Stent Retriever vs Aspiration as Primary Attempt

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Disclosures

- Research and consultant support: Canon, Stryker, Penumbra, Medtronic, Jacobs Institute
- Founding member: Neurovascular Diagnostics
- Stockholder: Blockade Medical

COMPASS

A COMPARISON of DIRECT ASPIRATION vs. STENT RETRIEVER AS A FIRST APPROACH

International Stroke Conference

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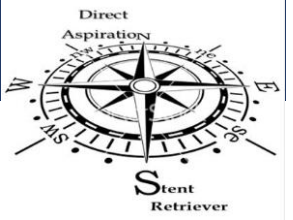


Key Inclusion Criteria

1. Age 18 and older
2. NIHSS >= 5 at the time of neuroimaging
3. Presenting or persistent symptoms within 6 hours of when groin puncture can be obtained
4. Neuroimaging demonstrates large vessel proximal occlusion (distal ICA through MCA bifurcation)
5. The operator feels that stroke can be appropriately treatment with traditional endovascular approaches (ADAPT or first-line stent retriever)
6. Pre-event Modified Rankin scale score 0-1
7. Non-contract CT/CTA or MRI/MRA for trial eligibility performed or repeated at treating ADAPT stroke center or outside medical facility within one hour (or as close as possible) of treatment initiation
8. Consenting requirements met according to local IRB

270 Subjects Enrolled

Randomization

PPI Analysis

19 Protocol deviations

3 Pre-event mRS>1

5 Cervical occlusion or stenosis requiring treatment

11 M2 clot location

115 Total

3 Loss to follow-up

112 Completed follow-up

Intent to Treat

6 Did not receive ADAPT

2 Spontaneous recanalization

3 Arch/Cervical vessel access failure

1 Physician chose alternative approach (ICAD)

128 ADAPT as randomized

134 Total

3 Loss to follow-up

131 Completed follow-up

Intent to Treat

6 Did not receive SRFL

5 Spontaneous recanalization

1 Physician chose alternative approach (ICAD)

130 SRFL as randomized

136 Total

6 Loss to follow-up

130 Completed follow-up

PPI Analysis

20 Protocol violations

3 Pre-event mRS>1

1 ASPECTS of < 7

3 Cervical occlusion or stenosis requiring treatment

11 M2 clot location

1 M3 clot location

1 Basilar clot location

116 Total

6 Loss to follow-up

110 Completed follow-up

Procedural Variables

	ADAPT	SRFL	P value
Percent using a Balloon Guide Catheter	33.6 (45/134)	44.8 (61/136)	0.06
Percent using a distal access/reperfusion catheter	97.8 (131/134)	86.8 (118/136)	0.001
Percent using at least one SR	20.9 (28/134)	97.8 (133/136)	<0.0001
Percent using >1 SR	6 (8/134)	12.5 (17/136)	0.09
Percent with documented reporting of using distal aspiration during SR thrombectomy	100 (28/28)	85.3 (110/129)	0.03
Percent achieving ≥TICI 2b with primary modality	83.2 (109/131)*	81.3 (109/134)*	0.75

* Core lab unable to determine when primary modality completed in 3 patients in ADAPT and 2 patients in SRFL

Outcomes

Secondary Efficacy Endpoints:

90d mRS Shift OR (95% CI) = 0.98 (0.64, 1.51)

	ADAPT	SRFL	P value
TICI 2c or greater within 45 minutes	50%	44%	0.2998
TICI 3 or greater within 45 minutes	34%	23%	0.0486
Time to TICI 2b or greater	22 min	33 min	0.0194

Conclusion

Level I evidence that Stent Retrievers and primary Aspiration have non-inferior clinical outcomes in the treatment of ELVO

