

# LM Bifurcation : Provisional Vs Two Stents – Which Techinque To Prefer & When ?

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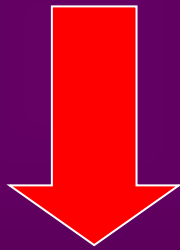
# Disclosure

- No Disclosures.
- No Conflict of interest.

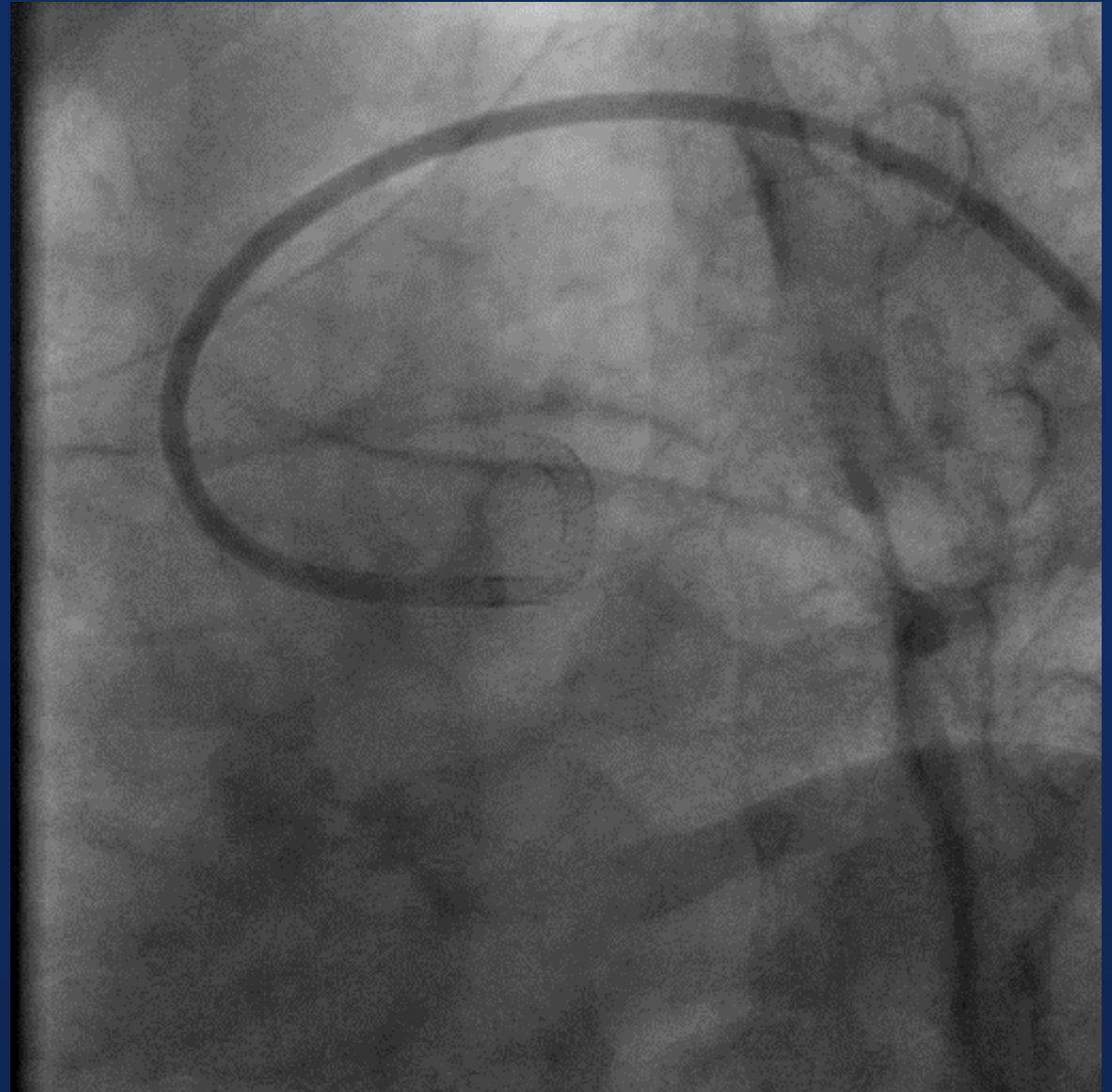
# Bifurcation Stenting

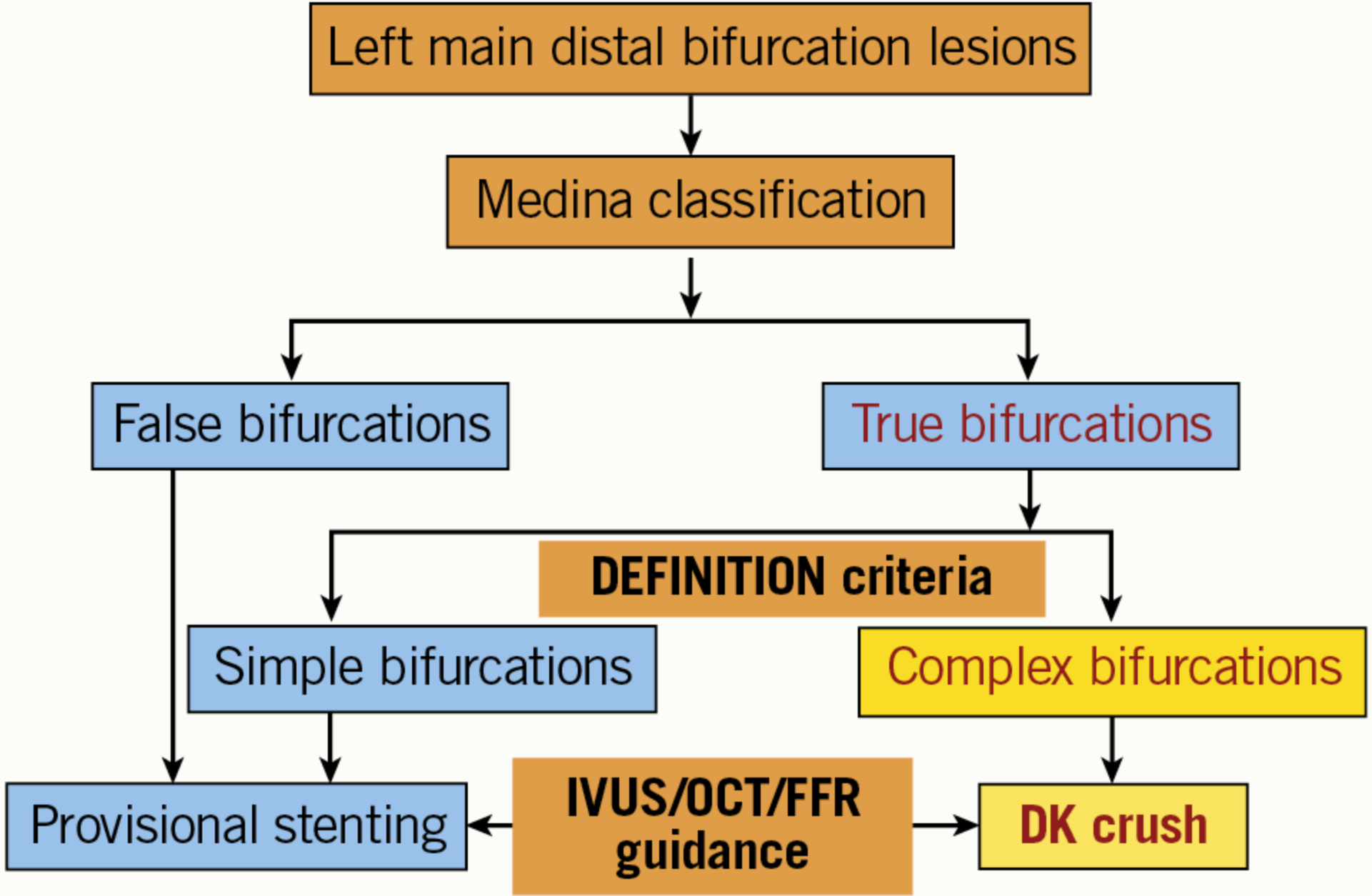
- Bifurcation stenting is always associated with increased risk of ISR, ST and other major adverse cardiovascular events.
- The majority of bifurcation PCI - lesions can be managed with a provisional strategy however a two stents strategy may be needed for a subset complex lesions.
- Complexity of bifurcation lesions (DEFINITION CRITERIA)
  - Medina 1,1,1 / 0,1,1
  - LM Side branch  $\geq 70\%$  stenosis
  - Non LM Side branch  $\geq 90\%$  stenosis
  - Side branch  $\geq 2.5$  mm
  - Side Branch lesion length  $\geq 10$  mm
  - Bifurcation Angle  $\leq 45$  degree

**What needs to be  
done for LM  
Bifurcations**



**More Challenging  
Issue...**

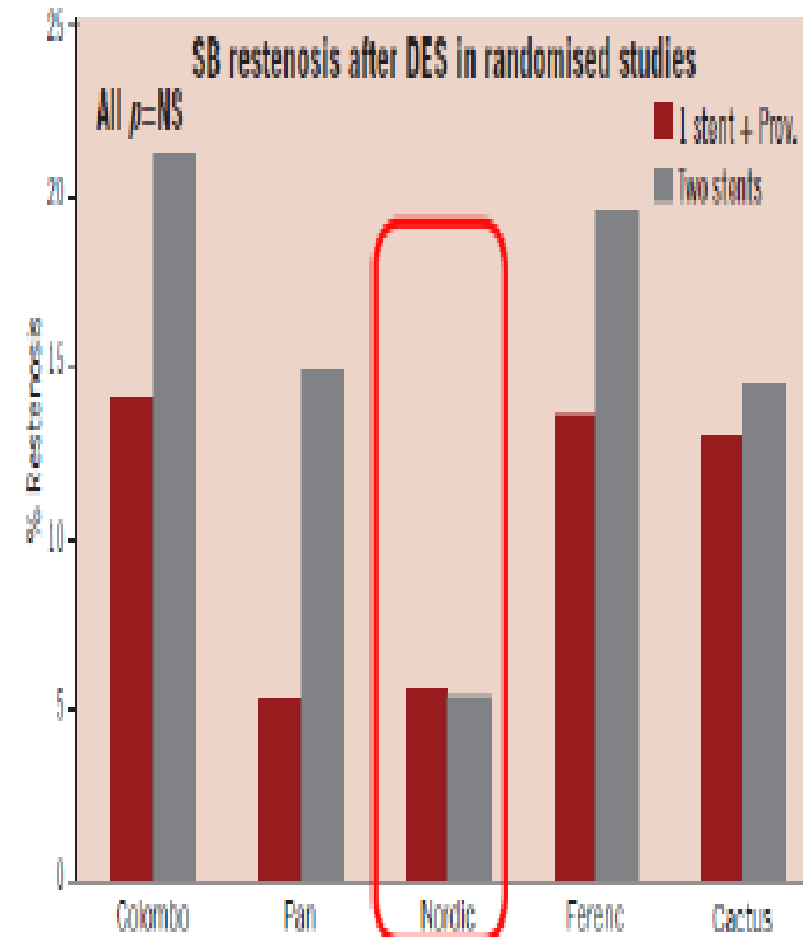
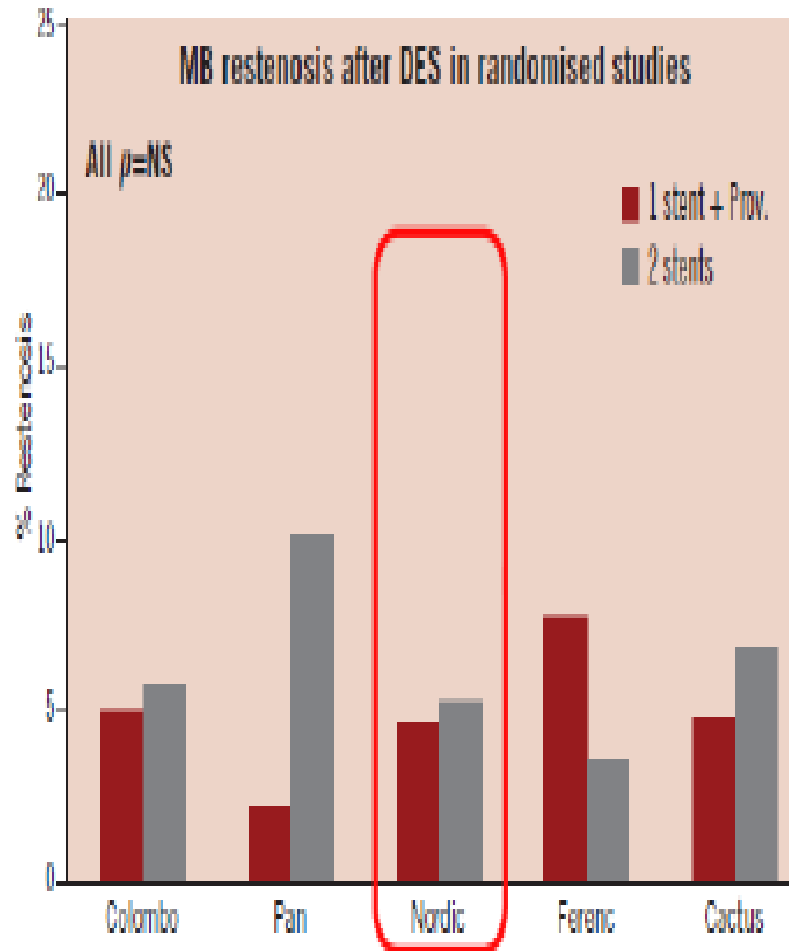






