

# BSET Travel Fellowship 2024 Report

## Visit Details

- **Fellow:** Dr. Colin Primrose
- **Funder:** British Society for Endovascular Therapy (BSET) Travel Fellowship 2024
- **Institution:** Clinica San Carlo, Milan, Italy
- **Supervisor:** Dr. Roberto Ferraresi
- **Dates:** 02/09/2024 – 27/09/2024

## Summary

In September 2024, I had the privilege of participating in a four-week observership at Clinica San Carlo in Milan, Italy, under the supervision of Dr. Roberto Ferraresi, a world-renowned expert in chronic limb-threatening ischemia (CLTI). The observership, generously funded by the British Society for Endovascular Therapy (BSET), offered a unique opportunity to immerse myself in the management of highly complex and no-option CLTI patients—cases where traditional revascularisation techniques may not be feasible.

The primary objective of this observership was to deepen my knowledge and expand my skillset in advanced techniques for treating CLTI. Given the increasing number of complex cases in my own clinical practice, I was particularly interested in innovative solutions for patients with severe peripheral arterial disease (PAD), many of whom face limited treatment options. While I had previously completed a two-week observership at the University Hospital Careggi in Florence, my exposure to peripheral interventions was limited. Clinica San Carlo's reputation for handling complex, high-risk cases made it an ideal setting to further my understanding of cutting-edge procedures, including foot vein arterialisation (FVA), and novel vascular access techniques.

The structure of the observership provided a comprehensive blend of procedural observations, case discussions, and didactic teaching, which allowed me to explore both the theoretical and practical aspects of CLTI management. I worked closely with Dr. Ferraresi and vascular surgeon Dr. Alessandro Ucci, who not only guided me through their decision-making processes but also demonstrated the latest advances in the field. Their focus on innovation, efficient workflow, and patient outcomes was inspiring and has provided invaluable lessons that I intend to integrate into my own clinical practice.

## Learning Outcomes

### 1. Team Structure & Workflow

One of the significant learning points was observing how Clinica San Carlo operates with a compact yet highly efficient team. Dr. Ferraresi's team included two very experienced nurses who alternated between the roles of scrub nurse (assisting and operating the C-arm) and circulating nurse (fetching equipment, administering analgesia, and scribing). These nurses have worked with Dr Ferraresi for over a decade and are experts in CLTI management. The absence of a radiographer was notable, as

the nurses took on tasks traditionally assigned to radiographers, which allowed for more streamlined workflow. This model contrasts with the typical UK setup, where there is a large rotating team with varying levels of experience, often leading to more logistical complexity.

## 2. Pre-procedural Work-up

At Clinica San Carlo, the pre-procedural work-up was markedly different from my experience in the UK, with a strong focus on simplicity and efficiency. For CLTI

patients, referrals were often made directly from diabetic foot or vascular clinics, and advanced imaging modalities such as CT or MRI were seldom used (possibly as a cost-saving measure). Instead, a basic Doppler ultrasound report, along with a photograph of the patient's foot, and transcutaneous oximetry (TcPO<sub>2</sub>) measurement was sufficient for initial assessments. This streamlined approach, often conducted via platforms like WhatsApp for quick image sharing, allowed for swift decision-making. The use of simplified protocols, particularly in high-volume centres, presents a model that could improve efficiency in managing patients with CLTI in my own practice. This said, I believe the MDT remains an important part of decision making for complex cases and CTA/MRA has a significant advantage over DSA for patients in which endovascular therapy is unsuitable.

## 3. Access Techniques

An area of significant technical learning involved vascular access techniques. Dr. Ferraresi's team frequently employed innovative approaches to access vessels, particularly in challenging cases. Antegrade puncture was often performed under fluoroscopy alone (instead of ultrasound which I always use), using a one-part needle and an angled back-end of a short J-wire (for steering in to SFA). The sheath size was usually 4F and rarely upsized. This technique minimised the need for large access sheaths, which reduced trauma and made closure devices redundant. Retrograde access, typically reserved for more complex cases, was also frequently used. These approaches were particularly valuable for navigating challenging anatomical regions, such as BTK popliteal artery, distal SFA or the peroneal artery. As well as the technique, the key learning point with retrograde access was the swift decision-making to move to puncture distally.

