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OCT-Corner: Hematoma? Fenestrate it! Dissection? Shred it!

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Hematoma? Fenestrate it! Dissection? Shred it!

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Stent edge dissection is an important factor for stent failure and future restenosis. Fifty percent of dissections that are diagnosed by OCT cannot be identified on angiograms. Given the superior spatial resolution, OCT offers higher sensitivity to detect intimal or medial dissection at the edge of deployed stents as compared to angiography and IVUS [1]. It is still unclear which dissection needs to be treated and what is the best approach.

In ILUMIEN IV trial significant edge dissection was defined as $\geq 60^\circ$ of the circumference of the vessel at the site of dissection and ≥ 3 mm in length with resulting minimal lumen area (MLA) less than 4.5 mm^2 within 5 mm of the stent edges [2].

As a common practice significant edge dissection is stented to prevent vessel closure. On the other hand higher metal burden may increase future risk for restenosis and also late stent malapposition especially if dissection had resulted in intramural hematoma that was later resorbed [3].

Case Report

A 69 year old male presented with acute coronary syndrome. There were two significant lesions: the first was a LAD-D1 bifurcation (Medina 0-1-1 stenosis), the second was located in the distal LAD. Dilatation of the distal lesion resulted in flow-limiting dissection, flow was restored by implanting a 2.5/22 mm drug eluting stent (DES). The LAD-D1 bifurcation lesion was predilated with NC balloon that caused non-flow limiting dissection. A 3.0/34 mm DES was implanted and post-dilated with NC balloons (3.5/6 mm distally and 4.0/6 mm proximally) (Fig. 1). D1 was occluded after LAD stenting, it was difficult to rewire, flow could be restored with kissing balloons. No intracoronary imaging was used for this procedure.

Three months later he presented with new onset exertional chest pain CCS III. Diagnostic angiography (Fig. 2) showed a hazy lesion after the proximal LAD stent with significant luminal narrowing, followed by a long diffuse lesion. Dilatation with NC balloon (2.0/15 mm) was done to open passage to OCT catheter.

OCT showed a deep dissection flap starting within 5 mm from the distal stent edge carrying a high risk of lumen occlusion (Fig. 3a). The dissection was followed by a short healthy looking segment, and after that there was significant lumen narrowing by a lesion comprised of lipidic plaque, dissection flaps and intramural hematoma (Fig. 3b and c).

The usual reflex for these findings is stenting! We tried to solve this situation differently: Scoring balloon (2.5/15 mm) was repeatedly inflated up to 24 bar all the way from beginning of dissection till the end of hematoma. The rationale behind this was to shred the protruding dissection flap and completely fenestrate the intramural hematoma, together with preparing the fibrolipidic plaque to achieve adequate lumen gain.

After scoring we saw an acceptable angiographic result. So according to the requirements of third report of the DCB Consensus group [4] (no flow limiting dissection, residual stenosis $< 30\%$), we decided to treat with a drug coated balloon (DCB). Angiographically satisfactory result was sustained (Fig. 4).

Discussion

- (1) The mechanism of OCT findings can be explained in different ways:
 - (a) NC balloon used for pre-dilation during the first PCI may have caused barotrauma to eccentric lesion that have created a deep dissection penetrating the media, potentially leading to injury of the vasa vasorum. The

