

## Case Report

# Percutaneous Decannulation of Femoral Venoarterial ECMO Cannulas Using MANTA Vascular Closure Device

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### ABSTRACT

Extracorporeal membrane oxygenation (ECMO) has been increasingly used in the treatment of refractory cardiac arrest and postarrest cardiogenic shock. We propose a technique for percutaneous decannulation of femoral venoarterial ECMO cannulas by using the MANTA vascular closure device, designed to close large-bore arteriotomies. This technique significantly simplifies the decannulation and might diminish the potential complications caused by the standard surgical removal.

### RÉSUMÉ

On utilise de plus en plus l'oxygénation par membrane extracorporelle (ECMO, de l'anglais *extracorporeal membrane oxygenation*) dans le traitement de l'arrêt cardiaque réfractaire et du choc cardiogénique post-arrêt cardiaque. Nous proposons une technique percutanée de décanulation des canules de l'ECMO veino-artérielle fémorale à l'aide du dispositif de fermeture vasculaire MANTA, qui est conçu pour fermer les artériotomies des artères de gros calibre. Cette technique simplifie considérablement la décanulation et diminuerait les complications potentielles causées par l'extraction chirurgicale habituelle.

A 45-year-old man was referred to our centre because of cardiac arrest caused by ventricular fibrillation. Extracorporeal membrane oxygenation (ECMO)-assisted cardiopulmonary resuscitation protocol was instituted. Ultrasound-guided femoral vein and artery cannulation was performed with 25Fr and 19Fr cannulas, respectively. Coronary angiography showed a proximal occlusion of the left anterior descending coronary artery, which was successfully treated by implanting a drug-eluting stent. At the end of the procedure, an 8.5Fr sheath was placed in the right superficial femoral artery to ensure limb perfusion (Fig. 1A). The patient evolved favourably, allowing ECMO weaning and decannulation 4 days later. It was decided to perform a percutaneous decannulation. Hemostasis of the anterograde perfusion sheath

