

Can we switch to radial access in most CTO cases?

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Jouw hart, onze zorg

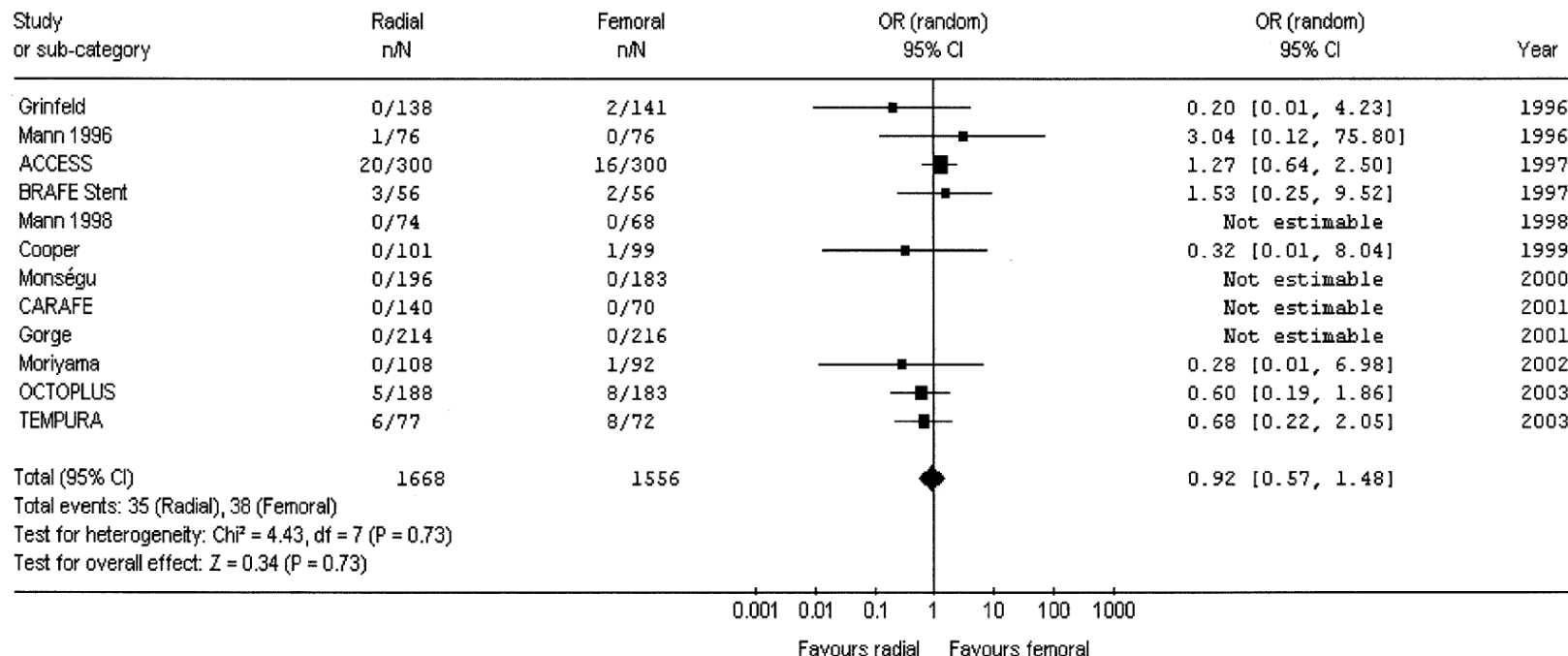
With the help of Dr. Carlo Zivelonghi, MD, fellow at ZNA Middelheim

Early days of trans-radial adoption...

Radial Versus Femoral Approach for Percutaneous Coronary Diagnostic and Interventional Procedures

Systematic Overview and Meta-Analysis of Randomized Trials

Comparison: Radial vs Femoral approach
Outcome: MACE



Overall risk of MACEs

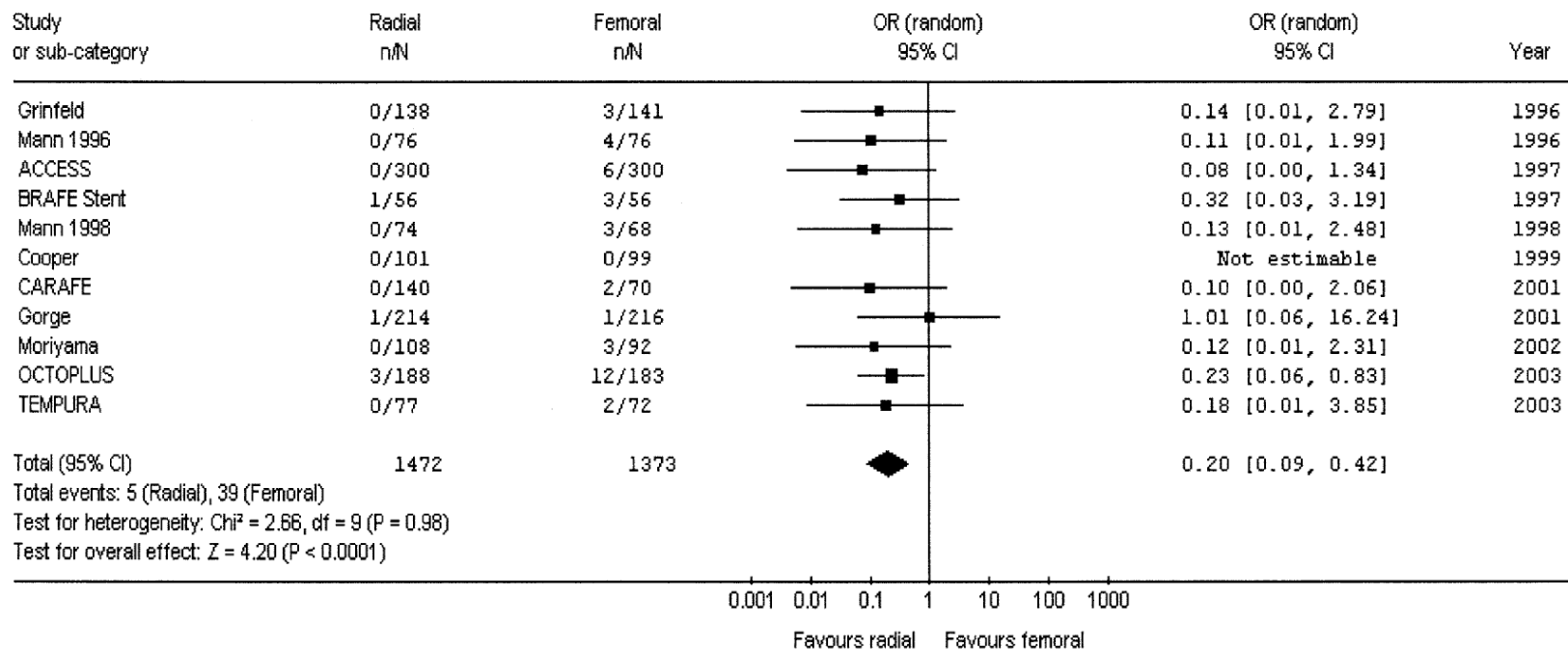
Agostoni et al. JACC 2004

Early days of trans-radial adoption...

