

## Open heart surgery: initial experience in Songklanagarind Hospital

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### Abstract:

Open heart surgery: initial experience in Songklanagarind Hospital

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**Objective:** To study patients' characteristics, variations of the heart diseases, operative techniques and operative results of open heart surgery from our initial experiences

**Design:** Retrospective descriptive study

**Materials and Methods:** We reviewed the medical records of the initial 100 cases of open heart surgery at Songklanagarind Hospital between August 2001 and October 2002. Patient's demographic characteristics, preoperative New York Heart Association (NYHA) class, diagnosis of heart disease, operation, postoperative course, morbidity, mortality and short-term follow up were reviewed.

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**Results:** There were 55 females and 45 males, average age 25.6 years (range from 1 year to 70 years). Fourteen patients (14%) were in NYHA class I, fifty-two (52%) in NYHA class II, twenty (20%) in NYHA class III and fourteen (14%) in NYHA class IV. There were 55 patients (55%) diagnosed with congenital heart diseases and 45 patients (45%) with acquired heart diseases. Seventy-two patients (72%) could be extubated within 6 hours after operation and sixty-six patients (66%) stayed in the ICU for only 1 day. The 30-day mortality occurred in three patients (3%). The average follow-up period was 6.8 months (range from 2-15 months) and an additional 2 patients died during follow-up. Most of our patients were in NYHA class I postoperatively.

**Conclusion:** We achieved acceptable morbidity and mortality rates in various of operative procedures. Also the short-term results were good.

**Key words:** Open heart surgery, results of surgery

### บทคัดย่อ:

**วัตถุประสงค์:** เพื่อศึกษาลักษณะทางคลินิก ชนิดของโรคหัวใจ ชนิดของการผ่าตัด และผลการผ่าตัดหัวใจแบบเปิด

**รูปแบบวิจัย:** พรรณนาแบบย้อนหลัง

**วัสดุและวิธีการ:** รวบรวมข้อมูลจากเวชระเบียนผู้ป่วยที่เข้ารับการรักษาโดยการผ่าตัดหัวใจแบบเปิด 100 รายแรกในโรงพยาบาลสงขลานครินทร์ ระหว่างเดือนสิงหาคม 2544 จนถึงเดือนตุลาคม 2545 โดยรวบรวมข้อมูลเกี่ยวกับลักษณะทางคลินิกของผู้ป่วย ชนิดของโรคหัวใจ ชนิดของการผ่าตัด อัตราการเกิดภาวะแทรกซ้อน อัตราการตาย และผลการผ่าตัดในระยะสั้น

**ผลการศึกษา:** ผู้ป่วยทั้งหมด 100 ราย เป็นเพศหญิง 55 ราย และเพศชาย 45 ราย อายุเฉลี่ยของผู้ป่วยเท่ากับ 25.6 ปี (พิสัย 1-70 ปี) ร้อยละ 14 อยู่ใน NYHA class I, ร้อยละ 52 อยู่ใน NYHA class II, ร้อยละ 20 อยู่ใน NYHA class III และร้อยละ 14 อยู่ใน NYHA class IV ผู้ป่วยเป็นโรคหัวใจพิการแต่กำเนิดร้อยละ 55 ภายหลังการผ่าตัดผู้ป่วยสามารถถอดท่อช่วยหายใจได้ภายใน 6 ชั่วโมง ร้อยละ 72 และร้อยละ 66 ใช้เวลาอยู่ในหอผู้ป่วย ICU 1 วัน อัตราการเสียชีวิตใน 30 วันแรกของการผ่าตัดคิดเป็นร้อยละ 3 มีผู้ป่วยอีก 2 ราย เสียชีวิตในระยะหลัง ระยะเวลาติดตามผลการรักษาโดยเฉลี่ย 6.8 เดือน (พิสัย 2-15 เดือน) ผู้ป่วยส่วนใหญ่อยู่ใน NYHA class I

**สรุป:** จากประสบการณ์การผ่าตัดหัวใจแบบเปิด 100 รายแรกในโรงพยาบาลสงขลานครินทร์ ผลการผ่าตัดเป็นที่น่าพอใจ รวมถึงผลการผ่าตัดในระยะสั้น

**คำสำคัญ:** การผ่าตัดหัวใจแบบเปิด, ผลการผ่าตัด

### Introduction

Dr. John Gibbon of Philadelphia performed the first successful intracardiac operation with the aid of a heart-lung machine in 1953. Unfortunately his achievement was followed by several unsuccessful efforts by both Dr. Gibbon and other surgical groups. In 1955, Dr. John Kirklin at Mayo Clinic began the first successful series of intracardiac repairs using the heart-lung machine. In July 1955, Drs. Dewall and

Lillihei developed a bubble oxygenator, which became the sole method of oxygenation for cardiopulmonary bypass at the University of Minnesota.<sup>1</sup> After that many surgical groups around the world began to perform open heart operations. Heart-lung machine, oxygenator and method of myocardial protection during operation have been developed and improved. Now open heart surgery is done very successfully with acceptable mortality and morbidity rates.

