

INITIAL RESULTS OF VIDEO - ASSISTED THORACOSCOPIC MINIMALLY INVASIVE MITRAL VALVE REPLACEMENT WITH FAST TRACT CARDIAC ANESTHESIA AT VIET DUC UNIVERSITY HOSPITAL

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ABSTRACT

Background: Video - assisted thoracoscopic minimally invasive mitral valve replacement, associated with fast tract anesthesia and early extubation, was accepted in clinical practice. At Viet Duc University Hospital, we began to use this technique in January 2021. The purpose of this study is to evaluate the initial results.

Methods: This is a retrospective, descriptive study with a convenient sample size, including all acceptable patients from January to August 2021.

Results: There were 12 patients with 41.7% male and average age 53.8 ± 6.3 (range 42 - 63). There was no hospital mortality. Cardio pulmonary bypass time and aortic cross clamp time were 108.0 ± 23.8 minutes (range 80 - 157), 86.3 ± 16.7 minutes (range 63 - 115) and 3.4 ± 0.5 hours (range 3 - 4.8) relatively. Ventilation time, ICU length of stay and hospital stay were 23.3 ± 8.3 minutes (range 11 - 42), 21.9 ± 8.6 hours (range 15 - 48) and 14.7 ± 6.3 days (range 10 - 16) relatively. Three patients had temporary agitation after surgery and there are no other complications.

Conclusion: A combination between video-assisted thoracoscopic minimally invasive mitral valve replacement and fast tract cardiac anesthesia was feasible and our initial results showed significantly reduce ventilation time and length of ICU stay in study group without serious complications.

Keywords: Minimally invasive mitral valve surgery, fast tract cardiac anesthesia

Received:

01/03/2022

Revised:

28/3/2022

Accepted:

05/04/2022

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I. INTRODUCTION

Mitral valve replacement is known as a routine procedure in cardiovascular surgery, and conventional surgery with a sternotomy has been used for over 50 years [1]. Although video - assisted thoracoscopic minimally invasive mitral valve surgery has just been used for over 25 years, it has equal outcome and more advantage [2]: more cosmetic, less invasiveness, fast recovery, and patient's satisfaction. During the development of cardiac surgery, cardiac anesthesia has reached many achievements. Over the past 50 years, mechanical ventilation has remained the cornerstone of postoperative strategy after cardiac surgery because of high incidence of pulmonary failure, low cardiac

output and high dose morphine painkiller during anesthesia time [2]. Since 1990s, based on cost-effectiveness, the fast-track cardiac anesthesia has appeared and become more and more popular [2-6]. It aims to not only reduce postoperative ventilation time, length of ICU stays, total hospitalization time and surgery cost but also remain safe and outcome that paid attention by many specialists in famous cardiovascular centers [2-4]. Because of the combination between minimal invasive mitral valve surgery and fast track cardiac anesthesia, the patient can be extubated just after surgery in the operation room or few hours after surgery. However, this technique is still under trial and research in as much as risk and benefit consideration.

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At Viet Duc university hospital, this combination has just been applied in early 2021 and the initial result is encouraging. This research aims to evaluate initial results of minimal invasive mitral valve replacement (MIMVR) with early extubation after fast track anesthesia and literature review.

