

### Tele-proctoring in vascular surgery implementing percutaneous creation of arteriovenous fistula

A. Isaak<sup>1</sup>, A. Mallios<sup>2</sup>, L. Gürke<sup>3</sup>, T. Wolff<sup>3</sup>

<sup>1</sup>Department of Vascular and Endovascular Surgery, Cantonal Hospital Aarau, Aarau, Switzerland, <sup>2</sup>Vascular Access Center, Hospital Saint-Joseph, Paris, France, <sup>3</sup>Vascular and Endovascular Surgery, University Hospital Basel, Basel, Switzerland

**Objective:** Percutaneous ultrasound-guided creation of an arteriovenous fistula (pAVF) for hemodialysis access is a relatively novel procedure with promising technical success and patency rates. The vascular surgery departments of two collaborating Swiss hospitals had decided to introduce the technique to their services. A surgeon experienced in the technique (AM) was supposed to come to Switzerland and proctor the first four procedures. Due to the SARS-CoV-2 pandemic and travel restrictions, this was not possible and we decided to perform the first four pAVF procedures tele-proctored via a video conference system. We present the setup and our experience with tele-proctoring.

**Methods:** The setup relied on an all-in-one live video production device, video encoder, video streamer and video recorder (Pearl-2, Epiphan), which made it possible to simultaneously transmit the live image from the ultrasound device (GE Logiq S8, linear probe 9L-D) and a live image from a video camera (JVC Camcorder G/-HM440E, Japan), both connected via HDMI (Figure). The live stream was shared with the proctor in France and the device support team in the US, using an encrypted Swiss video client ([www.vitimway.ch](http://www.vitimway.ch)). The setup was tested with all parties three days in advance.

**Results:** All 4 procedures started with a verbal briefing and a live ultrasound scan. All steps of the procedures were taken under the proctor's instruction and supervision. The proctor gave on average 21 instructions per procedure. An average 4 were device-related but these became less frequent as we proceeded. The operators consulted the proctor on average 5 times per procedure. The average duration of the procedure was 34 min. The pAVF creation was successful in all 4 patients, with an average fistula flow measured at the end of the procedure of 600 ml/min.

**Conclusion:** Our experience showed us that pAVF creation, which is a procedure performed entirely under sonographic guidance lends itself particularly well to tele-proctoring. The simultaneous transmission of the live sonographic image and the live image of the operators' hands allowed the proctor to supervise and correct the key steps of the procedures. The simplicity of the set-up and the quality of proctor-operator interaction was such a positive experience that we can well envisage a much wider use of tele-proctoring in the future.