
PUSAN NATIONAL UNIVERSITY HOSPITAL
부 산 대 학 교 병 원
PNUH

Should Transradial Approach be Always the First Choice of Percutaneous Route in Coronary Intervention?

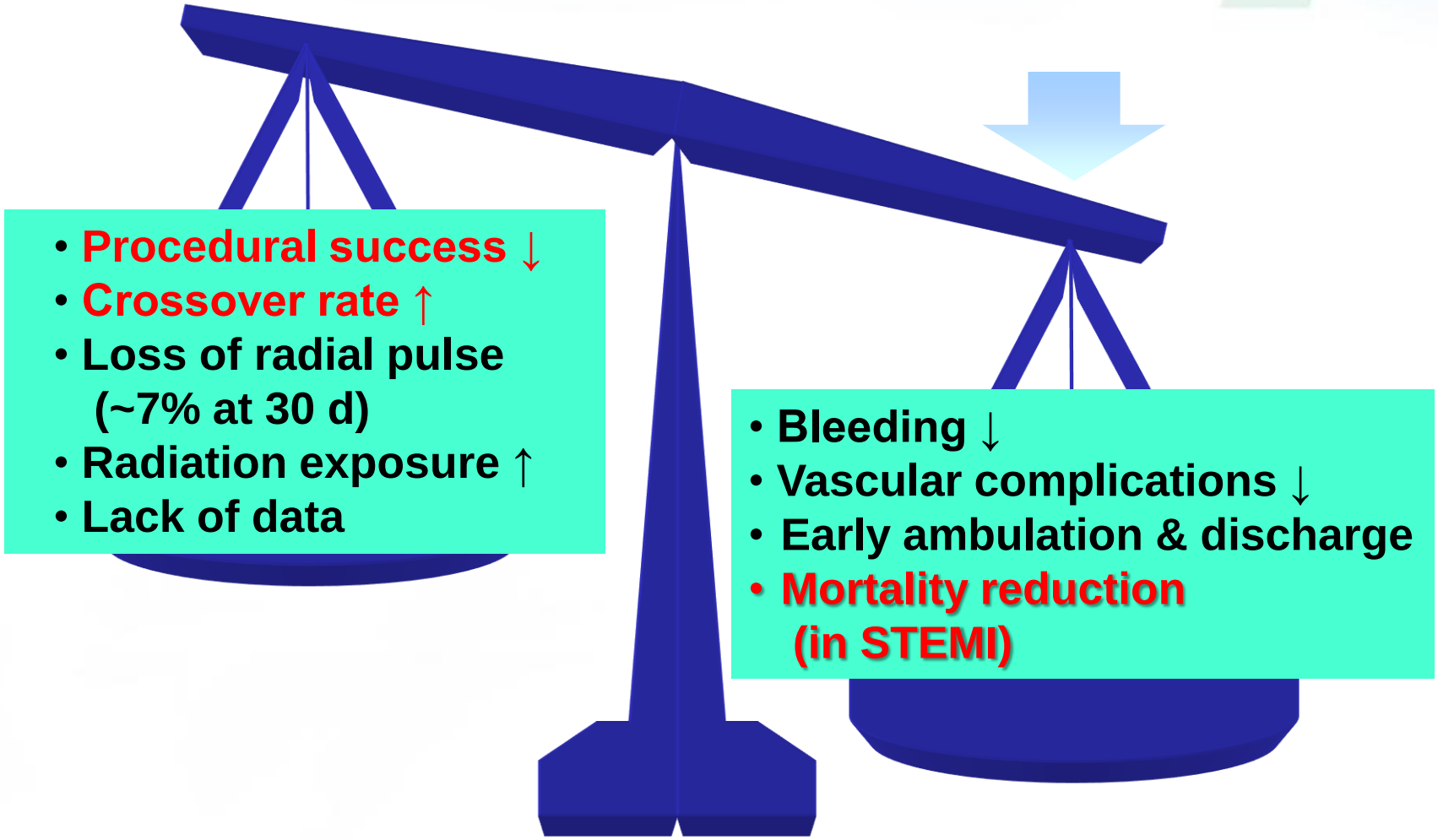
- A Pro's View -

Kwang Soo Cha, *MD, PhD, FACC, FESC, FSCAI*

Pusan National University Hospital

Busan, South Korea

Transradial Approach: Advantages and Disadvantages



Studies

- **ACCESS** study (n=900), Kiemeneij, 1997 JACC
- Metaanalysis, Agostoni (n=3,224), 2004 JACC

