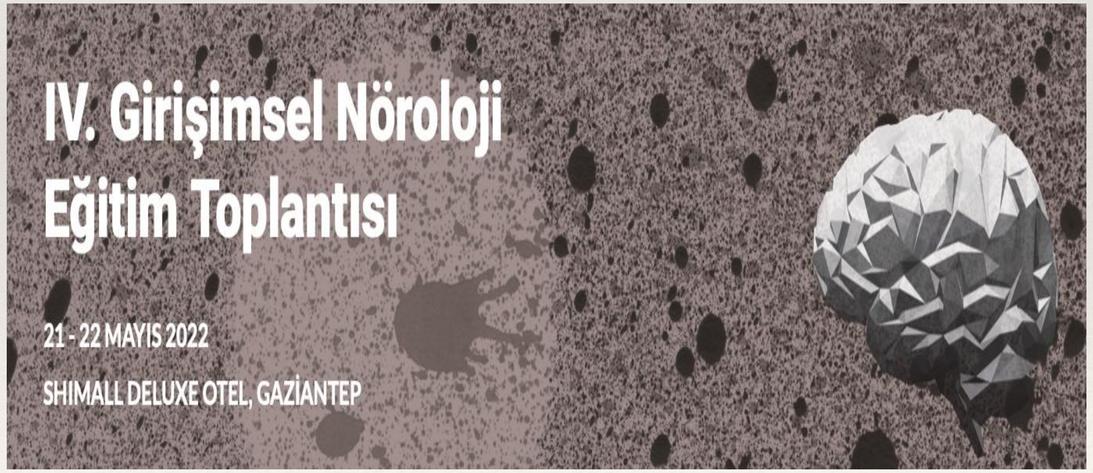
T.C. Sağlık Bakanlığı
Sağlık Bilimleri Üniversitesi
Antalya Eğitim ve Araştırma Hastanesi

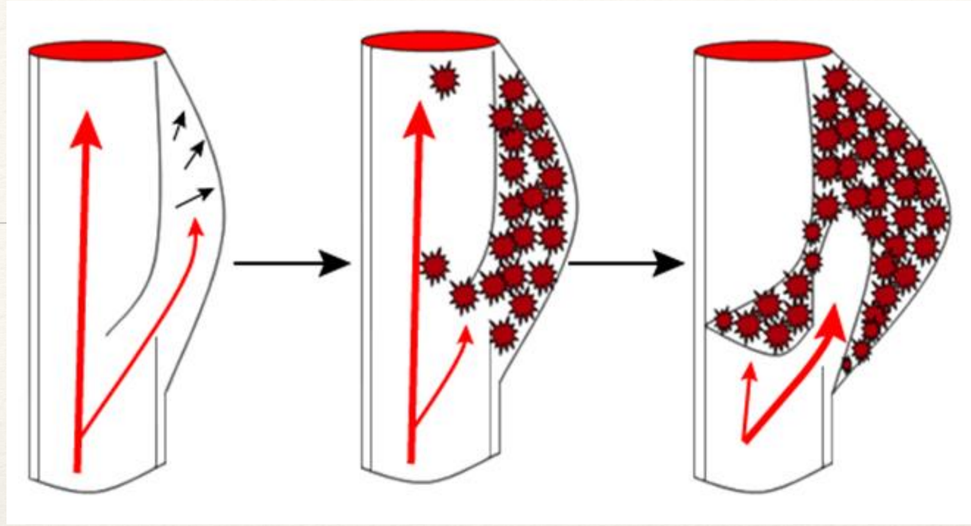
Ekstrakraniyal Akut Karotis Diseksiyonu& Tandem Orta Serebral Oklüzyonuna müdahale teknikleri :

Nasıl olmalı?

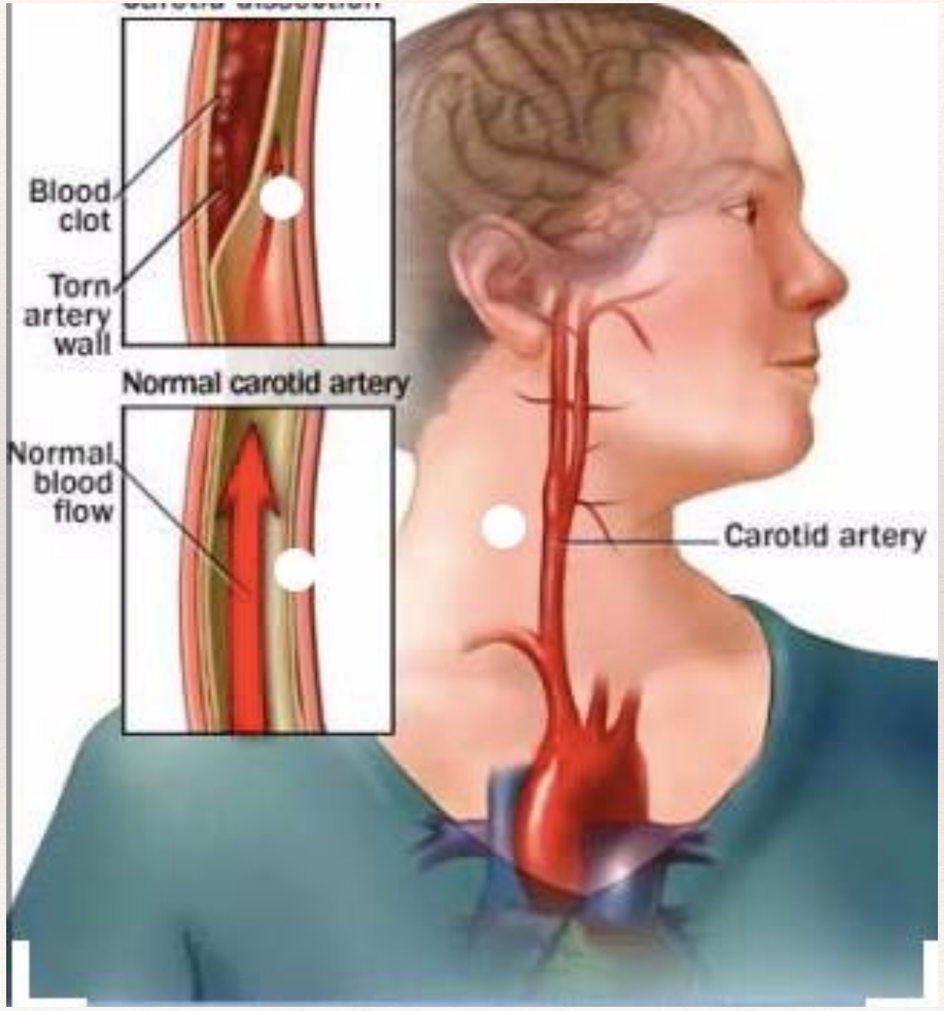


S.B.Ü. Antalya Eğitim Araştırma Hastanesi
Nöroloji Kliniği
Dr. Elif Sarıönder GENCER

Arter Diseksiyonu



- Arter duvarının yapısal bütünlüğü bozulduğunda meydana gelir
- Kanın **intramural hematom** olarak katmanlar arasında toplanması ile sonuçlanır.



- İnsidans %0,003 / yıl
- 5. dekatta pik yapar
- Genç ve orta yaşta iskemik inmenin %10-20 nedeni

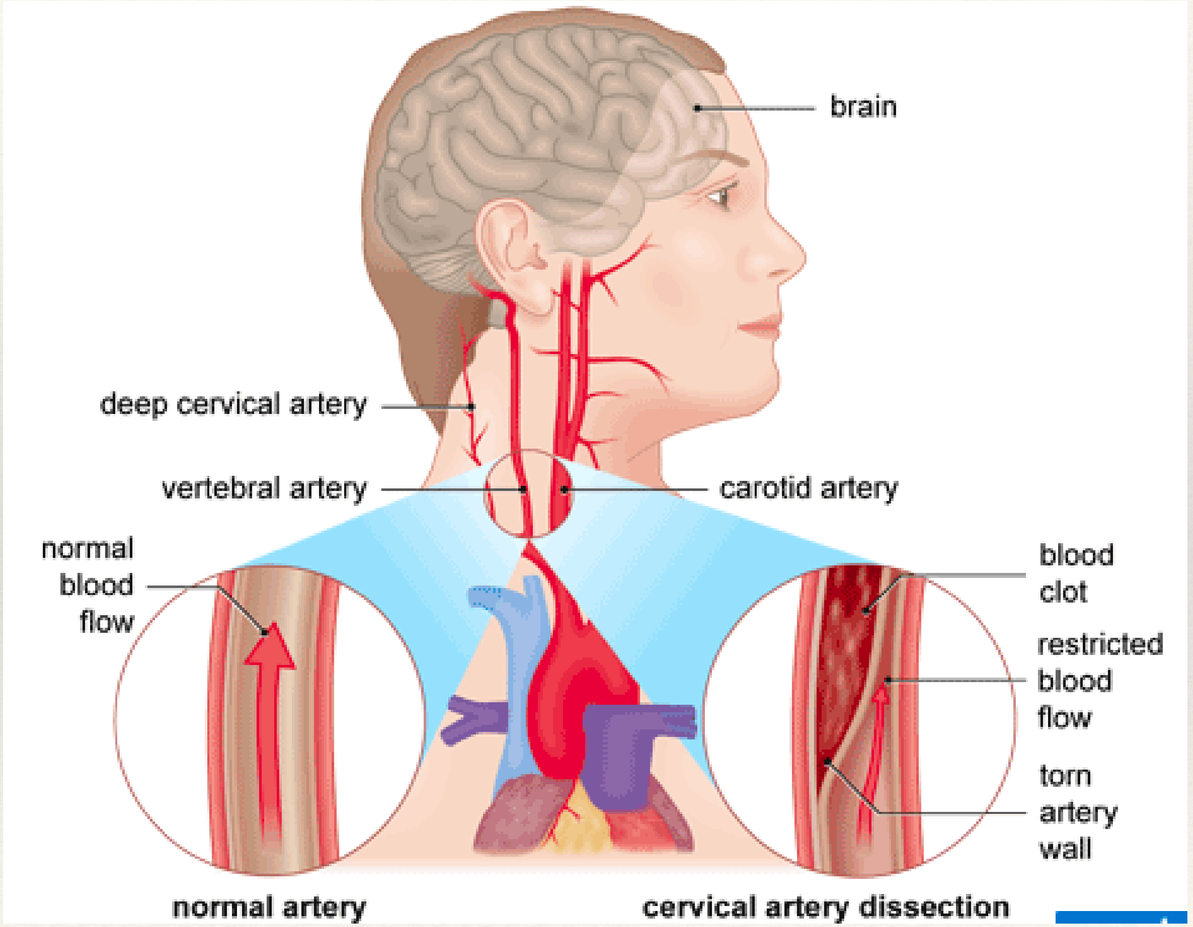
Etyoloji

- Travmatik
  - Penetran
  - Künt
  - Boğulma
- Spontan
  - Yoğun öksürme, kusma, uzamış baş eğme, çeşitli spor aktiviteleri.
  - Boyun hiperekstansiyonu
  - Kayropraktik manuplasyonlar

- Kollojen doku hastalığı %20 ‘sinde
  - Ehler danlos tip IV
  - Marfan
  - Osteogenezis imprefekta Tip 1
  - OD polikistik böbrek
  - Pseudoksantoma elastikum

Sınıflandırma

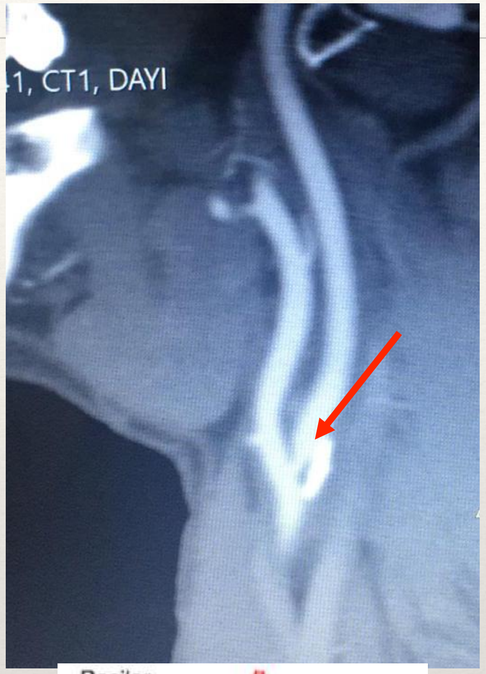
- İnternal karotid arter diskesiyonu
  - Extrakranial diseksiyon
  - İntrakraniyal diseksiyon
- Vertebral arter diseksiyonu
  - Extrakraniyal diseksiyon
  - İntrakraniyal diseksiyon

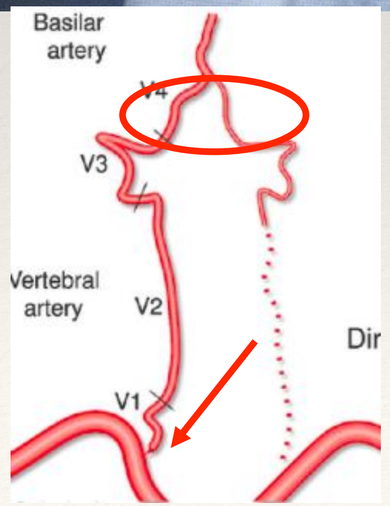


- **Karotis diseksiyonları>**vertebral diseksiyonlardan
  - 3 kat daha fazla görülür.
- **Ekstrakraniyal segment diseksiyonu** >intrakraniyal segment
  - 4 kat daha fazla görülür.

Caplan LR, Tettenborn B. Vertebraobasilar occlusive disease: review of selected aspects: I. Spontaneous dissection of extracranial and intracranial posterior circulation arteries. Cerebrovasc Dis1992;2:256–65.
Thanvi, B., Munshi, S. K., Dawson, S. L., & Robinson, T. G. (2005). Carotid and vertebral artery dissection syndromes. Postgraduate medical journal, 81(956), 383-388.

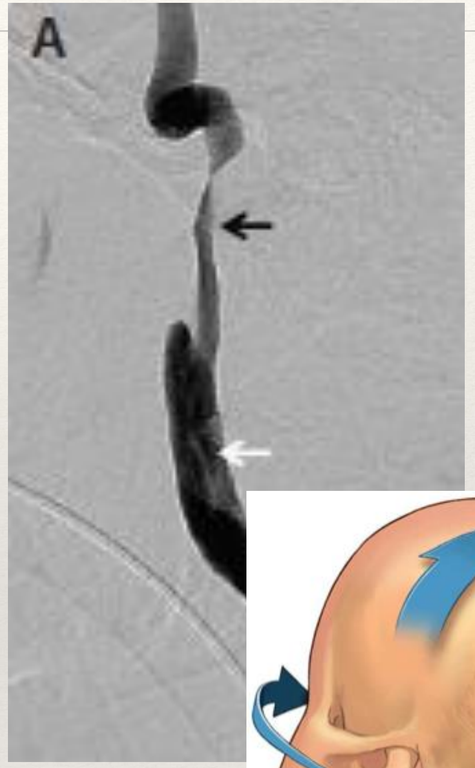
Ateroskleroz



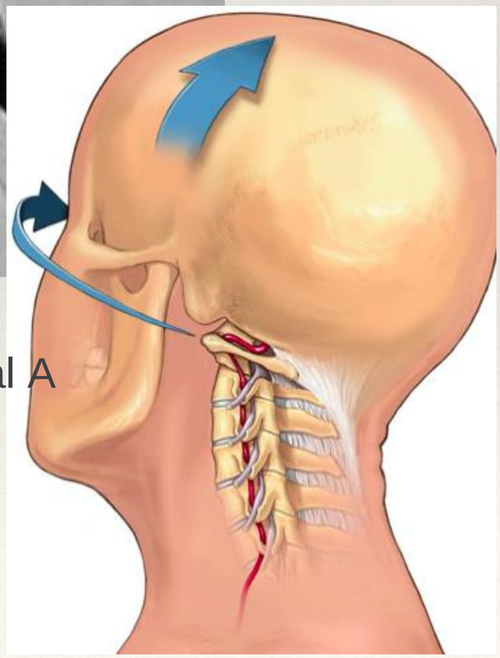


Diseksiyon

ICA

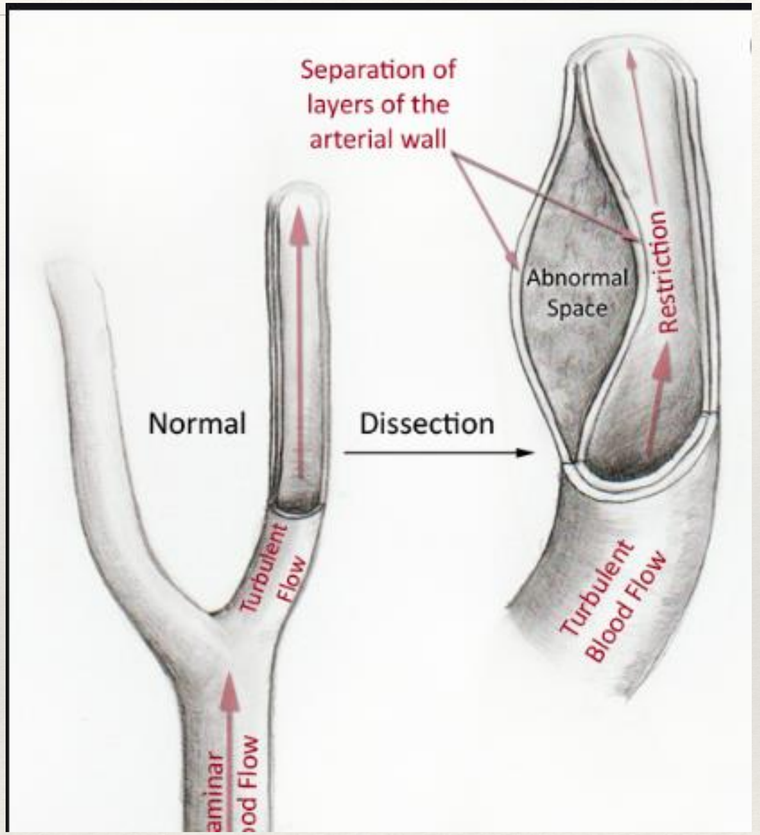


Vertebral A



Servikal arter diseksiyonu sonucunda

- Arter lümeninde oklüzyona bağlı **iskemik inme**
- Diseksiyon bölgesinden distal emboliye bağlı **iskemik inme**
- Diseksiyon adventisyayı içerirse arter rüptürü ve lokal hematom veya SAK
- Daha geç dönem **pseudo anevrizmalar** ortaya çıkabilir



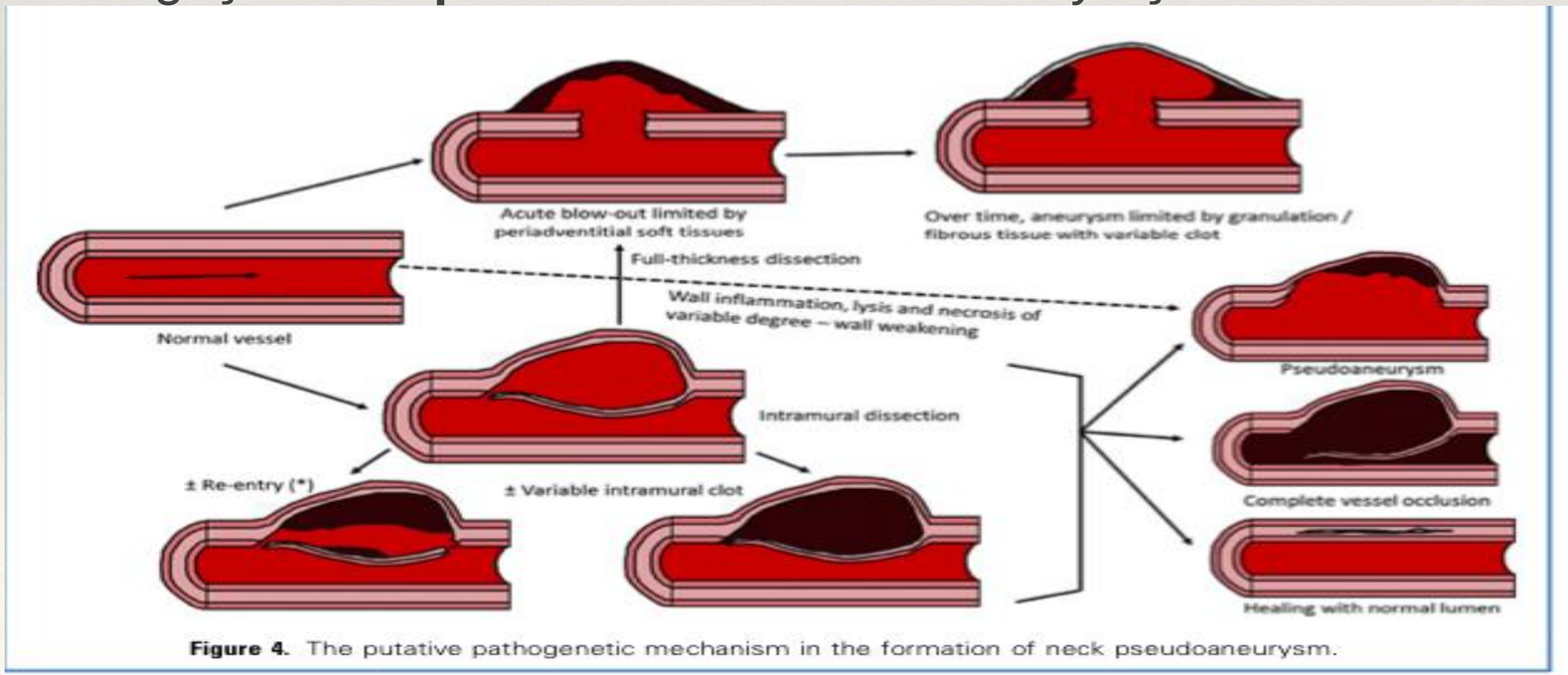
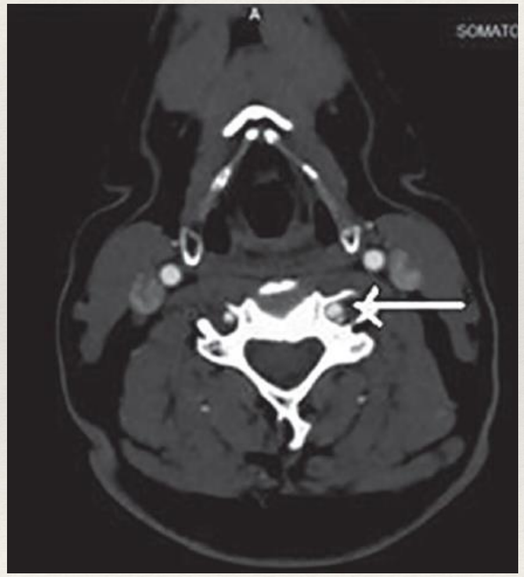


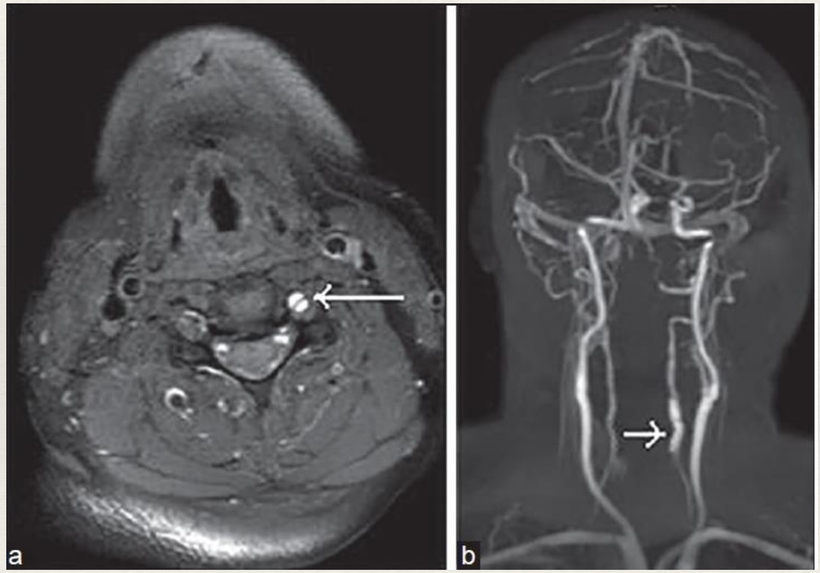
Figure 4. The putative pathogenetic mechanism in the formation of neck pseudoaneurysm.

Tanı-Vasküler görüntüleme

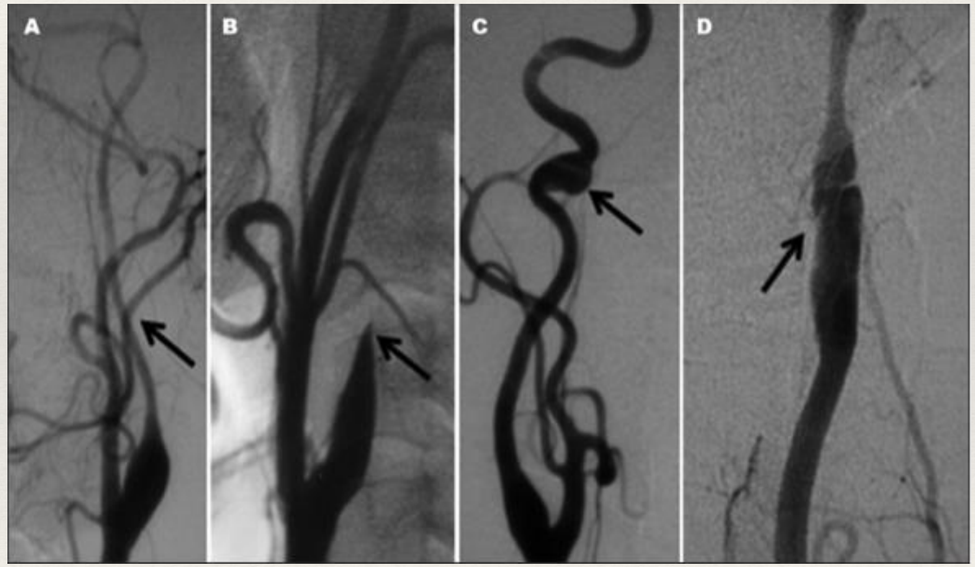
BT anjiografi



MRI yağ baskılı-MRA



DSA



Tedavi

- Kesin tanı koymadaki kısıtlamalar,
- Genel olarak düşük insidans,
- Düşük nüks oranı ve
- Hasta özelliklerinde belirgin varyasyonlar nedeniyle

diseksiyonun **tedavi optimizayonundaki zorluklar** devam etmektedir.

- Servikal diseksiyonun tedavisi,
  - Nedeni (travmatik vs spontan)
  - Hastanın inme geçirip geçirmediği
  - Diseksiyonun intrakraniyal veya ekstrakraniyal olup olmadığı
  - Hematom genişlemesi ile aktif kanama varlığına göre farklılıklar gösterir

Tedavi-Iv rtPA

- Servikal arter diseksiyonu olan hastalarda tromboliz teorik olarak intramural hematomun genişlemesine neden olabilir…
- Ancak
  - Multicenter RKT da kanıtlar servikal arter diseksiyonuna bağlı iskemik inme hastalarında Iv rtPA etkinliğinin ve güvenliği diğer nedenlere bağlı iskemik inme geçirenler ile benzer olduğunu gösteriyor.

Engelter ST, Intravenous thrombolysis in stroke attributable to cervical artery dissection. Stroke. 2009

Tablo 3.2. IV tPA kullanımında endikasyon ve kontraendikasyonlar

Daima dışlama kriteri	Göreceli (bazı şart/durumlarda) dışlama kriteri, ama hastaların çoğu için IV tPA uygundur. IV tPA verilebilir.	Dışlama kriteri değildir. IV tPA verilebilir.
Tedaviye semptom başlamasından sonraki 4,5 saat içinde başlanamayacak ise, Görüntülemede herhangi bir tip akut (intraserebral, subaraknoid, subdural) kanama, BT'de demarke ve geniş hipodansite, Sistolik kan basıncı >185 mmHg veya diastolik kan basınç >110 mmHg, Trombositopeni (<100 bin/mm3) INR> 1,7 aPTT> 40 saniye	Başlangıç zamanının belirlenememiş olması, Uyanma anında fark edilen inme, Son 3 ay içinde kraniyal/spinal cerrahi, Son 3 ay içinde kraniyal/spinal travma, Son 3 ay içinde iskemik inme, Son 3 hafta içinde gastrointestinal kanama, Son 3 hafta içinde genitoüriner kanama, Son 3 hafta içinde majör cerrahi, Son 2 hafta içinde majör sistemik travma, Son 1 hafta içinde komprese edilemeyecek arterlere ponksiyon, İntrakraniyal kanama öyküsü, NOAK (non-vitamin K antagonisti oral anti-koagülan) kullanımı (son 48 saatte), Son evre böbrek yetmezliği, diyaliz, İleri karaciğer yetmezliği, siroz, Aort diseksiyonu, İnfektif endokardit, Sistemik malignite, İntrakraniyal intraaksiyel tümör veya kitle, İntrakraniyal AVM, Yaygın ön duvar ST elevasyonlu miyokard enfarktüsü (STEMİ), Perikardit, Son 7 gün içinde dural ponksiyon.	BT'de hiperdens arter işareti, Minör inme (NIHSS <5), Majör inme (NIHSS >22), Hızlı düzelen hasta, İnsidental intrakraniyal anevrizma, Ekstraaksiyel intrakraniyal tümör, Servikokraniyal arter diseksiyonu, İleri yaş (>80 yıl), Demans, Epileptik nöbet, İnme öncesi mobiliteyi engellemeyen özürlülük, Hiperglisemi, Hipoglisemi, Menstrüel kanama, Hamilelik, Akut miyokard enfarktüsü (non-STEMİ, posterior veya inferior STEMİ), İntrakardiyak trombüs, Son 7 gün içinde aspirin ve/veya klopidogrel kullanımı, IV heparin kullanımı (son 24 saatte, aPTT <40 saniye), Düşük molekül ağırlıklı heparin kullanımı (son 24 saatte, aPTT <40 saniye, anti-faktör Xa normal).

- **Akut iskemik inmeli tüm hastalar**, intravenöz tromboliz ve / veya mekanik trombektomi ile reperfüzyon tedavisi için değerlendirilmelidir.
- Iv rtPA kontrendike olmayan ve servikal arter diseksiyonu aorta uzanmayan hastalara trombolitik tedavi ugulanabilir.
- Antiplatelet ve antikoagülan ajanlar **Iv rtPA uygulamasından 24 saat sonra** gerekirse kullanılabilir.

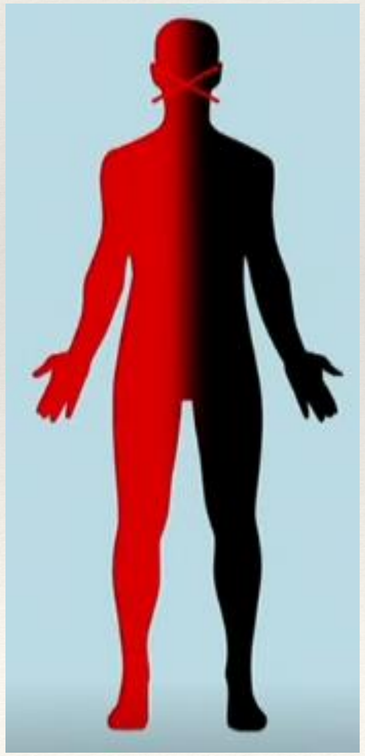
Endovasküler teknikler veya cerrahi onarım

- Esas olarak **antitrombotik tedaviye rağmen iskemik** semptomları devam eden hastalar için kullanılmıştır.
- Ancak akut inme semptomları ile başvuran hastada endovasküler tedavide **asıl amaç diseksiyon onarımı değil reperfüzyonu sağlamak** olmalıdır.

Olgu-KKÖ, 37y E , Sigara, HBV taşıy

10,30

Şiddetli burun silme sonrası sol gözde görme kaybı, baş boyun ağrısı



10,45

konuşamama ve sağ tarafta güçsüzlük

11,00

Manavgat DH başvuru

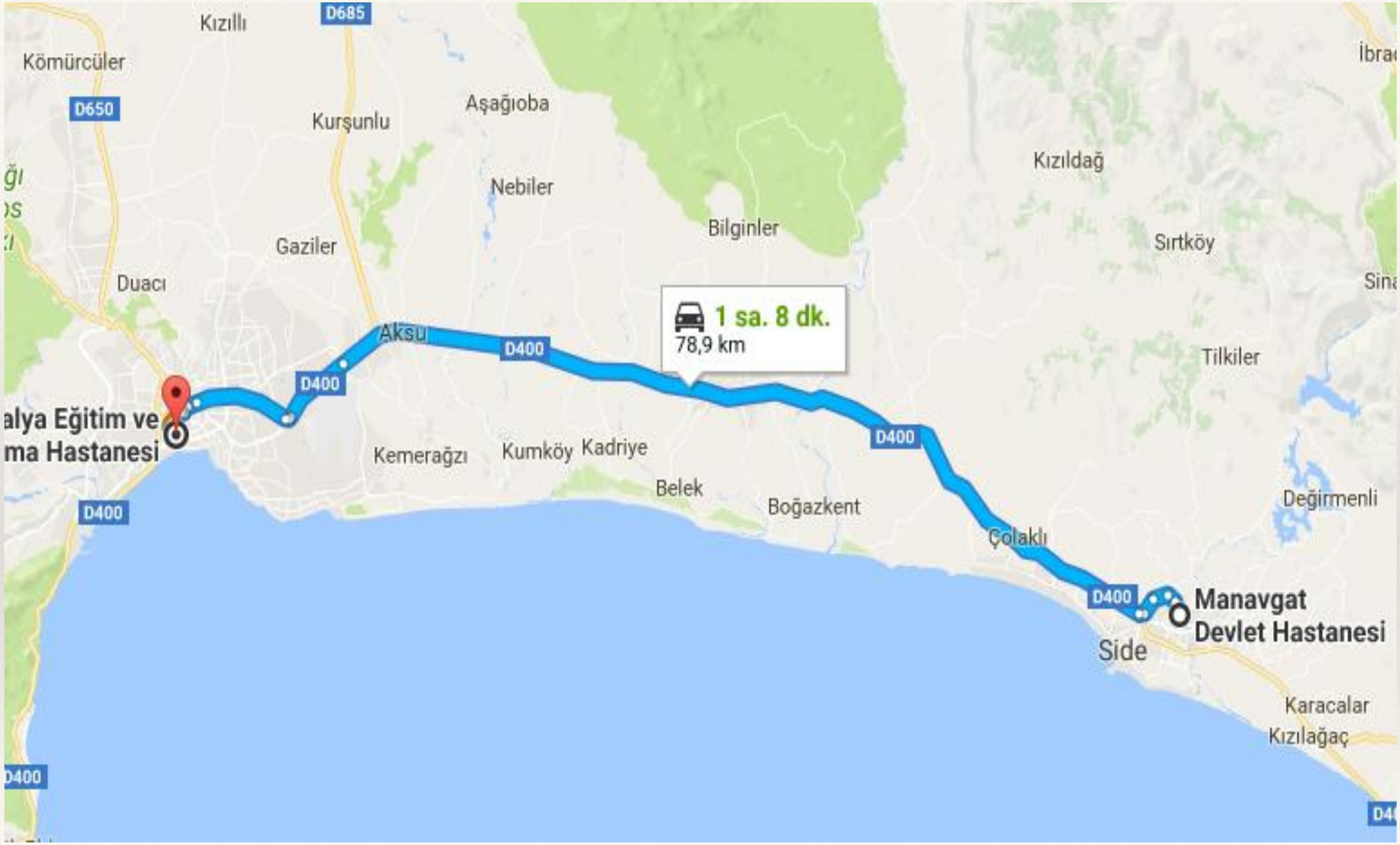
Manavgat Devlet Hastanesi Acil Servis (saat 11:00)

Acil BBT (saat 11:15)

BBT normal, kanama yok (saat 11:20)

7 mg bolus 60 mg infüzyon IV tPA (saat 11:25)

Hastanemize sevk ediliyor (saat 11:40)


Kızılı
D685
Kömürcüler
D650
Kurşunlu
Aşağıoba
Nebiler
Kızıldağ
Bilginler
Gaziler
Sırtköy
Duacı
Aksu
D400
1 sa. 8 dk.
78,9 km
Tilkiler
alya Eğitim ve
ma Hastanesi
Kemerağzı
Kumköy
Kadriye
Belek
Boğazkent
Değirmenli
Çolaklı
Manavgat
Devlet Hastanesi
Side
Karacalar
Kızılağaç

Antalya EAH Acil Servis (saat 12:45)

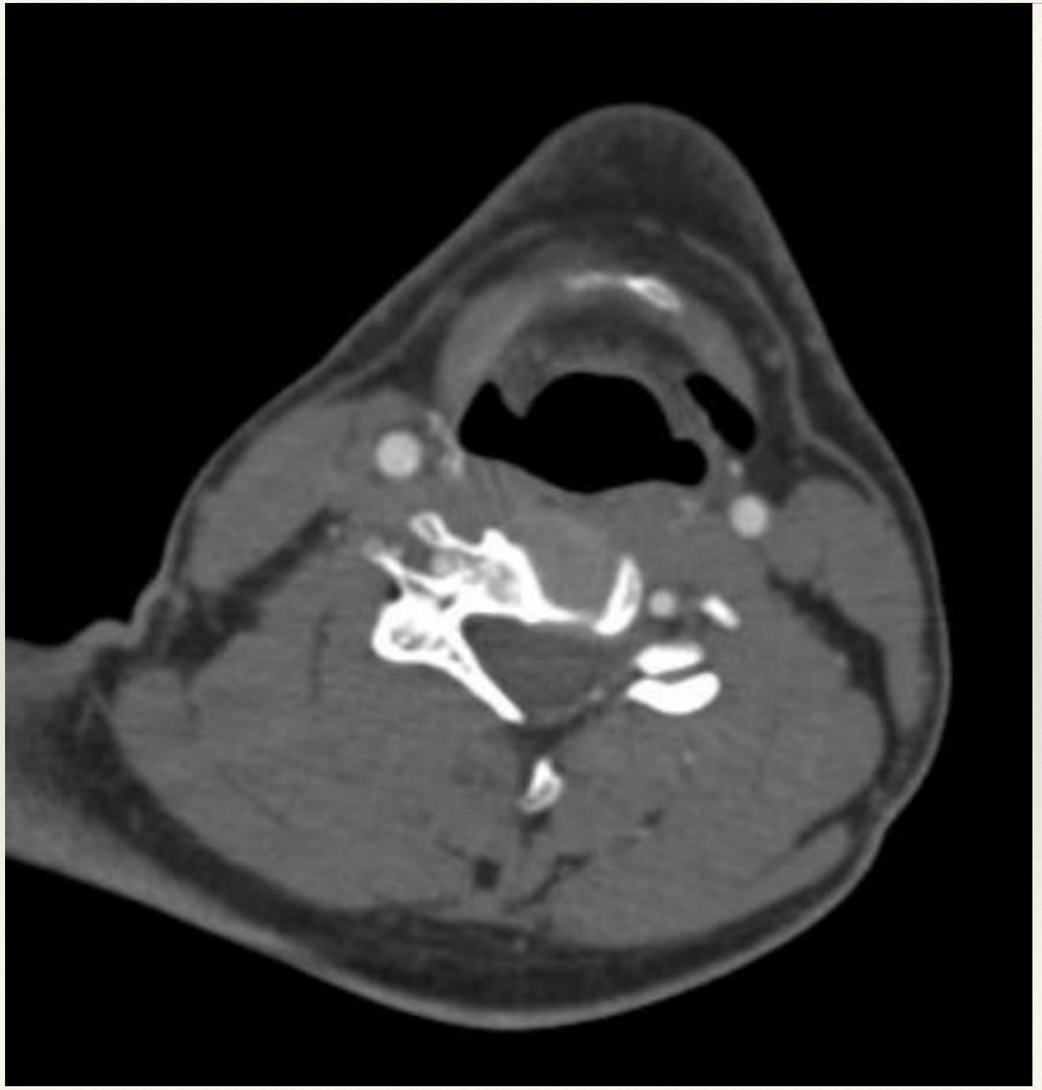
NIHSS SCORE	STROKE SEVERITY	IMPACTED BRAIN DENSITY
0	No Stroke	
0 – 4	Minor Stroke	
5 – 15	Moderate Stroke	
16– 20	Moderate to Severe Stroke	
21 - 42	Severe Stroke	

