Diagnosis and Management of Portal Vein Thrombosis in Liver Cirrhosis

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ABSTRACT

Portal vein thrombosis is formation of thrombus in main portal vein and its branches, that may also affect superior or mesenteric veins. Rebalanced coagulation system and changes in hepatic portal venous flow augment risk of portal vein thrombosis. Modalities to identify portal vein thrombosis include ultrasonography, contrast-enhanced Computed Tomography (CT), and Magnetic Resonance Imaging (MRI). The management of portal vein thrombosis in hepatic cirrhosis is challenging due to intricate balance between thrombosis and bleeding complicating treatment decision. Treatment option consisted of close monitoring, anticoagulation, thrombolysis, and trans-jugular intrahepatic portosystemic shunt (TIPS). Anticoagulant options for management of portal vein thrombosis encompass Low Molecular Weight Heparin (LMWH), Vitamin K Antagonist (VKA), and Direct Oral Anticoagulant (DOAC). There is still no consensus regarding the thrombolysis for the management of portal vein thrombosis in cirrhosis due to lack of evidence. TIPS may be considered in portal vein thrombosis with insufficient response or contraindication to anticoagulation, repeated variceal bleeding, and/ or refractory ascites which unable to be controlled by medical or endoscopic management. This review aims to discuss the current update in diagnosis and management of portal vein thrombosis in liver cirrhosis.

***Keywords**: Cirrhosis, portal vein thrombosis, anticoagulant*

ABSTRAK

Trombus vena porta merupakan kondisi yang ditandai dengan terbentuknya trombus pada vena porta utama dan percabangannya yang dapat meluas ke vena mesenterika dan vena splenika. Sirosis hati meningkatkan risiko terjadinya trombus vena karena terdapat perubahan keseimbangan sistem koagulasi dan aliran vena porta. Modalitas diagnosis trombus vena porta berupa ultrasonografi, contrast-enhanced computed tomography (CT), dan magnetic resonance imaging (MRI). Tatalaksana trombus vena porta pada pasien sirosis merupakan tantangan karena terdapat perubahan keseimbangan sistem koagulasi yang juga dapat meningkatkan risiko pendarahan. Pilihan tatalaksana trombus vena porta pada pasien sirosis antara lain monitoring berkala tanpa terapi, terapi antikoagulan, trombolisis, dan trans-jugular intrahepatic portosystemic shunt (TIPS). Antikoagulan yang dapat digunakan seperti low molecular weight heparin (LMWH), antagonis vitamin K (VKA), dan direct oral anticoagulant (DOAC). Terkait trombolisis hingga saat ini belum ada konsensus yang merekomendasikan terkait aplikasinya pada pasien trombus vena porta dengan sirosis. TIPS diindikasikan pada pasien trombus vena porta yang tidak respon atau memiliki kontraindikasi terapi antikoagulan, pendarahan variseal berulang, asites refrakter yang tidak dapat ditatalaksana dengan medikamentosa atau secara endoskopi. Artikel ini bertujuan untuk membahas diagnosis dan tatalaksana terkini trombus vena porta pada pasien sirosis hati.

Kata kunci: *Sirosis, trombus vena porta, antikoagulan*

INTRODUCTION

Portal vein thrombosis is formation of thrombus in main portal vein and its branches, that may also affect superior or mesenteric veins. Rebalanced coagulation system and changes in hepatic portal venous flow augment incidence of portal vein thrombosis. The manifestation of portal vein thrombosis may be acute or chronic. In acute condition, portal vein thrombosis may induce intestinal ischemia or hepatic decompensation. Chronic condition usually asymptomatic due to presence of collaterals bypassing the obstructed portion of portal vein.[1] Portal vein thrombosis is most often detected incidentally, but it should be suspected in patient with worsening hepatic decompensation.[2]

The management of portal vein thrombosis in liver cirrhosis is challenging. Intricate balance between thrombosis and bleeding in cirrhosis complicates treatment decision. Treatment options consist of close monitoring without any specific intervention, anticoagulation, thrombolysis, and trans-jugular intrahepatic portosystemic shunt (TIPS). The range of treatment option should be noted to help govern the benefit and risk of the most appropriate treatment.[3] This review aims to discuss the current update in diagnosis and management of portal vein thrombosis in liver cirrhosis.

