Assessment of the Results of Secundum Atrial Septal Defect Closure by Two Methods: Surgery (Right Thoracotomy) and Intervention (Transcatheter Amplatzer Septal Occluder)

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Abstract

Background- Secondary atrial septal defect is one of the most common congenital heart diseases, and treatment is required in cases of large defects. The aim of this study was to assess the short-term results of secundum atrial septal defect closure by two methods: surgery (right thoracotomy) and intervention (transcatheter Amplatzer septal occluder).

Methods- This is a descriptive study on 25 patients treated by one of the two above-mentioned methods at our center between 2004 and 2007. The patients underwent clinical and diagnostic examinations both before and after treatment such as chest X-ray, electrocardiography, echocardiography, catheterization, and angiography. The outcome and results were thereafter assessed and compared.

Results- The study population was comprised of 20 (80%) females and 5 (20%) males. The patients were divided into two groups: 17 (68%) patients were treated by intervention and 8 (32%) by right thoracotomy. The intervention group had a mean age of 12 years (±6years) and the surgery group 11 years (±4 years). The average size of the defect was approximately 15 mm, which was similar in both groups. The average duration of hospital stay in the intervention group was significantly shorter than that of the surgery group, and the average cost of treatment in the intervention group was slightly less than the surgery group. One of the patients in the surgery group needed blood transfusion, and one of the patients in the intervention group suffered from Amplatzer embolization to the left ventricle, necessitating the extraction of the device through open heart surgery. One of the patients in the surgery group had a residual defect in the atrial septum, which was not significant.

Conclusion- In light of the results of this study, it seems that in appropriately selected patients, the closure of the atrial septal defect via the interventional method is comparable to surgery ***(Iranian Heart Journal 2010; 11 (2):55-58).***

Key words: secundum atrial septal defect ■ amplatzer septal occluder ■ thoracotomy

Secundum atrial septal defect (ASD_2) is a congenital anomaly which accounts for about 6-10% of all congenital cardiac anomalies.[1,2] Small interatrial defects are clinically asymptomatic and may not cause any problem for the patient.

Received Apr. 2, 2009; Accepted for publication Jun. 23, 2010
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complications even in childhood such as heart failure, pulmonary hypertension, endocarditis, and thromboembolic events.[1, 2]

With respect to the above-mentioned instances, atrial septal defect closure is necessary in patients who have a pulmonary-to-systemic blood flow ratio of more than 1.5.[1, 2]

The standard conventional procedure for ASD_2 repair is surgery, and one of its newer types is right lateral thoracotomy. However, in contrast to its merits,[3] this approach may be associated with complications such as post-pericardiotomy syndrome, early or late supraventricular arrhythmias,[4] impaired breast development in prepubescent female patients,[5] and phrenic nerve damage.[6] For this reason, transcatheter ASD_2 closure by occluder devices such as the Amplatzer septal occluder was introduced in1976.[7, 8]

Catheter occlusion of atrial septal defects has its roots in 1950s, with early devices being implanted during closed heart surgery.[9]

Methods

This descriptive study was conducted on 25 patients who were treated via one of the aforementioned procedures at our center between 2004 and 2007.

The patients underwent clinical and diagnostic studies such as chest radiography (CXR), electrocardiography (ECG), echocardiography, catheterization, and angiography before treatment. The patients were assessed again for changes in clinical symptoms and signs, CXR, ECG, and also for residual defect and shunt by echocardiography and for any treatment complications, hospital stay duration, and treatment cost after therapy. The final results were analyzed by SPSS11. A p value <0.05 was considered meaningful statistically.

Results

The study population comprised 20 (80%) females and 5 (20%) males. In addition, 17 (68%) patients were treated by intervention and 8 (32%) by right thoracotomy. The average time of hospital stay in the intervention group was shorter than that of the surgery group, with the difference being statistically significant. The average cost of treatment in the intervention group was somewhat less than that of the surgery group (Table I).

With regard to the procedure, there were some notable complications: 1 (12.5%) of the 8 patients in the surgery group needed blood transfusion and 1 (5.8%) of the 17 patients in the intervention group suffered from Amplatzer embolization to the left ventricle, leading to the device being extracted via open heart surgery. Additionally, 1 (12.5%) of the patients of the surgery group had a residual defect in the atrial septum, which was not significant. None of the patients in either group had side effects such as heart block, endocarditis, thromboembolic events, or pulmonary infection.

Table I. Assessed parameters according to treatment procedure

Parameter	Treatment Procedure	N	Mean	Std. Deviation	P
Cost / Rial	Operation	8	34914719.38	17524504.27	.194
	Intervention	16	27423752.06	10088957.93	
Hospital Stay Duration	Operation	8	16.63	3.92	.000
	Intervention	17	6.41	2.23	
Age	Operation	8	10.88	3.83	.637
	Intervention	17	12.06	6.43	
Defect Diameter	Operation	8	15.25	5.06	.971
	Intervention	17	15.18	4.59	
PA Pressure	Operation	8	12.63	19.10	.799
	Intervention	14	21.50	15.72	
PA Resistant	Operation	8	2.23	.87	.353
	Intervention	12	1.92	.58	
QP/QS	Operation	8	2.17	.49	.981
	Intervention	17	2.16	1.04	

Discussion

This study was performed on 25 patients, consisting of 20 (80%) females and 5 (20%) males, similar to that in the references.[1, 2]

In our study, 17 patients were treated by interventional procedure and their mean age was 12 years old, which chimes in with the study of Berger et al.[10] In the present study, the average size of the interatrial defect was 15mm, akin to the Tanopolous et al. study in Greece. None of our patients had residual defects, which is in line with the Greece study, but the mean age of our patients (12 yr) was more than that in the Greece study (9.2 yr).[11]

The average hospital stay duration in the interventional group and surgery group was 6.4 days and 16.6 days, respectively, which was significantly more than that reported by European and Australian centers.[10,12]

In one of our patients, the occluder device was embolized into the left ventricle; a similar incident was reported by Berger in Germany.[10]

In our study, the treatment cost in the surgical group was slightly more than that of the interventional group, and this is consistent with the Hughes et al. study in Australia.[12]

In contrast to the patients of the surgery group, the patients in the intervention group did not need blood products, analgesics, or tranquilizers after the treatment procedure.[12]

Because there was no need for deep sedation in the interventional procedure, the time for complete recovery and return to usual activity was much shorter than that required in the surgery group.[12] The other benefit of the interventional procedure was that there was no need for sternotomy and cardiopulmonary bypass.

Conclusion

The results of this study show that both interventional and surgical procedures for the closure of ASD_2 are successful, but hospital stay duration in the interventional procedure is significantly less than that in the surgical one; consequently, fewer psychic and somatic disturbances and less financial cost are imposed upon the patient and the patient's family. In conclusion, in the presence of expert practitioners with convenient facilities and appropriate case selection, the interventional procedure for ASD_2 closure is safe and effective and comparable with the surgical procedure.[13, 14]

Conflict of Interest

No conflicts of interest have been claimed by the authors.

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