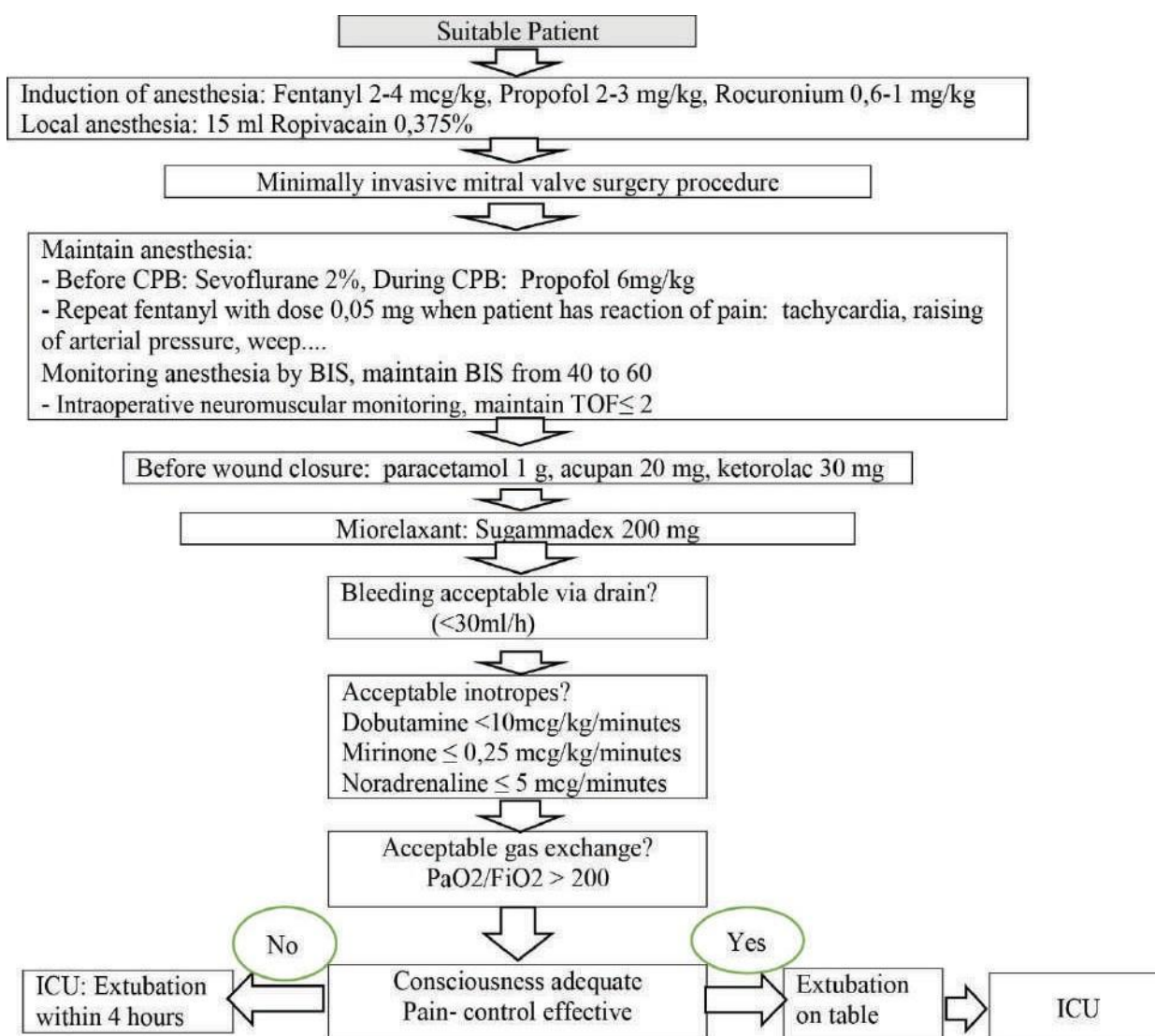
II. METHOD

A retrospective, descriptive study with convenient sample size was conducted on patients who

underwent MIMVR and or were not associated with tricuspid valve repair, which used fast track protocol of anesthesia and early extubation at Viet Duc university hospital from January to August, 2021.

Information is gathered from the electronic medical record and analyzed by SPSS 22 software.

Minimal invasive mitral valve replacement surgery and fast track anesthesia in Viet Duc university hospital was performed by unique protocol.



Hình 1: Sơ đồ các bước nghiên cứu

III. RESULT

Twelve patients were included in this study and clinical and paraclinical characteristics are shown in **Table 1**.

