Complex PCI 2023 Plenary Session 6

Make-it-Simple! Learning Through Experience @

My Experience Dealing with Coronary Perforation

Micro-Catheter Distal Perfusion Technique

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Potential conflicts of interest

Speaker's name: Shozo Ishihara

- ❑ **I do not have any potential conflict of interest**

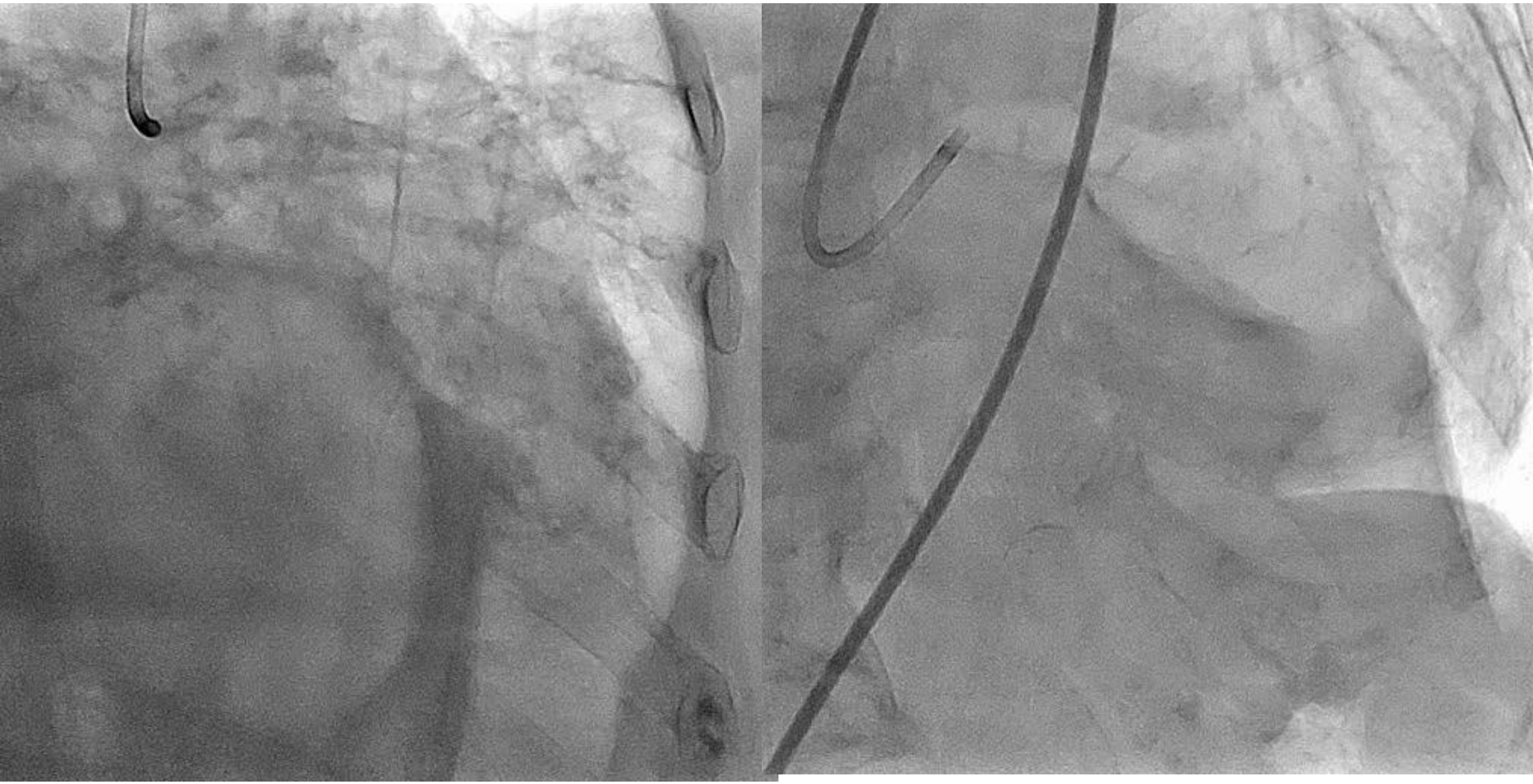
Background

Coronary artery perforation is an uncommon but life-threatening complication of percutaneous coronary intervention (PCI).

Frequency 0.2-0.9%

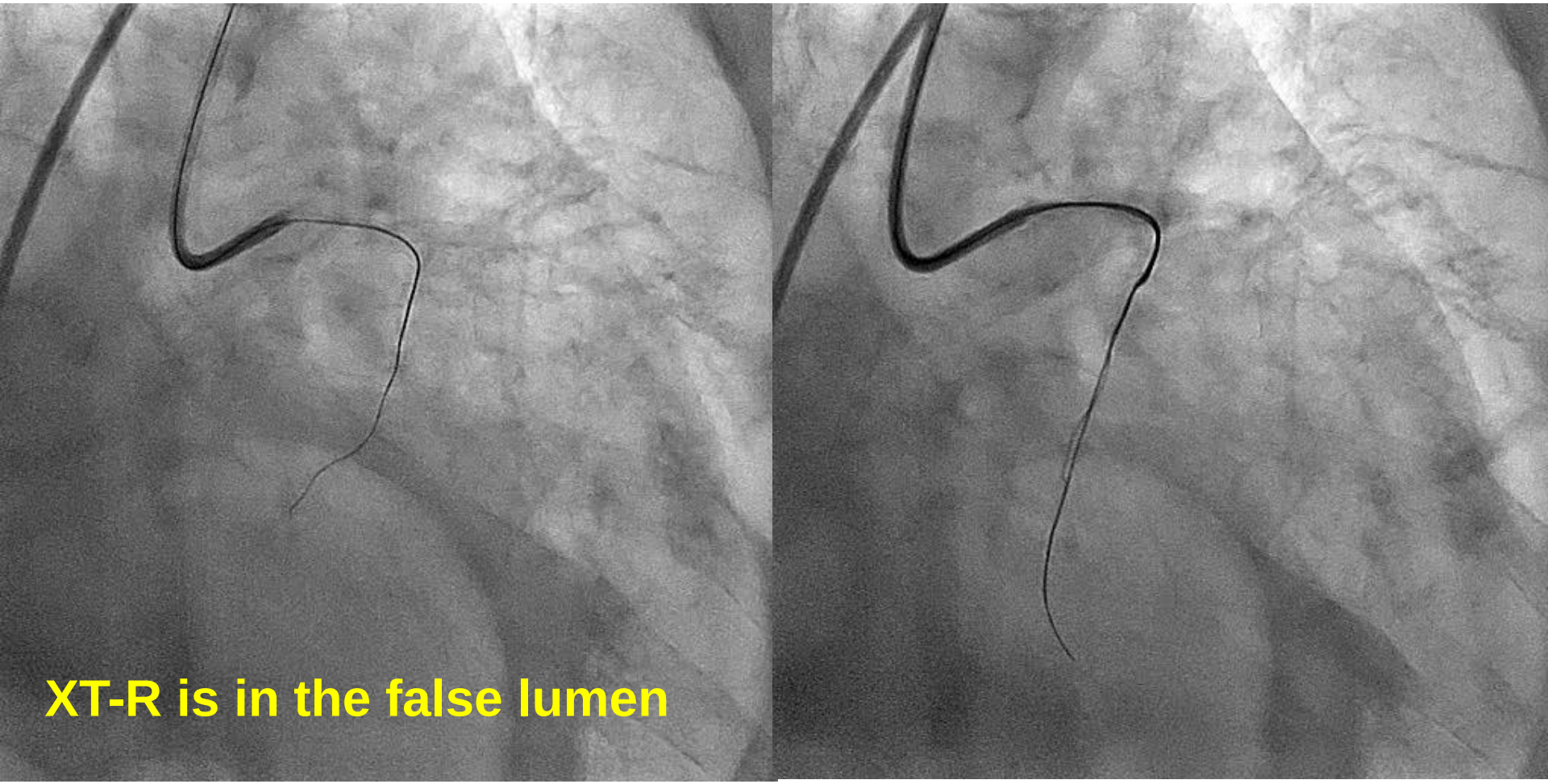
We cannot experience many perforation cases, therefore it is important to learn from others and to prepare just in case.

