CART to Reverse CART: Temporal Trend of Method

Satoru Otsuji, MD.
Higashi Takarazuka Satoh Hospital
Japan

Introduction

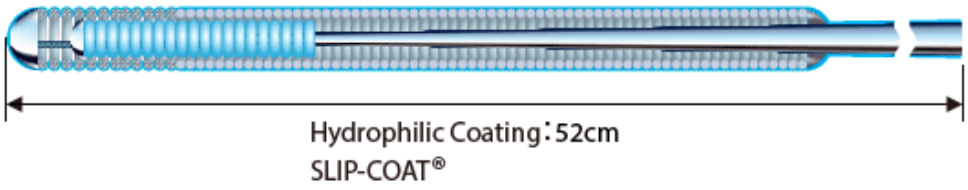
Development of retrograde approach and DES improved primary and long-term results, which expands CTO-PCI to be performed successfully all over the world.

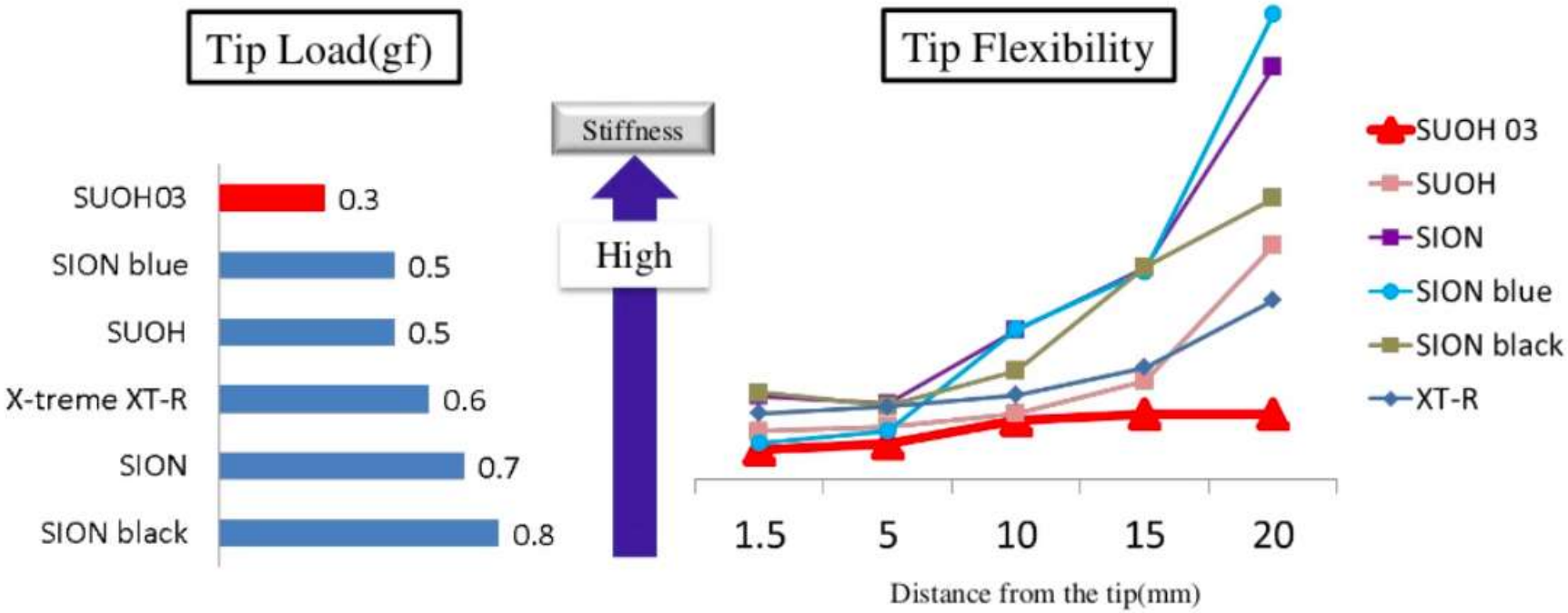
Innovation of guide wire and other devices lead primary success rate to be a high level.

