Surgical Considerations in the Management of Atrial Septal Defects

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Surgical treatment of atrial septal defects results in a very high percentage of good results with low mortality and morbidity.

Surgically speaking, the important atrial diseases are congenital defects of the atrial septum. Separation of atrial septal defects into those of the septum primum and those of the septum secundum is as significant in surgical consideration as it is in embryologic and physiologic discussion, as has been emphasized elsewhere in this symposium. Because of the physiologic similarities, frequent association and identical surgical approach it seems reasonable to include in the consideration the anomalies of pulmonary venous return. The purpose of this paper is to review briefly some surgical aspects of atrial septal defects and to present the accumulated surgical experience from the University of Oklahoma Medical Center.

HISTORY

The enormous surge of interest in surgical treatment of congenital anomalies of the heart and great vessels began with the closure of patent ductus arteriosus by Gross in 1938, and was accelerated by the Blalock-Taussig procedure for tetralogy of Fallot, its modification by Potts, and resection of coarctation of the aorta by Crafoord.1, 2, 3, 4 Early attention was directed toward the atrial septal defects. Several ingenious procedures, allowing closure of atrial septal defects without interrupting circulation, were devised and had varying degrees of success as outlined by Shumacker.5 Closure of the atrial septal defect under direct vision using hypothermia and inflow occlusion was reported by Lewis, and by Swan, and this approach was employed by many surgeons for several years after its introduction in 1953.6, 7 Development of techniques of extracorporeal circulation, demonstration of the low inherent risk in its use and the advantages of closure of the defect under direct vision without time limitation have led to almost universal acceptance of this method in operating on patients with atrial septal defects.8

INDICATIONS

The decision to operate on a patient with an atrial septal defect is based on weighing...
the estimated course of the patient with non-operative treatment against the anticipated surgical result. Surprisingly enough, there is considerably less information regarding the natural history of the patient with atrial septal defect than might be expected for a disease that has been recognized for many years and for which surgical treatment has only recently been effective. It is clear that the risk of bacterial endocarditis is extremely low, at least in the ostium secundum defects, and that the development of cardiac failure and/or the development of pulmonary vascular changes represent the greatest long range risk to the patient. Cardiac catheterization allows accurate physiologic assessment of the individual patient and it should be possible to correlate this information with prognosis. At the present time demonstration of a left-to-right shunt exceeding two-to-one is an indication for surgery. Other hemodynamic indications include demonstration of rising pulmonary vascular resistance on repeated cardiac catheterizations. The demonstration of a predominant right-to-left shunt in atrial septal defect is at present a contraindication to surgical repair. The surgical risk in repair of an uncomplicated atrial septal defect is quite low and the expectation of complete closure of the defect is high. The more complicated defects involve increased surgical risk. In the final determination of the desirability of operation other individual factors must be taken into account such as: The age of the patient, his family status, his own attitudes, wishes, etc. It should be emphasized that this balance which determines suggestion of surgical treatment, will be changed by the introduction of any new information regarding either natural history, or surgical results, and therefore cannot be accepted as an unchanging situation.

TECHNIQUES

All operations for atrial septal defect and/or anomalous pulmonary venous drainage are done using cardiopulmonary by-pass. The technique for this procedure has been reported previously. For most cases involving atrial septal defect the right anterolateral thoracotomy is preferred to the mid-sternal approach. The hazard of air embolism is minimized by carefully avoiding aspiration below the level of the atrial septum. Ordinarily, closure of the septal defects is done by continuous silk suture and is technically quite simple. Large defects, however, with friable borders are best repaired using a dacron patch carefully sutured in place with interrupted or continuous sutures. Discussion of the various procedures which may be necessary in variations of anomalous pulmonary venous drainage is beyond the scope of this communication and the reader is referred to any of several recent reviews.10,11,12 Technically, repair of the ostium primum defects is complicated by (1) The presence of the A. V. conduction bundle in the lower border of the defect (actually the ventricular septum) and (2) the necessity for repairing defects in either the mitral or tricuspid valves. Ordinarily, repair of this defect is accomplished by interrupted mattress sutures and the septal defects are closed with a patch using interrupted sutures along the lower border, placed during electrocardiographic monitoring to detect conduction disturbances.

