

17th ANGIOPLASTY SUMMIT

TCTAP 2012

CTO Forum in Collaboration with Japanese CTO Club and CCT

2012/4/26 15:00 - 15:15 @The Convention Center, Sheraton Grande Walkerhill Hotel, Seoul Korea

Histology Is a Big Key to Success in CTO-PCI

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Osaka University / Tokushukai (Nozaki, Nagoya)

Disclosure Statement of Financial Interest

Within the past 12 months, I or my spouse/partner have had a financial Interest /arrangement or affiliation with the organization(s) listed below

Affiliation/Financial Relationship
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Kaneka
Medtronic
Terumo

AstraZeneca
Daiichi-Sankyo/Eli Lilly
Sanofi-Aventis

Zio software

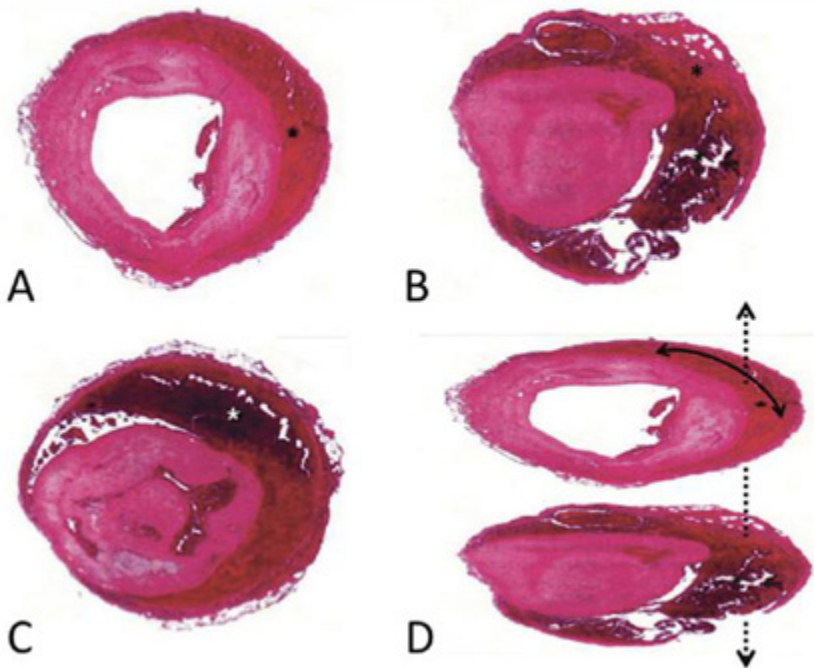
Why should we consider histology?

- CTO-PCI = Operator x Equipment x CTO lesion
 - Operator's Skill, and Strategy
 - Antegrade approach, retrograde approach
 - Single wire, Parallel wire
 - Retrograde wire cross, Kissing wire cross, CART, reverse CART
 - Equipment
 - Guiding catheter, micro catheter, wire, balloon, stent, etc.
 - CTO lesion itself
 - All CTO lesions are not same.
 - How serious to understand CTO lesion?

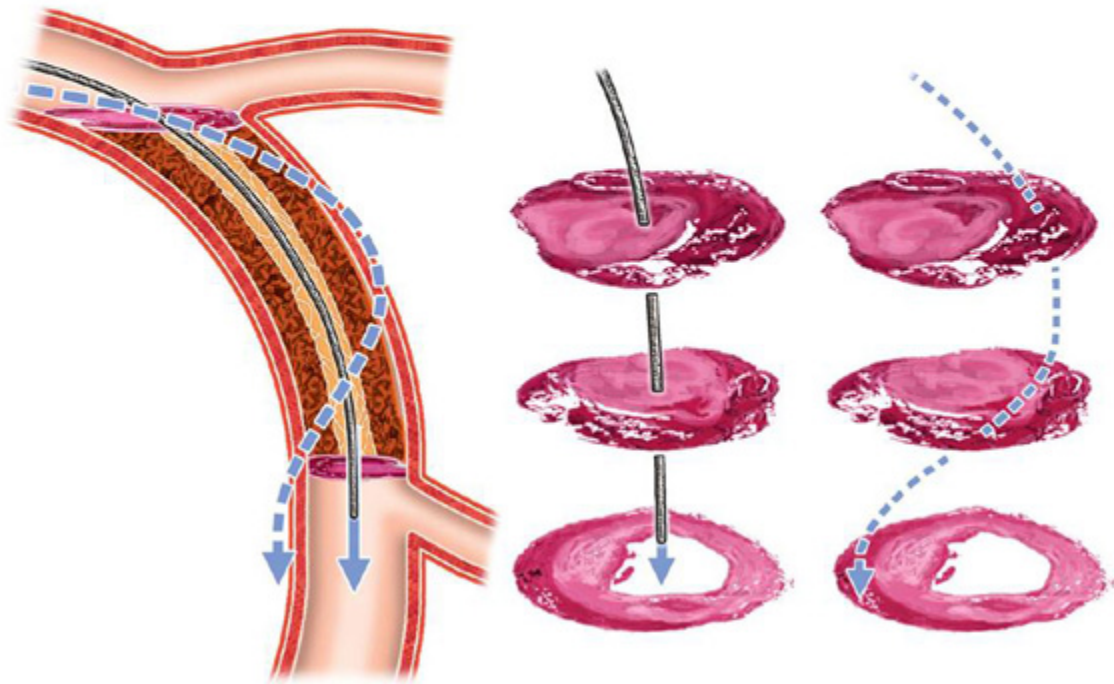
Key points in Histology

- Intimal plaque / subintimal space
 - Intimal plaque tracking, subintimal tracking
 - » Key to success of wire cross
- Micro-channel / Loose tissue
 - Loose tissue tracking
 - » Wire selection handling