- **Provisional Vs Two Stents ??**
- **Which Technique ??**
- **Imaging ?**

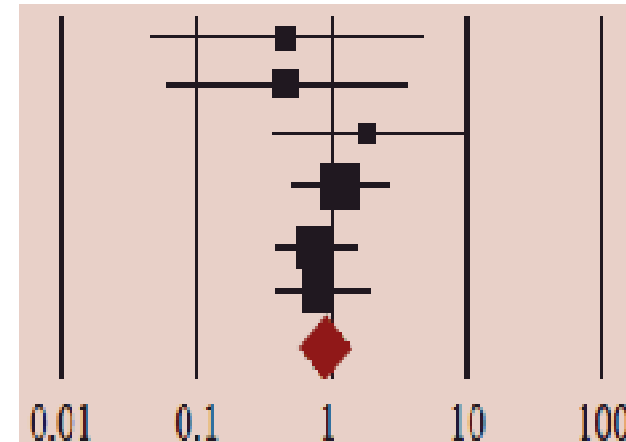
# ONE OR TWO STENTS SIX RANDOMIZED TRIALS COMPARED SINGLE VS COMPLEX STRATEGIES



# Meta-Analysis - Bifurcations with DES One (Provisional) vs Two Stents

**CLINICAL OUTCOME -> NO DIFFERENCE**

Study	Year	Events / Total		MH risk ratio and 95% CI	Statistics for each study		
		Provisional stents	Two stents		MH risk ratio	Lower limit	Upper limit
Pan et al	2004	1 / 47	2 / 44		0.47	0.04	4.98
Colombo et al	2004	1 / 22	6 / 63		0.48	0.06	3.75
NORDIC	2006	4 / 207	2 / 206		1.99	0.37	10.75
Ferenc et al	2008	11 / 101	9 / 101		1.22	0.53	2.82
BBC ONE	2008	14 / 250	18 / 250		0.78	0.40	1.53
CACTUS	2009	11 / 173	13 / 177		0.87	0.40	1.88
<i>Overall</i>		42 / 800	50 / 841		0.91	0.61	1.35



*Favours Provisional Favours Two Stents*

Test for heterogeneity:  $Q=2.2$ ,  $df=5$ ,  $P=0.82$   $I^2=0\%$   
 Test for overall effect:  $Z=-0.49$ ,  $P=0.63$

*Fixed Effects Model*



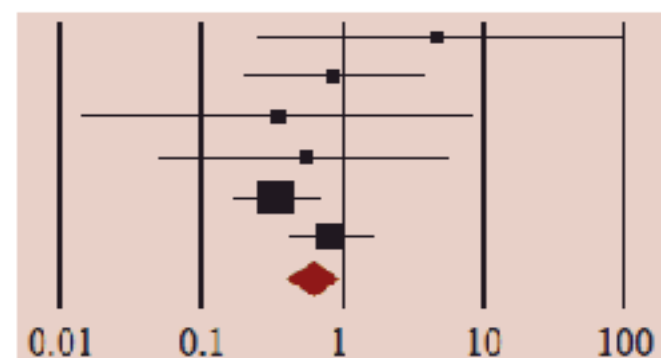


## Meta-Analysis - Bifurcations with DES One (Provisional) vs Two Stents

### Myocardial Infarction

Provisional -> Significantly lower

Study	Year	Events / Total		MH risk ratio and 95% CI		
		Provisional	Two stents	MH risk ratio	Lower limit	Upper limit
Pan et al	2004	2 / 47	0 / 44	4.69	0.23	95.00
Colombo et al	2004	2 / 22	7 / 63	0.82	0.18	3.65
NORDIC	2006	0 / 207	1 / 206	0.33	0.01	8.10
Ferenc et al	2008	1 / 101	2 / 101	0.50	0.05	5.43
BBC ONE	2008	9 / 250	28 / 250	0.32	0.15	0.67
CACTUS	2009	15 / 173	19 / 177	0.81	0.42	1.54
<i>Overall</i>		29 / 800	57 / 841	0.57	0.37	0.87



Favours Provisional Favours Two Stents

Test for heterogeneity:  $Q=5.72$ ,  $df=5$ ,  $P=0.33$   $I^2=13\%$   
Test for overall effect:  $Z=-2.58$ ,  $P=0.01$

Fixed Effects Model



# Meta-Analysis - Bifurcations with DES One (Provisional) vs Two Stents

## Stent Thrombosis

Provisional -> "Trend" for lower

Study	Year	Events / Total		MH risk ratio and 95% CI	MH risk ratio	Lower limit	Upper limit
		Provisional	Two stents				
Pan et al	2004	0 / 47	1 / 44		0.31	0.01	7.47
Colombo et al	2004	0 / 22	3 / 63		0.40	0.02	7.40
NORDIC	2006	1 / 207	0 / 206		2.99	0.12	72.87
Ferenc et al	2008	2 / 101	2 / 101		1.00	0.14	6.96
BBC ONE	2008	1 / 250	5 / 250		0.20	0.02	1.70
CACTUS	2009	2 / 173	3 / 177		0.68	0.12	4.03
<i>Overall</i>		6 / 800	14 / 841		0.56	0.23	1.35

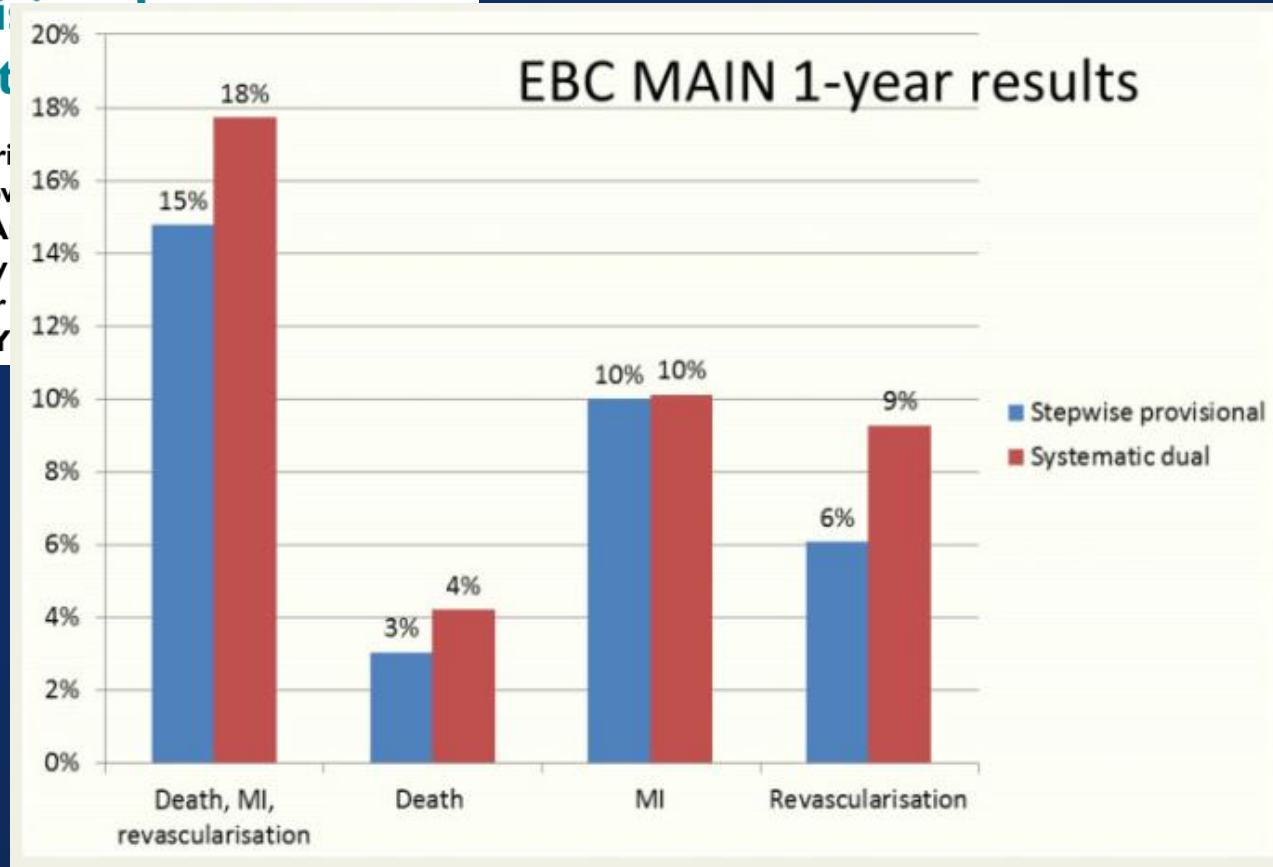
Favours Provisional Favours Two Stents

Test for heterogeneity:  $Q=2.2$ ,  $df=3$ ,  $P=0.52$   $I^2=0\%$   
Test for overall effect:  $Z=-0.76$ ,  $P=0.45$

Fixed Effects Model

# The European bifurcation club Left Main Coronary Stent study: a randomized comparison of stepwise provisional vs systematic dual stenting strategies

David Hildick-Smith<sup>1,\*</sup>, Mohamed Egred<sup>2</sup>, Adrien Philippe Brunel<sup>4</sup>, Miroslaw Ferenc<sup>5</sup>, Thomas Hovav<sup>7</sup>, Manuel Pan<sup>8</sup>, Thomas Schmitz<sup>9</sup>, Marc Silvestri<sup>10</sup>, Anders Jens Flensted Lassen<sup>13</sup>, Alaide Chieffo<sup>14</sup>, Thierry Francois Burzotta<sup>15</sup>, James Cockburn<sup>1</sup>, Olivier Goran Stankovic<sup>17</sup>, Marie-Claude Morice<sup>6</sup>, and Y



## Conclusions

Among patients with true bifurcation left main stem stenosis requiring intervention, fewer major adverse cardiac events occurred with a stepwise layered provisional approach than with planned dual stenting, although the difference was not statistically significant. The stepwise provisional strategy should remain the default for distal left main stem bifurcation intervention.

