Outcomes of Percutaneous Coronary Interventions for Chronic Total Occlusion Performed by Highly Experienced Japanese Specialists
The First Report From the Japanese CTO-PCI Expert Registry

Yoriyasu Suzuki, et al. JACC 2017, published online ahead of print

OBJECTIVES

This report describes the registry and presents an initial analysis of outcomes for the different PCI approaches taken by the specialists.

BACKGROUND

Strategies for percutaneous coronary intervention (PCI) for chronic total occlusion (CTO) are complex.

The Japanese Board of CTO Interventional Specialists has developed a prospective, nonrandomized registry of patients undergoing CTO-PCIs performed by 41 highly experienced Japanese specialists.

METHODS

Over the study period of January 2014 to December 2015, the registry included 2,846 consecutive CTO-PCI cases undertaken in Japan. The authors compared clinical outcomes between the different PCI approaches, following the intention-to-treat principle.

RESULTS

The overall technical success rate of the procedures was 89.9%. The specialists frequently chose a retrograde approach as the primary CTO-PCI strategy (in 27.8% of cases). The technical success rate of the primary antegrade approach was significantly better than that of the primary retrograde approach (91.0% vs. 87.3%; $p < 0.0001$). The technical success rate decreased to 78.0% with the rescue retrograde approach. Parallel guidewire crossing and intravascular ultrasound–guided wire crossing were performed after guidewire escalation during antegrade CTO-PCI with a high technical success rate (75.0% to 88.9%). Severe lesion calcification was a strong predictor of failed CTO-PCI.

CONCLUSIONS

CTO-PCI performed by highly experienced specialists achieved a high technical success rate.

日本心導管專家(Highly Experienced Japanese Specialists)施行冠狀動脈慢性完全阻塞(CTO)經心導管手術(PCI)後的成果報告分析

日本 CTO-PCI 專家登錄型資料庫的第一個研究報告

編譯:高雄長庚心臟內科總醫師 蕭豪毅

目標

這份研究報告主要呈現日本 CTO-PCI 登錄型資料庫,並且分析經由不同的 CTO 專家、不同策略(順向或逆向)完成的心導管手術, 追蹤至目前。

背景資料

慢性完全阻塞(CTO)大約佔全部心導管(PCI)手術的 10%,針對慢性完全阻塞的心導管手術策略擬定是非常複雜,而且術前的完整評估計畫是非常重要的。為了評估 CTO-PCI 策略的擬定和成敗,日本設計了一個前瞻性、非隨機分配的登錄型資料庫,主要由 41 個最有經驗的頂尖心導管專家所組成。

研究方法

這 41 位日本頂尖心導管專家,在 2014 年 1 月-2015 年 12 月總共做了 4205 例 CTO-PCI(圖 1),其中處理單一條血管 CTO 有 4148 例,兩條血管 CTO 有 57 例。絕大多數病人都是 1 CTO 病灶,少數病人有 2 CTO 病灶;其中 1359 例是在日本以外執行,2846 例是在日本國內進行。此分析研究只收入在日本國內進行的、單一條血管 CTO 手術、且血管構造符合適應症、病歷資料夠詳細的 2596 例。統計方法使用 intention-to-treat 分析方法。

結果

首先看基本資料(表 1),兩組冠狀動脈疾病危險因子的比例都非常高,高血壓和高血脂都將近 8 成,糖尿病將近 5 成;兩組互相比較, 選擇順向的這組病人中:男性比較多,高血脂較多,多血管疾病較多,反覆嘗試較多,J-CTO 分數較高,病灶較長,病灶彎曲度較大,病灶鈣化較嚴重,並且近端纖維帽形狀較複雜。

兩組臨床結果作分析(表 2),整體成功率將近 9 成,其中 技術成功與治療成功在順向嘗試顯著較好,順向嘗試所選擇的支架尺寸較大、長度較長、治療時間較長、顯影劑用量較多。技術失敗在兩組最主要都是導絲無法通過為主。住院中發生重大不良反應事件,如冠狀動脈破裂及顯影劑導致腎病變 的機會<2%。