- **EASY** study (n=1005), Betrand, 2006 Circulation – Abciximab study
- Eichhöfer (n=3,198 vs. 3,198 femoral), 2008 AHJ – Iib/IIIa study

- Metaanalysis, Jolly (n=7,020), 2009 AHJ
- Metaanalysis, Vorobcsuk (n=3,324), 2009 AHJ

- **MORTAL** study (n=32,822), 2008 Heart
- Rao NCDR study (n = 593,094, TRA 7,804), 2008 JACC Interv
- **PREVAIL** (n=1,052), 2009 Heart
- **PRESTO-ACS** (n=1,170), 2009 AJC
- Hetherington (n=1051), 2009 Heart

- **RIVAL** trial (n=7,021), **2011** Lancet - ACS
- Vink (n=2,209), **2011** Heart - STEMI

Outlines

- **Procedural success and clinical outcomes**
- **Bleeding and access site complications**
- **Access site crossover**
- **Primary PCI at the setting of acute STEMI**

Procedural Success and Clinical Outcomes

- **ACCESS** study (n=900), Kiemeneij, 1997 JACC
  - randomized comparison of of PCI by radial, brachial, and femoral approaches
  - PTCA success: 91.7%, 90.7%, and 90.7% (p=NS),
    Event free at 1-mo f/u: 88.0%, 87.7%, 90.0% (p=NS)

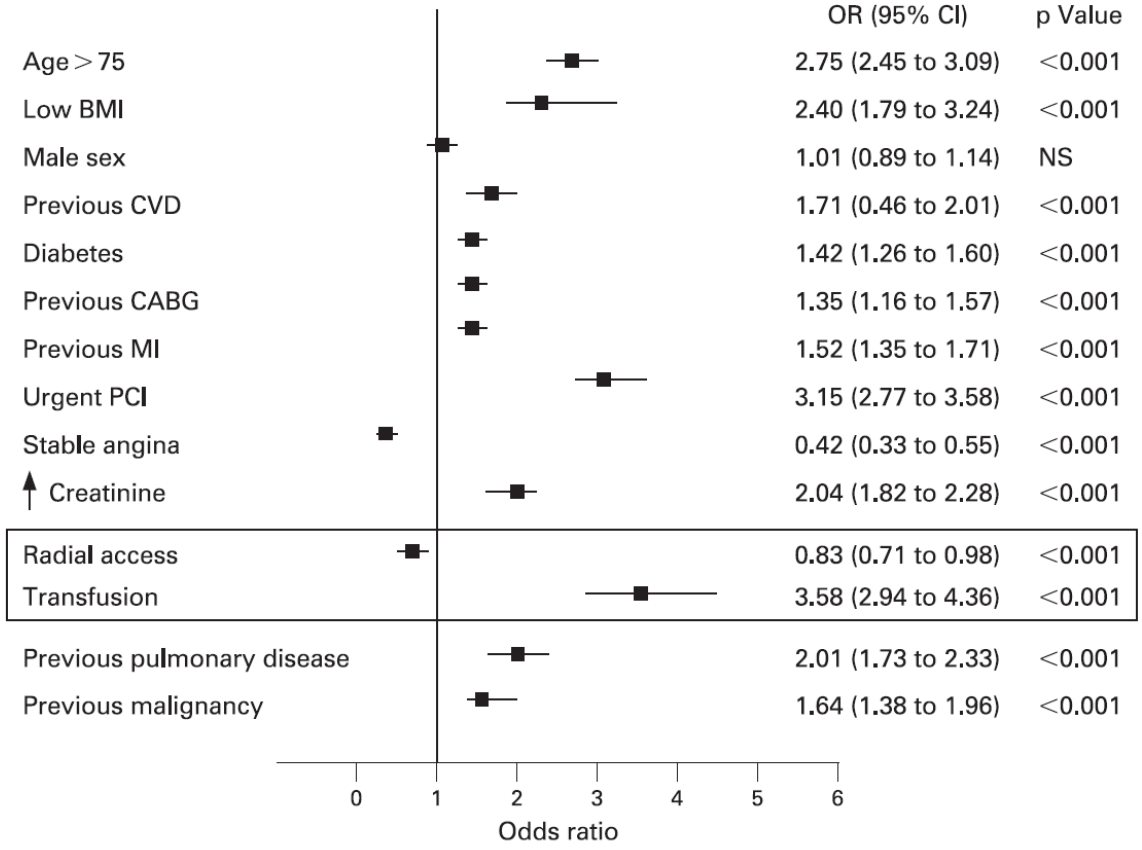
- Metaanalysis, Agostoni (n=3,224), 2004 JACC
  - Higher rate of procedural failure (OR 3.3, p<0.001),
    MACE similar (OR 0.92, p=0.7)

