Akut Serebral Damar Oklüzyonu ve İntrakraniyal Aterosklerotik Hastalık Varlığı Nasıl Şüphelenmeliyim? Nasıl Tedavi Etmeliyim?

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- Endovaskuler tedavi… büyük damar oklüzyonlarında standard tedavi

- Altta intrakranial ateroskleroz bulunanlarda istenilen rekanalizasyon kolay değil

- İşlem esnasında reokluzyon sık
- Kurtarma teknikleri (intraarterial trombolizis, balon anjioplasti, stent..) daha sık gerekebilmekte

- Intrakranial ateroskleroz (IKAS) ilişkili büyük damar oklüzyonlarında mekanizma emboliden ziyade in situ trombo-oklüzyon
- IKAS Asya populasyonlarında sık
- Son çalışmalarda IKAS-O Doğu Asyada büyük damar oklüzyonlarının yaklaşık %12-30'ndan sorumlu
- Endovaskuler tedavide başarılı rekanalizasyon <%30 sağlanılabilmekte…kurtarma metodlarına başvuru daha sık
- Bu nedenle akut inmede bu hastalara en iyi endovaskuler yaklaşımın belirlenmesi ayrıca önemli

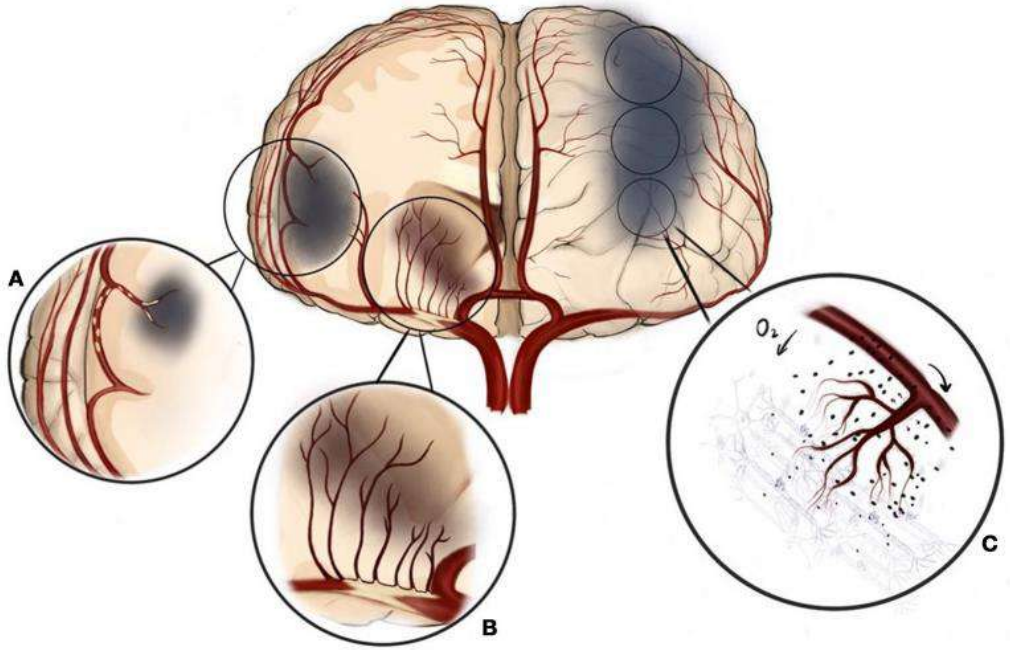


FIGURE 1 | Three different mechanisms of ischemic stroke can be present in intracranial atherosclerosis. **(A)** Artery to artery embolism, **(B)** Local perforator ischemia, **(C)** Hemodynamic hypoperfusion.

