

# *Open Heart Surgery: The First Three Years' Experience at Lampang Hospital*

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## **Abstract**

**Objective:** To review the results of the first three years of experience in treating patients at the Cardiovascular and Thoracic Surgery Unit of Lampang Hospital, and to compare these results with those obtained from standard databases such as the first National Adult Cardiac Surgical Database Report 2011 of the Society of Thoracic Surgeons of Thailand, the Society of Cardiothoracic Surgeons of Great Britain and Ireland, and the Society of Thoracic Surgeons national database.

**Materials and Methods:** We reviewed the medical records of the initial 766 cases of open heart surgery at Lampang Hospital between January 2010 and December 2012. Patient's demographic characteristics, preoperative New York Heart Association (NYHA) class, diagnosis of heart disease, operation, postoperative course, morbidity, and short-term follow up were reviewed.

**Results:** There were 410 women and 356 men, with an average age of 44.5 years (range: from 12 days to 82 years). Among these, 76 patients (10 %) were NYHA class 1, 405 patients (53%) were NYHA class 2, 163 patients (21 %) were NYHA class 3, and 122 patients (16 %) were NYHA class 4. Acquired heart disease was diagnosed in 660 patients (86%) and 106 patients (14 %) were diagnosed with congenital heart diseases. Extubation within 6 hours after operation could be achieved in 567 patients (74%) and 628 patients (82%) stayed in the ICU for only 1 day. Death within 30 days of operation occurred in 18 patients (2.3% mortality). Most of our patients were NYHA class 1 postoperatively.

**Conclusion:** As a newly opened cardiothoracic surgery center, we provide our services to patients in an effective and timely manner while achieving acceptable morbidity and mortality rates for a variety of operative procedures.

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

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## **INTRODUCTION**

The first heart operation in Thailand was performed in November 1953; the first open heart surgery using cardiopulmonary bypass was performed on 28<sup>th</sup> October 1959<sup>1</sup>. Ever since, these operations

were confined only within medical schools in Bangkok. Thanks to the advent of National Health Security Office (NHSO), which was established in 2002, open heart surgery is now done all over the country. However, in Northern of Thailand, there was only one medical

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center that can provide this service. The waiting list was more than two years for elective surgery. Without other means of access, patients in this region were still facing a high risk of stroke, heart failure or related deaths.

The monumental task of Lampang Hospital's director, Doctor Songwut Subtaweessin, begun in 2008, was successfully achieved on 4 January 2010, with the completion of the first open heart surgery in a public hospital in the northern region of Thailand. In this report we present our first three years of experience in open heart surgery at Lampang Hospital.

### MATERIALS AND METHODS

A review of medical records of the first 766 open heart surgical patients at Lampang Hospital treated between January 2010 and December 2012 was done. Preoperative demographic characteristics, preoperative NYHA class, diagnosis of heart disease, operation, postoperative course, morbidity, mortality and short-term follow-up results were reviewed.

### RESULTS

There were 766 open heart operations between January 2010 and December 2012. There were 410 (54%) female patients. The patients' age ranged from 12 days to 82 years (average 44.5 years). Other baseline characteristics of patients are presented in Table 1. Of the 766 patients, 10% were New York Heart Association (NYHA) class 1, 53% were NYHA class 2, 21% were NYHA class 3, and 16% were in NYHA class 4. Eighty six patients required inotropic drug support before the operation, 22 patients required mechanical ventilator support before the operation, 36 cases required intra-aortic balloon pump (IABP) support and 11 cases required dialysis.

There were 660 patients (86%) who were diagnosed with acquired heart disease and 106 patients (14%) with congenital heart disease. The most common acquired heart disease was rheumatic mitral valve disease, while the most common congenital heart disease was atrial septal defect (Table 2). There were 33 cases of aortic aneurysms or dissections with associated valvular disease (Table 3).