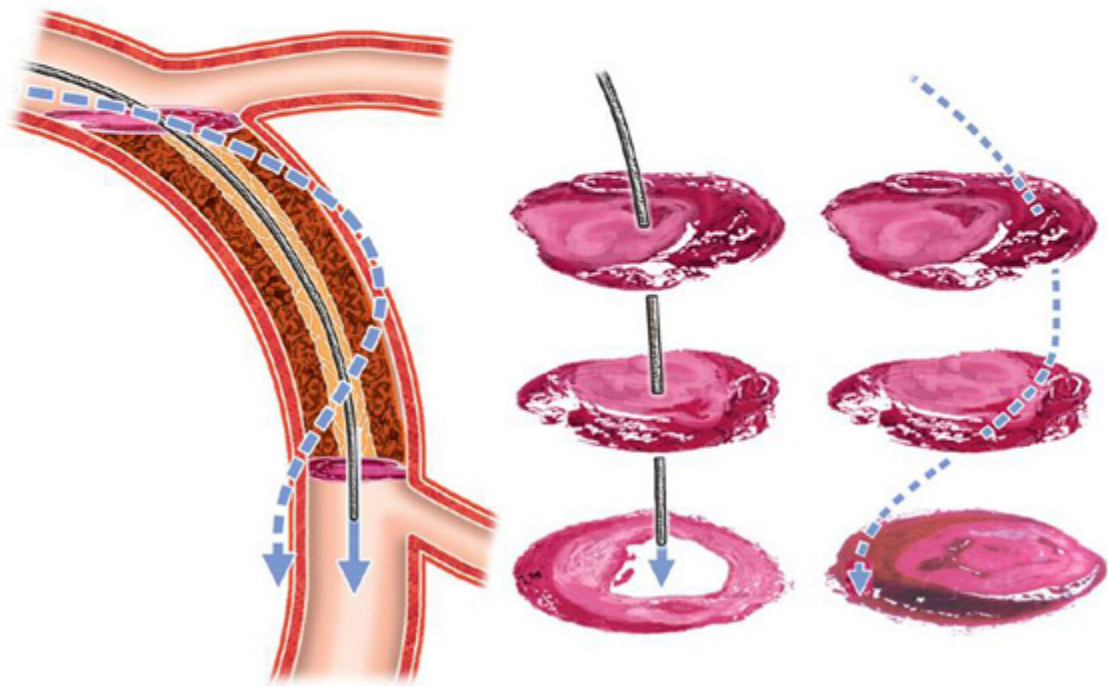
Feature of Subintima



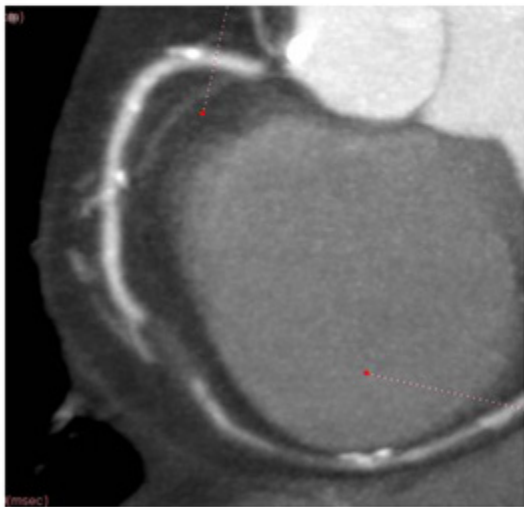
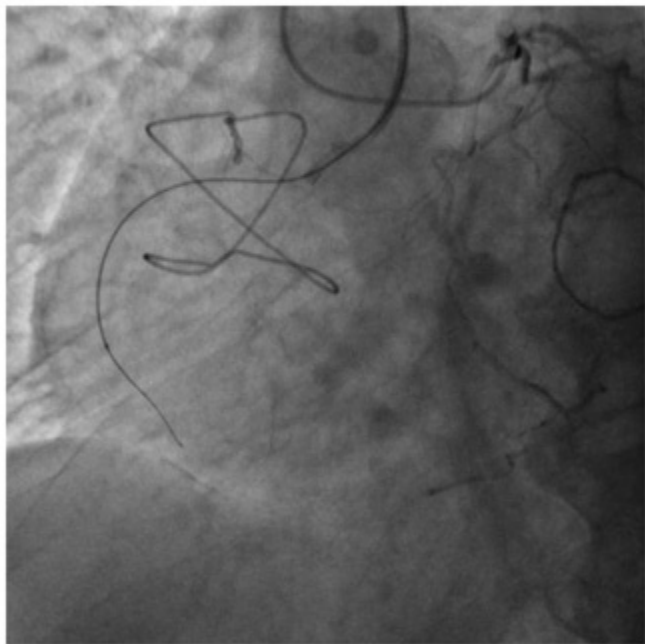
Subintimal tracking in antegrade



Subintimal tracking in antegrade

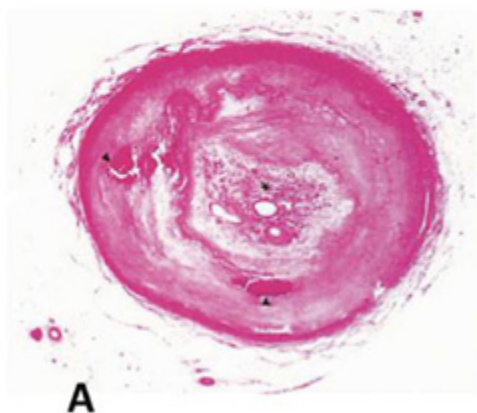


CT for intimal plaque tracking

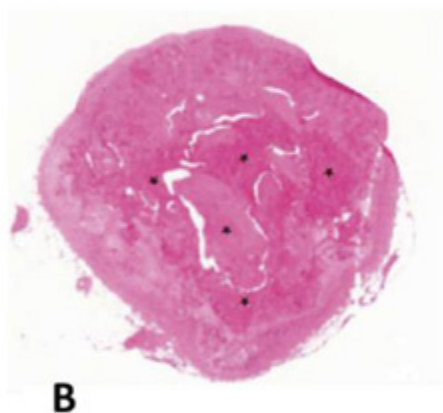


Typical young and aged CTO

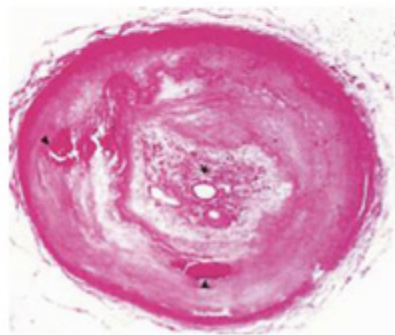
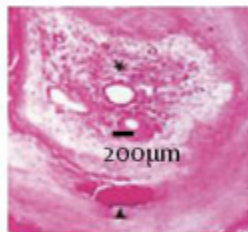
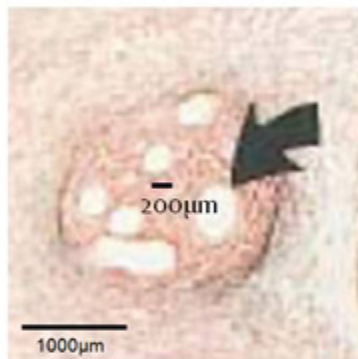
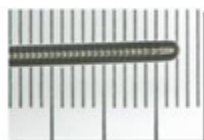
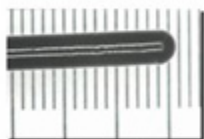
1.5 yrs



5 yrs



Loose Tissue / Micro-channel



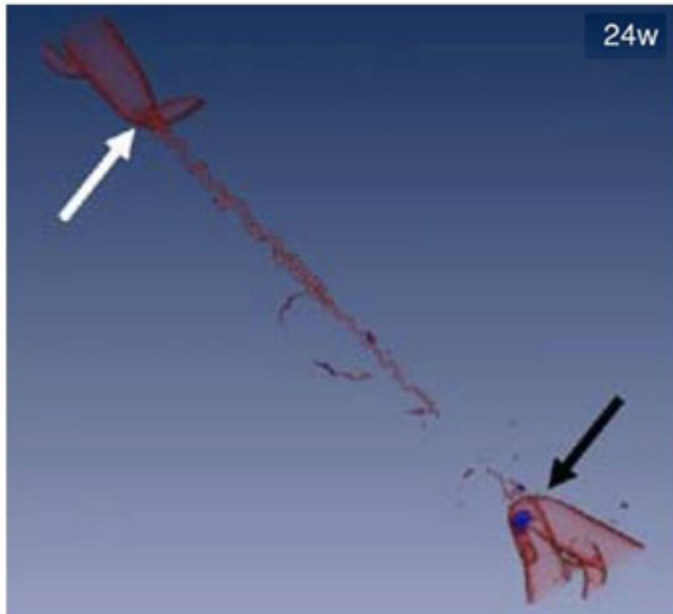
Loose Tissue / Micro-channel

Intravascular and Extravascular Microvessel Formation in Chronic Total Occlusions

A Micro-CT Imaging Study

Nigel R. Mance, PhD,* Bradley H. Strass, MD, PhD,†‡ Xueling Qi, PhD,†
Max J. Weisbrod,† Kevan J. Anderson, BEng,* General Leung, MSc,*
John D. Sparkes, MSc,† Julia Lockwood,† Ronen Jaffe, MD,† Jagdish Butany, MD,§
Aaron A. Teitelbaum, MD, MSc,† Beiping Qiang, MD, PhD,† Alexander J. Dick, MD,†
Graham A. Wright, PhD†
Toronto, Ontario, Canada

