Result of minimally invasive cardiac surgery in Thong Nhat Hospital

Do Kim Que, Dao Hong Quan

Thong Nhat Hospital

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Contact:
Do Kim Que
Thong Nhat Hospital
1 Ly Thuong Kiet, Ward 7, Tan Binh District, Ho Chi Minh City
Mobile: 0913 977 628
Email: dokimque@gmail.com

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Abstract

Introduction: Minimally invasive surgery has been a trend in modern medicine and there are no exceptions in the cardiothoracic surgery, which has been widely applied in Vietnam recently. Thong Nhat Hospital has deployed the minimally invasive cardiac surgery (MICS) for a trial septal defect (ASD) and left atrial myxoma since July 2018. Therefore we conducted this research to evaluate the result of this novel method in our hospital thus improving techniques and refining the procedures.

Subjects and methods: We retrospectively reviewed all the patients underwent video assisted MICS in Thong Nhat Hospital from July 2018 to February 2020.

Results: There had a total of 12 patients, in which 10 had an Atrial Septal Defect(ASD) and 2 had left atrial myxomal. Male/Female ratio was 1:1, mean age was 44,2 ± 4,5. All patients were intubated with double lumen endotracheal tube. Patients were put on cardiopulmonary bypass(CPB) with femoral artery cannula and bicaval cannulas achieved with right femoral vein and right internal jugular vein cannulation. Mean CPB duration was 98,6 ± 13,6 minutes (70 - 155), aortic cross-clamping duration was 44,2 ± 6,8 minutes (0 - 88), there were 5 cases underwent off - pump ASD closure. 1 case had post-op hemorrhage that required reoperation, cause of hemorrhage was due to injury to the internal thoracic artery, there was no death.

Conclusions: The application of MICS in treating ASD and left atrial myxoma showed positive short and medium term results, there was no severe complications or death.

Introduction

In Vietnam, Minimally Invasive Cardiac Surgery (MICS) has been applied in the last 5 years at E Hospital and Ho Chi Minh City Medicine and Pharmacy University Hospital. With advantages such as small incision, aesthetics and shorter recovery time compare to open heart surgery, MICS has grown rapidly in popularity in the last few decades. Developments in endoscopic surgery instruments like high definition endoscope, 3D endoscope facilitate the progress in the less invasive field of surgery.

According to Nguyen Hoang Nam, Le Ngoc Thanh et al, MICS is a safe method and has short recovery time. Beside ASD closure, MICS are also used in surgeries on mitral valve, aortic valve, Coronary Artery Bypass Graft (CABG) in lower-risk patients.

Nguyen Huu Uoc et al [6] reported 34 surgical cases with video-assisted technology, there were 11 cases had ASD closure, 12 had mitral valve repair and 13 cases had mitral valve replacement. In this series, there was no death, 6 cases had major bleeding post - op, 3 cases had reoperation for surgical hemostasis, 3 had stroke.

Vo Anh Tuan et al [8] reported 86 cases of mitral vavle repair through video-assisted mini thoracotomy with 96% good result and no death.

Thong Nhat Hospital has been doing open heart surgery since 2003, after years of practising classical surgery on adult patients, we introduced minimally invasive cardiac surgery in July 2018. This research is to evaluate the result of this method in treatment of ASD and left atrial myxoma.

Materials and methods

Method:

All the patients underwent MICS for ASD and left atrial myxoma between 7/2018 and 2/2020 in Thong Nhat Hospital.

Inclusion criteria:

+ Patients had secondary ASD or left atrial myxoma that was indicated for surgical repair.

+ Patients underwent MICS with right minithoracotomy.

Exclusion criteria:

+ Patients had associated with cardiovascular diseases that needed treatment.

+ Patients had contraindication for thoracoscopy.

Surgical procedure:

3D thoracoscopy system includes: 15 degree angle endoscope, image management, light source, monitor, CO2 insufflator.

Set of MICS

Sarn Heart Lung machine. Sorin™ femoral cannula size 22 - 24Fr, superior vein cannula 20 - 22 Fr, femoral veincannula size 18 - 20 Fr. Retractor for soft tissue.