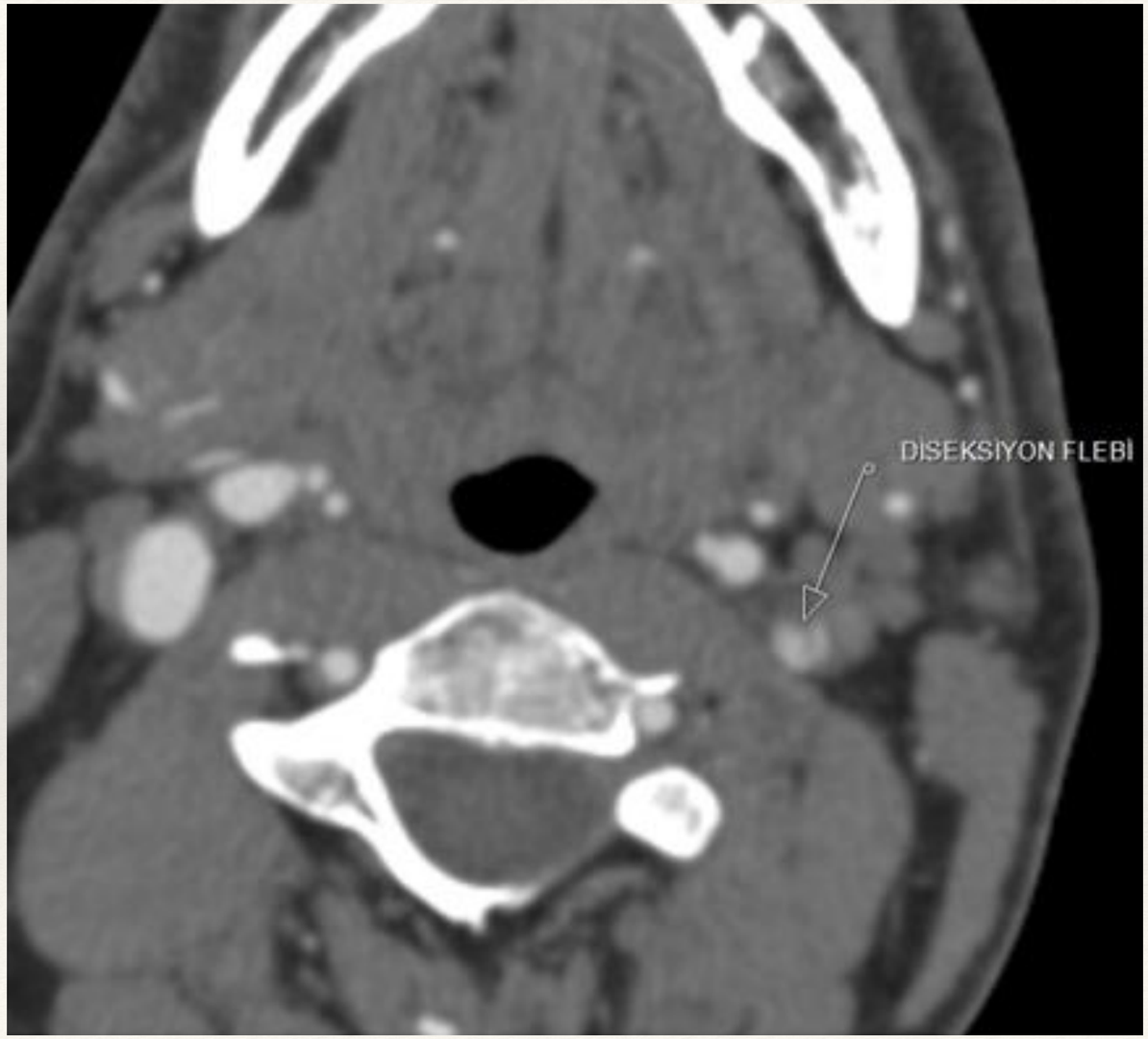
Figure 1. The National Institutes of Health Stroke Scale or NIH Stroke Scale (NIHSS) is a tool used by healthcare providers to objectively quantify and succinctly communicate the impairment caused by a stroke.

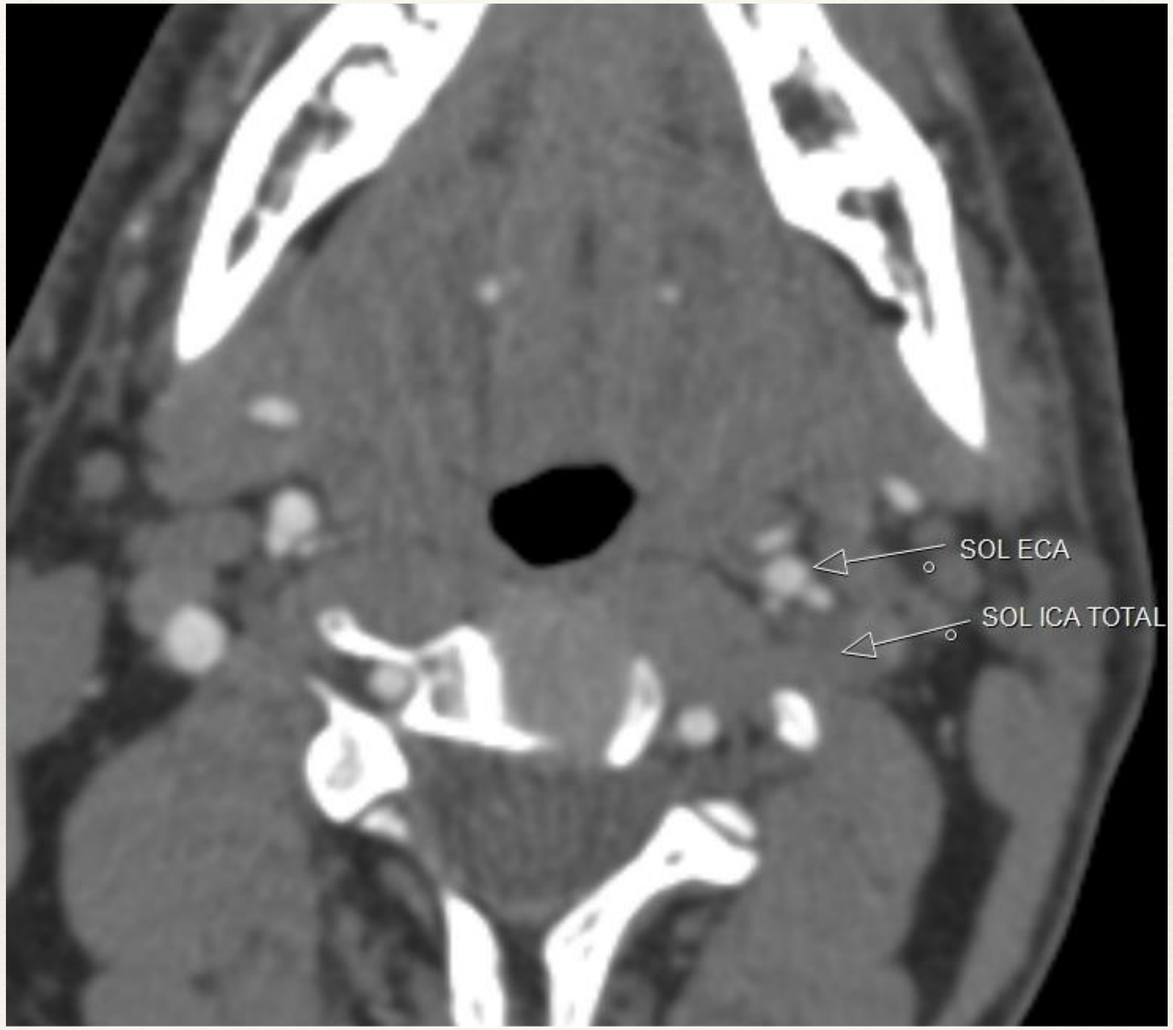
NIHSS 12

ASPECT skoru: 10

BT Anjiyografi (saat: 13:00)






SOL ECA
SOL ICA TOTAL


SOL MCA TROMBOZE

NEUROSURGICAL FOCUS

Neurosurg Focus 42 (4):E15, 2017

Revascularization of tandem occlusions in acute ischemic stroke: review of the literature and illustrative case

Nnenna Mbabuike, MD, Kelly Gassie, MD, Benjamin Brown, MD, David A. Miller, MD, and Rabih G. Tawk, MD

- Tandem oklüzyonda mortalite %24-27
- Etyoloji değişken
  - Ateroskleroz
  - Diseksiyon
  - Kardiyoemboli
  - Stent oklüzyonu vb
- Iv rtPA faydası plasebo ile benzer
- Endovasküler tedavi sonuçları daha iyi olabilir

TABLE 1. Literature review of tandem occlusions

Authors & Year	Level of Evidence	No. of Pts w/ Tandem Occlusions*	Treatment†	Description of Outcomes‡
Malik et al., 2011	3, retrospective, single center	77	Anterograde	TICI ≥2 in 75.3%; mRS ≤2 in 41.6% at 3 mos
Machi et al., 2011	3, retrospective	10	Retrograde	TICI 2b or better in 8 of 10 pts; mRS 2 or better in 4
Kwak et al., 2013	3, retrospective	35	Anterograde	TICI 3, 54.3%; TICI 2b, 20%; TICI 2a, 25.7%; mRS 0-2 at 3 mos, 62.9%; median NIHSS 4 at 3 mos (range 1–17)
Dalyai et al., 2013	3, retrospective	17	Anterograde	94% recanalization;§ mean mRS 2.88 at discharge
Soize et al., 2014	3, prospective	11¶	Retrograde approach used "whenever possible"	Pts w/ tandem occlusions had poorer functional outcomes than those w/ solitary anterior circulation occlusions (18.2% vs 67.7% , p = 0.01) & higher mortality rate at 3 mos (45.5% vs 12.9%, p = 0.03)
Tütüncü et al., 2014	3, retrospective single center	30**	Not specified	TICI 2b/3 in 64%; major neurological improvement†† in 64%; mRS <2 in 54%
Dababneh et al., 2014	3, retrospective single center	7	Anterograde	TICI 2b/3 in 6 of 7 pts; NIHSS ≤1 at 90 days in 4 of 7; mRS 0 at 90 days in 4 of 7
Stampfl et al., 2014	3, retrospective, single center	24	Anterograde in 21, retrograde in 3	TICI 2b in 62.5%; median mRS 3.0 at 3 mos
Puri et al., 2015	3, retrospective	28	Anterograde in 85.7%, retrograde in 14.3%	TICI 2a or better in 96.4%; mRS ≤ 2 in 52.5% at 3 mos
Duijsens et al., 2015	3, retrospective	15‡‡	Anterograde	True occlusions: TICI 2/3 in 60%; pseudo-occlusions: TICI 2/3 in 83%; mean NIHSS 3 for true occlusions & 2 for pseudo-occlusions
Spiotta et al., 2015	3, retrospective	16	Anterograde	TICI 2/3 in 100%; mRS ≤2 at 3 mos in 56.3%
Cohen et al., 2015	3, retrospective	24	Anterograde	TICI 2b in 79%; TICI 2a in 13%; TICI 1 in 8%; mRS ≤2 76% at 3 mos
Maurer et al., 2015	3, retrospective	43	Not specified	TICI 2b/3 in 76.7%; mRS ≤2 at discharge in 32.6%
Lockau et al., 2015	3, retrospective	37	Retrograde in 67.6%, anterograde in 32.4%	TICI 2b/3 in 73% w/ anterograde Tx; mRS ≤2 at 3 mos in 8.3% of anterograde cases vs 16%, retrograde
Mishra et al., 2015	3, retrospective	7	Anterograde	TICI 2b in 100%; mean NIHSS 4.9 at discharge; mRS 1 at 3 mos in 100%
Heck & Brown, 2015	3, retrospective, single center	23	Anterograde	TICI 2b/3 in 91%; mRS ≤2 at 3 mos in 52%
Lescher et al., 2015	3, retrospective	39	Not specified	TICI 2b in 64%; mRS ≤2 at 3 mos in 36%
Behme et al., 2015	3, retrospective, multicenter	170	Anterograde in 151 (89%)	TICI 2b in 77%; TICI 2a in 12%; mRS ≤ 2 at 3 mos in 36%
Weiner et al., 2017	4, case series single center	2	Anterograde	Case 1: TICI 2b, mRS 1 at 3 mos; Case 2: TICI 2b, mRS at 6 mos
Marnat et al., 2016	3, retrospective, single center	20	Retrograde	TICI 2b/3 in 70%; mRS ≤2 at 3 mos in 70%
Grigoryan et al., 2016	3, retrospective, multicenter	100	Anterograde & retrograde but not specified per cases	TICI 2b/3 in 88%; mRS ≤2 at 3 mos in 42%
Fahed et al., 2016	3, retrospective single center	70	Not specified	mRS 2 or better in 50.8%; TICI 2b/3 in 67%

frontiers in Neurology

ORIGINAL RESEARCH
published: 19 February 2019
doi: 10.3389/fneur.2019.00102

Acute Endovascular Treatment of Patients With Ischemic Stroke From Intracranial Large Vessel Occlusion and Extracranial Carotid Dissection

Kars C. J. Compagne[1,2], R. B. Goldhoorn[3], Maarten Uyttenboogaart[4,5], Robert J. van Oostenbrugge[3,6], Wim H. van Zwam[6,7], Pieter J. van Doormaal[1], Diederik W. J. Dippel[2], Aad van der Lugt[1], Bart J. Emmer[8], Adriaan C. G. M. van Es[1] and the MR CLEAN investigators[†]*

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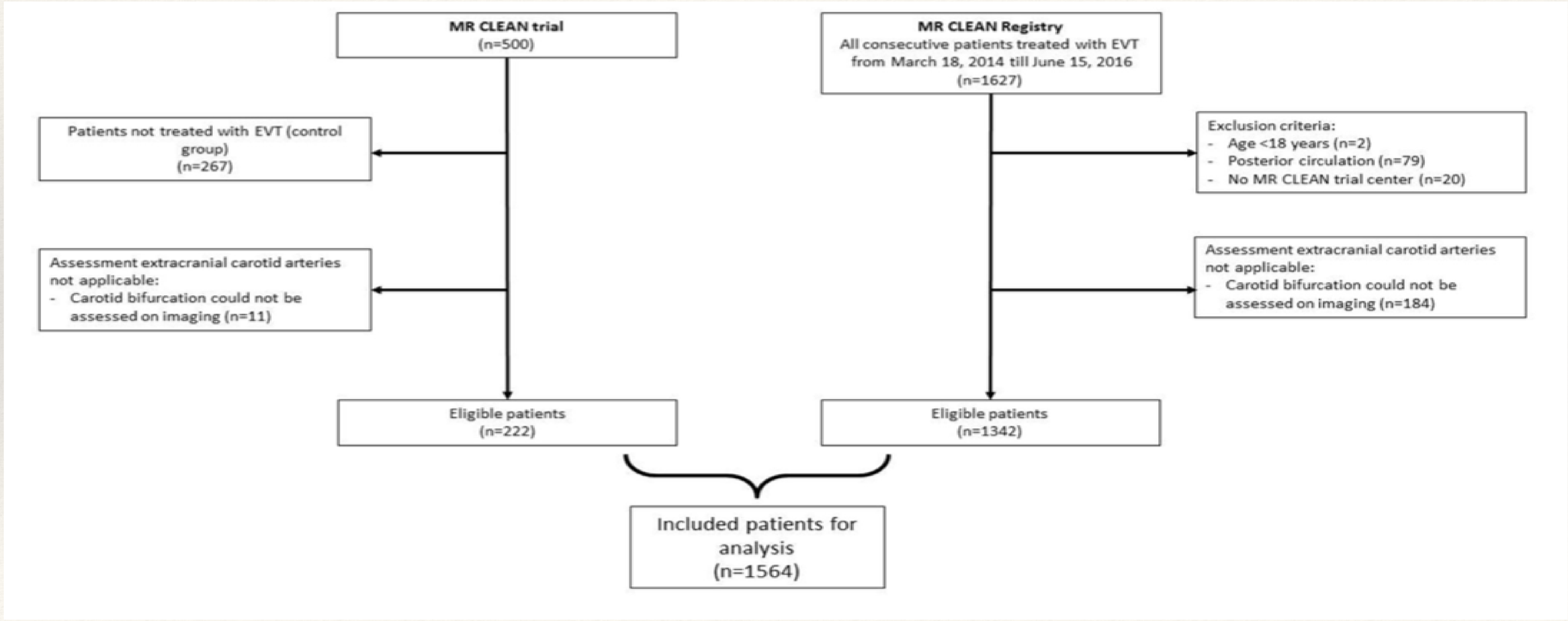

	Patients with CAD ($n = 74$)	Patients with ACAO ($n = 92$)	Patients without CAD or ACAO ($n = 1398$)	*P*-value CAD vs. ACAO	*P*-value CAD vs. without CAD or ACAO
Sex-male (%)	55 (74.3)	72 (78.3)	727 (52.0)	0.69	<0.001
Age-years (median [IQR])	52 [45–59]	68 [58–77]	71 [60–80]	<0.001	<0.001
Smoking (%)	21 (28.4)	36 (39.6)	313 (22.5)	0.18	0.31
Diabetes mellitus (%)	2 (2.7)	15 (16.7)	228 (16.4)	0.01	0.01
Atrial fibrillation (%)	7 (9.6)	3 (3.3)	344 (24.9)	0.17	0.01
Hypertension (%)	18 (24.3)	38 (41.8)	704 (51.0)	0.03	<0.001
Myocardial infarction (%)	2 (2.7)	12 (13.2)	224 (16.3)	0.04	0.01
Previous stroke (%)	6 (8.3)	7 (7.6)	241 (17.3)	1.00	0.07
Hypocholesteremia (%)	5 (6.8)	19 (21.1)	418 (30.8)	0.02	<0.001
Pre-stroke independence (mRS≤2) (%)	70 (95.9)	90 (98.9)	1221 (88.6)	0.46	0.08
Stroke severity at baseline (NIHSS) (median [IQR])[a]	16 [12–19]	16 [11–19]	16 [12– 20]	0.43	0.81
Location intracranial occlusion (%)				0.42	<0.001
Other	0 (0.0)	0 (0.0)	11 (0.8)		
Intracranial ICA	16 (22.2)	17 (18.7)	46 (3.4)		
ICA-T	25 (34.7)	33 (36.3)	298 (21.9)		
M1	26 (36.1)	39 (42.9)	828 (60.8)		
M2	5 (6.9)	2 (2.2)	178 (13.1)		
ASPECTS score at baseline (median [IQR])[b]	8 [7–10]	8 [7–9]	9 [7–10]	0.57	0.23
Collateral grading score (%)[c]				0.14	0.36
0	2 (2.9)	1 (1.1)	94 (7.0)		
1	28 (40.0)	27 (29.7)	435 (32.5)		
2	27 (38.6)	32 (35.2)	516 (38.5)		
3	13 (18.6)	31 (34.1)	294 (22.0)		
Treatment with intravenous thrombolysis (%)	63 (85.1)	79 (85.9)	1086 (77.7)	1.00	0.17
Duration from stroke onset to groin puncture (median [IQR])	235 [173–295]	211 [178–271]	210 [160–270]	0.54	0.15

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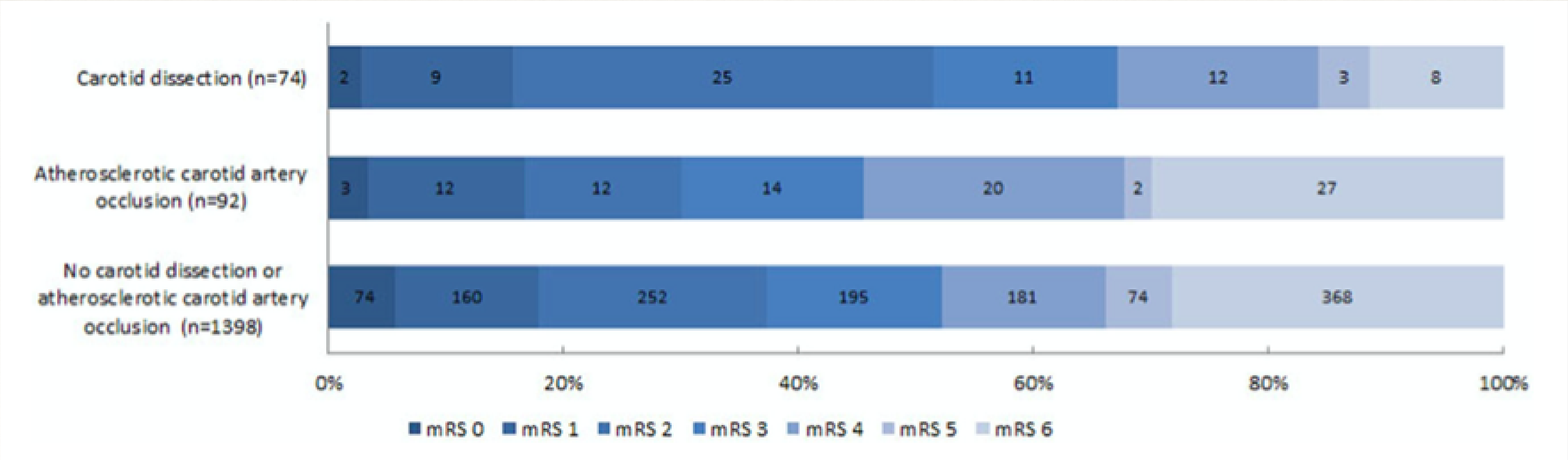
- CAD-ACAO başarılı rekanalizasyon oranları benzer
- Ancak CAD 3. ay fonksiyonel iyileşme daha iyi



Endovasküler tedavi ?

- Antegrad tedavi?
- Retrograd tedavi?
- Stent ?
- Emboli protection?
- Periprosedürel medikal tedavi?

Neuroradiology (2017) 59:641–647
DOI 10.1007/s00234-017-1850-y

REVIEW

Endovascular treatment in patients with carotid artery dissection and intracranial occlusion: a systematic review

Jan W. Hoving[1] · Henk A. Marquering[1,2] · Charles B. L. M. Majoie[1]

Table 1 Patient and study characteristics

Study	Study design	Vessel dissected	Additional thrombus	TTT (h)	Procedure of ICA dissection treatment	Procedure of intracranial occlusion treatment	Recanalisation (TICI)	90-day mRS	0-day NIHSS	90-day NIHSS	Favourable clinical outcome (FCO)
Baumgartner et al. [16]	Case-control	L ICA (4 points)	MCA	4.2	Carotid Wallstent	IA urokinase	N.A.	N.A.	18	8	+ 4/4
Bulsara et al. [28]	Case report	L ICA	L M2	1.5	None	IA rt-PA (2 mg) + 4 mg systemic rt-PA	N.A.	N.A.	20	0	+
Sainz de la Maza et al. [27] (2 cases)	Case report	L ICA	MCA	4.0	None	IA urokinase	3	0	N.A.	N.A.	+
	Case report	R ICA	R MCA	8.0	None	Solitaire stent retriever	3	N.A.	18	1	+
Fields et al. [2] (8 cases)	Case series	L ICA	L M1	9.4	Stent	Merci stent retriever + heparin	2b	3	N.A.	N.A.	–
	Case series	L ICA	L M1	3.9	Stent	Merci stent retriever + heparin + IA thrombolytics	2a	1	14	N.A.	+
	Case series	L ICA	L M2	2.8	None	Merci stent retriever + heparin	2b	3	28	N.A.	–
	Case series	R ICA	R intracranial ICA, R M1	3.1	None	Merci stent retriever	3	0	19	N.A.	+
	Case series	R ICA	R M1/M2	7.4	Stent†	Merci stent retriever + IA thrombolytics	0	2	11	N.A.	–
	Case series	L ICA	R M1/M2	3.2	None	Merci stent retriever + IA thrombolytics	3	0	14	N.A.	+
	Case series	L ICA	L ICA/M2	6.3	None	Merci stent retriever + IA thrombolytics	0	1	1	N.A.	+
	Case series	L ICA	L M1/M2	2.7	None	Merci stent retriever + IA thrombolytics	2b	2	23	N.A.	+
Fujimoto et al. [26]	Case report	R intracranial ICA	R M1/M2/A1	5.2	None	032 Penumbra System	2a	N.A.	20	1	+
Kondziella et al. [29]	Review article	R ICA	R M1	4.0	Carotid Wallstent	Solitaire stent retriever	2b	1	22	1	+
Kulcsár et al. [17]	Case report	L ICA	L M1	4.2	Enterprise stent‡	Heparin + IV aspirin	2a	4	16	N.A.	–
Lavallée et al. [1] (6 cases)	Case-control	ICA	M1	5.6	Carotid Wallstent	IA thrombolytics + clopidogrel + aspirin + heparin	1	2	19	6	+
	Case-control	ICA	M1	4.6	Carotid Wallstent	IA thrombolytics + clopidogrel + aspirin + heparin	2a	0	14	0	+
	Case-control	ICA	M1	3.4	Carotid Wallstent	IA thrombolytics + clopidogrel + aspirin + heparin	2a	0	16	0	+
	Case-control	ICA	M1	3.8	Carotid Wallstent	IA thrombolytics + clopidogrel + aspirin + heparin	2a	0	12	0	+
	Case-control	ICA	M1	6.0	Carotid Wallstent	IA thrombolytics + clopidogrel + aspirin + heparin + mechanical thrombectomy	2a	0	17	0	+
	n	ICA	M1	5.9	Carotid Wallstent	IA thrombolytics + clopidogrel + aspirin + heparin	2a	2	20	4	+
Lekoubou et al. [18] (3 cases)	Case report	R extracranial ICA	R M1	2.3	Leo stent	IA thrombolytics + clopidogrel + aspirin + heparin	N.A.	2	14	N.A.	+
	Case report	R extracranial ICA	R M1	4.0	Leo stent	IA thrombolytics + clopidogrel + aspirin + heparin	N.A.	0	6	N.A.	+
	Case report	R extracranial ICA	L PCA	2.2	Leo stent	IA thrombolytics + clopidogrel + aspirin + heparin	N.A.	1	16	N.A.	+
	Case series		N.A.	5.6	Carotid Wallstent	Clopidogrel + aspirin	4/7 ≥ 2b		15	N.A.	+ 4/7

Table 1 (continued)

Study	Study design	Vessel dissected	Additional thrombus	TTT (h)	Procedure of ICA dissection treatment	Procedure of intracranial occlusion treatment	Recanalisation (TICI)	90-day mRS	0-day NIHSS	90-day NIHSS	Favourable clinical outcome (FCO)
Lescher et al. [19]		extracranial ICA (7 points)						0–2 in 4/7			
Lockau et al. [20]	Review article	ICA (13 points)	ACA or MCA/distal ICA	1.8	Carotid Wallstent	IA thrombolytics + clopidogrel + aspirin	10/13 2b/3	0–2 in 8/13	18	N.A.	N.A.
Mourand et al. [21] (2 cases)	Case report	R extracranial ICA	R intracranial ICA, R MCA	4.0	Enterprise stent (2×)	IA thrombolytics + heparin	2a	0	15	0	+
	Case report	R extracranial ICA	R M1/M2, R A1	4.0	Wingspan stent	IA thrombolytics + heparin	3	1	18	0	+
Padalino et al. [25] (2 cases)	Case report	L extracranial ICA	L MCA	6.5	Acculink stent + balloon angioplasty	IA abciximab + mechanical thrombectomy +026 Penumbra system	3	N.A.	13	11	−
	Case report	L extracranial ICA	L MCA	6.1	Acculink stent	IA abciximab + mechanical aspiration +026 Penumbra system	3	N.A.	22	0	+
Jensen et al. [23]	Case-control	Extracranial ICA (17 points)	N.A. but yes	N.A.	Stent + angioplasty	IA thrombectomy + IA thrombolytics	16/17 2b/3	0–2 in 13/17	13	N.A.	+ 13/17
Cohen et al. [22] (6 cases)	Case series	L extracranial ICA	L ICA 'T'	1.0	Carotid Wallstent	IV heparin + Solitaire stent retriever + clopidogrel	2b	0	24	N.A.	+
	Case series	L extracranial ICA	M1	1.2	Carotid Wallstent	IV heparin + Solitaire stent retriever + clopidogrel	3	1	22	N.A.	+
	Case series	L extracranial ICA	L ICA T	–	Carotid Wallstent	IV heparin + Solitaire stent retriever + clopidogrel	1	3	24	N.A.	−
	Case series	L extracranial ICA	M1	0.8	Carotid Wallstent	IV heparin + Solitaire stent retriever + clopidogrel	3	1	12	N.A.	+
	Case series	R extracranial ICA	M1	0.8	Carotid Wallstent	IV heparin + Solitaire stent retriever + clopidogrel	3	1	12	N.A.	+
	Case series	L extracranial ICA	M1-M2	1.0	Carotid Wallstent	IV heparin + Solitaire stent retriever + clopidogrel	2b	2	20	N.A.	+
Marnat et al. [24]	Case-control	extracranial ICA (20 points)	M1, M1-M2	4.5	Carotid Wallstent + Leo stent	IV aspirin + clopidogrel	14/20 2b/3	0–2 in 14/20	18	N.A.	+14/20

L left, *R* right, *TTT* time to treatment, *BL* baseline

† extension of a dissected carotid artery by a microcatheter – was treated effectively with stenting; ‡ craniectomy

Endovascular Management of Tandem Occlusion Stroke Related to Internal Carotid Artery Dissection Using a Distal to Proximal Approach: Insight from the RECOST Study

G. Marnat, I. Mourand, O. Eker, P. Machi, C. Arquizan, C. Riquelme, X. Ayrignac, A. Bonafé and V. Costalat

American Journal of Neuroradiology July 2016, 37 (7) 1281-1288; DOI: https://doi.org/10.3174/ajnr.A4752

AJNR AMERICAN JOURNAL OF NEURORADIOLOGY

Table 3: Angiographic results, complication rates, and clinical follow-up

	Tandem Occlusion Related to Internal Carotid Dissection Group (*n* = 20)	Isolated Intracranial Occlusion Group (*n* = 201)	*P* Value
Favorable recanalization, TICI 2b and 3	70%	82%	.23
Procedure duration (median) (min)	74	47	.030
Median No. of intracranial device passes	2	2	.112
Internal carotid stenting	5/20 (25%)		
Significant hemorrhagic rate	5%	3%	.49
Clinical favorable outcome after 3 months (mRS ≤ 2)	70%	50%	.093

Emergent Self-Expanding Stent Placement for Acute Intracranial or Extracranial Internal Carotid Artery Dissection with Significant Hemodynamic Insufficiency

BACKGROUND AND PURPOSE: ICAD with hemodynamic insufficiency may present with either fulminant infarct or with progressive neurologic deterioration. The purpose of this study was to evaluate the safety and efficacy of emergent self-expanding stent placement for acute intracranial or extracranial ICAD with significant hemodynamic insufficiency.

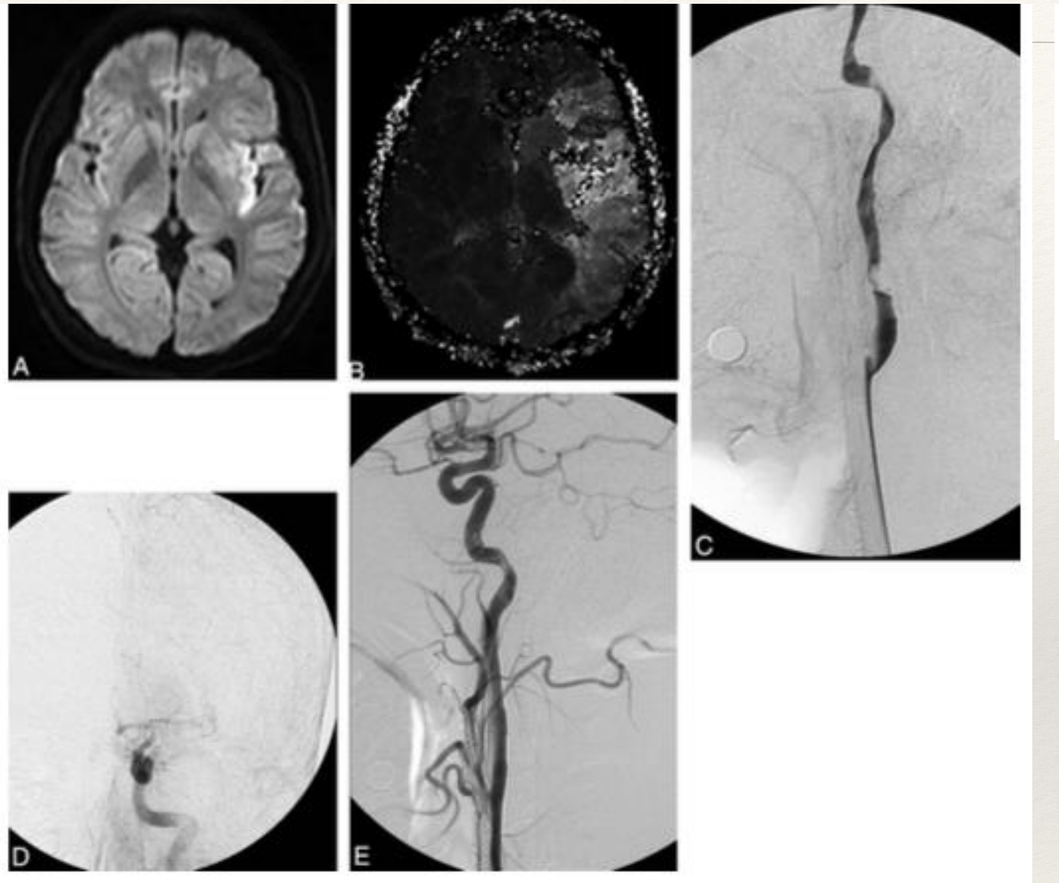
MATERIALS AND METHODS: Eight patients (7 men and 1 woman; age range, 20–55 years; NIHSS score, 5–21) underwent emergent self-expanding stent placement for treatment of significant hemodynamic insufficiency due to acute ICAD. The safety and efficacy of emergent self-expanding stent placement were retrospectively evaluated.

RESULTS: All patients presented with progressive ($n = 6$) or fluctuating ($n = 2$) neurologic deficits and revealed markedly decreased perfusion on CT or MR perfusion studies. Conventional angiography revealed acute occlusion ($n = 2$) or critical stenosis ($n = 6$) in intracranial ($n = 3$) or extracranial ($n = 5$) carotid arteries with a lack of sufficient collaterals. Stent placement was successful in all patients without any procedure-related complications. In all patients, hemodynamic insufficiency was corrected immediately after stent placement, and neurologic symptoms were completely resolved during several days. Mean improvement of the NIHSS score between baseline and discharge was 11.6 (range, 5–21). All patients remained neurologically intact (mRS, 0) during clinical follow-up for a mean of 21 months (range, 8–50 months). Angiographic follow-up was available for 6 patients at 3–12 months. None of the 6 patients revealed residual or in-stent restenosis.

CONCLUSIONS: Self-expanding stent placement is a safe and effective option for selected patients with significant hemodynamic insufficiency due to acute intracranial or extracranial ICAD.