# Meta-Analysis of Provisional Versus Systematic Double-Stenting Strategy for Left Main Bifurcation Lesions

Omar M Abdelfattah <sup>1</sup>, Ahmed Radwan <sup>1</sup>, Ahmed Sayed <sup>2</sup>, Ayman Elbadawi <sup>3</sup>, Laith A Derbas <sup>4</sup>, Yehia Saleh <sup>5</sup>, Yousif Ahmad <sup>6</sup>, Ammar ElJack <sup>7</sup>, Amirali Masoumi <sup>8</sup>, Dimitri Karpaliotis <sup>8</sup>, Islam Y Elgendy <sup>9</sup>, Fernando Alfonso <sup>10</sup>

**Conclusion:** For LM bifurcation PCI using second-generation DES, a provisional stenting strategy was associated with a trend towards lower incidence of MACE driven by statistically significant lower rates of TLR, compared with systematic double stenting. These differences were primarily driven by observational studies. Further RCTs are warranted to confirm these findings.

# Provisional Versus Dual Stenting of Left Main Coronary Artery Bifurcation

Lesio  
Analy

Sukhdeep B  
Ron Waksn

## Left Main Coronary Artery Bifurcation Stenting

Provisional Stenting (n=5157)

Dual Stenting (n=3220)



## Results

A total of 696 articles were initially found using search terms in the PubMed, *ClinicalTrials.gov* and Cochrane databases. Of these 677 articles were

Provisional  
[0.46-0.88]

## Discussion

To our knowledge, this is the first comprehensive meta-analysis to include all published studies comparing provisional- and dual-stenting strategies in the DES era. The key findings of our meta-analysis were: (1) at 3 years of follow-up, provisional stenting was associated with significantly better outcomes about MACE and TLR than dual stenting; and (2) the differences in death and MI between the 2 strategies were not statistically significant.

enting in  
ich 6  
etal  
2-year

# For Bifurcation Lesions, It's OK to Start With Just One Stent: EBC Trials

At 3 years in EBC MAIN and 5 years in EBC TWO, the provisional strategy did just as well as—or better than—dual stenting.

## **EBC MAIN in the LM**

EBC MAIN randomized 467 patients from 11 European countries to either a stepwise, provisional strategy or systematic dual-stent approach (Resolute Onyx; Medtronic) to LM bifurcations. The choice of technique (culotte, DK-minicrush, T/TAP) was left to the discretion of the operator, but proximal optimization and kissing balloon technique were mandated in both groups. In the provisional group, 22% ultimately received a second stent.

# **Trials which support 2 Stents Strategy**

# Double Kissing Crush Versus Provisional Stenting for Left Main Distal Bifurcation Lesions: DKCRUSH-V Randomized Trial

Shao-Liang Chen <sup>1</sup>, Jue-Jie Zhang <sup>2</sup>, Yaling Han <sup>3</sup>, Jing Kan <sup>2</sup>, Lianglong Chen <sup>4</sup>, Chunguang Qiu <sup>5</sup>, Tiemin Jiang <sup>6</sup>, Ling Tao <sup>7</sup>, Hesong Zeng <sup>8</sup>, Li Li <sup>9</sup>, Yong Xia <sup>10</sup>, Chuanyu Gao <sup>11</sup>, Teguh Santoso <sup>12</sup>, Chootopol Paiboon <sup>13</sup>, Yan Wang <sup>14</sup>, Tak W Kwan <sup>15</sup>, Fei Ye <sup>16</sup>, Nailiang Tian <sup>16</sup>, Zhizhong Liu <sup>2</sup>, Song Lin <sup>16</sup>, Chengzhi Lu <sup>17</sup>, Shangyu Wen <sup>18</sup>, Lang Hong <sup>19</sup>, Qi Zhang <sup>20</sup>, Imad Sheiban <sup>21</sup>, Yawei Xu <sup>22</sup>, Lefeng Wang <sup>23</sup>, Tanveer S Rab <sup>24</sup>, Zhanquan Li <sup>25</sup>, Guanchang Cheng <sup>26</sup>, Lianqun Cui <sup>27</sup>, Martin B Leon <sup>28</sup>, Gregg W Stone <sup>29</sup>

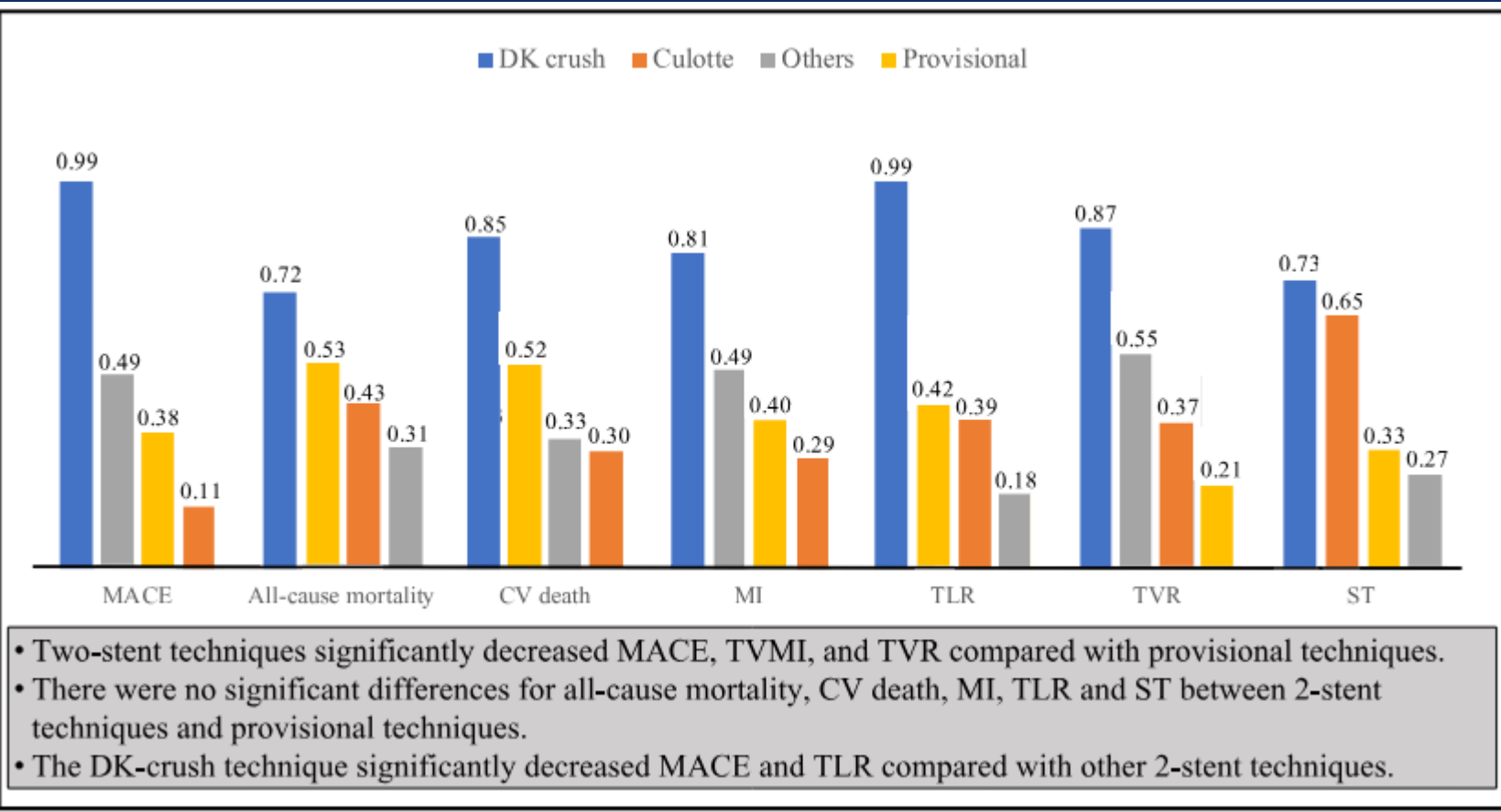
**Conclusions:** In the present multicenter randomized trial, percutaneous coronary intervention of true distal LM bifurcation lesions using a planned DK crush 2-stent strategy resulted in a lower rate of TLF at 1 year than a PS strategy. (Double Kissing and Double Crush Versus Provisional T Stenting Technique for the Treatment of Unprotected Distal Left Main True Bifurcation Lesions: A Randomized, International, Multi-Center Clinical Trial [DKCRUSH-V]; ChiCTR-TRC-11001213).