EXPERIENCE AT THE UNIVERSITY OF OKLAHOMA MEDICAL CENTER

From 1959 until the present, a total of 68 patients have undergone operation for repair of atrial septal defects at the University of Oklahoma Medical Center. This does not include operations in which a small atrial septal defect was closed incidental to repair of a more significant intracardiac lesion such as pulmonary stenosis or tetralogy of Fallot. The types of defects encountered and associated abnormalities are listed in table 1. It is interesting to note that nearly one-half of the ostium secundum defects were associated with some form of anomalous pulmonary venous drainage. Age at the time

<table>
<thead>
<tr>
<th>Table 1. Types of Atrial Septal Defects</th>
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<tbody>
<tr>
<td>Ostium Secundum</td>
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<tr>
<td>Anomalous Pulmonary Venous Drainage</td>
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<tr>
<td>Total</td>
</tr>
<tr>
<td>Partial</td>
</tr>
<tr>
<td>Ostium Primum</td>
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<tr>
<td>Total Cases</td>
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of operation ranged from two and one-half months to 39 years with the majority of patients in the first two decades of life. Sex incidence was exactly equal.

Preoperative symptomatology is listed in table 2. A total of 27 patients were taking digitalis prior to operation. Catheterization was performed in all patients and this data is recorded elsewhere in the symposium. Indications for operation were based on both clinical and laboratory data. Ten infants under one year were operated only because clinically and statistically there seemed to be little or no chance of survival without operation. All had complicated defects.

All operations were performed using cardiopulmonary by-pass. Direct suture of the defect was performed in 62 patients and patches were used in only six. The technique of correcting total anomalous pulmonary venous drainage has been reported previously.

In the entire series there were nine deaths and of these eight were in infants less than a year of age. All infants were critically ill before operation and all had complicated defects. Death was cardiorespiratory and occurred from two hours to two weeks after operation. The remaining death was a 36-year-old man with an ostium secundum defect and partial anomalous venous return. Preoperative catheterization revealed equal pulmonary and systemic pressure and a bidirectional shunt. The patient died a few hours after operation and at autopsy severe pulmonary arterial disease was demonstrated.

Table 3.
Postoperative Complications

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<tbody>
<tr>
<td>Sternotomy Dehiscence</td>
<td>1</td>
</tr>
<tr>
<td>Post-pericardiotomy Syndrome</td>
<td>6</td>
</tr>
<tr>
<td>Thrombophlebitis</td>
<td>2</td>
</tr>
<tr>
<td>Hemorrhax Requiring Operation</td>
<td>1</td>
</tr>
<tr>
<td>Cardiac Arrhythmias</td>
<td>5</td>
</tr>
</tbody>
</table>

The average hospital stay after operation was 12.9 days with a range from eight to 56 days. Complications are listed in table 3. Diagnosis of the “post-pericardiotomy syndrome” is clinical and is based on unexplained fever, pericardial effusion, petechiae and hepatosplenomegaly, all or in part. Cardiac arrhythmias consisted of transient postoperative block, auricular fibrillation and flutter. The entire group had a considerably lower incidence of bleeding complications after operation than the total series of operations involving cardiopulmonary bypass. Complications of all types were much more common in adults than in children.

The period of follow-up ranges from several weeks to six years and eleven months. Of the 59 surviving patients six have been lost to follow-up. The status of 53 patients followed is shown in table 4. Only a few postoperative catheterizations have been performed on these patients. However, clinical, roentgenographic and electrocardiographic evidence of a normal hemodynamic state has been achieved in 48 patients. The current status of the remaining five patients is described in table 4.

CONCLUSIONS

1) Surgical correction of atrial septal defects with or without anomalous pulmonary venous return in patients over one year old is associated with a low mortality rate.

2) Follow-up of patients after repair of atrial septal defects up to seven years after operation indicates excellent clinical results.

3) Elective surgical repair of all hemodynamically significant atrial septal defects seems clearly indicated.

4) The mortality rate for operations where the condition of the patient necessi-
tates attempted correction under one year of age remains high.

REFERENCES


800 N.E. 13th Street, Oklahoma City, Oklahoma

REGIONAL POSTGRADUATE COURSE

on

"THE THYROID"

March 3rd, 1966

Bartlesville, Oklahoma

Elsks Lodge

Elks Lodge

CONCLUSIONS

atrial septal defects pulmo-
operoneal repair rate, per year clinical results,
all hemopto-
even necessi-

AFFIRMATION SESSION

4:30 P.M. THE IODINE CYCLE AND THYROXINE SYNTHESIS
   G. Rainey Williams, M.D.

5:00 P.M. THYROID FUNCTION TESTS,
   NEW AND OLD
   Carl Smith, M.D.

5:30 P.M. THYROID FUNCTION
   DURING PREGNANCY
   Warren Crosby, M.D.

EVENING SESSION

7:30 P.M. NATURAL HISTORY OF
   THYROID NODULES
   Carl Smith, M.D.

7:50 P.M. MANAGEMENT OF THYROID
   NODULES
   G. Rainey Williams, M.D.

8:10 P.M. PANEL: TREATMENT OF
   HYPERTHYROIDISM
   (a) Surgical:
   G. Rainey Williams, M.D.
   (b) Medical: Carl Smith, M.D.
   (c) During Pregnancy:
   Warren Crosby, M.D.

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