SUOH 03

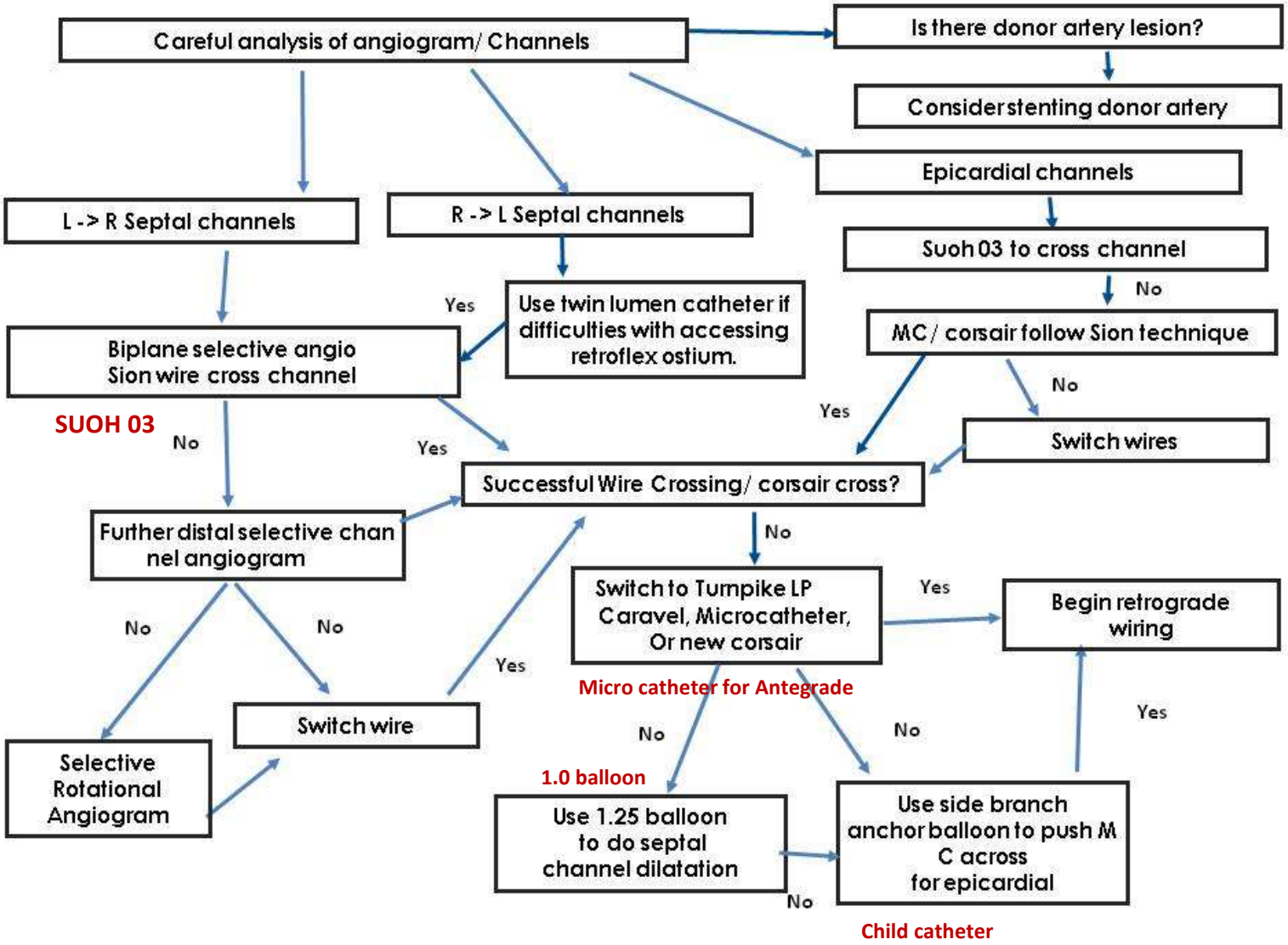
SUOH03 is a very flexible wire, flexibility maintained from tip to its proximal part.

It facilitates to cross the small bended vessel by using its increased flexibility and track-ability.

