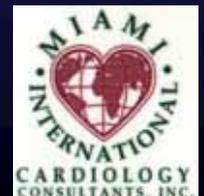


**Hydrophilic vs. Non-coated  
Guidewires for CTO**  
*Angioplasty Summit, Seoul*  
*April 29, 2005*

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# Introduction

- All guidewires (as well as balloons) are coated to allow easier passage down coronary arteries.
- Hydrophilic wires are coated with a coating that becomes slicker when exposed to water (or blood).
- As compared to conventional coatings, hydrophilic coatings do not deteriorate during prolonged use.
- Hydrophilic wires are many times more slippery than conventionally coated wires.
- This extreme lubricity represents both their forte and their failing.
  - They will go anywhere without resistance, even down minute branches and false channels.



# Conventional wire technique - I

- Conventional approach to CTO is with non-coated wires introduced through transit or small over the wire balloon catheters.
- Conventional wires are more controllable and provide better tactile feel.
  - This is especially important when trying to penetrate the distal fibrous cap.
- Technique with conventional wires is to drill through the distal cap with a to and fro rotation over several minutes.
- Using this technique with conventional wires one can actually feel the fibrous cap when the wire is properly engaged.

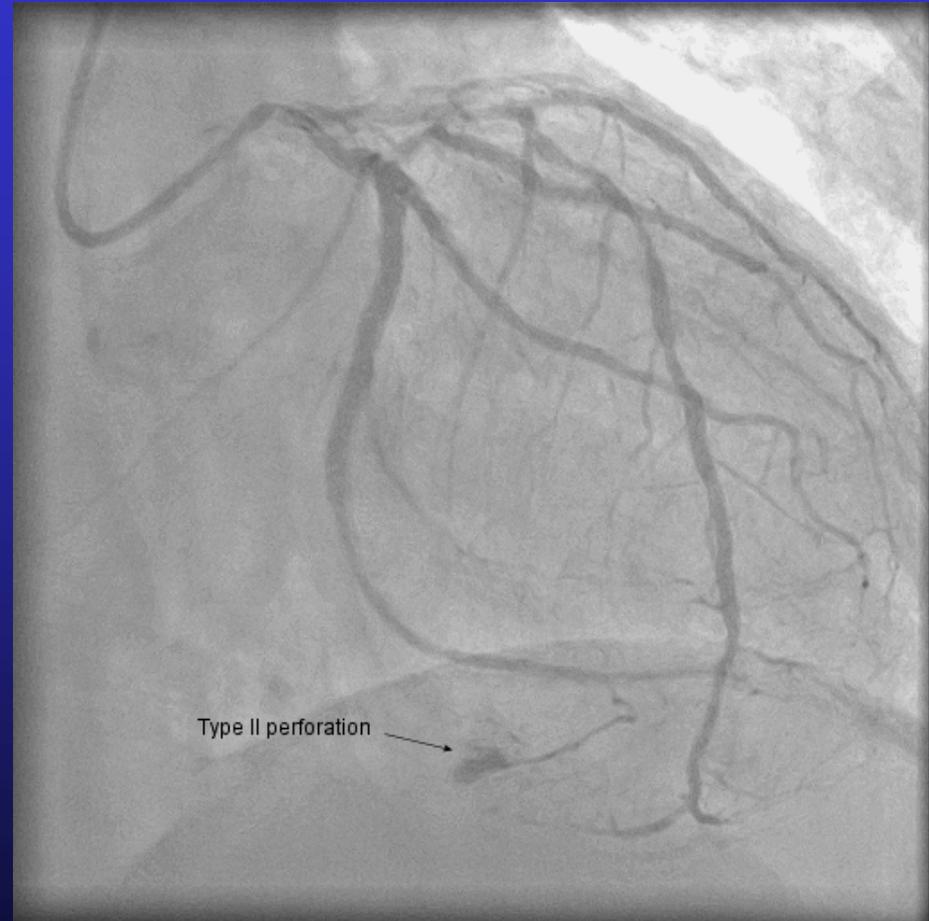
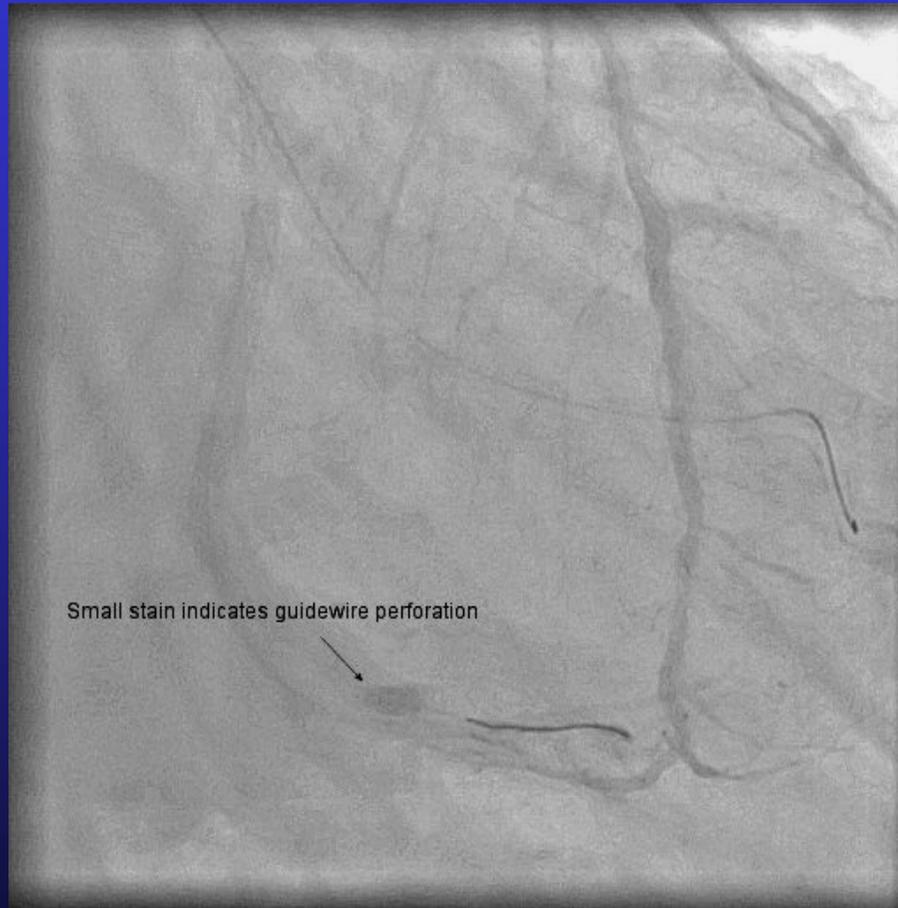
# Conventional wire technique - II