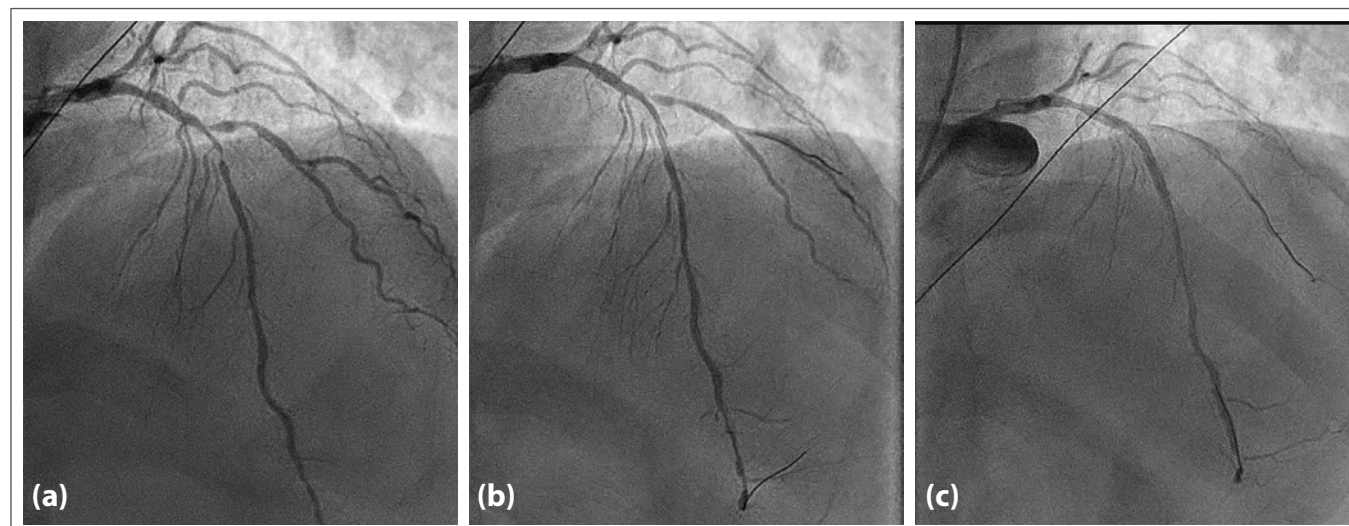


Figure 1: The lesion shape before ballooning (a); non-flow limiting dissection after predilatation with NC balloon (b); final result (c)

intramural hematoma from the bleeding vasa vasorum might have been the underlying cause of this phenomenon. This could have developed slowly, as the vessel lumen looked normal after stenting.



Figure 2: Follow-up angiography showed hazy lesion distal of the stent with significant luminal narrowing, followed by long diffuse lesion

- (b) Stent edge dissection with distally propagated hematoma with incomplete healing (healthy looking segment).
- (c) Spontaneous dissection as suggested by presence of multiple lipidic plaques.
- (d) Proximal edge dissection of the distal lesion that had been stented, with proximally propagated hematoma.

- (2) The therapeutic potential of cutting and scoring balloons in intramural hematoma is to create fenestrations between the true and false lumen to allow emptying of the subintimal space and decompression of the lumen (Fig. 5) [5]. This favours adequate distal flow recovery and should prevent abrupt vessel closure, while preventing intramural hematoma propagation (milking). Mere expansion of the cutting balloon may not sufficiently cut the dividing tissue layer, so “cuttering” may be needed, which means gently pulling the slightly expanded cutting balloon along the length of hematoma [6].
- (3) The same concept can be applied to treatment of dissection. Instead of caging the long dissection behind stent metal, scoring or cutting may help shred large dissection flaps that may lead to sudden occlusion, into harmless and small pieces that will not obstruct flow.
- (4) Initial results of meticulous lesion preparation and treatment with drug eluting balloons may cosmetically look less pretty than stent results. Uncaged vessels can grow with time.

