Prevalence and Correlation of Factors Affecting Outcome Of Atrial Septal Defect In Saudi Children

Rana A Eisa[1] ,Wafa Elfaki [2], Ayad CE[4], Balla EA[4,] Mohammed H Alghamdi [2, 3]

[1] College of Applied Studies and Community Services, King Saud University, KSA

[2] King Fahad Cardiac Centre, King Saud University, KSA

[3] College of Medicine, King Saud University, KSA

[4] College of Medical Radiological Sciences, Sudan University of Science & Technology, Sudan.

Rana Abd Almugeeth Eisa (**Corresponding Author**)

College Of Applied Studies And Community Services, Health Sciences Department & College Of Applied Medical Sciences Department Of Radiological Sciences, King Saud University- KSA

Phone Number: 00966508301309

PO Box:2454 -- 11451

E-mail: rana.eisa@gmail.com

Abstract

BACKGROUND:

Knowledge regarding the natural course of ASD is important in considering the optimal timing closure. Early intervention may forestall the possible spontaneous closure. Evaluation of the factors affecting natural course of ASD closure may help improved repair at an optimal time.

AIM:

To assess the prevalence of isolated ASD and to identify variables that correlates with ASD spontaneous closure.

METHODS:

We reviewed all children with isolated ASD. Measurements regarding ASD size, number and location were obtained. Patients with any additional hemodynamically significant heart defects were excluded.

RESULTS:

Total 84 patients with 45(53.6%) females. 78(92.9%) patients had single ASD while 6(7.1%) more than one. The ASD diameter at diagnosis was ≤3mm in 28.6 %, 3-5mm in 34.5%, 5-8mm in 17.9 %, and >8mm in 19 % of cases. 19.7% of ASD showed spontaneous closure while 47% decreased to a diameter of ≤3mm. ASD size gets enlarged in 4(6.1%). 18(27.3%) of patients needed either device or surgical closure. Logistic regression analysis revealed ASD size and age at diagnosis as independent predictors of spontaneous closure or regression to ≤3mm. Female gender was having an advantage of spontaneous closure.

CONCLUSIONS:

In the present study of children with ASD, 19.7 % showed spontaneous closure while 47% showed regression to ≤ 3mm. Initial ASD size was the main predictor of spontaneous closure followed by body weight and female gender.

Key words: atrial septal defects, spontaneous closure, predictors of ASD closure.

INTRODUCTION:

Atrial septal defect (ASD) is among the most common types of congenital heart disease(CHD);with reported incidence of 1.8%(Zhao OM et al 2013). Small defects can bear minor hemodynamic derangements while a large defects, it may progress to irreversible pulmonary hypertension, heart failure, or arrhythmias if left untreated.(Bassard M et al, 1993; Saxena Al et al,2005). Rate of closure ranges from 9 to 50%(Dickinson DF et al, 1981; Demir T et al, 2008). Depending on the baseline conditions, very small defects of <3 mm size are likely to be closed in 100 % of infants (RadzikD etal ,1993). While large ASD >10 mm rarely close due to the increased left to right shunting (Saito T et al, 2012;Fiszer R et al,2012). Little is known about ASD natural history in different subgroups of ethnicity, race and gender by what age ASDs get close, what is the safe waiting period to postpone catheter or surgical intervention. Its mandatory to evaluate the effect of various baseline variables which can affect the spontaneous closure of the ASD like gender, age, growth, and the initial size of the ASD (Senocak F ,1996).The echocardiography (echo) spatial resolution assists incomprehensive evaluation of ASD and associated cardiac pathology. A quantification of shunt flow and chamber size can be easily accomplished by echo which provides an objective means of follow up for these patients. Finally, echo can be used to guide percutaneous closure of ASD, providing an important avenue for minimally invasive intervention. Echo is currently the basis for the initial diagnosis and appropriate follow up and management of ASD.

Settings and Design:

  Present study is a cross sectional retrospective prospective study conducted King Fahd Cardiac Center at King Saud University; Kingdom of Saudi Arabia. We reviewed our electronic data and identified all children referred for echo and were found to have isolated ASD. All of their echocardiographic studies were reviewed by one reader (RE). Measurements regarding ASD size, number and location during serial follow up were obtained. Patients with any additional hemodynamically significant CHD were excluded.