Case 1　82 y.o.　female



Target Lesion: mid LCx CTO

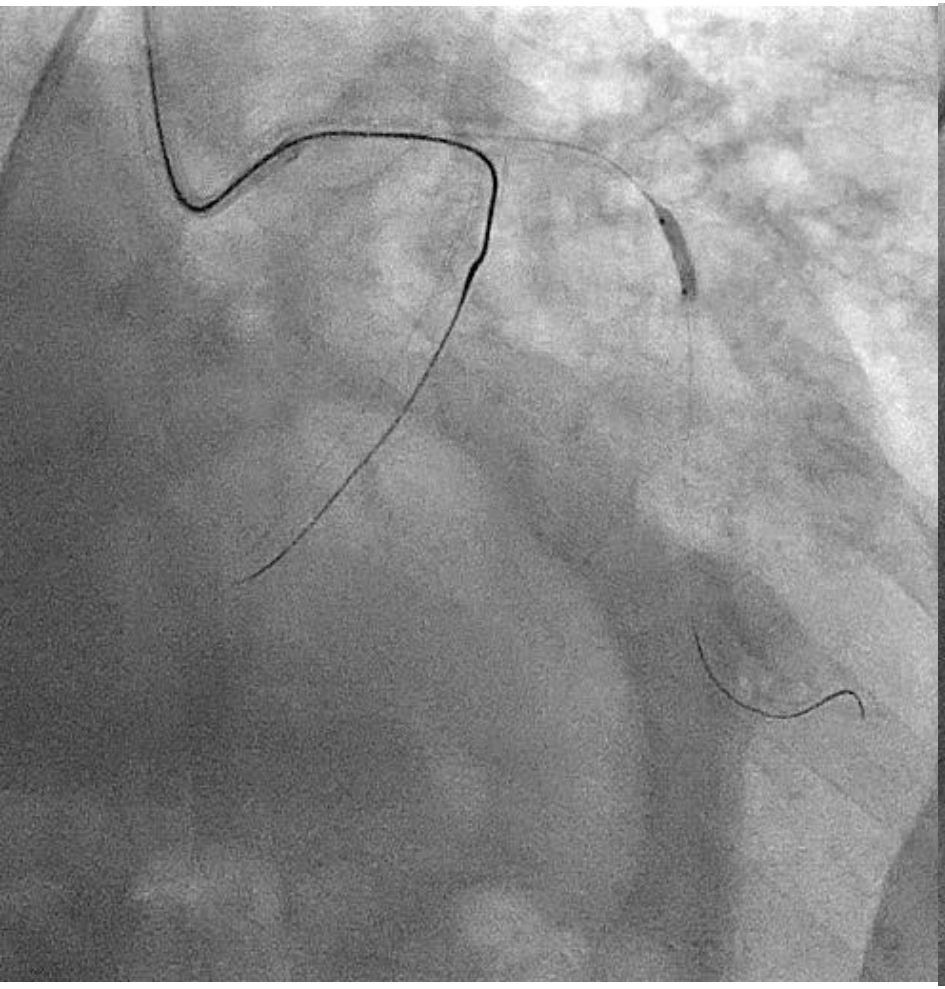
Case 1

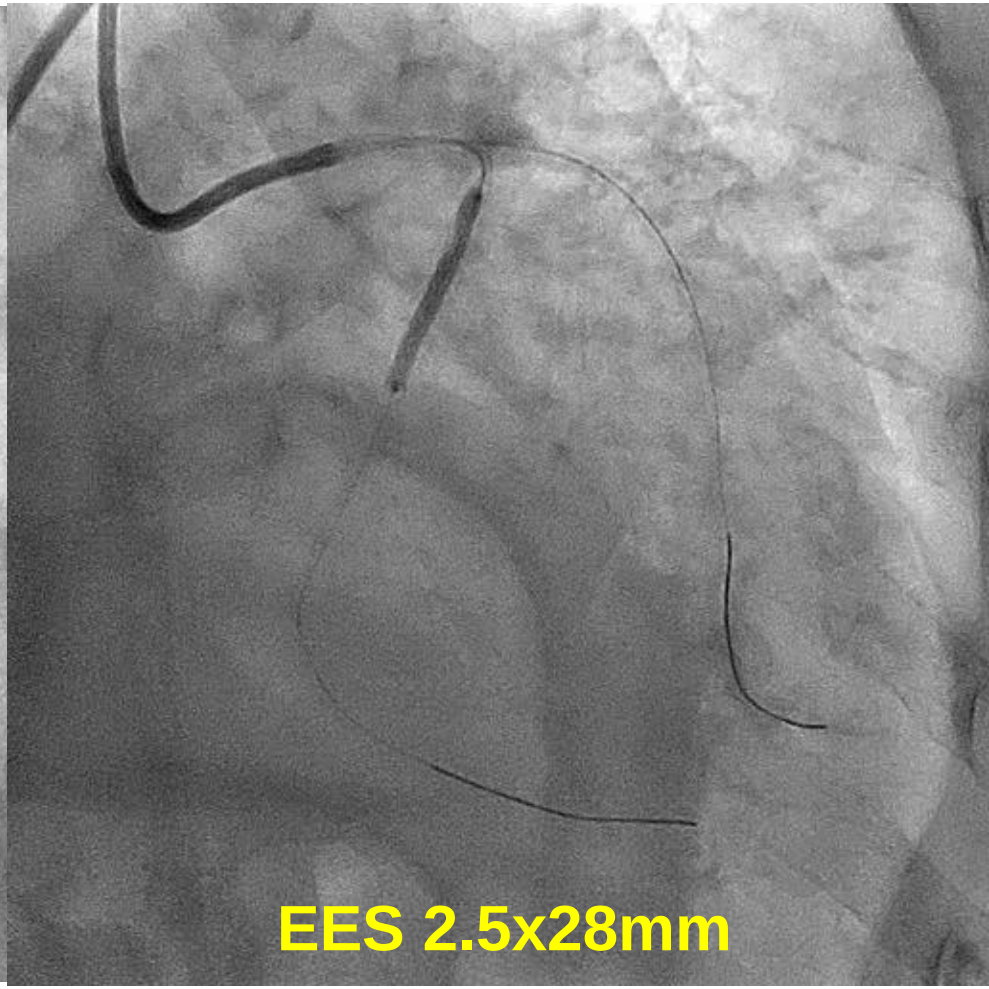


Parallel wire technique was effective

Gaia 2nd passed the CTO lesion

Case 1

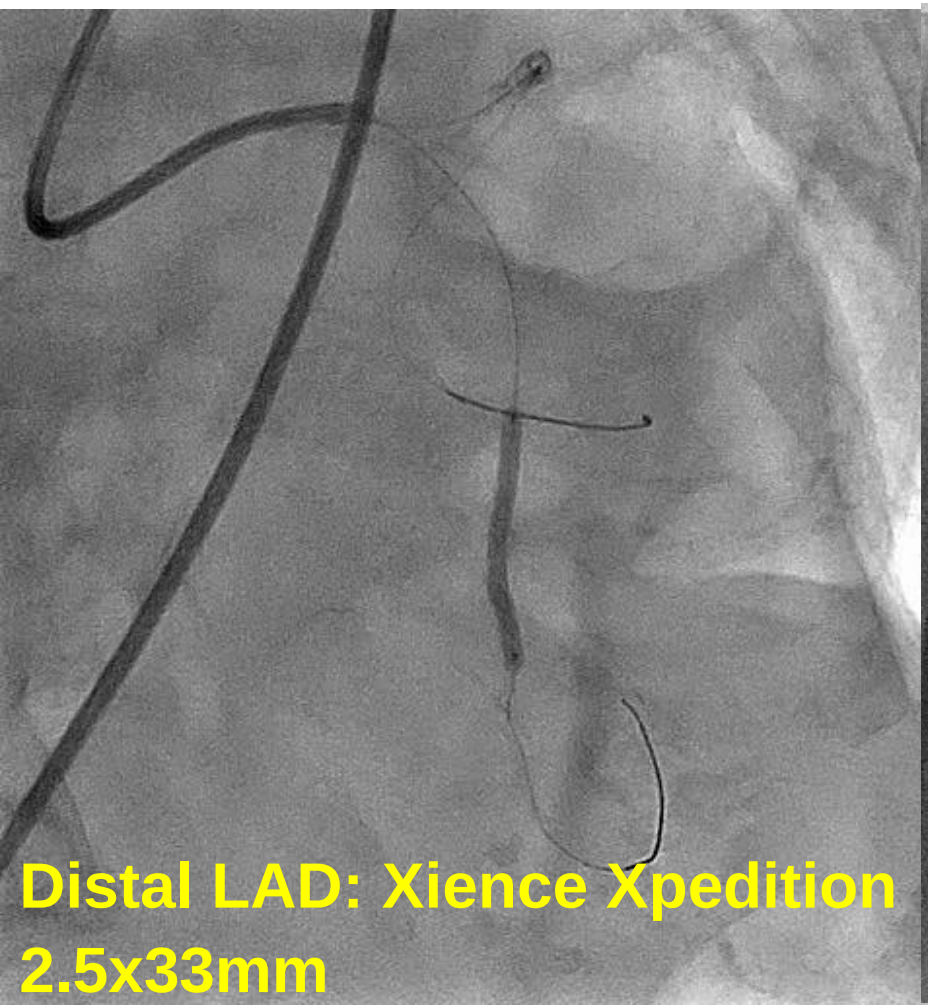


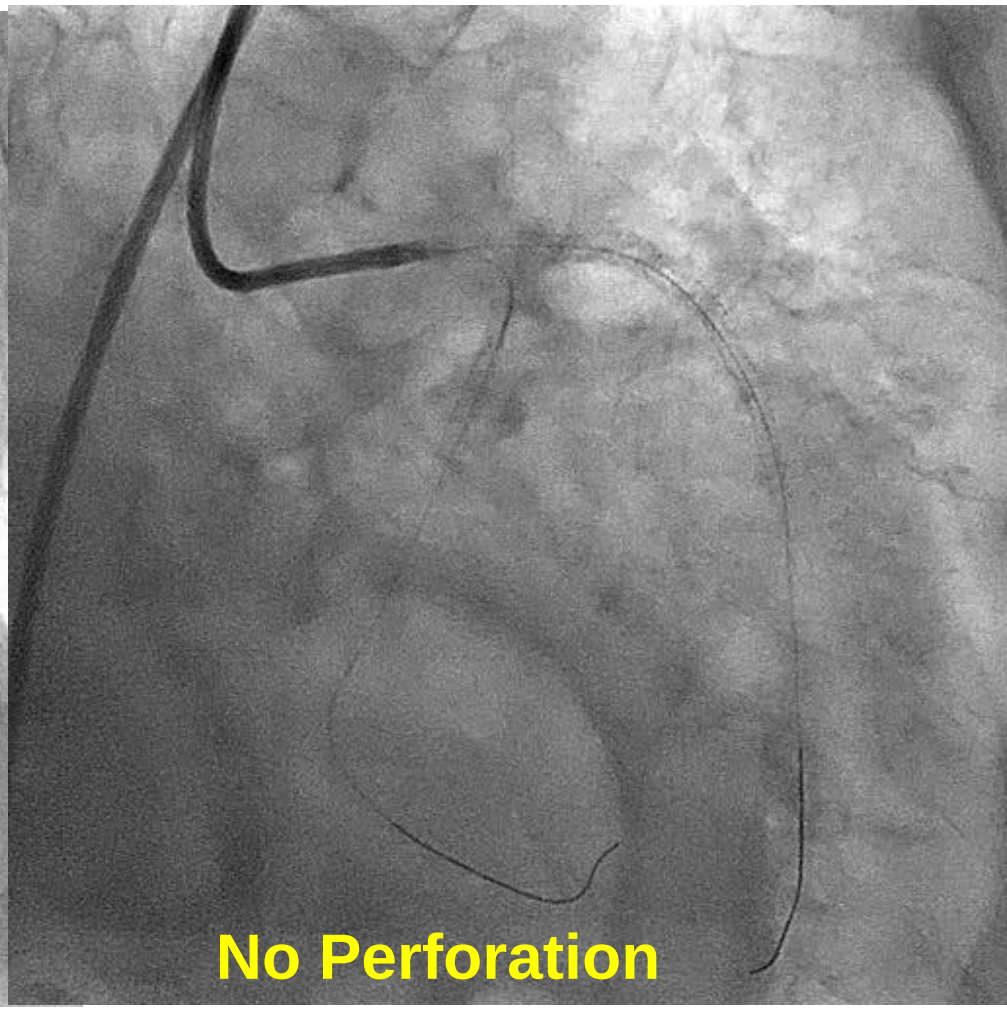


With the anchor balloon technique,

Corsair passed through the CTO lesion

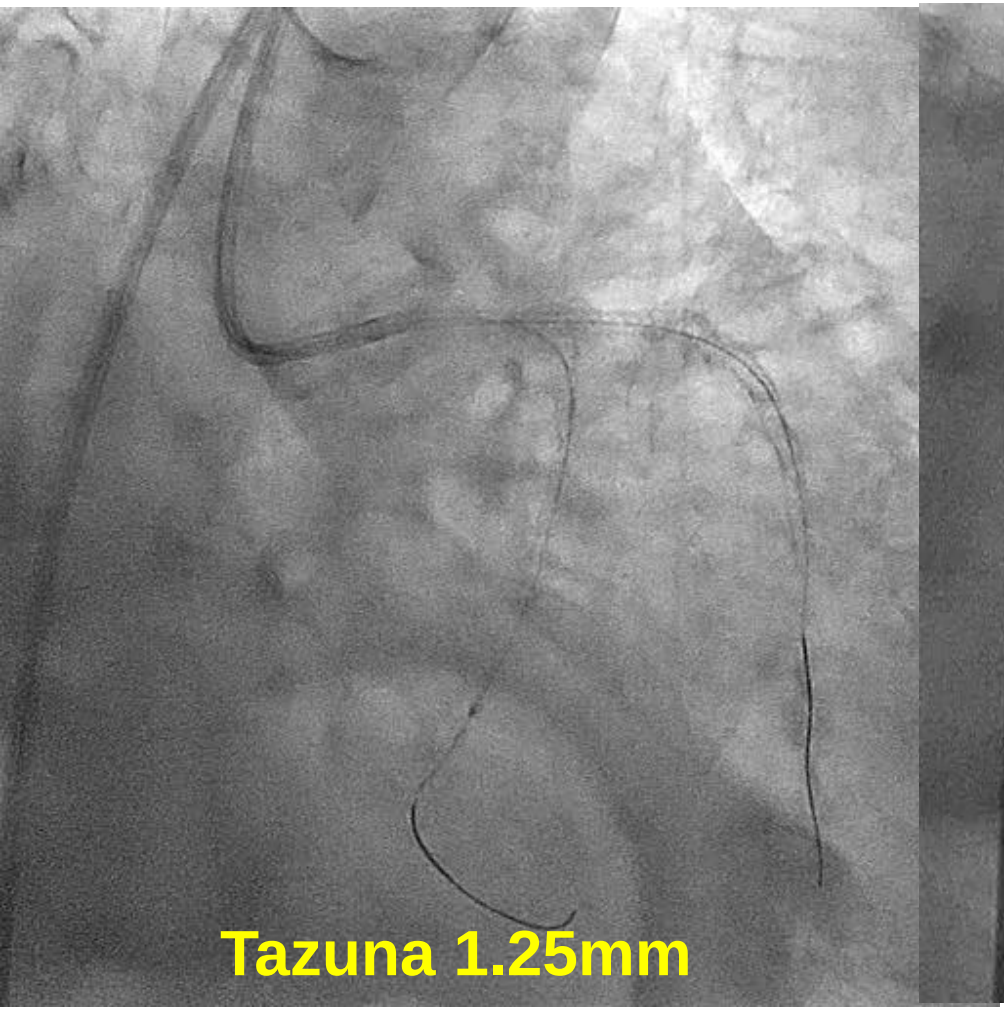
Case 1

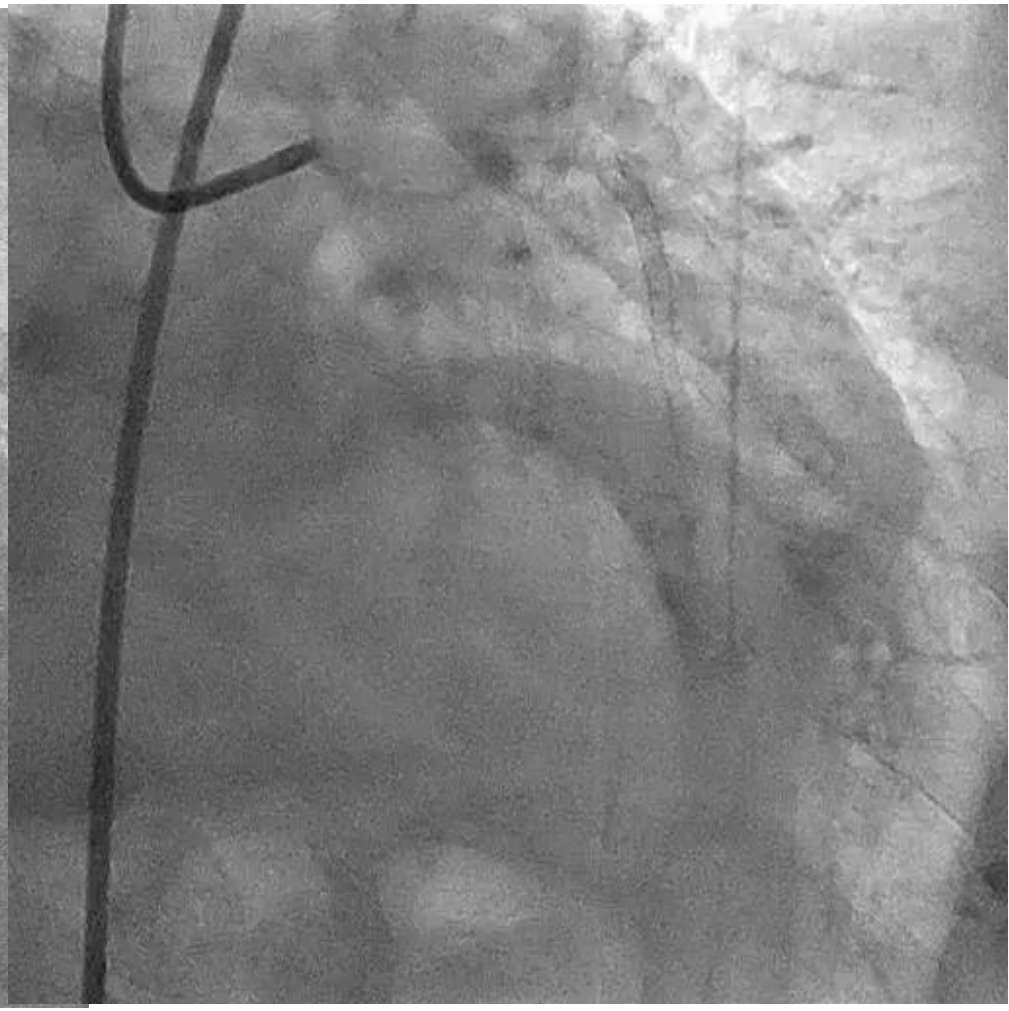




Coronary Flow of distal LCX is insufficient

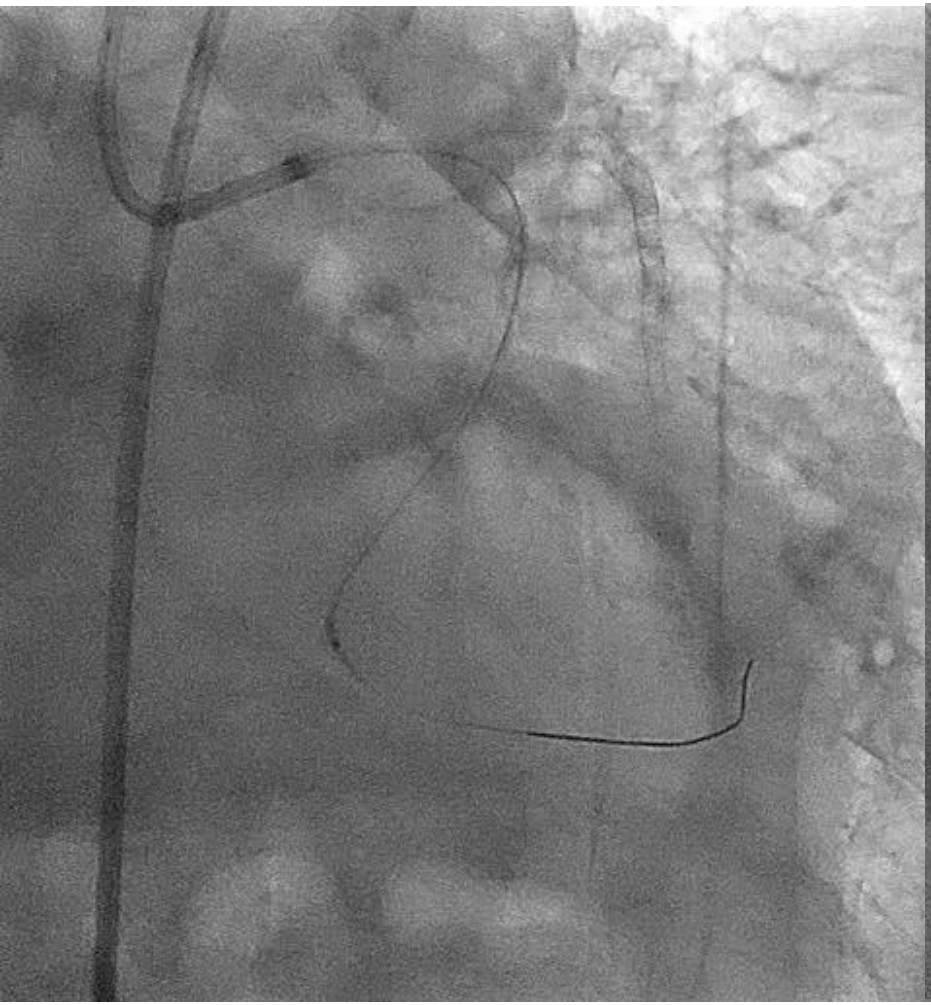
Case 1

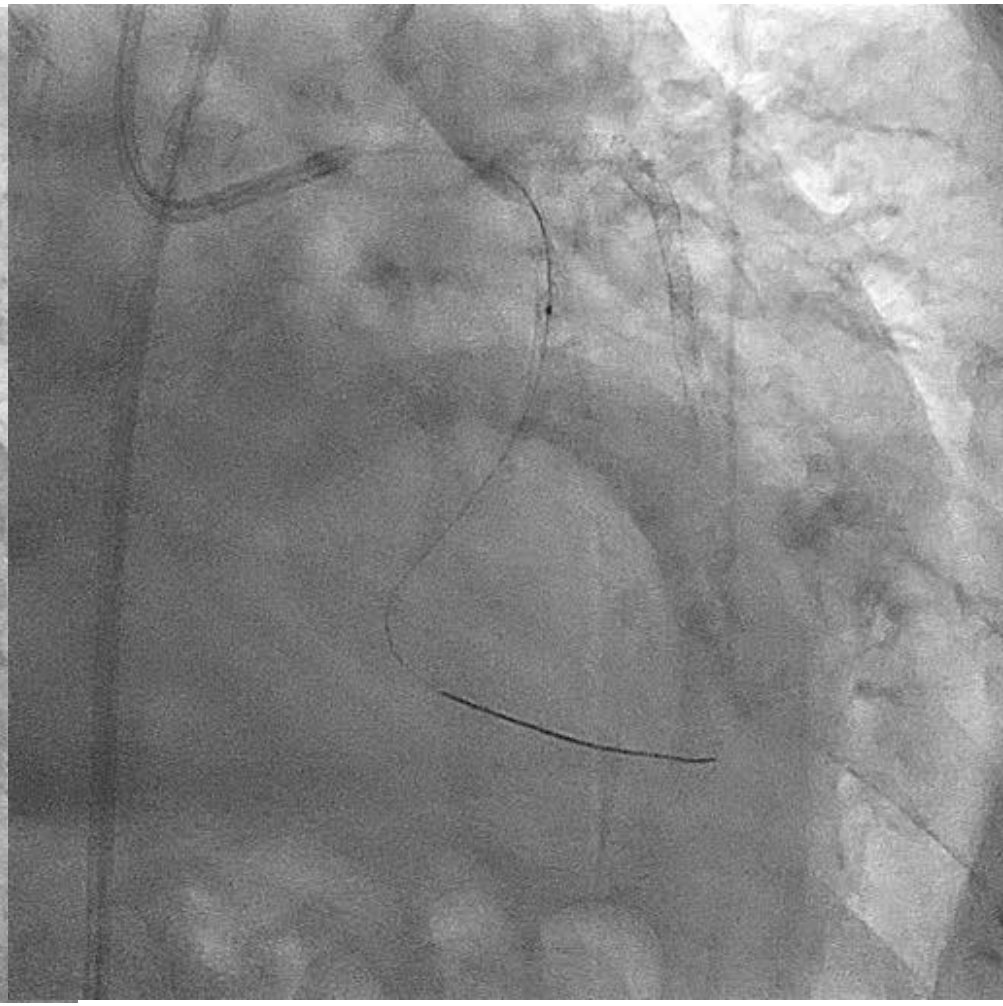




After 1.25mm POBA, GW perforation was revealed

Case 1

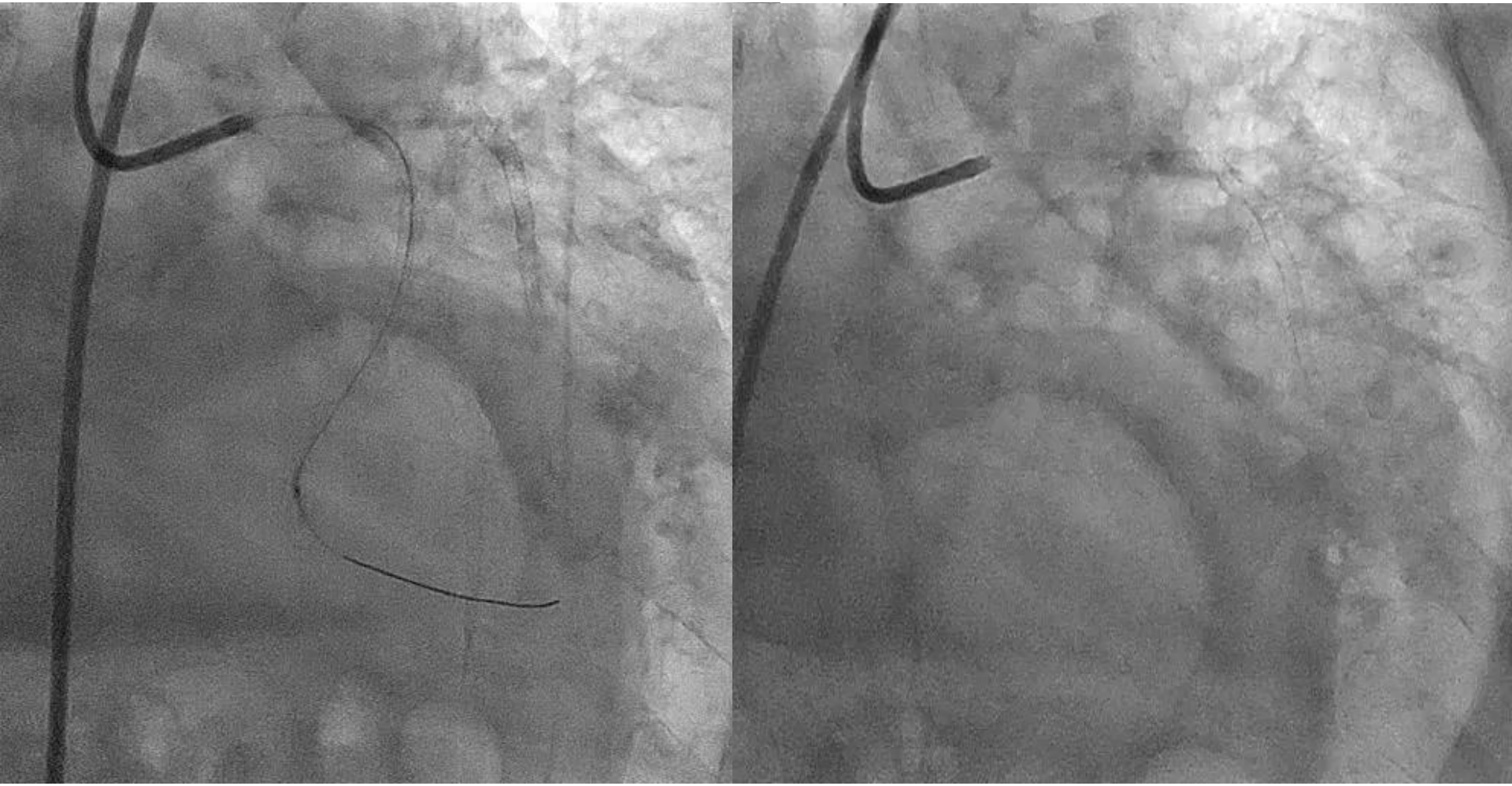




10min Balloon inflation → Bleeding continued

ACT control 330 to 160

Case 1



After 20min inflation, bleeding stopped

To stop bleeding…

- Long time balloon inflation