AJNR

AJNR Am J Neuroradiol 31:1529–32 | Sep 2010 | www.ajnr.org

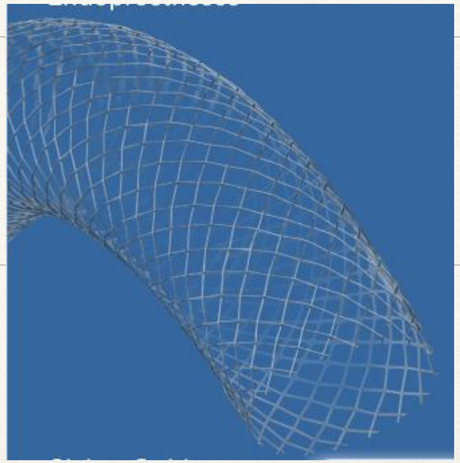


Summary of clinical characteristics, treatment, and outcomes for 8 patients presenting with significant hemodynamic insufficiency due to ICA dissection

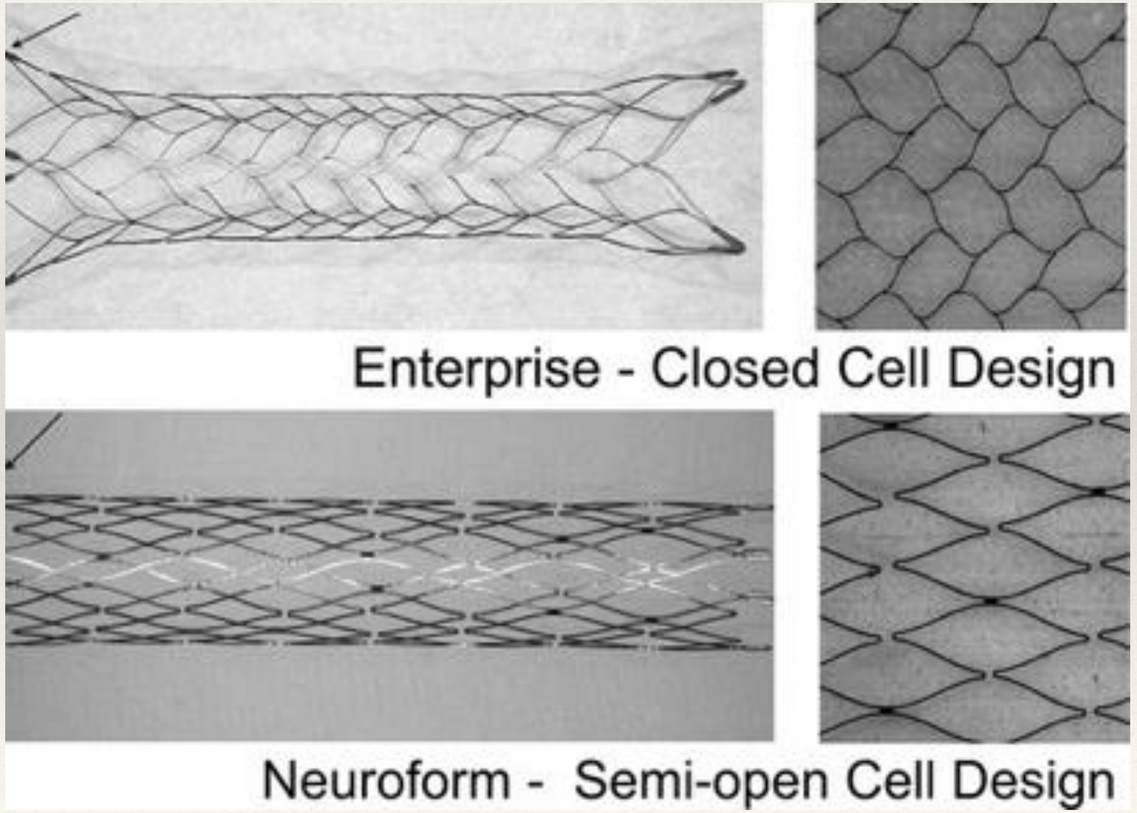
No.	Sex/Age (yr)	Cause	Location	Treatment Indication	Treatment	NIHSS Score at Treatment	NIHSS Score at Discharge
1	M/55	Traumatic	Supraclinoid ICA, left	Progressive neurologic deficit	Enterprise	10	1
2	M/20	Spontaneous	Supraclinoid ICA, right	Fluctuating neurologic deficit	Enterprise	5	0
3	M/45	Traumatic	Supraclinoid ICA, left	Progressive neurologic deficit	Neuroform	8	0
4	M/35	Spontaneous	Cervical ICA, left	Progressive neurologic deficit	Wallstent	21	0
5	M/42	Spontaneous	Cervical ICA, left	Progressive neurologic deficit	Wallstent	17	0
6	F/53	Spontaneous	Cervical ICA, right	Fluctuating neurologic deficit	Precise	5	0
7	M/42	Traumatic	Cervical ICA, left	Progressive neurologic deficit	Wallstent	13	0
8	M/45	Traumatic	Cervical ICA, left	Progressive neurologic deficit	Wallstent	15	0

- Zayıf kollateral dolaşım nedeniyle hemodinamik yetersizliği olan hastalarda selfexpandable- stent yerleştirilmesi güvenli ve etkili bir seçenek olabilir

Stent seçimi



- Carotid Wallstent
- Enterprise stent
- Wingspan stent
- Acculink stent
- Leo stent



Cardiovasc Intervent Radiol (2020) 43:1679–1686
https://doi.org/10.1007/s00270-020-02594-3

CIRSE

CLINICAL INVESTIGATION STROKE/NEUROINTERVENTIONS

Preliminary Experience Using a Covered Stent Graft in Patients with Acute Ischemic Stroke and Carotid Tandem Lesion

Carlos Piñana[1,2] · Laura Ludovica Gramegna[3,4] · Edgar Folleco[2] · Manuel Requena[5,2] · David Hernandez[1,2] · Alejandro Tomasello Weitz[1,2]

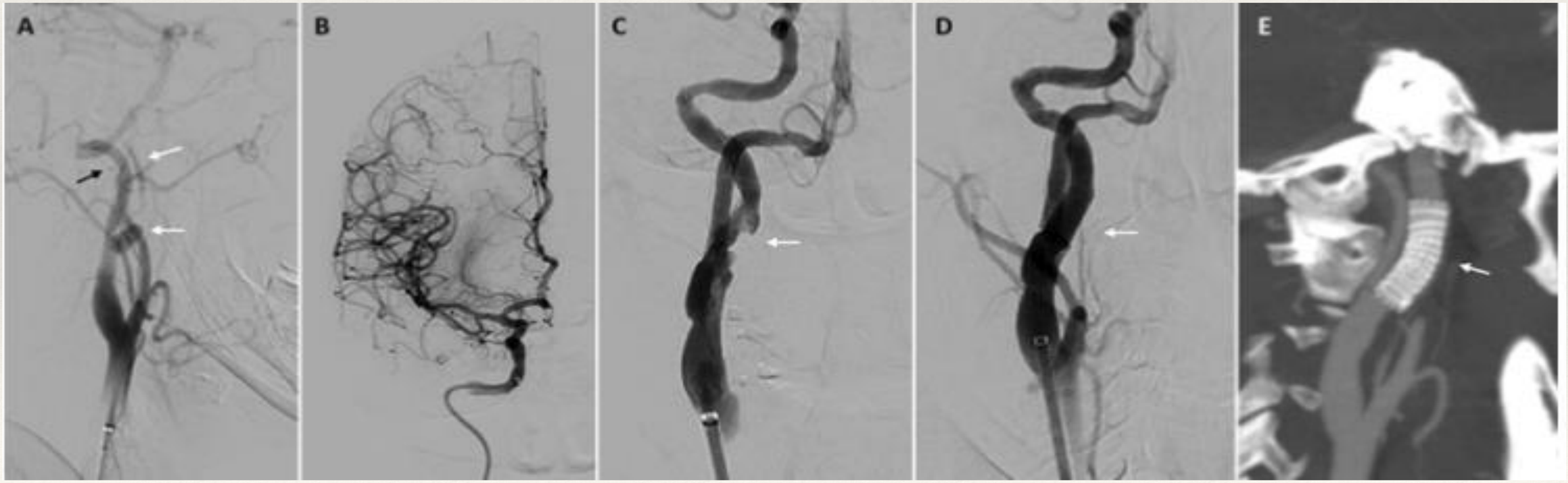


Table 1 Clinical baseline, procedural, and outcome characteristics of patients treated with Viabahn during thrombectomy for AIS with tandem lesions

Patient (age/sex)	#1 (75/M)	#2 (38/F)	#3 (54/M)	#4 (52/M)	#5 (74/M)	#6 (57/M)	#7 (60/M)	# 8 (33/F)
Pre-treatment mRS	0	0	1	2	3	0	0	0
CVRF	Y	N	Y	N	Y	Y	Y	Y
Clinical presentation								
NIHSS	22	16	18	19	16	20	23	7
ASPECTS	10	5	5	9	10	6	7	7
OTG (min)	145	47	975	299	762	720	45	395
rtPA	Yes	No	No	Yes	Yes	No	No	No
Lesion angiographic characteristics								
Degree of lesion	Occlusion	Near-occlusion	Occlusion	Occlusion	Near-occlusion	Occlusion	Occlusion	Occlusion
Dissection	No	Yes	No	Yes	Yes	No	Yes	Yes
Free-floating thrombus	Yes	Yes	Yes	No	No	Yes	No	Yes
Tortuous arterial anatomy	Yes	No	Yes	Yes	Yes	Yes	Yes	No
Arterial caliber change	Yes	Yes	Yes	No	No	No	Yes	Yes
Lesion location	L ICA	R ICA	L CCA/ICA	R ICA	L ICA	L ICA	L ICA	R ICA
Intracranial occlusion site	L MCA (M1)	R MCA (M1)	L MCA (M1)	R MCA (M1)	L MCA (M2)	L MCA (M1)	L Terminal ICA	R MCA (M1)
Procedural data								
Stenting location	L ICA/CCA	R ICA/CCA	L ICA	R ICA	L ICA	L ICA/CCA	L ICA/CCA	R ICA/CCA
Stenting timing	Post MT	Post MT	Post MT	Post MT	Post MT	Post MT	Post MT	Post MT
Stent measures (mm)	6 × 50	5 × 50 6 × 25	5 × 50	5 × 50	5 × 50	6 × 25	5 × 25 6 × 25	8 × 25
Antiplatelet regimen	Dual	Dual	Mono (Iny)	None	Mono (ASA)	None	Dual	Mono (ASA)
Antiplatelet start	12–24 h after	During stenting	During stenting		12–24 h after		12 h after	12 h after
Antiplatelets regime duration	ASA indefinitely*	ASA indefinitely*	ASA indefinitely		ASA indefinitely		ASA indefinitely*	ASA indefinitely
Outcome								
TICI grade	2c	2a	2a	3	0	2b	2b	3
NIHSS at 48 h	13	14	11	14	16	20	9	1
Hemorrhagic complications	None	None	ICH (HT-2)	ICH (PH-2)	None	None	None	None
Follow-up								
mRS at 90 days	3	4	2	4	4	4	3	1
Doppler-US/CTA at 90 days	Patent	Occlusion	Occlusion	Occlusion	Occlusion	Occlusion	Patent	Patent

NEUROSURGICAL FOCUS

Neurosurg Focus 42 (4):E15, 2017

Revascularization of tandem occlusions in acute ischemic stroke: review of the literature and illustrative case

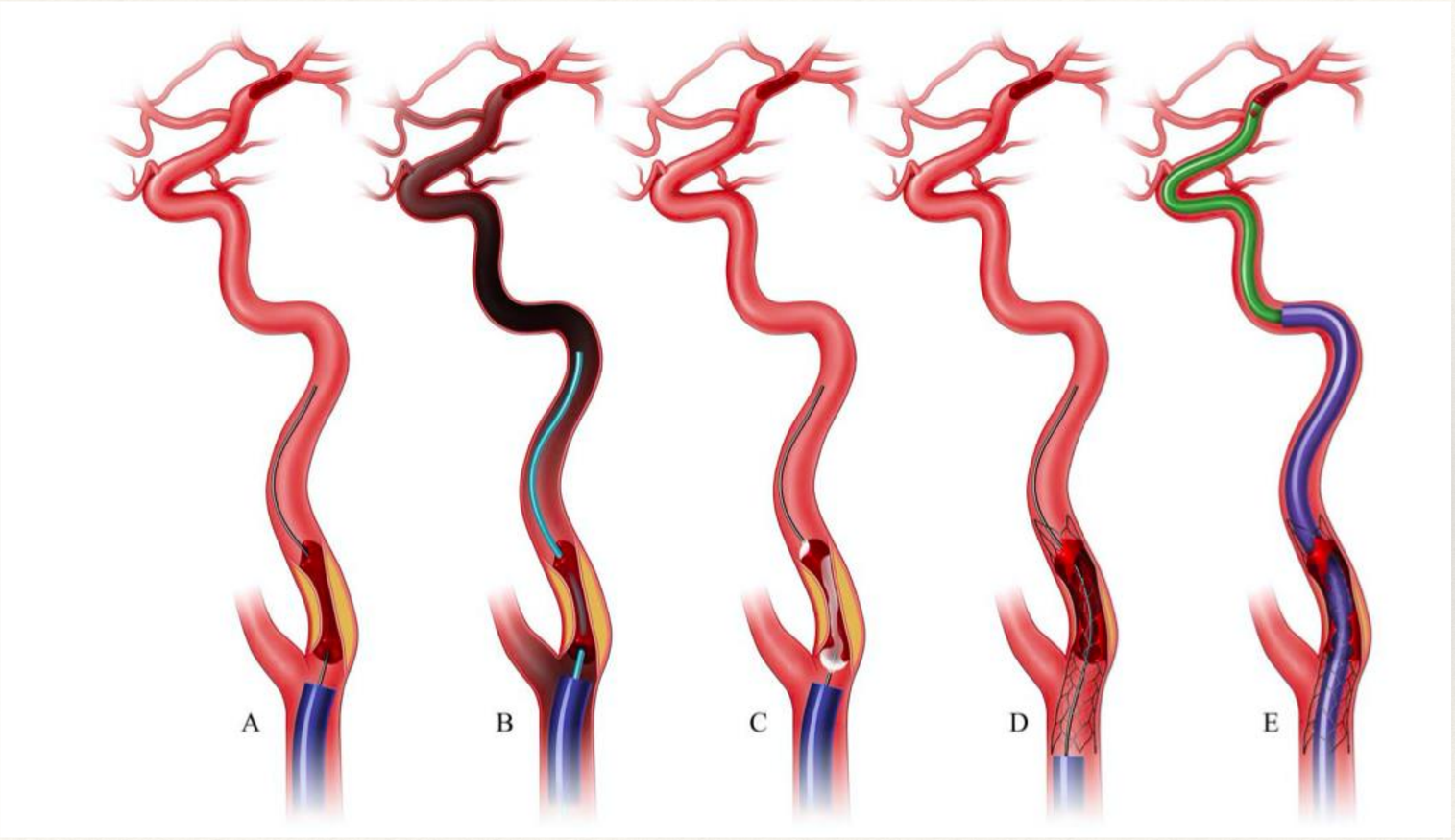
Nnenna Mbabuike, MD, Kelly Gassie, MD, Benjamin Brown, MD, David A. Miller, MD, and Rabih G. Tawk, MD

- Tandem oklüzyonda mortalite %24-27
- Etyoloji değişken
  - Ateroskleroz
  - Diseksiyon
  - Kardiyoemboli
  - Stent oklüzyonu vb
- Iv rtPA faydası plasebo ile benzer
- Endovasküler tedavi sonuçları daha iyi olabilir

TABLE 1. Literature review of tandem occlusions

Authors & Year	Level of Evidence	No. of Pts w/ Tandem Occlusions*	Treatment†	Description of Outcomes‡
Malik et al., 2011	3, retrospective, single center	77	Anterograde	TICI ≥2 in 75.3%; mRS ≤2 in 41.6% at 3 mos
Machi et al., 2011	3, retrospective	10	Retrograde	TICI 2b or better in 8 of 10 pts; mRS 2 or better in 4
Kwak et al., 2013	3, retrospective	35	Anterograde	TICI 3, 54.3%; TICI 2b, 20%; TICI 2a, 25.7%; mRS 0-2 at 3 mos, 62.9%; median NIHSS 4 at 3 mos (range 1–17)
Dalyai et al., 2013	3, retrospective	17	Anterograde	94% recanalization;§ mean mRS 2.88 at discharge
Soize et al., 2014	3, prospective	11¶	Retrograde approach used "whenever possible"	Pts w/ tandem occlusions had poorer functional outcomes than those w/ solitary anterior circulation occlusions (18.2% vs 67.7% , p = 0.01) & higher mortality rate at 3 mos (45.5% vs 12.9%, p = 0.03)
Tütüncü et al., 2014	3, retrospective single center	30**	Not specified	TICI 2b/3 in 64%; major neurological improvement†† in 64%; mRS <2 in 54%
Dababneh et al., 2014	3, retrospective single center	7	Anterograde	TICI 2b/3 in 6 of 7 pts; NIHSS ≤1 at 90 days in 4 of 7; mRS 0 at 90 days in 4 of 7
Stampfl et al., 2014	3, retrospective, single center	24	Anterograde in 21, retrograde in 3	TICI 2b in 62.5%; median mRS 3.0 at 3 mos
Puri et al., 2015	3, retrospective	28	Anterograde in 85.7%, retrograde in 14.3%	TICI 2a or better in 96.4%; mRS ≤ 2 in 52.5% at 3 mos
Duijsens et al., 2015	3, retrospective	15‡‡	Anterograde	True occlusions: TICI 2/3 in 60%; pseudo-occlusions: TICI 2/3 in 83%; mean NIHSS 3 for true occlusions & 2 for pseudo-occlusions
Spiotta et al., 2015	3, retrospective	10	Anterograde	TICI 2/3 in 100%; mRS ≤2 at 3 mos in 56.3%
Cohen et al., 2015	3, retrospective	24	Anterograde	TICI 2b in 79%; TICI 2a in 13%; TICI 1 in 8%; mRS ≤2 76% at 3 mos
Maurer et al., 2015	3, retrospective	43	Not specified	TICI 2b/3 in 76.7%; mRS ≤2 at discharge in 32.6%
Lockau et al., 2015	3, retrospective	37	Retrograde in 67.6% anterograde in 32.4%	TICI 2b/3 in 73% w/ anterograde Tx; mRS ≤2 at 3 mos in 8.3% of anterograde cases vs 16%, retrograde
Mishra et al., 2015	3, retrospective	7	Anterograde	TICI 2b in 100%; mean NIHSS 4.9 at discharge; mRS 1 at 3 mos in 100%
Heck & Brown, 2015	3, retrospective, single center	23	Anterograde	TICI 2b/3 in 91%; mRS ≤2 at 3 mos in 52%
Lescher et al., 2015	3, retrospective	39	Not specified	TICI 2b in 64%; mRS ≤2 at 3 mos in 36%
Behme et al., 2015	3, retrospective, multicenter	170	Anterograde in 151 (89%)	TICI 2b in 77%; TICI 2a in 12%; mRS ≤ 2 at 3 mos in 36%
Weiner et al., 2017	4, case series single center	2	Anterograde	Case 1: TICI 2b, mRS 1 at 3 mos; Case 2: TICI 2b, mRS at 6 mos
Marnat et al., 2016	3, retrospective, single center	20	Retrograde	TICI 2b/3 in 70%; mRS ≤2 at 3 mos in 70%
Grigoryan et al., 2016	3, retrospective, multicenter	100	Anterograde & retrograde but not specified per cases	TICI 2b/3 in 88%; mRS ≤2 at 3 mos in 42%
Fahed et al., 2016	3, retrospective single center	70	Not specified	mRS 2 or better in 50.8%; TICI 2b/3 in 67%

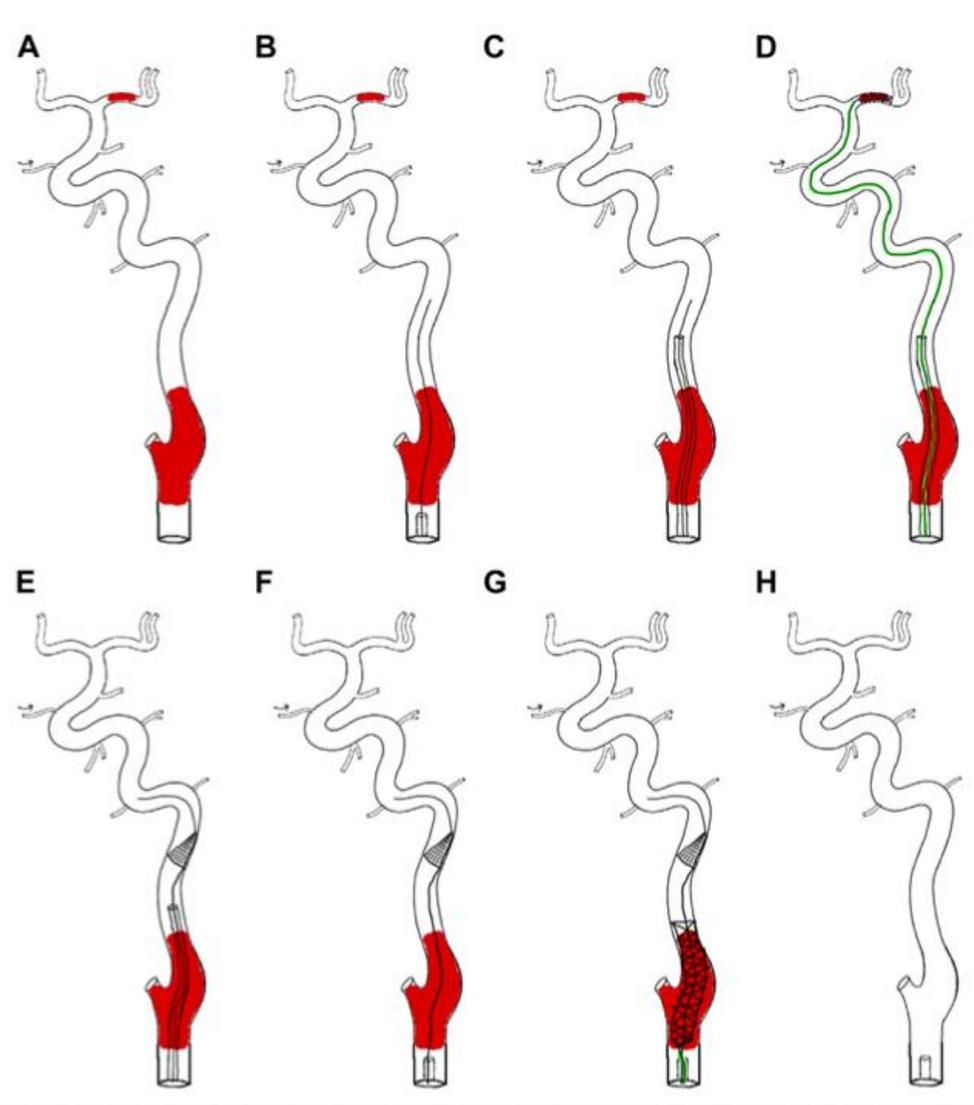
Antegrad yaklaşım



- Uygulaması daha kolay
- Plak stabilizasyonu sağlayarak distal embolileri önleyebilir
- Akımı arttırarak iskemiyi azaltabilir
- Antegrad kan akışı distal lezyonda trombolizi kolaylaştırabilir
- İşlem sırasında yeni distal emboliler !!

Spiotta AM, Lena J, Vargas J*, et al*Proximal to distal approach in the treatment of tandem occlusions causing an acute stroke*Journal of NeuroInterventional Surgery* 2015;**7:**164-169.

Retrograd yaklaşım



- Rekanalizasyon süresi daha kısa
- Proksimal koruma (Balon ve filtre) kullanılarak distal emboli önlenebilir

Case Report

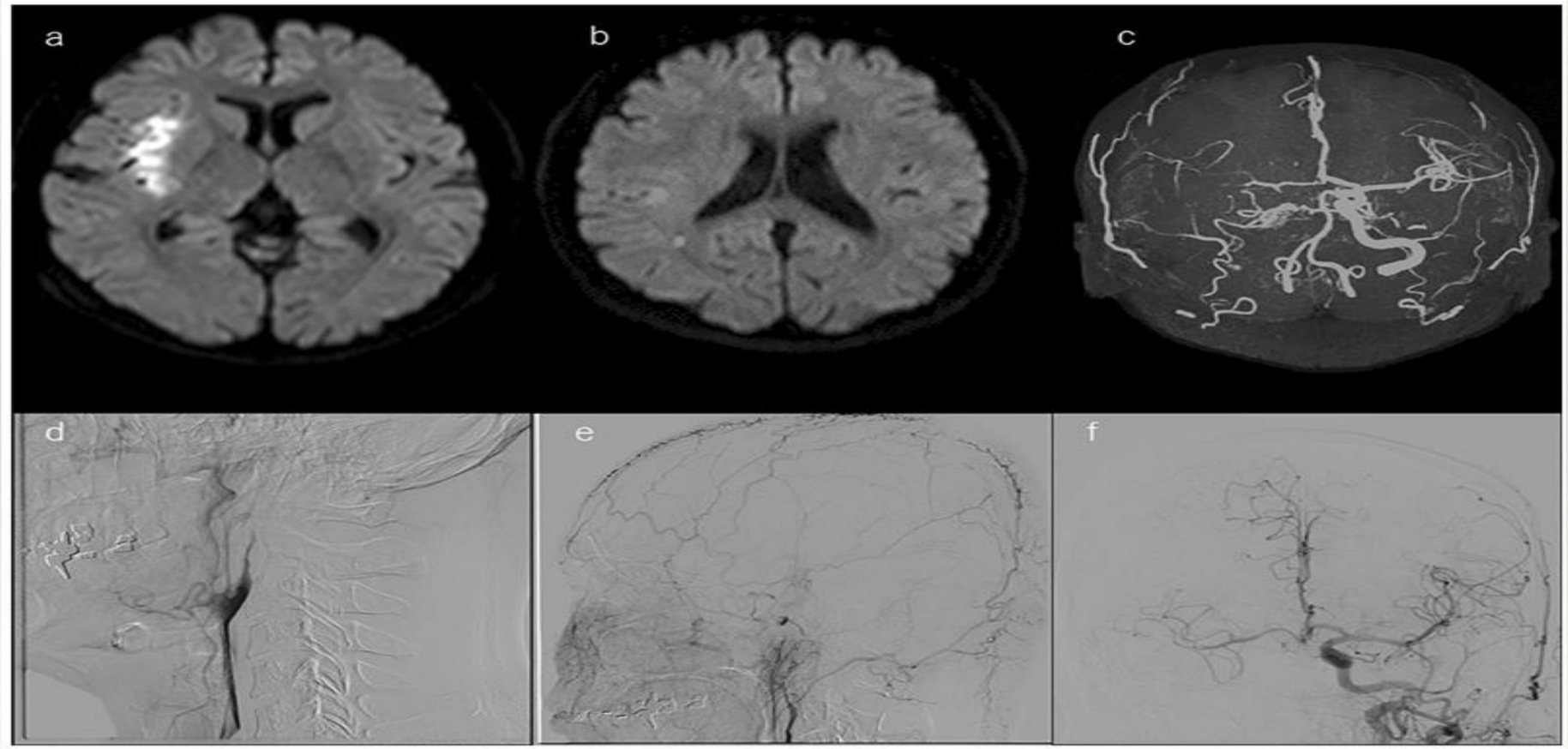
INR INTERVENTIONAL NEURORADIOLOGY

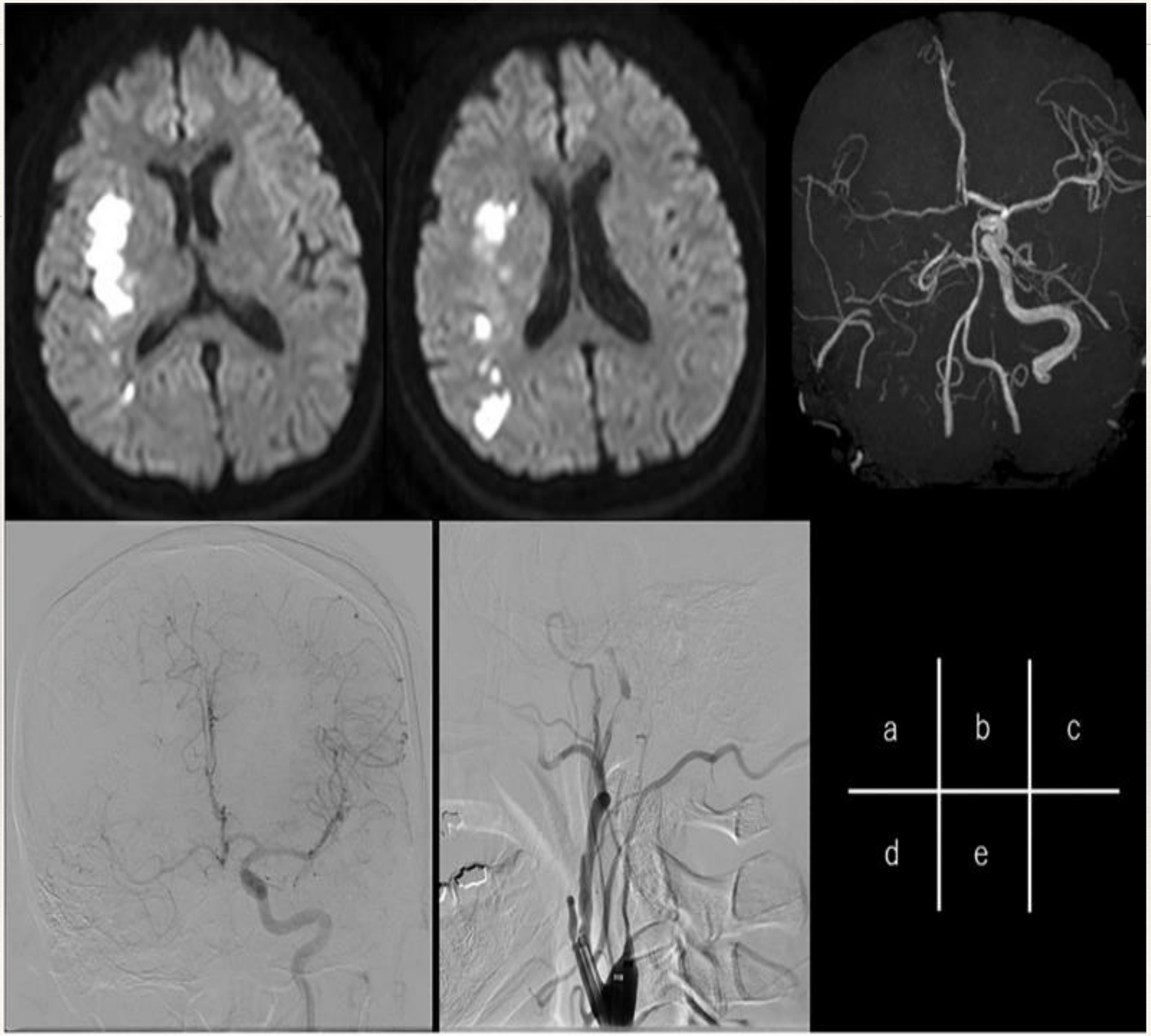
Interventional Neuroradiology
2018, Vol. 24(5) 533–539

DOI: 10.1177/1591019918776915
journals.sagepub.com/home/ine
SAGE

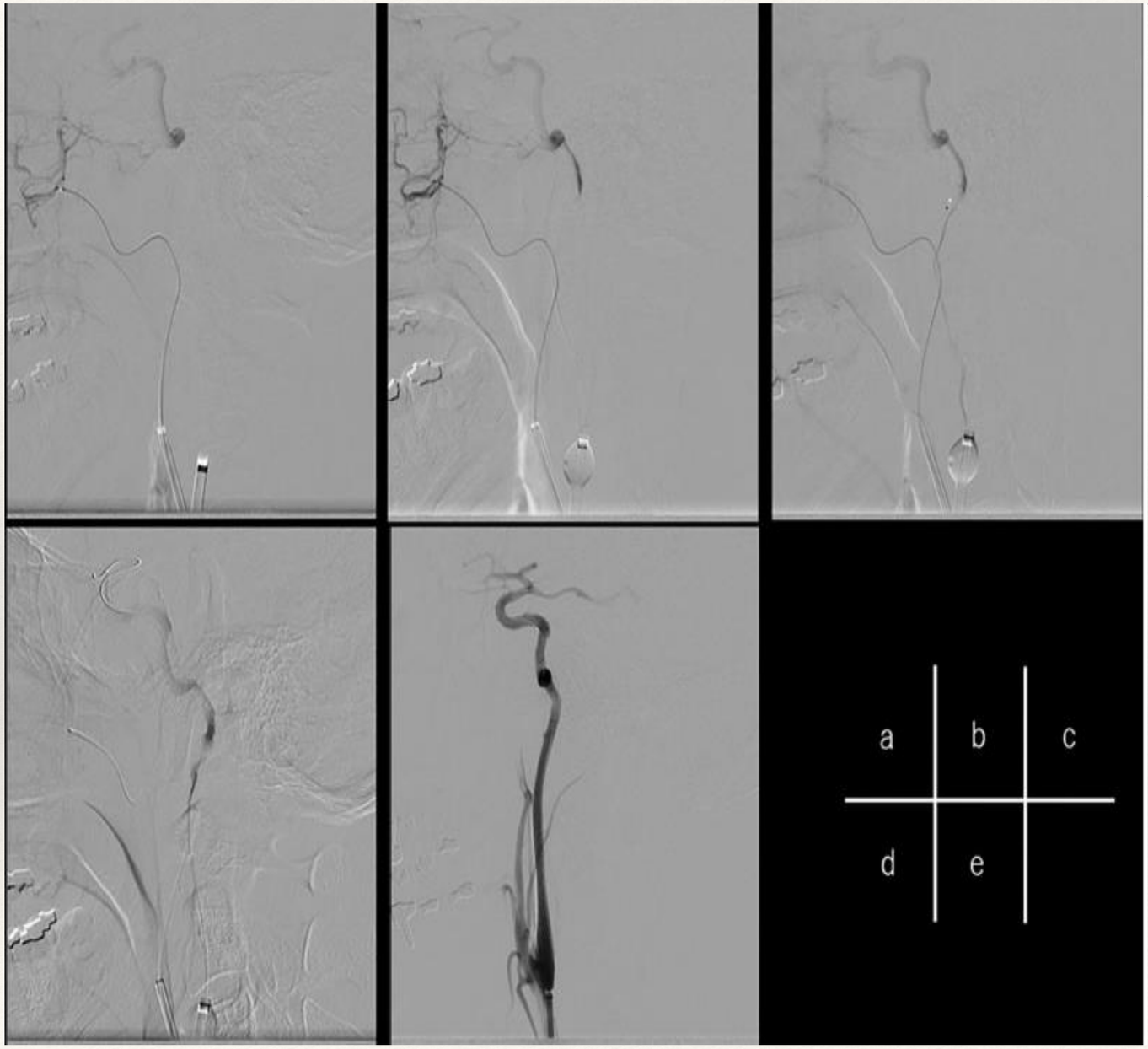
A novel technique to visualize true lumen in endovascular treatment of the occlusive carotid dissection and the usefulness of external–internal carotid collateral channel

Keiji Murata[1], Shigeru Yamauchi[1], Yuta Kaneshiro[1], Yumiko Urano[1], Keishi Yamagata[2] and Toshihiro Takami[3]

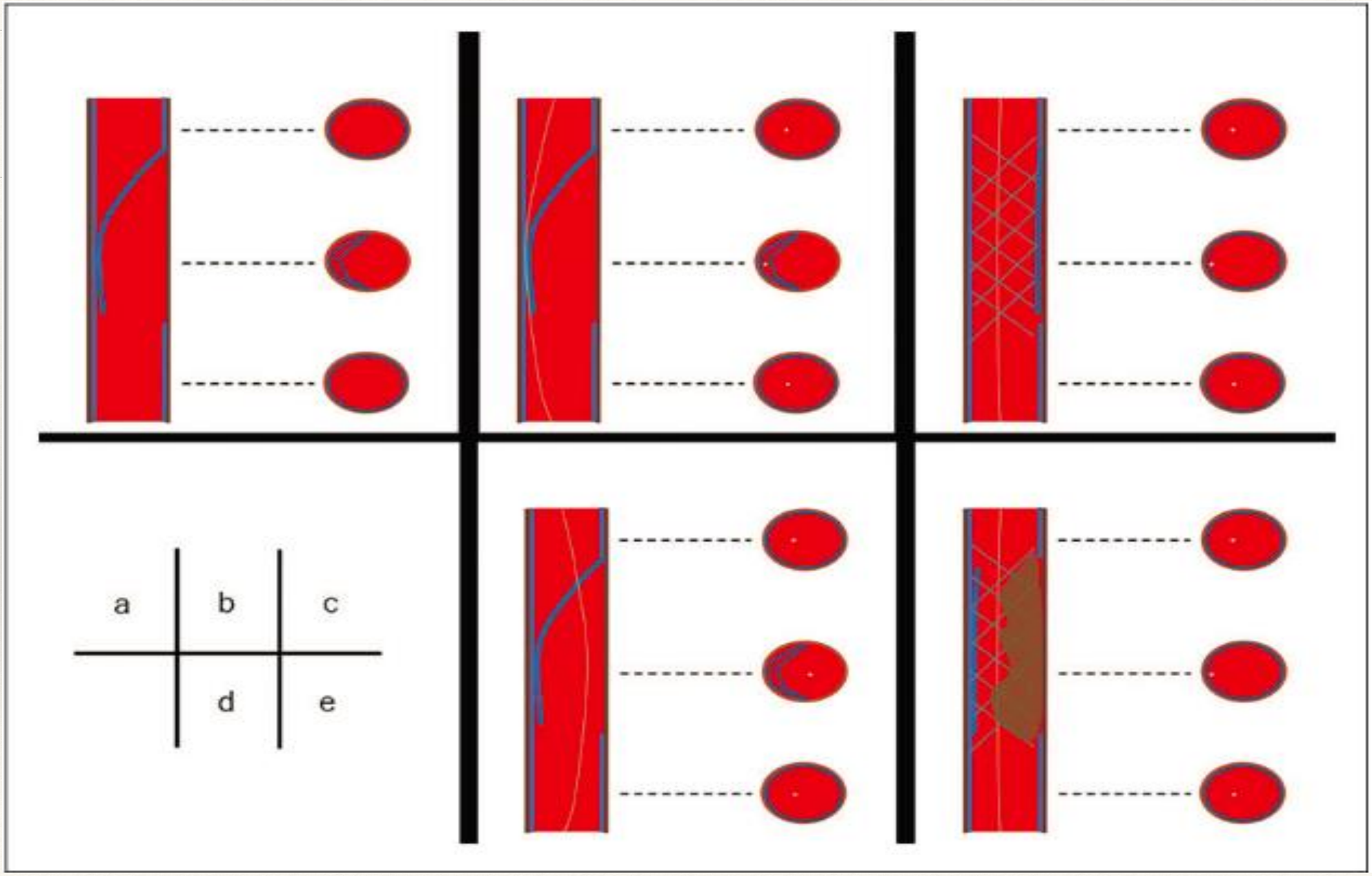




- Bilateral femoral ponksiyon
- DSA bilateral ICA
- İki klavuz kateter
  - 1. sağ ECA 6f Envoy
  - 2. Sağ ICA 9f Balon guiding Optimo



- a: İnternal maxiller arter vizüalize edildi
- b: ICA balonu şişirildi
- c: ICA aspire edilirken IMA süperselektif anjografi yapıldı
- d:Vizualize edilen gerçek lümenden klavuz tel gönderildi.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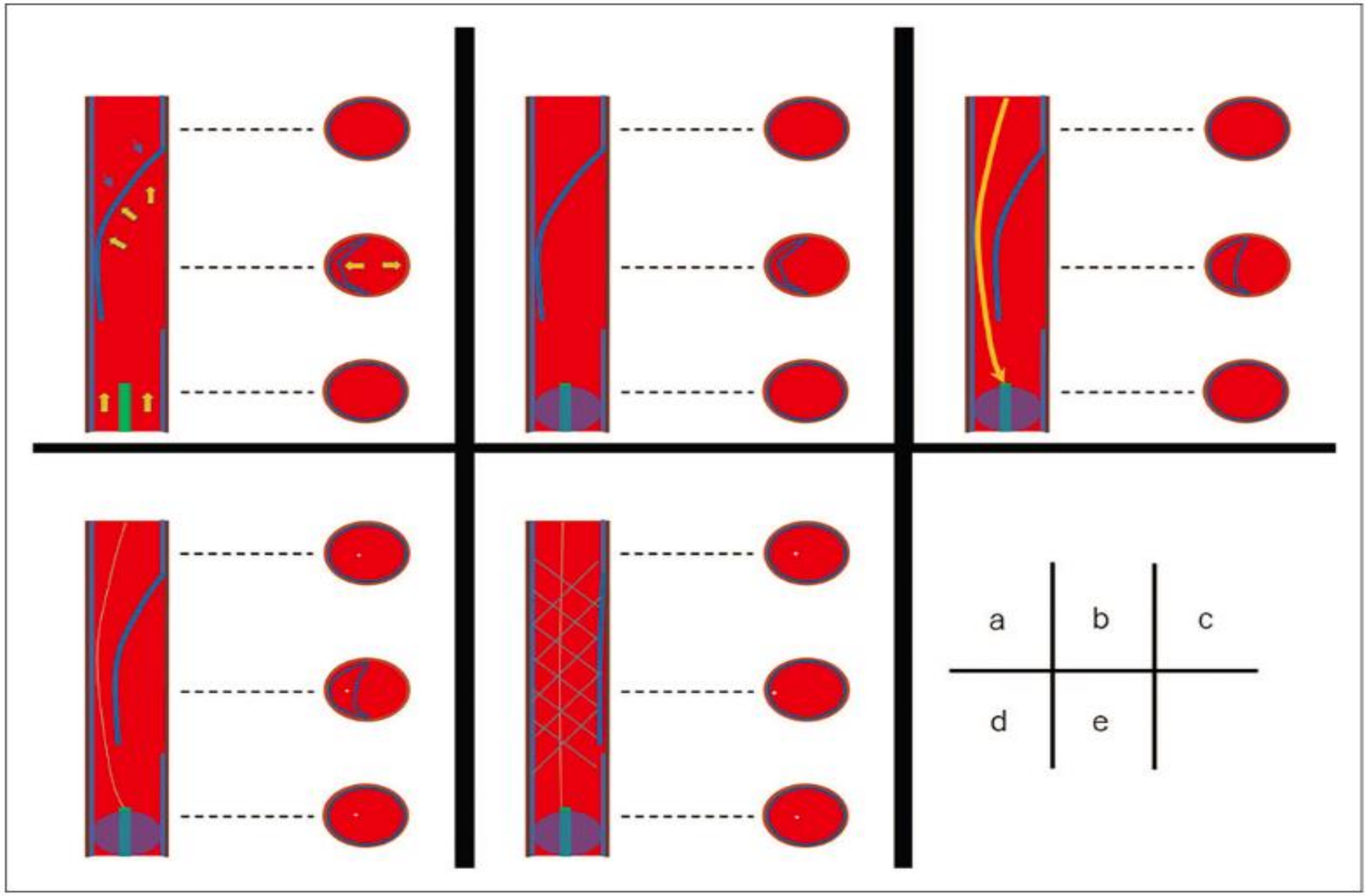
d
e


a
b
c
d
e

Teknik 1-?

