Chronic total occlusion(CTO) revascularization a comparison from Japanese and European expert CTO operators registries.

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Purpose

Development of different strategies and devices improved CTO revascularization. However, technical and procedural success might be influenced by several factors including geographical expertise. We examined about difference of CTO procedure in Japan and Euro.

Methods

A total of 4412 CTO coronary treated lesions (Japan 1531 Europe 2881) (mean age 64.5±10.7, male 85.2%, JCTO score 2.09±1.24) were analyzed in European and Japanese registries during the year 2016. The primary endpoint was to assess technical success rate of CTO-PCI cases and procedural outcomes.

Results

Primary Antegrade approach and success rate were 71.5% and 90.8% respectively in Japan while 77.0% and 94.1%, respectively in Europe, ($p<0001$). Primary Retrograde approach and success rate were 28.5% and 84.0% respectively in Japan, while 22.6% and 69.2%, in Europe ($p<0001$). There were no differences in technical success rate between Japan and Europe (89.9% vs 88.5%, $p=0.13$). Procedural time was higher in Japan than in Europe 156.3±1.8 vs 107.1±1.3 mins ($p<0.001$), but contrast media volume resulted the opposite 209.6±3.2 ml vs 267.5±2.4 ml, ($p<0.001$). Procedural complications were higher in Japan than Europe (death: 0.4% vs 0.07%, $p=0.024$, myocardial infarction: 1.2% vs 0.57% $p=0.045$, coronary artery occlusion: 0.26% vs 0.07% $p=0.026$, coronary perforation: 4.22% vs 3.04% $p=0.045$). A multivariate analysis showed that independent predictors of failed procedure were both for Japan and Europe unsuccessful retrograde crossing channel, severe lesion calcification and occlusion length>20mm.

Conclusions

Technical success rate was similar between Japan and Europe, but more retrograde approach was common in Japan. Unsuccessful retrograde crossing channel, severe lesion calcification and occlusion length>20mm were independent predictors of failed procedures for both countries. Procedural complications were higher in Japan probably because of longer procedural time and higher frequency of retrograde approach.

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Background

The initial success rate of chronic total occlusion (CTO) percutaneous coronary intervention (PCI) (CTO-PCI) was approximately 60-70%. However, the results improved with the introduction of so-called "hybrid" treatment using a retrograde procedure via the collateral circulation.
On the other hand, the standardization of CTOPCI is important, but it has not been sufficiently examined.
we examined the results of CTOPCI in different areas of Japan and Europe, the procedure contents, and complications.

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Endpoint
The primary endpoint was to assess the technical success rate of CTO-PCI cases performed in 2016

The secondary endpoint was to evaluate hospital mortality rate, major adverse cardiovascular and cerebrovascular events (MACCE; e.g. death, myocardial infarction, stroke and revascularisation during the following admission), procedure time, amount of contrast media, radiation exposure dose and fluoroscopy time.

We examined clinical outcomes between the different PCI approaches, following the intention-to-treat (ITT) principle in Japan and Euro.

Backgrounds

Patient/Lesion Back Ground	Japan	Euro	
Numbers	%(1531/4412)	%(2881/4412)	P value
Age	66.7±0.27	63.4±0.20	<0.001
BMI	24.7±0.12	28.6±0.09	<0.001
LVEF			0.0002
>50%	66.2	72.4	
35-50%	25.5	20.7	
<35%	8.3	7.0	
eGFR	61.5±0.88	83.9±0.64	<0.001
Hemodialysis	6.4	0	<0.001
Male gender, %	85.2	85.2	1.000
Hypertension, %	77.7	76.8	0.57
Dyslipidemia, %	78.3	69.7	<0.0001
Diabetes, %	46.1	42.4	0.0273
Current smoking, %	59.4	28.0	<0.001
OMI, %	49.1	44.1	0.0025
Prior CABG, %	6.8	12.8	<0.0001
Prior PCI, %	68.1	48.6	<0.0001
Reattempt, %	19.6	29.9	<0.0001
J-CTO score	1.79±0.03	2.24±0.02	<0.0001

Patient/Lesion Back Ground	Japan	Euro	
Target vessel, %			<0.0001
LAD	33.3	26.6	
LCX	17.6	15.5	
LMT	0.3	0.7	
RCA	48.9	57.2	
In-stent occlusion, %	11.5	7.8	<0.0001
Distal run off (<3.0mm), %	72.5	35.0	<0.0001
CTO length (≥20mm), %	53.8	70.3	<0.0001
Side branch at proximal cap, %	40.4	21.5	<0.0001
Collateral filling, %			<0.0001
Contralateral	49.0	53.6	
Ipsilateral	12.6	19.3	
Both	37.8	25.5	
None	0.7	1.6	
Lesion calcification, %	49.8	77.1	<0.0001
Severe calcification, %	7.5	18.1	<0.0001
Proximal tortuosity, %	50.3	51.8	0.27
Morphology of proximal cap, %			<0.0001
Blunt	18.7	43.2	
No stump	17.8	15.7	
Tapered/tunnel	63.6	41.1	

