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Interventional femoral "cross-over" bypass for peripheral ischemia under cardiocirculatory support with Impella CP®

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Short running title: interventional cross-over bypass for Impella®

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Over the last years, cardiocirculatory support by axial flow pumps (Impella®, Abiomed, Danvers, MA, USA) has become a routinely used advanced therapy for protected PCI and cardiogenic shock. In comparison to extracorporeal life support (ECLS), where peripheral complications by cannulation are not uncommon (8-25%[1]), little evidence exists on the incidence of limb ischemia under Impella and its therapies (3,9% in the USPella-registry vs. 4,2% need for vascular surgery not further specified in the Impella-EUROSHOCK-registry [2,3]), which seems to be rare due to a smaller cannula size (14F in Impella CP® vs. 15-17F arterial cannula in ECLS).

An Impella CP-system was implanted through the right femoral artery in an 84-years old male patient who underwent percutaneous coronary intervention under ongoing cardiogenic shock after successful cardiopulmonary resuscitation. Before implantation of the microaxial pump, angiography of the right femoral axis showed vessels of apparently sufficient diameter to accommodate the 14F sheath (A). Following coronary stenting of the right coronary artery (performed through an additional access through the left femoral artery), the patient was hemodynamically stable with a heart rate of 80 beats/minute and a blood pressure of 120/60mmHg. After transfer to the ICU, the patient developed critical limb ischemia of the right leg distal to the cannulation site (B). Ischemia was confirmed by the absence of pulse and Doppler flow. An attempt to wean the patient from Impella support failed despite ongoing maximal vasopressor therapy. In order to restore perfusion of the affected limb, the ipsilateral superficial femoral artery was cannulated in an antegrade manner with a 6F sheath under sonographic guidance. A “cross-over” shortcut was established by connecting the antegrade right leg sheath with the left leg sheath used for primary stenting with a male-male adapter (C and online supplementary content). Peripheral perfusion could be restored immediately and pulsatile flow in the downstream region of the leg was confirmed by sonography (D, E). The patient died the next day in multi organ failure.
We show the feasibility of an interventional approach in peripheral ischemia under cardiocirculatory support by an axial flow pump. Since this peripheral complication may become apparent hours after implantation, a final control angiography of the cannulated limb upon discharge from the catheterization laboratory may be important to anticipate potential ischemic problems.
REFERENCES


Supplementary data:
Video of bypass perfusion of the ischemic right leg by the interventional “cross-over” in kind of two connected 6F sheaths (for details: see article). After flushing the sheath with saline solution, blood flow towards the ischemic leg can be visualized.
FIGURE LEGEND

A: angiography (via 6F sheath) of the right femoral axis before introduction of Impella

B: critical limb ischemia (right leg) under extracorporeal augmentation with the microaxial pump

C: interventional femoral “cross-over” bypass (details see text)

D, E: doppler signal and aspect of the right leg after restoration of limb perfusion by interventional “cross-over” bypass