Left Main Bifurcation Stenting using the Culotte Technique

Courtesy of Dr. Stuart Watkins, Golden Jubilee, Glasgow (Scotland)

Case Background

82 yo male

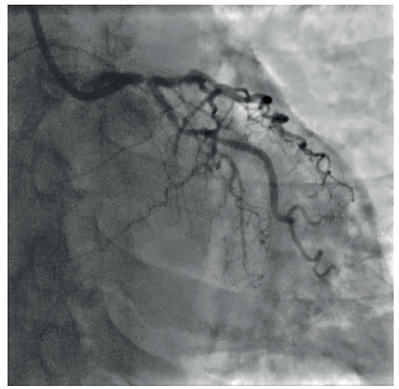
- Known IHD with previous PCI to RCA for angina in 2006
  – 3-mm Driver bare-metal stent
- Polymyalgia rheumatica on prenisolone
- Anaemia with macrocytosis (Hb 121g/dl)
- Iron deficiency anaemia in 2016
- Ischaemic small bowel resection in 2014 (volvulus)
- Duodenal ulcer requiring surgery in 1970
- Raynauds syndrome

Presentation

- Chest Pain requiring GTN infusion to settle
- Lateral NSTEMI diagnosed? with ST depression on ECG
- Troponin I hs 1006 ng/l
- Recent crescendo angina
- Good LV function on echocardiography with no WMA

Coronary Angiogram

The angiogram from one week ago shows a LM (1,1,1) stenosis.



In-Patient Cardiothoracic Surgery Review

- Turned down for CABG in view of comorbidities
  – 82 years old
  – LAD myocardial bridge
  – Anaemia
  – On steroids
  – Previous ischaemic bowel

IVUS is performed on LCx and LAD to help plan the procedure.

Culotte technique overview

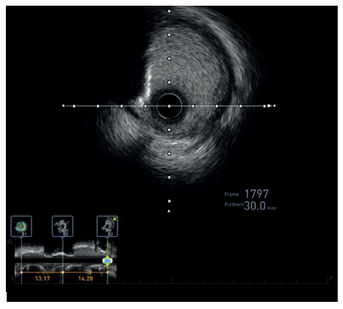


Fig.1 LCx

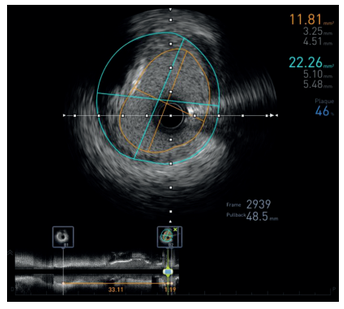
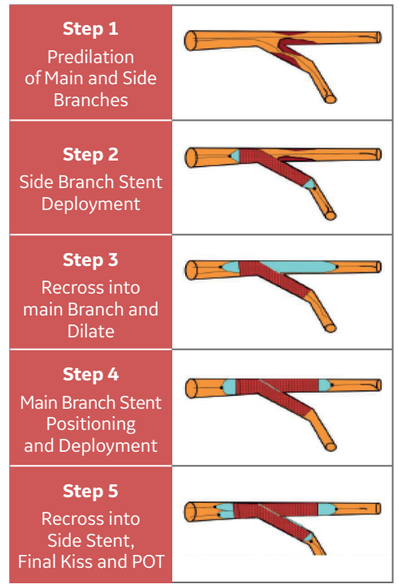
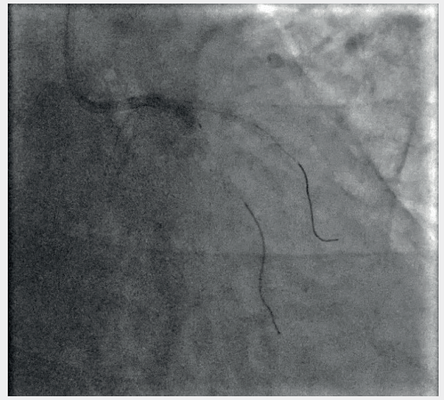


Fig.2 LAD



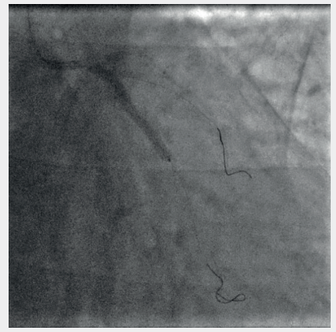
Step 1
Predilation of Main and Side Branches

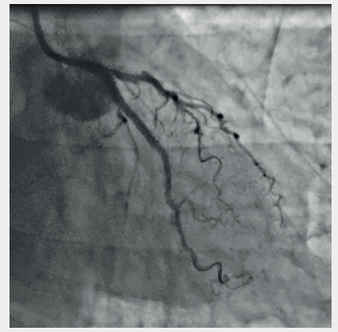
With 2.5x12-mm NC Emerge balloons
Aggressive predilation of the ostium of LAD and LCx with 3 mm Scoreflex balloon.



