

Indication and Limitation of Antegrade Dissection Reentry

Shunsuke Matsuno, MD
The Cardiovascular Institute, Japan

Disclosure

- I have no financial conflicts of interest to disclose concerning the presentation.

ADR in Japan

- Antegrade dissection reentry (ADR) with the Stingray system is one of the essential components of the hybrid algorithm and the hybrid operators use it in 20-34% of cases.
- In Japan, the Stingray device has been available since 2017, but its use has remained low.
- Though ADR may be helpful in shortening procedure time or avoiding possible risks concerning the retrograde approach, its application in Japanese CTO PCI field has not been established.

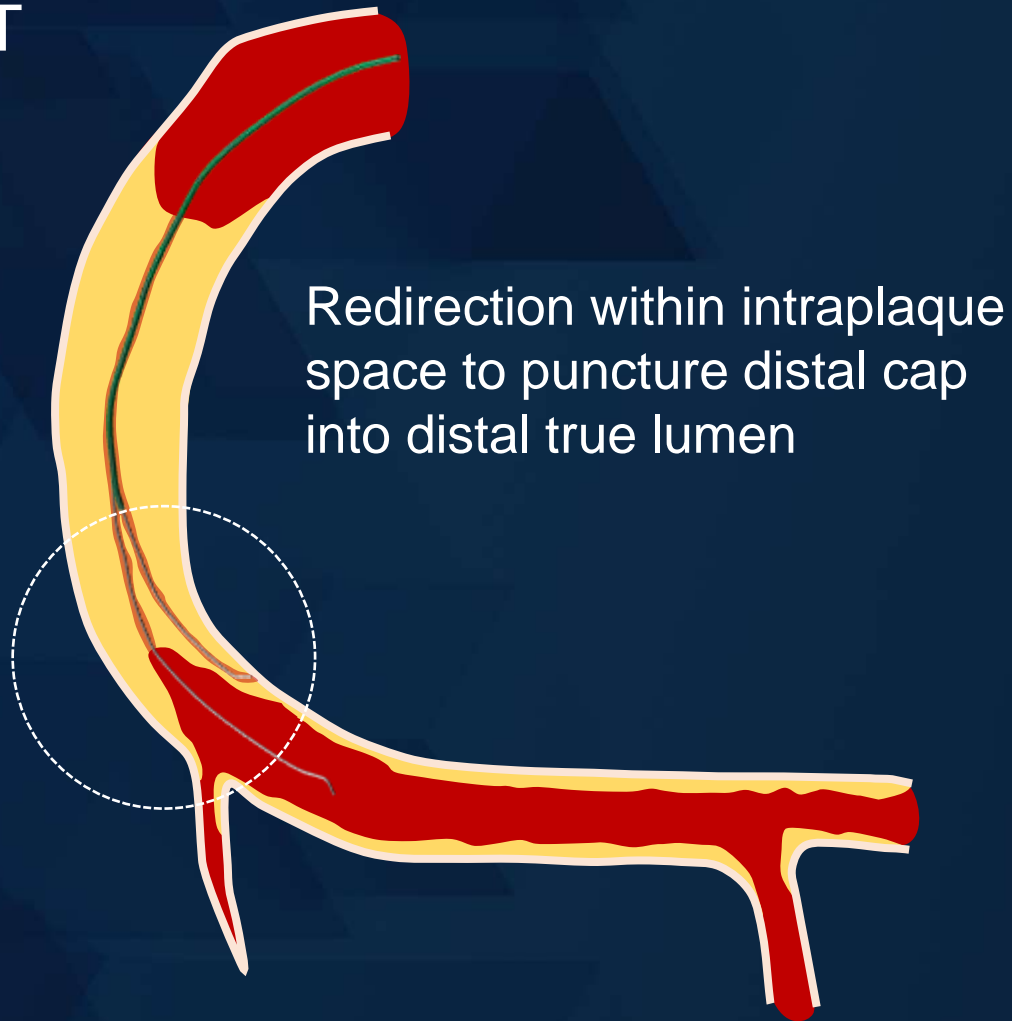
Indication of ADR

- In the APCTO club algorithm, ADR and parallel wiring are the two main options when antegrade single wire escalation has failed and retrograde option is not easy or unavailable.
- > We need to decide on whether ADR or parallel wiring should be done.