- Guiding kateter >6F CCA kateterizasyonu,
- 0,014 hydrofilik tel ;
- 17,21, 27 mikrokateter access kateter ile gerçek lümen erişim,
- Tromboaspirasyon ve/veya trombektomi

Risk ?

Distal emboli

Teknik 2-?

2- a) **Balon guidin kateter** CCA kateterizasyonu

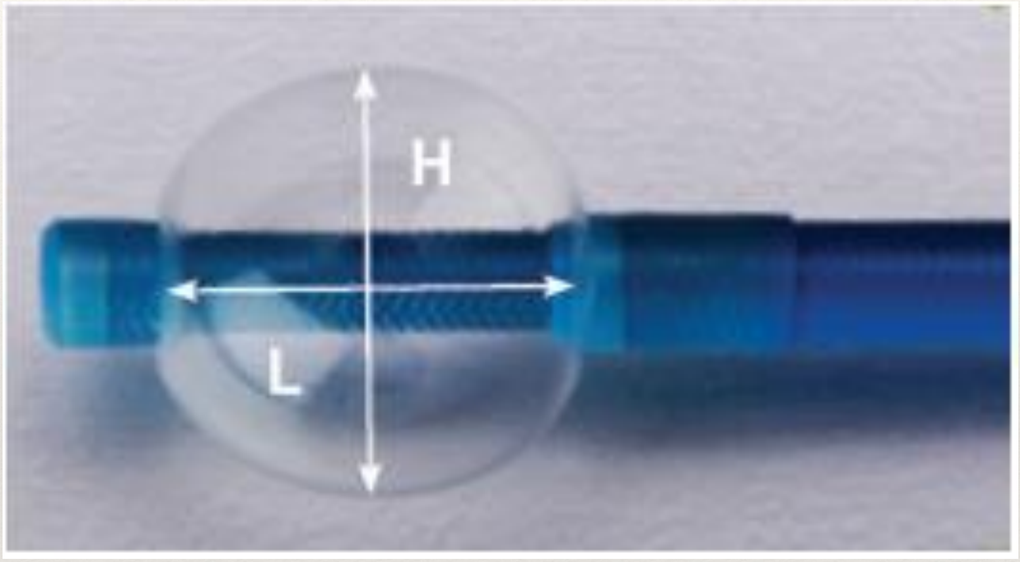
b) Geniş lümenli Acces kateter, 0,014 hidrofilik tel, mikrokateter gerçek lümen ve trombüs erişim

c) Tromboaspirasyon ve/ veya trombektomi

d) ICA stentleme !!!

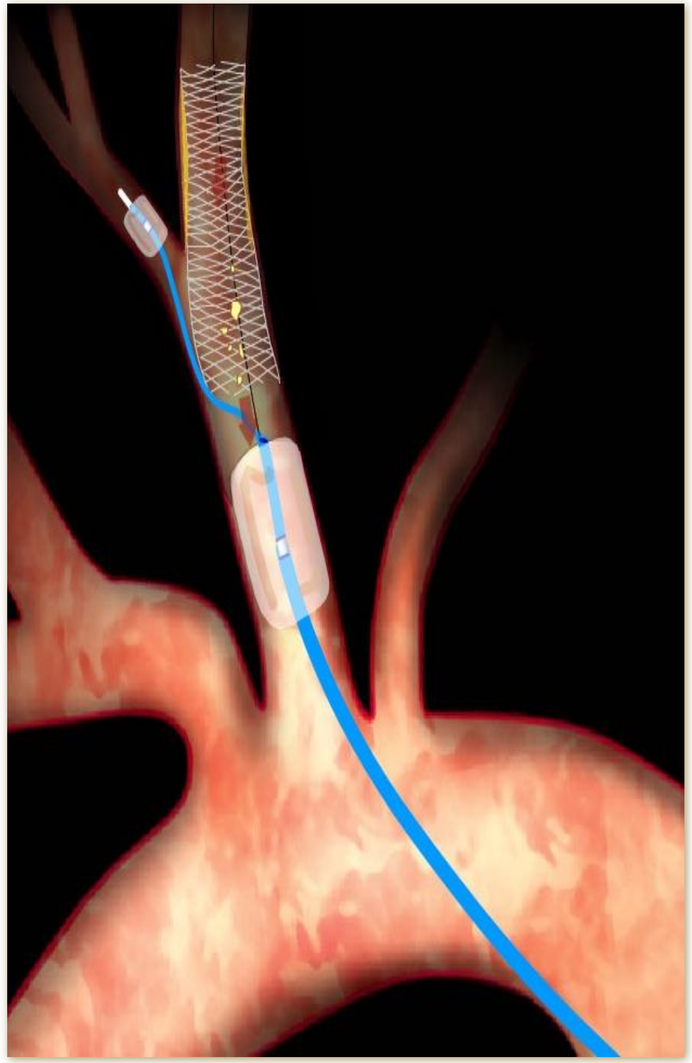
Balon guiding kateter

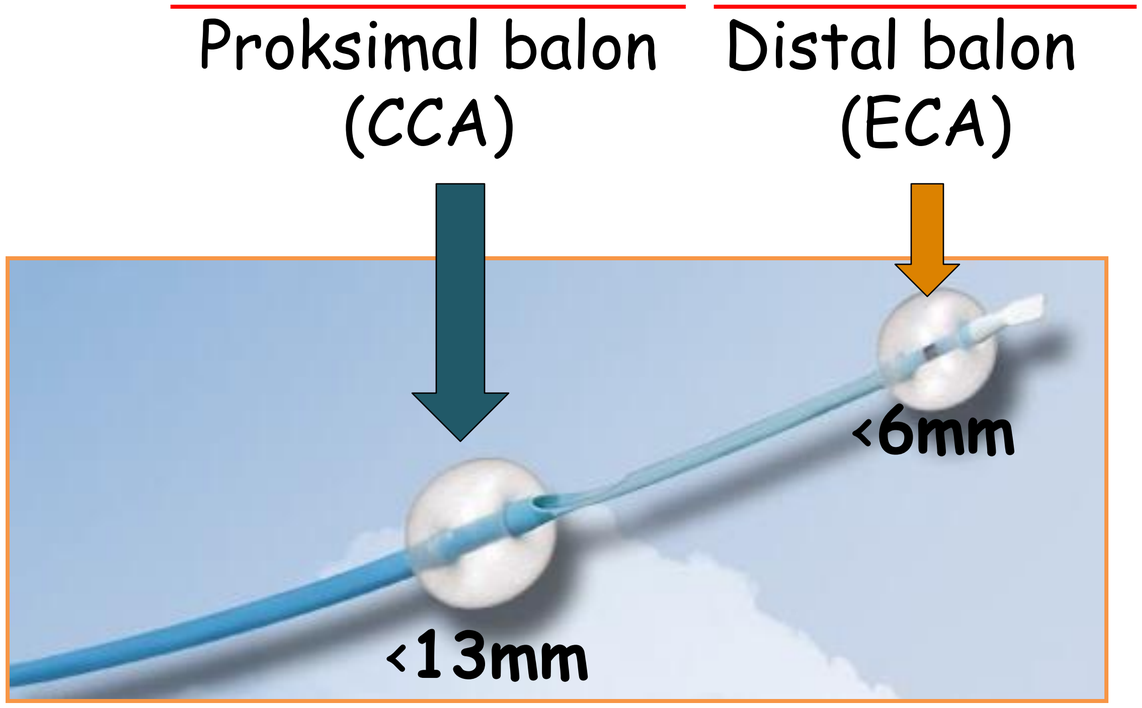
- CORAIL 8F (BALT)
- CELLO 8F (Medtronic)
- Concentric 8F, 9F (Stryker)
- MO.MA Ultra (Medtronic, INVAtec)
- FLOW-GATE (STRYKER)



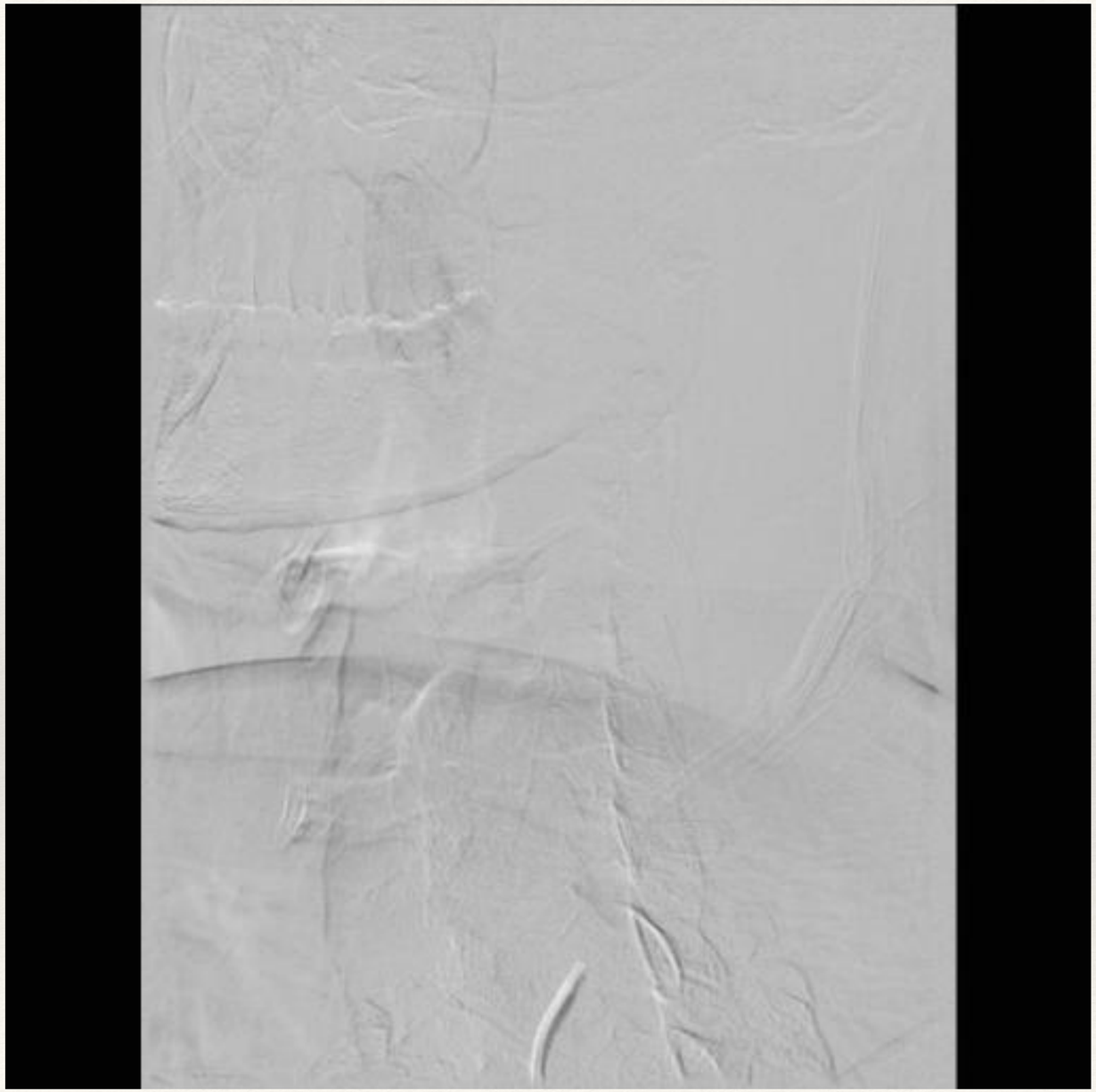
Balloon guide catheter improves recanalization, procedure time, and clinical outcomes with Solitaire in acute stroke: analysis of the NASA Registry. T Nguyen et al. J Neurointervent Surg 2013(5) A2-A3 2013. Stroke. 2014

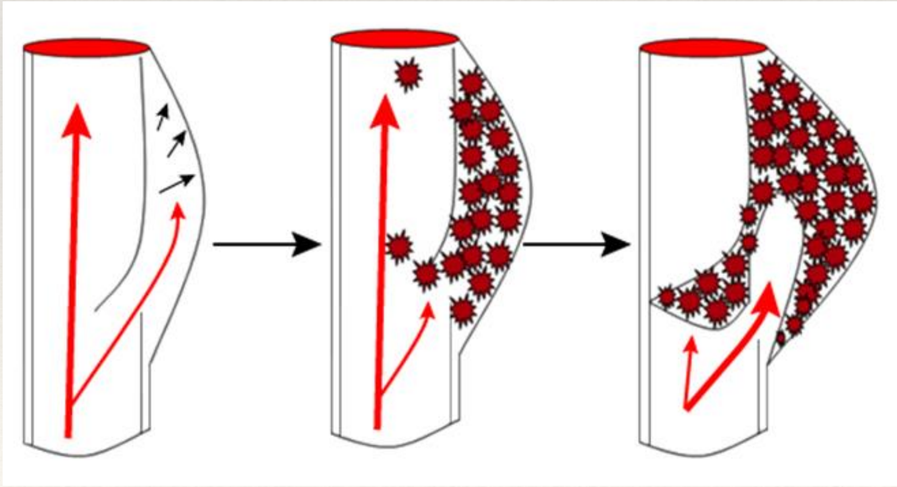
Proksimal koruma (Mo.Ma Sistemi)



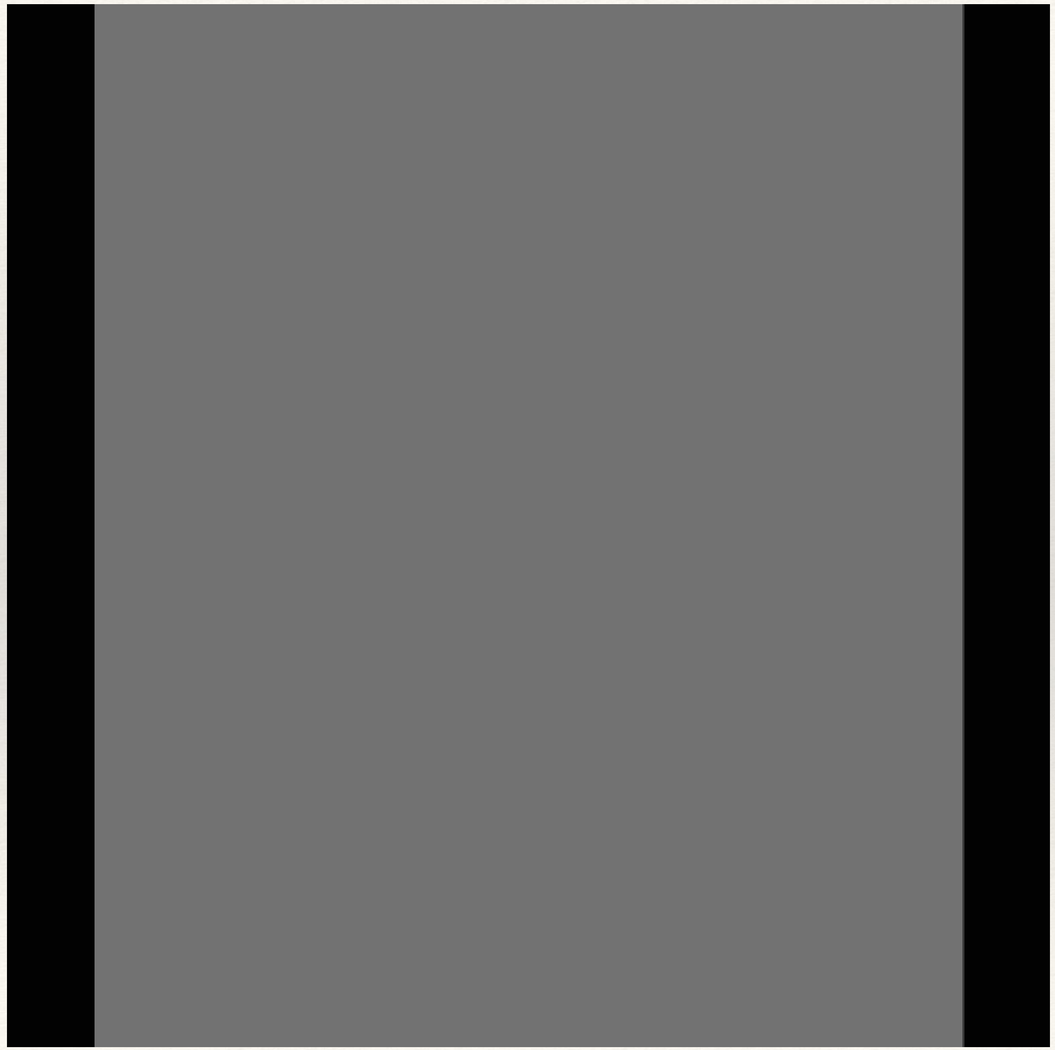


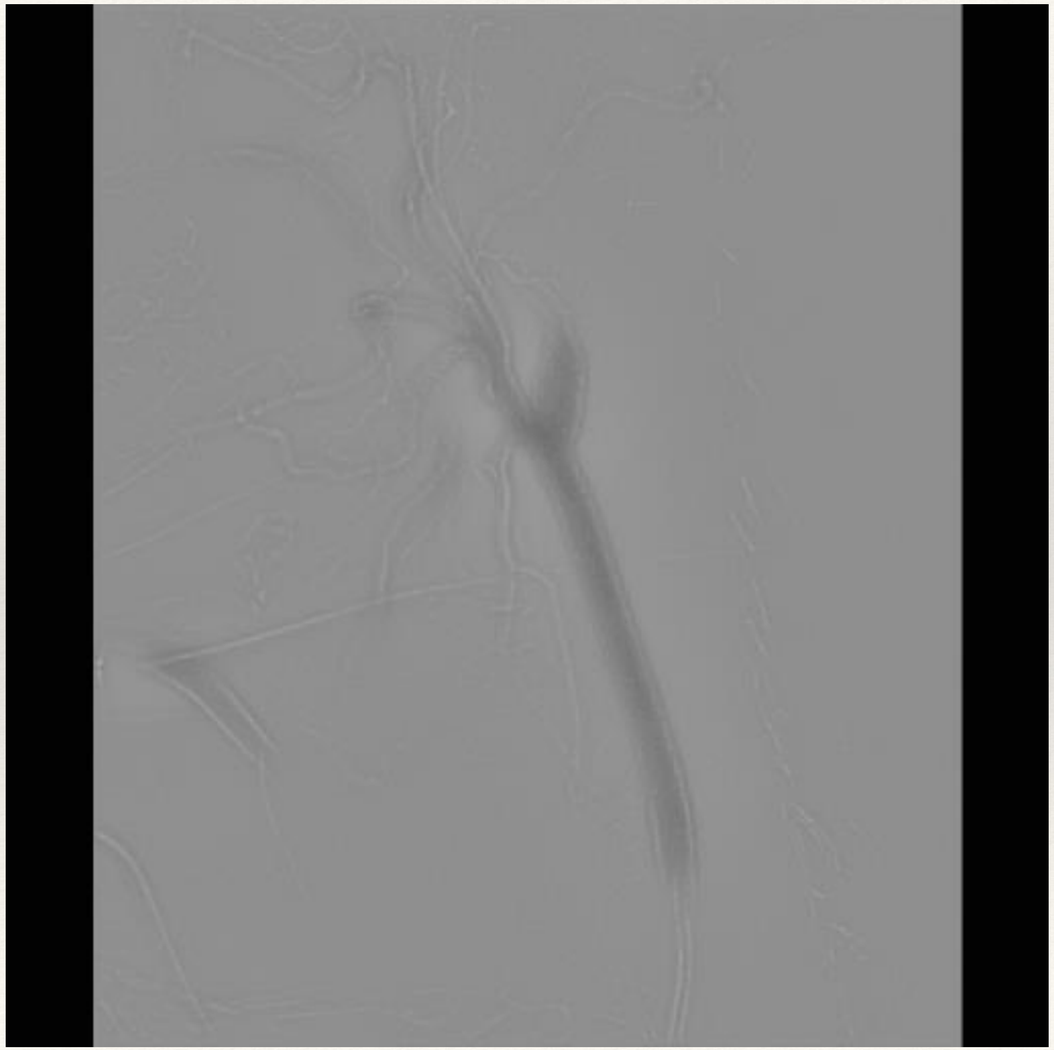
Sağ karotis anjiyografisi





ECA kanülasyonu

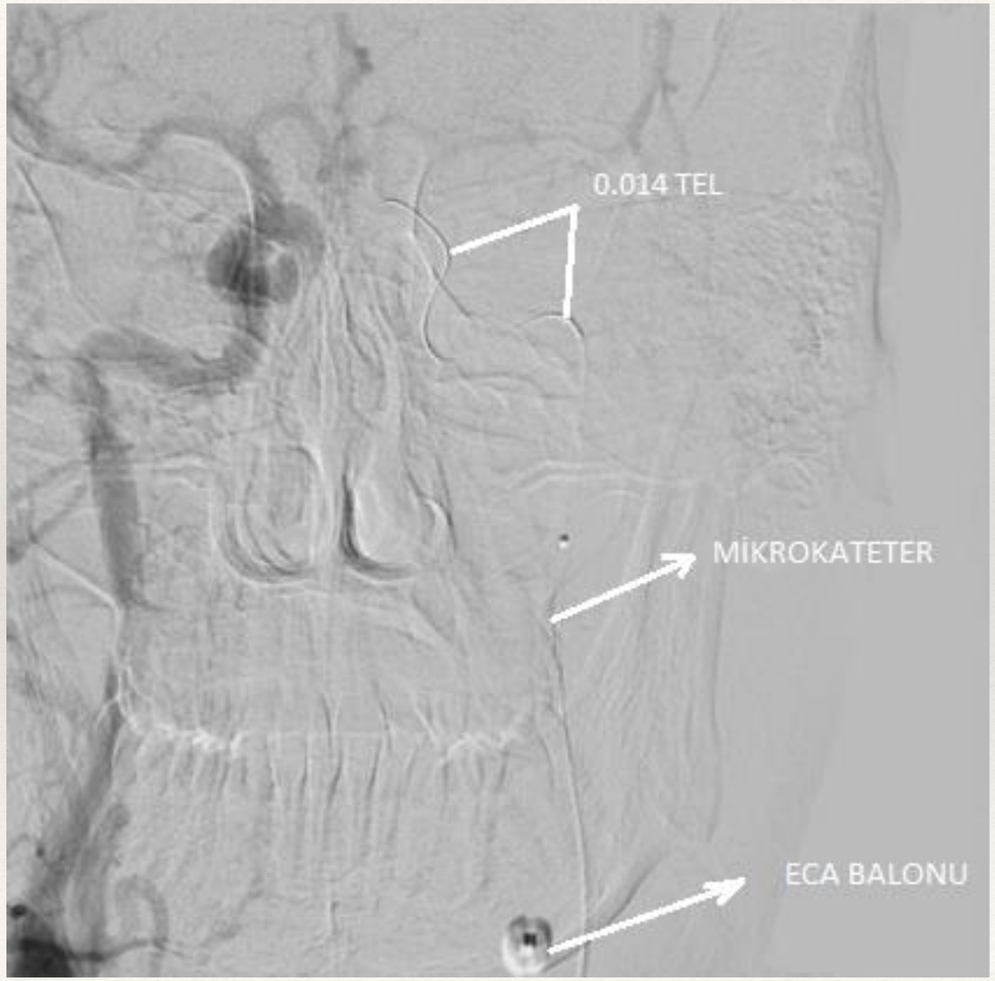




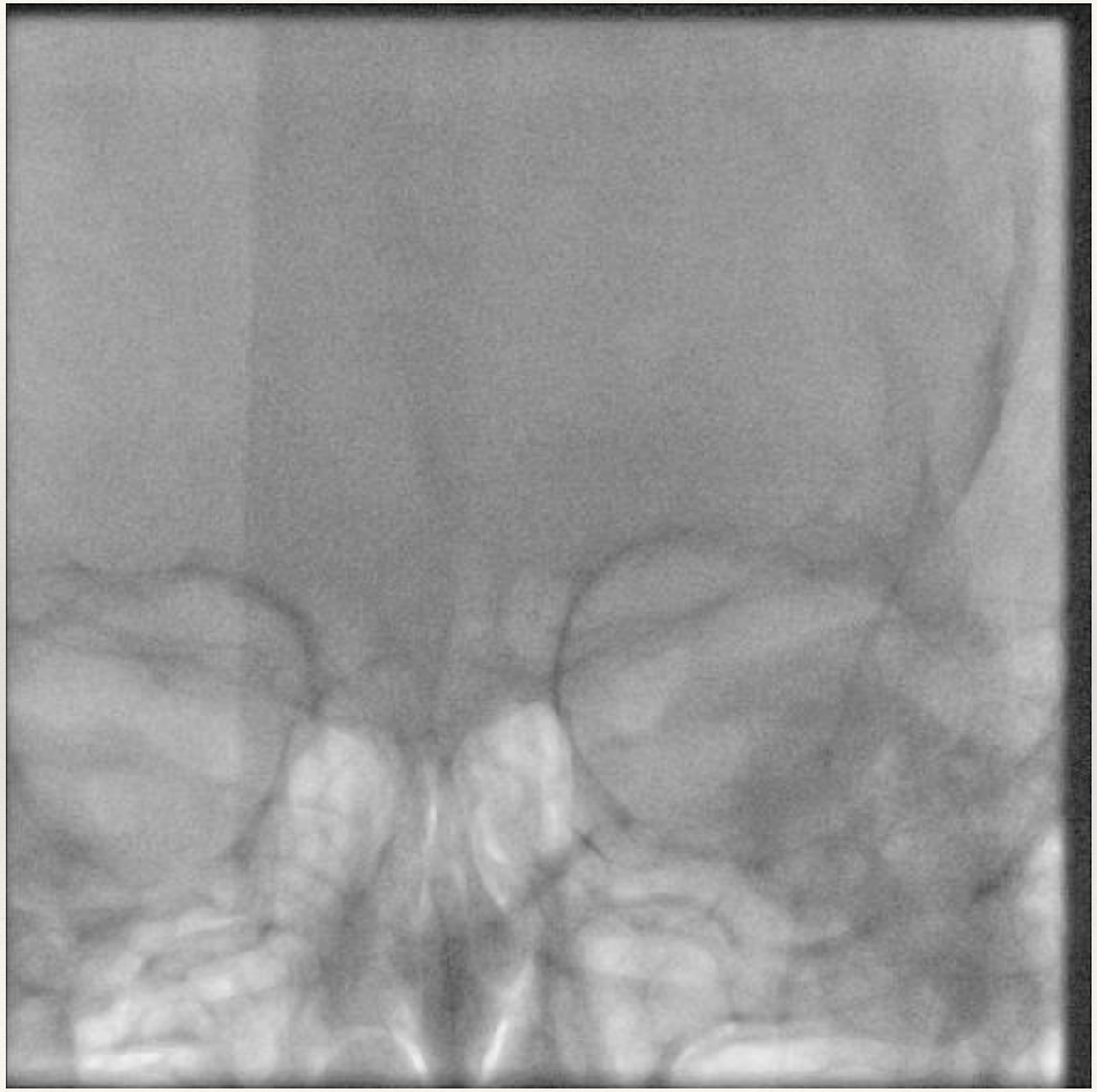
MO.MA yerleştirilmesi

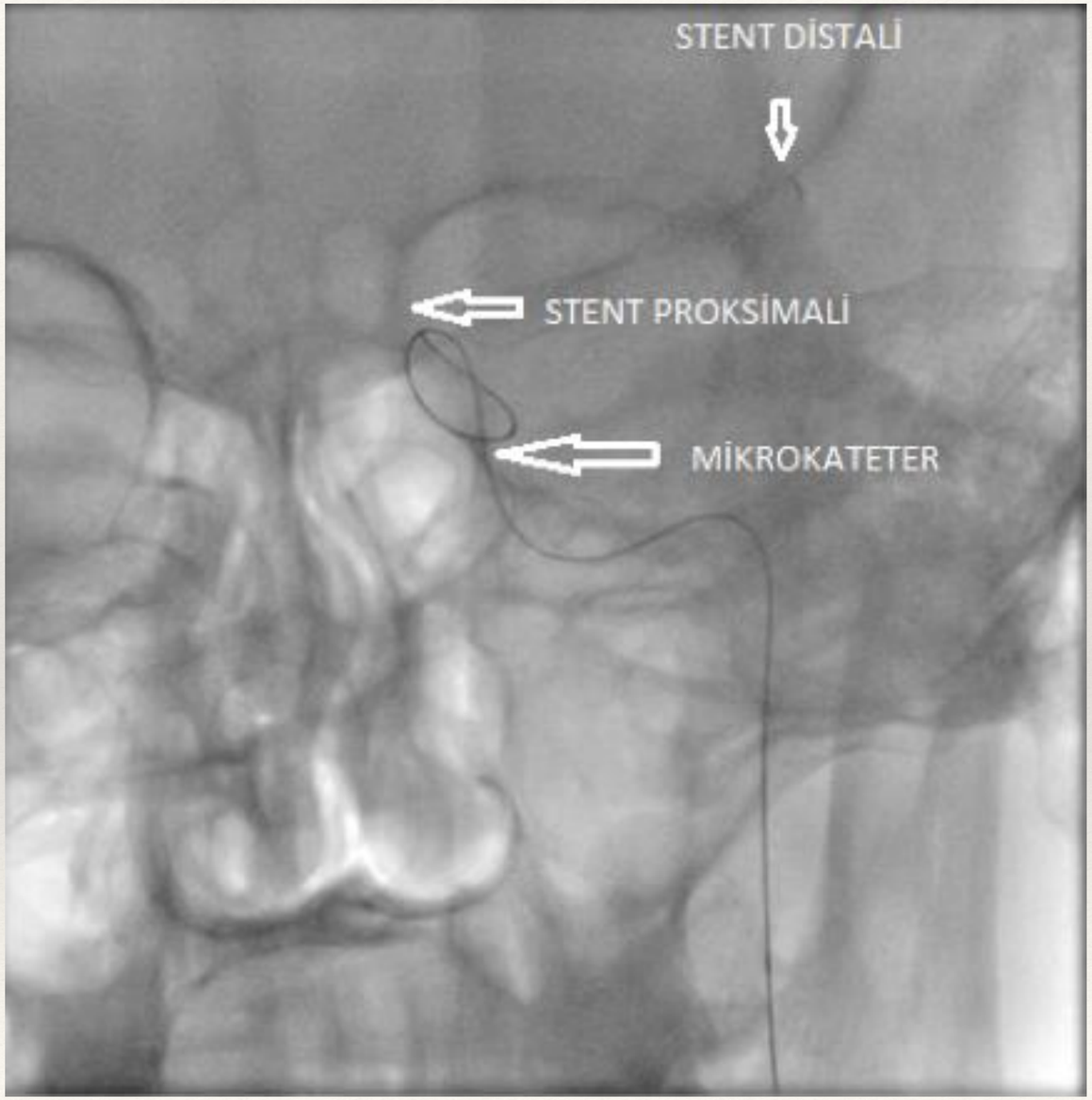
Sol femoralden ikinci ponksiyon sağ karotis diagnostik

