Imaging Selection in Endovascular Stroke Trials

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Baseline Imaging
NCCT & vascular imaging required

Modality	Required or Optional	No. obtained (%)
CT non-contrast	Required	**499**/500 (99.8%)
CT perfusion	Optional	333/500 (66.6%)
CT angiography	Required (or MRA/DSA)	**496**/500 (99.2%)
DSA	Required (or CTA/MRA)	**1**/500 (0.2%)
MR diffusion	Optional	19/500 (3.8%)
MR perfusion	Optional	Unknown
MR angiography	Required (or CTA/DSA)	**2**/500 (0.4%)

Time to Treatment

	Mean (SD)	Median (IQR)
Total scan time for Multimodal CT, min	n/a	n/a
CTP post-processing time, min	n/a	n/a
Total scan time for Multimodal MR, min	n/a	n/a
PWI/DWI post-processing time, min	n/a	n/a
"Onset-to-Groin" time, min		
for entire cohort = NCCT+CTA (MRA or DSA)	**265** (68)	**260** (210-311)
for patients selected based on NCCT alone	n/a	n/a
for patients selected based on NCCT/CTA	n/a	n/a
for patients selected based on NCCT/CTA/CTP	n/a	n/a
for patients selected based on MRI (only 2)	n/a	n/a

Selection Criteria

Criteria for	Description
Vessel Occlusion	**ICA-T-L/M1/M2/A1/A2**
Small Core	NA
Mismatch	NA
Collaterals	NA

Biases and Limitations

- Were selection criteria followed?
  - *Yes:*
    - *Proximal ant circ occlusion on CTA(MRA/DSA)*
    - *No hemorrhage on NCCT*
- Did selection criteria change during the study?
  - *No*
- Could certain patient groups have been excluded even though they met inclusion criteria?
  - *ASPECTS score was not used in clinical practice*
  - *It is possible that some patients with large hypodense areas on NCCT were not included (no data available)*

*One patient included without vessel imaging

Baseline Imaging Characteristics

Characteristic	Control (n=267)*	Intervention (n=233)
Site of vessel occlusion – no. (%)		
ICA(-T/L)	78/266 (**29%**)	60/233 (**26%**)
MCA-M1	165/266 (**62%**)	154/233 (**66%**)
MCA-M2	21/266 (7.9%)	18/233 (7.8%)
ASPECTS (predefined subgroup analysis)		
Mean (SD)	8.4 (2.0)	8.3 (1.8)
Median (IQR)	9 (8-10)	9 (7-10)
Ischemic core volume – ml (post-hoc)		
Mean (SD)	46 (44) (n=88)	42 (33) (n=87)
Median (IQR)	32 (10-69) (n=88)	36 (15-60) (n=87)
Perfusion volume – ml (post-hoc)		
Mean (SD)	112 (103) (n=88)	141 (97) (n=87)
Median (IQR)	97 (41-181) (n=88)	113 (60-190) (n=87)
Collateral grade 0/1/2/3 (post-hoc)	9/72/111/71	17/64/88/64

