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## Reviews:

### **MECHANICAL CIRCULATORY SUPPORT INFECTIONS**

#### **An ISHLT consensus document for prevention and management strategies for mechanical circulatory support infection**

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The Eighth annual INTERMACS registry focuses on analysis of the impact of adverse events in patients with mechanical circulatory devices (MCS). It reports that infections are the second most prevalent event in the first three months, one of the main cause of death within 1-year after implant and rate increased related to duration of device placement. In the follow up is estimated that more than 60% of device recipients will have an infectious event.

Because of left ventricular assist device (LVAD) implantation as destination therapy (DT) has increased since the last decade and deep tissue infections are associated with sepsis and high mortality , the International Heart and Lung Transplant Society (ISHLT) in collaboration with The International Consortium of Circulatory Assist Clinicians (ICCAC) developed a consensus for the prevention and management of this complication.

The recommendations of this document apply to implantable or paracorporeal devices, with drive-line or cannulas and continuous or pulsatile flow.

The complications were divided into three categories:

- 1) VAD-specific infections: pump, cannula, pocket or drive-line
- 2) VAD-related infections: bacterial, mediastinitis, infective endocarditis, bacteremia
- 3) non-VAD infections

The group revalued general infection prevention principles in cardiac surgery and highlighted the importance of knowledge of microbiology, epidemiology and antimicrobial resistance patterns of each institution.

In the pre-implant phase, they recommend administration of standard anti-microbial prophylaxis in cardiac surgery for gram-positive (one hour before) and in MRSA colonization use vancomycin (two hours before). They suggest do not use routine prophylaxis for gram-negative and antifungal agents.

During implant phase, if the procedure is longer than two half-lives of the antibiotic or the patient is transfused more than 2 units red blood cells, increase dose of anti-microbial; maintain blood glucose 200 mg / dl, normothermia and minimize surgical stress.

Post-implantation care requires meticulous care of the drive-line exit site emphasizing rigid immobilization to avoid trauma, which appears to be the main risk factor for infection.

The management of infection processes is based on observation data and expert opinion:

- Define the pathogens, location of the specific infection of MCS and type of infection related to MCS (imaging studies are considered a useful tool).
- In superficial infections, the treatment can be ambulatory guided according to the cultures for two weeks. In patients with specific MCS infection or systemic involvement (sepsis), hospitalization is indicated for treatment during 6-8 weeks.
- Consider the possible interaction between antibiotics, anticoagulation and infectious disease. Avoid the use of rifampin.
- Recurrent infections are a clinical challenge. The infectious focus should be controlled by drainage or surgical debridement using a vacuum-assisted closure system. In addition to the long-term suppressive antibiotic treatment it may be necessary device exchange in BTT patients before the failure of the final organ occurs. It is still controversial the recipient heart transplant outcome with MCS infection but is not a contraindication in hemodynamically stable patients in target anti-microbial therapy. In DT patients, it may be necessary to consider device replacement to control the infection. Palliative care and not pump exchange can be considered in old age patients with severe comorbidities.

This consensus suggests the use of standardized recommendations on prevention and treatment of infectious complication in MCS patients and it proposes the development of future directions, in order to reduce morbidity and mortality in this group of patients.

## **INTERMACS Analysis of Stroke During Support With Continuous-Flow Left Ventricular Assist Devices**

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In spite of technological advances in mechanical circulatory support, the stroke rate is still unacceptable in left ventricular assist device according data from the Eighth INTERMACS report. It is associated with high mortality (36% at 1-month and 56% at 1-year) and it has severe impact on quality of life in patients and caregivers.

Acharya et al, analyzed the pre-implant variables that could predict stroke risk, its impact on morbidity, mortality and transplantability rate. They evaluated 7112 patients with LVDA from INTERMACS registry between May 2012 and March 2015. The rate of events per patient per year was 0.123 (51.38% were ischemic stroke and 48.62% were hemorrhagic stroke).

The hemorrhagic stroke had a worse prognosis; no differences were observed according to age or the type of strategy BTT vs DT. At follow-up, the recurrence rate was higher after a hemorrhagic event. The incidence of early stroke was 16.4% vs late stroke 83.6%.

