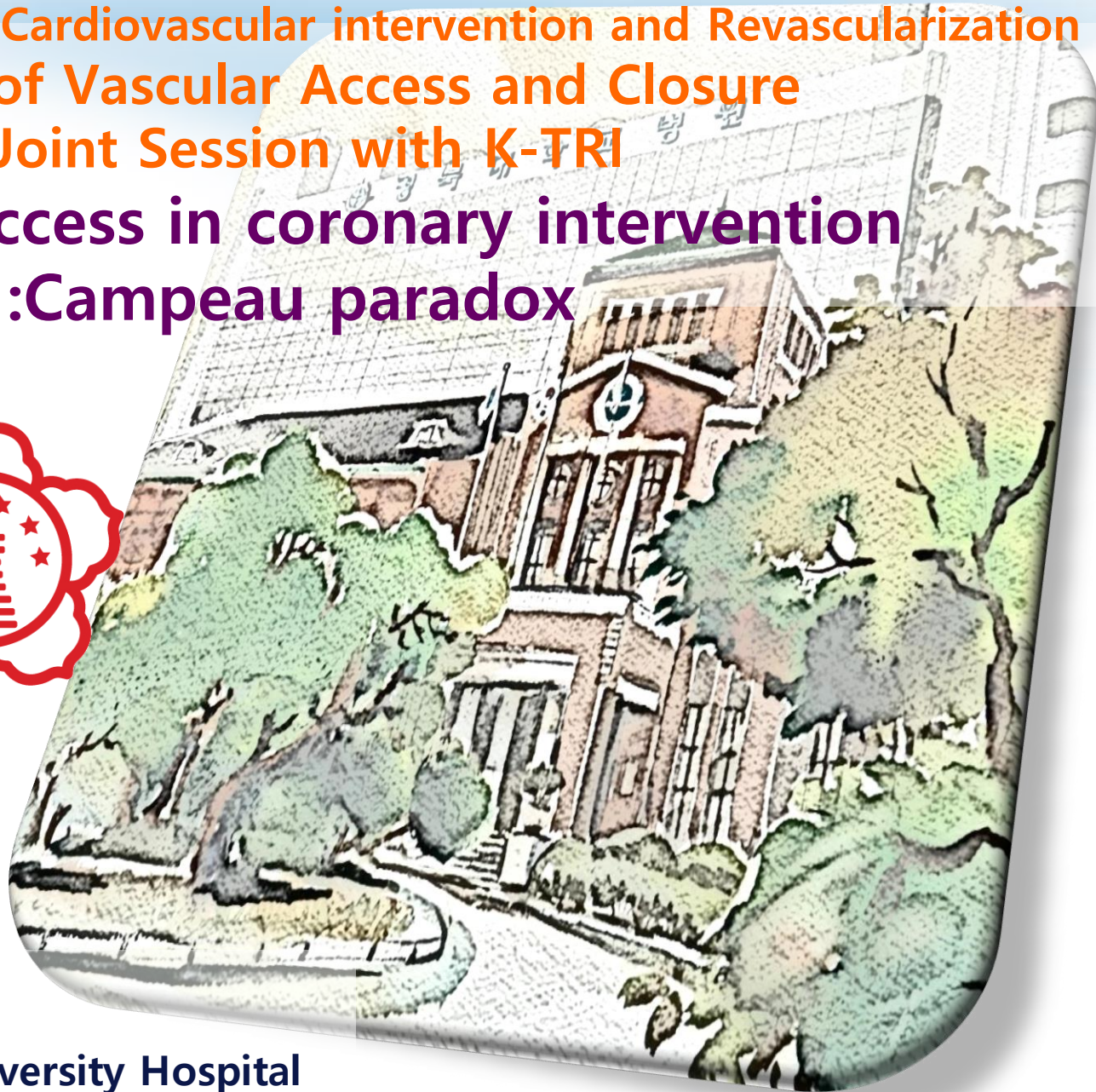


2019 Joint Meeting of Cardiovascular intervention and Revascularization
Update of Vascular Access and Closure
: Joint Session with K-TRI
Vascular access in coronary intervention
:Campeau paradox



Jang Hoon Lee, MD
Kyungpook National University Hospital



Historical Perspective of TRI

- 1989: First published series of transradial coronary angiography
(Campeau L. Cathet Cardiovasc Diagn 1989;16:3-7)



Dr. Lucien Campeau (1927-2010)
Montreal Heart Institute

- 1992: First transradial coronary angioplasty
- 1993: First transradial coronary stenting
(Kiemeneij F, et al. Am Heart J 1995;129:1-7)