Results

%	JAPAN	Euro	P value
GW success, %	92.2	90.4	0.0407
Technical success, %	89.9	88.5	0.157
Procedural success, %	88.1	85.6	0.0231
Procedure time(min)	156.3±1.80	101.2±1.15	<0.0001
Contrast volume(ml)	209.6±3.23	251.5±2.77	<0.0001
Fluoro time(min)	76.3±1.18	36.8±0.84	<0.0001
collateral channel Try	43.6	31.7	<0.0001
Septal	65.1	69.5	
Epicardial	33.5	26.6	
Graft	1.4	3.9	

Complication	JAPAN	Euro	P value
Death	0.4	0.07	0.024
Myocardial Infarction	1.2	0.57	0.045
Stent thrombosis	0.2	0.1	0.423
Coronary artery occlusion	0.26	0.10	0.2446
Cerebral infarction	0.40	0.07	0.026
Coronary Perfolation	4.22	3.04	0.045
Blood Access complication	1.91	0.70	0.0004
Emergency PCI	0.13	0.07	0.613
Emergency CABG	0.13	0.00	0.120

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Multivariate Analysis

	Japan		
	OR	CI	P-value
eGFR	0.9969	0.986-1.007	0.5570
Re-Attempt	1.0269	0.615-1.713	0.9188
LAD	0.642	0.363-1.134	0.1274
Occlusion length>20mm	1.964	1.101-3.502	0.022
Collateral Flow Contralateral (-)	2.564	1.155-5.691	0.020
Collateral Flow Contralateral+Ipsilateral (-)	3.816	0.109-0.628	0.002
Severe calcification	2.297	1.590-9.158	0.023
Morphology of Proximal cap; No stump	1.029	0.640-1.653	0.905
Retrograde channel unsuccessful	6.717	3.976-11.348	<0.0001

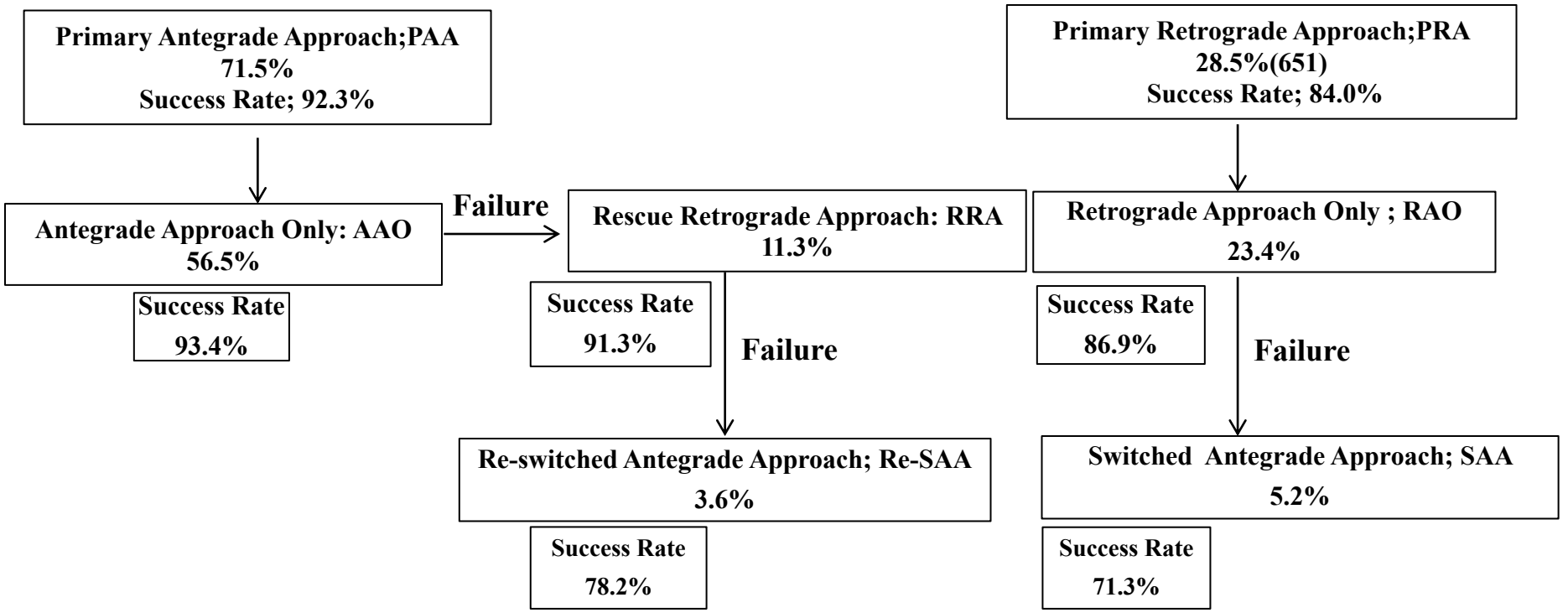
	Euro		
	OR	CI	P-value
Age	1.019	0.992-1.047	0.1560
BMI	1.010	0.958-1.064	0.7071
LVEF<35%	1.333	0.468-3.795	0.5891
LVEF>50%	1.035	0.574-1.865	0.9082
Post CABG	1.446	0.732-2.855	0.2876
RCA	1.440	0.743-2.790	0.2789
LCX	0.773	0.468-1.276	0.315
Target Vessel<3mm	0.910	0.342-2.419	0.850
Occlusion length>20mm	2.317	1.054-5.095	2.317
Collateral flow(Contralateral) (-)	5.657	0.699-45.751	0.1041
Collateral flow(Ipsilateral) (-)	3.544	0.029-2.699	0.2721
Collateral flow(Contralateral + Ipsilateral) (-)	8.204	0.975-69.023	0.0528
Severe calcification	2.409	1.372-4.231	0.0022
Proximal tortuosity	1.216	0.729-2.029	0.4528
Morphology of Proximal cap; No stump	2.365	1.277-4.378	0.0062
Retrograde channel unsuccessful	68.90	40.056-118.520	<0.0001