Radial Versus Femoral Approach for Percutaneous Coronary Diagnostic and Interventional Procedures

Systematic Overview and Meta-Analysis of Randomized Trials

Comparison: Radial vs Femoral approach
Outcome: Entry site complications



Overall risk of entry site complication

Agostoni et al. JACC 2004



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What the Holy Texts say... in 2018

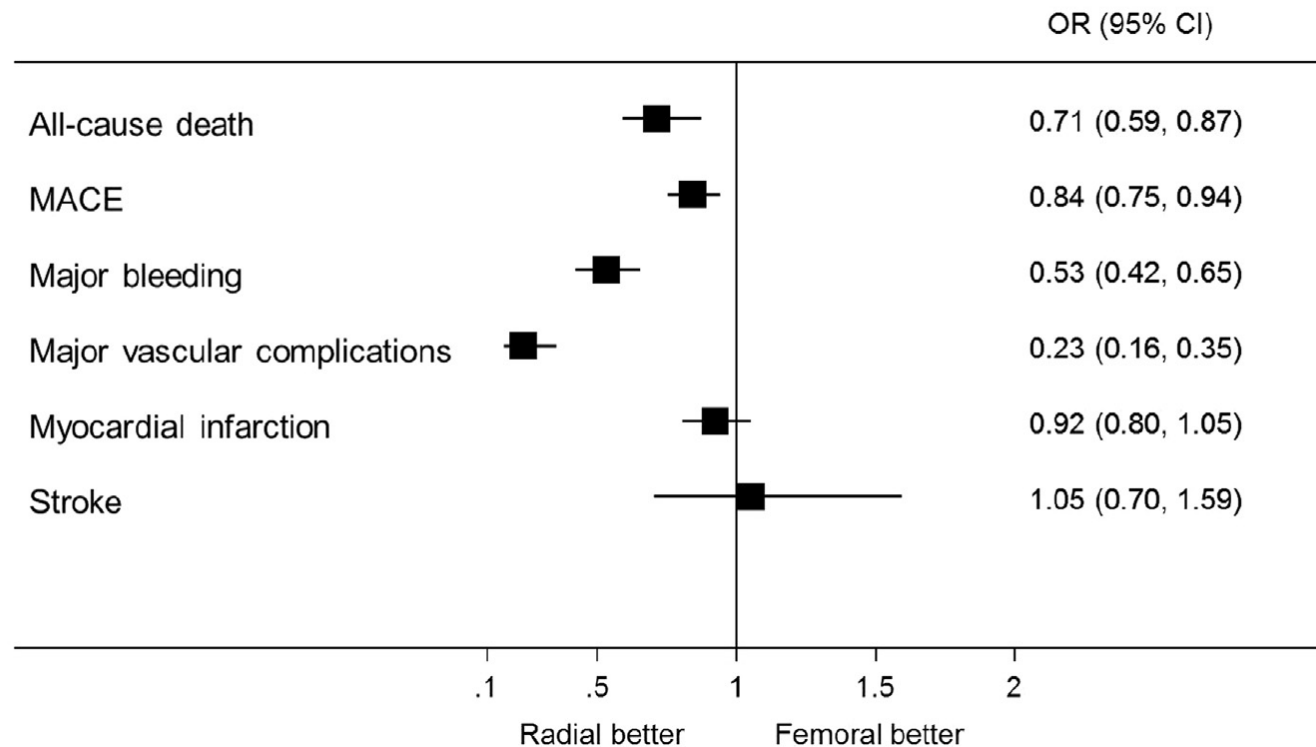
- Current indications in vascular access for percutaneous coronary interventions

Recommendations on choice of stent and access site

Recommendations	Class ^a	Level ^b
DES are recommended over BMS for any PCI irrespective of: • clinical presentation • lesion type • planned non-cardiac surgery • anticipated duration of DAPT • concomitant anticoagulant therapy.^{100,578,579,640}	I	A
Radial access is recommended as the standard approach, unless there are overriding procedural considerations. ^{172,638,641}	I	A
BRS are currently not recommended for clinical use outside of clinical studies. ^{642–650}	III	C

Radial Versus Femoral Access for Coronary Interventions Across the Entire Spectrum of Patients With Coronary Artery Disease

A Meta-Analysis of Randomized Trials



Radial Versus Femoral Access for Coronary Interventions Across the Entire Spectrum of Patients With Coronary Artery Disease

A Meta-Analysis of Randomized Trials

	Stable		NSTE ACS		STEMI		p Value for Interaction		
	(n = 3,096)	p Value	(n = 9,876)	p Value	(n = 9,871)	p Value	STEMI vs. Stable	STEMI vs. NSTE ACS	NSTE ACS vs. Stable
All-cause death	0.78 (0.29-2.14)	0.63	0.79 (0.27-2.34)	0.67	0.66 (0.52-0.83)	0.001	0.76	0.76	0.97
Major bleeding	0.24 (0.11-0.52)	<0.001	0.71 (0.48-1.04)	0.08	0.51 (0.52-0.83)	<0.001	0.06	0.15	0.01
MACE	0.72 (0.43-1.19)	0.20	0.95 (0.66-1.38)	0.79	0.80 (0.67-0.96)	0.015	0.68	0.39	0.35
							p Value for interaction		
MI	1.04 (0.69-1.55)	0.85	0.90 (0.78-1.04)	0.17				0.51	
Stroke	0.32 (0.01-7.89)	0.49	1.08 (0.71-1.63)	0.72				0.48	
Major vascular	0.15 (0.06-0.37)	<0.001	0.26 (0.17-0.41)	<0.001				0.29	
							p Value for interaction (NSTE ACS vs. STEMI)		
NACE	NA		0.91 (0.70-1.17)	0.46	0.64 (0.48-0.84)	0.001		0.06	

Why is it difficult to implement trans-radial approach in the settings of CTO?

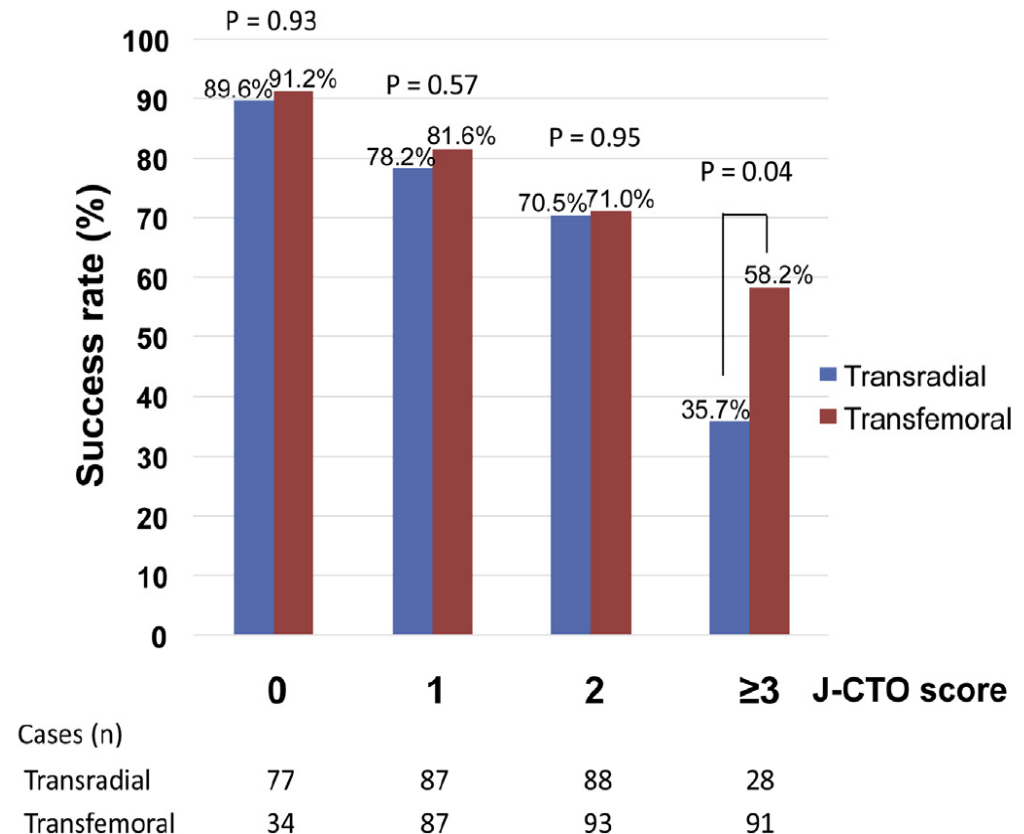
- Need for enhanced support
- Larger French size catheters to accommodate additional materials
- Operator comfort
- “Old school” indications
- First experiences and reports...