EPIDEMIOLOGY AND RISK FACTORS

There were diverse reports regarding epidemiology of portal vein thrombosis. The prevalence ranged from 0.6 to 23%.[4] Variance in study subjects, severity of liver cirrhosis, and diagnostic modalities contributes to discrepancy in epidemiological data. A meta-analysis by Pan, et al reported that prevalence of portal vein thrombosis in liver cirrhosis was 13.92% with 1-year and 3-year cumulative incidence were 4.78% and 9.34%, respectively.[5] Other study by Ferreira, et al in Portugal reported 2-year and 3-year cumulative incidence of portal vein thrombosis were 3.7% and 7.6%, respectively.[6] Another study by Zhang, et al in China stated that prevalence of portal vein thrombosis was 5.24% in compensated liver cirrhosis and 9.36% in decompensated cirrhosis.[4]

The prevalence and incidence of portal vein thrombosis were higher in Child-Pugh Class B/C patients, ascites, and treatment with non-selective beta-blocker (NSBB). According to meta-analysis by Pan, et al predictor of the occurrence of portal vein thrombosis were Child-Pugh Class B or C, elevated MELD score, elevated d-dimer level, lower platelet count, reduced portal flow velocity, presence of ascites, treatment with NSBB, and presence of moderate to high-risk esophageal varices.[5] Use of NSBB can decrease portal velocity and increased risk of thrombus formation. Other risk factors of portal vein thrombosis include inherited prothrombotic disorder such as factor V Leiden mutation, prothrombin G20210A mutation, and presence of MTHFR C677T; acquired thrombophilic disorder such as antiphospholipid syndrome or myeloproliferative neoplasm; and obesity.[7]

PATHOGENESIS

Portal venous circulation drains blood from gastrointestinal tract to hepatic sinusoids. The venous system is devoid of valves and not influenced by pulsatile flow of cardiac cycle. Low pressure, slow flow, and high volume are the features of portal venous system in general population; hence occurrence of thrombus is rare. However, in cirrhosis, alteration in splanchnic area increases the risk of thrombus development.[8]

Virchow's triad, classically characterized by hypercoagulability, stasis of blood flow, and endothelial injury, is the main mechanism underlying development of portal vein thrombosis. Liver dysfunction decreases synthesis of procoagulants (prothrombin, factor V, dan factor X) and anticoagulants factors (protein C, protein S, and antithrombin), resulting in rebalance of coagulation system (table 1). Cirrhotic patients have higher thrombotic risk, but also prone to bleeding (table 1). In cirrhosis, fibrosis accumulation in portal vein contributes to intrahepatic vascular resistance and portal hypertension. Portal hypertension promotes production of vasodilators and reduces systemic response to vasoconstrictors leading to increase of portal vein inflow. Increasing flow to portal venous system in turn aggravates portal hypertension and cause enlargement of portal vein and formation of porto-collateral vessels, which divert blood from portal circulation to systemic circulation. This condition renders reduction in portal flow velocity causing stasis of blood flow in portal circulation. Moreover, congestion in portal system cause vascular shear stress and endothelial injury and vascular dysfunction, thus contributing to thrombus formation.[1, 8]

Table 1. Rebalanced Coagulation System in Liver Cirrhosis[1]

Antihemostatic Drivers	Prohemostatic Drivers
Primary Hemostatis	**Primary Hemostatis**
Thrombocytopenia Abnormal platelet function Reduced thrombopoietin level Increased production of NO and prostacycline	Elevated level of von Willebrand factor Low level of ADAMTS13
Coagulation	**Coagulation**
Low level of factor II, V, VII, IX, X, and XI Vitamin K deficiency Dysfibrinogenemia	Elevated level of factor VIII Low level of protein C, protein S, antithrombin Inherited thrombophilia
Fibrinolysis	**Fibrinolysis**
Low level of α-2 antiplasmin, faktor XIII, and TAFI Elevated level of t-PA	Low level of plasminogen

ADAMTS13: a disintegrin and metalloproteinase with thrombospondin motifs-13, NO: nitric oxide, TAFI: Thrombin Activatable Fibrinolysis Inhibitor; t-PA: Tissue Plasminogen Activator

