



## Important Medical Device advisory - Update

### HeartMate 3™ Left Ventricular Assist System Catalog # 106524INT – HM3 LVAS KIT

May 25, 2018

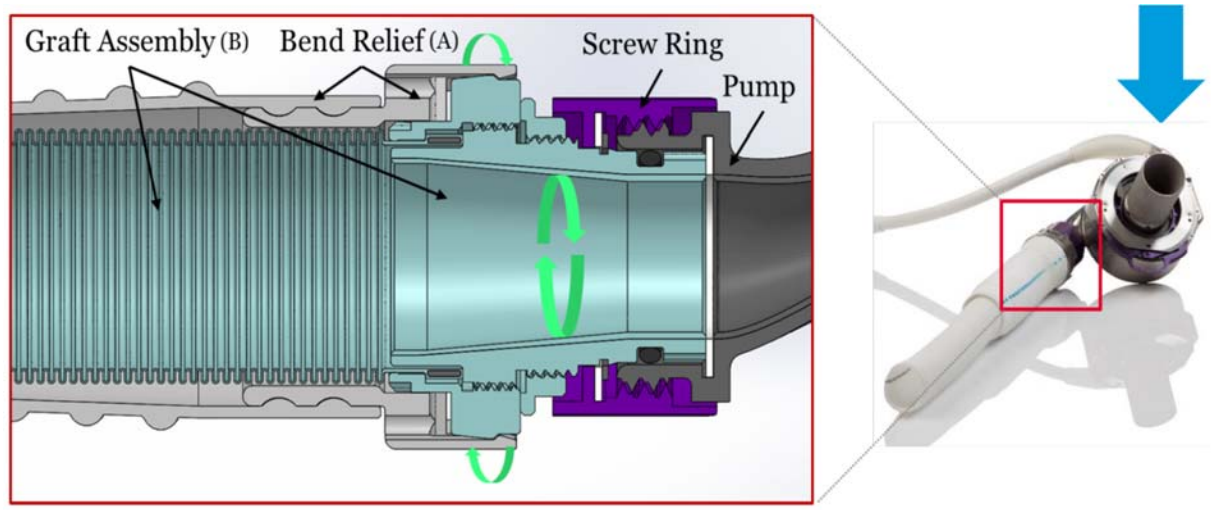
Dear Physician,

We are providing additional information to the letter we recently issued associated with HeartMate 3 (HM3) Outflow Graft twist occlusions. On April 5th, 2018 Abbott issued a Medical Device Advisory regarding the HeartMate 3 Left Ventricular Assist System and reports of outflow graft twist occlusions with a low incidence rate (0.72%). For your reference, the prior letter is included. This current communication provides further clarification on the origin of the outflow graft twist, the persistent low flow alarm, additional recommendations for patient management, and future mitigations that we will implement. We have formulated this communication in conjunction with the US Food and Drug Administration.

Outflow Graft twist is not a new event, and was previously reported by Potapov et. al. (JHLT 2018) and in the 2-year Outcomes of the MOMENTUM 3 Trial (Mehra, et. al. NEJM 2018). Abbott's analysis of the totality of the data (including the low incidence rate of outflow graft twist occlusion) confirmed the overall benefit of implanting the HeartMate 3. HeartMate 3 remains safe for use and the effectiveness has not been compromised. No devices were removed from the field and new patients can continue to be implanted with the HeartMate 3.

#### **Origin of Outflow Graft Twist in HeartMate 3 LVAS**

The HM3 is designed to allow for Outflow Graft connector rotation by the surgeon after connection to the pump, so that proper alignment of the Outflow Graft can be made during implantation without disconnecting the Outflow Graft connector from the pump. Appropriate tightening of the Screw Ring (see below) during implantation reduces, but does not eliminate, the propensity of the Outflow Graft connector to rotate. *In vivo*, normal forces can rotate the metallic Outflow Graft connector; if the rotation is in one direction only (instead of back-and-forth (clockwise/counter-clockwise)), then twist will accumulate in the graft. Accumulation of Outflow Graft twist can occur at any time point post-implantation. The twist may deform the Outflow Graft (a twist occlusion) and reduce or stop pump flow. The time course from the beginning of an accumulation of twist to an occlusion is unknown and may be variable among patients. Occlusion of the HM3 Outflow Graft often requires urgent surgical intervention.



### **Persistent Low Flow Alarm**

During normal communication between the HM3 pump and controller, the HM3 pump calculates an estimated flow and sends the information to the controller once every second. The controller will trigger a low flow alarm if the estimated flow it receives from the pump is below 2.5 liters per minute (lpm) for more than 5 seconds.

A **persistent** low flow alarm presumed to be caused by Outflow Graft twist is one that is not resolved after addressing patient medical conditions such as hypertension, low preload, right heart dysfunction, inflow occlusion, volume status and arrhythmias.