ADAPT/Standard Aspiration

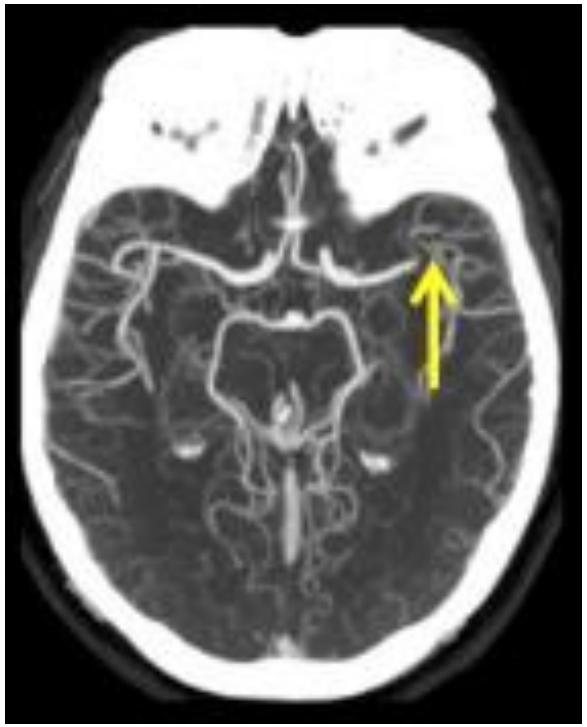
- Standard aspiration technique recommends no balloon guide and just navigate Asp catheter proximal to the clot and then wedge catheter into the clot/vacuum and wait 2 min to see if clot pushes through suction system. If not then remove catheter under vacuum hoping clot stays attached.
- Comments
  - Without crossing clot and microinjection to image distal tissue you have no idea of the distal clot burden (Important for TICI scoring)
  - This process works well if exceptional collateral flow all the way to the distal clot. Important NOT to occlude proximal flow since this serves as pressure head to push clot through the aspiration system.
  - HOWEVER, If clot does not get pushed through the system…there is no protection for clot embolization during retrieval.
  - Restoration of flow for patient only occurs if most distal portion of clot is removed…partial thrombectomy isn’t helpful.

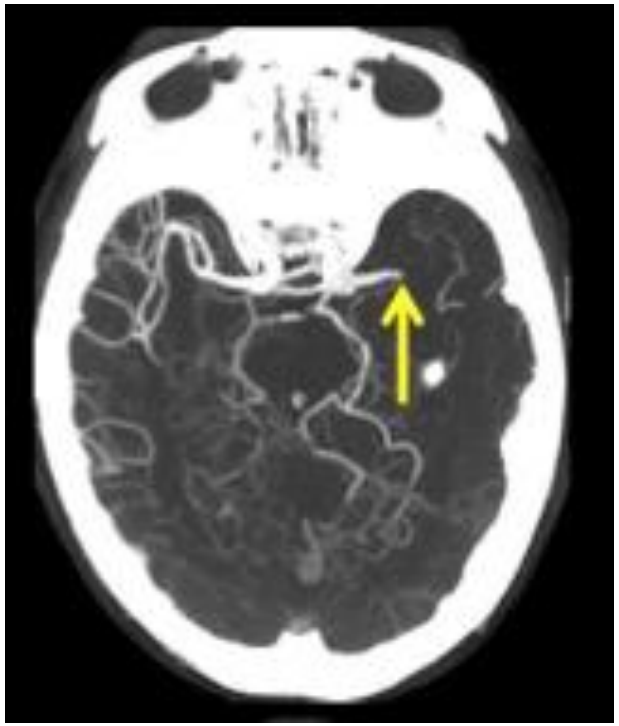
Balloon Guide Aspiration

- By using a Balloon Guide you can protect yourself from clot embolization during retrieval.
- More control of aspirating through guide and ensuring all clot is removed before doing an injection.
- Improved Blood pressure control prior to revascularization

Imaging Selection Criteria	NIHSS>=2 <6 hr MR CLEAN	NIHSS (tPA) <6 hr, dual EXTEND-IA	NIHSS>=6 <12 hr, consecutive ESCAPE	NIHSS>=8 <6 hr SWIFT PRIME	NIHSS>=6 <8 hr REVASCAT
Small core	Not required	RAPID perfusion infarct <70 mL (relCBF<30% threshold)	ASPECTS score 6–10	ASPECTS score 6–10 on NCCT or DWI, RAPID perfusion infarct <50 mL (relCBF<30% threshold)	ASPECTS score >6 on NCCT, ASPECTS score >5 on DWI (NCCT ASPECTS >8 for age 80–85)
Penumbra	Not required	Target mismatch: RAPID perfusion ischemic core mismatch ratio >1.2, absolute mismatch >10 mL (T_{max}>6 s threshold)	Not required	Target mismatch: RAPID perfusion penumbra/ infarct ratio>1.8, penumbra absolute volume >15 mL (T_{max}>6 s threshold) -T_{max}>10 s Lesion ≤100 mL	Not required (clinical/core mismatch [NIHSS>5])
Collaterals	Not required	Not required	Adequate collateral circulation defined as some filling of 50% or greater of the ischemic territory pial circulation beyond occlusion on CT angiography (preferably multiphase CTA)	Not required	Not required
mRS <=2	32.6% vs 19.1%	**71% vs 40%**	53% vs 29.3% 19.0% vs 10.4%	**60.2% vs 35.5%**	43.7% vs. 28.2%

