

Right Axillary Mini-thoracotomy approach for surgical correction of Congenital Heart Disease

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Abstract

Introduction: We describe our initial experience with minimally invasive approach using Peripheral cardiopulmonary bypass (CPBP) and a 4-5 cm long right axillary mini-thoracotomy (RAMT) incision for surgical correction of congenital heart diseases. A right axillary mini-thoracotomy with the aid of peripheral CPBP is a surgical option that has been adopted in our institution in selected patients with congenital heart disease. We present our selection criteria, describe our technique, and analyze our results with this modified technique.

Methods: This is retrospective descriptive study conducted at Green city Hospital, Kathmandu and the procedures were followed in accordance with the institutional guidelines for retrospective record review and protection of patient confidentiality. The preoperative variables, intraoperative data and postoperative outcomes of patients undergoing minimally invasive cardiac surgery were collected and analyzed.

Results: Total 12 patients were included in the study who underwent a minimally invasive approach with the aid of peripheral CPBP for repairing congenital heart disease (CHD) in our institutions. Main diagnosis leading to surgery included: (1) ostium secundum atrial septal defect in 7 patients, (2) ostium secundum atrial septal defect with moderate tricuspid regurgitation in 3 patients, (3) perimembranous ventricular septal defect with patent ductus arteriosus in 1 patient, (4) ostium secundum atrial septal defect with core triatriatum in 1 patient. There were 6 females and 6 males. Median hospital stay was 4 days. There were no residual intracardiac anomalies at discharge two-dimensional echo, and all patients were satisfied with the surgical approach.

Conclusion: The combination of RAMT and peripheral CPBP is safe and effective for treating some congenital heart disease with excellent clinical results.

Keywords: congenital heart disease, minimally invasive cardiac surgery, axillary mini thoracotomy.

Introduction

We describe our initial experience with minimally invasive approach using Peripheral CPBP and 4-5 cm long RAMT incision for surgical correction of congenital heart diseases. A right axillary mini-thoracotomy with the aid of peripheral CPBP (Fig. 1, Fig 2) is a surgical option that has been adopted in our institution in selected patients with congenital heart disease.

Since August 2015, we routinely adopted the surgical minimally invasive different approach for all patients with simple CHD^{1,2}. As a refinement of our protocol we have routinely used a peripheral cannulation for establishing cardiopulmonary bypass (CPBP) in patients with simple CHD and a body weight greater than 25 kg.

Methods

This was a retrospective descriptive study conducted at Green city Hospital, Kathmandu. The procedures were

followed in accordance with the institutional guidelines for retrospective record review and protection of patient confidentiality. The preoperative variables, intraoperative data and postoperative outcomes of patients undergoing minimally invasive surgery were collected. All patients underwent correction of the congenital heart defects via right axillary mini-thoracotomy incision of 4-6 cm.

This approach is through a limited right axillary skin incision (4-6cm; Fig 3) just in right mid axillary line. The subcutaneous attachments of the latissimus dorsi muscle are mobilized, and the muscle is retracted posteriorly by exposing the serratus anterior muscle that is split and entering the right chest in the fourth intercostal space. Right lung exclusion is usually preferred. The use of peripheral CPBP, by percutaneous cannulation of the internal jugular vein and a direct surgical cannulation of the femoral vessels, has allowed us to further minimize the surgical incisions. Before opening the right atrium, both venae cavae were encircled and controlled with umbilical tapes. Our routine practice in patients requiring femoral cannulation is to include the monitoring of oxygen saturation, in the cannulated leg, during the extracorporeal perfusion.



Fig 1. Peripheral cannulation- Right internal jugular vein cannulation

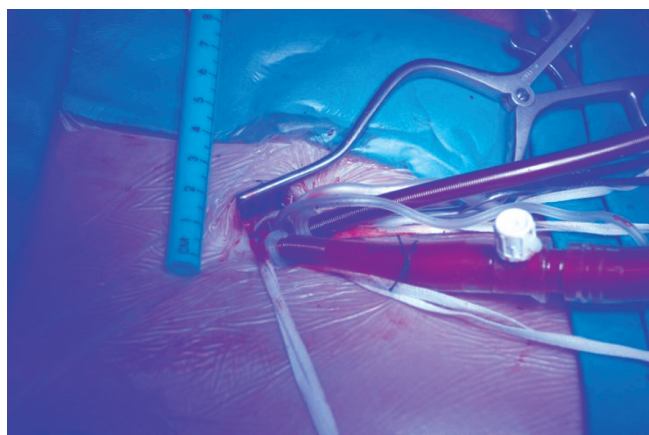


Fig. 2. Peripheral Cannulation- Right Femoral artery and femoral vein cannulation



Fig. 3. Right axillary mini-thoracotomy: Intraoperative view



Fig 4. Right axillary mini-thoracotomy: 1year follow-up image in a 16-year-old female patient who underwent repair of ostium secundum atrial septal defect.