Transradial Coronary Interventions for Complex Chronic Total Occlusions



Yutaka Tanaka, MD, PhD, Noriaki Moriyama, MD, Tomoki Ochiai, MD, Takuma Takada, MD, Kazuki Tobita, MD, Koki Shishido, MD, Kazuya Sugitatsu, MD, Futoshi Yamanaka, MD, Shingo Mizuno, MD, Masato Murakami, MD, PhD, Junya Matsumi, MD, Saeko Takahashi, MD, Takeshi Akasaka, MD, PhD, Shigeru Saito, MD

- Analysis of 585 pts undergoing CTO procedures
- All complexity scenarios included – Real Life environment
- Propensity-score matching to reduce bias in the analysis
- Transfemoral approach should be preferred for complex lesions (especially when calcifications are present)

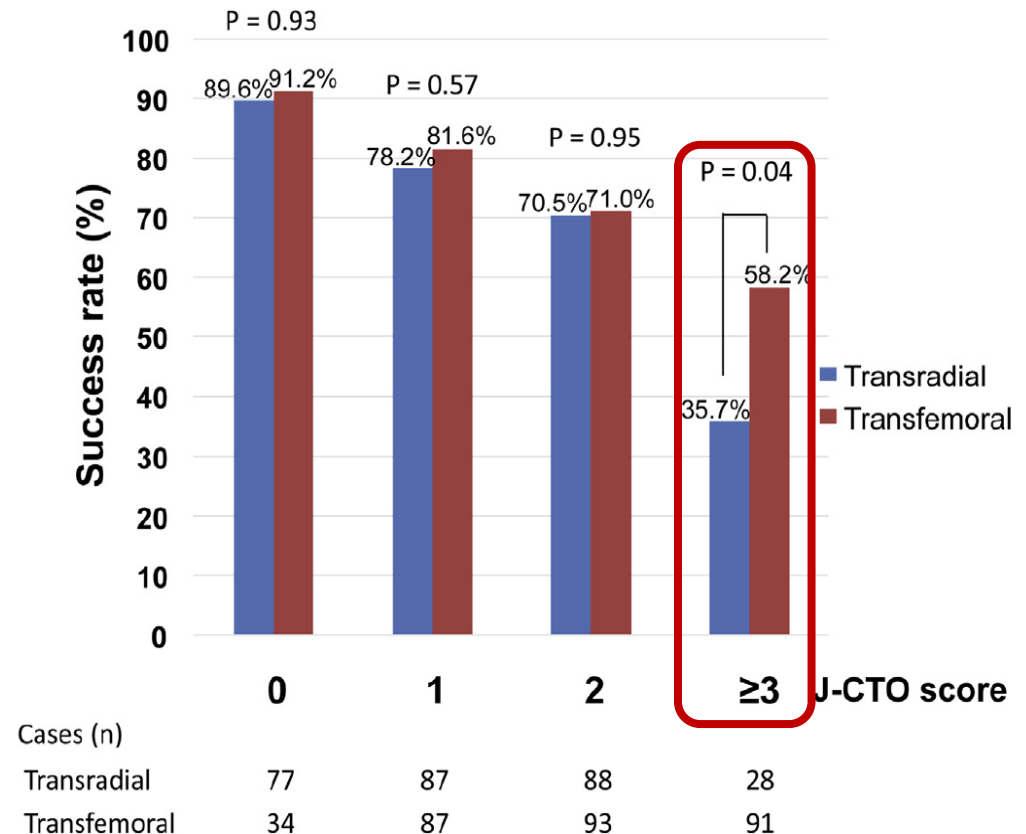


Transradial Coronary Interventions for Complex Chronic Total Occlusions



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- Single centre study
- Retrospective analysis over a 10 years period (2005-2014)
- No data on operators number or dedication to trans-radial procedures
- No data about use of microcatheters/guide extensions



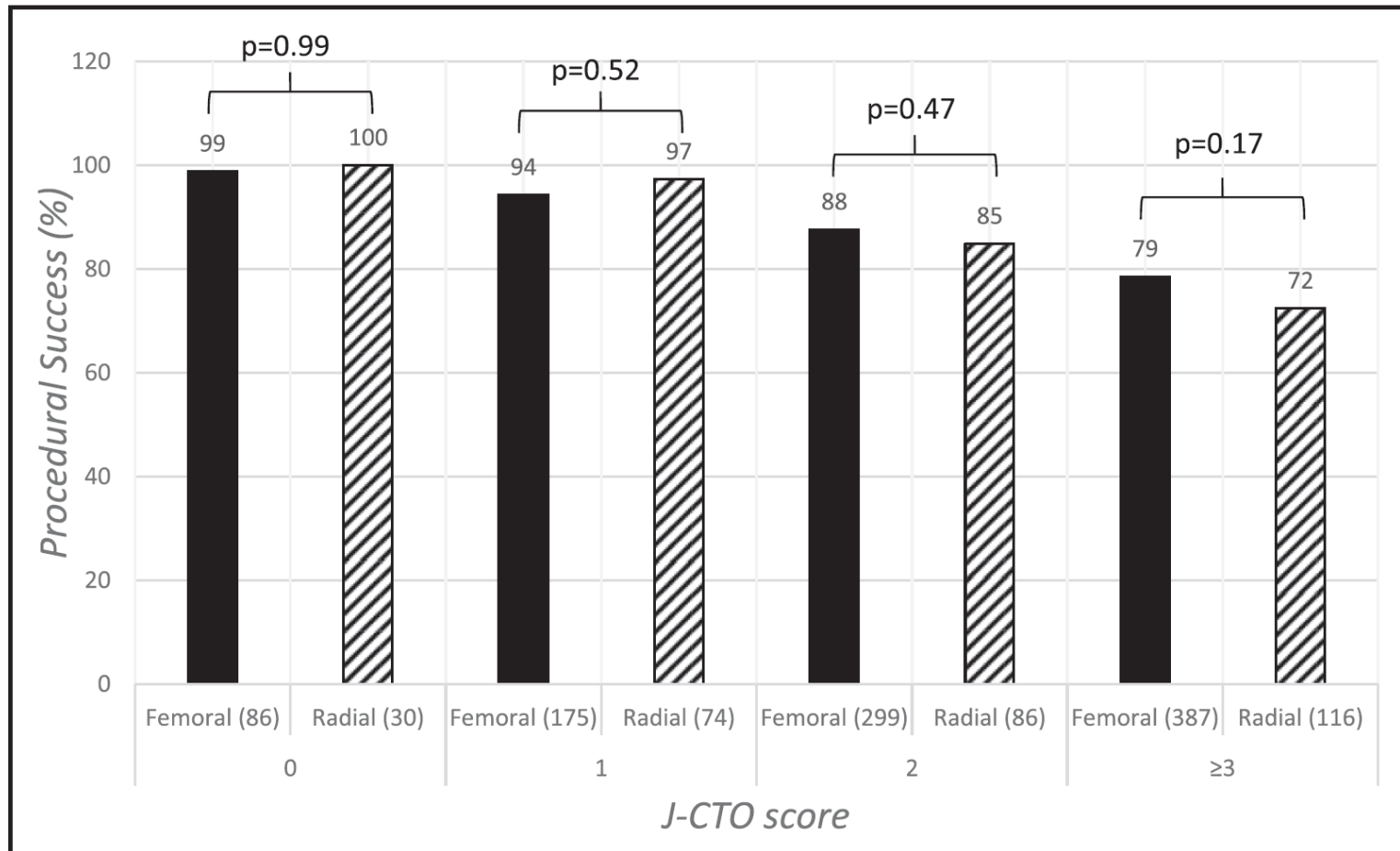
Fully Transradial Versus Transfemoral Approach for Percutaneous Intervention of Coronary Chronic Total Occlusions Applying the Hybrid Algorithm