比較直接只做順向和逆向失敗後才換成順向兩組(圖 3)。在順向這組,平行導絲穿通使用佔 14.4%,而血管內超音波指引下穿通佔 3.2%;在逆向失敗後才換成順向這組,平行導絲穿通和血管內超音波指引下穿通的比例都顯著比較高。

比較直接只做順向嘗試或順向失敗後換成逆向這兩組(表 3)。兩組基本資料做分析比較,逆向拯救這組:J-CTO 分數較高、反覆嘗試病例較多、CTO 病灶較長、鈣化比例較高、近端纖維帽形狀較複雜。

比較直接順向失敗後換成逆向這兩組(圖 4)。比較兩組最後所選擇使用的側支循環,發現兩組的選擇並沒有顯著差異,兩組最常選擇使用的側支循環都是中隔支。

最後比較全部成功和失敗的案例(表 4),在失敗的案例中,J-CTO 分數較高,CTO 病灶較長,近端纖維帽有側枝比例高,病灶鈣化較嚴重,病灶較彎,近端纖維帽形狀較複雜。

最後比較各個經過不同策略達到成功的組(圖 5),直接只做順向就成功這組,單一導絲穿越是使用最多的策略;逆向失敗後換成順向才成功這組,平行導絲穿通和血管內超音波指引下穿通的比例大增;利用逆向成功的,reverse CART 是使用最多的策略。

最後我們利用單變項、多變項分析(表 5),找出嚴重病灶鈣化是 CTO-PCI 失敗最重要的原因。

結論

針對複雜性 CTO,逆向嘗試常常被用來當作首選的策略。針對中度複雜的 CTO,大多數醫師選擇順向嘗試即可完成 PCI。嚴重鈣化對於 CTO-PCI 是一個非常重要的課題。