Fig 5. Right axillary mini-thoracotomy: 1year follow-up image in a 22-year old male patient who underwent repair of ostium secundum atrial septal defect.

Standard aortic cross clamping followed by cold hematic cardioplegic cardiac arrest was obtained in all. Postoperative pain was controlled by a continuous infusion of analgesic medications (ropivacaine 0.2 mg /kg / h) in the intercostal space for 48 hours and subsequently with oral nonsteroidal antiinflammatory medications. Leg pulses were checked in the postoperative period and a discharge two-dimensional echo control with Doppler evaluation of the leg vessels was routinely performed.

Results

Between August 2016 and September 2017, 12 patients underwent a minimally invasive approach with the aid of peripheral CPBP for repairing CHD in our institutions. Indication for surgery included: (1) ostium secundum atrial septal defect in 7 patients, (2) ostium secundum atrial septal defect with moderate tricuspid regurgitation in 3 patients, (3) perimembranous ventricular septal defect with patent ductus arteriosus in 1 patient, (4) ostium secundum atrial septal defect with cor triatriatum in 1 patient. The mean age at surgery was 23 years (range 14 to 57 years). There were 6 females (50%) and 6 males; their median body weight was 49.5 kg (range, 35 to 65 kg). Median CPBP time was 52minutes (range, 25 to 92 minutes). Median aortic cross-clamp time was 31 minutes (range, 13 to 75 minutes).

No complications were reported with the use of peripheral CPBP, and there were no peripheral to central CPBP conversions. Oxygen saturation level in cannulated leg recorded above 90% during the extracorporeal perfusion.

Postoperative complications were reported in 1 patient and included an intrathoracic bleeding requiring the reexploration and transfusion of two units of packed cells. All patients were extubated within 4 hours from surgery and discharged from the intensive care unit within 24 hours. Median hospitalization time was 4 days (range, 3 to 6 days). There were no residual intracardiac anomalies at the discharge two-dimensional echo, and all patients were satisfied with the surgical approach.

Discussion

A routine median sternotomy has been the conventional approach for correction of congenital cardiac defects for many years. However, it often yields to poor cosmetic results with displeasure and psychological distress, especially in young patients. Currently in many

institutions, a full midline sternotomy is rarely used for correcting simple CHD, and comparable clinical results can be achieved by means of various minimally invasive approaches^{3,4,5}.

The introduction of peripheral cannulation for cardiopulmonary bypass further reduces surgical trauma by decreasing surgical access and allowing the spectrum of surgical access for the correction of simple congenital heart defects to be widened. Right internal jugular vein percutaneous cannulation, together with the direct surgical cannulation of femoral vessels, proves to be a safe and effective tool in patients with body weight above 15 kg^{6,7}.

A anterior lateral mini-thoracotomy with peripheral CPBP⁸ has been a surgical option for patient with CHD in many Institutions worldwide. This technique underwent several modifications, we have used this new technique of RAMT for the treatment of congenital heart lesions to achieve a better exposure of the superior vena cava and ascending aorta, apply aortic cross clamp as an alternative to a right anterior mini-thoracotomy; (Fig 3).

The use of peripheral CPBP has shown to be a safe and excellent option in selected patients. It allows limited surgical chest incisions, reducing in this way the patient's surgical trauma. The oxygen saturation monitoring of the blood perfusion to the lower extremities by pulse oxymeter in patients with peripheral CPBP is a safe maneuver for controlling the blood flow perfusion to the lower extremities during the cannulation of the femoral vessels and the CPBP time.

Conclusion

The combination of RAMT and peripheral CPBP for surgical correction of simple CHD is safe and effective, with excellent clinical results that are comparable to classic^{9,10,11} and other minimally invasive approaches.

Conflict of interest: None declared.

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