

# Cardiac Tamponade After Interventional Procedures

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## Summary:

Cardiac catheterization for diagnostic or interventional procedures is a standard and well established procedure performed throughout the world with excellent safety record. The procedure, however, is not entirely free from risk of potential serious complications. Medical literature is full of reports of these complications. We report three cases of cardiac tamponade developing as procedure-related complication during cardiac catheterization which were successfully managed surgically. Careful & gentle technique, close monitoring of patient during and immediately after the procedure with mind fully alive to possibility of serious complications is of essence. Close liaison with surgical colleagues for immediate consultation and intervention is highly desirable in all cases.

## Key Words:

Tamponade, PTMC, cardiac catheterization, complication.

## Introduction:

Cardiac Catheterization procedures, after extensive experience, have come to be recognized as fairly safe and are routinely performed even in centers where facility of surgical backup does not exist. These procedures, however, are not entirely free from complications even if performed by experienced operators under best of circumstances. Incidence of reported complications in different procedures varies considerably in different series. Most of these complications are relatively minor and managed easily. However, there are certain potentially serious ones which are subtle in their manifestations and may escape notice if not specifically considered. We report three cases of cardiac tamponade occurring after catheter based procedures which were recognized and managed surgically.

## Case 1:

A 14 years old girl with echocardiographically documented severe mitral stenosis was undergoing PTMC. While manipulating the catheter & needle right atrial wall was punctured inadvertently without notice of operator. She developed hypotension after the procedure. Echocardiography confirmed diagnosis of cardiac tamponade. Pericardial aspiration revealed blood. However, in spite of aspiration of considerable amount of blood, her condition gradually deteriorated. With consultation of cardiac surgeon, emergency EES was planned. Her sternotomy revealed clots in the pericardium without any place showing active bleeding. CPB was established and stenotic valve was replaced with 25 mm Omniscience valve. She picked up nicely and was discharged on 7th day and is coming to the OPD regularly.

## Case 2:

An 8 years old girl was found to be having severe mitral stenosis and a small pericardial effusion on echocardiography. PTMC was planned and attempted.

During the procedure, atrial wall was inadvertently punctured as evidenced by aspiration of pericardial fluid through catheter. The procedure was immediately abandoned and patient intensively monitored for evidence of tamponade which she did develop. Emergency sternotomy showed blood and clots in pericardium. A puncture site was found at fossa ovalis. Severe mitral stenosis was found. Mitral valve was excised and replaced with Omniscience 25 mm. Patient had an uneventful recovery.

### Case 3:

A 40 years old lady, and known case of MVD was admitted with CCF. Echocardiogram showed large LA with grade II MR, prolapsing anterior mitral leaflet, mild MS and Trivial AR. Patient was planned for coronary angiogram and catheterization. Right heart pressures recorded with GL catheter and left and right coronary angiograms were done with JL and JR catheter. In the final part of the procedure for LV cine, Pig-tail catheter was tried but it would not enter the LV. It was presumed that either it was bicuspid aortic valve or aortic stenosis. Sones II catheter was taken which crossed the aortic valve easily. Then catheter was positioned in the center of LV and less than usual dye used, i.e., 24 ml at 12 ml per sec. As the injector was switched on the catheter tip due to pressure touched the wall of the ventricular and pericardial effusion appeared. Patient was observed on the table for half an hour, and since there was no increase in effusion patient was shifted to post-cath ward, where BP pulse was recorded half hourly. Blood sent for cross match and two units were arranged and colloid transfused. Her BP remained 100/70 and there was no pulsus paradoxus and no increase in JVP. After two hours dyspnoea appeared and she became restless with BP of 80 mmHg systolic. Emergency Echo showed pericardial effusion, causing tamponade. Patient was rushed to the cath lab and through sub-xiphoid approach, 950 ml of blood aspirated. There was no effect on effusion size and patient's BP further fell in spite of further plasma volume expanders. Patient was very restless and breathless with deteriorating hemodynamic condition. Transthoracic echocardiogram was done to estimate the exact amount of blood in the pericardial cavity and location of the catheter tip. Patient was shifted to operating room in emergency and median sternotomy was done with rapid infusion of fluids. On opening the pericardium there

was a gush of blood with clots. Relief of pressure in the pericardium with fluid influx lead to improvement in the hemodynamic condition of the patient and her condition improved. Evaluation of injury revealed damage to the right ventricular anterior wall by the catheter tip with catheter still in the right ventricular cavity. The main offending lesion was injury to the left ventricular posterior wall near circumflex artery with mild bruising and non expanding hematoma, which was left as such. Right ventricular injury was repaired and mitral valve replaced via left atrium with 25 size Omniscience prosthetic valve. Off-bypass course was slow with heavy inotropic supports. Patient remained well in post operative days and was discharged from the hospital on 12-post-operative day.