## Meta-analysis

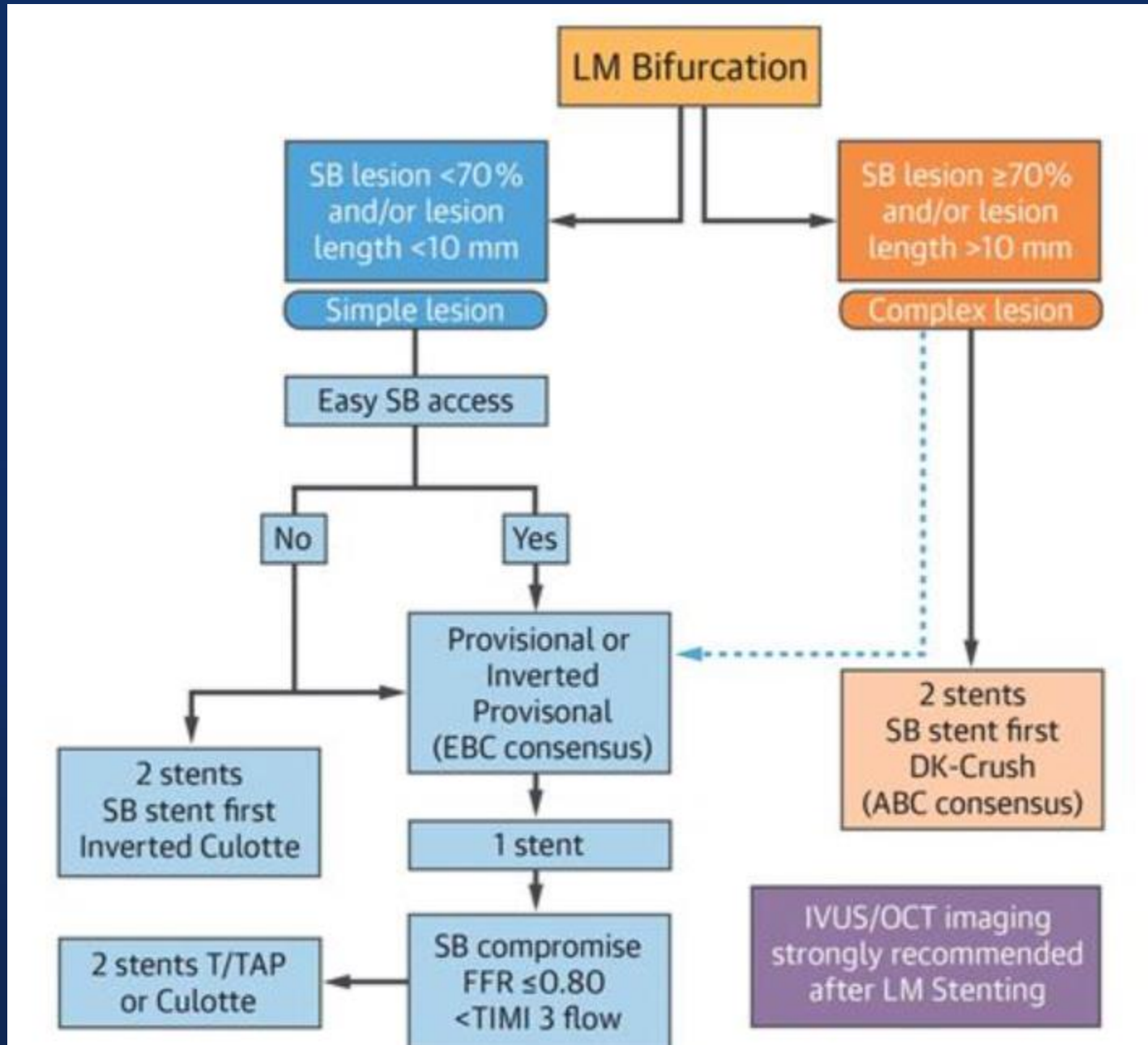
## Provisional or 2-Stent Technique for Bifurcation Lesions in the Second-Generation Drug-Eluting Stent Era

Tomohiro Fujisaki, MD<sup>a,b,†</sup>, Toshiki Kuno, MD, PhD<sup>c,d,†</sup>, Yohei Numasawa, MD, PhD<sup>e</sup>, Hisato Takagi, MD, PhD<sup>f</sup>, Alexandros Briasoulis, MD, PhD<sup>g</sup>, Tak Kwan, MD<sup>h</sup>, Azeem Latib, MD<sup>c</sup>, Jacqueline Tamis-Holland, MD<sup>i</sup>, Sripal Bangalore, MD, MHA<sup>j,\*</sup>



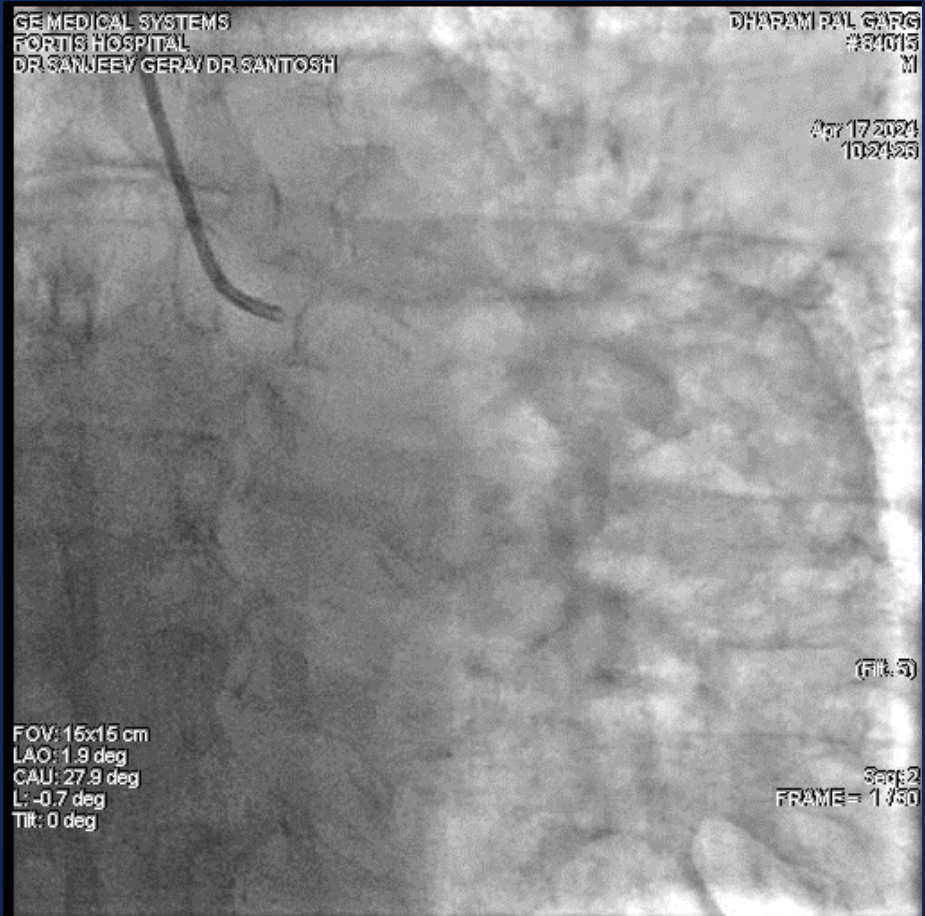
# Selection Criteria for Provisional Stenting

Strategy	Anatomical features
Favour provisional approach	<ul style="list-style-type: none"><li>– Insignificant stenosis at the ostial LCX with Medina classification 1,1,0 or 1,0,0</li><li>– Small LCX &lt;2.5 mm in diameter</li><li>– Diminutive LCX, right dominant coronary system</li><li>– Wide angle between LAD and LCX</li><li>– No concomitant disease or only focal disease in LCX</li></ul>
Favour two-stent technique	<ul style="list-style-type: none"><li>– Significant stenosis at the ostial LCX with Medina classification 1,1,1 or 1,0,1 or 0,1,1</li><li>– Large LCX <math>\geq</math>2.5 mm in diameter</li><li>– Diseased left dominant coronary system</li><li>– Narrow angle between LAD and LCX</li><li>– Concomitant diffuse disease in LCX</li></ul>



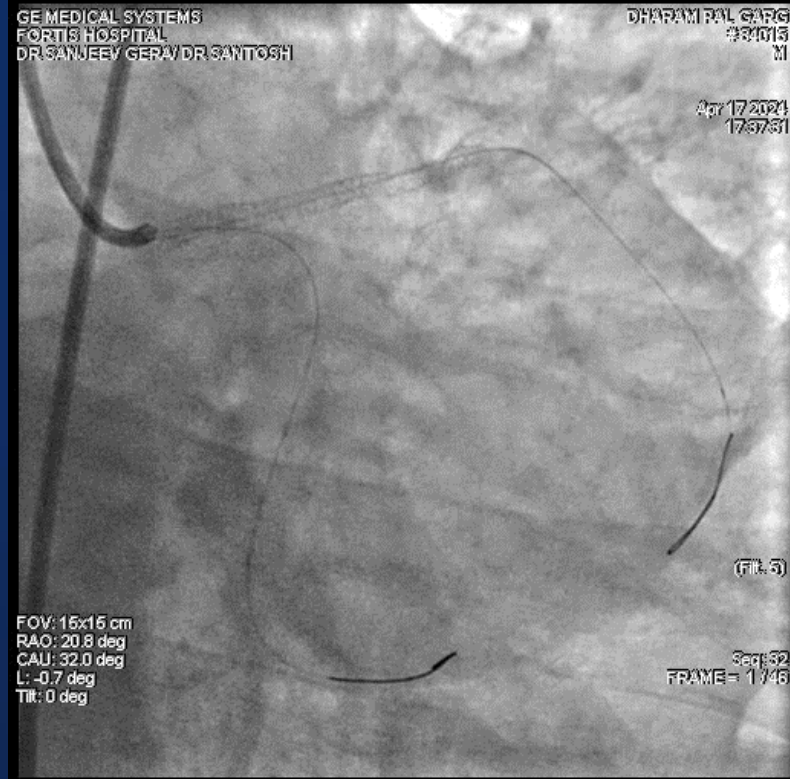
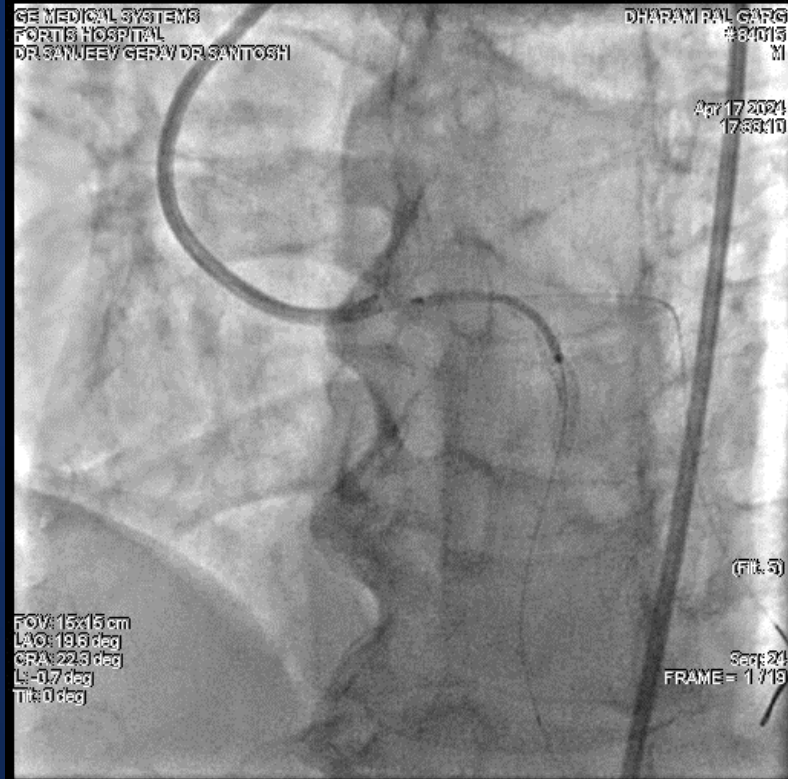
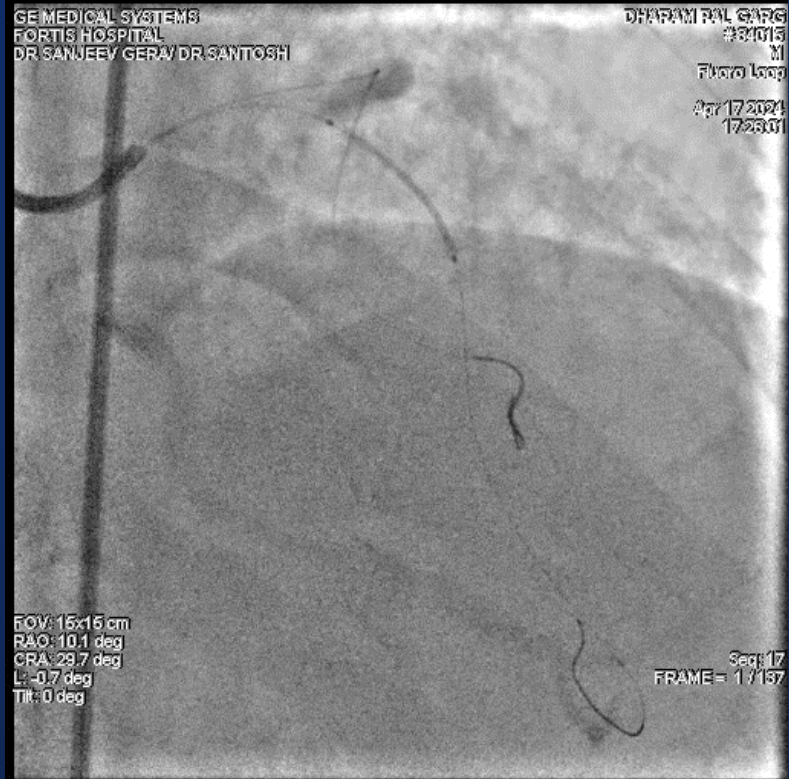
# Provisional Vs Two Stents – Exceptions??