FIGURE 1 Flowchart for the Study

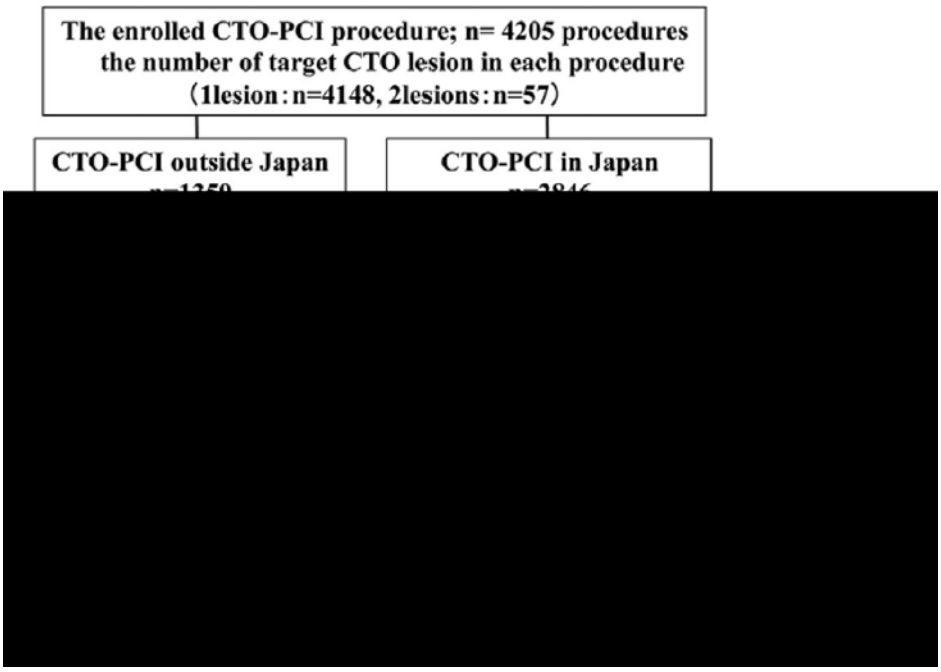
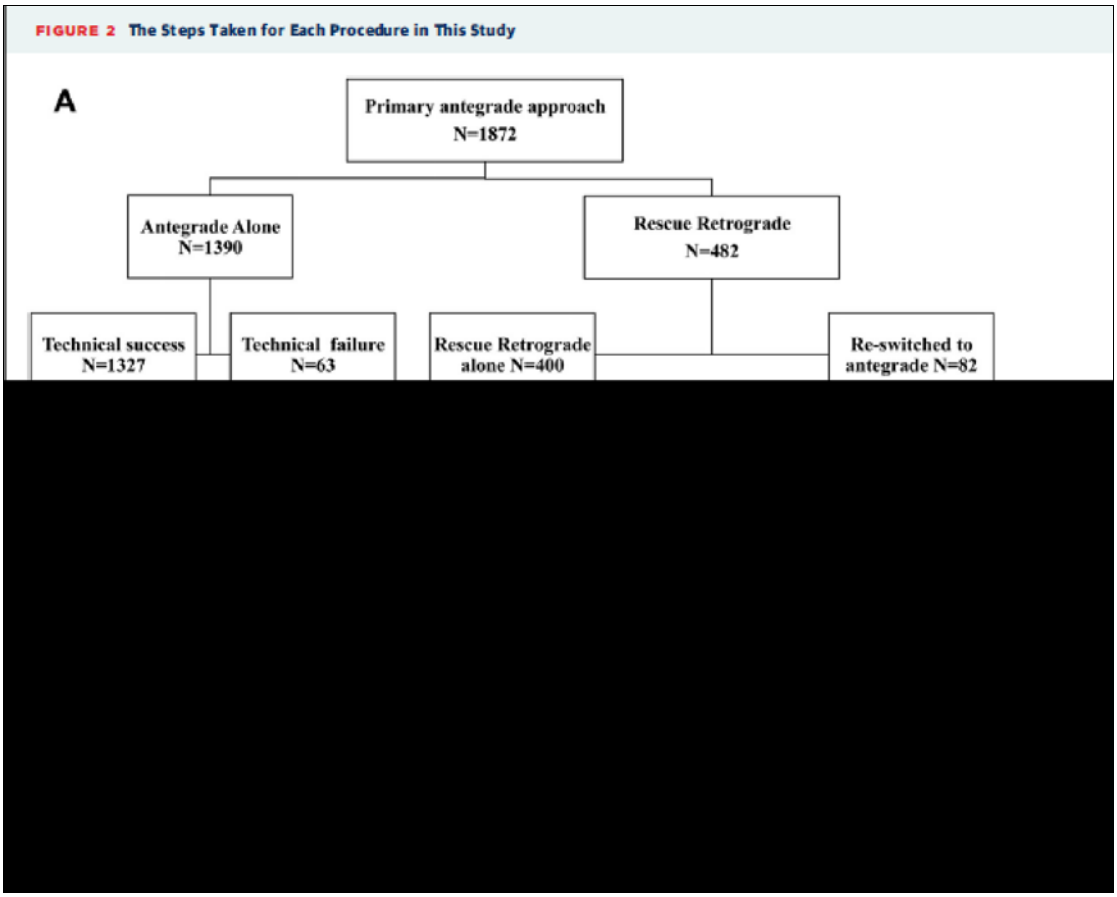


TABLE 1 Baseline Patient Characteristics and Baseline Angiographic Characteristics