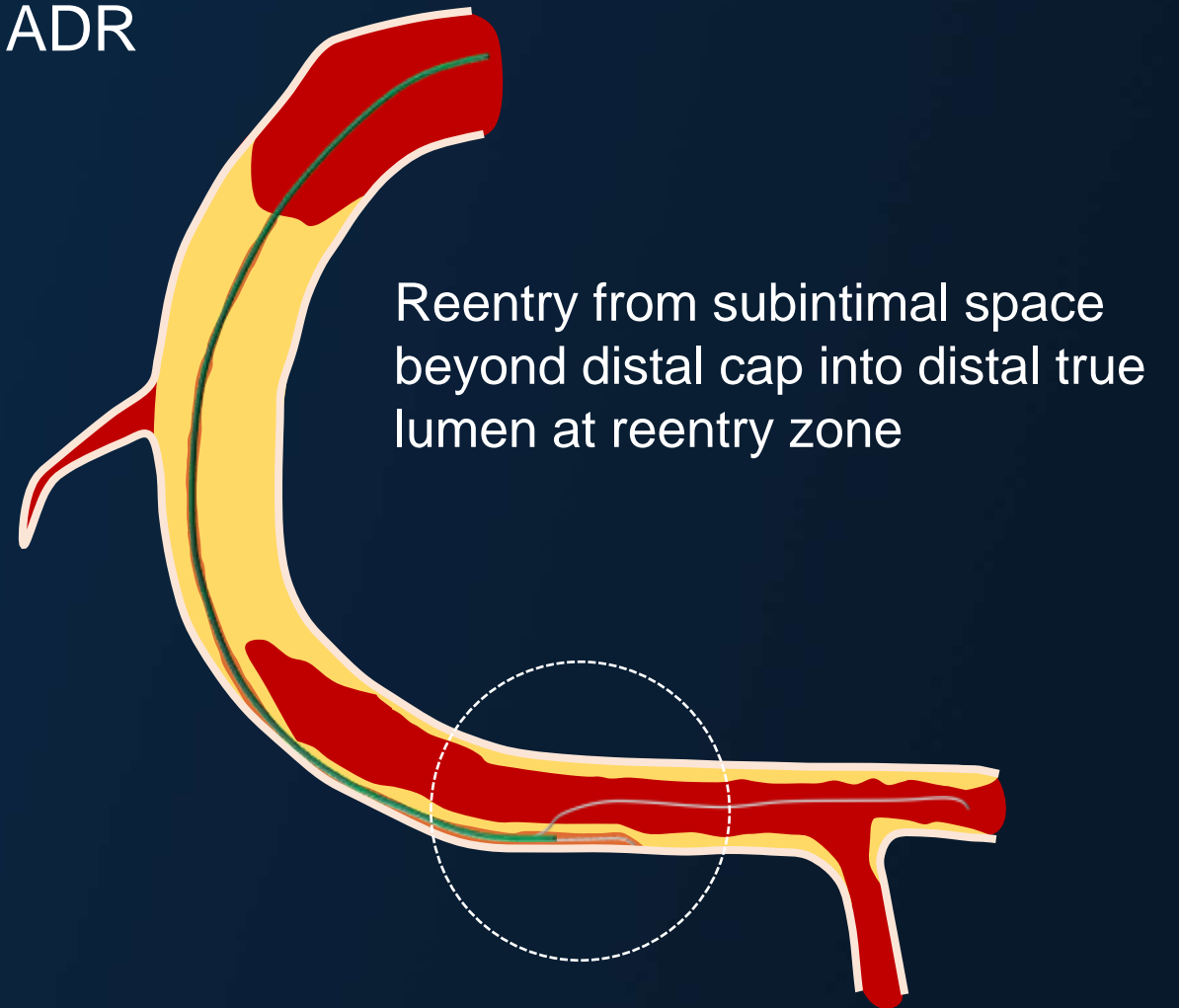


Difference in concepts of PWT and ADR

PWT



ADR



Anatomical factors which impacts on choice

- Favorable to ADR
 - Disease and calcification free reentry zone
 - Absence of bifurcation close to distal cap
 - Lack of hematoma expansion
- Favorable to PWT
 - Non-calcified softer distal cap
 - Intraplaque position of the first wire
 - Lack of peri-wire space expansion with preserved antegrade wire control
- Favorable to both
 - Large distal lumen size
 - Good retrograde filling
 - Ease of delivery of the Stingray or dual-lumen catheter

