SURGICAL TREATMENT OF PULMONARY ATRESIA WITH VENTRICULAR SEPTAL DEFECT AT HUE CENTRAL HOSPITAL

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ABSTRACT

Pulmonary atresia with ventricular septal defect (PA-VSD) is a complex cardiopathy represented by a complete obstruction between the right ventricle outflow and the pulmonary trunk associated with a ventricular septal defect (VSD). Treatment of PAVSD has evolved during recent decades, but it still remains challenging.

Objective: *to evaluate the result of surgical treatment for children with PAVSD at Hue Central Hospital.*

Methods: *A retrospective study was carried out between january 2012 and january 2017, all patients underwent operated PA-VSD at Hue central hospital.*

Results: *52 patients included this study; mean age: 2.12 ± 0.46 (0.15-5); classification: type I: 18 (34.6%), type II: 15 (28.9%), type III and IV: 19 (36.5%). Techniques of operation: total repair: 30 (57.7%), blalock shunt: 10 (19.2%) extends to the bifurcation + blalock shunt: 122 (23.1%). Early mortality was 5/52 (9.6%): Early mortality of total repair was 2/30 (6.7%), Early mortality of extends to the bifurcation +blalock shunt was 3/22 (13.6%).*

Conclusion: *Early diagnosis and surgery in right time bring the good result. Surgical PA-VSD gives good results.*

Key words: *ventricular septal defect (PA-VSD), ventricular septal defect (VSD).*

I. INTRODUCTION AND OBJECTIVE

Pulmonary atresia with ventricular septal defect (PA-VSD) is a complex cardiopathy represented by a complete obstruction between the right ventricle outflow and the pulmonary trunk associated with a ventricular septal defect (VSD) [9]. Patients who did not receive surgical treatment have a survival probability in the first year less than 50% and less than 8% after 10 years [7]. Surgical management of these defects has been improved in the recent years, but is still a challenge [6].

Objective: to evaluates the outcomes of surgical treatment for patients with PA-VSD at Hue Central Hospital.

II. MATERIALS AND METHODS

Materials: 52 patients with PA-VSD underwent operation from 1/2012 to 1/2017.

Methods: Retrospective study; Research data: clinical evaluation, para-clinical test

III. RESULTS

3.1. General characteristics

- Sex ratio: male/female: 28/24

1. Hue Central Hospital

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- The mean age: 2.12 ± 0.46 (youngest 2 months, oldest 5 years).

Table 1. Symptoms

Symptoms	n	%
Cyanosis	52	100
Tet spells, syncope	12	23.1

CBC count:

- RBC (g/dl): 6.8 ± 1.2 (5.2 – 8.4)
- HCT (%): 58.8 ± 13.4 (40 – 78.5)
- HgB (g/l): 160.3 ± 24.2 (110 - 240)

Table 2. Classification type

Classification type	n	%
Type I	18	34.6
Type II	15	28.9
Type III & IV	19	36.5

3.2. Surgery operation

Table 3. Technique of operation:

Type	Total repair	Blalock shunt	Extends to the bifurcation + Blalock	n
I	17	1	0	18
II	13	2	0	15
III & IV	0	7	12	19
n	30	10	12	

CPB time and aortic clamping time

- CPB time: 125.3 ± 19.5 minutes
- Aortic clamping time: 84.3 ± 14.2 minutes

Table 4. Total repair

		n	%
Gradient of RV – pulmonary artery (mmHg)	<40	28	93.3
	>40	2	6.7
RV/LV ratio	<0.7	26	86.7
	>0.7	4	13.3

Table 5. Postoperative ultrasound examination

		n	%
Pulmonary regurgitation	mild	26	86.7
	moderate – severe	4	13.3
Tricuspid regurgitation	Mild – moderate	4	13.3
	Severe	0	0
Gradient RV – Pulmonary artery > 40mmHg		1	3.3

Table 6. Surgical complications

Surgical complications	n	%
Low-cardiac-output syndrome	6	11.5
Pericardial or pleural effusion	4	7.7
Bleeding	8	15.4
Acute kidney failure	7	13.5
Mortality	5	9.6

