

Catheter Induced Coronary Artery Dissection: A Case Study, Risk Factors and Successful Intervention

Dr. Dolly Mathew

Professor of Cardiology, Calicut Government Medical College

Abstract: *This article presents a comprehensive case study of catheter induced coronary artery dissection, an uncommon complication arising from diagnostic coronary angiography. The clinical scenario involves a middle aged male with established risk factors who developed acute symptoms during the procedure. The article explores the various risk factors associated with this complication, including anatomical considerations and catheter related factors. The patient's successful intervention through bail - out stenting is discussed, highlighting the importance of precise positioning and strategy in managing this condition. The study underscores the significance of careful engagement techniques and tailored interventions, shedding light on the overall management of catheter - induced coronary artery dissections.*

Keywords: diagnostic coronary angiography, right coronary artery, coronary dissection

1. Introduction

Coronary artery dissection is a rare complication of diagnostic coronary angiography. Ramasamy et al reported the incidence of catheter induced coronary artery dissection to be 0.083%¹. The clinical outcome of coronary artery dissection is dependent on extent and direction of its progression. Dissection may progress anterogradely to close off the coronary artery, leading to acute myocardial infarction. Anterograde progression may be associated with normal (TIMI 3) flow into distal bed, with no damage to myocardium and heals without any intervention. Retrograde progression can result in aortic dissection. Left main coronary artery disease, use of Amplatz catheter, catheterization for acute myocardial infarction, catheter manipulation, vigorous contrast injection, sudden deep engagement of catheter within coronary artery, variant anatomy of coronary ostia and vigorous and deep inspiration are considered to be the risk factors that increases the likelihood of catheter induced coronary artery dissection

2. Clinical Scenario and Presentation

A 46 year old male smoker, hypertensive, with strong family history of coronary artery disease presented with exertional angina class II. Clinical examination, ECG and echocardiography findings were unremarkable. He was remaining symptomatic on optimum medical management.

Diagnostic coronary angiography was done via right radial access using standard 5French Tiger diagnostic catheter (Terumo). Left coronary artery injection showed significant obstructive lesions in both Left anterior descending and circumflex artery. Right coronary artery was engaged with the same 5French Tiger diagnostic catheter. First injection showed proximal discrete 50% and 50% stenosis in mid RCA and a disease free RCA ostium (figure 1). Following the second injection, RCA developed type D dissection of RCA from ostium down till the precross region (figure 2, 3). Immediately after the second injection, patient developed

severe angina. ECG monitor showed ST elevation in inferior leads and subsequent complete heart block. He went into acute heart failure. Intravenous fluids and inotropic support and nasal oxygen started immediately. Inj. Morphine 3 mg was given. Temporary pace maker was inserted via right femoral vein. Right femoral artery access was obtained via modified Seldinger technique for stenting the RCA. RCA was engaged with 7French Judkins right 3.5 SH Cordis guide catheter. True lumen was wired, blindly with 0.014 inch Run through NS coronary wire. Coronary wire could be passed till posterior descending artery through the true lumen successfully after multiple attempts. Position of the wire was confirmed with two orthogonal test injections. RCA was stented from ostium to precross with 3 drug eluting stents (2.5 * 30 mm orsiro, 2.75 * 40 mm orsirobiotronic AG 3.0 * 40 mm orsiro) from distal to proximal (figure4). TIMI 3 flow has been attained. Patient had a dramatic relief of symptoms post stenting. ST elevation settled down and hemodynamics improved. Rhythm also became normal. There was no elevation in post procedural troponin level.



Figure 1: RCA 1st injection

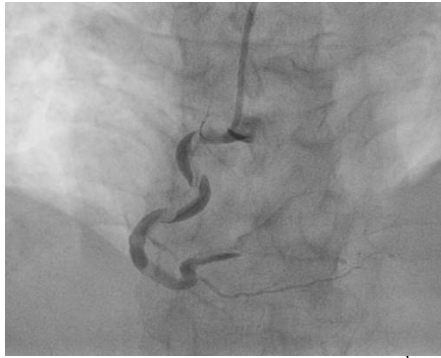


Figure 2: Dissection of RCA following 2nd injection

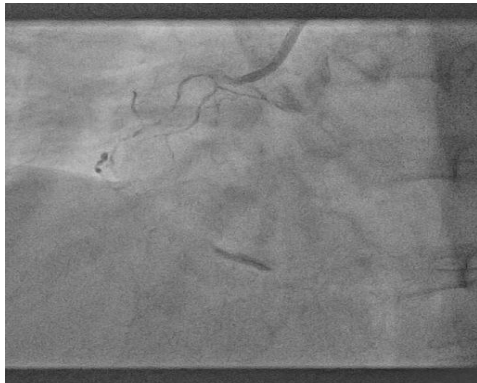


Figure 3: Angiographic image immediate post dissection



Figure 4: Final image post stenting RCA

Clinical, pathological discussion & discussion on management

Coronary artery dissection is extremely rare complication of diagnostic coronary artery catheterization. H Amano et al³ reported that incidence of coronary artery dissection during diagnostic coronary angiography was 20 times lesser than that during PCI (percutaneous coronary artery intervention). Ramasamy et al observed that RCA is more commonly affected than left main coronary artery. Goldstein et al⁴ also observed the higher incidence of dissection in Right coronary artery than in Left main (89 % v/s 11%). Lesser diameter of ostia of RCA as compared to left main, abnormal noncoaxial alignment of RCA ostium in relation to ascending aorta and presence of type III collagen in RCA ostium as opposed to type I collagen in LM ostium (type I collagen has more tensile strength than type III collagen) make RCA ostium more prone for dissection.⁵ Dissection more likely occur while using guiding catheters, especially EBU and Amplatz left for RCA.⁶ Exact incidence of dissection with Tiger diagnostic catheter is not known. Even though considered to be safe, cases of dissection with tiger