- If the wire runs askew of the cap or enters a false channel, the tactile feel is lost.
- If the wire enters a false channel, there is resistance to further passage.
- Recognizing this resistance and not forcing the wire will allow a better opportunity to probe for the true route.
- Forcing a guidewire in the false channel serves to widen the channel, risks possible perforation and make it impossible to finish the case successfully.

# Hydrophilic Wires - Shortcomings

- Hydrophilic wires have the disadvantage that once in a false passage, the wire can continue for long distances without encountering resistance.
- This leads to a greater tendency to create large false channels that preclude success.
- Similarly, hydrophilic wires frequently seek tiny branches.
  - Once in small branches the wires can travel distally without resistance, eventually penetrating the branch and entering the pericardial cavity.

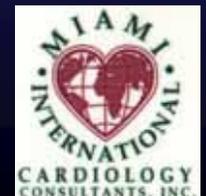
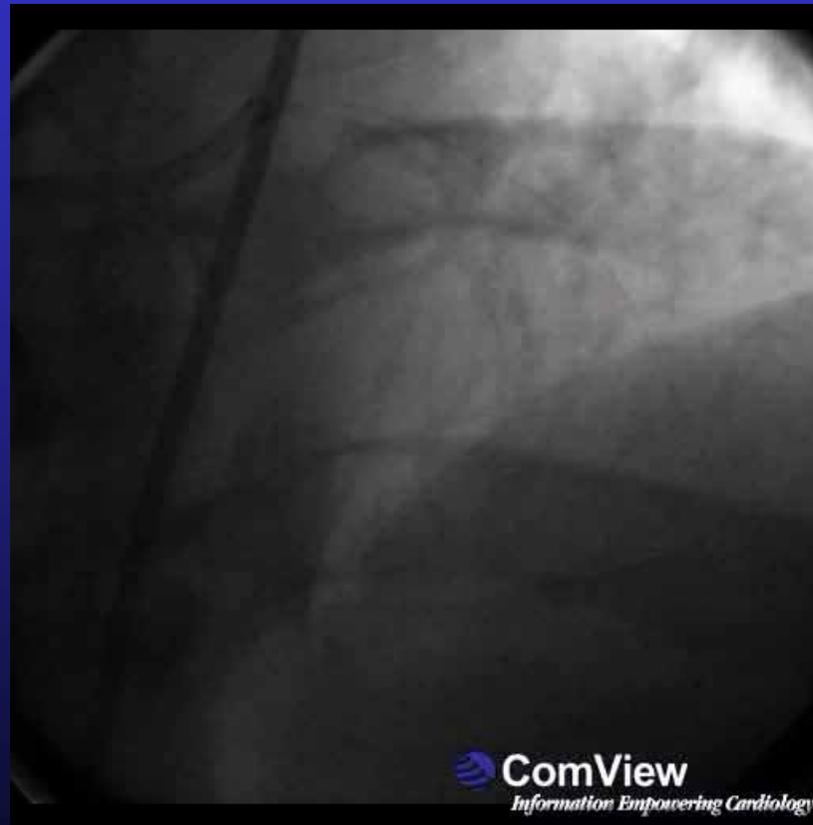
# Hydrophilic Wires in Small Distal Branches



# Hydrophilic Wires Shortcomings - II

- This can lead to cardiac tamponade, especially in the presence of group IIb/IIIa inhibitors.
- If an operator fails to recognize that a hydrophilic wire has entered a false passage or tiny branch and a balloon is subsequently inflated, massive perforation, cardiac tamponade and death can ensue.
- Although proper technique can prevent these disasters, there have been many such complications with hydrophilic wires - causing them to fall into disfavor in the management of CTO's.

