Original Article

# Review Of surgery of VSD in Ibn Al-Nafees Teaching Hospital

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*Abstract:*

**Background:** Ventricular septal defect (VSD) is the most commonly recognized congenital heart defect. Isolated VSDs represent about 20-30% of all congenital cardiac malformations and have a prevalence of 1- 2 % per 1,000 live births.

**Objective:** This study is planned to review the outcome of surgical closure of VSD at Ibn Al-Nafees Teaching Hospital (Department Cardiac Surgery) Baghdad/Iraq.

**Patients and methods:** This study includes 50 cases of VSD both isolated and VSD associated with other congenital malformations admitted and underwent surgical repair of age range between 3 to 28 years and weight range between 9 to 80 kg. Different type of VSD, were found and repaired whether isolated or with other associated congenital anomalies which dealt with at the same time.

**Results:** The following VSD types were found: 40 peri- membranous 80%, 3 outlet 6%, 5 inlet 10% and 2 muscular 4%. Additional surgery were 3 pulmonary valvotomy 6%, 3 right ventricular outflow patch 6%, 7 closure of atrial septal defect 14%, 2 excision of subaortic ridge 4% and 2 aortic valve replacement 4%. One patient required reoperation for bleeding. Four patients had complete heart block that required temporary pacemaker. Over all operative mortality were two cases (4%), median postoperative hospital length stay was 7 days (range 5-18 days).

**Conclusions:** Surgical closure of VSD is a safe and effective therapy in isolated VSD or VSD with other malformations and reoperation is minimal. Other cardiac malformations can be repaired at the same time with the closure of VSD with good results and very minimal complications.

**Key wards:** Ventricular septal defect, pulmonary hypertention, cardio- pulmonary bypass.

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## Introduction:

A ventricular septal defect (VSD) is a hole between left and right ventricle.(1) It may occur as an isolated anomaly or with a wide variety of intracardiac anomalies such as Tetralogy of Fallot, transposition of great arteries, patent ductus arteriosus, atrial septal defect (ASD) and coartication of aorta.(2) Knowledge about surgery of VSD is important for most congenital heart diseases; isolated VSDs represent about 20-30% of all congenital cardiac malformations and have a prevalence of 1 to 2 per 1000 live birth.(3) The first VSD closure was performed in 1954 by Lillehei and associates at the University of Minnesota, using controlled cross-circulation between the child and parent.(4) In 1955 Kirklin and associates at the Mayo Clinic closed VSD using heart-lung machine.(5) In 1958 transatrial VSD closure was performed.(6) The current techniques of hypothermia and cardiopulmonary bypass were first reported in the 1970s. (7,8) Since then improvements in surgical repair including improved techniques of cardiopulmonary bypass, myocardial preservation, anesthesia, and postoperative care have greatly reduced operative mortality.(9).

Anatomically, there are 4 types of VSD; peri-membranous, inlet, outlet and muscular VSD. A useful classification of VSDs was initially developed in 1980 by Soto and associates. (10) Percutaneous transcatheter closure of muscular VSDs with occluding devices is another approach for patients with apical VSDs or multiple muscular VSDs. (11).

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## Patients and methods:

This is a retrospective study of patients with VSD who had surgical repair from March 2008 to August 2011 at Ibn Al-Nafees Teaching Hospital for Cardiothoracic Surgery.

The medical records of patients with VSDs (isolated and VSD with others cardiac anomalies) who were admitted to Ibn Al-Nafees Hospital during the period of study were reviewed to retrieve data relevant to ages, sex, body weight, body surface area and management of these patients were recorded.

The diagnostic techniques employed in these patients are reviewed including chest x-ray echocardiography and cardiac catheterization.

The method of surgical repair offered to every patient is noted, including surgical approach (trans- atrial, trans-ventricular, trans aortic, and trans- pulmonary), and the technique of surgical repair (direct closure, and closure by patch). The use of interrupted or continuous sutures and use of primary versus patch material were dictated by surgeon preferences.

All patients underwent median sternotomy. Cardiopulmonary bypass with moderate hypothermia. So cardiopulmonary bypass time and aortic cross clamp time were noted. Intermittent cold crystalloid cardioplagia was used for myocardial preservation.

Additional surgery were pulmonary valvotomy in 3, right ventricular patch with resection of subventricular hypertrophy in 4, closure of ASD in 7, excision of subaortic ridge in 2 and aortic valve replacement with mechanical valves.

Intra operative complications (bleeding and block), as well

as post operative complications were noted. Follow-up information's were only available by personal communication with doctors in-charge of most patients.

**Results:**

Among 50 cases there were 26 males 52% and 24 females 48% and ages ranged from 2 years to 28 years with mean age of 15 years.

The body weight of patients ranged from 9 kg to 80 kg the median weight was 29 kg.

Patients body surface were ranged from 0.5 to 2 $m^2$ with 22 patients 44% below 1 $m^2$.

