

# Shockwave Lithotripsy

## How to overcome severely calcified lesions with new device

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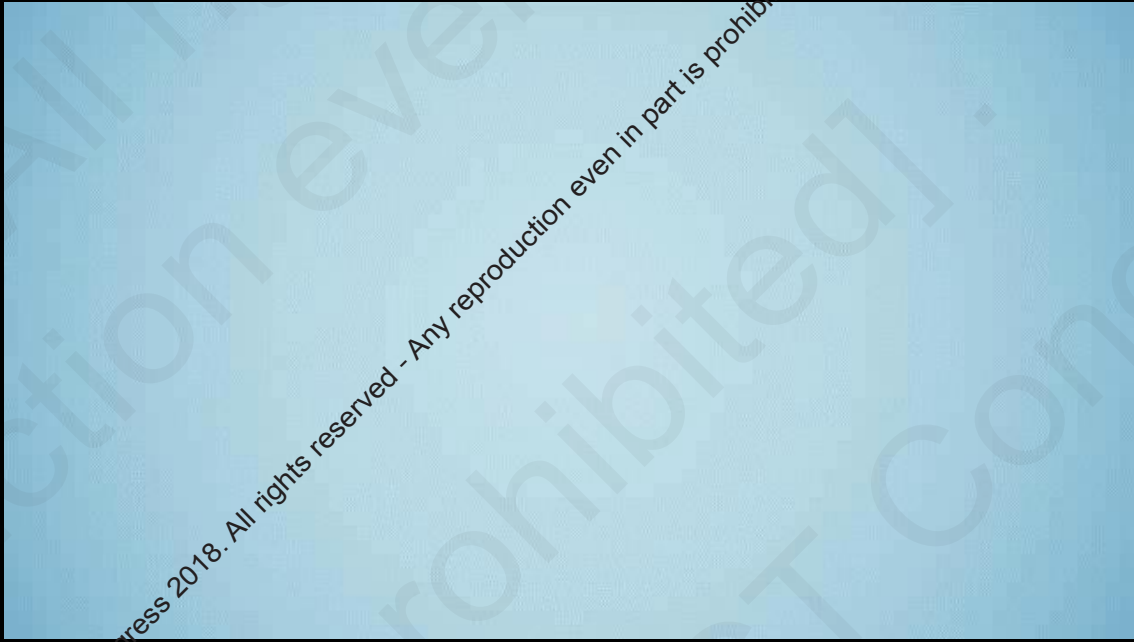
President : New Tokyo Hospital ; Tokyo

Professor of Advanced Cardio-Vascular Medicine : Kumamoto University

Senior Consultant : National Cardiovascular Center Japan

**FACC, FAHA, FESC, FSCAI**

# What is Shockwave?



**Mechanism**  
**High-speed sonic pressure wave**  
 → similar to urologic extracorporeal lithotripsy.  
 (soft tissue: pass through, calcification: disrupt)

- 1. Balloon inflation (4atm, 10 sec)**  
 Contacting vessel wall and delivering optimal energy.  
 → Balloon should be well prepared (no air contained)
- 2. Balloon inflation up to 6atm (breaking calcium)**
- 3. Repeat the cycle (maximum 8 cycles / catheter)**

**Lithoplasty® Coronary Balloon Dilatation Catheter**  
 Cathéter de dilatation coronaire par ballonnet Lithoplasty®  
 Lithoplasty®-Ballondilatationskatheter für Koronargefäße  
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 Lithoplasty® ballongdilataationskateter för koronarkärl  
 Coronaire Lithoplasty®-ballondilatatiekatheter

Ø	3.0 mm	Pressure	3.0	Diameter	
↔	12 mm	ATM - kPa	Treatment	Ø (mm)	
UL	138 cm	4 - 405		2.96	
GW <sub>R</sub>	0.014" / 0.4mm	5 - 507	Nominal	2.99	
GC <sub>R</sub>	6F	6 - 608		3.02	
RX	2018-07-31	7 - 709		3.04	
		8 - 811		3.07	
		9 - 912		3.10	
		10 - 1013	RBP		

