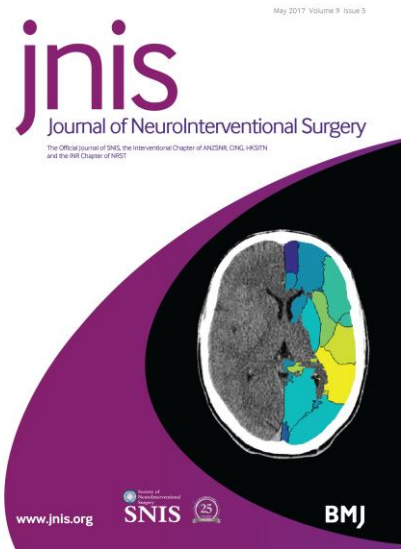
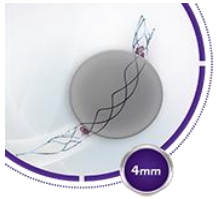
ISCHEMIC STROKE TREATMENT GUIDELINES:

NOTES AND CONSIDERATIONS





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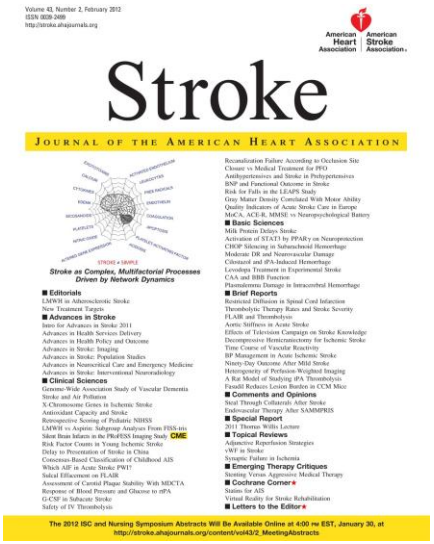
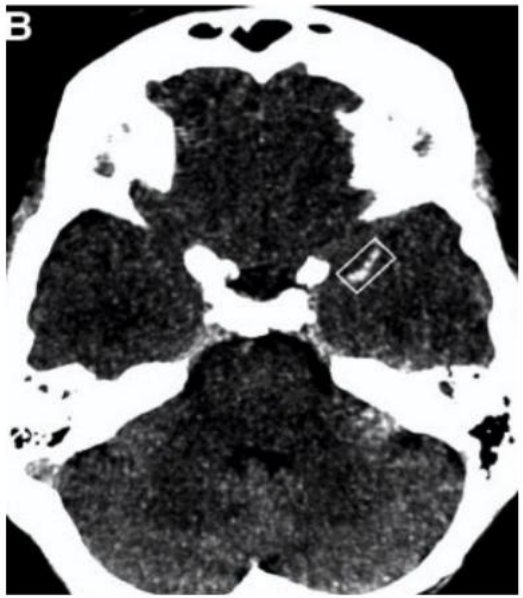
ASL CITTÀ DI TORINO

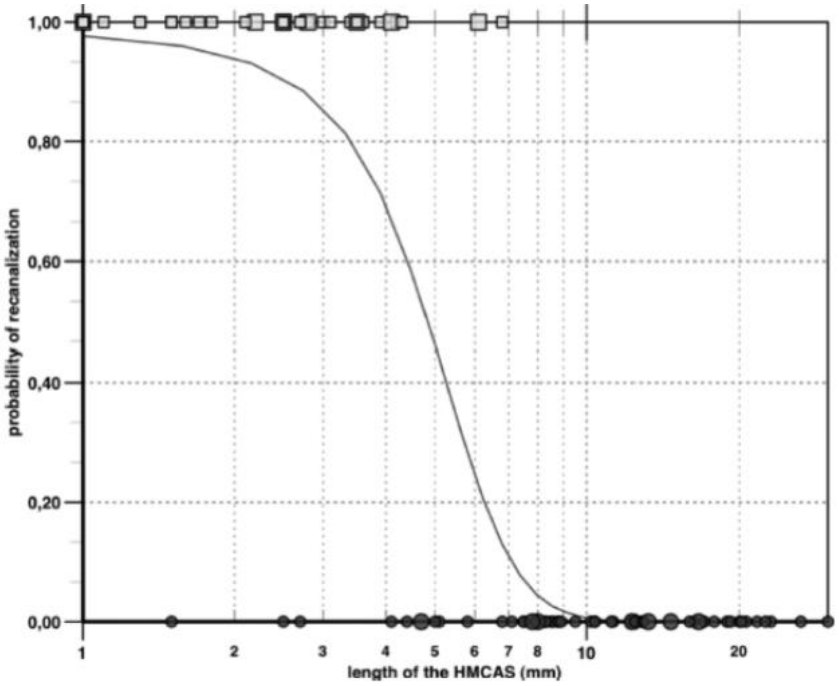
Literature



- IVT: 20% better outcome than control group (placebo) (0-4.5 hrs)
  - *The National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group. N Engl J Med. 1995*
  - *Hacke et al. Thrombolysis with alteplase 3 to 4.5 hours after acute ischemic stroke. N Engl J Med. 2008 (ECASS 3)*
- Inefficacy in LVO (ICA, M1, BA)
  - *Saqqur et al Stroke 2007*
- Recanalization rate LVO: IVT < than MT
  - *Nogueira Stroke 2012*

Literature





- SITS-ISTR: 45% ACM hyperdensity IVT non-responders (mortality rate 30%; mRS 90 days: 19%)

- > 8 mm clot: no recanalization with IVT

Literature

American Heart Association | American Stroke Association

Together to End Stroke™

INTERNATIONAL STROKE CONFERENCE 2013

Nursing Symposium: February 5
ISC Pre-Conference: February 5
Sessions: February 6-8
Exhibits: February 6-7
Honolulu, Hawaii
strokeconference.org

3 Recent Negative Endovascular Trials in AIS

Study	Study Question	Comment
Interventional Management of Stroke III (IMS-III):	Is endovascular therapy after administration of IV t-PA in moderate-to-severe AIS more effective (and safe) compared to IV t-PA alone *within 3 hours* after symptom onset?	Primary Endpoint mRS ≤2: Endovascular 40.8% IV t-PA 38.7% (*P*= 0.70) Predefined Endpoints NIHSS 8-19 or ≥20 (*P*-value= 0.27)
Mechanical Retrieval and REcanalization of Stroke Clots Using Embolectomy (MR RESCUE)	1. Does presence of substantial penumbral tissue predict patients most likely to respond to mechanical embolectomy? 2. Do embolectomy patients have improved functional outcome compared to randomized controls?	*P*= not significant for either question (penumbra or embolectomy)
SYNTHESIS Expansion	AIS patients within 4.5 hours randomized to endovascular therapy (IA thrombolysis with t-PA, mechanical clot disruption or retrieval or a combination of approaches vs. IV tPA)	For mRS (0,1), *P*=.16

Broderick J, et al. *N Engl J Med*. 2013 online February 7, 2013; Kidwell CS, et al. *N Engl J Med*. 2013. DOI: 10.1056/NEJMoa1212793; Ciccone A, et al. *N Engl J Med*. 2013. DOI: 10.1056/NEJMoa1213701; mRS= modfied Rankin score

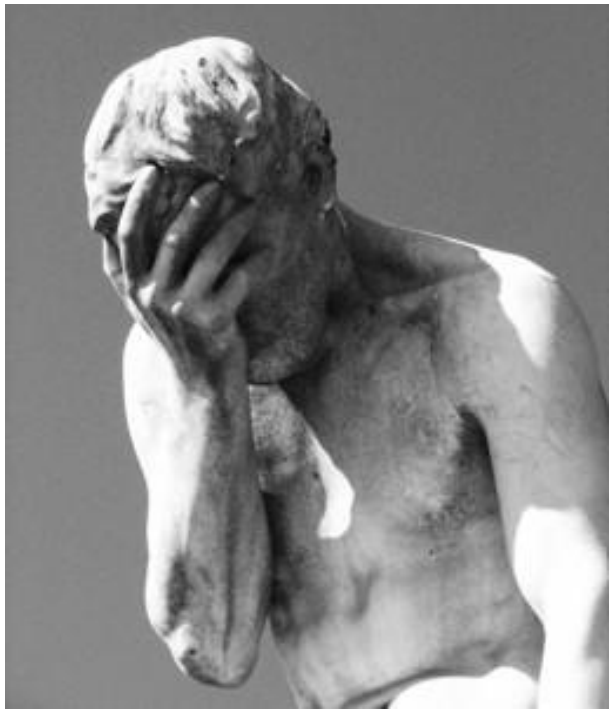
2013 NEJM

- IMS III (interrupted for futility)
- MR RESCUE
- SYNTHESIS

i.v.rtPA vs i.v.rtPA + endovascular therapy
showed neutral results on clinical outcome

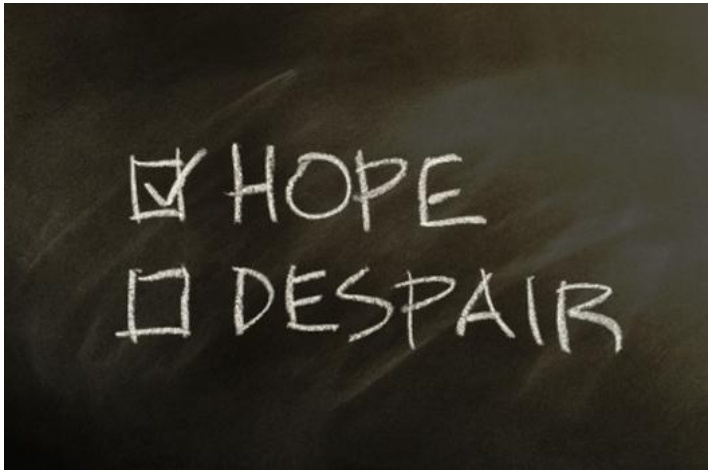
(long delays, inadequate pt selection and imaging, old devices, …)

Literature



- Not the END for EVT in stroke
- > recanalization rate: better outcome
- Better slection pts (PCT,PWI): better outcome
- EVT in LVO: better outcome

need for a better trial strategy and design



Literature

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Thrombectomy within 8 Hours after Symptom Onset in Ischemic Stroke

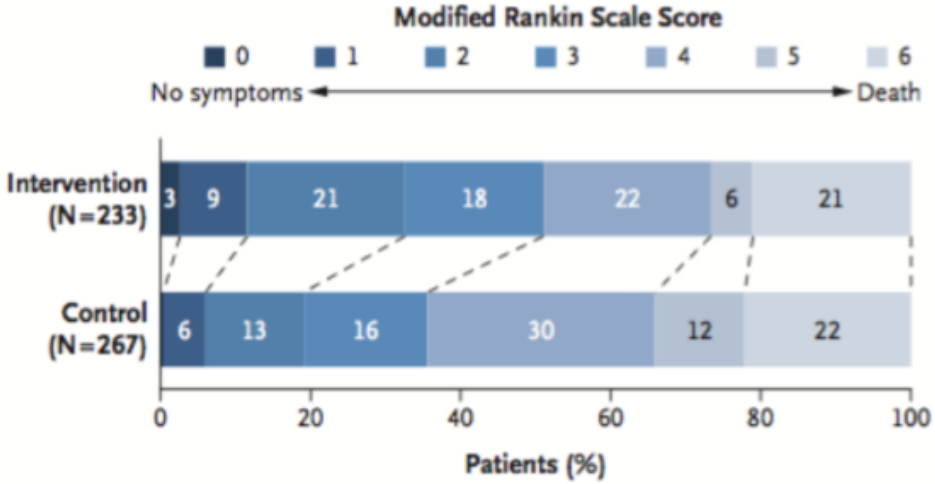
T.G. Jovin, A. Chamorro, E. Cobo, M.A. de Miquel, C.A. Molina, A. Rovira, L. San Román, J. Serena, S. Abilleira, M. Ribó, M. Millán, X. Urra, P. Cardona, E. López-Cancio, A. Tomasello, C. Castaño, J. Blasco, L. Aja, L. Dorado, H. Quesada, M. Rubiera, M. Hernández-Pérez, M. Goyal, A.M. Demchuk, R. von Kummer, M. Gallofré, and A. Dávalos, for the REVASCAT Trial Investigators*

M.A. Simpson, F. Miteff, C.R. Levi, M. Krause, T.J. Harrington, K.C. Faulder, B.S. Steinfort, M. Priglinger, T. Ang, R. Scroop, P.A. Barber, B. McGuinness, T. Wijeratne, T.G. Phan, W. Chong, R.V. Chandra, C.F. Bladin, M. Badve, H. Rice, L. de Villiers, H. Ma, P.M. Desmond, G.A. Donnan, and S.M. Davis, for the EXTEND-IA Investigators*

W.H. van Zwam, Y.B.W.E.M. Roos, A. van der Lugt, R.J. van Oostenbrugge, C.B.L.M. Majoie, and D.W.J. Dippel, for the MR CLEAN Investigators*

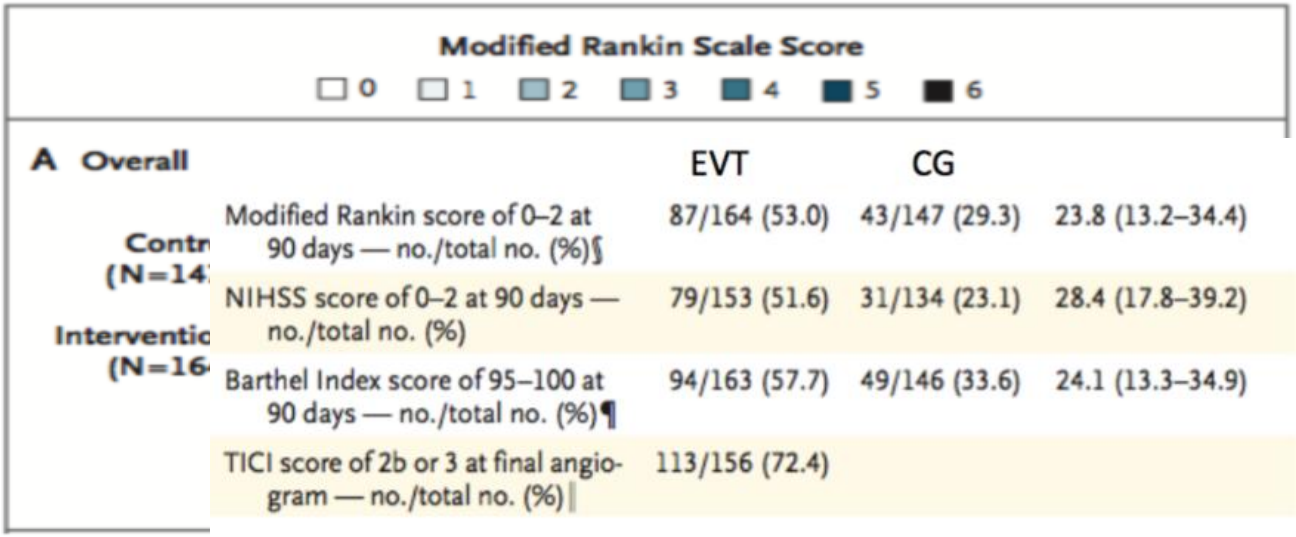
Literature

- MR CLEAN dec 2010-march
  - 16 centers, 502 pts >18
  - i.v. rtPA vs i.v.rtPA + end
  - up to 6 hours (end EVT a
  - stent retrievers in 97% c
  - tandem pathology in 29



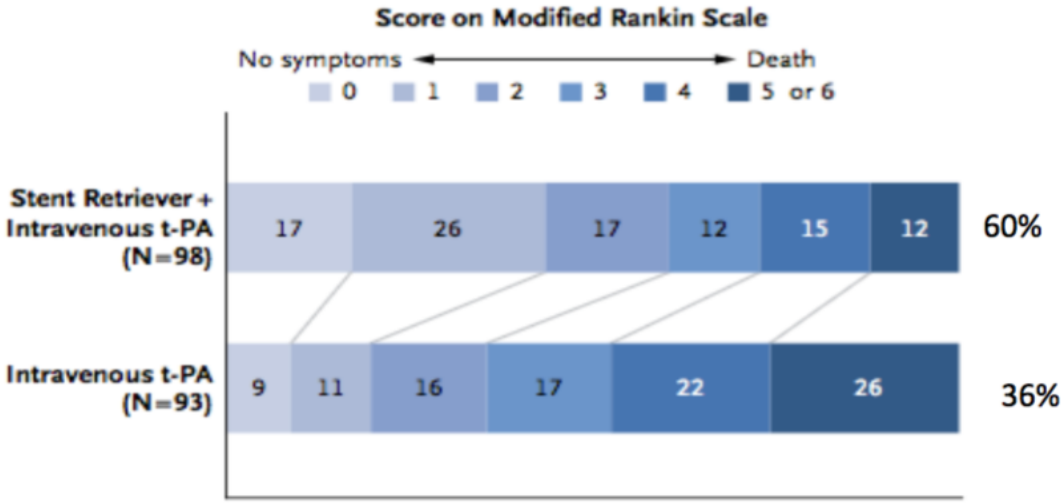
mRS<2
EVT 33.5%
CG 19%

- ESCAPE (Canada U
  - 316 pts, >18 aa,
  - CTA, good collate
  - CT-ASPECT > 5
  - < 12 hours SR an
  - i.v. rtPA if possibl