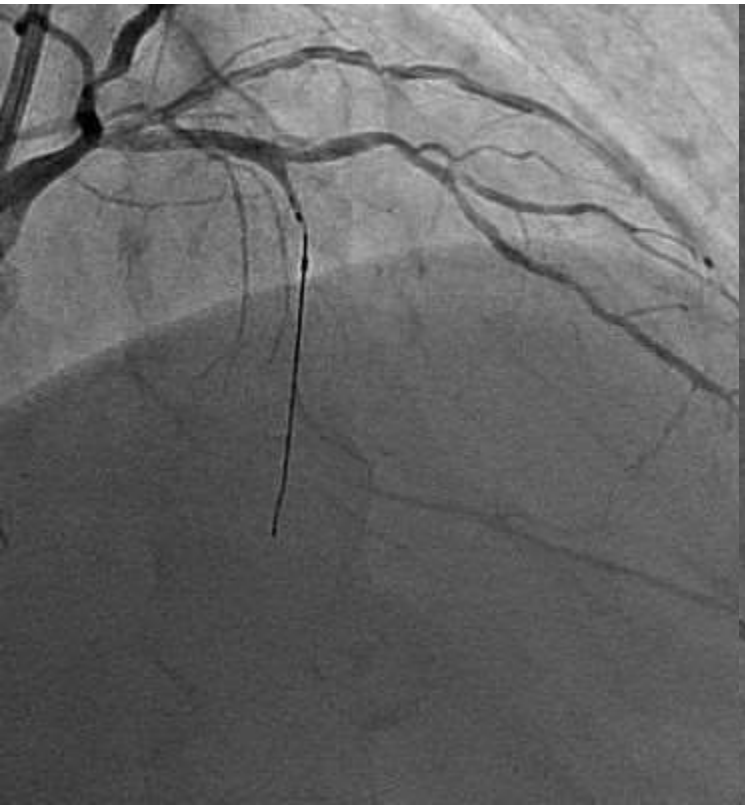




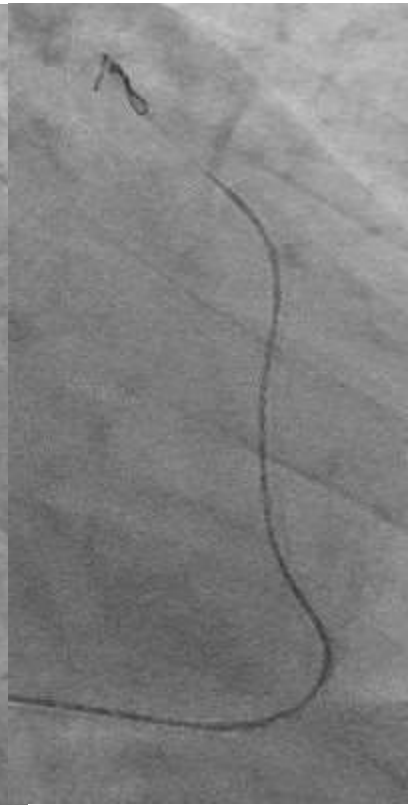
Retrograde approach algorithm



LAD CTO



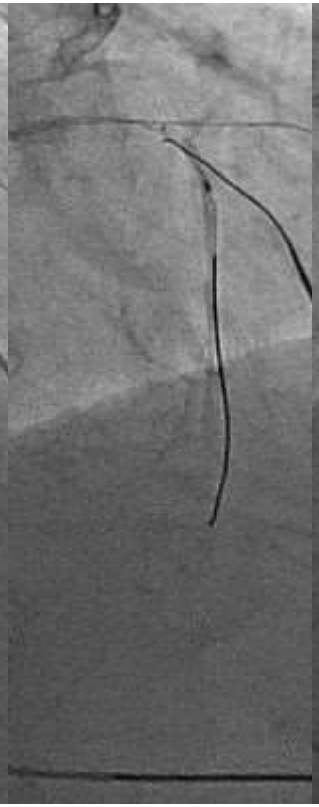
IVUS confirming the entry



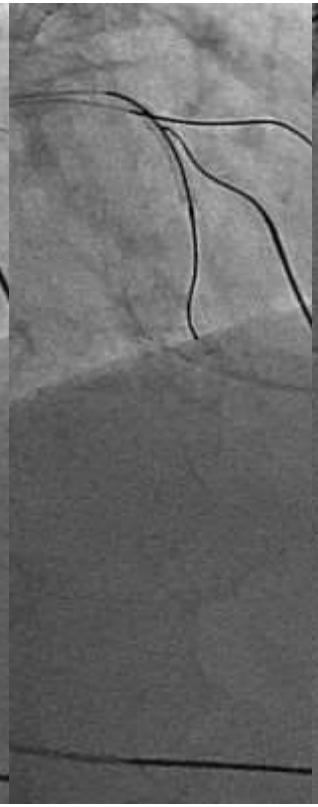
Tiny retrograde route successfully crossed by SUOH 03 and Corsair pro

Procedures

Difficulty for antegrade insertion of Conquest pro 12



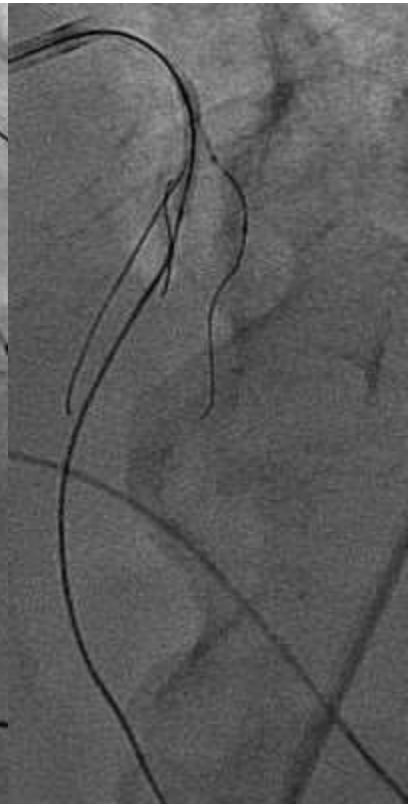
Difficulty for retrograde crossing via GAIA3



