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Early transcatheter thrombectomy and thrombolytic therapy in acute non-cirrhotic and non-malignant mesenteric vein thrombosis: Case report of two cases and literature review

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ABSTRACT

AIM: To present two cases of acute non-cirrhotic and non-malignant mesenteric vein thrombosis (MVT) treated with early transcatheter thrombectomy and thrombolysis with tissue plasminogen activator (tPA) and to review the literature on transcatheter thrombectomy and thrombolytic therapy of such condition. **METHODS:** Two cases of acute MVT treated with transhepatic transcatheter thrombectomy and thrombolysis in addition to systemic anticoagulation upon diagnosis are presented. In addition, a Pubmed literature search was undertaken using keywords *acute mesenteric vein thrombosis, thrombolysis and thrombectomy*. The inclusion criteria were studies examining the impacts of transcatheter thrombolysis and thrombectomy in the management of acute MVT.

RESULTS: Early transcatheter thrombectomy and thrombolysis achieves technical success in both patients and result in nearly complete recanalization of the venous system, with no recurrent thrombosis to date in follow up. Both patients do not require extensive bowel resection despite extensive thrombus on presentation. However, both patients develop intra-abdominal bleeding requiring blood transfusion and embolization of the transcatheter tract.

CONCLUSION: Catheter-directed first approach provides a minimal invasive approach for management of non-malignant and non-cirrhotic acute mesenteric thrombosis. It offers the benefits of rapid venous recanalization and avoid massing bowel resection despite extensive thrombosis. Subsequent progression into chronic MVT was also reduced. However, the procedure could lead to bleeding from puncture site and hence embolization of the catheter tract is advised during catheter removal.

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1. Introduction

Acute mesenteric vein thrombosis (MVT) was defined as thrombosis involving the superior mesenteric vein (SMV), with an identifiable time of symptoms onset and no evidence of established collaterals [1]. Acute MVT represents a rare but recognized cause of small bowel infarction, which accounts for 5–15 percent of all mesenteric ischaemic event [2].

The aetiologies of acute non-cirrhotic, non-malignant and non-transplant MVT can be due to local insults such as pancreatitis, blunt abdominal trauma, or post-surgical intervention. Underlying pro-coagulation states in inherited or acquired condition

can also contribute. Patients usually present with non-specific abdominal pain, other reported symptoms include nausea or vomiting, melaena and constipation. Physical examination may reveal abdominal tenderness while fever and peritoneal signs may indicate progression to bowel infarction [3].

CT abdomen with triphasic scan is currently the “gold standard” diagnostic test for MVT, with an overall accuracy of 95%–100% [4]. Other more invasive diagnostic modalities include mesenteric angiography, while laparotomy or laparoscopic exploration may be required those with high suspicion of infarcted bowel.

Systemic anticoagulation, open or transcatheter thrombectomy and thrombolysis, or in combination have been reported to recanalize the portomesenteric venous system in managing acute MVT. For those with suspicion of bowel infarction, resection of bowel is warranted. Currently there is no established treatment guideline for acute MVT; there are various reports with different clinical scenarios and different treatment combination. In this article, we reported the outcomes of two cases of acute non-cirrhotic,

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non-malignant MVT treated with early transcatheter thrombectomy with thrombolysis. A literature review was also carried out in the hope of appraising the current evidence for early transcatheter thrombectomy and thrombolysis in the management of non-cirrhotic, non-malignant MVT in resulting early venous recanalization, avoiding extensive bowel resection and preventing recurrent thrombosis.

2. Methods

Two cases of acute non-malignant, non-cirrhotic MVT treated with transhepatic transcatheter thrombectomy and thrombolysis were retrospectively retrieved from the Clinical Management System (CMS) in Hong Kong between 2017 and 2020.

