

Coronary artery aneurysm - A complication of post percutaneous coronary interventions and strategies for management

Vaibhav A Patil^{1*}, G R Kane², Rohit Kumar³, Somnath M⁴

^{1,3}Senior Resident, ²Professor and HOD, ⁴Faculty, Department of Cardiology, Dr D Y Patil Hospital Sector 5 Nerul, Navi Mumbai, Maharashtra, INDIA.

Email: patilvaibhav102@gmail.com

Abstract

A 54 years married female patient was presented with chest pain and dyspnea on exertion. She was known case of hypertension and type 2 Diabetes mellitus she was asymptomatic until she develops chest pain and dyspnea on exertion for last 2 days associated with sweating. On physical examination general conditions are normal with normal cardiac examination. Her electrocardiogram showed normal sinus rhythm and normal axis with T wave inversion in leads v4-v6, cardiac enzymes showed raised CPKMB and TROPONIN. On 2D-ECHO examination she had apicolateral regional wall abnormality with ejection fraction of 45% and diastolic dysfunction. Patients underwent coronary angiography which revealed left anterior descending artery (LAD) 80% stenosis and left circumflex artery 99% stenosis, she had successful percutaneous coronary intervention with sirolimus eluting stent to left anterior descending artery (LAD) and left circumflex artery done on 01/09/2016. She was discharged on double antiplatelets and high dose statins and was regularly followed up with control of blood pressure and diabetic. After 3 months on, patients came with chest pain and dyspnea on exertion which were not relieved with oral medications, so patients was hospitalised again and check coronary angiography was done which shows patent stent in left anterior descending artery (LAD). The left circumflex artery stent showed in-stent restenosis with pseudoaneurysm formation. This was again confirmed on CT-CORONARY ANGIOGRAM. On 23/01/2017 coiling to left circumflex artery aneurysm was done with progreat. Patients stabilised hemodynamically and symptomatically. Follow up check coronary angiography done on 25/04/2017 which revealed patent stents and disappearance of aneurysmal swelling. There is no clear mechanism responsible for the occurrence of coronary artery aneurysms occurring after drug-eluting stent implantation, and hence the treatment strategy remains controversial. The cause and treatment of this complication are PTCA with DES is discussed. Here we give emphasis on cause and treatment of aneurysm.

Key Word: Coronary artery aneurysm.

*Address for Correspondence:

Dr. Vaibhav A Patil, Senior Resident, Department of Cardiology, Dr D Y Patil Hospital Sector 5 Nerul, Navi Mumbai, Maharashtra, INDIA.

Email: patilvaibhav102@gmail.com

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INTRODUCTION

Coronary artery aneurysm (CAA) is a rare complication occurring after drug-eluting stent (DES) implantation. DES implantation pre-disposes an individual to acute stent thrombosis, which is a potentially fatal event because of acute vessel occlusion and is reduced due to use of DAPT. The incidence of DES thrombosis seems to be increasing. A DES may affect the normal healing process of the vessel wall as well as the remodelling process, leading to late stent malposition.

CASE REPORT

A 54 year married female patient presented with chest pain and dyspnoea on exertion. Being known case of

hypertension and type 2 DM she was asymptomatic until she develops chest pain and dyspnea on exertion since last 2 days associated with sweating. On physical examination general conditions are normal with normal cardiac examination. On investigations patients ECG shows normal sinus rhythm axis with T wave inversion in leads v4-v6, cardiac enzymes shows CPKMB and TROPONIN raised. On 2D-ECHO examination apicolateral regional wall abnormality with ejection fraction 45% and diastolic dysfunction. So patients

underwent coronary angiography which reveals left anterior descending artery (LAD) 80% stenosis and left circumflex artery 99% stenosis, for that percutaneous coronary intervention with sirolimus eluting stent to left anterior descending artery (LAD) and left circumflex artery done on 01/09/2016 (fig. 1 and 2). Patients discharged on double antiplatelets and high dose statins and regularly followed up with control of blood pressure and sugar.



Legend

Figure 1: coronary angiogram showing OM stenosis, **Figure 2:** TIMI 3 flow after PCI to OM with sirolimus DES, **Figure 3:** Angiogram showing giant aneurysm to OM, **Figure 4:** Angiogram showing obliteration of flow in aneurysm

After 3 months on i.e. 19/12/016, patients came with chest pain and dyspnea on exertion which were not relieved with oral medications, so patients admitted. Meanwhile check coronary angiography was done which shows patent stent in left anterior descending artery (LAD) and left circumflex artery stent shows in-stent restenosis with pseudoaneurysm formation which again confirmed with CT- CORONARY ANGIOGRAM (fig. 3). And on 23/01/2017 coiling to left circumflex artery aneurysm done with progreat. Patients stabilised and discharged and follow up. Patients course was uneventful. Follow up check coronary angiography done on 25/04/2018 which reveals patent stents and disappearance of aneurysmal swelling (fig.5).



