



## Case Report

# Anaesthesia management of coronary artery perforation during Percutaneous Coronary Intervention (PCI)

Ninad D Chodankar<sup>1,\*</sup>, Sulekha Jain<sup>1</sup>, Harvesp D Panthakey<sup>1</sup>, Hemant H Mehta<sup>1</sup>

<sup>1</sup>Dept. of Anaesthesiology, Sir HN Reliance Foundation Hospital, Mumbai, Maharashtra, India



## ARTICLE INFO

### Article history:

Received 30-08-2020

Accepted 04-09-2020

Available online 15-03-2021

### Keywords:

Coronary  
Intervention  
Perforation  
Percutaneous

## ABSTRACT

Percutaneous Coronary Intervention (PCI) is an accepted modality of treatment in patient with coronary artery disease. Coronary artery perforation is very rare but serious complication that can occur while performing PCI.

We describe two cases of coronary perforation while performing PCI. In first case, coronary perforation could not be sealed with coronary stent and required emergency surgery. And in second case, we were able to seal the coronary perforation with stent and avoid surgery.

Coronary artery perforation requires team approach by cardiologist, anaesthesiologist and surgeon for early recovery and good outcome.

© This is an open access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

## 1. Introduction

Percutaneous Coronary Intervention (PCI) is an accepted modality of treatment in patient with coronary artery disease. Coronary artery perforation is very rare but serious complication that can occur while performing PCI.

While the incidence of coronary perforation is only 0.2%, 17% of these patient develop cardiac tamponade.<sup>1</sup> 2.8-12.7% may require emergency surgery and mortality is 5.9-8%.<sup>2</sup> Many patients with coronary perforation are treated successfully medically or by repeated balloon inflations or by conventional or covered stent. Nevertheless, thoracic exploration with or without coronary bypass surgery were necessary in one-third of the patients.

We describe two cases of coronary perforation while performing PCI. In first case, coronary perforation could not be sealed with coronary stent and required emergency surgery. And in second case, we were able to seal the coronary perforation with stent and avoid surgery.

## 2. Case Report

### 2.1. Case 1

52 years old, female patient presented with complaints of squeezing type of chest pain localised in right pectoral area, non-radiating, since 2 weeks with dyspnoea on exertion for 4 weeks.

Patient is a case of Chronic Kidney Disease on Haemodialysis twice a week. Diagnosed 8 years back and on haemodialysis twice a week, since 4 years. She was also Obese with BMI of 37 kg/m<sup>2</sup>.

Preprocedure Haemoglobin was 9.0g/dl, Serum Creatinine 3.2mg/dl. Echocardiogram was otherwise normal with LVEF of 60%. ECG showed ST depression in lateral leads. Rest all biochemical and haematological value were within normal limits.

Patient was taken up for Coronary Angiography with Percutaneous transluminal coronary angioplasty (PTCA) under Local anaesthesia.

Coronary Angiography done showed Left Main coronary artery showed evidence of calcification and eccentric 80% narrowing distally involving the origin of Left Anterior Descending artery (LAD). LAD showed 50% narrowing

\* Corresponding author.

E-mail address: [ninad.chodankar@gmail.com](mailto:ninad.chodankar@gmail.com) (N. D. Chodankar).

proximally on a bend and another long segment 40-50% narrowing. Left Circumflex artery (LCX) showed severe disease and totally occluded in mid portion. Right Coronary Artery (RCA) showed 70% narrowing in mid portion.

Due to comorbidities and risks involved, patient and cardiologist preferred Coronary Angioplasty for all 3 vessels over Open surgery.

While undergoing PTCA to LAD, while dilating narrowed segment, patient developed sudden severe chest pain. Angiogram showed perforation of LAD. Patient was sedated with IV Midazolam 0.02mg/kg and IV Fentanyl 0.5 mcg/kg. Further angiogram showed Pericardial Tamponade and Blood pressure started dropping. Systolic BP fell below 80mmHg, hence initially Noradrenaline infusion was started and later Adrenaline infusion was added. All the while trying to maintain Mean BP above 65mmHg and systolic BP above 80mmHg. Meanwhile cardiologist was able to put pericardial drain to reduce tamponade. Maximum dose of adrenaline and noradrenaline infusions required was 0.05mcg/kg/min each. After insertion of pericardial drain, hemodynamic started improving and vasopressors could be tapered. Cardiologist tried sealing perforation with repeated balloon inflation and tried stenting but was unsuccessful with persistent arterial leak. Hence decision was taken to go ahead with open exploration with off pump Coronary Artery Bypass Graft.

General anaesthesia was induced with IV Etomidate 0.3 mg/kg and IV Rocuronium 1mg/kg. Intubated with No 7 ETT cuffed, ventilated with FiO<sub>2</sub> of 50% and Isoflurane with MAC of 0.7-0.9. BP was maintained by continuing Adrenaline and Noradrenaline infusion. BP fluctuations were maximum during induction, after opening of pericardium and during handling of heart. Maximum dose of adrenaline and noradrenaline infusion required was 0.1mcg/kg/min and 0.12 mcg/kg/min respectively. There were no incidences of arrhythmias noted during surgery. Hemodynamic of patient were otherwise maintained stable with vasopressor infusion.

