SCIENCEFORECAST
A digital science library

Case Report
Published: 25 Nov, 2020

Journal of Cardiology Forecast

Can Nominal Burst Pressure (NBP) Guarantee the Safeguard against Dissection during Percutaneous Transluminal Coronary Angioplasty (PTCA)?

Sinha SK, Sharma AK, Pandey U and Razi M*

Department of Cardiology, LPS Institute of Cardiology, Kanpur, Uttar Pradesh, India

Abstract

A 68-year-old male with hypertension, dyslipidemia, and current smoking as coronary risk factors was referred for Coronary Angiography (CAG) in lieu of chronic stable angina-Canadian cardiovascular society III despite guideline directed medical treatment which revealed a critical stenotic lesion (90%) in the proximal Left Circumflex (LCx) coronary artery with mild calcification. 3.5x23 mm Xience prime drug eluting stent (Abott Vascular, USA) was deployed at 8 atm pressure. During the procedure, he developed chest pain. Angiogram revealed a long spiral dissection starting from distal edge of stent. To bail out, another overlapping 3x38 mm Xience prime stent was deployed at 10 atm pressure showing proper stents expansion and no residual dissection flap with TIMI-3 coronary flow. This case highlights that dissection may occur in calcified vessel even below the nominal pressure which could be successfully bailed out by implantation with another coronary stent with complete cover of the coronary dissection.

Keywords: Calcium; Chronic stable angina; Nominal pressure; Spiral dissection; Stent

Introduction

Plaque fracture, plaque redistribution, and dissection of the arterial wall are key mechanisms of lumen enlargement after balloon angioplasty [1]. During stent implantation, unplanned vessel tearing may occur at the transition between the rigid stent struts and the adjacent arterial wall, which has been associated with increased risks of thrombosis and Major Adverse Cardiac Events (MACE) [2]. Vessel overstretching and the presence of large, calcified or attenuated plaques at stent edges are some of the predictors for stent edge dissection which can originate from either the proximal or distal edge of stent. It can be outcome of stent deployment at Rated Burst Pressure (RBP), over expansion by non-compliant balloon, or deployment over a diseased region than over a normal vessel [3,4].

Case Report

A 68-year-old male with hypertension, dyslipidemia, and current smoking as coronary risk factors was referred for Coronary Angiography (CAG) in lieu of chronic stable angina-Canadian Cardiovascular Society (CCS) III despite guideline directed medical treatment. Electrocardiogram was normal and echocardiogram revealed mild concentric left ventricular hypertrophy with normal ejection fraction. The coronary angiography showed a critical stenotic lesion (90%) in the proximal segment of the Left Circumflex (LCx) coronary artery with mild calcification (Figure 1A). Percutaneous Transluminal Coronary Angioplasty (PTCA) of culprit artery was planned after proper consent. Left main artery was hooked with 6F Extra Backup (EBU-3.5) guiding catheter (Medtronic, USA) and 0.014" run through wire was parked in second Obtuse Marginal branch (OM) of LCx. Lesion was sequentially predilated with 1.5x10 and 2x10 mm Maverick semicompliant balloon (Boston Scientific, USA) at 10 atm pressure (Figure 1B). 3.5x21 mm Xience prime stent (Everolimus eluting stent-Abott Vascular, USA) was tracked across the lesion (Figure 2A) and inflated at 8 atm pressure (Figure 2B). After 15 second of inflation, patient developed sudden chest pain with ST-T changes in inferior leads. Scout revealed contrast extravasations beyond the stent (Figure 3A). Balloon was deflated and angiogram revealed spiral dissection starting from the distal edge of stent down to second OM (Figure 3B). Apart from pain and ST-T changes, hemodynamics was stable. The same stent balloon was intermittently inflated and deflated at low pressure to seal the dissection. Dissection flap was still visible after 5 minute of intermittent inflation and also distal LCx was barely visible (Figure 4A). In lieu of ongoing angina and ST-T changes, LCx was