CLINICAL MANIFESTATION

Duration of thrombosis, degree of occlusion, and underlying hepatic condition determine manifestation of portal vein thrombosis. While portal vein thrombosis is usually asymptomatic, in acute condition, patient may present with abdominal pain, bloody diarrhea, paralytic ileus, or peritonitis which suggest extension of thrombus to superior mesenteric vein causing intestinal ischemia and bowel infarction. Chronic portal vein thrombosis, which is signified by presence of thrombus and/or abdominal symptoms for duration more than 60 days, is mostly asymptomatic.[9] Recent symptoms marking the deterioration of portal hypertension in compensated cirrhosis such as variceal bleeding and refractory ascites is warning sign of presence of portal vein thrombosis and should be further evaluated. [1, 10]

Classification and grading of portal vein thrombosis in shown in table 2. Previously, there were several classifications for portal vein thrombosis such as Stieber Classification, Nonami Classification, Jaimeson Classification, Yerdel Classification. However, most of previous classification focus only on anatomical area and no delineation between timing, clinical or therapeutic implication of thrombus. The new classification covers not only anatomical aspect, but also functional and clinical aspect of portal vein thrombosis.[11] Portal vein thrombosis may also be linked with acute-on-chronic liver failure (ACLF). Abrupt blockage of hepatic blood flow invoking ischemia and instigating ACLF could be the result of acute portal vein thrombosis. On the other side, systemic inflammation and release of endotoxin in ACLF might predispose to thrombus formation in portal vein.[1]

Formation of collaterals bypassing obstructed portal vein can ensue subsequently after few weeks. This occurrence is rare in non-cirrhotic patient, but it might be sporadically occurred in cirrhotic patient. In meta-analysis by Wang, et al, 12% patients had complete spontaneous portal vein thrombosis recanalization. Other study showed 70% patients with compensated cirrhosis had spontaneous resolution of portal vein thrombosis. Another study showed spontaneous improvement of portal vein thrombosis in 45% subject.[14] Even so, recurrence of portal vein thrombosis after spontaneous

Table 2. Classification and Grade of Portal Vein Thrombosis in Cirrhosis[1]

Location of portal vein thrombosis	Type 1: only trunk Type 2: only branch 2a: one branch 2b: both branches Type 3: trunk and branches
Duration	Recent: first time detected in previously patent portal vein, presence of hyperdense thrombus on imaging, absent or limited collateral circulation, dilated portal vein at the site of occlusion Chronic: no hyperdense thrombus, previously diagnosed portal vein thrombosis on follow-up, portal cavernoma, and clinical features of portal hypertension
Extent of portal vein system occlusion	Splenic vein Mesenteric vein Both
Relation to ACLF	Type A: portal vein thrombosis triggers the onset of ACLF in a patient with previously known or unknown chronic liver disease Type B: ACLF develops in patients with preexisting portal vein thrombosis and previously known or unknown chronic liver disease Type C: Onset of acute PVT after the development of ACLF
Grade	
BAVENO VII[12]	Completely occlusive: No persistent lumen Partially occlusive: Clot obstructing more than half of vessel lumen Minimally occlusive: Clot obstructing less than half of vessel lumen Cavernous transformation: Gross porto-portal collaterals without native portal vein documented
Chinese Society of Gastroenterology[13]	Mural portal vein thrombosis: thrombus occlusion of less than half of portal vein. Partial portal vein thrombosis: thrombosis between mural and complete PVT Fibrotic cord: portal vein completely obliterated and organized, in which the lumen of the portal vein cannot be identified by imaging examination Complete portal vein thrombosis: complete thrombosis of the portal vein.

Notes: ACLF: acute-on-chronic liver failure; PVT: portal vein thrombosis

recanalization is also common. Some studies described thrombus recurrence after 47 months in 21.3% patients and after 47 months in 45% patients.[10]

DIAGNOSIS

Portal vein thrombosis is usually discovered incidentally on routine imaging. To help distinguish patients with high probability of portal vein thrombosis, Sarin et al proposed pretest probability assessment (table 3). Fulfilment of 2 major, 1 major and 2 minor, or 4 minor criteria signifies increased likelihood of portal vein thrombosis, thus requiring further examination. However, this pre-test scoring system would need to be further validated in prospective study.[11]

Ultrasonography is initial imaging of choice to detect portal vein thrombosis. Acute Thrombus appears as hypoechoic or isoechoic material inside portal vein. Acute thrombus is seen more hypoechoic, while chronic thrombus appears more hyperechoic due to thrombus organization. Doppler could be used to evaluate velocity of flow in the vessel and detect shunts and collaterals. Ultrasound has 92% specificity and 89% sensitivity to detect portal vein thrombosis. In doubtful case, contrast enhanced ultrasonography may increase sensitivity up to 95%. The disadvantages of ultrasonography are operator-dependant and its utility can be limited in presence of ascites, obesity, or bowel gas.[1, 14]