Dr. Ferdinand Kiemeneij
Amsterdam, Netherlands



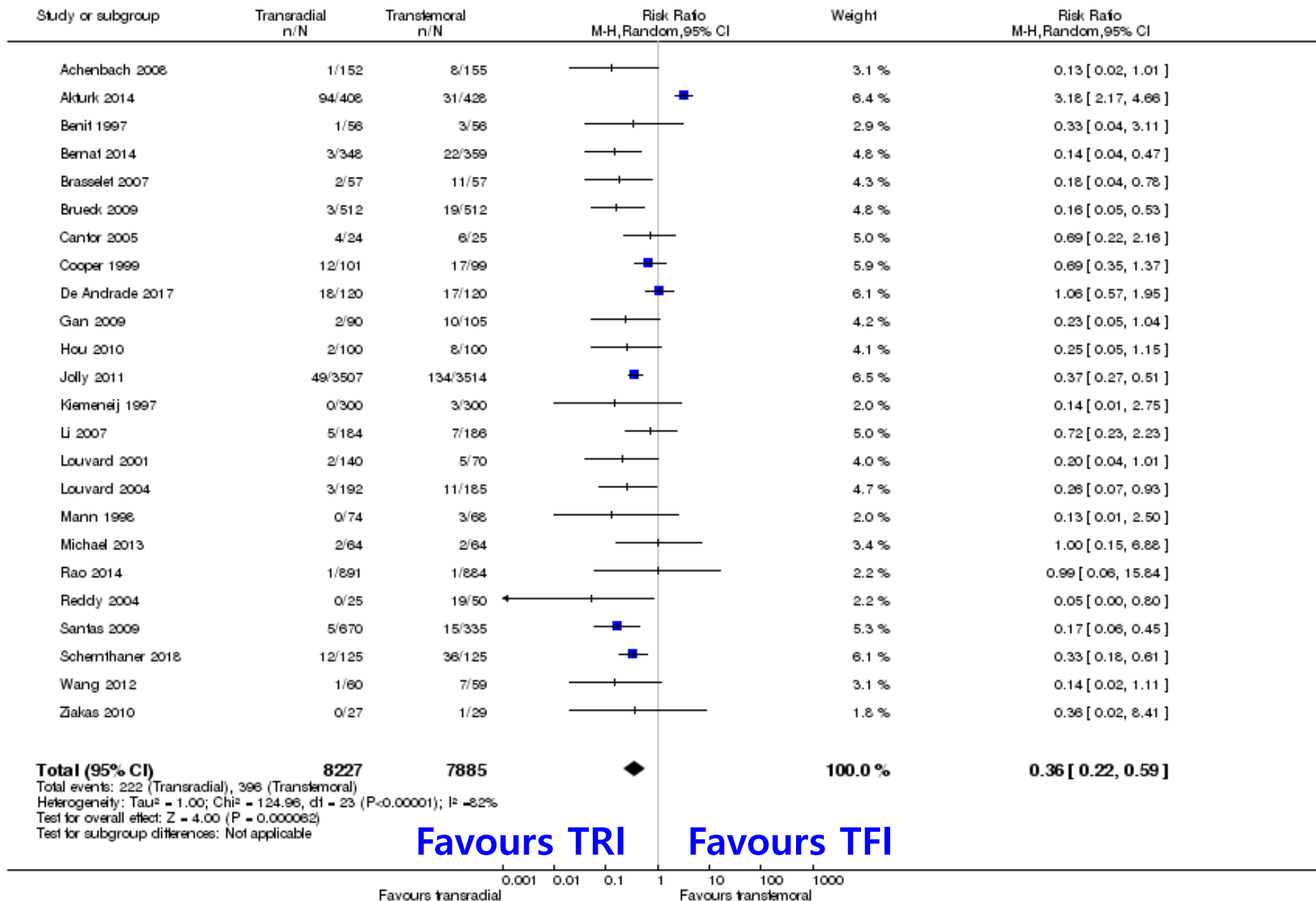


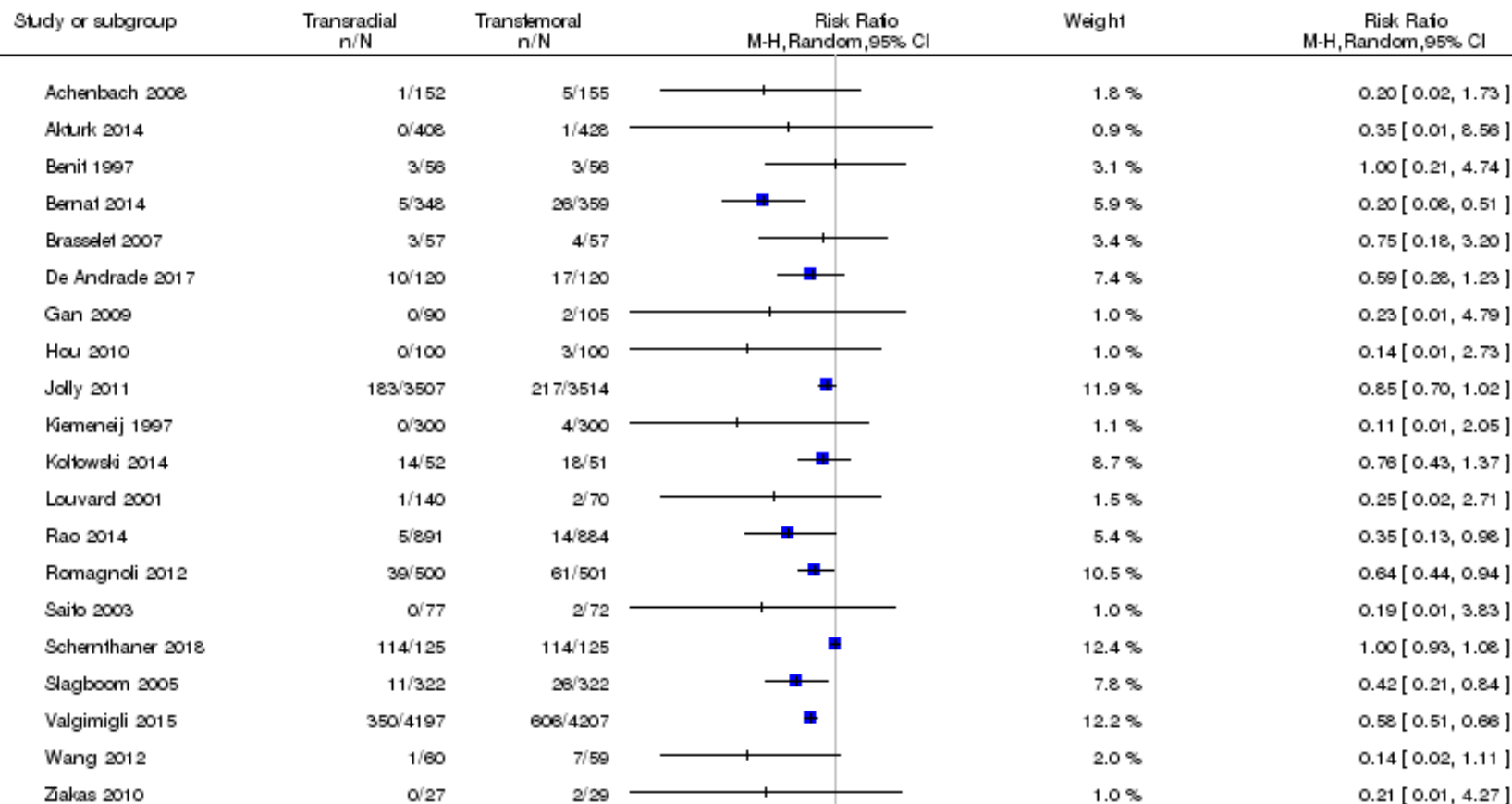
Campeau radial paradox

- With the increasing dominance of TRI for PCI, concerns have been expressed that as operators/centers become increasingly unfamiliar with TFI, outcomes in procedures where femoral access is necessary might become compromised.
- However, it is unclear from the existing literature whether this is a real-access-related effect or represents the impact of case mix on outcomes.



Meta-analysis: Access site complications





Total (95% CI)

11529

11514



100.0 %

0.54 [0.40, 0.74]

Total events: 740 (Transradial), 1134 (Transfemoral)

Heterogeneity: Tau² = 0.21; Chi² = 145.15, df = 19 (P<0.00001); I² = 87%

Test for overall effect: Z = 3.82 (P = 0.00013)

Test for subgroup differences: Not applicable

Favours TRI

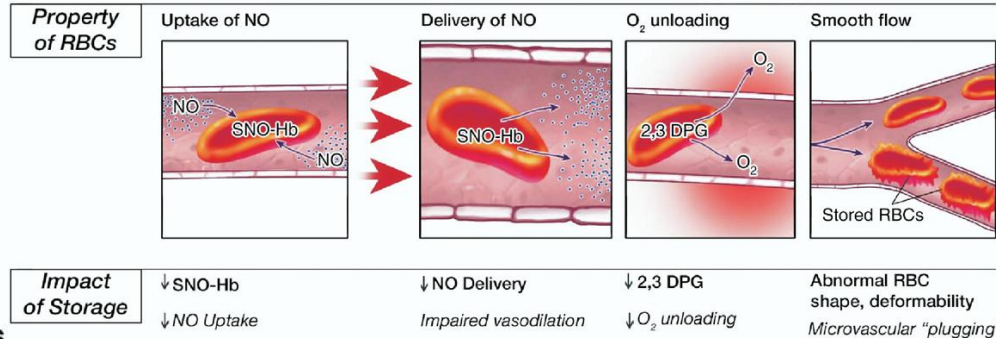
Favours TFI

0.01 0.1 1 10 100
Favours transradial Favours transfemoral





Intracranial bleeding



Blood transfusion

↓ O₂ delivery
Prothrombotic?
Proinflammatory?



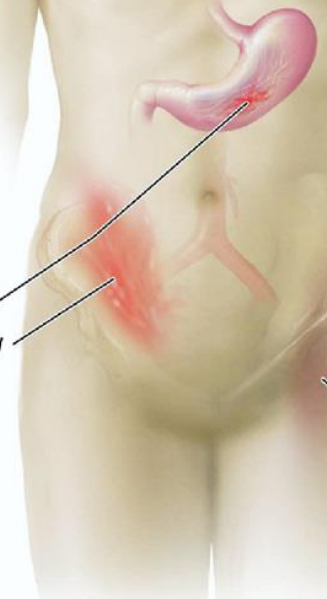
Ischemic events

Stent thrombosis



Severe hemorrhage

Gastrointestinal
Retroperitoneal



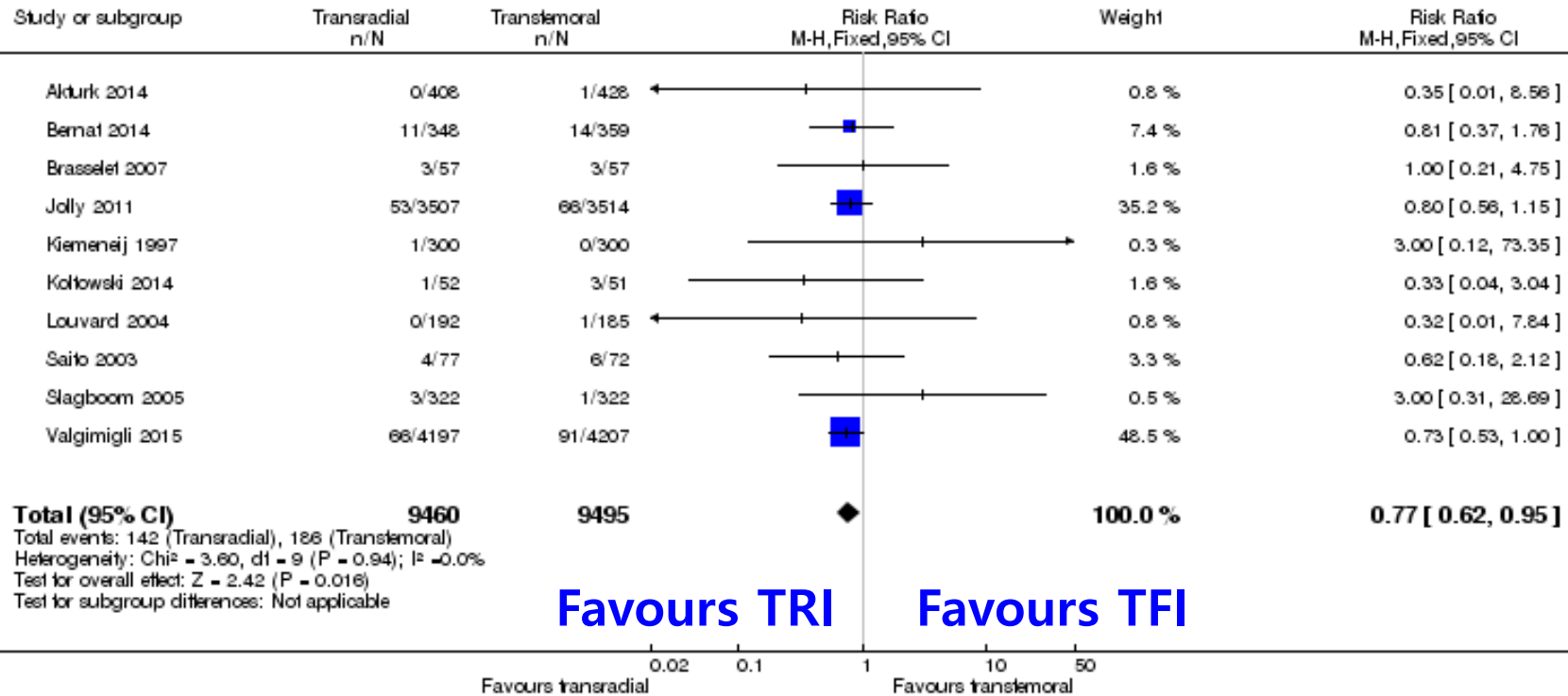
Stop antiplatelet therapy
Prothrombotic state?