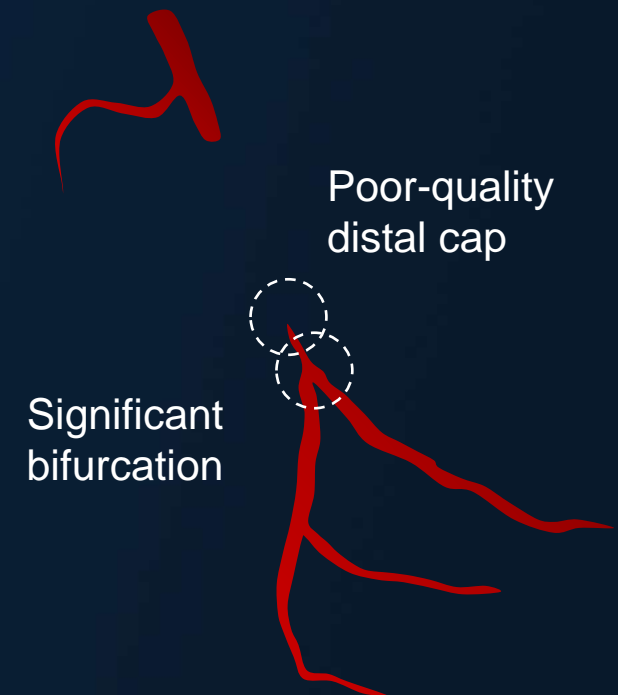
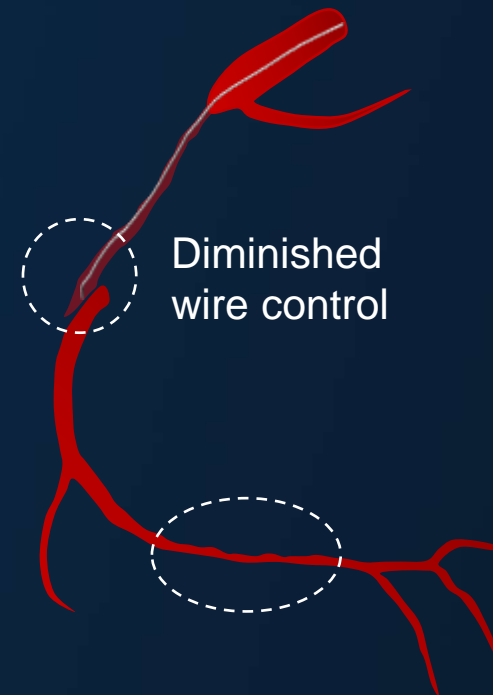
Next option after single WE has failed ?

PWT << ADR

PWT >> ADR

PWT < ADR

PWT > ADR

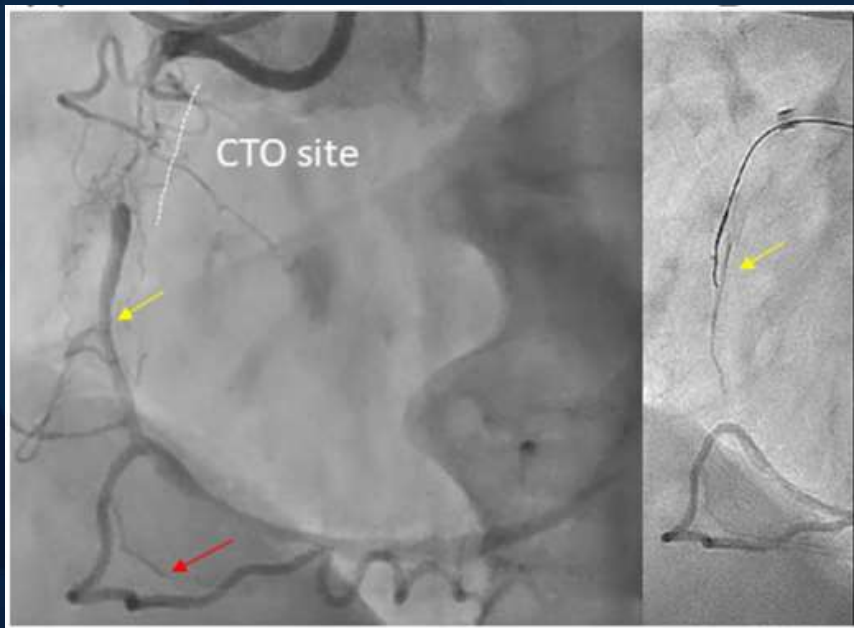


Limitations of ADR

- Higher incidences of peri-procedural complications
 - Coronary perforation
 - Myocardial infarction
- Unreliability of reentry procedure