Table 3. Parameters for predicting pre-test probability of portal vein thrombosis in cirrhosis[11]

Major Criteria	Minor Criteria
Child pugh B or C cirrhosis	Evidence of portosystemic shunt
History of portal vein thrombosis	Active hepatocellular malignancy
Presence of thrombophilic condition (Factor V Leiden Mutation, prothrombin gene mutation, MTHFR mutation)	Prior or recent systemic venous thrombotic events or abortions
	Clinical symptoms and signs of acute abdomen
	New episode or deterioration of portal hypertension complications
	Current abdominal procedures (endoscopic, radiological or surgical)
	Previous doppler showed portal flow velocity < 15 cm per second

Contrast-enhanced computed tomography (CT) is gold standard to diagnose portal vein thrombosis. In CT, partial portal vein thrombosis appears as filling defect within portal venous system, while complete portal vein thrombosis appears as an absence of contrast agent within the portal vein lumen. Acute thrombus materializes as hyperdense lesion on non-contrast CT. Benign thrombus has distinct characteristic compared with tumoral thrombus. Tumoral thrombus is composed by malignant tissue with rich vascularization; hence it may appear as punctate or linear enhancement in arterial phase of contrast-enhanced CT. Neovascularity and disruption of vein walls could also be seen.[1, 9]

On MRI, acute portal vein thrombosis appears as zone with aberrant signal inside portal vessel. Acute thrombus hallmarked by hyperintensity contrasted with hepatic parenchyma and adjacent muscle in T1 and T-2 weighted image. Attenuated signal intensity in T1 weighted image exhibited by chronic thrombus. MRI may differ bland thrombus from malignant thrombus. Malignant thrombus depicts T1-hypointensity and T2-hyperintensity, enhancement on T1-postcontrast, and hyperintense on diffusion-weighted imaging.[1]

MANAGEMENT

The decision to initiate treatment of portal vein thrombosis in cirrhosis should consider grade and extent of thrombus, clinical manifestation, transplantation status, and risk of bleeding. Grade of portal vein thrombosis is shown in table 2. Management of portal vein thrombosis comprises of watchful waiting, anticoagulation, thrombolysis, and TIPS. Algorithm of treatment strategy in portal vein thrombosis proposed by Chinese Society of Gastroenterology Consensus was shown in figure 1. [1, 13]

Close monitoring may be applied to patients with mural portal vein thrombosis without involvement of mesenteric vein. However it is difficult to determine which patient would be spontaneously recanalize without intervention and the ideal interval of follow up examination.[13]

According to BAVENO VII guideline, anticoagulation is indicated in patients with current (occurring within 6 months) complete or partial thrombosis of portal vein with or without extension to superior mesenteric vein, symptomatic portal vein thrombosis, or potential prospects for liver transplantation independently of the degree of occlusion and extension. In potential prospects for liver transplantation, anticoagulant is utilized to prevent development of novel thrombus and advancement of thrombosis which may hinder portal anastomosis during transplantation. In patient with minimally occlusive portal vein thrombosis, anticoagulation should be considered if thrombosis expands in 1-3 months or affects superior mesenteric vein. Duration of anticoagulation should be at least 6 months or until portal vein recanalization is documented. In candidates of liver transplantation, anticoagulation