Femoral bleeding,
hematoma



Studies of the impact of Major Bleeding on Mortality After PCI

	N	Patient	Blood transfusion (%)	Impact of Bleeding on Mortality [95% CI]	P value
Kinnaird et al.	10,974	Unselected	5.4	30-day adjusted OR: 3.5 [1.9 - 6.7]	<0.001
REPLACE-2	6,001	Elective and 'urgent' PCI	3.2	1-year adjusted OR: 2.66 [1.44 - 4.92]	0.002
Ndrepepa et al.	5,348	Elective, ACS	4.0	1-year adjusted HR: 2.96 [1.96 - 4.48]	<0.0001
ACUITY	13,819	ACS only	4.7	30-day OR: 7.55 [4.68 - 12.18]	<0.0001
Kim et al.	6,799	Unselected	8.0	1-year RR: 2.03 (transfused patients)	0.0028
Doyle et al.	17,901	Unselected	4.8	30-day adjusted HR: 9.96 [6.94 - 14.3]	<0.0001
GRACE Registry	24,045	ACS	3.9	In-hospital adjusted OR: 1.64 [1.18 - 2.28]	<0.001
Yatskar et al.	6,656	Unselected	1.8	In-hospital adjusted OR: 3.59 [1.66 - 7.77] 1-year adjusted HR: 1.65 [1.01 - 2.70]	0.001 0.048



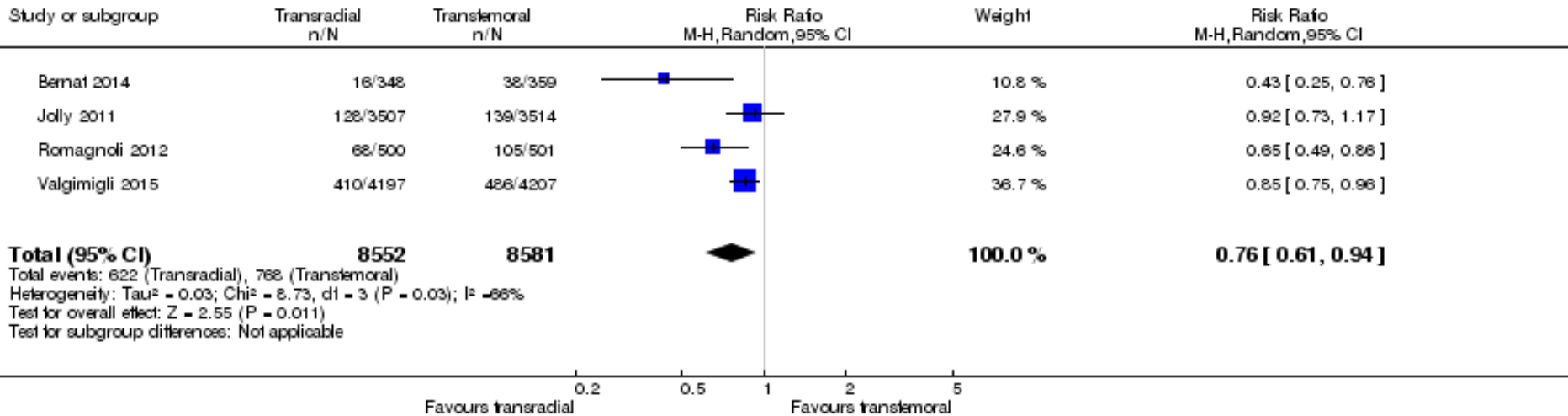


Five Pivotal RCTs for TFI versus TRI

	N	NSTEMI/ STEMI	Primary outcome	MACE	Bleeding	FU
RIVAL	7,021	NSTEMI/ STEMI	NACE	Death, MI, Stroke	TIMI major	30 days
RIFLE- STEACS	1,001	STEMI	NACE	Cardiac death, MI, Stroke, TLR	TIMI major	30 days
STEMI- RADIAL	707	STEMI	NACE	Death, MI, Stroke	HORIZONS-AMI	30 days
MATRIX	8,404	NSTEMI/ STEMI	MACE NACE	Death, MI, Stroke	BARC major	30 days
SAFARI- STEMI	2,292	STEMI	All-cause mortality			30 days

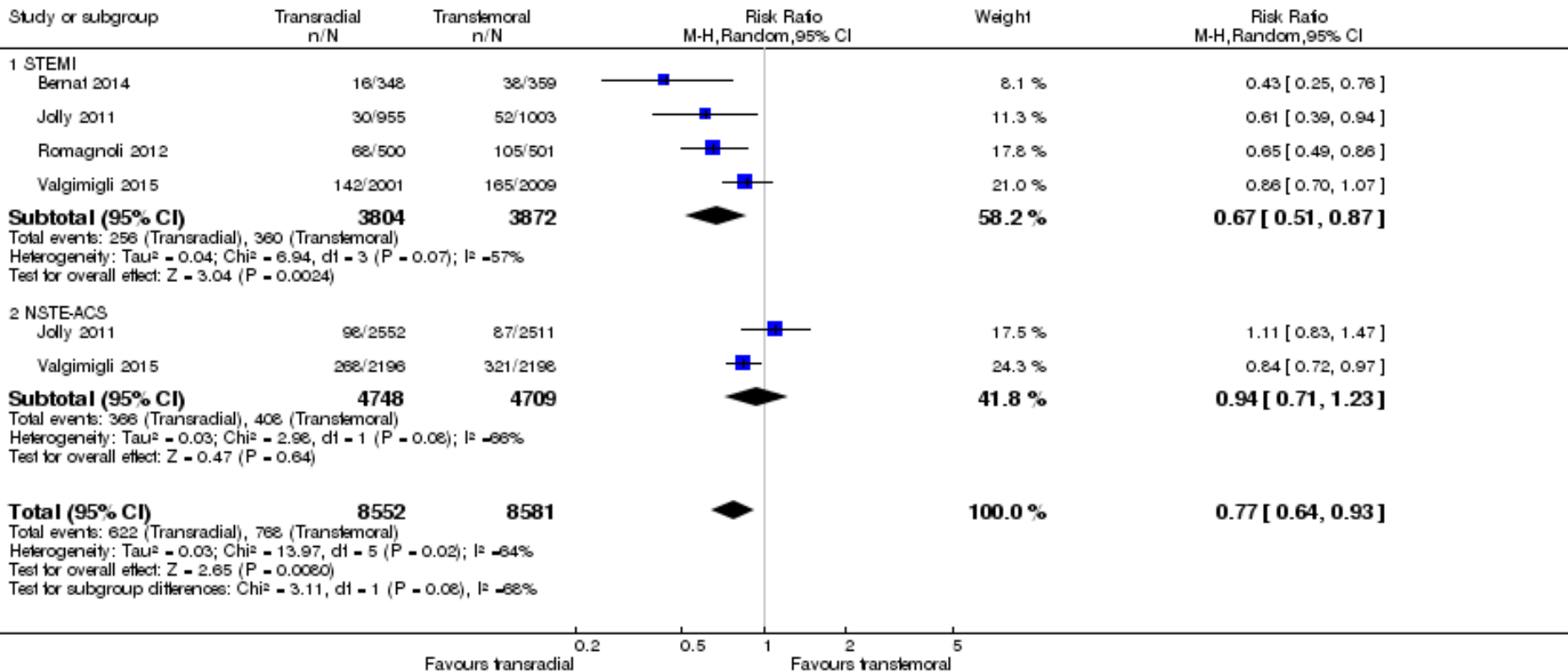
NACE (MACE + Major bleeding)

Review: Transradial versus transfemoral approach for diagnostic coronary angiography and percutaneous coronary intervention in people with coronary artery disease
Comparison: 1 Transradial versus transfemoral approach
Outcome: 1 ShortTerm NACE



NACE (MACE + Major bleeding)

Review: Transradial versus transfemoral approach for diagnostic coronary angiography and percutaneous coronary intervention in people with coronary artery disease
 Comparison: 1 Transradial versus transfemoral approach
 Outcome: 3 Short-Term NACE (STEMI vs NSTEMI-ACS)





Procedural aspects of the primary percutaneous coronary intervention strategy

CHANGE IN RECOMMENDATIONS 2012 2017

Radial access^a
MATRIX¹⁴³

DES over BMS
EXAMINATION^{150, 151}
COMFORTABLE-AMI¹⁴⁹, NORSTENT¹⁵²

Complete Revascularization^b
PRAMI¹⁶⁸, DANAMI-3-PRIMULTI¹⁷⁰,
CVLPRIT¹⁶⁹, Compare-Acute¹⁷¹