Karşı taraftan opak enjeksiyonu ile trombüs görüntülendi

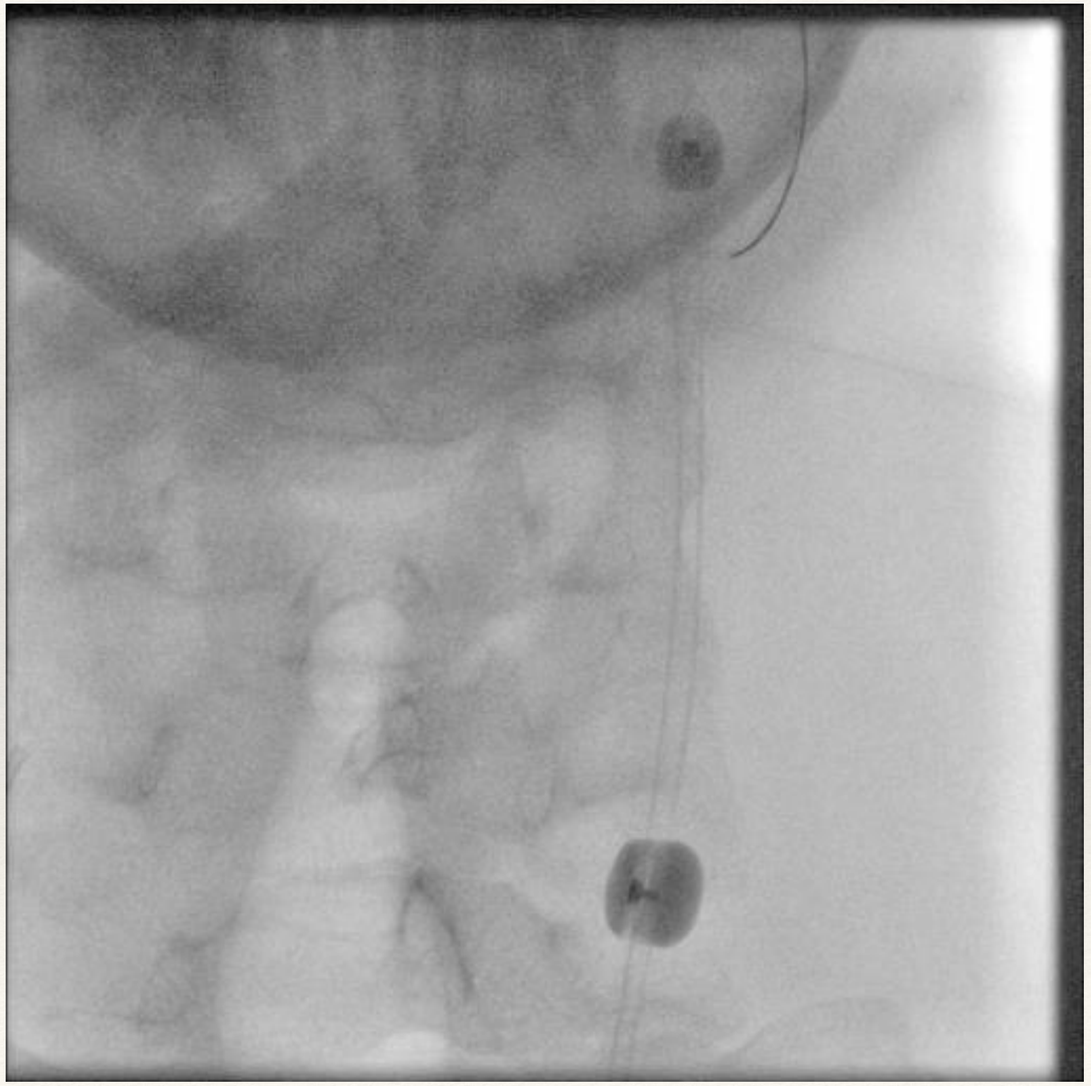


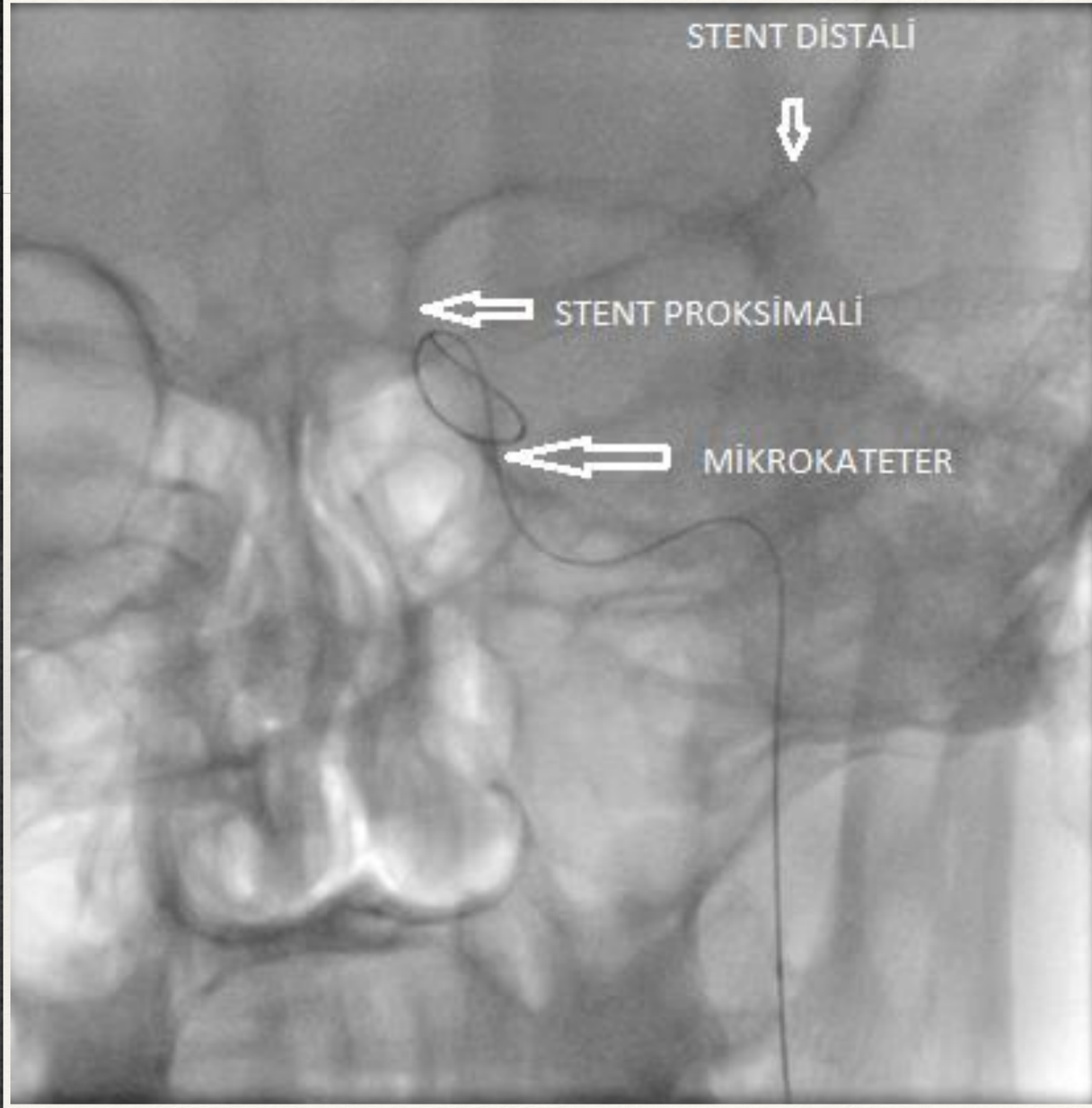
Mikrokateter uç enjeksiyonu



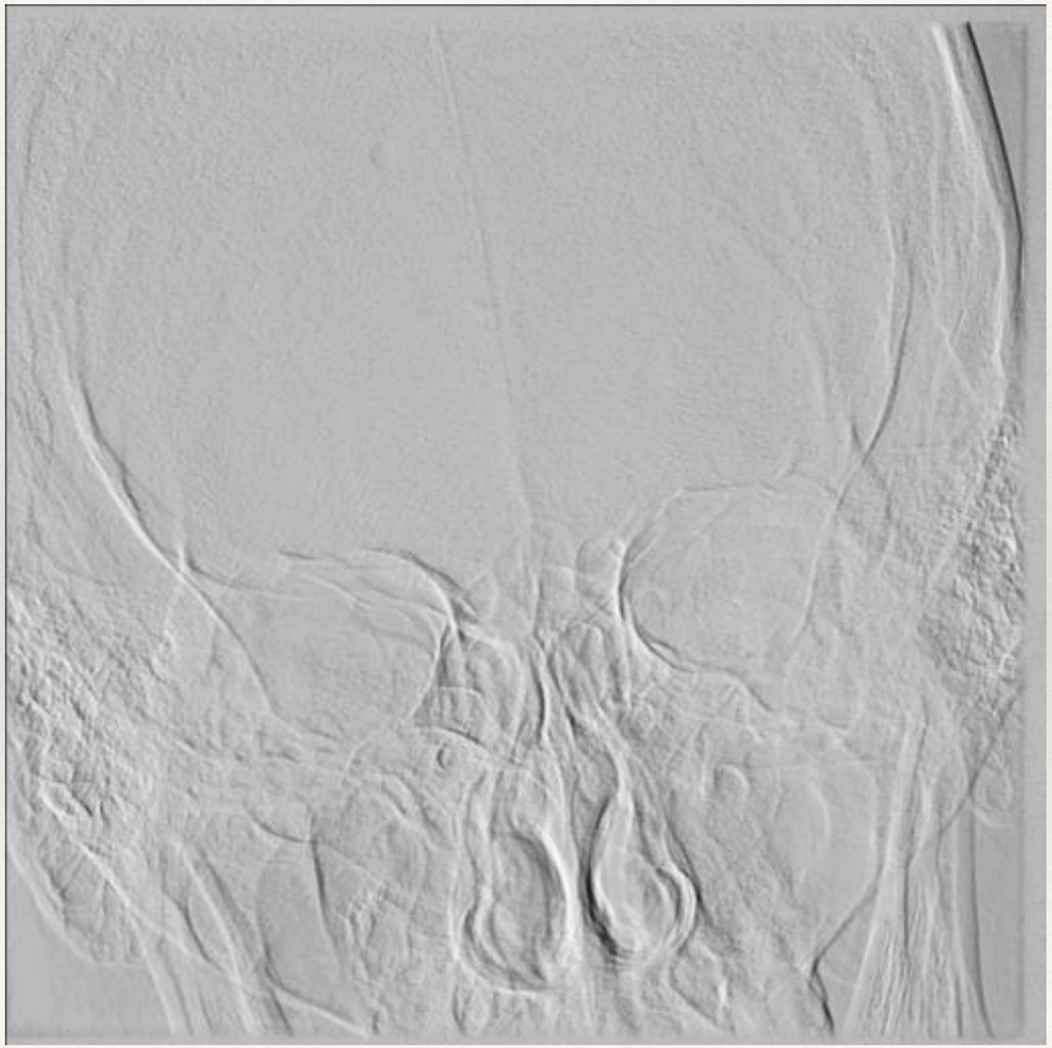

STENT DİSTALİ
STENT PROKSİMALİ
MİKROKATETER

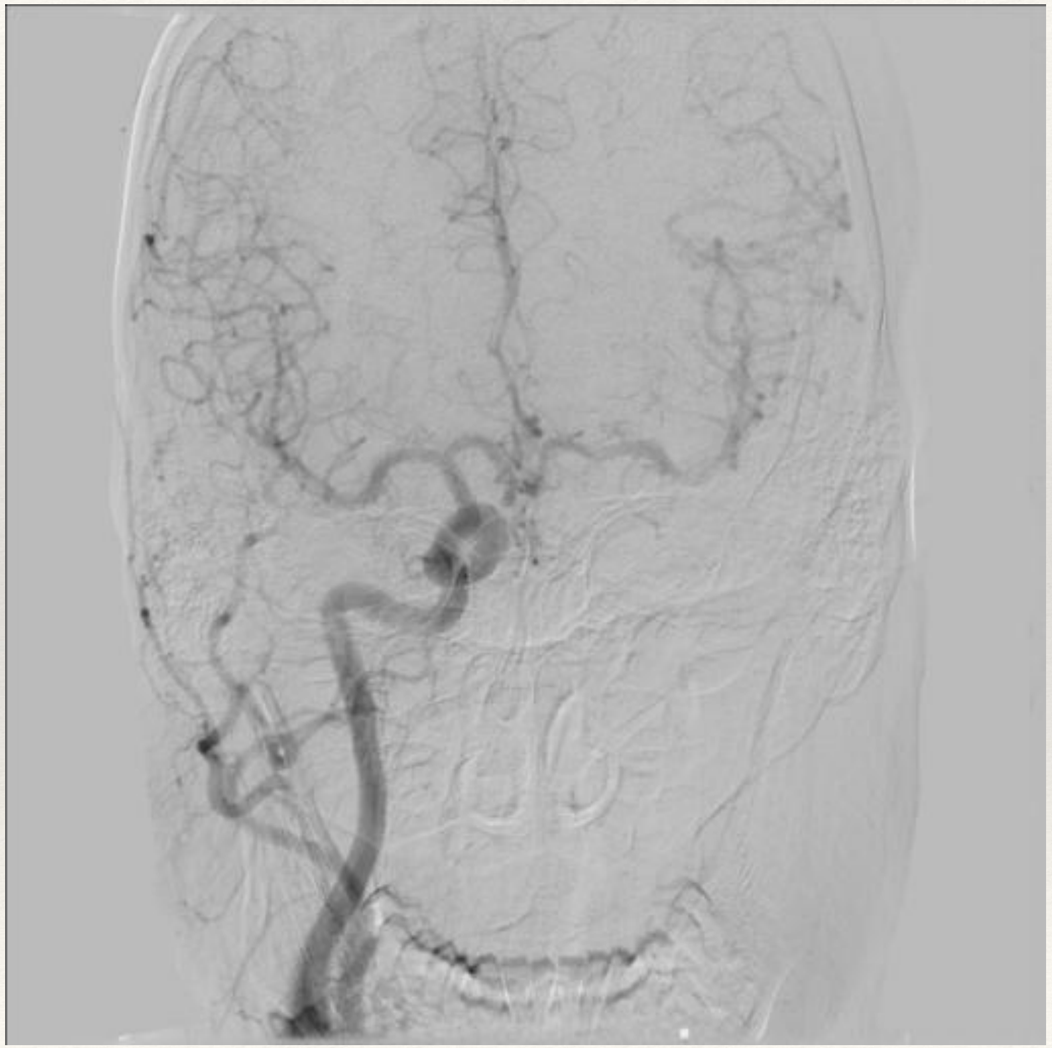
MO.MA balonu şişirildi



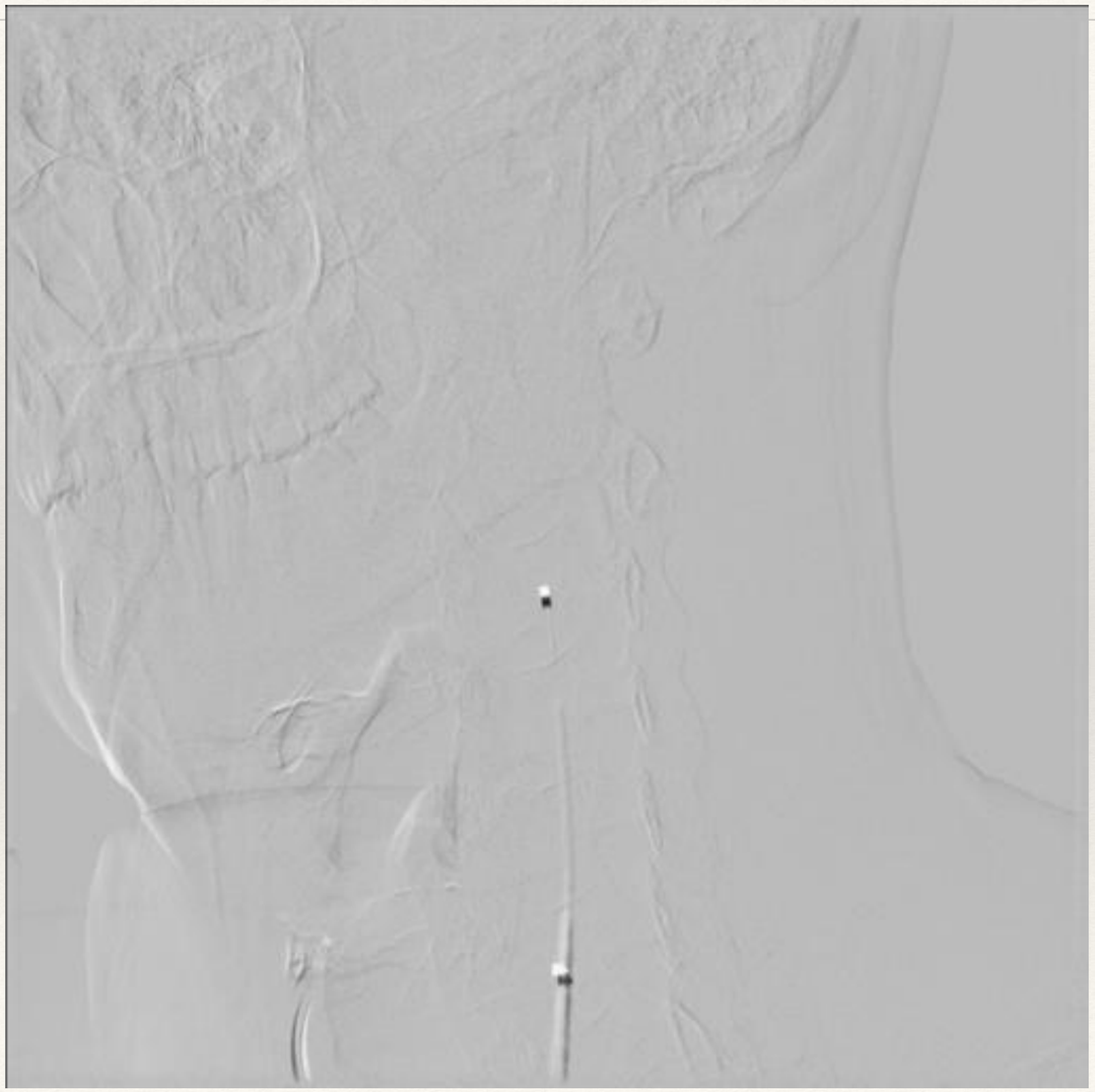

STENT DİSTALİ
STENT PROKSİMALİ
MİKROKATETER

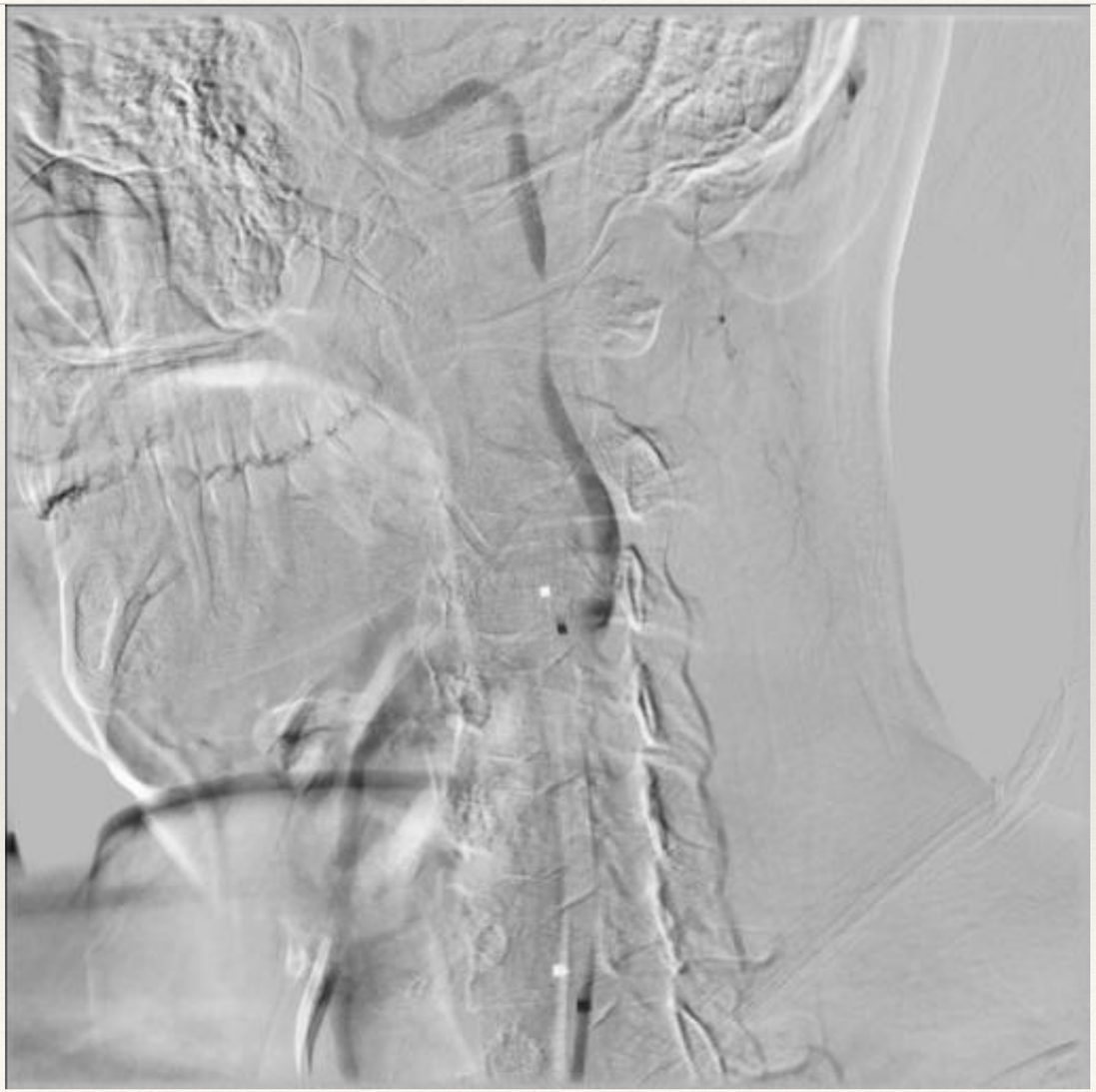
Final Beyin Anjiografi



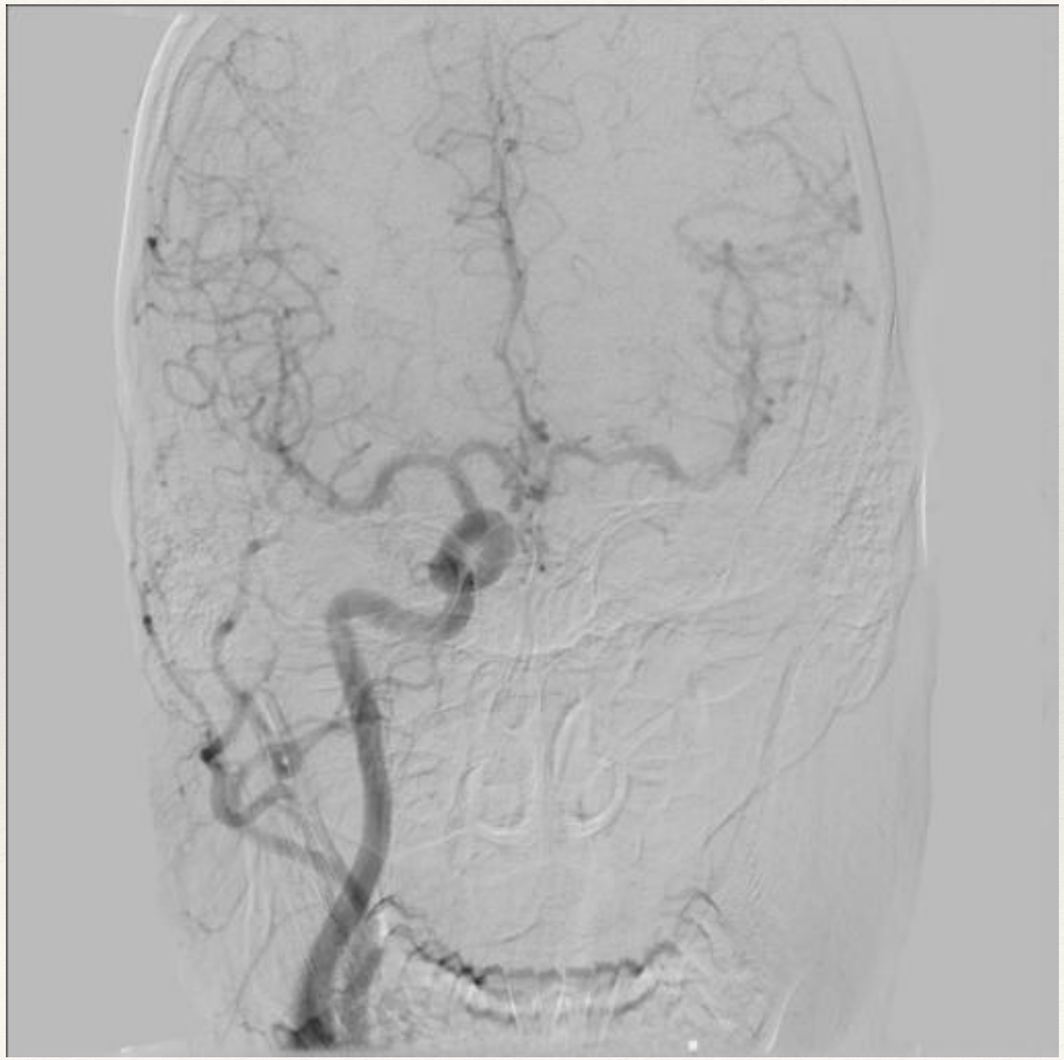


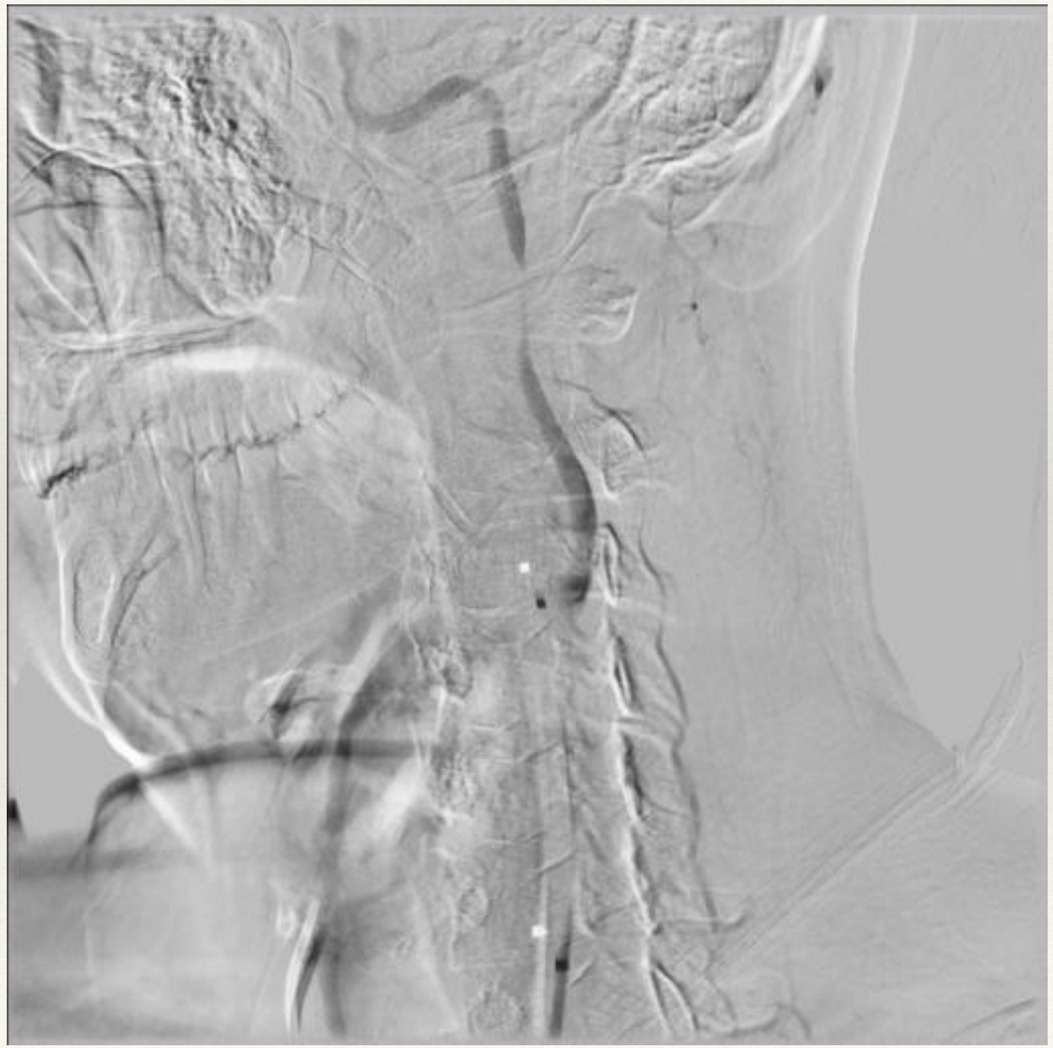
Final sol karotis diagnostik

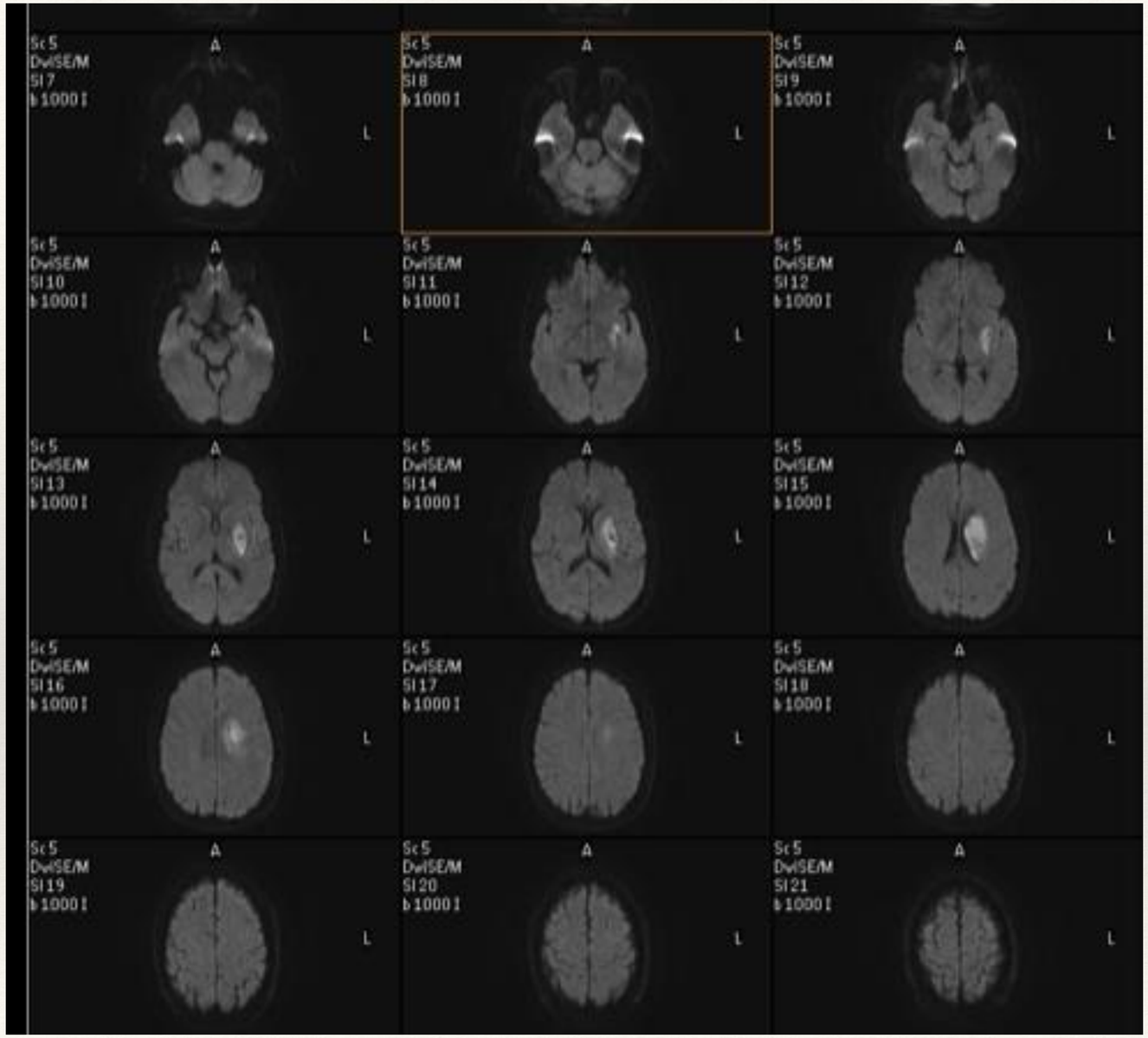




Sol ICA stent gerekir mi?






Sc 5
DwISE/M
SI 7
b 1000 I
Sc 5
DwISE/M
SI 8
b 1000 I
Sc 5
DwISE/M
SI 9
b 1000 I
Sc 5
DwISE/M
SI 10
b 1000 I
Sc 5
DwISE/M
SI 11
b 1000 I
Sc 5
DwISE/M
SI 12
b 1000 I
Sc 5
DwISE/M
SI 13
b 1000 I
Sc 5
DwISE/M
SI 14
b 1000 I
Sc 5
DwISE/M
SI 15
b 1000 I
Sc 5
DwISE/M
SI 16
b 1000 I
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SI 17
b 1000 I
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b 1000 I
Sc 5
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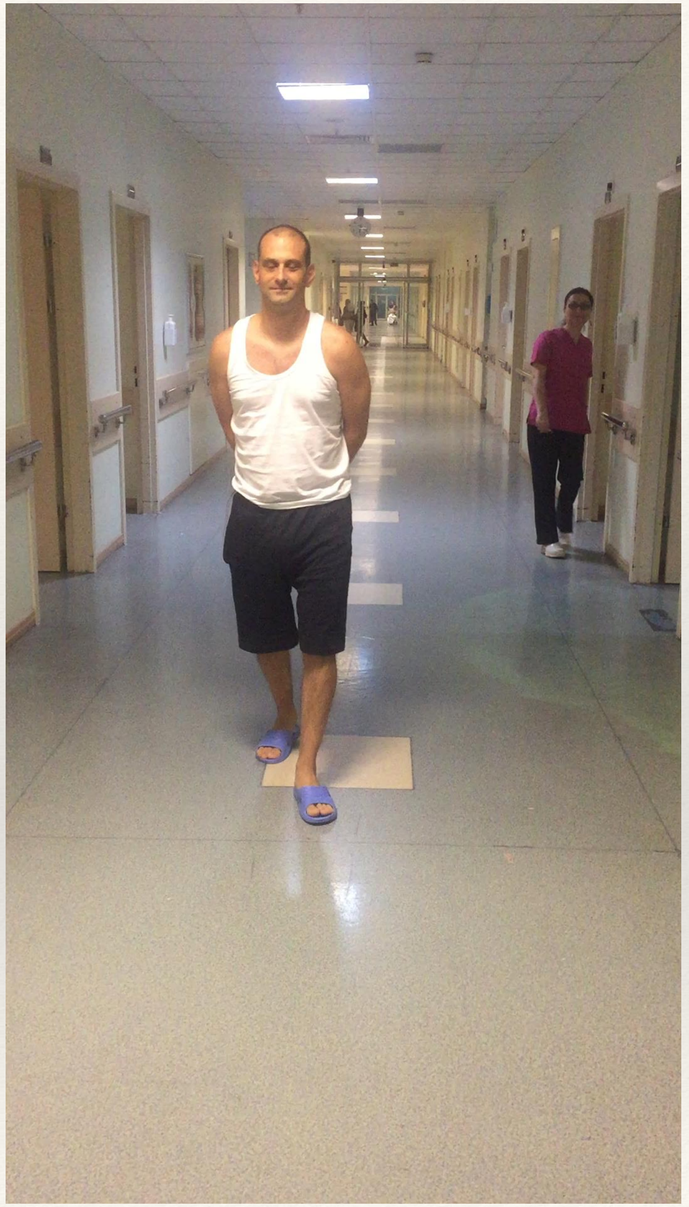
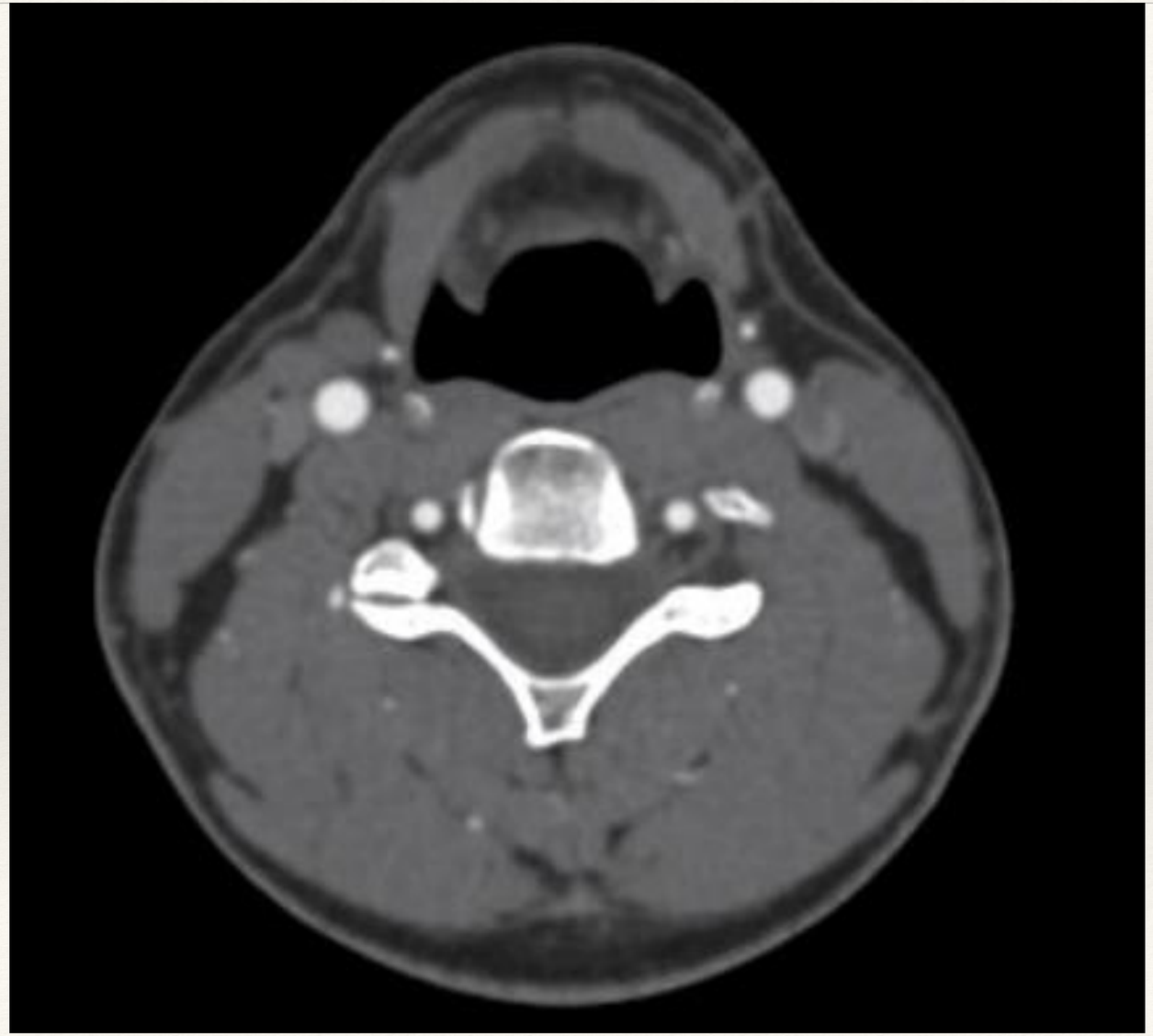
SI 21
b 1000 I



3. ay BTA



- 3 ay antikoagüle edildi
- 3. ay mRS 0
- Uzun dönem takip ASA 100 mg

Eve götürülecek mesajlar

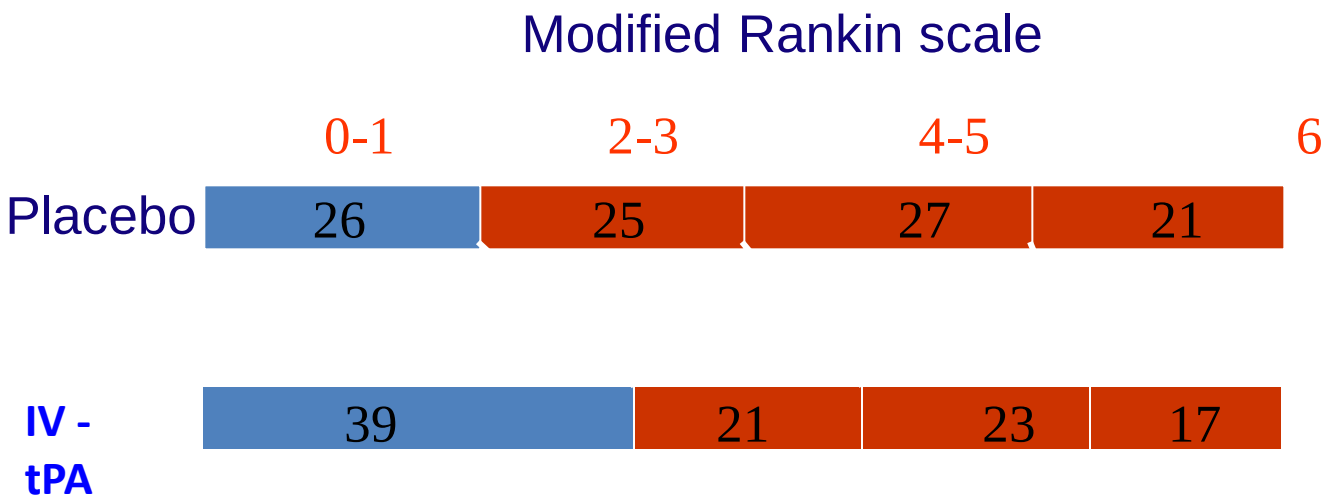
- Akut ICA diseksiyonunan bağlı inme tedavisinde ilk 4.5 saatte Iv rtPA düşünülmelidir. (Class IIb)
- Tandem oklüzyonlarında retrograd yaklaşım özellikle Willis halkası patent olan hastalarda öncelikli tercih edilebilir.
- Reperfüzyona kadar geçen sürenin daha kısa olması nedeniyle retrograd yaklaşım antegrad yaklaşımdan daha iyi fonksiyonel sonuç sağlayabilir.
- Tandem oklüzyonlerın etiyolojileri değişken olabildiğinden tedavi seçenekleri kişiselleştirilmelidir.


teşekkürler

IV Trombolitik Tedavi Endovasküler Tedavi Öncesi Verilmeli Midir?