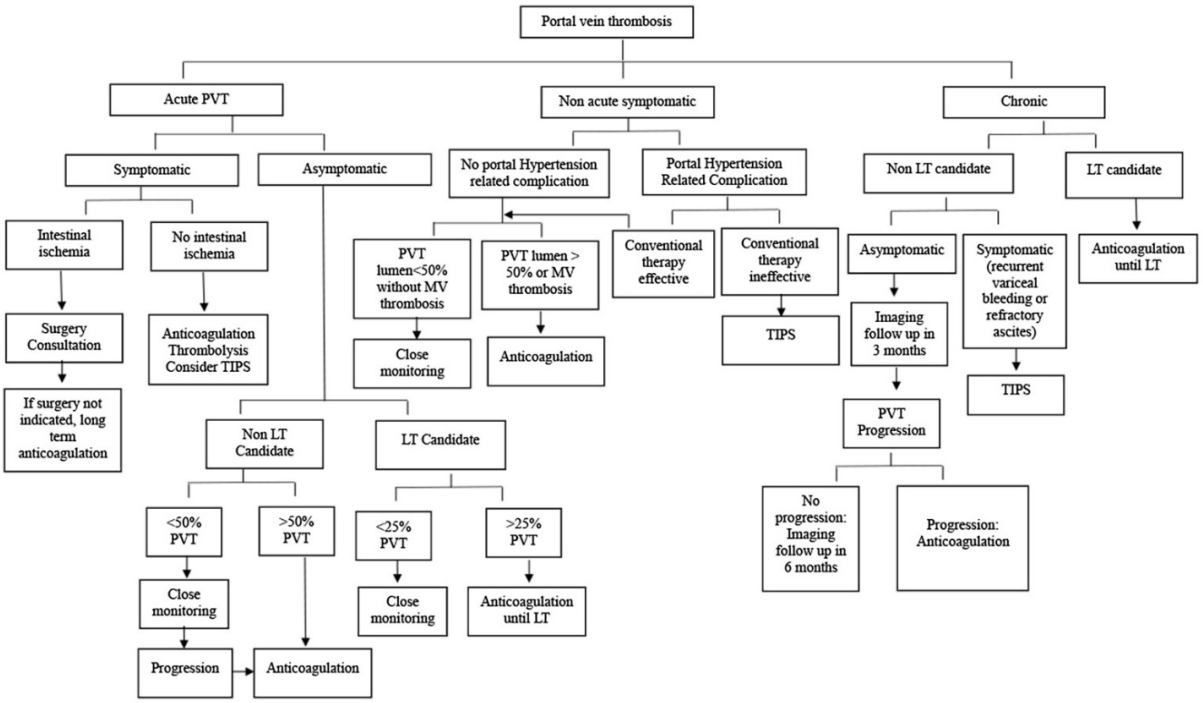

Figure 1. Algorithm of Management of Portal Vein Thrombosis[7, 13]

LT: liver transplantation; PVT: portal vein thrombosis; TIPS: Trans-jugular intrahepatic portal shunt

should be continued after recanalization. Long term anticoagulation after recanalization should be considered to prevent recurrence if benefit outweigh the risk of bleeding.[12]

Chinese consensus proposed performing endoscopic examination before initiating anticoagulation to evaluate the risk of bleeding. As primary and secondary prophylaxis of variceal bleeding, non-selective beta blockers (NSBB) with/ without endoscopic band ligation should be considered. Major contraindication of anticoagulation includes recent history of bleeding, high risk gastroesophageal varices, and severe thrombocytopenia. In patients with advanced cirrhosis (Child-Pugh C), anticoagulation should be used cautiously.[13]

Previous studies supported the benefit of anticoagulation in liver cirrhosis with portal vein thrombosis. IMPORTAL study, showed anticoagulation promotes portal vein recanalization and reduces all cause and liver-related mortality.[15] Cohort study by Ferreira, et al also showed anticoagulation increased portal vein recanalization and improve survival in patient with Child Pugh B or C cirrhosis.[16] Another meta-analysis by Wang, et al stated that anticoagulation is significantly associated with portal vein recanalization, improves overall survival, and decreases thrombus progression.[17] Study by Niu et al, showed lower risk of death in patients both compensated and decompensated liver cirrhosis with portal vein thrombosis receiving anticoagulant.[18] Risk of bleeding is not significantly increased with anticoagulation.[17, 18] Anticoagulant for management of portal vein thrombosis is summarized in table 4.

BAVENO consensus recommended sequential anticoagulation initiated with low molecular weight heparin (LMWH) and then maintained with either LMWH, vitamin K antagonist (VKA), or direct oral anticoagulant (DOAC).[12] LMWH inhibits conversion of fibrinogen into fibrin and activates antithrombin III that inhibit factor Xa. VKA inhibits vitamin K epoxide reductase complex in liver, thus reducing level of vitamin K that is required for carboxylation of vitamin K- dependent coagulation factor (factor II, VII, IX, and X). Dabigatran is reversible direct thrombin inhibitor. Rivaroxaban, apixaban, and edoxaban block both free and clot-bound factor Xa.[20]