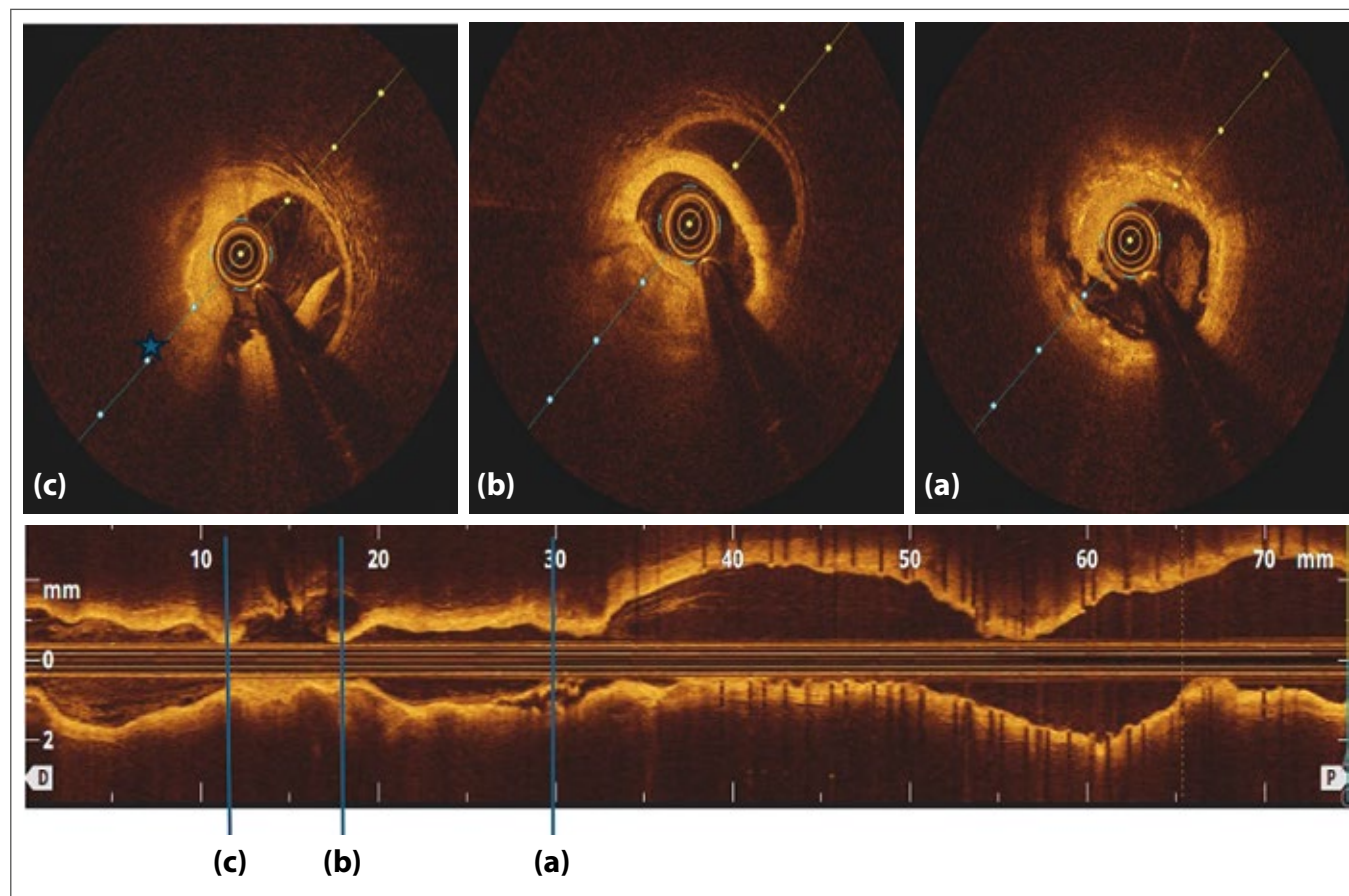


Figure 3: OCT run after NC dilatation: **(a)** Significant deep medial dissection starting < 5 mm from distal stent edge with apparent inlet. In L-Mode flap appears long and significantly protruding with risk of lumen occlusion (* = wire artifact). **(b)** Intramural hematoma (separation of IEL and EEL) from 12 to 3 o'clock and lipidic plaque from 6 to 9 o'clock and significant luminal narrowing. **(c)** Hematoma is partially evacuated after NC-balloon.

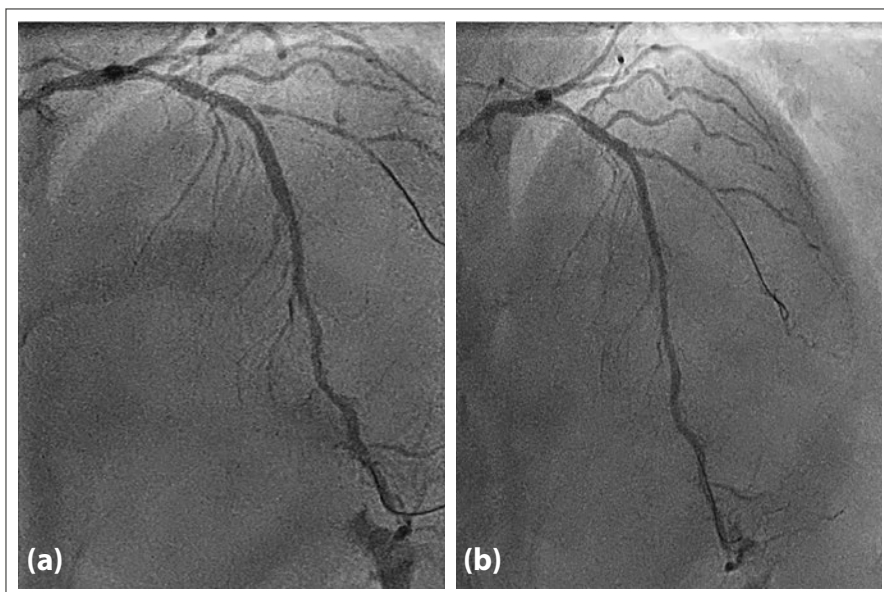


Figure 4: (a) Result after scoring balloon and (b) after drug-eluting balloon

- (5) This approach can open the door for decreasing unplanned stent use in vessel dissection and intramural hematoma. Randomized controlled trials will be needed to create reliable data.

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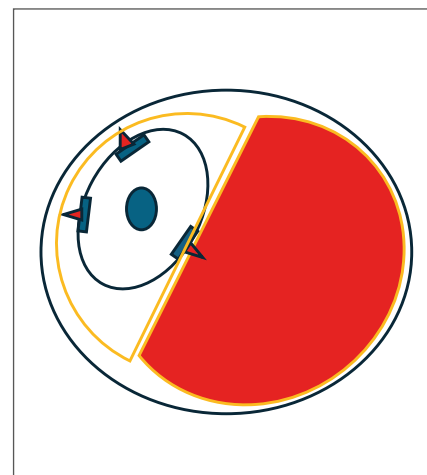


Figure 5: Cutting balloon can create multiple fenestrations between the true lumen and intramural hematoma: If expansion is not effective, “cutting” technique (pulling cutting balloon back along hematoma at low pressure) can help [4].

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