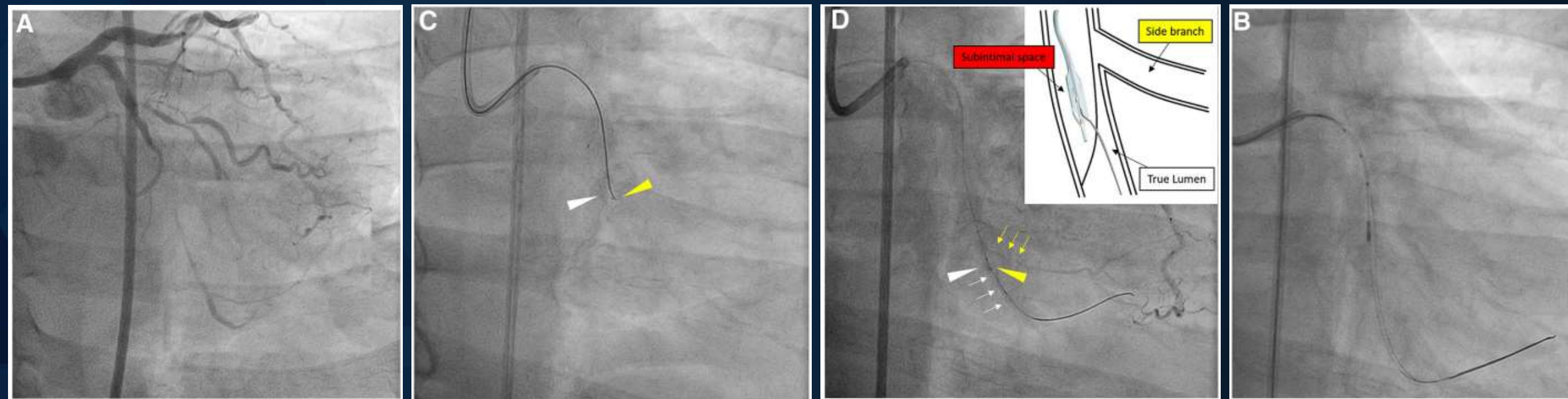
Coronary perforation

- 9.3% in the FAST-CTOs trial
 - Approximately 30% of perforations were caused by CrossBoss migration into a small side branch
- > CrossBoss has not been used for subintimal crossing.



Myocardial infarction

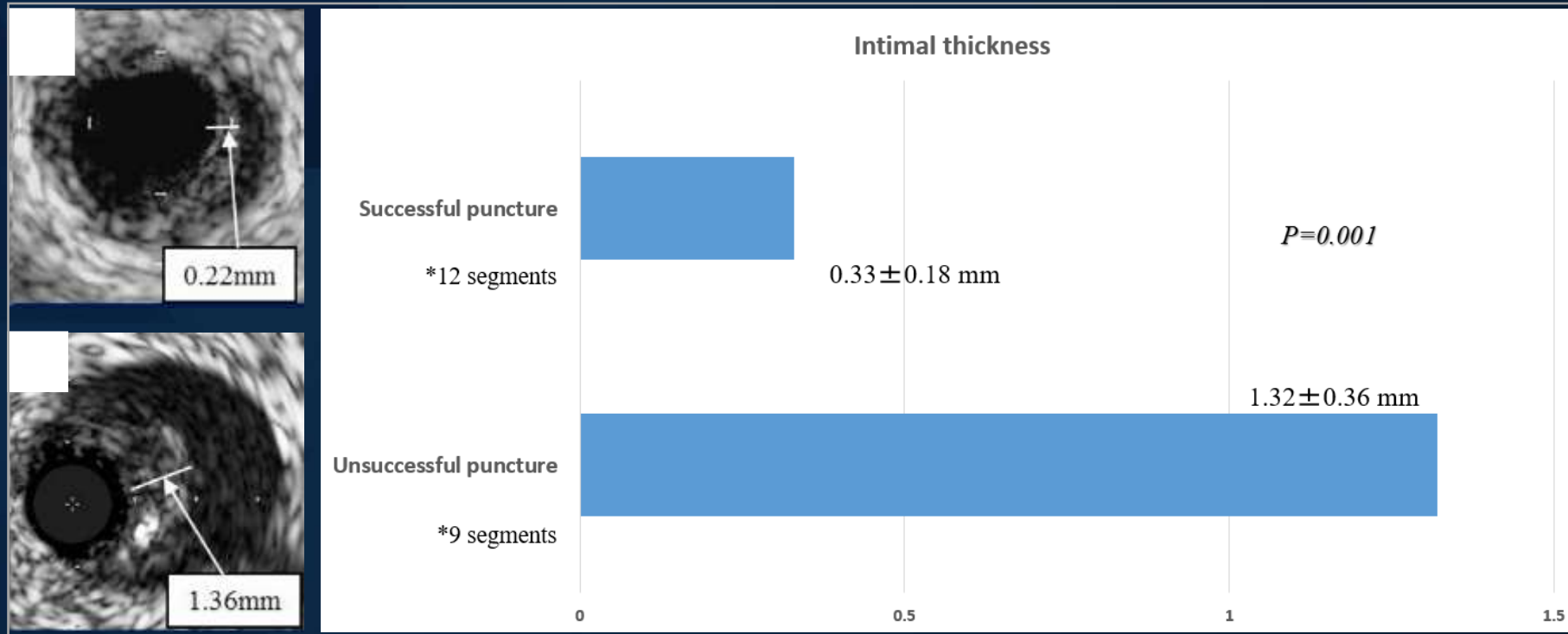
- As side branch occlusion can lead to myocardial infarction, ADR should be avoided or carefully applied for CTO involving significant side branches.
- IVUS-guided rewiring after ADR was reported to be useful to rescue a side branch in the distal true lumen.



Unreliability of reentry procedure



Plaque thickness and reentry procedure



Tsuchikane E, et al. J Invasive Cardiol. 2012; 24(8): 396-400.

