Early View Article: Online published version of an accepted article before publication in the final form.

Journal Name: International Journal of Case Reports and Images (IJCRI)

Type of Article: Case Report

Title: Very delayed coronary stent fracture presenting as unstable angina-A case report

Authors: Saurabh Mehrotra, Praful Sharma P, Yashpaul Sharma YP

doi: To be assigned

Early view version published: November 21, 2016

**How to cite the article:** Mehrotra S, Sharma PP, Sharma YPY. Very delayed coronary stent fracture presenting as unstable angina-A case report. International Journal of Case Reports and Images (IJCRI). Forthcoming 2016.

Disclaimer: This manuscript has been accepted for publication. This is a pdf file of the Early View Article. The Early View Article is an online published version of an accepted article before publication in the final form. The proof of this manuscript will be sent to the authors for corrections after which this manuscript will undergo content check, copyediting/proofreading and content formatting to conform to journal's requirements. Please note that during the above publication processes errors in content or presentation may be discovered which will be rectified during manuscript processing. These errors may affect the contents of this manuscript and final published version of this manuscript may be extensively different in content and layout than this Early View Article.
TITLE: Very delayed coronary stent fracture presenting as unstable angina-A case report

AUTHORS
Saurabh Mehrotra¹, Praful Sharma P², Yashpaul Sharma YP³

AFFILIATIONS
¹MD, DM, Assistant Professor, Department of Cardiology, Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh, Punjab, India
²MD, DM, Senior Resident, Department of Cardiology, Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh, Punjab, India
³MD, DM, Head, Cardiology, Department of Cardiology, Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh, Punjab, India

CORRESPONDING AUTHOR
S. Mehrotra
Assistant Professor, Cardiology,
Post Graduate Institute of Medical Education and Research (PGIMER),
Sector-12, Chandigarh- 160012, Punjab (India)
Email: smehrotrapgi@gmail.com

Short Running Title: Delayed coronary stent fracture

Guarantor of Submission: The corresponding author is the guarantor of submission.
TITLE: Very delayed coronary stent fracture presenting as unstable angina-A case report

ABSTRACT

Introduction
Coronary stent fracture (SF) represents an under diagnosed clinical event of drug-eluting stents (DES) which is often associated with adverse clinical outcomes of in-stent restenosis. Numerous risk factors are associated with SF that include stent overexpansion, creation of hinge points due to stent overlapping, use of longer stents for complex lesions as well as mechanical fatigue causing stent distortion in the right coronary artery and vein grafts.

Case Report
A 64-year old male, a cigarette smoker, presented to us with rest angina. Coronary angiogram showed discrete 99% stenosis in proximal left anterior descending (LAD) artery and a mid-eccentric 90% lesion in the right coronary artery (RCA). The patient was taken up for angioplasty of both the vessels. A type V fracture was detected after four years of zotarolimus-eluting stent (ZES) placement in the RCA.

Conclusion
Despite the recent advances in DES design, there remains a potential of stent fracture especially when a long DES is implanted in a tortuous vessel and is exposed to torsion forces at the hinge points.

Keywords: Stent fracture (SF), Drug eluting stent (DES), Zotarolimus-eluting stent (ZES)
TITLE: Very delayed coronary stent fracture presenting as unstable angina-A case report

INTRODUCTION
The introduction of Drug eluting stents (DES) has marked a new era in the field of interventional cardiology with significant reduction in the incidence of restenosis as well as repeat revascularisation [1, 2]. Although DES has become the standard of care for percutaneous coronary intervention (PCI), the occurrence of late stent thrombosis has raised concern over their long term safety. Stent fracture is being increasingly recognised as a potential cause of in-stent restenosis and stent thrombosis with the clinical manifestation of recurrent angina, myocardial infarction and even sudden death [3-6]. We report a rare case of delayed stent fracture after PCI with ZES.

CASE REPORT
A 64-year old male, a cigarette smoker, presented to us with rest angina. The patient was not on any medication at the time of presentation. Clinical evaluation revealed ST segment elevation in anterior precordial leads on electrocardiogram along with raised troponins (29.834 ng/ml, normal level <1.5 ng/ml). His white blood cell count was 11.26 × 10^9/l (4–10 × 10^9/l), granulocyte proportion was 79.7% (46–75%), red blood cell count was 4.07 × 10^12/l (4.0–5.5 × 10^12/l), blood platelet count was 167 × 10^9/l (100–300 × 10^9/l), potassium was 3.54 mmol/l (3.5–5.3 mmol/l), sodium was 137 mmol/l (135–145 mmol/l) and urea was 6.6 mmol/l (2.9–8.6 mmol/l. The patient was thrombolysed with streptokinase (1.5 MU over 45 min). Coronary angiogram showed discrete 99% stenosis in proximal left anterior descending (LAD) artery along with diffuse disease distally. The right coronary artery (RCA) showed a mid-eccentric 90% lesion (Figure 1).