Insights From RECHARGE Registry

- Multicenter registry in Europe
- Operators experienced with Hybrid Algorithm
- 1253 CTO-PCI – all techniques included
- Patients were divided according to fully-transradial approach procedures and transfemoral approach (including transradial+transfemoral)
- Propensity score analysis and matching
- Primary endpoint: technical success
- All procedural data available

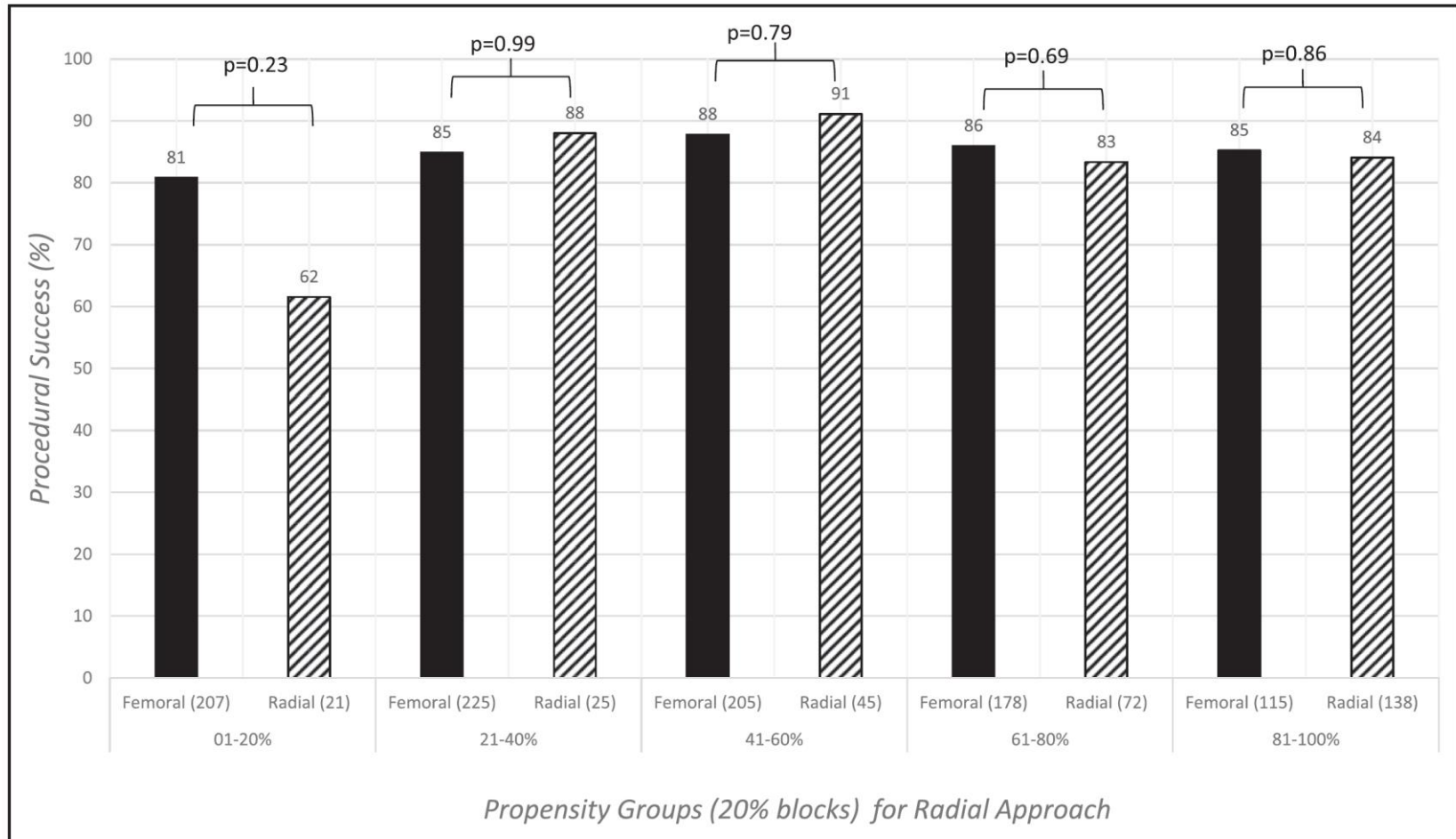
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Insights From RECHARGE Registry



Fully Transradial Versus Transfemoral Approach for Percutaneous Intervention of Coronary Chronic Total Occlusions Applying the Hybrid Algorithm

Insights From RECHARGE Registry



Procedural Outcomes of Percutaneous Coronary Interventions for Chronic Total Occlusions via the Radial Approach: Insight from an International CTO Registry.