## 4. Imaging and Prognostication

Another important learning area was imaging and its role in both treatment planning and prognostication. The team at Clinica San Carlo utilised a pragmatic approach to imaging, starting with single-shot DP & lateral radiographs of the foot to establish a disease severity score known as SAD-MAC (small artery disease-medial arterial



Figure 1: The Team. 1 Operator & 2 Nurses



Figure 2 Retrograde access of P3

calcification) which Ferraresi has shown to be a good prognosticator in whether below-the-ankle angioplasty would be successful<sup>1</sup>. This score played a crucial role in treatment planning and prognostication. For patients with renal impairment, CO<sub>2</sub> angiography using the Angiodroid system was employed to minimise nephrotoxicity while still providing high-quality vascular imaging. The team's careful balance of thorough imaging and patient safety was particularly insightful for managing high-risk patients.

For initial assessment of the lower limb I had been performing a three-station DSA, however Dr Ferraresi often used a bolus chase – which is a single dynamic run from the sheath distally with moving the bed and angling the C-arm to see the lateral foot. This method gives a good overview of the entire vasculature while limiting contrast and radiation dose. In the event of a “desert foot” in which no pedal-plantar arteries were evident; a catheter angiogram from as distal as possible was performed to opacify any hidden “hibernating” arteries which could be distal targets.



Figure 3: Angiodroid CO<sub>2</sub> injector

## 5. Equipment

Clinica San Carlo's approach to treating complex CLTI patients involved a range of specialised equipment designed for precision and efficacy in difficult cases. In most cases antegrade crossing of a CTO (chronic total occlusion) was performed with an 0.018 Abbott Command guidewire (with custom angled tip) and a 4F Cordis Tempo Aqua Berenstein 100cm catheter (attached to a Tuohy Borst). This combination allowed for swift crossing occlusion and the option to administer contrast (via Y-connector) without removing the guidewire. Biotronik Pulsar self-expanding stents and Micro Medical MicroStent XL devices were used above and below-the-knee, respectively, due to their excellent trackability and 4F compatibility. That said, a “nothing left behind” policy was usually adhered to and stenting was generally avoided. The standard primary treatment in most instances was extensive vessel prep, often with high pressure balloons, following by use of paclitaxel drug-eluting balloons of the diseased area.

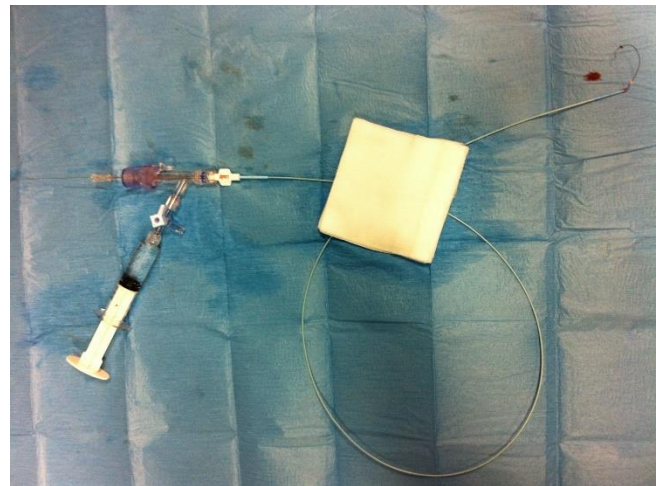


Figure 4 0.018 Command guidewire, 4F Berenstein catheter & Tuohy Borst

Another key device which I had not used before was the Abbott Armada XT 1.5mm x 2cm angioplasty balloon which is low profile and hydrophilic therefore excellent in crossing CTOs.

This exposure has broadened my understanding of available equipment and how to select the most appropriate devices for different anatomical challenges.