CTA Collaterals





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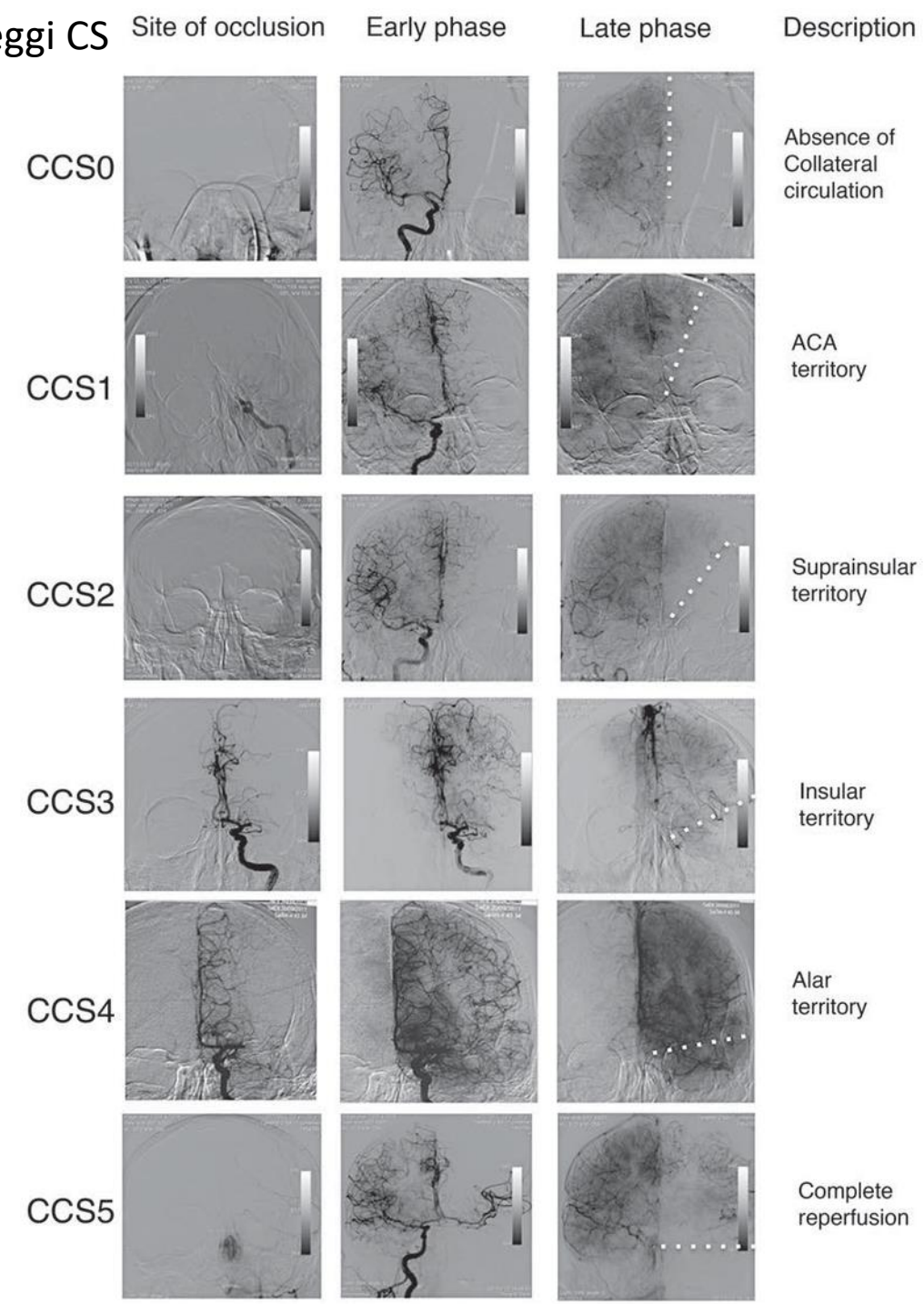
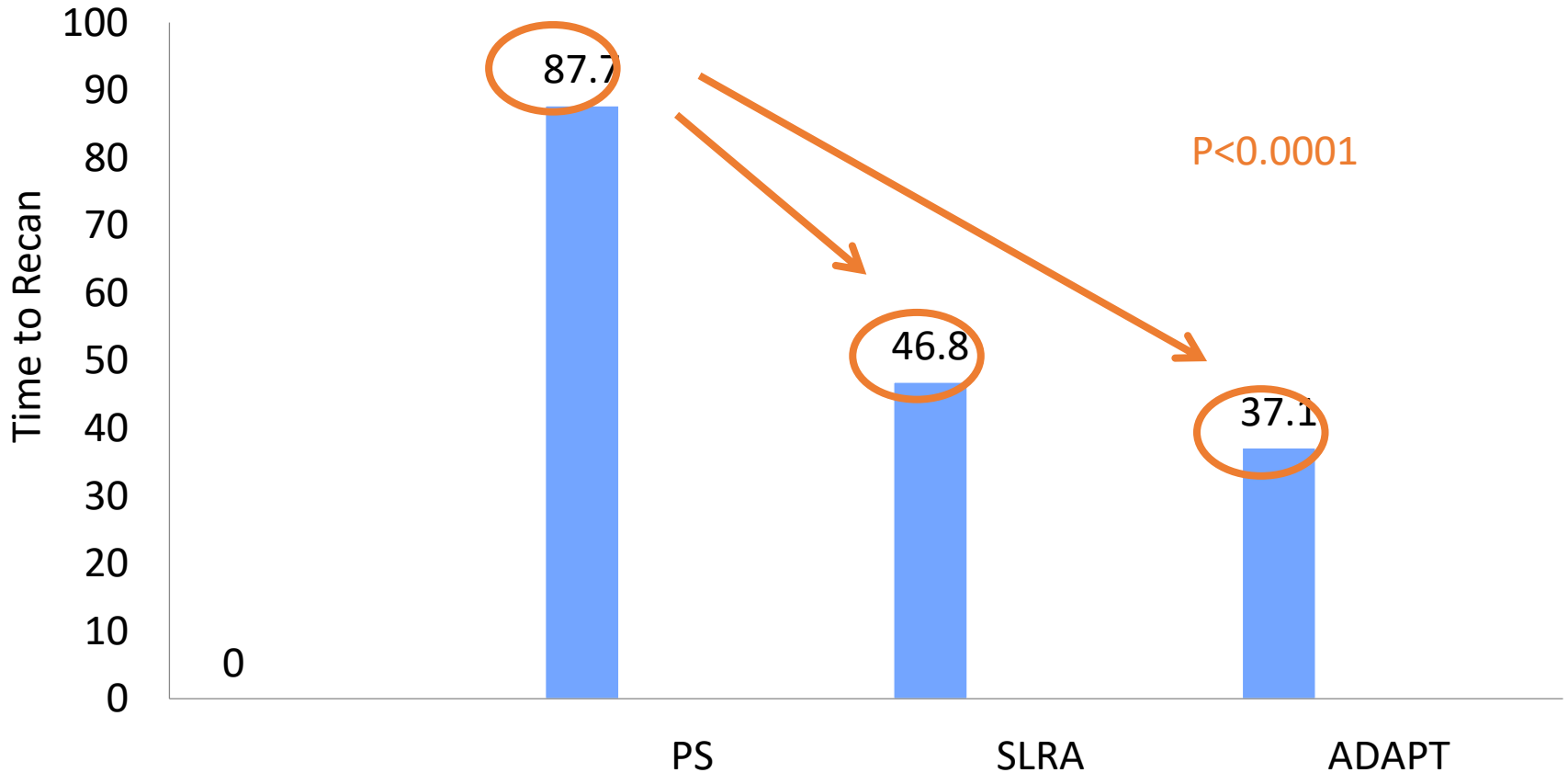