Table 7. Early mortality

Operation	n	%
Total repair	2	6.7
Blalock shunt		
Extends to the bifurcation + Blalock	3	13.6

Postoperative period, length of hospital stay:

- Postoperative period: 14.3 ± 3.7 days
- Length of hospital stay: 21.4 ± 8.5 days

IV. DISCUSSION

Early diagnosis of PA-VSD is normally base on echocardiography. Echocardiography is useful to characterize the intracardiac anatomy, the presence of additional lesions [10]. However, to classify the degree of pulmonary narrowing for surgical options, more imaging examinations are required such as angiography, cardiac catheterization, MSCT. Surgery in patients is recommended between 3 and 6 months of age. The rationale for this timing is that most patients will remain with stable cardiopulmonary physiology and early enough to avoid the development of pulmonary vascular disease in high flow collaterals [10].Choosing one or two-stage surgery follow the algorithm of Gupta [3].

In our center, patients undergo total repair surgery when Z score > 0, Nakata index > 200 mm/m^2. However, in other studies, total repair can be indicated when the Nakata index > 150mm/m^2 [1] but should ensure that the gradient between Pulmonary artery and RV < 40 mmHg and RV/LV ratio < 0.7. In our study, single-stage total repair were performed in 57.7% patients with type I and II, similar to other centers [3]. Early mortality rate of total repair surgery is 6.7%, according to Metras et al, total repair in 70% patients with early mortality rate 10% [5]. Therefore, the indication single or two-stage surgery in patients PA-VSD mostly based on the classification type. Patients with VSD type I and type II are recommended to single-stage total repair. Type III and Type IV are advised two-stage surgery with first stage operation is temporary for waiting the respiratory system to grow.

Todays, technique of unifocalization pulmonary artery is widely use for PA-VSD patients with small pulmonary artery and major aortopulmonary collateral arteries (MAPCAs). Inifocalization is recommended for early stage patients may have better outcome because of preventing the development of pulmonary vascular obstructive disease [8], [11]. Recently, Mei J has reported a new complete repair method for PA-VSD that all the patients underwent two sequential operations. Stage one included left major aortopulmonary collateral unifocalization and modified Blalock – Taussig shunt from left posterior lateral thoracotomy. After 6 to 11 months, stage two comprised right unifocalization, ligation of the shunt, followed by ventricular septal defect closure and right ventricular outflow tract reconstruction assisted with cardiopulmonary bypass from midline sternotomy.

All the patients survived the initial surgery, but one of them died of low cardiac output syndrome on the third day after the second operation, there were no late death and no need for re-intervention.

Another option is to make a central shunts to increases the blood flow to main pulmonary artery (Melbourne shunt, Blalock shunt). The central shunts promote a more uniform growth of the pulmonary arteries. However, they may lead to early development of congestive heart failure and pulmonary arterial hypertension [2].

V. CONCLUSION

Pulmonary atresia with ventricular septal defect is a complex congenital heart lesions. Exact diagnosis required a conbination: angiography, cardiac catheterization, MSCT. Early surgical intervention should be indicated to avoid development of aortopulmonary collateral arteries. Choice of single or two-stage operation depends on type of classification. Type I and II are recommended to total repair surgery.

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SURGICAL EXPERIENCE FOR ACTIVE ENDOCARDITIS

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ABSTRACT

Background: *Surgical treatment for acute and sub-acute infective endocarditis (IE) are always complex with many severe complications. Indication for surgery and timing of surgery still debate.*

Patient and Method: *retrospected all IE patients who were operated at HCM Heart Institute from 1995 to 2016 and focus on group acute and sub-acute IE.*

Results: *In total, 324 IE patients were operated and among that acute and sub-acute IE were 85 patients (26.2%). In this group, according to pathology we had primary IE: 5, secondary on congenital defect :19, secondary on valvular heart disease: 44, IE post PM: 2 and secondary post valvular surgery: 15. In almost cases, pathogens of IE were Streptoccoci spp and Staphyloccocus aureus. 100% cases found out vegetations and 31 cases had annular abscess .*

Surgical procedure were as follow: vegetations ablation and radical repair of congenital defect: 19, valve repair: 20, valve replace: 39, electrodes ablation: 2 and Bentall procedure: 5. Operative mortality: 7 cases (8.2%): 3 cerebral haemorrhage, 3 MOF and 1 LCO. Median time of follow up was 9.2 years. Redo in 1st 3month and after 1 year caused by deinsertion ring or valve prosthesis were 12 cases and 4 case, respectively. Late death after 1 years was 6 (4 irreversible HF, 1 cerebral haemorrhage and 1 sudden death).