Study Population:

  All neonates, infants and older children, either gender male and female, ages from 1 day to 15 years old, who were referred to the Pediatric Cardiology Unit.

Data Collection Sheet Contents:

  Data collection sheet include patient age, gender, weight, height, age at diagnosis, the presence or absence of known syndrome, the Presence or absence of heart murmur. Comprehensive and detailed echo including 2-dimensional, M-mode, and color-coded Doppler were performed in all patients. The ASD diameter was measured from standard subcostal views and the largest diameter during the cardiac cycle was measured.

Echocardiographic examination findings that were assessed include the following; ASD types, sizes, numbers, shunt direction, right atrium and ventricle sizes either normal, mildly, moderately or severely dilated. The outcomes including spontaneous closure, spontaneously getting smaller to $\leq$ 3mm, needing device closure, or surgical closure and associated other cardiac anomalies were assessed.

Statistical Analysis:

Statistical analyses were performed with SPSS software (version 21 SPSS, Chicago, IL). Continuous variables are summarized as mean$\pm$ SD and categorical data as percentages. Pearson's correlation and Logistic regression analysis was used to see the factors affecting or correlating with the outcome. Logistic regression analysis was performed to assess simultaneously the effect of several potential predictors of the natural course of ASD. ASD diameter, number and type at diagnosis, age at diagnosis, weight, height, body surface area, gender, and observation time were used as independent variables and while spontaneous closure, decrease in the diameter, increase in the diameter, needing

catheter or surgical closure, was taken as dependent variable. Results are presented as odds ratios (ORs) and 95% confidence intervals (CIs). P values of <.05 were considered significant.

1. RESULTS:

Table 1. shows the socio-demographics of the study population. Total of 84 patients, 45(53.6%) were female. 15 (17.9%) had Down's syndrome while 1 (1.2%) had Turner syndrome. The age at the diagnosis was 5.18+3.5 months. At the diagnosis, ASD mean size was 5.2+3.0 mm, the average weight was 10.6+7.8 kg, the average height was 78.7+26.2 cm. The age at spontaneous closure of ASD was 39.4+78.4 days.54 (64.3%) had heart murmur. 79(92%) of patients had secundum ASD type and78 (92.9%) had single ASD.

Table2. Shows the percentage of the patients with different size of ASD. The size of ASD was<3mm in 24(28.6%) , 3-5 mm in 29(34.5%) . 5-8mm in 15 (17.9%). And >8 in 16(19%) of patients.

ASD defects which ended by spontaneous closure had small size at diagnosis of 3.9+1.1 mm, while ASD defects that become larger had a large size at diagnosis of 7.75+1.5 mm. ASD defects which needed device or surgical closure the ASD size at diagnosis was 8.5+2.6 mm.(p<0.05).

The Children with ASD defects ended by spontaneous closure has gained more weight (10.5+9.8 kg) than those in which ASD defects did not close or even got larger (8.8+4 kg) in subsequent follow up. 74 (88 %) of our patients were asymptomatic from cardio-respiratory point of view while 10 (12%) patients has either recurrent chest infection or symptom of heart failure.

Table3. Shows the outcome of ASD. 13(19.7%) patients showed spontaneous closure , 31(47%) showed regression of ASD size to $\leqslant$ 3 mm but not a complete closure and 4 (6.1%) patients showed increase in ASD size.

18 (21.4%) patients required ASD intervention either ASD device closure in 10 (15.2%) patients or surgical repair in 8(12.1%) patients.

Table4. shows the ASD closure pattern. Female gender was associated with more favorable outcome with greater number 12(38.7%) female patients had spontaneous closure or regression of ASD to $\leqslant$ 3 mm in comparison to 6(46.2%) male patients.

Children with Downs syndrome had less

DISCUSSION:

ASD are quite frequent congenital anomaly and which can present with symptoms of heart failure (Bostan OM et al ,2007; Oskit EM et al ,1993).The natural cours e of ASD closure varies from patients to patient. ASD often closes spontaneously (da silva VM et al ,2007;Chang HK et al , 2011) ,but some times the size increases with growth of the patient (Kharouf R et al, 2011; Nawal Azhari e tal, 2004).