Failure of modified reverse CART

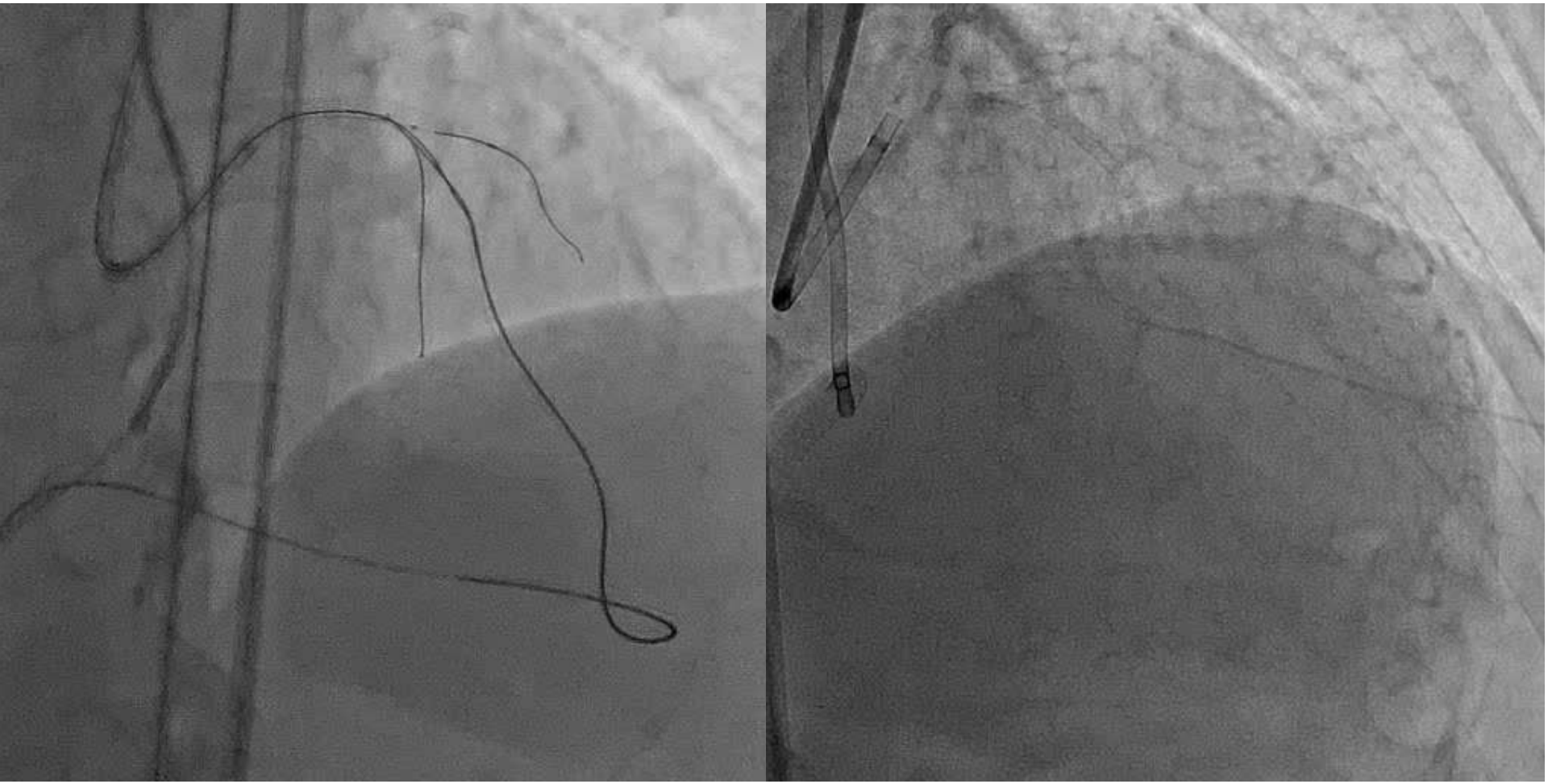
Antegrade wire insertion of Conquest pro 8-20

Successful small balloon of 1.0mm insertion via anchor balloon technique after preparation of Tornus