In addition, a Pubmed literature search was undertaken using keywords *acute mesenteric vein thrombosis, thrombolysis and thrombectomy*. The inclusion criteria were studies examining the impacts of transcatheter thrombolysis and thrombectomy in the management of acute MVT. Search limits were from 1995 to January 2020 and to English manuscripts only. Articles relating to chronic MVT, cirrhosis, malignancy, or liver transplant were excluded. Treatment options of surgical or intraarterial thrombectomy, systemic thrombolysis and TIPSS were also excluded. The report was constructed in line with SCARE 2020 Criteria [5].

3. Results

3.1. Case 1

A patient with unremarkable past health was presented to us due to road traffic accident. He was a bus driver and he collided to the lorry in front of him at 40 km/hr. With his epigastric area hit on the steering wheel, he was trapped inside the bus for 15 min before being rescued. Upon admission, he complaint of generalized dull abdominal discomfort. Physical examination showed slightly tender abdomen with guarding. Initial CT scan of the abdomen and pelvis showed only mild mesenteric stranding and short segment of ileal thickening, which was suggestive of mesenteric and bowel injury given the history of blunt trauma. There was no active bleeding or haemoperitoneum, and the patient was put under close observation.

The next day following admission, he developed fever with persistent dull central abdominal pain, associated with frequent passages of watery loose stool. Initial blood results showed a normal white cell count and increased C-reactive Protein (CRP) to the highest of 180.2 mg/L. Lactate was 1.3 mmol/L, and base excess was -1. CT scan of the abdomen and pelvis was repeated and revealed filling defects in SMV branches up to confluence with the SMV. Subsequent CT scan 3 days later showed SMV thrombosis extending more superiorly to involve the main SMV, portal vein and proximal splenic vein. Bowel wall enhancement was preserved with no pneumatosis intestinalis or portal venous gas suggesting signs of impending bowel ischaemia in both scans.

Low molecular heparin was immediately started upon radiological diagnosis, and transhepatic portovenogram with transcatheter thrombectomy and thrombolysis was performed. The right portal vein was punctured with 18G Diamond needle under ultrasound localization and transhepatic portovenogram showed extensive thrombosis of main portal vein and SMV (Fig. 1). Thrombosed main divisions of the SMV tributaries were catheterized with 260 cm Zip wire and 5Fr MPA catheter. With 8Fr JET Peripheral Thrombectomy System inserted, repeated cycles of suction thrombectomy were performed along the thrombosed SMV main divisions and main portal vein. 4Fr Uni-Fuse Infusion catheter for infusion of tissue plasminogen activator (tPA) was positioned at SMV, and tPA

infusion was started overnight for 24 h at rate of 1 mg/hr; with heparin infusion of loading dose 3000U then 500U/hr.

Immediate post-procedure portovenogram showed satisfactory partial recanalization of the portomesenteric system (Fig. 2). CT portovenogram 1 day post-operation showed improvement with the non-occlusive SMV and patency of SMV tributaries.

1 day after the procedure, patient developed increased abdominal pain with marked shock. Haemoglobin dropped from 12.0 to 7.4 g/dL. CT abdomen showed gross hemoperitoneum with contrast extravasation in venous phase from bleeding from liver close to the catheter entry site. He required intensive care unit (ICU) admission with immediate embolization of the parenchymal tract with glue. Suction was applied to drain hemoperitoneum with 4 L of blood drained out. Total of 12 units of packed cells, 10 units of fresh frozen plasma and 10 units of platelet were transfused pre-operatively and intra-operatively.

He recovered gradually and is currently symptoms-free. He was discharged 36 days after his initial admission. Follow-up CT portovenogram 4 weeks later showed largely resolved portomesenteric thrombosis with only small amount of residual thrombus seen along the SMV. No major laparotomies nor bowel resection was needed during his hospital stay.

3.2. Case 2

Another patient who had past history of metabolic syndrome, polycystic ovarian syndrome and obstructive sleep apnoea, admitted for elective stomach greater curve plication for morbid obesity.