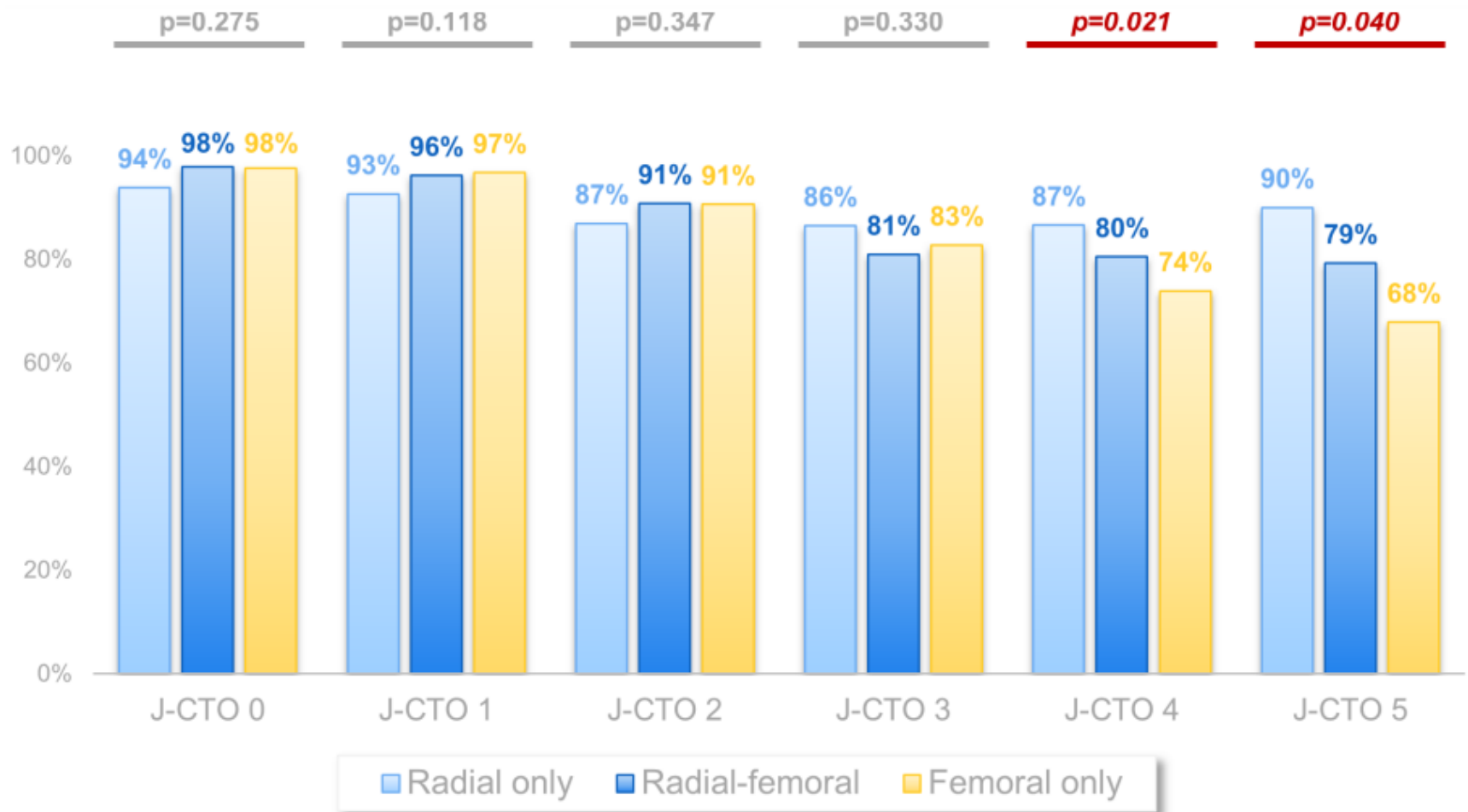
- Large multicentre registry in US/Europe/Russia (3790 CTO PCIs)
 - Increased adoption of trans-radial approach between 2012 (11%) and 2018 (67%).
 - Similar success rates if compared with trans-femoral (89% vs 86%, $p=.06$)
 - Similar cardiac complication rates (2.5% vs 3.4%)
 - Lower major bleeding complication rates (0.55% vs 1.94%)

Procedural Outcomes of Percutaneous Coronary Interventions for Chronic Total Occlusions via the Radial Approach: Insight from an International CTO Registry.

Variable	Overall (n=3709)	Radial-only (n=728)	Radial-femoral (n=824)	Femoral-only (n=2157)	P values	Adjusted p value ‡
In-hospital MACE	2.51%	2.47%	3.40%	2.18%	0.163	0.830
• Death	0.51%	0.27%	0.97%	0.42%	0.101	-
• Acute MI	0.92%	0.82%	0.97%	0.93%	0.952	-
• Re-PCI	0.30%	0.41%	0.49%	0.19%	0.329	-
• Stroke	0.24%	0.14%	0.49%	0.19%	0.268	-
• Emergency CABG	0.13%	0.14%	0.12%	0.14%	0.993	-
• Pericardiocentesis	0.84%	1.24%	0.97%	0.65%	0.287	-
Perforation	4.37%	4.53%	3.52%	4.64%	0.399	0.260
Vascular access complication	1.59%	0.55%	1.70%	1.90%	0.040	0.130
Bleeding	1.05%	0.55%	1.94%	0.88%	0.013	0.040

‡ Analysis of deviance p-value adjusted for intra-center dependency.

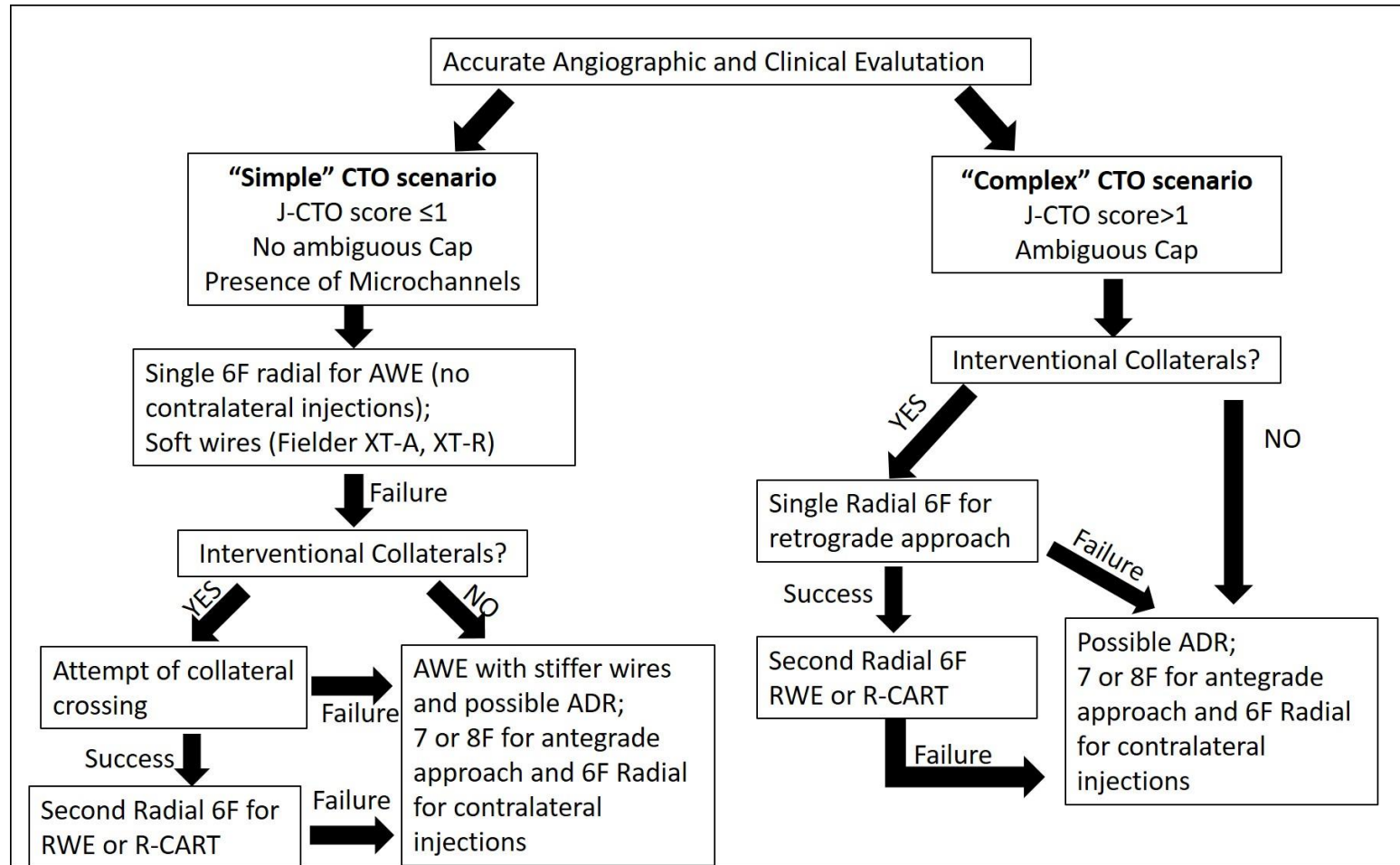
Procedural Outcomes of Percutaneous Coronary Interventions for Chronic Total Occlusions via the Radial Approach: Insight from an International CTO Registry.