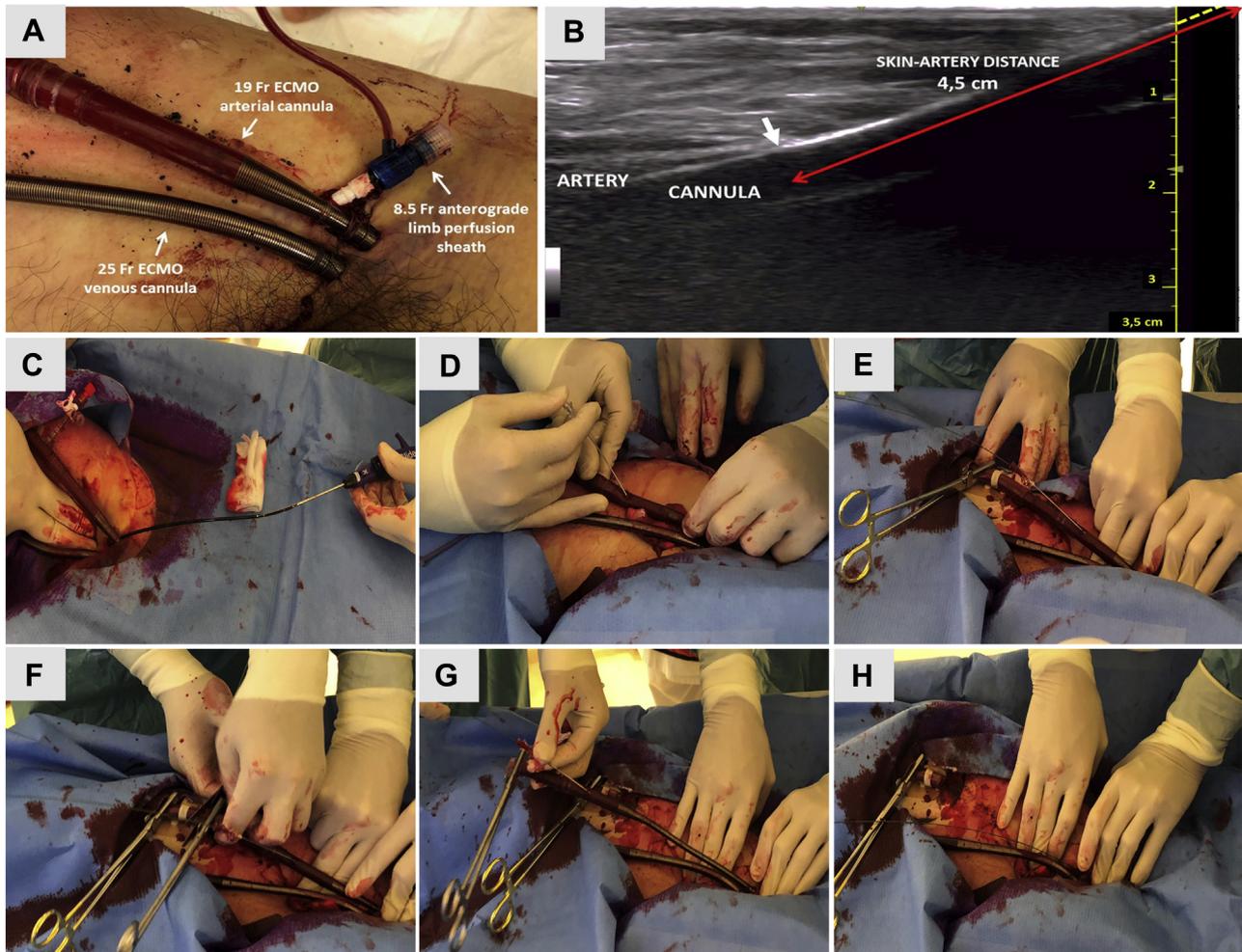
arterial access was achieved with a ProGlide device (Abbott Vascular, Santa Clara, CA) (Fig. 1C). Closure of the arterial ECMO cannula arteriotomy was performed using a MANTA vascular closure device (VCD) (Essential Medical Inc, Malvern, PA). The MANTA VCD consists of a dedicated collagen plug device designed to close large-bore arteriotomies, ranging from 10 to 25F.<sup>1</sup> The standard approach requires the upfront use of a puncture location dilator, aiming to measure the skin-artery distance to deploy the device safely.<sup>1</sup> Because of the emergency setting in which the ECMO was placed, this measurement was not performed. To overcome this critical step, ultrasound evaluation was performed to estimate the skin-artery distance. The method is depicted in Figure 1B. Using a longitudinal view, the entry point of the arterial cannula into the artery was identified (Fig. 1B, white arrow). The skin reference point was located at the intersection of a line prolonging the anterior cannula wall echographic signal (Fig. 1B, yellow dotted line) with the skin level. The skin-artery distance was then defined as the gap between both landmarks. To ensure intra-arterial position and minimize loss of blood, the arterial cannula was punctured directly after the re-enforced segment (Fig. 1D), and a 0.035-inch guidewire was advanced (Fig. 1E). The cannula

Received for publication December 20, 2018. Accepted February 17, 2019.

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See page 796.e11 for disclosure information.