## Case 1

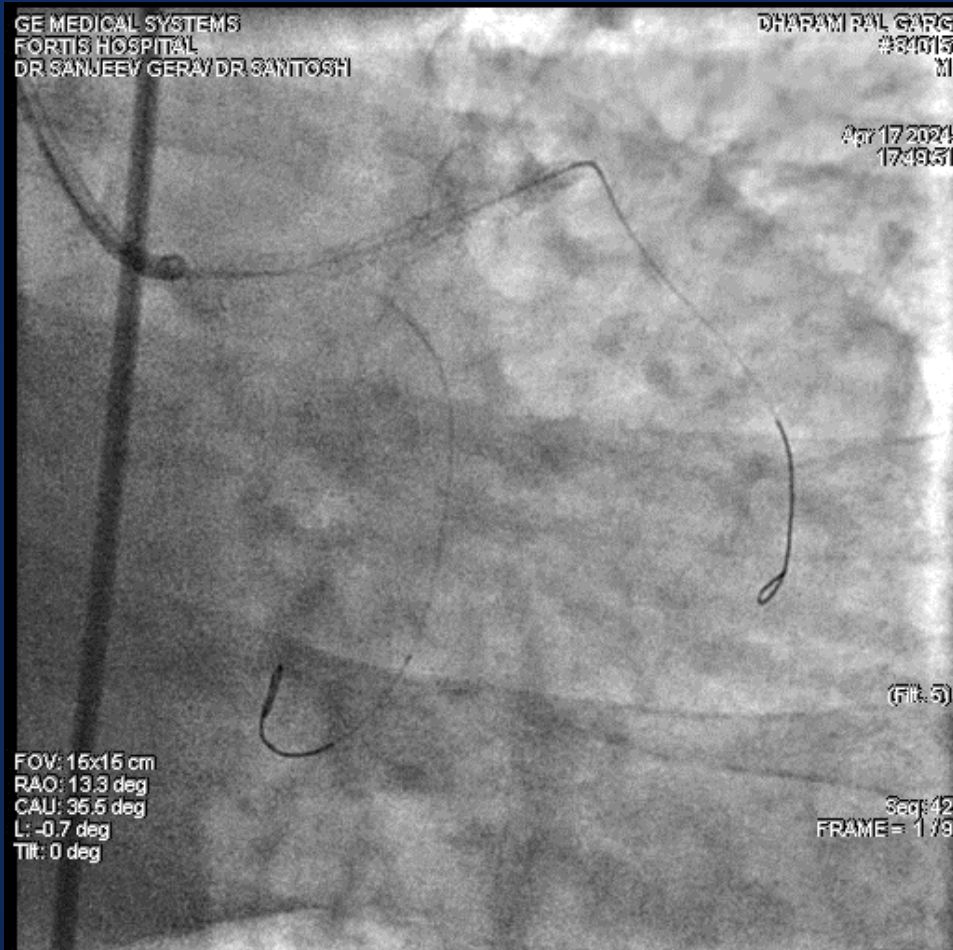


- 75Yrs, ACS
- EF 30 – 35 %
- Creat – 1.8
- CABG refusal

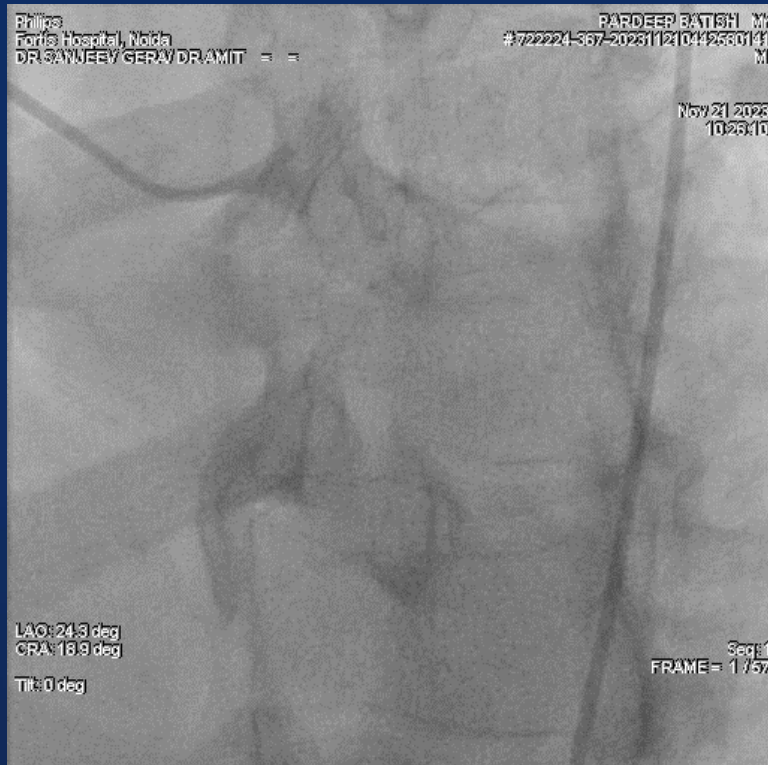




# Final Result

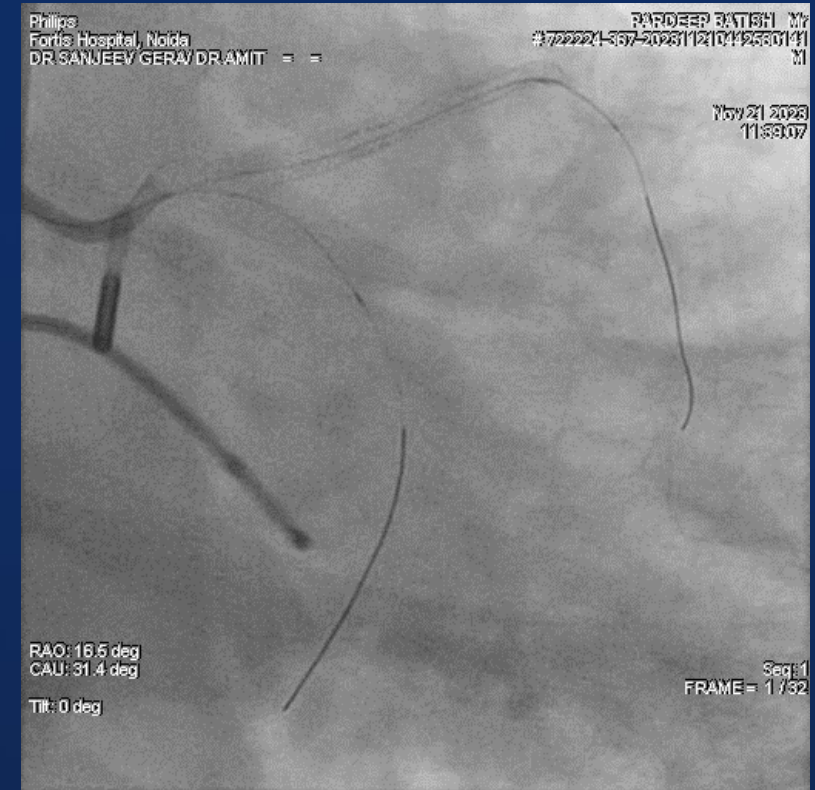


# Case 2 : ACS, Late Presentation, EF 30%, Hypotensive

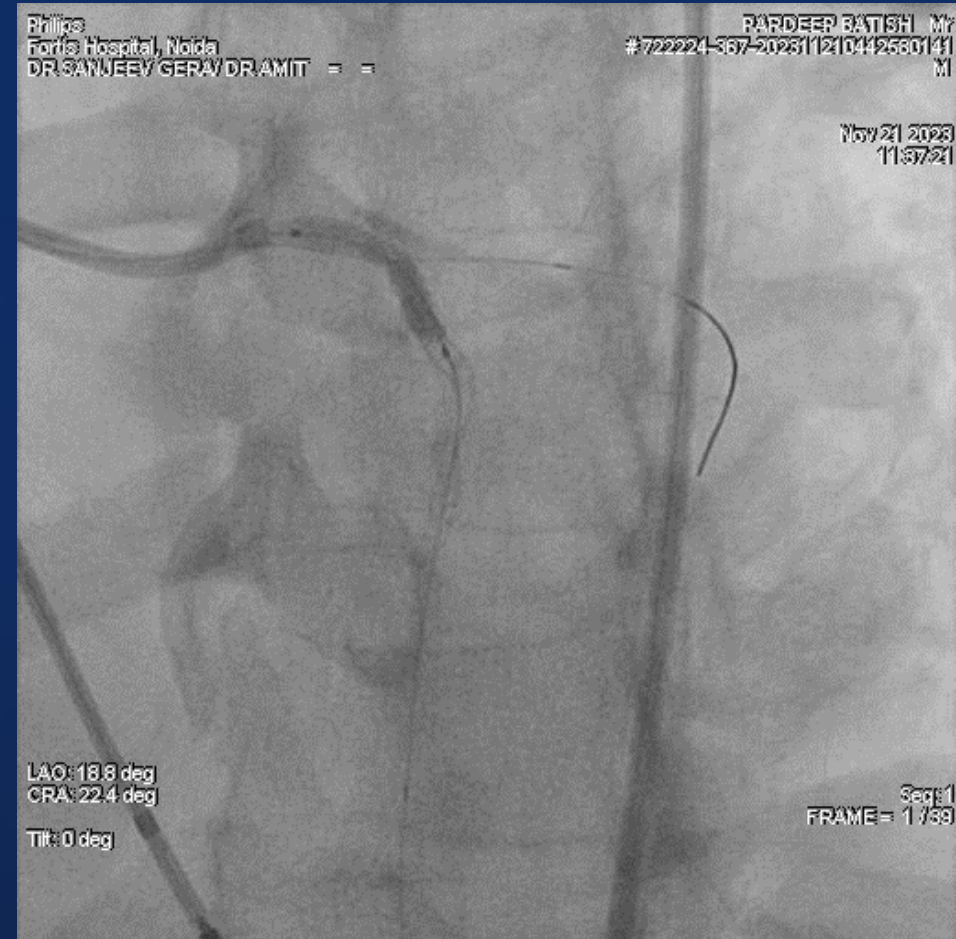
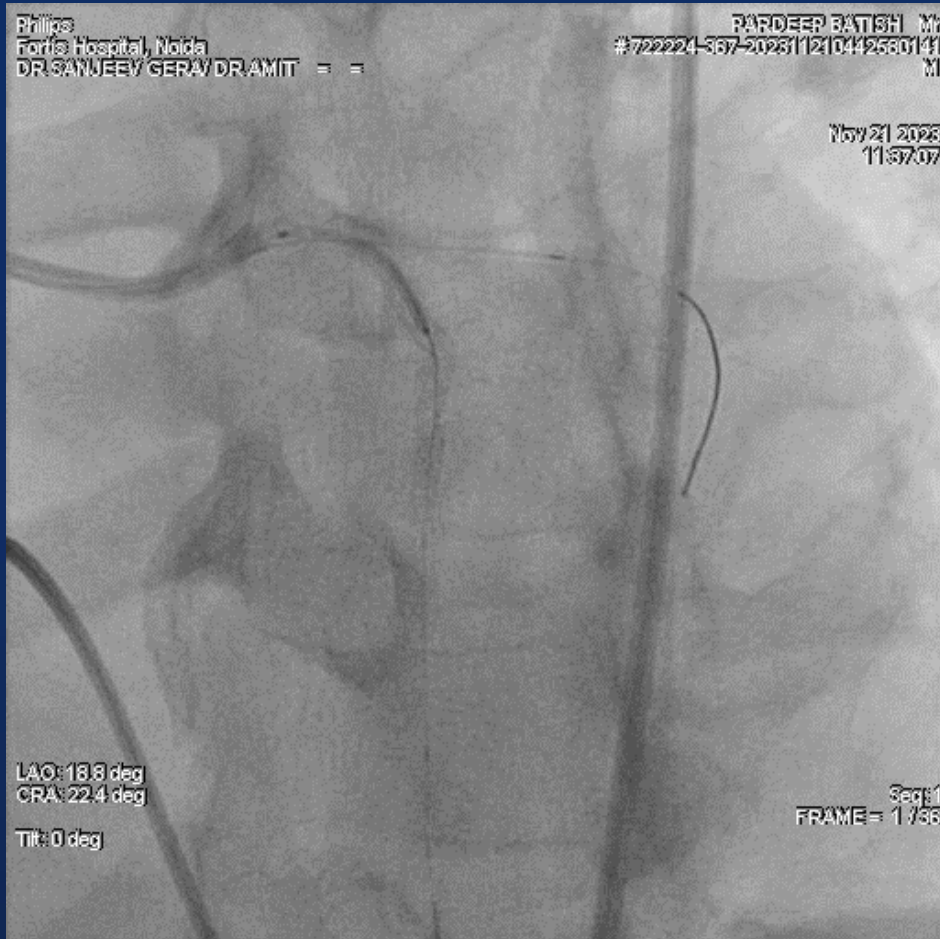