# The Problem with Hydrophilic Wires



# So Why Do I Use Hydrophilic Wires?

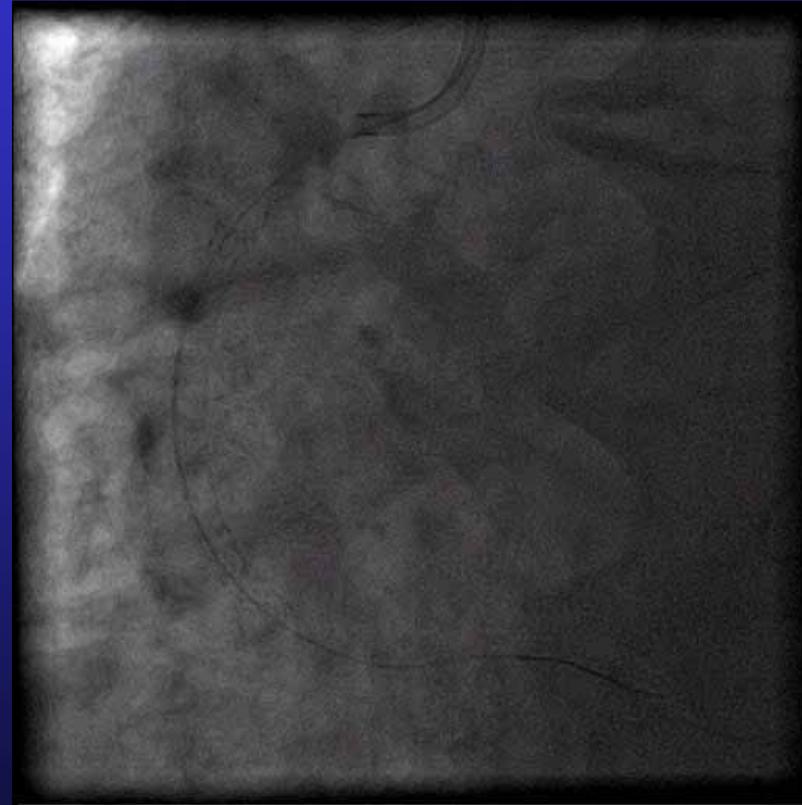
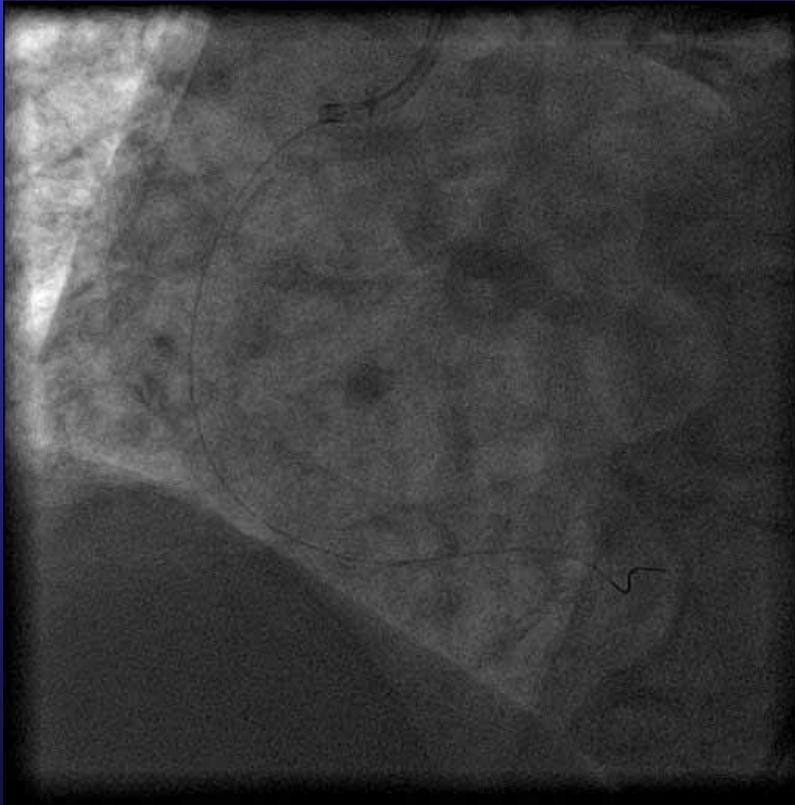
- Despite these shortcomings, hydrophilic wires are my wires of choice for CTO.
- The reason I use them routinely is that they work.
- With careful technique I am able to do CTO cases more quickly, with a higher success rate and as safely as with conventional wires.

# The Beauty of Hydrophilic Wires

## CTO of RCA > One Year



# Twenty Minutes Later



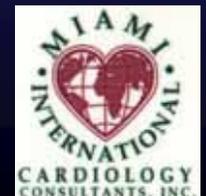
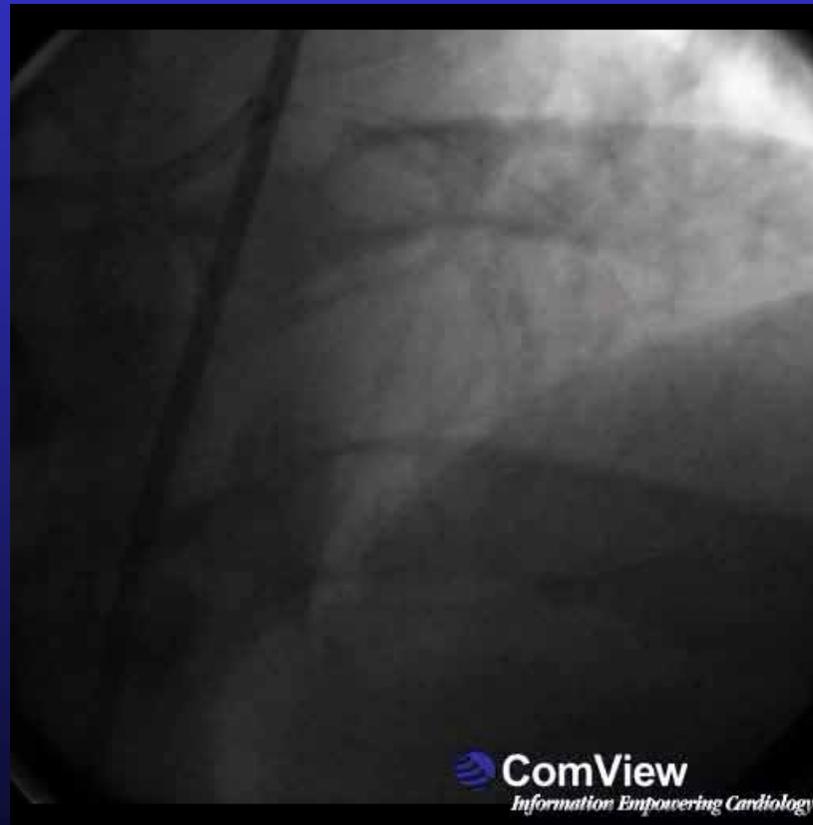
# Caveat

- To safely use hydrophilic wires for coronary CTO, it is absolutely imperative to assure that the wire is in the true lumen of the distal vessel.
  - The safest and most reliable way to do this is with contralateral injections in at least two orthogonal views.
  - If this is not possible, a less desirable alternative is distal injection through a transit catheter or 1.5 mm coronary balloon catheter.
- A balloon should never be inflated distally unless the operator is 100% certain that the balloon and wire are in the true lumen.