Thrombus Aspiration^c
TOTAL¹⁵⁹, TASTE¹⁵⁷

Bivalirudin
MATRIX²⁰⁹, HEAT-PPCI²⁰⁵

Enoxaparin
ATOLL^{200,201}, Meta-analysis²⁰²

Early Hospital Discharge^d
Small trials & observational data²⁵⁹⁻²⁶²

Oxygen when SaO₂ <95% AVOID⁶⁴, DETOX⁶⁶ **Oxygen when SaO₂ <90%**

Dose i.V. TNK-tPA same in all patients STREAM¹²¹ **Dose i.V. TNK-tPA half in Pts ≥75 years**

Recommendations	Class ^a	Level ^b
IRA strategy		
Primary PCI of the IRA is indicated. ^{114,116,139,140}	I	A
New coronary angiography with PCI if indicated is recommended in patients with symptoms or signs of recurrent or remaining ischaemia after primary PCI.	I	C
IRA technique		
Stenting is recommended (over balloon angioplasty) for primary PCI. ^{146,147}	I	A
Stenting with new-generation DES is recommended over BMS for primary PCI. ^{148-151,178,179}	I	A
Radial access is recommended over femoral access if performed by an experienced radial operator. ^{143-145,180}	I	A
Routine use of thrombus aspiration is not recommended. ^{157,159}	III	A
Routine use of deferred stenting is not recommended. ¹⁵³⁻¹⁵⁵	III	B





Five Pivotal RCTs for TFI versus TRI

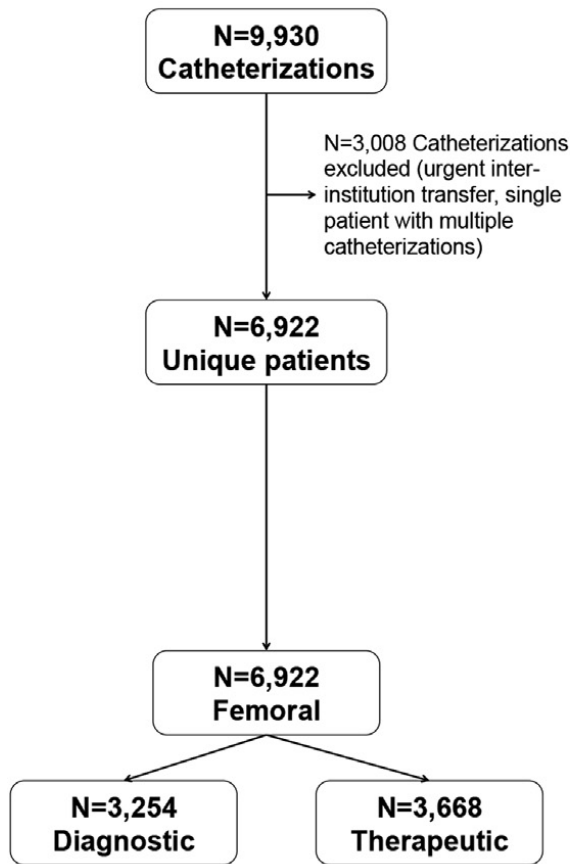
	N	Crossover	
		%TRI to TFI	%TFI to TRI
RIVAL	7,021	5.3%	1.6%
RIFLE-STEACS	1,001	9.4%	2.8%
STEMI-RADIAL	707	3.7%	0.6%
MATRIX	8,404	4.3%	2.4%
SAFARI-STEMI	2,292	8.1%	2.3%



Campeau radial paradox Does Exist !!

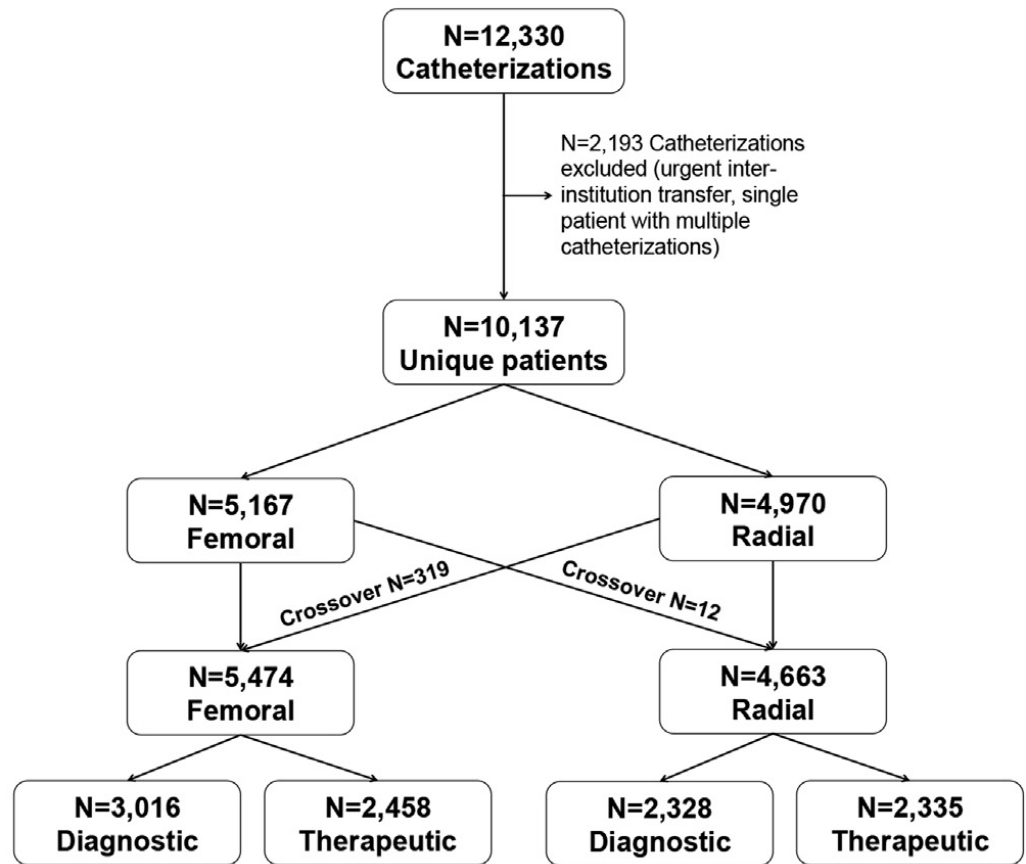
(1996-1998)

Historical cohort



(2006-2008)

Contemporary cohort



YES

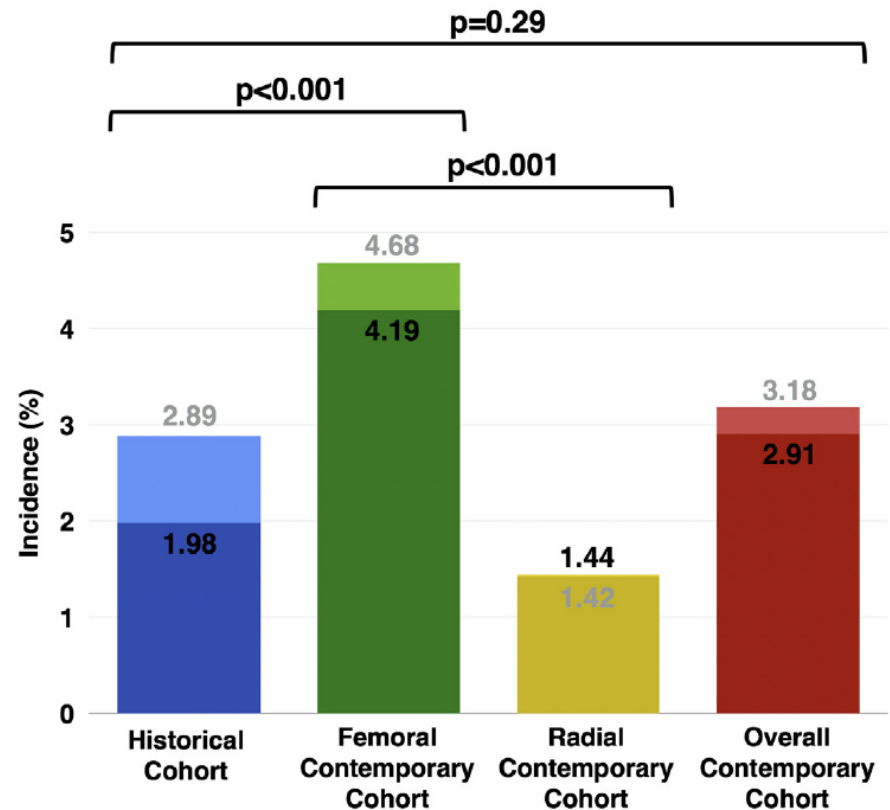
Campeau radial paradox Does Exist !!

