

Heart, Lung and Circulation (2016) xx, 1–7
1443-9506/04/\$36.00
<http://dx.doi.org/10.1016/j.hlc.2015.05.028>

Mid-term outcomes of Common Congenital Heart Defects Corrected through a Right Subaxillary Thoracotomy

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Received 8 December 2014; received in revised form 6 May 2015; accepted 7 May 2015; online published-ahead-of-print xxx

Objective

To evaluate the mid-term outcomes of the correction of various congenital heart defects through a right subaxillary thoracotomy.

Methods

Between June 2004 and April 2014, all eligible patients were those with a common congenital heart defect corrected via an approach through a right subaxillary thoracotomy. There were 836 patients (male 417, female 419; median age, 3.5 years; median weight 13.6 kg) with ventricular septal defect (VSD) closure (523 patients), atrial septal defect (ASD) closure (235 patients), partial atrioventricular canal (PAVC) correction (55 patients), mild tetralogy of Fallot (TOF) (23 patients). Additional procedures involved tricuspid valvuloplasty (TVP) (68 patients), repair of partial abnormal pulmonary venous connection (PAPVC) (54 patients), mitral annuloplasty (42 patients), closure of patent ductus arteriosus (PDA) (35 patients), correction of cor triatriatum (eight patients). The median cardiopulmonary bypass (CPB) and aortic cross-clamp times were 67 (28~217) and 23 (3~116) min, respectively.

Results

The procedures were performed successfully in all patients, and no in-hospital mortality occurred. There was no need for conversion to another approach in all procedures. The main complications involved arrhythmia in 21 patients, atelectasis in 18, pneumothorax in 17, subcutaneous emphysema in 15, pulmonary infection in 14, low cardiac output syndrome in eight, transient cerebral dysfunction in two. The patients were all in excellent condition after a mean follow-up of 34 months. The cardiac defect was repaired with no residual defect in 820 patients and with trivial to mild residual defect in 16 patients (10 with small VSD residual shunt, four with mild mitral regurgitation, two with mild residual right ventricular outflow tract obstruction). The incision healed properly in all, and the thorax showed no deformity.

Conclusions

The right subaxillary thoracotomy, providing an advantageous alternative, can be performed with favourable cosmetic and satisfactory clinical results for the correction of a wide range of common congenital heart defects.

Keywords

Congenital heart defect • Minimally invasive cardiac surgery • Right subaxillary thoracotomy

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Introduction

The ultimate goal of surgical management of congenital heart defects is to accomplish a perfect correction that ensures the longest life expectancy and the best quality of life physically as well as psychologically and minimise the occurrence of complications. With the improvement of the techniques and devices, simple congenital heart defects like ASDs or VSDs are presently corrected with a mortality rate approaching zero [1,2]. Non-surgical percutaneous transcatheter closure of simple congenital heart defects has been used for more than 20 years and has been performed with excellent cosmetic results [3]. Several alternative approaches [4-6] to a median sternotomy have been explored to reduce surgical trauma, while at the same time ensuring a perfect correction. These include a small incision with a partial sternotomy, anterolateral thoracotomy, as well as posterior thoracotomy. The right anterolateral thoracotomy, an approach once considered cosmetically superior to a sternotomy, has led to less optimal than expected outcomes, mainly because of subsequent deformation of the thoracic cage (caused by rib deformation and atrophy of the severed pectoral muscles) and asymmetric development of the breasts when used in pre-pubescent girls.

Between June 2004 and April 2014, a right subaxillary thoracotomy was performed in 836 patients to repair a wide range of common congenital heart defects which provides satisfactory access to the right side of the heart. The right subaxillary incision in an area free from thoracic wall muscles allows for a less invasive access to the heart, furthermore, being far away from the breast, and being hidden by the resting arm, provides excellent cosmetic results.

Materials and Methods

Materials

This study was approved by our institutional ethics committee, and written informed consent was obtained from all participants. Between June 2006 and April 2014, 836 patients underwent the correction of congenital heart defects through a right subaxillary thoracotomy. With the accumulated experiences of right subaxillary thoracotomy used in open heart operations, we extended the indications from ASD closure to total correction of TOF in recent years in our department. The patient had a definite diagnosis preoperatively. The patients who needed reoperation, had respiratory diseases and a history of undergoing right thorax procedure were excluded from the study. None of the patients had another surgical approach to their defects during the procedure. Demographic and clinical data of the patients are listed in Table 1.

Position of the Patient and a Right Subaxillary Incision

An echocardiographic probe was inserted into the oesophagus in all patients. The patient was placed in a left 80~90° lateral position. The right arm was brought over the head and supported by a sling. The anterior axillary line (as anterior limit for the incision) and posterior axillary line were marked with a pen, serving as guiding parameters for the axillary incision, as was the fourth intercostal space (Figure 1,2). A 5-7 cm longitudinal or oblique incision was made, the subcutaneous tissue was undermined, the anterior border of the latissimus dorsi was set free of attachments, and the muscle was mobilised to expose the fifth rib, with the preservation of

Table 1 Demographic and clinical data of the patients.

	No. of patients	Median age (y)	Median weight (kg)	Median CPB time (min)	Median aortic crossclamp time (min)
ASD	235	5.8(0.6-12)	23(7-48)	56	17
ASD+TVP	48	8.5(5-15)	28(20-48)	45	12
ASD+PDA	15	2.3(0.6-5)	12(7-18)	50	13
ASD+PAPVC	54	8.0(6-16)	27(22-45)	48	18
ASD+MVP	14	4.0(2.2-10)	18(13-34)	63	23
ASD+cor triatriatum	8	5.3(1.8-12)	20(12-35)	65	25
VSD	523	3.6(0.4-9)	13(5-30)	86	37
VSD+PDA	20	2.8(0.6-7)	13(6-27)	87	35
VSD+MVP	28	3.0(0.4-9)	11(5-30)	95	40
VSD+TVP	20	4.2(0.7-8)	14(7-30)	83	36
PAVC	55	5.3(2.0-15)	18(13-46)	96	42
TOF	23	4.0(2.3-7)	16(10-23)	165	78

The presentation of the data was expressed as median \pm interquartile range.

The data were described as being normally distributed.

Abbreviation: ASD, atrial septal defect; TVP, tricuspid valve plasty; PDA, patent ductus arteriosus; PAPVC, partial abnormal pulmonary venous connection; MVP, mitral annuloplasty; VSD, ventricular septal defect; PAVC, partial atrioventricular canal; TOF, tetralogy of Fallot; CPB, cardiopulmonary bypass.

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