JRM1

Try to find Baptist CD of consequences of inflating balloon in false channel.  
James R. Margolis, 2005-01-25

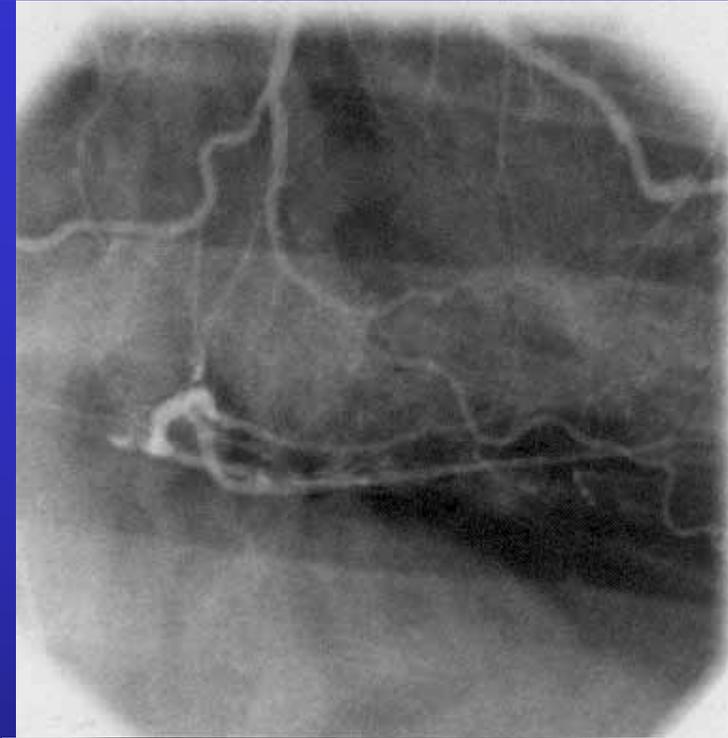
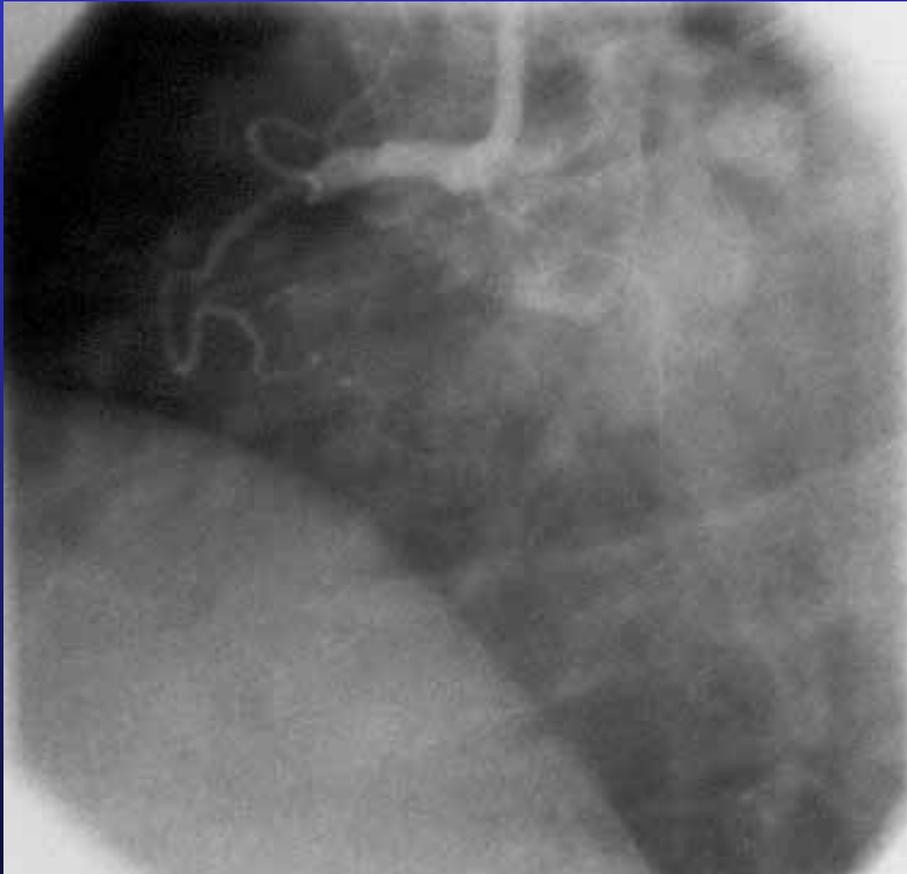
# The Problem with Hydrophilic Wires



# My Personal Technique (Gaijin Technique)

- I almost always begin with bare wire technique.
- I normally start by probing the CTO with a PT Graphix™ or Cougar™ intermediate wire.
- On some occasions, this wire will cross – sometimes without difficulty.
- This is the case when the occlusion is less chronic than originally thought or there is evidence for partial recanalization.
- Occasionally, an apparently impossible CTO is crossed in seconds with a PT Graphix™ or Cougar™ intermediate wire.