Various factors which impact on reentry

- Plaque load
- Plaque thickness
- Calcification
- Lumen size



Pre-procedure cardiac CT

- Tortuosity of zone
- Distance of first wire to true lumen
- Hematoma size
- Stability of Stingray balloon
- Operator experience

ADR with pre-procedure cardiac CT

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ORIGINAL ARTICLE



Japanese multicenter registry evaluating the antegrade dissection reentry with cardiac computerized tomography for chronic coronary total occlusion

Maoto Habara¹ · Etsuo Tsuchikane¹ · Kazuki Shimizu² · Yoshifumi Kashima³ · Kenichiro Shimoji⁴ · Shigeru Nakamura⁵ · Takeshi Niizeki⁶ · Takaki Tsutsumi⁷ · Yoshiaki Ito⁸ · Tomohiro Kawasaki⁹ · for the Bridge point Club Japan

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Abstract

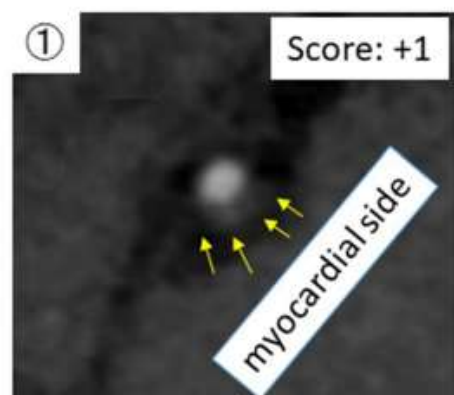
Recently, antegrade dissection re-entry (ADR) with re-entry device for chronic total occlusion (CTO) percutaneous coronary intervention (PCI) has evolved to become one of the pillar techniques of the hybrid algorithm. Although the success rate of the device is high, it could be improved. We sought to evaluate the current trends and issues associated with ADR in Japan and evaluate the potential of cardiac computed tomography angiography (CCTA) for ADR procedure. A total 48 patients with CTO suitable for ADR evaluated by baseline conventional angiography and CCTA were enrolled. Procedural success and technical success were evaluated as the primary and secondary observations. Furthermore, all puncture points were analyzed by CCTA. CT score at each punctured site depended on the location of plaque deposition (none; +0, at isolated myocardial site; +1, at epicardial site; +2) and the presence of calcification (none; +0, presence; +1) was analyzed and calculated (score 0–3). Overall procedure success rate was 95.8%. Thirty-two cases were attempted with the ADR procedure and 25 cases of them were successful. The technical success rate was 78.1% and myocardial infarction or other major complications were not observed in any cases. CT score at 60 puncture sites in 32 cases were analyzed and the score at technical success points was significantly smaller compared to that at technical failure points (0.68 ± 1.09 vs 1.77 ± 1.09 , $p < 0.0001$). CTO-PCI with Stingray device in Japan could achieve a high procedure success and technical success rate. Pre procedure cardiac CT evaluation might support ADR procedure for appropriate patient selection or puncture site selection.

Keywords Antegrade dissection reentry · Chronic total occlusion · Cardiac computed tomography angiography

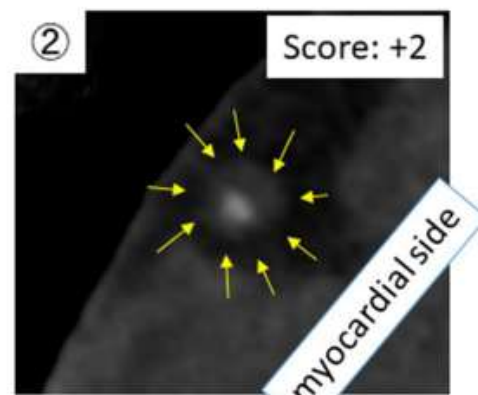
Definition of cardiac CT score

CT score

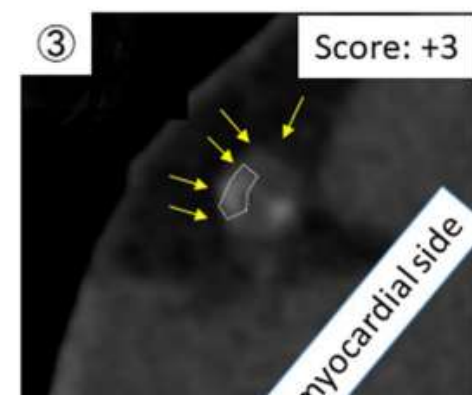
- | | |
|---|----|
| ① Plaques on the isolated myocardial side at distal puncture site | +1 |
| ② Any plaques excluded myocardial side at distal puncture site | +2 |
| ③ Calcification at distal puncture site | +1 |