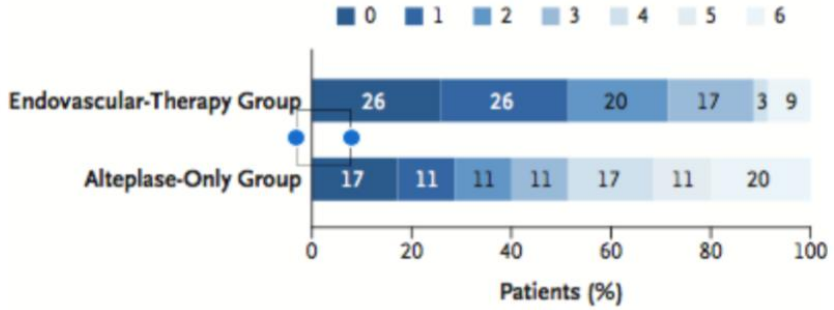


Literature

- SWIFT PRIME prematurely stopped
  - 196 pts (98 EVT: Solitaire SR
  - i.v. rtPA < 4.5 hours in all pts
  - NIHSS 8 - 30
  - CTA or MRA /CTP/DWI (Rapi
  - CT-ASPECT > 6, no difficult a
  - EVT up to 6 hours: TICI 2b/3



- EXTEND-IA (Australia/New Zeland
  - 70 pts > 18 yo, pre-mRS <2 (3
  - i.v. rtPA < 4.5 hours in all pts
  - CTA or MRA
  - EVT up to 6 hours: TICI 2b 82
  - **significant mismatch and limi**

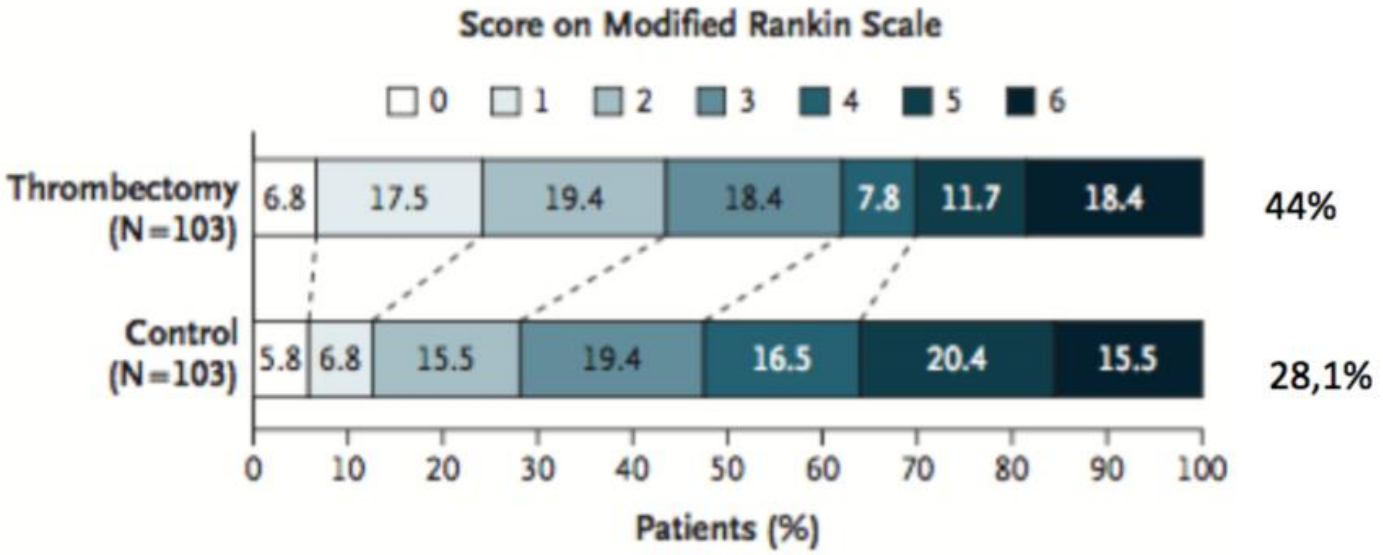


CONCLUSIONS

In patients with ischemic stroke with a proximal cerebral arterial occlusion and salvageable tissue on CT perfusion imaging, early thrombectomy with the Solitaire FR stent retriever, as compared with alteplase alone, improved reperfusion, early neurologic recovery, and functional outcome. (Funded by the Australian National Health and Medical Research Council and others; EXTEND-IA ClinicalTrials.gov number, NCT01492725, and Australian New Zealand Clinical Trials Registry number,

Literature

- REVASCAT p
  - 206 pts: 18
  - i.v. rtPA vs i
  - CTA or MR/
  - CT-ASPECT
  - up to 8 hou

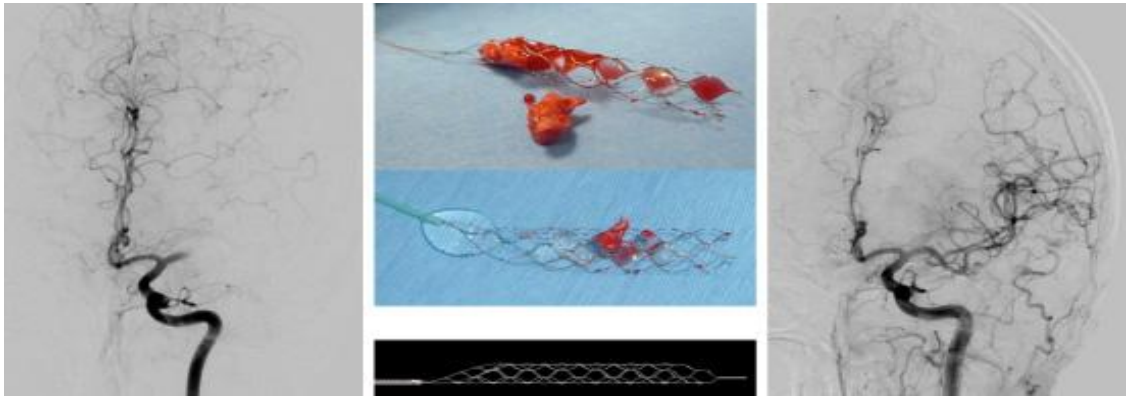


Literature

Endovascular thrombectomy after large-vessel ischaemic stroke: a meta-analysis of individual patient data from five randomised trials

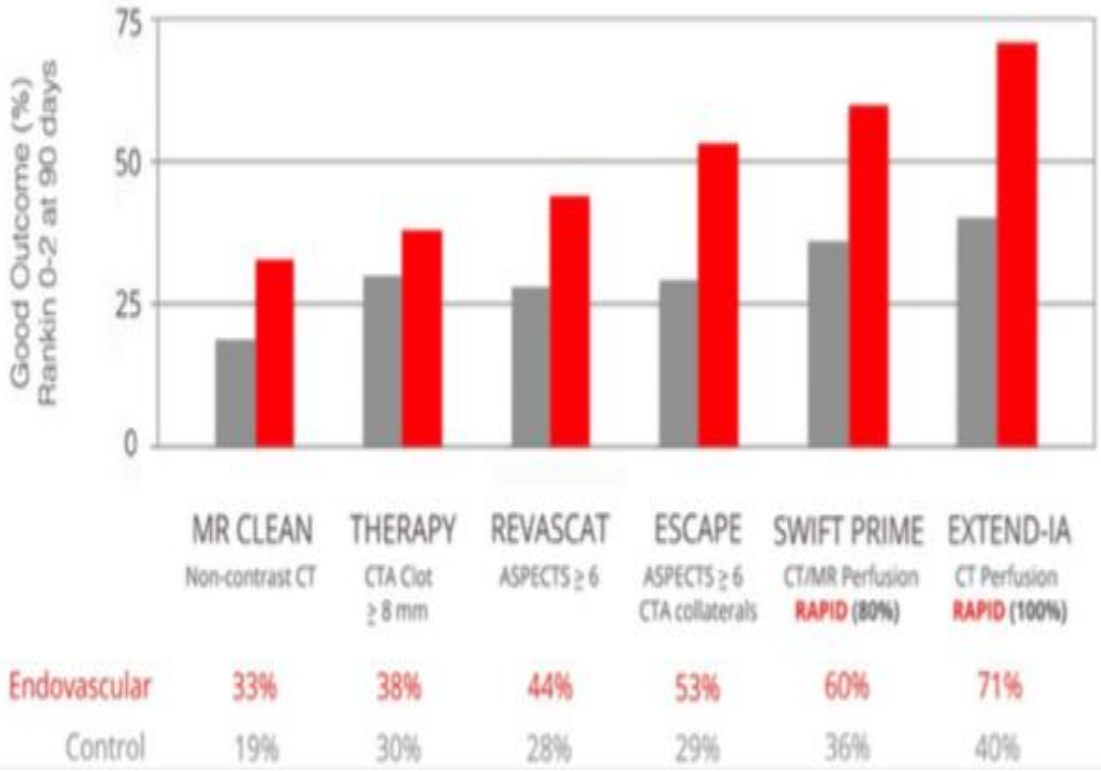
Mayank Goyal, Bijoy K Menon, Wim H van Zwam, Diederik W J Dippel, Peter J Mitchell, Andrew M Demchuk, Antoni Dávalos, Charles B L M Majoie, Aad van der Lugt, Maria A de Miquel, Geoffrey A Donnan, Yvo B W E M Roos, Alain Bonafe, Reza Jahan, Hans-Christoph Diener, Lucie A van den Berg, Elad I Levy, Olvert A Berkhemer, Vitor M Pereira, Jeremy Rempel, Mònica Millán, Stephen M Davis, Daniel Roy, John Thornton, Luis San Román, Marc Ribó, Debbie Beumer, Bruce Stouch, Scott Brown, Bruce C V Campbell, Robert J van Oostenbrugge, Jeffrey L Saver, Michael D Hill, Tudor G Jovin, for the HERMES collaborators

	SR	recan. rate	onset to groin p.	onset to recan
OVERALL	536 (84.5%)	373 (80.4%)	200 to 269 min	241 to 355 min



Literature

	ASPECTS (CT)	Occlusion	Penumbra evaluation	mRS 0-2 MT	mRS 0-2 Control	ARR	NNT (mRS 0-2)
MR Clean	0-10	distal ICA, M1, M2, A1, A2	-	33%	19%	14%	7
REVASCAT	7-10	distal ICA, ICA	-	44%	28%	16%	6



1 - Berkhemer OA et al. N Engl J Med 2015
2 - Goyal M et al. N Engl J Med 2015
3 - Campbell BCV et al. N Engl J Med 2015
4 - Saver J et al. N Engl J Med 2015
5 – Jovin T et al. N Engl J Med 2015

Consensus statement on mechanical thrombectomy in acute ischemic stroke

A collaboration of the ESO – Karolinska Stroke Update, ESMINT and ESNR

European Stroke Organisation (ESO)

European Society for Minimally Invasive Neurological Therapy (ESMINT)

European Society of Neuroradiology (ESNR)

Treatment recommendations

- Mechanical thrombectomy, in addition to intravenous thrombolysis within 4.5 hours when eligible, is recommended to treat acute stroke patients with large artery occlusions in the anterior circulation up to 6 hours after symptom onset (Grade A, Level 1a, KSU Grade A). - *new*
- Mechanical thrombectomy should not prevent the initiation of intravenous thrombolysis where this is indicated, and intravenous thrombolysis should not delay mechanical thrombectomy (Grade A, Level 1a, KSU Grade A). - *changed*
- Mechanical thrombectomy should be performed as soon as possible after its indication (Grade A, Level 1a, KSU Grade A).
- For mechanical thrombectomy, stent retrievers approved by local health authorities should be considered (Grade A, Level 1a, KSU Grade A). - *new*
- Other thrombectomy or aspiration devices approved by local health authorities may be used upon the neurointerventionists discretion if rapid, complete and safe revascularisation of the target vessel can be achieved (Grade C, Level 2a, KSU Grade C) - *new*
- If intravenous thrombolysis is contraindicated (e.g. Warfarin-treated with therapeutic INR) mechanical thrombectomy is recommended as first-line treatment in large vessel occlusions (Grade A, Level 1a, KSU Grade A) – *changed and updated level of evidence*.

Treatment recommendations

- Patients with acute basilar artery occlusion should be evaluated in centres with multimodal imaging and treated with mechanical thrombectomy in addition to intravenous thrombolysis when indicated (Grade B, Level 2a, KSU Grade C); alternatively they may be treated within a randomized controlled trial for thrombectomy approved by the local ethical committee - *new*
- The decision to undertake mechanical thrombectomy should be made jointly by a multidisciplinary team comprising at least a stroke physician and a neurointerventionalist and performed in experienced centres providing comprehensive stroke care and expertise in neuroanesthesiology (Grade C, Level 5, GCP, KSU Grade C).
- Mechanical thrombectomy should be performed by a trained and experienced neurointerventionalist who meets national and/or international requirements (Grade B, Level 2b, KSU Grade B) – *changed in level of evidence*.
- The choice of anesthesia depends on the individual situation; independently of the method chosen, all efforts should be made to avoid thrombectomy delays (Grade C, Level 2b, KSU Grade C) – *changed.*

Patient selection

- Intracranial vessel occlusion must be diagnosed with non-invasive imaging whenever possible before considering treatment with mechanical thrombectomy (Grade A, Level 1a, KSU Grade A) - *new*.
- If vessel imaging is not available at baseline, a NIHSS score of ≥ 9 within three, and ≥ 7 points within six hours may indicate the presence of large vessel occlusion (Grade B, Level 2a, KSU Grade B) - *new*.
- Patients with radiological signs of large infarcts (for ex. using the ASPECTS score) may be unsuitable for thrombectomy (Grade B, Level 2a, KSU Grade B) - *new*
- Imaging techniques for determining infarct and penumbra sizes can be used for patient selection and correlate with functional outcome after mechanical thrombectomy (Grade B, Level 1b, KSU Grade B) - *new*.
- High age alone is not a reason to withhold mechanical thrombectomy as an adjunctive treatment (Grade A, Level 1a, KSU Grade A) - *new*.