（ Perfusion balloon catheter might be effective）

- Heparin half reverse and control ACT within 150-200

- Check the pericardial effusion by UCG, and pericardial centesis in case of tanponade

- PTFE covered-stent

- Surgical operation

Management of severe perforation

- Longtime inflation in large vessel is needed, but it causes serious ischemia.

ex) chest pain, ST elevation, blood pressure decrease, fatal arrhythmia (AV block, VT/VF…)

- Perfusion balloon sometimes works effective, but available only in limited countries.
- PTFE Covered-Stent (Graft master, etc..) might be an option, but it has some problems about difficulty of delivery and high restenosis rate.

Case Report

A Novel Method to Bail out Coronary Perforation:
Micro-Catheter Distal Perfusion Technique

Shozo Ishihara,* MD, Shiro Tabata, MD, and Takehiro Inoue, MD

Coronary perforation is a rare, but life-threatening complication during percutaneous coronary intervention. Prolonged balloon inflation is one option for achieving hemostasis, but it often causes ST elevation, chest pain, decreased blood pressure, or fatal arrhythmia due to ischemia. We present the case of a 73-year-old woman who suffered severe coronary perforation after stent implantation and post-dilatation. To allow prolonged balloon inflation without ischemia, we perfused the distal area with the patient's own arterial blood injected via micro-catheter. With this method, we could prolong balloon inflation for 20 min, successfully achieving hemostasis. This novel technique, which we named the "distal perfusion technique," is useful to minimize ischemia during prolonged balloon inflation. © 2015 Wiley Periodicals, Inc.

Key words: percutaneous coronary intervention; coronary perforation; complication; hemostasis

