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***Video Article** / Video Makalesi*

Repair of ventricular septal defect and pulmonary stenosis with right lateral mini-thoracotomy

Sağ lateral mini-torakotomi ile ventriküler septal defekt ve pulmoner darlık tamiri

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Ventricular septal defect (VSD) repair via standard midline sternotomy is an operation associated with very low mortality and morbidity rates and excellent long-term results. However, sternotomy scars may cause serious cosmetic and psychological problems in pediatric patients. With technological developments and less invasive approaches, minimizing or completely preventing surgical scars reduces physical and psychological traumas and hospitalization time.[1] Repair of cardiac defects through right lateral thoracotomy (RLT) in children is an option with more acceptable cosmetic results and to expand indications such as Tetralogy of Fallot.[2]

In this video, technical details of minimally invasive repair of a VSD and low-lying pulmonary stenosis (PS) with right lateral mini-thoracotomy (RLMT) are discussed.

TECHNIQUE

The patient is placed in the lateral decubitus position with the right side and elevated to 90 degrees. External defibrillation peds are applied. The correct landmarks (sternum, xiphoid, jugulum, nipple, inferior part of scapula and fourth intercostal space) are identified. A skin incision about 5 to 7 cm in length is made from the fourth intercostal space between the anterior and posterior axillary lines. The subcutaneous tissue and muscles are divided with cautery until the upper edge of the rib is reached. After discontinuation of ventilation of the right lung, the pleural cavity is entered. The rib retractor is placed. The right lung is retracted and pericardium is opened 2-cm above the phrenic nerve. After heparinization and cannulation, the patient is cooled to 32°C. All cannulations are performed through the same incision. The HeartPort instruments (Ethicon Inc., CA, USA) are used during the repair. The heart is arrested with 32°C hypothermia and intermittent antegrade tepid blood cardioplegia. The right atrium is opened longitudinally, and the left heart is vented through the foramen ovale. Tricuspid leaflets are suspended with 6.0 prolene sutures. Obstructive muscle bands are resected through the tricuspid valve (TV). Perimembranous VSD is closed with interrupted sutures with Teflon pledgets via right atriotomy using a Dacron® patch. Then, TV commissuroplasty is done. A small fenestration of 2 to 3 mm in size in the atrial septum is left. Right atriotomy is closed with running sutures. After weaning from cardiopulmonary bypass, the right ventricle pressure is measured by direct puncture. After decannulation, one chest

Video 1. Minimally invasive repair of a ventricular septal defect and low-lying pulmonary stenosis with right lateral mini-thoracotomy.

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tube is inserted through the pleural cavity and a Jackson-Pratt drain is inserted into mediastinum. The intercostal space is adapted with braided sutures and prilocaine is used for local anesthesia. The pectoral muscle, subcutaneous tissue, and skin are closed with running sutures.

Comments

Operations such as atrial septal defect (ASD) closure with conventional cannulation techniques can be performed safely with minimally invasive RLT method without any further incision. The VSD closure with RLMT is only done in certain experienced centers and repair of VSD+PS is even less frequently done. Using the anterolateral or submammary approach, problems with breast growth, rib deformation, and pectoral muscle atrophy may be seen.[3] In lateral mini-thoracotomy, the incision does not cross the anterior axillary line and, therefore, it is unlikely to interfere with normal growth of the breast gland tissue. The scar remains in a less exposed bikini area than the standard sternotomy area, and aesthetic results are excellent with great patient and parent satisfaction.[4,5] This technique also eliminates the risks of peripheral groin or jugular vessels cannulation such as of ischemia and stenosis of the vessels. As no sternal healing needs to occur, patients are encouraged to return back to physical activity. Less mediastinal dissection enables less wound infection, less postoperative blood loss and pain, and faster recovery of the patient.[6] In a report, Chen et al.[7] compared percutaneous device occlusion methods to minimally invasive surgical methods for VSD closure and concluded that minimally invasive surgical repair was more cost-effective than device occlusion with similar complication rates. Liu et al.[8] performed VSD closure in 198 patients with mini-sternotomy (n=66), RLT (n=59), and median sternotomy (n=73). There was no mortality in all three groups and cardiopulmonary bypass and cross-clamp times were similar. Both mini-sternotomy and RLT were found to be suitable for VSD closure, and shorter duration of intensive care unit and hospital stay were the advantages of VSD closure by RLT. Up to date, we have performed 85 minimally invasive procedures in our hospital such as ASD repair, ASD + partial pulmonary venous return anomaly repair, partial atrioventricular septal defect repair, and VSD repair. Twenty of these operations were VSD repair and four of these VSD patients have also pulmonary infundibular stenosis. Our experience indicates that RLT can be safely performed even in low-weight patients with good exposure. The lowest body weight among our patients was 5 kg. With increasing experience, perfect results can be achieved without compromising repair quality, compared to median sternotomy.

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