The Impella system as a ‘bridge to recovery’: a case series of four ST-elevation myocardial infarction patients presenting in cardiogenic shock

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Engström et al. [1] described a case series of four patients who underwent implantation of a temporary percutaneous circulatory support system as a bridge to recovery for acute heart failure due to acute myocardial infarction (AMI). No major device-related complications were encountered and all four patients were discharged from the hospital in good clinical condition. In this editorial, we have put this case history into a broader perspective.

When circulatory support for acute cardiac failure is considered, several treatment modalities that have been proven successful in this setting should be looked at. While intraaortic balloon pumping (IABP) is still the first line of treatment, both in the setting of AMI and post-cardiotomy, several more powerful and versatile treatment options have been developed. As demonstrated in this case series, the use of the Impella system may be effective in temporarily supporting the circulation in this patient group. A larger trial will be performed by this research group [1], which will focus on recovery of left ventricular (LV) function after treatment with the Impella system. So far, no studies have been published that have been powered to discriminate efficacy in terms of mortality and morbidity [2].

However, several issues related to using the Impella for acute circulatory failure in this patient group have to be addressed. As already indicated by the authors, the completely percutaneous implantable 2.5 l device will not provide enough support in all patients, while the 5.0 l Impella® requires a surgical cut-down of the femoral artery. As with all indwelling intravascular devices, the use of Impella is not without thrombo-embolic risks [3] and has a similar major adverse cardiac events (MACE) rate when compared with more invasive devices like the Tandem Heart [4]. Extracorporeal membrane oxygenation (ECMO) with (even completely percutaneous) cannulation of the common femoral artery and vein is a reasonable alternative, especially with the advent of percutaneous arterial closure devices (Prostar®). The addition of an arterial shunt to the distal artery femoralis communis ensures adequate leg perfusion with this system. In experienced hands, priming of the system and introduction of the cannulas will take 15-20 minutes and a swift and adequate restoration of circulation is obtained. In some centres, arterial groin cannulation may be followed by cannulation of the right subclavian artery to ensure antegrade flow, resulting in stable brain perfusion. Another advantage of ECMO is that it can be used in patients with biventricular failure, resulting in complete unloading of both right and left ventricle. Furthermore, gaseous exchange problems resulting from the associated pulmonary oedema must also be treated.

For patients with a sole respiratory problem, veno-venous ECMO could be considered. One of the disadvantages of ECMO is that this can only be effectively used in centres with an active cardiothoracic surgery and circulatory support department that is able to prime the system and implant the ECMO in an emergency setting. Furthermore, even with heparin-coated systems, systemic heparinisation is mandatory with possible bleeding complications mentioned as one of the drawbacks. However, this is also the case when the Impella is used.

The implantation of any circulatory support system may be initially intended as a bridge to recovery (IABP, Impella or ECMO). However, in some patients it may be considered a bridge to decision, as restoration of adequate tissue perfusion will buy time to analyze the subsequent treatment options in the presence of failure of recovery. In patients who do not demonstrate a tendency to recover or patients who have gone into a more chronic type of heart failure, acute circulatory support may be used as a bridge to bridge (implantation of a long term implantable assist device) or bridge to transplant device. In these patients, inadequate restoration of circulation may lead to an indication for the implantation of a longer term support device, for instance a second (Heartmate-II) or third (HeartWare) generation left ventricular assist device (LVAD). Patients should be routinely screened for heart transplantation. When this is not an option, e.g. because of comorbidity, referral for implantation of a permanent LVAD might be considered. With the advent of third generation LVADs, with a low incidence of complications (mainly driveline infections and thrombo-embolic complications) and the weaning numbers of donor organs, LVAD implantation as destination therapy might be an appealing option for an increasing number of end-stage heart failure patients in the near future. The development of both short and long term devices forces us to rethink our protocols for the treatment of patients with acute myocardial infarction and circulatory failure.

References