There were several studies regarding the effectiveness and safety of DOAC in patients with liver cirrhosis and portal vein thrombosis (table 5). In study by Ai, et al, after 3 months of DOACs treatment, complete recanalization of portal vein thrombosis was observed in 5.1% subjects, partial recanalization was observed in 7.7% subjects, and no recanalization in placebo.[21] Most studies showed DOAC was superior in achieving complete and partial recanalization compared with placebo or VKA.[21-24] However, no significant difference in recanalization when DOAC compared with sequential treatment of LMWH and VKA.[23] In study by Zhou, et al, both rivaroxaban and

Table 4. Anticoagulant for Management of PVT in Liver Cirrhosis[3, 19, 20]

	LMWH	VKA	Rivaroxaban	Apixaban	Edoxaban	Dabigatan
Mechanism of action	Inhibit conversion of fibrinogen into fibrin Activate antithrombin III	Inhibit vitamin K epoxide reductase complex in liver	Factor XA inhibitor	Factor XA inhibitor	Factor XA inhibitor	Thrombin inhibitor
Dosing	Enoxaparin 1 mg/kgb every 12 hours Dalteparn 10000-18000 IU qday	Initial dose: 2 mg qday Titrate to therapeutic INR range of 2-3	15 mg bid for 21 days then 20 mg qday	10 mg bid for 7 days then 5 mg bid	60 mg (or 30 mg) qday	150 mg bid or 220 mg qday
Pros in cirrhosis	- Subcutaneous administration - Easy interruption	Oral administration	Oral administration Fever interaction than VKA			
Cons in cirrhosis	Contraindicated in severe renal failure	INR not reliable in cirrhosis	Not recommended in Child Pugh C Higher cost			
Side effects	Bleeding, altered liver function, thrombocytopenia	Bleeding	Bleeding Altered liver function			
Antidote	Protamine sulfate	Vitamin K	Andexanet alpha			Idarucizumab

Table 5. Studies Regarding Effectiveness and Safety of DOAC for Portal Vein Thrombosis in Liver Cirrhosis

Studies	Design	Subjects	Comparison	Results
Nagaoki, et al (2018)[22]	Retrospective cohort	50 cirrhotic patients with portal vein thrombosis	Edoxaban vs warfarin	Treatment with edoxaban (70%) is associated with higher complete resolution of the PVT compared with warfarin (20%). There were no significant differences in adverse events between the two groups.
Ai, et al (2020)[21]	Prospective Cohort	80 subjects (18-75 years old) with cirrhosis and chronic portal vein thrombosis	DOAC vs placebo	The complete/partial recanalization rates were higher in the DOACs group compared with the placebo group with no difference in bleeding events between the two groups.
Ng, et al (2021)[23]	Meta-analysis	10 studies involving non tumoral PVT in cirrhosis	DOAC vs LMWH, VKA, and no treatment	Complete recanalization was higher in DOACs compared with LMWH, warfarin, and no treatment. No significant difference in complete recanalization was found when DOACs were compared to sequential LMWH–warfarin and antithrombin III. No significant bleeding event difference found between DOACs and other treatments.
Koh, et al (2021)[24]	Meta-analysis	11 studies involving adult cirrhosis patients with non-tumoral PVT	DOAC vs VKA	DOAC was associated with a higher rate of PVT recanalization, lower risk of PVT progression, and lower major bleeding risk compared with VKA
Zhang, et al (2022)[30]	Meta-analysis	17 studies (3 RCTs and 14 cohort studies) involving cirrhotic patients with PVT	DOAC vs warfarin	DOAC was associated with higher recanalization rate and lower PVT extension compared with warfarin. There was no difference in the rate of total bleeding, major bleeding and variceal bleeding between the DOACs and warfarin.
Zhou, et al (2023)[25]	Retrospective cohort	94 adults adult patients with child pugh A or B cirrhosis and acute portal vein thrombosis	Rivaroxaban vs dabigatran	The rivaroxaban group had a higher rate of complete recanalization not significantly different relative to the dabigatran group. Survival was not different in patients receiving rivaroxaban and dabigatran There were no significant differences for major and minor bleeding events between rivaroxaban and dabigatran.
Niu, et al (2024)[18]	Retrospective cohort	Adult patients with cirrhosis and PVT	DOAC vs VKA	There were lower mortality rates in DOAC group compared to VKA group. Rates of hemoptysis, hematuria, and gastrointestinal bleeding were similar between the groups.