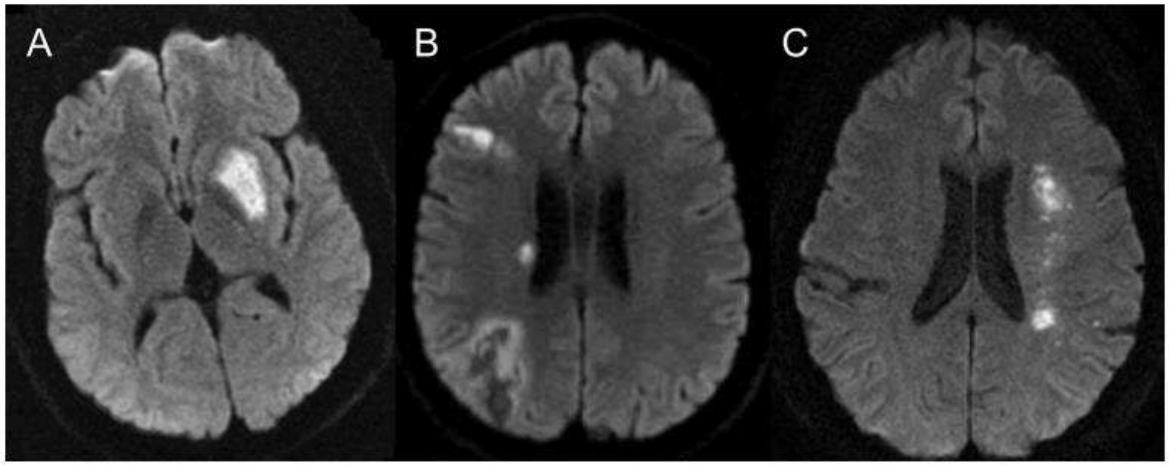


FIGURE 2 | Ischemia pattern for the different pathological mechanisms seen in intracranial atherosclerosis: **(A)** demonstrates the typical perforator type infarct, **(B)** demonstrates the artery to artery embolic infarct and **(C)** demonstrates the classical deep watershed zone for the hemodynamic infarcts.