Fig 1. MICS instruments

Patients in supine position with cushion on the back to make a 15-20 degrees angle with the surgical table. Arms were positioned along side the body with right arm abduction by a small degrees. Patients were intubated with double-lumen endotracheal tube.

Peripheral CPB set up: femoral artery cannulation, inferior vena cava cannula accessed through femoral vein and superior vena cava cannula accessed through right internal jugular vein.

Incision was made through the fourth intercostal space anterior to mid axillary line. A soft tissue retractor was place to enlarge the surgical field. A 10mm trocar was placed in the fourth intercostal space at the anterior axillary line to introduce a 15 degree endoscope. Opened the pericardium, put in stay suture, retracted the diaphragm. Started normothermic CPB, superior vena cava was tied, inflated the cavity with CO2.

A cannula was placed in the root of the aorta, followed by aorta cross - clamping with Chiwood clamp placed through the third intercostal space, Custodiol solution was infused to the heart. Incised the right atrium to accessed the lesion (ASD or myxoma). Excised the tumor, closed the ASD with prosthetic patch. Ensured an airless heart, close the right atrium. Opened the aortic clamp, stopped the CPB, closed the cannulation site, closed the pericaridum, put in a chest tube. Closed the wounds.

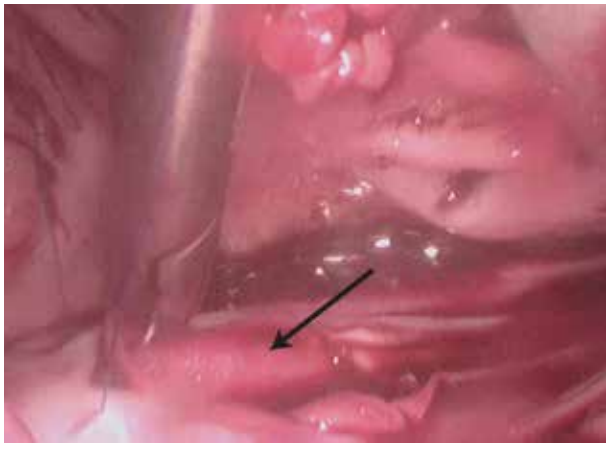

Fig 2. ASD closure with MICS (Black indicator shows the septal patch)

Fig 3. Scar of an ASD closure with MICS

Data analysis:

Data was analyzed with SPSS22.0 software. Continuous variables were described in form of mean ± standard deviation.

Results

Between 7/2018 and 2/2020, there were 12 patients underwent MICS in Thong Nhat Hospital, 2 patients had left atrial myxoma resection, 10 had ASD closure.

Table 1: Patient demographic

Patients name	Age	Sex	Admission date	Diagnosis	NYHA*
Pham Van Ch	25	Male	02/7/2018	ASD	II
Tran Van H	54	Male	20/7/2018	Left atrial myxoma	II
Nguyen Thi H	43	Female	16/10/2018	ASD	II

Nguyen Thi H	51	Female	25/02/2019	ASD	III
Huynh Ngoc L	49	Male	16/5/2019	ASD	II
Tran Ngoc Tr	54	Male	17/6/2019	ASD	II
Le Thi Hong C	41	Female	19/7/2019	Left atrial myxoma	III
Dao Hong C	71	Male	16/7/2019	ASD	II
Trinh Dinh Ng	55	Male	19/11/2019	ASD	III
Hoang Thi Ng	24	Female	19/11/2019	ASD	II
Ha Thi Phuong M	33	Female	27/12/2019	ASD	II
Nguyen Thi K	61	Female	18/02/2020	ASD	III

*New York Heart Association

Patients' mean age was 44,2 years (25 - 71), Male/female ratio = 1/1. 8 patients had NYHA II heart failure, 4 had NYHA III heart failure.

Surgical information:

All patients were intubated with double-lumen endotracheal tube. CPB setup included cannulation of femoral artery, inferior vena cava cannula access through femoral vein and superior vena cava cannula through internal jugular vein. All patients were in normothemia, 6 were operated without cardioplegia, while the rest had cardioplegia with Custadiol perfused via the aortic root.

Mean operative time was 330,2 minutes.