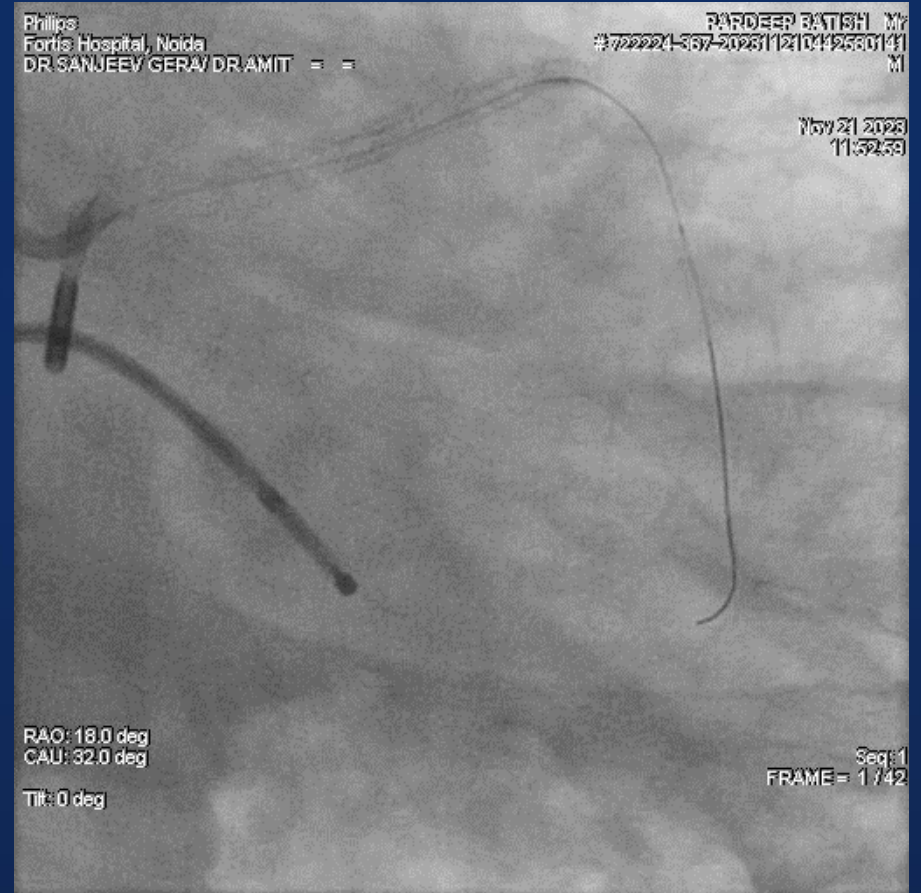
# 2 DES LM to LAD



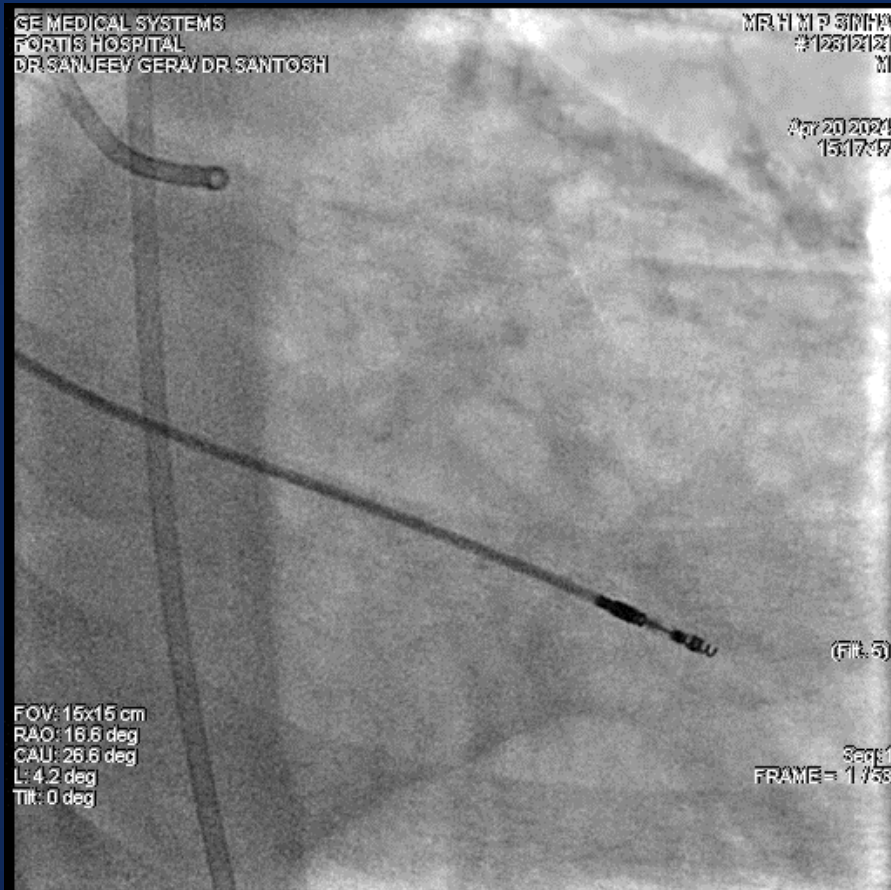
# DEB in LCx



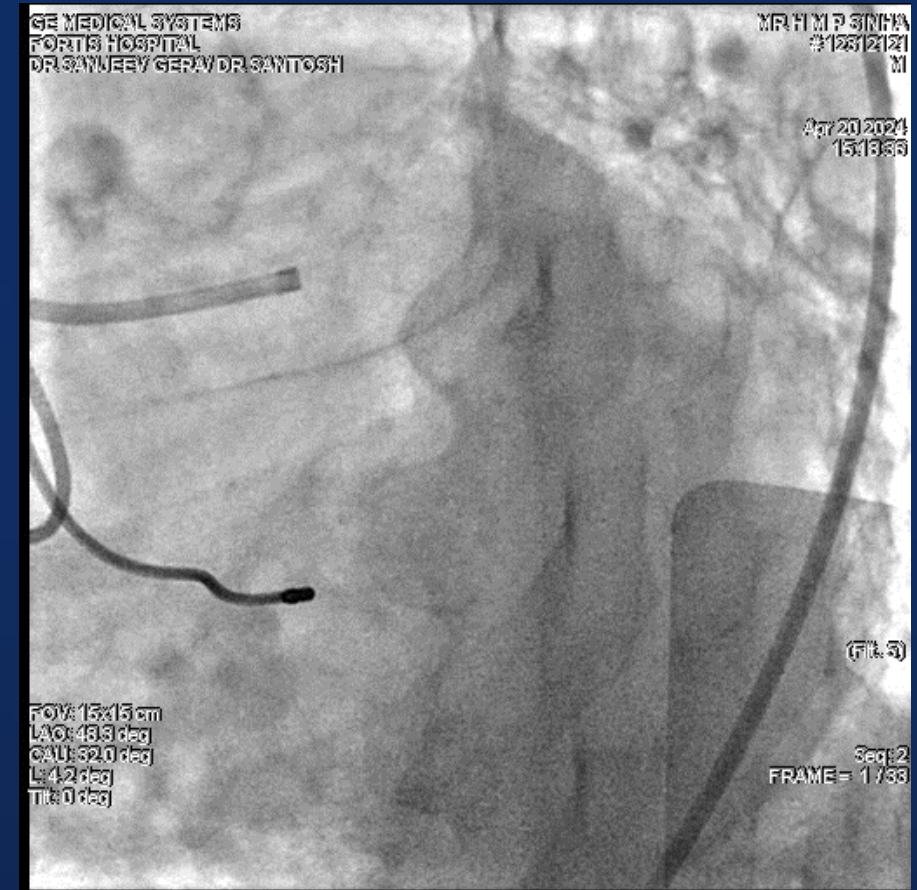
# Final Result

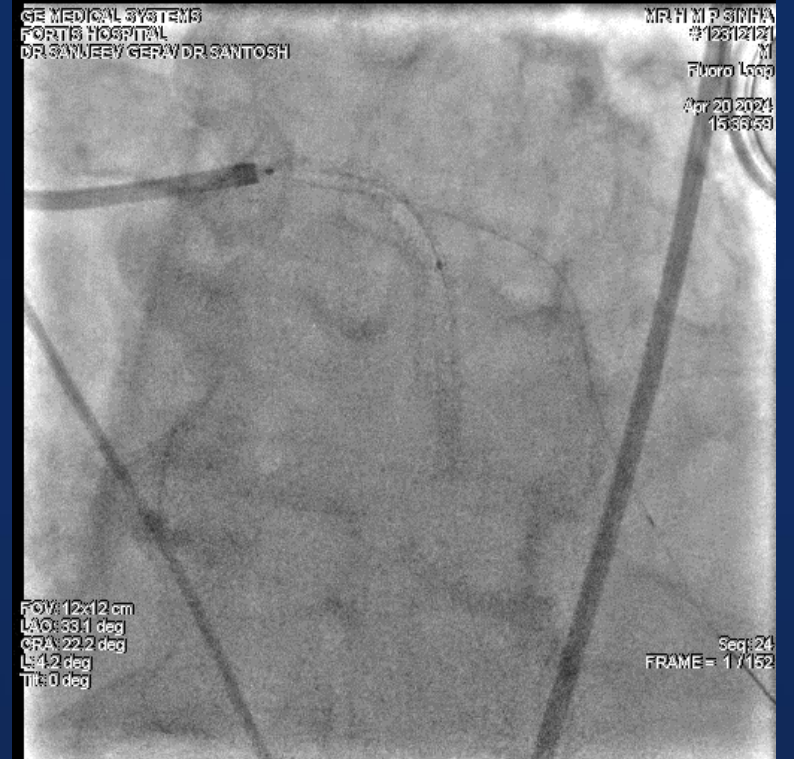
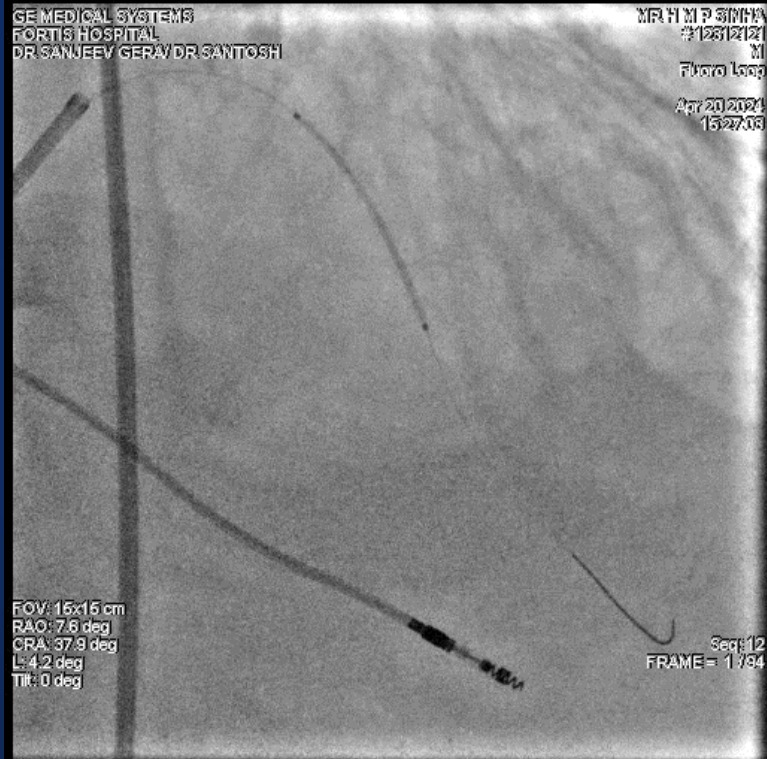