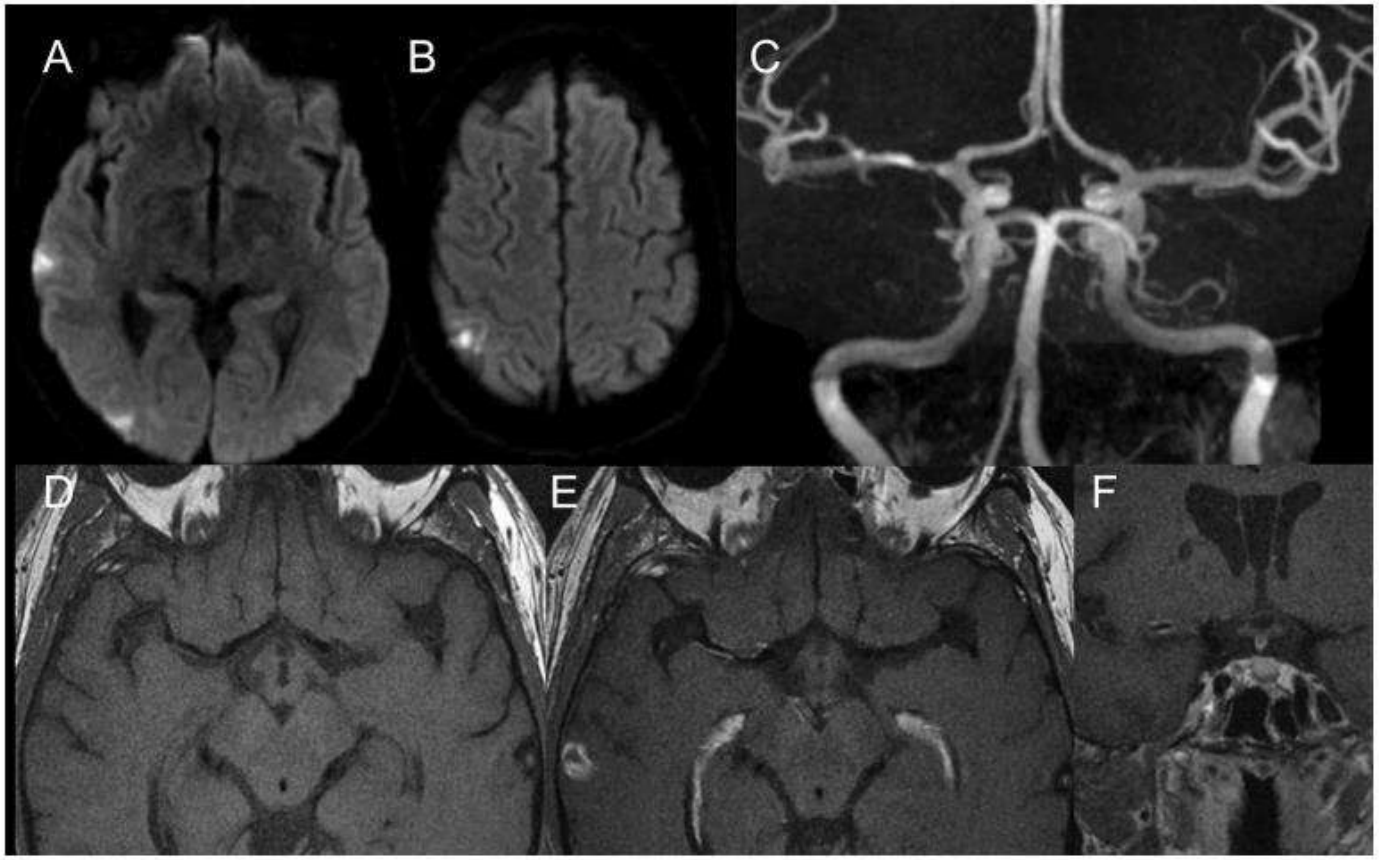


FIGURE 4 | Diffusion weighted scans **(A,B)** demonstrate multiple distal (embolic) foci of ischemia in the right MCA territory. MR Angiography **(C)** shows a moderate degree MCA stenosis in the proximal M1. High resolution vessel wall imaging in axial cuts before **(D)** and after **(E)** contrast enhancement as well as coronal T1 weighted vessel wall imaging sequences after contrast enhancement **(F)** demonstrate a hot plaque with dense eccentric enhancement. Given the embolic nature, the "hot plaque" characteristics and the relatively low degree of stenosis in a patient who was not on optimal therapy, it was decided to not perform an endovascular therapy.

tanım

- IKAS EVT esnasında oklüzyon bölgesinde belirgin fikse fokal stenoz izlenmesi olarak karşımıza çıkar
- Belirgin darlık
  - Fikse stenoz %70
  - Fikse stenoz >%50 yanında akım ve perfüzyonda belirgin yetmezlik veya yeterli EVT yaklaşımına karşılık reoklüzyona yatkınlık

- Bazı demografik ve klinik risk faktörleri yanında nöroradyolojik bulgular ipucu vermekte

- Ama demografik özellikler özgüllük anlamında yetersiz!

Kimlerde şüphelenmeli?

- 1967 hasta (496 IKAS-O vs 1471 nIKAS-O) ele alınan bir derlemede
- IKAS-O grubunda
  - HT ([OR] 1.46; 95% CI, 1.10–1.93),
  - DM (OR, 1.68; 95% CI, 1.29–2.20),
  - Dislipidemi (OR, 1.94; 95% CI, 1.04–3.62),
  - Sigara öyküsü (OR, 2.11; 95% CI, 1.40–3.17) daha sık
  - AF (OR, 0.20; 95% CI, 0.13–0.31) daha az

Tsang ACO, et al. Thrombectomy Outcomes of Intracranial Atherosclerosis-Related Occlusions. Stroke. 2019 Jun;50(6):1460-1466.