The patient was taken up for angioplasty of both the vessels. Endeavour Resolute stent 3.0 × 38 mm (Medtronic Inc. Santa Rosa, CA, USA) was deployed in mid to distal LAD, followed by another overlapping Endeavour Resolute stent 3.5 × 38 mm in mid to proximal LAD. Both the stents were post-dilated sequentially with 3.0 × 10 mm and 4.0 × 9 mm Dura Star noncompliant balloons (Cordis Corp, Johnson &
Johnson, Miami Lakes, FL 33014) respectively. A third Endeavour Resolute stent 3.0 × 38 mm was deployed in the RCA at 10 atmospheric pressure (atm) then post dilated with 4.0 × 12mm noncompliant balloon at 10, 12 and 14 atm distal to proximally, with good angiographic results (Figure 2 A & B).

Patient was subsequently discharged in stable condition and followed up as outpatient uneventfully. His medications included ecosprin 150 mg daily, metoprolol 50 mg daily, clopidogrel 75 mg daily, and atorvastatin calcium 40 mg daily. After four years, patient once again presented with unstable angina. Laboratory tests revealed an HbA1c of 6.1%, lipid profile within goal range with total cholesterol 3.4mmol/l, triglyceride 1.10mmol/l, HDL 1.64mmol/l and LDL 1.29 mmol/l. Serum creatinine was elevated at 120 mmol/l (58–110) and 24-h urinary protein 1.13 g. Further investigations revealed a normal troponin I of 0.3 ng/ml on the day of admission. Repeat coronary angiogram showed stents in LAD. The RCA stent showed a Type V fracture (multiple strut fractures with acquired transaction with gap in the stent body) in the middle with a clear gap between the two fractured segments (Figure 3 A, B & C). The patient was advised bypass graft to RCA and is currently asymptomatic at 6 months follow up.

DISCUSSION

Stent fracture is an important yet underestimated clinical entity associated with adverse clinical sequelae. Various clinical studies have reported the incidence of SF in the range of 0.84 to 7.7% [7] whereas an autopsy study by Nakazawa et al. reported a 29% incidence of SF in DES at autopsy [8]. Stent fracture is classified as isolated strut fractures (type 1, single-strut fracture; type 2, incomplete trans-verse fracture) and complete fracture (type 3, complete transverse fracture without displacement; type 4, transverse fracture with displacement).

Risk factors associated with SF that has been reported in clinical studies include longer stent length, extremely angular and calcified lesion, post-dilatation with high pressure, RCA or saphenous vein graft lesion location, lesion with high motion, overlapping stent and use of sirolimus eluting stent [9]. The rigid, closed cell design of the sirolimus eluting stent results in greater straightening of the vessel thereby subjecting the stent to greater forces during the cardiac cycle [1, 10].
Zotarolimus-eluting stent with its open cell flexible design is less affected by torsion forces and there are only isolated case reports of SF with ZES. In our case a single ZES was implanted in non-calcified RCA and the post dilatation pressure was well within the prescribed burst pressure. Symptomatic SF four years after implantation in our case is possibly due to the chronic stretch at the bend point in the tortuous vessel resulting from the forceful exaggerated motion of the RCA. Stent fracture can present as recurrent angina, MI or even sudden death with the adversity of clinical presentation having a direct relation to the severity of SF [8]. Our case of Type V SF has presented as unstable angina while the more significant clinical presentation of stent thrombosis was probably prevented due to the extended dual antiplatelet therapy of the patient.

As on date there is no clear cut consensus statement for the treatment of SF and the decision is generally guided by the type of SF, presence of ischemia as well as likelihood of recurrence. Since the patient in our case presented with rest angina along with a Type V SF despite being on dual antiplatelet therapy, revascularisation was indicated. Considering the high likelihood of recurrence in our case, the decision to graft the RCA was taken.

**CONCLUSION**

This case highlights the importance of considering stent fracture, a not so rare entity as previously believed, as an etiological factor for causing late DES related complications with adverse clinical sequelae. Despite the recent advances in DES design, there remains a potential of this dreaded complication more so when a long DES is implanted in a tortuous vessel (RCA in our case) and is exposed to torsion forces at the hinge points.

**CONFLICT OF INTEREST**

The authors report no conflicts of interest in this work. No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.
AUTHOR’S CONTRIBUTIONS

Saurabh Mehrotra
Group 1 – Substantial contribution to Conception and design, Analysis and interpretation of data
Group 2 - Drafting the article
Group 3 - Final approval of the version to be published

Praful Sharma P
Group 1 - Substantial contribution to Conception and design, Analysis and interpretation of data
Group 3 - Final approval of the version to be published

Yashpaul Sharma YP
Group 1 - Substantial contribution to Conception and design, Analysis and interpretation of data
Group 3 - Final approval of the version to be published

REFERENCES


FIGURES LEGENDS

Figure 1: Right coronary artery mid discrete stenosis

Figure 2: (A) - Right coronary artery post stenting-with contrast (B) - Right coronary artery post stenting-without contrast

Figure 3: (A) Type V stent fracture in RCA-with contrast (B) - Type V stent fracture in RCA-without contrast (C)- Proximal and distal portions of RCA stent following the Type V stent fracture with the gap in between
FIGURES

Figure 1: Right coronary artery mid discrete stenosis

Figure 2: (A) - Right coronary artery post stenting-with contrast (B) - Right coronary artery post stenting-without contrast
Figure 3: (A) Type V stent fracture in RCA-with contrast (B) - Type V stent fracture in RCA-without contrast (C)- Proximal and distal portions of RCA stent following the Type V stent fracture with the gap in between.