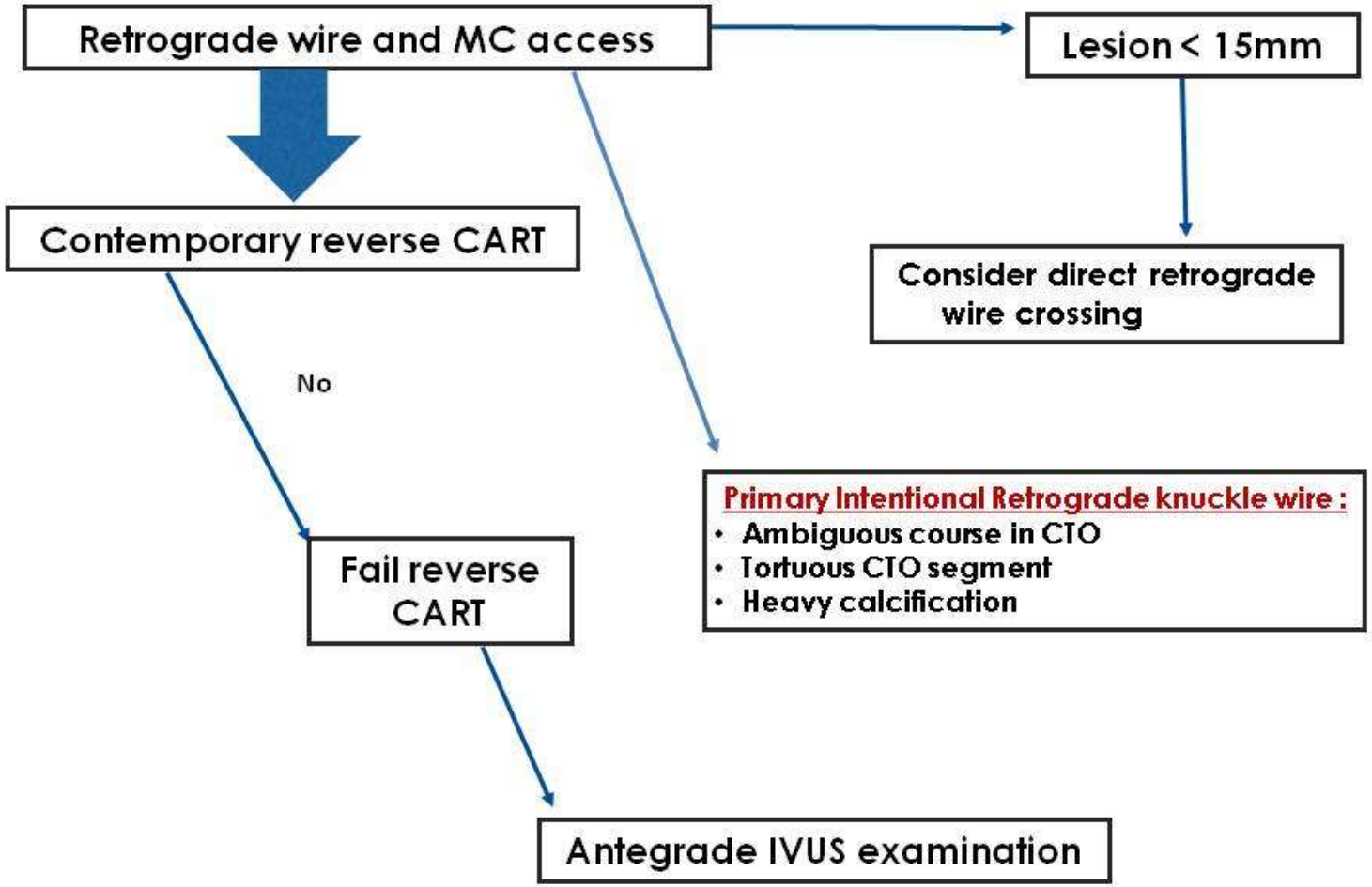


Contemporary reverse CART by using 2mm balloon and GAIA 3

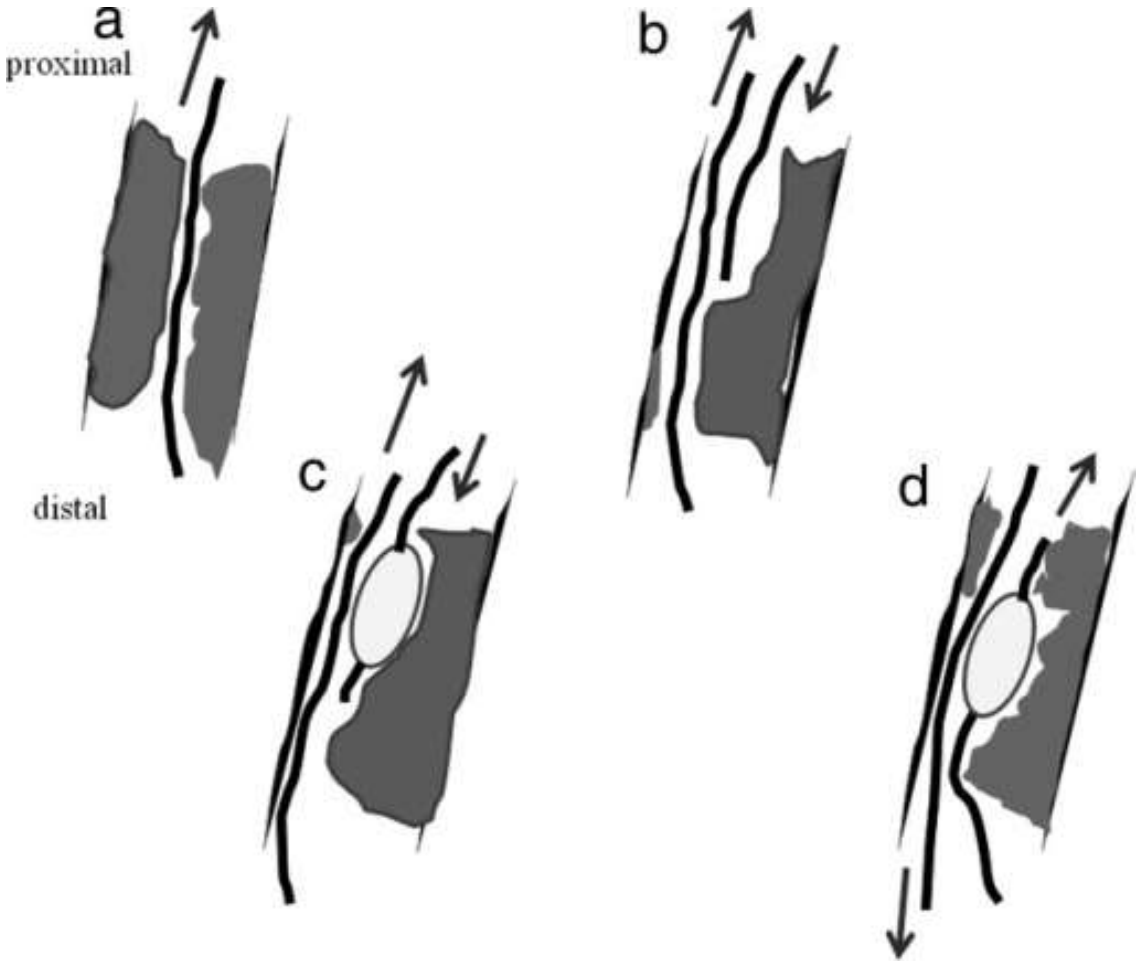
Successful contemporary r-CART



Retrograde approach algorithm



