

## Research Article

# Transcatheter Closure Of Atrial Septal Defects In Myanmar Children, Initial 3 Years' Experience

Hnin Le Phyu<sup>1</sup>, Khin Maung Oo<sup>2</sup>, Ohnmar Ko<sup>1</sup>, L Jaryung<sup>1</sup>, Nu Htar Wai<sup>1</sup>

### Author's Affiliation:

1- Medical Unit, Yankin Children Hospital, Pediatric Department, University of Medicine II, Yangon, Myanmar.

2- Cardiac Medical Unit, Yankin Children Hospital, Pediatric Department, University of Medicine II, Yangon, Myanmar.

### Correspondence:

Dr Hnin Le Phyu, Email: drhlp81@gmail.com

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## ABSTRACT

**Background:** In Myanmar, although secundum atrial septal defect(ASD) was a common congenital heart disease, percutaneous transcatheter closure (TCC) was seldomly done for children with ASD before. Only from 2015, it became available and now it is the first choice of treatment modality for ASD closure in children.

**Aim:** The study was aimed to evaluate the results of the first three years of practicing of TCC of ASD in Myanmar children.

**Methods:** This is retrospective study by reviewing data and records of children who were undergone TCC of ASD in Cardiac Catheterization Laboratory, Yankin Children Hospital, Yangon, during three years' period of 2015 to 2018

**Results:** Total number of 143 of children and adolescents were included. Mean age of children was 7.84 year {STDEV =2.87}. Mean body weight was 20.6 ± 8.54 kg. Small children with body weight <15 kg were 27 (19%). Mean ASD size in echocardiogram was 16.76 mm {STDEV =4.94}. Mean size of single septal occluder device used was 21.45 mm {STDEV =5.56}. Procedural success rate was 97.2% and closure rate was 100%. Multiple ASD were occluded with single device in 8 and double devices were used in 4 patients. In terms of complications, device embolization was commonest and occurred in 4 patients (2.8%). There was no mortality.

**Conclusion:** The experience of high implantation success and minimal complications during first three years of TCC of ASD in Myanmar children were encouraging and it was a step in upgrading health care standard for Myanmar children.

**Keywords:** Atrial Septal Defect, Children, Transcatheter closure, Complications, HealthCare Standard.

## INTRODUCTION

Myanmar is a developing country of South East Asia region and is 26<sup>th</sup> most populous in the world. Among estimated population of 54 million in 2019, about a quarter were children [1]. According to World Health Organization, health care standard of Myanmar is lagging seriously behind other countries [2]. However, to Myanmar, congenital heart disease (CHD) doesn't break its promise to come. Myanmar hold a large number of children with CHD despite experts and facilities for caring them are enormously out of proportion.

Even though trans catheter closure (TCC) of secundum atrial septal defects(ASD) has been widely practiced all over the world since 1990s, it was not available for Myanmar children until late 2015 owing to lack of cardiac catheterization facilities. Symptomatic children were only undergone open heart surgery from a long waiting list. From September 2015, after opening pediatric cardiac catheterization laboratory in Yankin Children Hospital, Yangon, Trans catheter closure (TCC) of ASD became available and since then, this procedure has been routinely practiced.

## AIM

Despite us being the late bloomers; we believe that it is never too late to share experience and knowledge. This study is aimed to evaluate and share the experience of TCC of ASD in Myanmar children during the first three years of practicing. We also hope to deliver the message of feasibility and effectiveness of TCC of ASD in children among Myanmar pediatrician and regional colleagues.

## PATIENTS AND METHODS

### Patients

This is retrospective study carried out by reviewing admission charts, echo finding records, catheterization procedure notes and fluoroscopic images during percutaneous closure of secundum ASD in children at Cardiac Catheterization Laboratory, Yankin Children Hospital, Yangon, Myanmar. Only the procedures done in initial three years' period from 2015 to 2018 were evaluated. Total number of 143 children and adolescents were included in the study.

### Pre procedure preparation

Routinely, as a pre-op preparation, Complete Blood Count, Renal function test, CXR, standard 12 leads ECG were done. Written informed consents were taken from parents or caregivers in all cases. All children were undergone transthoracic 2D and Color Doppler Echocardiography (TTE) using Phillip Affinity 70 machine. Having single or multiple ASD with left to right shunt, with marked right ventricular volume overload (RVVO) and presence of adequate rims were considered suitable for device closure.