TABLE 3 Vascular Access Site Complications

	Historical Cohort		Contemporary Cohort		p Value
	Femoral (n = 6,922)	Femoral (n = 5,474)	Radial (n = 4,663)	Overall (n = 10,137)	
Major hematoma	86 (1.24%)	208 (3.80%)	61 (1.31%)	269 (2.65%)	<0.0001* <0.0001† <0.0001‡
Pseudoaneurysm	81 (1.17%)	16 (0.29%)	0	16 (0.16%)	<0.0001* <0.0001† 0.0002‡
Arterial thrombosis	12 (0.17%)	6 (0.11%)	1 (0.02%)	7 (0.07%)	0.04* 0.35† 0.09‡
Arterial dissection	3 (0.04%)	7 (0.13%)	0	7 (0.07%)	0.50* 0.10† 0.01‡
Arterial perforation	0	3 (0.05%)	1 (0.02%)	4 (0.04%)	0.10* 0.05† 0.40‡
Arteriovenous fistula	9 (0.13%)	2 (0.04%)	0	2 (0.02%)	0.005* 0.08† 0.19‡
Retroperitoneal hematoma	2 (0.03%)	12 (0.22%)	0	12 (0.12%)	0.05* 0.002† 0.001‡
Distal embolization	4 (0.06%)	1 (0.02%)	0	1 (0.01%)	0.07* 0.28† 0.36‡
Others§	3 (0.04%)	1 (0.02%)	3 (0.06%)	4 (0.04%)	0.90* 0.44† 0.24‡
Total	200 (2.89%)	256 (4.68%)	66 (1.42%)	322 (3.18%)	0.29* <0.0001† <0.0001‡

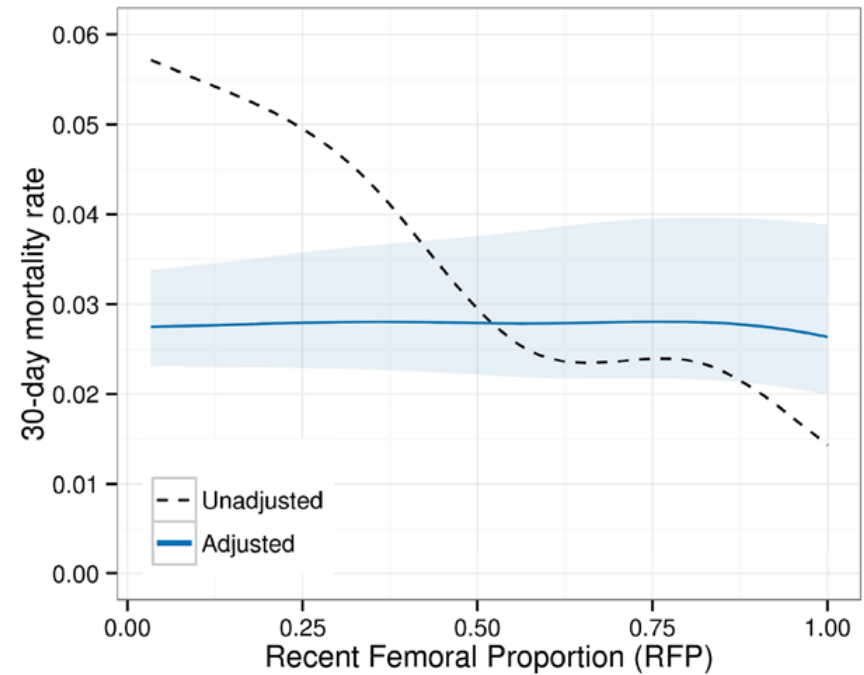
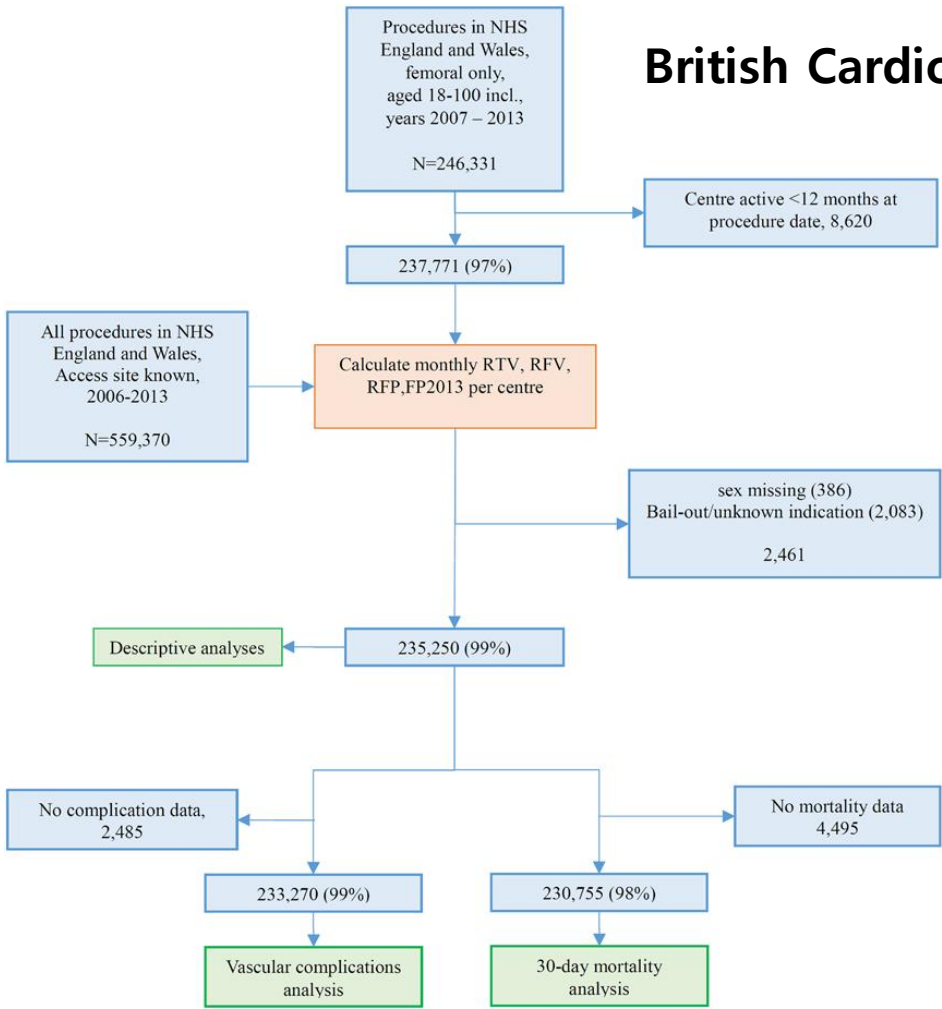
Values are n (%). The p value comparisons: *historical vs. overall contemporary cohort; †historical vs. femoral contemporary cohort; ‡radial vs. femoral contemporary cohort. §"Others" indicates arterial avulsion, femoral nerve injury, and local infection.

Rates of VASC



NO Campeau radial paradox Does **Not** Exist !!

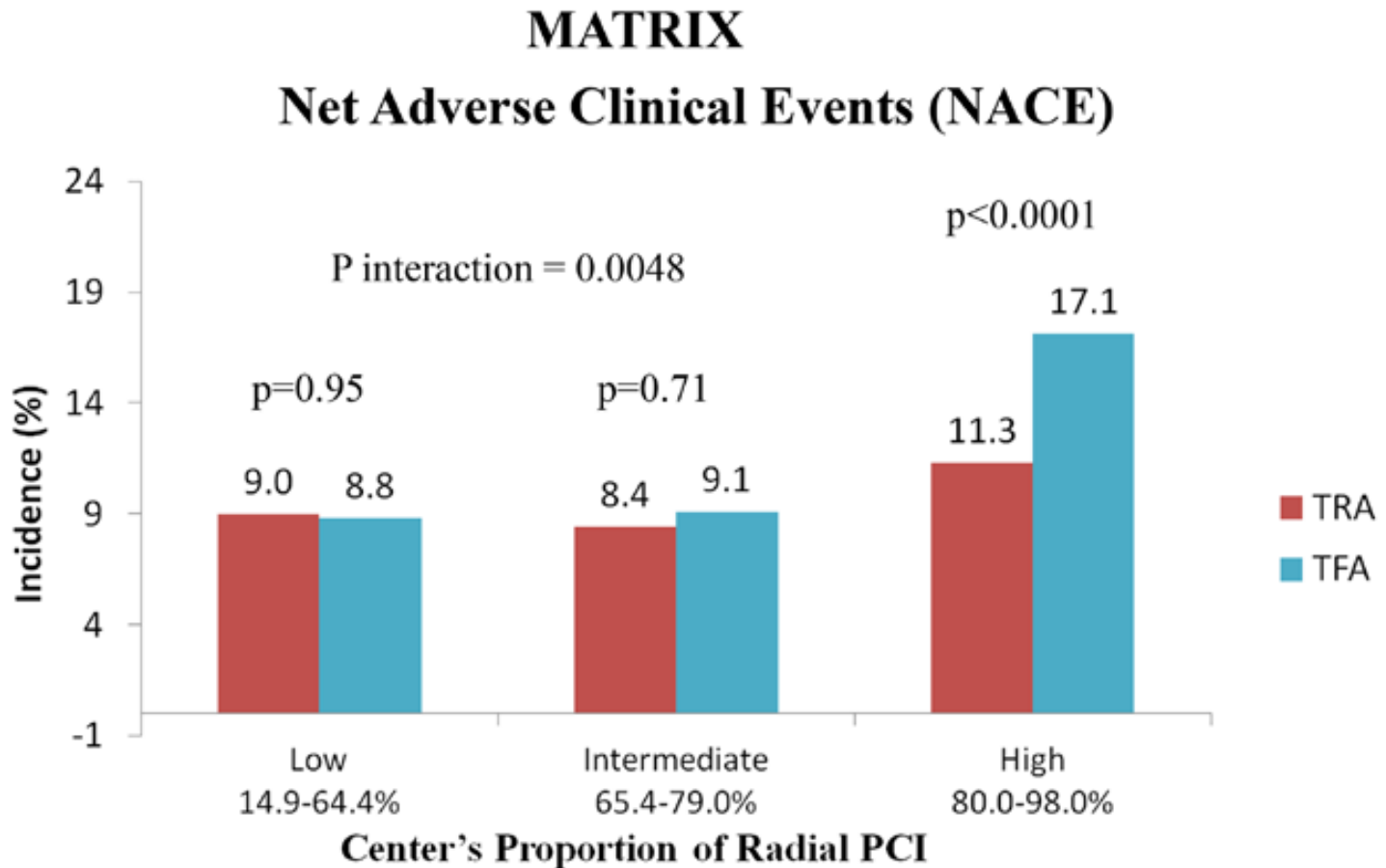
British Cardiovascular Intervention Society (BCIS)