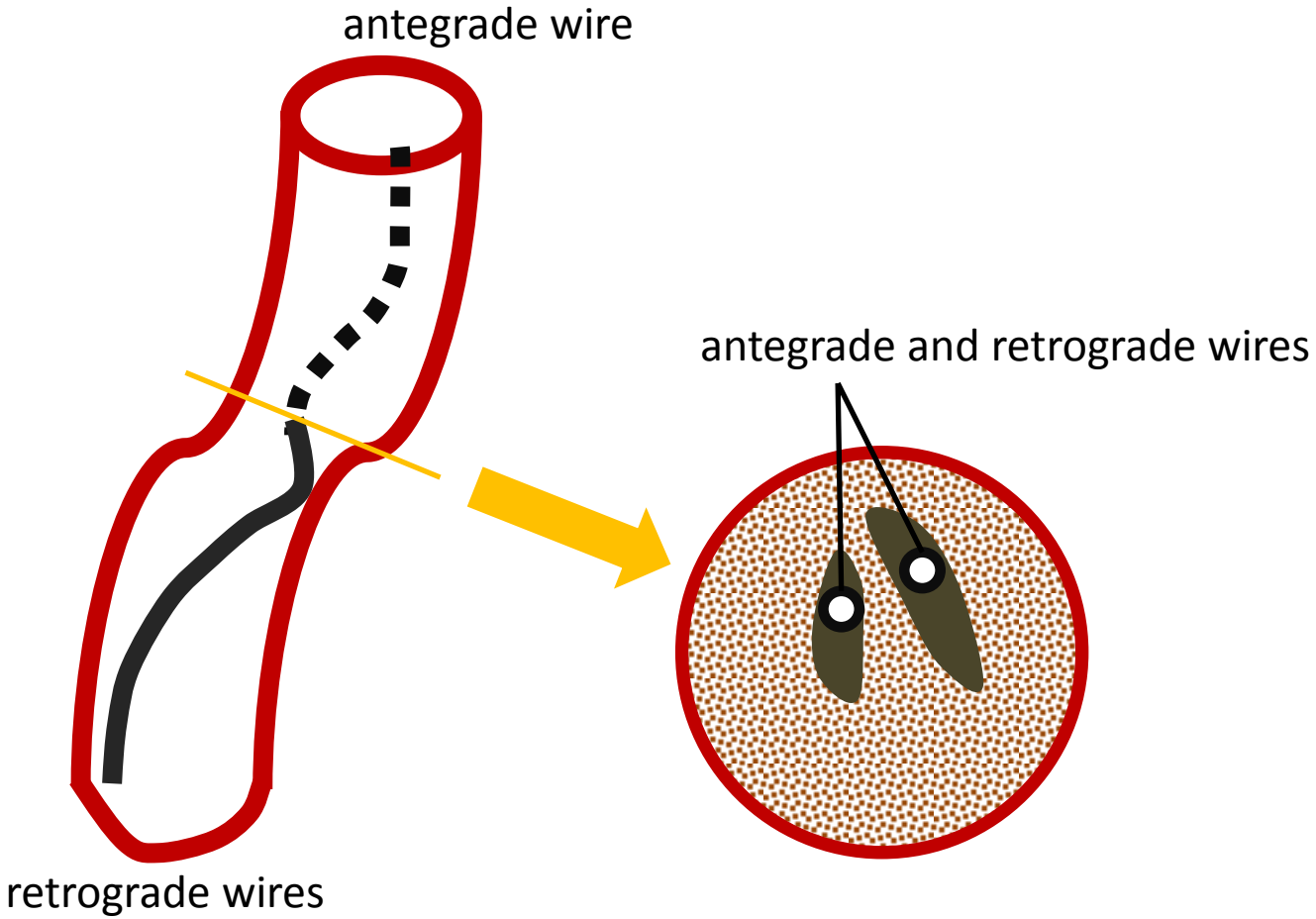
Retrograde CTO crossing techniques.
(a) Retrograde wiring, (b) Kissing wire technique,
(c) Reverse CART technique, (d) CART technique.