Our cardiopulmonary bypass strategy uses mild hypothermia technique. The average bypass time was

**Table 1** Baseline characteristics of patients undergoing open heart surgery

Baseline comorbidity and characteristics	Number (%); n = 766
Hypertension	138 (18)
Diabetes mellitus	123 (16)
Dyslipidemia	76 (10)
Asthma	9 (1)
Down's syndrome	4 (0.5)
Stroke	30 (4)
Thalassemia	27 (4)
Thyroid	16 (2)
COPD	36 (5)
Renal Failure	24 (3)
NYHA class	
1	76 (10)
2	405 (53)
3	163 (21)
4	122 (16)

84 minutes (range from 19 to 600 minutes) and the average cross clamp time was 53 minutes (range from 17 to 215 minutes). The myocardial protection technique was done using cold blood cardioplegia (warm induction and terminal warm blood technique) in most cases. In quick and simple cases as in closure of atrial septal defect (ASD) or ventricular septal defect (VSD), we used cold crystalloid cardioplegia.

**Table 2** Types of heart diseases

Acquired heart diseases	Number (%); n = 660
Mitral valve disease	218 (33)
Mitral valve disease and tricuspid valve disease	108 (16)
Aortic valve disease	85 (13)
Triple valve disease	73 (11)
Others mixed valvular disease	41 (6)
Coronary artery heart disease	102 (15)
Aortic aneurysms and dissections	33 (5)
Congenital heart diseases	Number (%); n = 106
Atrial septal defect	69 (65)
Ventricular septal defect (VSD)	21 (20)
Tetralogy of Fallot	10 (9)
Ruptured sinus of Valsalva	3 (3)
Pulmonary artery sling	1 (1)
Interrupted aortic arch type B	1 (1)
Giant coronary AV fistula with PDA	1 (1)

**Table 3** Aortic aneurysms and dissections

Aortic diseases	Number (%); n = 33
Acute aortic dissection type A	3 (9)
Chronic aortic dissection type A	2 (6)
Ascending aortic aneurysm	2 (6)
Severe aortic stenosis with ascending aortic aneurysm	4 (12)
Severe aortic regurgitation	3 (9)
with ascending and aortic arch aneurysm	
Severe aortic regurgitation and aortic root aneurysm	6 (18)
Distal Arch aneurysm	4 (12)
Thoracic aortic aneurysm	6 (18)
Aortic transection	1 (3)
Aortic dissection type B with leakage	2 (6)

In coronary artery bypass graft (CABG) cases, we started off pump coronary artery bypass graft (OPCABG) since early 2011, in 13 cases. In 2012 we performed OPCABG in 23 additional cases, which is currently our procedure of choice. For aortic aneurysms and dissections that involved the aortic arch, we routinely used selective antegrade cerebral perfusion through right axillary artery cannulation cooled down to 18 degrees celsius. We performed modified Bentall operation in 12 cases, aortic valve sparing operation (David 1) for severe aortic valve regurgitation from aortic root aneurysm in 4 cases with uneventful results with a short-term follow-up. Various operative procedures for acquired heart diseases are shown in Table 4, while those for congenital heart diseases are shown in Table 5.

Most of our patients (74%) could be extubated within 6 hours after operation, only 3% was intubated beyond 24 hours, and 82% of the patients stayed in ICU for less than 1 day. Only 6% of patients stayed in the ICU for longer than 4 days. The mean postoperative hospital stay was 6.2 days (range: from 3 to 41 days) and 81% of the patients could be discharged within 10 days after the operation. The vast majority of patients (90%) were in NYHA class I after surgery, and only 1% was in class 4.