Figure 5: Angiogram on follow up after 12 month showing complete regression of aneurysmal swelling

DISCUSSION

Definition: Coronary artery aneurysm (CAA) defined as dilatation of the coronary artery that exceeds at least 1.5 times the adjacent reference diameter of normal vessel segments (1, 8,9).Coronary artery aneurysms after coronary intervention are rare, with a reported incidence of

0.3% to 6.0%, and most “aneurysms” are in fact pseudoaneurysms rather than true aneurysms (3–4).

Mechanism of injury: Arterial wall injury caused by oversized balloons or stents, high-pressure balloon inflations, atherectomy, and laser angioplasty have all been associated with coronary artery aneurysms after coronary intervention (1–3). Drug eluting stent is covered with anti-

proliferative drugs like sirolimus everolimus, paclitaxel which do prevent re-stenosis but at the cost of arterial wall injury related as delayed re-endothelialization, inflammatory changes of the medial wall, and hypersensitivity reactions (5-7). These changes may be due to delayed healing secondary to the antiproliferative action, cell necrosis and/or apoptosis from the antimetabolite effect of the drug, and hypersensitivity reactions to the drug/polymer. The rate of late stent malposition and aneurysmal formation is higher for DESs than for bare metal stents (BMSs). The incidence rate of late stent malposition after SES implantation is 8–10% of patients¹. That's why the DES implantation may be associated with a greater risk of aneurysm formation. However, the true incidence, mechanism, clinical course, and treatment of coronary artery aneurysms after DES implantation remain largely unknown.

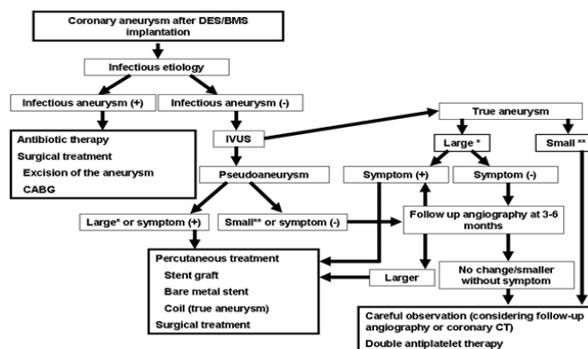
Investigations for CAA: Most of the time CAA diagnosed with coronary angiography for the patients with symptoms or as routine follow up as per study protocols. Intravascular ultrasound has become the gold standard investigations for diagnostic information and to anatomic evaluations⁷. CT coronary angiography, coronary magnetic angiography are non-invasive investigation of choice of which CT coronary angiogram has utmost importance as it is not interfere with metal artefact.

CAA in Bare metal v/s drug eluting system: The mechanism for this phenomenon remains unclear, even though previous reports have described local hypersensitivity and chronic inflammation. The polymer carriers of DESs can induce an inflammatory reaction of the arterial wall¹. Factors such as drug toxicity and infection, and mechanical factors such as residual dissection, injury to arterial wall caused by oversized balloons and stents, high-pressure inflations, atherectomy

and perforations may also be associated with aneurysm formation after PCI. In the DES versus BMS randomized trials, routine angiographic follow-up was performed in a large subset of patients at 6 to 9 months after the initial procedure (10-12). In this analysis, the incidence of coronary aneurysms was similar overall with DES compared with BMS (1.1% [18 of 1,615] with DES and 0.8% [12 of 1,587] with BMS [odds ratio 1.326, 95% confidence interval 0.571 to 3.078; p 0.512]).

Classification of coronary artery aneurysm after coronary interventions: After reviewing available literature on CAA developing after BMS or DES implantation classified into 3 types. Type 1 rapidly growing pseudoaneurysm formation which is detected within 4 weeks which is mostly as a result of the direct arterial injury rather than stent, drug or polymer (13-14). Type 2 is chronic presentation incidentally detected for recurrent symptoms or follow up study protocols in which patients are asymptomatic or complaint of mild angina. Type 2 CAA is mostly related to reactions to the drug, polymer or metal stent(15-29). Type 3 is related to infection or mycotic in etiology which may presented with fever and systemic manifestations due to bacteremia(30-33).

Treatment: A treatment strategy has not been established for this rare clinical entity. Recently, some authors have reported therapeutic options such as interventional treatments (stent grafts or coils or BMSs) but treatment strategies remain controversial and surgery somewhat based on case-by-case "best clinical judgment" decisions¹. Concerning the indications for invasive treatments, Aoki *et al*¹ recommended that treatment should depend on the aneurysm size, expansion history, pathophysiology (true or false aneurysm) and symptoms of the patient.



Proposed Treatment Algorithm: A symptomatic patients with large CAA which is rapidly expanding should be treated as early as possible to prevent serious consequences like rupture. Type 3 CAA should be treated with antibiotics and urgent coronary artery bypass grafting.

CONCLUSION

As per the previous discussion there is need to prevent CAA operation room sterilization and personnel sterility handling to prevent contamination during procedures and long term medical management including DAPT as there are no any specific data regarding treatment plan of this rare complications. Early diagnosis on follow up and appropriate treatment according to case we can prevent life threatening events like stent thrombosis, in-stent restenosis, thromboembolism and arterial rupture.

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