Using a multivariate model analysis of INTERMACS registry the authors determined risk factors preimplant:

- Female-sex increased probability of stroke by 51% (HR: 1.51, 95% CI, 1.25 to 1.82, p <0.001), without differences between ischemic and hemorrhagic stroke.
- The pre-implant SBP discreetly increased the risk, 1% for stroke (HR: 1.01, 95% CI: 1.00 to 1.01, p<0.002) and 0.08% (HR: 1.008, 95% CI: 1.002 to 1.013, p = 0.004) for late stroke.
- Patients with HIT have tripled the possibility of developing stroke (HR: 3.68, 95% CI: 1.60 to 8.47, p<0.002) and hemorrhagic type (HR: 5.04, 95% CI: 1.85 to 13.70, p = 0.002) .
- IABP increases 21% the possibility of stroke (HR: 1.21, 95% CI: 1.01 to 1.46, p = 0.043), 38% for the hemorrhagic type (HR: 1.38; 95% CI: 1.08 to 1.77; p<0.011) and 23% for late strokes.
- INR (range is unknown) was a protection factor for early events (HR: 0.46, 95% CI: 0.22 to 0.96, p = 0.038).

It is highlighted that risk factors for traditional stroke such as previous stroke, diabetes mellitus, atrial fibrillation, age, dyslipidemia and smoking were not independent predictors in the multivariate analysis, neither thrombosis pump. The authors conclude that risk of stroke is more related to LVAD factors and post-implant complications, such as infection, gastrointestinal bleeding, INR out of range and management of SBP instead of patients specific factors.

In patients BTT, stroke is one of the main causes that decreases transplantability rate, with prevalence of 9.26% and mortality of 38.92% for this group. The risk of disability and mortality is necessary to be discussed with patients and be part of the informed consent.

This analysis allows to identify modifiable stroke risk factors during the selection of LVAD candidates and balance risk / benefit for the indication of these devices in patients with non-modifiable risk factors.

### **Other publications:**

#### CIRCULATION

- [Left Ventricular Assist Device Malfunctions: It's More Than Just The Pump Circulation.](https://www.ncbi.nlm.nih.gov/pubmed/28674109) 2017 Oct 31;136(18):1714-1725. doi: 10.1161/CIRCULATIONAHA.117.027360. Epub 2017 Jul 3. <https://www.ncbi.nlm.nih.gov/pubmed/28674109>

#### EUROPEAN HEART JOURNAL

- No mechanical circulatory support article in October 2017

#### THE INTERNATIONAL SOCIETY FOR HEART & LUNG TRANSPLANTATION

- Japanese registry for Mechanically Assisted Circulatory Support: First report [J Heart Lung Transplant.](https://www.ncbi.nlm.nih.gov/pubmed/28942783) 2017 Oct;36(10):1087-1096. doi: 10.1016/j.healun.2017.08.002. Epub 2017 Aug 12. <https://www.ncbi.nlm.nih.gov/pubmed/28942783>
- 2017 INTERMACS REPORT Eighth annual INTERMACS report: Special focus on framing the impact of adverse events [J Heart Lung Transplant.](https://www.ncbi.nlm.nih.gov/pubmed/28942782) 2017 Oct;36(10):1080-1086. doi: 10.1016/j.healun.2017.07.005. Epub 2017 Jul 15. <https://www.ncbi.nlm.nih.gov/pubmed/28942782>

#### JOURNAL OF CARDIAC SURGERY

- Durable left ventricular assist device as a bridge to recovery for Addisonian crisis related cardiomyopathy

[J Card Surg.](#) 2017 Oct;32(10):665-666. doi: 10.1111/jocs.13209. Epub 2017 Sep 11.  
<https://www.ncbi.nlm.nih.gov/pubmed/28895194>

#### JACC HEART FAILRE

- Impact of Center Left Ventricular Assist Device Volume on Outcomes After Implantation An INTERMACS Analysis  
[JACC Heart Fail.](#) 2017 Oct;5(10):691-699. doi: 10.1016/j.jchf.2017.05.011. Epub 2017 Sep 6.  
<https://www.ncbi.nlm.nih.gov/pubmed/28888521>

#### ANNALS OF THORACIC SURGERY

- First Implantation of a Novel Left Ventricular Assist Device: The ReliantHeart aVAD  
[Ann Thorac Surg.](#) 2017 Oct;104(4):e311-e313. doi: 10.1016/j.athoracsur.2017.04.049.  
<https://www.ncbi.nlm.nih.gov/pubmed/28935323>
- Management of Patients After Percutaneous LVAD Deactivation  
[Ann Thorac Surg.](#) 2017 Oct;104(4):1440. doi: 10.1016/j.athoracsur.2017.01.005.  
<https://www.ncbi.nlm.nih.gov/pubmed/28935321>