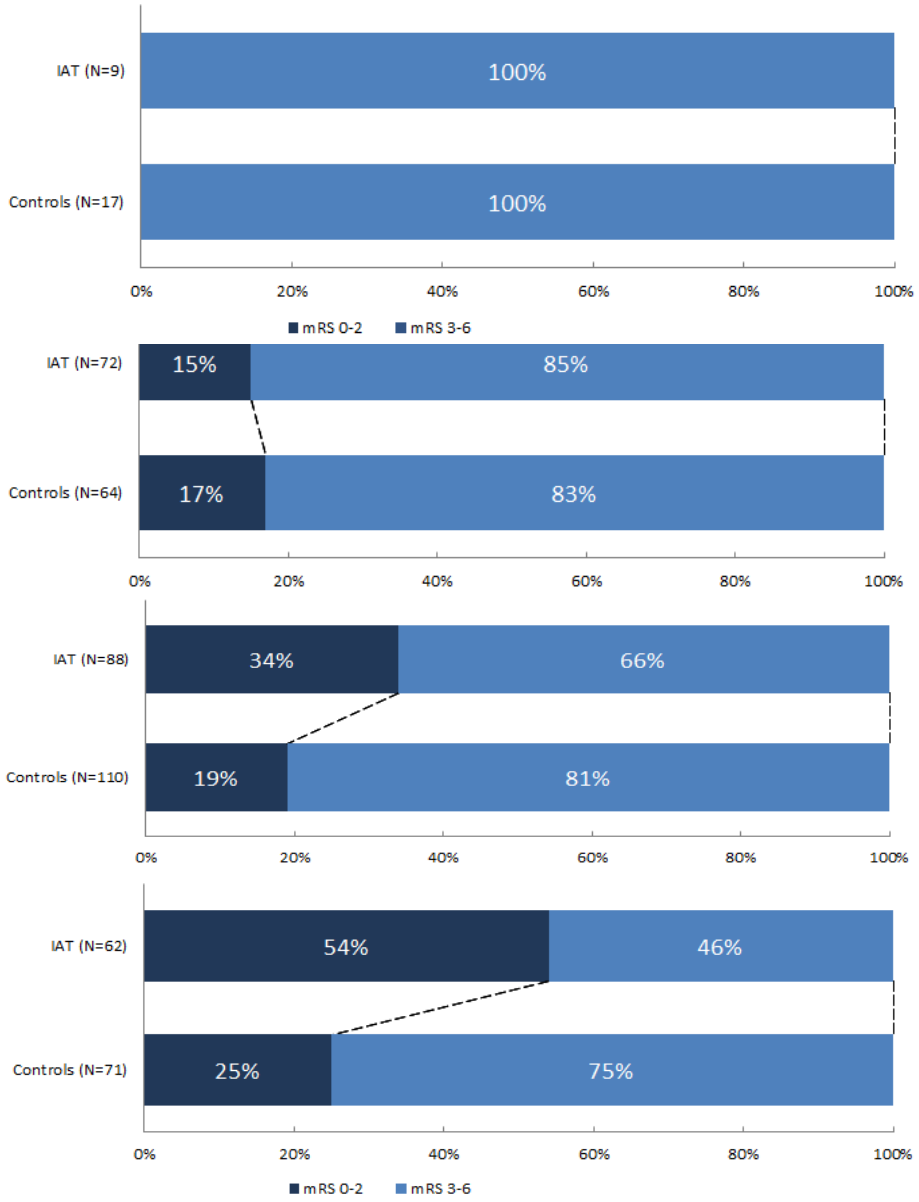
Subgroup Analysis

According to Baseline NCCT/CTA Characteristics

Example Criteria	Endovascular Tx		Medical Tx		Adjusted OR (95% CI) for mRS 0-2	Adjusted common OR (95% CI) (shift analysis)
	mRS 0-2	Total	mRS 0-2	Total		
ASPECTS	n	N	n	N		
8-10	57	167	45	206	1.80 (1.08-3.01)	1.61 (1.11-2.33)
5-7	17	54	5	39	3.01 (.95-9.6)	1.87 (.85-4.10)
0-4	1	11	0	19	n/a	1.26 (.17-9.33)
Collateral grade	post-hoc					
0 absent	0	9	0	17	n/a	1.0 (0.1-8.7)
1 poor	11	72	11	64	0.8 (0.3-2.3)	1.2 (0.7-2.3)
2 moderate	30	88	21	110	**2.2** (1.1-4.5)	**1.6** (1.0-2.7)
3 good	34	62	18	71	**4.2** (1.9-9.3)	**3.2** (1.7-6.2)

P-value of interaction with treatment effect on primary outcome for collateral score: 0.038!

Effect of collateral grade on functional outcome (■ mRS 0-2)



