

# Successful rescue of a perforated chronic total occlusion using retrograde technique

Skuteczne zaopatrzenie perforacji przewlekłego zamknięcia tętnicy wieńcowej przy użyciu techniki *retrograde*

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## Abstract

Percutaneous coronary intervention of chronic total occlusion (CTO) is one of the greatest challenges in coronary interventions. Retrograde wiring is suggested as a solution to improve the success rate of intervention for CTO. We experienced the coronary perforation during antegrade wiring at the CTO lesion and sealed it using retrograde wiring and antegrade stenting in a patient who underwent coronary arterial bypass grafting. We found that, in selected cases, the retrograde wire technique may provide a valuable rescue option for perforated CTO in a patient having a retrogradely accessible conduit vessel.

**Key words:** percutaneous coronary intervention, total occlusions, coronary rupture, cardiac tamponade

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## Introduction

Here, we introduce a case of a successful intervention using retrograde wire technique in a chronic total occlusion complicated by perforation from antegrade wiring in a patient who underwent coronary arterial bypass grafting.

## Case report

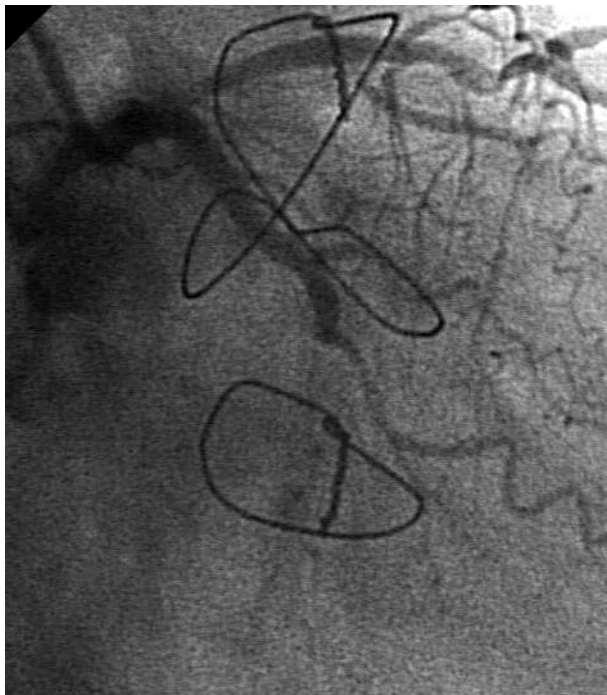
A 71-year-old man, who had a history of diabetes mellitus, an inferior myocardial infarction, and 4-vessel coronary bypass surgery one and a half years ago, presented with recurrent dyspnoea on exertion for the last 3 months. Diagnostic coronary angiography showed the following: The left anterior descending artery (LAD) had a 50% stenosis at the ostium. The left internal mammary artery to mid LAD was patent. The left circumflex artery (Cx) was totally occluded at the proximal portion (Figure 1). A saphenous vein graft (SVG) to the obtuse marginal branch of the Cx and a radial artery graft to the distal right coronary artery were completely occluded at the ostium. The SVG to the distal Cx had a 70% stenosis just before the anastomosis site (Figure 2). The decision was made to perform PCI to the total occlusive Cx lesion. However, the Shinobi wire perforated the Cx (Figure 3). Follow-up coronary angiography showed dye stain around the perforation. But the patient was haemodynamically stable and did not complain of chest pain.

Then we planned to perform PCI to the perforated total occlusive lesion of the Cx in a retrograde approach via the SVG. A BMW guidewire (Guidant) was initially used. But it was prolapsed at the anastomosis site owing to an acute angle between the SVG and the distal Cx and was not able to reach to the lesion of the Cx retrogradely. After placing the BMW wire in the distal Cx, this wire was exchanged for the Shinobi guidewire using a 2.4 Progreat microcatheter (Terumo). The Shinobi wire under support of the microcatheter was able to advance to just before the Cx total lesion but it could not pass the total lesion. Then a 2.0 × 15 mm RyuJin balloon catheter (Terumo) dilated the SVG lesion and a 3.0 × 20 mm Taxus stent (Boston) was precisely deployed at the distal end of the SVG not to protrude into the Cx. Next the guidewire with support of the RyuJin balloon catheter crossed the occluded Cx lesion with successful advancement of the wire tip to the proximal Cx. The occluded Cx lesion was dilated with the same balloon catheter retrogradely (Figure 4). For stenting at the lesion, antegrade stenting was planned because the angle at the anastomosis of the SVG and the distal Cx was expected to prohibit passing of a stent. Again the left coronary artery was engaged with a 6F AL1 catheter. After the Shinobi wire was antegradely placed into the large third obtuse marginal branch, a 2.75 × 33 mm Cypher stent (Cordis) was deployed