dabigatran are equally effective and safe as treatment for acute portal vein thrombosis in cirrhosis.[25]

Although DOAC is beneficial in treatment of portal vein thrombosis, use of DOAC in cirrhosis patient is limited. Patients with Child-Pugh B or C are often excluded from clinical trials. Higher plasma concentration of DOAC is anticipated in liver cirrhosis due to lower albumin level and decreased clearance of drug metabolized by cytochromes P450. All DOAC, rivaroxaban, apixaban, edoxaban, dan dabigatran, can be used unsparingly in Child Pugh A cirrhosis. However rivaroxaban should be avoided in Child-Pugh B or C. Apixaban, edoxaban, and dabigatran should be used with caution in Child-Pugh B and should be avoided in Child Pugh C.[26]

Thrombolysis using streptokinase, urokinase or tissue plasminogen activator (t-PA) with concomitant administration of LMWH has been attempted in a few cases to treat recent PVT. Pilot study by De Santis, et al evaluate efficacy of thrombolysis using t-PA in 9 subjects with acute portal vein thrombosis and liver cirrhosis. The results showed 4 subjects obtained total regression and 4 subjects obtained partial regression of thrombus without major complication.[27] Thrombolysis may be considered as rescue therapy in condition of unsuccessful treatment with anticoagulants.[28] Until now there is still no consensus regarding the application of thrombolysis for portal vein thrombosis in liver cirrhosis because the high quality evidence is still lacking.[14]

Transjugular intrahepatic portal shunt (TIPS) is one of the modalities to treat portal vein thrombosis. Direct access to portal vein for thrombolysis with subsequent TIPS placement improve portal flow.[2] Indications of TIPS in portal vein thrombosis include inadequate response or contraindication to anticoagulation, recurrent variceal bleeding and/ or refractory ascites which unable to be controlled by medical or endoscopic management..[1] Meta-analysis Rodrigues, et all showed recanalization of portal vein with TIPS implantation was successfully performed in majority of cases (95%). Complete portal vein recanalization was achieved in 79% subjects at 12 months and TIPS patency was maintained in 84% subjects. Risk of re-thrombosis was rare after TIPS. However, TIPS is associated with moderate risk of complication (10%), such as bleeding, perforation, hematoma.[29]

To summarize, the option for management of portal vein thrombosis in cirrhosis depends on clinical manifestation and timing of presentation. Close monitoring may be an option for asymptomatic patients. In acute portal vein thrombosis, the option of management includes anticoagulation, thrombolysis, TIPS, or surgery. In chronic portal vein thrombosis, the option of management includes anticoagulation or TIPS in refractory cases.

PROGNOSIS

Studies regarding risk of mortality due to portal vein thrombosis in liver cirrhosis showed conflicting results. It is hypothesized that portal vein thrombosis leads to portal hypertension complication and subsequently increases risk of mortality. Study by Amitrano, et al stated that portal vein thrombosis increased risk of mortality. However other studies by Noronha Ferreira, et al and Nery, et al showed no effect of portal vein thrombosis on mortality.[4] Portal vein thrombosis is associated with worse outcome in patients undergoing liver transplantation. Analysis of registry of transplant recipients in United States showed that portal vein thrombosis was associated with higher significant post-transplantation mortality. Preexisting portal vein thrombosis increased risk of graft failure and death at 90 days, 1 years, 3 years, and 5 years.[10]

After stopping anticoagulation, risk of re-thrombosis was 35,3% as shown by cohort study by Ferreira, et al.[16] Meta-analysis by Wang, et al showed higher re-thrombosis rate of 46,7% after stopping anticoagulant.[17] Monitoring of portal vein patency is required within 3 months of discontinuing anticoagulant.[13]

CONCLUSION

Management of portal vein thrombosis in liver cirrhosis includes anticoagulation, thrombolysis, and TIPS. Anticoagulant such as LMWH, VKA, and DOAC may be used. Recent studies showed DOAC is beneficial and safe for management of portal vein thrombosis compared with VKA. However further studies regarding potency and safety of DOAC is required. There is still no consensus regarding the thrombolysis for the management of portal vein thrombosis in cirrhosis due to lack of evidence. TIPS may be indicated in portal vein thrombosis with unsatisfactory response or contraindication to anticoagulation, recurrent variceal bleeding and/ or refractory ascites which unable to be controlled by medical or endoscopic management.

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