Campeau Radial Paradox Might Exist for Several Reasons

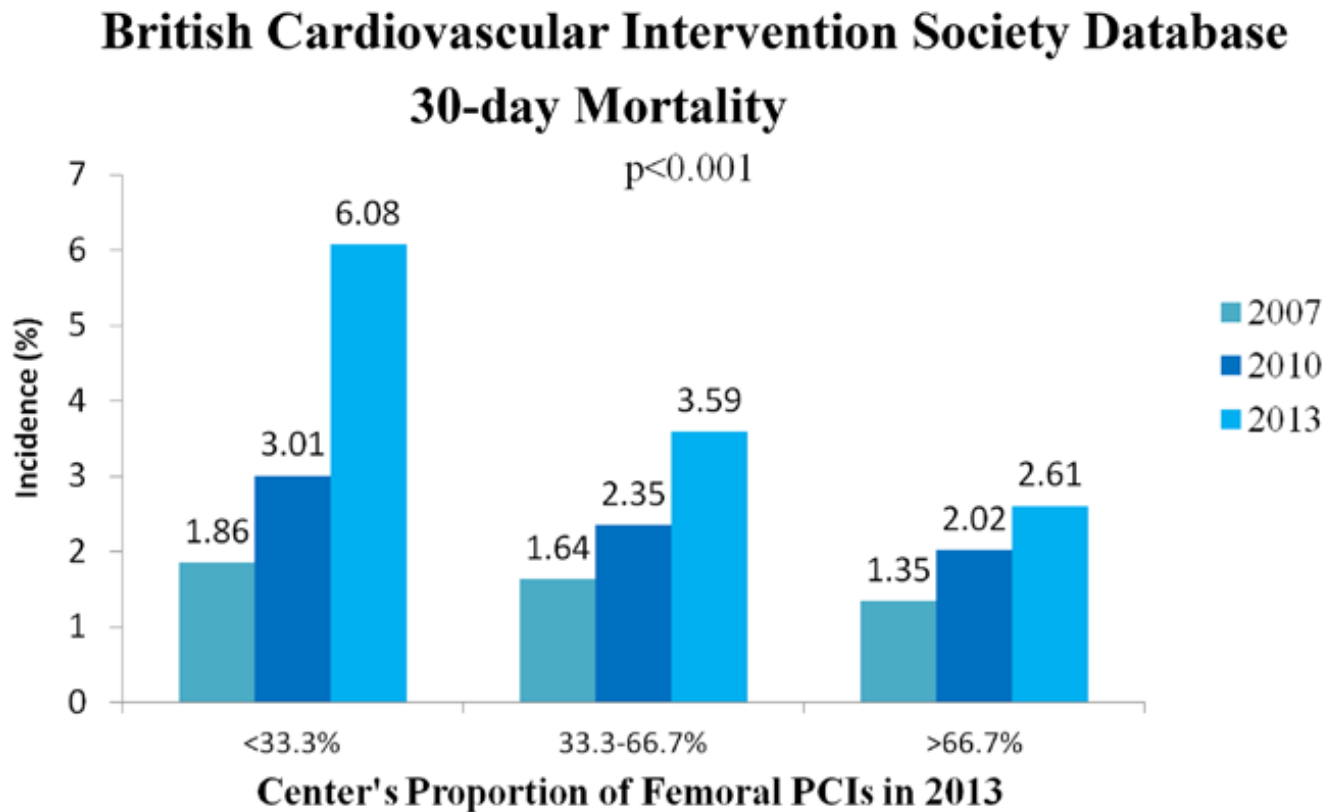
First: higher clinical events of femoral access in high-volume default radial center





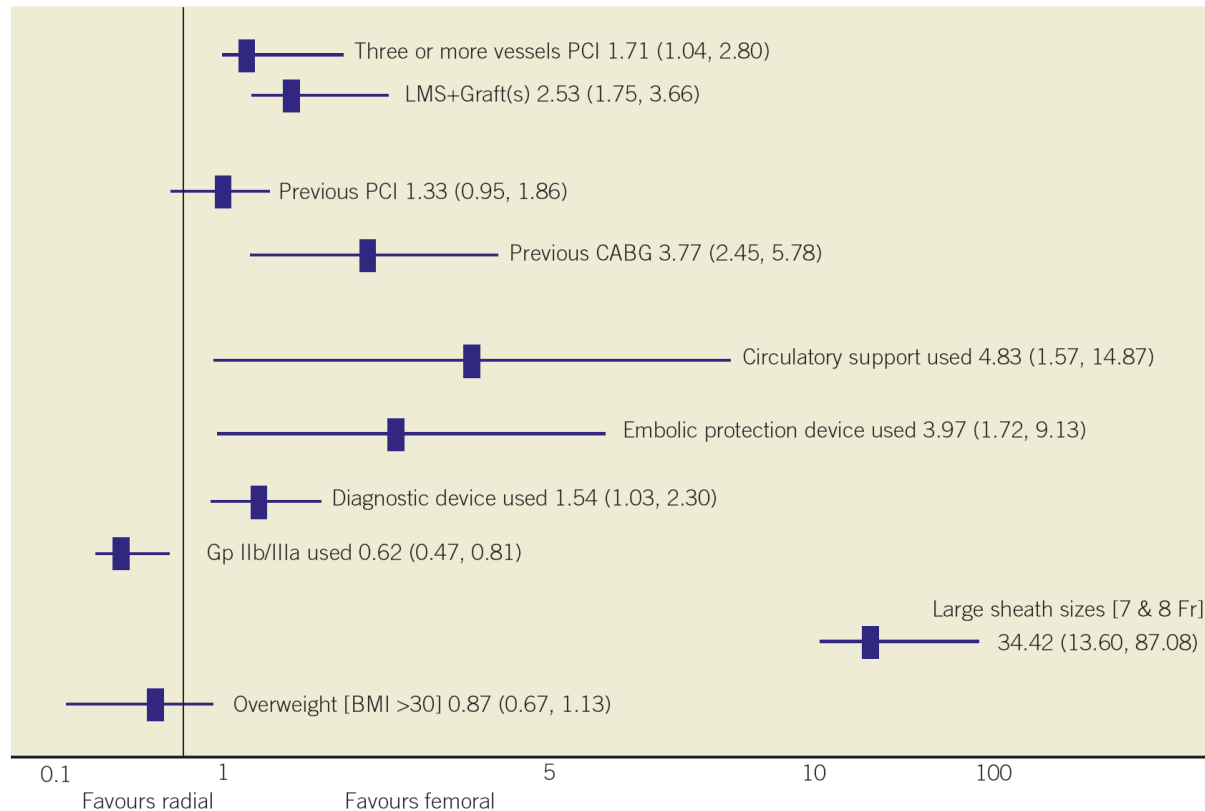
Campeau Radial Paradox Might Exist for Several Reasons

Second: Newly trained operators who predominantly use TRI may have struggled with TFI because of suboptimal training