Table 1: Clinical and paraclinical parameters (N=12)

Parameters	n	%
Mean age (year)	53.8 ± 6.3	(42 - 63)
BMI	18.85	(15 - 23)

Parameters		n	%
Sex	Male	5	41.7
	Female	7	58.3
Medical history	Mitral valve commissurotomy	1	8.3
	Rheumatism	1	8.3
	Hypertension	4	33.3
NYHA	I	1	8.3
	II	10	83.3
	III	1	8.3
Clinical feature	Tired	8	66.7
	Dyspnea	11	91.6
	Chest pain	3	25
	Tachycardia	7	58.3
	Edema	1	8.3
	Systolic murmurs	6	50
ECG	Sinus rhythm	4	33,3
	Atrial fibrillation	8	66,7
Mitral valve disease	Mitral valve stenosis/regurgitation	11	91.7
	Mitral valve regurgitation	1	8.3
Tricuspid valve regurgitation	$\leq 1/4$	5	41.7
	$1/4 - 2/4$	3	25
	$2/4 - 3/4$	4	33.3

Most of the patients had mild stage of heart failure, good physical condition, late stage of rheumatic heart valve diseases with atrial fibrillation, enlargement of left atrium, pulmonary artery hypertension and preserved heart function.

Table 2: Preoperative and postoperative echocardiography (N=12)

Parameters		Pre-operation	Post-operation	P
LA (mm)		53.0 ± 7.6	48.4 ± 10.6	0.186
Dd (mm)		47.3 ± 7.1	49.6 ± 4.1	0.392
Ds (mm)		29.4 ± 5.8	31.3 ± 4.7	0.383
EF (%)		65.4 ± 8.1	65.8 ± 8.2	0.871
RV (mm)		21.8 ± 4.7	23.1 ± 3.3	0.272
Pulmonary artery pressure		42.1 ± 15.7	29.9 ± 6.9	0.010
Pressure gradient across mitral valve (mmHg)	Maximum	18.2 ± 8.3	9.2 ± 3.3	0.001
	Mean	11.2 ± 5.5	3.9 ± 1.2	0.001

Table 3: Intraoperative parameters (N=12)

Parameters		n	%
Lesions of Mitral valve	Thick and shrinkage	11	91.7
	Chordae tendineae rupture	1	8.3
Left atrial thrombus		1	8.3
Operative techniques	Removal of left atrial thrombus	1	8.3
	Closure of left atrial appendage	5	41.7
	Reduction of left atrium	11	91.7
	Maze procedure	1	8.3
	Mechanical valve replacement	12	100
	Tricuspid valve repair by De Vega	5	41.7
	Aortic cross - clamping (minutes)	86.3 ± 16.7	
	CPB (minutes)	108.0 ± 23.8	
	Surgery (hours)	3.4 ± 0.5	
	Ventilation time (minutes)	23.3 ± 8.3	
	ICU (hours)	21.9 ± 8.6	
	Hospitalization time(days)	14.7 ± 6.3	

Mitral valve lesions were almost thick and shrinkage of leaflets due to rheumatism. Mechanical valve was used in all patients because of young age; contemporary tricuspid valve repair's incidence was 40%.

Table 4: Complications after surgery

Complication	N	%
Agitation	3	25
Pleural effusion	1	8.3
Lung atelectasis	1	8.3

Our patient was extubated just after surgery and in the surgery room or within 4 hours after surgery in ICU. There are three patients who had agitation, but no one had cerebrovascular accident.

IV. DISCUSSION

Mitral valve diseases are the most popular heart valve diseases in developing countries. Most of them were acquired mitral valve disease, caused by rheumatism [7]. The majority of patients included in the study were in labor age and their rheumatic mitral valve disease was a long time because of the high frequency of atrial fibrillation, so they still had a good condition before operation (**Table 1**). Echocardiography showed a left atrium enlargement, mild to severe pulmonary hypertension and preserved left ventricular function (**Table 2**).