Muramatsu et al. CCI 2013

Limitation of kissing wire technique

If antegrade and retrograde wires are in different layers,
It is difficult to connect both wires.



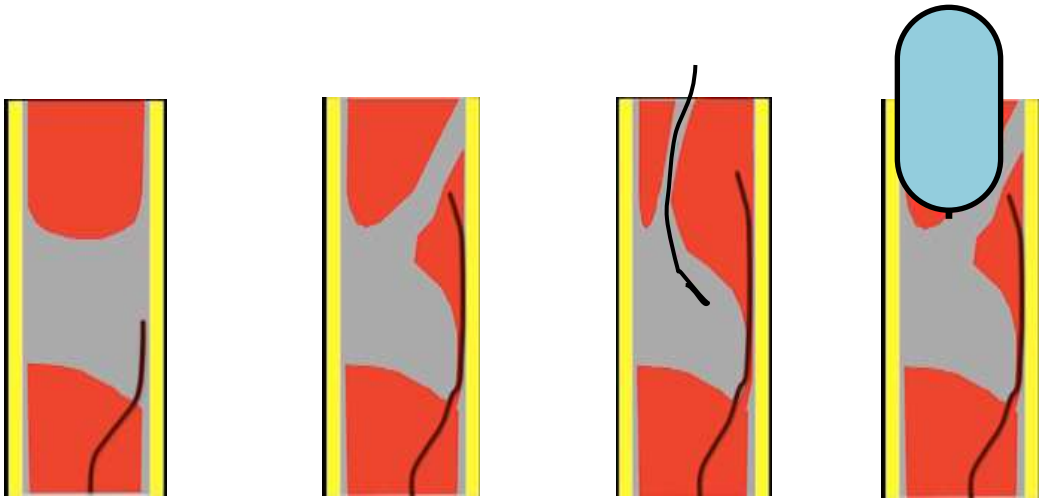
Limitation of original reverse CART

In the original reverse CART, a retrograde wire was advanced first, including attempting at retrograde direct crossing.

Connection was made at the position where bilateral wires was overlapped.

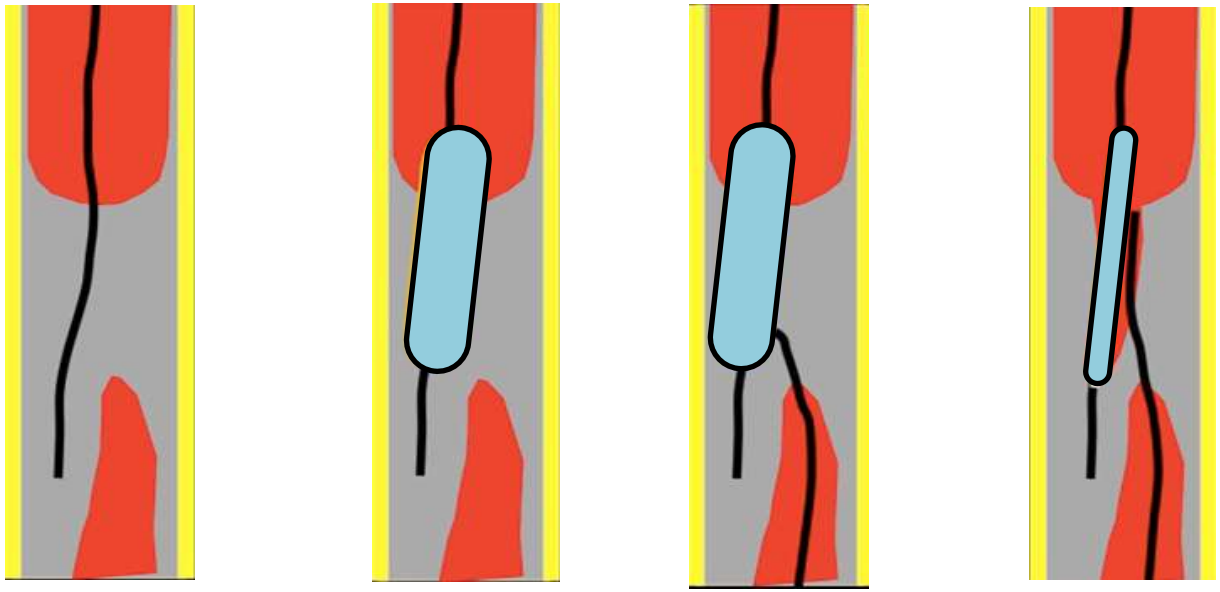
Once the retrograde dissection was created by retrograde wiring, further retrograde GW control became very difficult.

In those situations even if using IVUS guidance, making a connection is sometimes very difficult.



Concept of contemporary reverse CART

Avoid primary retrograde wiring
Avoid kissing wire technique
Preferred antegrade ballooning (preparation)
Smaller Balloon
Wire with good torque-able stiff wires



Limitation of contemporary reverse CART

Short CTOs

Difficult antegrade preparation. Ballooning beyond the CTO segment will make a hematoma.

