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Discrete Subaortic Stenosis: Surgical Outcome (2016-2022)

Amjed Abdulridha Ahmed Alhilo MBChB, FICMS

dramjed72@yahoo.com

Kassem Mohammed Zaier MBChB, FICMS

Jalal Jaafar Abdulhussein MBChB, FICMS

Abstract

Background:

Discrete subaortic stenosis is a dynamic and presumably gained cardiac anomaly in which the left ventricular outflow tract is impeded by a subvalvular fibromucular band. This condition may occur as an isolated defect or be associated with other anomalies. Discrete subaortic stenosis remains a surgical challenge for the comparatively high prevalence of relapse of stenosis or evolution to aortic regurgitation.

Objective:

To review surgical outcome in discrete subaortic stenosis and evaluate of additional risk of associated anomalies in surgical outcome.

Methods:

Thirty-seven patients (16 males and 21 females) underwent surgical resection of subaortic membrane. Their data were collected and retrospectively studied from 1st of January 1999 to 1st of November 2017 at Ibn-Alnafees Teaching hospital for cardiothoracic surgery in Baghdad, Iraq. We divided the patients into two groups, group A: included eight patients who had isolated subaortic membrane and group B: included 29 patients who had associated anomalies. A comparison was made between the two groups according to preoperative variables and postoperative morbidity and mortality.

Results:

Postoperative mitral valve injury, iatrogenic ventricular septal defect,residual subaortic stenosis and aortic valve injury were not observed in any patient. Post-operative complete heart blockwasseen in one patient only belong to group B (3.45%). Tachyarrhythmia post

repair was founded intwo patients in group B (6.89%) versus no any patient in group A. There was no operative death, the mortality was (0%) in both groups.

Conclusion:

Surgical outcome of resection subaortic membrane is excellent in early term with low morbidity and mortality whether it was isolated lesion or associated with other anomalies.

Keywords: Associated anomalies, Aortic valve regurgitation, Subaortic stenosis Tachyarrhythmia, Reoperation.

Introduction

Discrete subaortic stenosis is a type of settled subaortic impediment in which fibrous membrane is situated beneath the aortic valve[1,2]. Trendy around half of the cases subaortic stenosis happens in isolation, in spite of the fact that it tends to be related with other heart condition for example coarctation of the aorta, persistent left superior vena cava, ventricular septal defect, bicuspid aortic valve, patent ductus arteriosus, abnormal left ventricular papillary muscle, and atrioventricular septal defect[3,4]. Subaortic stenosis is by all accounts gained as it has just infrequently been accounted for in neonates and has been analyzed after past documentation of an "ordinary" left ventricular outflow tract[5,6]. Subaortic stenosis may likewise cause aortic valve incompetence through fierce blood stream bringing about scarring and prolapse of the valve, or on the other hand coordinate augmentation of subaortic tissue onto the valve[12,13]]. A high frequency of infective endocarditis has been beforehand revealed[5,14].

Surgery is the typical treatment, indications for it are pressure gradient across stenosis of 25 mmHg or more, present of aortic valve regurgitation, when associated with other anomalies and an abnormal stress test'[15] Surgical procedure must be gone for the expulsion of all structures causing stream choppiness in the left ventricular outflow tract with a specific end goal to decrease the occurrence of inconveniences[16]. Surgical resection of subaortic stenosis has generally brought about palatable alleviation of left ventricular outflow tract obstruction and a lessened frequency of infective endocarditis. Lamentably the evolution of aortic valve incompetence may not be captured by surgical resection of subaortic stenosis[3,17].Although membranectomy, with or without septal myotomy or myectomy, has been the acknowledged technique for treating settled subaortic stenosis, there are still contentions concerning operative strategies and vulnerabilities concerning the repeat of subaortic obstacle and the advancement of aortic incompetence after repair[6,18]. Surgical procedure for subaortic stenosis conveys a generally safe of mortality albeit perceived morbidities incorporate complete heart block, harm to the aortic or mitral valves, and in addition the production of a ventriculoseptal defect, likewise a recurrence rate of 7-27% has been accounted for in different arrangement[2,17].

The aim of the current study is to review the surgical outcome in discrete subaortic stenosis and assess the impact of associated anomalies on the results.