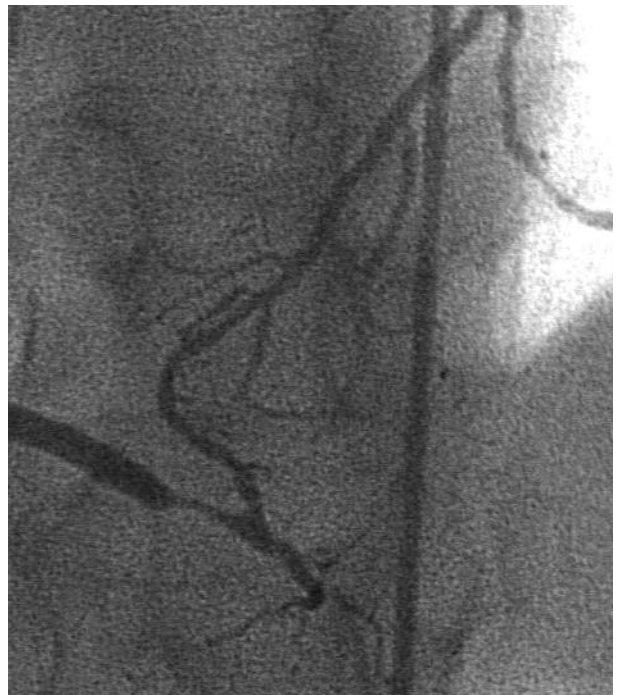
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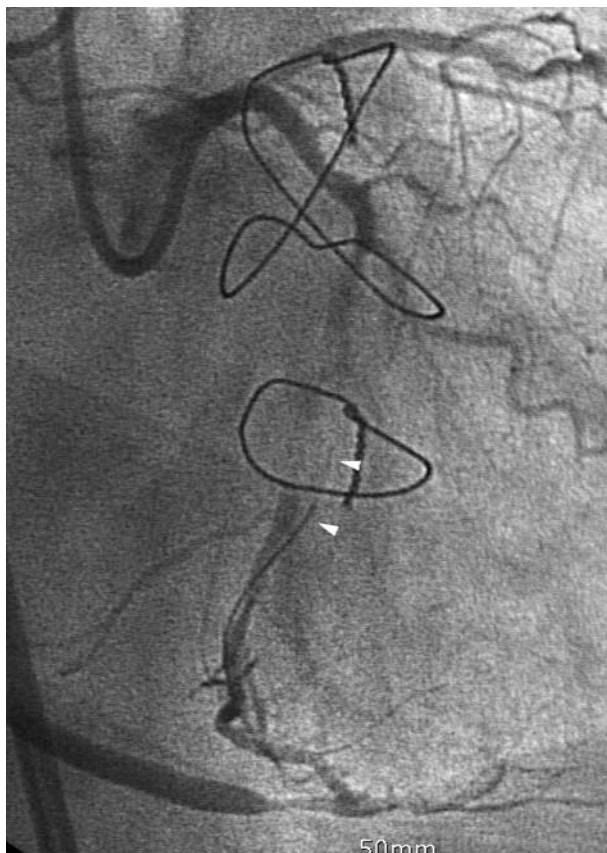
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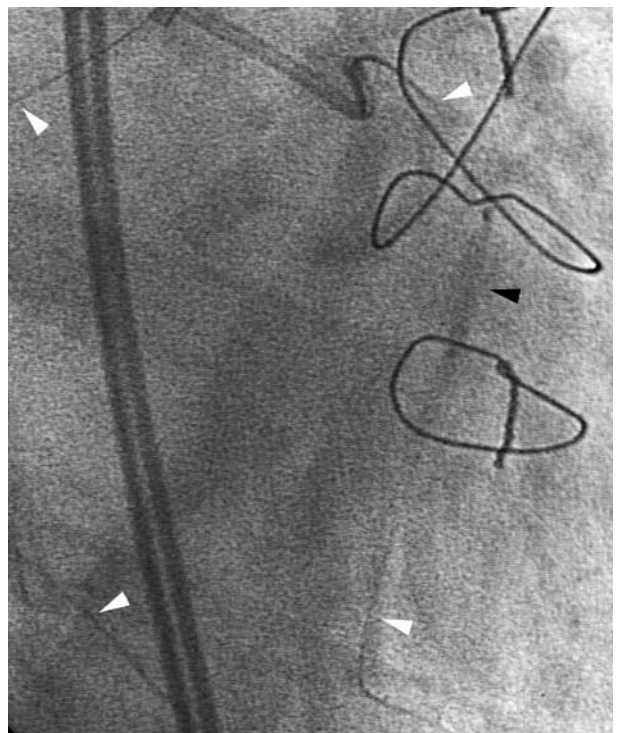
**Figure 1.** The proximal left circumflex artery is totally occluded