After securing the leak, two Grafts were done Left Internal Mammary Artery (LIMA) to LAD artery and Right Internal Mammary Artery (RIMA) to Posterior Descending Artery (PDA). Intraoperatively, IV Fentanyl and IV Atracurium was used to maintain depth of anaesthesia. Total blood loss was estimated at 3 litres and intraoperative input was 750ml crystalloids, using Cell saver 800ml washed RBCs were returned, 1.7 litres Packed Red Blood Cells, 900ml FFP and 300ml of Random Donor Platelets. There was no Urine output intraoperatively.

Patient was shifted to ICU on IPPV on Adrenaline and Noradrenaline infusions. Patient underwent Sustained low efficiency dialysis (SLED) was done same day. She developed pulmonary oedema postoperatively in Post-Operative Day (POD) 1. To treat pulmonary oedema, patient was started on dialysis, hemodynamics maintained with

vasopressors and maintenance of negative balance. Patient was extubated on POD 4. Adrenaline and Noradrenaline infusions slowly tapered and omitted on POD 6. Shifted to ward on POD 10 after start of regular dialysis as per previous requirements. Echocardiogram done after 2 weeks was normal with LVEF of 60%. Patient was discharged on POD 20 with Tablet Aspirin 75mg once daily.

## 2.2. Case 2

68 years old, female patient presented with complaints chest pain with radiation of pain to left arm for 1 week, increased in severity for 1 day.

Patient was case of Hypertension on Tab Amlodipine 5mg once daily.

Echocardiogram showed Hypokinetic Inferoposterior wall with LVEF 50%. Rest was WNL. ECG showed ST elevation in inferior leads. All biochemical and haematological value were within normal limits.

Patient was taken up for Coronary Angiography with Percutaneous transluminal coronary angioplasty (PTCA) under Local anaesthesia

Coronary Angiography showed- LAD artery showed 90% narrowing proximally. Obtuse Marginal (OM) artery showed 80% narrowing mid portion.

While undergoing PTCA to LAD artery, while post dilating the stent there was a perforation which was noticed. Patient developed sudden severe chest pain. Patient was sedated with IV Midazolam 0.02mg/kg and IV Fentanyl 0.5 mcg/kg.

Immediately cardiologist started repeated balloon inflations for 20mins and later check shoot showed the perforation to be sealed. Patient was hemodynamically stable all the while and 2D Echocardiogram done in cardiac catheterisation lab as well post procedure in ICU showed no pericardial effusion.

Shifted to ward on Post-Operative Day (POD) 3. Discharged on POD 4 with Tab Amlodipine 5mg once daily and Tablet Aspirin 75mg once daily.

## 3. Discussion

Percutaneous Coronary Intervention (PCI) is an accepted modality of treatment in patient with coronary artery disease. Technique of anaesthesia in Cardiac catheterization laboratory can vary from Monitored anaesthesia Care (MAC), General anaesthesia, Sedation to Regional anaesthesia, depending upon the type of procedure.<sup>3</sup> A discussion with cardiologist and patient regarding the procedure and types of anaesthesia is highly recommended.<sup>4</sup>

PCI is usually performed with Local anaesthesia at puncture site with use of sedatives for anxiolytics. General anaesthesia is usually not required.<sup>5</sup>

Various complications can occur during PCI from Longitudinal Stent deformation, Burr entrapment, abrupt stent closure, device embolization and coronary artery perforation. Amongst these, Coronary artery perforation has lowest incidence at 0.2% but highest mortality at 8%.<sup>2</sup>

Hence it is essential that for all patients undergoing PCI should have all essential monitors attached. Ventilator, suction, emergency and anaesthesia drugs and emergency airway equipment should be readily available. As well as facility to arrange blood and blood products, if need arises.

Coronary artery perforations are treated successfully medically or by repeated balloon inflations or by conventional or covered stent. Reversal of anticoagulation can also be attempted.<sup>6</sup>

Other modalities for smaller caliber segments include Coiling, Microspheres, Thrombin Injection, Autologous Blood Clots and Autologous Fat Embolization.<sup>7</sup>

Echocardiography should be done at first possible time when possible to look for pericardial blood collection or in case of hemodynamic collapse. Pericardiocentesis should be done immediately from multiple sites and perform aspiration. Drain should be place for 6-24 hrs and accessed continuously with echocardiography.<sup>6</sup>

Administration of fluids is recommended. Vasopressors may need to be administered in case to hemodynamic collapse. Reversal of anticoagulation (Heparin) can be achieved with protamine. If the perforation cannot be sealed, repeated balloon inflations should be made by cardiologist. Distal ischemia is major concern during balloon inflation, perfusion balloons can be used without blocking distal blood flow.<sup>8</sup>

During coronary artery perforation, patient can have sudden severe pain which can make patient uncooperative which hampers the procedure as well as thwarts the rescue procedure such as balloon inflation or stent deployment. Hence it is essential to adequately sedate and provide analgesia depending upon hemodynamic stability.

