

Repair of Atrial Septal Defect at Lampang Regional Hospital

Jaroen Cheewinmethasiri, MD

Angsu Chartrungsan, MD

Boonsap Sakboon, MD

Nuttapon Arayawudhikul, MD

Cardiovascular Thoracic Unit, Department of Surgery, Lampang Regional Hospital, Thailand

Abstract

Objectives: We would like to present our experience in repairing all types of atrial septal defect at Lampang Regional Hospital. In this study we also report the results of conventional and on-pump beating heart technique.

Methods: From January 2010 to April 2015, 124 patients underwent atrial septal defect closure. There were 91 females and 33 males, with mean age 36.2 (range, 3 months-75 years).

Results: The operation was performed with conventional technique in 45 patients compared to beating heart in 79 patients. The mean cardiopulmonary bypass time was 41.15 minutes in patients with conventional closure technique without tricuspid valve repair and 32.55 minutes in patients with beating heart closure technique without tricuspid valve repair. There was no death, no stroke and no residual shunt in all patients. The mean ICU stay was less than 24 hours in all patients.

Conclusion: Repair of atrial septal defect at Lampang Regional Hospital is safe with no stroke or death. Repair of atrial septal defect secundum type with beating heart under cardiopulmonary bypass technique is an alternative technique that is also safe and can avoid ischemic-reperfusion injury.

Keywords: Atrial septal defect, ASD secundum, repair of atrial septal defect, beating heart repair atrial septal defect

INTRODUCTION

Atrial septal defect (ASD) is present in 10% of patients with congenital heart disease and it is the most common congenital cardiac malformation first diagnosed in adults. Patients with a significant shunt may have an experience of dyspnea in about 30% of patients by the third decade and in over 75% of patients by the fifth decade. Longstanding right heart, pulmonary arterial and venous volume overload and dilatation in the setting of an ASD may lead to the development of right heart failure, arrhythmia,

thromboembolic events, and pulmonary vascular obstructive disease. The natural course of untreated atrial septal defects often leads to a shortened life expectancy compared to healthy subjects. In this study, we present our experience in repairing all types of atrial septal defect at our hospital which is non-university regional hospital and our cardiac surgery unit has been established since 2010. We also reported the result of conventional repair technique and beating heart under cardiopulmonary bypass repair technique.

Correspondence address: Jaroen Cheewinmethasiri, MD, Cardiovascular Thoracic Unit, Department of Surgery, Lampang Regional Hospital, Paholyotin Road, Amphur Muang, Lampang 52000, Thailand; Telephone: +66 5423 7400; Fax: +66 5423 7444; E-mail: learniecv@hotmail.com

PATIENTS AND METHODS

From January 2010 through April 2015, 124 patients who were diagnosed with ASD underwent ASD closure. There were 91 females and 33 males, with mean age 36.2 years (range, 3 months-75 years). Preoperative diagnosis was established with echocardiography. The type, size, location of the ASD and associated anomalies were evaluated. All patients aged 40 years or more underwent coronary angiography to rule out concomitant coronary artery disease. Type of ASD and concomitant disease are shown in Table 1 and Table 2 respectively. The ASDs, by type, comprised of 115 secundum ASD, 6 sinus venosus defects (with partial anomalous pulmonary venous connection), 1 secundum ASD plus sinus venosus defect and 2 primum ASD. Two patients with secundum ASD had Patent Ductus Arteriosus (PDA). Two patients also had degenerative mitral regurgitation, 29 patients had tricuspid regurgitation which needed tricuspid valve repair. Three patients had concomitant coronary artery disease.

Surgical technique

The conventional aortic crossclamp operations were performed through a median sternotomy in the following manner: after fully heparinization, total cardiopulmonary bypass (CPB) was established by

cannulating the ascending aorta and both venae cavae. The venae cavae were snugged, the aorta was crossclamped, and antegrade cold crystalloid cardioplegia was administered via aortic root canula under normothermic conditions. We used carbon dioxide insufflation into the operative field in every case. The right atriotomy was made, and the ASD was closed in various techniques depending on anatomy of ASD and surgeon preference (Dacron patch, autologous pericardial patch, or direct closure). De-airing from the pulmonary veins was made by asking the anesthesiologist to perform positive-pressure ventilation from self-insufflation bag, and insufflation was held before closing the ASD. In patients with tricuspid regurgitation, tricuspid valve repair was made. The right atriotomy was closed and aorta was declamped after de-airing was made. In cases that involved a concomitant mitral valve procedure, a vent is inserted through the right superior pulmonary vein.

In beating-heart, no crossclamp technique, the establishing of the CPB was the same as the conventional technique. Before right atriotomy was made, the patient was moved into the Trendelenburg position and a blood suction tip was placed in the coronary sinus ostium to keep the operative field bloodless. Suction tip must not be put in the left atrium for emptying left atrium. Retraction was kept to a minimum to prevent distortion of the aortic root. Electrocardiography monitored any ischemic changes. Before closing the defect, de-airing was made with the same fashion of conventional technique. Patients were followed up at the hospital and outpatient clinic. Follow-up was complete in all patients.