	Overall (N = 2,596)	PAA (n = 1,872)	PRA (n = 724)	PAA vs. PRA p Value
Age, yrs	66.9 ± 10.9	66.8 ± 10.9	66.9 ± 10.7	0.863
BMI, kg/m^2	24.7 ± 3.8	24.7 ± 3.8	24.6 ± 3.8	0.413
LVEF	54.8 ± 12.9	54.9 ± 12.9	54.6 ± 12.8	0.458
eGFR	64.9 ± 29.0	65.1 ± 30.2	64.3 ± 25.7	0.458
Male	86.1	85.1	88.4	0.018
Hypertension	78.5	78.0	80.8	0.12
Dyslipidemia	77.5	76.1	82.1	0.001
[redacted]				
In-stent occlusion	13.6	16.9	5.1	<0.0001
Distal runoff <3.0 mm	65.0	64.9	67.2	0.274
CTO length ≥20 mm	60.5	57.0	69.6	<0.0001
Side branch at proximal cap	34.1	34.8	32.0	0.181
Collateral filling				<0.0001
Contralateral	50.7	47.6	58.8	
Ipsilateral	13.3	15.9	6.6	
Both	35.2	35.5	34.4	
None	0.7	1.0	0.1	
Lesion calcification	52.3	50.5	56.9	0.003
Proximal tortuosity	50.7	49.1	49.3	0.108
[redacted]				

FIGURE 2 The Steps Taken for Each Procedure in This Study



GW success
Technical success
Procedural success
Stent size
<2.5 mm
2.5-2.9 mm
3.0-3.4 mm
>3.5 mm
Total stent length, mm
Procedure time
Contrast volume
Reasons for technical failure
GW did not pass
Device did not pass
Poor runoff of distal artery
Others
In-hospital death
Myocardial infarction
Acute stent thrombosis
Stroke
Emergent CABG
Emergent PCI
Coronary embolism
Coronary perforation (tamponade)
Complication of puncture site

FIGURE 3 The Frequency and Technical Success Rate of Parallel Wire Crossing and IVUS-Guided Wire Crossing in the PAA and in the Antegrade Approach After a Failed PRA