Conclusion: *Surgical treatment for acute and sub- acute IE have good result although outcome is complex and time of hospital stay is very long. Early surgery for active IE could be solve absolutely all infective lesion with mortality rate acceptable.*

Key word: *infective endocarditis (IE), surgery*

I. BACKGROUND

Acute and subacute infectious endocarditis (IE) or active endocarditis is a serious disease that is complex and in many cases still a treatment challenge. Surgery is a method of life saving in 25-50% of acute and subacute cases. Curently, surgical mortality rates are very high, ranging from 6-35% due to a variety of possible causes, therefore the problem are: (1) when to have surgery and (2) surgery for what subgroup

We conducted this study to help answer these questions as well as to summarize the experience of IE treatment strategies in progress.

II. PATIENTS AND METHODS

We review all case of acute and subacute IE which were operated in the period 1995-2016 at the Heart Institute of Ho Chi Minh City. Eliminate patients who underwent surgery during a stable IE and patients who received medical treatment. Data collection before, during and postoperatively until the last follow-up.

1. HCM Heart Institute

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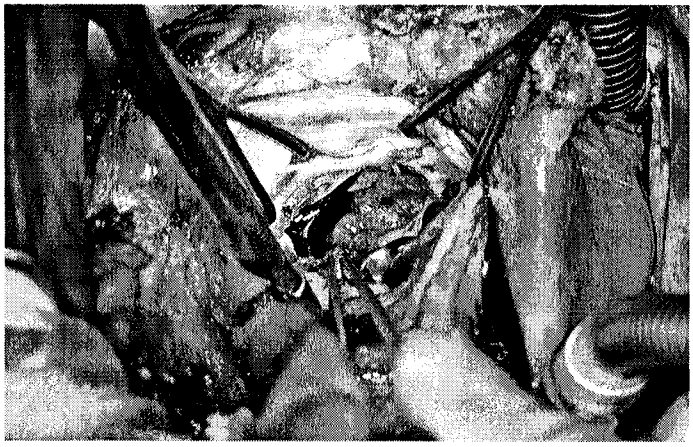
III. RESULTS

During the period 1995-2016, 696 patients were treated for IE at the Heart Institute of Ho Chi Minh City (Table 1):

Table 1: Classification of IE

Type of IE	N	%
Medical treatment only*	372	53.4
Surgical treatment : Stable IE	239	34.3
Active IE	85	12.2
Total	696	100

* included cases reject surgery



Picture 1: Aortic annulus abcess post AVR

We diagnose IE according to modified Duke criteria since 2000 [9]. The rate of positive hemoculture or vegetation culture is 50/85 (59%). Pathogenic agents are listed in Table 2. The incidence rates of vegetation for ultrasound diagnosis and during surgery were 97.3% and 100%, respectively. The largest vegetation was 25x15mm that found in operation. Prevalence of annulus abscess : 31 cases were mostly in aortic annulus in which 4 cases of abscess on the natural valve and 16 cases of abscess in prosthetic valves.