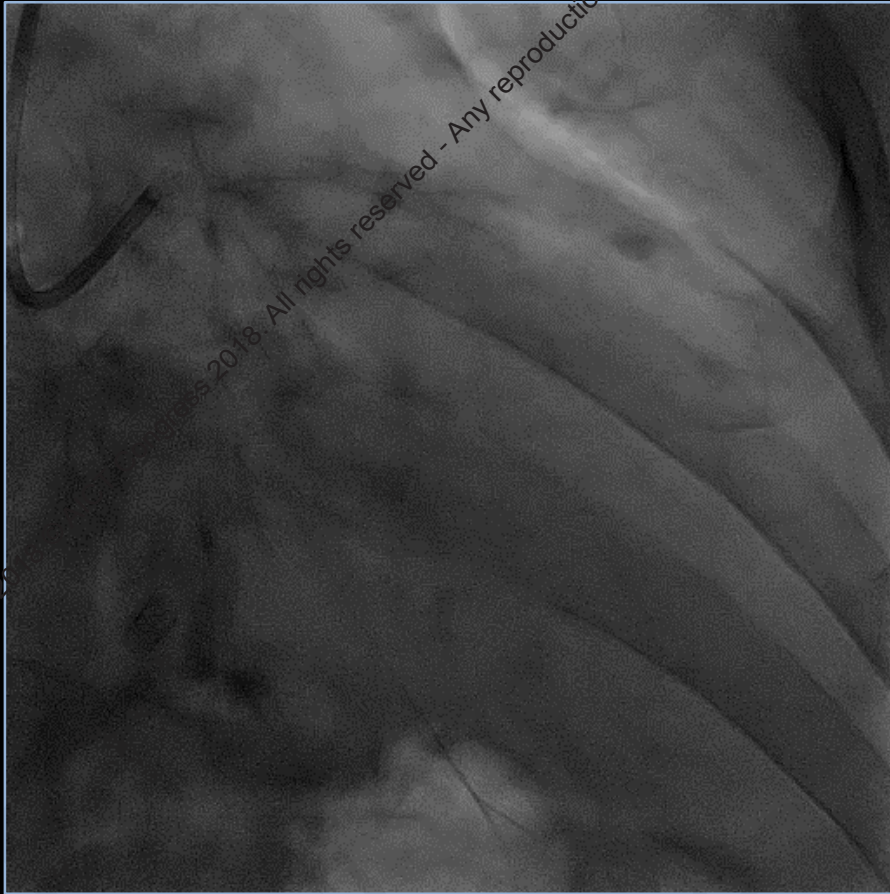
CE PAT www.shockwavemedical.com

## Case: Diffuse proximal to mid LAD lesion

74 year-old, male

Coronary risk factors: hypertension, dyslipidemia

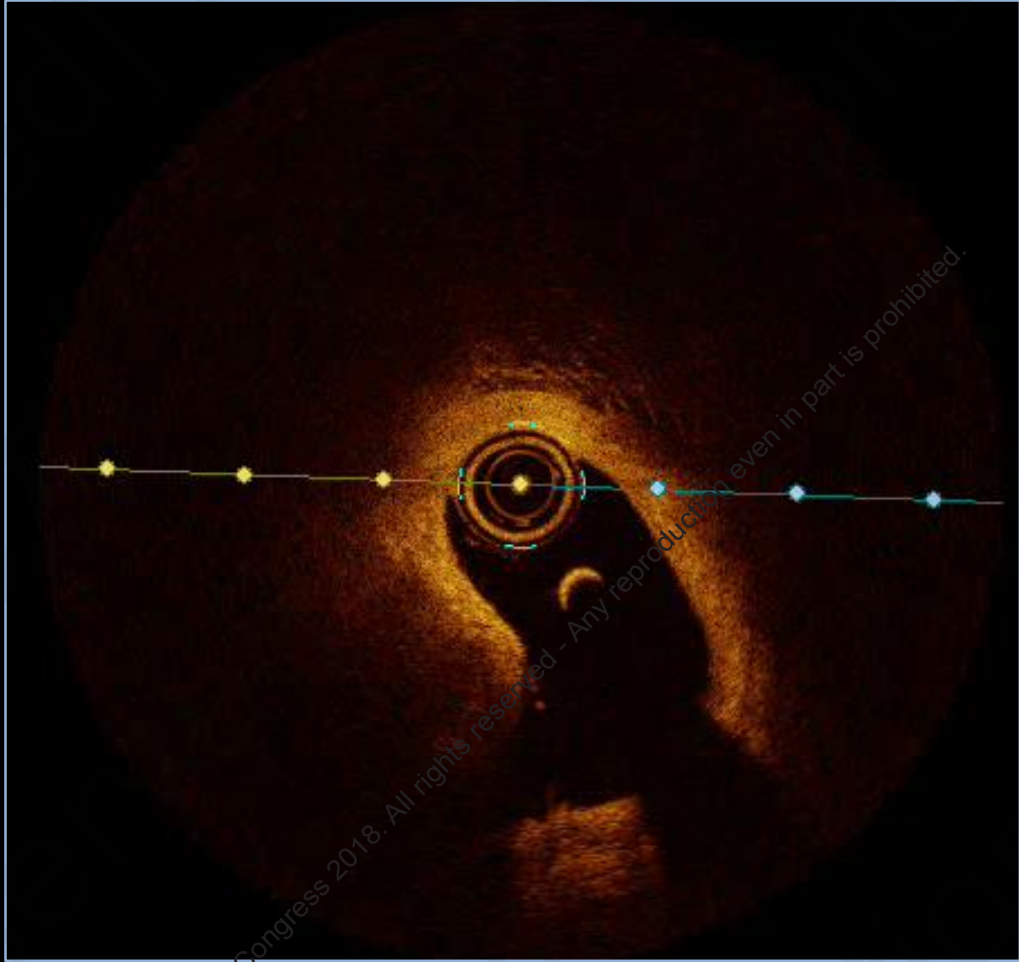
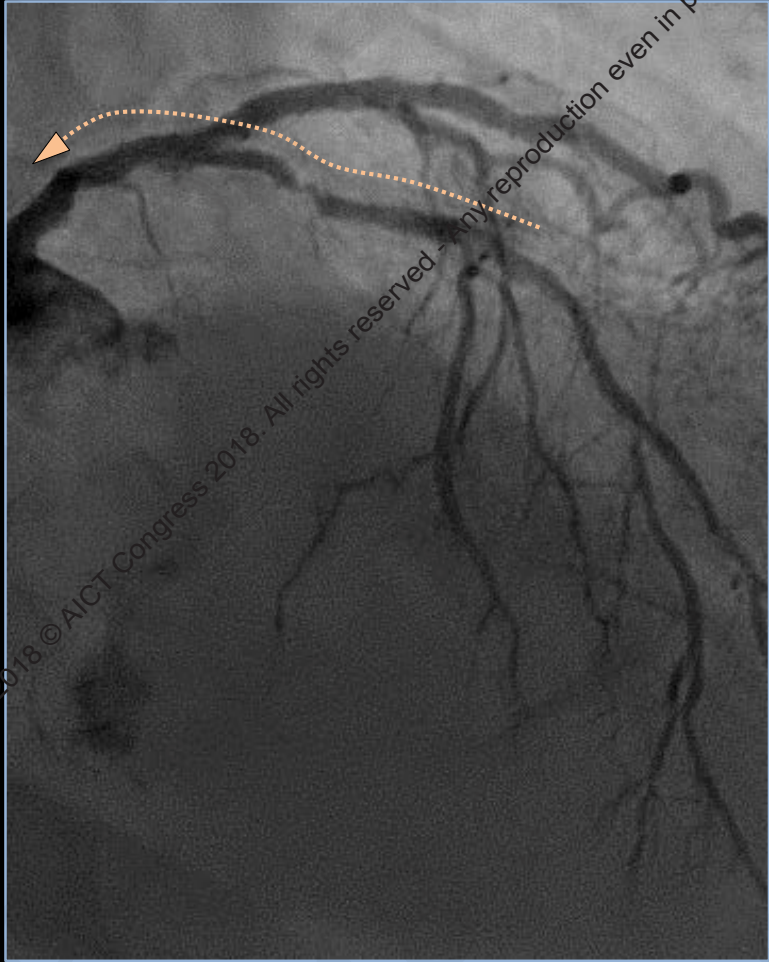
Stable angina



Proximal to mid LAD: **diffusely and severely calcified lesion**

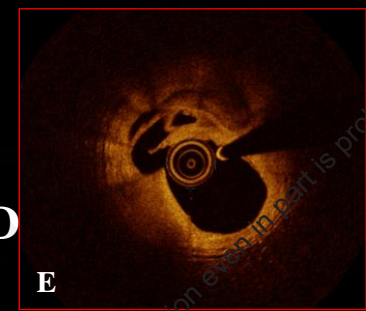
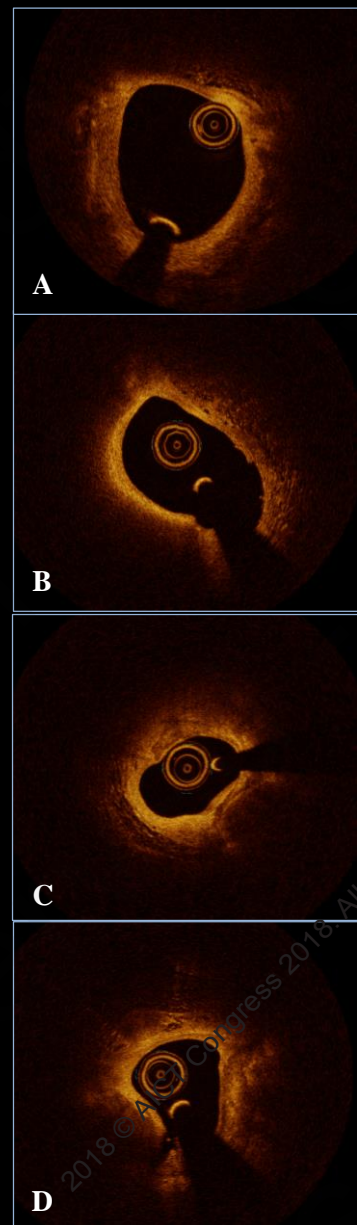
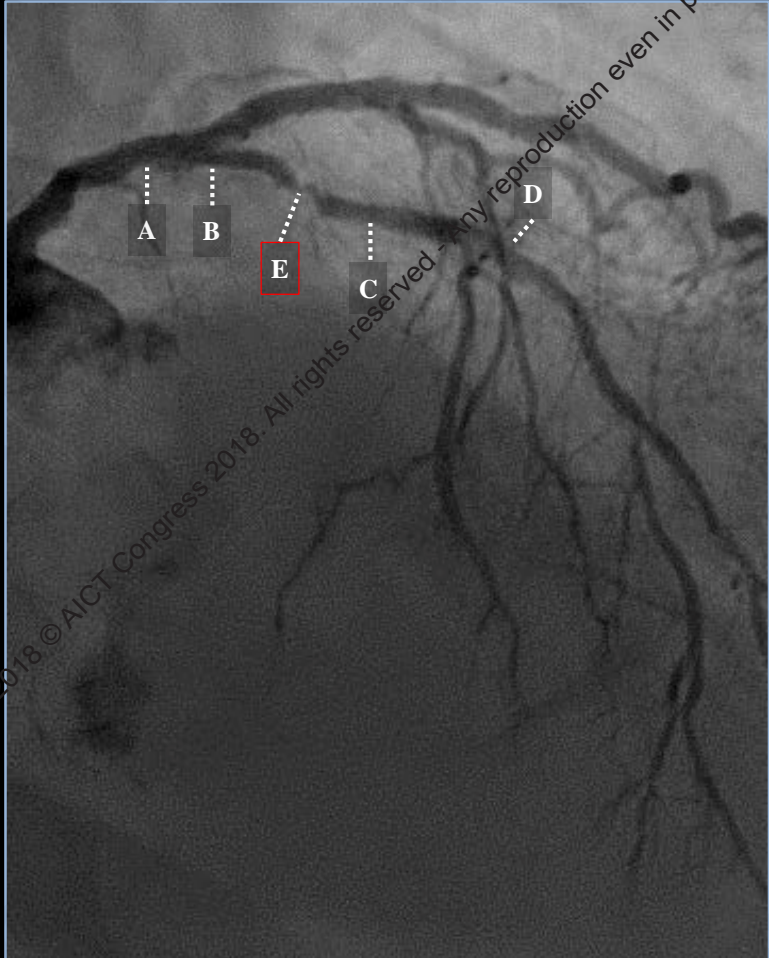