Table 2. Clinical Features and Risk Factors of ICAS-O Versus Non–ICAS-O

	ICAS-O	Non–ICAS-O	OR (95% CI)	*P* value	I^2 (*P* Value)
Male*	70.4%	51.8%	1.84 (1.45 to 2.34)	<0.001	2.8% (0.42)
Hypertension*	71.4%	63.1%	1.46 (1.10 to 1.93)	0.009	21.3% (0.24)
Diabetes mellitus*	31.9%	22.5%	1.68 (1.29 to 2.20)	<0.001	13.0% (0.32)
Atrial fibrillation*	16.4%	54.1%	0.20 (0.13 to 0.31)	<0.001	48.6% (0.041)
Coronary artery disease	12.1%	14.7%	0.46 (0.42 to 1.49)	0.46	49.1% (0.081)
Dyslipidemia*	36.0%	28.6%	1.94 (1.04 to 3.62)	0.037	69.5% (<0.001)
Smoking*	44.6%	21.8%	2.11 (1.40 to 3.17)	<0.001	58.6% (0.009)
ICA occlusion	27.3%	35.4%	0.72 (0.44 to 1.17)	0.19	58.3% (0.048)
MCA occlusion	67.7%	61.8%	1.17 (0.67 to 2.04)	0.59	71.8% (0.007)
IV thrombolysis	30.7%	43.9%	0.89 (0.56 to 1.42)	0.49	51.7% (0.043)
Mean and mean difference (95% CI)					
Age (years)*	63.7	67.2	−3.17 (−4.68 to −1.66)	<0.001	25.4% (0.202)
Baseline NIHSS*	14.5	17.0	−2.23 (−2.98 to −1.48)	<0.001	20.4% (0.249)

ICA indicates internal carotid artery; ICAS-O, intracranial atherosclerosis–related occlusion; IV, intravenous; MCA, middle cerebral artery; NIHSS, National Institutes of Health Stroke Severity Scale; and OR, odds ratio.

*$P<0.05$.

Kimlerde şüphelenmeli? Demografik özellikler ve risk faktör farklılıkları

Table 2. *Baseline demographic characteristics and vascular risk factors*

	IAD	Embolism				
	In situ thrombotic	Subtotal	Cardiogenic	Cryptogenic	Artery to artery	*P* value
Number	24	134	104 (77.6)	25 (18.7)	5 (3.7)	
Age, y	59.5 ± 11.8	68.3 ± 14.3	70.0 ± 13.4	60.0 ± 15.6	73.4 ± 11.8	.005
Male sex	22 (91.7)	72 (53.7)	51 (49.0)	16 (64.0)	5 (100)	<.001
Initial NIHSS	12.5 (9.5-20.25)	17 (14-19)	17 (14-19)	17 (13.25-19)	16 (12.5-21)	.100
Hypertension	14 (58.3)	93 (69.4)	71 (68.3)	17 (68.0)	5 (100)	.285
Diabetes mellitus	8 (33.3)	33 (24.6)	21 (20.2)	10 (40.0)	2 (40.0)	.370
Atrial fibrillation	0 (0)	80 (59.7)	80 (76.9)	0 (0)	0 (0)	<.001
Dyslipidemia	21 (87.5)	84 (63.2)	65 (63.1)	19 (76.0)	0 (0)	.020
Smoking	12 (50.0)	18 (13.4)	13 (12.5)	4 (16.0)	1 (20.0)	<.001
Prior stroke	3 (12.5)	25 (18.7)	21 (20.2)	4 (16.0)	0 (0)	.467
Initial systolic blood pressure (mm Hg)	155 ± 28	147 ± 25.7	145 ± 24	153 ± 31	156 ± 26	.131
Initial diastolic blood pressure (mm Hg)	88 ± 17	84 ± 16	84 ± 16	87 ± 17	86 ± 14	.352

Lee JS, Hong JM, Lee KS, Suh HI, Demchuk AM, Hwang YH, Kim BM, Kim JS. Endovascular Therapy of Cerebral Arterial Occlusions: Intracranial Atherosclerosis versus Embolism. J Stroke Cerebrovasc Dis. 2015 Sep;24(9):2074-80.