12 days post-operation, she complaint of persistent severe abdominal pain. CT abdomen and pelvis showed splenic vein, SMV, main and right portal vein thrombosis, with congested mesentery and focal wall thickening in left proximal ileum suggesting impending ischaemia of the related bowel segment. At the time of presentation, white cell count was normal, with unremarkable renal and liver function biochemistries. C-reactive proteins, lactate and venous blood gases were not taken at that time.

Low molecular weight heparin was immediately started, transhepatic portovenogram with transcatheter thrombectomy and thrombolysis was also commenced on the same day of radiological diagnosis. Transhepatic portal venogram showed thrombosis of left and right portal vein, main portal vein, SMV and its tributaries (Fig. 3). Thrombectomy was then performed using the Penumbra system negotiating the SMV and major tributaries, splenic and main portal veins. Persistent stasis in portal vein and formation of new clots were noted after successful thrombectomy downstream (Fig. 4). 8Fr long sheath and coaxial 4Fr MP-A catheter were introduced at SMV and main portal vein for overnight intravascular thrombolysis with regional alteplase infusion for 9 days post-thrombectomy. Patient also underwent laparotomy with partial resection of the ischaemic segment of small bowel of 50 cm in length. Intravascular thrombolysis was repeated for 2 more times the following 2 days after the initial intervention (a total of 3 transcatheter thrombolysis were done). A side-to-side small bowel anastomosis was constructed on the third operation.

Direct portovenogram was conducted on 4 and also 5 days after the third operation, which showed persistent improved portal venous outflow with patent PV and SMV (Fig. 5). Previously seen clots were largely resolved.

7 days after the third procedure, patient developed increased abdominal pain with hypotension and shock, with haemoglobin dropped from 8.0 to 5.0 g/dL. CT abdomen and pelvis showed a 9 × 12 × 13.5 cm subcapsular haematoma with active contrast extravasation and haemoperitoneum. Patient received blood transfusion and embolization of the parenchymal tract with glue was performed.

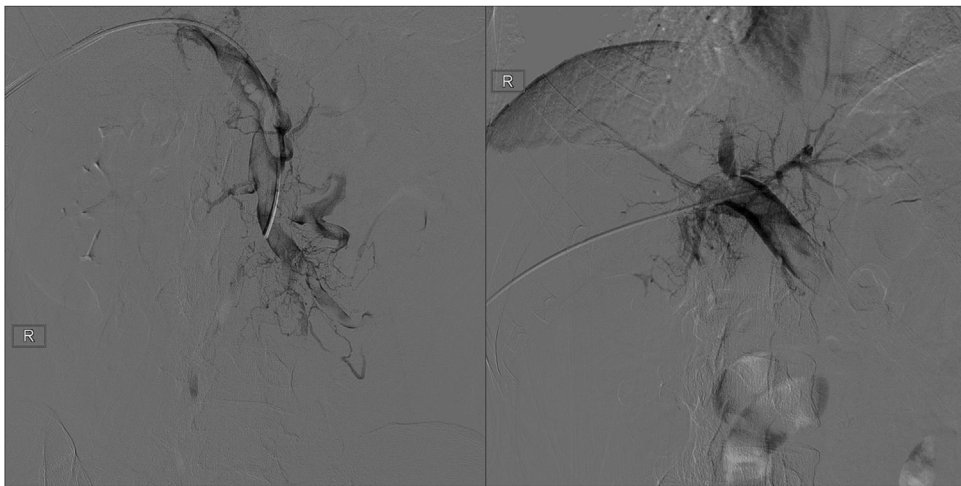


Fig. 1. Direct catheter portovenogram found extensive acute thrombus over main portal vein and main trunk of superior mesenteric vein (Patient 1).



Fig. 2. Direct catheter portovenogram after thrombectomy indicating almost complete resolution of thrombus over main portal vein and main trunk of superior mesenteric vein (Patient 1).



Fig. 3. Direct catheter portovenogram found extensive acute thrombus over main portal vein and main trunk of superior mesenteric vein (Patient 2).