Minimal invasive mitral valve surgery has been performed over 25 years, which has many advantages: more cosmetic results, better recovery, patient's satisfaction improvement, and equal quality and safety as sternotomy [8]. In Viet Duc hospital, video-assisted mitral valve surgery has been used since 2014 with good results [9]. In this series of cases, the operation was uncomplicated and all patient was replaced mitral valve by mechanical prosthesis, because of young age (**Table 3**).

Go along with the development of cardiac surgery, cardiac anesthesia underwent significant change during cost - effectiveness strategy, so that "Fast track" cardiac anesthesia has been applied in uncomplicated cardiac procedures [2-5,10,11]. Researches showed that "Fast track" cardiac anesthesia has many advantages [3,5,12] such as reduction of airway irritations and other complications related to mechanical ventilation; decreasing relative's stress; reduction of sedative demand and hemodynamic affectation; early activation; decreasing ICU time and hospitalization time; reducing treatment cost (related to a ventilator, ICU and hospitalization time).

Maj G et al [6] conducted a meta-analysis about minimally invasive heart surgery with fast-track cardiac anesthesia, based on researches that were published in MEDLINE/PubMed. The authors

concluded that this is a safe strategy and has not increased the risk of complications and mortality.

The combination between fast track cardiac anesthesia and early extubation has been applied in Viet Duc University Hospital since last 2020,

and for the first time, we used this combination in atrial septal defect closure or mitral valve surgery. We selected the patients who had the early or mild heart failure and good physical condition (**Table 1**).

Table 6: Comparison of our results with those in other studies in Vietnam

Author	N	Studying period	Aortic cross-clamp time (minute)	CPB time (minute)	Surgery time (hour)	Ventilation time (hours)	ICU Time (day)	Hospital stays (day)
Nguyen HD [13]	72	8/2014 - 8/2016	115 ± 25	162 ± 42		15	2 - 3	
Duong DH [14]	49	1/2016 - 12/2016	64.0 ± 15.3	103.1 ± 24.3		21.6 ± 14.9	1.3 ± 0.67	8.4 ± 1.76
Pham TD [15]	57	9/2013 - 3/2015	113 ± 25	157 ± 29		8.7 ± 6.5	2.14 ± 0.9	16.2 ± 5.6
Tran N [16]	10	12/2016 - 3/2018	113 ± 25	157 ± 29	5.4 ± 0.7	7.05 ± 0.3		
Nguyen HU [9]	40	4/2014 - 12/2016	95.7 ± 33.6	161.5 ± 38.25		60 ± 58		12.6 ± 6.2
Our study (Table 3)	12	1 - 8/2021	86.3 ± 16.7	108.0 ± 23.8	3.4 ± 0.5	0.4 ± 0.1	0.91 ± 0.4	14.7 ± 6.3

In our series, the aortic-cross clamp time, bypass time and total operation time were 86.3 ± 16.7 minutes, 108.0 ± 23.8 minutes and 3.4 ± 0.5 hours relatively, what is shorter than other studies in **Table 6**. It may be explained by our experiences, technique and simple procedure on mitral valve. The extubation in this series was done just after surgery on the operation table or during 4 hours in the ICU with an average time of 0.4 ± 0.1 hours; ICU stays were less than a day (0.91 ± 0.4 day). These results significantly shorter than other centers in Vietnam (**Table 6**), where the fast - tract protocol was not applied. There were three patients (25%) with temporary agitation and they were treated by medical therapy. These patients had not any neurological deficits after that. All of them were extubated on the operating table about 30 minutes after operation and no other who extubated at ICU later. We think that delay extubation several times (1-4 hours) could solve this problem. One patient with lung atelectasis was successfully treated by

physiotherapy; all postoperative echocardiograms showed good function of mechanical valve prosthesis and improvement of heart function (**Table 2**).

V. CONCLUSION

The combination between video-assisted thoracoscopic minimally invasive mitral valve replacement and fast-track cardiac anesthesia with early extubation has feasible and it could be help to reduce ventilation time, ICU stay. In our initial results, this combination did not increase risk of complication and morbidity. However, this study has a limitation of a small sample size and we will continue this study in the future to have strong recommendations.

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