Campeau Radial Paradox Might Exist for Several Reasons

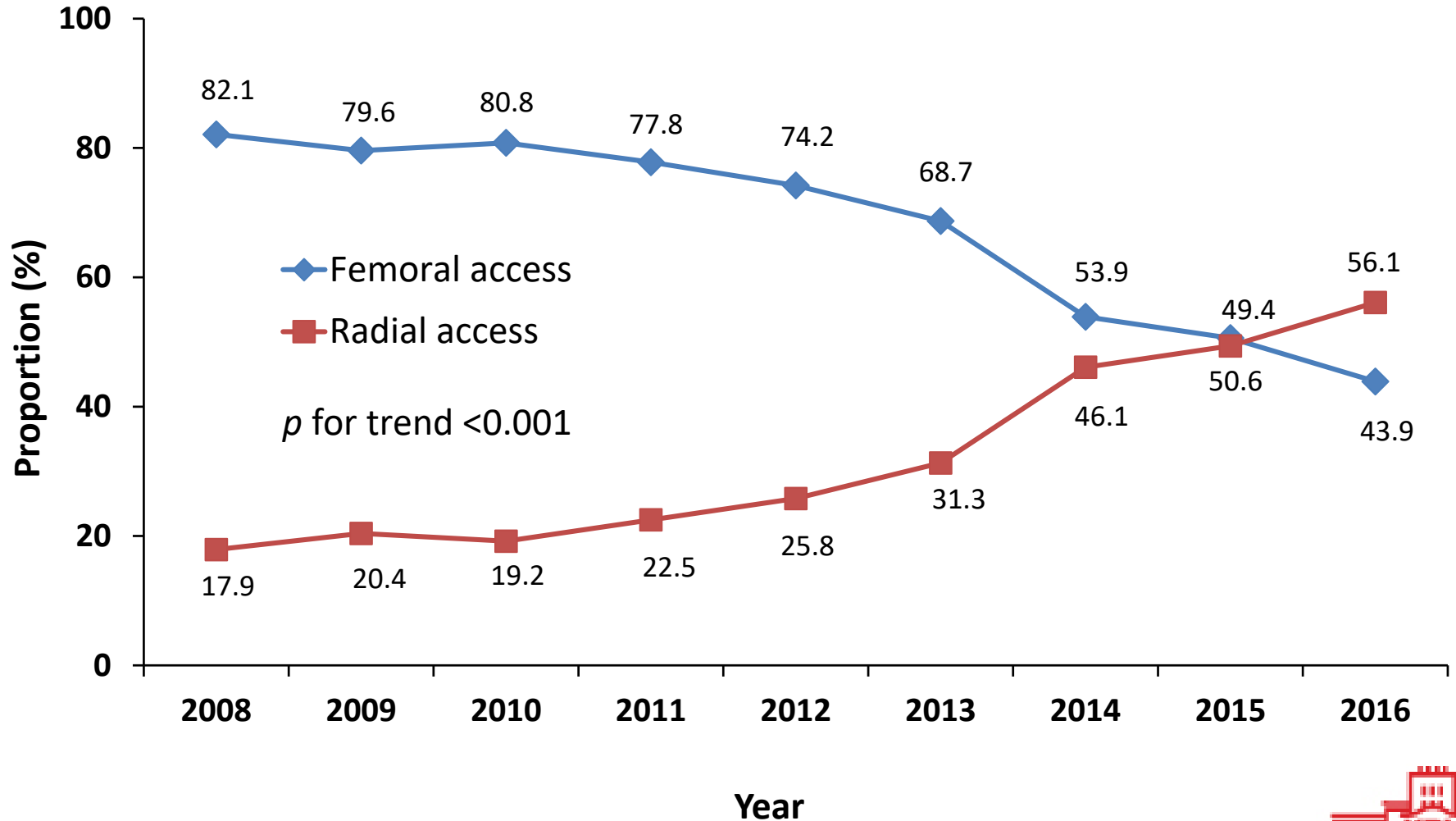
Third: Modern radial operators reserve the femoral access for complex PCIs in critical clinical scenarios



Variables Independently associated with femoral route by default radial operators