J Am Coll Cardiol Img 2010;3:797-805



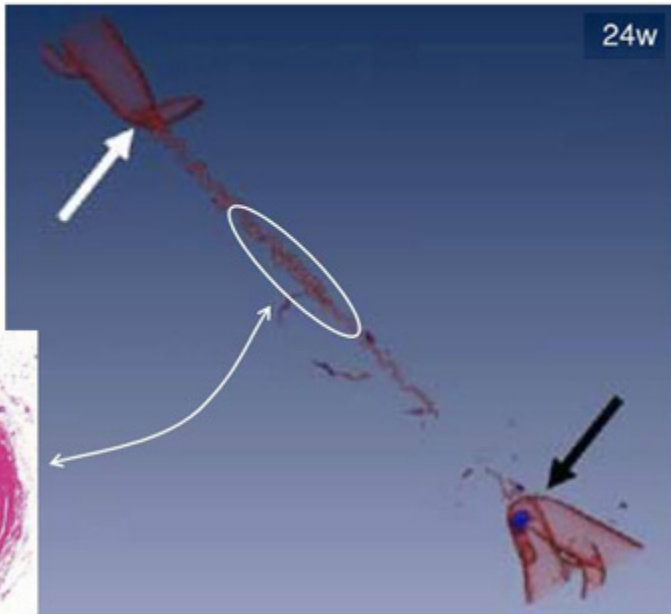
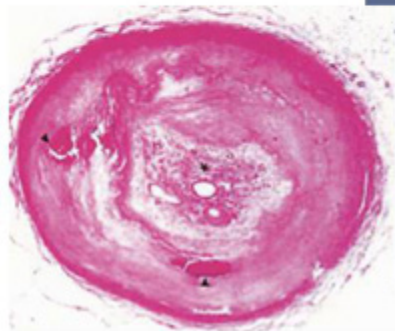
Loose Tissue / Micro-channel

Intravascular and Extravascular Microvessel Formation in Chronic Total Occlusions

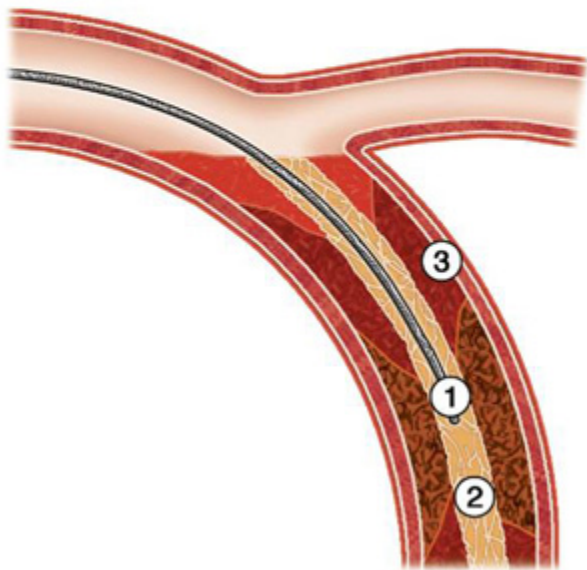
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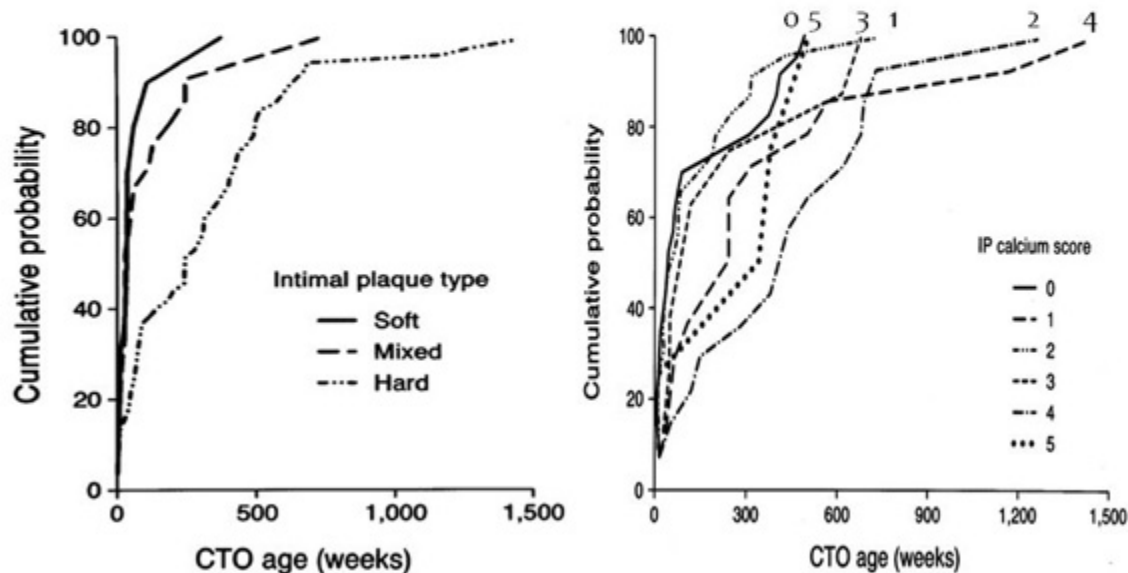
Concept of “Loose Tissue Tracking”




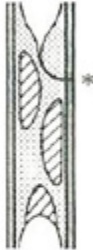
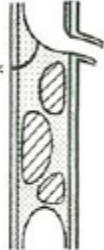

- ① wire-tip force
- ② resistance in loose tissue
- ③ resistance in plaque

If we can control
 $② < ① < ③$,
wire might easily pass CTO.