### Discussion:

Cardiac catheterization for diagnostic or interventional procedures is routinely performed in many centers of our country. With experience, these procedures have come to be established as safe and are even being performed in absence of surgical backup. Although these patients are kept under observation in post-cath wards for hemodynamic monitoring for a variable period, intensive monitoring is usually reserved for high risk patients. Initially stable patients after seemingly uncomplicated procedures may not be subjected to extensive monitoring.

All interventional procedures are known to be associated with a finite risk of complications, some of which might be potentially serious and may even require surgical management. Cardiac tamponade is one such complication. Subtlety of signs and symptoms, immediate or delayed presentation makes its recognition difficult unless specifically looked for. Rapid progression leading to cardiovascular collapse may be the presenting feature. The condition can be life threatening unless recognized early and prompt therapeutic interventions undertaken<sup>1</sup>.

Tamponade after interventional procedures is fifth largest cause and has been reported to account for 7.5% cases of cardiac tamponade<sup>2</sup>. Coronary angiography and ventriculography is the commonest diagnostic procedure and is extensively performed. Perforation of right or left ventricular wall has been mentioned as one of the possible complications of right as well as left

heart catheterization. The perforation may not be detected initially and may later present as tamponade. Surgical exploration may have to be resorted to as pericardiocentesis may fail due to early clotting of blood due to presence of contrast material in pericardial sack<sup>3</sup>.

Balloon mitral valvuloplasty is relatively new interventional technique for treatment of mitral stenosis in selected patients. Simplicity, efficacy and relatively non-invasive nature had made this mode a favourite with cardiologists. The technique is being adopted in increasing number of centers. The procedure, however, has a significant incidence of potentially serious complications. Cardiac tamponade after PTMC has been reported in different series with a frequency ranging from nil<sup>4</sup> to 4.4%<sup>5,6,7,8</sup>. At times atrial puncture may go undetected without any immediate hemodynamic manifestation and present only later.

The diagnosis of cardiac tamponade is primarily clinical: raised JVP, hypotension, tachypnoea, tachycardia and pulsus paradoxus. However, by the time these are fully manifest, patient may already be in critical state. Earliest possible diagnosis is of essence. Of all available investigational tools, echocardiography is most valuable under the circumstances. Diastolic collapse of anterior right ventricular free wall, right atrial collapse, and Doppler flow paradox are the most useful signs<sup>9</sup>. If the situation develops while the patient is still in cath lab, pressure studies may be diagnostic. However, in patients with mitral stenosis, who frequently have significant pulmonary hypertension, echocardiographic signs may be less sensitive. In one study, predictive accuracy of echocardiographic signs of tamponade was studied in a blinded fashion. Predictive accuracy for Right Atrial Collapse, Right Ventricular Diastolic Collapse, Flow Velocity Paradox across mitral valve, and IVC Paradox were 75%, 80%, 90%, and 95%, respectively, for the patients without pulmonary hypertension and 67%, 58%, 58%, and 83%, respectively, for the patients with pulmonary hypertension. Although predictive accuracy of all signs was lower in patients with pulmonary hypertension, statistically significant decreased predictive accuracy was found only with Flow Velocity Paradox ( $p < 0.05$ ).

Once the diagnosis of procedure-related tamponade has been made, the patient requires intensive hemodynamic monitoring. Pericardiocentesis using

standard techniques may be given a trial<sup>11</sup>. However, if hemodynamic profile does not improve, no further time should be wasted and immediate surgical intervention carried out. The results of surgery under these circumstances are generally very gratifying as evidenced by our experience.

### Conclusion:

Interventional cardiac procedures are associated with definite morbidity and complication risk even in best hands. Operator should always be keenly alive to the possibility during the procedure, and even at minutest suspicion, should not hesitate to seek help/advice. All patients, regardless of apparent simplicity of procedure, should be carefully observed after the procedure. Staff concerned should be trained to look for earliest signs of complications. At first indication of any complication, all available diagnostic facilities should be utilized promptly without any reservation. Once the diagnosis is confirmed, immediate management decisions should be taken and surgical advice sought early.

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