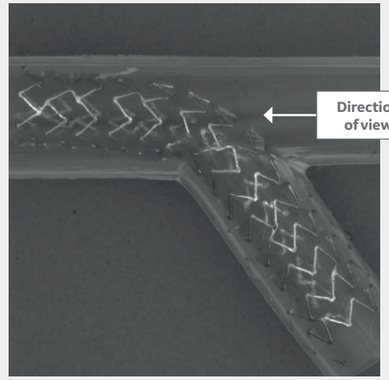
Step 2
Side Branch Stent Deployment

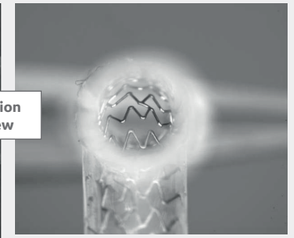
A Synergy 3x38 mm (Boston) stent is deployed from LCx to LM.

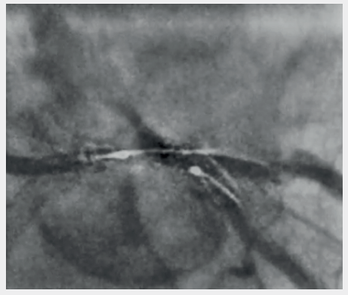




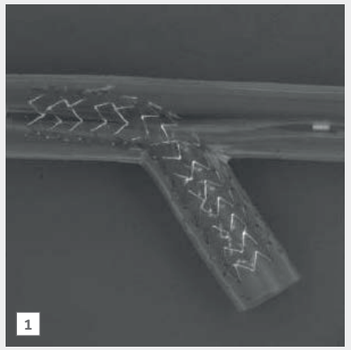
PCI ASSIST is then used to assess the position of the POT balloon vs. the carina the LM/LAD bifurcation. POT is performed using a 4-mm NC Emerge balloon.

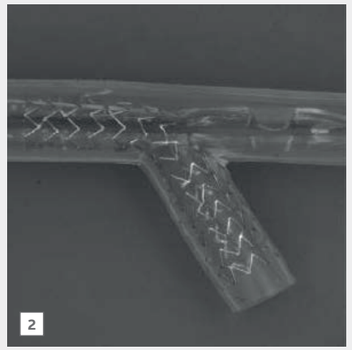


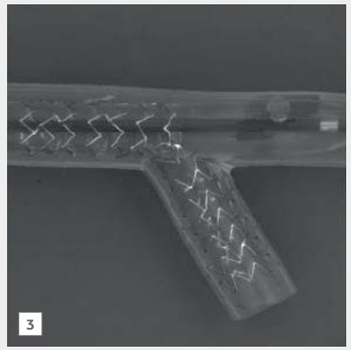


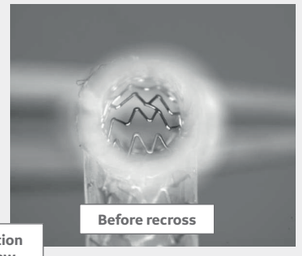


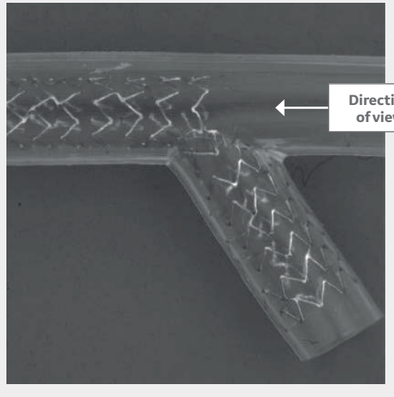
Step 3
Recross into Main Branch and Dilate