### Procedure

The procedure was usually performed under general anesthesia. Multiplane trans esophageal echo (TEE) examination was usually done with the same machine, before vascular access. Only Femoral vein was usually punctured. Heparin was usually given at a dose of 50IU per kilogram body weight but activated coagulation time (ACT) was not usually measured. Similarly, owing to limited resources, right heart catheterization to measure shunt magnitude and pulmonary vascular resistance was usually skipped. Balloon sizing of defect was usually done. Stop-flow diameter of balloon was measured in echo as well as in cine image.

Decision for device size was usually based upon stop-flow diameter and nature of rims. During device deployment, we used TEE as well as fluoroscopic guidance. Before release, device position and stability were usually checked by TEE, fluoroscopy and doing "Minnesota Wiggle" test.

Oral Aspirin was usually started the next day after procedure, provided that there was no residual shunt, and continued for 6 months. Children were reexamined clinically as well as with CXR, ECG and TTE recheck after 24hr, 1, 3 and 6mth after procedure, and then annually. Any residual shunt, device impingement or erosion to adjacent sensitive structures such as aorta, dysrhythmia and infective endocarditis were recorded.

### Statistical analysis

Data was expressed as a frequency or percentage for nominal variables and as the mean  $\pm$  SD for continuous variables.

## RESULTS

At our center, during the 3 years from 2015 September to 2018 September, total of 143 children underwent device implantation for ASD and it was successful in 139 patients. Summary of patient characteristics are described in Table (1).

Mean age of children was 7.84 year {STDEV =2.87}. 19 children were younger than 5 yr. Mean body weight was 20.6  $\pm$ 8.54 kg. Small children with body weight <15 kg were 27(19%). The youngest child was 1yr and 2mth old, weighing 6.5kg.

Mean ASD size in TTE was 16.76 mm {STDEV =4.94}. Mean size of single septal occlude device used was 21.45 mm {STDEV =5.56}. Smallest device was 7.5mm and largest was 36mm. In all cases of successful device indwelling, no residual shunt was detected in TTE next day (100% closure rate).

Multiple ASD were seen under TEE in 12 patients. Among them, 8 were occluded with single device and double devices were used in 4 patients.

**Table (1) Demographics, Defects, Device variables and Complications**

Variables	Mean	Range
<b>Age (yr)</b>	7.84 {SD=2.87}	
<5	19 (14%)	1.16-15
5-15	120	
<b>Weight (kg)</b>	20.6	
<15	27 (19%)	6.5-73.5
≥15	112	
<b>2D TTE diameter of ASD (mm)</b>	16.76 {SD=4.94}	
<b>Device sizes (mm)</b>	21.45 {SD=5.56}	
Largest	36	7.5-36
Smallest	7.5	
<b>Complications</b>		
Device embolization	4 (2.8%)	
Dysrhythmia	2 (1.4%)	

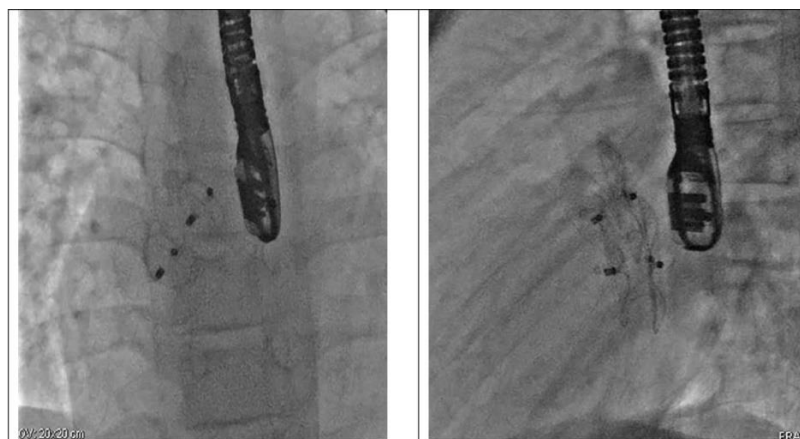


Figure (i): Fluoroscopy, status post implantation, showing two deployed atrial septal occluders

**Complications**

Embolization of device occurred in 4 (2.8%) of patients. In 3 of them, it was noticed immediately after release and retrieved percutaneously by using snare catheter and large sheaths. In one boy, the device was found out dislodging in left atrium, near mitral valve orifice, on recheck echo next day and we immediately referred him to surgeon to retrieve and repair atrial septum.

