

## Clinico-Surgical Outcome of Repair of Isolated Atrial Septal Defect At Care Hospital, Banjara Hills-Hyderabad India, 2004-2006.

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### Introduction

Atrial septal defect (ASD) is the second commonest congenital heart disease accounting for 8% - 13% following ventricular septal defects (1). ASD is classified into three major types which include ostium secundum, ostium primum and sinus venosus. Among all ASDs, ostium secundum account for 70%-80%<sup>1,2</sup>. Small defects, less than 5 mm diameter are asymptomatic and may decrease in size or close spontaneously whereas large defects, 12 mm or more they enlarge further<sup>3,4</sup>. Anita et al<sup>3</sup> when evaluating 52 patients with secundum ASD in the first year of life with a follow-up of 2 – 3 years found that 46% of patients had decrease in the size of ASD with complete closure in 14 patients, 25 % the defects remained the same and 29% enlarged. Similar study was done by Mc Mahon CJ et al<sup>4</sup> when evaluating the natural history of 104 patients with ostium secundum ASD revealed that the defects in 65% of patients increased in size and 4 % had spontaneous closure. The increase in size was attributed to the initial size of the defect rather than age at diagnosis.

Small to moderate ASDs may remain asymptomatic till 4<sup>th</sup> decade of life while large defects may present early in life with heart failure, recurrent respiratory tract infection and failure to thrive<sup>3</sup>. Several studies revealed that surgical closure of ASD at young age have good outcome compared to those done in adults<sup>5,6,7</sup>. Roos-Hesselink et al<sup>5</sup> followed-up 135 patients after surgical closure of ASD to evaluate the long- term outcome results in terms of arrhythmias, pulmonary artery hypertension and left ventricle dysfunction for 21-33 years. It was concluded that ASD closure at young age, less than 11 years have excellent survival and low morbidity than when done at adult age. Similar results were obtained by Murphy JG et al<sup>6</sup> when evaluating early repair of ASD in terms of sinus node dysfunction, atrial flutter or fibrillation, right ventricle dilatation, pulmonary artery hypertension and left ventricle dysfunction. Shah D et al<sup>7</sup> did a comparative study on 72 patients with secundum ASD first diagnosed after the age of 25 years.

The results concluded that there was no difference in survival or symptoms between those treated medically and those who underwent surgical closure. Also, the long-term outcome in terms of arrhythmias, stroke or emboli and heart failure was not improved by surgical closure. Retrospective study was done to evaluate

the clinical presentation and outcome of the surgical closure of isolated ASD at CARE Hospital, Banjara Hills- Hyderabad, India. The aim of this study was to determine the clinical presentation and outcome of the surgical repair of isolated ASD. The Specific objectives were:

1. To determine the prevalence of isolated ASD with respect to age and sex of presentation
2. To determine the clinical presentation in terms of the presenting symptoms.
3. To determine the indications for cardiac catheterization, surgical techniques and indications for patch closure.
4. To determine the outcome of surgical repair of isolated ASD in terms of the duration of ICU stay, duration of mechanical ventilation, duration and type of cardiac supports, development of the atrial fibrillation, development of pulmonary hypertension, residual
5. ASD, hospital stay and mortality. To compare the clinical presentation and surgical outcome with respect to age group.

### Patients and Methods

Retrospective study for two and half years was done from January 2004 to June 2006 at CARE

Hospital, Banjara Hills-Hyderabad India. Study included all patients who underwent surgical closure of the isolated ASD, either by direct suture or patch closure, both sexes and all age groups.

Data were obtained from the Operating Room Registry and Medical Records and included age, sex, duration of symptoms, presenting symptom(s), intra-operative type of the defect, duration of ICU stay, duration of mechanical ventilation, duration and type of cardiac support used, development of atrial fibrillation, pre- and post-operative echocardiography findings, indications for cardiac catheterization where applicable, types of surgical techniques used and indications for patch closure, hospital stay and mortality. Data were analyzed using Epi-info 6 program for statistical significance.

Echocardiography Definitions:

- Pulmonary Hypertension by measuring Right Ventricular Systolic Pressure (RVSP): mild < 45 mmHg, moderate = 45-70mmHg, severe > 70 mmHg.

- Pericardial effusion: Mild (small) effusion- less than 10mm thickness, often localized and usually posterior.
- Moderate effusion-10 to 20mm thickness, anterior and posterior, during diastole completely surrounding the heart.
- Severe effusion- greater than 20mm thickness, swinging heart.