Recommendation for implementation, registries and further trials

- Health authorities are strongly encouraged to implement access to thrombectomy within a reasonable time range in a network including stroke centres - *new.*
- It is encouraged to perform and include patients in RCT addressing unresolved thrombectomy questions such as thrombectomy for basilar artery occlusion, treatment in a late und unknown time windows, treating patients with imaging findings not sufficiently covered in recent trials, comparing new devices with widely-used stent retrievers, thrombectomy with or without intravenous thrombolysis, and different types of anesthesia. - *new.*
- Non-randomized trials comparing centres not yet having access to mechanical thrombectomy with others should continue (such as SITS OPEN) - *new.*
- Ischemic stroke patients undergoing any type of acute revascularization treatment should be included systematically in national or international registries (such as SITS or SITS-TBY) - *new.*

Stroke Physician qualifications

Baseline training and qualifications as well as ongoing professional education (new practitioners)

1. residency training (radiology, neurology or neurosurgery) or
   "additional period" (1-2 years) including stroke diagnosis and management, dsa cerebral arteriography interpretation, neuroimaging under board certified neuroradiologist (national standards of country involved)

2. dedicated training in Interventional Neuroradiology at high volume centers (dedicated year after residency)

Training guidelines for endovascular stroke intervention: an international multi-society consensus document
S.D. Lavine et al; Neuroradiology (2016) 58:537-541

Physician qualifications

- Maintenance of physician qualifications

1. Minimum 16/h of stroke specific education/2years is suggested
2. Partecipate quality assurance and improvement program
3. Monitor periprocedural and 90 days outcomes (national registry)

    - successful recanalisation (mTICI 2b-3) at least 60%
    - embolisation in new territory < than 15%
    - SICH (symptomatic intracranial hemorrage) <10%

Training guidelines for endovascular stroke intervention: an international multi-society consensus document
S.D. Lavine et al; Neuroradiology (2016) 58:537-541

Hospital requirements

- Multidisciplinary team
- 365/24/7
- Angiography suites suitably equipped as well as equipment and capability to handle complications
- Dedicated suites and intensive care units (all with specific training)
- Vascular Neurology and Neurocritical expertise
- Neurosurgery expertise, including Vascular Neurosurgery
- All relevant neuroimaging modalities (CT/CTA, MR/MRA, TCD) 24/7

Training guidelines for endovascular stroke intervention: an international multi-society consensus document
S.D. Lavine et al; Neuroradiology (2016) 58:537-541

Literature

ORIGINAL RESEARCH

CT angiography-based collateral flow and time to reperfusion are strong predictors of outcome in endovascular treatment of patients with stroke

Fabrizio Sallustio,[1,2] Caterina Motta,[1,2] Silvia Pizzuto,[1] Marina Diomedi,[1] Angela Giordano,[1] Vittoria Carla D'Agostino,[1] Domenico Samà,[1] Salvatore Mangiafico,[3] Valentina Saia,[4] Jacopo Maria Legramante,[5] Daniel Konda,[6] Enrico Pampana,[6] Roberto Floris,[6] Paolo Stanzione,[1] Roberto Gandini,[6] Giacomo Koch[1,2]

ABSTRACT

Background Collateral flow (CF) is an effective predictor of outcome in acute ischemic stroke (AIS) with potential to sustain the ischemic penumbra. However, the clinical prognostic value of CF in patients with AIS undergoing mechanical thrombectomy has not been clearly established. We evaluated the relationship of CF with clinical outcomes in patients with large artery anterior circulation AIS treated with mechanical thrombectomy.

Methods Baseline collaterals of patients with AIS (n=135) undergoing mechanical thrombectomy were independently evaluated by CT angiography (CTA) and conventional angiography and dichotomized into poor and good CF. Multivariable analyses were performed to evaluate the predictive effect of CF on outcome and the effect of time to reperfusion on outcome based on adequacy of the collaterals.

Results Evaluation of CF was consistent by both CTA and conventional angiography ($p<0.0001$). A higher rate of patients with good collaterals had good functional outcome at 3-month follow-up compared with those with poor collaterals (modified Rankin Scale (mRS) 0–2: 60% vs 10%, $p=0.0001$). Patients with poor collaterals had a significantly higher mortality rate (mRS 6: 45% vs 8%, $p=0.0001$). Multivariable analyses showed that CF was the strongest predictor of outcome. Time to reperfusion had a clear effect on favorable outcome (mRS ≤ 2) in patients with good collaterals; in patients with poor collaterals this effect was only seen when mRS ≤ 3 was considered an acceptable outcome.

Conclusions CTA is a valid tool for assessing the ability of CF to predict clinical outcome in patients with AIS treated with mechanical thrombectomy. Limiting time to reperfusion is of definite value in patients with good collaterals and also to some extent in those with poor collaterals.

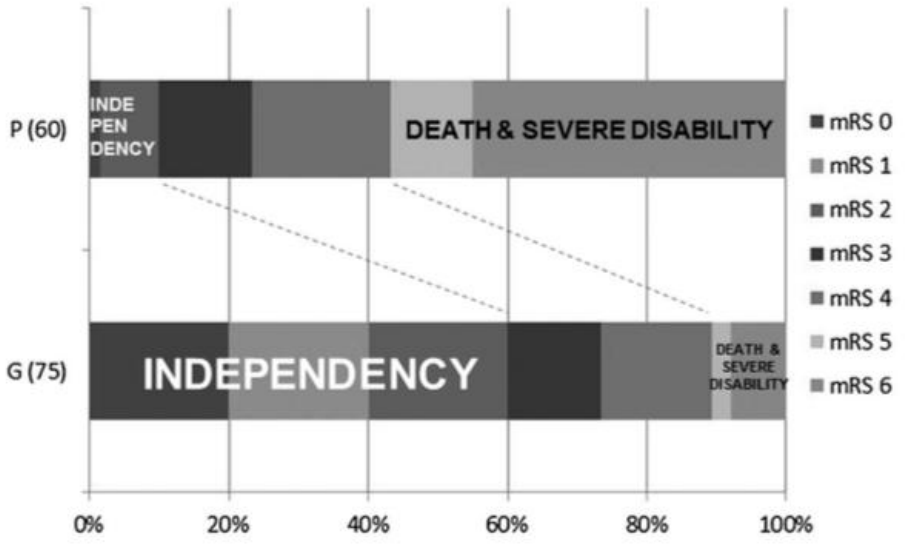


Figure 1 Scores on the modified Rankin Scale (mRS) at 3 months in good (G) and poor (P) collateral flow groups stratified on conventional angiography.

2016

Literature

Ischemic stroke
Original research

Continuous aspiration prior to intracranial vascular embolectomy (CAPTIVE): a technique which improves outcomes

Ryan A McTaggart[1, 2], Eric L Tung[1, 2], Shadi Yaghi[2, 3], Shawna M Cutting[2, 3], Morgan Hemendinger[2, 3], Heather I Gale[1], Grayson L Baird[1, 4], Richard A Haas[1, 2, 5], Mahesh V Jayaraman[1, 2, 3, 5]

Author affiliations+

Abstract

Background Modern stent retriever-based embolectomy for patients with emergent large vessel occlusion improves outcomes. Techniques aimed at achieving higher rates of complete recanalization would benefit patients.

Objective To evaluate the clinical impact of an embolectomy technique focused on continuous aspiration prior to intracranial vascular embolectomy (CAPTIVE).

Methods A retrospective review was performed of 95 consecutive patients with intracranial internal carotid artery or M1 segment middle cerebral artery occlusion treated with stent retriever-based thrombectomy over an 11-month period. Patients were divided into a conventional local aspiration group (traditional group) and those treated with a novel continuous aspiration technique (CAPTIVE group). We compared both early neurologic recovery (based on changes in National Institute of Health Stroke Scale (NIHSS) score), independence at 90 days (modified Rankin score 0–2), and angiographic results using the modified Thrombolysis in Cerebral Ischemia (TICI) scale including the TICI 2c category.

Results There were 56 patients in the traditional group and 39 in the CAPTIVE group. Median age and admission NIHSS scores were 78 years and 19 in the traditional group and 77 years and 19 in the CAPTIVE group. Median times from groin puncture to recanalization in the traditional and CAPTIVE groups were 31 min and 14 min, respectively ($p<0.0001$). While rates of TICI 2b/2c/3 recanalization were similar (81% traditional vs 100% CAPTIVE), CAPTIVE offered higher rates of TICI 2c/3 recanalization (79.5% vs 40%, $p<0.001$). Median discharge NIHSS score was 10 in the traditional group and 3 in the CAPTIVE group; this difference was significant. There was also an increased independence at 90 days (25% traditional vs 49% CAPTIVE).

Conclusions The CAPTIVE embolectomy technique may result in higher recanalization rates and better clinical outcomes.

http://dx.doi.org/10.1136/neurintsurg-2016-012838

2016

Retrospective analysis in 95 pts
ICA-M1 occlusion with stent-retriever based thrombectomy

- traditional group 56 pts
- CAPTIVE group 39 pts

- TICI 2b/2c/3 rates
  81 vs 100%
- TICI 2c/3
  40% vs 79.5%
- Median discharge NIHSS
  10 vs 3
- Independence @90 days
  25% vs 49%

Literature

A Direct Aspiration, First Pass Technique (ADAPT) versus Stent Retrievers for Acute Stroke Therapy: An Observational Comparative Study

B. Lapergue, R. Blanc, P. Guedin, J.-P. Decroix, J. Labreuche, C. Preda, B. Bartolini, O. Coskun, H. Redjem, M. Mazighi, F. Bourdain, G. Rodesch, and M. Piotin

ABSTRACT

BACKGROUND AND PURPOSE: Mechanical thrombectomy with stent retrievers is now the standard therapy for selected patients with ischemic stroke. The technique of A Direct Aspiration, First Pass Technique for the Endovascular Treatment of Stroke (ADAPT) appears promising with a high rate of recanalization. We compared ADAPT versus stent retrievers (the Solitaire device) for efficacy and safety as a front-line endovascular procedure.

MATERIALS AND METHODS: We analyzed 243 consecutive patients with large intracranial artery occlusions of the anterior circulation, treated within 6 hours with mechanical thrombectomy by either ADAPT or the Solitaire stent. Th primary outcome was complete recanalization (modified TICI ≥ 2b); secondary outcomes included complication rates and procedural and clinical outcomes.

RESULTS: From November 2012 to June 2014, 119 patients were treated with stent retriever (Solitaire FR) and 124 by using the ADAPT with Penumbra reperfusion catheters. The median baseline NIHSS score was the same for both groups (Solitaire, 17 [interquartile range, 11–21] versus ADAPT, 17 [interquartile range, 12–21]). Time from groin puncture to recanalization (Solitaire, 50 minutes [range, 25–80 minutes] versus ADAPT, 45 minutes [range, 27–70 minutes], $P = .42$) did not differ significantly. However, compared with the Solitaire group, patients treated with ADAPT achieved higher final recanalization rates (82.3% versus 68.9%; adjusted relative risk, 1.18; 95% CI, 1.02–1.37; $P = .022$), though differences in clinical outcomes between the cohorts were not significant. Use of an adjunctive device was more frequent in the ADAPT group (45.2% versus 13.5%, $P < .0001$). The rate of embolization in new territories or symptomatic hemorrhage did not differ significantly between the 2 groups.

CONCLUSIONS: Front-line ADAPT achieved higher recanalization rates than the Solitaire device. Further randomized controlled trials are warranted to define the best strategy for mechanical thrombectomy.

ABBREVIATIONS: ADAPT = A Direct Aspiration, First Pass Technique for the Endovascular Treatment of Stroke; MT = mechanical thrombectomy; mTICI = modified TICI

2016

75% ricanalization
46 deaths
10 SICH

119 stent-triever -> 69% TICI 2b-3
mRS 0-2 55%

124 ADAPT -> 82% TICI 2b-3
mRS 0-2 53%

Literature

Stroke

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ORIGINAL CONTRIBUTION

Successful Reperfusion With Mechanical Thrombectomy Is Associated With Reduced Disability and Mortality in Patients With Pretreatment Diffusion-Weighted Imaging–Alberta Stroke Program Early Computed Tomography Score ≤6

Jean-Philippe Desilles, Arthuro Consoli, Hocine Redjem, Oguzhan Coskun, Gabriele Ciccio, Stanislas Smajda, Julien Labreuche, Cristian Preda, Clara Ruiz Guerrero, Jean-Pierre Decroix, Georges Rodesch, Mikael Mazighi, Raphaël Blanc, Michel Piotin, Bertrand Lapergue, on behalf of the ETIS (Endovascular Treatment in Ischemic Stroke) Research Investigators*

DOI https://doi.org/10.1161/STROKEAHA.116.015202
Stroke. 2017;48:963-969
Originally published February 24, 2017

Abstract

Background and Purpose—In acute ischemic stroke patients, diffusion-weighted imaging (DWI)–Alberta Stroke Program Early Computed Tomography Score (ASPECTS) is correlated with infarct volume and is an independent factor of functional outcome. Patients with pretreatment DWI-ASPECTS ≤6 were excluded or under-represented in the recent randomized mechanical thrombectomy trials. Our aim was to assess the impact of reperfusion in pretreatment DWI-ASPECTS ≤6 patients treated with mechanical thrombectomy.

Methods—We analyzed data collected between January 2012 and August 2015 in a bicentric prospective clinical registry of consecutive acute ischemic stroke patients treated with mechanical thrombectomy. Every patient with a documented internal carotid artery or middle cerebral artery occlusion with pretreatment DWI-ASPECTS ≤6 was eligible for this study. The primary end point was a favorable outcome defined by a modified Rankin Scale score ≤2 at 90 days.

Results—Two hundred and eighteen patients with a DWI-ASPECTS ≤6 were included. Among them, 145 (66%) patients had successful reperfusion at the end of mechanical thrombectomy. Reperfused patients had an increased rate of favorable outcome (38.7% versus 17.4%; *P*=0.002) and a decreased rate of mortality at 3 months (22.5% versus 39.1%; *P*=0.013) compared with nonreperfused patients. The symptomatic intracranial hemorrhage rate was not different between the 2 groups (13.0% versus 14.1%; *P*=0.83). However, in patients with DWI-ASPECTS <5, favorable outcome was low (13.0% versus 9.5%; *P*=0.68) with a high mortality rate (45.7% versus 57.1%; *P*=0.38) with or without successful reperfusion.

Conclusions—Successful reperfusion is associated with reduced mortality and disability in patients with a pretreatment DWI-ASPECTS ≤6. Further data from randomized studies are needed, particularly in patients with DWI-ASPECTS <5.

2017

ICA/M1-M2 occlusion 2012-2015
prospective clinical registry
impact of reperfusion in DWI-ASPECT < 6

- 218
- 145 (66%) successful reperfusion
- lower mRS @ 90 days
  38.7% vs 17.4% (not reperfused)
- lower mortality @ 3 months
  22.5% vs 39.1% (not reperfused)
- same SICH: 13 % vs 14.1 %

- DWI-ASPECT <5
- low favourable outcome 13% vs 9.5%
- high mortality rate 45.7% vs 57.1%
  (both groups)

- no inreased SICH
- beneficial MT in DWI-ASPECT 5-6
- Trend toward better neurological outcome (23.1 vs 9.5%), lower mortality rate @ 3 months (45% vs 57%) in reperfused
  0-4 DWI-ASPECT group

Literature

Impact of Modified TICI 3 versus Modified TICI 2b Reperfusion Score to Predict Good Outcome following Endovascular Therapy

C. Dargazanli, A. Consoli, M. Barral, J. Labreuche, H. Redjem, G. Ciccio, S. Smajda, J.P. Desilles, G. Taylor, C. Preda, O. Coskun, G. Rodesch, M. Piotin, R. Blanc and B. Lapergue

American Journal of Neuroradiology January 2017, 38 (1) 90-96; DOI: https://doi.org/10.3174/ajnr.A4968

Abstract

BACKGROUND AND PURPOSE: The TICI score is widely used to evaluate cerebral perfusion before and after the endovascular treatment of stroke. Recent studies showing the effectiveness and safety of mechanical thrombectomy combine modified TICI 2b and modified TICI 3 to assess the technical success of endovascular treatment. The purpose of this study was to determine how much clinical outcomes differ between patients achieving modified TICI 2b and modified TICI 3 reperfusion.

MATERIALS AND METHODS: We analyzed 222 consecutive patients with acute large intracranial artery occlusion of the anterior circulation having achieved modified TICI 2b or modified TICI 3 reperfusion after thrombectomy. The primary end point was the rate of favorable outcome defined as the achievement of a modified Rankin Scale score of 0–2 at 3 months.

RESULTS: Patients with modified TICI 3 more often had favorable collateral circulation and atherosclerosis etiology, with a shorter time from onset to reperfusion than patients with modified TICI 2b (all $P < .05$). The number of total passes to achieve reperfusion was higher in the modified TICI 2b group (median, 2; interquartile range, 1–3, 1–9) versus (median, 1; interquartile range, 1–2, 1–8) in the modified TICI 3 group ($P = .0002$). Favorable outcome was reached more often for patients with modified TICI 3 than for those with modified TICI 2b (71.7% versus 50.5%, $P = .001$), with a similar difference when considering excellent outcome. In addition, patients with modified TICI 3 had a lower intracerebral hemorrhage rate (23.0% versus 45.0%, $P < .001$).

CONCLUSIONS: Patients with modified TICI 3 reperfusion have better functional outcomes than those with modified TICI 2b. Given the improving reperfusion rates obtained with thrombectomy devices, future thrombectomy trials should consider modified TICI 2b and modified TICI 3 status separately.

2017

Pts with TICI 3 reperfusion have better functional outcome and less hemorragic transformation than those with TICI2b

Literature

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SAGE

First-line use of contact aspiration for thrombectomy versus a stent retriever for recanalization in acute cerebral infarction: The randomized ASTER study protocol

Bertrand Lapergue[1], Julien Labreuche[2], Raphael Blanc[3], Xavier Barreau[4], Jérome Berge[4], Arturo Consoli[1], Georges Rodesch[1], Susanna Saleme[5], Vincent Costalat[6], Serge Bracard[7], Hubert Desal[8], Alain Duhamel[3], Sandrine Baffert[3], Mikael Mazighi[3], Benjamin Gory[9], Francis Turjman[5] and Michel Piotin[3]; on behalf of the ASTER Trial Investigators

Abstract

Rationale: Mechanical thrombectomy with a stent retriever is now the standard of care in anterior circulation ischemic stroke caused by large vessel occlusion. New techniques for mechanical thrombectomy, such as contact aspiration, appear promising to increase reperfusion status and improve clinical outcome.