In this paper we would like to present our initial experiences with open heart surgery at Songklanagarind Hospital, which is a new cardiac surgical center. We retrospectively review our initial 100 cases of open heart surgery and report on our operative results.

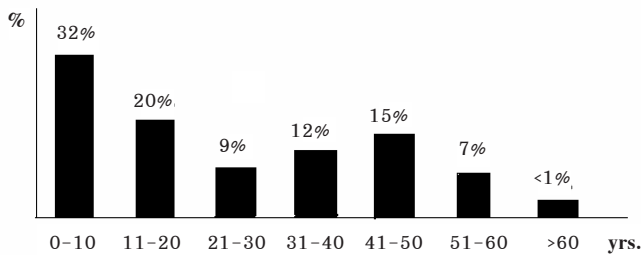
**Material and Methods**

A review of medical records of the first 100 open heart surgical patients at Songklanagarind Hospital between August 2001 and October 2002 was made.

Preoperative demographic characteristics, preoperative NYHA class, diagnosis of heart disease, operation, post-operative course, morbidity, mortality and short-term follow-up results were reviewed.

**Results**

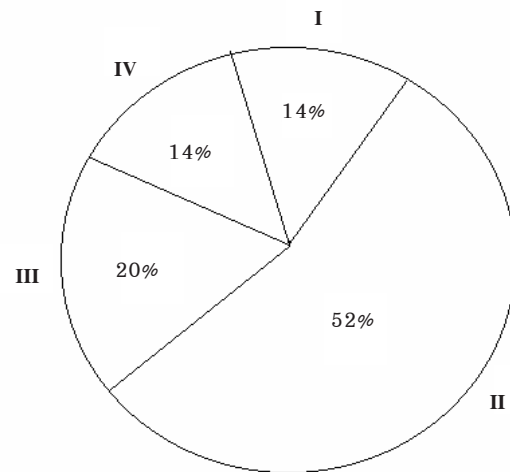
There were 100 open heart operations between August 2001 and October 2002. Fifty-five patients (55%) were female. The patients' age ranged from 1 year to 70 years (average 25.6 years) with 52 percent below 20 years (Figure 1) and 5 cases weighed below 10 kilograms.



**Figure 1 The patient's age**

There were 14 percent in NYHA class I, 52 percent in class II, 20 percent in class III and 14 percent in class IV (Figure 2). The average NYHA class was 2.34. Ten percent of our patients required inotropic drug support before the operation and 1 case required an intra-aortic balloon pump support.

There were 55 patients (55%) diagnosed with congenital heart disease and 45 patients (45%) diagnosed with acquired heart disease. The most common congenital heart diseases were atrial septal defect and ventricular septal defect. We did total correction for Tetralogy of Fallot in 3 patients. The most common acquired heart disease in our initial experience was rheumatic mitral valve disease. Three coronary artery bypass grafts were done (Tables 1 and 2).



**Figure 2 Preoperative NYHA class**

**Table 1 Congenital heart disease**

Disease	No.
Atrial septal defect (ASD)	
Primum	3
Secundum	14
Sinus venosus	4
Secundum and pulmonic stenosis	3
Secundum and mitral valve disease	2
Ventricular septal defect (VSD)	
VSD alone	11
VSD and pulmonic stenosis	5
VSD and aortic valve regurgitation	5
Tetralogy of Fallot	3
Subvalvular aortic stenosis	2
Ruptured sinus of Valsalva	2
Single ventricle	1
<b>Total</b>	<b>55</b>

**Table 2 Acquired heart disease**

Disease	No.
Mitral valve disease	20
Mitral valve disease and tricuspid valve disease	8
Mitral valve disease and aortic valve disease	4
Aortic valve disease	8
Triple valve disease	2
Coronary artery disease	3
<b>Total</b>	<b>45</b>

Cardiopulmonary bypass was performed with mild to moderate systemic hypothermia technique during the operation, the average cardiopulmonary bypass time was 88.43 minutes (range from 26-600 minutes). The myocardial protection was done using either cold crystalloid or cold blood cardioplegia with topical myocardial cooling. The average aortic cross clamp time was 54.72 minutes (range from 0-174 minutes). The various operative procedures are shown in Tables 3 and 4.