# Case 2. diffuse proximal to mid LAD lesion



Baseline OCT pullback:  
➔ Diffusely and severely calcified lesion

# Case 2. diffuse proximal to mid LAD lesion



**Proximal LAD**

- ✓ Thick calcification
- +
- ✓ Lotus root appearance (recanalized total occlusion)

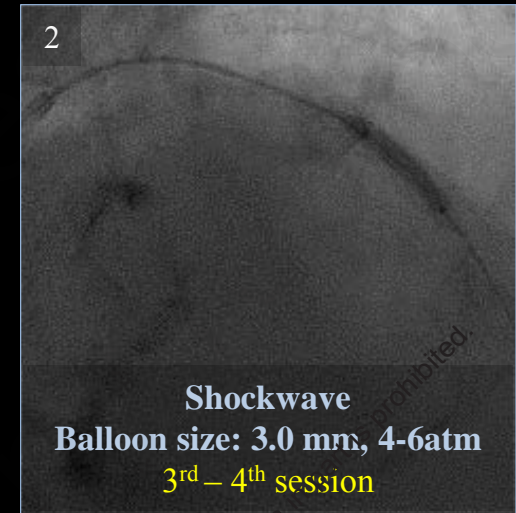
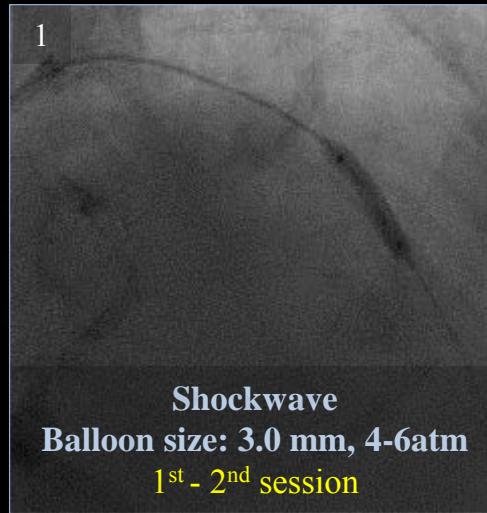
# Lesion preparation with shockwave



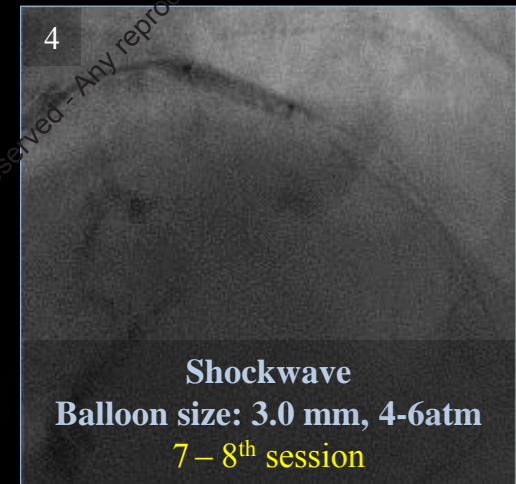
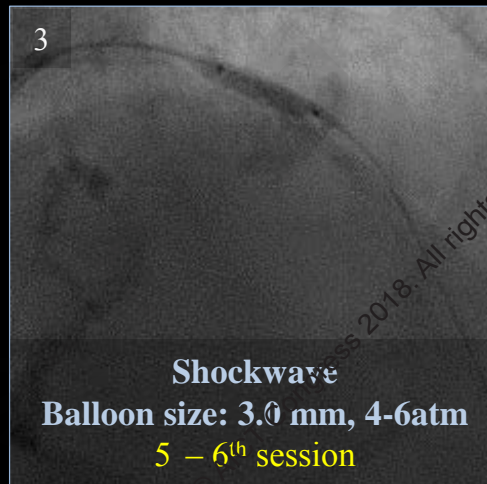
## Lesion preparation with shock wave

Balloon inflation: 4atm (10 sec shock wave)  
→ 6atm → deflation

(Maximum: 8 sessions/ catheter)



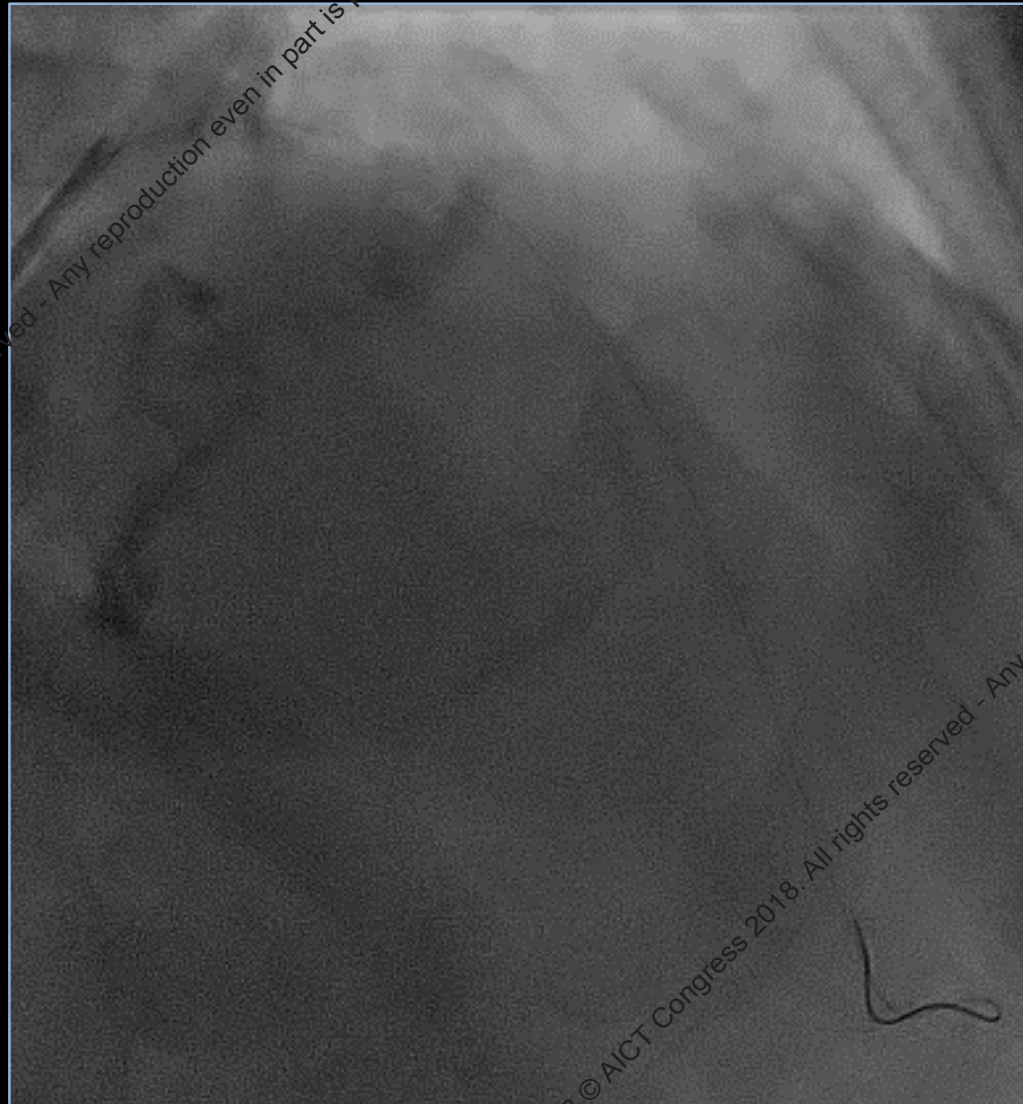
## Mid lesion



## Proximal lesion



# Lesion preparation with shockwave

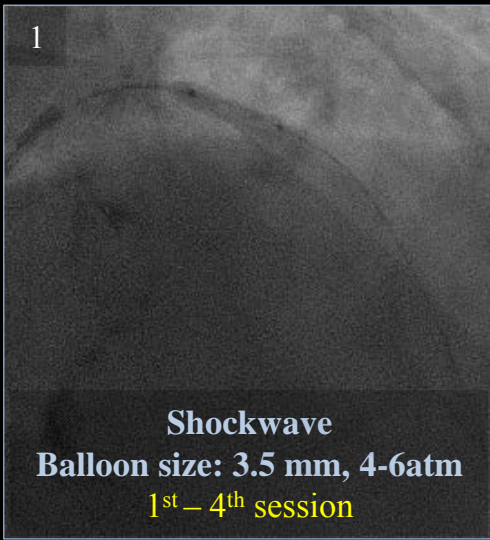


After shock wave (8 sessions)