Data analysis

Data were presented as percentage and mean values.

RESULTS

Types of operation and number of operations are shown in Table 3. There was no complication such as death or stroke and no residual shunt in both groups of patients. The operations were performed with conventional technique in 45 patients compared to beating heart under cardiopulmonary bypass technique in 79 patients. Mean cardiopulmonary bypass time, mean ICU stay and mean length of stay in each group

Table 1 Type of ASD

Type of ASD	Number of patients	Percentage
Secundum ASD	115	92.74
Sinus venosus ASD	6	4.84
Secundum ASD plus sinus venosus ASD	1	0.81
Primum ASD	2	1.61
Total	124	100

Table 2 Concomitant disease

Concomitant disease	Number of patients
Degenerative mitral valve regurgitation	2
Tricuspid valve regurgitation	29
Coronary artery disease	3
Mitral valve regurgitation from cleft mitral valve	2
PDA	2
Pulmonic valve stenosis	1

Table 3 Types of operation

Type of operation	Number of operation	Percentage
Closure of secundum ASD	85	68.54
Closure of secundum ASD + TV repair	22	17.74
Closure of primum ASD + MV repair	1	0.81
Closure of primum ASD + MV repair + TV repair	1	0.81
Closure of sinus venosus ASD	4	3.22
Closure of sinus venosus ASD + TV repair	2	1.61
Closure of sinus venosus ASD + Closure of secundum ASD	1	0.81
Closure of secundum ASD + CABG	1	0.81
Closure of secundum ASD + TV repair + MVR	1	0.81
Closure of secundum ASD + TV repair + MV repair	1	0.81
Closure of secundum ASD + CABG + TV repair	2	1.61
Closure of secundum ASD + PDA ligation	2	1.61
Closure of secundum ASD + Transannular patch	1	0.81
Total	124	100

Table 4 Comparison between conventional group and beating heart under cardiopulmonary bypass group

Technique	Mean Cardiopulmonary Bypass time (minutes)	Mean ICU stay (hours)	Mean Length of stay (days)
Beating heart, no TV repair	32.55	16.66	4.28
Beating heart, TV repair with ring annuloplasty	54.33	16.16	4.33
Beating heart, TV repair without ring annuloplasty	35.50	15.17	3.5
Conventional, no TV repair	41.15	17.76	4.38
Conventional, TV repair with ring annuloplasty	83.83	29.00	5.16
Conventional, TV repair without ring annuloplasty	62.33	29.66	4.67

are shown in Table 4. The mean cardiopulmonary bypass time was 41.15 minutes in patients with conventional closure technique without tricuspid valve repair and 32.55 minutes in patients with beating heart closure technique without tricuspid valve repair. The mean ICU stay was less than 24 hours in both groups of patients.

CONCLUSION

Repair of atrial septal defect at Lampang Regional Hospital is safe with no stroke or death. Repair of atrial septal defect secundum type with beating heart under cardiopulmonary bypass technique is also an alternative technique that is safe and can avoid ischemic-reperfusion injury.

DISCUSSION

ASD repair via median sternotomy still has a high benefit for patients with low-risk procedure and mortality close to zero. For the result of beating-heart under cardiopulmonary bypass group, we found that beating-heart group seems to have better result than conventional group due to some factors; we perform beating-heart strategy only in closure of secundum ASD. But in conventional strategy, we do more complex operation such as closure ASD sinus venosus type, closure of ASD primum type. So, the shorter cardiopulmonary bypass time, the better the outcomes. Beating-heart ASD closure is another technique for repair ASD. Although it is still the debate issue, the primary aim of the beating-heart technique is to avoid ischemic-reperfusion injury. It is a safe and effective

technique. Other advantages of beating-heart ASD repair include the immediate ability to evaluate the severity of any associated mitral or tricuspid valve insufficiency, and to identify cardiac conduction system injury during repair. Our results indicate that the beating-heart technique is a safe and may be an alternative technique for the surgeons who need to avoid ischemic-reperfusion injury.

REFERENCES

1. Pendse N, Gupta S, Geelani MA, Minhas HS, Agarwal S, Tomar A, et al. Repair of atrial septal defects on the perfused beating heart. *Tex Heart Inst J* 2009;36:425-7.
2. Ak K, Aybek T, Wimmer-Greinecker G, Ozaslan F, Bakhtiary F, Moritz A, et al. Evolution of surgical techniques for atrial septal defect repair in adults: a 10-year single-institution experience. *J Thorac Cardiovasc Surg* 2007;134:757-64.
3. Weman SM, Karhunen PJ, Penttilä A, Jarvinen AA, Salminen US. Reperfusion injury associated with one-fourth of deaths after coronary artery bypass grafting. *Ann Thorac Surg* 2000;70:807-12.
4. Hopkins RA, Bert AA, Buchholz B, Guarino K, Meyers M. Surgical patch closure of atrial septal defects. *Ann Thorac Surg* 2004;77:2144-50.
5. Chaudhuri K, Marasco SF. The effect of carbon dioxide insufflation on cognitive function during cardiac surgery. *J Card Surg* 2011;26:189-96.