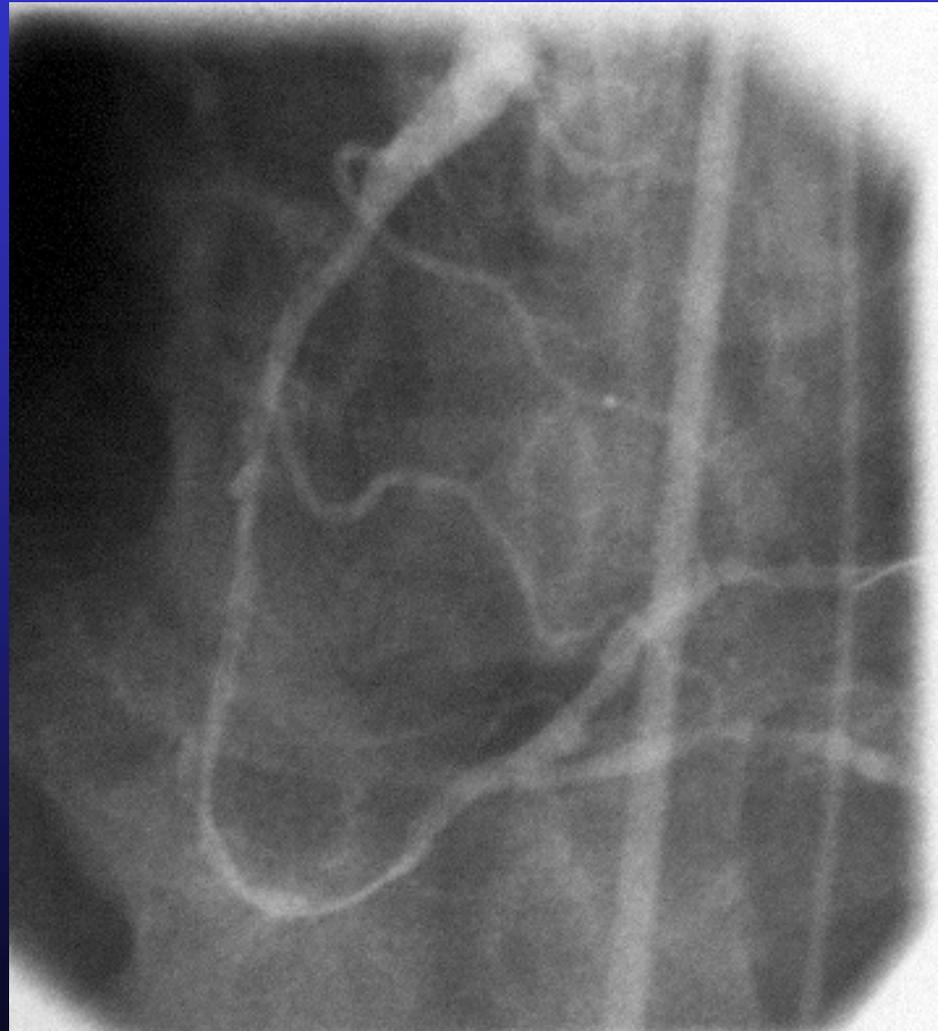
# RCA Flush Occlusion



Left to Right Collaterals

Lesion was easily crossed with PT Graphix  
Intermediate wire and 2.0 mm balloon

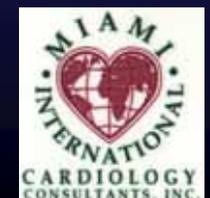
After 2.0  
Balloon



# PT Graphix Wire

- More frequently, the PT Graphix™ will penetrate the proximal fibrous cap and proceed one or more centimeters beyond, then buckle as it encounters the distal fibrous cap.
- I do not try to force the PT Graphix™ wire in such cases. If it does not cross with careful probing, I immediately switch to a stronger wire.
- Even when the PT Graphix™ fails, it usually provides some information regarding the correct route through the occlusion.

