THE ANATOLIAN JOURNAL OF CARDIOLOGY

Official journal of the TURKISH SOCIETY OF CARDIOLOGY

Successful management of distal coronary artery perforation with the modified cut balloon technique during percutaneous coronary intervention

CASE REPORT

INTRODUCTION

Coronary artery perforation (CAP) is a rare and fatal complication of percutaneous coronary intervention (PCI) (1). CAP is classified according to its location into 3 categories: large vessel, distal vessel, and septal or epicardial collateral perforation (2). Early detection of CAP is very important to begin treatment. In this case report, we present the management of a patient who developed CAP during PCI.

CASE REPORT

A 76-year-old male patient with a history of coronary artery bypass graft was admitted to the emergency department with acute chest pain. Vital signs of the patient included a heart rate of 65 bpm, blood pressure 120/75 mm Hg, and spO2 97%. Electrocardiography showed Mobitz type 1 AV block with ST-segment elevation in the inferior leads (Fig. 1). Echocardiography revealed that the left ventricular ejection fraction was 35% with motion defects in the apex and inferior walls. The patient was taken to the catheter laboratory for PCI. Coronary angiography revealed total occlusion in the distal branches of the right coronary artery (RCA) (Fig. 2a). RCA distal branches were wired (Fig. 2b). Dilatation was performed to both the occluded branches with a 1.5×20 mm balloon. It was observed that there was extravasation in the distal part of the RCA owing to perforation (Fig. 2c, Supplementary Video 1). The balloon was inflated proximal to the area of the rupture, and distal blood flow was interrupted. It was observed that extravasation continued despite prolonged balloon inflation (PBI) (Fig. 2d). As we did not have a 2.5 mm diameter covered stent or coil, we decided to apply the modified cut balloon tech-

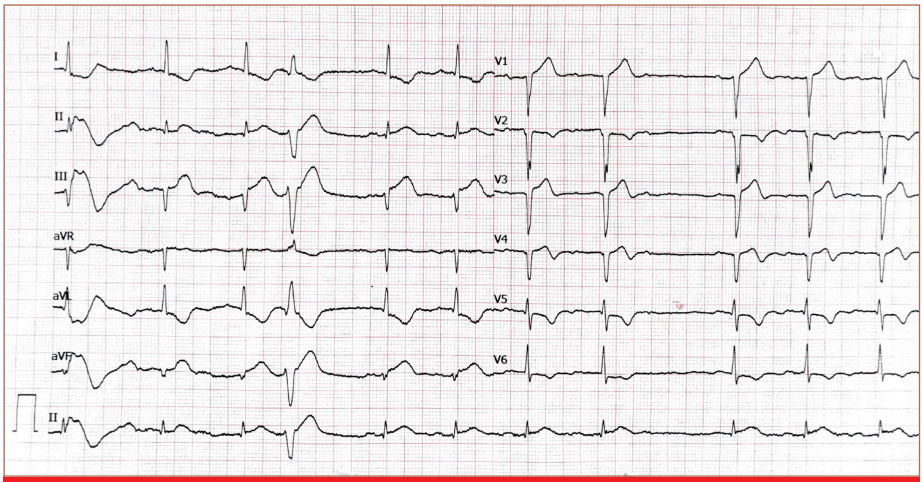

Figure 1. Electrocardiography of a 76-year-old male patient during emergency service admission.

Lütfi Öcal
Cemalettin Yılmaz
Samet Uysal
Sinan Cerşit
Regaip Zehir

Department of Cardiology, Kartal Koşuyolu Training and Research Hospital; İstanbul-Turkey

Corresponding Author:
Cemalettin Yılmaz
✉ cmlddyn@gmail.com

Cite this article as: Öcal L, Yılmaz C, Uysal S, Cerşit S, Zehir R. Successful management of distal coronary artery perforation with the modified cut balloon technique during percutaneous coronary intervention. Anatol J Cardiol 2022; 26: 66-8.

DOI: 10.5152/AnatolJCardiol.2021.202

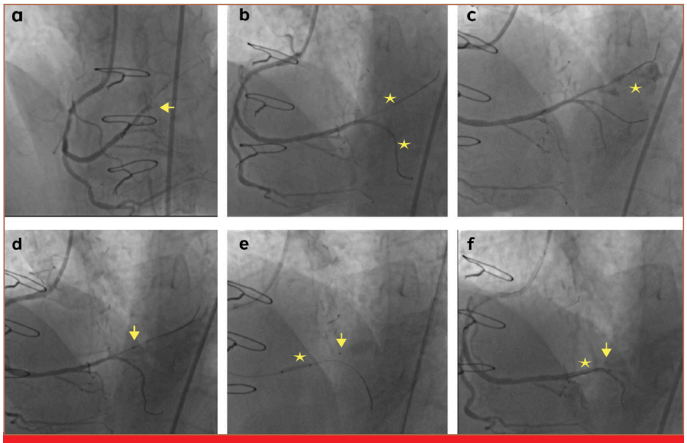

Figure 2. a) Coronary angiography showing total occlusion in the distal branches of the right coronary artery (yellow arrow). b) Right coronary artery (RCA) distal branches are wired (yellow stars). c) Extravasation in the distal part of the RCA owing to perforation (yellow star). d) Prolonged balloon inflation in the proximal perforation side (yellow arrow). e) Cut balloon delivered over the wire with its own shaft to the proximal part of the ruptured area (yellow arrow). A balloon is inflated through the side branch to the ostium of the target branch (yellow star), and the wire of the cut-balloon is taken back (yellow arrow). f) A stent is implanted to the side branch (yellow star), and part of the balloon is jailed between the stent and the vessel (yellow arrow). Final angiographic images showing no extravasation.

