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**SHORT COMMUNICATION****Banode-Mishra Technique (BMT) for acute deep venous iliofemoral thrombolysis**

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**Abstract**

This technique refers to a novel yet simple technique with sequential enlisting of steps which can be replicated in the operation theaters of Interventional Radiology when dealing with treatment of cases with acute deep venous thrombosis involving the iliofemoral venous vasculature. The endpoints mentioned herein may be targeted for thrombus clearance mainly eyeing and achieving prospective improvement in the patency rate of involved venous vasculature and probable reduction of disease severity.

**Keywords:** Thrombosis, Venous Thrombosis, Thrombolysis, Deep Venous Thrombolysis, Interventional Radiology, Vascular Interventional Radiology

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**Introduction**

Ilio-femoral deep vein thrombosis is a condition where there is either partial or total occlusion of the iliac and/or common femoral vein due to intravascular occlusive thrombus leading to luminal obstruction and increasing venous blood pressure thereafter. This leads to functional disability of the affected leg causing pain, cramps, hyperpigmentation, heaviness etc. [1-2]. Based on these clinical features, the patients develop Post Thrombotic Syndrome (PTS) thereafter because of the functional disability and hampering of the antero-gradate venous flow [3-7]. There have been multiple treatment modalities incorporated to treat deep venous thrombosis of the lower limb irrespective of part involved – iliac, femoral, popliteal, tibial and pedal. However, literature states that the more distal the thrombus is located, the better

recanalization potential of the involved vessel there is if treated with anticoagulant therapy alone [8-9]. This may be attributed to the fact that the more proximal the site of thrombus in the venous vasculature, the more venous blood pressure it takes to propel the blood for the veins towards the heart and again, this puts the venous valves at extreme pressure. Venous valvular incompetence is one of the common factors leading to deep venous thrombosis making it a vicious circle.

Main outcome in question apart from long term follow up remains vessel patency at different points in the timeline. There have been various randomized controlled trials where anticoagulant therapy augmented with catheter directed thrombolysis was evaluated as against anticoagulant therapy alone [10-13].

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It is stated clearly in literature that one of the most important factors contributing towards PTS along the timeline is residual thrombus as a result of an incomplete thrombolysis treatment [14]. It is also stated that the role of early thrombus removal with augmented anticoagulant drug therapy in reducing the risk of PTS is unclear [15]. Nowadays, the concept of pharmacomechanical catheter directed thrombolysis is being utilised to treat deep venous thrombosis of the lower limbs. Some studies have stated about its successful results in reduction of thrombus load when used in conjunction with anticoagulant therapy versus anticoagulant therapy alone [12, 15]. The object of the invention is to maintain the patency of the affected iliofemoral venous vasculature by the usage of the novel technique as stated herein at its best.

#### **Need for invention**

The need for invention of this technique is to improve the vascular patency rate with the progression of time and also to prevent or rather delay the incidence of PTS which is considered to be a leading sequelae to iliofemoral deep venous thrombolysis for as long as possible. In other words, the severity of symptoms which present with PTS lead to debilitation and considerable reduction in both the Quality of Life (QoL) as well as the symptom severity as per the presentation of the deep venous thrombosis.

#### **Working of the subject**

The novel technique for thrombus recanalization incorporates the use of a suitable pigtail catheter which will be positioned at the thrombus site in a small area created by thrombus maceration by suitable hydrophilic guidewire. This will be

followed by forceful injection of 1 to 2 ml of Actilyse (Alteplase 10 mg in 50 ml solution of normal saline). The vial of the said drug comes in 20 mg, 50 mg and 100 mg respectively. The 20 mg vial will be made use of. The pigtail catheter will then be rotated by 90 degree and withdrawn post rotation by about 1 to 2 cm distally. Then, another forceful injection of 2 cm Actilyse is administered and the catheter is withdrawn about 2 cm distally. This process will be cyclically carried out in repetition until the entire thrombotic segment has been covered. Then, after a time period of about 4 hours, mechanical thrombolysis will be carried out until the endpoint is achieved which will be subject to the post procedural venogram. The endpoint for the technique aims at maximum thrombus recanalization after mechanical catheter directed thrombolysis with reference to vessel patency.

All the patients with acute iliofemoral deep venous thrombosis may be subject to benefitting from this new and novel technique. An improvement in the patency rate of involved venous vasculature will directly lead to reversal of the disease severity as the presentation of the disease itself is due to occlusion or stenosis or luminal reduction of the involved venous vasculature. The symptom severity as well as presentation of the venous occlusive diseases and iliofemoral deep venous thrombosis will reduce relatively subject to better thrombus load removal. The main advantage which can be said to be derived out of the said novel technique is better removal of venous thrombus leading to decrease in the thrombus load with progression of time and thereby delaying of the occurrence of PTS.