Fig. 4. Direct catheter portovenogram after thrombectomy indicating complete resolution of thrombus over main portal vein and main trunk of superior mesenteric vein (Patient 2).

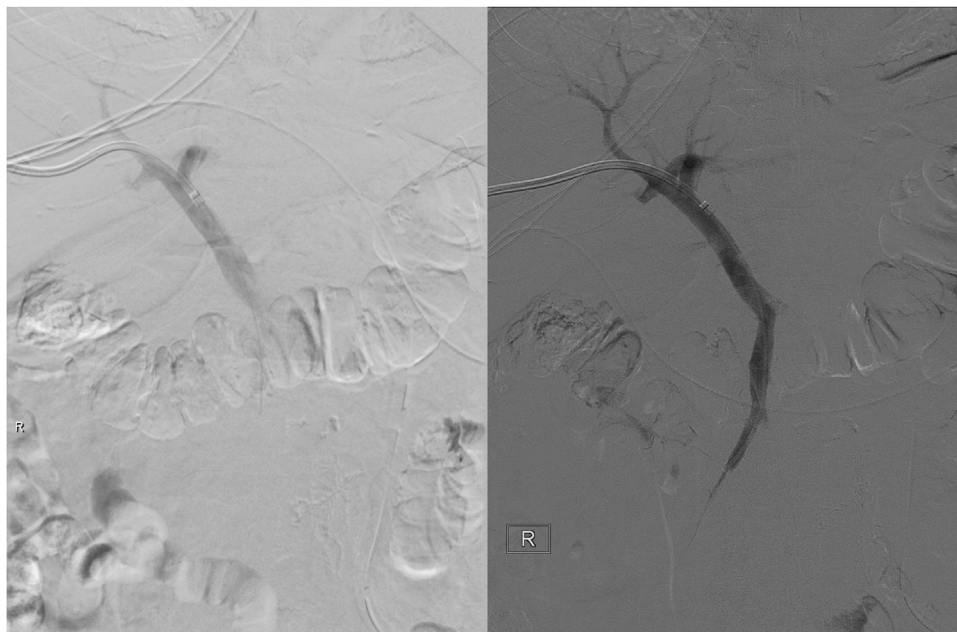


Fig. 5. Delayed direct catheter portovenogram 5 days after thrombectomy indicating sustainable complete resolution of thrombus over main portal vein and main trunk of superior mesenteric vein (Patient 2).

Patient gradually recovered and was discharged 32 days after initial presentation. Subsequent haematological workup revealed protein C deficiency of 67%, which in addition to the operation of plication of greater curve of stomach she received, may be the two contributing factors triggering portomesenteric thrombosis. With lifelong systemic anticoagulation, follow-up CT scan 3 years later revealed no formation of extensive venous collaterals, and the portomesenteric venous system were also patent with no new formation of thrombus. She is currently symptoms-free. Throughout her disease course with established bowel infarct, only 50 cm of small bowels were resected.

All the procedure were performed by a consultant radiologist with expertise in vascular intervention and a surgical fellow with training in endovascular surgery. The procedure was done in hybrid theatre with *syngo DynaCT*, Siemens which allow both open surgical procedures and image guided vascular intervention. Both of the patients were followed up in outpatient clinic 3 monthly after discharge and found no evidence of gastrointestinal insufficiency nor chronic diarrhoea. Follow up CT scan done in 1 month after the procedure found patent PV and SMV.

Table 1

Results of literature review on case series with non malignant, non-cirrhotic acute mesenteric venous thrombosis treated with catheter directed therapy and the corresponding outcome.