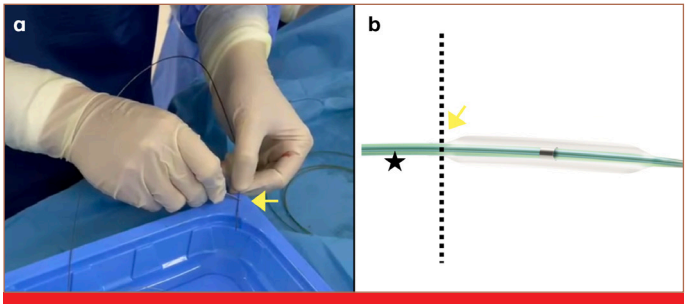

Figure 3. a and b: Preparation of the cut balloon. Monorail balloon is cut from proximal part of the balloon's marker (yellow arrow). The balloon's shaft is used for delivering the cut balloon (black star).

nique. The 1.5×20 mm monorail balloon was cut from proximal part of the balloon's marker (Fig. 3a and 3b) and delivered over the wire with its own shaft (Fig. 3b) to the proximal part of the ruptured area. A balloon was inflated through the side branch to ostium of the target branch, and the wire of the cut balloon was taken back (Fig. 2e, Supplementary Video 2). A 2.25×24 mm stent was implanted to the side branch (Fig. 2f). Part of the balloon was jailed between the stent and the vessel (Fig. 2f). Thus, the blood passage to the distal vessel was prevented by reducing the flow from the side branch. Final PBI was performed at the proximal part of the stent. Extravasation was not observed in the final angiographic images (Fig. 2f, Supplementary Video 3). The anticoagulant effect was then reversed with protamine. Echocardiography showed a 4-mm pericardial effusion around the right ventricle. He was discharged from the hospital on the fourth day as no increase in pericardial effusion was observed during the follow-up.

DISCUSSION

Mortality is directly related to the Ellis classification of CAP; type I perforations rarely cause tamponade compared with type III (3). As soon as CAP is detected, a balloon should be inflated proximal to the perforation site to reduce the risk of cardiac tamponade. Thus, the operator saves time when managing the case (pericardiocentesis, etc.) and also surgical support. PBI may provide CAP sealing; however, but if extravasation continues, further treatment is required. Although large vessel perforations usually require implantation of covered stents, distal artery and collateral canal perforations can usually be managed by administering coils, microspheres, thrombin, or subcutaneous fat (4). However, as these are expensive and not easily accessible, we may need alternative methods.

Solomonica et al. (5) used the cut balloon technique in a case of distal tip rupture caused by a hydrophilic coated wire.

In our patient, however, the distal coronary artery rupture originated from the body of the vessel rather than the end region. Therefore, we modified the previous technique and chose to use a previously inflated balloon to reduce the side branch flow. We jailed it with a stent to prevent it from embolizing to the distal part. The cut balloon which was jailed with a stent acted as a graft stent. We observed that the extravasation disappeared after the last balloon dilation.

CONCLUSION

The cut balloon technique represents an effective and safe treatment option for the management of CAP during PCI. It can be easily applied with balloons and stents used in routine practice, and the patient may not need surgery.

Informed consent: Written informed consent was obtained from the patient.

Supplementary Video 1. Extravasation in the distal part of the right coronary artery owing to perforation

Supplementary Video 2. The cut balloon is delivered over the wire with its own shaft to the proximal part of the rup-tured area. A balloon is inflated through the side branch to the ostium of the target branch, and the wire of the cut balloon is taken back

Supplementary Video 3. Final angiographic images showing no extravasation

REFERENCES

1. 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: 843-50. [Crossref]
2. Xenogiannis I, Brilakis ES. Advances in the treatment of coronary perforations. Catheter Cardiovasc Interv 2019; 93: 921-2. [Crossref]

3. Dash D. Complications encountered in coronary chronic total occlusion intervention: Prevention and bailout. Indian Heart J 2016; 68: 737-46. [Crossref]
4. Giannini F, Candilio L, Mitomo S, Ruparelia N, Chieffo A, Baldetti L, et al. A Practical Approach to the Man-agement of Complications During Percutaneous Coronary Intervention. JACC Cardiovasc Interv 2018; 11: 1797-810. [Crossref]
5. Solomonica A, Kerner A, Feld Y, Yalonetsky S. Novel Technique for the Treatment of Coronary Artery Perfo-ration. Can J Cardiol 2020; 36: 1326.e1-3. [Crossref]