# PT Graphix™ Intermediate Wire in CTO

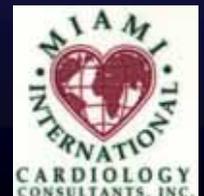


# Gaijin Technique - II

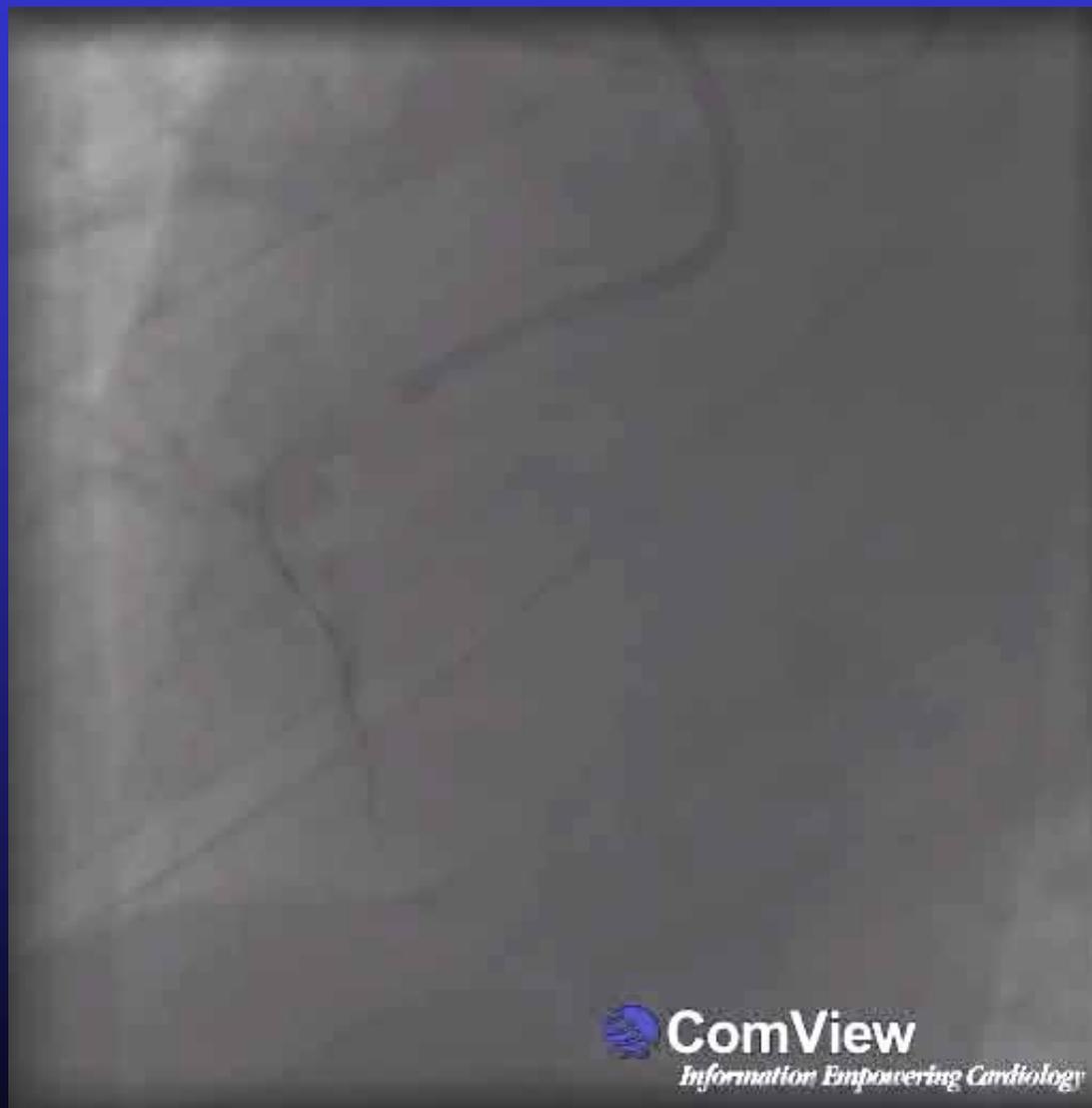
- My second choice of wires is usually a 300 cm SHINOBI Plus.<sup>TM</sup>
- This is both the most useful and the most dangerous of the CTO wires.
- Features:
  - Exquisite torque control that transmits to the tip, even in long and tortuous CTO lesions.
  - Retains tip shape reasonably well.
  - Stiff enough to penetrate most distal fibrous caps.
- Initial approach with this wire is also with bare wire technique.

# SHINOBI Plus™ Wire Technique

- SHINOBI Plus™ invariably passes the proximal cap without difficulty, but can stray into tiny branches or subintimally while negotiating the portion between the proximal and distal caps.
- This is where knowledge obtained from initial probing with the PT Graphix™ wire can be useful.
- The SHINOBI Plus™ wire can be directed along the correct path originally followed by the PT Graphix™.



# Shinobi Plus™

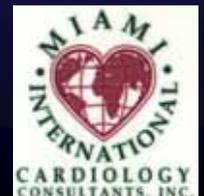


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# SHINOBI Plus™ Wire Technique

- At the distal fibrous cap, SHINOBI Plus™ wire technique differs from that with conventional wires.
- Instead of trying to drill through the distal cap, I try to spear the cap with the relatively sharp tip of the SHINOBI™.
- Although this maneuver invariably involves some element of drilling, the focus is in keeping the wire tip pointed in the direction of the distal vessel.
  - Perpendicular to the tangent of the fibrous cap.
- This must be constantly checked in orthogonal views using frequent contralateral injections.
- The stiffness of the SHINOBI Plus™ tip allows for some tactile feel.
- This feel combined with visual input makes it clear when the wire tip and fibrous cap are engaged.



# Penetrating Distal Fibrous Cap

Tip too inferior

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*Information Empowering Cardiology*

Tip too superior

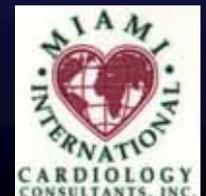
 **ComView**  
*Information Empowering Cardiology*