Author	Year	Number of patients	Site of occlusion	Intervention	Initiation of thrombolysis	Need for small bowel resection	Recanalization	Imaging at follow-up	Complications
Kercher et al. [5]	2002	1	SMV and PV	Transhepatic, UK with suction embolectomy and angioplasty	Upon diagnosis	No	Right PV remained thrombosed	15 months, right PV remained thrombosed	Haematuria and epistaxis
Lopera et al. [6]	2002	3	2 SMV and PV	Transhepatic, mechanical thrombectomy, 1 had UK infusion at 100,000 U/hr × 36 h	After failed trial of anticoagulation with worsening symptoms	No	Complete	Yes	–
Kim et al. [7]	2005	11	1 SMV only SMV and PV	Transhepatic, mechanical thrombectomy	Upon diagnosis	No	10 complete, 1 recurrent thrombosis	Yes	1 intrabdominal bleeding; 1 sepsis and multiple organ failure resulting in death 4 haematoma at puncture site
Wang et al. [8]	2011	12	SMV	Transjugular intrahepatic, with aspiration thrombectomy and continuous UK	After failed trial of anticoagulation with worsening symptoms	No	7 complete, 5 nearly complete	Yes	4 haematoma at puncture site
Yang et al. [9]	2014	8	SMV	Aspiration thrombectomy and direct thrombolysis by UK via SM	Upon diagnosis	4 required delayed localized bowel resection	Nearly complete	Yes	2 puncture site bleeding 2 sepsis
Jun KW et al. [10]	2014	2	1 PV, SMV, IMV and SV; 1 PV, SMV and SV	Transhepatic, mechanical thrombectomy with continuous UK (100,000/hr) × 48 h	Upon diagnosis	No	Partial	Yes	–
Cai et al. [11]	2020	13	SMV and PV	7 transjugular intrahepatic and 6 percutaneous transhepatic, aspiration thrombectomy with 353,000 ± 87,700 IU UK	Upon diagnosis	1 required bowel resection	8 complete lysis, 1 grade II lysis, 4 grade I lysis	Yes	4: transient haematuria 1: palpitation

PV = portal vein; SMV = superior mesenteric vein; IMV = inferior mesenteric vein; SV = splenic vein; UK = urokinase; rt TPA = tissue plasminogen activator.

4. Literature review

Seven articles [6–12] were identified describing the use of transcatheter thrombolysis and thrombectomy. Six included thrombectomy in addition to thrombolysis [6,7,9,7–12] and the total study group was 50 patients (Table 1). In addition, all patients received systemic anticoagulation treatment and after discharge. Transcatheter thrombolysis and thrombectomy was initiated in 15 patients after failed anticoagulation with persistent or worsening symptoms, with persistent pain and thrombus described as the indication for thrombolysis and thrombectomy [7,9]. For the other 35 patient, transcatheter thrombolysis and thrombectomy were initiated upon diagnosis.

Recanalization of the portomesenteric vein was complete in 28 patients (56%), nearly complete or partial in 20 patients (40%). Portomesenteric system remained thrombosed in 2 patients (4%). Only 5 patients (10%) required laparotomy for bowel resection after thrombolysis and thrombectomy [10,12]. Procedure related morbidity was described in 15 patients: minor complications include 5 cases of transient haematuria and epistaxis (10%) [6,12] and 2 cases of minor puncture site bleeding [10]. Major complications reported included 4 cases of puncture site haematoma with some requiring blood transfusion (8%) [9]. 1 case of intrabdominal or perihaptic bleeding (2%) [8] and 3 cases of sepsis (6%) [8,10] were

reported. There was 1 case of mortality (2.4%), which was the circumstances of sepsis, gastrointestinal haemorrhage, and necrotic bowel [8].

All articles had follow-up periods exceeding 12 months with follow-up imaging. Among these patients, there is no reported case of cavernous transformation or oesophageal varices occurrence. There was 1 case of re-thrombosis of the portomesenteric vein [8].

5. Discussion

With advancement of imaging technologies, acute mesenteric venous thrombosis (MVT) is now diagnosed with increased ease to be one of the recognized causes of gastrointestinal ischaemia. Incidence of acute MVT between 1970 and 1982 was estimated to be 2 per 100,000 compared to 2.7 per 100,000 between 2000 and 2006 [13].