Aim: We aim at ascertaining whether contact aspiration is more efficient than the stent retriever as a first-line endovascular procedure.

Sample size estimates: With a two-sided test (alpha = 5%, power = 90%) and an anticipated rate of spontaneous recanalization and catheterization failures of 15%, we estimate that a sample size of 380 patients will be necessary to detect an absolute difference of 15% in primary outcome (superiority design).

Methods and design: The ASTER trial is a prospective, randomized, multicenter, controlled, open-label, blinded end-point clinical trial. Patients admitted with suspected ischemic anterior circulation stroke secondary to large vessel occlusion, with onset of symptoms <6 h, will be randomly assigned to contact aspiration or stent retriever in a 1:1 ratio; stratified by center and prior IV thrombolysis. If the assigned treatment technique is not successful after three attempts, another technique will be applied, at the operator's discretion.

Study outcomes: The primary outcome will be successful recanalization (modified Thrombolysis in Cerebral Infarction score 2b–3) at the end of the endovascular procedures. Secondary outcome will include successful recanalization after the assigned first-line treatment technique alone, procedural times, the need for a rescue technique, complications and modified Rankin Scale at three months.

Discussion: No previous head to head randomized trials have directly compared contact aspiration versus stent retriever reperfusion techniques. This prospective trial aims to provide further evidence of benefit of contact aspiration versus stent retriever techniques among patients with ischemic stroke.

Literature

Effect of Endovascular Contact Aspiration vs Stent Retriever on Revascularization in Patients With Acute Ischemic Stroke and Large Vessel Occlusion

The ASTER Randomized Clinical Trial

Bertrand Lapergue, MD, PhD; Raphael Blanc, MD, MSc; Benjamin Gory, MD, PhD; Julien Labreuche, BST; Alain Duhamel, PhD; Gautier Marnat, MD;

IMPORTANCE The benefits of endovascular revascularization using the contact aspiration technique vs the stent retriever technique in patients with acute ischemic stroke remain uncertain because of lack of evidence from randomized trials.

OBJECTIVE To compare efficacy and adverse events using the contact aspiration technique vs the standard stent retriever technique as a first-line endovascular treatment for successful revascularization among patients with acute ischemic stroke and large vessel occlusion.

DESIGN, SETTING, AND PARTICIPANTS The Contact Aspiration vs Stent Retriever for Successful Revascularization (ASTER) study was a randomized, open-label, blinded end-point clinical trial conducted in 8 comprehensive stroke centers in France (October 2015-October 2016). Patients who presented with acute ischemic stroke and a large vessel occlusion in the anterior circulation within 6 hours of symptom onset were included.

INTERVENTIONS Patients were randomly assigned to first-line contact aspiration (n = 192) or first-line stent retriever (n = 189) immediately prior to mechanical thrombectomy.

MAIN OUTCOMES AND MEASURES The primary outcome was the proportion of patients with successful revascularization defined as a modified Thrombolysis in Cerebral Infarction score of 2b or 3 at the end of all endovascular procedures. Secondary outcomes included degree of disability assessed by overall distribution of the modified Rankin Scale (mRS) score at 90 days, change in National Institutes of Health Stroke Scale (NIHSS) score at 24 hours, all-cause mortality at 90 days, and procedure-related serious adverse events.

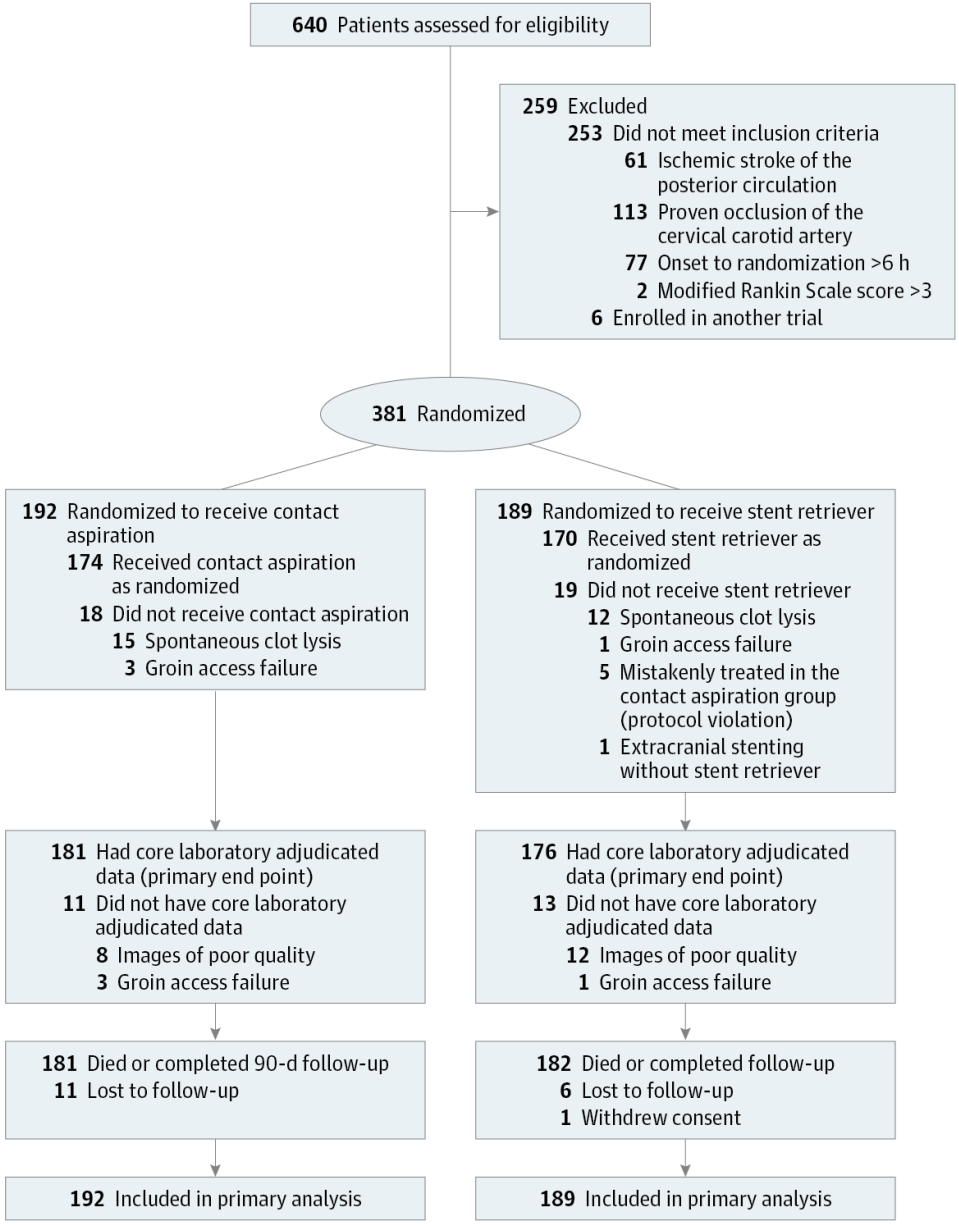
RESULTS Among 381 patients randomized (mean age, 69.9 years; 174 women [45.7%]), 363 (95.3%) completed the trial. Median time from symptom onset to arterial puncture was 227 minutes (interquartile range, 180-280 minutes). For the primary outcome, the proportion of patients with successful revascularization was 85.4% (n = 164) in the contact aspiration group vs 83.1% (n = 157) in the stent retriever group (odds ratio, 1.20 [95% CI, 0.68-2.10]; *P* = .53; difference, 2.4% [95% CI, −5.4% to 9.7%]). For the clinical efficacy outcomes (change in NIHSS score at 24 hours, mRS score at 90 days) and adverse events, there were no significant differences between groups.

CONCLUSIONS AND RELEVANCE Among patients with ischemic stroke in the anterior circulation undergoing thrombectomy, first-line thrombectomy with contact aspiration compared with stent retriever did not result in an increased successful revascularization rate at the end of the procedure.

TRIAL REGISTRATION clinicaltrials.gov Identifier: NCT02523261

Literature

The ASTER randomized clinical Trial- STUDY DESIGN



Literature

DESIGN TRIAL

- Prospectic RCT, no age limits
- 8 french centers
- LVO < 6h
- 380 pts (192 ADAPT/189 SR)
- Primary endpoint : ADAPT superiority over SR (TICI 2b/3 > 15%)
- Secondary outcomes:
  - recanalization rate (TICI 2b/3) with other technique (if ADAPT fails 3 times, other technique available)
  - procedure time
  - complications
  - 90 days mRS

Literature

RESULTS

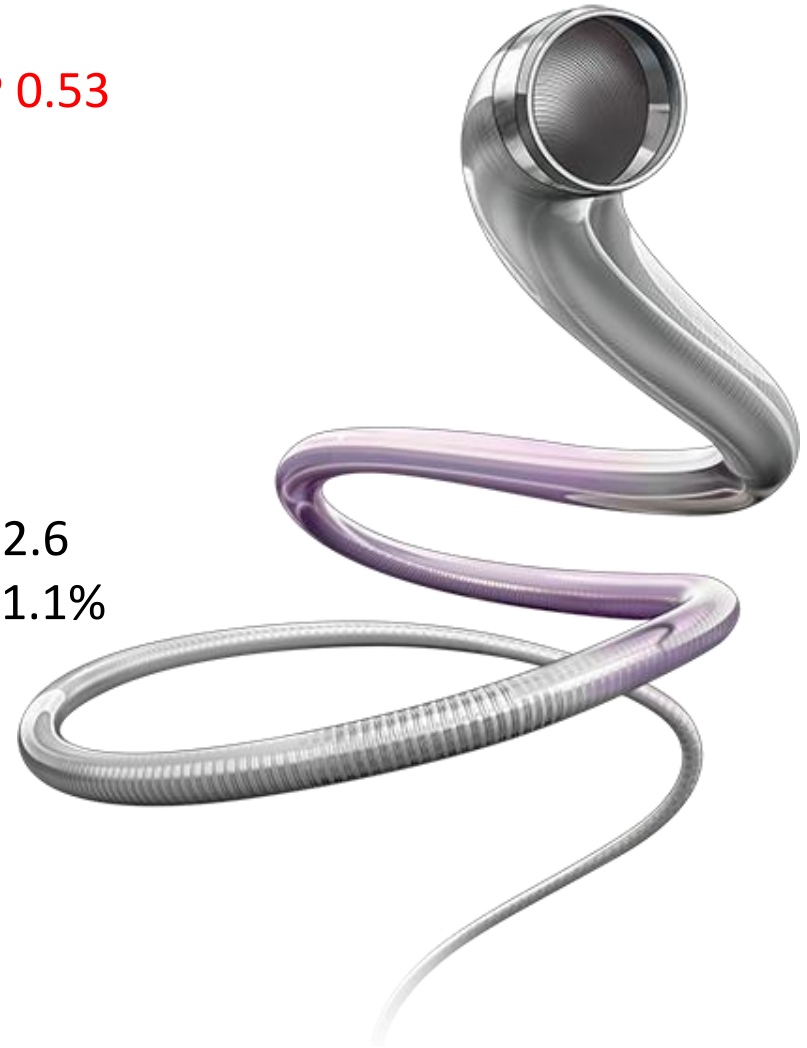
- RR TICI 2b/3: neutral (85.4% ADAPT vs 83.1 SR), P 0.53

- Procedure time: neutral (ADAPT 34’ vs SR 44’)

- Other manouvres: ADAPT 32.8% vs SR 23.8%

- Complications
  - EVT: ENT 3.1%, dissections 2.6%, perforations 2.6
  - SR: ENT 2.1%, dissections 1.1%, perforations 1.1%

- mRS 0-2 @ 90 days
  - mRS 0-2: ADAPT 45% vs SR 50% (P 0.346)
  - mRS 0-1: ADAPT 33% vs SR 43% (P 0.04)
  - mRS 0 : ADAPT 13% vs SR 22% (P 0.029)

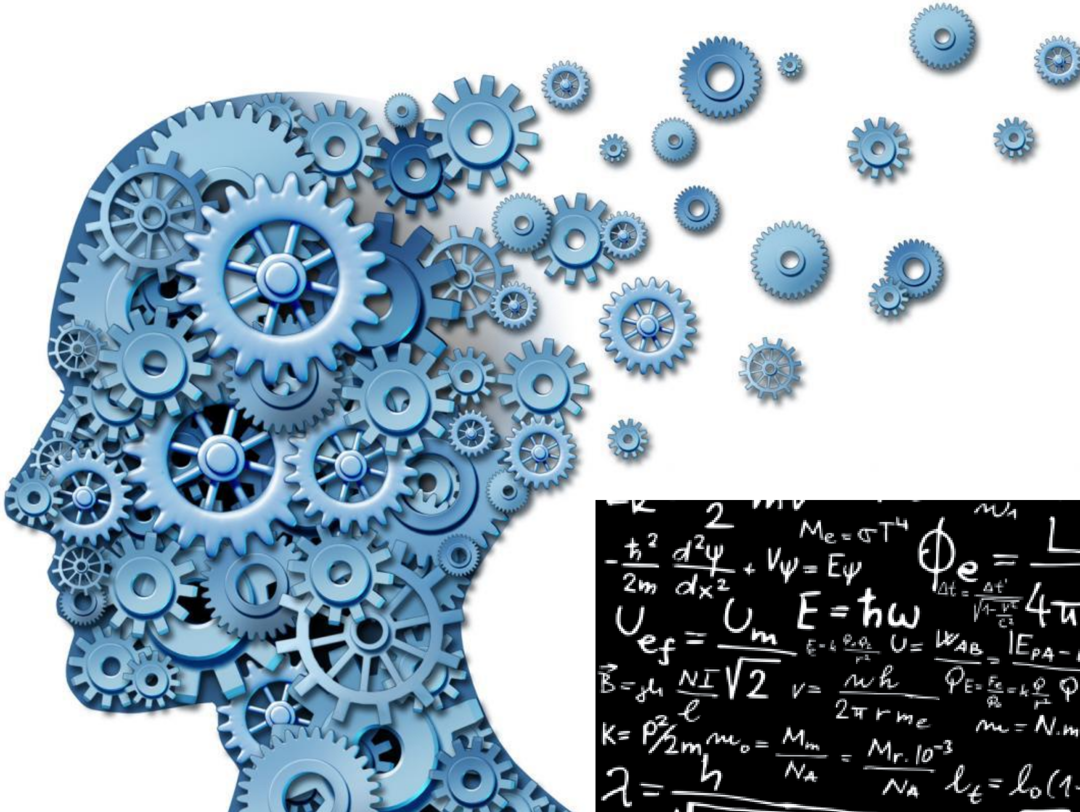


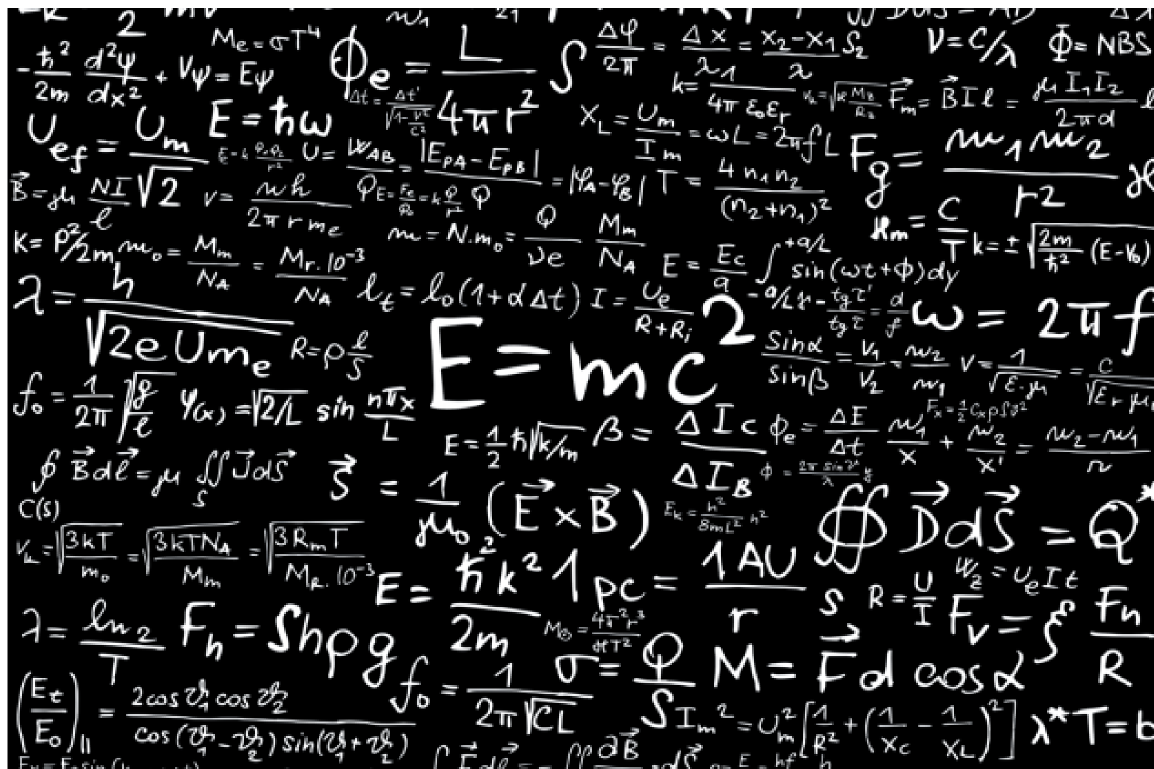
Literature

CONCLUSIONS

- No ADAPT superiority over SR with TICI 2b/3 > 15%
- Not technique equivalence (not “no inferiority study”)
- Favourable outcome for SR
- Benefit EVT for tandem lesions
- Onset > 6h and CT-ASPECT < 5: no mRS outcome benefits
- Worse clinic outcome if iv-rTPA coming from other centers

