



Case Report / Olgu Sunumu

Implantation of left ventricular epicardial leads for biventricular resynchronization through a single-port video-assisted thoracoscopy

Biventriküler resenkronizasyon için tek port video yardımcı torakoskopi ile sol ventrikül epikardiyal lead implantasyonu

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ABSTRACT

Cardiac resynchronization therapy is a promising therapeutic option for patients with end-stage heart failure. The preferred method for left ventricular lead implantation is the percutaneous access through the coronary sinus. However, this technique may impose certain technical difficulties due to suboptimal lead positioning. In such cases, a video-assisted thoracoscopic epicardial approach may be a good alternative. To date, video-assisted left ventricular epicardial lead implantation from two or three port incisions have been described. Herein, we present the first successful left ventricular epicardial lead implantation through a simplified single-port video-assisted thoracoscopy technique in Turkey.

Keywords: Cardiac resynchronization therapy, left ventricular lead implantation, video-assisted thoracoscopic surgery.

Prognosis of end-stage heart failure is still poor for many patients, despite the overwhelming advances in pharmacological treatment strategies. Cardiac resynchronization therapy (CRT) is a promising therapeutic option for this subgroup of patients. The mechanism behind the CRT therapy is resynchronization of the ventricular activation sequence and, thereby, improving ventricular pumping performance by enhancing coordination of atrioventricular timing.^[1]

Although the usual approach for left ventricular (LV) lead implantation for CRT therapy is the percutaneous access via the coronary sinus, this method may impose certain technical difficulties, mainly due to suboptimal

ÖZ

Kardiyak resenkronizasyon tedavisi, son dönem kalp yetmezliği olan hastalar için umut vadeden bir tedavi seçeneğidir. Sol ventrikül lead implantasyonu için tercih edilen yöntem, koroner sinüsten perkütan erişimin sağlanmasıdır. Ancak, bu teknik lead pozisyonunun optimal olmaması nedeniyle birtakım teknik zorluklara yol açabilir. Bu tür durumlarda, video yardımcı torakoskopik epikardiyal yaklaşım iyi bir alternatif olabilmektedir. Bugüne kadar video yardımcı sol ventrikül epikardiyal lead implantasyonu için iki veya üç port insizyonu kullanıldığı bildirilmiştir. Bu yazıda, Türkiye’de basitleştirilmiş tek port video yardımcı torakoskopik cerrahi tekniği ile uygulanan ilk başarılı sol ventrikül epikardiyal lead implantasyon olgusu sunuldu.

Anahtar sözcükler: Kardiyak resenkronizasyon tedavisi, sol ventrikül lead implantasyonu, video yardımcı torakoskopik cerrahi.

lead positioning. In such cases, lead placement requires surgical methods. In addition to open surgical approaches, minimally invasive thoracoscopic methods have been designed for CRT implantation.^[2] Almost all of these techniques require two or three port incisions for video-assisted thoracoscopic surgery (VATS) insertion of the LV lead. Herein, we, for the first time, present a new and simplified approach for LV lead implantation using a single-port VATS technique.

CASE REPORT

A 62-year-old man with advanced heart failure with the New York Heart Association (NYHA)

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Figure 1. Closed single-port incision with the chest tube.

Class IV was admitted to our hospital with complaints of exertional dyspnea and reduced exercise capacity. His medical history revealed, dual chamber device-implantable cardioverter defibrillator (DDD-ICD) implantation 18 months ago. Echocardiography revealed dilated cardiomyopathy and moderate-to-high mitral regurgitation. The LV ejection fraction was 31%, the QRS duration was 158 ms, and the LV end-diastolic diameter was 74 mm. There was no severe valvular disease. Based on diagnostic testing, CRT therapy was scheduled for the patient. Due to the failure of intravenous LV lead implantation attempt, however, a thoracoscopic approach was planned. A written informed consent was obtained from the patient.

The intervention was performed under general anesthesia with a double-lumen tube for single lung ventilation. The patient was placed in the right lateral decubitus position with a slight posterior tilt. A 3-cm-long skin incision was performed (left fifth intercostal space, midaxillary line), the intercostal muscles were divided, and a XS Alexis® retractor (Applied Medical, Rancho Santa Margarita, CA, USA) was positioned. The camera and endoscopic instrument were inserted through the Alexis® retractor. A 2-cm pericardiotomy was performed with an endoscissor to expose the posterolateral wall of the LV. The sutureless LV lead and introducer (Myodex, Bipolar 1084 T/54 St. Jude Medical Inc., MN, USA) were screwed into the posterolateral wall of the LV through the Alexis® retractor and the introducer was removed. Following confirmation of the thresholds, the proximal end was passed through the subcutaneous tunnel created over xiphoid process and connected to the generator in the previously reopened pacemaker pocket. The lead was