Our experience on managing acute MVT with catheter-directed first approach was promising. This provided a minimally invasive approach with the benefits of rapid venous recanalization with high successful rate, reducing risk of progression into chronic MVT as well as averting massive bowel resection. Literature review findings also concur to our experience, although the case volume is not large. It should be considered as first approach for condition when expertise available. However, close monitoring after the procedure

should be provided in case of further deterioration or bleeding occur.

Risk factors of acute non-cirrhotic, non-malignant MVT can be broadly classified into systemic factors and local factors. Systemic factors include inherited or acquired state of hypercoagulability, such as factor V Leiden, protein C and protein S deficiency, anti-thrombin III deficiency, etc. Oral contraceptive use also accounted for 9–18% of acute MVT in reproductive female. Local factors include intra-abdominal infection or inflammation such as inflammatory bowel diseases and pancreatitis; postoperative states usually following laparoscopic surgery, bariatric surgery, and splenectomy; as well as abdominal trauma are all recognized risk factors for the development of acute MVT [14,15].

Thrombosis due to intra-abdominal causes started usually in larger vessels at the site of compression and progressed peripherally to involve smaller branches. On the contrary, smaller vessels are usually involved first in those who have underlying hypercoagulable states and progresses to involve the larger venous vessels [2]. For infarction of bowels to develop, the involvement of venous arcades and vasa recta are usually required to cause complete occlusion of venous blood flow. Arterial vasospasm in the presence of venous occlusion is another recognized factor in the pathogenesis of acute MVT to progression of bowel ischaemia and infarction [13].

Clinical manifestations of acute MVT are frequently non-specific. The most common presenting symptom is abdominal pain which occurs in 91–100% of the cases, with the duration of symptoms more than 1.5–2 days in more than 75% of the cases [3]. Other reported symptoms include nausea or vomiting, melaena and constipation. Physical examination may reveal abdominal tenderness, while fever and peritoneal signs are late indicators of impending bowel infarction.

There is currently no laboratory test that is diagnostic of acute MVT [16]. Laboratory finding of elevated white blood cells, lactate and metabolic acidosis may already indicate impending bowel ischaemia. Therefore, clinical suspicion of acute MVT should be high in patients presenting with acute abdominal complaints out of proportion of clinical findings. CT abdomen with triphasic scan is currently the “gold standard” diagnostic test for MVT, with an overall accuracy of 95%–100%. It offers the advantages of precise localization of the thrombus, and gives information of the viability of bowel, which is vital for decision making in management [4]. CT findings of acute MVT include a central low attenuation filling defect in the portal venous phase that represents the venous thrombus, while findings of wall thickening of bowel with distended bowel segment, abnormal enhancement patterns, hazy mesentery and the presence of new or unexplained ascites are suggestive of intestinal ischaemia [1]. Other imaging modalities include duplex ultrasound of portomesenteric venous system, with the main disadvantages of poor sensitivity and operator-dependency [17]. Splanchnic angiography, although more invasive, may be beneficial in terms of providing the exact location of venous occlusion, while providing assess for intra-arterial vasodilator therapy. Findings on angiography include late filling of the SMV, thrombus in the SMV with partial/ complete obstruction, or even reflux of contrast back to the arterial system with spasm [18]. Laparotomy or laparoscopic exploration may be required in those with high suspicion of infarcted bowel with inconclusive radiological findings.

Systemic anticoagulation, open or transcatheter thrombectomy and thrombolysis, or combinations of the above are the current reported methods to recanalize the portomesenteric venous system in managing acute MVT [13]. For those with suspicion of bowel infarction, diagnostic laparoscopy, or exploratory laparotomy, together with resection of obviously dead bowel is warranted. Various systematic reviews have suggested the initiation of systemic anticoagulation to be the standard in majority of cases [1,13]. Anticoagulation following acute MVT was reported in one systematic

review to achieve complete and partial recanalization of the portal vein in 38.3% and 14.0% patients respectively, and no mortality has been reported with the use of systemic anticoagulation [19]. Most common complications reported with the use of systemic anticoagulation include bleeding, but its absolute risk is still low (10%) [13]. While risk of recurrent thrombosis is largely dependent on the underlying aetiologies of acute MVT, previous systematic review has quoted the rate of recurrent thrombosis of patients on anticoagulation alone to be around 3–40%, regardless of the duration of anticoagulation [4].