Plaque at myocardial site +1



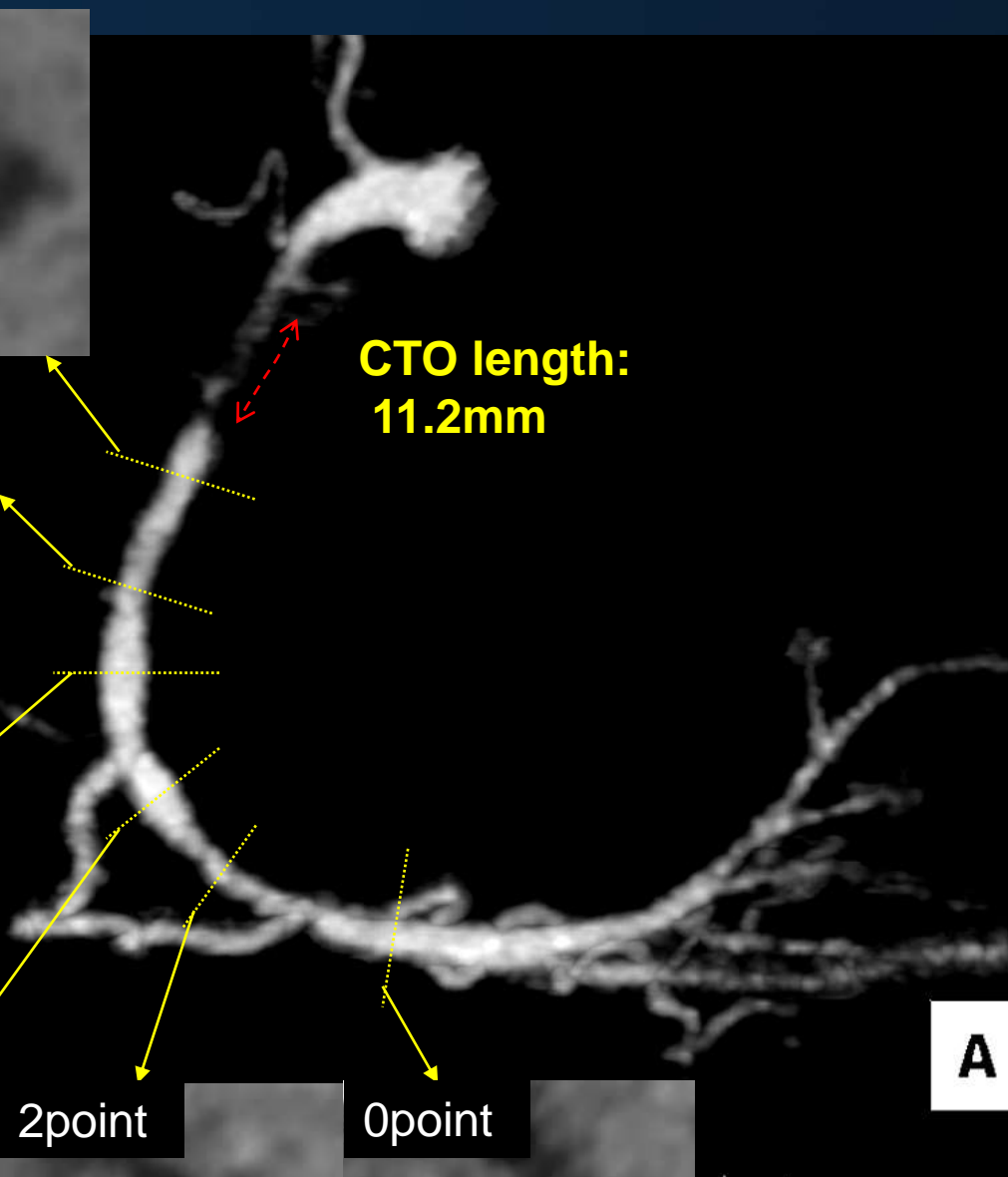
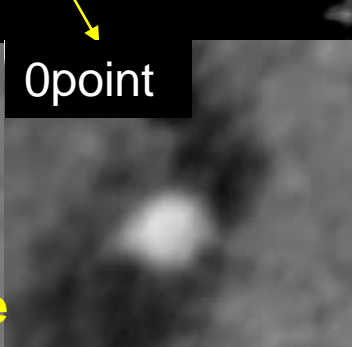
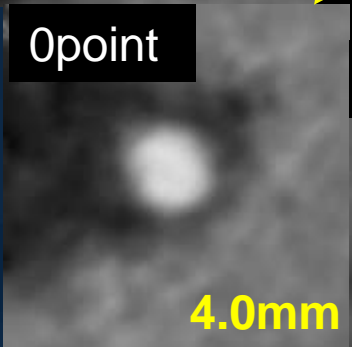