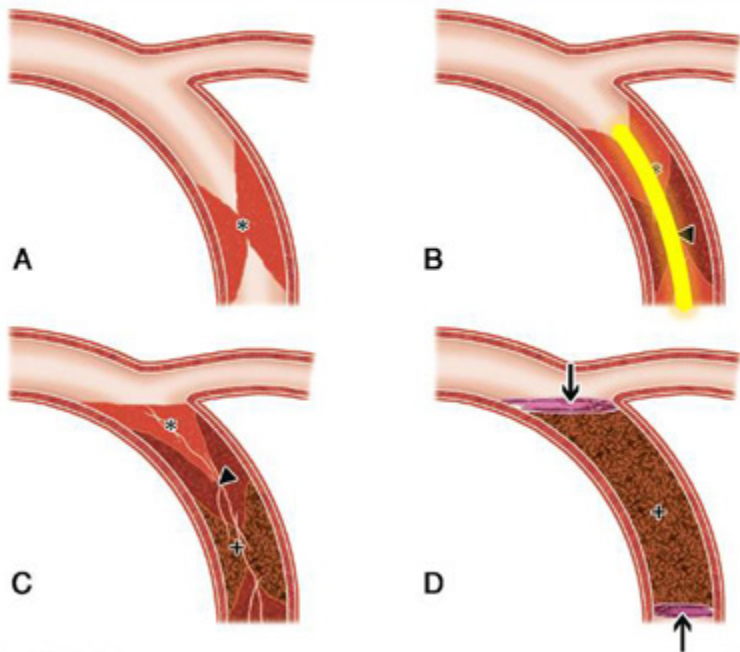
Histopathological features of CTO



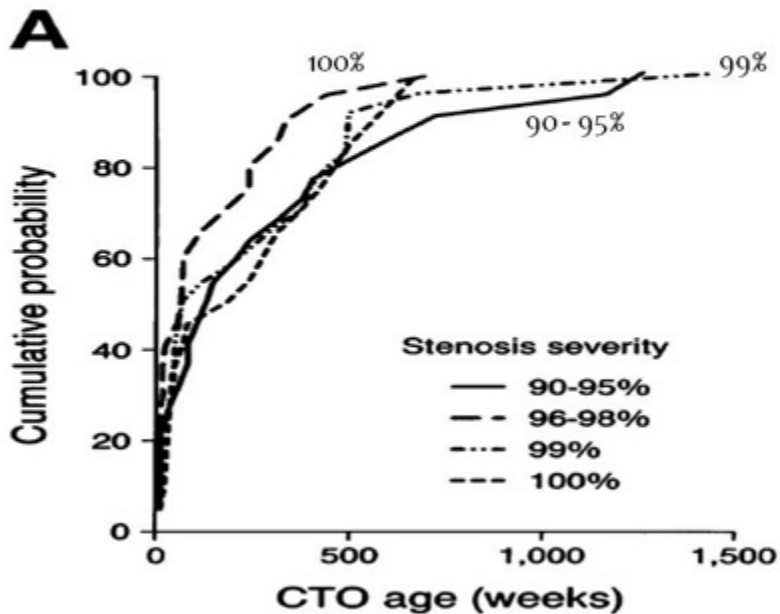
Histopathological features of CTO

	Tapering types		Abrupt types	
				
Number of cases	4	1	2	3
Small recanalization	(+)	(-)	(-)	(-)
Configuration of loose fibrous tissue	type 1	type 2	type 2	type 1
Length of the occluded segment	short	long	long	short

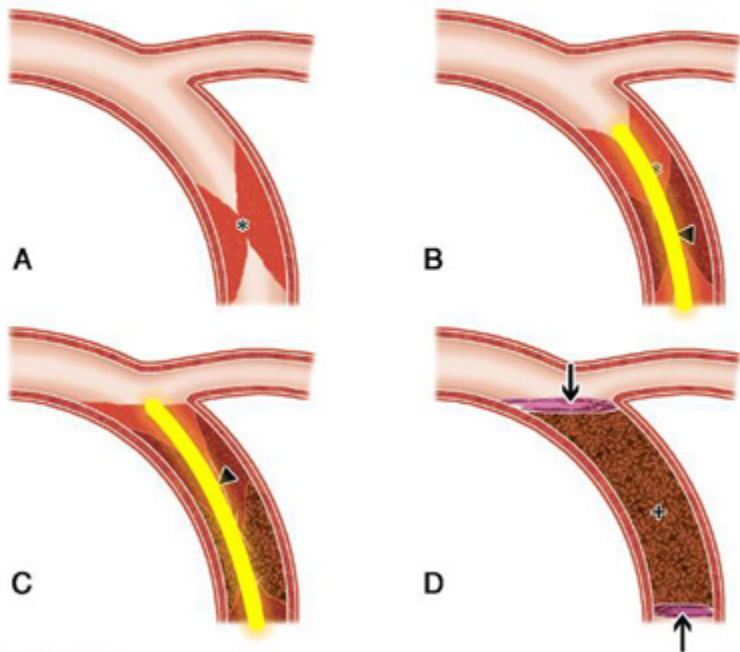
Progression of CTO



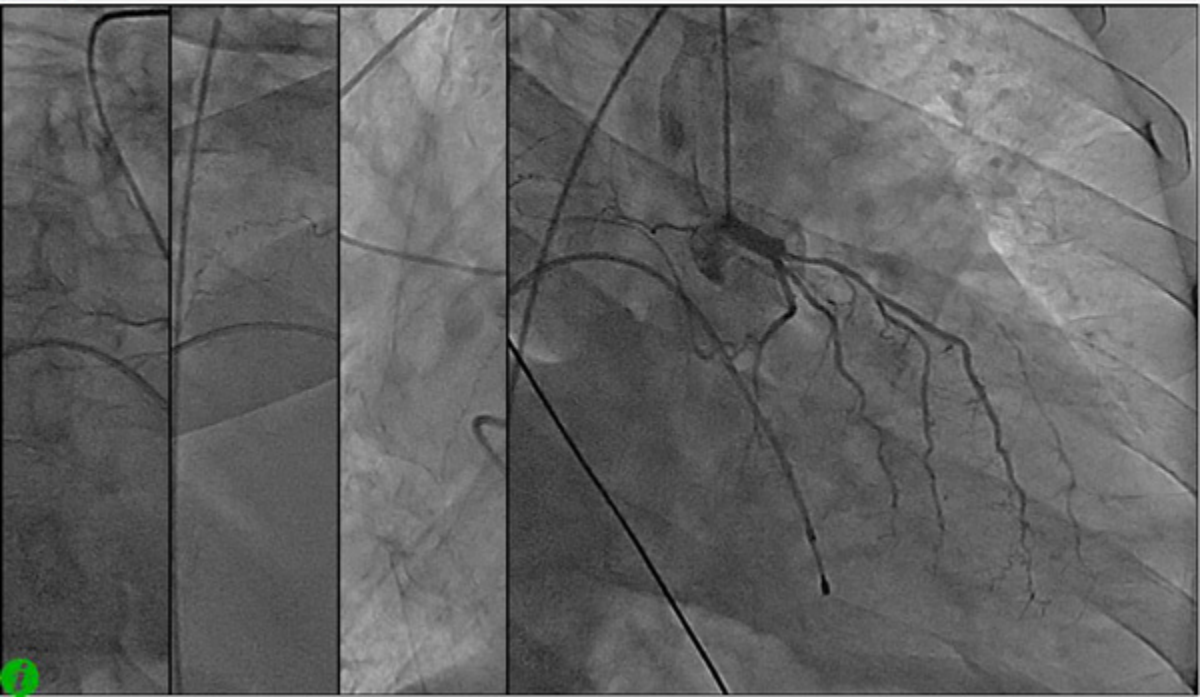
Histopathologic features of CTO



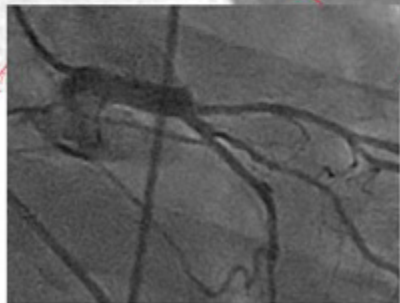
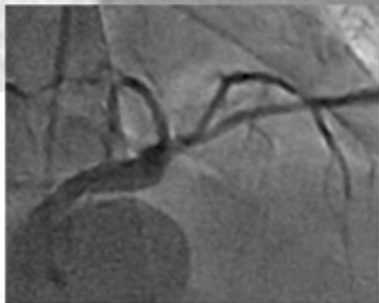
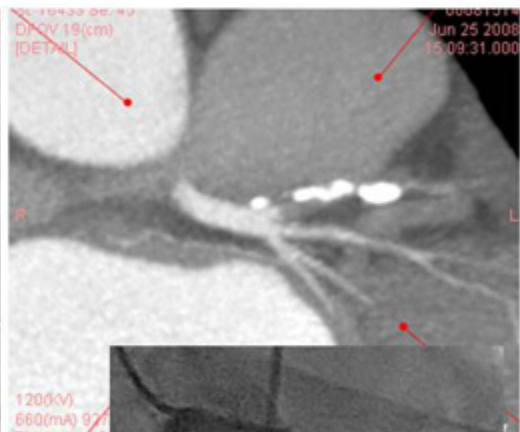
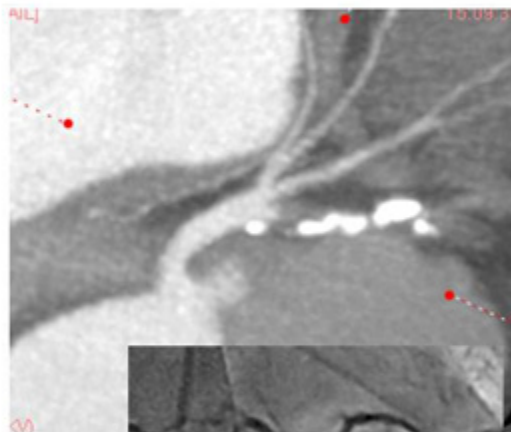
Progression of CTO