Over the last two decades, transcatheter therapies such as thrombectomy, thrombolysis or both, have been described due to the low success rate of systemic anticoagulation alone. While open thrombectomy is associated with high morbidity [20], endovascular approaches to thrombectomy include percutaneous, transhepatic, transfemoral and transjugular, with transjugular approach are getting more used widely [1]. Thrombolytic agents are used in conjunction with thrombectomy, usually streptokinase or tissue plasminogen activator (tPA), with the latter more efficacious in dissolving thrombi due to its high selectivity to fibrin [21]. Approaches to thrombolysis include systematic administration, or with transcatheter approach either transarterially through the SMA or transvenously through the portomesenteric venous system for usually 24–72 hours [4]. The arterial approach allows access to intramural venous branches or in marginal veins of intestine and is also suitable for collateral veins. The venous approach offers the advantage for direct thrombolytic effect. Venous use of tPA also reduces the risk of haemorrhage due to fast hepatic metabolism of tPA as compared to the systemic or intraarterial approach [22].

While most published data on transcatheter thrombectomy, thrombolysis or both were from case reports and small case series, the use of such intervention has been shown to result in rapid venous recanalization with reduced risk of major laparotomy, massive bowel resection, as well as reduced risk of recurrent thrombosis and progression into chronic MVT. From the cases we reported to the literatures reviewed with transcatheter thrombectomy, thrombolysis or both with technical success involving a total patient population of 52, 55.7% of patients treated with this approach enjoyed complete recanalization of the portomesenteric vein while 40.3% had nearly complete or partial recanalization (overall recanalization rate = 96%). The durability of venous recanalization with the use of thrombectomy and thrombolysis was also shown to be satisfactory. Among patients who were treated with transcatheter thrombectomy with or without thrombolysis, there is no reported case of cavernous transformation or oesophageal varices occurrence signifying development of chronic MVT. There was only one case (2.4%) of recurrent thrombosis of the portomesenteric vein during follow-up periods exceeding 12 months with follow-up imaging. It has also been shown that patients with transcatheter thrombectomy with or without thrombolysis had reduced risk for major laparotomy, massive bowel resection and subsequent short gut syndrome. Among the population studied, 6 patients (11.5%) required surgical bowel resection. Length of bowel resection if surgery is required was not specified in the reports, but no occurrence of short gut syndrome was reported as a secondary outcome.

Risks and complications of transcatheter thrombectomy and thrombolysis, mainly bleeding, were reported in multiple reports. Minor haemorrhages include transient haematuria and epistaxis (9.6%) and minor puncture site bleeding (3.6%), which can usually resolve on their own without active intervention. As compared to anticoagulation alone, patients who underwent transcatheter thrombectomy and thrombolysis have higher risks of major haemorrhages included puncture site haematoma (7.6%), intrabdominal or perihepatic bleeding (5.8%) requiring blood transfusion, and in our reported cases, embolization of parenchymal tract with inten-

sive care unit resuscitation. But there is no need for laparotomy for haemostasis. Other complications reported included sepsis (5.8%). While there is no mortality case reported in patients treated with anticoagulation alone, there was 1 case of mortality (1.9%) reported with transcatheter thrombectomy and thrombolysis. Recurrent thrombotic events after treatment of MVT is also a recognized complication of acute MVT, reported in 3–40% of patients [4]. However, there was only 1 case (2.4%) of recurrent thrombosis of the portomesenteric vein during follow-up periods among the literatures and cases reviewed describing the use of transcatheter thrombectomy and thrombolysis in patients with acute MVT.