- 158 hastanın dahil edildiği bu çalışmada

24 IKAS-O ve 134 emboli nedenli akut iskemik inme hastası karşılaştırılmış.

- Posterior dolaşım iskemisinin daha fazla görüldüğü (p=0.001)
- Başarılı reperfüzyon oranının farketmediği (TICI2b or 3; 63% versus 64%, p=5.915)
- Multivaryans analiz sonrasında da IKAS-O bağımsız prediktörleri
  - Erkek cinsiyet
  - Posterior dolaşım tutulumu
  - Yüksek kolesterol seviyesi

Table 5. *Multiple regression model for predicting IAD*

	Odds ratio (95% confidence interval)	*P* value
Age	.976 (.938-1.015)	.229
Male sex	6.416 (1.248-32.973)	.026
Diabetes mellitus	2.154 (.676-6.866)	.194
Smoker	2.763 (.871-8.761)	.084
Total cholesterol level	1.019 (1.005-1.033)	.008
Posterior circulation	3.573 (1.086-11.754)	.036

Abbreviation: IAD, intracranial atherosclerotic disease.

***Lee JS, et al (2015)http://dx.doi.org/10.1016/j.jstrokecerebrovasdis.2015.05.003**

- Aynı çalışmada embolik grup yaş ortalaması daha yüksek .. Olasılıkla AF ileri yaşta daha fazla
- Embolik grupta AF daha sık

- Erkek cinsiyetin daha fazla olması koroner ve periferal aterosklerotik hastalıkların erkeklerde daha sık olması ile uyumlu
- Erkeklerde daha fazla olması IKAS-O aynı zamanda Çin ve Fransız çalışmalarında da bildirilmiş. (*,**)

***Huang HW, et al. Prevalence and riskfactors of middle cerebral artery stenosis in asymptomatic residents in Rongqi County, Guangdong. Cerebrovasc Dis 2007;24:111-115.**
****Mazighi M, et al. Autopsy prevalence of intracranial atherosclerosis in patients with fatal stroke. Stroke 2008;39:1142-1147.**

İşlem ve sonrasına dair özellikler

- 1967 hasta (496 IKAS-O vs 1471 non–ICAS-O)
  - IKAS-O daha sık reoklüzyon oranı(OR, 23.7; 95% CI, 6.96–80.7)
  - Balon anjioplasti ve intrakranial stentleme ihtiyacı daha fazla izlenmiş.
  - Ponksiyon-reperfüzyon süresi daha uzun saptanmış (80.8 vs 55.5 min, MD 21.3; 95% CI, 11.3–31.3).
  - Ancak final rekanalizasyon oranında istatistiksel farklılık saptanmamış (mTICI 2b/3; OR, 0.67; 95% CI, 0.36–1.27)
  - Semptomatik intraserebral hemoraji
  - İyi fonksiyonel sonlanım(mRS0-2)
  - Mortalite açısından farklılık yok.

Tsang ACO, et al. Thrombectomy Outcomes of Intracranial Atherosclerosis-Related Occlusions. Stroke. 2019 Jun;50(6):1460-1466.