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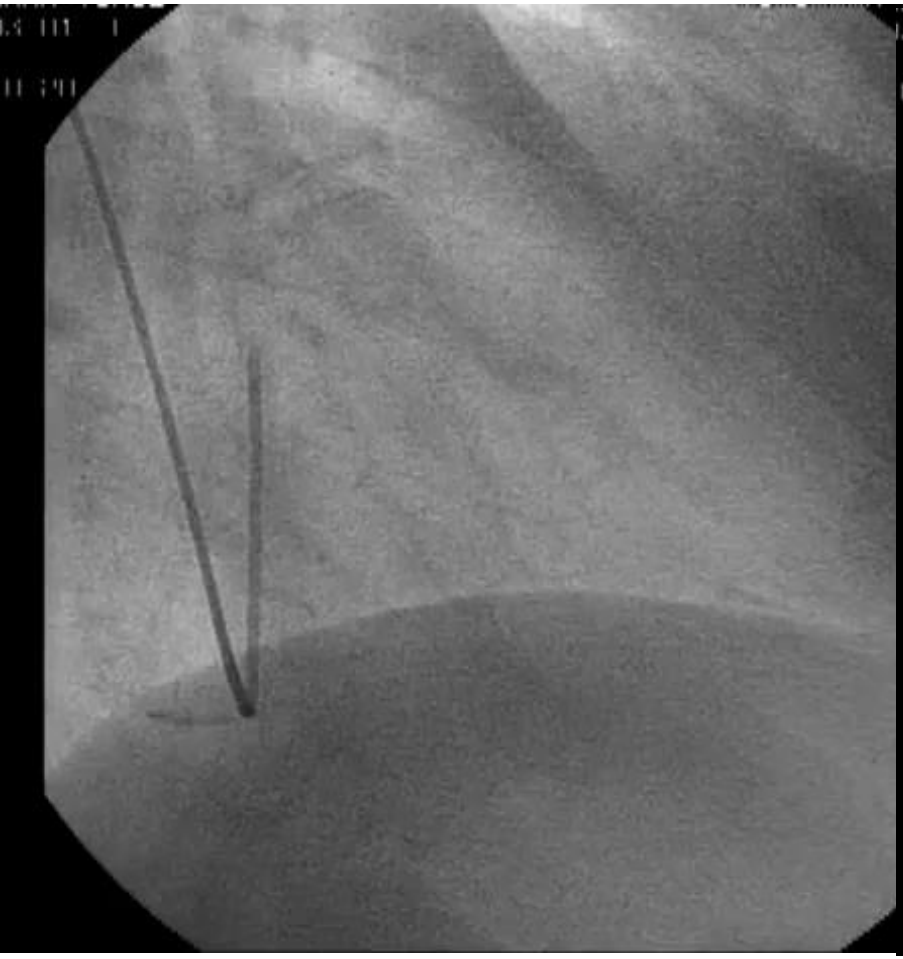
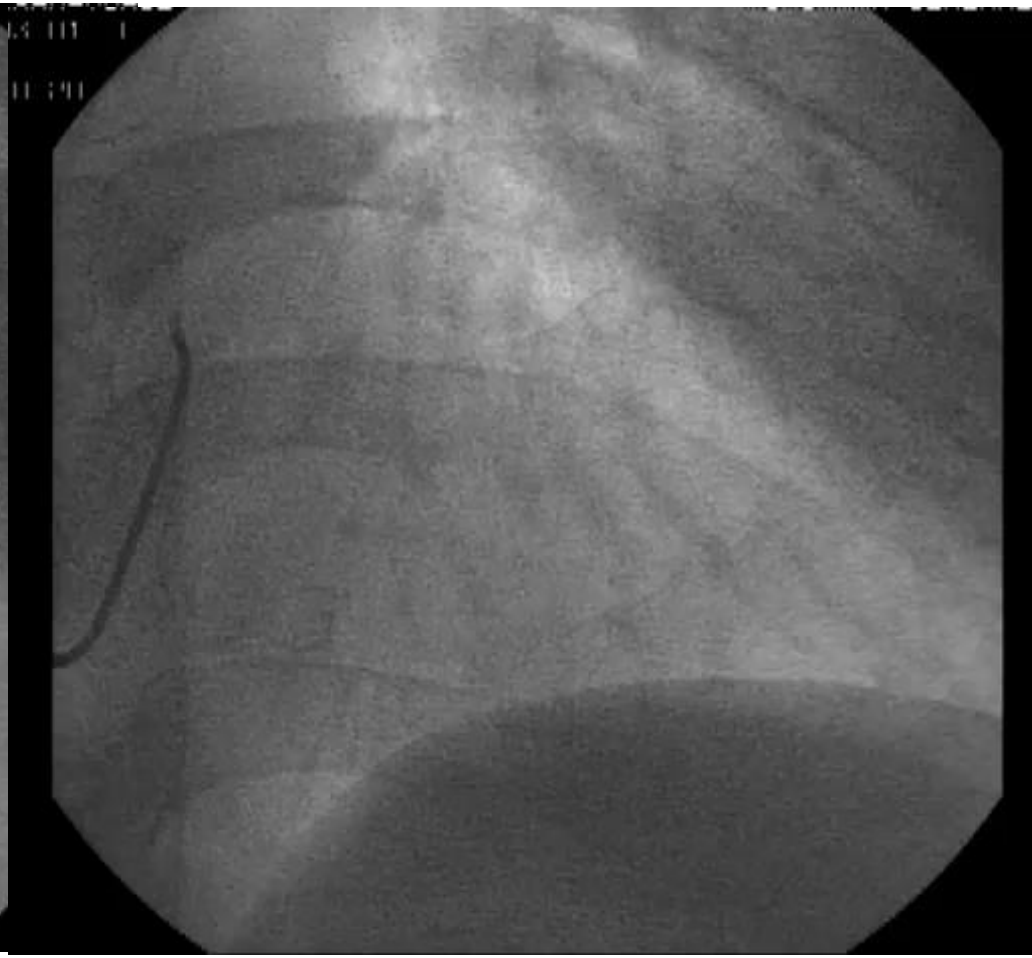
Case 73y.o. female

CAG（6Mo after AMI）

RAO30° CRA30°

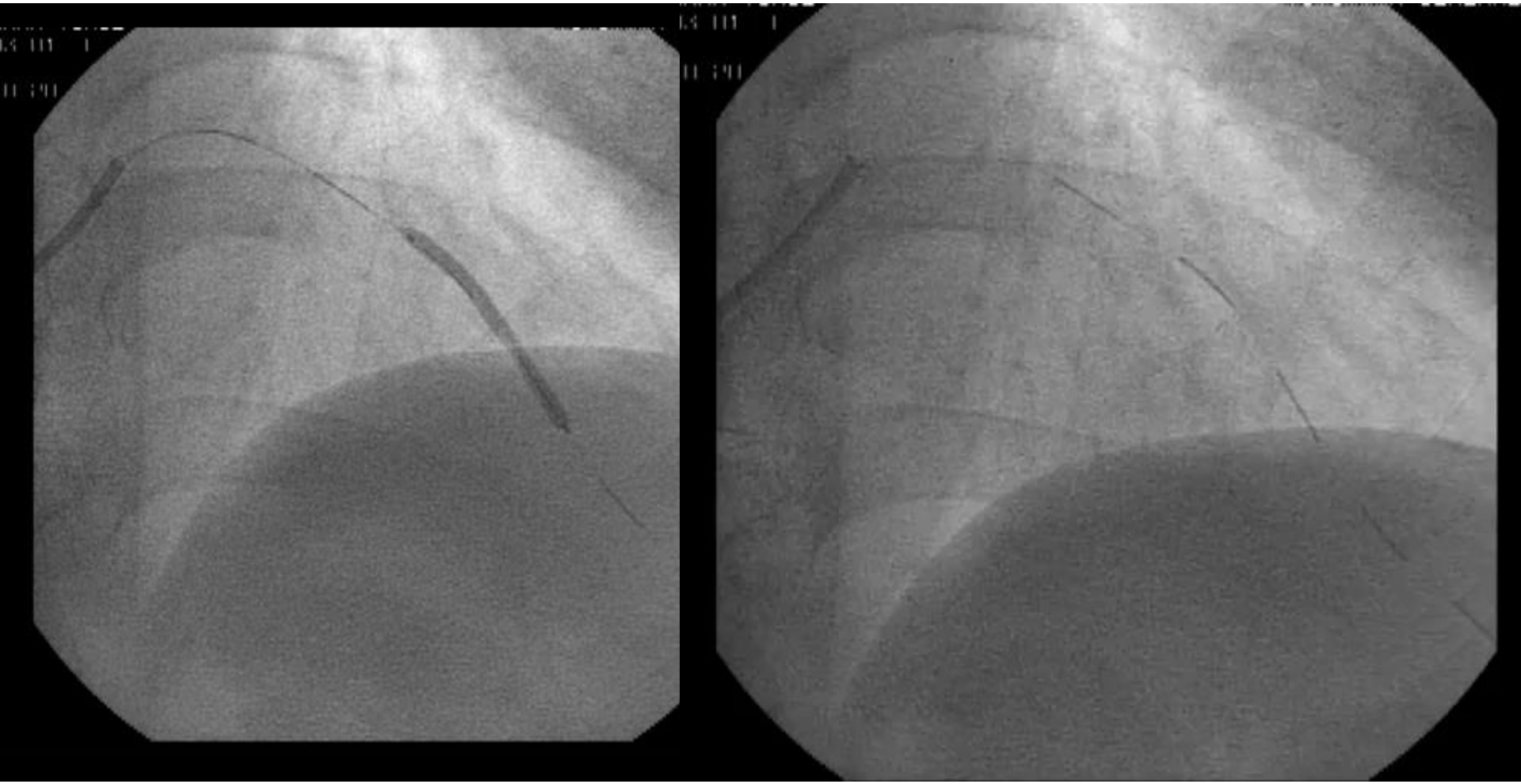


AP CRA30°



mid LAD 75-90% (progression)

DES implantation



PES 2.5x32mm 14atm

Post Dilation

IVUS: not full expansion →dilate upto 24atm (2.75mm)

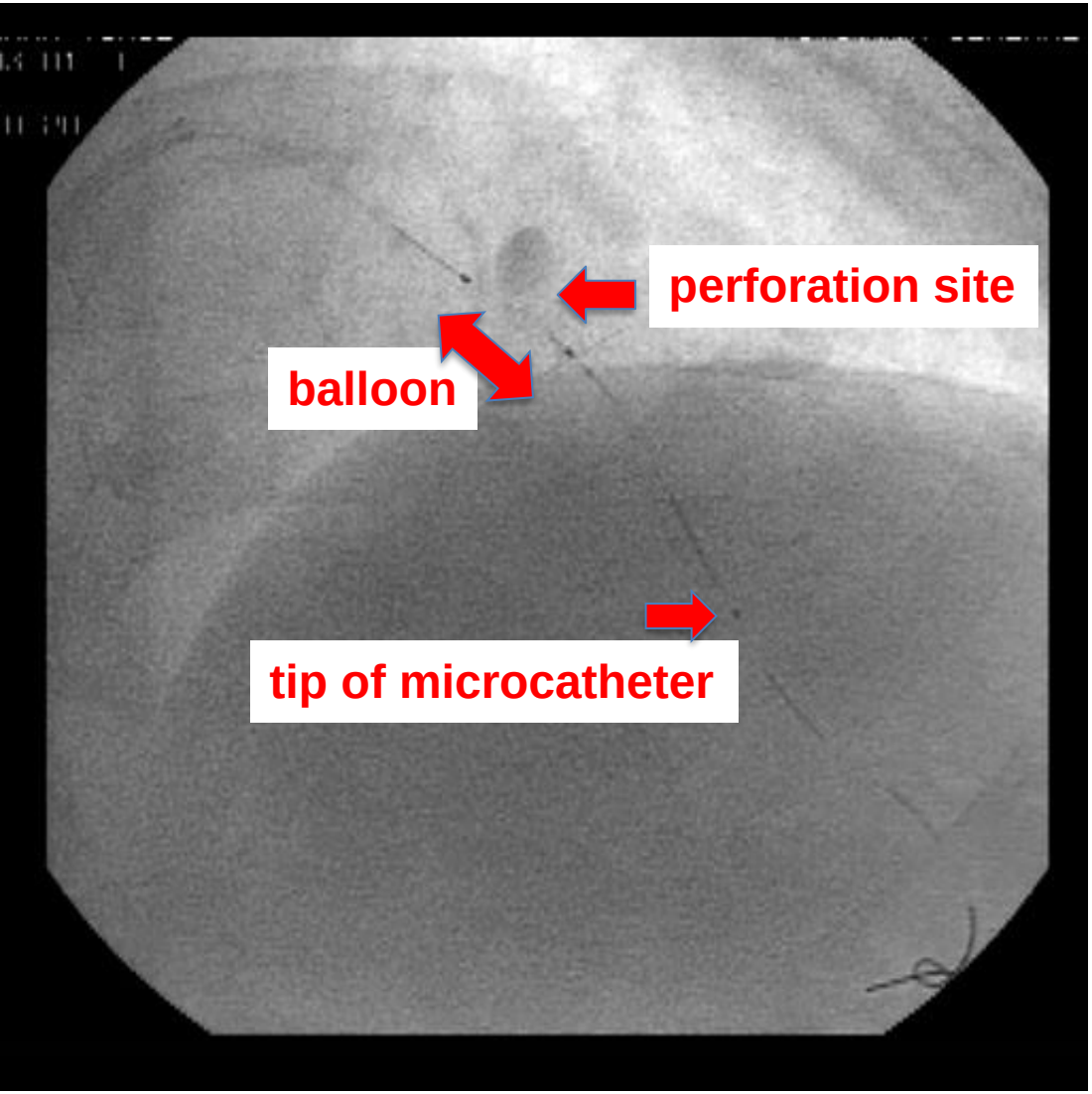
Indentation disappeared

After dilatation

（24atm）

Perforation !!