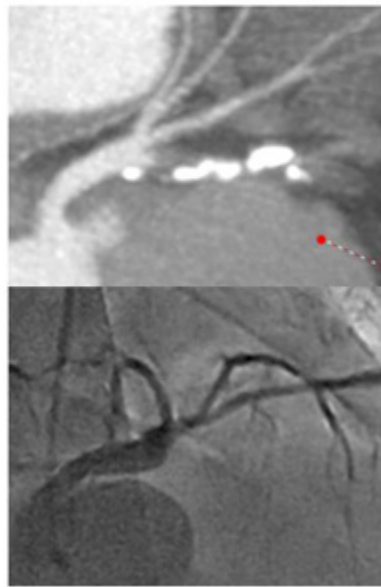
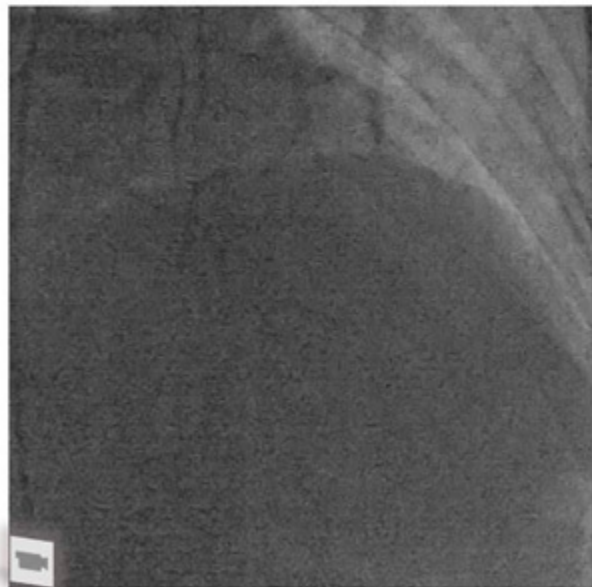
Case: occluded LAD (2008/6/14)



Heart CT (2008/6/25)

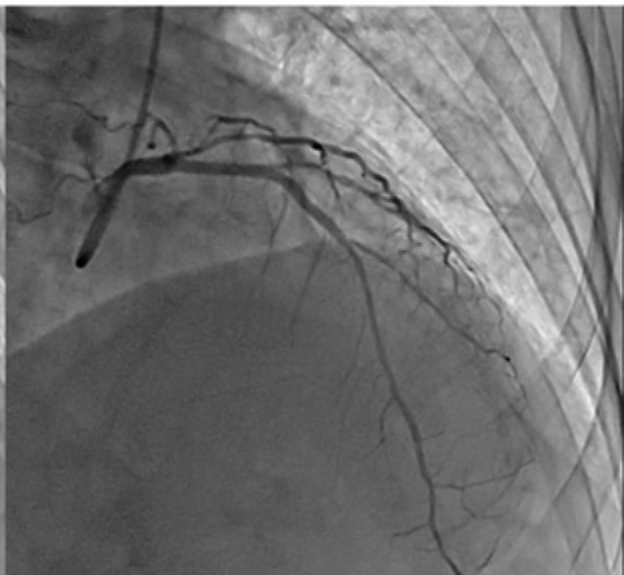
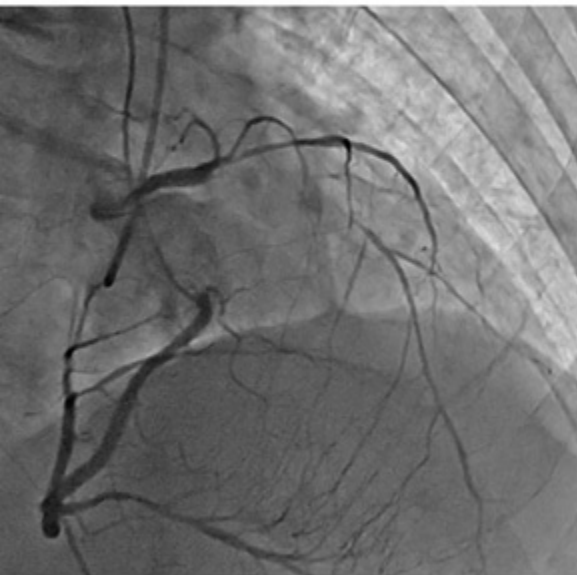


Loose Tissue Tracking

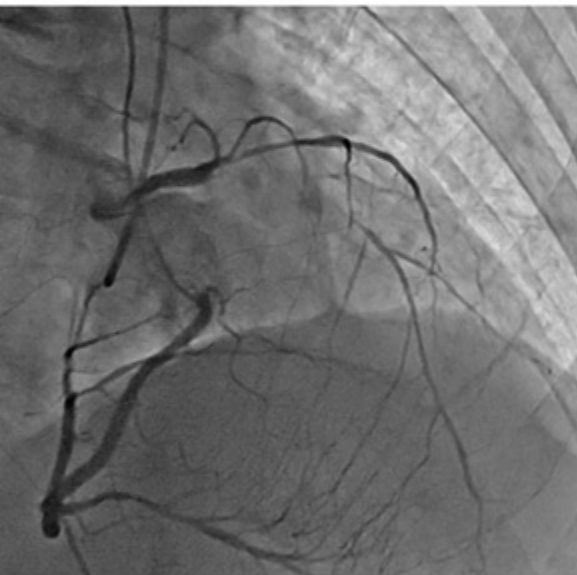


Wire looks like tracking soft part (loose tissue) in occlusion.