The presentations of symptoms were shown in table 1:

**Table-1: Presenting symptoms**

| Presentation | Number of cases | Percentages |
|---|---|---|
| Unknown/asymptomatic | 10 | 20% |
| Palpitation | 17 | 34% |
| Dyspnea on exertion | 25 | 50% |
| Fatigue | 12 | 24% |
| Failure to thrive | 3 | 6% |

Fifteen patients 30% did cardiac catheterization and all had VSD with other associated anomalies (not isolated VSD), 34 patients 68% had pulmonary hypertension and 16 patients 32% had normal pulmonary artery pressure, no patient was suspected of having irreversible pulmonary vascular changes.

Types of VSDs were variable (as shown in table 2); the perimembranous type was 80%..

Trans-atrial approach was used in 35 patients (70%) while transventricular approach was used in 15 (30%) patients.

Table-2: Types of VSD

| Type of VSD | Number of cases | Percentages |
|---|---|---|
| Perimembranous | 40 | 80% |
| Inlet | 5 | 10% |
| Outlet | 3 | 6% |
| Muscular | 2 | 4% |
| 100 | Total | 50 |

Regarding the technique of surgical closure, 45 patients (90%) underwent patch repair of their VSD, while 5 patients (10%) has closed primarily by direct suturing using interrupted stitches. Ventricular septal defect patch materials used were synthetic Dacron and PTFE (Gortex) patch.

Additional surgeries were variable as shown in table 3:

**Table-3: Type of additional surgeries**

| Type of surgery | Number of cases | Percentages |
|---|---|---|
| Pulmonary valvotomy | 3 | 6% |
| Right ventricular outflow patch | 3 | 6% |
| Closure of ASD | 7 | 14% |
| Excision of subaortic ridge | 2 | 4% |
| Aortic valve replacement | 2 | 4% |
| Total | 17 | 34% |

As regard bypass time the shortest time was 44 minutes while the longest was 185 minutes and details of CPB time is illustrated in table:(4)

**Table-4: CPB time**

| Time/minutes | Number of cases | Percentages |
|---|---|---|
| Less than 60 | 14 | 28% |
| 61-90 | 23 | 46% |
| 91-120 | 5 | 10% |
| More than 120 | 8 | 16% |

As regard aortic cross-clamp the shortest cross clamp time was 19 minutes while the longest was 125 minutes.

Median intensive care unit time stay (range between 1 to 5 days).

Median operative hospital stay was 7 days (range, 5 to 18 days).

One patient required reoperation for bleeding.

For surgical complications 2 post- operative deaths in the I.C.U. one patient with VSD, ASD and pulmonary hypertension died due to pulmonary hypertensive crisis and the second patient with VSD with RVOT patch died due to postoperative pump failure. Mortality was (4%), four of our patients developed transient A-V block requires pacing (8%), one of them required permanent pacemaker.

**Discussion:**

VSD whether isolated or associated with other anomalies are still common in our hospital. Results of surgical closure of VSD have improved significantly since the first series of direct

vision closure reported by Lillehei and colleagues in 1955. (4) Advances in surgical technique and intraoperative and perioperative management have lead to marked improvement of these patients.

Long term survival and clinical outcomes for these patients are excellent, with one recent study citing 92% of patients in NYHA class 1, had more than 20 years after repair.(12)

The male to female ratio was 1.1:1. The median age was 15 years and the median weight was 29kg. This is inconsistent with other studies, (13, 14) that may be because we have limitation for VSD repair such as body weight and patient ages while there is no limitation in other studies to proceed with definitive surgery.

The most frequent type of VSD was perimembranous. This finding is similarly reported by other study. (13)

Cardiac catheterization used in the diagnosis of 15 patients. In our study patients had various degrees of pulmonary hypertension and of associated anomalies this results was nearly similar to other study. (13)

The most frequent surgical approach to VSD in our study was transatrial, which is also reported by other studies.(13, 14)

Patch material used for closure of VSD was synthetic Dacron patch in all cases (because lack of bovine pericardium), while autologous pericardium and bovine pericardium are used in other studies.(13, 14)

Heart block may accompany repair of VSD especially perimembranous, so 4 patients (8%) developed heart block require temporary pacing all of them has perimembranous (subaortic) VSD. This result is high when compared with other studies.(13,14) This is may be due to technical lack of expertise.

For the operative mortality: 2 patients, both were VSD with other associated cardiac anomalies. One died due to pulmonary hypertensive crisis and the second death was due to postoperative pump failure. This represents a mortality rate of (4%) because of surgery for VSD with associated anomalies. This mortality is high when compared with other studies with isolated VSD. (13,14)

**Conclusions:**

Early diagnosis of VSD and referral for definitive surgery is recommended to maintain cardiac function and to prevent serious complications as a result of delayed definitive management.

Pre-school medical screening of children is important to detect some congenital cardiac defect like VSDs

Heart block is a major complication accompanying closure of VSD especially peri- membranous type. This is because of the course of bundle in the posterior inferior rim of this type of VSD.

Associated cardiac anomalies can be repaired with closure of VSD.

In the current era, results for surgical repair of isolated VSD are excellent. Although recognizing the value of trans-catheter device closure for surgically challenging VSDs, concerns remain for the use of the current devices for the management of defects that are readily accessible to the surgeon. As new technologies continue to evolve, current surgical results such as these should be considered when evaluating patients, choosing therapeutic options, and counseling families.

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