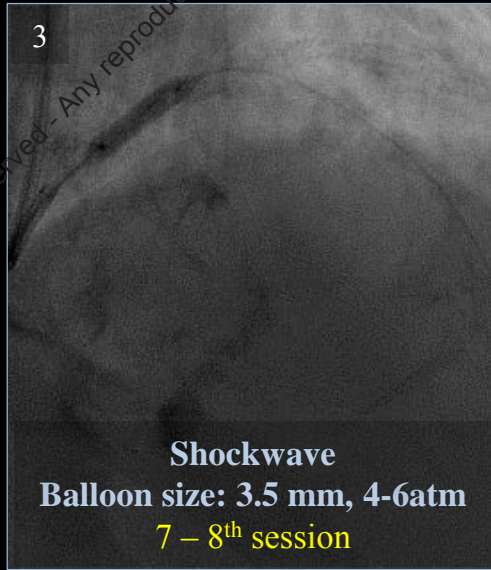
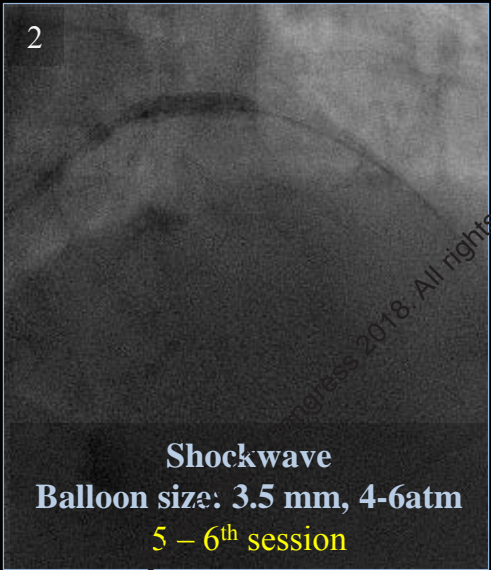
# Additional shockwave for the proximal lesion



Additional shock wave  
for the proximal LAD to LMT  
Balloon size up: 3.0 → 3.5 mm



Proximal LAD lesion



LMT lesion

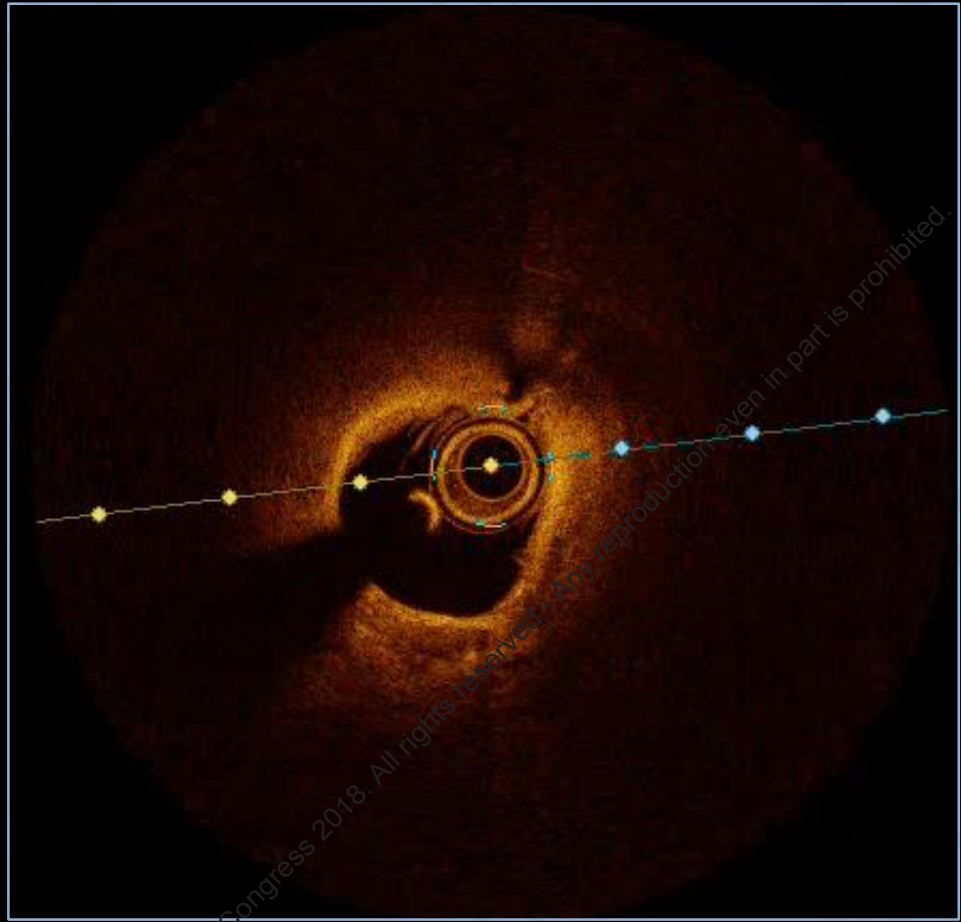
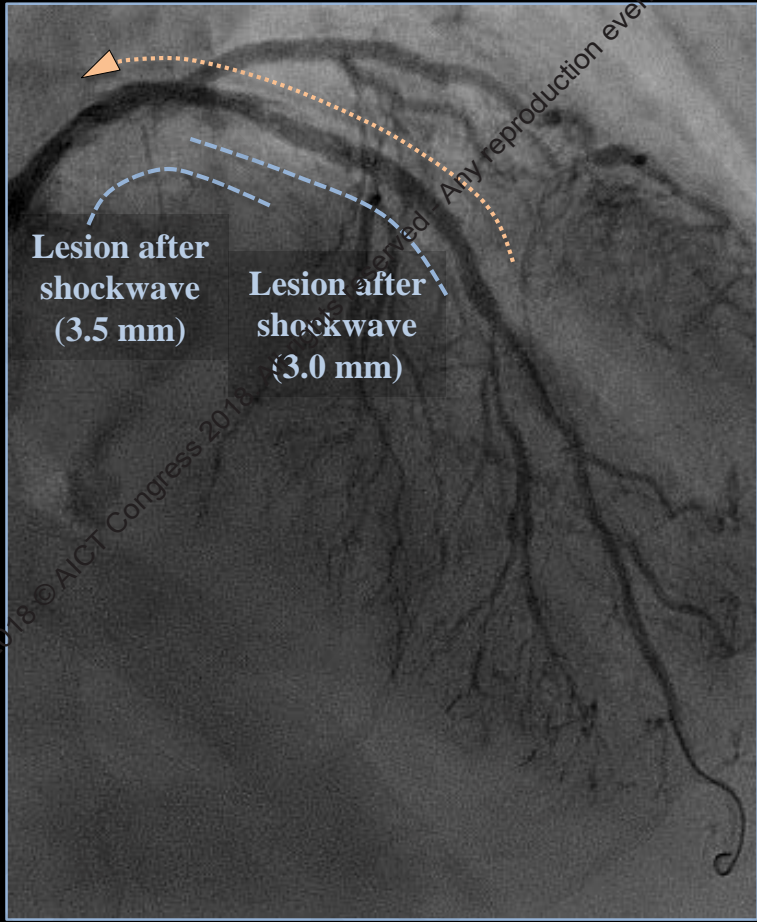