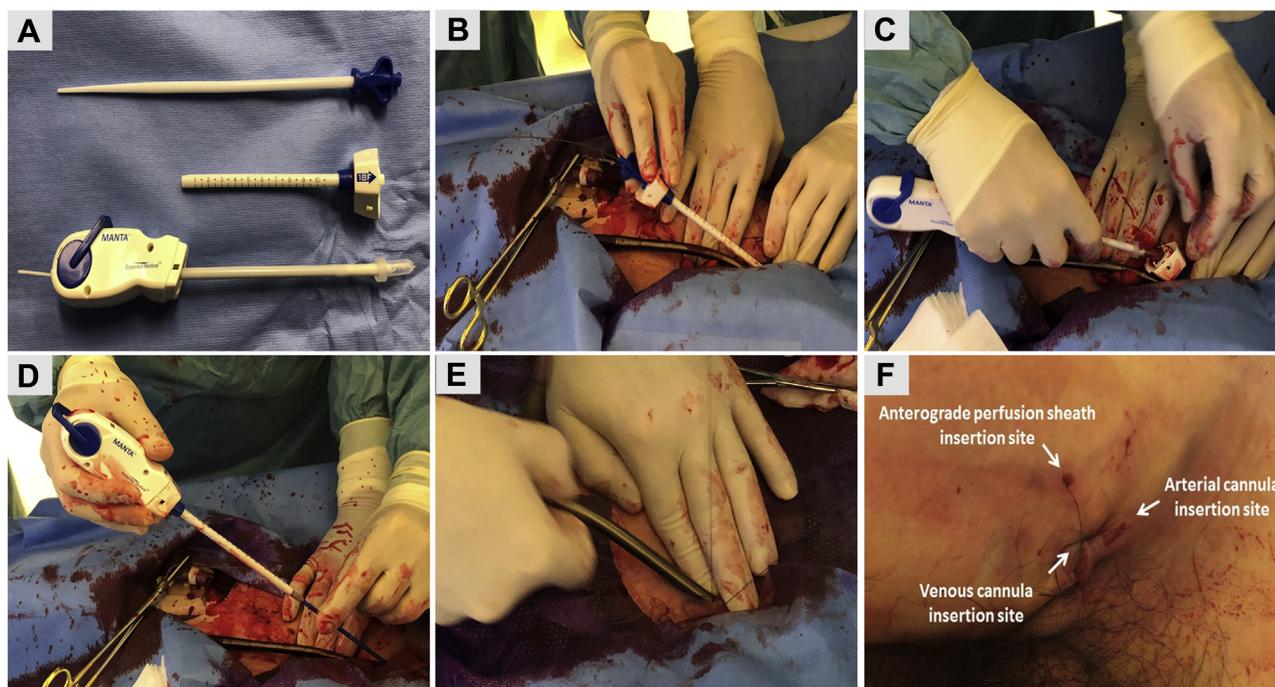
**Figure 1.** (A) Initial setup with VA-ECMO cannulas and the anterograde perfusion sheath. (B) Ultrasound-derived skin-artery distance measurement. In a longitudinal view, the entry point of the arterial cannula is identified (**white arrow**). Skin reference point is located at the intersection of the skin level with a line prolonging the echographic signal of the anterior aspect of the cannula (**yellow dotted line**). (C) Anterograde perfusion sheath arteriotomy closure with ProGlide. (D, E) arterial cannula puncture (D) and 0.035-inch wire introduction (E). (F-H) Arterial cannula clamping and cutting (F) and posterior removal (G, H).

was then clamped, cut (Fig. 1, F and G) and posteriorly removed while applying manual compression at the puncture site (Fig. 1F). A MANTA VSC 18Fr was chosen (Fig. 2A). The dedicated sheath was placed into the artery (Fig. 2B), and the closure unit was subsequently introduced (Fig. 2C). The sheath-closure assembly was then pulled back up to the pre-specified skin-artery distance, allowing a safe deployment of the closure device (Fig. 2D). Arterial haemostasis was achieved instantaneously. Venous hemostasis was achieved by applying a circular suture followed by cannula removal and manual compression (Fig. 2F). The final result is shown in Figure 2G. The patient had an uneventful recovery, without bleeding complications or infections and was discharged 9 days later.

We describe, for the first time, a modified MANTA VSC delivery technique for percutaneous closure of an arterial

ECMO cannulas placed in the femoral position. Of importance, the described ultrasound-derived skin-artery distance determination allows the use of the MANTA VSC without requiring the up-front use of the puncture locator dilator, which is not provided separately by the manufacturer. Other vascular closure devices have been used for percutaneous decannulation for venoarterial (VA)-ECMO. Hwang et al. described a technique for percutaneous arterial decannulation by using ProGlides after gaining vascular access by direct puncture of the ECMO cannula.<sup>2</sup> The technique was proven to be as effective as surgical closure. However, the use of the MANTA VSC may significantly simplify the process, making it an attractive choice for operators not familiar with the Perclose technique.

Percutaneous VA-ECMO decannulation with the MANTA VSC is a feasible and safe technique, which



**Figure 2.** (A) MANTA vascular closure device components. From top to bottom: dilator, dedicated sheath, and closure unit. (B) Insertion of the dedicated sheath. (C, D) Introduction of the closure unit (C) and deployment (D) of the device. (E) Removal of the venous ECMO cannula. (F) Final result.

significantly simplifies the decannulation and diminishes the potential complications caused by standard surgical removal.

### Disclosures

The Department of Cardiology of the Leiden University Medical Center received grants from Biotronik, Medtronic, Boston Scientific Corporation, and Edwards Lifesciences.

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