Personal View

- IF excellent collateral flow:
  - Aspiration as first attempt makes sense but I was always try to use a balloon guide if anatomy allows

- IF trying to use aspiration without good collateral flow, the use of the tool is different…you are likely using the catheter like a snake head, and will have better success driving the catheter through the entirety of the clot so that the suction just allows the system to try and capture the clot within the catheter.
  - This is the preferred technique when suction is used for distal (m3) clot retrieval.

MUSC Procedural Time (minutes)



PS Primary stentretriever, SLRA-Solumbra, ADAPT- Aspiration

Journal of
NeuroInterventional Surgery

ORIGINAL RESEARCH

Comparison of endovascular treatment approaches for acute ischemic stroke: cost effectiveness, technical success, and clinical outcomes

Aquilla S Turk,[1] Raymond Turner,[2] Alejandro Spiotta,[2] Jan Vargas,[2] Christine Holmstedt,[2] Shelly Ozark,[2] Julio Chalela,[2] Tanya Turan,[2] Robert Adams,[2] Edward C Jauch,[3] Holly Battenhouse,[4] Brian Whitsitt,[2] Matt Wain,[5] M Imran Chaudry[1]

Turk AS, *et al*. *J NeuroIntervent Surg* 2014;**0**:1–5. doi:10.1136/neurintsurg-2014-011282

ADAPT

Direct cost directly influenced by LOS:
PS 10.6 days
SLRA 8.3 days
ADAPT 7 days (SS)