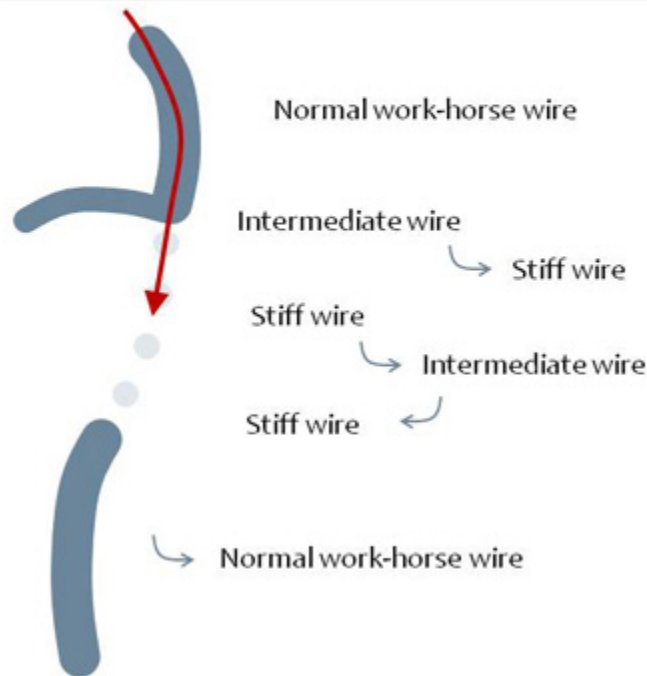
Wire cross for easy total occlusion



Wire cross for easy total occlusion



PCI CTO wire selection & handling antegrade approach



Careful wire control to
get dimple of CTO entry

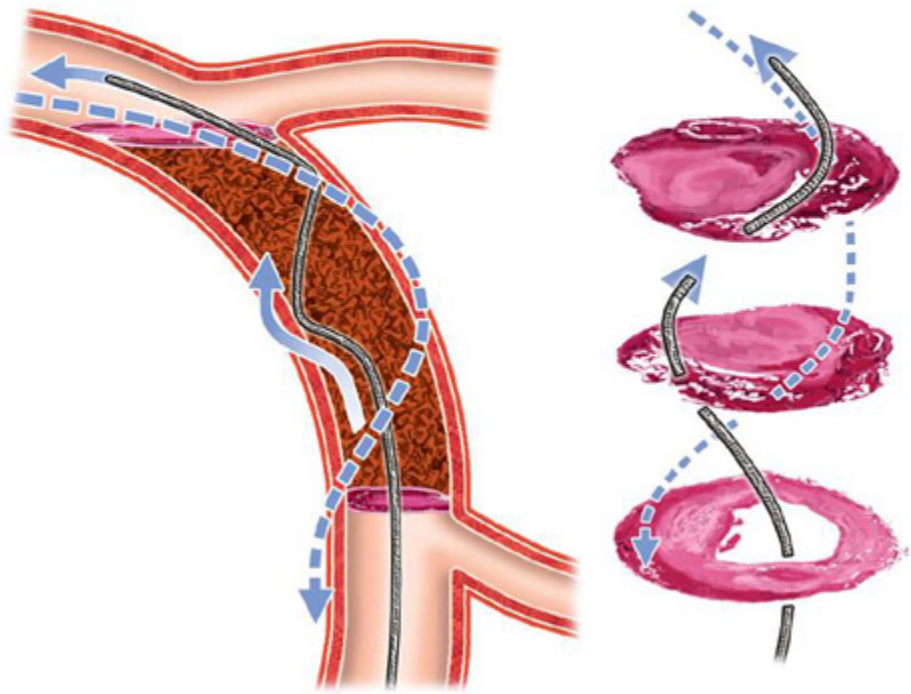


Drill or Controlled drill

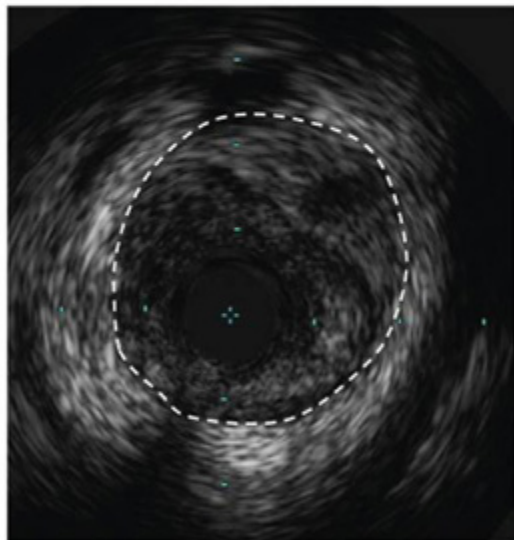


Controlled wire manipulation
(needs controllable wire)