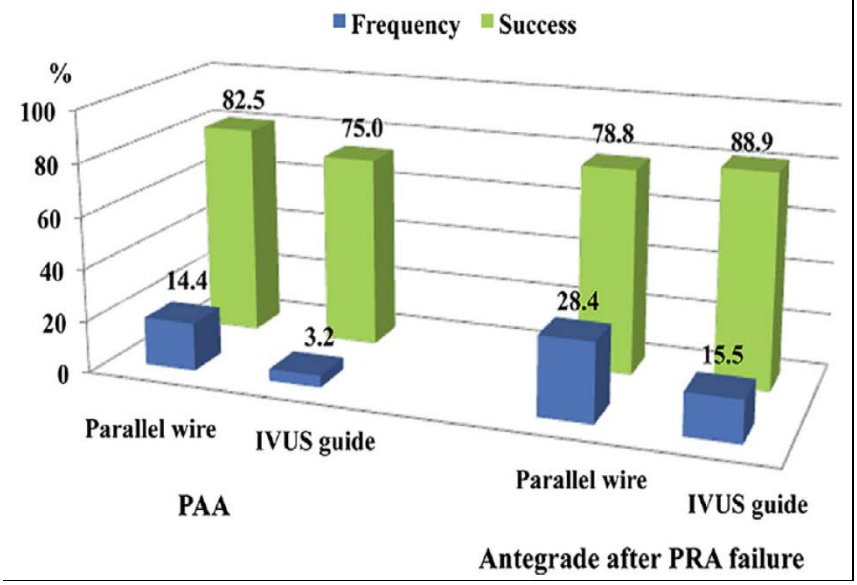


FIGURE 4 The Distribution of Ultimately Used Collateral Channels in PRA and RRA

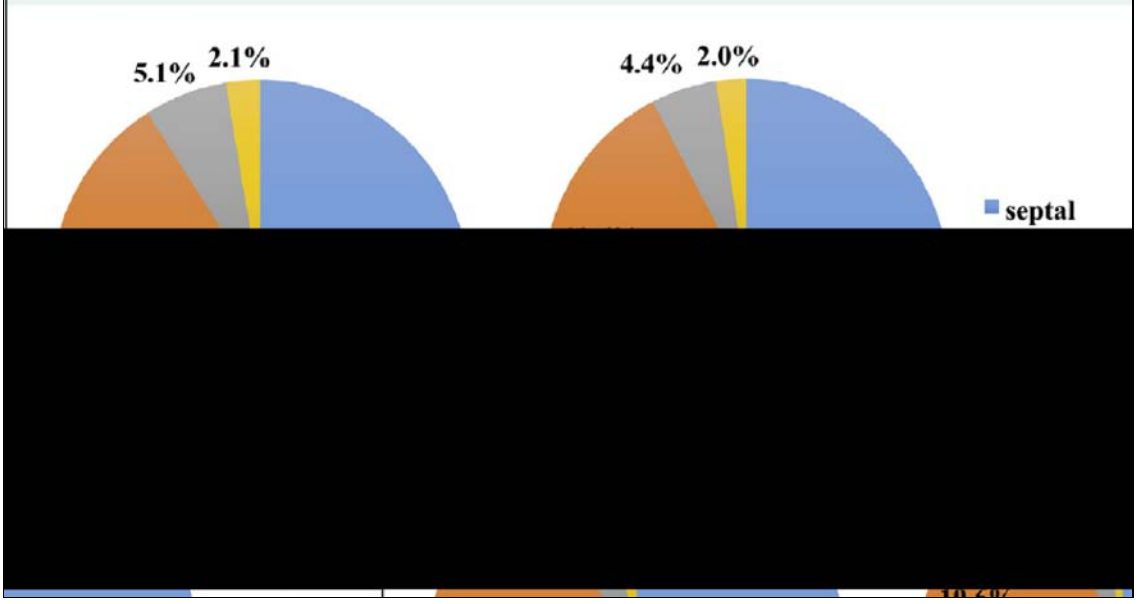


TABLE 3 The Baseline Characteristics Between the Cases Involving Only the Antegrade Approach and the RRA Cases

	Antegrade Alone (n = 1,390)	RRA (n = 482)	Antegrade vs. RRA p Value
Age, yrs	67.1 ± 11.0	66.2 ± 10.8	0.171
Male	84.1	88.2	0.031
BMI, kg/m^2	49.7	55.0	0.120
Prior CABG	6.6	9.6	0.096
Prior PCI	59.9	65.5	0.025
Syntax score	16.1 ± 8.5	15.8 ± 8.1	0.797
J-CTO score	1.7 ± 1.1	2.2 ± 1.1	<0.0001
Target vessel			<0.0001

TABLE 4 The Differences Between Successful and Failed Cases

	Overall			PAA			PRA		
	Success (n = 2,209)	Failure (n = 278)	p Value	Success (n = 1,601)	Failure (n = 171)	p Value	Success (n = 632)	Failure (n = 92)	p Value
Dyslipidemia	77.6	76.5	0.531	75.5	78.2	0.567	83.0	73.8	0.048
Prior CABG	7.2	14.7	<0.0001	6.7	14.6	0.001	8.6	15.0	0.084
Prior PCI	62.0	70.9	0.014	60.5	68.4	0.11	66.1	74.8	0.119
Syntax score	15.7 ± 8.5	17.0 ± 9.2	0.054	15.9 ± 8.5	16.6 ± 8.2	0.276	15.2 ± 8.5	17.6 ± 10.5	0.056
J-CTO score	1.95 ± 1.13	2.48 ± 1.10	<0.001	1.80 ± 1.10	2.29 ± 1.10	<0.0001	2.4 ± 1.1	2.8 ± 1.0	<0.0001
Target vessel			0.135			0.442			0.178
LAD	31.7	24.8		33.6	27.5		26.8	20.6	
LCX	16.9	18.3		20.4	21.6		7.7	13.1	
LMT	0.6	0.7		0.6	0.6		0.5	0.9	

[redacted]

50.3		65.0	65.4		RCA	50.7	56.1		45.3
20.5	0.026	33.6	41.1	0.152	Reattempt	19.5	28.4	0.001	14.1