- **EASY** study (n=1005), Betrand, 2006 Circulation – Abciximab study
- Eichhöfer (n=3,198 vs. 3,198 femoral), 2008 AHJ – IIb/IIIa study
- Metaanalysis, Jolly (n=7,020), 2009 AHJ
- Metaanalysis, Vorobcsuk (n=3,324), 2009 AHJ
- **MORTAL** study (n=32,822), 2008 Heart
- Rao NCDR study (n = 593,094, TRA 7,804), 2008 JACC Interv
- **PREVAIL** (n=1,052), 2009 Heart
- **PRESTO-ACS** (n=1,170), 2009 AJC
- Hetherington, 2009 Heart
- **RIVAL** trial (n=7,021), **2011** Lancet - ACS
- Vink (n=2,209), **2011** Heart - STEMI

Procedural Success and Clinical Outcomes

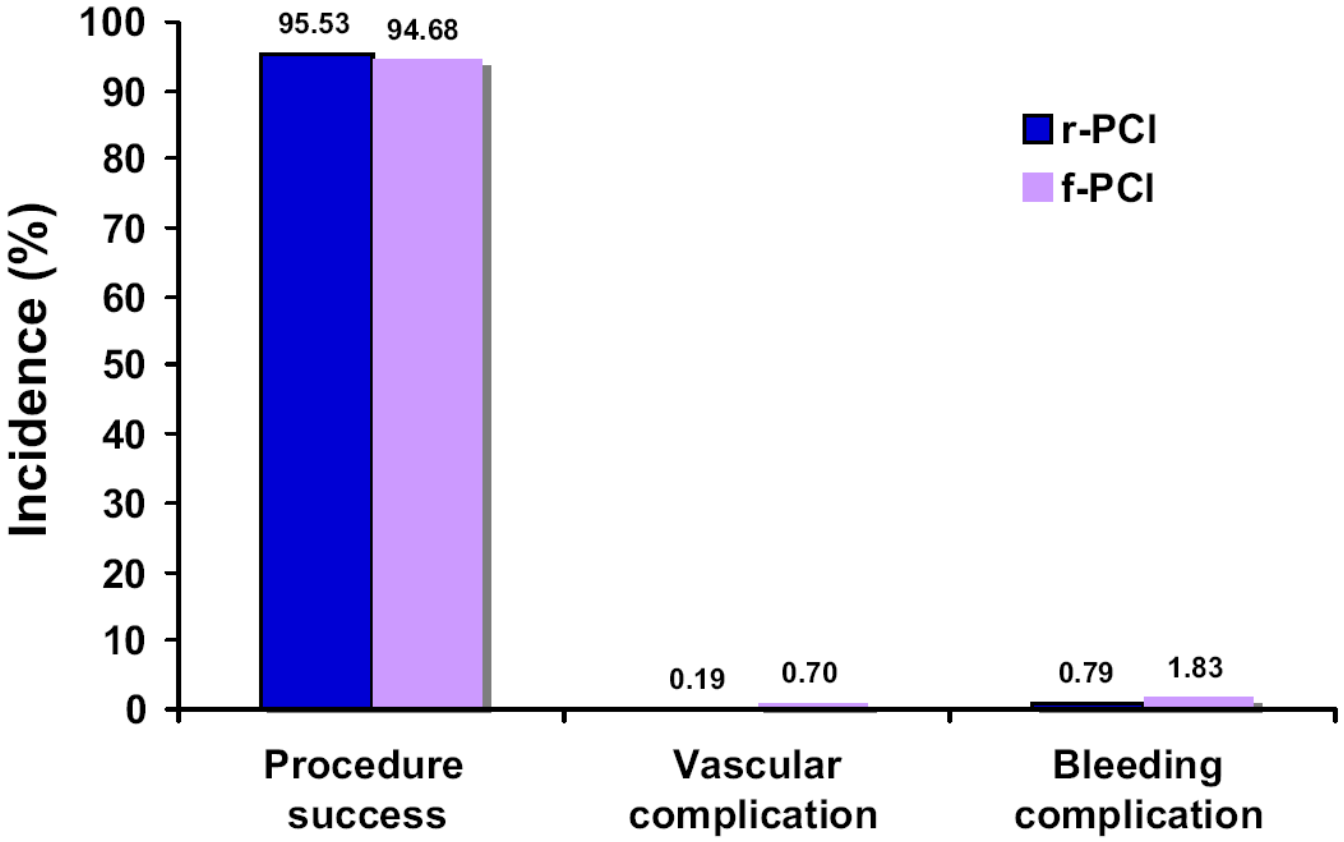
- **MORTAL** study (n=32,822, British Columbia, Canada), 2008 Heart
  - association between access site, transfusion, and outcomes
  - significant reduction in 30-days and 1-yr mortality (OR 0.71, OR 0.83; p<0.001)