If perforation is large and there is severe ischemia with hemodynamic collapse which cannot be sealed with percutaneous techniques then open emergency surgery is only option.

Blood and blood products should be arranged before going ahead with emergency surgery. It is essential to remember that GP IIb/IIIa inhibitors are given to patients prior to PCI hence platelet transfusions should be used if needed.<sup>8</sup>

Emergency Coronary Artery Bypass Grafting (CABG) carries increased risk of mortality and morbidity. Studies have shown that tolerance for cardioplegic arrest is impaired in patient undergoing Emergency CABG.<sup>9</sup> They also have increased in frequency of inotropic support, with greater postoperative bleeding, require prolonged postoperative ventilation and extended ICU care. Those patient who receive preoperative thrombolytic therapy exhibit greater bleeding tendencies.

Our first patient was a case of Chronic Kidney Disease on regular haemodialysis. Hence we preferred PTCA over CABG in spite of Triple Vessel Disease. But Coronary Artery Perforation during PTCA meant the patient needed emergency exploration. Multiple comorbidities, emergency nature of surgery, use of multiple blood and blood products and need for mechanical ventilation are reasons why our patient needed longer ICU and hospital stay. In second patient, we were able to conservatively manage the patient after coronary artery perforation with balloon dilatation and avoid emergency surgery or any pericardial blood collection. Hence we were able to safely monitor the patient for 48 hours in ICU with regular echocardiography to look for any increase in blood collection, and avoid prolonged hospital stay.

#### 4. Conclusion

PTCA has been an excellent treatment modality for patients with coronary artery disease, especially those with multiple co-morbidities. Improvements in procedure and understanding has helped to carry out the procedure safely. For anaesthesiologist it is essential to know various complications that could arise and ways to deal with it. PTCA requires suitable anaesthesia, along with good team work, leading to relief of symptoms and early recovery.

#### 5. Source of Funding

None.

#### 6. Conflict of Interest

The authors declare that there is no conflict of interest.

#### References

1. Ajluni SC, Glazier S, Blankenship L, O'Neill WW, Safian RD. Perforations after percutaneous coronary interventions: clinical, angiographic, and therapeutic observations. *Catheterization Cardiovasc Diagn.* 1994;32(3):206–12. doi:10.1002/ccd.1810320303.
2. Giannini F, Candilio L, Mitomo S, NRuparelia, Chieffo A, Baldetti L, et al. A Practical Approach to the Management of Complications During Percutaneous Coronary Intervention. *Cardiovasc Interv.* 2018;11(18):1797–1810. doi:10.1016/j.ccin.2018.05.052.
3. Hamid M. Anesthesia for cardiac catheterization procedures. *Heart Lung Vessel.* 2014;6(4):225–31.
4. Haddy S. Anesthesia for Structural Heart Interventions. *Cardiol Clin.* 2013;31:455–65. doi:10.1016/j.ccl.2013.04.005.
5. Shetti AN, Karigar SL, Mustilwar RG, Singh DR, Nag K. Anesthesiologist in cardiac catheterization laboratories; the roles and goals!! a postgraduate educational review. *Anesth Essays Res.* 2017;11(4):811–5. doi:10.4103/0259-1162.186866.
6. Shimony A, Joseph L, Mottillo S, Eisenberg MJ. Coronary Artery Perforation During Percutaneous Coronary Intervention: A Systematic Review and Meta-analysis. *Can J Cardiol.* 2011;27(6):843–50. doi:10.1016/j.cjca.2011.04.014.
7. Lemmert ME, van Bommel R, Diletti R, Wilschut JM, de Jaegere P, Zijlstra F, et al. Clinical Characteristics and Management of Coronary Artery Perforations: A Single-Center 11-Year Experience and Practical Overview. *J Am Heart Assoc.* 2017;6:1–8.

- doi:10.1161/jaha.117.007049.
8. Wang X, Ge J. Balloon Occlusion Types in the Treatment of Coronary Perforation during Percutaneous Coronary Intervention. *Cardiol Res Pract.* 2014;doi:10.1155/2014/784018.
  9. Hill RF, Kates RA, Davis D, Reves JG. Anesthetic implications for the management of patients with acute myocardial infarction: A matched cohort study of patients undergoing emergency myocardial revascularization. *J Cardiothorac Anesth.* 1988;2(1):23–9. doi:10.1016/0888-6296(88)90143-3.

### Author biography

**Ninad D Chodankar**, Clinical Associate

**Sulekha Jain**, DNB Trainee

**Harvesp D Panthakey**, Consultant

**Hemant H Mehta**, Director

**Cite this article:** Chodankar ND, Jain S, Panthakey HD, Mehta HH. Anaesthesia management of coronary artery perforation during Percutaneous Coronary Intervention (PCI). *Indian J Clin Anaesth* 2021;8(1):137-140.