	PS	SLRA	ADAPT
Device cost ($)	$10,263	$15,798	$7421
Direct Cost ($)	$35,126	$37,539	$21,324
Indirect Cost ($)	$16,474	$17,161	$12,387
Total Cost($)	$51,599	$54,700	$33,611
+/- (DRG $38,963)	($12,636) LOSS	($15,737) LOSS	$5,352 GAIN

Journal of Stroke and Cerebrovascular Diseases
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In Press, Corrected Proof

Direct Aspiration versus Stent Retriever Thrombectomy for Acute Stroke: A Systematic Review and Meta-Analysis in 9127 Patients

Christopher T. Primiani BS *, Angel Chinea Vicente MD *, Michael T. Brannick PhD †, Aquilla S. Turk DO ‡, J Mocco MD, MS §, Elad I. Levy MD ¶, Adnan H. Siddiqui MD, PhD ¶, Maxim Mokin MD, PhD *

- ADAPT vs. Stent-retriever first line
- 25 studies with 2252 patients ADAPT
- 64 studies with 6875 patients stent-retriever first line
- ADAPT used alone: 65%
- ADAPT had higher recanalization TICI2b/3: 89% vs. 80%
- Similar outcomes mRS 0-2 90d: 52% vs. 48%
- Similar sICH: 6% vs. 7%

Clinical and Procedural Predictors of Outcomes From the Endovascular Treatment of Posterior Circulation Strokes

Maxim Mokin, MD, PhD; Ashish Sonig, MD, MS; Sananthan Sivakanthan, BS; Zeguang Ren, MD, PhD; Lucas Elijovich, MD; Adam Arthur, MD, MPH; Nitin Goyal, MD; Peter Kan, MD, MPH; Edward Duckworth, MD; Erol Veznedaroglu, MD; Mandy J. Binning, MD; Kenneth M. Liebman, MD; Vikas Rao, MD; Raymond D. Turner IV, MD; Aquilla S. Turk, DO; Blaise W. Baxter, MD; Guilherme Dabus, MD; Italo Linfante, MD; Kenneth V. Snyder, MD, PhD; Elad I. Levy, MD, MBA; Adnan H. Siddiqui, MD, PhD

(*Stroke*. 2016;47:782-788.

- Multi-center retrospective study
- N=100 patients
  - ADAPT: 42
  - Stent-retriever 1st line: 58
- Favorable outcome (mRS <= 2) at 90d: 35%
- Predictors of favorable outcome:
  - Recanalization
  - Shorter time between stroke onset and EVT initiation

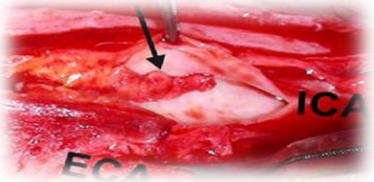
Table 4. Comparison of Endovascular Treatment Approaches Using Multivariate Analysis

	Overall, n=100	Stent Retriever as Primary Strategy, n=58	Aspiration as Primary Strategy (Including Subsequent Stent Retriever Use), n=42	*P* Value
Procedure duration (min), mean±SD	52±38	56±44	46±28	0.093
Use of rescue therapy, n (%)	19/100 (19)	13/58	6/42	0.439
TICI 2b/3, n (%)	80/100 (80)	45/58 (78)	35/42 (83)	0.32
mRS score ≤2 at 3 mo, n (%)	35/100 (35)	21/58 (36)	14/42 (33)	0.5

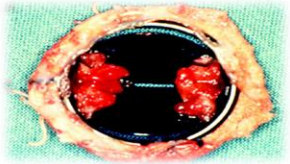
Personal View

- Distal run to ensure entire vascular tree is not filled with clot.
- ADAPT with Balloon guide if excellent Collaterals on angiogram or if patchy distal clots within affected territory (want flow reversal)…
- If no good collaterals…Stent Triever –for immediate flow (endovascular bypass)
  - Wait a period of time to allow tissue to reperfuse
  - Then Bring up intermediate suction catheter to vacuum onto prox portion of clot. Once vacuumed…take slack out of system.
  - Use Balloon Guide, inflate to retrieve clot trapped between stent-triever and aspiration system.

Clot property differences impact revascularization



Carotid



Heart valve

Atrium

Example of Fresh Erythrocyte Clot Forming Occlusion

Conclusions

- ADAPT excellent first pass technique. Proven Randomized trial results.
- Many techniques are using combination modalities (i.e. swiss army knife)
- Need to continue to study clot composition to see if certain techniques work better on various clot types (i.e. heavily calcified)

Thank You