Long CTOs

Ambiguous vessel course

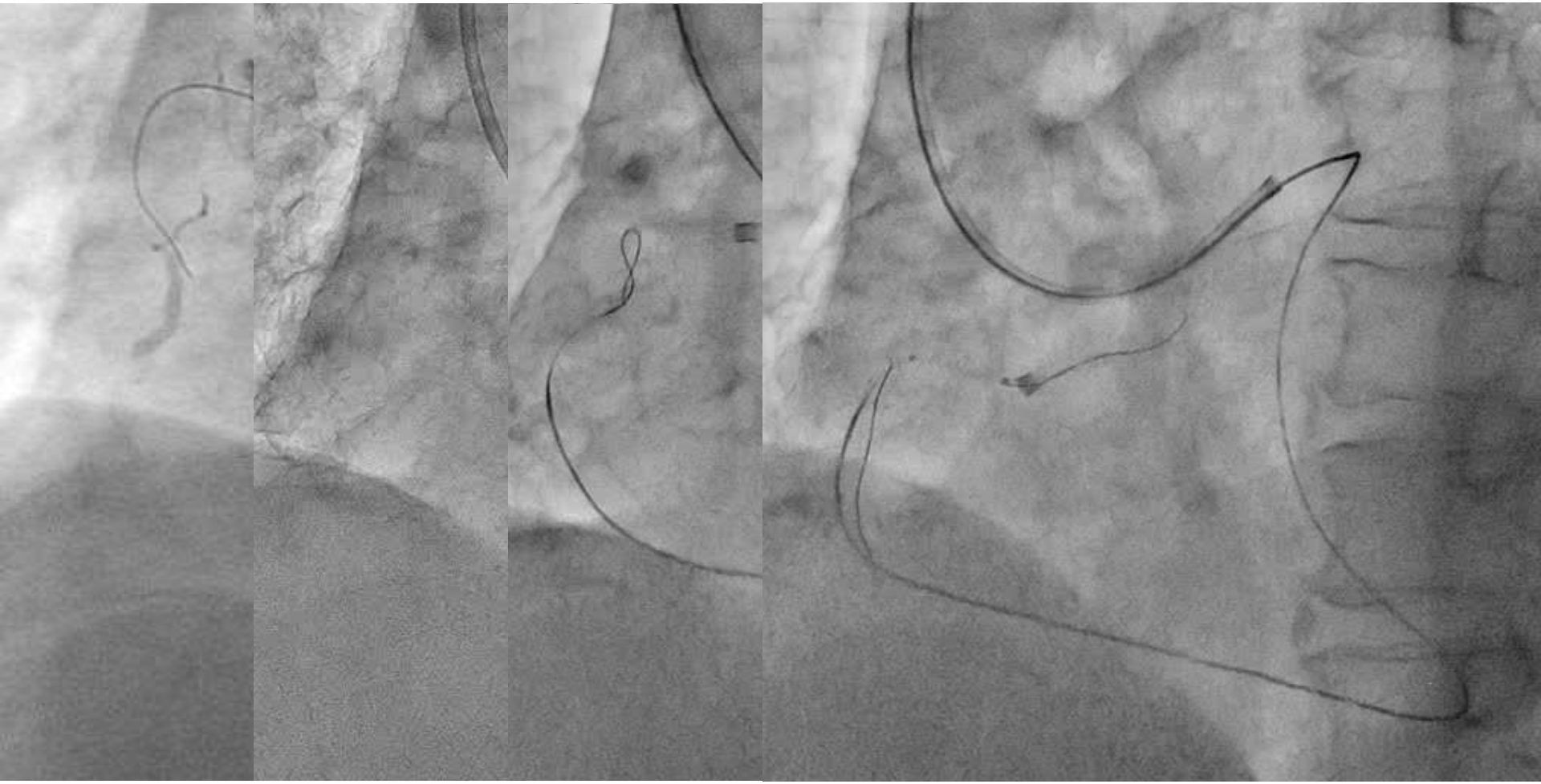
It is very difficult to draw the ideal line along to the vessel. Non-taped wire and/or knuckle wire is recommended.

No interventional collateral

Antegrade IVUS guidance

ADR device

RCA CTO, Knuckle wire original r-CART



Final angiograms

Contemporary retrograde approach

Antegrade preparation before retrograde wiring in contemporary reverse CART. Antegrade ballooning position should be limited within the CTO.

Antegrade wire position far beyond the occlusion may cause the dissection/hematoma.

In short length CTO, direct retrograde wire crossing may be attempted.

In long CTO, to avoid vessel perforation, it is reasonable to use non tapered wires and knuckle wire from retrogradely. Retrograde GAIA should not be used, if a long distance remains target antegrade balloon or in case of ambiguous vessel course.

Conclusion

Contemporary retrograde approach using algorithm would be effective to improve clinical outcomes.

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