  - Independent predictors of 1-yr mortality



Procedural Success and Clinical Outcomes

- Rao's **NCDR** study (n = 593,094, TRA 7,804, 1.32%), 2008 JACC Interv
  - r-PCI – similar rate of procedural success (adjusted OR 1.02)



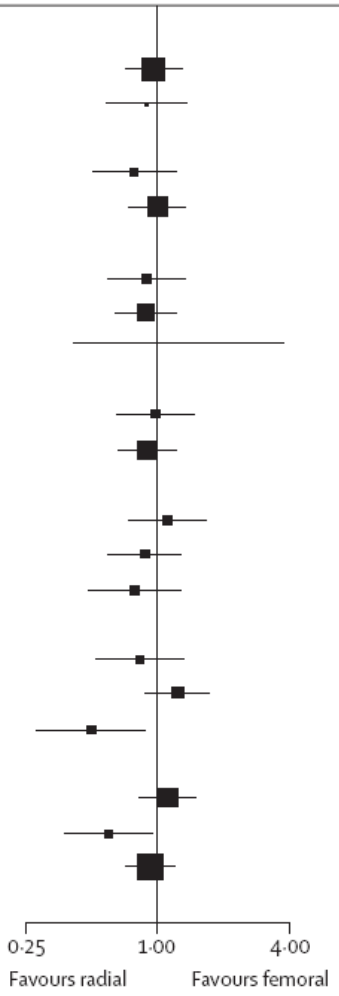
Procedural Success and Clinical Outcomes

- Randomized **RIVAL** trial (n=7,021), 2011 Lancet
  - r-PCI – similar rate of procedural success (adjusted OR 1.02)
  - ACS pts (UA ~45%, NSTEMI ~28%, STEMI ~27%)

  - procedural success (95.4% radial vs. 95.2% femoral, p=0.83)
  - primay outcome (death+MI+stroke+non-CABG bleeding at 30-d)
    : (3.7% radial vs. 4.0% femoral, p=0.50)

Prespecified Subgroup Analyses of the RIVAL trial

	Total	Radial (n/N [%])	Femoral (n/N [%])	HR (95% CI)	Primary outcome	
					p value	Interaction p value
Age (years)						
<75	5986	87/3001 (2·9)	91/2985 (3·0)	0·95 (0·71–1·27)	0·73	0·79
≥75	1035	41/506 (8·1)	48/529 (9·1)	0·89 (0·58–1·34)	0·57	
Sex						
Women	1861	36/908 (4·0)	48/953 (5·0)	0·78 (0·50–1·20)	0·25	0·36
Men	5160	92/2599 (3·5)	91/2561 (3·6)	0·99 (0·74–1·33)	0·97	
BMI (kg/m²)						
<25	2152	44/1067 (4·1)	50/1085 (4·6)	0·89 (0·59–1·33)	0·57	
25–35	4386	73/2205 (3·3)	82/2181 (3·8)	0·88 (0·64–1·20)	0·42	0·83
>35	454	7/219 (3·2)	6/235 (2·6)	1·24 (0·42–3·70)	0·70	
PCI in hospital						
No	2361	49/1196 (4·1)	49/1165 (4·2)	0·97 (0·65–1·44)	0·89	0·72
Yes	4660	79/2311 (3·4)	90/2349 (3·8)	0·89 (0·66–1·20)	0·45	
Radial PCI volume by operator						
≤70	2363	49/1164 (4·2)	46/1199 (3·8)	1·10 (0·74–1·65)	0·63	
71–142	2315	50/1158 (4·3)	57/1157 (4·9)	0·87 (0·60–1·27)	0·48	0·54
>142	2336	29/1182 (2·4)	36/1154 (3·1)	0·79 (0·48–1·28)	0·33	
Radial PCI volume by centre						
Lowest tertile	1920	33/958 (3·4)	40/962 (4·2)	0·83 (0·52–1·31)	0·42	
Middle tertile	2846	77/1420 (5·4)	63/1426 (4·4)	1·23 (0·88–1·72)	0·22	0·021
Highest tertile	2255	18/1129 (1·6)	36/1126 (3·2)	0·49 (0·28–0·87)	0·015	
Clinical diagnosis						
NSTE-ACS	5063	98/2552 (3·8)	87/2511 (3·5)	1·11 (0·83–1·48)	0·49	0·025
STEMI	1958	30/955 (3·1)	52/1003 (5·2)	0·60 (0·38–0·94)	0·026	
Overall	**7021**	**128/3507 (3·7)**	**139/3514 (4·0)**	**0·92 (0·72–1·17)**	**0·50**	