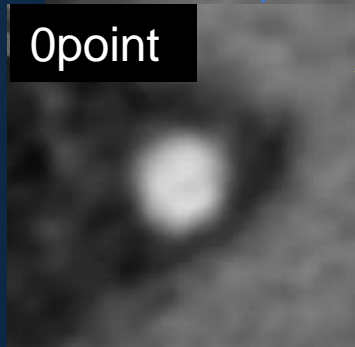
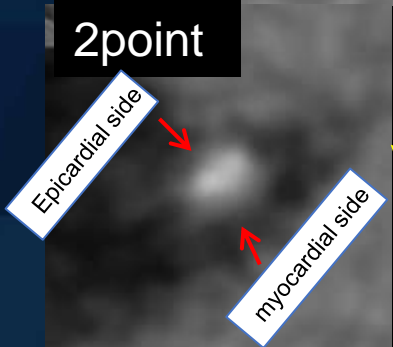
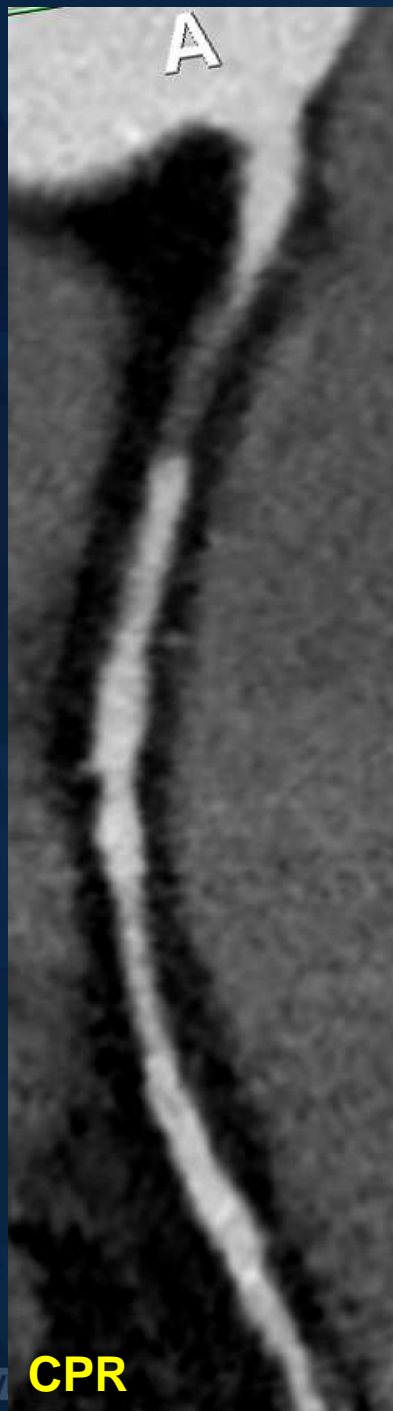
Plaque all around +2
(excluded myocardial side)