**Beneficiaries**

All the patients with acute iliofemoral deep venous thrombosis.

**Purpose of invention**

An improvement in the patency rate of involved venous vasculature will directly lead to reduction of disease severity as the presentation of the disease itself is due to occlusion or stenosis or luminal reduction of the involved venous vasculature.

**Problems solved**

The symptom severity as well as presentation of the venous occlusive diseases and iliofemoral deep venous thrombosis will reduce relatively subject to better thrombus load removal.

**Advantage(s) offered**

The main advantage which can be said to be derived out of the said novel technique is better removal of venous thrombus leading to decrease in the thrombus load with progression of time and thereby delaying of the occurrence of PTS.

**Registration**

The technique has been registered under the Copyright Office, Department of Promotion of Industry and Internal Trade, Government of India with diary number 21369/2022-CO/L and ROC number **L-123704/2023**.

**References**

- Jaff MR, McMurtry MS, Archer SL, Cushman M, Goldenberg N, Goldhaber SZ, et al. Management of massive and submassive pulmonary embolism, iliofemoral deep vein thrombosis, and chronic thromboembolic pulmonary hypertension: a scientific statement from the American Heart Association. *Circulation* 2011; 123(16):1788-830.
- Vedantham S, Grassi CJ, Ferral H, Patel NH, Thorpe PE, Antonacci VP, et al. Reporting standards for endovascular treatment of lower extremity deep vein thrombosis. *J Vasc Interv Radiol* 2006; 17(3):417-434.
- O'Donnell TF, Browse NL, Burnand KG, Thomas ML. The socio-economic effects of an iliofemoral venous thrombosis. *J Surg Res* 1977; 22(5):483-488.
- Comerota AJ, Gravett MH. Iliofemoral venous thrombosis. *J Vasc Surg* 2007; 46(5):1065-1076.
- Delis KT, Bountouroglou D, Mansfield AO. Venous claudication in iliofemoral thrombosis: long-term effect on venous hemodynamics, clinical status, quality of life. *Ann Surg* 2004; 239(1):118-126.
- Douketis JD, Crowther MA, Foster GA, Ginsberg JS. Does the location of thrombosis determine the risk of disease recurrence in patients with proximal deep vein thrombosis? *Am J Med* 2001; 110(7):515-519.
- Kahn SR, Shrier I, Julian JA, Ducruet T, Arsenault L, Miron MJ, et al. Determinants and time course of the postthrombotic syndrome after acute deep venous thrombosis. *Ann Intern Med* 2008; 149(10):698-707.
- Meissner MH, Manzo RA, Bergelin RO, Markel A, Strandness DE. Deep venous insufficiency: the relationship between lysis and subsequent reflux. *J Vasc Surg* 1993; 18(4):596-608.
- Goldhaber SZ, Buring JE, Lipnick RJ, Hennekens CH. Pooled analyses of randomized trials of streptokinase and heparin in phlebographically documented acute deep venous thrombosis. *Am J Med* 1984; 76(3):393-397.
- Enden T, Haig Y, Kløw NE, Slagsvold CE, Sandvik L, Ghanima W, et al. Long-term outcome after additional catheter-directed thrombolysis versus standard treatment for acute iliofemoral deep vein thrombosis (the CaVenT study): a randomised controlled trial. *Lancet* 2012; 379(9810):31-38.
- Lu Y, Chen L, Chen J, Tang T. Catheter-Directed Thrombolysis versus standard anticoagulation for acute lower extremity deep vein thrombosis: A meta-analysis of clinical trials. *Clin Appl Thromb Hemost* 2018; 24(7):1134-1143.

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12. Camerota AJ, Kearon C, Gu CS, Julian JA, Goldhaber SZ, Kahn SR, et al. Endovascular thrombus removal for acute iliofemoral deep vein thrombosis: analysis from a stratified multicenter randomized trial. *Circulation* 2019; 139(9):1162-1173.
  13. Vedantham S Catheter-directed thrombolysis to avoid late consequences of acute deep vein thrombosis. *Thromb Res* 2018;164:125-128.
  14. Avgerinos E, Saadeddin Z, Abou Ali A, Pandya Y, Hager E, Singh M, et al. Outcomes and predictors of failure of iliac vein stenting after catheter-directed thrombolysis for acute iliofemoral thrombosis. *J Vasc Surg Venous Lymphat Disord* 2019; 7(2):153-161.
  15. Avgerinos E, Hager E, Naddaf A, Dillavou E, Singh M, Chaer R. Outcomes and predictors of failure of thrombolysis for iliofemoral deep venous thrombosis. *J Vasc Surg Venous Lymphat Disord* 2015; 3(1): 35-41.
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