## 6. CTO Management Techniques

A focus of the observership was the management of chronic total occlusions (CTOs), where I learned advanced techniques for both antegrade and retrograde crossing. The

team's proficiency in wire manipulation, particularly in using subintimal approaches, was impressive. They also demonstrated novel crossing techniques, including the téléphérique technique, which involves through-and-through access and pulling a PTA balloon from below with it fixed to the wire with a torque device. This high level of expertise in CTO management is directly applicable to my practice, where I frequently encounter challenging occlusions in PAD patients.

#### 7. Foot Vein Arterialisation (FVA)

One of the most groundbreaking techniques I observed was foot vein arterialisation (FVA), a procedure designed for patients with no-option CLTI. The procedure, which reverses blood flow through the foot's venous system to deliver oxygenated blood to ischemic tissues, was performed both surgically and percutaneously. Dr Ferraresi is an inventor of the LimFlow system for percutaneous foot vein arterialisation (pFVA), however has also developed "artisanal" methods for achieving FVA without off-the-shelf devices. This technique has significant potential for improving outcomes in patients for whom the other options are major amputation or palliation. Recent meta-analyses published by Dr Ferraresi's team indicate that there is potential with this technique<sup>2</sup> - roughly avoiding major amputation in 2/3 of patients at one year. I am interested the possibility of offering FVA to "no-option" patients locally, however I understand the complexities in performing not only the index procedure, but also the difficulties in patient selection and the thorough follow-up required for these patients.

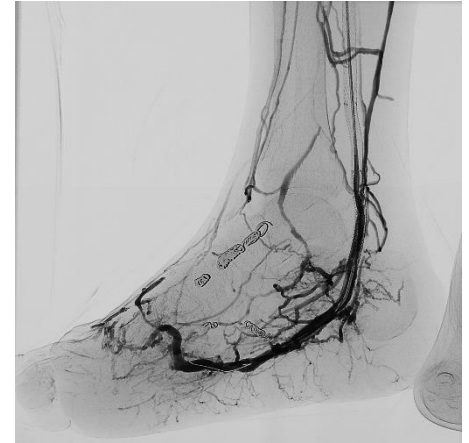


Figure 5 Foot vein arterialisation

#### Evaluation

This observership has been one of the most impactful experiences of my career, offering an immersive exploration of advanced techniques that I plan to incorporate into my own practice. The focus on team efficiency, streamlined pre-procedural work-ups, and cutting-edge vascular access methods has inspired me to rethink several aspects of patient care in peripheral arterial disease. The innovative techniques for CTO management and foot vein arterialisation were particularly enlightening and will encourage me in the development of a dedicated peripheral arterial disease service.

I have already presented these learning points to the Interventional Radiology department at the Queen Elizabeth University Hospital, Glasgow, where they were well-received and stimulated much discussion. My colleagues were particularly interested in the simplified patient work-up, the use of CO<sub>2</sub> angiography, and the advanced techniques for managing complex occlusions. This presentation has allowed me to share the insights gained from this observership with my wider professional network,



Figure 6 Dr Colin Primrose & Dr Roberto Ferraresi

contributing to ongoing discussions about innovation in vascular interventions.

I am deeply grateful to the British Society for Endovascular Therapy (BSET) for their generous support, and to Dr. Roberto Ferraresi and his team at Clinica San Carlo for their mentorship and dedication to advancing the field of PAD treatment. This observership has been an invaluable opportunity to expand my technical expertise and enhance the quality of care I provide to patients with complex peripheral arterial disease. I look forward to applying these techniques as I continue to evolve my practice.

---

<sup>1</sup> Ferraresi R, Ucci A, Pizzuto A, et al. A Novel Scoring System for Small Artery Disease and Medial Arterial Calcification Is Strongly Associated With Major Adverse Limb Events in Patients With Chronic Limb-Threatening Ischemia. *J Endovasc Ther.* 2021;28(2):194-207. doi:10.1177/1526602820966309

<sup>2</sup> Ucci A, Perini P, Freyrie A, et al. Endovascular and Surgical Venous Arterialization for No-Option Patients With Chronic Limb-Threatening Ischemia: A Systematic Review and Meta-Analysis. *J Endovasc Ther.* Published online November 27, 2023. doi:10.1177/15266028231210220