catheter have also been reported.⁷ Dissection was found to occur more commonly in radial access as compared to femoral access. Coronary catheters have been designed for femoral approach. Aggressive manipulation during engagement and noncoaxial alignment were observed in RCA dissection in transradial approach.⁶

In our case, RCA was engaged without any aggressive manipulation, it happened accidentally. Ostial lesion is also a known risk factor for catheter induced ostial coronary artery dissection. Gorden et al reported that the left main dissection was observed in 24% of patients when the distance between atherosclerotic plaque and catheter tip was less than 6mm, whereas the rate was 3% when the distance between atherosclerotic plaque and catheter tip was more than 6 mm⁸. Devin et al, on reviewing cardiac catheterization records over 9 years found out that 93% of the left main dissection occurred during the first contact of catheter with a left main atherosclerotic plaque⁹. Interestingly, our patient didn't have RCA ostial disease.

Care must be taken for coaxial positioning and avoidance of deep intubation during engagement, when there is ostial lesion. Bail out stenting is the best strategy to manage coronary artery dissection that progress anterogradely to cause acute myocardial infarction. Long term outcome of bail out stent implantation was found to be acceptable in a study conducted by H Amano et al³. In our case, RCA has been successfully wired and stented from ostium to precross without imaging modalities such as IVUS or OCT. IVUS or OCT can be used whenever there is difficulty in identifying and wiring the true lumen. No data about the incidence of iatrogenic coronary artery dissection in post chemotherapy patients, are available.

3. Final Diagnosis

Coronary artery disease, Three vessel disease
Acute inferior wall myocardial infarction due to catheter induced right coronary artery dissection
Successful RCA stenting with drug eluting stents

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References

- [1] A Ramasamy, DA Jones, A Wragg, EJ Smith, CJ Knight, A Mathur, C O'Mahony; Iatrogenic catheter induced coronary artery dissection: incidence, management and outcomes; *bmj*, volume 107, 2017
- [2] Boyle, A. J., Chan, M., Dib, J., & Resar, J. (2006). Catheter - induced coronary artery dissection: Risk factors, prevention and management. *Journal of Invasive Cardiology*, 18 (10), 500 - 503.
- [3] H Amano, K Kadota, A Kuwayama, K Miura, M Ohya, T Shimada, S Kubo, S Otsuru, S Habara, T Tada, H Tanaka, YFuku, TGoto, P4560; Long - term outcomes of iatrogenic coronary artery dissection during cardiac catheterization, *European Heart Journal*, Volume 39, Issue suppl_1, August 2018, ehy563. P4560
- [4] Goldstein JA, Casserly IP, Katsiyannis WT, Lasala JM, Taniuchi M. Aortocoronary dissections complicating a

- percutaneous coronary intervention. J Invasive Cardiol.2003; 15: 89–92.
- [5] José R. López - Mínguez, Vicente Climent, Siew Yen - Ho Structural features of the sinus of valsalva and the proximal portion of the coronary arteries: their relevance to retrograde aorto - coronary dissection Rev Esp Cardiol, 59 (7) (2006), pp.696 - 702
- [6] Anantharaman Ramasamy MBChB, MRCP, Retesh Bajaj MBBS, MRCP, Daniel A Jones MBBS, PhD, Rajiv Amersey MD, Anthony Mathur MD, PhD, Andreas Baumbach MD, Christos V. Bourantas MD, PhD, Iatrogenic catheter - induced ostial coronary artery dissections: Prevalence, management, and mortality from a cohort of 55, 968 patients over 10 years; catheterisation and cardiovascular intervention; volume 98, issue 4, October 2021; *page 649 - 655*
- [7] Damera SR, Barik R, Sivaprasad A. percutaneous intervention for optitorque tiger catheter induced dissection of right coronary artery and aortic root. Nig J Cardiol 2017; 14: 31
- [8] Gordon PR, Abrams C, Gash AK, Carabello BA. Percatheterization risk factors in left main coronary artery stenosis. Am J Cardiol.1987; **59** (12): 1080 - 1083.
- [9] Devlin G, Lazzam L, Schwartz L. Mortality related to diagnostic cardiac catheterization. The importance of left main coronary disease and catheter induced trauma. Int J Card Imaging.1997; **13** (5): 379 - 384.

Author Profile

Dr. Dolly Mathew, Professor of Cardiology, Calicut Government Medical College