The follow-up period ranged from 1 to 36 months. Early complications included massive bleeding needed reoperation in 29 cases (3.7%), arrhythmias needing cardioversion in the ICU in 9 cases (1.2%), bradycardia needing temporary pacemaker in 29 cases (3.7%),

**Table 4** Operations for acquired heart diseases

Mixed valvular operations	Number (%); n = 525
Mitral valve replacement	102 (19)
Aortic valve replacement	62 (12)
Tricuspid valve replacement	3 (1)
Mitral valve replacement and tricuspid valve repair	82 (16)
Isolated Mitral valve repair	147 (28)
Mitral valve and aortic valve replacement	24 (5)
Mitral valve and aortic valve replacement and tricuspid valve repair	12 (2)
Mitral valve repair and aortic valve replacement	30 (6)
Mitral valve and tricuspid valve repair	34 (6)
Redo valve operation	18 (3)
Others	11 (2)
<b>Operations for coronary artery disease</b>	<b>Number (%); n = 102</b>
Coronary artery bypass graft (CABG), on pump	31 (30)
Off pump CABG (OPCABG)	42 (41)
CABG with other operations	29 (28)
<b>Operations for aortic aneurysms and dissections</b>	<b>Number (%); n = 33</b>
Modified Bentall Operation	12 (36)
Valve sparing aortic root replacement	4 (12)
Patch aortoplasty	1 (3)
Ascending aortic replacement	2 (6)
Ascending aortic replacement + Hemiarch replacement	4 (12)
Ascending aortic replacement + Hemiarch replacement + CABG	1 (3)
Thoracic aortic replacement	6 (18)
Total arch replacement	3 (9)

**Table 5** Operations for congenital heart diseases

Operations of congenital heart diseases	Number (%); n = 106
ASD closure	64 (60)
VSD closure	17 (16)
Total correction for TOF	10 (9)
Repair RSOV	3 (3)
Repair PA Sling	1 (1)
Repair Interrupted Aortic Arch type B	1 (1)

complete heart block needing permanent pacemaker in 1 case, pneumo-hemothorax in 18 (2.3%) cases, true vocal cord paralysis in 4 cases (0.5%), and 12 cases (1.5%) needed tracheostomy due to prolonged intubation. There were 36 cases (4.7%) with low cardiac output that required IABP support, and 11

cases (1.4%) with stroke in which 1 case fully recovered within 6 months. Other complications included 5 cases (0.7%) of superficial surgical site infection, 6 cases (0.8%) of massive hemothorax and 8 cases (1%) of massive pericardial effusion (postpericardiotomy syndrome).

Death within 30 days of operation included 18 cases (2.3%), of which 1 case had left ventricular rupture after mitral and aortic valve repair, 1 case had massive gastrointestinal (GI) bleeding with low cardiac output after CABG, 1 case had subdural hematoma (after valve replacement) with hospital acquired pneumonia after craniotomy, 1 case had lung complications from delayed prosthetic valve thrombosis, 6 cases had refractory low cardiac output, 1 case had free rupture of aortic transection, 3 cases had multi-organ failure and sepsis after emergency repair of ruptured thoracic aneurysm, 3 cases had stroke and sepsis after aortic arch replacement, 1 case had low cardiac output and sepsis after VSD repair, and 1 case had hospital acquired pneumonia after repair PA sling.

## DISCUSSION

Modern day open heart surgery can be performed with low morbidity and mortality due to improvements in operative techniques and better quality of cardiac surgical care. In the present report we share our early experiences in modern cardiac surgery with our surgical colleagues and the public as well.

The majority (86%) of our patients suffered from acquired cardiac problems, most of which were due to rheumatic heart disease. In 2012, however, cases of coronary artery heart disease and congenital heart diseases increased rapidly partly because of referrals from our cardiac surgical network.

We achieved acceptable postoperative results within three years of our Unit's opening. For example, 74% of patients could be extubated within 6 hours after operation, and 82% had an ICU stay of less than 1 day. The 30-day mortality was only 2.3%. The mean postoperative hospital stay was 6.2 days and 81% of the patients could be discharged within 10 days after the operation. Most of our patients were in NYHA class I postoperatively. Our results were comparable to those obtained from the first National Adult Cardiac Surgical Database Report 2011 of the Society of Thoracic

Surgeons of Thailand, the Society of Cardiothoracic Surgeons of Great Britain and Ireland<sup>2</sup> and the Society of Thoracic Surgeons national database<sup>3</sup>.