OPEN ACCESS

**Correspondence:*
Santosh Kumar Sinha, LPS Institute of Cardiology, Kanpur, Uttar Pradesh, India.
Tel: *91-9670220088*
Fax: *91-0512-255699*
E-mail: *fionasan@rediffmail.com*

Received Date: *01 Nov 2020*
Accepted Date: *20 Nov 2020*
Published Date: *25 Nov 2020*

Citation: *Sinha SK, Sharma AK, Pandey U, Razi M. Can Nominal Burst Pressure (NBP) Guarantee the Safeguard against Dissection during Percutaneous Transluminal Coronary Angioplasty (PTCA)?. J Cardiol Forecast. 2020; 3(2): 1012.*

Figure 1: Antero-posterior caudal view showing a critical stenotic lesion (90%) in the proximal segment of the Left Circumflex (LCx) coronary artery with mild calcification (A-white arrow); Lesion being pre-dilated with semicompliant balloon (B).

Figure 2: 3.5x21 mm Xience prime stent being deployed at 8 atm pressure (A;B).

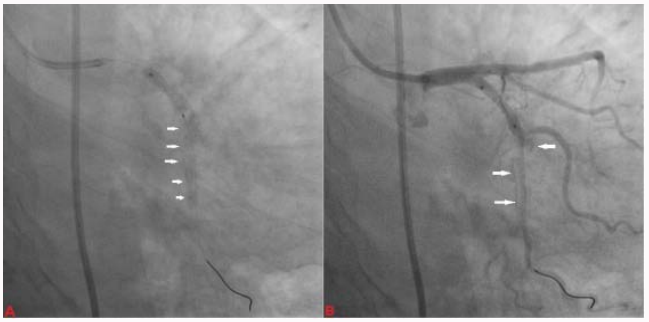

Figure 3: Contrast extravasations beyond the stent while balloon is still inflated (A-white arrows); Spiral dissection starting from the distal edge of stent down to second OM (B).

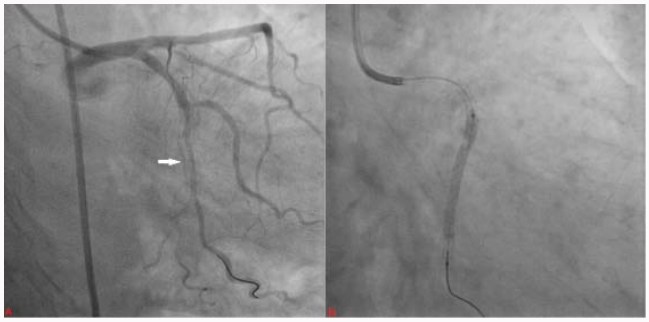

Figure 4: Dissection flap was still visible after 5 minute of intermittent inflation (A); LCx was further stented with another overlapping 3x38 mm Xience prime stent at 8 atm pressure (B).

Figure 5: The final angiogram revealed a good result with TIMI-3 coronary flow with complete sealing of dissection flap (A;B).

further stented with another 3x38 mm Xience prime stent which was deployed at 8 atm pressure (Figure 4B). Stent balloon was little pulled up and overlapping part was dilated at 16 atm pressure. Immediately after procedure, chest pain and ST-T changes subsided. The final angiogram revealed a good result with TIMI-3 coronary flow with complete sealing of dissection flap (Figure 5A and B). His hospital stay remained uneventful and was discharged with aspirin-150 mg, prasugrel-10 mg, rosuvastatin-20 mg, metoprolol-100 mg and ramipril-10 mg.