84 patients were included in the present study their findings and all investigations were included in the results however some patients lost follow-up and their outcome could not be included. The data in the outcome is for 66 patients only.

In the present study we found a significant relationship between the initial size of ASD and the initial age at the time of diagnosis. Larger ASDs were present in older children while younger children had smaller ASD size. 19 % of patients showed an increase in ASD size which is likely related to proportionate increase in heart size and ASD wall stretching due to more dilatation of the right atrium. This finding was more than what had been reported in other studies which found only in 6.6% of patients in which ASD size increase with time(Lee C et al, 2014; Hansilk Al et al, 2006). In our study, almost half of the patients showed regression of the size of ASD size and one fifth had spontaneous ASD closure. The spontaneous closure in our study is less compared to previous studies in which even 90%of ASD ended by spontaneous closure (Helgason H et al,1999). These findings could be due to

difference in the base line characteristics of different studies. Majority of our patients 88% were asymptomatic from cardio-respiratory point of view while only smaller number had presented with recurrent pulmonary infection and symptoms of heart failure which correlates with previously reported data (Lee C et al, 2014).

We found an unfavorable effect of low body weight on the spontaneous ASD closure. However, it is difficult to determine if the low weight gain is what leads to less chance of spontaneous ASD closure or if the large ASD is what causes these children to gain less weight.

Other factor that influenced the incidence of spontaneous ASD closure was the gender. Both spontaneous closure of ASD and regression in ASD was noted more in females. Our study population is small and such gender difference of ASD natural outcome can't be clearly determined. Children with Downs's syndrome showed less chance of spontaneous ASD closures which is agreement with previously published reports.

2. ACKNOWLEDGEMENT:

3. CONCLUSION:

The present study agreed with previously published report which reveals that patients with small ASD of 3 mm or less will close spontaneously. Patients with moderate ASD who shows tendency of regression can be followed periodically and can be given longer time before intervention. Larger defects >8 mm never closes and very likely to need either catheter or surgical intervention. Down syndrome and may be male gender are associated with less chance of spontaneous ASD closure. On the basis of this information, parents can be informed about the prognosis for their child's disease. Considerations regarding the timing of elective closure for clinically asymptomatic children must take into account the probability of spontaneous closure.

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Tables

Table 1.showing the demographic characteristics of study population.

variables	All	Spontan.closure	regressed	Need intervention	Became large
Age at diag (months)	5.18+3.5	22.7+34.8	20+26.3		48.1+25.4
Height cm	78.7+26.2	74.7+26.1	77.6+19	91.8+34.2	75.5+1.5
Weight kg	10.6+7.8	10.5+9.8	9.7+5.7	14.5+10.7	8.8+4
ASD size	5.16+3.03	3.9+1.1	3.8+1.3	8.5+2.6	7.75+1.5
Age at closure(m)	5.18+ 3.5	5.18+ 3.5	Not closed	Not closed	Not closed
Gender female/males	45(53.6%)/ 39(46.6%)	7(53.8%)/ 6(46.2%)	19(61.3%) 12(38.7%)		

Table 2 . ASD size at the time of diagnosis.

category	Number of patients	percentage
≤ 3mm	24	28.6%
3-5mm	29	34.5%
5-8mm	15	17.9%
>8 mm	16	19%

Table 3. Outcome of ASD.

Outcome	Number of patients	Percentage
Spontaneous Closure	13	19.7%
Regressed	31	47%
Needed device closure	10	15.2%
Needed surgical closure	8	12.1%
Increased in size	6	6.1%

Table 4. Association of gender and ASD with outcome

OUTCOME	FEMALES	MALES
Spontaneous Closure	7(53.8%)	6 (46.2%)
Regressed	19 (61.3%)	12 (38.7%)
Needed device closure	4 (40%)	6 (60%)
Needed surgical closure	3(37.5%)	5(62.5%)
Increased in size	4(100%)	0(0)