MRS @ 90 Days	0	1	2	3	4	5	6	Total
ADAPT	24	35	23	25	25	14	35	181
Stentriever	40	38	13	26	17	13	35	182
								363




Φ = NBS
ν = c/λ
E = ħω
E = mc²
ω = 2πf
M = Fd cos α
λ*T = b

Literature

NeuroNews

Issue 26 June 2017

ASTER trial final data

Page 4

DAWN of a new era may be longer than

The much-anticipated results from the DAWN trial were fina Organisation Conference (ESOC; 16–18 May, Prague, Czech beyond six hours of time-last-seen-well embolectomy in ap occlusion stroke patients is associated with improvement i rates of functional independence (mRS 0–2) compared to s

The DAWN (Diffusion weighted imaging [DWI] or computerized tomography perfusion [CTP] assessment with clinical mismatch in the triage of wake up and late presenting strokes undergoing neurointervention with Trevo) data were delivered in a joint presentation by co-principal investigators Raul Nogueira (Marcus Stroke & Neuroscience Center, Grady Memorial Hospital, Atlanta, USA) and Tudor Jovin (University of Pittsburgh Medical Center Stroke Institute, Pittsburgh, USA).

"Current evidence suggests that the benefit of thrombectomy rapidly decays over time and may no longer exist beyond 7.3 hours from stroke onset or time-last-seen-well. Indeed, the current AHA and ESO guidelines define a rigid therapeutic window of six hours as level 1a evidence. However, this treatment paradigm disregards individual variations in compensatory mechanisms for ischaemia led by, but not restricted to, collateral flow. Moreover, there is growing evidence to support a physiological rather than a purely time based approach where patients with clinical-core mismat (meaning those patients with sig clinical deficits but still limited size) could potentially benefit fr reperfusion regardless of time to ment. From the healthcare impor standpoint, wake-up stroke, strok unclear onset time, and witnesse presenting stroke (>6 hours) repr a large proportion of LVOs (~40 no proven treatment options exis population," Nogueira noted.

In response, DAWN aimed to strate superior functional outcom days with Trevo thrombectomy (plus medical treatment compare ical treatment alone in appropria selected patients who could be treated six to 24 hours after last seen well. The study is a global, multicentre, adaptive, population enrichment, prospective randomised, open, blinded endpoint, controlled these criteria could then be randomised 1:1 to either thrombectomy with Trevo or control medical therapy after stratification for clinical imaging mismatch subgroup, site of occlusion and time-from-last- enrolment be terminated.

One hundred and seven patients were randomised to receive Trevo and 99 patients to receive medical management. Four patients are missing outcomes at 90 days but their 30-day outcome was used for analysis. Two patients were lost to follow up after 30 days and two patients withdrew after the 30-day visit.

Continued on page 2

Enrolment stopped early in DAWN trial

An early end to patient enrolment in the DAWN trial has been activated following a pre-planned interim analysis of the data from the first 200 patients. DAWN is a clinical study designed to compare mechanical thrombectomy with the Trevo Retriever (Stryker) plus medical therapy against medical therapy alone when initiated within six to 24 hours after time last known well.

The independent Data Safety Monitoring Board (DSMB) recommended stopping study enrolment based on a pre-planned interim review of data from the first 200 patients, which concluded that multiple pre-specified stopping criteria were met. A final analysis of the data will be conducted upon completion of the remaining patient follow-up.

The study was designed to enrol up to a maximum of 500 patients with a pre-specified interim analysis to assess for efficacy initiated upon enrolment of the first 200 patients.

Stroke survivors commonly experience devastating disabilities and loss of independence due to impaired movement, paralysis, loss of speech and memory. Randomised clinical data have proven the benefit of mechanical thrombectomy with stent retrievers in helping patients with large vessel occlusion strokes, but these devices have only been indicated to reduce disability if used within six hours of stroke onset. For patients presenting with stroke symptoms beyond six hours, the benefit of clot retrieval using a stent retriever is unknown.

"Treating acute stroke patients with large vessel occlusion who present later than six hours from last seen well has the potential to help thousands of stroke patients around the world," said co-principal investigator Tudor Jovin, (University of Pittsburgh Medical Center, Pittsburgh, USA). "These patients, many of whom present to the hospital outside of the six hour time window, could have a better chance for an independent life with improved clinical outcomes."

Raul Nogueira (Grady Memorial Hospital/ Emory University, Atlanta, USA), co-principal investigator, commented, "If the final results of the DAWN trial are positive, it will provide physicians who treat stroke with evidence of the benefits of thrombectomy even when administered out as far as 24 hours, and should help to make decisions clearer as to which patients to treat."

According to a press release, the DAWN investigators are now focused on gathering and securing all of the remaining patient data for final statistical analysis. If confirmed positive, the outcomes of the DAWN trial may represent a major change in patient selection for endovascular therapy for stroke.

The Trevo Retriever indication within the DAWN Trial is currently approved for investigational use only by the US Food and Drug Administration in the United States under an investigational device exemption (IDE) study approval.

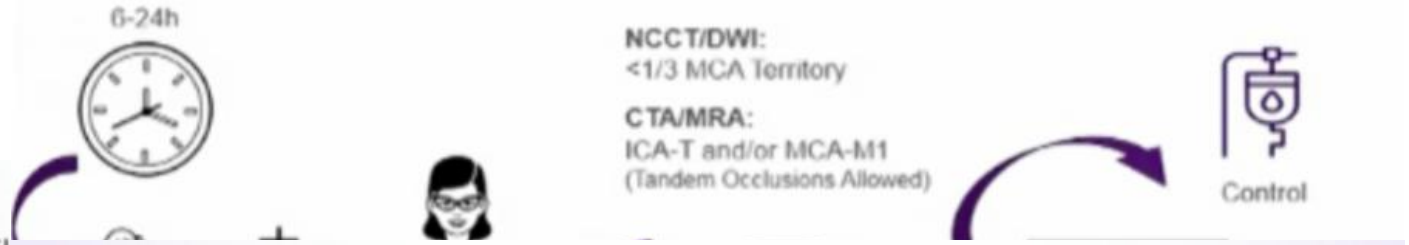
Word has reached *NeuroNews* that the data from the DAWN trial will be revealed at the European Stroke Organisation Conference (ESOC; 16–18 May, Prague, Czech Republic).

NeuroNews

BIBAPublishing

Literature

Study Methods: Workflow



To demonstrate su
management com
patients treated si

Study design	G o
Patient population	• • •
Target vessel	In
Randomization	1
Sites	U
Sample size	5 M
Follow-up	2

Patient presentation

	Treatment arm N=107	Control arm N=99	P- value
Time since time last seen well to randomization (hrs)			
Mean ± SD Median (Q1, Q3) Range (min, max)	13.4 ± 4.1 12.2 (10.2, 16.0) (6.1, 23.5)	13.0 ± 4.5 13.2 (9.4, 15.8) (6.4, 23.9)	0.53
Stroke sub-population			
Wake up stroke	64.5%	47.5%	0.01
Witnessed stroke	10.3%	14.1%	0.52
Un-witnessed stroke	25.2%	38.4%	0.05

DAWN TRIAL

Literature

Co-primary endpoints

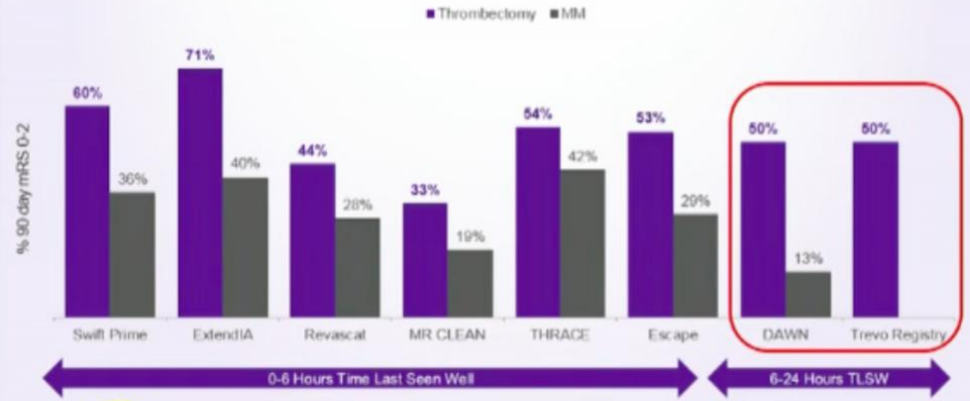
	Trevo	MM	Treatment benefit (95% CI)	Bayesian probability of superiority
Day 90 weighted mRS	5.5 ± 3.8	3.4 ± 3.1	2.1 (1.20, 3.12)	>0.9999*
Day 90 mRS (0-2)	48.6%	13.1%	35.5% (23.9%, 47.0%)	>0.9999*

NNT for 90-day functional independence = 2.8

DAWN TRIAL

*Similar to p<0.0001

Clinical Evidence Diaspora



DAWN

Primary outcome

Probability of superiority >0.9999

73% relative risk reduction of dependency in ADL's
NNT for any lower disability 2.0

DAWN TRIAL

Literature

ENDOVASCULAR THERAPY F

Trial Summary:

DEFUSE 3 is a prospective ranc
occlusion treated between 6-16
will be assessed at 3 months. Tl
patients over 4 years. **The purp**
time window. Only the devices
therapist.

Trial Design Summary:

DEFUSE 3 is a prospective ranc
stroke onset. Patients who meet
occlusion and a Target Mismatcl
approved for use in DEFUSE 3)
local guidelines. Baseline data,

Randomization of a maximum o
endovascular treatment, based
efficacy/futility, or the inclusion c

Study Sponsor and Chair: Gr

Awarded Investigators:
Protocol Director: Gregory Alber
Protocol Director: Michael Mark
Protocol Director: Maarten Lans

DEFUSE 3 terminated early with high likelihood of benefit in the endovascular group

Following an interim analysis of data from the first 182 patients enrolled in DEFUSE 3, the trial has been terminated and is no longer actively enrolling patients. The interim analysis showed a high likelihood of benefit in the endovascular group of the study.

DEFUSE 3 (Endovascular Therapy Following Imaging Evaluation for Ischemic Stroke 3) is a prospective randomised phase III multicentre controlled trial of patients with acute ischaemic anterior circulation strokes due to large artery occlusion treated between six and 16 hours of stroke onset with endovascular thrombectomy therapy plus standard medical therapy versus standard medical therapy. The purpose of DEFUSE 3 is to assess the safety and efficacy of thrombectomy in carefully selected patients in this extended time window. Gregory Albers (Stanford University, Stanford, USA) is the principal investigator of the trial which was conducted by the NIH StrokeNet funded by the National Institute of Neurological Disorders and Stroke (NINDS).

In the study, patients who met the inclusion criteria underwent either CT perfusion/CT angiography (CTP/CTA) or magnetic resonance (MR) diffusion weighted imaging/perfusion weighted imaging/angiography (DWI/PWI/MRA) studies prior to randomisation. These images were processed with an automated image analysis platform (RAPID, iSchemaView) to identify patients with salvageable brain tissue (Target Mismatch Profile). Patients who had evidence of an internal carotid artery (ICA) or middle cerebral artery (MCA) M1 occlusion and a Target Mismatch Profile were randomised in a 1:1 ratio to treatment with one or more FDA-approved thrombectomy devices plus standard medical therapy versus standard medical therapy alone. Selection of the specific device (or devices) was determined by the individual endovascular therapist.

The devices listed in the protocol were: the Trevo Retriever (Stryker), the Solitaire FR Revascularization Device (Medtronic), the Penumbra thrombectomy system (Penumbra) and the Covidien MindFrame Capture Revascularization Device (Medtronic).

The primary endpoint is modified Rankin Score (mRS) at 90 days.

The study planned to randomise up to 476 patients over four years, and it employed a novel adaptive design to identify, at interim analyses, the group with the best prospect for showing benefit from endovascular treatment.

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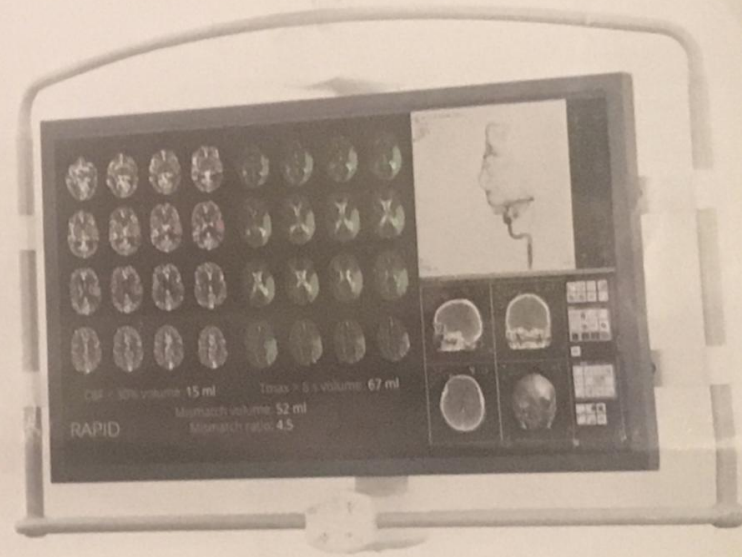

RAPID platform

Literature

- Prospective randomize phase III multicenter controlled trial
- 182 pts: acute ischemic anterior circulation strokes due to LVO treated between 6-16 hrs onset
- EVT + ivt vs ivt only: NIHSS >6
- CTP/CTA or DWI/PWI/MRA (Rapid): larger ischemic core than DAWN
- Devices: Trevo, Stryker; Solitaire, Medtronic; Capture, Medtronic,; Penumbra System
- Primary endpoint: mRS @ 90days
- Late window therapy may have a major impact on reducing stroke morbidity

Literature

Successful endovascular thrombectomy 90 h after stroke onset

Rusiru Gunawardena [a], Andrew Cheung [b], Paul Spira [b], Jianna He [c], Jason Wenderoth [b,d], Albert H.Y. Chiu [b,d,*]

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[b] *Institute of Neurological Sciences, Prince of Wales Hospital, NSW, Australia*
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ABSTRACT

Endovascular thrombectomy (EVT) has extended the conventionally accepted time window of treatment, from 4.5 h (ECASS III trial) for intravenous thrombolysis, to 7.3 h for EVT (HERMES collaboration). More recent evidence suggests EVT times could be extended to 24 h in carefully selected patients (DAWN trial). Some patients present after these time windows with large areas of ischemia but little established infarction on imaging. They represent a major dilemma with much to gain from EVT but at theoretically higher risk of a poor outcome. We present a case of near-complete left M1 occlusion in which EVT achieved reperfusion 90 h 41 min after stroke onset with excellent clinical outcome. Current guidelines on treatment windows for EVT according to HERMES collaboration do not reflect individual patient factors. In appropriate patients delayed EVT may give positive clinical outcomes.