Distal Perfusion via Microcatheter

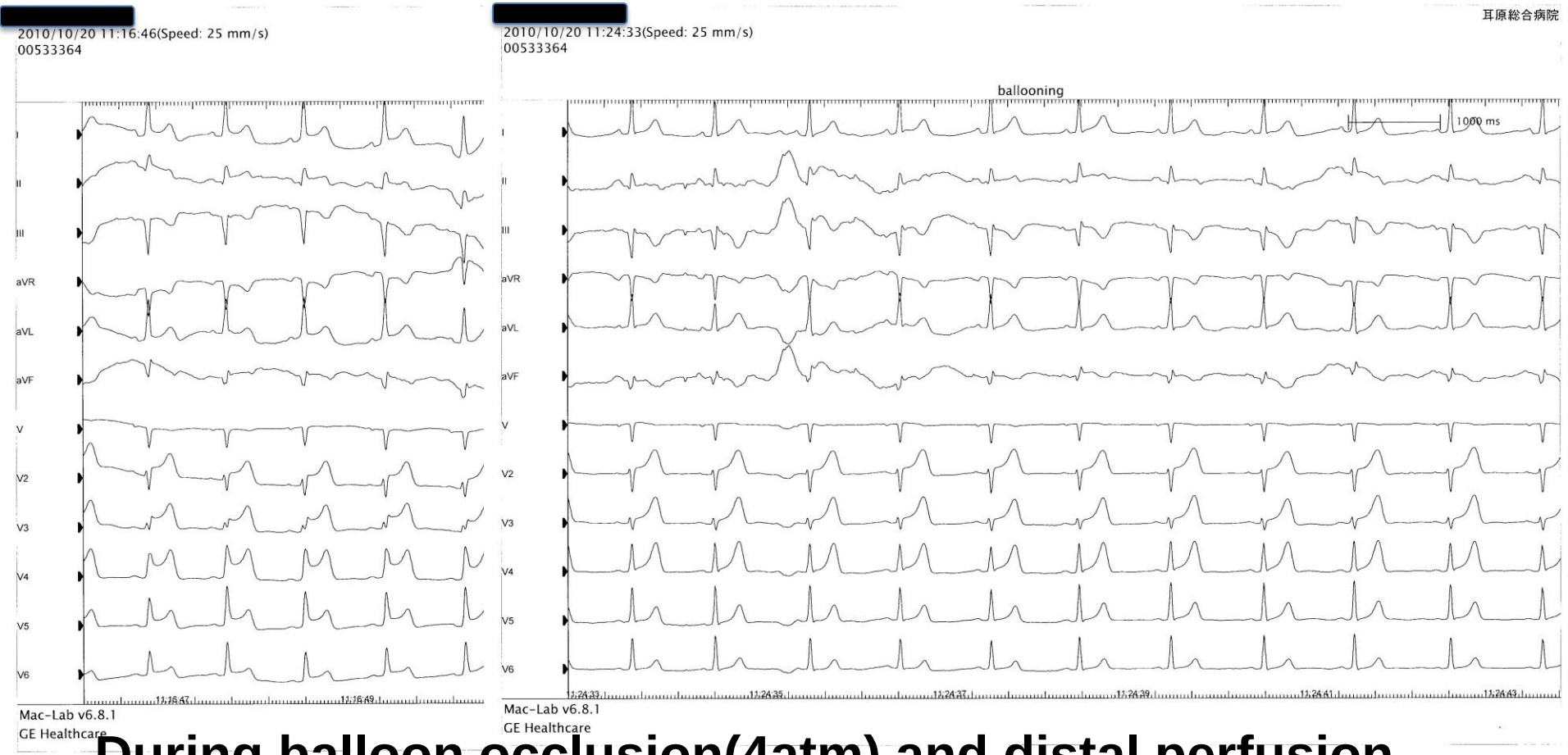


1) insert a guide wire and a micro-catheter to the proximal site of the balloon occlusion

2) deflate the balloon and quickly insert the wire and micro-catheter to the distal site of perforation, and soon inflate the balloon again

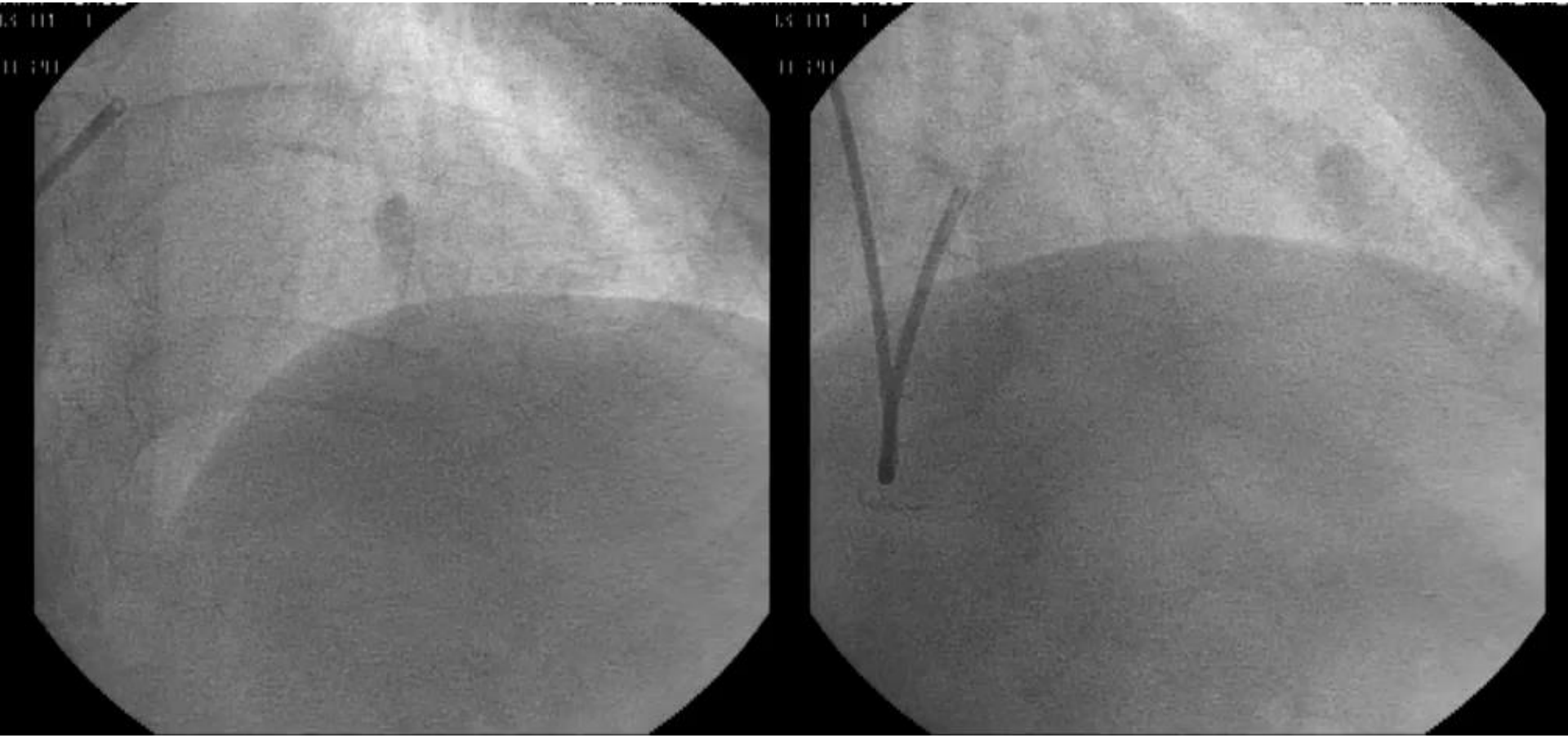
3) during balloon occlusion, pull out the wire and inject blood via micro-catheter which is taken from the patient's artery

ECG during occlusion



During balloon occlusion(4atm) and distal perfusion via microcatheter (Finecross), tall T wave is still remain but ST elevation and her chest pain were disappeared.