Tip in position to  
penetrate distal cap

 **ComView**  
*Information Empowering Cardiology*

# SHINOBI Plus™ Wire Technique

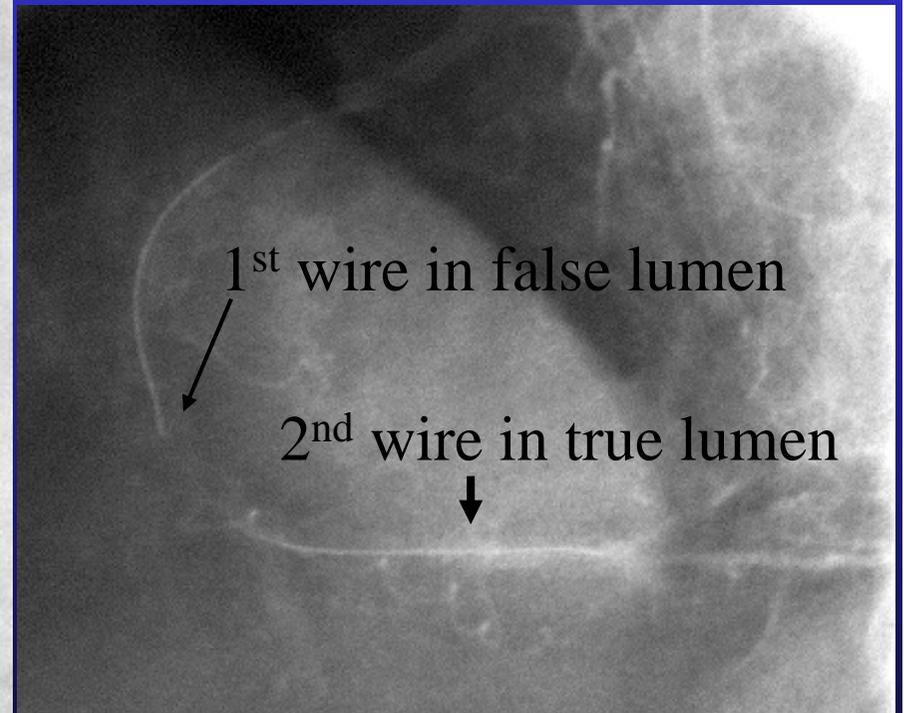
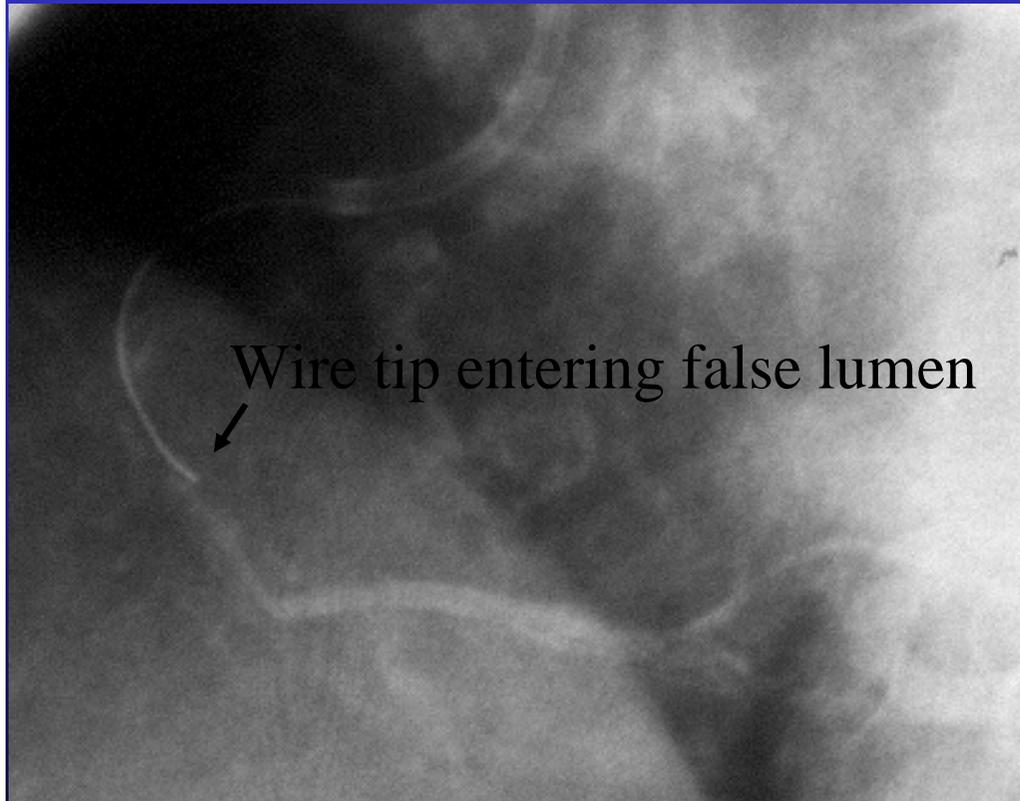
- As with conventional wires, the SHINOBI Plus™ not infrequently slides off the fibrous cap and/or courses subintimally.
- When this occurs, the management is similar to that with conventional wires.
- The most important first step is to immediately recognize the aberrant course, pull back the wire and attempt to redirect it.
- It is equally important to avoid forcing the wire in a subintimal course thus enlarging the false channel.
- If the wire continually re-enters the false channel, it is best to leave the wire in place and introduce a second wire – again, a technique identical to that used with conventional wires.