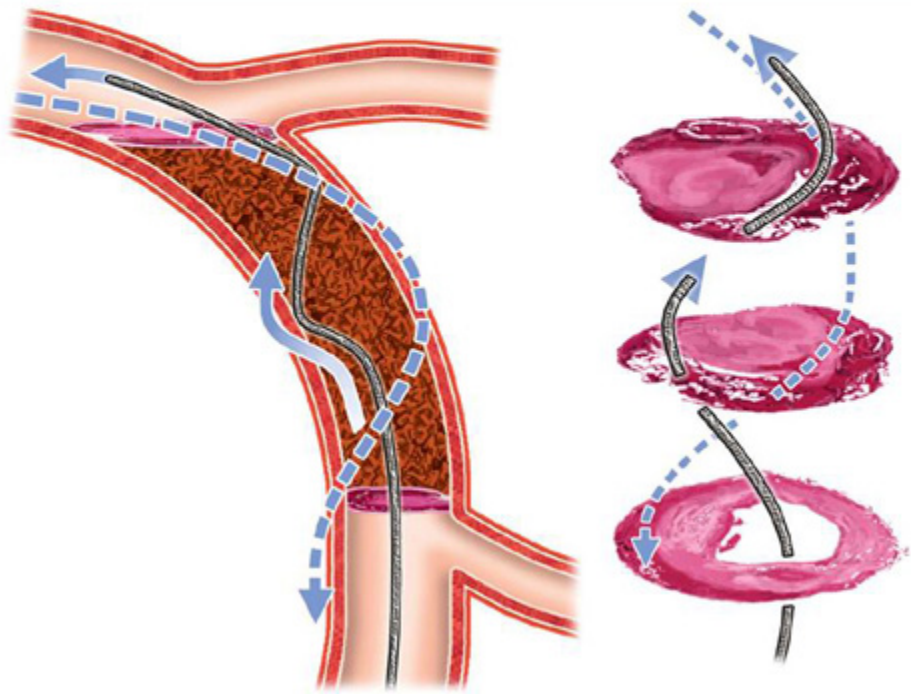
Subintimal tracking in retrograde



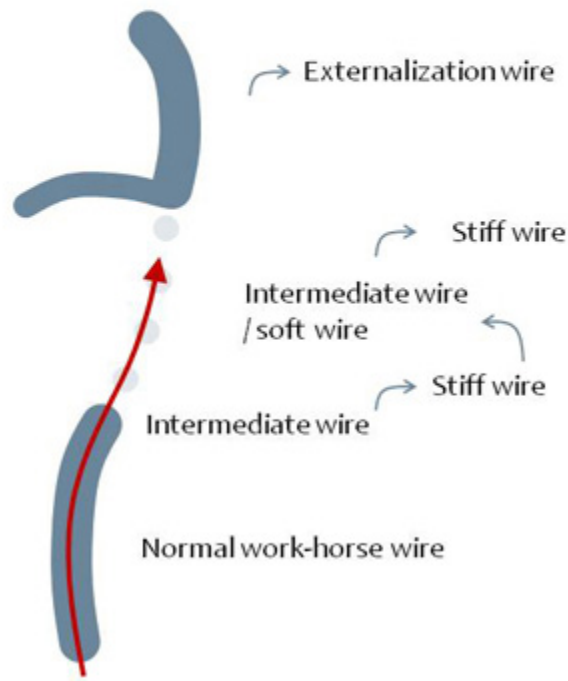
Subintima : histopathology vs. IVUS



Subintimal tracking in retrograde

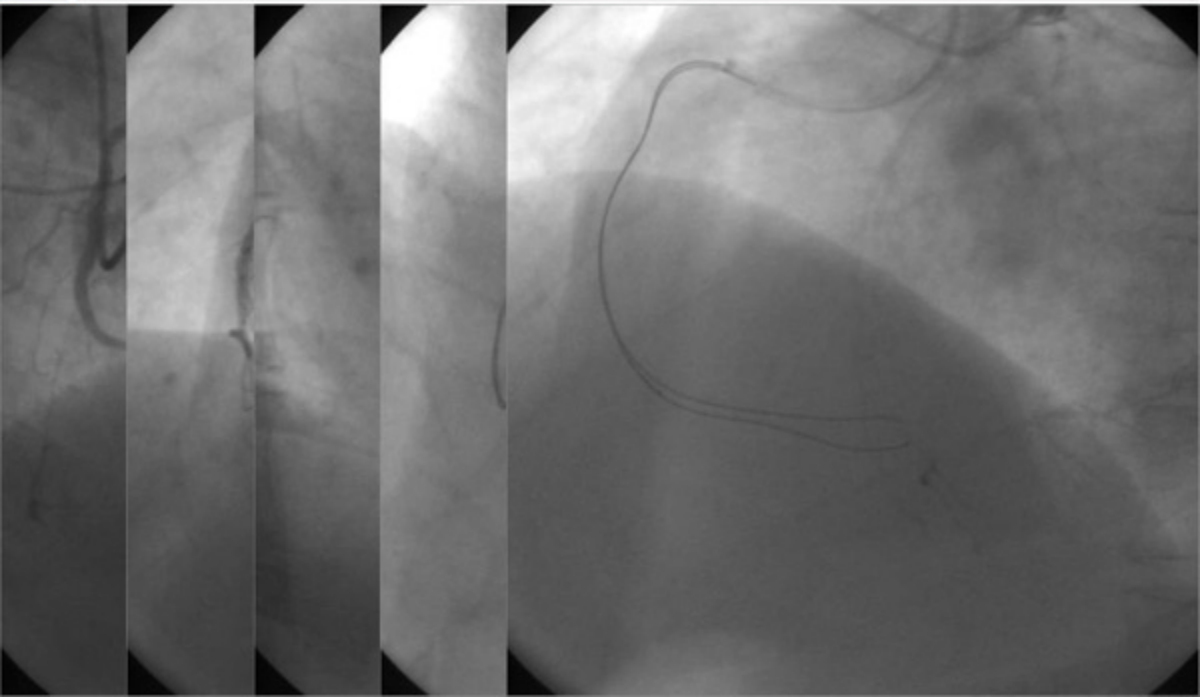


PCI CTO wire selection & handling retrograde approach



Intentional wire cross
↑
Polymer Jacket wire
Intermediate wire
with
Drilling or Knuckle
technique
↑
Careful wire control not
to perforate

