Simplified Subxiphoid Placement of Implantable Cardioverter Defibrillators Using a Posterior Rectus Pocket

Salem M. Habal, MD, Irving B. David, MD, and Richard M. Luceri, MD
Interventional Arrhythmia Center, Holy Cross Hospital, Fort Lauderdale, Florida

A simplified subxiphoid procedure using a single longitudinal epigastric incision and posterior rectus pocket for implantable cardioverter defibrillators was used in 100 patients. Through a single incision, ventricular patches are placed via a transverse pericardiotomy, and a pouch is created behind the rectus abdominis muscle in the left upper quadrant for placement of the implantable cardioverter defibrillator. Patients have minimal discomfort soon after operation, and the implantable cardioverter defibrillator generator is imperceptible to most.

(Ann Thorac Surg 1994;57:723-5)

Implantable cardioverter defibrillators (ICDs) have been implanted using several different surgical approaches including sternotomy, left or bilateral thoracotomy, subcostal or subxiphoid incisions [1-6], and recently transvenous and transthoracoscopic approaches. Most authors have described placement of the generator in a subcutaneous pocket. However, many patients complain of discomfort, and there is a substantial risk of skin erosion. Placement of the generator in a posterior rectus pocket in the left upper quadrant has greatly improved patient acceptance of the device.

Since 1987, our surgical team has implanted more than 350 ICDs for the treatment of malignant ventricular tachycardia and ventricular fibrillation. In the last 175 patients, all of the ICD generators were implanted in the posterior rectus pocket, regardless of the surgical approach for placement of the defibrillator patches. In 100 patients who had not had a previous cardiac operation, we used a simplified technique using a subxiphoid approach to place the patches and a posterior rectus pocket for the ICD. Here we describe this technique.

Technique

The patient is placed in the supine position on the operating table. Hemodynamics are monitored with a radial artery catheter and a thermodilution pulmonary catheter in the right internal jugular vein. Endotracheal general anesthesia is administered using standard cardiac anesthesia techniques.

The patient is prepared from the neck to the pubis and steriley draped. A small incision is made in the infraclavicular fossa, and a 100-cm bipolar endocardial lead is passed via direct subclavian puncture. The lead tip is positioned in the apex of the right ventricle under fluoroscopic guidance. Pacing and sensing thresholds and lead resistance are measured and recorded at this time.

Through a midline epigastric incision extending from the xiphisternal junction to approximately 10 cm below the tip of the xiphoid, the linea is meticulously divided (Fig 1A). If necessary, the xiphoid is excised. Using anterior retraction of the xiphisternum, a retrosternal space is created by dividing the insertion of the diaphragm to the anterior costal margin. This permits excellent exposure of the acute margin of the pericardial sac, which is then opened transversely. The pericardiotomy should be approximately 8 cm long to allow for passage of the large defibrillator patches. The pericardial incision can be easily extended, almost to the apex of the left ventricle and the right atrioventricular junction, without entering either pleural cavity. Ventilation can be interrupted for several seconds to prevent the opening of the pleura.

A malleable retractor is inserted into the pericardial cavity and the diaphragmatic pericardium is retracted caudally. A Richardson retractor is placed under the xiphisternum and the sternum is retracted cephalad and anteriorly. This provides excellent exposure of the acute margin of the heart. The two large defibrillator patches are then placed into the pericardial cavity. One patch is placed posteriorly, against the inferoposterior wall of the left ventricle. The second patch is placed posteriorly, against the inferoposterior wall of the left ventricle. The second patch is placed on the anterior surface of the right ventricle. After electrophysiologic testing is completed and a satisfactory defibrillation threshold is obtained, the two patches are fixed to the free edge of the pericardium using interrupted 3-0 polypropylene sutures.

The posterior rectus pocket for the generator is then created. A longitudinal incision is made in the left side of the linea alba, exposing the medial edge of the left rectus abdominis muscle. The pouch is created by dissecting the plane between the rectus abdominis muscle and the
Fig 1. (A) Skin incisions: subclavian and subxiphoid. (B) Appearance of complete procedure with implantable cardioverter defibrillator generator implanted between rectus muscle and posterior rectus sheath, endocardial pacing/sensing electrode, and two epicardial defibrillator patches.

posterior rectus sheath. This is done with low-current electrocautery, with care taken to achieve meticulous hemostasis. Care must be taken to avoid injuring the superior epigastric vessels, which should remain intact on the posterior aspect of the muscle. The dissection is continued laterally to the rectus border and inferiorly to a point no further caudad than the level of the umbilicus. This ensures preservation of the linea semilunaris and prevents inferior migration of the generator. To accommodate the ICD and assure its stability, the dissection is continued caudad beneath the costal margin by mobilizing the insertion of the diaphragm to the lower left rib cage. The space beneath the costal margin should be large enough to accommodate one-third the length of the ICD (Fig 2).

The pacing/sensing electrode and patch lead terminal are tunneled through to the pocket using a 28F trocar chest tube and connected to their appropriate ports in the ICD connector block. After final electrophysiologic testing, the ICD generator is positioned in the pouch. The ICD is placed with the connector block positioned inferiorly. Excess lead is carefully placed behind the ICD (Fig 1B). This positioning allows satisfactory telemetric communication during follow-up and also ease of access to the ICD during subsequent replacement procedures.

The linea alba is reaproximated in the midline using running 0 polyglycolic acid suture, beginning at each end, to create a watertight closure. In the rare instance where meticulous hemostasis cannot be achieved, a right-angle chest drain is placed in the pericardial cavity. The subcutaneous tissue and skin may be closed in a routine fashion.

Comment

A tremendous improvement was noted in patient acceptance of the ICD using this technique, due to the minimal discomfort experienced from the generator. After 4 to 6 weeks, most patients were unable to notice the generator, even upon full waist flexion. This technique simplified the surgical approach and reduced the operating time to less than 1 hour. Patients remained in the intensive care unit for 24 hours for close hemodynamic monitoring and were later monitored on an ambulatory telemetry unit. Patients
typically were discharged between 5 and 7 days after operation, following a final electrophysiologic study.

We thank Adella Jonas, RN, and Alexandria Hutchins, CCVT, for their help in collecting data and for illustrative work.

References


Notice From the American Board of Thoracic Surgery

The part I (written) examination will be held at the Hilton Executive Conference Center, Dallas Fort Worth Airport, Dallas, TX, on February 12, 1995. The closing date for registration is August 1, 1994. To be admissible for the part II (oral) examination, a candidate must have successfully completed the part I (written) examination.

A candidate applying for admission to the certifying examination must fulfill all the requirements of the board in force at the time the application is received.

Please address all communications to the American Board of Thoracic Surgery, One Rotary Center, Suite 803, Evanston, IL 60201.