# Case 3

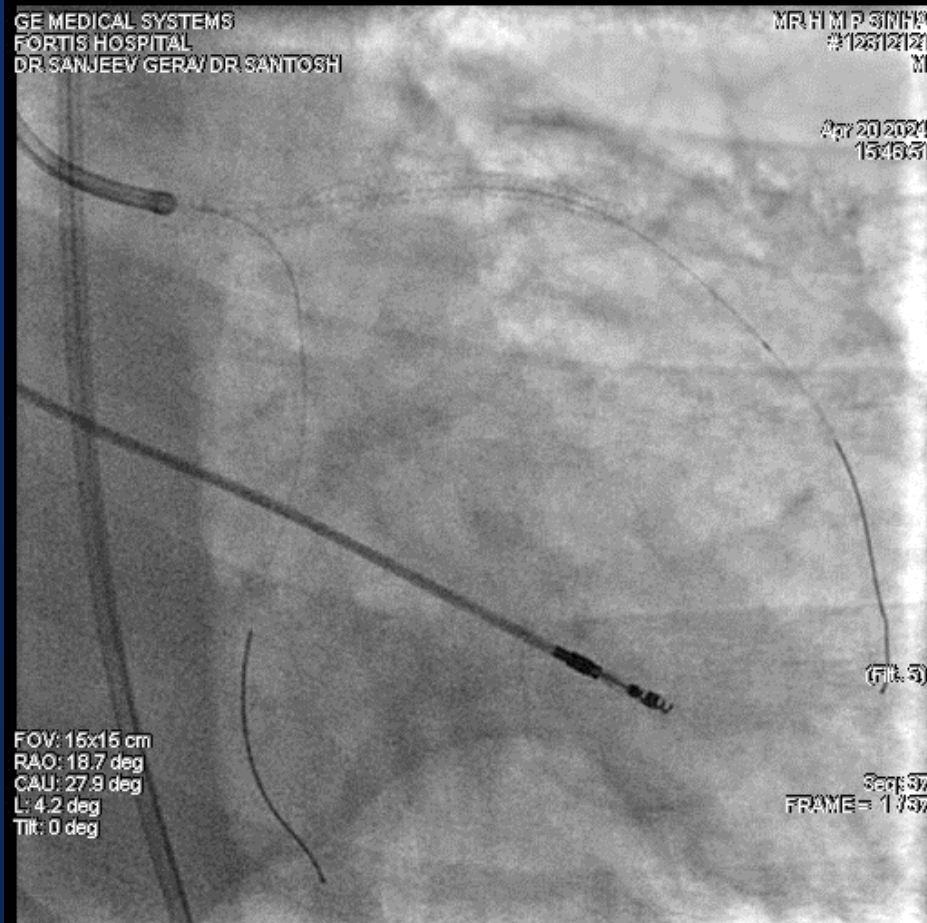


- EF – 30%
- COPD, CKD
- Refractory Angina
- IVUS Guided low contrast PCI done

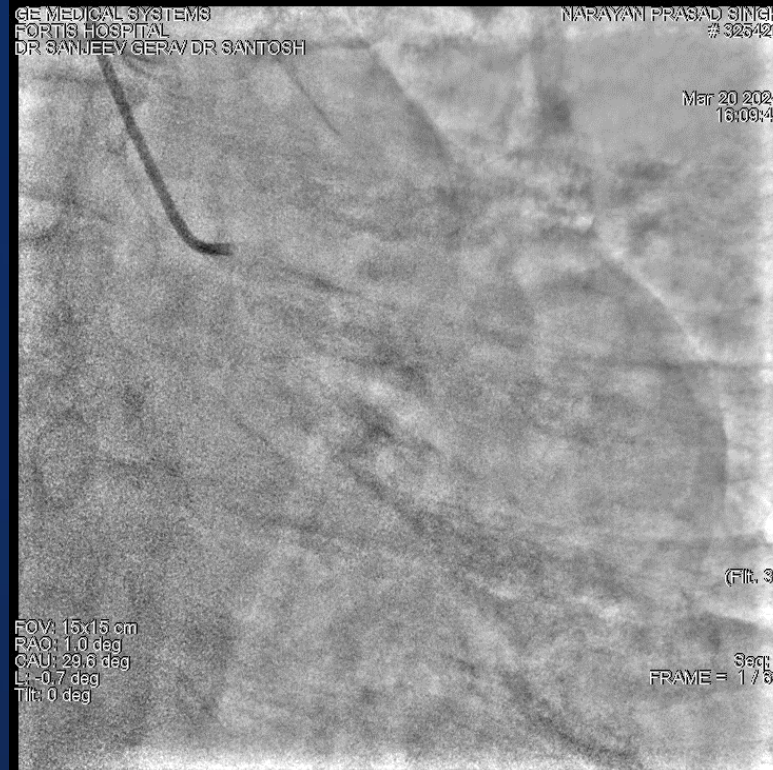




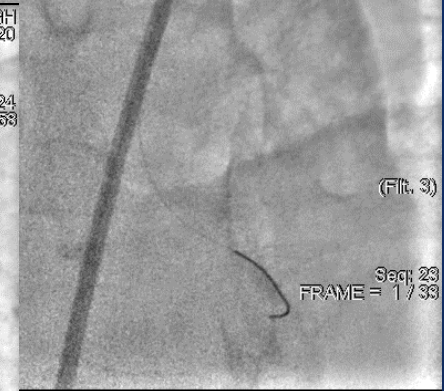
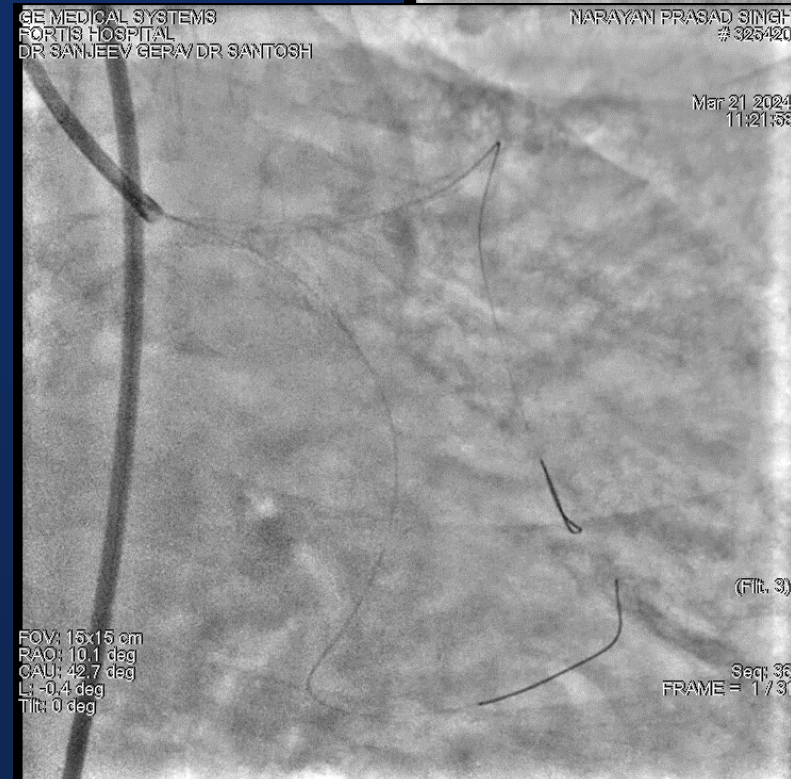
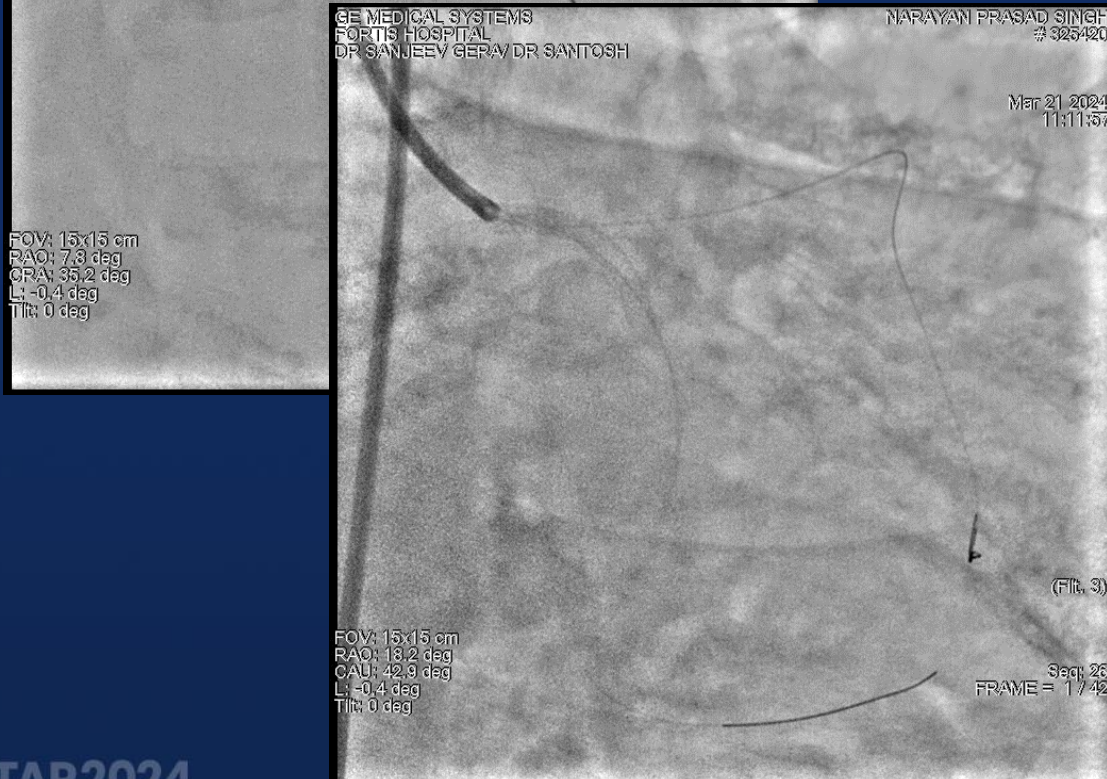
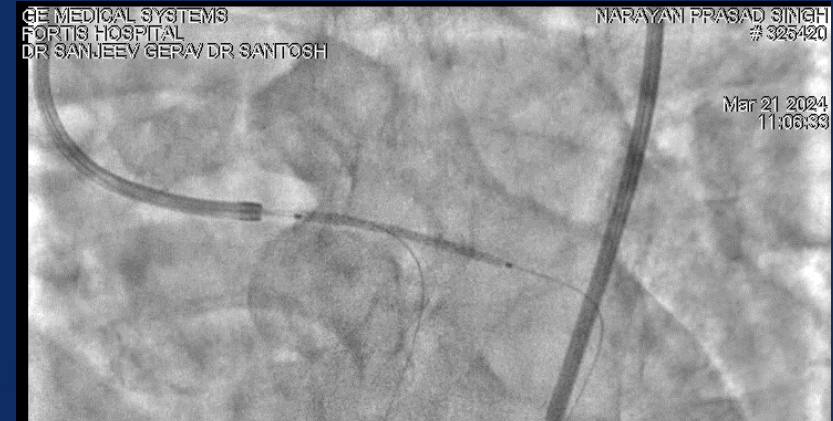
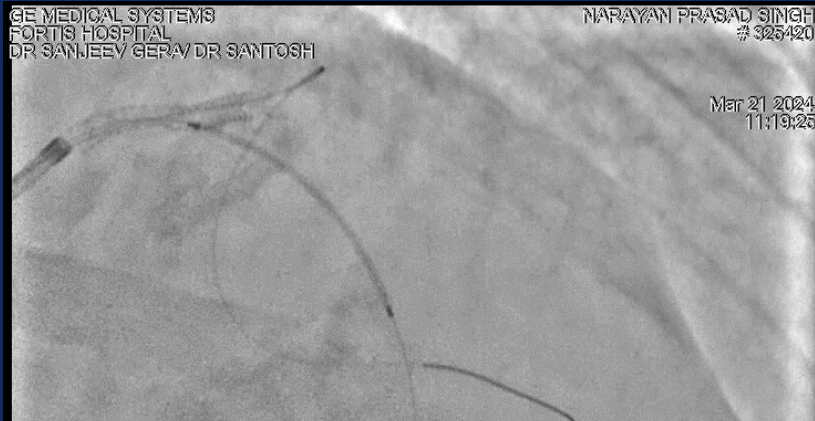
# Final Result



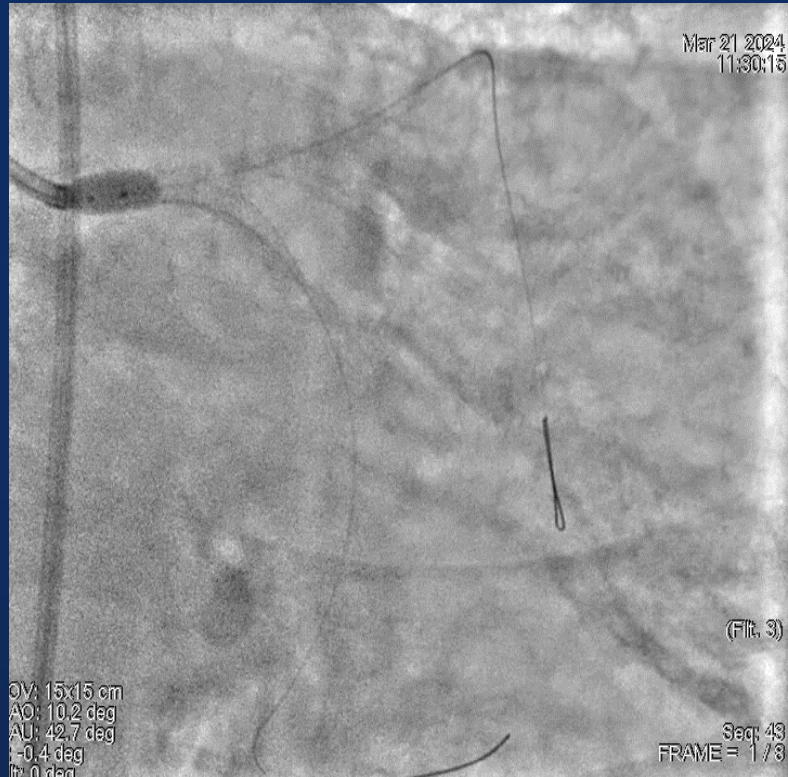
# Case 4: Medina 1,1,1 Dominant LCx



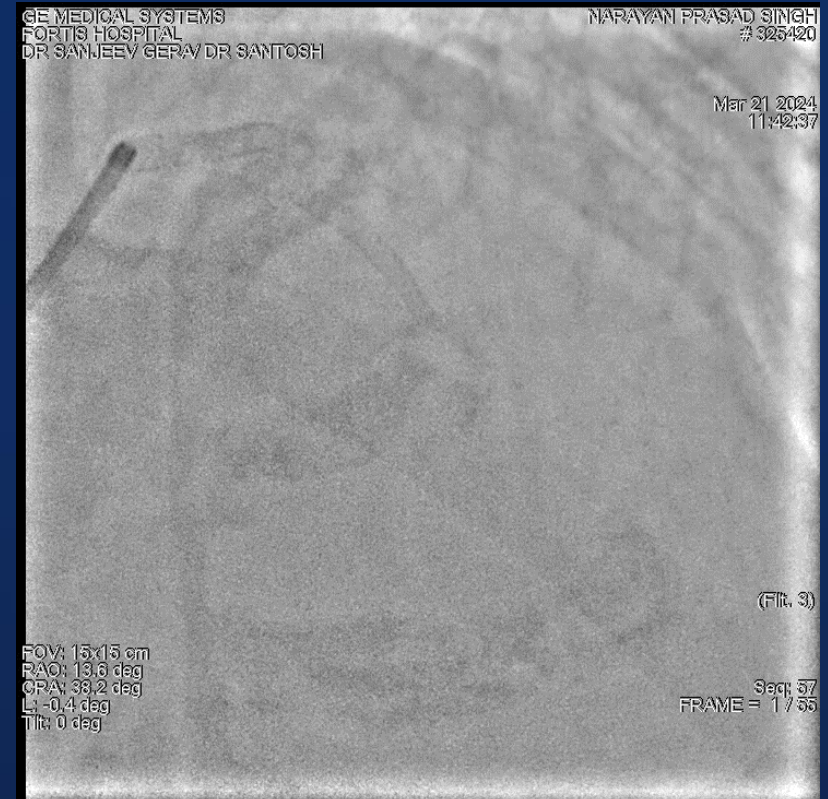
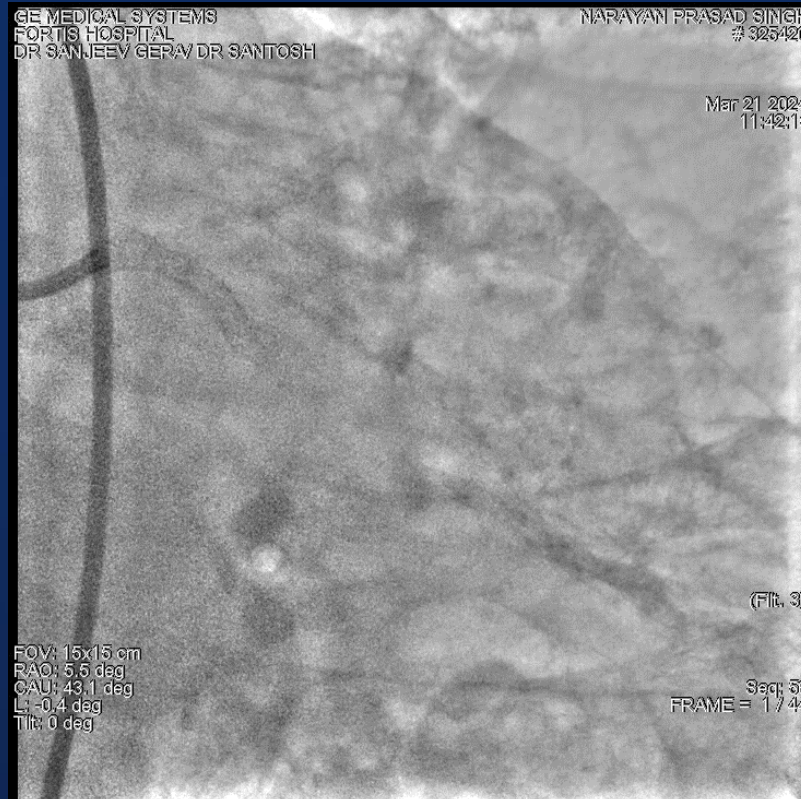
# DES Placement in LCx & LAD (Mini Crush)







# Final Result with IVUS Optimisation



# CONCLUSION

- 2/3 cases of Left Main cases are Bifurcation cases.
  - Results Influenced By
    - Simple vs Complex Bifurcation
    - Experience and Expertise of the Operator
    - LM Bifurcation Angle
- Much evidences are in favor of Provisional step wise strategy in view of lower MACE, TLR, TVR, MI, ST etc.
- IVUS or OCT – Valuable tools for pre PCI lesion assessment and stent optimization.
- DK Crush a better technique with upfront two stent strategy.
- FFR / IVUS based side branch assessment, need more evidence.