Introduction

Acute limb ischemia is a potentially life-threatening clinical event. Thrombosis in situ, bypass graft thrombosis, and embolic occlusion are the three major precipitating events leading to acute limb ischemia. Depending on the severity of thrombosis the treatment options for acute limb ischemia may include anticoagulation alone, percutaneous treatment, surgical revascularization, and amputation.

The use of thrombolytic agents has become routine medical practice in the treatment of embolic and thrombotic vascular occlusions. Thrombolytic therapy has been established as an important therapeutic tool in the treatment of native peripheral artery occlusive disease and thrombosed arterial bypass grafts. Catheter directed therapy (CDT) is now accepted as the first-line treatment for properly selected patients with acute limb ischemia. In addition, mechanical thrombectomy and balloon angioplasty may help in conjunction. Catheter-directed thrombolysis relies on thermal-mediated diffusion, a slow process requiring a high concentration gradient to drive the reagent into the clot.

Ultrasound when applied to the thrombosed vessel during thrombolysis delivers energy that also separates/loosens the fibrin strands, increasing the surface area of the thrombus and making more plasminogen activator receptor sites available to the lytic agent, leading to a faster treatment time and lower required doses of t-PA.

Objectives

The EKOS Infusion Catheter System (EKOS Corporation, Bothell, WA) has been used to achieve ultrasound accelerated catheter directed thrombolysis (CDT) in appropriate patients. The catheter is available at lengths ranging from 106 to 135 cm, and treatment segments ranging from 6 to 50 cm. Certain technical challenges have been encountered with the present system related to kink of the catheter over acute bifurcations, limited treatment infusion zones, and small caliber of distal occluded vessels. In our retrospective study we have shown various techniques to overcome these challenges.

We retrospectively reviewed data of 7 patients with acute limb ischemia who underwent CDT using a 5.3 Fr EKOS catheter system between January 2011 and July 2012. Three had bypass graft occlusions (femoro-popliteal), three native vessel occlusions (femoro-popliteal) and one extensive clot from femoral to tibial vessels. One patient underwent three sessions of therapy with EKOS, and the rest of the rest had only one therapy session with EKOS catheter.

In occluded grafts, tip of the EKOS was placed in the distal graft. In the rest it was placed beyond the trifurcation with the most distal being in the plantar arch. The distal vessels were of small caliber and the proximal of diminutive caliber (average luminal diameter 1.6mm.) In most of patients a treatment zone from 12-50cm was used. In one long segment occlusion, a long sheath was placed proximally and tPA was infused via the sheath and EKOS catheter.

Patients were followed up the next day after overnight thrombolysis using tPA. They were closely monitored for complications including vessel perforation, dissection, thrombosis, distal embolization, vasospasm, and hemorrhage. The fibrinogen levels were monitored per visit. The reduction in fibrinogen levels was 25%.

All patients including the case that required additional tPA via the sheath, showed dramatic improvement with near total lysis of clot and restoration of blood flow. No major complications were noted. There was one small common femoral pseudo aneurysm which resolved after manual compression. For a single case, which showe slight increase in fibrinogen levels the remainder of patients had fibrinogen level drops ranging from 358 to 86, with a total average rate of 162.5.

Conclusions

CDT using the EKOS system is very effective but presents with technical challenges related to catheter kinking over acute bifurcations, insufficient length of treatment zones in long occlusions and placement of the 5.3 Fr catheter tip in very small vessels. In our study we have sought to overcome these challenges using various techniques. Good resolution of clot was obtained even in distal small caliber vessels with minimal complications.

References

5. McNamara T, Parikh S, Motarjeme Aet al. “Ultrasound accelerated thrombolysis in peripheral arterial occlusion: complete lysis rates using the EKOS Lypos system in the same day setting”. Presented at: Transcatheter Cardiovascular Therapeutics; October 2005; Abstract 365

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