Literature

RESEARCH ARTICLE

Does Antiplatelet Therapy during Bridging Thrombolysis Increase Rates of Intracerebral Hemorrhage in Stroke Patients?

Anne Broeg-Morvay, Pasquale Mordasini, Agnieszka Slezak, Kai Liesirova, Julia Meisterernst, Gerhard Schroth, Marcel Arnold, Simon Jung, Heinrich P. Mattle, Jan Gralla, Urs Fischer

Published: January 17, 2017 • http://dx.doi.org/10.1371/journal.pone.0170045

Background

Symptomatic intracerebral hemorrhage (sICH) after bridging thrombolysis for acute ischemic stroke is a devastating complication. We aimed to assess whether the additional administration of aspirin during endovascular intervention increases bleeding rates.

Methods

We retrospectively compared bleeding complications and outcome in stroke patients who received bridging thrombolysis with (tPA+ASA) and without (tPA-ASA) aspirin during endovascular intervention between November 2008 and March 2014. Furthermore, we analyzed bleeding complications and outcome in antiplatelet naïve patients with those with prior or acute antiplatelet therapy.

Results

Baseline characteristics, previous medication, and dosage of rtPA did not differ between 50 tPA+ASA (39 aspirin naïve, 11 preloaded) and 181 tPA-ASA patients ($p>0.05$). tPA+ASA patients had more often internal carotid artery (ICA) occlusion ($p<0.001$), large artery disease ($p<0.001$) and received more often acute stenting of the ICA ($p<0.001$). 10/180 (5.6%) tPA-ASA patients and 3/49 (6.1%) tPA+ASA patients suffered a sICH ($p = 1.0$). Rates of asymptomatic intracerebral hemorrhage, systemic bleeding complications and outcome did not differ between both groups ($p>0.1$). There were no differences in bleeding complications and mortality among 112 bridging patients with antiplatelet therapy (62 preloaded, 39 acute administration, 11 both) and 117 antiplatelet naïve patients. In a logistic regression analysis, aspirin administration during endovascular procedure was not a predictor of sICH.

Conclusion

Antiplatelet therapy before or during bridging thrombolysis in patients with acute ischemic stroke did not increase the risk of bleeding complications and had no impact on outcome. This finding has to be confirmed in larger studies.

No evidence

2017

Literature

Predictors for Symptomatic Intracranial Hemorrhage After Endovascular Treatment of Acute Ischemic Stroke

Yonggang Hao, MD*; Dong Yang, MD*; Huaiming Wang, MD; Wenjie Zi, MD, PhD; Meng Zhang, MD, PhD; Yu Geng, MD; Zhiming Zhou, MD, PhD; Wei Wang, MD; Haowen Xu, MD, PhD; Xiguang Tian, MD; Penghua Lv, MD, PhD; Yuxiu Liu, MD; Yunyun Xiong, MD, PhD; Xinfeng Liu, MD, PhD; Gelin Xu, MD, PhD; for the ACTUAL Investigators (Endovascular Treatment for Acute Anterior Circulation Ischemic Stroke Registry)

Background and Purpose—Symptomatic intracranial hemorrhage (SICH) pose a major safety concern for endovascular treatment of acute ischemic stroke. This study aimed to evaluate the risk and related factors of SICH after endovascular treatment in a real-world practice.

Methods—Patients with stroke treated with stent-like retrievers for recanalizing a blocked artery in anterior circulation were enrolled from 21 stroke centers in China. Intracranial hemorrhage was classified as symptomatic and asymptomatic ones according to Heidelberg Bleeding Classification. Logistic regression was used to identify predictors for SICH.

Results—Of the 632 enrolled patients, 101 (16.0%) were diagnosed with SICH within 72 hours after endovascular treatment. Ninety-day mortality was higher in patients with SICH than in patients without SICH (65.3% versus 18.8%; $P<0.001$). On multivariate analysis, baseline neutrophil ratio >0.83 (odds ratio [OR], 2.07; 95% confidence interval [CI], 1.24–3.46), pretreatment Alberta Stroke Program Early Computed Tomography Score of <6 (OR, 2.27; 95% CI, 1.24–4.14), stroke of cardioembolism type (OR, 1.91; 95% CI, 1.13–3.25), poor collateral circulation (OR, 1.97; 95% CI, 1.16–3.36), delay from symptoms onset to groin puncture >270 minutes (OR, 1.70; 95% CI, 1.03–2.80), >3 passes with retriever (OR, 2.55; 95% CI, 1.40–4.65) were associated with SICH after endovascular treatment.

Conclusions—Incidence of SICH after thrombectomy is higher in Asian patients with acute ischemic stroke. Cardioembolic stroke, poor collateral circulation, delayed endovascular treatment, multiple passes with stent retriever device, lower pretreatment Alberta Stroke Program Early Computed Tomography Score, higher baseline neutrophil ratio may increase the risk of SICH. **(*Stroke*. 2017;48:1203-1209. DOI: 10.1161/STROKEAHA.116.016368.)**

2017

21 stroke centers in China

632 pts
101 (16%) SICH 72h after rec

Incidence of SICH is higher in asian pts after MT

Literature

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Two-Year Outcome after Endovascular Treatment for Acute Ischemic Stroke

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ABSTRACT

BACKGROUND

Several trials involving patients with acute ischemic stroke have shown better functional outcomes with endovascular treatment than with conventional treatment at 90 days after initiation of treatment. However, results on long-term clinical outcomes are lacking.

METHODS

We assessed clinical outcomes 2 years after patients were randomly assigned to receive either endovascular treatment (intervention group) or conventional treatment (control group) for acute ischemic stroke. The primary outcome was the score on the modified Rankin scale at 2 years; this scale measures functional outcome, with scores ranging from 0 (no symptoms) to 6 (death). Secondary outcomes included all-cause mortality and the quality of life at 2 years, as measured by means of a health utility index that is based on the European Quality of Life–5 Dimensions questionnaire (scores range from −0.329 to 1, with higher scores indicating better health).

RESULTS

Of the 500 patients who underwent randomization in the original trial, 2-year data for this extended follow-up trial were available for 391 patients (78.2%) and information on death was available for 459 patients (91.8%). The distribution of outcomes on the modified Rankin scale favored endovascular treatment over conventional treatment (adjusted common odds ratio, 1.68; 95% confidence interval [CI], 1.15 to 2.45; P=0.007). There was no significant difference between the treatment groups in the percentage of patients who had an excellent outcome (i.e., a modified Rankin scale score of 0 or 1). The mean quality-of-life score was 0.48 among patients randomly assigned to endovascular treatment as compared with 0.38 among patients randomly assigned to conventional treatment (mean difference, 0.10; 95% CI, 0.03 to 0.16; P=0.006). The cumulative 2-year mortality rate was 26.0% in the intervention group and 31.0% in the control group (adjusted hazard ratio, 0.9; 95% CI, 0.6 to 1.2; P=0.46).

CONCLUSIONS

In this extended follow-up trial, the beneficial effect of endovascular treatment on functional outcome at 2 years in patients with acute ischemic stroke was similar to that reported at 90 days in the original trial. (Funded by the Netherlands Organization for Health Research and Development and others; MR CLEAN Current Controlled Trials number, ISRCTN10888758, and Netherlands Trial Register number, NTR1804, and MR CLEAN extended follow-up trial Netherlands Trial Register number, NTR5073.)

2017

- Endovascular group
- Control group

better mRS and mortality in the first group over 2 years is similar to that reported @ 90 days

Literature

International meeting of the French society of neurology 2017

Techniques for endovascular treatment of acute ischemic stroke

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INFO ARTICLE

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ABSTRACT

Early recanalization of occluded vessels in patients with acute ischemic stroke (AIS) by either intravenous thrombolysis (IVT) or endovascular revascularization has been shown to be associated with improved clinical outcomes and reduced mortality. Since the initial report regarding endovascular treatment (EVT) of AIS in 1983, endovascular techniques have been tremendously improved, advancing from intra-arterial administration of thrombolytic drugs to stent retrievers. IVT has been evaluated in several large randomized trials and has been shown to improve clinical outcomes at 90 days if treatment was initiated within 3 h of stroke onset, while its benefit at 3–4.5 h was subsequently demonstrated in the European Cooperative Acute Stroke Study (ECASS) III. Thus, EVT had to be evaluated against IVT. The first randomized controlled trials (RCTs) were published in 2013, and demonstrated no major differences between IVT and EVT for AIS, although these trials had important limitations. The positive results of the Multicenter Randomized Clinical Trial of Endovascular Treatment for Acute Ischemic Stroke (MR CLEAN) in the Netherlands, followed by five other positive RCTs, finally established the efficacy of mechanical thrombectomy (MT) with stent retrievers (also called 'stentrievers') in AIS due to large vessel occlusion within 6 h of stroke onset. Currently, the European and US guidelines recommend MT with stent retrievers as a first-line treatment in the management of AIS. The recent publication of the DWI or CTP Assessment with Clinical Mismatch in the Triage of Wake-Up and Late-Presenting Strokes Undergoing Neurointervention (DAWN) trial is expected to lead to extension of the time window for patients carefully selected by imaging. Thus, optimizing the selection of patients as well as the EVT procedures and techniques used is still an important goal to be evaluated in further trials.

Literature

NEUROSURGICAL FOCUS

Neurosurg Focus 42 (4):E12, 2017

Novel and emerging technologies for endovascular thrombectomy

Alexander G. Chartrain, BS, Ahmed J. Awad, MD, Justin R. Mascitelli, MD, Hazem Shoirah, MD, Thomas J. Oxley, PhD, Rui Feng, MSc, Matthew Gallitto, BA, Reade De Leacy, MD, Johanna T. Fifi, MD, and Christopher P. Kellner, MD

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Endovascular thrombectomy device improvements in recent years have served a pivotal role in improving the success and safety of the thrombectomy procedure. As the intervention gains widespread use, developers have focused on maximizing the reperfusion rates and reducing procedural complications associated with these devices. This has led to a boom in device development. This review will cover novel and emerging technologies developed for endovascular thrombectomy.

https://thejns.org/doi/abs/10.3171/2017.1.FOCUS16518

KEY WORDS acute ischemic stroke; large vessel occlusion; endovascular thrombectomy; stent retriever; aspiration catheter

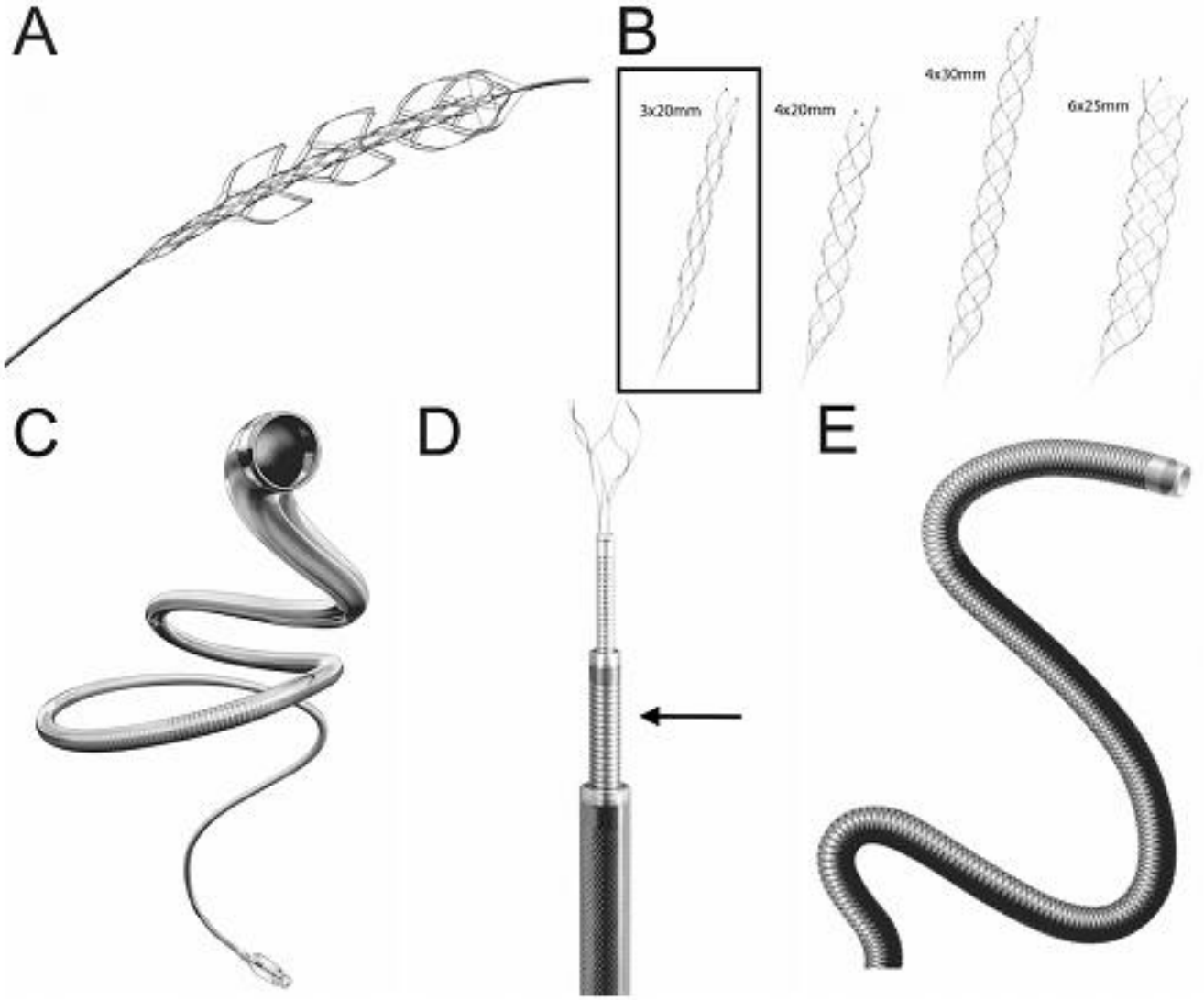

FIG. 1. Depictions of the devices reviewed in this study. **A:** Neuravi EmboTrap II Revascularization Device. Note that it is an investigational device that is not yet approved by the FDA. Copyright Neuravi Ltd. Published with permission. **B:** Stryker Trevo Provue 3 × 20–mm (**inset**), 4 × 20–mm, 4 × 30–mm, and 6 × 25–mm devices. Images used courtesy of Stryker. **C:** Penumbra ACE68 aspiration catheter. Image used with permission from Penumbra, Inc. **D:** Stryker AXS Catalyst 6 intermediate catheter (*arrow*). Image used courtesy of Stryker. **E:** Sofia Plus intermediate catheter. Image used with permission from MicroVention, Inc.

Literature

Endovascular Stroke Therapy Focused on Stent Retriever Thrombectomy and Direct Clot Aspiration : Historical Review and Modern Application

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Intravenous recombinant tissue plasminogen activator had been the only approved treatment for acute ischemic stroke since its approval in 1995. However, the restrictive time window, numerous contraindications, and its low recanalization rate were all limitations of this modality. Under those circumstances, endovascular stroke therapy went through a great evolution during the past two decades of intravenous thrombolysis. The results of the 2013 randomized trials for endovascular stroke therapy were neutral, although they were limited by insufficient imaging screening at enrollment, early-generation devices with less efficacy, and treatment delays. Huge progress was made in 2015, as there were five randomized clinical trials which all demonstrated the safety and efficacy of endovascular stroke treatment. Despite differences in detail patient enrollment criteria, all 5 trials employed key factors for good functional recovery; (1) screening with non-invasive imaging to identify the proximal occlusion and exclude a large infarct core, (2) using highly effective modern thrombectomy devices mainly with stent retriever, and (3) establishment of a fast workflow to achieve effective reperfusion. The results of those trials indicate that modern thrombectomy devices can allow for faster and more effective reperfusion, which can lead to improved clinical outcomes compared to intravenous thrombolysis alone. These advances in mechanical thrombectomy are promising in the global fight against ischemic stroke-related disability and mortality. Two current mainstreams among such mechanical thrombectomy techniques, "stent retriever thrombectomy" and "direct clot aspiration", are the topic of this review. Stent retriever thrombectomy using Solitaire and Trevo retriever will be firstly discussed. And, the commonalities and the differences between two major clot aspiration thrombectomy techniques; a direct aspiration first pass technique (ADAPT) and forced arterial suction thrombectomy (FAST), will be additionally explained. Finally, details regarding the combination of direct clot aspiration and stent retriever thrombectomy, the switching strategy and the Solumbra technique, will be described.