# Additional shock wave for the proximal lesion



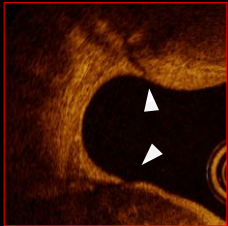
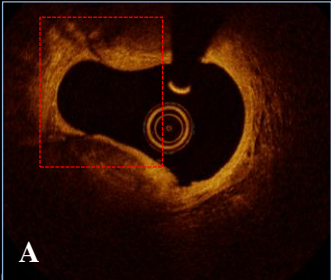
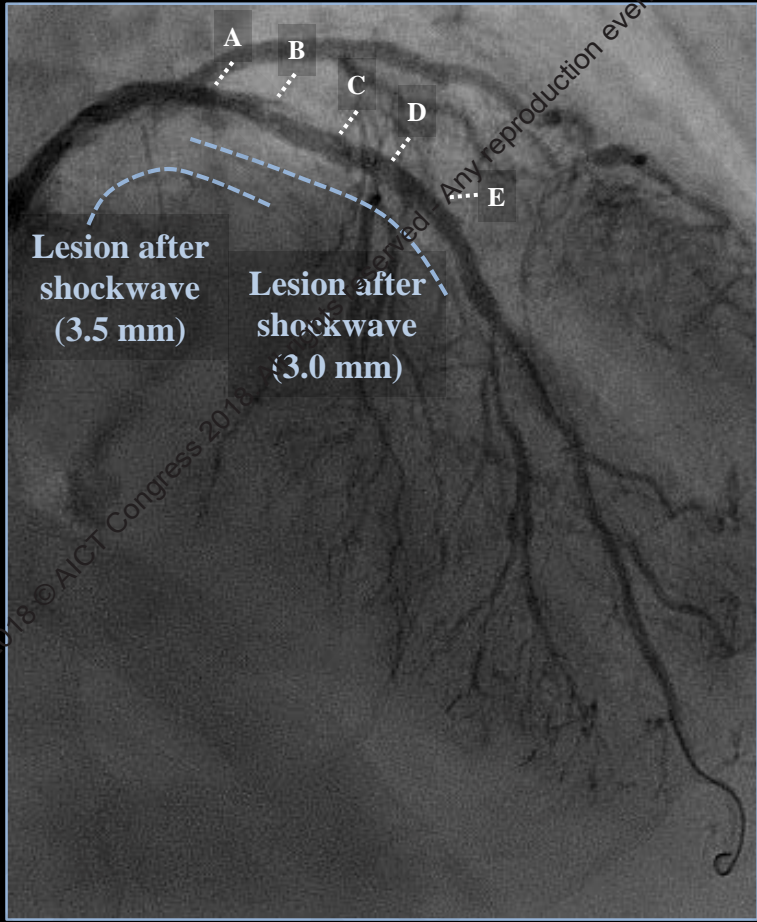
After additional shockwave (8 sessions)

# OCT pullback after lesion preparation with shockwave

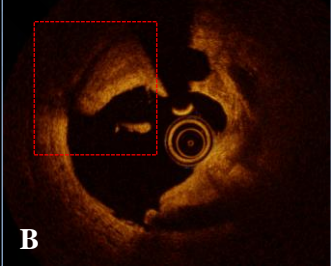


➔ Cracks of calcification and dissection of the lesion

OCT findings after lesion preparation with shockwave

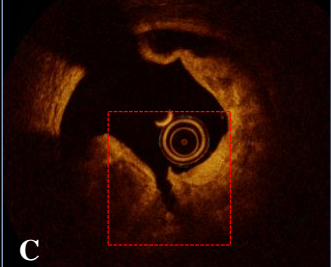


Cracks of thick calcification

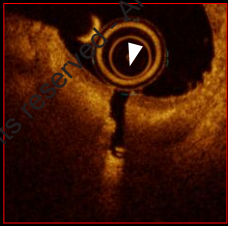
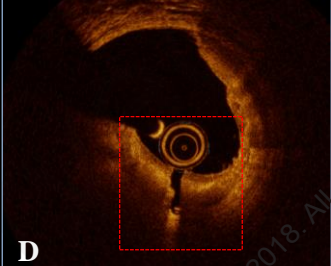


Lesion with lotus root appearance

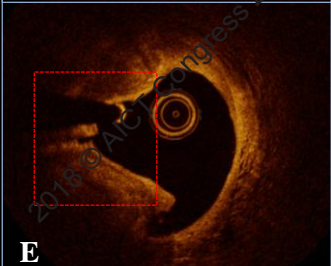
→ Dissection and lumen expansion



Crack of thick calcification



Crack of thick calcification

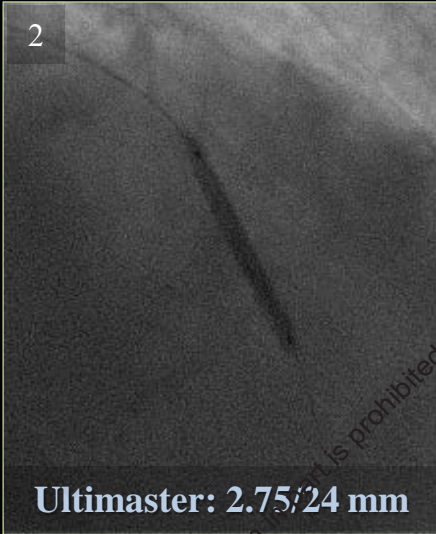
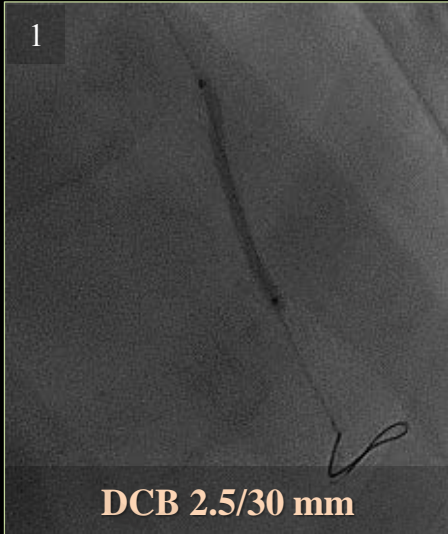
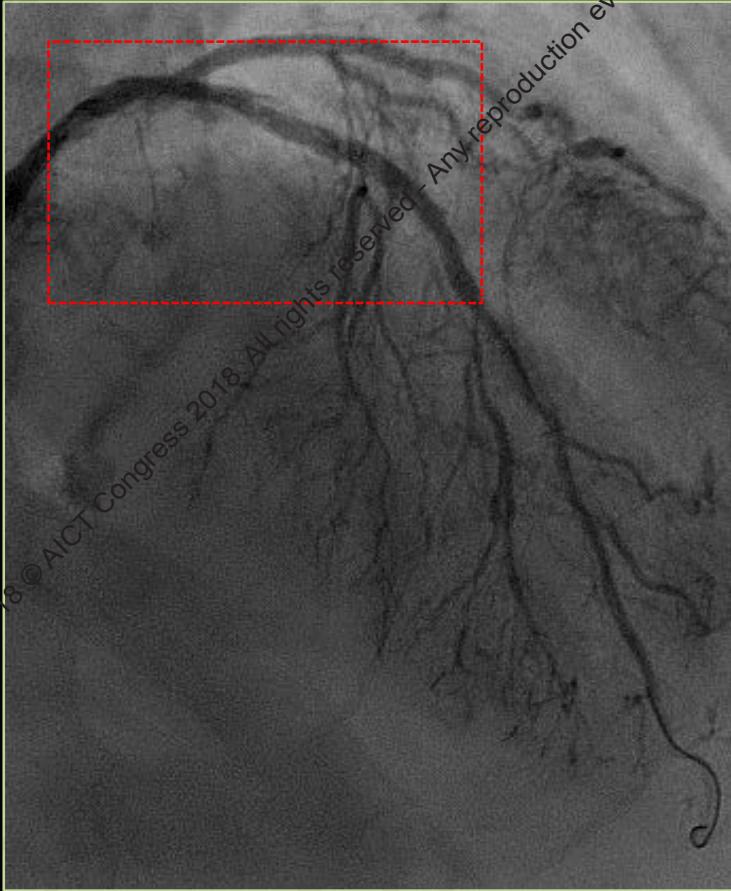


