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Nonsternotomy Approaches to Left Ventricular Assist Device Placement: Combined Left Subcostal–Right Minithoracotomy Technique

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Alternative non-sternotomy approaches to implanting left ventricular assist devices have become viable and reproducible alternatives to standard sternotomy approach. This paper outlines the essential steps of the left subcostal- right-minithoracotomy approach for left ventricular assist device implantation. The left subcostal approach offers excellent access to the cardiac apex without disrupting the left chest wall, while the aorta can be easily accessed via a right mini-thoracotomy incision.
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The standard method of implantation of an implantable left ventricular assist device (LVAD) involves a median sternotomy. We have adopted a nonsternotomy approach for implantation of the HeartMate II LVAD (Thoratec Inc, Pleasanton, CA) using a subcostal incision and a right minithoracotomy.[1] We use this technique for routine implantation of the HeartMate II LVAD in patients who have not had prior sternotomy and who do not need concurrent valve surgery. This technique is adaptable to other implantable LVADs but is described here for HeartMate II implantation (Figs. 1-12).

Patient Selection

This technique is unsuitable for patients with fibrous pericardial adhesions. Patients who would predictably have adhesions are therefore excluded from this approach, particularly those who have undergone prior cardiac surgery or pericardiotomy. Because of the need to place a side clamp on the ascending aorta, we routinely perform computed tomography scanning, and patients with moderate or severe aortic calcification are excluded from this approach. This technique may be used in patients in cardiogenic shock; however, unstable patients who require quick institution of bypass are probably best served with median sternotomy. Prior laparotomy or thoracotomy is not a contraindication to this approach. We have used this approach in patients with advanced lung disease, as we believe a right minithoracotomy is less disruptive on respiratory mechanics when compared with a sternotomy. A prior right thoracotomy in a patient with parenchymal lung disease is a contraindication. Patients who would predictably require a right ventricular assist device and patients requiring valvular heart surgery should undergo median sternotomy. A patent foramen ovale is not a contraindication as these can be closed via the right minithoracotomy or postoperatively using a percutaneous approach, if necessary.

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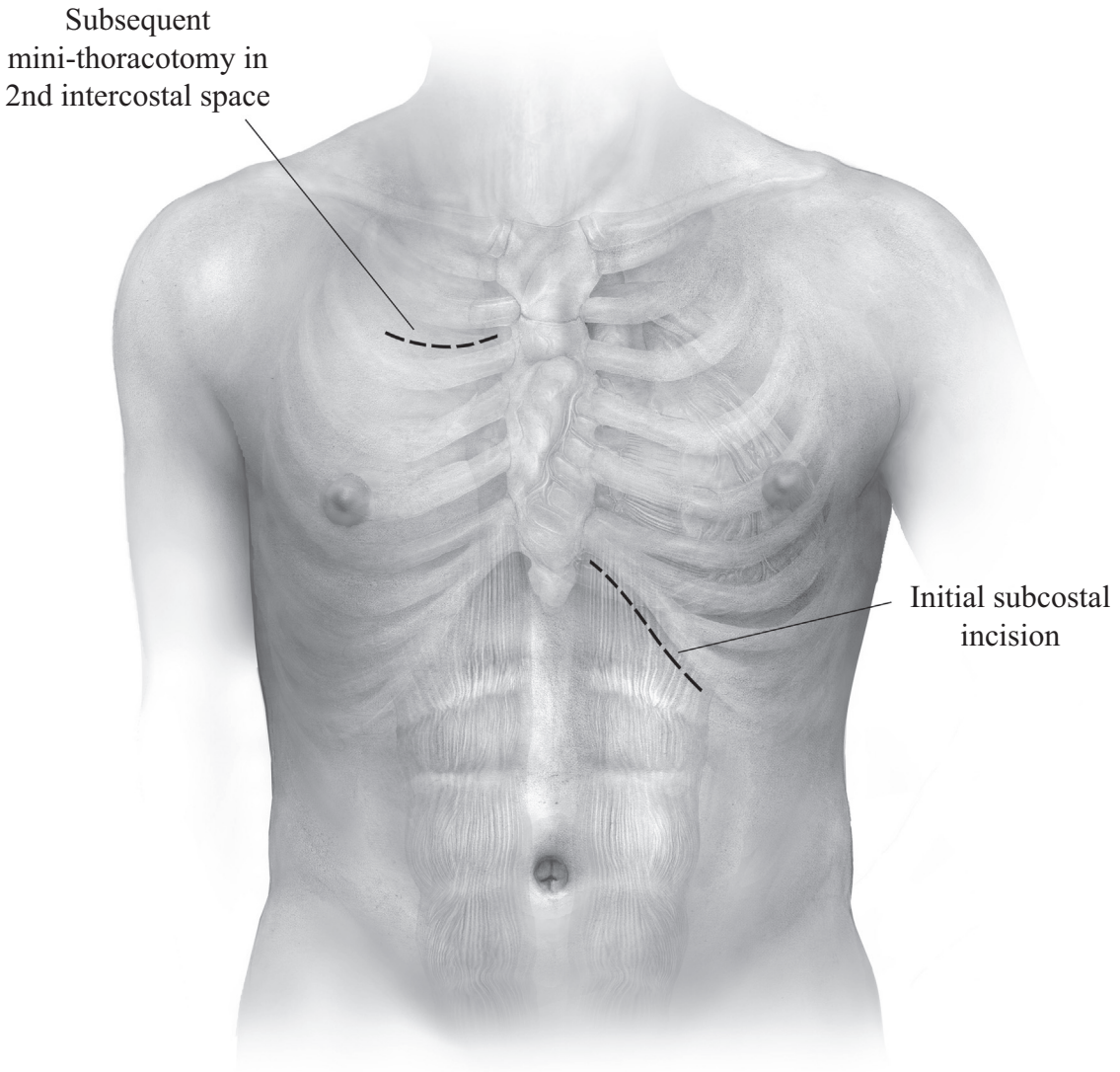

Figure 1 Anesthetic and surgical preparation is same as for implantation of HeartMate II through sternotomy. General anesthesia with a single lumen endotracheal tube is used. A transesophageal echocardiogram is performed to confirm that there are no valve dysfunctions or structural lesions that need surgical correction (if there are structural or valve lesions that need correction, then this technique is contraindicated, and the device should be implanted via median sternotomy to allow cardiac repair). External defibrillator paddles are placed. If the patient has an internal defibrillator, this is left active, as it may be used as a defibrillator later in the operation. A sterile magnet is placed over the device after draping to prevent interference by diathermy. The patient is placed in a supine position and prepared and draped as for a median sternotomy. A typically 8-12 cm long left subcostal incision is made, starting approximately 2 cm lateral to the xiphoid process and then extended laterally. The incision is deepened through the subcutaneous layers with cautery.