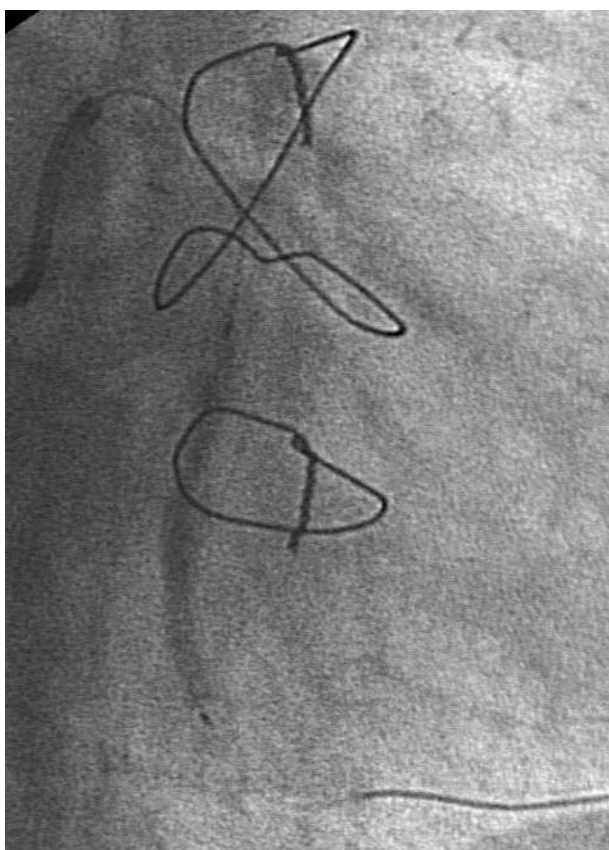
**Figure 2.** The anastomosis site between the vein graft having 70% stenosis and the distal circumflex artery has an acute angle



**Figure 3.** The Shinobi guidewire perforates the circumflex coronary artery. White arrowheads indicate the perforated guidewire



**Figure 4.** The occluded lesion of the circumflex coronary artery is dilated with a balloon catheter over the guidewire crossing the occluded lesion retrogradely. White arrowheads indicate the guidewire reaching to the left main coronary artery and the black arrowhead indicates the balloon catheter



**Figure 5.** After placing the Shinobi guidewire in the large third obtuse marginal branch antegradely, a 2.75 × 33 mm Cypher stent is deployed at the lesion



**Figure 6.** The final angiogram shows a good result without dye stain

at the lesion (Figure 5). The final angiogram showed a good result without dye stain (Figure 6). A 6-month follow-up coronary angiogram revealed patent stenting sites.

## Discussion

Coronary perforation is classified by the angiographic appearance of the perforation (I, extraluminal crater without extravasation; II, pericardial or myocardial blushing; III, perforation  $\geq 1$  mm diameter with contrast streaming and cavity spilling) [1].

In our case, the coronary perforation of class II was developed during antegrade wiring at the CTO lesion. Delayed cardiac tamponade by coronary perforation of class I or II has been reported [1, 2]. And the incidences of pericardial tamponade were reported as 8%, 13% and 63% in class I, II and III perforation, respectively [1]. The rescue options for coronary perforation have been known to be reversal of anticoagulation, long inflation of a balloon, implantation of stent graft, local injection of thrombogenic molecules, placement of microcoils, pericardiocentesis, or surgical intervention [2-6]. Perforation could be treated conservatively or with PCI but without

cardiac surgery in 85%, 90%, and 44% of class I, II, and III perforations, respectively [1]. However, the additional antegrade wiring for rescue PCI in the perforated CTO would aggravate the extent of coronary perforation and might make the haemodynamics unstable. A retrograde approach via the collateral channel or bypass graft has been recently proposed to improve the success rate of PCI in CTO lesions of the coronary arteries. The success rate by retrograde PCI has been reported to be 69% [7]. Therefore we decided to perform retrograde wiring through a bypass graft to pass the occluded lesion and antegrade stenting to seal the perforation.

In conclusion, in the case of a perforated CTO, which developed during antegrade wiring, the retrograde wire technique may provide a valuable rescue option in a patient having a retrogradely accessible conduit vessel.

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