Table 3. Summary of Meta-Analysis Outcomes of Thrombectomy in ICAS-O Versus Non–ICAS-O

	ICAS-O	Non–ICAS-O	OR (95% CI)	*P* Value	I^2 (*P* Value)
Intraprocedural reocclusion*	36.9%	2.7%	23.7 (6.96–80.7)	<0.001	78.2% (0.01)
Rescue with balloon angioplasty alone*	9.0%	1.3%	9.49 (4.11–21.9)	<0.001	0% (0.6)
Rescue with intracranial stenting*	37.8%	2.6%	14.9 (7.64–29.2)	<0.001	36.3% (0.15)
Final mTICI 2b/3	81.5%	84.3%	0.67 (0.36–1.27)	0.22	68.1% (<0.001)
Symptomatic intracranial hemorrhage	5.5%	8.1%	0.79 (0.50–1.25)	0.31	0% (0.72)
mRS score of 0–2 at 90 d	49.8%	47.9%	1.16 (0.85–1.58)	0.34	44.0% (0.057)
Mortality at 90 d	20.2%	18.0%	0.94 (0.64–1.39)	0.76	4.4% (0.40)
Mean and mean difference (95% CI)					
Puncture-to-reperfusion (min)*	80.8	55.5	+21.3 (11.3–31.3)	<0.001	78.4% (<0.001)
Onset-to-reperfusion (min)*	401.5	333.4	+56.4 (18.7–94.1)	0.003	53.0% (0.059)

ICAS indicates intracranial atherosclerosis–related occlusion; mRS, modified Rankin Scale; mTICI, modified Thrombolysis in Cerebral Infarction scale; and OR, odds ratio.

*$P<0.05$.

- Yakın tarihli bir çalışmada embolik ve IKAS-O rekanalizasyon oranları benzer olmasına karşılık IKAS-O multivaryans analizler sonucunda kötü prognostik faktör olarak bulunmuş. *

- Sonlanıma en belirgin etki uzamış işlem süresi ile ilişkili (ponksiyon-rekanalizasyon süresi)

- IKAS-O kötü sonlanım
  →sürenin uzun olması
  →işlemin kompleks
  →reoklüzyon yüksek oranda izlenmesi

- Kısaca IKAS-O'nda başarılı rekanalizasyon kısa işlem süresi etyolojik faktörden (IKAS/embolik) daha fazla sonlanım üzerine etkili

Lee JS, Lee S-J, Yoo JS, Hong J-H, Kim C-H, Kim Y-W, et al. Prognosis of acute intracranial atherosclerosis-related occlusion after endovascular treatment. *J Stroke*. (2018) 20:394–403. doi: 10.5853/ios.2018.01627

Anjiografik görünüm IKAD ayırmada işe yarar mı?

- Başarılı bir EVT için anjiografik görünüm üzerinden etiyolojiye dair ipuçları mümkün mü??
- Hiperdens arter bulgusu Blooming artifakt emboli lehine değerlendirilebilir.
- DSA'da oklüzyonun ilk görüntüsü üzerinden alttaki lezyon hakkında bilgi sahibi olunabilir mi??

TABLE 2 | Surrogate markers suggested of intracranial atherosclerosis-related large vessel occlusion.

	Surrogate markers	ICAS-related	Embolic
Before starting EVT	Atrial fibrillation, 2017 (13)	+*	+++
	Susceptibility artifact on MR gradient echo image, 2015 (28)	+	+++
	Hyperdense artery sign on NECT, 2017 (29)	+	++
	Truncal-type occlusion on CT angiography, 2017 (13), 2016 (14)	+++	+
During the EVT	Truncal-type occlusion, 2016 (7), 2017 (13), 2016 (14)	++++	+
	Residual stenosis, 2014 (8), 2015 (16), 2018 (23)	++++	+

EVT, endovascular treatment; ICAS, intracranial atherosclerotic stenosis; MR, magnetic resonance; NECT, non-enhanced computed tomography; CT, computed tomography.
** The number of + sign indicates to have more probability to have ICAS-related or embolic surrogate markers.*