We learnt valuable lessons from patients who died under our care, and would like to share some of these experiences.

Our first mortality occurred in the operating room after mitral and aortic valve repair in a patient with rheumatic mitral stenosis and a clot in the left atrium. The cause of death was from atrial-ventricular groove rupture which we could not effectively repair. Looking back, however, a repair using a pericardial patch, the Teflon felt BioGlue<sup>4,5,6</sup> technique, should be applied in the future.

The second mortality was in a fragile old lady with complicated acute ST segment elevation myocardial infarction (STEMI) with refractory ventricular tachycardia and fibrillation, and acute renal failure. The patient died from refractory low cardiac output and coagulopathy. We performed an operation as a salvage procedure, which was considered very high risk according to the American College of Cardiology and American Heart Association (ACC/AHA) Practice Guidelines<sup>7</sup>.

The third case was a middle aged woman who underwent a mitral valve repair one year previously. She was referred to our hospital because of sudden loss of consciousness, with the diagnosis of acute subdural hematoma<sup>8</sup> (her International Normalized Ratio, or INR, was within the range of 2.0 to 3.0 after valve replacement). She never recovered from a craniectomy, which was complicated by hospital acquired pneumonia.

The fourth case was another middle-aged woman with a mitral valve repair done ten years previously, recently diagnosed with valve thrombosis, cardiogenic shock, and pulmonary edema. This patient died in the ICU from lung complications. After her past medical history was reviewed, a suboptimal anticoagulant therapy was identified as the immediate cause of her thrombosis, and the subsequent delayed diagnosis precipitated her worsening cardiac status. Surgery in this patient would be considered very high risk, and the treatment of choice might be the use of thrombolytics<sup>9</sup>.

The fifth to tenth cases underwent valvular replacement despite poor preoperative ejection fraction and multiple comorbidities. Although their

recovery was at first uneventful, they finally passed away.

The eleventh to thirteenth cases suffered cerebral embolic episodes and developed sepsis after aortic arch replacement. While selective antegrade perfusion and axillary artery cannulation might minimize possible embolic complications<sup>10</sup>, an alternative combined opened and endovascular approach ("hybrid repair") to aortic arch pathology, which appeared to be safe and effective at midterm follow-up,<sup>11</sup> might be considered in the near future at Lampang Hospital. The fourteenth to sixteenth cases died from multi-organ failure and sepsis after emergency repair of ruptured thoracic aneurysm. There have been reports showing that thoracic endovascular aortic repair (TEVAR) might be associated with fewer complications than open repair, especially in emergency or urgency situations. Hence, TEVAR could be a safer alternative to open repair for ruptured descending thoracic aortic aneurysms<sup>12,13</sup>.

The seventeenth case was a three year-old child with a large ventricular septal defect and severe pulmonary hypertension and failure to thrive. She expired on postoperative day 5 from pulmonary hypertensive crisis and hospital acquired pneumonia. This patient should have been operated on within one to two years of life to avoid these complications<sup>14</sup>. Alternatively, we may do pulmonary artery banding instead. Severe hypertensive crisis is a well-known risk after ventricular septal defect closure, which carries high operative morbidity and mortality<sup>15</sup>.

The last, eighteenth, case was a one month-old infant with severe respiratory distress due to certain congenital anomalies. We performed an emergency repair of the pulmonary artery sling by relocating the right pulmonary artery and reconstructing her trachea under cardiopulmonary bypass support. She developed cardiac arrest in the neonatal intensive care unit (NICU), but after hours of heroic cardiopulmonary resuscitation, she recovered. Tragically, her endotracheal tube slipped off in ICU on day 5 and developed hospital acquired pneumonia and expired on day 28 after the operation.

## CONCLUSION

Our early experience with open heart surgery and a variety of operative procedures was reviewed.

Our short-term results were comparable to those from various established cardiac surgery institutes both in Thailand and abroad, in terms of low morbidity and mortality. After reviewing the morbidity and mortality cases, there were important points that could be improved upon and further developed, for the benefit of our future patients.

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