Procedural Outcomes and Patient Preference of the RIVAL trial

	Radial (n=3507)	Femoral (n=3514)	HR (95% CI)	p value
Abrupt closure	12 (0·5%)	11 (0·5%)	1·11 (0·49–2·51)	0·81
No reflow	21 (0·9%)	31 (1·3%)	0·69 (0·40–1·20)	0·19
Dissection with reduced flow	30 (1·3%)	25 (1·1%)	1·22 (0·72–2·07)	0·46
Coronary perforation	5 (0·2%)	4 (0·2%)	1·27 (0·34–4·73)	0·72
Catheter thrombus	2 (0·1%)	2 (0·1%)	1·01 (0·14–7·21)	0·99
Stent thrombosis‡	16 (0·7%)	26 (1·2%)	0·63 (0·34–1·17)	0·14
Definite	8 (0·4%)	16 (0·7%)	0·51 (0·22–1·19)	0·12
Probable	8 (0·4%)	11 (0·5%)	0·74 (0·30–1·84)	0·52
PCI procedural time (min)	35 (22–50)	34 (22–50)	..	0·62
Fluoroscopy time (min)§	9·8 (5·8–15·0)	8·0 (4·5–13·0)	..	<0·0001
PCI contrast volume (mL)	181 (140–240)	180 (145–240)	..	0·87
Length of stay in hospital (days)	4 (3–7)	4 (3–7)	..	0·18
Persistent pain at access site for >2 weeks	87/3378 (2·6%)	104/3392 (3·1%)	0·84 (0·63–1·12)¶	0·22
Patient prefers radial next procedure	2962/3282 (90·2%)	1629/3210 (50·7%)	8·99 (7·86–10·28)¶	<0·0001

Procedural Success and Clinical Outcomes

- **Hetherington** (n=1051), 2009 Heart
  - STEMI without cardiogenic shock
  - peripheral vascular dz (5.1% radial vs. 5.4% femoral, p=0.799)
  - IABP use (3.2% radial vs. 6.0% femoral, p=0.024)

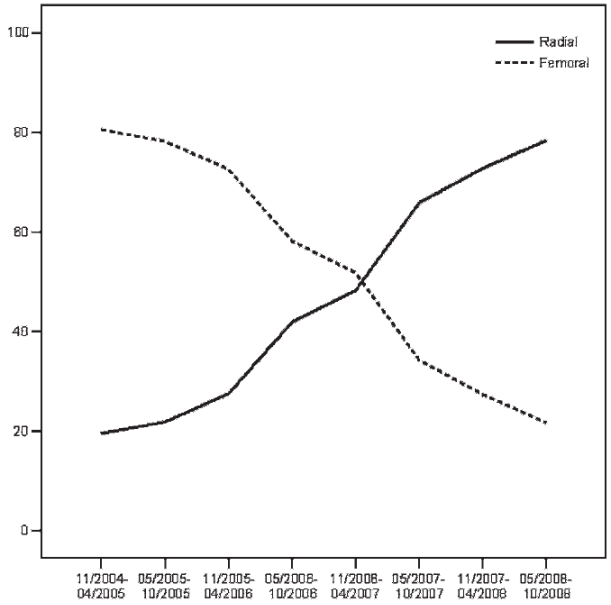
  - procedural success similar (92.1% radial vs. 89.9% femoral, p=0.201)
  - failure of initial access more frequent in radial (7.7% vs. 0.6%, p<0.001)

- **Vink** (n=2209), 2011 Heart
  - STEMI without cardiogenic shock
  - procedural success rate 94.1%