Implementing a minimally invasive approach (combining radial approach, small guiding catheters and minimization of double access) for coronary chronic total occlusion intervention according to the hybrid algorithm: The Minimalistic Hybrid Algorithm.

- Alternative Hybrid Approach for **advanced** CTO operators
- Objective:
 - Increase adoption of trans-wrist approach
 - Reduce the use of dual-catheter injection as a first strategy
 - Limiting access-related complications
 - Improve patients' comfort

Implementing a minimally invasive approach (combining radial approach, small guiding catheters and minimization of double access) for coronary chronic total occlusion intervention according to the hybrid algorithm: The Minimalistic Hybrid Algorithm.



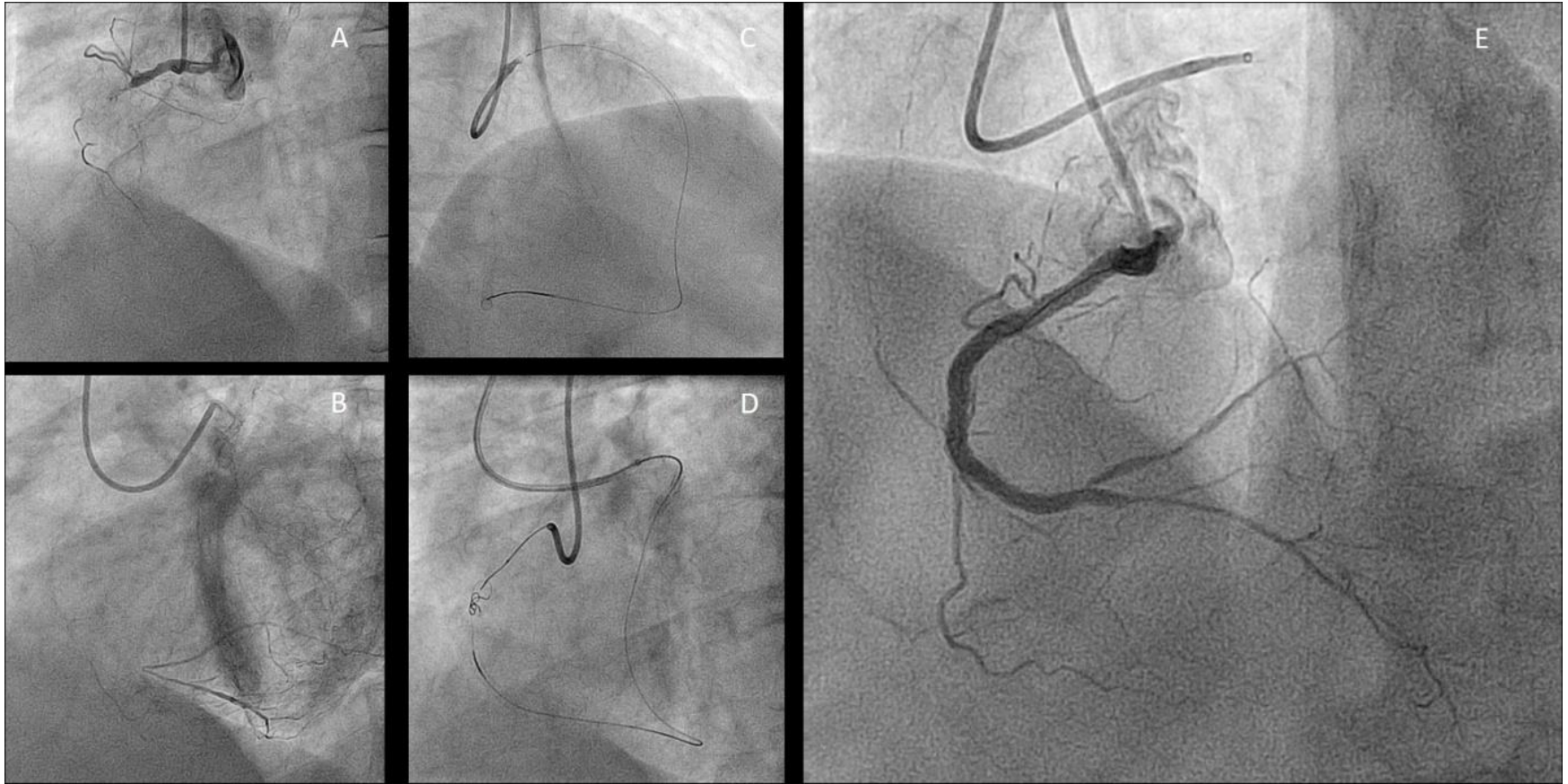
Implementing a minimally invasive approach (combining radial approach, small guiding catheters and minimization of double access) for coronary chronic total occlusion intervention according to the hybrid algorithm: The Minimalistic Hybrid Algorithm.

		Minimalistic Approach(n=91)	Conventional Approach (n=9)
Procedural Success		81(89%)	8(88.9%)
Access site			
	Single Femoral	0	3(33.3%)
	Radial and Femoral	8(8.8%)	6(66.7%)
	Single Radial	50(54.9%)	0
	Bi-radial	26(28.6%)	0
	Single Ulnar	3(3.3%)	0
	Bi-Ulnar	1(1.1%)	0
	Radial and Ulnar	3(3.3%)	0
Catheter Size			
	Antegrade 6F	79(86.8%)	5(55.6%)
	Antegrade 7F	4(4.4%)	0
	Antegrade 8F	8(8.8%)	4(44.4%)
	Retrograde 6F	39(42.8%)	6(66.6%)
Successful technical approach for CTO crossing			
	AWE	52(64.2%)	1(12.5%)
	ADR	5(6.2%)	1(12.5%)
	RWE	3(3.7%)	1(12.5%)
	R-CART	21(25.9%)	5(62.5%)

Implementing a minimally invasive approach (combining radial approach, small guiding catheters and minimization of double access) for coronary chronic total occlusion intervention according to the hybrid algorithm: The Minimalistic Hybrid Algorithm.

