Managing Acute Limb Ischemia with Penumbra Lightning Bolt™ Technology

Vascular Disease Management spoke with vascular surgeon Katherine Teter, MD, from Hackensack Meridian Medical Group in New Jersey, about managing acute limb ischemia (ALI) with the Penumbra Lightning Bolt™ computer-assisted vacuum thrombectomy (CAVT) system. Dr. Teter discusses how she uses it in her practice and gives her thoughts on the future of vascular surgery using endovascular devices.

What are the primary factors that have influenced your shift from traditional open surgical embolectomies to endovascular-first interventions, especially when addressing ALI?

The technology has really improved over time, and more and more frequently we are consulted for ALI in extremely medically complex and ill patients to a greater degree than we used to be. Previously, open surgery was felt to be a more expeditious means of treating patients. The technology has really evolved such that we have a much more comprehensive endovascular toolbox to be able to manage even multilevel occlusions, both quickly and with a lot less blood loss. Open surgery still has a role in specific cases, but we now have the ability to address high-risk patients without incisions, and sometimes without even using general anesthesia.

How have improvements in percutaneous thrombectomy devices impacted the efficacy and safety of endovascular procedures as compared to open surgery?

One of the biggest improvements is related to decreased blood loss, especially when we consider the larger bore devices, which we may use more often in extensive venous thrombosis. Blood loss really was the limiting factor for how much we could do and how long we could persist before it became prohibitive.

Have you used the Bolt 6X with TraX? How has Penumbra's first arterial-designed dilator helped in tracking through diseased arteries or navigating through challenging anatomy?

Yes, I have. The dilator is very helpful in cases where we have a lot of underlying atherosclerotic disease; previously we were using catheters as a telescoping system to give the Penumbra device support to cross some of those lesions to be able to get to more distal targets. This dilator has really eliminated the need for doing that.

How has Lightning Bolt technology impacted your practice? How do you decide between the Lightning Bolt 12, 7, or 6X in your arterial cases?

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The Lightning Bolt technology has really been a game-changer. I had previously been a very passionate user of the Separator (Penumbra) for almost every case where I was using aspiration mechanical thrombectomy, and this newer technology has decreased the need for that, as well as decreased the technique of corking thrombus.

I tend to use the Lightning Bolt 12 for aortoiliac pathology. The Lightning Bolt 7 is my go-to for nearly any part of the leg, and I will use it all the way down to the ankle, provided that the vessels are a relatively normal size and free of disease. The 6X in particular is very helpful for addressing the tibial vessels in patients who have a lot of underlying atherosclerotic disease, where you may have some difficulty tracking the larger devices, and you can even advance the 6X into the pedal arch, which I have done as well.

What has the latest STRIDE study data shown us? What does this mean for patient care?

What STRIDE has shown is that patients presenting with ALI, regardless of the severity, can be managed very safely and effectively with endovascular thrombectomy. STRIDE demonstrated very high rates of limb salvage, greater than 98% at 30 days, relatively short aspiration times (about 22 minutes as a median aspiration time), and overall low blood loss.[1] For patient care, this is just another option that can allow you to manage these patients in a minimally invasive fashion.

One of the things that STRIDE highlights is even patients who are presenting with Rutherford 2B ischemia, which we think of as being the most emergent presentation for ALI, are being successfully managed using these modalities. Historically, we would have always thought that open surgery is just going to be faster. Again, I think that in certain cases there is obviously a role for open surgery, but clearly STRIDE shows

us that endovascular thrombectomy can be done well and can be done quickly in 22 minutes—I can't do a bypass in 22 minutes.

How do you foresee the future of vascular surgery evolving as endovascular devices and techniques continue to advance?

Vascular surgery is a constantly evolving field. Each iteration of devices, such as the Penumbra devices, has evolved to solve the real-world issues that we have in the OR—blood loss, difficulty tracking devices in diseased vessels, procedural time. There is always going to be a need for open vascular surgery, but as these devices continue to improve, it will allow us to perform more of these procedures without using open surgery and, ideally, without the risks of using tissue plasminogen activator as an adjunct. I find that the improvement in these devices has allowed me and many of my colleagues to avoid lytic therapy in patients where we may have significant concerns about doing so, whether from a patient risk perspective or simply thinking about the health care costs associated with catheter-directed thrombolysis.

I have personally seen the evolution of this technology and the different iterations of it over time, and it has evolved to fix some of the challenges that we have faced in the OR. I think that more and more, as these devices become more sophisticated, there are many surgeons who are considering at least an attempt at an endovascular-only approach upfront for ALI.

REFERENCE

1. Maldonado TS, Powell A, Wendorff H, et al; Stride Study Group. One-year limb salvage and quality of life following mechanical aspiration thrombectomy in patients with acute lower extremity ischemia. *J Vasc Surg.* 2024;80(4):1159-1168.e5.