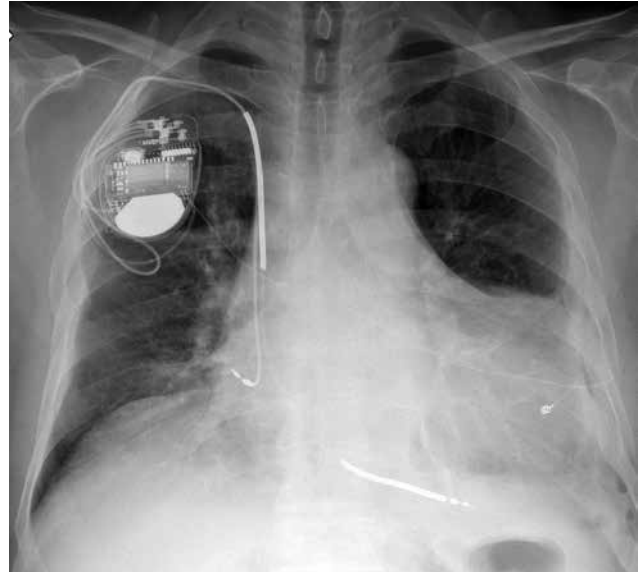


Figure 2. The position of the left ventricular lead confirmed by the postoperative chest X-ray.

loosely placed in the thoracic cavity to prevent traction of the lead after re-expansion of the lung. The lung was slowly ventilated and lead position was checked. The retractor was removed and the chest tube was inserted through the same incision (Figure 1). The position of the LV lead was confirmed by chest X-ray after the procedure (Figure 2). The postoperative electrocardiogram showed an improvement in the QRS duration with 137 ms and the ventricular contractions were synchronous. The chest tube was removed in the first postoperative day and the patient was discharged in the third postoperative day.

DISCUSSION

Cardiac resynchronization therapy is a pacemaker-based therapy for advanced heart failure which enhances ventricular function by biventricular stimulation. Posterolateral wall of the LV is considered the most optimal area for the lead implantation. Although percutaneous approach seems feasible in most cases, it has a failure rate of 8% depending on the venous and coronary sinus anatomy, technical difficulties in reaching proper anatomical area and ineffective pacing due to the scar burden in the lead placement area. This procedure also requires prolonged exposure to X-ray, particularly in case of suboptimal anatomy which poses a risk both for the patient and the heart team. Also, lethal complications such as coronary sinus perforation may occur, although very rarely.^[3,4] Accordingly, surgical approach may be required in some subgroup of patients.

Surgical positioning of LV lead has the advantage of direct visualization and proper selection of the ideal surface for implantation which leads to higher success rates in some series. However, open thoracotomy is considerably painful and carries a high rate of morbidity. In recent years, VATS has become a routine procedure in thoracic surgical practice.^[5] The main advantages of VATS include better visualization, less trauma and pain, more rapid recovery, short hospital stay, and improved cosmetic results.^[5] It also obviates X-ray exposure and contrast agent use. Nevertheless, VATS has some drawbacks over both transvenous and open thoracotomy approaches. First, VATS requires general anesthesia and single lung ventilation. Second, pleural or pericardial adhesions may hinder the operation, resulting in conversion to open thoracotomy. Finally, epicardial lacerations may occur during intrathoracic manipulation of the instruments.

Gabor et al.^[5] used two-port VATS approach for CRT in 15 patients and considered this technique as a simple and excellent alternative procedure for LV lead implantation with favorable pacing results. In another report, Hofmann et al.^[4] used an Alexis[®] retractor and a camera port for LV lead implantation in a case with massive pleural adhesions for the first time in the literature.

In our case, we describe a new and slightly different method than VATS technique. We used a single-port and a retractor for all instruments. This approach is simpler, has better cosmetic results, and causes less pain due to reduction in the number of intercostal spaces and avoiding the use of a trocar in the procedure, which minimizes the risk of intercostal nerve injury. Our technique is similar to the method used by Hofmann et al.^[4] However, we used single port for the instrumentation, camera, and chest tube insertion rather than opening an additional camera port.

In conclusion, left ventricular lead implantation via a single port is an excellent alternative both for open surgical approach and conventional video-assisted thoracoscopic surgery procedure. It is simpler and more tolerable with improved cosmetic outcomes than video-assisted thoracoscopic surgery procedure.

Declaration of conflicting interests

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