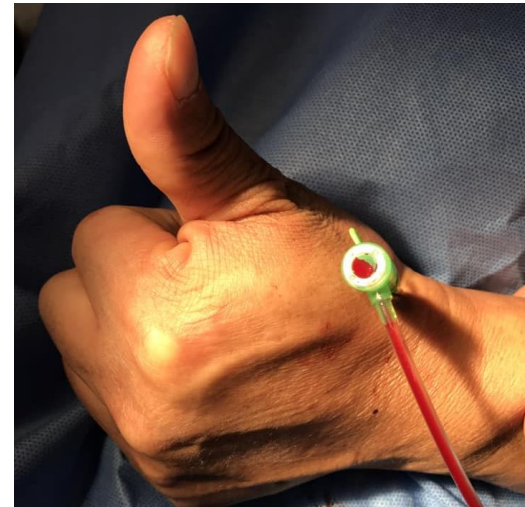
		Minimalistic Approach (n=91)	Conventional Approach (n=9)
Procedural Success		81(89%)	8(88.9%)
J-CTO			
	0	10/10 (100%)	0
	1	30/30 (100%)	2/2 (100%)
	2	17/20 (85%)	3/3 (100%)
	3 or more	24/31 (77.4%)	3/4 (75%)

Implementing a minimally invasive approach (combining radial approach, small guiding catheters and minimization of double access) for coronary chronic total occlusion intervention according to the hybrid algorithm: The Minimalistic Hybrid Algorithm.



First prospective multicenter experience with left distal transradial approach for coronary chronic total occlusion interventions using a 7-french glidesheath slender.

- 41 consecutive pts undergoing CTO-PCI in experienced centres
- LdTRA access successful in 34 (82.9%). Reasons for failure: weak pulsation (3 pts) or excessive tortuosity (4 pts)
- Second access:
 - femoral 70%
 - radial/ulnar 30%
- Mean J-CTO score 2.19 ± 1.27
- Technical CTO success 90%



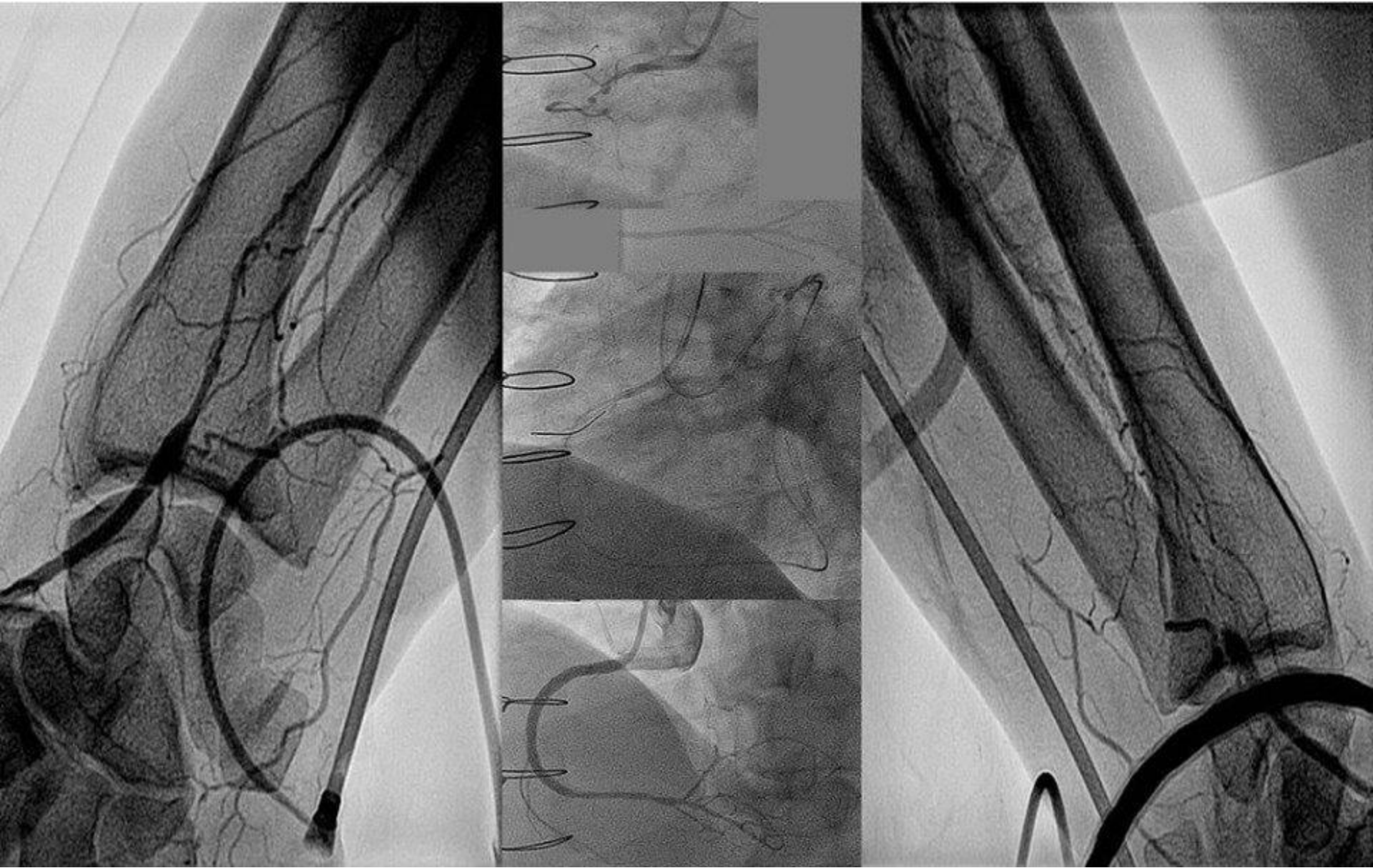
Suggesting a New Primary Access Site for Treating Chronic Total Occlusions: Bilateral Distal Transradial Intervention (bdTRI)

Irzal Hadžibegović, MD, PhD and Boris Starčević, MD, PhD



FIGURE 1. A female patient at our center who underwent CTO intervention of the right coronary artery that utilized 7 Fr hydrophilic sheaths in both radial arteries. The right radial artery was punctured in a classic fashion, with both sheaths almost aligned and a comfortable left hand position, not so distant from the operator standing on the right patient side

Ulnar approach can also be considered in case of radial failure / previous occlusion



Ulnar approach can also be considered in case of radial failure / previous occlusion



Trans-Wrist Intervention: TWI instead of TRI



Distal radial left- distal radial right
Radial left – radial right
Ulnar left – ulnar right