Mean CPB duration was 98,6 minutes.

Mean aortic cross-clamping duration was 44,5 minutes.

Table 2: Surgical information

	Mean (min)	Standard deviation
Operating time	330,2 (180 – 354)	11,5
CPB duration	98,8 (70 – 155)	13,6
Aortic cross-clamping duration	44,2 (0 – 88)	6,8

Post-operative care:

Length of ICU stay 2,1 days.

Length of hospital stay 12,2 days.

Table 3: Post operative care

	Mean	Standard deviation
Length of hospital stay	12,2 days	2,8
Length of ICU stay	2,1 days	1,2

There was no death and only 1 case had post operative hemorrhage that required thoracoscopic evacuation of the pleural hemothorax.

Follow up duration ranged from 1 to 12 months, all 12 patients had pleasing signs of recovery, follow up ultrasound showed good cardiac function with no observable structure damage.

Discussions

Minimally invasive cardiac surgery is gaining ít popularity globally and in Vietnam there is no exception. In the late 90s of the last century, there have been researches on coronary artery surgery and ASD surgery with MICS [1], [7]. Elbeery and

Chitwood predicted MICS is the technique of choice in the 21st century.

Technology advancements help make the technique safer and more efficient. In Vietnam, Nguyen Hoang Nam and Le Ngoc Thanh had performed 200 MICS cases between 2013 - 2015 with good results. Cardiovascular surgery center in Vietnam has already started to brought the technique into practice.

In Thong Nhat Hospital, we have been doing open heart surgery since 2003 and we started video-assisted minimally invasive cardiac surgery with right minithoracotomy in July 2018.

Conventional sternotomy is the incision of choice for almost all cardiovascular diseases. Advantages of this incision are it can provide an adequate surgical field, thus facilitate the surgeon in performing the procedure and completely repairing of the defects. However, the incision comes with disadvantaged such as a long scar that affect the patients appearance, post operative pain and higher chance of sternum infection.

Recent progresses in minimally invasive surgery field with developments in instruments and techniques make this technique more approachable and more applicable for surgeons. Choices of incisions depend on location of the defect and surgeons experiences. The right parsternal incision through the fourth intercostal with 2 rib cartilages excision and internal thoracic artery ligation was developed by Cosgrove and Sabik for surgeries on aortic valves, however, this is not a common incision [2], [4]. Minimal sternotomy developed by Bichell et al since 1996 for ASD closure in pediatric patients. The right minithoracotomy incision is 3 - 5cm in length on the right anterior chest wall assisted by video technology is widely used by many author for its superiority in aesthetic, especially for female patients. The incision is made on the fourth intercostal space (or submammary fold). This is our choice of incision for all patients in the research.

There are many cannulation strategies, for arterial cannulation, the cannula can be placed in the femoral or axillary artery. For venous cannulation, a dual-stage cannula can be placed through the femoral vein or single staged cannulation through femoral and jugular vein. We chose to do the femoral artery cannulation and single-stage bicaval cannulas accessed through femoral and internal jugular vein.

There have been improvements in myocaridal protection recently. Aorta is clamped with Chitwood clamp. Cold Custodiol solution allows aorta clamping for up to 120 minutes. Zeng-Shan Ma et al have done research on off-pump normothermia ASD closure [9]. In Vietnam, Dang Quang Huy, Le Ngoc Thanh [2] reported a series 25 cases of off-pump ASD closure with no complication and death.

Surgical result: 1 patient had post op hemorrhage that required surgery, the bleeding was from internal thoracic artery, there was no death in the research. CBP and aortic cross - clamping duration were similar to previous national researches.

Table 4: CPB and aortic cross clamping durationV. Conclusions

	Cardiopulmonary bypass (min)	Aortic cross-clamping (min)
Do Kim Que	98,6 ± 13,6	44,2 ± 6,8
Nguyen Huu Uoc [6]	126,0 ± 28,2	68,5 ± 27,1
Dang Quang Huy [2]	156,1 ± 33,6	No clamping
Le Ngoc Thanh [5]	118 ± 59	No clamping

The application of MICS in ASD and left atrial myxoma showed positive short and medium term results with no death or major complications.

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