As per arrhythmia problem, two children were diagnosed with second degree AV block on post op day1. They were clinically fine, and after treating with steroid and aspirin, normal conduction returned after a few days.

All children were followed regularly at post-operative 1month, 3month, 6month and then yearly. Recheck TTE examination and ECG were usually done and there was no child with significant ECG abnormality or residual shunt and device related complications.

## DISCUSSION

In the management of moderate and some large ASD, TCC of ASD has many advantages over open heart surgery. There were also a large number of reported series of successful occlusion of ASD in children with percutaneous device closure technique [3-6]. Du et al., described that percutaneous device closure has lower complication rate, compared to surgical closure[7] According to Newman et al., bypass circulation, which is inevitable in surgical closure of ASD is associated with cognitive dysfunction in later life. In addition, thoracotomy scar can cause psychosocial problems for cosmetic disfiguring [8].

Although surgical closure is already well recognized as a safe procedure and have almost 100% closure rate, it has its own obstacles in poor country like Myanmar. Myanmar has limited facilities and man power of pediatric cardiac surgery. Despite of extra effort of our surgical colleagues, many CHD patients are waiting for surgery. Device closure, on the other hand need less procedural time, rapid recovery and shorter hospital stay. Therefore, like other countries with limited resources, device closure should become treatment of choice in Myanmar.

TCC of ASD is well established as a safe, less time consuming procedure with high success rate and low complication. Butera et al., in 2003 described successful closure of ASD with devices in all 48 of small children less than 5 yrs. Here, we reported a series of 143 children, with successful device closure in 139, which meant 97.2% procedural success rate[9].

Large ASD in small children are also amenable to trans catheter closure and is not associated with greater risk of significant complications [10]. In our study, device  $\geq$  20mm was needed to implant in 95 (68%) of children without higher number of complications. Regarding feasibility of TCC ASD in small children, the smallest kid in our study was 1yr and 2mth girl, body weight 6.5kg, with marked RVVO. Amplatzer Septal Occluder Device 12 mm was successfully implanted, with no complication in successive follow up, supporting that in very small child, TCC of ASD is feasible if clinical indications are warranted.

In 2 children with multiple ASD, we used two different devices to be simultaneously implanted. Although this choice originated from limited stock of devices, it was a unique and beautiful experience to see two devices working very well together in the heart. Figure [i]

In terms of immediate complication, device embolization or malposition was commonest complication in our series, (2.8%), which was consistent with most of other reports [11,12]. As per dysrhythmia, 2 children (1.4%) suffered transient heart block but responded very well to steroids. It was consistent with report by other authors that dysrhythmia complications (either SVT or heart block) are transient and benign, and are well controlled medically or can recover spontaneously [4,13,14].

In our study, mortality was zero. For medium term complications, there was no suspected or proven device erosion or arrhythmic problem so far although successive follow up is mandatory to detect long term complication.

Not only the immediate complication rate which is very low in our study, we believed also that TCC of ASD has its own advantages in long term. The absence of myocardial scar is believed to decrease the incidence of incisional dysrhythmias, such as atrial flutter. Moreover, macro re-entry atrial arrhythmia can also occur around the site of patch closure. In Myanmar, there was no facility for electrophysiological study (EPS) and ablations for pediatric arrhythmia so far. That's why, in considering long term, percutaneous technique is better suited to Myanmar.

## CONCLUSION

Trans catheter closure replaced surgical repair as a treatment of choice for secundum atrial septal defects all over the world. Even in developing country like ours, with limited facilities, the procedure fulfilled it's promise of high implantation success and minimal complications since the very first years of practice. These excellent

results were encouraging us and it was an important step in upgrading health care standard of a developing country like Myanmar.

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**Conflict of Interest:** There is nothing to declare as conflict of interests.

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