FIGURE 5 The Distribution of the Crossing Strategies in Cases With Guidewire Success

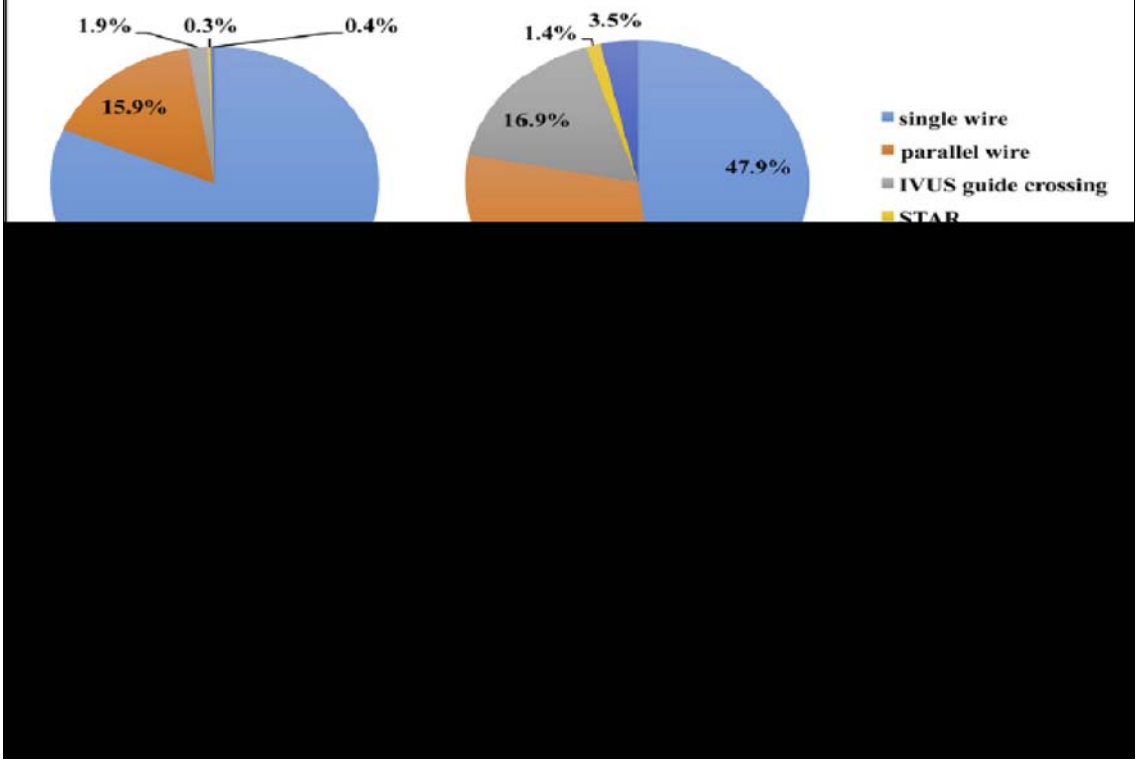


TABLE 5 Multivariate Analyses Investigating Possible Predictors of Failed CTO-PCIs

		Overall			PAA			PRA	
		OR	95% CI	p Value	OR	95% CI	p Value	OR	95% CI	p Value
Prior CABG		1.47	0.765-2.715	0.219	1.677	0.780-3.604	0.186			
Prior PCI		1.276	0.928-1.756	0.134	1.135	0.759-1.696	0.588			
Diabetes		1.12	0.850-1.476	0.421	1.429	0.995-2.052	0.053			
	eGFR >60 ml/min/1.73 m^2	0.764	0.576-1.012	0.061	0.818	0.565-1.184	0.288			
	Reattempt	1.131	0.811-1.577	0.469	0.906	0.552-1.487	0.697			
	Target (LAD)	1.26	0.878-1.808	0.211	0.207	0.041-1.052	0.058			
	CTO length ≥20 mm	1.42	1.036-1.946	0.029	1.262	0.850-1.874	0.249			