DOÇ.DR EMRAH AYTAÇ

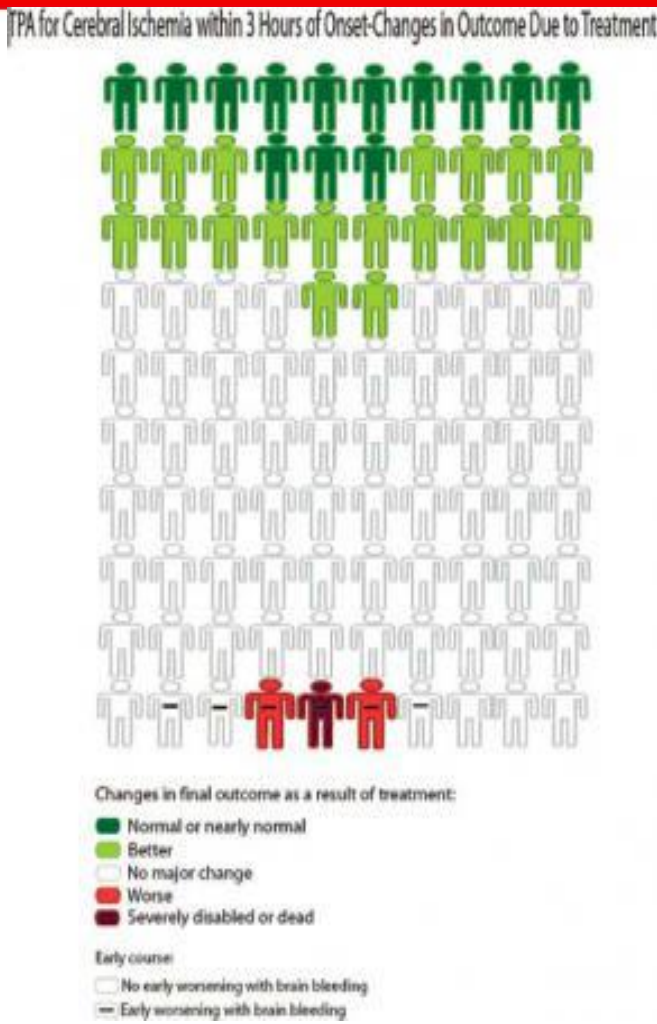
NINDS Study



Benefical effect of IV-tpa

- IV thrombolitik Class I level of evidence in acute ischemic stroke

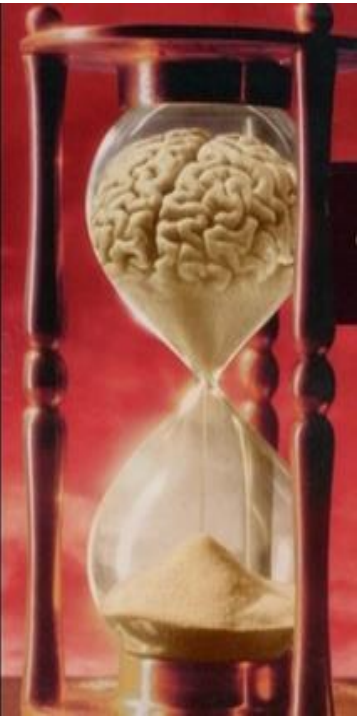
- IV Thrombolytic Tedavi ile : 1/8.3 (%12) (normal or nearly normal)



- Tissue plasminogen activator for acute ischemic stroke. The National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group. N Engl J Med 1995; 333:1581-1588

-

Lancet NINDS, ECASS, ATLANTIS meta-analysis



İmprovement after 3 months

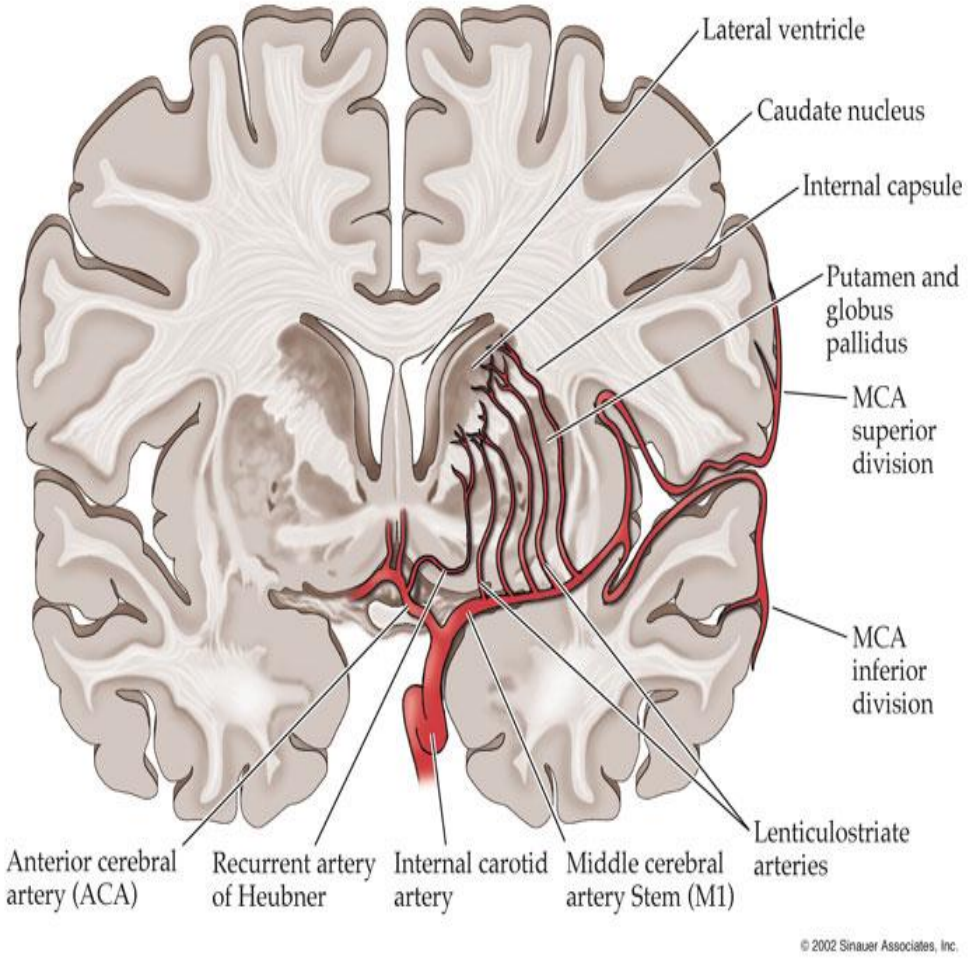
TİME (min)	*Treatment (n)*	*Odds ratio*
0-90	t-PA (181) Placebo (150)	2.81
91-180	t-PA (302) Placebo (315)	1.55
181-270	t-PA (390) Placebo (411)	1.40
271-360	t-PA (538) Placebo (508)	1.15

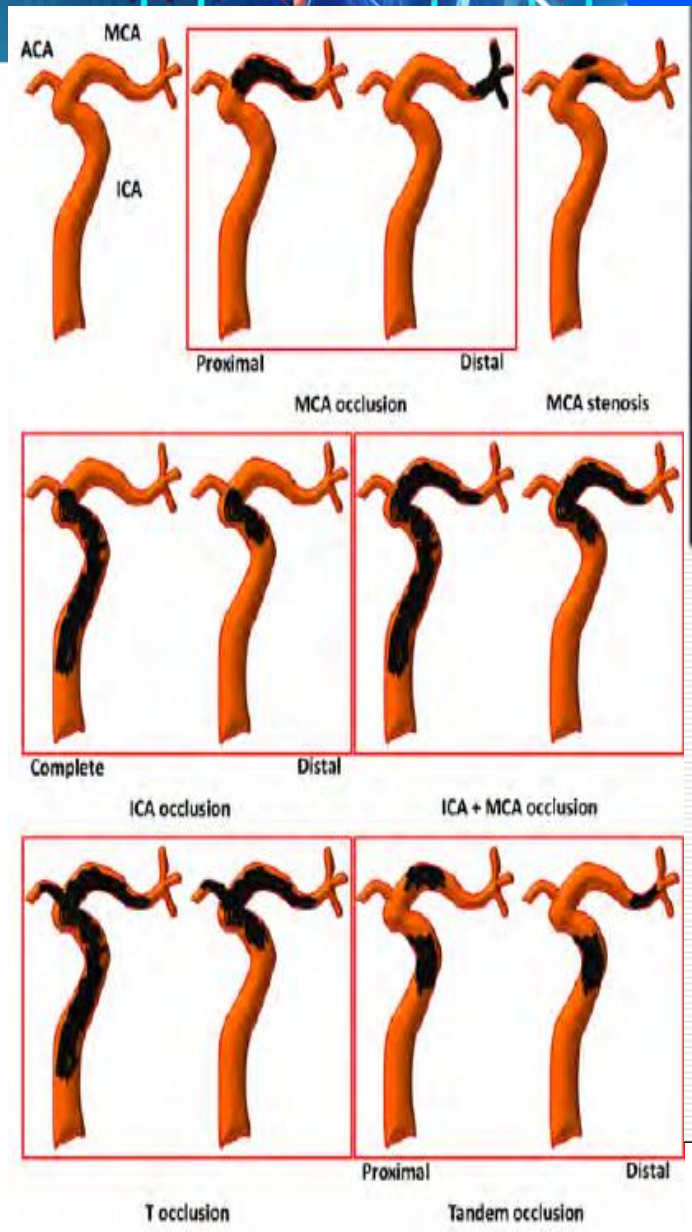
Association of outcome with early stroke treatment: pooled analysis of ATLANTIS, ECASS, and NINDS rt-PA stroke trials. Lancet 2004; 363: 768–74

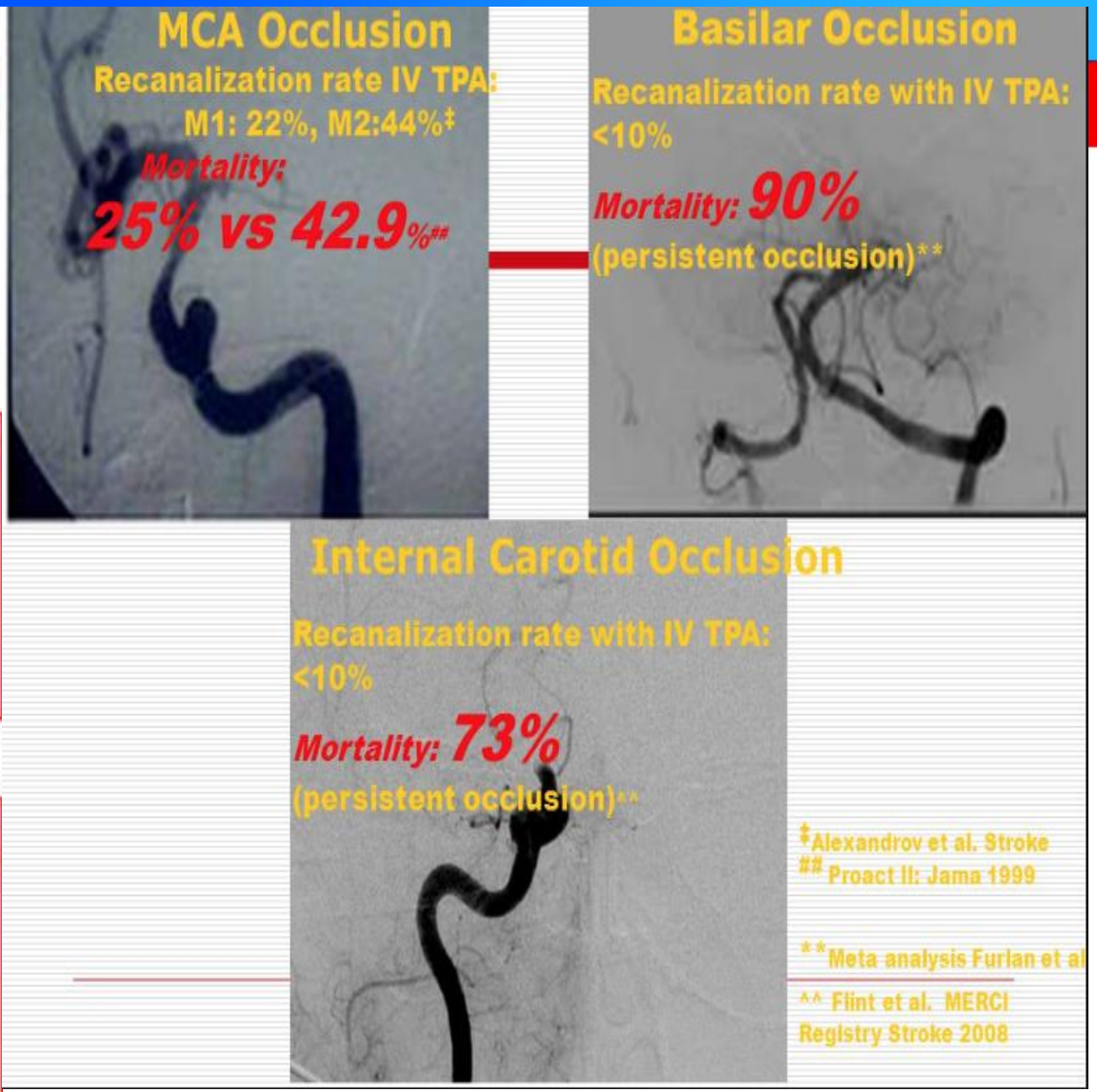
Recanalization ratio with IV rt-PA

- ICA-MCA %10
- ICA %15

- M1 %20
- M2-3 %44
- Basiler %10



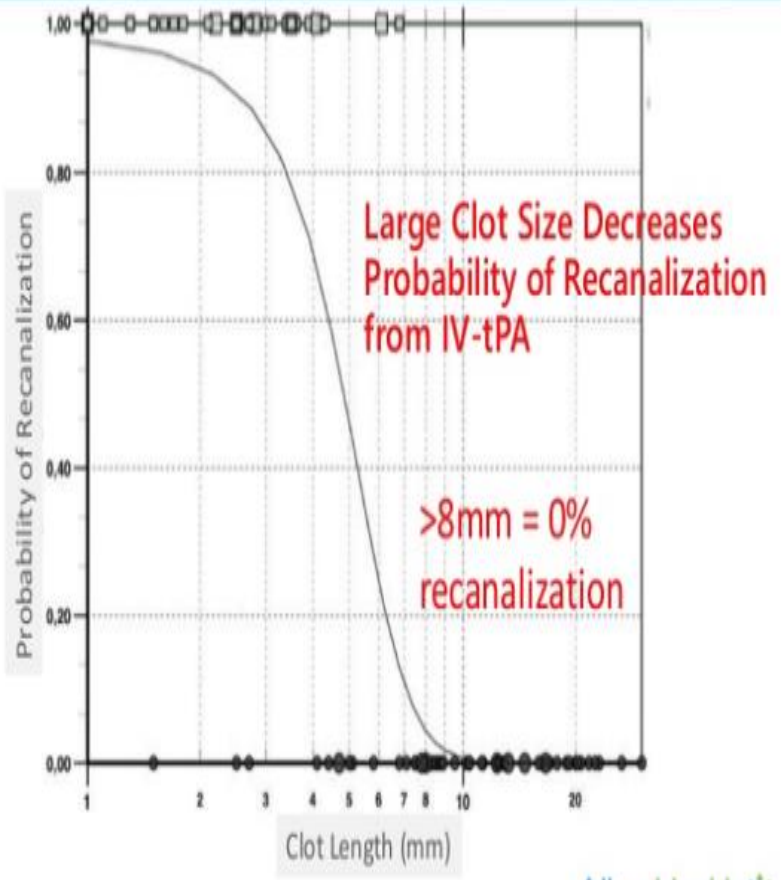




Malferrari G et al. et alNeurosonological Evaluation of the Acute Stroke Patients. DOI: 10.5772/24348

- American Heart Association/American Stroke Association guidelines uygun hastalarda halen trombektomi öncesi ıv trombolitik verilmesini önermektedir

- Bununla birlikte, mekanik trombektomi öncesi intravenöz trombolizin hastalara herhangi bir ek fayda sağlayıp sağlamadığı belirsizliğini korumaktadır.



3.7. Mechanical Thrombectomy

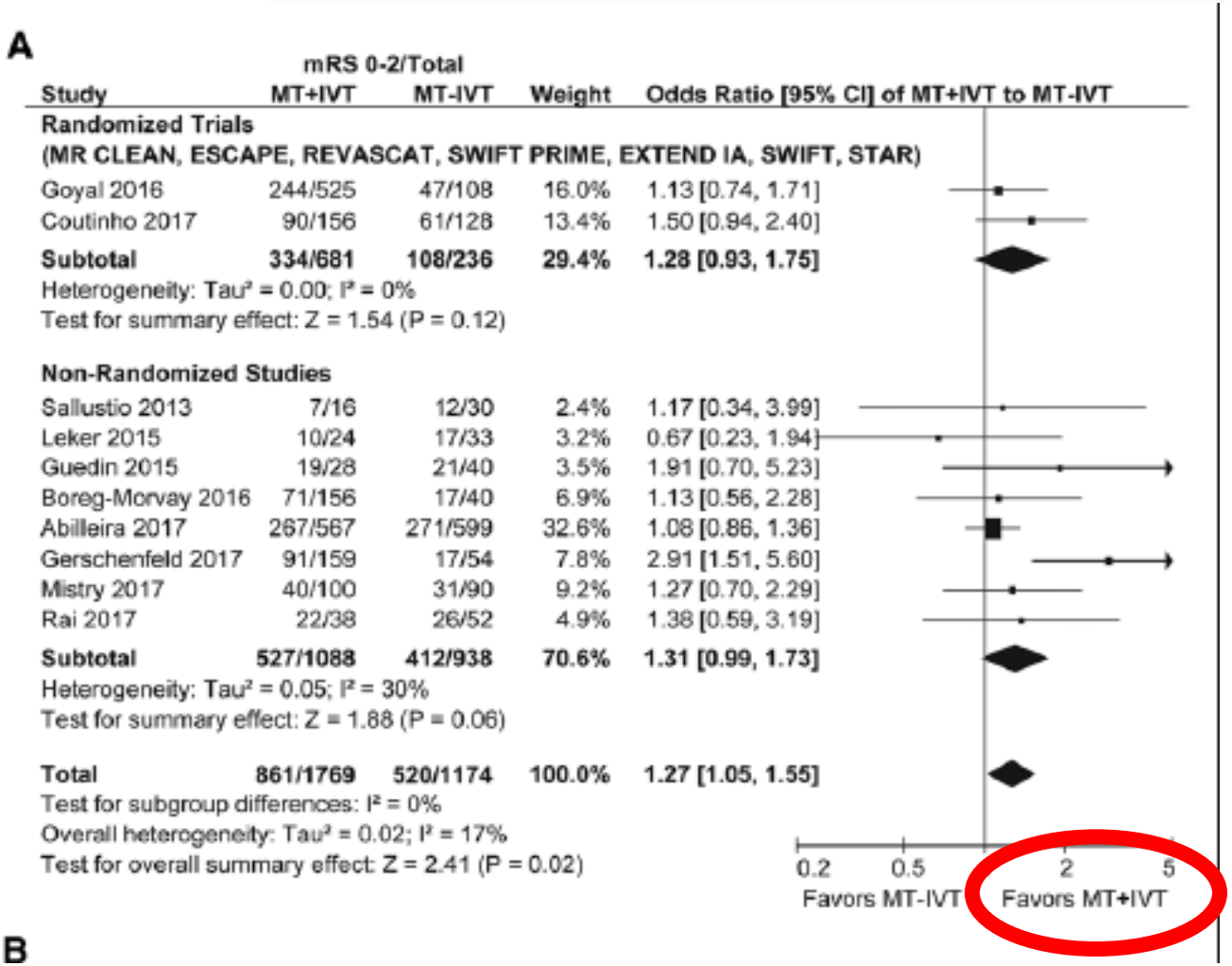
3.7. Mechanical Thrombectomy	COR	LOE
1. Patients eligible for IV alteplase should receive IV alteplase even if EVTs are being considered.	I	A

Original Contribution

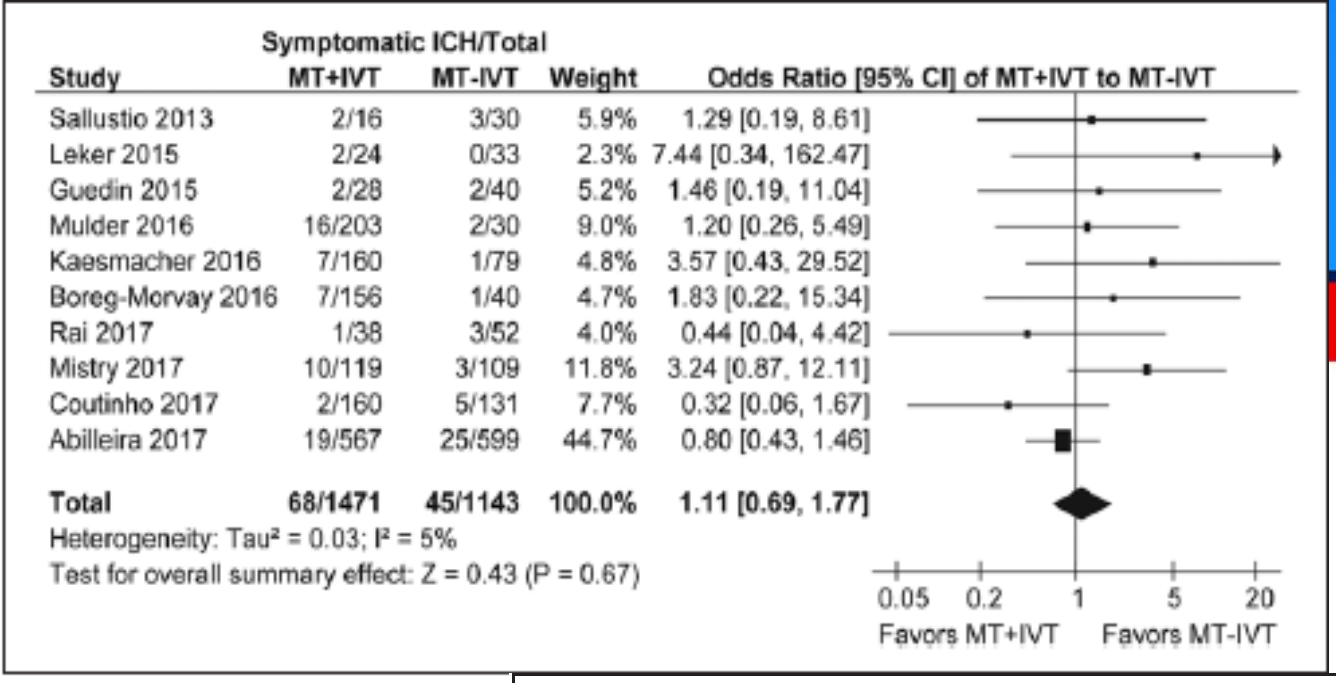
Mechanical Thrombectomy Outcomes With and Without Intravenous Thrombolysis in Stroke Patients

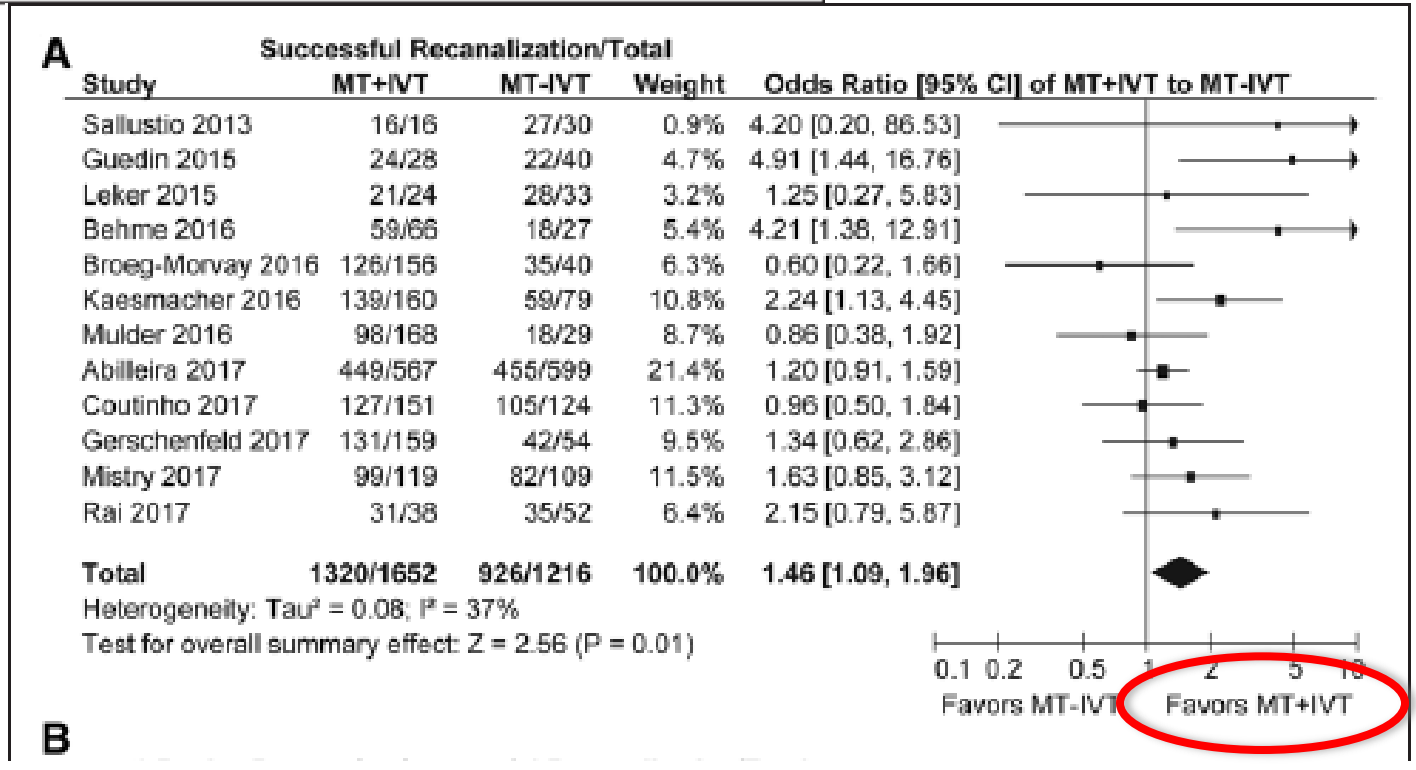
A Meta-Analysis

Eva A. Mistry, MD*; Akshitkumar M. Mistry, MD*; Mohammad Obadah Nakawah, MD; Rohan V. Chitale, MD; Robert F. James, MD; John J. Volpi, MD†; Matthew R. Fusco, MD†



• Stroke . 2017;48:00-00. DO





Stroke . 2017;48:00-00.
DOI: 10.1161/

- MT+IVT Hastaları, Yalnızca MT Hastalarıyla Karşılaştırıldığında
- Daha Iyi Fonksiyonel Sonuçlara
- Daha Düşük Mortaliteye
- Daha Yüksek Başarılı Rekanalizasyon Oranına
- Daha Düşük Sayıda Cihaz Geçişine
- Ve Eşit kanama Oranlarına Sahipti.

Stroke . 2017;48:00-00. DOI: 10.1161/

Direct Mechanical Thrombectomy Versus Combined Intravenous and Mechanical Thrombectomy in Large-Artery Anterior Circulation Stroke

A Topical Review

Urs Fischer, MD, MSc; Johannes Kaesmacher, MD; Vitor Mendes Pereira, MD; René Chapot, MD; Adnan H. Siddiqui, MD; Michael T. Froehler, MD, PhD;

Outcome	Bridging thrombolysis (n=156)	MT patients MT ONLY (n=40)	P value
Vessel recanalization and reperfusion			
Immediately after endovascular intervention (TICI 2b-3), n (%)	126 (80.8)	35 (87.5)	0.37
Immediately after endovascular intervention (TICI 3), n (%)	104 (67.5)	28 (71.8)	0.70
24h after endovascular intervention (TIMI 3), n (%)	92/120 (76.7)	30/32 (93.8)	0.043
Bleeding complications			
sICH, n (%)	7 (4.5)	1 (2.5)	1.0
aICH, n (%)	38 (24.4)	5 (12.5)	0.13
Systemic bleeding, n (%)	8 (5.1)	0	0.36
Any bleeding, n (%)	50 (32.1)	6 (15)	0.048
Clinical outcome			
NIHSS, median (range)	5 (0–42)	4 (0–42)	0.76
NIHSS change from baseline, median	-5	-11	0.049
mRS 0-2, n (%)	71 (45.5)	17 (42.5)	0.86
mRS 0-1, n (%)	50 (32.1)	11 (27.5)	0.70
Mortality, n (%)	41 (26.3)	8 (20)	0.54

(Stroke. 2017;48:2912-2918. DOI: 10.1161/STROKEAHA.117.017208.)

Original Paper

Outcomes of Endovascular Thrombectomy with and without Thrombolysis for Acute Large Artery Ischaemic Stroke at a Tertiary Stroke Centre

Chee-Keong Wee[a] William McAuliffe[b] Constantine C. Phatouros[b]
Timothy J. Phillips[b] David Blacker[a] Tejinder P. Singh[b] Ellen Baker[a]
Graeme J. Hankey[a, c]

	EVT + thrombolysis (n = 21)	EVT alone (n = 29)	p value
mTICI 2B–3 reperfusion	19 (90.5)	27 (93.1)	0.735
Mean time to reperfusion ± SD, h:min	3:47±1:12 (n = 19)	4:33±3:08 (n = 29)	0.322
Mean improvement in NIHSS score at 24 h ± SD	6.7±4.6 (n = 19)	6.9±5.3 (n = 27)	0.872
Significant improvement in NIHSS score ≥8 or 0–2 at 24 h	10 (47.6)	15 (51.7)	0.774
Clot lysis before EVT	1 (4.8)	0 (0)	0.420
Complications			
Groin haematoma	5 (23.8)	3 (10.3)	0.170
Pseudoaneurysm	1 (4.8)	0 (0.0)	
Intracranial haemorrhage[1]	3(14.3)	6 (20.7)	0.716
Subarachnoid haemorrhage	0 (0.0)	2 (6.9)	0.503
Parenchymal haematoma	2 (9.5)	2 (6.9)	1.000
Clot fragmentation and distal embolization	2 (9.5)	0 (0.0)	0.171
Recurrent stroke	1 (5.0)	1 (3.6)	0.807
Inpatient demise	4 (19.0)	2 (6.9)	0.223

- 50 Patient
- Australia
- Single center
- Retrospective study

No difference reperfusion time,
No difference mTICI score and NIHSS score

Cerebrovasc Dis Extra. 2017;7(2):95-102. doi: 10.1159/000470855..

JAMA Neurology | Original Investigation

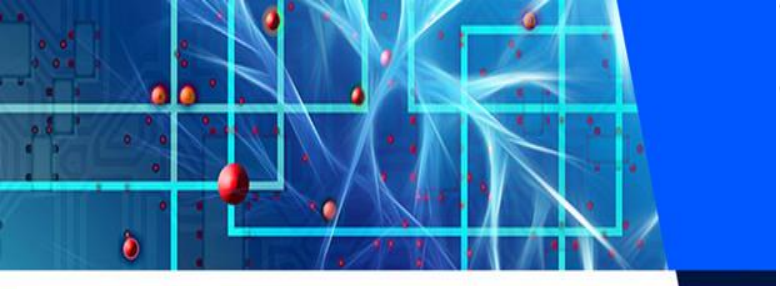
Combined Intravenous Thrombolysis and Thrombectomy vs Thrombectomy Alone for Acute Ischemic Stroke
A Pooled Analysis of the SWIFT and STAR Studies

Jonathan M. Coutinho, MD; David S. Liebeskind, MD; Lee-Anne Slater, MD; Raul G. Nogueira, MD; Wayne Clark, MD; Antoni Dávalos, MD; Alain Bonafé, MD; Reza Jahan, MD; Urs Fischer, MD; Jan Gralla, MD; Jeffrey L. Saver, MD; Vitor M. Pereira, MD

2 büyük çok merkezli klinik çalışmaya dahil edilen mekanik trombektomi ile tedavi edilen 291 hasta;

%55'i mekanik trombektomiye ek olarak intravenöz tromboliz alan ve %45'i sadece mekanik trombektomiye alınan hasta grubuydu. Çalışma sonucunda klinik veya radyolojik sonuçların hiçbirinde 2 grup arasında fark bulunmadı.

Bu çalışma, mekanik trombektomiye alınan iskemik inmeli hastalarda intravenöz trombolizin belirgin bir yararı olmadığını gösterdi.



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Conclusions

We observed no benefit or harm of treatment with IVT and MT compared with MT alone in patients with AIS and a proximal occlusion. On the basis of these data, we believe that a randomized clinical trial directly comparing both strategies is warranted.

Variable	MT and IVT (n = 160)	MT Alone (n = 131)	*P* Value
Times, median (IQR), min			
Symptom onset to hospital arrival	171 (75-245)	190 (108-274)	.04
Symptom onset to groin puncture	254 (195-305)	262 (201-375)	.10
Hospital arrival to groin puncture	79 (49-111)	77 (54-120)	.46
Symptom onset to reperfusion	308 (253-361)	315 (242-424)	.15
No. of passes with stent retriever, mean (SD)	1.7 (0.9)	1.8 (1.0)	.28
No. of passes with stent retriever, median (range)	1 (1-5)	1 (1-7)	.30
mTICI 2b or 3 reperfusion	127/151 (84.1)	105/124 (84.7)	>.99
mTICI 3	86/151 (57.0)	66/124 (53.2)	.54
Rescue therapy	20/160 (12.5)	17/131 (13.0)	>.99
Complications			
Emboli to uninvolved territory	7/156 (4.5)	3/126 (2.4)	.52
Device-related serious adverse events	8/160 (5.0)	8/131 (6.1)	.80
Vasospasm	43/160 (26.9)	18/131 (13.7)	.006
sICH	2/160 (1.1)	5/131 (3.8)	.25
SAH	2/160 (1.1)	4/131 (3.1)	.41
PH1	1/160 (0.6)	4/131 (3.1)	.18
PH2	1/160 (0.6)	2/131 (1.5)	.59
HI1	29/160 (18.1)	25/131 (19.1)	.88
HI2	19/160 (11.9)	11/131 (8.4)	.44
Remote ICH	1/160 (0.6)	0/131 (0)	>.99
Vessel perforation	0/160 (0)	1/131 (0.8)	.45
Groin hematoma	3/160 (1.9)	2/131 (1.5)	>.99
Outcome at 90 d			
mRS score of 0-1[b]	65/156 (41.7)	46/128 (35.9)	.33
mRS score of 0-2[b]	90/156 (57.7)	61/128 (47.7)	.10
Mortality	13/160 (8.1)	16/131 (12.2)	.32

- Kass-Hout *et al*. 2014;
- Leker *et al*. 2015;
- Broeg-Morvay *et al*. 2016;
- Weber *et al*. 2016

- Gözlemsel tek merkezli çalışmalar: MT vs MT+IVT ……FARK YOK

Table. Pros and Cons of Bridging Therapy

Potential benefit	Effect
Early reperfusion at first angiography run (5%–10%), especially if short thrombi or residual flow	High rates of excellent clinical outcome for this subpopulation
Thrombus softening and facilitation of successful reperfusion	Fewer passes of stent devices/less cost, shorter procedure time, and better outcomes
Chance of reperfusion when no EVT access to thrombus possible	Higher proportion with early reperfusion translating to better outcomes
Reperfusion of remaining distal occlusions after mechanical thrombectomy	Potential better outcomes since more complete reperfusion (TICI 3) and less severe capillary microthrombosis
Potential harm	**Effect**
IV tPA-related local and systemic bleeding complications	Puncture-site hematoma (1%–2%) and major systemic bleeding (1%)
IV tPA-related coagulopathy and small vessel fragility	More large symptomatic extraischemic parenchymal hemorrhage (1%–2%)
IV tPA-related coagulopathy and sICH in patients at risk	Higher rates of sICH and aICH with poor functional outcome
IV tPA-related blood–brain barrier breakdown, coagulopathy, and potentiated large vessel damage because of stent retrievers	Increased symptomatic parenchymal hemorrhage when infarct. Poorer functional outcome and increased infarct volume
Tandem extracranial and intracranial occlusions may require additional procedures during EVT and potentially immediate antiplatelet therapy	Increased symptomatic intracranial hemorrhage (10%)
Distal thrombus migration	Inability to retrieve thrombus with MT. Neurological deterioration and more severe/extensive ischemia
Increase thrombus fragility by softening the thrombus	Higher rates of peri-interventional thrombus fragmentation leading to lower rates of complete (TICI 3) reperfusions
IV tPA lysis of left atrial appendage or other proximal thrombus	Early stroke recurrence or multiple systemic emboli
Delay to MT initiation	Later median onset to reperfusion resulting in worse outcomes
IV tPA-associated allergic reactions (1%)	During IV tPA infusion/EVT procedure, which may worsen ischemia or require intubation/prolonged ICU stay
IV tPA-related neurotoxicity in animal models	More neuronal loss
IV tPA cost	Adds to procedural cost

(Stroke. 2017;48:2912-2918. DOI: 10.1161/STROKEAHA.117.017208.)

