We chose bilateral PAB to minimize risks of complete repair of multiple VSDs in the neonatal period and to reduce potential complications of neo-aortic valve insufficiency or root dilation. Palliation can improve physiology, cause some VSDs to close or become restrictive, allow easier technical repair of remaining VSDs, and limit aortic valve insufficiency and root dilation. Recently, the use of Amplatzer septal occluder devices (St Jude Medical, Inc, St Paul, Minn) has been described in older children with multiple ventricular septal defects. Improved the outcome of high-risk neonates with hypoplastic left heart syndrome: hybrid procedure or conventional surgical palliation? Eur J Cardiothorac Surg. 2008;33:613-8.


Hybrid approach to HeartMate II left ventricular assist device exchange

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Along with the increasing use of long-term destination therapy with left ventricular assist device (LVAD) support has come an increasing incidence of pump thrombosis and an anticipated growing need for pump exchange in high-risk patients. Pump exchange is complicated by multiple patient comorbid conditions and previous cardiac surgical procedures. We describe here a novel hybrid technique for pump exchange avoiding a resternotomy.

CLINICAL SUMMARY

An 80-year-old man with a HeartMate II LVAD (Thoratec Corporation, Pleasanton, Calif) that had been implanted in June of 2008 was seen in 2011 with fatigue, lightheadedness, and palpitations. LVAD interrogation revealed flows of 12 to 15 L/min, with increase in power to 12 to 17 W. Despite intensified anticoagulation and eptifibatide infusions, the patient had multiple admissions for hemolytic anemia and pump thrombosis. He was evaluated for pump replacement; however, this procedure was refused at 2 centers because of his advanced age and severe chronic obstructive pulmonary disease (forced expiratory volume in 1 second of 1.2 L). The outflow graft of the device was directly behind the sternum, and the patient also had severe bullae surrounding his outflow graft, preventing a thoracotomy. A hybrid surgical interventional approach was therefore undertaken. Surgery was performed in a hybrid operating room with the patient under general anesthesia and with transesophageal echocardiographic monitoring. With the patient in the supine position, preparation for cardiopulmonary bypass was performed through direct right common femoral artery (19F cannula) and vein (22F cannula) cannulation. Percutaneous access was gained in the left femoral artery with a 12F sheath. Incisions were made subxiphoid in the midline for access to the outflow pump connection and left subcostal for access to the inflow connection (Figure 1). Subsequently, full cardiopulmonary bypass was initiated, with decompression of the heart visualized by transesophageal echocardiography. A 20 × 40-mm Z-Med balloon (B. Braun Interventional Systems Inc, Bethlehem, Pa) was then advanced retrograde into the outflow graft. Balloon inflation resulted in complete occlusion of the outflow graft and facilitated pump exchange (Figure 2, A). Extensive mobilization of the threaded pump connections was not needed because of endovascular control of the outflow graft, minimizing surgical trauma. The drive line of the original device was mobilized through the surgical incision and subsequently transected in the field at explantation. The drive line of the new device was tunneled...
to the left side of the abdomen to achieve better positioning and avoid contamination from the previous subcutaneous tunnel on the right. The remaining portion of the original drive line was removed at the level of the skin after all incisions were closed. The exit wound was left open and packed. Deairing was accomplished retrograde by balloon deflation and a percutaneous vent in the outflow graft with a pigtail catheter (Figure 2, B). Complete deairing of the heart was confirmed on transesophageal echocardiography. Examination of the explanted device revealed a thrombus in the rotor unit. The patient was extubated within 6 hours of the procedure. He had an uncomplicated postoperative course and was discharged home 14 days after surgery. The surgical incisions intraoperatively and 6 months after surgery are shown in Figure 3. The patient has continued a very active lifestyle, without subsequent device malfunctions.

**DISCUSSION**

Mechanical support with implantable ventricular assist devices has revolutionized the treatment of end-stage heart failure. With increasing transplant waiting times and growing emphasis on destination therapy, patients with ventricular assist devices are increasingly exposed to device malfunctions necessitating pump exchange. These procedures can pose significant risks because of possible need for resternotomy, injury to unsupported right ventricle, bleeding, air embolism, and multiple patient comorbidities.

We describe a minimally invasive approach of exchanging the HeartMate II LVAD through a hybrid approach in the context of a heart team. A multidisciplinary interventional and surgical approach permitted a controlled exchange of the device without resternotomy while ensuring safety of the procedure. A similar method of deairing the device through an intra-aortic catheter has been described.
previously; however, the addition of balloon occlusion of the outflow graft allowed controlled exchange of the device without the need to surgically control and clamp the graft, reducing surgical dissection and potential morbidity. Placement of a Foley catheter into the outflow graft offers another option of controlling back bleeding from the aorta; however, connecting the outflow graft to the new device can be made difficult by uncontrolled bleeding because the Foley catheter must be removed. Furthermore, deairing of the outflow graft is more difficult with this approach, whereas endovascular control facilitates this process. We advocate a combined hybrid approach to device exchange in patients for whom minimal surgical trauma is paramount.

References

Surgical treatment for secondary pneumothorax in patients aged more than 80 years
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Secondary pneumothorax in elderly patients is usually a refractory condition and sometimes leads to a fatal outcome because of underlying diffuse lung disease, such as emphysema and interstitial pneumonia. Surgical approaches should be considered for these patients after failure of chest drainage or pleurodesis; however, surgeons hesitate to apply surgical treatment because of concerns related to operative mortality and morbidity. We describe 11 patients aged more than 80 years with secondary pneumothorax who were successfully treated with surgical approaches.

CLINICAL SUMMARY
A total of 171 patients with primary or secondary spontaneous pneumothorax underwent surgical treatment at the NHO Okayama Medical Center between January 2005 and March 2012. Eleven patients (6%) were aged more than 80 years with secondary pneumothorax. Table 1 summarizes the clinical features of these patients. All patients were male, and the median age at the time of surgery was 81 years (range, 80-95 years). Ten patients had severe emphysema, 2 of whom were also diagnosed with interstitial pneumonia. Two patients were receiving home oxygen...