Currently there is no standard guideline for acute MVT suggesting indications to transcatheter therapies available; various studies also report different outcomes and suggest different indications for this treatment option. Some literatures have suggested aggressive transcatheter therapy to be considered as an adjunct in candidates with persistent symptoms refractory to anticoagulation alone with no establishment of infarction considering the higher operative risks associated with this treatment modality [1], while another systematic review suggested similar indication of transcatheter therapies in patients with signs of bowel compromise without infarction, occlusive thrombus refractory to anticoagulation to be candidates for catheter-directed thrombectomy and thrombolysis [4]. We have initiated transcatheter thrombectomy and thrombolysis immediately upon diagnosis of acute MVT in symptomatic patients for the aims of more rapid symptoms resolution, venous recanalization and averting progression into acute mesenteric ischaemia warranting major bowel resection, as per other case reports and series reviewed in this article. Currently, there is no study available to compare the outcomes of early transcatheter thrombolysis upon diagnosis versus delayed transcatheter thrombolysis in patients who are refractory to anticoagulation alone in acute MVT.

Catheter-directed thrombectomy and thrombolysis offers a minimal invasive approach for treatment of this condition. Comparing with conventional open venotomy and thrombectomy, which is of higher morbidity, catheter directed therapy should be considered as first approach in attempt of treatment of acute portal vein thrombosis. Patients with no evidence of bowel infarction or perforation will be exempted from a laparotomy. Patients requiring laparotomy due to bowel infarction can also be benefit from catheter-directed first approach as there is no need to explore portal vein and the limit extent of bowel resection if rapid recanalization can be achieved [20]. The procedure can also be repeated without much additional trauma if there is residual thrombosis as long as the sheath was kept in situ. The downside of such approach is that contrast nephropathy is a concern if repeated procedures have to be done in a short period of time.

Outcome of patients in terms of 30-day mortality with acute MVT has significantly improved with advancement of diagnostic imaging and endovascular therapies. Recent reports suggest mortality rate of 10–20% as compared to 44% quoted nearly two decades ago [23]. The long term outcomes of patients with acute MVT are largely based on the presence of bowel ischaemia requiring major resection leading to potential short gut syndrome, any recurrent thrombosis or failure in resolution of thrombosis whereas progression into chronic MVT could lead to portal hypertension and variceal haemorrhage. Currently, there is no large clinical trial data to support decreased mortality rates or reduced long term complication rates in patients who undergo transcatheter thrombectomy with or without thrombolysis due to limited case reports and case series published.

The study is limited by the small number of cases retrospectively reported and reviewed. There are also only limited case reports and small series available with potential publication bias. More large scale and well-designed studies are required to clearly report

the outcomes and delineate the benefit-to-risk ratio in favouring early employment of transcatheter thrombectomy and thrombolysis in patients with acute non-cirrhotic, non-malignant mesenteric venous thrombosis.

6. Conclusion

Acute non-malignant, non-cirrhotic mesenteric vein thrombosis (MVT) is a rare but potential lethal condition. Catheter-directed first approach upon diagnosis provided a minimally invasive approach with the benefits of rapid venous recanalization with high successful rate, reducing risk of progression into chronic MVT as well as averting massive bowel resection. It should be considered as first approach for condition when expertise available. However, major haemorrhage from puncture site could be life threatening; and we suggest embolization of catheter tract during removal of catheter during endovascular therapies.

Declaration of Competing Interest

There are no conflict of interest to declare.

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Ethical approval

Study is exempted from ethnical approval in our institution.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author's contribution

Anson Huen-yan, CHAN (data collection, data analysis or interpretation, writing the paper).

Man-fung HO (study concept or design, data collection, data analysis or interpretation, operating surgeon, capturing images, writing the paper).

Janet Fung-ye LEE (study concept or design, writing the paper).

Jeffery Ka-tak WONG (study concept or design, operating surgeon, capturing images, writing the paper).

Simon Siu-man NG (study concept or design, writing the paper).

Registration of Research Studies

Not Applicable.

Guarantor

Dr Man-fung HO.

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