## Results

The study revealed a total of 124 (58.8%) patients with an isolated ASD. The other associated conditions commonly included anomalous pulmonary venous connection, atrio-ventricular canal, pulmonary stenosis, mitral valve disease and ventricular septal defect (Table 1). Females had higher predominance than males and ostium secundum was the commonest type of ASD accounting for 92.7% (Table 2 & 3).

The commonest symptoms included shortness of breath, recurrent respiratory tract infection, failure to thrive and poor feeding in children

**Table 1.** Proportion of Isolated ASD and other associated conditions

Isolated ASD	124 (58.8%)
ASD with Partial Anomalous Pulmonary Venous Connection	27
ASD with Total Anomalous Pulmonary Venous Connection	17
ASD with Partial or Complete Atrio-Ventricular Canal	18
ASD with Pulmonary Stenosis	8
ASD with Mitral Valve Disease	7
ASD with Ventricular Septal Defect	6
ASD with Patent Ductus Arteriosus	2
ASD with Aortic Stenosis	1
ASD with Coronary Artery Disease	1
<b>Total</b>	<b>211</b>

**Table 2.** Proportion of Isolated ASD per age group (years) and sex

Age group/sex	Male	Female	Total (%)
≤1	4	2	6 (4.8)
2 – 5	18	16	34 (27.4)
6 – 10	9	16	25 (20.2)
≥ 11	25	34	59 (47.6)
<b>Total</b>	<b>56 (45.2%)</b>	<b>68 (54.8%)</b>	<b>124 (100)</b>

**Table 3.** Proportion of Intra-operative Type of Isolated ASD

Type	Number (%)
Ostium Secundum ASD	115 (92.7)
Superior Vena Cava (Sinus venosus) ASD	5 (4.0)
Ostium Primum ASD	2 (1.6)
Mixed ASDs	2 (1.6)
<b>Total</b>	<b>124 (100)</b>

**Table 4.** The Proportion of the Commonest Symptoms for Isolated ASD

Symptom	Number (%)
Shortness of breath	79 (63.7)
Recurrent respiratory tract infection	69 (55.6)
Failure to thrive	39 (31.5)
Poor feeding	18 (14.5)
Palpitation	12 (9.7)
Chest pain	8 (6.5)
Febrile convulsion	1 (0.8)
Asymptomatic	13 (10.5)

**Table 5.** The proportion of the pre-operative pulmonary hypertension

Pulmonary hypertension	Number (%)
Mild	18 (14.5)
Moderate	7 (5.6)
Severe	2 (1.6)
<b>Total</b>	<b>27 (21.7)</b>

**Table 6.** Indications for Cardiac Catheterization in isolated ASD

Indication	Number (%)
Inconclusive echocardiography results	3 (2.4)
Severe Pulmonary Hypertension	2 (1.6)
Age above 40	13 (10.5)
Not Applicable	106 (85.5)
<b>Total</b>	<b>124 (100)</b>

**Table 7.** The Surgical Technique used to repair isolated ASD

Type of Technique	Number (%)
Direct suturing	80 (64.5)
Patch closure	44 (35.5)
<b>Total</b>	<b>124 (100)</b>

**Table 8.** Indications for Patch closure

Indication	Number (%)
Friable margins	10 (8.1)
Ill-defined margins	34 (27.4)
Not applicable	80 (64.5)
<b>Total</b>	<b>124 (100)</b>

**Table 9.** The Surgical Out-come of isolated ASD closure

Surgical outcome	Number
Means duration of mechanical ventilation (hours)	5.5 (Std Dev =4.8)
Proportion of the use of Cardiac Support (%)	89 (71.8%)
Type of Cardiac Support used	*NTG alone=56 (62.9%) **NTG+DOB=33 (37.1%)
Means duration of Cardiac Support (hours)	13.04 (Std Dev=9.7)
Development of Pulmonary Hypertension (%)	1 (0.8%)
Development of Atrial Fibrillation (%)	1 (0.8%)
Means duration of ICU stay (days)	1.8 (Std Dev=4.3)
Post-operative pericardial effusion (%)	10 (8.1%)
Post-operative Residual ASD	0 (0.0%)
Means duration of Hospital stay (days)	5.9 (Std Dev=1.9)
Mortality (%)	1 (0.8%)