Crack of thick calcification

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# Stent implantation after appropriate lesion preparation



➔ Post-dilatation: 3.0 (NC), 18atm



➔ Post-dilatation: 3.0 (NC), 24atm ➔ Post-dilatation: 3.5 (NC), 24atm

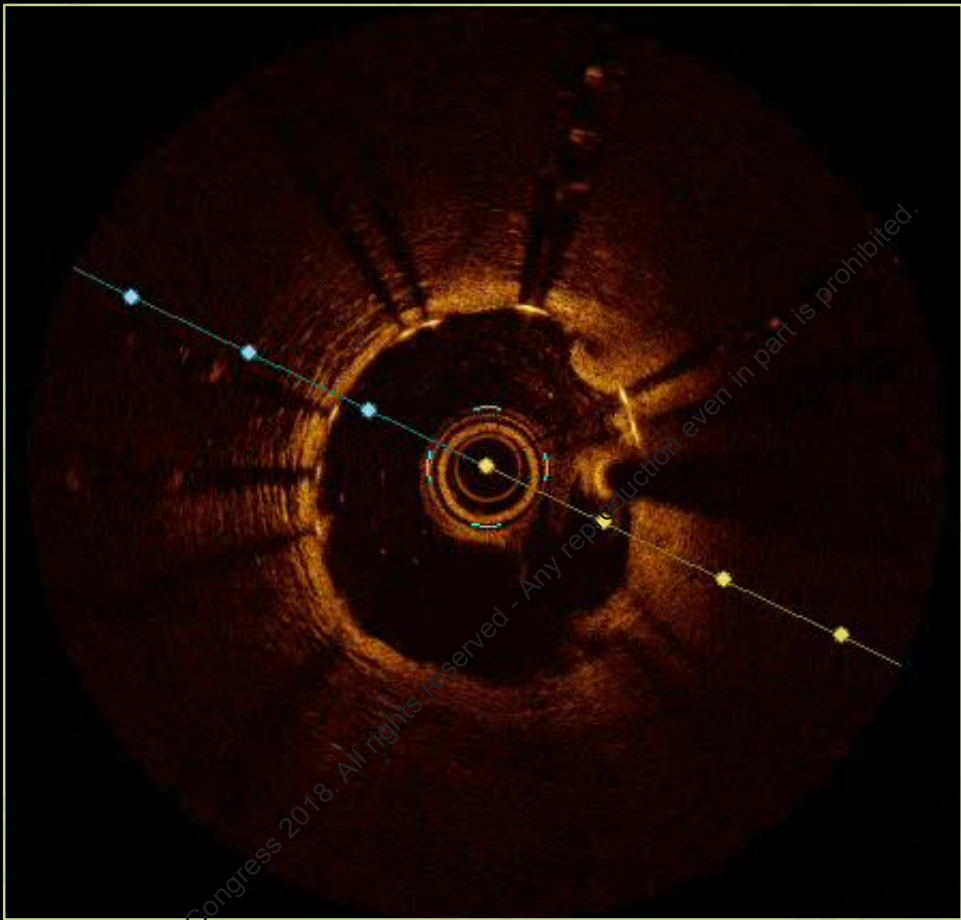
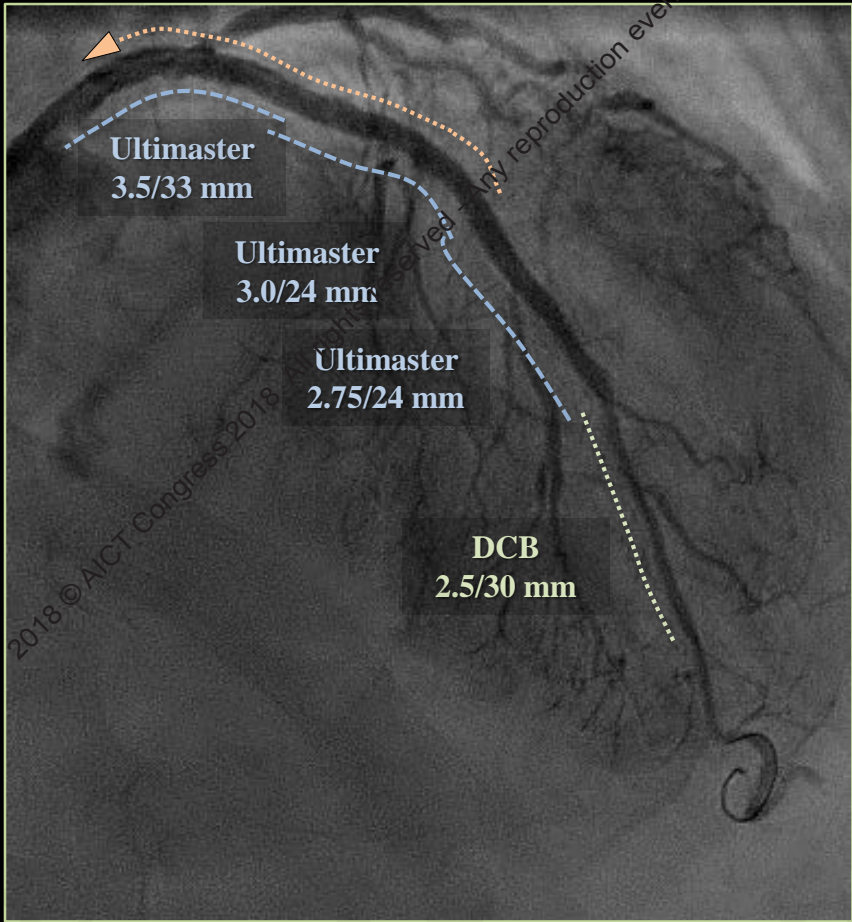
- Additional predilatation after shock wave
- ✓ Mid LAD: 3.0mm
  - ✓ Proximal LAD – LMT: 3.5 mm