Methods

Thirty-seven patients median age was 14.32years range from 2 to 22 years (16 males and 21 females) underwent surgical resection of subaortic membrane. Their data were collected and retrospectively studied from 1st of January 1999 to 1st of November 2017 at Ibn-Alnafees teaching hospital for cardiothoracic surgery in Baghdad, Iraq.Most cases were referred from the department of pediatric, cardiology unit to cardiac surgery unit and all patients were evaluated by pediatric cardiology preoperative and postoperative. Electrocardiography, chest x-ray and transthoracic echocardiography were applied to all patients, the mean pressure gradient was 75.34 mm/Hg. Eight patients had isolated subaortic membrane and 29 patients had associated anomalies, 11 of the 29 patients had ventricular septal defects (VSD), seven patients had VSD and patent ductus arteriosus (PDA), eight patients had PDA, two patients had coarctation of aorta and one patient had tetralogy of Fallot. Twenty-five patients had aortic valve regurgitation (AR). Cardiac catheterization was needed in those 25 patients to qualify aortic valve incompetence which was mild in 17 patients, moderate in 7 and severe in one patient. Two patients who had associated coarctation of aorta underwent balloon angioplasty and one patient who had associated PDA underwent closure by occluder.

Surgery was done through classical median sternotomy, and classical cardiopulmonary bypass with antegrade cardioplegia. The surgical procedure for subaortic membrane was membranectomy and deep myectomy. Intraoperative direct pressure recording or transesophageal echocardiograph were not employed. In 35 patients, surgical resection of subaortic membrane was performed by transaortic approach and in two patients the resection thought VSD by transatrial approach. Seven patients underwent aortic valve repair and only one patient underwent aortic valve replacement. All associated anomalies were repaired. There was no reoperation for any patient. All cases assessed postoperatively by transthoracic echocardiography in early postoperative period and before discharge. We divide the patients into two groups, group A: included eight patients who had isolated subaortic membrane and group B: included 29 patients who had associated anomalies. Aortic valve regurgitation was not included as an associated anomaly. A comparison was created between two groups according to mean body weight, mean surface area, mean preoperative pressure gradient, aortic cross clamp, cardiopulmonary bypass time, intubation time, full inotropic support time, intensive care unit stay, postoperative morbidity and mortality.

The SPSS (statistical package for the social sciences) program version 22 was used for authentic examination. The results were imparted by mean and standard deviation for tenacious components or with repeat and rate for total variables. Individual Chi square test

was used for relationship and assessing association. P-values under 0.05 were idea to be quantifiably immense.

Results

Common age group was 16-20 years (50%) in group A versus group B 2-10 years (44.83%). Median age was 20.87 years in group A versus 9.72 years in group B. Females to male ratio was 1.3:1, where female was common gender (56.76%), (Table 1).

Mean body weight was higher in group A than in group B (57.6 versus10.66 kg), mean body surface area was also higher in group A than in group B (1.49 versus 0.97 m^2). Mean preoperative pressure gradient was higher in group A than in group B (98 mmHg versus 57 mmHg). Mean aortic cross clamp time was less in group A than in group B (15 versus 55.9 min), mean cardiopulmonary bypass time was also less in group A than in group B (28 versus 78.9 min). Mean intubation time was less in group A than in group B (4.8 versus 5.7 hour), mean intensive care unit stay was less in group A than in group B (2 versus 2.3 days), mean time needed for full inotropic support was 0.98 day in group B, no such need was found in group A, (Table 2).

There was no intra-operative death, the morality was (0%) in both groups. Postoperative mitral valve injury, iatrogenic VSD,residual subaortic stenosis and aortic valve injury were not observed in any patient in this present study. Post-operative complete heart block was seen in one patient in group B (3.45%) versus (0%) in group A.Tachyarrhythmia post repair founded intwo patients in group B (6.89%) versus no any patient in group A. Postoperative acute renal failure and bleeding were noticed in one (3.45%) and three patients (10.34%), respectively in group B versus no such observation in group A.Pericardial effusion, respiratory tract infection and wound infection, all were seen in both groups postoperatively without significant difference in their incidence, (Table 3).

Pre-operative AR was present in 25 patients (67.56%), eight patients in group A (100%) versus 17 patients in group B (58.62%), (Table 4).

Table 1: Age and sex of patients.

Variable	Group A	Group B	Total	%	P-Value
Age (Years)					
2-5	0 (0%)	9 (31.03%)	9	24.32	0.07
6-10	0 (0%)	13 (44.83%)	13	35.14	0.018
11-15	1 (12.5%)	6 (20.69%)	7	18.92	0.20
16-20	4 (50%)	1 (3.45%)	5	13.51	0.0006
21-22	3 (37.5%)	0 (0%)	3	8.11	0.0005
Total	8 (100%)	29 (100%)	37	100	
Gender					
Female	5 (62.5%)	16 (55.17%)	21	56.76	0.37
Male	3 (37.5%)	13 (44.83%)	16	43.24	0.71
Total	8 (100%)	29 (100%)	37	100	

Table 2: Mean values of variables of groups A and B.

