

## Case Report

# Coronary artery hematoma in a case of chronic total occlusion treated with intravascular imaging and a novel scoring balloon catheter

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**Abstract:** A 69-year-old female with stable angina pectoris underwent percutaneous coronary intervention for a chronic total occlusion (CTO) in the left anterior descending coronary artery (LAD). A semi-compliant balloon catheter (BC) ruptured in the CTO lesion, causing a hematoma due to coronary artery dissection in the distal LAD. A new scoring BC; NSE Alpha (Goodman, Aichi, Japan) was selected for use after intravascular imaging. The NSE Alpha contains 3 triangular nylon elements along the outside of the balloon. The hematoma was treated prior to successful implantation of a drug-eluting stent. Coronary artery hematoma as a complication in percutaneous coronary intervention is rare but is sometimes associated with coronary artery obstruction which may result in further complications such as acute myocardial infarction. Cutting balloon angioplasty using intravascular imaging is a useful treatment strategy to resolve a hematoma. However, the cutting balloon catheter is associated with poor deliverability to locations such as distal to the left anterior descending coronary artery. For these types of cases, a new scoring balloon catheter has shown to be efficacious and safe in resolving coronary artery hematomas.

**Keywords:** Coronary artery hematoma, percutaneous coronary intervention, complication, scoring balloon catheter, intravascular imaging

## Introduction

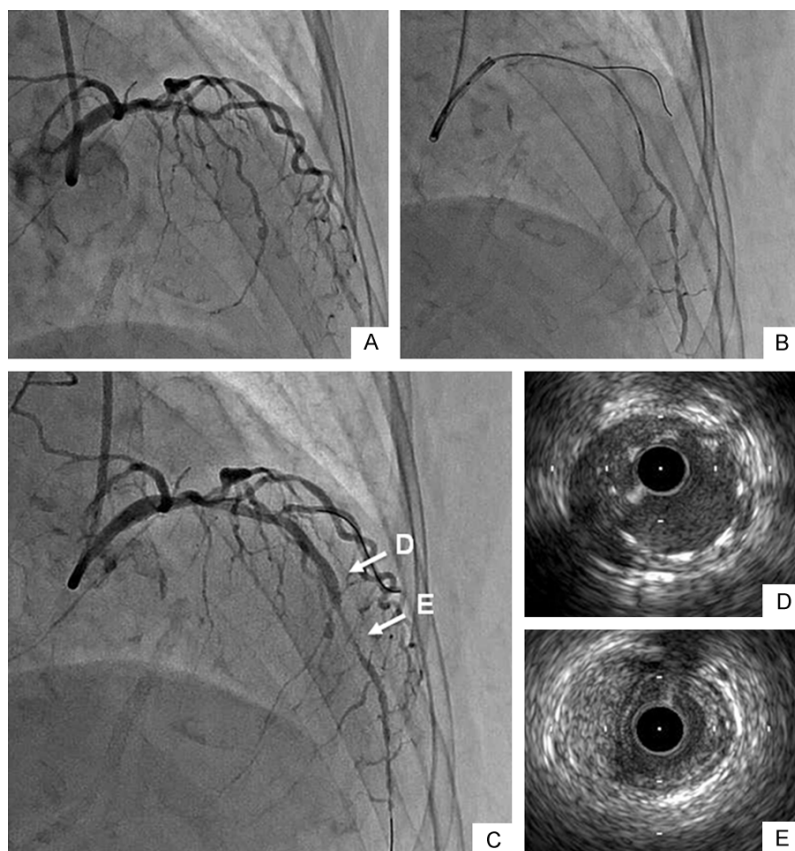
Coronary artery hematoma is a rare complication of percutaneous coronary intervention (PCI), and influences primary success [1]. It has been reported that diagnosis with only angiography is difficult and cutting balloon angioplasty is an effective treatment strategy [2, 3]. The success rate of PCI for chronic total occlusion (CTO) remains problematic, requiring complex treatment strategies and is associated with higher risk [4]. It has been reported that there is a correlation between prognosis and presence of CTO's for patients with coronary artery disease [5].

Recently, developments and improvements to devices provide for various treatment strategies of CTO's allowing for more difficult cases to be treated. We report the efficacy of a new scoring balloon for the treatment of coronary

artery hematoma in a patient with a CTO in the left anterior descending coronary artery (LAD).

## Case report

A 69-year-old female underwent PCI of CTO in the LAD #7 via right femoral artery (**Figure 1A**). Coronary risk factors included diabetes mellitus, hypertension and dyslipidemia. A CTO guide wire (XT-R, Asahi Intecc, Aichi, Japan) crossed the lesion under micro catheter support. Selective angiography showed 99% stenosis at the distal LAD #8 (**Figure 1B**). A 2.0 mm balloon catheter (BC) ruptured in the CTO lesion causing a coronary artery dissection. An everolimus-eluting stent (EES), 2.5\*28 mm Promus Element (Boston Scientific, Natick, MA) was implanted at the CTO lesion. New stenosis appeared at the distal stent site (**Figure 1C**). Initial consideration was that it was a spasm, but was unresolved with isosorbide dinitrate. Intravascular



**Figure 1.** Coronary angiography and intravascular ultrasound images. A: Coronary angiography shows a chronic total occlusion (CTO) in the middle of the left anterior descending coronary artery (LAD). B: Selective angiography showed significant stenosis at the distal LAD #8. C-E: After stent implantation to CTO, new stenosis appeared at the distal stent site. Intravascular ultrasonography determined a hematoma.

ultrasonography (IVUS) was performed showing the stenosis was actually a hematoma related dissection (**Figure 1D, 1E**).