# Stent implantation after appropriate lesion preparation



→ Excellent angiographic results

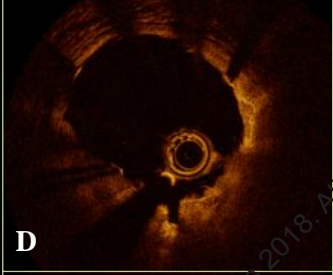
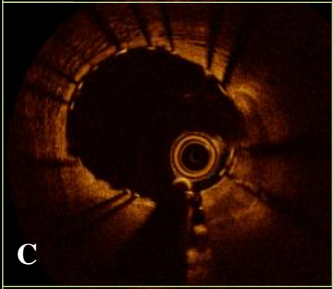
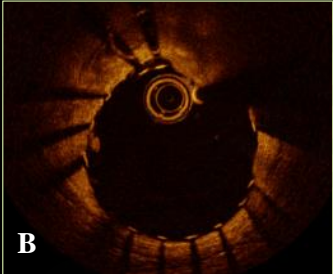
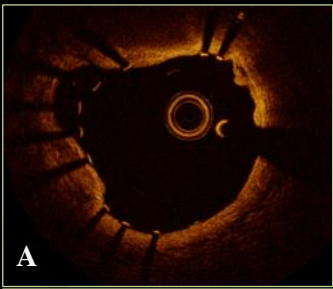
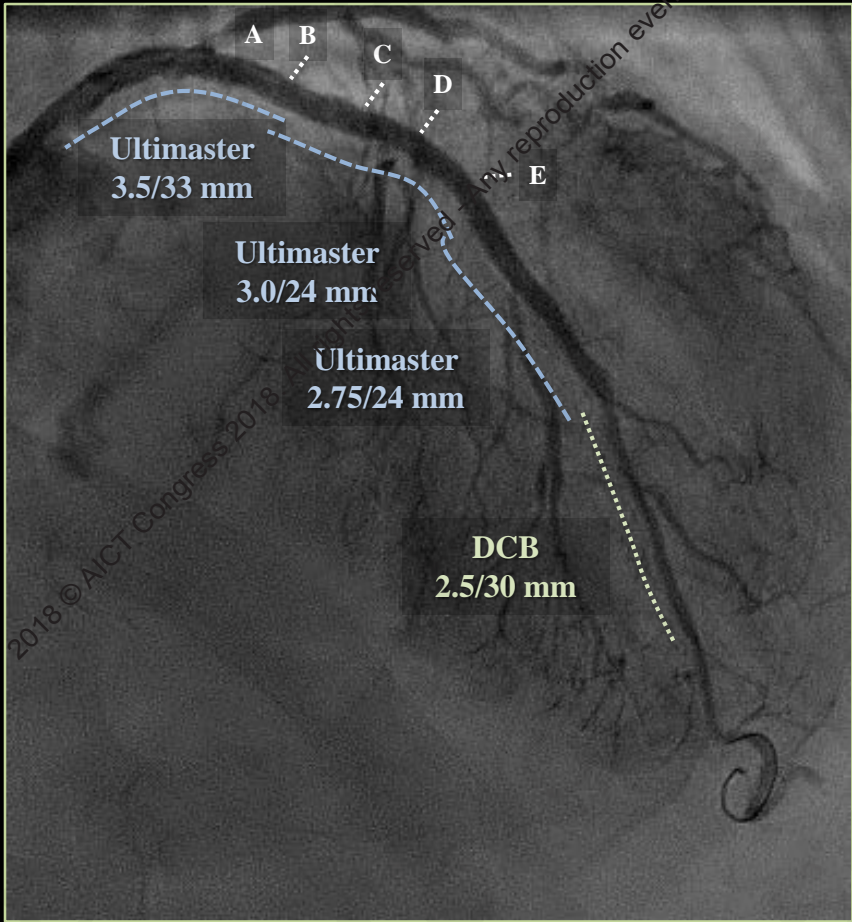
# OCT pullback after stent implantation



→ Optimal stent expansion: “Round shape”  
Optimal stent apposition

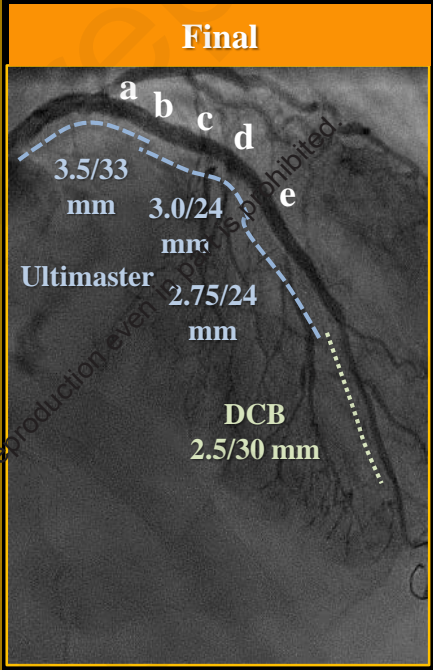
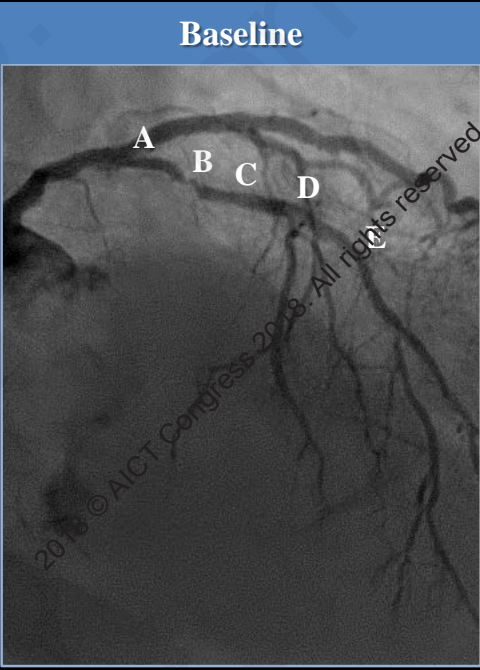
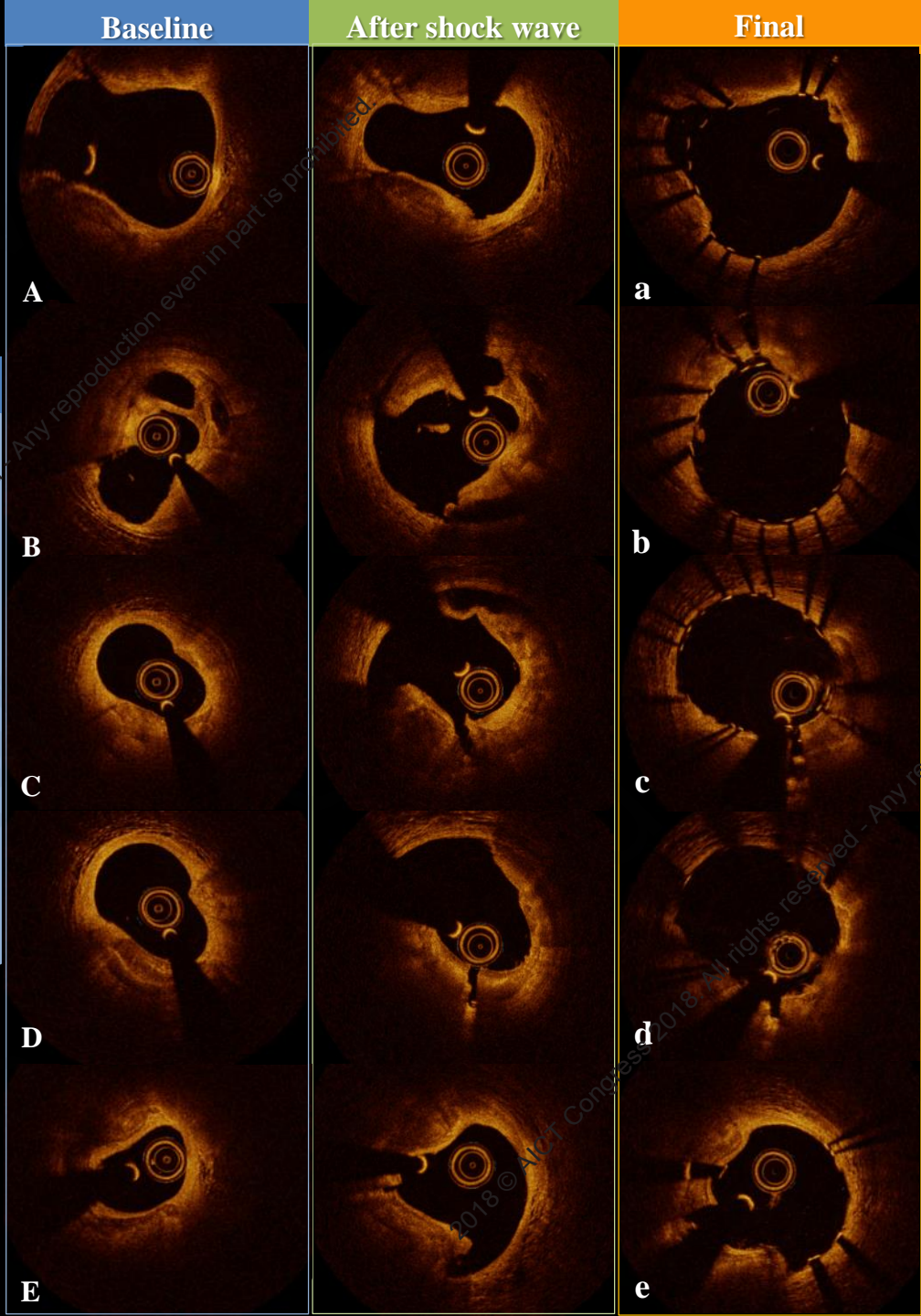