### **Patient Management – Ongoing Patients**

Abbott consults with a Medical Advisory Board (MAB) to help address patient management. Based on input from the MAB, Abbott recommends the following for existing HM3 patients:

- Patients should be followed per recommendations from the American Society of Echocardiography (*J Am Soc Echocardiogr* 2015;28:853-909), which states that “An LVAD surveillance echo exam should be considered at approximately 2 weeks after device implantation or before index hospitalization discharge (whichever occurs first), followed by consideration of surveillance transthoracic echo (TTE) at 1, 3, 6, and 12 months post implantation and every 6 to 12 months thereafter.”
- TTE imaging is not a definitive tool to identify an outflow graft twist obstruction. However, it can be used as an indirect assessment of obstruction by imaging the size of the left ventricle, the mitral valve and aortic valve opening, and diastolic velocity (inflow or outflow).
- A decrease in flow over time may be an indicator of Outflow Graft twist obstruction. If such a trend in flow is observed, or if flow velocity anywhere in the Outflow Graft exceeds 2 meters/sec (*J Am Soc Echocardiogr* 2015;28:853-909) more frequent surveillance echo exams than listed above, or other investigative methods, may be necessary.
- If a persistent low flow alarm, as defined above (i.e., a low flow alarm not resolved after all relevant patient medical conditions having been ruled out as the cause), occurs at any time following implant, a Computed Tomography (CT) angiogram should be urgently obtained, if there are no contraindications, to identify a possible Outflow Graft twist occlusion.

## Abbott Cardiovascular and Neuromodulation

- In the event that surgical repair of the Outflow Graft is needed due to a twist occlusion, the Outflow Graft Bend Relief should be reattached in its original state or repaired to prevent bending, abrasion or occlusion of the Outflow Graft at the graft's attachment point to the pump.

### **Patient Management – New Patients**

During implant, when attaching the Outflow Graft to the Pump Cover, a clicking sound will be heard as the Screw Ring is tightened. Continue turning the Screw Ring clockwise until it comes to a complete stop and stops clicking. Firmly hand-tightening the Screw Ring may reduce the risk of Outflow Graft twisting by increasing the resistance to metallic Outflow Graft connector rotation. To avoid damaging the Outflow Graft assembly, do not use tools to tighten the screw ring. This updated information (see Appendix 1) will be incorporated into the Instructions for Use following regulatory approval in each geography.

### **Future System Enhancements**

Future mitigations to prevent Outflow Graft twist occlusion for future interventions or implantations are being investigated and will be implemented after design verification and validation are complete and regulatory approval is received. We will promptly inform you when these mitigations become available.

If you have questions, please contact your local Abbott MCS Clinical Specialist or Technical Service +46-8474-4147 which is available 24 hours a day, 7 days a week.

Thank you for your continued support.

Sincerely,



Lance Mattoon  
Divisional Vice President, Quality  
Abbott Heart Failure

## Appendix 1: Updated IFU Information

# Surgical Procedures 5

## Attaching the Sealed Outflow Graft to the Pump

### FOR THIS TASK YOU NEED:

- 1 sealed Outflow Graft with bend relief (attached to the Aorta)
- 1 Pump (inserted into the Apical Cuff)

### TO ATTACH THE SEALED OUTFLOW GRAFT:

1. Remove the thread protector from the Pump and the Outflow Graft. Using the Screw Ring, attach the Outflow Graft to the Pump Cover, turning the ring clockwise. You will hear a clicking sound as you tighten the Screw Ring (this is normal). Continue turning the ring clockwise until it comes to a complete stop and stops clicking. See **Figure 5.34**.

### CAUTION !

Firmly hand-tighten the Screw Ring to ensure sufficient resistance to Outflow Graft twisting. To avoid damaging the assembly, do not use tools to tighten the Screw Ring.

### WARNING !

- Twisting of the Outflow Graft has been identified in some patients post-operatively. Occurrences of twisting have resulted in graft occlusion, thrombosis, and/or death. The accumulation of twist within the graft is related to rotation of the metallic Outflow Graft connector within the attached Outflow Graft Bend Relief connector.
- Firmly hand-tightening the Screw Ring may reduce the risk of Outflow Graft twisting by increasing the resistance to metallic Outflow Graft connector rotation. Hand-tightening will not eliminate metallic Outflow Graft connector rotation.
- Twisting of the Outflow Graft can manifest as persistent low flow unexplained by other causes. It may be confirmed by appropriate imaging, such as computed tomography (CT) angiography.
- In the event that surgical intervention of the Outflow Graft is used to correct an Outflow Graft twist, the Outflow Graft Bend Relief should either be reattached in its original state or suitably repaired to prevent subsequent kinking of the Outflow Graft.

**Appendix 1: Updated IFU Information (continued)**

## 5 Surgical Procedures

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Figure 5.34 Attach the Graft

2. Verify that the graft is not twisted or kinked by checking the position of the black line on the graft above and below the bend relief. The line should be straight.