# SHINOBI Plus™ wire in false lumen



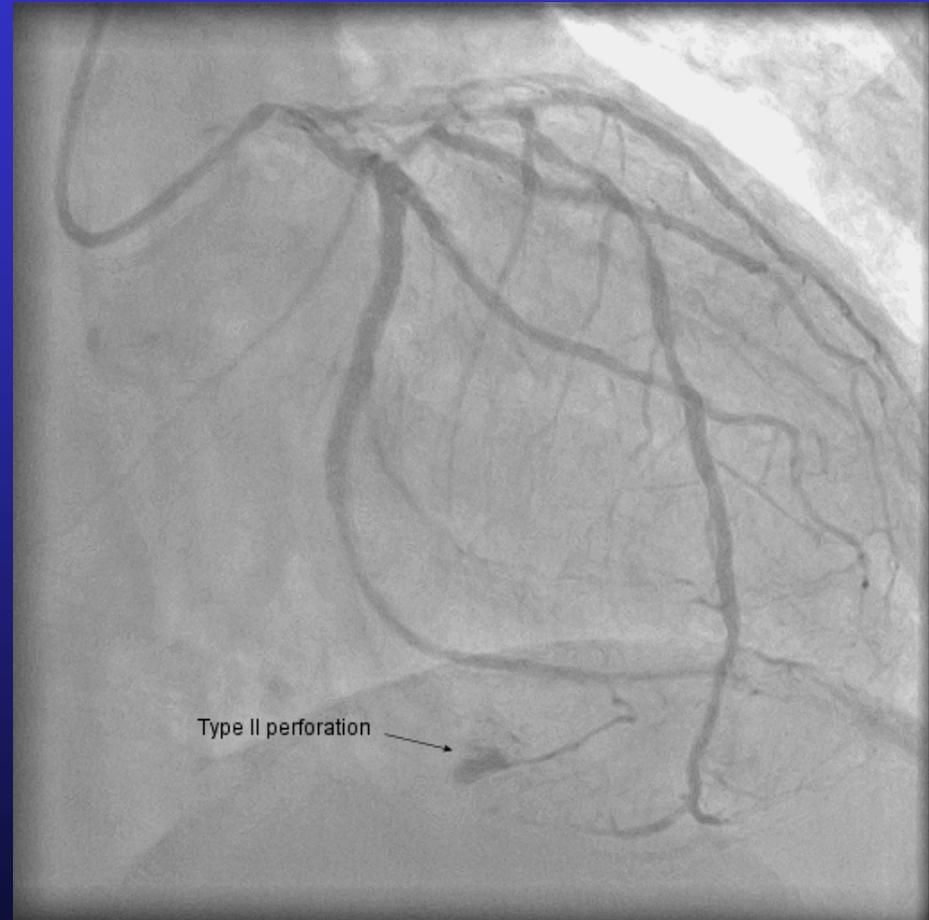
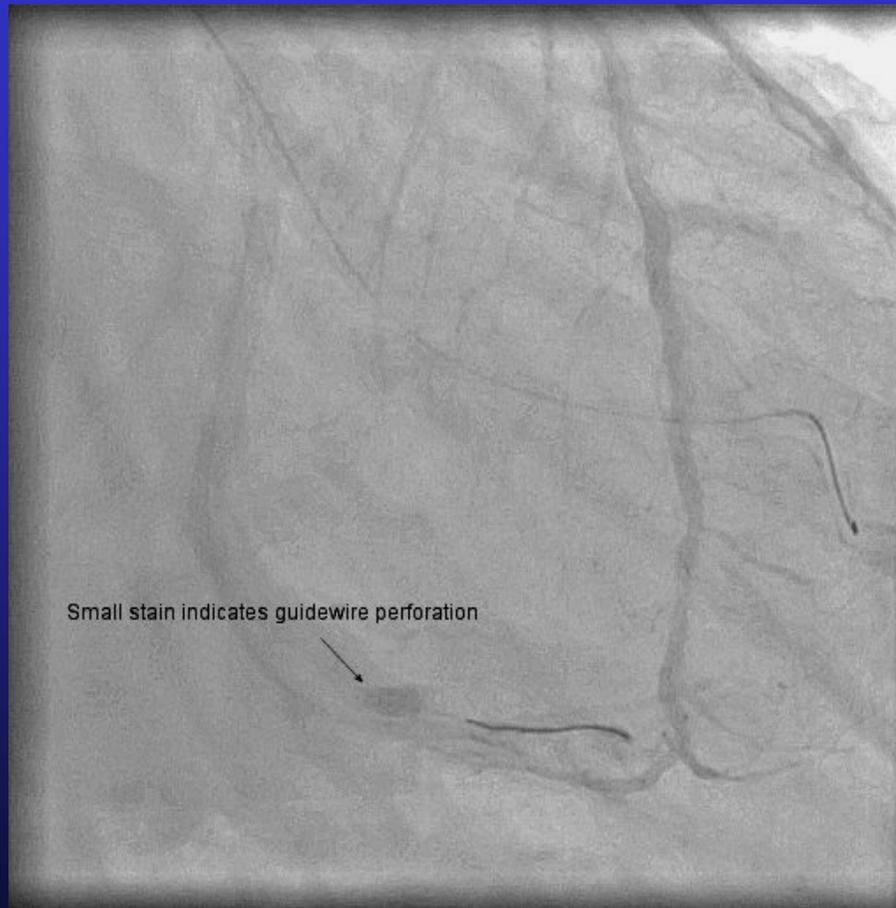
# SHINOBI Plus™ enters false lumen, but second SHINOBI Plus™ finds true lumen



# SHINOBI Plus™ Wire Technique

- When a CTO is successfully crossed with the SHINOBI Plus™ wire, it is important to immediately exchange for a conventional wire (A 300 cm wire is used for this reason).
- If the wire is left in place during proximal ballooning and stenting the extreme stiffness and lubricity of the SHINOBI Plus™ makes it prone to distal migration and perforation.
- Wire exchange is usually performed through a 1.5 mm over-the-wire balloon catheter which can then be used for initial dilatation.
- Prior to wire exchange position is again verified by contralateral injections and/or injection through the distal balloon catheter tip.

# Consequences of Not Exchanging SHINOBI Plus™ Wire



# Excimer Laser

- The Excimer laser has been useful in crossing CTO lesions that have been crossed by a wire, but cannot be crossed with a balloon.
- The X-80 high 0.9 mm catheter is particularly useful in this regard.

# Excimer Laser Crosses “Uncrossable Lesions”

Wire in distal lumen, balloon  
will not cross

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After 0.9 mm Excimer laser

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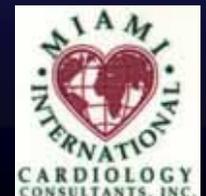
# Footnote

- I have had positive experiences with other hydrophilic wires in CTO
  - Sometimes when I have failed with the PT Graphix intermediate and SHINOBI Plus.
- There are many wires that are not marketed in the US, and are thus unavailable to me.
- It is important for each operator to familiarize himself with as many different wires as possible, but to choose a few workhorse wires with which he has a substantial experience. This is true whether one primarily uses conventional or hydrophilic wires.



# Summary

- In the approach to CTO, hydrophilic wires are a reasonable alternative to conventional wires.
- The very characteristics that make hydrophilic wires easier to use also make them more dangerous.
- Meticulous adherence to technique, especially verification of position, is mandatory.
- Not all hydrophilic wires are the same.
- As with conventional wires, in order to properly deal with CTO, one must have access to a family of hydrophilic wires with varying degrees of stiffness and tip characteristics.
- Whether one chooses to use conventional or hydrophilic wires, experience, technique and patience are essential to solving the problem of CTO.



# But It's Worth It