# OCT findings after DES implantation



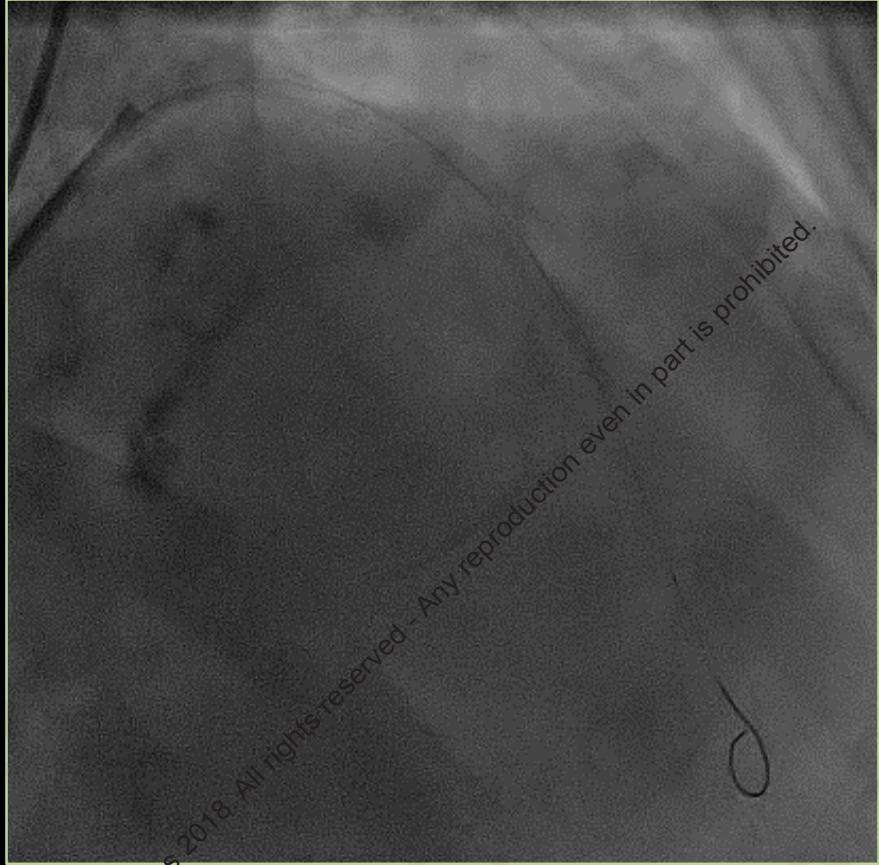
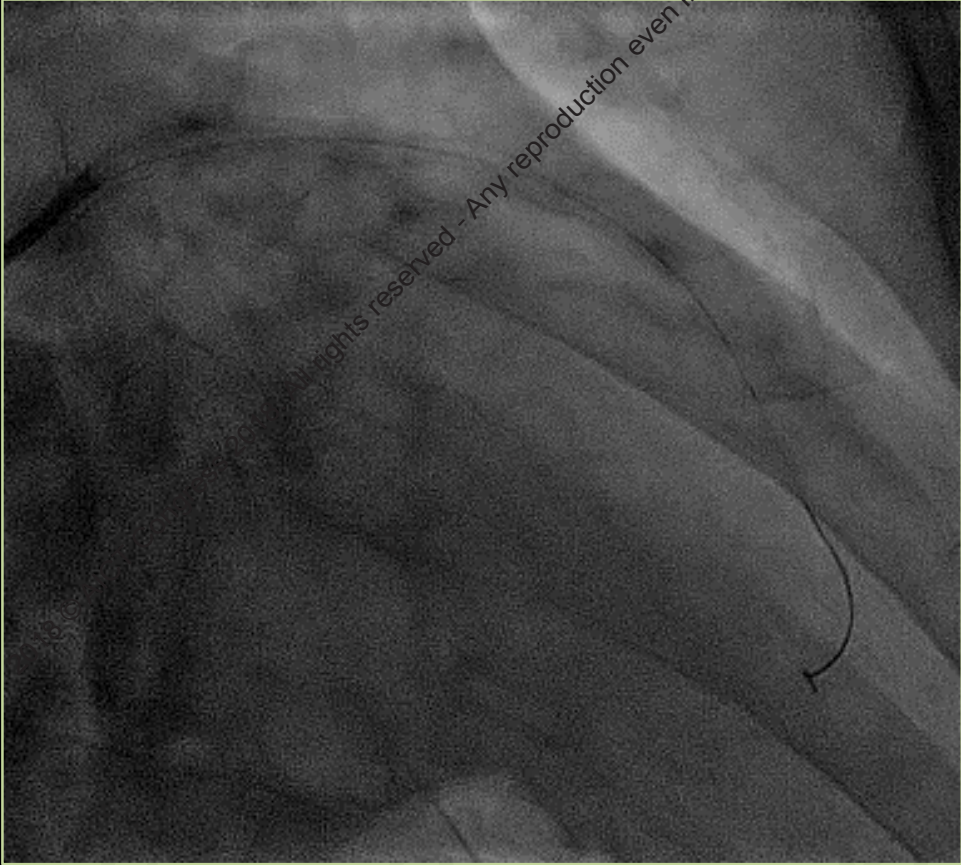
**Diffusely and severely calcified LAD**

- ✓ Optimal stent expansion
- ✓ Optimal stent apposition
- ✓ MSA: 5.08 mm<sup>2</sup>  
(Segment treated with 2.75mm DES)





# DES implantation for the severely calcified lesion after lesion preparation with shockwave



Final angiography

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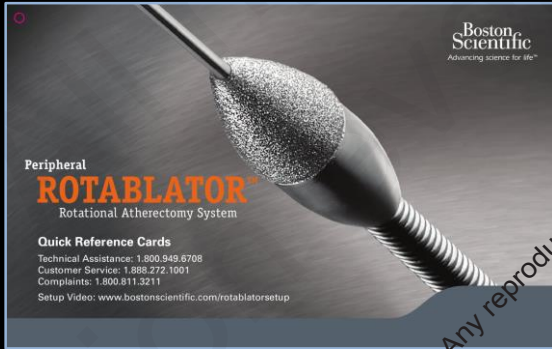
## Feasibility of shockwave

- ✓ Even **thick calcification** was cracked.
- ✓ Even without obvious calcification cracks, **severely calcified lesions (thick, deep, and large arc)** were expanded optimally.
  - ➔ Changing plaque compliance: **efficacy of “lithotripsy”**
- ✓ **Successful DES implantation (optimal stent expansion and apposition)** was achieved in all cases.
  - ➔ More **symmetric stent expansion**: “Round shape”

## Safety of shockwave

There were **no cases of procedural complications**

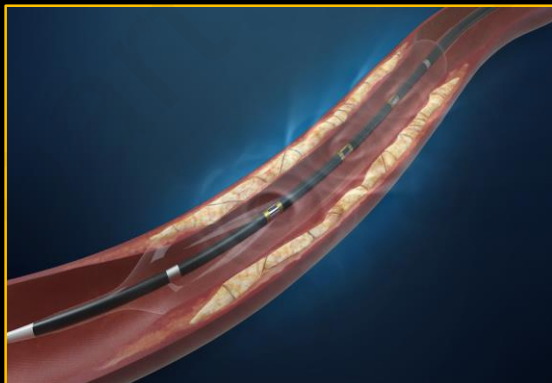
- ✓ No coronary rupture
- ✓ No slow flow
- ✓ No periprocedural MI



- ✓ effectively debulk especially **superficial calc.**
- ✓ can be used for even **uncrossable lesion.**
- ✓ can adjust the performance **quantitatively.**
- ✓ limited efficacy for the lesions with **deep or thick calc.**
- ✓ **require experience.**
- ✓ concerns regarding **complications.**



- ✓ effectively modify the lesion even with **deep or thick calc.**
- ✓ can not be used for **uncrossable lesions.**
- ✓ require **experience.**
- ✓ **semi-quantitative performance.**
- ✓ concerns regarding **complications.**



- ✓ effectively modify the lesion even with **deep or thick calc.**
- ✓ **easy to use**
- ✓ not quantitative, but possible to **confirm the efficacy**
- ✓ **less risk of complications.**
- ✓ can not be used for **uncrossable lesions.**

14<sup>th</sup>

# AICT

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Hong Kong

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