\* NTG=Sodium Nitroglycerine. \*\* DOB=Dobutamine

**Table 10.** Comparison of clinical and surgical outcome with respect to age group

Feature	≤ 10 years	≥11years	p-value
Means duration of symptoms (months) (Overall mean=43.9)	49.5 (Std Dev.=38.1)	37.9 (Std Dev.=60.5)	p=0.0008
Shortness of breath (%)	37 (46.8)	42 (53.2)	p=0.1004
Recurrent respiratory tract infection (%)	58 (84.1)	11 (15.9)	p=0.0000
Pre-op. Pulmonary Hypertension (%)	9 (33.3)	18 (66.7)	p=0.0253
Means duration of mechanical ventilation (hours)	5.3 (Std Dev.=4.1)	5.8 (Std Dev.=4.3)	p=0.0683
Use of Cardiac Support (N=89)	51.7%	48.3%	p=0.7949
Means duration of cardiac support (hours)	11.4(Std Dev=8.9)	14.8(Std Dev.=10.3)	p=0.0571
<b>Means hospital stay (days)</b>	5.6 (Std Dev.=1.9)	6.3 (Std Dev=2.0)	p=0.0027

Among 124 patients, only 14.5% had cardiac catheterization done for preoperative assessment while the rest were diagnosed by clinical examination and echocardiography only.

Surgical repair for these defects included direct suturing (64.5%) and 0.5% glutaraldehyde treated autologous pericardial patch (35.5%). Pericardial patch closure was applied for defects with friable margins and ill-defined margins including one patient with common atrium.

The surgical outcome for these patients revealed a mean duration of mechanical ventilation of 5.5 hours (Std Dev. = 4.2), 71.8% of all patients were maintained on a post operative cardiac support with a mean duration of 13.0 hours (Std Dev. = 9.7). Commonly used cardiac supports included NTG alone (45.2%) and a combination of NTG and Dobutamine (26.6%). Mean duration of ICU stay was 1.8 days (Std Dev. = 4.3) and mean duration of hospital stay was 5.9 days (Std Dev. = 1.9). Mild to moderate post-operative pericardial effusion was observed in 8.1% of the patients and

this recovered spontaneously. One patient with severe post-operative pulmonary hypertension was managed medically with oral Sildenafil, Milirirone, NTG, Sodium Nitroprusside and Frusemide with good recovery. Mortality rate was 0.8% in this study for one patient who was 45 years old developed atrial fibrillation and low output syndrome on the third post-operative day. The necessary resuscitation measure, cardiac supports and expertise consultation were done but patient died of multiple organs failure on the eleventh post-operative day.

When comparing the clinico-surgical outcome between the age-group 10 or less and above 11 years it was found that there was a significant difference in the means duration of symptoms, 49.5 months (Std Dev.=50.1) vs. 37.9 months (Std Dev.=60) respectively, (p=0.0008), significant proportion of recurrent respiratory tract infection, 84.1% vs. 15.9% respectively(p=0.0000) and significant mean hospital stay 5.6 days (Std Dev.=1.8) vs. 6.3 days (Std Dev.=2) respectively

( $p=0.0027$ ). Clinically the incidence of preoperative pulmonary hypertension was increasing with age although statistically it was not significant (33.3% vs. 66.7% respectively,  $p=0.0253$ ).

### Discussion

The study revealed that females had higher predominance than males and ostium secundum was the commonest type of ASD accounting for 92.7%. Similar results were obtained by the other studies<sup>1,2,8</sup>.

Adult patients presented with palpitation, shortness of breath and chest pain. Anita et al<sup>3</sup> found the similar symptoms.

Cardiac catheterization is only indicated in patients with ASD to evaluate severe pulmonary artery pressure, left heart function and haemodynamics, co-morbid anomalies, coronary artery for patients above 40 years or for percutaneous closure of ostium secundum ASDs<sup>9</sup>. Echocardiography is the primary imaging modality used in the evaluation of ASDs because of its high sensitivity and specificity, low cost and easy accessibility<sup>10</sup>.

The necessary resuscitation measure, cardiac supports and expertise consultation were done but patient died of multiple organs failure on the eleventh post-operative day. The above findings were similar to other studies<sup>8,11,12,13,14,15</sup>.

Clinically the incidence of preoperative pulmonary hypertension was increasing with age although statistically it was not significant (33.3% vs. 66.7% respectively,  $p=0.0253$ ). There was no significant difference between the two groups in terms of mean duration of mechanical ventilation, use of cardiac support, mean duration of cardiac support and ICU stay. Several studies<sup>2,5,6,7,8,13,16,17</sup> concluded that surgical repair of ASD has a good outcome when done during childhood than in adults in terms of atrial fibrillation, thrombo-embolic phenomena, left ventricle systolic function, degree of mitral and tricuspid valve regurgitation.

### Conclusion

- Children with a significant ASD lesion present with shortness of breath, recurrent respiratory tract infection, failure to thrive and poor feeding compared to palpitation,

shortness of breath and chest pain in adults.

- Diagnosis of ASD is mainly done by clinical examination and echocardiography.
- Clinically the incidence of pulmonary hypertension increases with age in patient with ASD and therefore early repair is advised for good outcome.

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