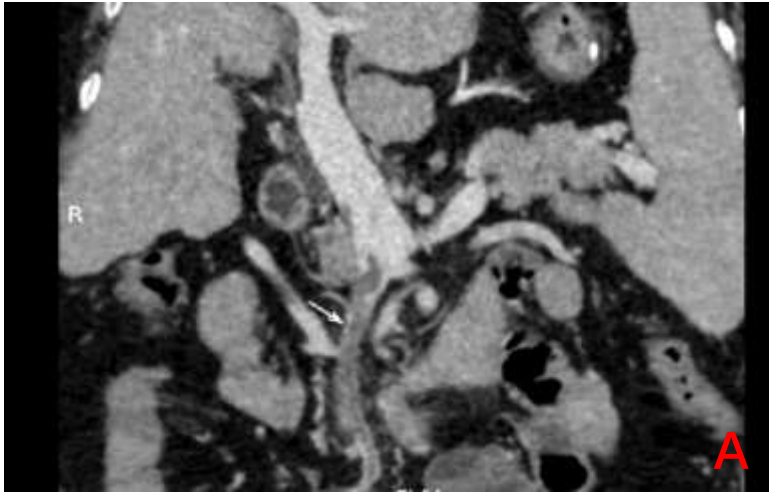
partial absorption of emboli compared to previous imaging radiographs





## Postoperative 1 year

the main portal vein and superior mesenteric vein emboli were mostly absorbed



**No obvious symptoms of discomfort were observed during follow-up**





# A Patient with PMVT( death ) characters

Male, BMI 45, 25 ys

Diagnosis:

1. Metabolic syndrome;
2. Severe fatty liver;
3. Hyperuricemia; Vitamin D deficiency;
4. Hyperlipidemia;
5. Hypoxemia; Sleep apnea; OSA
6. Type 2 diabetes



# Perioperative process

- Procedure : SG
- VTE prevention : low molecular heparin 3 days after surgery , early amputation ,
- Discharged on POD3
- Instruction : strictly follow the postoperative diet and exercise after discharge.





## Second time Readmission

- POD 14 in the emergency department
- a history of related unclean diet and abdominal pain for 3 days , very little water intake during discharge.
- Readmission diagnosis: 1. **Septic shock**; 2. **Intestinal necrosis**; 3. Portal vein thrombosis '4. Abdominal infection; 5. Metabolic acidosis;
- .Blood gas analysis: PCO<sub>2</sub> 26.20mmHg, PO<sub>2</sub> 69.40mmHg; Lactic acid 2.17mmol/l. 4. Blood routine tips: white blood cells 20.79\*10<sup>~9</sup>/L, hemoglobin 237g/L, platelets 288\*10<sup>~9</sup>/L.



# POD 15 Second operation

Subtotal small bowel resection  
preserve : 5cm (Triz ligament ) , 10cm (ileum )



POD2 died by multiple organ failure



# Possible predisposing factors of PMVT

## Patient's factors:

- Metabolic diseases, cirrhosis
- History of thrombosis, tendency to thrombosis
- Oral contraceptives and smoking

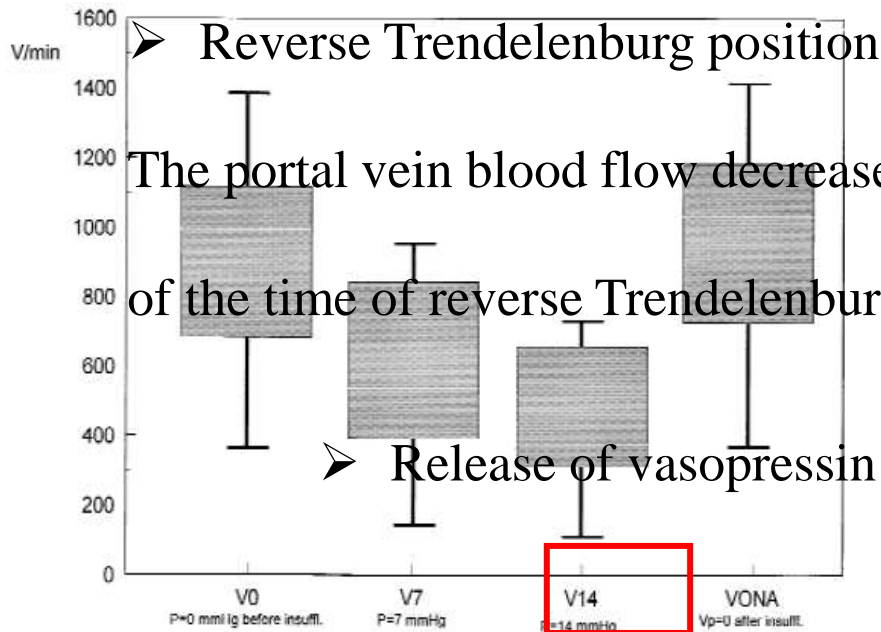
## Surgeons' factors :

- Operative factor
- Venous stasis, postoperative dehydration

# Possible predisposing factors of PMVT

## Operative factors

- Intraoperative pneumoperitoneum pressure



When intraperitoneal pressure (IPP) gradually with the extension of the time of reverse Trendelenburg position compared with baseline flow measured at 0 mmHg pressure, and at an IPP level of 14 mmHg, portal flow was reduced compared with the initial baseline value 了 53%.

Fig. 1. Effect of IPP changes on portal venous flow.

# Possible predisposing factors of PMVT

## Operative factor

- Mechanical or thermal effects on the left gastric epidermal arch or short gastric vessels during dissociation of one side of the greater gastric curvature
- **ligation of many gastric vessels** and tributary vessels Changes in blood flow patterns and decreased blood flow due to
- **Splenic ischemia or infarction** Ligation of short gastric vessels during LSG may result in hypoperfusion of the upper pole of the spleen
- Liver retraction



# Intestinal ischemia after SG during OP (Female , 26 BMI 34.5 T2D )



# Possible predisposing factors of PMVT

## Dehydration after surgery

Restrictive factors of procedure, fluid intake after bariatric surgery is limited,

Early discharged with a negative fluid balance





# Summary

1. PMVT is a **infrequent** , **but fatal** complication after bariatric surgery.
2. Chinese SG patients seems have lower PMVT rate ( 0.05% VS 0.3%) and less prophylatic using heparin
3. If **abdominal distension and abdominal pain** occur in a short period of time after bariatric surgery, and the symptoms continue to worsen, PMVT should be considered and excluded .
4. 4. Perioperative evaluation and care for patients is critical to prevent PVMT





*Thank  
you !*