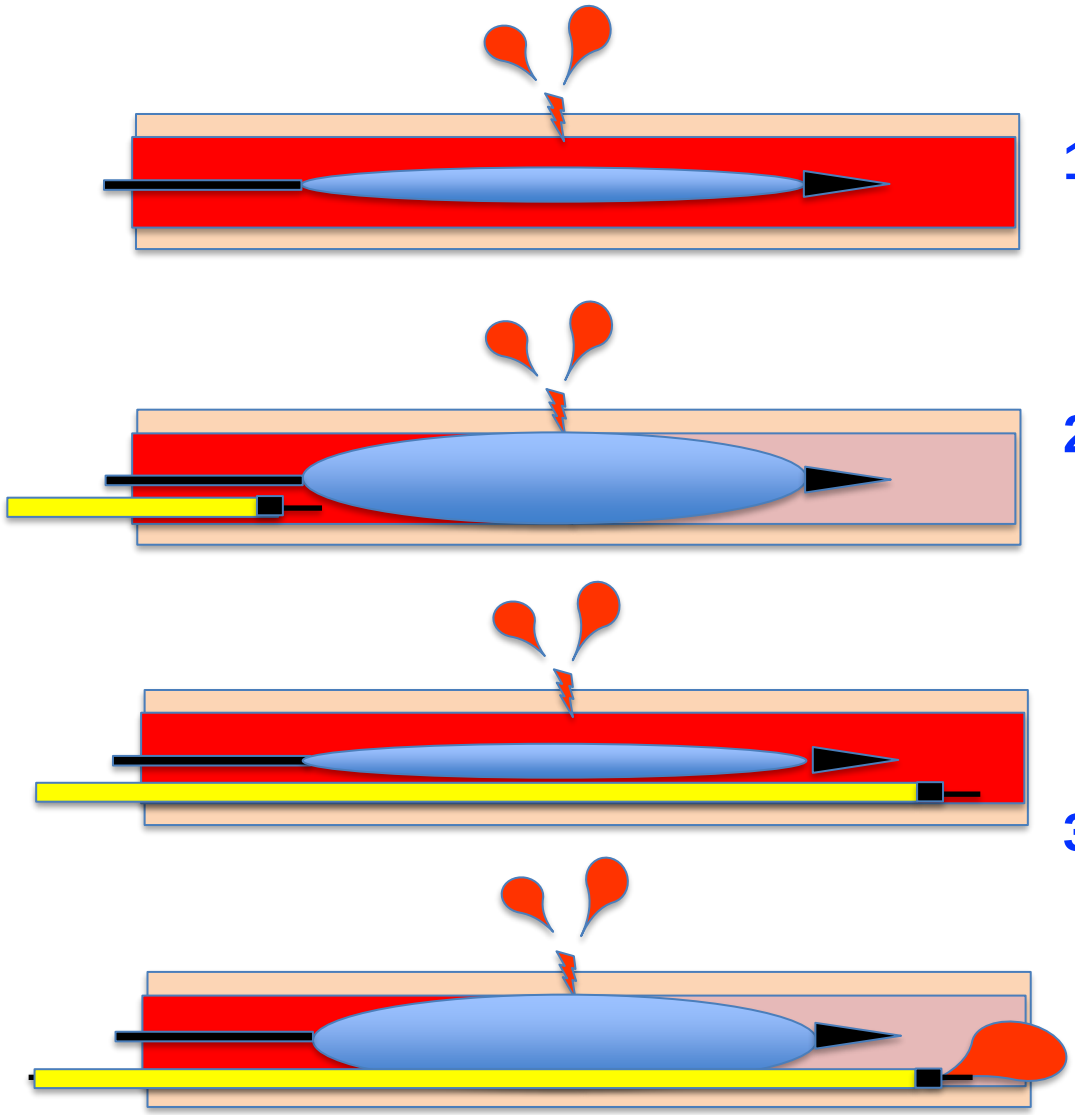
Final CAG



After 20 minutes, bleeding stopped.

No pericardial effusion.

Micro-catheter Distal Perfusion Technique



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2) deflate the balloon and quickly insert the wire and micro-catheter to the distal site of perforation, and soon inflate the balloon again

3) during balloon occlusion, pull out the wire and inject blood via micro-catheter which is taken from another sheath

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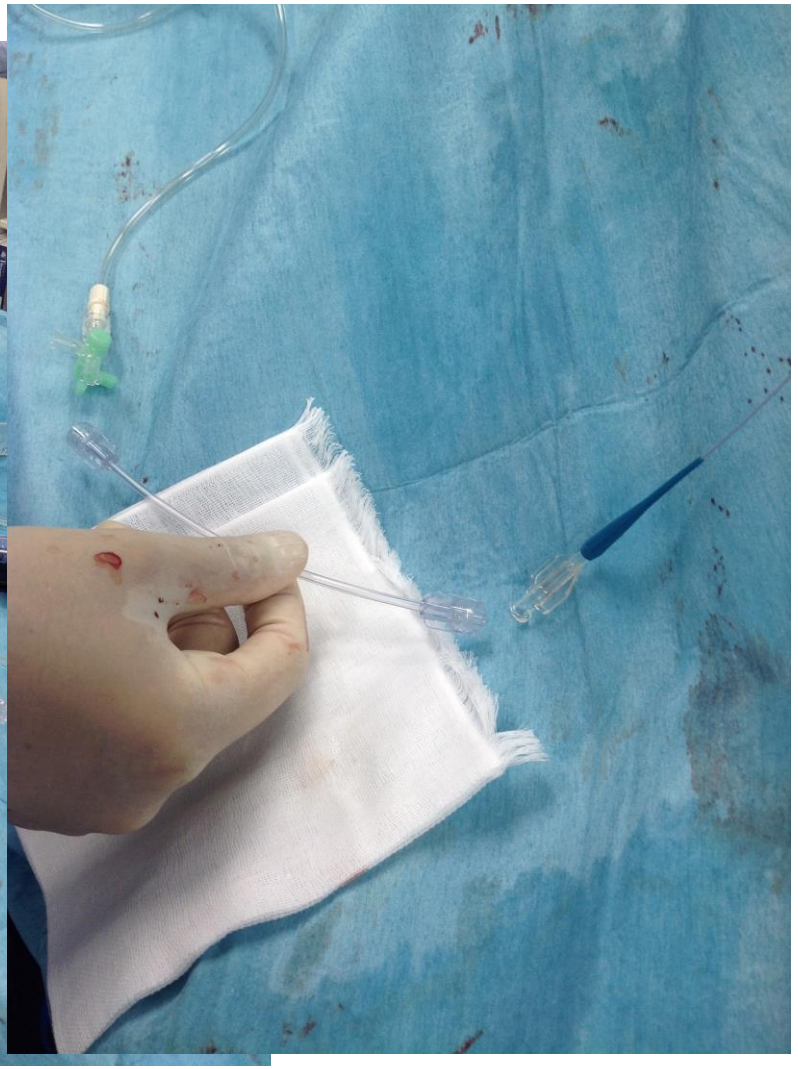
Micro-catheter Distal Perfusion Technique

