

How to do it by smart canula[®]

Decannulation



A detailed description of smart venous decannulation after optimized venous drainage without augmentation

Decannulation

Remote smart cannulation is the solution for achieving full flow with cardio-pulmonary bypass (CPB) based on gravity drainage alone (1), in small access open heart surgery (2, 3), as well as complex redo procedures (4) etc. The self-expanding smartcanula® which is used in this setting is collapsed with the corresponding mandrel (Fig. 1) prior to insertion (over a guide wire) through a peripheral (e.g. femoral) vein (Fig. 2) and expanded in situ within the target vein (Fig. 3), typically the vena cava. The detailed description for smart cannulation with open, semi-open and percutaneous techniques has been provided previously (5).



Fig. 1 The smartcanula® comes together with the corresponding mandrel. The smartcanula® is stretched with the corresponding mandrel and collapsed (top) prior to insertion over a guide wires. Once the tip has been positioned within the target vessel, the smartcanula® is expanded (bottom) by removing the guide wire first and the mandrel second.

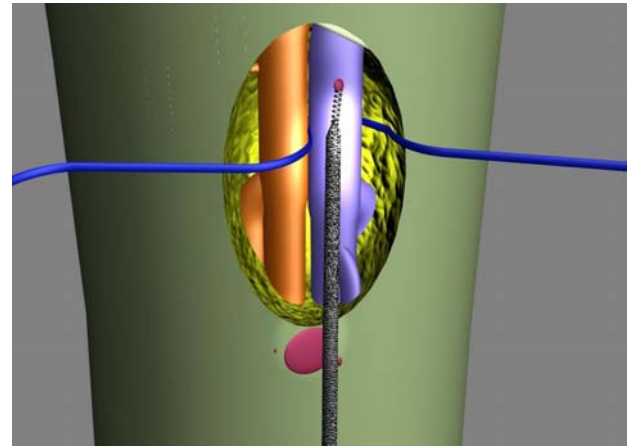


Fig. 2 Artists view of the femoral vein with a guide wire in position, prior to smartcanula® insertion (semi-open technique)

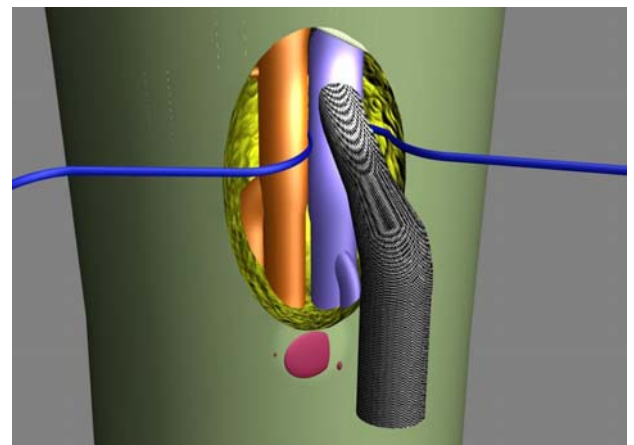


Fig. 3 The smartcanula® is expanded in situ by removal of the guide wire first and the mandrel second) and allows for full CPB-flow with gravity drainage alone

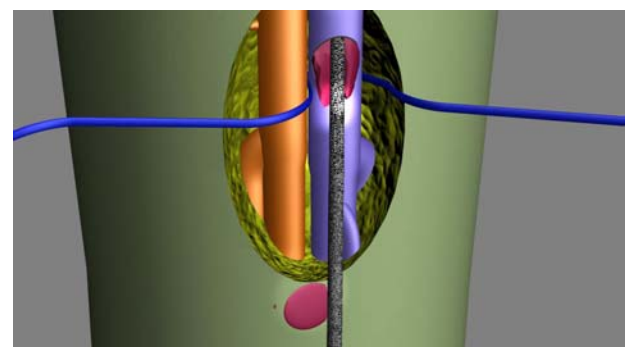


Fig. 4 Simple traction is required for Smartcanula® removal. However, when the smartcaula® diameter collapses under traction, blood can exit the vascular compartment in parallel.

