

## Preanesthetic Cardiopulmonary Bypass for Mechanical Mitral Valve Dysfunction

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2. Prosthesis failure  
3. Heart valve prosthesis

### INTRODUCTION

Although the overall performance of prosthetic heart valves is excellent, prosthesis-related problems occur within 10 years of surgery in 30% to 35% of patients with a mechanical prosthesis [1]. Mechanical valve dysfunction is one of the most dreadful complications following heart valve replacement. It generally causes acute pulmonary edema and acute cardiac failure and necessitates urgent intervention [2]. Induction of anesthesia may cause cardiac arrest due to decreased pulmonary and cardiac reserves.

We described our method of cannulation to overcome the risks of both anesthesia induction and Trendelenburg position for patients with mechanical valve dysfunction. This article presents four urgent surgical cases of mechanical valve dysfunction with acute pulmonary edema and cardiac insufficiency.

### DESCRIPTION OF CASES AND OPERATIVE TECHNIQUE

We had four cases. All of them had severe pulmonary edema, hemodynamic instability, and a critical preoperative

**Table 1.** The demographic varies of the patients

Characteristic	Case 1	Case 2	Case 3	Case 4
Age (yr)	51	35	28	27
Gender	Female	Female	Female	Female
Thepathology of the valve	PVT, PVL	PVT	PVT	PVT
NYHA	4	4	4	4

PVT, prosthetic valve thrombosis; PVL, paravalvular leak; NYHA, New York Heart Association.

status. Redo valve surgery was performed on all of our cases. Tables 1, 2 describe the patient characteristics and surgical strategies.

### TECHNIQUE OF OPERATION

The femoral artery and femoral vein were cannulated in the semi-fowler position under local anesthesia. The patient was repositioned to be supine, and general anesthesia was induced and tracheal intubation performed after initiating cardiopulmonary bypass (CPB) and hemofiltration. Re-median sternotomy was performed by air saw and the adhesions were repaired. The venous cannulation sites were changed

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**Table 2.** The operative data

Variable	Case 1	Case 2	Case 3	Case 4
Surgical procedures	MVR, TVR	MVR	MVR	MVR
Mortality	None	None	None	None
Morbidity	None	None	None	None
Hospitalization time (day)	14	25	11	11
Cardiopulmonary bypass time (time)	230	165	172	158
X clemp time (min)	Beating heart	80	88	77
Operation time (min)	366	336	327	315

MVR, mitral valve replacement; TVR, tricuspid valve replacement.

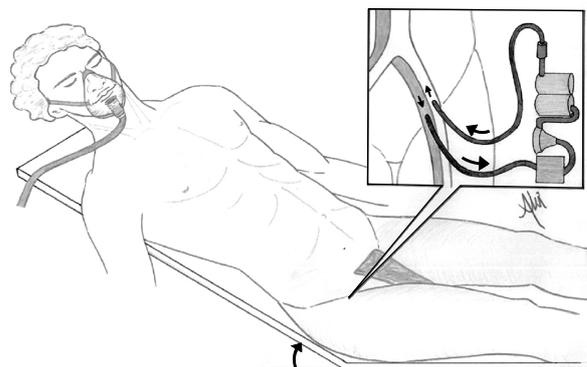
and standard bicaval venous cannulation performed when suitable. The operation was continued as a planned surgical procedure (Fig. 1).

## RESULTS

The mean age of the patients was  $35.2 \pm 11$  years. Mechanical mitral valve replacement was performed in all of the patients and tricuspid valve replacement was performed only in case 1. The operation was performed on the beating heart in case 1, and the other patients underwent surgery by cross-clamping the aorta. There were neither mortality nor morbidity. The mean hospitalization time was  $10.5 \pm 3.3$  days. The second case was transferred to the cardiology department due to colonization on the prosthetic material (Table 2).

## DISCUSSION

Prosthetic valve obstruction is a relatively rare but serious complication and is a major cause of reoperation for prosthetic valve dysfunction. Clinical deterioration is acute and quickly becomes life-threatening in most cases. General anesthesia may also contribute to hemodynamic collapse in this severely compromised condition by causing myocardial depression and generalized or venous vasodilatation, increasing pulmonary pressure, and decreasing catecholamine release [3,4]. Emergency reoperations for a dysfunctional mechanical valve prosthesis may also cause injury to the heart due to pericardial adhesions and an unstable hemodynamic status.

**Fig. 1.** The operative view of cannulation technique.

Hence, a normal hemodynamic status should be maintained with drugs and/or mechanical support such as a cardiopulmonary bypass.

Most studies have declared that reoperations in patients with reduced ventricular function are one of the risk factors that increase mortality and morbidity [5]. Moreover, prosthetic valve dysfunctions have a very high risk of mortality and morbidity [6].

Anesthesia induction has a potential risk of cardiac arrest before re-sternotomy, especially in patients with acute pulmonary edema. Deviri et al. [7] also showed that surgical treatment does not necessarily carry a high risk compared with elective valve surgery if the patient's condition is not unstable (4.7% in class I to class III vs. 17.4% in class IV patients). Buttard et al. [1] analyzed 29 patients with mitral valve dysfunction retrospectively, Twelve patients died (41.3%), 8 of them (27.5%) preoperatively. Two patients died of mechanical dissociation while awaiting emergency surgery. Six died of acute worsening of heart failure [1]. When cardiac arrest has occurred, re-sternotomy should be performed simultaneously with cardiopulmonary resuscitation; thereby, the risk of cardiac puncture increases. Hence, initiating cardiopulmonary bypass prior to anesthesia induction and re-sternotomy allows for a safe re-sternotomy without cardiac arrest and the operation can be continued safely.

Since most of the patients in such critical conditions develop cardiac arrest before any surgery can be attempted, we decided to start CPB at the same time as general anesthesia induction. We believe that establishment of femoro-femoral bypass before general anesthesia is a simple, feasible, and re-

liable method that allows sternotomy to be performed safely and rapidly in these patients. Furthermore, we believe this is a safe surgical technique not only in cases of mechanical valve dysfunction but in cases with pulmonary edema in which induction of anesthesia is precarious. In addition, this surgical approach may decrease the mortality of the patients who have undergone urgent surgery.

## CONCLUSION

In redo valve surgery with severe hemodynamic instability, femoro-femoral CPB under local anesthesia was instituted before general anesthesia induction, safely. This may have some advantage in avoiding anesthetic complications.

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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