Arterial oklüzyonun anjiografik görünümü

A,B..tapered
C…meniskus
D…cut off
E…tramtrack
F…tanımlanamayan

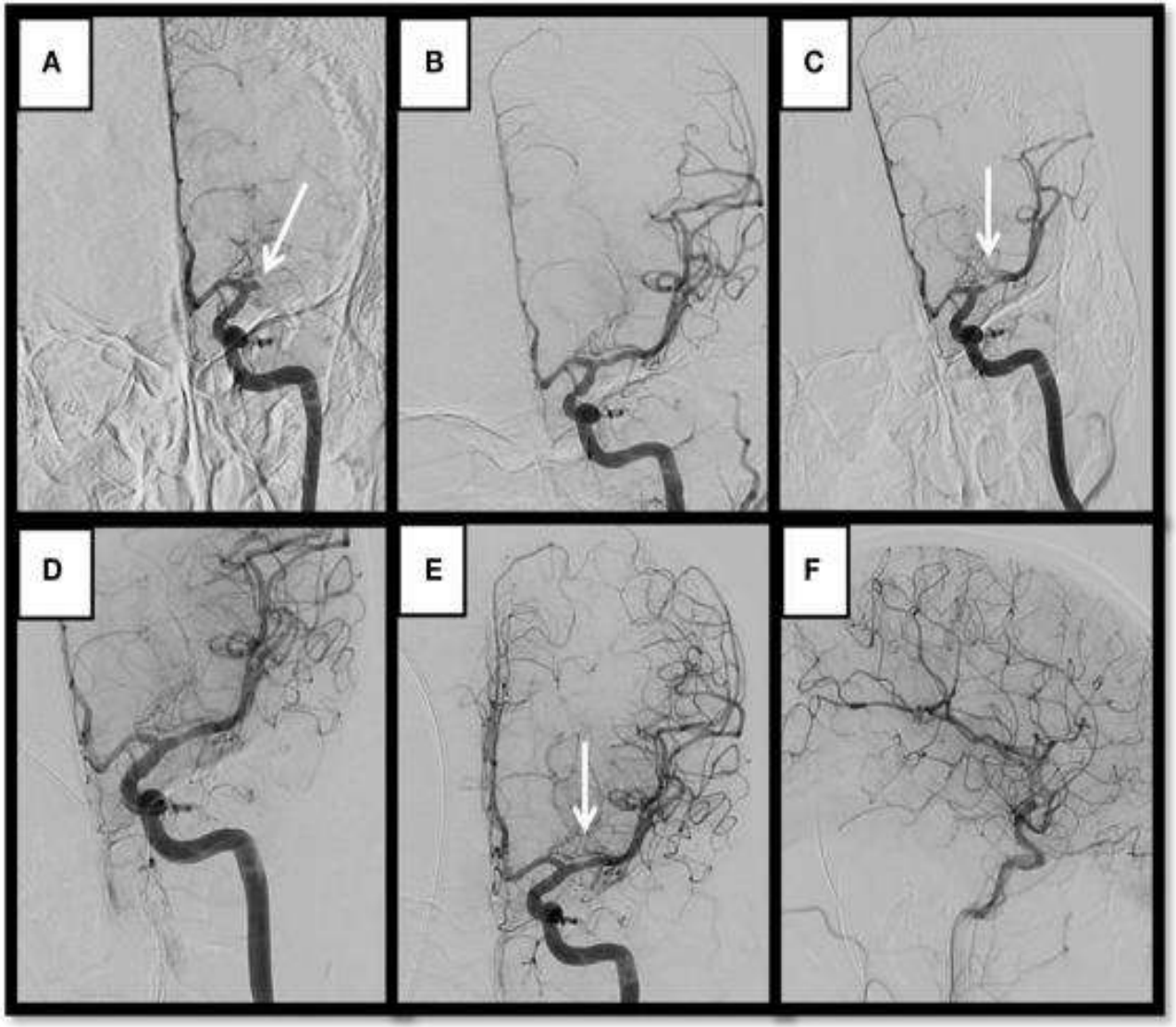


FIGURE 2 | Representative MT of a case with a tapered occlusion who experienced severe stenosis after pass and required rescue therapy with permanent stenting and GP IIb/IIIa inhibitors. Thirty-six year-old Bangladeshi male with history of HTN, presenting a "wake up" complete left MCA syndrome (NIHSS 20). **(A)** Baseline angiogram shows left proximal M1 occlusion with tapered aspect. **(B)** Complete recanalization after 1 pass of stent-retriever. **(C)** Early spontaneous severe re-stenosis after 10 min. **(D)** By pass of detachable stent-retriever over the lesion after IA bolus of eptifibatide. **(E,F)** Anteroposterior and lateral views of complete recanalization after detachment of stent showing complete recanalization and reperfusion.