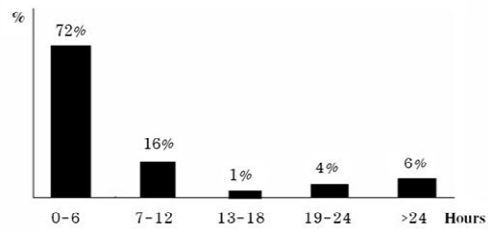
Most of the patients (72%) could be extubated within 6 hours after the operation (Figure 3) and 66 percent of the patients stayed in the ICU for 1 day (Figure 4). The mean postoperative hospital stay was 8.38 days (range from 3 to 46 days) and 80 percent of the patients could be discharged within 10 days after the operation (Figure 5).

**Table 3 Operation for congenital heart diseases**

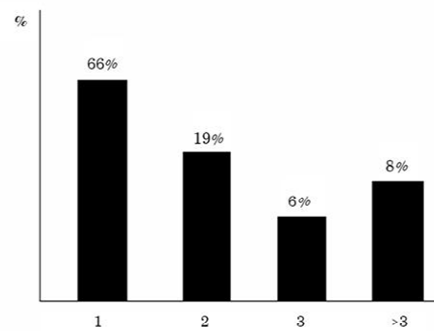
Operation	No.
Mitral valve cleft repair and ASD primum closure	3
Sinus venosus ASD closure	4
Secundum ASD closure	14
Secundum ASD closure and pulmonic valvulotomy	3
Mitral valve repair and secundum ASD closure	2
VSD closure	11
VSD closure and pulmonic valvulotomy	5
VSD closure and aortic valve repair	5
Subaortic ridge resection	2
Total correction of TOF	3
Repair ruptured sinus of Valsalva	2
Bilateral bidirectional Glenn's shunt	1
<b>Total</b>	<b>55</b>

**Table 4 Operation for acquired heart disease**

Operation	No.
Mitral valve replacement	13
Mitral valve replacement and tricuspid valve repair	7
Mitral valve repair	7
Mitral valve replacement and aortic valve replacement	4
Mitral valve replacement, aortic valve replacement and tricuspid valve repair	1
Aortic valve replacement	8
Mitral valve repair and aortic valve replacement	1
Mitral valve repair and tricuspid valve repair	1
Coronary artery bypass grafting	2
Coronary artery bypass grafting and mitral valve repair	1
<b>Total</b>	<b>45</b>



**Figure 3 Postoperative ventilator time (Hours)**



**Figure 4 Postoperative ICU stay (Days)**

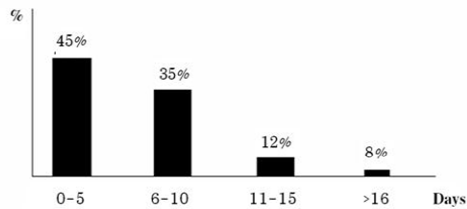


Figure 5 Postoperative hospital stay (Days)

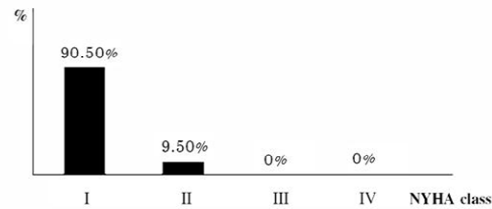


Figure 6 Postoperative NYHA class

The most common postoperative complications were paroxysmal atrial fibrillation (9%) which required therapeutic intervention, and 4 percent of the patients required temporary pacemaker. The infectious complications were pneumonia (2%), sternal wound infection (1%), and infective endocarditis of tricuspid valve (1%). We had only one case of postoperative bleeding which required re-operation.

There was a 3 percent 30-day mortality. The first death occurred on the operating table from myocardial stunning after aortic valve replacement (intraoperative transesophageal echocardiography showed functioning of valve prosthesis and at autopsy the coronary artery ostium was widely patent), and the second on postoperative day 17 after urgent coronary artery bypass grafting and mitral valve repair (post-infarction mitral valve regurgitation). The causes of death were pneumonia, sepsis and low cardiac output. The third death occurred on postoperative day 4 due to pulmonary hypertensive crisis (large VSD with severe pulmonary hypertension).