At this stage an additional EES (2.25\*24 mm Promus Element stent, Boston Scientific) was implanted to LAD #7 for the treatment of the hematoma. Unfortunately, the hematoma progressed at the distal LAD (**Figure 2A**). A semi-compliant BC with buddy wire technique was unable to cross the distal LAD due to the hematoma and distal stenotic lesion. A new scoring BC, 2.0\*13 mm NSE Alpha (Goodman, Aichi, Japan) (**Figure 2B, 2C**) was selected in order to treat the hematoma. Utilizing a “leopard crawl technique” [6], the catheter was advanced and was successfully delivered to the distal LAD (close to apex) with step by step inflation (**Figure 2D-F**). The hematoma was resolved (**Figure 2G**) and a 3<sup>rd</sup> EES (2.25\*28 mm Promus Element stent, Boston Scientific) was successfully

implanted at distal LAD#8. Final angiogram and 8 month follow up coronary angiogram showed a good result (**Figure 2H**).

### Discussion

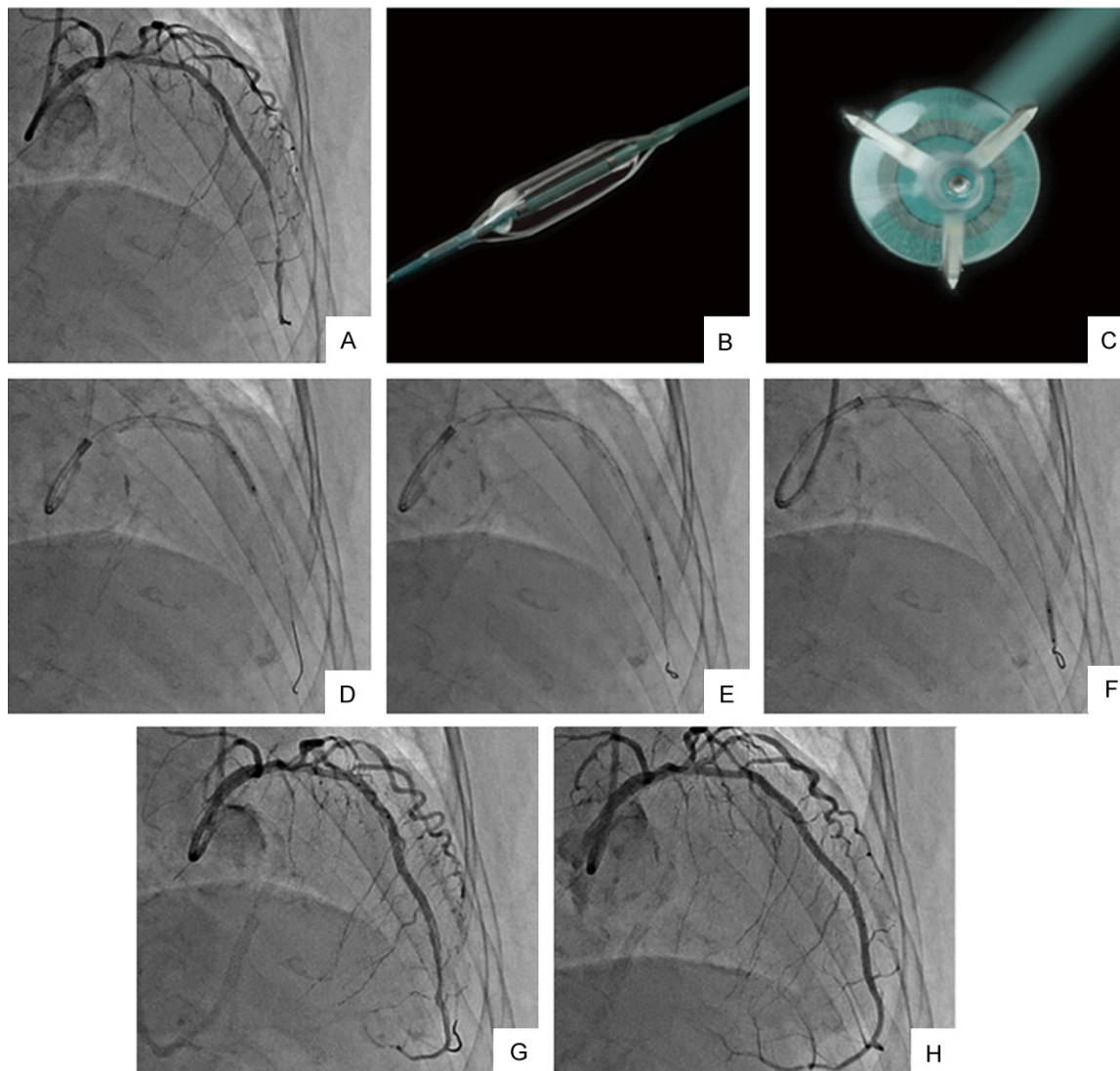
A coronary artery hematoma during a PCI procedure is a rare complication [1], however, enlargement of a hematoma induced coronary obstruction can cause chest pain and ST elevation in an electrocardiogram such as acute myocardial infarction. Therefore, operator awareness of such a complication is important when undergoing complex PCI such as a CTO. A cutting BC is effective in treating coronary artery hematoma [3], however delivery of a cutting BC to the distal LAD is often problematic [7]. NSE Alpha contains 3 triangular nylon elements along the outside of the balloon that create a scoring effect as well as eliminate slipping during balloon inflation. A modified tip