Key Words : Acute ischemic stroke · Clot aspiration thrombectomy · Endovascular stroke therapy · Mechanical thrombectomy · Stent retriever thrombectomy.

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Literature

Comparison of non–stent retriever and stent retriever mechanical thrombectomy devices for the endovascular treatment of acute ischemic stroke

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OBJECTIVE Mechanical thrombectomy is standard of care for the treatment of acute ischemic stroke. However, limited data are available from assessment of outcomes of FDA-approved devices. The objective of this study is to compare clinical outcomes, efficacy, and safety of non–stent retriever and stent retriever thrombectomy devices.

METHODS Between January 2008 and June 2014, 166 patients treated at Jefferson Hospital for Neuroscience for acute ischemic stroke with mechanical thrombectomy using Merci, Penumbra, Solitaire, or Trevo devices were retrospectively reviewed. Primary outcomes included 90-day modified Rankin Scale (mRS) score, recanalization rate (thrombolysis in cerebral infarction [TICI score]), and incidence of symptomatic intracranial hemorrhages (ICHs). Univariate analysis and multivariate logistic regression determined predictors of mRS Score 3–6, mortality, and TICI Score 3.

RESULTS A total of 99 patients were treated with non–stent retriever devices (Merci and Penumbra) and 67 with stent retrievers (Solitaire and Trevo). Stent retrievers yielded lower 90-day NIH Stroke Scale scores and higher rates of 90-day mRS scores ≤ 2 (22.54% [non–stent retriever] vs 61.67% [stent retriever]; $p < 0.001$), TICI Score 2b–3 recanalization rates (79.80% [non–stent retriever] vs 97.01% [stent retriever]; $p < 0.001$), percentage of parenchyma salvaged, and discharge rates to home/rehabilitation. The overall incidence of ICH was also significantly lower (40.40% [non–stent retriever] vs 13.43% [stent retriever]; $p = 0.002$), with a trend toward lower 90-day mortality. Use of non–stent retriever devices was an independent predictor of mRS Scores 3–6 ($p = 0.002$), while use of stent retrievers was an independent predictor of TICI Score 3 ($p < 0.001$).

CONCLUSIONS Stent retriever mechanical thrombectomy devices achieve higher recanalization rates than non–stent retriever devices in acute ischemic stroke with improved clinical and radiographic outcomes and safety.

https://thejns.org/doi/abs/10.3171/2016.2.JNS152086

KEY WORDS endovascular procedures; thrombectomy; stroke; vascular disorders; interventional neurosurgery

Literature

A direct aspiration first-pass technique vs stentriever thrombectomy in emergent large vessel intracranial occlusions

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OBJECTIVE Endovascular thrombectomy in patients with acute ischemic stroke caused by occlusion of the proximal anterior circulation arteries is superior to standard medical therapy. Stentriever thrombectomy with or without aspiration assistance was the predominant technique used in the 5 randomized controlled trials that demonstrated the superiority of endovascular thrombectomy. Other studies have highlighted the efficacy of a direct aspiration first-pass technique (ADAPT).

METHODS To compare the angiographic and clinical outcomes of ADAPT versus stentriever thrombectomy in patients with emergent large vessel occlusions (ELVO) of the anterior intracranial circulation, the records of 134 patients who were treated between June 2012 and October 2015 were reviewed.

RESULTS Within this cohort, 117 patients were eligible for evaluation. ADAPT was used in 47 patients, 20 (42.5%) of whom required rescue stentriever thrombectomy, and primary stentriever thrombectomy was performed in 70 patients. Patients in the ADAPT group were slightly younger than those in the stentriever group (63.5 vs 69.4 years; $p = 0.04$); however, there were no differences in the other baseline clinical or radiographic factors. Procedural time (54.0 vs 77.1 minutes; $p < 0.01$) and time to a Thrombolysis in Cerebral Infarction (TICI) scale score of 2b/3 recanalization (294.3 vs 346.7 minutes; $p < 0.01$) were significantly lower in patients undergoing ADAPT versus stentriever thrombectomy. The rates of TICI 2b/3 recanalization were similar between the ADAPT and stentriever groups (82.9% vs 71.4%; $p = 0.19$). There were no differences in the rates of symptomatic intracranial hemorrhage or procedural complications. The rates of good functional outcome (modified Rankin Scale Score 0–2) at 90 days were similar between the ADAPT and stentriever groups (48.9% vs 41.4%; $p = 0.45$), even when accounting for the subset of patients in the ADAPT group who required rescue stentriever thrombectomy.

CONCLUSIONS The present study demonstrates that ADAPT and primary stentriever thrombectomy for acute ischemic stroke due to ELVO are equivalent with respect to the rates of TICI 2b/3 recanalization and 90-day mRS scores. Given the reduced procedural time and time to TICI 2b/3 recanalization with similar functional outcomes, an initial attempt at recanalization with ADAPT may be warranted prior to stentriever thrombectomy.

https://thejns.org/doi/abs/10.3171/2016.11.JNS161563

KEY WORDS acute ischemic stroke; ADAPT; emergent large vessel occlusion; stentriever; thrombectomy; vascular disorders

Literature

Acute ischemic stroke with tandem lesions: technical endovascular management and clinical outcomes from the ESCAPE trial

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CL is deceased

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ABSTRACT

Background Tandem occlusions of the extracranial carotid and intracranial carotid or middle cerebral artery have a particularly poor prognosis without treatment. Several management strategies have been used with no clear consensus recommendations. We examined subjects with tandem occlusions enrolled in the ESCAPE trial and their outcomes.

Methods Data are from the ESCAPE trial. Additional data were sought on interventions for each subject.

Results There were 54 (17%) subjects with tandem extracranial and intracranial occlusions. Patients in the endovascular treatment arm (n=30) were more likely to be younger (median age 66 years, p<0.01), male (66.7%, p=0.03), diabetic, and without atrial fibrillation. Subjects with tandem occlusions were more likely to have intracranial internal carotid artery occlusions than M1 occlusions (p<0.01). Of the 30 intervention-arm subjects, 17 (57%) underwent emergency endovascular treatment of the extracranial disease, 10 subjects before and seven subjects after intracranial thrombectomy. Of the remaining 13 subjects, only four required staged carotid revascularization due to persistent severe carotid stenosis; four had cervical pseudo-occlusions with no residual stenosis after large distal carotid thrombus burden aspiration/retrieval. Outcomes were similar between subjects with and without tandem lesions. The use of antithrombotic agents after acute carotid artery stenting was variable but no symptomatic intracerebral hemorrhage was seen in subjects who underwent emergency endovascular treatment of extracranial carotid artery.

Conclusions Tandem occlusions occurred in one-sixth of patients and were treated highly variably within the ESCAPE trial. While outcomes were similar, the best method to treat the carotid artery in patients with tandem occlusion awaits further randomized data.

Trialregistration number NCT01778335.

Literature

Impact of balloon guide catheter on technical and clinical outcomes: a systematic review and meta-analysis

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ABSTRACT

Background and purpose Flow arrest with balloon guide catheters (BGCs) is becoming increasingly recognized as critical to optimizing patient outcomes for mechanical thrombectomy. We performed a systematic review and meta-analysis of the literature for studies that compared angiographic and clinical outcomes for patients who underwent mechanical thrombectomy with and without BGCs.

Materials and methods In April 2017 a literature search on BGC and mechanical thrombectomy for stroke was performed. All studies included patients treated with and without BGCs using modern techniques (ie, stent retrievers). Using random effects meta-analysis, we evaluated the following outcomes: first-pass recanalization, Thrombolysis In Cerebral Infarction (TICI) 3 recanalization, TICI 2b/3 recanalization, favorable outcome (modified Rankin Scale (mRS) 0–2), mortality, and mean number of passes and procedure time.

Results Five non-randomized studies of 2022 patients were included (1083 BGC group and 939 non-BGC group). Compared with the non-BGC group, patients treated with BGCs had higher odds of first-pass recanalization (OR 2.05, 95% CI 1.65 to 2.55), TICI 3 (OR 2.13, 95% CI 1.43 to 3.17), TICI 2b/3 (OR 1.54, 95% CI 1.21 to 1.97), and mRS 0–2 (OR 1.84, 95% CI 1.52 to 2.22). BGC-treated patients also had lower odds of mortality (OR 0.52, 95% CI 0.37 to 0.73) compared with non-BGC patients. The mean number of passes was significantly lower for BGC-treated patients (weighted mean difference −0.34, 95% CI−0.47 to −0.22). Mean procedure time was also significantly shorter for BGC-treated patients (weighted mean difference −7.7 min, 95% CI−9.0to −6.4).

Conclusions Non-randomized studies suggest that BGC use during mechanical thrombectomy for acute ischemic stroke is associated with superior clinical and angiographic outcomes. Further randomized trials are needed to confirm the results of this study.

Table 1 Summary of studies

Reference	Total number of patients	Number with BGC	Number without BGC	Number anterior/ Number posterior	Differences in baseline NIHSS?	Differences in comorbidities?	Study design	Inclusion criteria	Risk of bias
Pereira *et al*, 2015[21]	87	48	39	48/0; 39/0	No	No	Post-hoc analysis of SWIFT-PRIME	Pre-stroke mRS ≤1, NIHSS 8–29. Treatment within 6 hours with Solitaire for anterior circulation stroke. Infarct <100 mL of tissue. ASPECTS ≥6	Moderate
Nguyen *et al*, 2014[8]	338	149	189	142/7; 161/28	No	More afibrillation in BGC	Post-hoc analysis of NASA Registry	Present within 8 hours onset for anterior circulation, 12 hours for posterior circulation. Treatment with Solitaire device	Moderate
Velasco *et al*, 2016[9]	183	102	81	102/0; 81/0	No	No	Single-center, retrospective	Present within 8 hours onset for anterior circulation stroke. Treatment with stent-retriever only	High
Zaidat *et al*, 2017[15,16]	880	505	375	505/0; 375/0	No	No	Post-hoc analysis of STRATIS Registry	Pre-stroke mRS ≤1, NIHSS 8–30. Present within 8 hours onset for stroke. Treatment with Solitaire device. Only anterior circulation strokes included in BGC subanalysis.	Moderate
Nguyen [14]	534	279	255	279/0; 255/0	NA	Younger patients in BGC group, higher afibrillation in BGC, lower hypertension in BGC	Post-Hoc analysis of TRACK Registry	Anticipated life expectancy of 3 months. Large vessel occlusion treated with TREVO. Only anterior circulation strokes included in BGC subanalysis	Moderate

BGC, balloon guide catheter; NIHSS, NIH Stroke Scale.

10.000.000 ab
450.502 kmq

60.600.000 ab
301.340 kmq

Stoccolma quasi 1.000.000

Torino quasi 1.000.000

Welfare

Modello svedese

Da Wikipedia, l'enciclopedia libera.

Per **modello svedese**, **modello scandinavo** o più in generale **modello nordico**, si intende il peculiare sistema socio-economico di tipo socialdemocratico affermatosi progressivamente in Svezia e negli altri paesi nordici (Danimarca, Norvegia, Finlandia). Sebbene ci siano differenze significative tra i paesi nordici, tutti condividono alcuni tratti comuni. Questo sistema intende proteggere i propri cittadini "dalla culla alla tomba", cioè durante l'intero arco di vita, attraverso un *welfare state* equo ed efficiente che garantisca un livello elevato di qualità della vita ed un livello elevato di protezione sociale.[1]

Il modello economico svedese non è da confondere col cosiddetto "modello svedese" in materia di prostituzione, in vigore dagli anni '90 e 2000 in Svezia, Islanda e Norvegia, per il quale è opportuno parlare di modello neo-proibizionista.

Panoramica [modifica | modifica wikitesto]

Il sistema presenta tali caratteristiche:

- Programmi universalistici di *welfare* nazionali (ovvero assistenza sanitaria di tipo universale, diritto all'istruzione gratuita , sistema previdenziale).[1]
- Alta spesa pubblica causata dal numero molto elevato di dipendenti pubblici, trasferimenti pubblici[*non chiaro*], come le indennità di disoccupazione e i pensionamenti anticipati e assicurazioni sociali collegate al reddito.[1] I disoccupati sono in grado di ricevere indennità per molti anni prima delle riduzioni, rispetto alle riduzioni veloci delle indennità degli altri paesi. La spesa pubblica per la sanità e l'istruzione è significativamente più alta in Danimarca, Svezia e Norvegia rispetto alla media OCSE.
- Politica fiscale egualitaria.[1] La pressione fiscale complessiva è fra le più alte al mondo. L'imposizione fiscale è progressiva, cioè i redditi più elevati pagano una percentuale di imposte più che proporzionale rispetto ai redditi più bassi, anche al fine di ridistribuire il reddito.
- Attiva politica di occupazione finalizzata al pieno impiego. Politiche del lavoro finalizzate all'incremento della mobilità occupazionale ed estesi programmi di formazione.[1]
- Bassa regolamentazione del mercato, grande facilità d'impresa e basse barriere al libero commercio, combinati con i meccanismi collettivi di "condivisione dei rischi" che proteggono i cittadini contro le conseguenze negative della concorrenza straniera e della nuova tecnologia.[1]
- Posizione forte dei sindacati.[1] Partnership tra datori di lavoro, sindacati e il governo, per cui i termini per regolare il lavoro sono negoziati tra queste parti sociali, piuttosto che essere imposti dalla legge.
- Bassi livelli di corruzione.

Welfare

Le caratteristiche fondamentali del Welfare State italiano

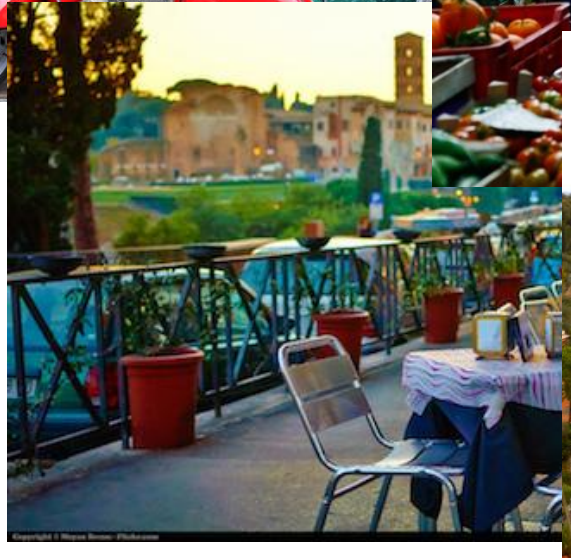
Ugo Ascoli
La Collana degli Archivi di Stato
Cittadinanza.
Individui, diritti sociali, collettività nella storia contemporanea
a cura di C. Sorba

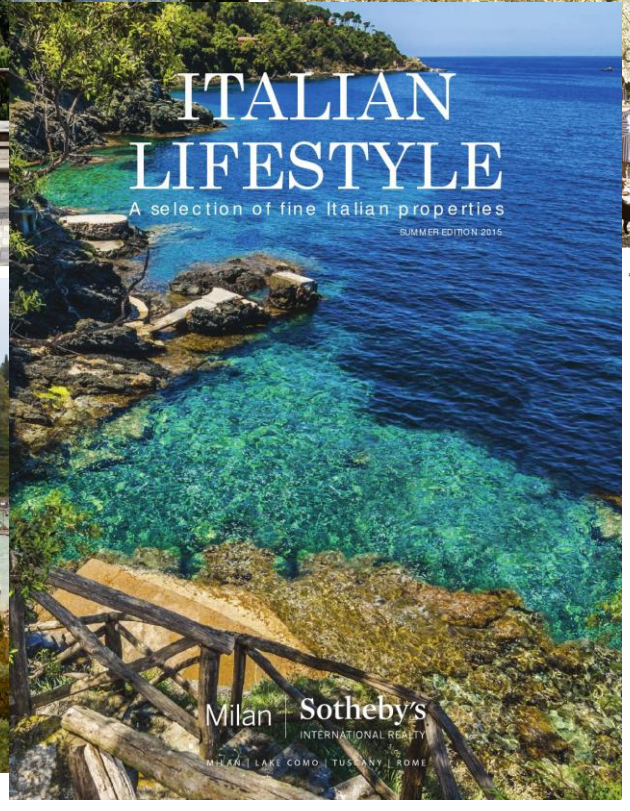
Con questo intervento intendo riflettere con voi, sinteticamente, sulle specificità del *Welfare-state* italiano, cercando di seguire le tracce e l'evoluzione nel tempo di tali elementi.
Se dovessi identificare quelle che chiamo le "caratteristiche fondamentali del welfare-state italiano", ne indicherei cinque; su queste cinque proverò a fare con voi un ragionamento. Solo per combinazione corrispondono a quelle che Maurizio Ferrera definisce in un suo recente lavoro "i cinque peccati originali" del *Welfare italiano*; in realtà io preferisco non usare quel termine e mantenere una visione un po' più' laica (!) del funzionamento di questo sistema. Per di più le mie "caratteristiche fondamentali" non coincidono perfettamente con i suoi "peccati originali".
Il nostro *Welfare-state* corrisponde, innanzitutto, a un modello che possiamo definire – ed è la prima delle caratteristiche che vorrei evidenziare – *particolaristico*. Inoltre, e continuo a enumerarle, è un modello largamente appoggiato su *culture clientelari*, profondamente *dualistico*, basato prevalentemente su *trasferimenti di reddito*, piuttosto che su servizi (quello che un tempo nella letteratura comparata sul *Welfare* si definiva come "modello continentale"); infine, ultima delle cinque caratteristiche, è largamente basato su una *cultura familistica*, *paternalistica* e *patriarcale*.
Le caratteristiche fondamentali di tale modello affondano le loro radici nel diciannovesimo secolo e sono ben leggibili nella storia sociale e politica dell'Ottocento, così come delle prime decadi del Novecento; occorre inoltre evidenziare come siano rimaste alla base anche delle politiche sociali degli ultimi decenni. Naturalmente cinquant'anni di storia repubblicana non sono passati invano: nuove questioni, nuovi attori collettivi, nuove culture e nuovi interventi si sono succeduti sulla scena, ma mi sembra di poter sottolineare come le caratteristiche fondanti siano ancora le stesse. Tutto ciò contribuisce a spiegare come sia così difficile modificare in profondità gli elementi costitutivi della cittadinanza in questo nostro paese.