Table 2: Pathogen of IE (surgical subgroup)

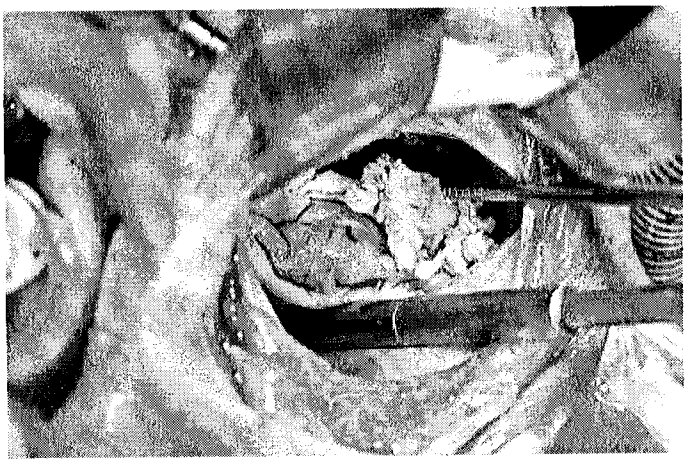
Pathogen	N (%)
Streptoccoci spp.	26 (52%)
Staphyloccocus aureus	12 (24%)
Enteroccoci spp.	4 (8%)
Candida spp	2 (4%)
Others	6 (12%)

Surgical treatment were as follow: infectious eradication and defect reair in 19 cases, valve repair: 20 cases, anatomic reconstruction by pericardium and valve replacement in 39 cases, electrodes removed in 2 and Bentall operation in 5. Three cases have coronary artery bypass surgery asociated.

Surgical mortality was 7 cases (8.2%): 3 from cerebral haemorrhage, 3 from multiorgan failure and 1 from LCO.

Early operation within the first 3 months due to recurrent regurgitation or valve dehiscence is 12 cases. The number of ring dehiscence is 2,

valve dehiscence is 8 and both dihiscence is 2. At the time of 1 year after the first operation, 4 cases have to redo because of aortic valve dehiscence. In 16 patients redo, there were 2 patients were de-hiscence 2 time and 3 patients were dehiscence 3 times due to IE recurrence. The last time we have to do Bentall modified for all and three of these died. The remaining cases are stable.



Picture 2: big vegetation destroy completely posterior valve

Table 3: Classification according to position and pathology

Pathology	N	Position				
		Aortic	Mitral	Tricuspid	Pulmonary	Others (VSD,PDA)
Congenital	19	4			2	13
Acquired VHD	44	18	25	1		
Nature valve	5	4	1			
Prosthetic valve	15	12	3			
PM electrodes	2					

The shortest follow-up period was 3 months and the longest was 19 years, median follow-up was 9.2 years. Late death: 6 patients (4 due to severe heart failure, 1 due to cerebral hemorrhage and 1 sudden death). IE recurrent later than 1 year after the first surgery is 5 cases, 4 cases have to redo and 2 deaths.

IV. DISCUSSION

4.1. About surgical indication

Surgical indication are often quite hard and complex, it must be based on the condition of clinical and prognostic factors. These data is very variable in each patient such as infection status, type of bacteria, size and nature of the lesions, sèverity of heart failure, embolism status, abscess or not. The conclusion should be a consultation of cardiologist, cardiac surgeon, imaging doctor, infectious disease specialist, microbiologist and others specialits that namely "Endocarditis Team". Some authors recommend early surgery before end of antibiotic therapy. These authors suggest not to delay surgery even if patients had have cerebral complications and these patients have surgical indication for reasons such as severe heart failure, uncontrolled infection, embolie relapse. Delayed surgical option (up to 4 weeks) when the patient has a high risk of cerebral hemorrhage in patients with severe intracranial haemorrhage or severe stroke [1], [9], [12], [14], [17]. However, surgical treatment in patients with big or mobile vegetation, uncontrolled infection is

most at risk for active IE due to Staphylococcus aureus. We screen carefully for potentially infectious outside the heart, such as splenic abscess (2 cases), femoral artery aneurysm (1 case) by means of ultrasonography, MSCT, angiography before operation. Recently, we performed a cerebral MSCT in patients with embolic complications or suspected cerebral aneurysm (mycotic aneurysm) in the brain for a more accurate indication of the time of surgery as well as a preventive measure to avoid severe neurological complications.