ensures a small tip entry profile while maximizing flexibility of the material. It is considered that such a device is useful for not only calcified lesions but also in-stent restenosis, bifurcation lesions and hematoma. The element creates a ‘controlled dissection’ (tear in the intima to true lumen), resolving the hematoma. The plaque of a CTO lesion can potentially shift to the distal site in the vessel. In the case of large dissection and hematoma, stent implantation without resolution of the compressed true lumen may worsen the coronary flow due to progression of the false lumen. Immediately resolving the hematoma after IVUS imaging may prevent the progression of hematoma to distal LAD.

### Conclusion

In the present case we reported the efficacy of a new scoring balloon catheter NSE Alpha, for the treatment of a coronary artery hematoma

## Hematoma of a chronic total occlusion treated with novel scoring catheter



**Figure 2.** Coronary angiography and inflation of the new scoring balloon. A: After additional stent implantation, the hematoma progressed at distal LAD. B, C: NSE Alpha contains 3 triangular nylon elements along the outside of the balloon. D-F: Following an inflation at low pressure, it is advanced during balloon deflation. G: NSE Alpha made a tear in the coronary artery intima, resolving the hematoma. H: Final coronary angiogram.

in a patient with CTO in the LAD. The catheter was delivered through stents to the distal LAD, creating a controlled dissection, re-establishing TIMI 3 grade flow and facilitating stent implantation.

Informed consent was obtained from the patient in accordance with the Helsinki declaration, and the case report was approved by the institutional ethics committee.

### Disclosure of conflict of interest

None.

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### References

- [1] Maehara A, Mintz GS, Bui AB, Castagna MT, Walter OR, Pappas C, Pinnow EE, Pichard AD, Satler LF, Waksman R, Suddath WO, Laird JR Jr, Kent KM, Weissman NJ. Incidence, morphology, angiographic findings, and outcomes of intramural hematomas after percutaneous coronary interventions: an intravascular ultra-

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- sound study. *Circulation* 2002; 105: 2037-2042.
- [2] Hirose M, Kobayashi Y, Kreps EM, Stone GW, Moussa I, Leon MB, Moses JW. Luminal narrowing due to intramural hematoma shift from left anterior descending coronary artery to left circumflex artery. *Catheter Cardiovasc Interv* 2004; 62: 461-465.
- [3] Ito S, Ojio S, Suzuki T. A novel use of cutting balloon in treating coronary artery dissection that developed during PCI. *J Invasive Cardiol* 2003; 15: 216-220.
- [4] Patel VG, Brayton KM, Tamayo A, Mogabgab O, Michael TT, Lo N, Alomar M, Shorrock D, Cipher D, Abdullah S, Banerjee S, Brilakis ES. Angiographic success and procedural complications in patients undergoing percutaneous coronary chronic total occlusion interventions: a weighted meta-analysis of 18,061 patients from 65 studies. *JACC Cardiovasc Interv* 2013; 6: 128-136.
- [5] Mehran R, Claessen BE, Godino C, Dangas GD, Obunai K, Kanwal S, Carlino M, Henriques JP, Di Mario C, Kim YH, Park SJ, Stone GW, Leon MB, Moses JW, Colombo A. Multinational Chronic Total Occlusion Registry Long-term outcome of percutaneous coronary intervention for chronic total occlusions. *JACC Cardiovasc Interv* 2011; 4: 952-961.
- [6] Ashida K, Hayase T, Shinmura T. Efficacy of la-cross NSE using the "leopard-crawl" technique on severely calcified lesions. *J Invasive Cardiol* 2013; 25: 555-564.
- [7] Haridas KK, Vijayakumar M, Viveka K, Rajesh T, Mahesh NK. Fracture of cutting balloon microsurgical blade inside coronary artery during angioplasty of tough restenotic lesion: a case report. *Catheter Cardiovasc Interv* 2003; 58: 199-201.