Plaque at epicardial site +2
Calcification +1

Fig. 3 Definition of computed tomography (CT) score at puncture site. ①–③: Cross sectional images of coronary CT angiography at antegrade dissection re-entry (ADR) puncture sites. CT score was

calculated based on the definition. White arrows indicated the plaque. White dot lines shows the calcification



Patient flow chart of the study

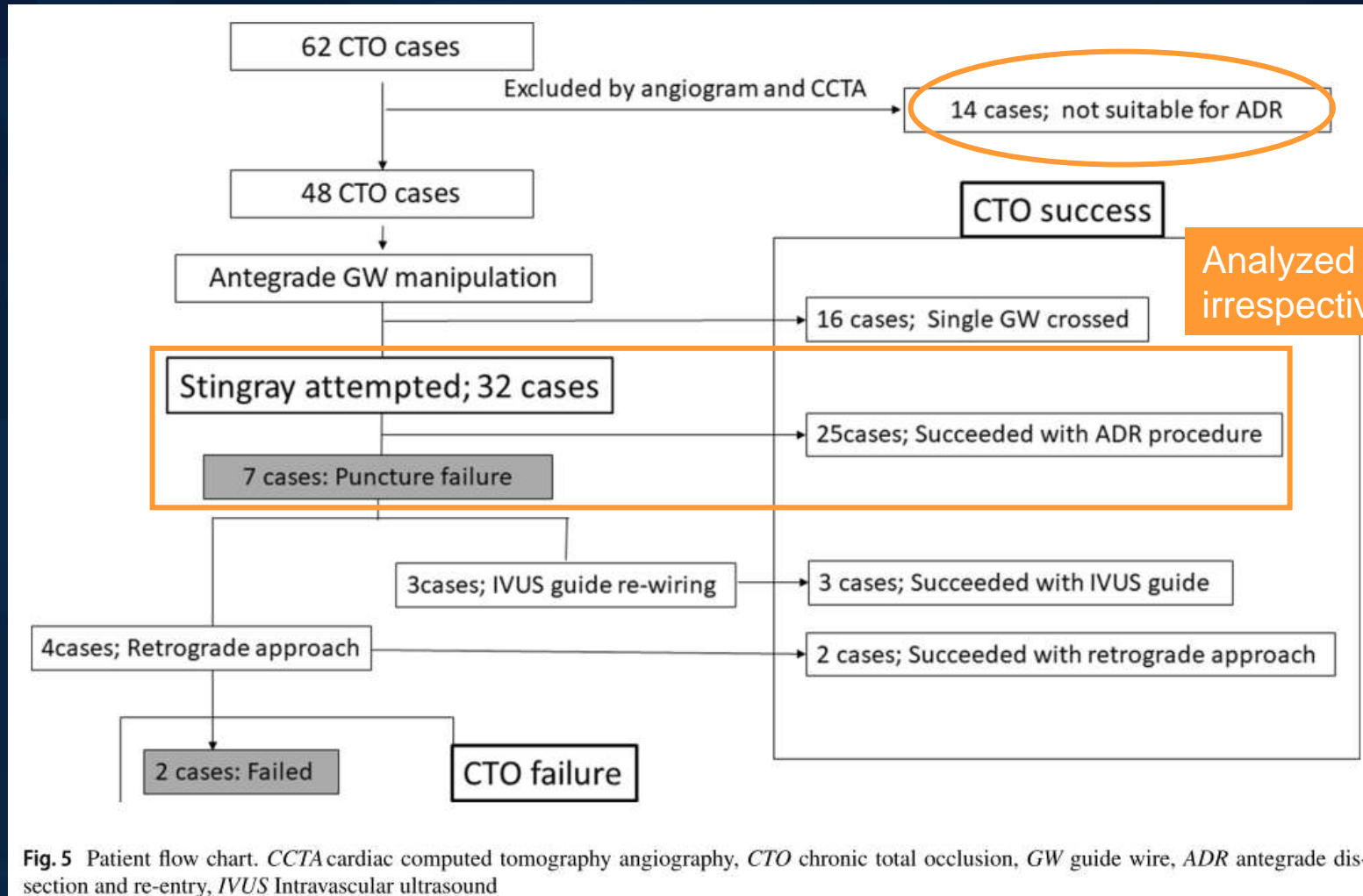


Fig. 5 Patient flow chart. *CCTA* cardiac computed tomography angiography, *CTO* chronic total occlusion, *GW* guide wire, *ADR* antegrade dissection and re-entry, *IVUS* Intravascular ultrasound

Clinical outcome

- Overall procedure success rate: 95.8% (46/48)
- Technical success rate of the Stingray system: 78.1% (25/32)
- Subintimal-based: 64% (16/25), intimal-based: 36% (9/25)
- Mean procedure time: 169.3 ± 83.9 min
- Contrast volume: 206.5 ± 92.1 ml

- In-hospital MACE: 3% (1/32)
 - 1 coronary perforation successfully treated with coil embolization
 - No MI, stroke, CIN and death

Cardiac CT findings at puncture sites

Table 3 Comparison analysis of cardiac computed tomography angiography at distal puncture site

Plaque distribution	Puncture success <i>n</i> = 25	Puncture failure <i>n</i> = 35	<i>p</i>
None	15 (60.0%)	5 (14.3%)	0.0002
At myocardial site	6 (24.0%)	7 (20.0%)	0.76
All around	4 (16.0%)	23 (65.7%)	0.0003
With calcification	3 (12.0%)	9 (25.7%)	0.19
CT score	0.68 ± 1.09	1.77 ± 1.09	< 0.0001
	Puncture success <i>n</i> = 25		
Plaque distribution	Intimal-based success <i>n</i> = 9	Subintimal-based success <i>n</i> = 16	<i>p</i>
None	5 (55.6%)	10 (62.5%)	0.73
At myocardial site	2 (22.2%)	4 (25.0%)	0.88
All around	2 (22.2%)	2 (12.5%)	0.52
With calcification	2 (22.2%)	1 (6.3%)	0.24
CT score	0.89 ± 1.09	0.75 ± 1.06	0.4

CT computed tomography, ADR antegrade dissection re-entry

Usefulness of pre-procedure cardiac CT

- Case selection: Combination of angiography and CT can precisely identify quality of the distal vessel, resulting in exclusion of unfavorable cases.
- Puncture site selection: A zone of which CT score is lower (0 or 1) might be suitable for reentry.

Take-home Message

- ADR use is considered when:
 - Antegrade single wire escalation has failed and retrograde option is not easy or unavailable.
 - PWT is not promising due to calcified distal cap or poor antegrade wire control.
 - There is a large, plaque and calcification free reentry zone without an important bifurcation.
- ADR-related complications can be prevented by avoidance of CrossBoss use and meticulous care for side branch loss.
- Reliability of reentry procedure might be improved by case and puncture site selection using pre-procedure cardiac CT.