Variable	Group A	Group B	Average	P-value
Body weight (kg)	57.6	10.66	34.13	0.32
Body surface area (m^2)	1.49	0.97	1.23	0.47
Aortic cross clamp time (min)	15	55.9	35.45	0,35
Cardiopulmonary bypass time (min)	28	78.9	53.45	0.49
Intubation time (hr.)	4.8	5.7	5.25	0.86
Intensive care unit stay (day)	2	2.3	2.15	0.93
Preoperative pressure gradient	98	57	77.5	0.65
Need full inotropic support time (day)	0	0.98	0.49	0.14

Table 3: Comparison between two groups according to morbidity and mortality after surgery.

Variable	Group A	Group B	Total	%	P-value
Pericardial effusion	1(12.5%)	5(17.24%)	6	16.21	
Tachyarrhythmia	0(0%)	2(6.89%)	2	5.40	
Respiratory tract infection	1(12.5%)	4(13.79%)	5	13.51	
Wound infection	4(50%)	16(55.17%)	20	54.05	0.79
Post-operative heart block	0(0%)	1(3.45%)	1	2.70	0.59

Table 4: Preoperative aortic valve regurgitation in the two groups.

Preoperative AR	Group A	Group B	Total	%	P-value
Mild AR	2 (25%)	15 (51.72%)	17	45.95	0.1
Moderate AR	5 (62.5%)	2 (6.89%)	7	18.92	0.0003
Severe AR	1 (12.5%)	0 (0%)	1	2.70	0.05
Total	8 (100%)	17 (58.62%)	25	67.56	0.021

Discussion

The sample size was somewhat equivalent to a similar study done by Darcin and colleagues in 2003, (37 vs 21 pt) with longer duration of study in our institution and younger patients (although the mean age was nearly the same : 14.3 vs 12.6) due to the fact that the majority of cases were referred by pediatric cardiology department .

Another reason for choosing this study to compare our results with , it was conducted in a single institution so the surgical outcome and experience can be judged without interferenc.[17] In the present study, the age of patients with discrete subaortic stenosis (group A) was tending to be older than patients who had associated anomalies (group B) it reflected that patients with isolated subaortic membrane became symptomatic later on in adulthood period while patients

who had associated anomalies presented earlier due to clinical picture of associated anomalies[3,4]. Subaortic stenosis is twice as common in males[7,8]. In the present study, females to male ratio was 1.3:1, which was opposite to international studies and this discrepancy may due to high female percentage in our community according to national statistical data . this was supported by Darcin and collegues study where M:F ratio was 1.3:1.

weight and body surface area tended to be higher than group B and also this late presentation was showed higher preoperative pressure gradient which reflect that subaortic stenosis was a progressive disease.Aortic cross clamp time and cardiopulmonary bypass time were less in group A which means that resection ofsubaortic membrane was not difficult technique and does not need much time where more time needed to repair associated anomalies. In the present study, there was a strong associated of subaortic stenosis with aortic valve regurgitation (AR) (67.56%) of all cases and (100%) in group A, which reflected evolution of AR with time and indicate that early surgery is recommended even with mild AR to safe aortic valve where seven patients had moderate AR needed concurrent aortic valve repair and one patient had severe AR who necessitated aortic valve replacement this was comparable to Darcin's study , where 15 out of 21 patient had AR (70%)[17]

In present study, mortality and significant complications mitral valve injury**,** residual subaortic stenosis**,** iatrogenic VSD and aortic valve injury were zero in both groups which reflect safety and practicably of membranectomy and deep myectomy in isolated subaortic membrane or when other associated anomalies were present. Post-operative complete heart block, tachyarrhythmia, acute renal failure and bleeding were observed in group B only which reflect that they were complication of repair of the associated anomalies. Pericardial effusion, respiratory tract infection and wound infection were seen postoperatively in both groups without significant different in their incidence where wound infection was common post-operative complication (54.05%) , while the complications related to Darcins study was totally different , only 2 cases os residual gradient , on longterm follow up who required reoperation .

Increased incidence of surgical site infections may be explained by rush in preparing the patients due to emergency presentation , or deficient nutritional support .

Mean of intubation time, intensive care unit stay and the need for full inotropic support time were much higher in group B than group A which reflect the morbidity was founded due to associate anomalies[2,16].

This study is limited because of short term follow up. Longer follow up is needed to determine the need of reoperation which was improved to be high by other studies abroad (mean follow up duration was 40 months in Darcin's and colleagues study which is fair enough to assess long term complications regarding this subject)

In conclusion; Surgical outcome of resection of subaortic membrane is excellent in early term with low morbidity and mortality and there was no impact of associated anomalies in result. Resection of subaortic membrane must be indicated if mild aortic valve regurgitation observe to preserve aortic valve by prevent progression of aortic valve damage.

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