JAMA | Original Investigation

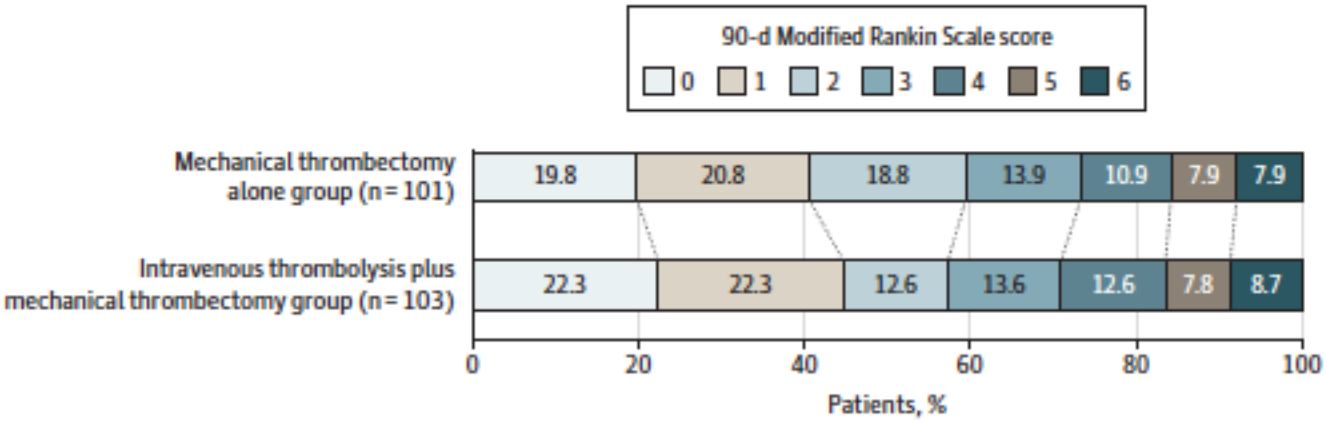
Effect of Mechanical Thrombectomy Without vs With Intravenous Thrombolysis on Functional Outcome Among Patients With Acute Ischemic Stroke
The SKIP Randomized Clinical Trial

Kentaro Suzuki, MD, PhD; Yuji Matsumaru, MD, PhD; Masataka Takeuchi, MD; Masafumi Morimoto, MD, PhD; Ryuzaburo Kanazawa, MD, PhD; Yohei Takayama, MD; Yuki Kamiya, MD, PhD; Keigo Shigeta, MD, PhD; Seiji Okubo, MD, PhD; Mikito Hayakawa, MD; Norihiro Ishii, MD, PhD; Yorio Koguchi, MD, PhD; Tomoji Takigawa, MD, PhD; Masato Inoue, MD, PhD; Hiromichi Naito, MD; Takahiro Ota, MD, PhD; Teruyuki Hirano, MD, PhD; Noriyuki Kato, MD, PhD; Toshihiro Ueda, MD, PhD; Yasuyuki Iguchi, MD, PhD; Kazunori Akaji, MD, PhD; Wataro Tsuruta, MD, PhD; Kazunori Miki, MD, PhD; Shigeru Fujimoto, MD, PhD; Tetsuhiro Higashida, MD, PhD; Mitsuhiro Iwasaki, MD; Junya Aoki, MD, PhD; Yasuhiro Nishiyama, MD, PhD; Toshiaki Otsuka, MD, PhD; Kazumi Kimura, MD, PhD; for the SKIP Study Investigators

Table 2. Primary and Secondary Efficacy End Points and Adverse Events[a]

	Mechanical thrombectomy alone (n = 101)	Intravenous thrombolysis plus mechanical thrombectomy (n = 103)	Noninferiority analysis			Superiority analysis		
			Estimate of difference, % (97.5% 1-sided CI)	Odds ratio (97.5% 1-sided CI)[b]	*P* value[c]	Estimate of difference, % (95% CI)	Odds ratio (95% CI)	*P* value[c]
Primary outcome								
Modified Rankin Scale score 0-2 at 90 d, No. (%)	60 (59.4)	59 (57.3)	2.1 (-11.4 to ∞)	1.09 (0.63 to ∞)	.18			
Secondary outcomes								
Modified Rankin Scale score reduction (shift analysis)				0.97 (0.60 to ∞)	.37			
Mortality at 90 d, No. (%)	8 (7.9)	9 (8.7)				-0.8 (-9.5 to 7.8)	0.90 (0.33 to 2.43)	>.99
TICI grade ≥2b, No. (%)[d]	91 (90.1)	96 (93.2)				-3.1 (-11.8 to 5.6)	0.66 (0.24 to 1.82)	.46
Adverse event outcomes								
Any ICH at 36 h from onset, No. (%)	34 (33.7)	52 (50.5)				-16.8 (-32.1 to -1.6)	0.50 (0.28 to 0.88)	.02
Symptomatic ICH (NINDS criteria) at 36 h from onset, No. (%)[e]	8 (7.9)	12 (11.7)				-3.7 (-13.0 to 5.6)	0.65 (0.25 to 1.67)	.48
Symptomatic ICH (SIT-MOST criteria) at 36 h from onset, No. (%)[f]	6 (5.9)	8 (7.8)				-1.8 (-9.7 to 6.1)	0.75 (0.25 to 2.24)	.78

Figure 2. Functional Outcomes at 90 Days From Onset According to the Modified Rankin Scale Score



CONCLUSIONS AND RELEVANCE Among patients with acute large vessel occlusion stroke, mechanical thrombectomy alone, compared with combined intravenous thrombolysis plus mechanical thrombectomy, failed to demonstrate noninferiority regarding favorable functional outcome. However, the wide confidence intervals around the effect estimate also did not allow a conclusion of inferiority.

0,6mg/kg - japonya

JAMA | Original Investigation

Effect of Endovascular Treatment Alone vs Intravenous Alteplase Plus Endovascular Treatment on Functional Independence in Patients With Acute Ischemic Stroke
The DEVT Randomized Clinical Trial

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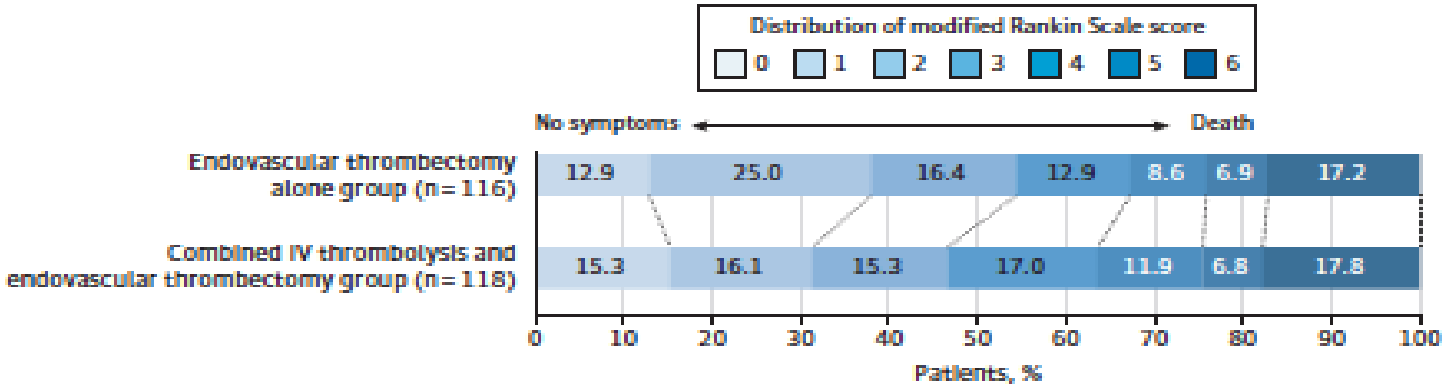
Table 2. Modified Rankin Scale Score at 90 Days and Secondary Outcomes

	No. (%)				
	Endovascular thrombectomy alone (n = 116)	Combined IV thrombolysis and endovascular thrombectomy (n = 118)	Unadjusted difference (95% CI)	Unadjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)[a]
Primary efficacy outcome[b]					
Functional independence[c]	63 (54.3)	55 (46.6)	7.7 (−5.1 to ∞)[d]	1.36 (0.82 to 2.28)	1.48 (0.81 to 2.74)
Secondary efficacy outcomes					
Excellent outcome[e]	44 (37.9)	37 (31.4)	6.6 (−5.6 to 18.7)	1.34 (0.78 to 2.30)	1.38 (0.75 to 2.56)
Disability level, median (IQR), mRS score[c]	2 (1 to 4)	3 (1 to 4)	0 (−1 to 0)	1.17 (0.75 to 1.84)[e]	1.13 (0.71 to 1.79)[e]
Successful reperfusion (eTICI 2b-3) at final angiogram[f]	100 (88.5)	102 (87.2)	1.3 (−7.1 to 9.8)	1.13 (0.51 to 2.53)	1.14 (0.50 to 2.61)
No.	113	117			
Reperfusion on follow-up CT or MR angiography ≤48 h[g]	96 (97.0)	94 (93.1)	3.9 (−2.1 to 9.9)	2.38 (0.64 to 11.31)	2.37 (0.63 to 11.34)
No.	99	101			
NIHSS score, median (IQR), change from baseline				β Coefficient (95% CI)[h]	
24 h[i]	−4 (−8 to 0)	−3 (−6 to −1)	−1 (−2 to 1)	−0.14 (−1.97 to 1.69)	−0.26 (−2.06 to 1.54)
5 to ≈7 d or early discharge[i]	−7 (−11 to −1)	−6 (−10 to −2)	0 (−2 to 2)	1.02 (−1.76 to 3.80)	0.77 (−1.96 to 3.50)
Health-related qualify of life, EQ-5D-5L score, median (IQR)[j]	0.89 (0.22 to 1.00)	0.74 (0.26 to 0.96)	0.00 (0.00 to 0.05)	0.04 (−0.06 to 0.14)	0.04 (−0.04 to 0.13)

Figure 2. Distribution of the Modified Rankin Scale Score at 90 Days



Conclusions

Among patients with ischemic stroke due to proximal anterior circulation occlusion within 4.5 hours from onset, endovascular treatment alone, compared with IV alteplase plus endovascular treatment, met the prespecified statistical threshold for noninferiority for the outcome of 90-day functional independence. These findings should be interpreted in the context of the clinical acceptability of the selected noninferiority threshold.

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Endovascular Thrombectomy with or without Intravenous Alteplase in Acute Stroke

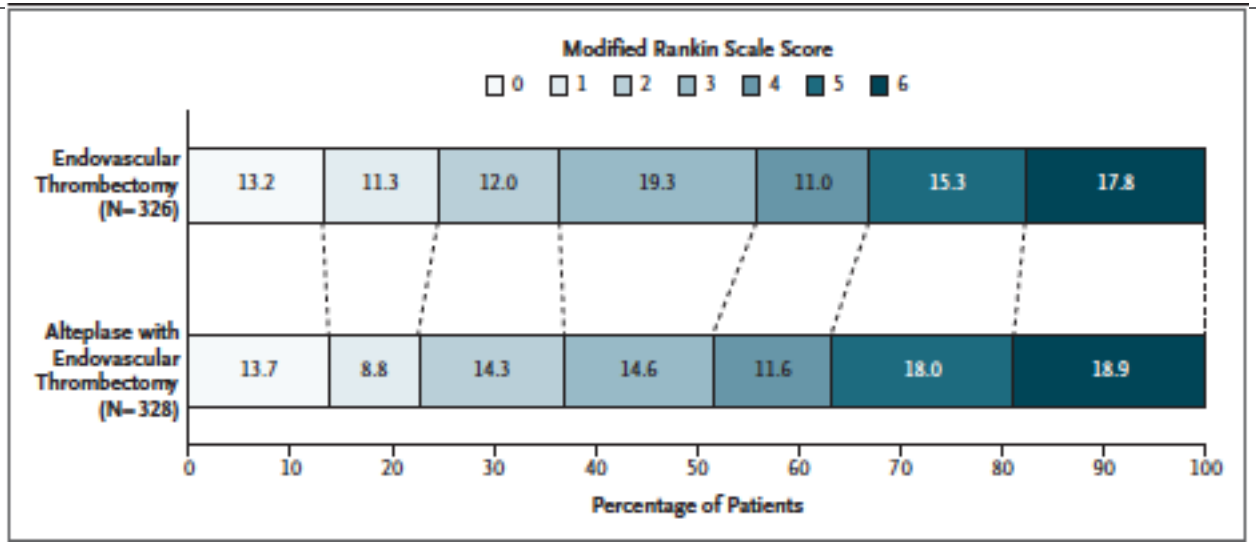
P. Yang, Yongwei Zhang, L. Zhang, Yongxin Zhang, K.M. Treurniet, W. Chen, Y. Peng, H. Han, J. Wang, S. Wang, C. Yin, S. Liu, P. Wang, Q. Fang, Hongchao Shi, J. Yang, C. Wen, C. Li, C. Jiang, J. Sun, X. Yue, M. Lou, M. Zhang, H. Shu, D. Sun, H. Liang, Tong Li, F. Guo, K. Ke, H. Yuan, G. Wang, W. Yang, Huaizhang Shi, Tianxiao Li, Z. Li, P. Xing, P. Zhang, Y. Zhou, H. Wang, Y. Xu, Q. Huang, T. Wu, R. Zhao, Q. Li, Y. Fang, Laixing Wang, J. Lu, Y. Li, J. Fu, X. Zhong, Y. Wang, Longde Wang, M. Goyal, D.W.J. Dippel, B. Hong, B. Deng, Y.B.W.E.M. Roos, C.B.L.M. Majoie, and J. Liu, for the DIRECT-MT Investigators*

Table 2. Trial Outcomes.*

Outcome	Endovascular Thrombectomy (N = 327)	Alteplase with Endovascular Thrombectomy (N = 329)	Measure of Effect	Adjusted Value (95% CI)
Primary outcome: modified Rankin Scale score at 90 days				
No. of patients with data	326	328		
Median score (IQR)	3 (2–5)	3 (2–5)	Common odds ratio	1.07 (0.81 to 1.40)
Secondary outcomes				
Clinical outcomes				
Modified Rankin scale score at 90 days according to range — no. (%)				
0 or 1	80 (24.5)	74 (22.5)	Odds ratio	1.09 (0.74 to 1.59)
0 to 2	119 (36.4)	121 (36.8)	Odds ratio	0.97 (0.68 to 1.37)
0 to 3	182 (55.7)	169 (51.4)	Odds ratio	1.25 (0.89 to 1.76)
0 to 4	218 (66.7)	207 (62.9)	Odds ratio	1.25 (0.88 to 1.77)
0 to 5	268 (82.0)	266 (80.9)	Odds ratio	1.10 (0.73 to 1.67)
Median NIHSS score (IQR)†				
After 24 hr	12 (5 to 20)	12 (5 to 22)	Beta coefficient	−0.52 (−2.13 to 1.09)
At 5–7 days or discharge	8 (2 to 16)	8 (2 to 19)	Beta coefficient	−1.26 (−3.20 to 0.68)
Barthel Index of 95 or 100 at 90 days — no./total no. (%)‡	156/326 (47.9)	151/328 (46.0)	Odds ratio	1.09 (0.78 to 1.53)
Median EQ-5D-5L score at 90 days (IQR)§	0.84 (0.48 to 0.95)	0.85 (0.26 to 1.00)	Beta coefficient	0.00 (−0.06 to 0.07)
Imaging outcomes				
Successful reperfusion before thrombectomy, as assessed on initial DSA — no. (%)¶	8 (2.4)	23 (7.0)	Odds ratio	0.33 (0.14 to 0.74)
eTICI score of 2b, 2c, or 3, as assessed on final angiogram — no./total no. (%)‖	243/306 (79.4)	267/316 (84.5)	Odds ratio	0.70 (0.47 to 1.06)
Recanalization at 24–72 hr, as assessed on CTA — no./total no. (%)**	240/282 (85.1)	245/275 (89.1)	Odds ratio	0.71 (0.42 to 1.20)
Median lesion volume on CT (IQR) — ml††	36.3 (9.8 to 114.8)	36.7 (9.6 to 99.2)	Beta coefficient	3.78 (−9.43 to 16.99)

Table 3. Serious Adverse Events within 90 Days (Intention-to-Treat Population).*

Variable	Endovascular Thrombectomy (N=327)	Alteplase with Endovascular Thrombectomy (N=329)	Risk Ratio (95% CI)	P Value
	number (percent)			
Safety outcomes				
Death	58 (17.7)	62 (18.8)	0.94 (0.68–1.30)	0.71
Asymptomatic intracranial hemorrhage	109 (33.3)	119 (36.2)	0.92 (0.75–1.14)	0.45
Symptomatic intracranial hemorrhage†	14 (4.3)	20 (6.1)	0.70 (0.36–1.37)	0.30
Infarction in new territory at 5–7 days	11 (3.4)	9 (2.7)	1.23 (0.52–2.93)	0.64
Other adjudicated serious adverse events				
Large or malignant MCA infarction	42 (12.8)	43 (13.1)	0.98 (0.66–1.46)	0.93
Pneumonia, aspiration or other	49 (15.0)	45 (13.7)	1.10 (0.75–1.59)	0.63
Allergic reaction to contrast material	1 (0.3)	1 (0.3)	1.01 (0.06–16.02)	1.00
Other	15 (4.6)	24 (7.3)		
Procedural complications‡				
Any procedural complication	49 (15.0)	47 (14.3)	1.05 (0.72–1.52)	0.80
Vessel dissection	8 (2.4)	5 (1.5)		
Contrast extravasation	6 (1.8)	10 (3.0)		
Embolization into a new territory	35 (10.7)	31 (9.4)		
Femoral access complications	2 (0.6)	1 (0.3)		



RESEARCH SUMMARY

A Randomized Trial of Intravenous Alteplase before Endovascular Treatment for Stroke

LeCouffe NE et al. DOI: 10.1056/NEJMoa2107727

MR CLEAN NO-İV

CLINICAL PROBLEM

Guidelines recommend use of intravenous thrombolysis before endovascular treatment (EVT) for anterior-circulation ischemic stroke, but trials involving Asian patients have suggested that outcomes with EVT alone are noninferior to those with EVT preceded by thrombolysis.

CLINICAL TRIAL

Design: A multicenter, randomized, open-label trial in Europe compared the use of EVT with or without intravenous alteplase pretreatment for ischemic stroke.

Intervention: 539 patients with stroke caused by occlusion of a proximal anterior-circulation artery were randomly assigned to receive EVT alone or EVT after standard-dose intravenous alteplase (usual care). The primary end point was functional outcome at 90 days according to the modified Rankin scale.

RESULTS

Efficacy: The median score on the modified Rankin scale at 90 days was 3 in the group treated with EVT alone and 2 in the group treated with EVT plus alteplase, with overlapping interquartile ranges. The odds ratio for a shift in modified Rankin scale score indicated neither noninferiority nor superiority of EVT alone.

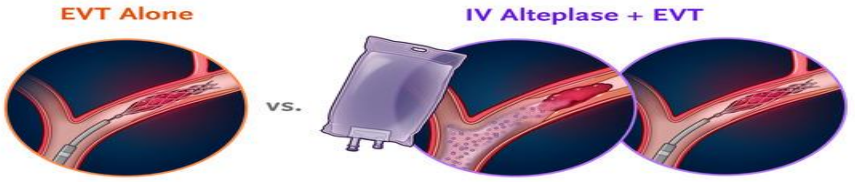
Safety: The incidences of death from any cause and symptomatic intracerebral hemorrhage at 90 days did not differ significantly between the two treatment groups.

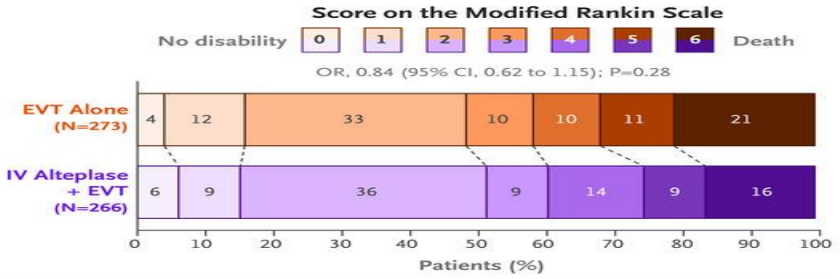
LIMITATIONS AND REMAINING QUESTIONS

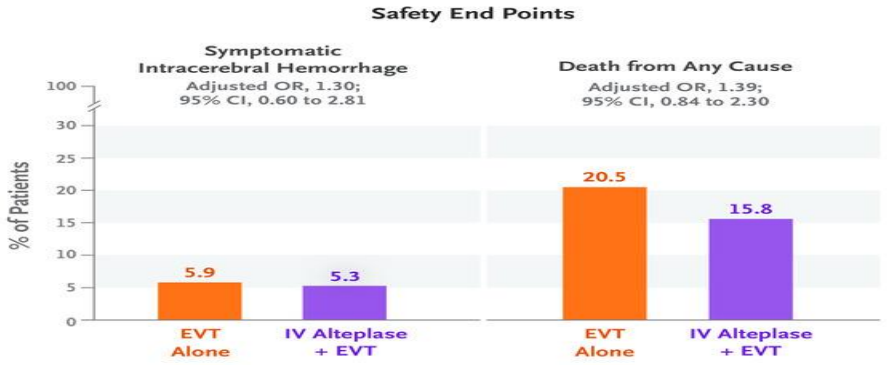
Further study is required to understand whether the findings would apply to other groups of patients:

- patients not presenting directly to a center with EVT capability.
- patients with longer times to hospital arrival.

Links: Full Article | NEJM Quick Take







CONCLUSIONS

In this randomized trial focusing on 90-day functional outcomes in European patients, EVT alone was neither superior nor noninferior to intravenous alteplase plus EVT for ischemic stroke.

INR INTERVENTIONAL NEURORADIOLOGY

Interventional Neuroradiology
1–8

DOI: 10.1177/15910199221080232
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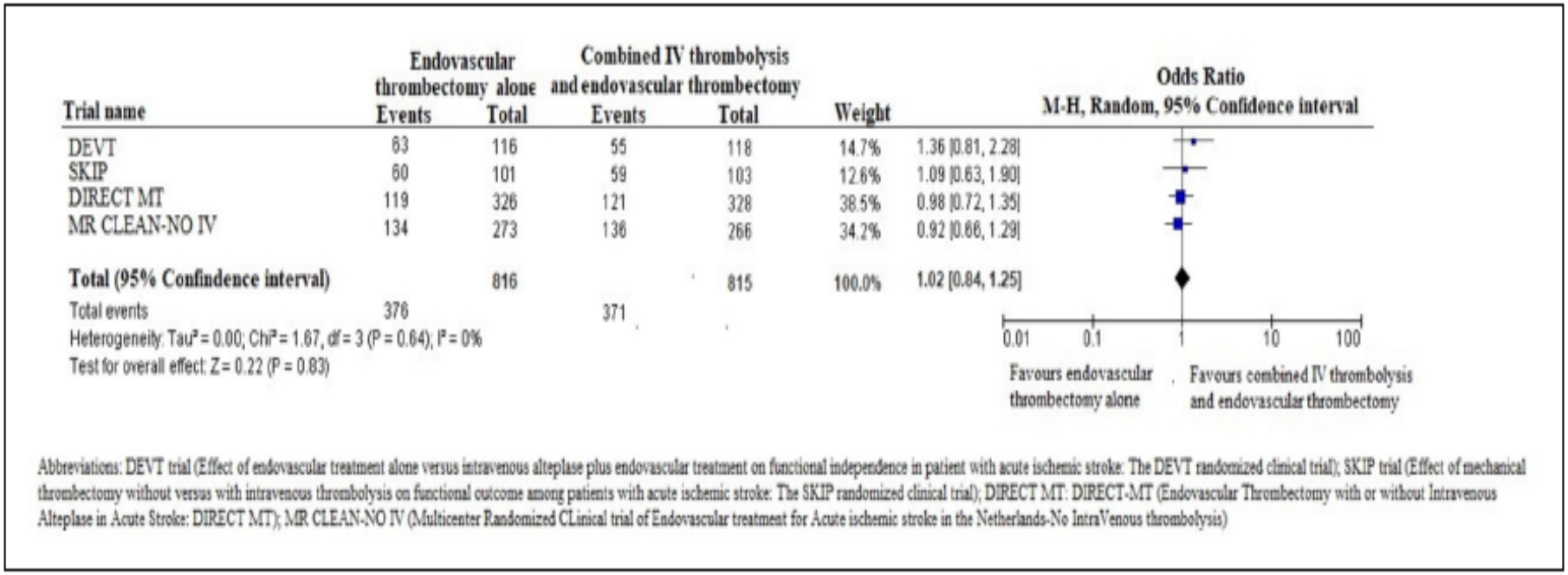
Endovascular Thrombectomy With or Without Intravenous thrombolysis: A Meta-Analysis of Randomized Controlled Trials

Muhammad F. IshfaqMD[1,2], Sana GulraizMD[1], Wei HuangMA[1,2], Iryna LobanovaMD[1,2], Renee Y. MartinPhD[2], Brandi R. FrenchMD[2], Farhan SiddiqMD[3], Erdem GurkasMD[1], Emrah AytacMD[1], Camilo R. GomezMD[2] and Adnan I. QureshiMD[1,2]



Abbreviations: DEVT trial (Effect of endovascular treatment alone versus intravenous alteplase plus endovascular treatment on functional independence in patient with acute ischemic stroke: The DEVT randomized clinical trial); SKIP trial (Effect of mechanical thrombectomy without versus with intravenous thrombolysis on functional outcome among patients with acute ischemic stroke: The SKIP randomized clinical trial); DIRECT MT: DIRECT-MT (Endovascular Thrombectomy with or without Intravenous Alteplase in Acute Stroke: DIRECT MT); MR CLEAN-NO IV (Multicenter Randomized CLinical trial of Endovascular treatment for Acute ischemic stroke in the Netherlands-No IntraVenous thrombolysis)

Figure 2. Odds of favorable functional outcome (modified rankin scale scores, 0, 1 or 2) at 3 months post randomization.

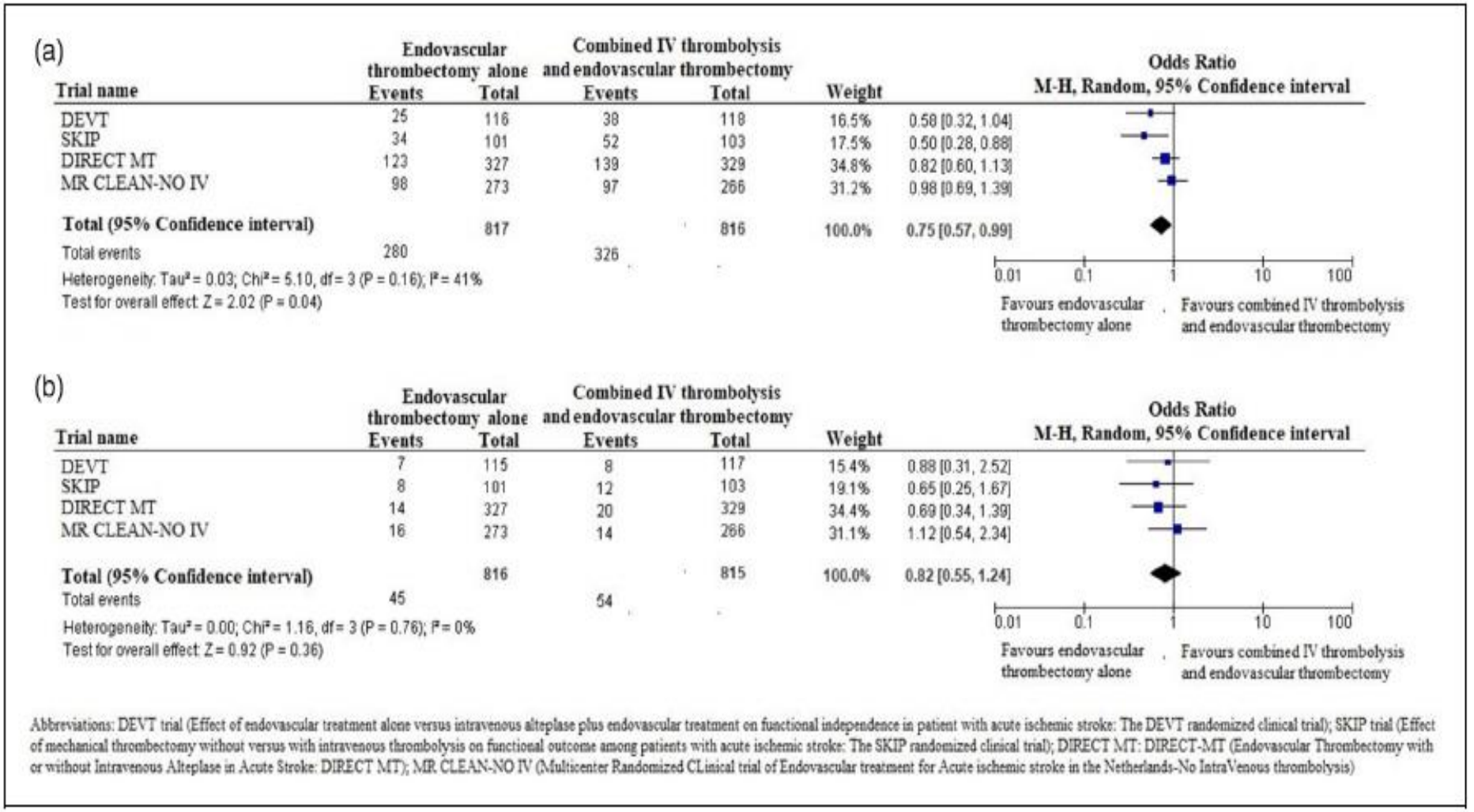


Figure 3. Odds of any intracerebral hemorrhage (3a) and symptomatic intracerebral hemorrhage (3b).

ORIGINAL RESEARCH

Intravenous thrombolysis before endovascular therapy for large vessel strokes can lead to significantly higher hospital costs without improving outcomes

Ansaar T Rai,[1] SoHyun Boo,[1] Chelsea Buseman,[2] Amelia K Adcock,[3] Abdul R Tarabishy,[4] Maurice M Miller,[4] Thomas D Roberts,[4] Jennifer R Domico,[1] Jeffrey S Carpenter[1]

Table 2 Functional and safety outcomes for the entire cohort and for the subgroup presenting within 4.5 hours of symptom onset

	EV-Only vs IV+EV Entire cohort (n=90)			EV-Only vs IV+EV Onset to presentation ≤4.5 hours (n=64)		
	EV-Only (n=52)	IV+EV (n=38)	p Value	EV-Only (n=26)	IV+EV (n=38)	p Value
Recanalization	35 (67)	31 (81.6)	0.12	21 (81)	31 (81.6)	0.93
Favorable outcome	26 (50)	22 (58)	0.45	14 (54)	22 (58)	0.75
Hemorrhage (PH1/PH2)	3 (5.8)	1 (2.6)	0.46	1 (3.8)	1 (2.6)	0.78
Mortality	13 (25)	4 (10.5)	0.07	5 (19.2)	4 (10.5)	0.33
Home discharge	19 (36.5)	11 (29)	0.45	11 (42)	11 (29)	0.27

All values shown are n (%).
EV-Only, endovascular therapy alone group; IV+EV, endovascular therapy following IV rt-PA administration group.

Rai AT, et al. J NeuroIntervent Surg 2017;0:1–6. doi:10.1136/neurintsurg-2016-012830

COSTS?


"We combined all your medications into ONE convenient dose."
NICKEL

ORIGINAL RESEARCH

Intravenous thrombolysis before endovascular therapy for large vessel strokes can lead to significantly higher hospital costs without improving outcomes

Ansaar T Rai,[1] SoHyun Boo,[1] Chelsea Buseman,[2] Amelia K Adcock,[3] Abdul R Tarabishy,[4] Maurice M Miller,[4] Thomas D Roberts,[4] Jennifer R Domico,[1] Jeffrey S Carpenter[1]

Table 3 Comparison of length of stay and hospital costs between the two treatment groups

	EV-Only vs IV+EV Entire cohort (n=90)			EV-Only vs IV+EV Onset to presentation ≤4.5 hours (n=64)		
	EV-Only (n=52)	IV+EV (n=38)	p Value	EV-Only (n=26)	IV+EV (n=38)	p Value
Total cost, $	33 810 (13 505)	40 743 (17 177)	0.024*	31 621 (12 874)	40 743 (17 177)	0.027*
Direct cost, $	23 034 (8786)	28 711 (11 406)	0.007*	[illegible]	[illegible]	0.017*
Indirect cost, $	10 777 (5104)	12 032 (6311)	0.39	9534 (3928)	12 032 (6311)	0.09
Length of stay, days	8 (6)	8 (6)	0.86	6 (4)	8 (6)	0.34
Length of ICU stay, dayst	2.1 (2.1)	2.2 (1.5)	0.48	2 (2.2)	2.2 (1.5)	0.23

All values shown are mean (SD).
*Significance level is set at 0.05.
†ICU stay comparison is for 39 patients in the EV-Only group and 30 patients in the IV+EV group for the entire cohort and 20 patients in the EV-Only group and 30 patients in the IV +EV group for the ≤4.5 hours cohort.
EV-Only, endovascular therapy alone group; ICU, intensive care unit; IV+EV, endovascular therapy following IV rt-PA administration group.

- Bu çalışmada endovasküler tedaviden önceki IV tromboliz rekanalizasyon oranlarını, prosedür süresini, trombektomi geçişlerinin sayısını, kabul süresini veya fonksiyonel sonuçları tek başına endovasküler tedaviye göre iyileştirmedi.

- IV t-PA kullanımı, önemli ölçüde daha yüksek toplam ve doğrudan hastane maliyetlerine neden oldu.

MT+IVT vs MT

IVT

- Avantajlar

- Multifokal iskemi tedavisi
- Zor pıhtılar için distale erişilebilir
- Trombektomi yapılana kadar pıhtı çözülebilir.??
- Başarılı rekanalizasyon için kilit rol ???

- Dezavantajlar
- Hemorajik komplikasyonlar
- Trombektominin başlama zamanını geciktirebilir
- Maliyet oranında artış
- Distal embolide artış ???

Therapeutic Advances in Neurological Disorders Original Research

Endovascular thrombectomy with or without systemic thrombolysis?

Georgios Tsivgoulis, Aristeidis H. Katsanos, Dimitris Mavridis, Anne W. Alexandrov, Georgios Magoufis, Adam Arthur, Valeria Caso, Peter D. Schellinger and Andrei V. Alexandrov

Ther Adv Neurol Disord
2017, Vol. 10(3) 151–160
DOI: 10.1177/1756285616680549

HANGİ DURUMLARDA SADECE MT DAHA ETKİLİ OLABİLİR??

- ICA occlusion with need for stenting during the endovascular treatment [Mokin *et al*. 2012];
- High thrombus burden in tandem ICA/MCA occlusions that have a very low probability of successful recanalization with IVT [Dorn *et al*. 2016] [Tsivgoulis *et al*. 2015c];
- Patients with cumulative relative contraindications to IVT, e.g.
  - anticoagulant pretreatment with an international normalized ratio of less than 1.7
  - novel oral anticoagulant intake within 48 h [Jauch et al. 2013] or patients already on double antiplatelet therapy [Anderson *et al*. 2016]
- Elderly patients with high cerebral microbleed burden (>10) on pretreatment emergent MRI scan [Tsivgoulis *et al*. 2016c].

Teşekkürler!

Rekanalizasyon Skalaları TICI 2b, TICI 2c, e TICI vb…

Murat ÇABALAR

20-22 Mayıs 2022, Gaziantep

Sunum planı

- Tanım
- Revaskülarizasyon nedir?
- Revaskülarizasyon skalaları?

    Özellikleri…

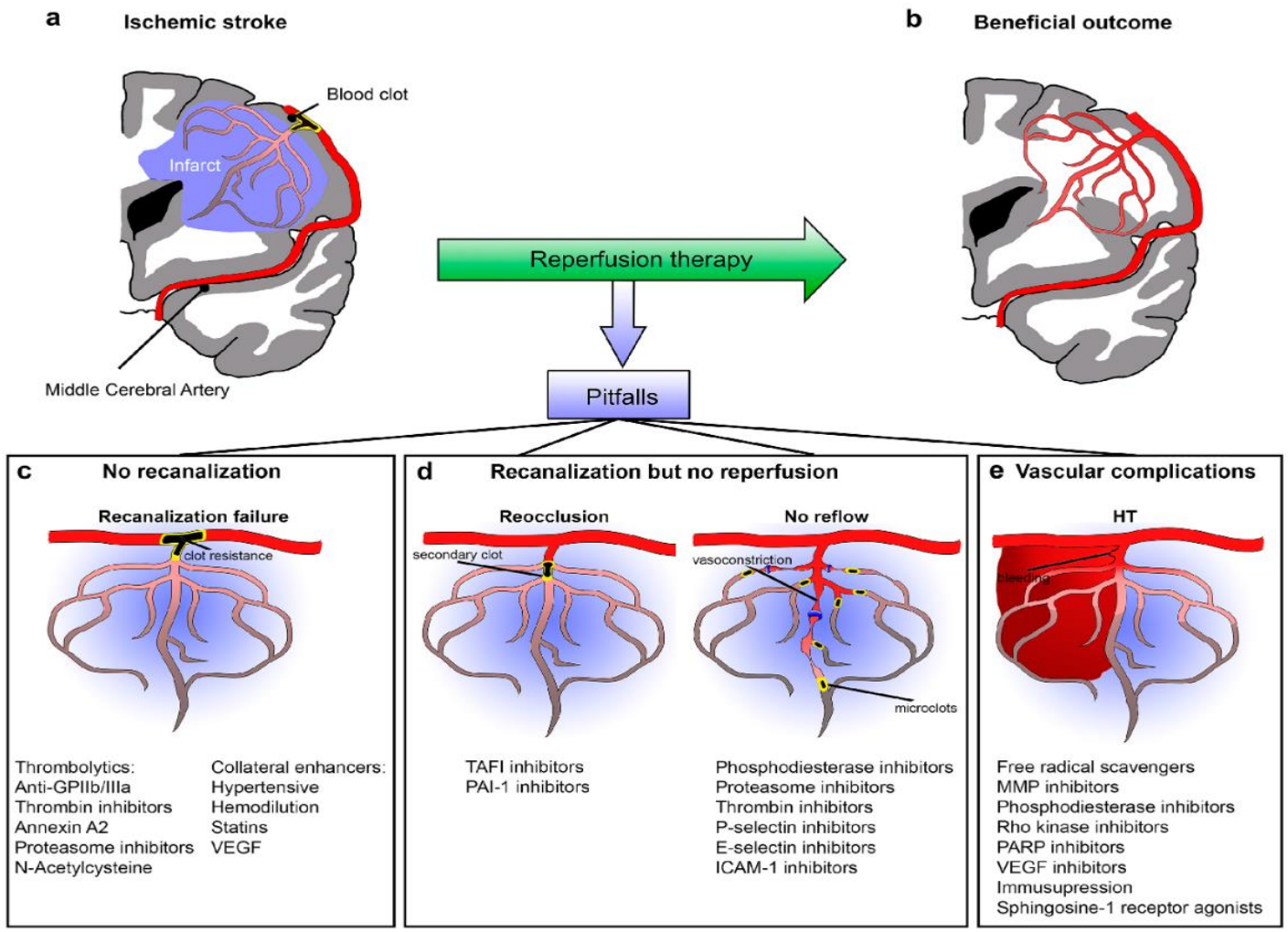
    Kronolojik…
- Reperfüzyon hedef? (TICI ? 2b & 3)
- Özet

Tanım

- **Rekanalizasyon** (trombusun rekanalizasyonu)

  Kanın tıkanma yerinden öbür tarafa aktarılmasını sağlamak ve akımı yeniden başlatmak

  Futil rekanalizasyon; beyin damarlarında rekanalizasyon sağlanmasına karşın mikrosirkülasyon düzeyinde kan akımının düzelmemesi ve mikrodamarlar tarafından beslenen parankimal dokuda **reperfüzyon** sağlanamamasıdır (no-reflow)


a
Ischemic stroke
Blood clot
Infarct
Middle Cerebral Artery
b
Beneficial outcome
Reperfusion therapy
Pitfalls
c
No recanalization
Recanalization failure
clot resistance
Thrombolytics:
Anti-GPIIb/IIIa
Thrombin inhibitors
Annexin A2
Proteasome inhibitors
N-Acetylcysteine
Collateral enhancers:
Hypertensive
Hemodilution
Statins
VEGF
d
Recanalization but no reperfusion
Reocclusion
secondary clot
No reflow
vasoconstriction
microclots
TAFI inhibitors
PAI-1 inhibitors
Phosphodiesterase inhibitors
Proteasome inhibitors
Thrombin inhibitors
P-selectin inhibitors
E-selectin inhibitors
ICAM-1 inhibitors
e
Vascular complications
HT
bleeding
Free radical scavengers
MMP inhibitors
Phosphodiesterase inhibitors
Rho kinase inhibitors
PARP inhibitors
VEGF inhibitors
Immusupression
Sphingosine-1 receptor agonists

Revaskülarizasyon ?