The follow up period ranged from 2 months to 15 months (average 6.8 months). The late complications were hemolysis (1%), bleeding complication (2%), and thromboembolic complication (1%). We had additional 2 cases of late death. The first was due to subarachnoid hemorrhage (after mitral valve replacement) and the second one was sudden death after double valve replacement suspicious of prosthetic valve obstruction. So our overall survival rate was 95 percent. Most of the survivors (86 cases) were in NYHA class I and the others were in NYHA class II (9 cases) (Figure 6).

### Discussion

Nowadays, open heart surgery can be performed with low morbidity and mortality due to improvement in operative technique and quality of cardiac surgical care. To be really effective in this operation we would like to show our initial experience in our new open heart center. This report will help us to understand the nature of our practice and the quality of care we offer. It also allows us to provide our patients with appropriate information and advice.

The average patients' age was 25.6 years, as 55 percent of our patients suffered from congenital heart disease, and most of the acquired heart disease were rheumatic valvular diseases.

We also had a variation of diseases and operations as shown in the results. Fourteen percent of our patients were operated on under emergency conditions.

We achieved the good postoperative courses, 72 percent could be extubated within 6 hours, 66 percent stayed in ICU for only 1 day and 80 percent could be discharged within 10 days after the operation. Our results were comparable with the report from the Society of Cardiothoracic Surgeons of Great Britain and Ireland<sup>2</sup> and the Society of Thoracic Surgeons national databases.<sup>3</sup>

Most of our patients were categorized in congenital and rheumatic valvular heart diseases, which are still major problems in developing countries in contrast to the report by the Society of Thoracic Surgeons national databases in which the majority of the operations were coronary artery bypass grafting and surgery for degenerative valvular heart disease.<sup>3</sup>

The overall operative mortality after open heart surgery varies from 2-10 percent<sup>2,3</sup> and depends on preopera-

tive risk factors, type of operation, priority of operation and re-operation. Our 30-day mortality rate was 3 percent which is comparable to the annual report by the Society of Cardiothoracic Surgeons of Great Britain and Ireland.<sup>2</sup>

The first mortality case occurred after aortic valve replacement due to severe myocardial stunning. Clinical observational studies have shown that ventricular hypertrophy from pressure overload increased vulnerability to ischemia/reperfusion injury and is a well-recognized risk factor in cardiac surgery.<sup>4,5</sup> The mechanisms responsible for the decreased tolerance to ischemia of hypertrophied hearts is likely to be a complex array of interactive events. During myocardial ischemia, hypertrophied hearts exhibit accelerated loss of high-energy nucleotides, greater accumulation of tissue lactate and hydrogen ions, earlier onset of ischemic contracture and accelerated calcium overload during early reperfusion.<sup>5</sup> Despite improvement in myocardial protection during the operation myocardial injury still occurs.

The second mortality case was a patient with severe mitral regurgitation complicated acute myocardial infarction. The patient was supported by inotropic medication and intra-aortic balloon pump (IABP) before emergent operation. We performed coronary bypass grafting and mitral valve repair. The patient tolerated well after separation from the cardiopulmonary bypass, but she developed sepsis and low cardiac output syndrome and expired on the 17<sup>th</sup> day post-operatively. Surgery in this condition carries a high mortality rate which ranges from 18-50 percent.<sup>7-9</sup> Multivariable analysis identified need for IABP and COPD as risk factors for early death.<sup>9</sup> However, if the patient survives the long-term result is reasonable.<sup>9</sup>

The third mortality case was 5-year child weighing 8 kilograms with large ventricular septal defect and severe pulmonary hypertension. She expired on postoperative day 4 from pulmonary hypertensive crisis. Severe pulmonary hypertension is a well-known risk factor for ventricular septal defect closure which carries high operative morbidity and mortality. From clinical evidence nitric oxide plays an important role in the management of the postoperative pulmonary hypertensive crisis,<sup>10-12</sup> but nitric oxide is not available in our institute. To

avoid this complication early closure within 1-2 year of life has been recommended.<sup>13</sup>

We achieved the good short term results 90.5 percent of our patients were in NYHA class I and 9.5 percent were in NYHA class II.

## Conclusion

**Our initial experience of open heart surgery has given acceptable mortality and morbidity rates in various of operative procedures. The short-term results were also good. This information will help us to improve the quality of surgical care in the future.**

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