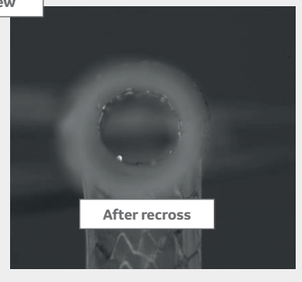




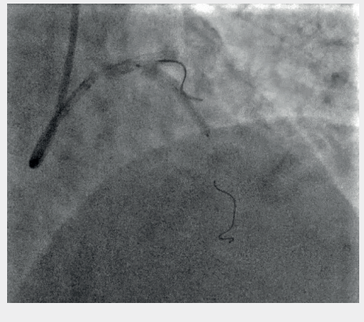




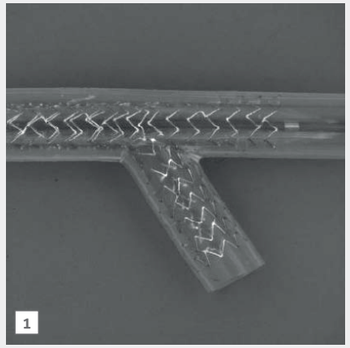


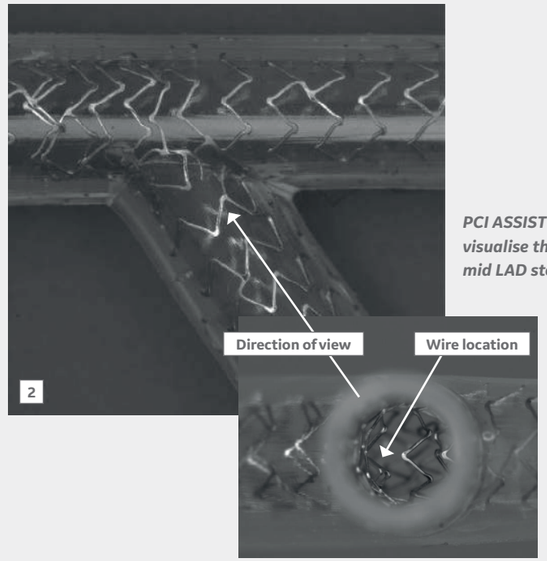


Results after recross:
The pre-dilation was difficult. Anchor balloon technique was required in order to allow a balloon to cross and open struts. Despite aggressive predilation with a 3mm NC balloon, the stent wouldn't cross into LAD. After rewiring the LAD, a Synergy 2.5x24 mm was deployed in the mid LAD.

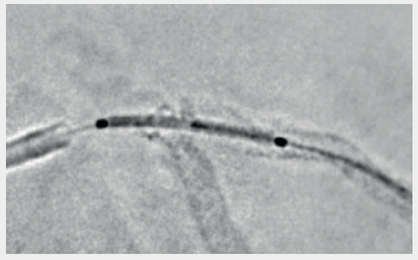


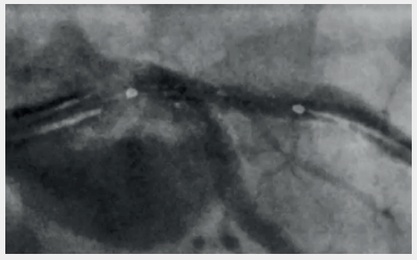
Step 4
Main Branch Stent Positioning and Deployment





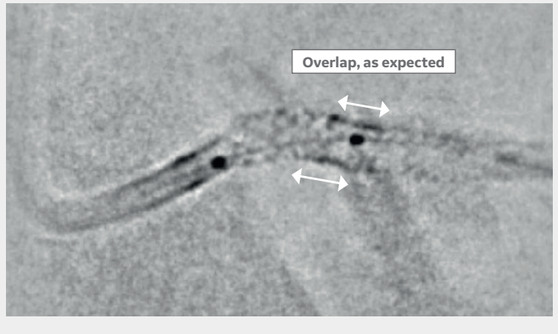
PCI ASSIST is used to visualise the overlap vs. the mid LAD stent

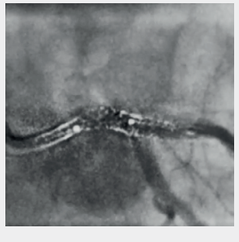




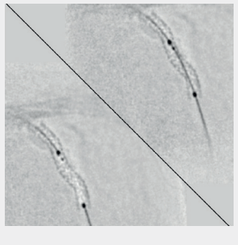
PCI ASSIST is used to accurately position the LM stent, ensuring coverage of the ostium.

Once the stent is in position (SYNERGY 3.5x16 mm), we remove the side branch wire before deployment. PCI ASSIST is used to assess the result and, in particular, to ensure that the ostial left main stem is covered.