15%

29%

Collateral score*
Grade 0 (absent)
Absent filling of occl territory

Grade 1 (poor)
>0 - ≤50% filling

Grade 2 (moderate)
>50-<100% filling

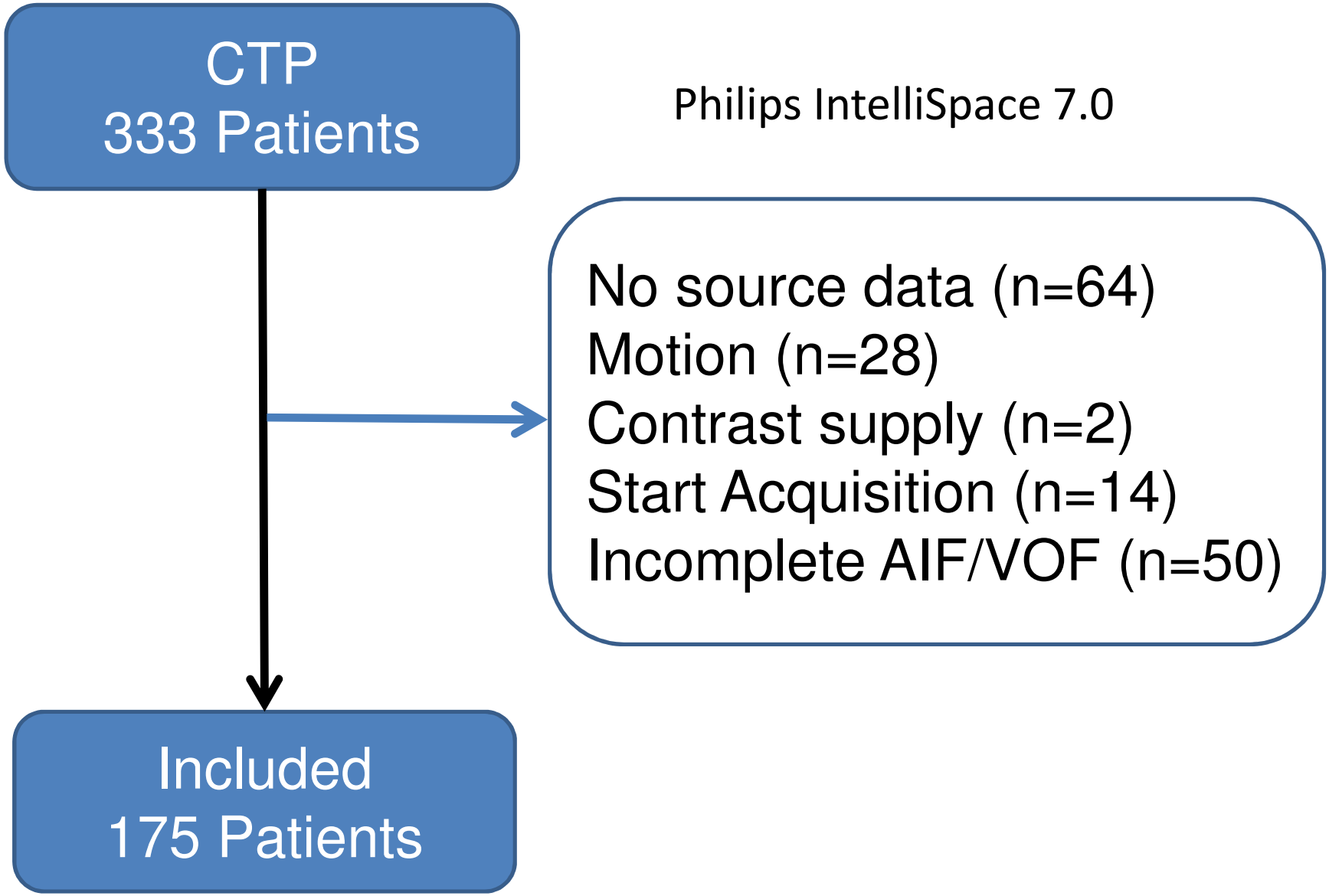
Grade 3 (good)
100% filling

*Tan IY, AJNR 2009

Collaterals: post-hoc analysis safety parameters

Parameter	Grade 0 Absent (n=26)	Grade 1 Poor (n=132)	Grade 2 Moderate (n=198)	Grade 3 Good (n=133)
Death within 7 days - n (%)	10 (38.5%)	27 (19.9)	18 (9.1)	3 (2.3%)
Death within 30 days - n (%)	11 (42.3%)	39 (28.7)	27 (13.6)	14 (10.5%)
Progression of Ischemic Stroke - n (%)	13 (50.0%)	37 (27.2)	30 (15.2)	14 (10.5%)

CT Perfusion: Post-hoc analysis



CT Perfusion Results (post-hoc)

	Association with outcome Adjusted OR	P- value of Interaction term
Ischemic core **(per 10 ml)**	**0.79 (95%CI:0.73-0.87) P<0.001**	P=0.82
Proportion ischemic core (per 10 %)	**0.82 (95%CI:0.67-0.90) P=0.002**	P=0.82
Penumbra **(per 10 ml)**	0.97(95%CI:0.92-1.01) P=0.15	P=0.92

Subgroup Analysis

According to Baseline CTP Characteristics

Example Criteria	Endovascular Tx		Medical Tx		Adj OR (95% CI) for mRS 0-2	Adj Common OR (95% CI) (shift analysis)
	mRS 0-2	Total	mRS 0-2	Total		
Core	n	N	n	N		
<70 ml	33	74	20	67	2.16 (1.02 -4.59)	1.54 (0.83-2.86)
≥70 ml	1	13	0	21	Not available	3.01 (0.47-19.29)
Mismatch	24	54	15	48	1.86 (0.71-4.85)	1.40 (0.67-2.89)
No mismatch	10	33	5	40	3.62 (0.81-16.22)	1.85 (0.76-4.45)

Mismatch:
ischemic core < 70ml;
penumbra/Ischemic core > 1.2
Penumbra-ischemic core > 10 ml
Campbell BC Stroke 2012

Key Imaging Findings

- ASPECTS
  - ASPECTS **5-10**: clear benefit from IAT
  - ASPECTS 0-4: only marginal benefit from IAT, but subgroup **small** and no interaction with treatment effect
- **Collateral score:**
  - moderate-good collateral filling: a large benefit of IAT
  - absent-poor collateral filling: no benefit observed
  - **Treatment effect modifier!**
- CT Perfusion
  - CTP ischemic core volume predicted functional outcome
  - CTP **could not** identify patients who will not benefit from IAT
  - No significant interaction of CTP-derived parameters with treatment effect

References

- Berkhemer OA,…Majoie CB. Collaterals on baseline CTA and IAT effect in patients with anterior circulation stroke. Stroke 2016 March
- Borst J,…Majoie CB. Value of CTP-based patient selection for IA AIS treatment. Stroke 2015; 46: 3375-82

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