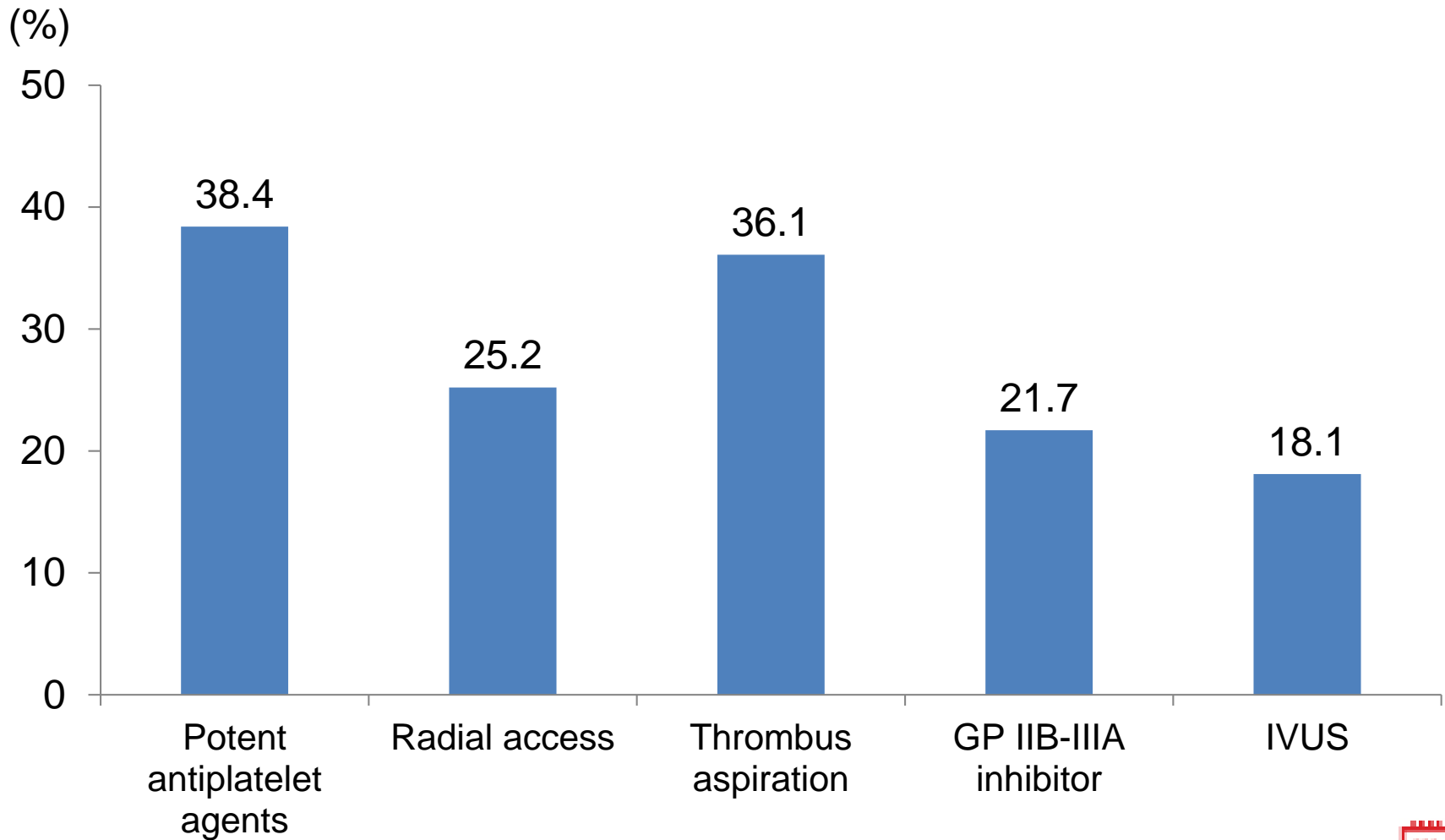


Temporal trends in vascular access in Korean AMI patients



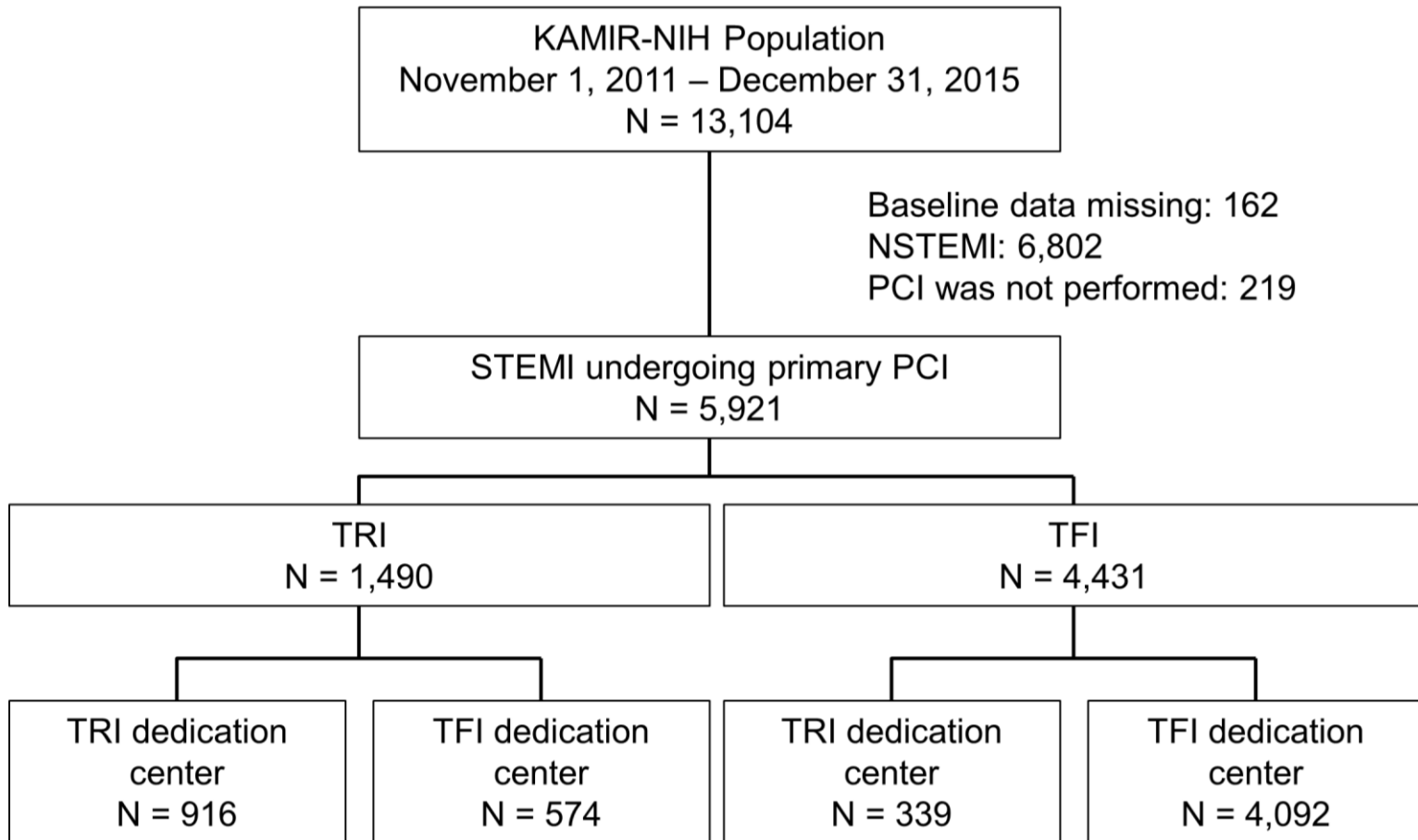


Usages of each strategy in KAMIR





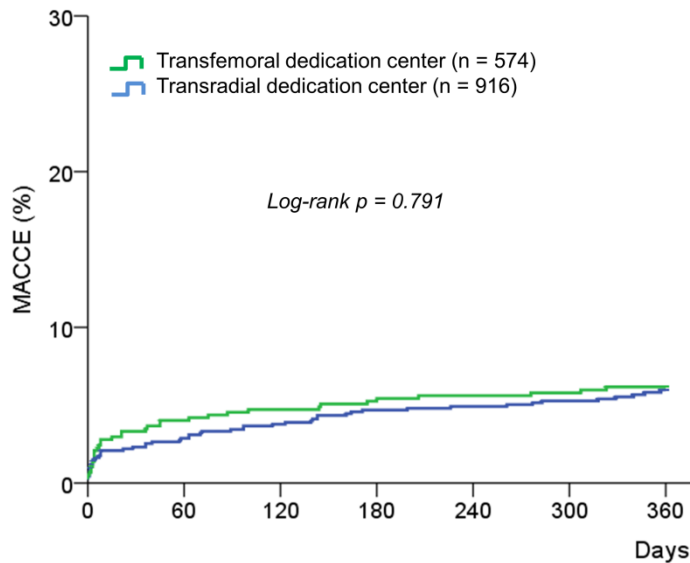
KAMIR-NIH





Kaplan-Meier survival curves for MACCEs at 1 year between TRI dedicated center and TFI dedicated center

TRI

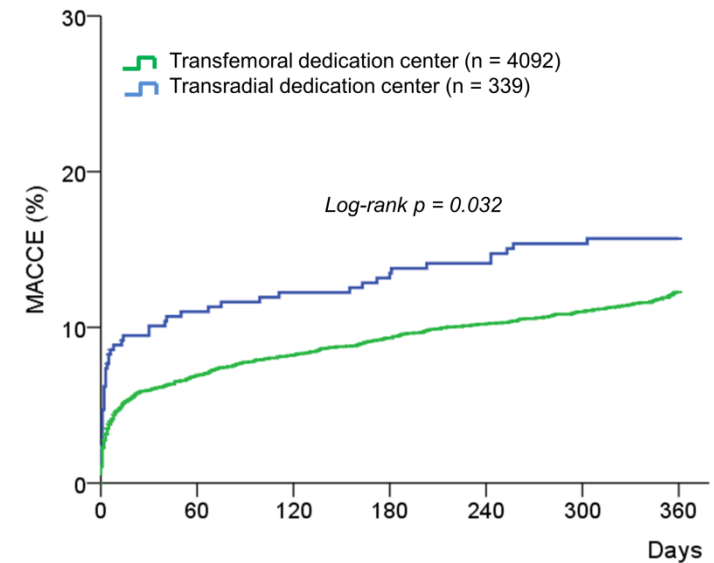


No. at risk

Transfemoral center	574	545	541	534	527	508	350
Transradial center	916	861	848	833	806	784	563

(A)

TFI



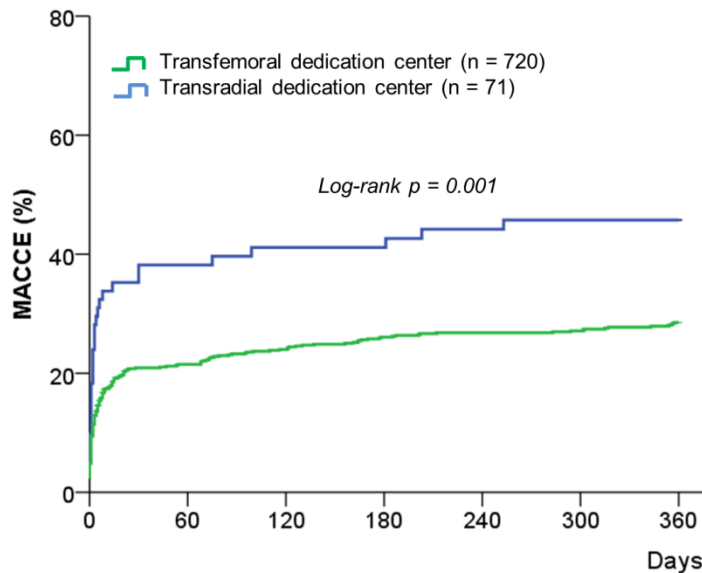
No. at risk

Transfemoral center	4092	3720	3654	3594	3525	3429	2332
Transradial center	339	289	285	279	272	258	182

(B)

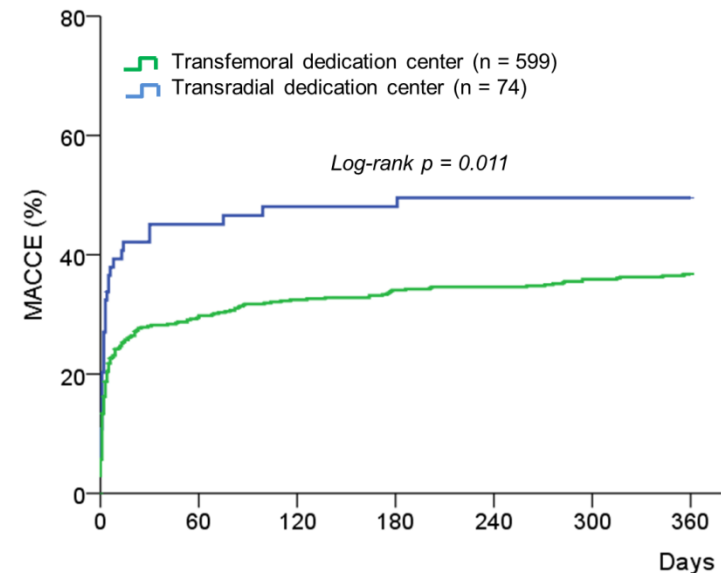


Kaplan-Meier survival curves for MACCEs at 1 year between TRI and TFI dedication center in TFI group



No. at risk	0	60	120	180	240	300	360
Transfemoral center	720	535	514	498	488	480	332
Transradial center	71	42	40	39	36	30	20

Cardiogenic Shock



No. at risk	0	60	120	180	240	300	360
Transfemoral center	599	399	378	366	359	347	237
Transradial center	74	37	35	35	32	32	21

Killip Class III-IV



Take Home Message

- Default radial operators would undertake a PCI from the femoral access in patients with challenging clinical scenarios.
- Femoral access in a default radial PCI center was an independent predictor for clinical events.
- Radial paradox might exist and appear to offset the benefit of radial access.
- Therefore, high-volume default radial PCI centers should make an effort to overcome radial paradox and improve clinical outcome during transfemoral PCI.



Thank you for your attention!!



KYUNGPOOK NATIONAL UNIVERSITY SCHOOL OF MEDICINE