ITT(intension-to-treat) Analysis

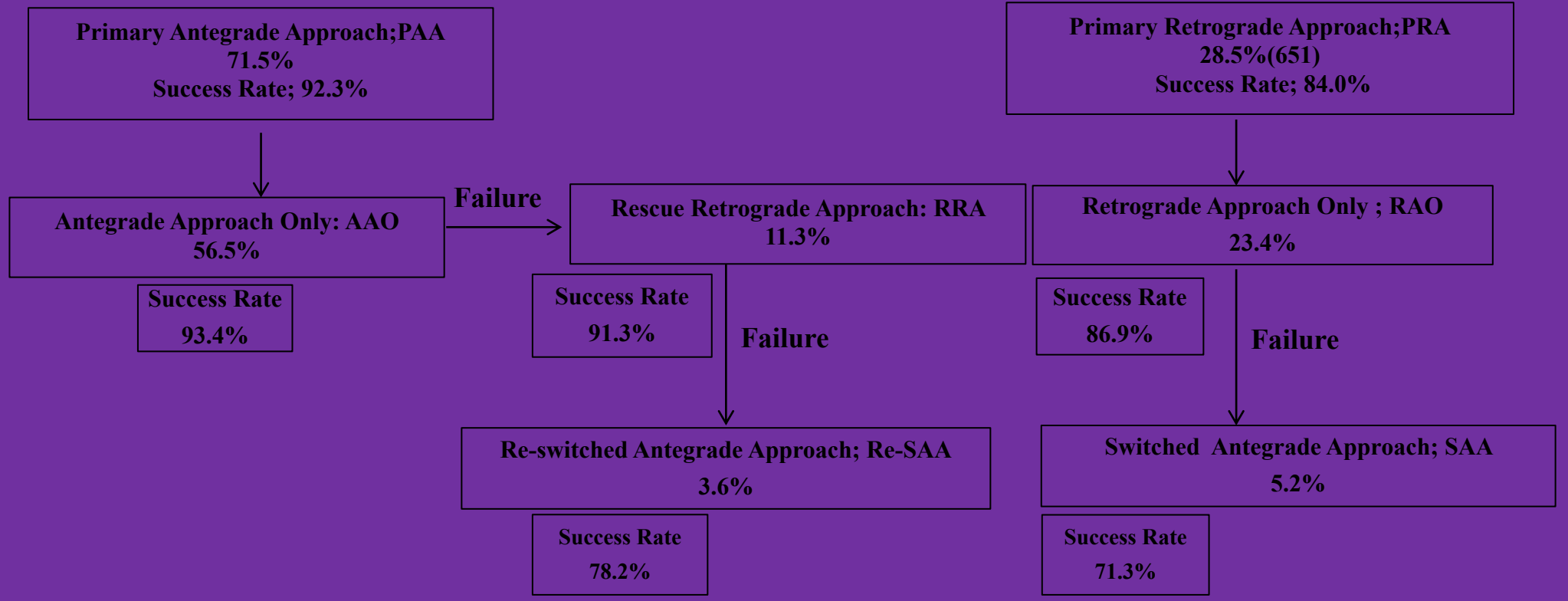
		JAPAN	Euro	P value
PAA	Frequency	71.4	77.3	<0.0001
	AAO	56.5	61.3	
	RRA	11.3	11.7	
	Re-SAA	3.6	4.1	
PAA	Success	92.3	94.1	
Antegrade	Crossing Strategy			<0.0001
	Single wire	77.8	59.3	
	Double wire	17.6	16.0	
	IVUS Guide	4.5	18.6	
	ADR	0	4.0	
	STAR	0.1	2.1	