Primary and Secondary Outcomes in Hetherington study

Outcome	Radial approach (n = 571)	Femoral approach (n = 480)	p Value
Procedural success, n (%)	515 (92.1)	425 (89.9)	0.201
Major vascular complication, n (%)	3 (0.5)	6 (1.3)	0.315
Minor vascular complication, n (%)	10 (1.8)	12 (2.5)	0.398
Failed initial access strategy, n (%)	44 (7.7)	3 (0.6)	<0.001*
In-hospital mortality, n (%)	7 (1.2)	13 (2.7)	0.111
In-hospital MACCE, n (%)	15 (2.6)	25 (5.2)	0.029
Dual access required, n (%)	61 (10.7)	15 (3.1)	<0.001*
Needle-to-balloon time (minutes)	17 (13–22)	17 (12–23)	0.188
Door-to-balloon time (minutes)	46 (30–73)	67 (40–104)	<0.001*
Symptom-to-balloon time (minutes)	183 (131–279)	211 (143–305)	0.003*
Contrast volume used (ml)	210 (170–273)	240 (200–300)	<0.001*
Radiation dose absorbed (Gy/cm^2)	25 (15–37)	32 (20–49)	<0.001*
Time to discharge (days)	2.46 (1.60–3.83)	3.51 (2.36–6.07)	<0.001*

Change in Volume, Operator Preference in Hetherington study



Radial

Femoral

Outcome	Radial approach (n = 571)	Femoral approach (n = 480)	p Value
Lead operator preference, n (% of individual operator's activity)			<0.001*
Operator 1	86 (48)	94 (52)	
Operator 2	210 (90)	24 (10)	
Operator 3	110 (56)	86 (44)	
Operator 4	47 (21)	173 (79)	
Operator 5	16 (89)	2 (11)	
Operator 6	102 (50)	101 (50)	

Bleeding and Access Site Complications in RIVAL

	Radial (n=3507)	Femoral (n=3514)	Hazard ratio (95% CI)	p value
Secondary outcomes at 30 days				
Non-CABG major bleeding	24 (0·7%)	33 (0·9%)	0·73 (0·43–1·23)	0·23
Major vascular complications	49 (1·4%)	131 (3·7%)	0·37 (0·27–0·52)	<0·0001
Minor bleeding	100 (2·9%)	118 (3·4%)	0·84 (0·65–1·10)	0·21
Post-hoc exploratory outcomes				
ACUITY major bleeding†	66 (1·9%)	157 (4·5%)	0·43 (0·32–0·57)	<0·0001
Death, MI, or stroke, or ACUITY major bleed†	167 (4·8%)	256 (7·3%)	0·65 (0·53–0·78)	<0·0001
Non-CABG major bleeding and major vascular complications	67 (1·9%)	157 (4·5%)	0·43 (0·32–0·57)	<0·0001
Death, MI, stroke, non-CABG major bleeding, or major vascular complications	167 (4·8%)	260 (7·4%)	0·63 (0·52–0·77)	<0·0001

Data are number (%). MI=myocardial infarction. CABG=coronary artery bypass graft. PCI=percutaneous coronary intervention. TIMI=thrombolysis in myocardial infarction. ACUITY=Acute Catheterization and Urgent Intervention strategy. *As a proportion of patients who had PCI: n=2311 in the radial group and n=2349 in the femoral group. †Large haematomas diagnosed as per investigator's clinical decision.

Access Site Crossover

- 7.7%, 6.5%, and 4.7% of TRA failure in 3 recent retrospective studies

- In RIVAL, crossover of TRA faiure:
  - 7.6% (whole ACS; 7.6% radial vs. 2.0% femoral, p<0.0001),
  - 5.3% (STEMI)
  - Only 4.4% in the highest tertile by TRA volume

- Vink study, PPCI in STEMI, 2011
  - 3.8% (nearly all PPCI performed in 8-yr experience (2,209/2300, 96.1% of total PPCI)
  - During study period, 5.9% $\rightarrow$ 1.5% (9.2% $\rightarrow$ 1.3% in cases of TRA not primary approach)
  - Independent predictors of crossover: female, age over 75 yrs, SVG interventions

Summary

- Procedural success rate of TRA remained high and stable, comparable to TFA (~95%), despite a constant increase in procedural complexity and the use of other devices
- Furthermore, procedural and fluoroscopy times decreased substantially over the years, presumably because of both an increased proficiency of the operators and improvements in catheters and materials.
- The need for crossover had no apparent impact on procedural success rates.

Conclusion

- Transradial approach for PCI in patients with CAD is efficacious in achieving both high rates of arterial access and procedural success.

- The radial artery may thereby represent the arterial access site of choice for the majority of patients with CAD undergoing PPCI.

감사합니다