4.2. Timing of surgery

4.2.1. Guideline of the American Heart Association 2015: early surgery is recommend for native left- sided IE in the following scenarios [1]:

- Valve dysfunction resulting in symptoms or signs of heart failure.
- IE caused by fungi or highly resistant organisms.
- IE complicated by heart block, annular abscess, or destructive perforating lesions.
- Persistent infection (bacteremia or fever) lasting >5-7 days after the start of appropriate antimicrobial therapy, assuming other sources of infection or fever have been excluded.
- Recurrent emboli or persistent/enlarging vegetations despite appropriate antimicrobial therapy.

And early surgery is recommend for prothetic valve IE in the following scenarios:

- Symptoms or signs of heart failure resulting from valve dehiscence, intracardiac fistula, or severe prosthetic dysfunction.
- Persistent bacteremia >5-7 days after the start of appropriate antimicrobial therapy.
- Prosthetic valve IE complicated by heart block, annular abscess, or destructive perforating lesions.
- Prosthetic valve IE caused by fungi or highly resistant organisms.
- Recurrent emboli despite appropriate antimicrobial therapy

4.2.2. Guideline the European Heart Association in 2015 have given 3 indications for urgent surgery (within 7days) for the left-sided valve IE (native and prosthetic valve) as follows: [6]

(1) Heart failure : Aortic or mitral NVE or PVE with severe regurgitation or obstruction causing symptoms of HF or echocardiographic signs of poor haemodynamic tolerance.

(2) Uncontrolled infection : Locally uncontrolled infection (abscess, false aneurysm, fistula, enlarging vegetation or Persisting positive blood cultures despite appropriate antibiotic therapy and adequate control of septic metastatic foci.

(3) Prevention of embolism : Aortic or mitral NVE or PVE with persistent vegetations > 10 mm after one or more embolic episode despite appropriate antibiotic therapy or Aortic or mitral NVE with vegetations >10 mm, associated with severe valve stenosis regurgitation, and low operative risk or Aortic or mitral NVE or PVE with isolated very large vegetations >30 mm.

Thus, indicative of early surgery for left heart on the natural valve or on the artificial valve is similar. At Ho Chi Minh Heart Institute, we also follow these instructions. The average surgical time for IE cases is 7.5 ± 3 days from the start of antibiotics (48 hours at the shortest).

A randomized comparison study of Kang in 2012 showed that the early surgical group (operation in 48-72 hours) had a total incidence of death and perioperative embolization of only 3% compared with the usual standard surgical group of 9%. And the total incidence of death, embolism, IE recurrence at 6 months postoperatively, early surgical group was only 3% compared with 28% of conventional surgery group. Similarly, Funakoshi showed that in 73/212 patients undergoing surgery in the first two weeks had a lower surgical mortality rate, 5% compared with 13% and survival rate after 7 years of follow-up, 94% compared with 82% [5]. Caes's 2014 report also showed that the delay in surgery was reduced from 14 days to 7 days in stage 2 with more radical surgery (replacing both aortic root and

valve instead of replacing the valve only) [3]. In the 2016 report of Cahill, shows that despite a great deal of progress both diagnosis and treatment, the overall mortality rate is still very high, up to 30% for all causes [4]. In our study, the mortality rate in the early operation group was 8.2% compared to the conventional surgical group of 4.1%, which is different from the other authors, probably because of the incidence of IE on the acquired valves and prosthetic valves constitute the majority (69.4%) while in the European and American the IE on the native valve was majority. Moreover, IE's patient in Europe and the United States have a higher age. In addition, the group had to undergo early surgery is the group has a more severe clinical conditions due to serious complications of IE. However, the total mortality rate of both surgical death and late death due to complications are still very high (16%) indicates that active IE is still complicated.

V. CONCLUSION

Until now, active IE is still a challenging treatment especially IE on prosthetic valve or IE with periannular extension of infection. Surgery is often complicated with many serious complications as well as high mortality rates. Surgical management should be based on many factors in which the most important is the clinical status of patients and the nature of IE .Surgery early and radical treatment from the first time when patients had complications such as severe heart failure, annulus abscess , mobile and large vegetation, embolism... to reduce the rate of perioperative mortality, reduce the rate of recurrent IE as well as increase the survival rate in the long-term.

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