		JAPAN	Euro	P value
PRA	Frequency	28.6	22.7	<0.0001
	RAO	23.4	17.0	
	SAA	5.2	5.9	
PRA	Success	84.0	67.7	<0.0001
Retrograde crossing	Strategy			<0.0227
Reverse CART		67.1	74.0	
Kissing Wire Technique		32.5	24.7	
CART		0.2	1.3	

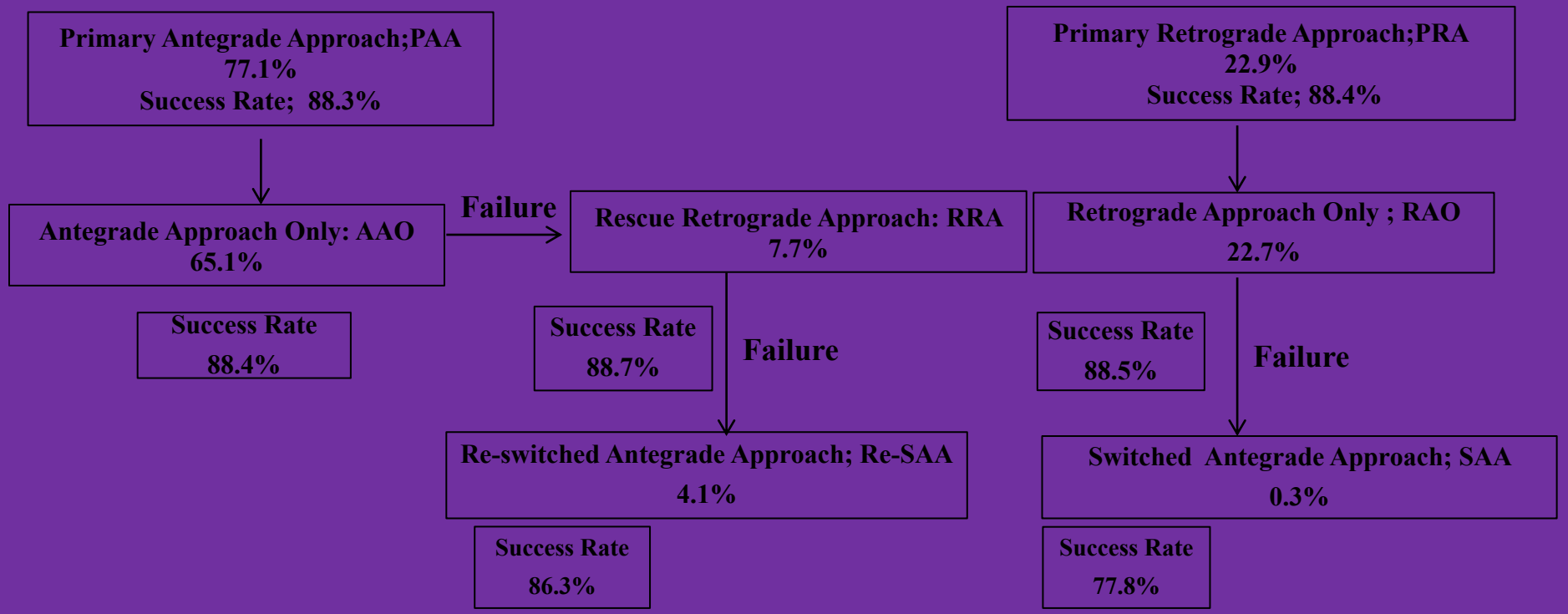
2016;Total 1531 CTO Lesions ; Japan



2016;Total 1531 CTO Lesions ; Japan



2016; Total 2881 CTO Lesions; Euro



Summary

- ✓ There was no significant difference of technical success rate between Japan and Euro (89.9% vs 88.5%, P=0.1301).
- ✓ In ITT analysis, Japan is significantly higher frequency/success rate of PRA than Euro. On the other hand, frequency/success of PAA of Euro is significantly higher than Japan respectively.
- ✓ Procedure complications of Japan is higher than Euro (death, myocardial infarction, coronary artery occlusion, Coronary Perforation.
- ✓ In a multivariate analysis, retrograde channel unsuccess, severe lesion calcification and occlusion length>20mm were independent common factors of failed procedure of Japan and Euro.

Conclusion

- ✓ **In Japan and Euro, technical success rate was no significant difference.**
- ✓ **Japanese CTO management was observed many complications because of needness of long time procedure and high frequency of retrograde approach.**