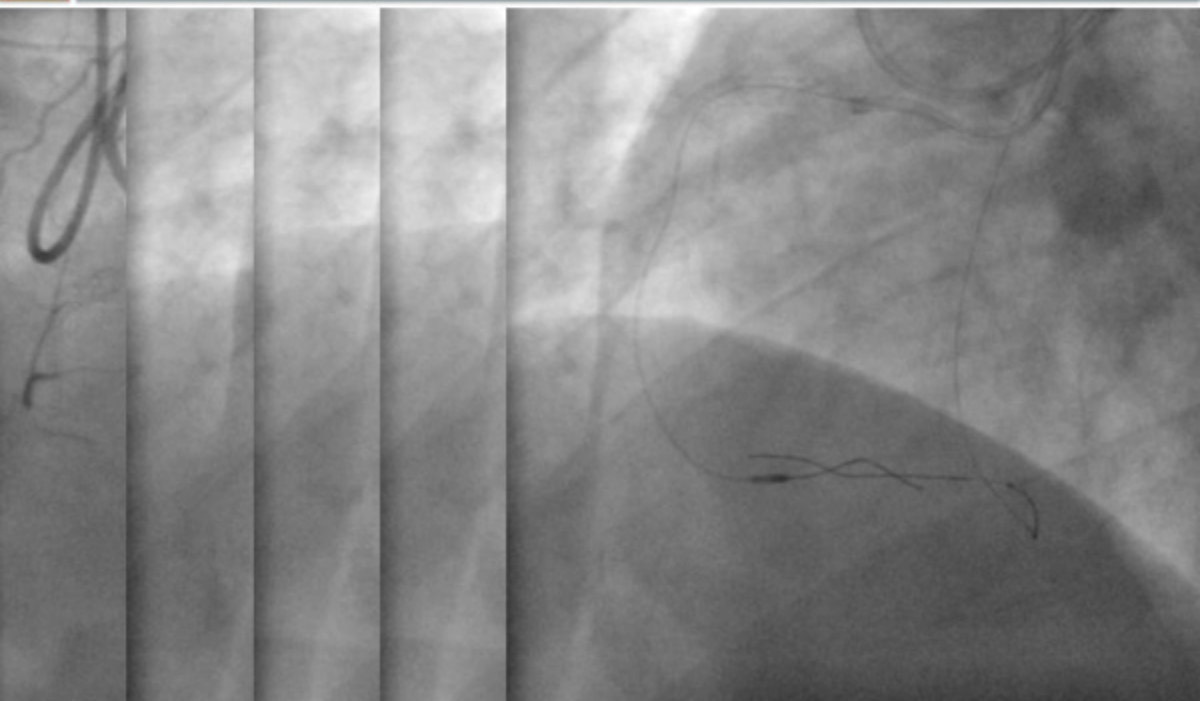
Diagnostic Angio & Stage 1 PCI



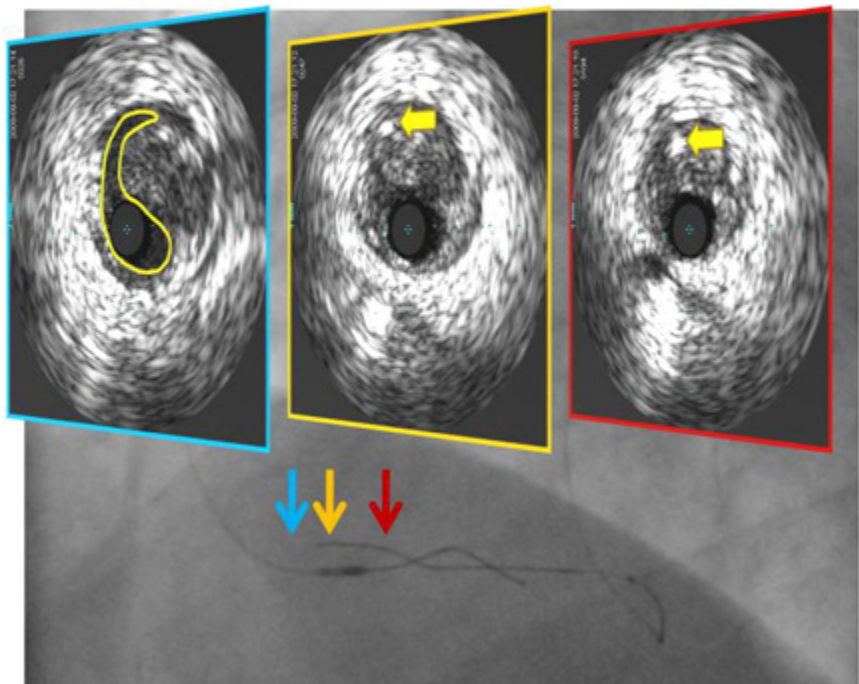
Stage 2 RETRO CTO PCI



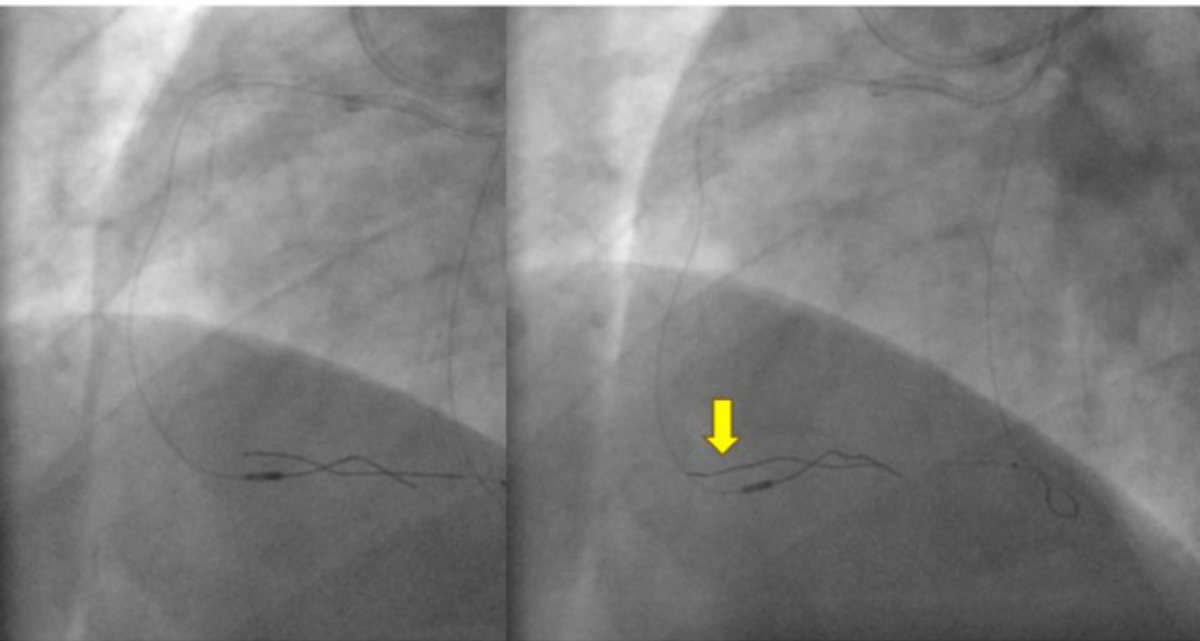
Stage 2 RETRO CTO PCI



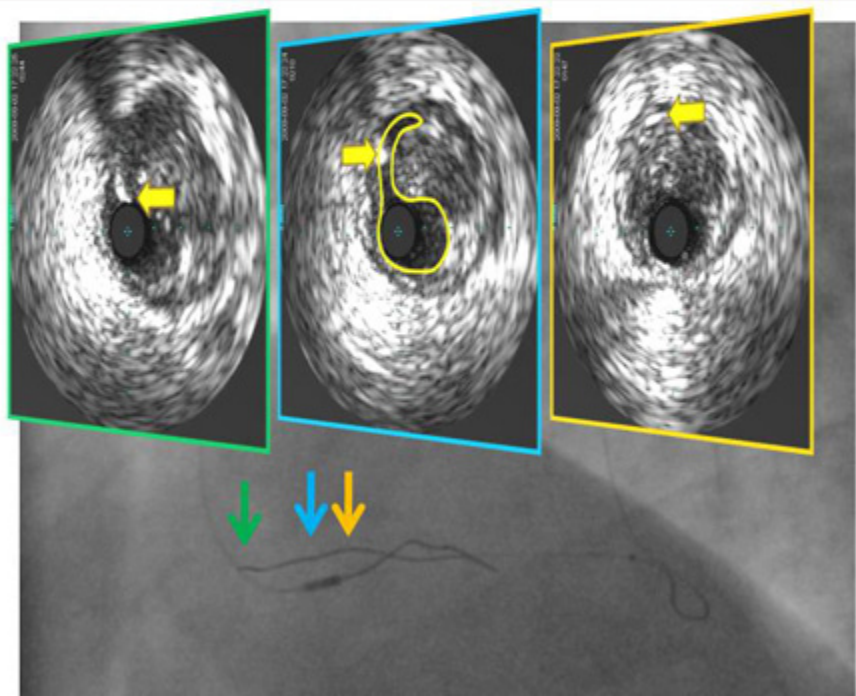
IVUS in reverse CART



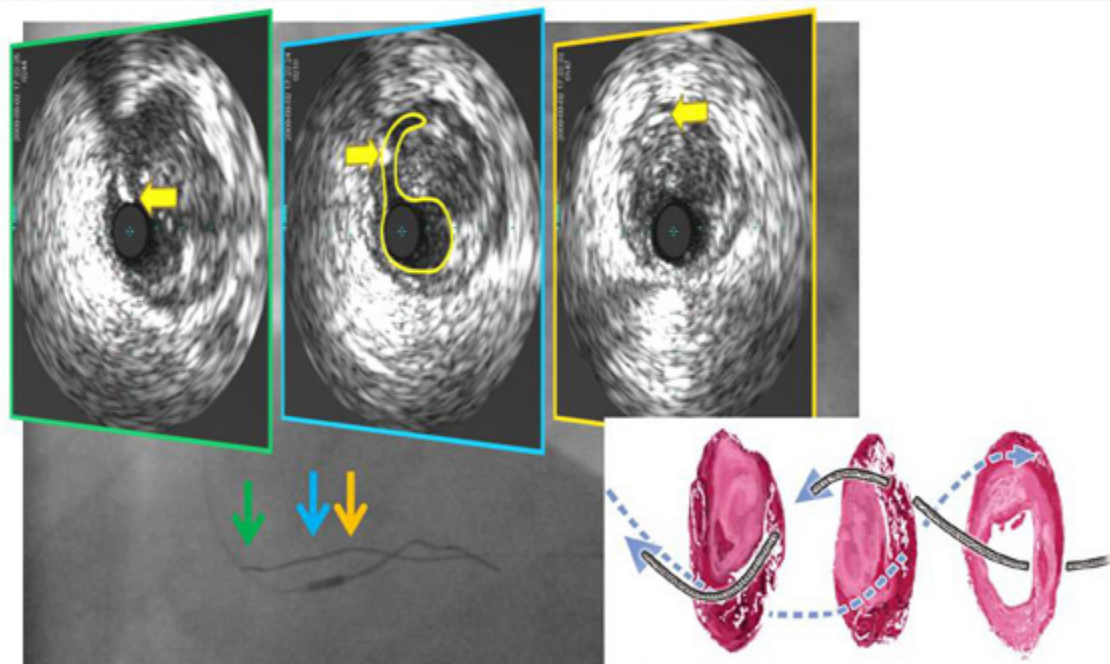
RETRO wire cross to prox. true lumen



IVUS after little advancing RETRO wire



IVUS after little advancing RETRO wire



Procedure & Final Result



Fundamental Wire Technique and Current Standard Strategy of Percutaneous Intervention for Chronic Total Occlusion With Histopathological Insights

Satoru Sumitsuji, MD,* Katsumi Inoue, MD,† Masahiko Ochiai, MD,‡
Etsuo Tsuchikane, MD,§ Fumiaki Ikeno, MD||

Osaka, Kitakyushu, Yokohama, and Toyobashi, Japan; and Palo Alto, California

Currently, successful treatment of chronic total occlusion (CTO) seems markedly improved, due to several new techniques and dedicated device developments. However, this improved success rate is often limited to procedures performed by skilled, highly experienced operators. To improve the overall success rate of percutaneous coronary intervention of CTO from a worldwide perspective, a deeper understanding of CTO histopathology might offer insights into the development of new techniques and procedural strategies. In this review, CTO histopathology and wire techniques are discussed on the basis of the fundamental concepts of antegrade and retrograde approaches. Although details pertaining to wire manipulation are very difficult to explain objectively, we tried to describe this as best as possible in this article. Finally, a systematic review of the current standard CTO strategy is provided. Hopefully, this article will enhance the understanding of this complex procedure and, consequently, promote safe and effective CTO-percutaneous coronary intervention for patients who present with this challenging lesion subset. (J Am Coll Cardiol Intv 2011;4:941-51) © 2011 by the American College of Cardiology Foundation

Summary

- Because CTO-PCI consist of physician, equipment, and lesion, we must know CTO lesion with histologic aspect.
- In CTO histology, “intimal plaque vs. subintimal space” and “loose tissue including micro-channels” are most important for CTO-PCI.
- With understanding of those, CTO-PCI can be more logic, reproducible, and successful.