5 caratteristiche o peccati originali

- Particolarismo -> status
- Culture clientelari
- Dualismo (nord-sud)
- Trasferimenti di reddito (piu' che sui servizi)
- Cultura familistica, paternalistica e patriarcale

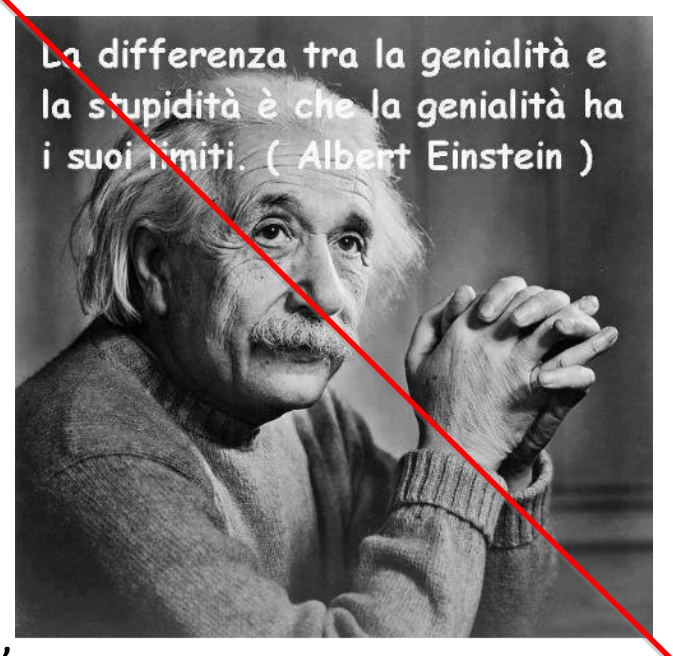
Italian life-style





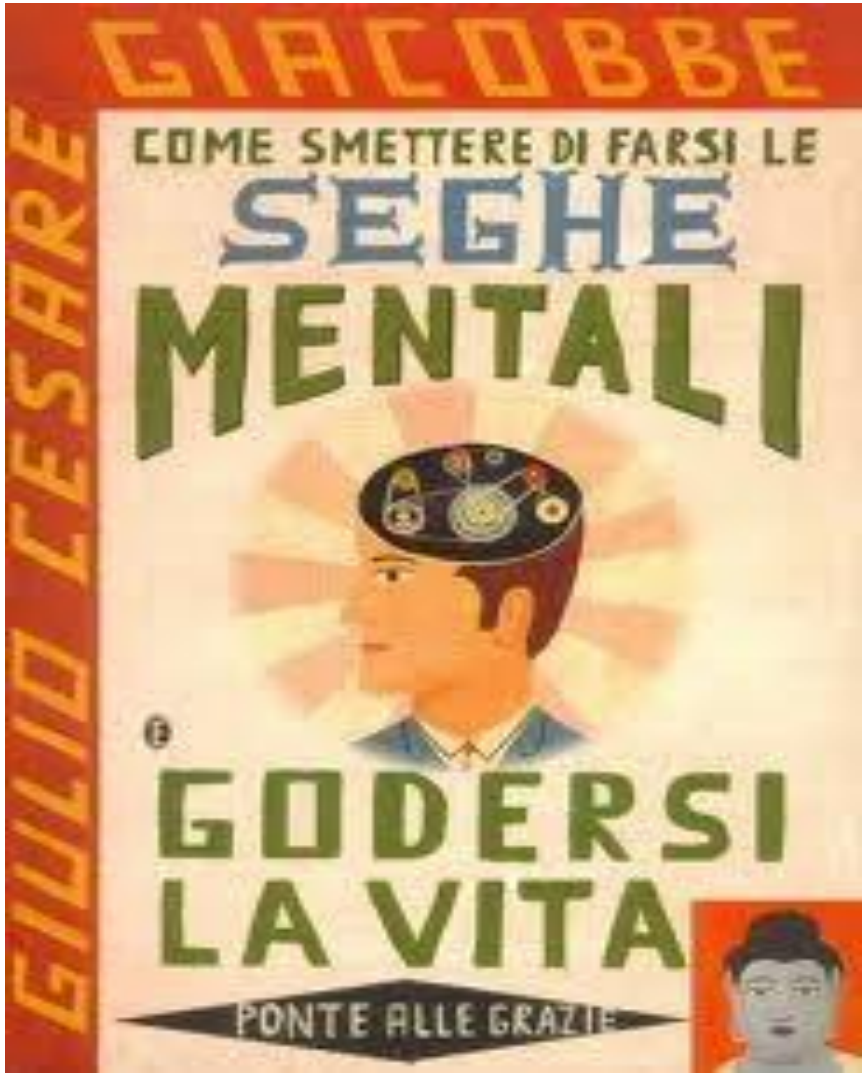
Italian life-style

swedish life-style



- Elevatissimo peso fiscale/standard di vita
- “Working welfare” scrupoloso
- Nessuna improvvisazione o “fantasia” -> anaelasticita’
- Percorsi ragionati prima e blindati poi
- Disponibilita’ generale alla comunicazione lavorativa (quotidiana)
- Tempo adeguato per studio e aggiornamento
- Disponibilita’ “sconfinata” ad investimenti socialmente utili (sanita’ ad es)
- Accesso ad infrastrutture per tutti

swedish life-style


GIULIO CESARE GIACOBBE
COME SMETTERE DI FARSI LE
SEGHE
MENTALI
E
GODERSI
LA VITA
PONTE ALLE GRAZIE

Karolinska and Calgary Stroke Program ”approach”

Major trials conclusions:

- Teamwork and fast reperfusion are the keys to good outcome
- Endovascular tratment with stent-trievers is safe and effective
- Imaging plays a critical role in pts selection for ev therapy

- Best stroke centers have reduced door-to needle time for iv therapy to 20 min
- Direct referral of stroke pts to Hub H w/out prior imaging shortens onset to treatment time
- High-volume H maintain case volume and expertise
- Need to adapt triage rules and processes and never stop training existing personnel
- Stretch-to-CT protocol to minimize delays

Review Article | INTERVENTIONAL

Imaging, Intervention, and Workflow in Acute Ischemic Stroke: The Calgary Approach

C. Zerna, Z. Assis, C.D. d'Esterre, B.K. Menon and M. Goyal

American Journal of Neuroradiology June 2016, 37 (6) 978-984; DOI: https://doi.org/10.3174/ajnr.A4610

Karolinska and Calgary Stroke Program ”approach”

Neuroimaging

- Non contrast CT (NCCT) as primary imaging technique that leads to ASPECTs (ganglia and supra ganglionic level of MCA territory) which subtracts 1 point to each hypoattenuated territory
- 0-4 poor; 5-6 moderate; 7-10 good
- Once decided, ivt bolus is administrated directly on CT table
- CTA and CTA collaterals study with multiphasic technique
- CTP controversial: not universally adopted (SWIFT-PRIME and EXTEND-IA respectively successful post-processing 22 and 6.30 min)

- More complicate imaging, more time it takes: short to the minimum
- Decision to thrombectomy is an evolving process
  a. exclusion pts with poor ASPECTs
  b. proximal vessel occlusion
  c. at least some collaterals at multiphasic CTA

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Karolinska and Calgary Stroke Program ”approach”

Workflow: improving imaging-to-puncture time

- ESCAPE trial metrics of performance: CT to groin puncture <60 min, to reperfusion <90 min
- Angiosuite always ready to start with the BRISK: brisk recanalization ischemic stroke kit
- anyone with a specific role (?)

General Anesthesia:

- Growing body of evidence against GA in stroke intervention (hypotension/neurological assess)
- ESCAPE /REVASCAT against GA (respectively 9.1% and 6.7%)
- Conscious sedation
- Better if hypertension

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Karolinska and Calgary Stroke Program ”approach”

Neurointervention

- Prearranged stroke tray
- Using standadized techniques and devices (occlusion balloon catheter raccomanded)
- Cross-trained staff (nurses and technicians) if “single handed” situation arises
- No need for shaving groins or Foley catheter insertion

1. No need for time-consuming anatomical/collaterals assessment during DSA: go and see CTA
2. Retrievers best validated, but new studies and technology are coming up
3. If stent-triever and no “by-pass effect”:
   a. stent-triever not in a correct position…checking and then repositioning
   b. complete capture of the clot (ready to be pulled out)
   c. clot is firm and stent-triever has no impact on it

Understanding difference between b. or c. not easy:
often just need to retrieve

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Karolinska and Calgary Stroke Program ”approach”

As soon as reperfusion: lower blood pressure

- Success of EVT: measuring reperfusion using TICI o mTICI (2b/c or 3 good result) and then indicating it on your report (useful for National Registry)
- ESCAPE, MR CLEAN, SWIFT-PRIME, EXTEND-IA and REVASCAT respectively 72.4%, 58.7%, 86.2%, 88% and 65.7%

Tandem lesions

- Implication of additional proximal extra-cranial ICA/VT disease outcome: yet to be studied
- Intracranial occluded segment should be the first target
- An extracranial occlusion/tight stenosis “on the way” should probably best treated with PTA

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Stroke management at Karolinska

- 90-95% awake
- Balloon occlusion catheter (Mercy or Flowgate2)
  in anterior circulation, 6Fr Envoy in posterior (VA)
- Penumbra pump, but not Penumbra system
- Intermediate catheter (Catalyst, Sofia)
- Embotrap, Neuravi (does not collapse in bending zones), rarely other retrievers delivered by Prowler Select Plus microcath, Codman
- Double aspiration and balloon inflation whilst retrieving your clot (pump and syringe from the catheter)
- Abandoned waiting time

Tromboaspiration (ADAPT) is not enough:

Why using an *underscored* method risking to spend more at the end?

once you catch the thrombus, the thromboaspiration is over and are ready to spray emboli distally while retrieving your catheter

Pre-Literature

In process (2017):

Karolinska experience on use of EmboTrap revascularization device

- Acute stroke candidate for MT, regardless time of onset
- Within 4.5 h -> ivt if possible
- Signs of infarction: not to exclude if viable tissue to save in other areas
- Successful recanalization: mTICI2b-3
- Secondary outcomes: mRS 0-2 @ 3 months
- Safety outcomes: sICH and deaths

2014 -> 2017

Pre-Literature

In process (2017):

- nov 2013-apr 2016 : 166 patients
  (first line 163, rescue 3)
- EmboTrap alone 146 (89.2%)
  143 anterior circulation, 23 posterior circulation (real world)
- 140 (84.3%) mTICI 2b-3 global
- 123 (out of 146) with EmboTrap alone mTICI 2b-3 (84.2%)
- sICH: 4
- Deaths @90 days: 19
- Currently mRS @90 days available in 142 pts: 80 (56.3%) mRS 0-2

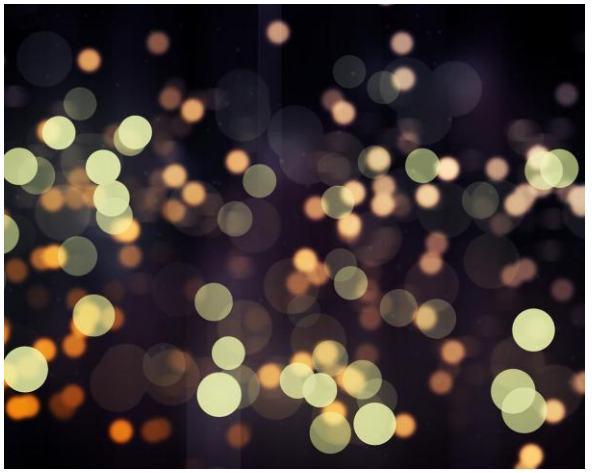
- mTICI 2b-3 results (84.2%) are higher when compared to HERMES collaboration (5 randomized trials) in 2015 (71%)

2014 -> 2017

Stroke management at Hopital Foch (172 cases/2017)

- Basal CT
- DWI and FLAIR
- DSA angio and collaterals study
- ADAPT first (Penumbra)
- Stent-triever when necessary (Trevo and Solitaire); Embotrap too expensive
- Almost published a study on substancially equivalence between ADAPT and stent-triever technique

Highlights



- Best patient selection: not just opening a vessel
- Clinical features : Pre-mRS, NIHSS, onset time
- Best/fast Neuroimaging (CTA, MRA, CTP, DWI, PWI mCTA)
- Faster door-to-needle and door-to-recanalization times
- Devices (best generation still to come?): over SR and ADAPT
- TICI 2b is probably going to become a complication

  - window extension

  - TICI 3

  - no futile recanalizations/mRS @ 90days < 2

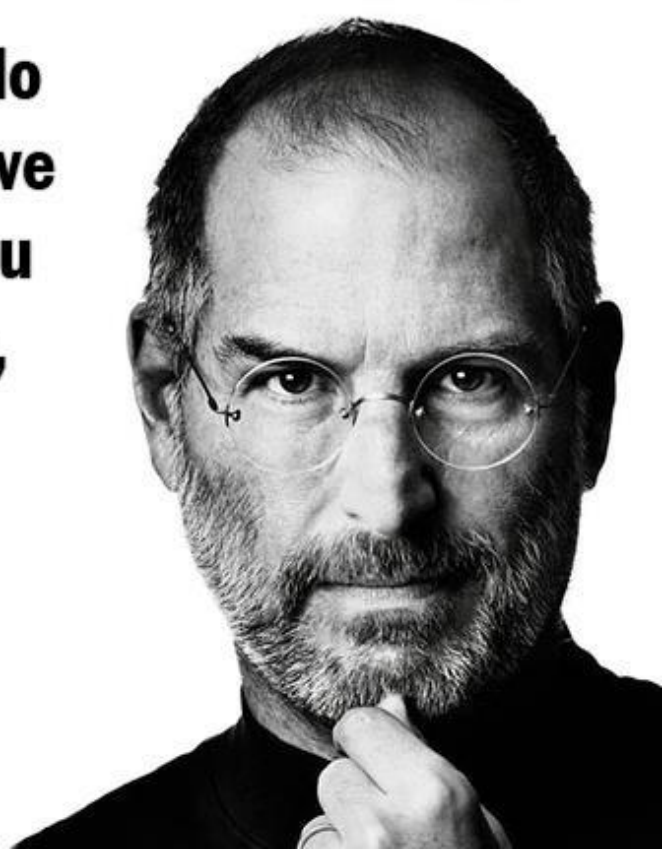
Shadows

In general

- Different Welfares
- Not enough patients
- Network
- Still apples vs pears (challenging anatomie
- Posterior circulation
- Money

"The only way to do great work is to love what you do. If you haven't found it, keep looking. Don't settle."

- Steve Jobs



THANKS