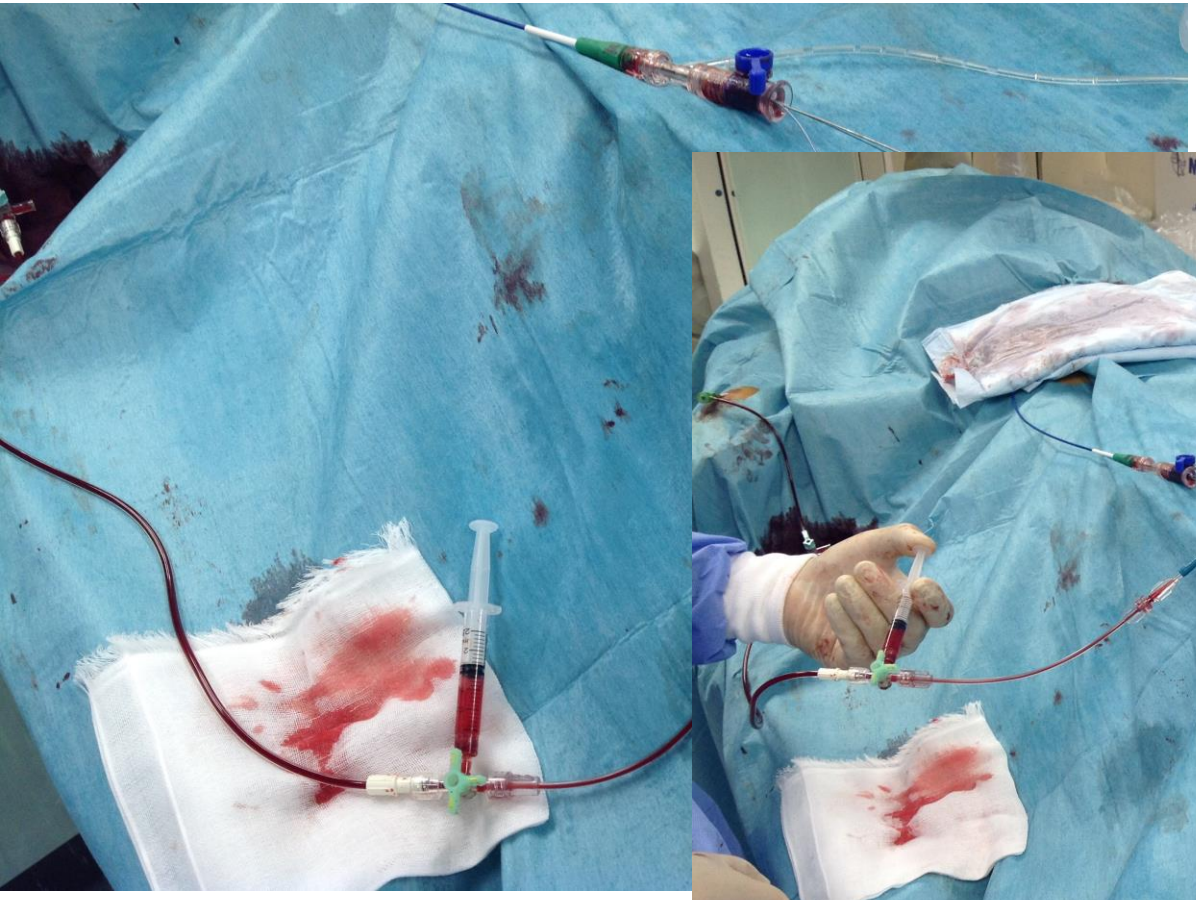
Image

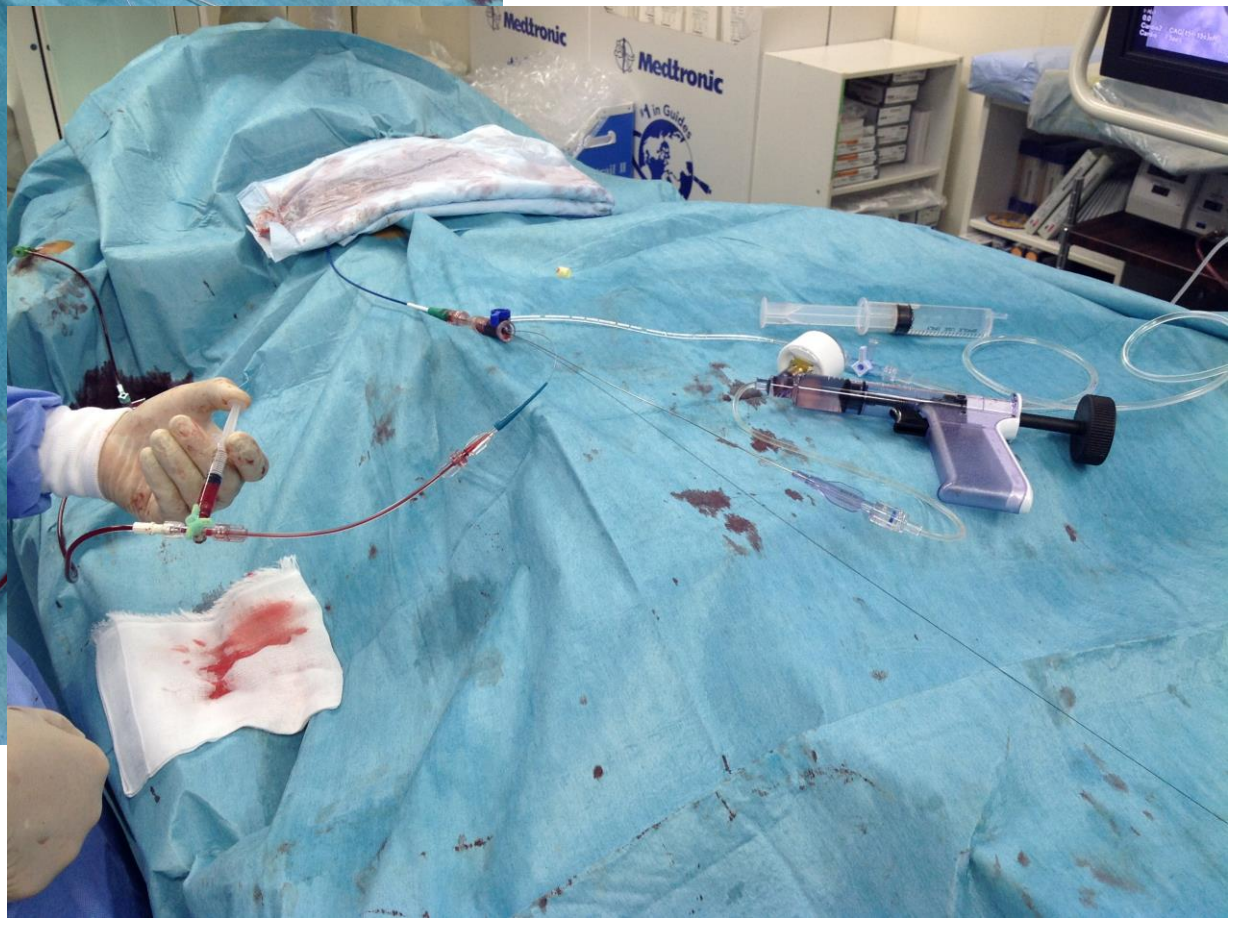
3-way cock and extension tube



Micro-catheter Distal Perfusion Technique

Image





Micro-catheter Perfusion Method

・This technique may be useful, but …

【Problems】

1）Can we get complete occlusion and stop bleeding?

2）Do the balloon oppress the lumen of micro-catheter?

3）Self blood flow from other arterial line is enough to perfuse distal area?

Ex.) Femoral sheath connect to MC

4）Which micro-catheter is the best to use?

→ **We examined.**

Micro-catheter Perfusion Method

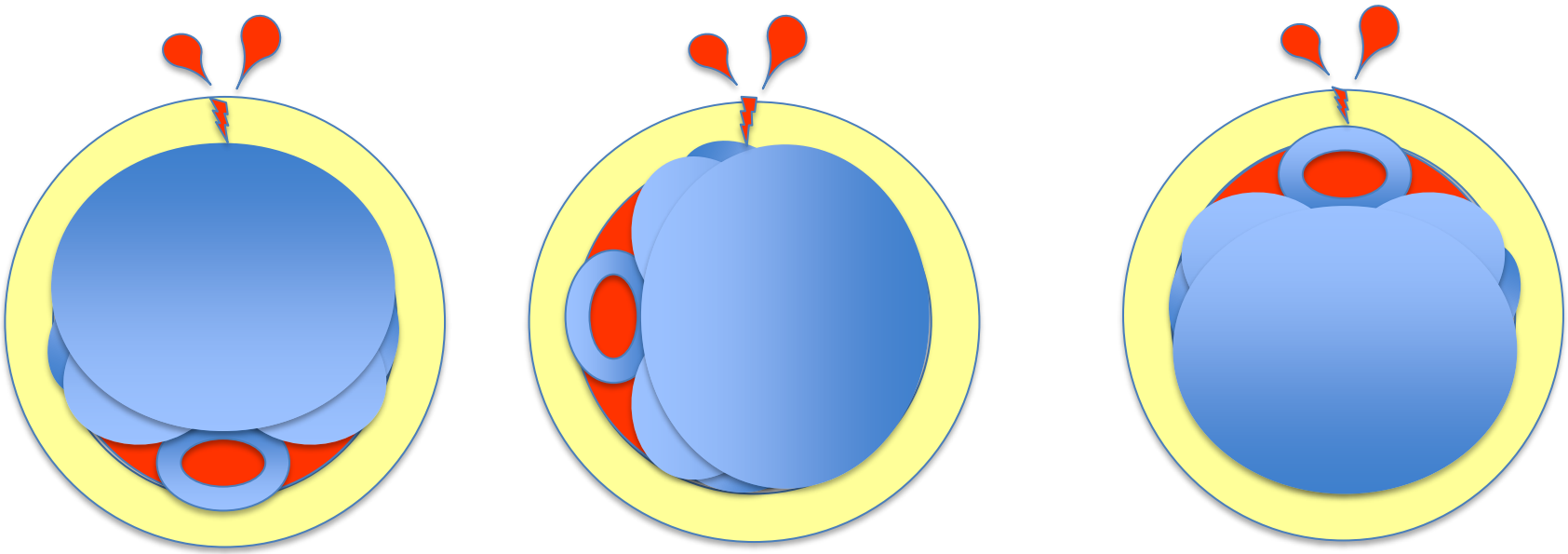
1）Can we get complete occlusion and stop bleeding?

- **MC at opposite side or lateral side**

  →stop bleeding!

- **MC at perforation site**

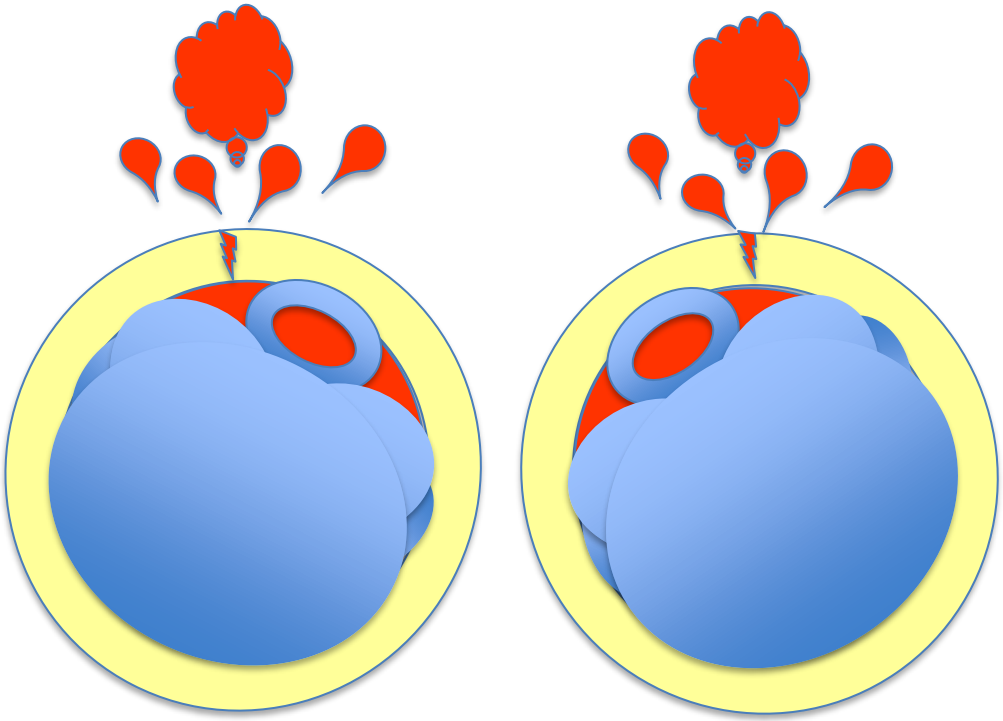
  →almost OK



Micro-catheter Perfusion Method

- **MC is near the perforation site**

  →continue bleeding



There are small spaces between the balloon and MC.

After insert MC and balloon inflation, inject contrast to check bleeding or not.
If bleeding continue, pull buck GW and MC and insert again, so we can change the location of MC.
In our study,
(1st. attempt)
70% success
(good location)
30% continue bleeding

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Micro-catheter Perfusion Method

2）Do the balloon oppress the lumen of micro-catheter?

→The lumen and blood flow don’t change with 20atm dilatation.

3）Self blood flow from other arterial line is enough to perfuse distal portion?

→Self blood flow is not enough. Need pumping injection.

4）Which micro-catheter is the best to use?

→Finecross™ is the best device for the distal perfusion.
It is easily insert in 6Fr guiding catheter with a balloon catheter.
We can also use Corsair and Over-The-Wire(OTW) balloon,
but it is difficult to inject enough because of the narrow lumen.

Perfusion Volume /1min

(in vitro test : Vessel size 3.0mm)

Mean BP	Perfusion Balloon GW(+)	Perfusion Balloon GW(−)	Control
60mmHg	17.4 ml	28.5 ml	62.0 ml
80mmHg	21.5 ml	34.5 ml	72.0 ml
100mmHg	24.5 ml	40.0 ml	80.0 ml
120mmHg	27.8 ml	45.5 ml	98.0 ml

Microcatheter Perfusion

(2.5ml syringe)

23ml (by male)

20ml (by female)

No influence of Blood Pressure

（official data: 22.1ml　　32.1ml）

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Summary

- **Micro-catheter distal perfusion technique are useful when long inflation is needed.**
- **If it is not effective enough to stop bleeding, but we can consider and carry out other therapeutic options (covered stent, surgical, etc) during occlusion and distal perfusion.**

Take Home Message

- **Coronary perforation comes suddenly.**

- **We should learn some bail out options to stop bleeding.**