Discussion

Mechanical factors, such as vessel overstretching by an oversized stent relative to the reference vascular dimensions, have also been suggested as an important cause of dissection at stent edges which is more pronounced in the distal compared with the proximal dissected edges. Other factors may be plaque type, fibrous cap thickness, circumferential and focal calcification [2]. Gonzalo et al., assessed 24 stent edge dissections with optical coherence tomography and found fibrocalcific plaques (43.8%) to be more frequent at distal dissected edges than were fibrotic plaques (10%, p=0.009) [5]. Calcification leads to loss of circumferential vessel compliance which makes vessel prone to dissection irrespective of its depth. Intravascular Ultrasound (IVUS) data demonstrated that plaque burden at the stent reference segments was significantly greater in lesions with versus without dissections [6]. Liu et al., reported that the presence of calcified plaque at the edge of a stent was an important predictor for dissection regardless of the angle of the calcified plaque and suggests that landing zones be selected to avoid calcified and attenuated plaques [7]. In our case, stent was deployed below the nominal pressure which ruled out any over stretching. There was mild plaque at the distal edge of the stent but as it was not significant, we planned for only focal stenting. During the deployment, distal edge of stent landing in softer plaque along with calcium precipitated the dissection.

Nominal pressure refers to the pressure at which when balloon is inflated, it achieves the listed balloon diameter. It varies for different stent but usually which usually ranges from 6-8 atm while Rated Burst Pressure (RBP) refers to the pressure below which 99.9% of the balloons will not burst upon single inflation. Therefore, during high pressure inflation by non-compliant balloon, we should not go beyond RBP. Our case is unusual in a sense that dissection occurred below the nominal pressure.

Dissections are detected by angiography in about 30% of lesions after angioplasty with a smaller fraction of 4-8% being major dissections, which bear a high risk for subsequent vessel closure leading to adverse ischemic events [8]. In cases of dissections, entry point should be sealed as it further stops its distal progression as in

our case. Not all dissections needs stenting as antegrade flow may seal the smaller one. In our case, patient was symptomatic with dynamic electrocardiographic changes, stenting was mandatory to prevent its progression.

References

1. Rogers JH, Lasala JM. Coronary artery dissection and perforation complicating percutaneous coronary intervention. J Invasive Cardiol. 2004; 16: 493-499.
2. Biondi-Zoccai GG, Agostoni P, Sangiorgi GM, Airoldi F, Cosgrave J, Chieffo A, et al. Incidence, predictors, and outcomes of coronary dissections left untreated after drug-eluting stent implantation. Eur Heart J. 2006; 27: 540-546.
3. Liu X, Tsujita K, Maehara A, Mintz GS, Weisz G, Dangas GD, et al. Intravascular ultrasound assessment of the incidence and predictors of edge dissections after drug-eluting stent implantation. J Am Coll Cardiol Intv. 2009; 2: 997-1004.
4. Schwarzacher SP, Metz JA, Yock PG, Fitzgerald PJ. Vessel tearing at the edge of intracoronary stents detected with intravascular ultrasound imaging. Cathet Cardiovasc Diagn. 1997; 40: 152-155.
5. Gonzalo N, Serruys PW, Okamura T, Shen ZJ, Garcia-Garcia HM, Onuma Y, et al. Relation between plaque type and dissections at the edges after stent implantation: an optical coherence tomography study. Int J Cardiol. 2011; 150: 151-155.
6. Gibson CM, de Lemos JA, Murphy SA, Marble SJ, McCabe CH, Cannon CP, et al. Combination therapy with abciximab reduces angiographically evident thrombus in acute myocardial infarction: a TIMI 14 substudy. Circulation. 2001; 103: 2550-2554.
7. Liu X, Tsujita K, Maehara A, Mintz GS, Weisz G, Dangas GD, et al. Intravascular ultrasound assessment of the incidence and predictors of edge dissections after drug-eluting stent implantation. JACC Cardiovasc Interv. 2009; 2: 997-1004.
8. Sharma SK, Israel DH, Kamean JL, Bodian CA, Ambrose JA. Clinical, angiographic, and procedural determinants of major and minor coronary dissection during angioplasty. Am Heart J. 1993; 126: 39-47.