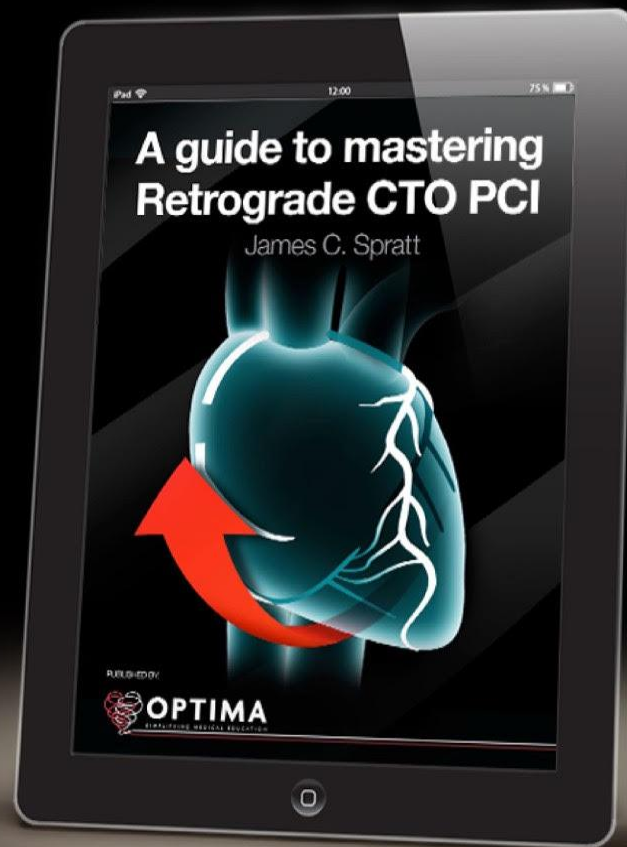
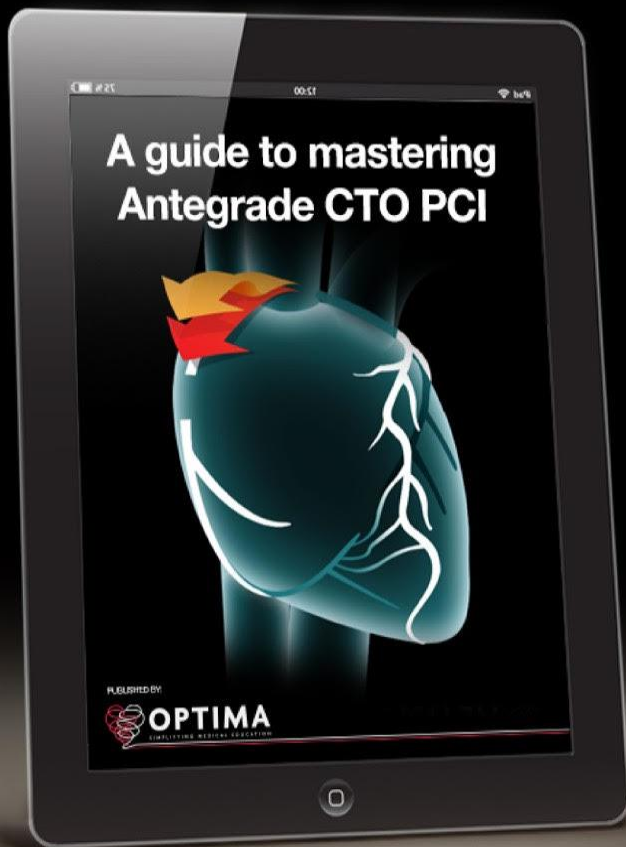
6 WRIST ACCESSES!

Femoral left – femoral right

2 GROIN ACCESSES!

Conclusions

- The overall number of CTO-PCIs is constantly growing, and as in other settings, the routine adoption of TRA has the potential to reduce complications and eventually save lives
- Implementation of trans-radial (or trans-wrist) access in CTO-PCI is a phenomenon already taking place
- Recent evidence suggests that also complex CTO lesions can be approached transradially with high success rates
- Issues concerning lack of support can be solved with proper technical strategies (oversized guiding catheter curves for LCA, more supportive guiding catheters for RCA, GuideExtension adoption...)
- With new sheaths (but also with conventional sheaths) 7F radial is possible in the majority of patients
- When radial artery is not adequate... don't forget the Ulnar!



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EXTRA SLIDES

		Minimalistic Approach(n=91)	Conventional Approach (n=9)
Culprit vessel			
	RCA	52(57.1%)	6(66.7%)
	LAD	28(30.8%)	1(11.1%)
	LCX	11(12.1%)	2(22.2%)
J-CTO score			
	Easy	10(11%)	0
	Intermediate	30(33%)	2(22.2%)
	Difficult	20(22%)	3(33.3%)
	Very difficult	31(34%)	4(44.4%)
	Mean±SD	1.9±1.2	2.3±1
J-CTO score components			
	Blunt Stump	24(26.4%)	3(33.3%)
	Calcium	56(61.5%)	5(55.6%)
	Bending	48(52.7%)	5(55.6%)
	Length>20 mm	37(40.7%)	5(55.6%)
	Re-try lesion	7(7.7%)	3(33.3%)
PROGRESS CTO score		0.9±0.9	1.2±0.7
	Ambiguous Cap	22(24.2%)	5(55.6%)
	LCX vessel	11(12.1%)	2(22.2%)
	Absence of interventional collaterals	26(28.9%)	1(11.1%)
	Proximal tortuosity	28(30.8%)	2(22.2%)

	Patient Number	Culprit Vessel	Vascular Access	Techniques Attempted	Techniques not attempted	J-CTO score	Other Details	Reasons for Interruption
Single Catheter Procedures	1	LAD	Radial (6F)	Retrograde-AWE	ADR	2	Ipsilateral septo-septal collaterals only	Retrograde channel crossing failed with septal perforation. Failed antegrade lesion crossing.
	2	RCA	Radial (6F)	AWE	ADR-Retrograde	3	Trans-septal retrograde channels	When attempting retrograde approach through trans-septals, evidence of LAD occlusion, not disclosed during baseline CAG performed in other hospital. Patient was further evaluated by the heart-team and surgical revascularization was indicated.
	3	OM	Radial (6F)	AWE-ADR	-	2	No retrograde channels	Failed distal re-entry after subintimal lesion crossing. Attempt interrupted in reason of the small territory downstream the occlusion.
	4	OM	Radial (6F)	AWE-Retrograde	ADR	2	Ipsilateral diagonal-OM collaterals only	Failed distal re-entry after antegrade approach; retrograde channels crossed but failed distal cap penetration; attempt interrupted in consideration of the small occluded vessel.
	5	Diagonal	Ulnar (7F)	Retrograde	AWE-ADR	3	Ipsilateral LAD-diagonal collaterals only;	Successful retrograde crossing and predilation (LAD was previously stented at level of diagonal origin). However, the stent could not cross the lesion; procedure interrupted after dissection of the LAD with need for stent implantation and therefore additional sealing of the diagonal origin.
Dual Catheter Procedures	1	RCA	Double-Radial (6F)	Retrograde-ADR	-	3	Epicardial LCx-RCA collaterals	After successful retrograde crossing failed distal cap puncture (bifurcation in site). Failed ADR because of distal re-entry difficulties.
	2	RCA	Femoral (8F)-Radial (6F)	ADR	-	3	Absence of interventional collaterals	Failed re-entry with CrossBoss-Stingray system.
	3	RCA	Femoral (8F)-Radial (6F)	ADR-Retrograde	-	4	Trans-septals collaterals only	Failed re-entry with CrossBoss-Stingray system. Failed trans-septals wire crossing.
	4	RCA	Femoral (8F)-Radial (6F)	Retrograde-ADR	-	3	Trans-septals collaterals only	Failed trans-septal collaterals wire crossing; conversion to ADR with CrossBoss-Stingray system, with failed distal re-entry.
	5	RCA	Double-Radial (6F)	Retrograde-AWE	ADR	3	Trans-septals collaterals only	After successful trans-septals crossing, failed proximal and distal cap penetration (also with Confianza pro 12 g wire)