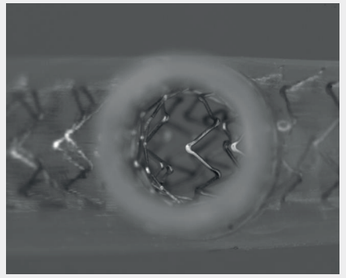


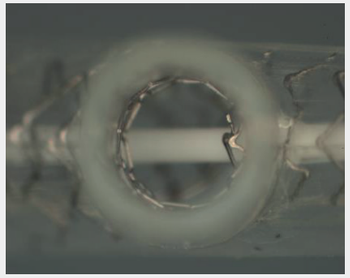
We then post dilate the LAD stent with a 3-mm NC Emerge balloon, using PCI ASSIST to verify the balloon stops at the stent borders



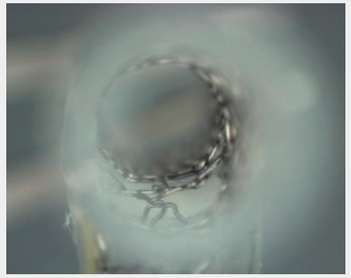
Step 5
Recross into Side Stent, Final Kiss and POT

Side branch before and after final kissing balloons

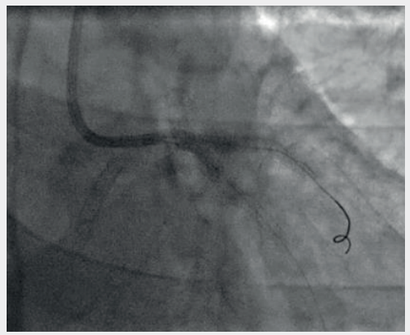




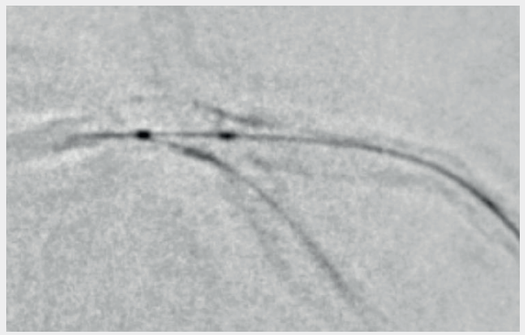
Main artery



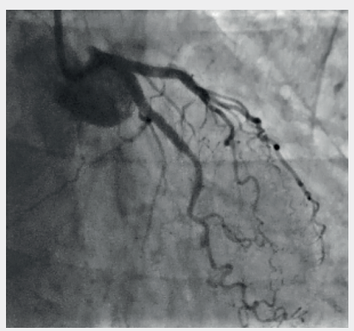
Final kissing balloon inflation is performed with two 3.5x12-mm NC Emerge balloons at 12 atm.

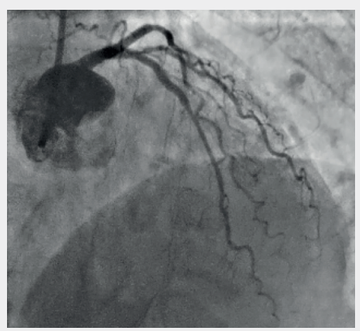


PCI ASSIST is used to position the POT balloon (4.5-mm NC Emerge).



PCI ASSIST can be used to position the POT balloon accurately in the carina and assess the stent expansion.



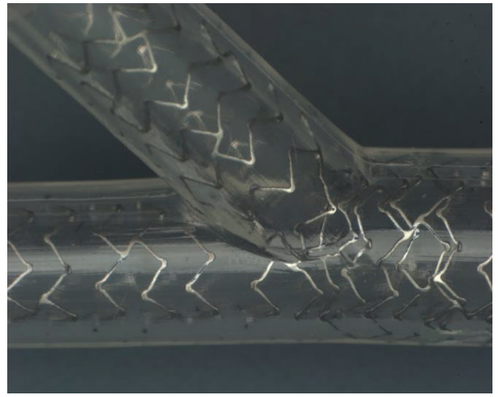


Final angios:
FFR using the Comet pressure wire gives a score of 0.87 for the diagonal and 0.88 for the LAD. Therefore PCI was not required to the diagonal artery.

Conclusion

The culotte technique, although complex, ensured a complete coverage of this left main bifurcation lesion with excellent results. PCI ASSIST was particularly helpful to accurately position stents before their deployment, to make sure they were deployed properly and well expanded, and to guide the post dilation balloons within the stent margins.

The Culotte Technique



Step 1
Predilation of Main and Side Branches

Step 2
Side Branch Stent Deployment

Step 3
Recross into Main Branch and Dilate

Step 4
Main Branch Stent Positioning and Deployment

Step 5
Recross into Side Stent, Final Kiss and POT

Advantages:

- Good radial strength
- Complete coverage
- Best immediate angiographic result
- It may guarantee a more homogeneous distribution of struts and drug
- Can be used for a wide variety of bifurcation angles

Disadvantages:

- Complex, time-consuming
- Rewiring of both branches through the stent struts can be challenging
- More overlapping metal in main branch