Komponentleri nelerdir?

- Rekanalizasyon
- Reperfüzyon

Optimal revaskülarizasyon ölçeği için kriterler ne olmalıdır?

- Rekanalizasyon + Reperfüzyon
- Kollateral dolaşım
- Uygulanabilir ve güvenilir
- Uygulama kolaylığı
- Karşılaştırılabilir sonuçlar
- Klinik sonuçlarla korele

TIMI (Thrombolysis in Myocardial Infarction)

Grade	TIMI
0	No recanalization
1	Minimal recanalization
2	Partial recanalization
3	Complete recanalization

- MI için ilk anjiyografik skor
- Trombolitik ajanlar, balon anjioplasti ve stentlemede kullanılmış
- **Basit** olması avantaj
- Kalp hastaları için sonucu tahmin etmede faydalı olmuş
- Kullanım klavuzu/Derecelendirme tanımındaki **değişkenlik** dezavantaj

. TIMI Study Group. The Thrombolysis in Myocardial Infarction (TIMI) Trial: Phase I Findings. N. Engl J Med 1985;932-936.
. Canon CP, Braunwald E, McCabe CH, Antman EM. The Thrombolysis in Myocardial Infarction (TIMI) Trials: The First Decade. J Interv Cardiol 1995;8:117-135.

Mori reperfusion scale

Grade	Mori
0	No reperfusion
1	Minimal reperfusion
2	Reperfusion of **<50%** of the occluded artery territory
3	Reperfusion of **>50%** of the occluded artery territory
4	Complete reperfusion

- MCA (n=31, double-blind, placebo-controlled study, iv rtPA-duteplase)
- Serebral anjiyografik reperfüzyon
- TIMI 2 skoruna karşılık gelen kısmı ikiye ayırıyor (**Mori 2 ve 3**) (**<%50** ve **>%50**)
- Klinik sonuçla ilişki olduğunu gösterdi

. Mori E, Yoneda Y, Tabuchi M, et al. Intravenous recombinanttissue plasminojen activator in acute carotid artery territory stroke. Neurology 1992;42:976-982.

Qureshi grading scale

Grade	Qureshi gs
0	No occlusion
1	MCA occlusion (M3 segment) or ACA occlusion (A2 segment) or one basilar or vertebral branch occlusion
2	MCA occlusion (M2 segment) or ACA occlusion (Aa segment) or two basilar or vertebral branch occlusion
3 3a 3b	MCA occlusion (M1) Leptomeningeal collaterals visualized Leptomeningeal collaterals not visualized
4	ICA occlusion or BA occlusion (partial filling direct or via collaterals)
5	Complete occlusion (ICA or BA)

- Daha yüksek dereceler, daha düşük derecelere göre daha kötü
- Arteriyel tıkanıklık **yeri** ve **kollateral** dolaşımın varlığı
- Küçük damar tıkanıklığından (M3, A2, BA dalları) Orta büyüklükteki (M1) ve büyük arterlere (ICA ve BA) göre şiddette artar
- Tıkalı damarın **vasküler bölgesinin boyutunu** göstermesi avantaj
- **Karmaşıklığı** dezavantaj

. Oureshi AI. New grading system for angiographic evaluation of arterial occlusions and recanalization response to intra-arterial thrombolysis in acute ischemic stroke. Neurosurgery 2002;50:1405-1414.

TICI (Thrombolysis in Cerebral Infarction)

Grade	TICI and modified TICI
0	No perfusion
1	Minimal perfusion
2 2a 2b	Partial perfusion Partial filling (<2/3, modified <1/2) Partial filling (>1/2) but the filling is slower than normal
3	Complete perfusion

- TIMI ölçeğinin değiştirilmiş bir versiyonu (2003)
- 2a ve 2b gibi açık tanımlar sağlar
- TIMI 1 ve TIMI 3 arasındaki geniş kısmı katmanlaştırır
- Mori skalasında olduğu gibi TICI skalası kısmi reperfüzyon için başka kategoriler yaratır
- **Yaygın** olarak kullanılır
- Prognozu tahmin eder

. Higashida RT, Furlan AJ, Roberts H, et al. Trial desing and reporting standards for intra-arterial cerebral thrombolysis for acute ischemic stroke. Stroke 2003;34:e109-e137.

Arterial Occlusive Lesion score (AOL)

Grade	AOL
0	No recanalization
1	Complete or partial recanalization No distal flow
2	Incomplete or partial recanalization Any distal flow
3	Complete recanalization Any distal flow

- IMS I çalışmasında tanıtılmış
- Pıhtı yüküne odaklanmış
- Rekanalizasyon → **Distal Akım**
- TIMI ile karşılaştırıldığında istatistiksel fark bulunmamış Ø
- Her iki ölçek arasında uyum orta düzeyde bulunmuş

. Khatri P, Neff J, Broderick JP, Khoury JC, Carrozzella J, Tomsick T. Revascularization end points in stroke interventional trials: recanalization versus reperfusion in IMS-I. Stroke 2005;36:2400–2403

American Society of Intervention and Therapeutic Neuroradiology/Society of Interventional Radiology Collateral Flow Grading Scale (ASITN/SIR Collateral Flow Grading Scale)

Grade	ASITN/SIR Collateral Flow Grading Scale
0	No collaterals visible to the ischemic site
1	Slow collaterals Persistence of the some of the defect
2	Rapid collaterals Persistence of the some of the defect
3	Collaterals with slow but complete angiographic blood flow, late venous phase
4	Complete and rapid collaterals blood flow Retrograde perfusion

- **Kollateral** dolaşım
- Yok→ Yavaş→ Hızlı
- Revaskülarizasyon sağlandığında, zayıf kollateralleri olan hastalarda iyi kollateralleri olanlara göre daha fazla infarkt büyümesi meydana geldiği gösterilmiş (**p=0.012**)*

>>>>> Wang ve arkadaşları (Mates testi)… oklüzyondan hemen sonra verilen izotopun ilk geçiş etkisi değerlendiriliyor…2 sn'den fazla bir süre zayıf kollateral göstergesi

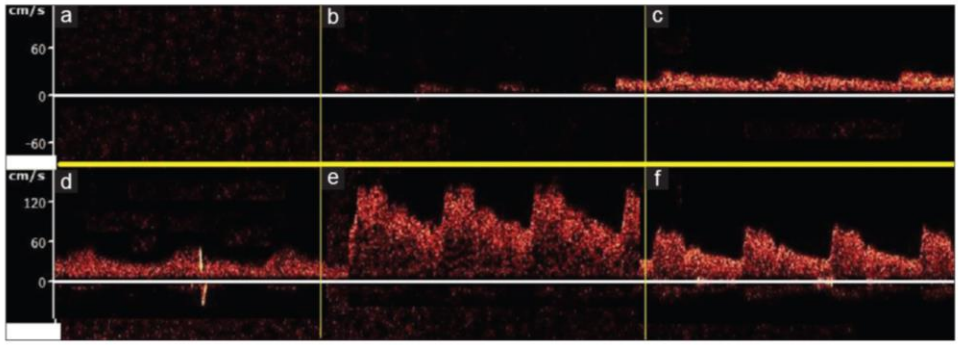
. Bang OY, Saver JL, Buck BH, et al. ; UCLA Collateral Investigators. Impact of collateral flow on tissue fate in acute ischaemic stroke. J Neurol Neurosurg Psychiatry 2008;79:625–629
*. *Bang OY, Saver JL, Kim SJ, et al. Collateral flow predicts response to endovascular therapy for acute ischemic stroke. Stroke Epub 2011 Jan 13*

Thrombolysis in brain ischemia scale (TIBI)

Grade	TIBI
0	Absen: absent flow
1	Minimal: systolic spikes Absent diastolic flow
2	Blunted: flattened systolic spikes, Positive EDV and pulsatility
3	Dampened: normal systolic flow, Positive EDV Decreased MFV (by > 30%
4	Stenotic: MFV of > 80% and velocity difference of > 30%
5	Normal: < 30% MFV difference vs control

- Sonothrombolysis
- TCD
- rtPA etkinliğini arttırabilir

Figure 2: Thrombolysis in brain ischemia grades: (a) Grade 0 (absent flow) - no regular pulsatile flow signals. (b) Grade 1 (minimal flow) - only spikes of systolic flow seen. (c) Grade 2 (blunted flow) - flattened systolic flow with variable acceleration. (d) Grade 3 (dampened flow) - systolic flow acceleration with positive end diastolic velocity. Mean flow velocities is <70% of opposite side (e) Grade 4 (stenotic flow) - the mean flow velocities >30% when compared to opposite side (at least >80 cm/s). (f) Grade 5 (normal flow) - mean flow velocities of at least 70% compared to opposite side

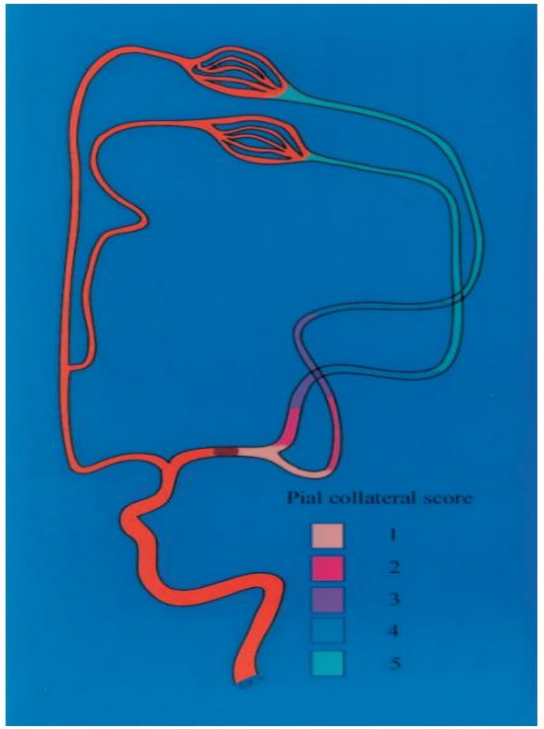


. Alexandrov AV, Demchuk AM, Wein TH, Grotta JC. Yield of transcranial Doppler in acute cerebral ischemia. Stroke 1999;30:1604–1609
. Aaron S, et. al. Sonothrombolysis for acute ischemic **stroke** - Break on through to the other side. Neurol India. 2017 Jan-Feb;65(1):52-57.

Christoforidis pial collateral scale

Grade	CPCS
1	M1
2	Proximal M2
3	Distal M2
4	M3
5	There was little or no significant reconstitution of the territory of the occluded vessel

- **Pial** collateral score
- Her renk uzak mesafeyi gösterir



. Christoforidis GA, et al. Angiographic assessment of pial collaterals as a prognostic indicator following intra-arterial thrombolysis for acute ischemic stroke. AJNR Am J Neuroradiol 2005 Aug;26(7):1789-97.

Advantages and limitations of different revascularization scales in ischemic stroke

Scale	Advantages	Limitations
TIMI	Simple, frequently used	Not accurate for collateral and reperfusion Does not account for eloquencyl occlusion site
TICI	**Simple**, **frequently** used Reperfusion adjustment	**Better** reperfusion adjustment but still not precise Does not account for eloquencyl occlusion site
AOL	Simplest, high interobserver reliability	No reperfusion
Mori reperfusion	Simple, Reperfusion adjustment	Better reperfusion adjustment but still not precise Does not account for eloquencyl occlusion site
Qureshi	Accounts for occlusion site	Complex Not precise for reperfusion
ASITN/SIR collateral flow grading	Collateral grading	No recanalization No reperfusion

TICI indicades thrombolysis in cerebral infarction

TICI Grade	Original TICI	m TICI	Revised m TICI	e TICI
0/1	No/minimal reperfusion	No/minimal reperfusion	No/minimal reperfusion	No perfusion
2a	Partial filling <2/3 territory	Partial filling <50% territory	Partial filling <50% territory	Reperfusion of 1-49 % of the territory
2b 2b 50 2b 67	Partial filling ≥ 2/3 territory … …	Partial filling ≥50% territory … …	Partial filling ≥50% territory … …	 Reperfusion of 50-66 % of the territory Reperfusion of 67-89 % of the territory
2c	…	…	Near complete perfusion except slow flow or few distal cortical emboli	Extensive reperfusion of 90–99% of the territory
3	Complete perfusion	Complete perfusion	Complete perfusion	Complete or full reperfusion

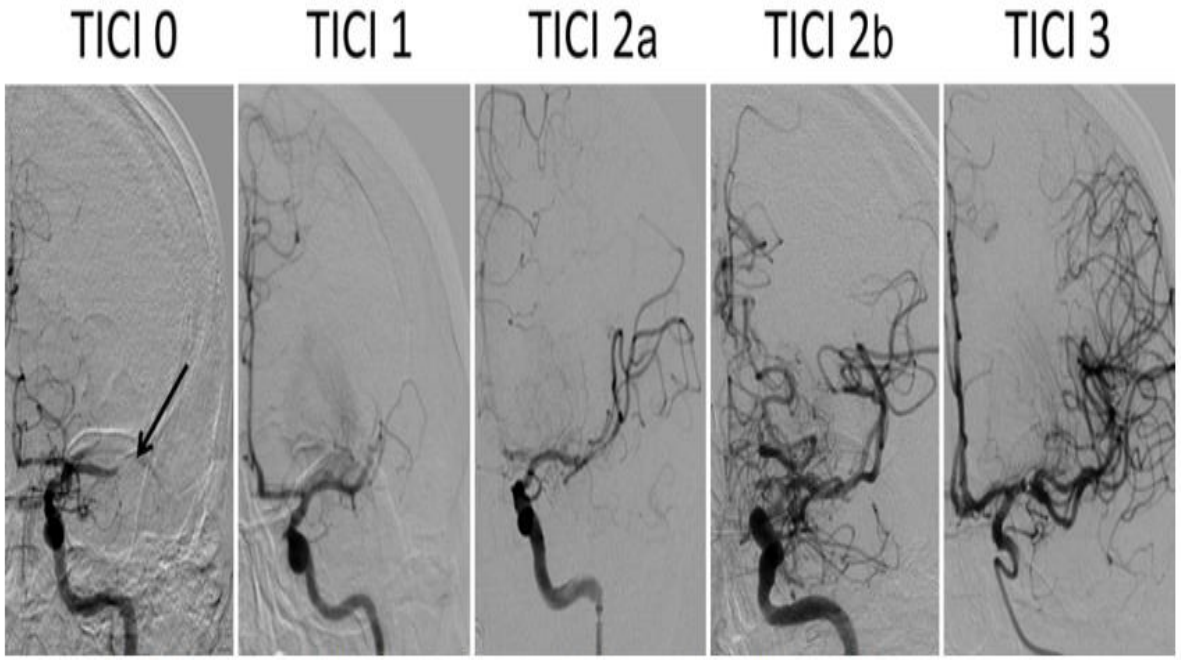


FIG. 2. Examples of the TICI score in a case of proximal MCA occlusion. From left to right: TICI 0 shows no recanalization/reperfusion of the primary occluded vessel *(arrow)*. TICI 1 shows partial reperfusion beyond the initial occlusion but not filling of distal MCA branches. TICI 2a and TICI 2b correspond to partial (< 50%) and near-complete (> 50% but less than full) reperfusion beyond the occlusion site, respectively. TICI 3 indicates complete reperfusion of the entire MCA territory.

Maxim Mokin et al. Endovascular treatment of acute ischemic stroke: the end or just the beginning? Neurosurg Focus 36 (1):E5, 2014.

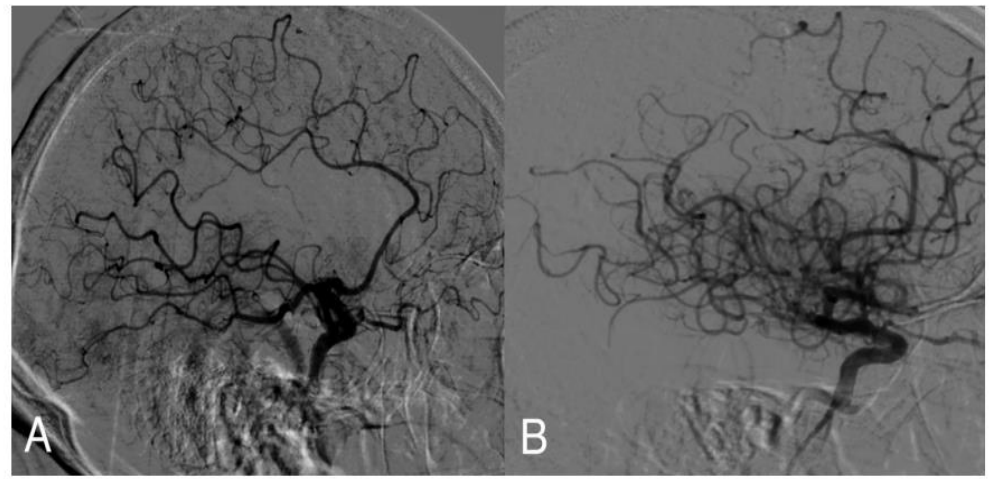


Figure 1 Angiography of final reperfusion of the middle cerebral artery territory showing (A) eTICI 2b50 (50–66%) versus (B) eTICI 2b67 (67–89%).

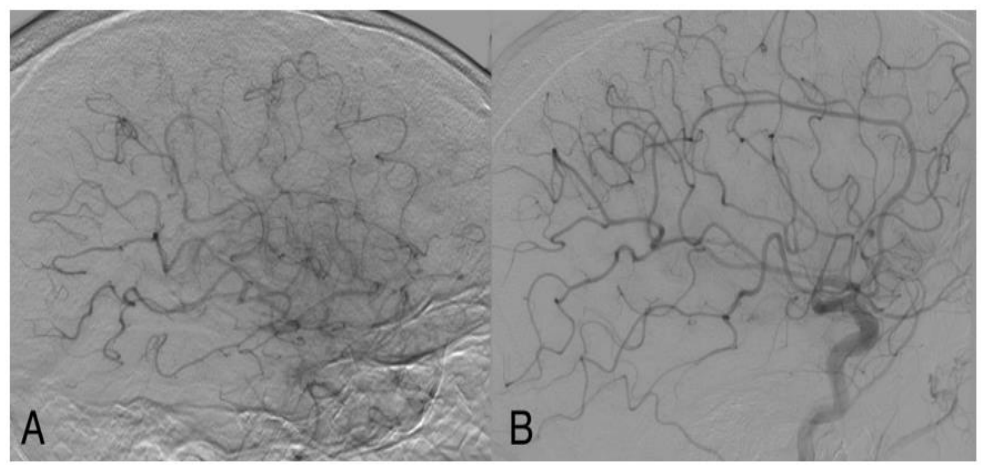
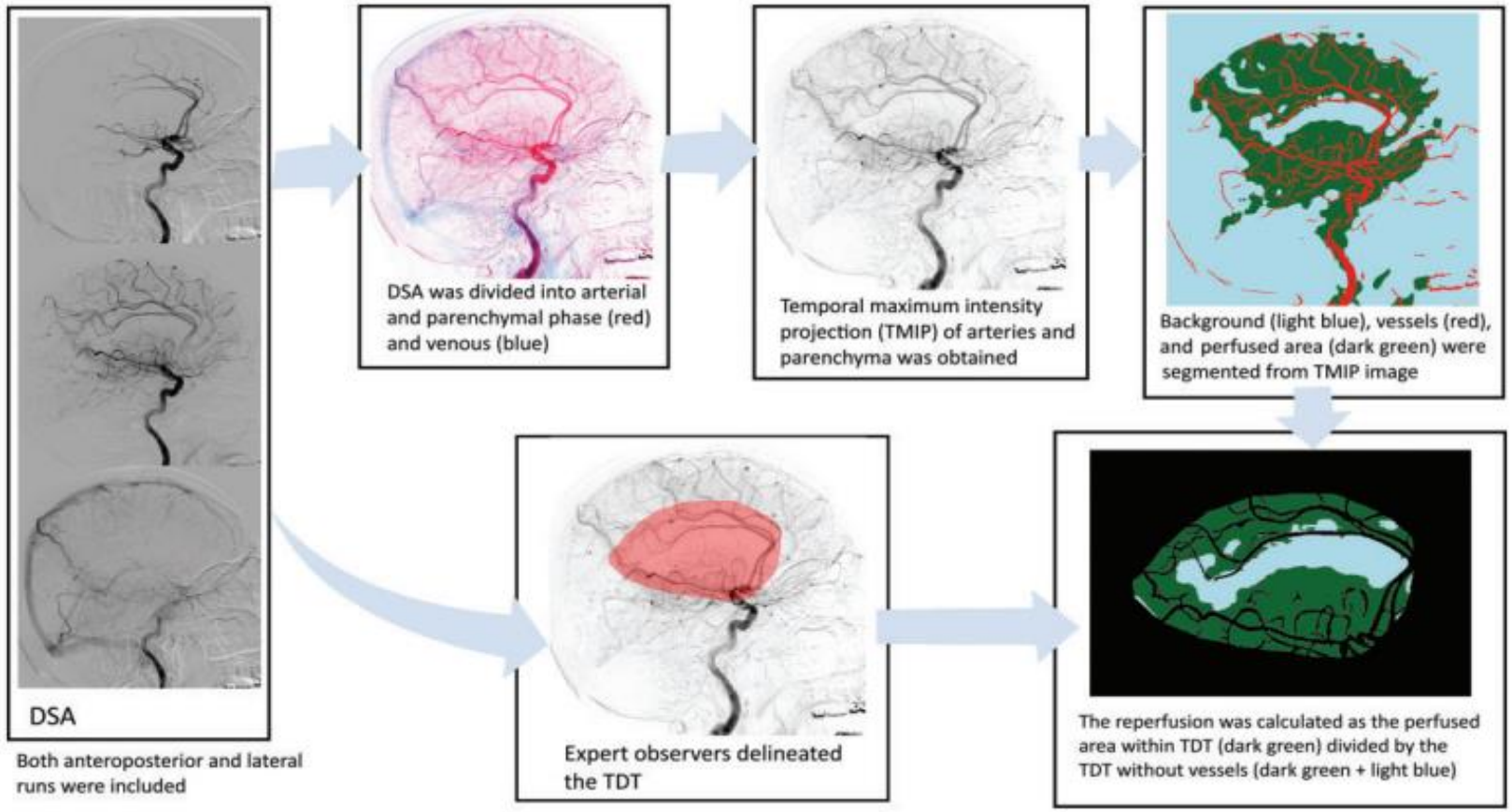


Figure 2 Angiography of final reperfusion of the middle cerebral artery territory showing (A) eTICI 2c (90–99%) versus (B) eTICI 3 (100%).

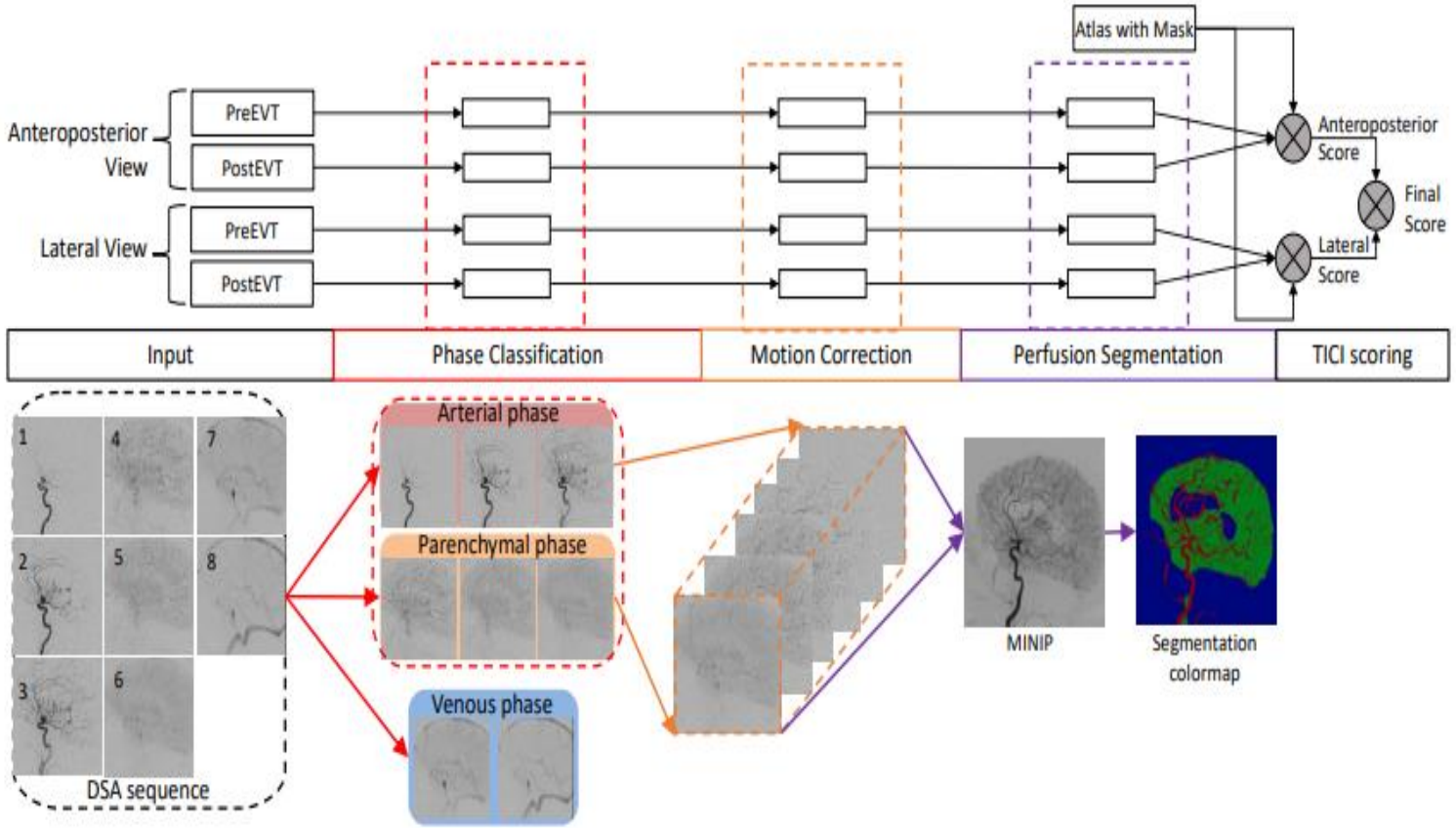
q TICI ? and autoTICI ?

- semi-automated quantitative reperfusion measure (quantified TICI (qTICI))
- autoTICI (automatic TICI scoring)?
    - … shown that qTICI is an independent predictor of functional outcome and has **similar** prognostic value as the standard eTICI
    - … have demonstrated that autoTICI is significantly **correlated** with the eTICI..

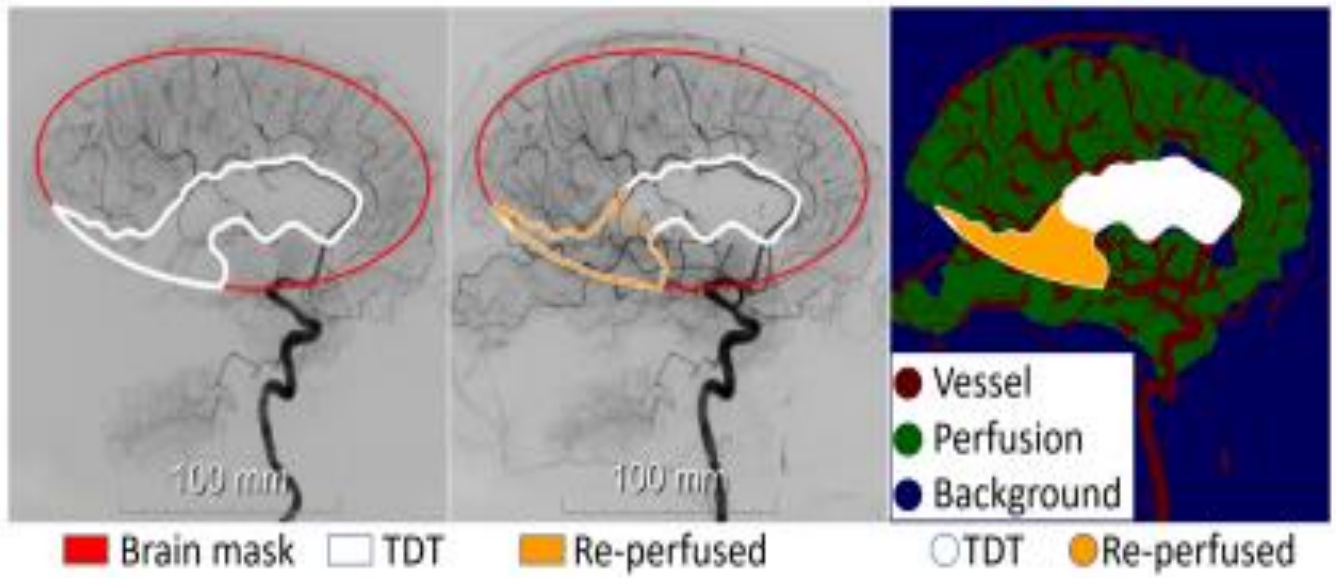
. Haryadi P. et al. qTICI: Quantitative assessment of brain tissue reperfusion on digital subtraction angiograms of acute ischemic stroke patients. International Journal of Stroke. January 2020.
. Ruisheng S. et al. autoTICI: Automatic Brain Tissue Reperfusion Scoring on 2D DSA Images of Acute Ischemic Stroke Patients. IEEE TRANSACTIONS ON MEDICAL IMAGING. 2020.



. Haryadi P. et al. qTICI: Quantitative assessment of brain tissue reperfusion on digital subtraction angiograms of acute ischemic stroke patients. International Journal of Stroke. January 2020.



. Ruisheng S. et al. autoTICI: Automatic Brain Tissue Reperfusion Scoring on 2D DSA Images of Acute Ischemic Stroke Patients. IEEE TRANSACTIONS ON MEDICAL IMAGING. 2020.



(a) pre-EVT MINIP (b) post-EVT MINIP (c) post-EVT segmentation

TAB-TICI ?

- Emergency Room-to-puncture **T**ime (**T**)
- **A**djuvant devices used (**A**)
- Procedural intracranial **B**leeding (**B**)
- Post-thrombectomy reperfusion status [Thrombolysis in Cerebral Infarction (**TICI**)]

. Woo-Keun Seo et. al. TAB-TICI Score: Successful Recanalization Score After Endovascular Thrombectomy in Acute Stroke. Front. Neurol. 14 October 2021.

TAB-TICI

Acronym	Item	Response	Score
T	ER-to-puncture time	> 110 min ≤ 110 min	1 0
A	Adjuvant thrombectomy device	Yes No	1 0
B	Procedure-related intracranial bleeding	Yes No	1 0
TICI	mTICI	0 or 1 2a 2b or 3	2 1 0
TAB-TICI			0-5

- n=446
- Güney Kore (17 Merkez)

-Farklı popülasyonlarda doğrulanmalı

-Ön ve arka sistem inmeler ayrı ayrı çalışılmalı

-Klinik yararlılığı doğrulanmalı

-Yeni bir skorlama sistemi sunmakta

-Basit ve kullanımı kolay

. Woo-Keun Seo et. al. TAB-TICI Score: Successful Recanalization Score After Endovascular Thrombectomy in Acute Stroke. Front. Neurol. 14 October 2021.

Reperfüzyon hedefi?

- **TICI 2b** ve **TICI 3** → Teknik başarı

. Goyal M. et al; HERMES Collaborators. Endovascular thrombectomy after large-vessel ischaemic stroke: a meta-analysis of individual patient data from five randomised trials. Lancet. 2016;387:1723–1731.

- TICI 2b & **TICI 3** → Klinik sonuç

.

. Kleine JF. et al. Time to redefine success? TICI 3 versus TICI 2b recanalization in middle cerebral artery occlusion treated with thrombectomy. J Neurointerv Surg. 2017;9:117-121.
. Dargazanli C. et al. Impact of modified TICI 3 versus modified TICI 2b reperfusion score to predict good outcome following endovascular therapy. AJNR Am J Neuroradiol. 2017;38:90–96.

European Stroke Organisation (ESO) - European Society for Minimally Invasive Neurological Therapy (ESMINT) Guidelines on Mechanical Thrombectomy in Acute Ischemic Stroke

Recommendation
For adults with large vessel occlusion-related acute ischemic stroke, we recommend that interventionalists should attempt a TICI grade 3 reperfusion, if achievable with reasonable safety. Quality of evidence: **Low** ⨁⨁; strength of recommendation: **Strong** ↑↑

Early TICI 2b or Late TICI 3—Is Perfect the Enemy of Good?

- German Stroke Registry—Endovascular Treatment database
- June 2015 and December 2019 (25 stroke centers in Germany)
- M1 oklüzyonu → EVT
- n=1497 [**TICI 2b** = 586 (%39.1) / **TICI 3** = 911 (%60.9)]

. F. Flottmann et al. Early TICI 2b or Late TICI 3—Is Perfect the Enemy of Good?. Clin Neuroradiol. June 2021

Early TICI 2b or Late TICI 3—Is Perfect the Enemy of Good?

Table 2 TICI grade and clinical outcome by number of retrievals

Number of retrievals	1 pass ($n=793$)		2 passes ($n=334$)		≥3 passes ($n=370$)	
Final TICI	TICI 2b	TICI 3	TICI 2b	TICI 3	TICI 2b	TICI 3
n	235	558	139	195	212	158
% per pass	29.7%	70.3%	41.6%	58.4%	57.3%	42.7%
Functional independence *n*, (%)	94 (40)	279 (50)	44 (32)	91 (47)	54 (26)	68 (43)
Mortality *n*, (%)	53 (23)	118 (21)	40 (29)	43 (22)	78 (37)	33 (21)

TICI Thrombolysis in Cerebral Infarction score

Early TICI 2b or Late TICI 3—Is Perfect the Enemy of Good?

Table 3 Summary table of the logistic regression model with good clinical outcome (mRS at day 90 of 0–2) as the dependent variable

Predictor variable	OR (95% CI)	Coefficient[b]	*P*-value
Age[a]	0.93 (0.92–0.94)	–0.07	$<2 \times 10^{-16}$
NIHSS[a]	0.89 (0.87–0.91)	–0.12	$<2 \times 10^{-16}$
ASPECTS 0–5	–	Ref	–
ASPECTS 6–7	1.43 (0.83–2.49)	0.36	0.20
ASPECTS 8–9	2.07 (1.26–3.47)	0.73	0.0047
ASPECTS 10	2.42 (1.46–4.10)	0.89	0.0007
Proximal M1 occlusion	–	Ref.-	–
Distal M1 occlusion	1.54 (1.19–1.98)	0.43	0.0008
Iv-Thrombolysis	1.76 (1.37–2.26)	0.57	8.72×10^{-6}
TICI 2b at first pass	–	Ref.-	–
TICI 3 at first pass	1.71 (1.18–2.47)	0.53	0.0046
TICI 2b at 2nd pass	0.53 (0.31–0.89)	–0.63	0.017
TICI 3 at 2nd pass	1.55 (0.98–2.45)	0.44	0.06
TICI 2b at 3rd or more passes	0.44 (0.27–0.70)	–0.82	0.0006
TICI 3 at 3rd or more passes	0.93 (0.57–1.50)	–0.07	0.76
(Intercept)	94.26 (36.36–249.61)	4.55	$<2 \times 10^{-16}$

NIHSS National Institutes of Health Stroke Scale, *ASPECTS* Alberta stroke programme early CT score, *TICI* Thrombolysis in Cerebral Infarction score

[a]Age and NIHSS were treated as continuous variables; ASPECTS and TICI at the n^{th} retrieval were treated as factors

[b]Coefficients are reported on the logit scale

Early TICI 2b or Late TICI 3—Is Perfect the Enemy of Good?

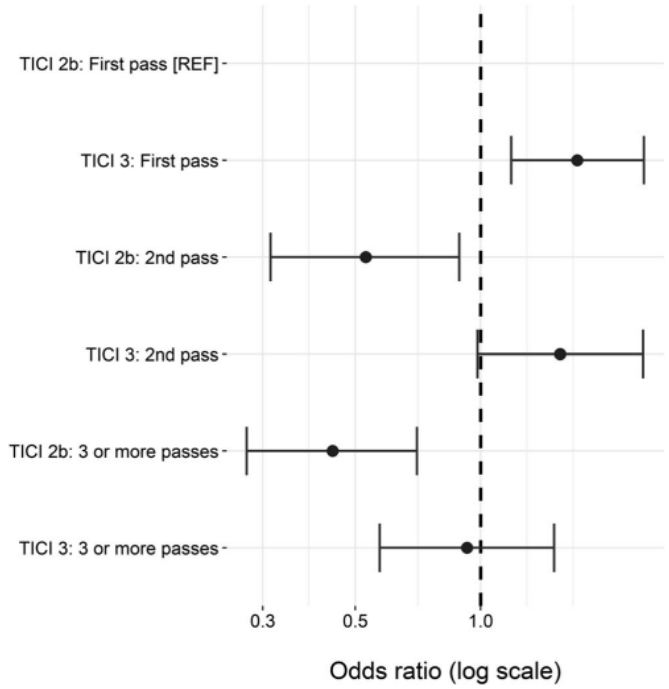


Fig. 3 Odds ratio of good clinical outcome (defined as mRS of 0–2 at day 90) by final TICI score and number of retrieval attempts, adjusted for age, NIHSS score on admission, location of occlusion (proximal vs. distal segment of the MCA), ASPECTS on admission and iv-thrombolysis. *mRS* modified Rankin scale, *TICI* thrombolysis in cerebral infarction, *MCA* middle cerebral artery, *ASPECTS* Alberta stroke programme early CT score

Özet

- TIMI → TICI (2003)
- Kolay-Yaygın-kullanım
- Prognoz tahmini (TICI 0 → TICI 2b & TICI 3)
- TICI-mTICI-eTICI-qTICI/autoTICI-TAB TICI (2021)…TABA TICI ??

Teşekkürler…