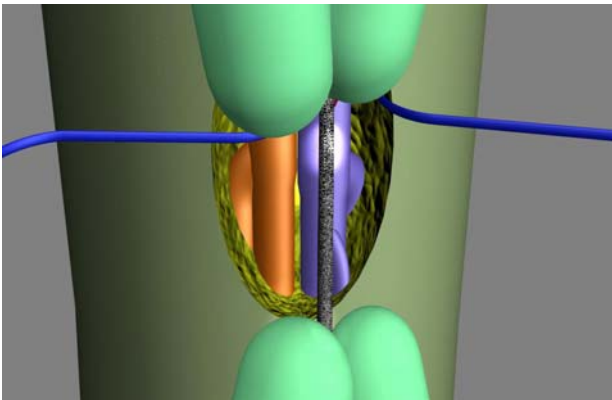


Fig. 5 The smartcanula® under traction between two fingers allows for reduction of its diameter to a minimum in combination with control of the vascular access aperture. As a result, collateral blood loss can be minimized.

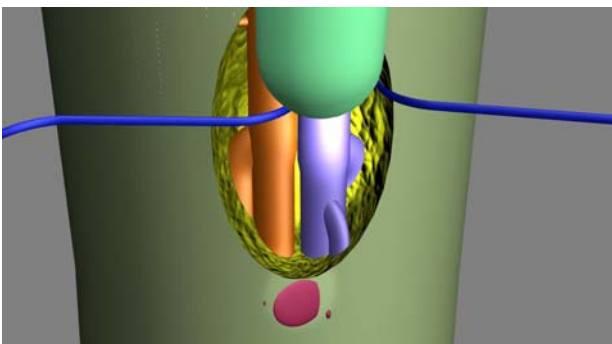


Fig. 6 Once the smartcanula® is removed the vascular aperture can be controlled by gentle finger pressure. State of the art vascular repair is selected as a function of the cannulation technique initially selected:

- Open technique:* *end-to-end anastomosis by separate sutures*
- Semi-open:* *a purse string suture may be sufficient for repair without restriction; otherwise, same as above*
- Percutaneous:* *digital compression initially may be replaced by a compressive dressing; otherwise, same as above*

All techniques require careful verification of the peripheral perfusion at the end of the procedure and during follow-up.

Although reinsertion of the mandrel is usually necessary for repositioning of the smartcanula® tip, it is preferable to use again a guide wire for this purpose (6) even if this implies that the cannulation procedure as to be restarted from the very beginning. The guide wire which can be seen with trans-oesophageal echocardiography in the target vessel, serves as a rail for easy smartcanula® introduction and greatly reduces the risk of *via falsa* or other drawbacks.

In theory, smartcannula® removal is easy. As a matter of fact, simple traction reduces the cross-sectional area of the smartcanula® to a fraction of its expanded diameter. Hence the collapsed smartcanula® can be easily pulled back through the access vessel. However, reducing the space occupied by the smartcanula® within the vascular access aperture allows for the blood to exit the vascular system (Fig 4). This in turn can be avoided, if the smartcanula® is stretched between two fingers and the latter are positioned on the vascular access aperture (Fig 5). Gentle finger pressure is only very shortly relaxed for passing the smartcanula® tip. Haemostasis is completed in standard fashion by gentle finger pressure (Fig. 6), which is later replaced by a suture, or, in case of percutaneous insertion, by a compressive dressing. As usual, care is taken to check for the presence of the peripheral pulses and adequate venous drainage at the end of the procedure.

Literature

- 1) Mueller XM, Mallabiabarrena I, Mucciolo G, von Segesser LK. Optimized venous return with a self-expanding cannula: from computational fluid dynamics to clinical application. *Interactive CardioVascular and Thoracic Surgery* 2002; 1: 23-27
- 2) von Segesser LK, Westaby S, Pomar J, Loisanche D, Groscurth P, Turina M. Less invasive aortic valve surgery: rationale and technique. *Eur J Cardiothorac Surg* 1999; 15: 781-785
- 3) Bonatti J, Schachner T, Bonaros N, Laufer G. A new exposure technique for the circumflex coronary artery system in robotic totally endoscopic coronary artery bypass grafting. *Interactive CardioVasc Thorac Surg* 2006; 5: 279-281
- 4) von Segesser LK, Jegger D, Mucciolo G, Tozzi P, Mucciolo A, Delay D, Mallabiabarrena I, Horisberger J. The Smart Canula™: A new tool for remote access in limited access cardiac surgery. *Heart Surg Forum* 2005;8:E241-E245
- 5) von Segesser LK, Peripheral cannulation for cardiopulmonary bypass MMCTS (October 9, 2006). doi:10.1510/mmcts.2005.001610