Tapered olarak tanımlanan oklüzyonlarda başarılı rekanalizasyon sağlansa dahi reoklüzyon ve rezidual stenoz daha sık

TABLE 1 | Comparison of baseline demographics, etiological classification of stroke and clinical outcome between tapered and non-tapered occlusion groups.

	Overall ($n = 131$)	Tapered ($n = 31$)	Non-tapered ($n = 100$)	*P*-value
Age	50.9 ± 13.9	50.6 ± 12.6	50.9 ± 14.3	0.901
Sex				
• Male	107(81.7%)	26(83.9%)	81(81.0%)	0.718
Baseline NIHSS	14.7 ± 7.2	10.3 ± 6.2	16.1 ± 7.0	<0.001
Risk Factors				
• HTN	77(58.8%)	20(64.5%)	57(57.0%)	0.458
• DM	53(40.5%)	13(41.9%)	40(40.0%)	0.848
• Dyslipidemia	29(23.0%)	6(20.0%)	23(24.0%)	0.653
• AF	26(23.9%)	4(16.0%)	22(26.2%)	0.294
• CHF	7(5.3%)	0(0.0%)	7(7.0%)	0.130
• TIA	10(7.6%)	2(6.5%)	8(8.0%)	0.777
• Smoking	18(13.7%)	4(12.9%)	14(14.0%)	0.877
Thrombolysis given	78(59.5%)	15(48.4%)	63(63.0%)	0.148
TOAST Classification				<0.001
• ICAS	35(26.7%)	17(54.8%)	18(18.0%)	
• Cardioembolic	46(35.1%)	5(16.1%)	41(41.0%)	
• Undetermined	50(38.2%)	9(29.0%)	41(41.0%)	
Good long term outcome $\leq 2^{(n=112)}$	57(50.9%)	12(50.0%)	45(51.1%)	0.921

Garcia-Bermejo P, (2019)Baseline Occlusion Angiographic Appearance on Mechanical Thrombectomy Suggests Underlying Etiology and Outcome. Front. Neurol. 10:499. doi: 10.3389/fneur.2019.00499

- Ayrıca tapered oklüzyonlarda daha hafif nörolojik semptomların ve daha küçük infarkt boyutları olduğu izlenilmiş.
- Bu IKAS-O larında aterosklerotik plak progrese oldukça kollaterallerin devreye girmesi ve gelişmesi ile ilişkili olduğu??

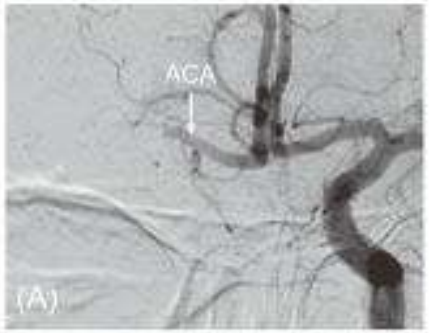
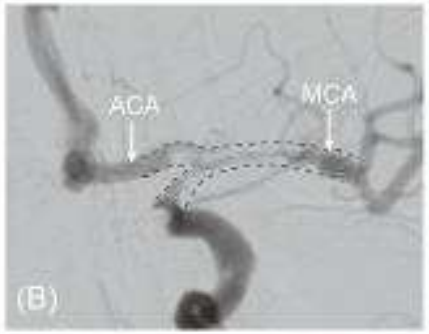
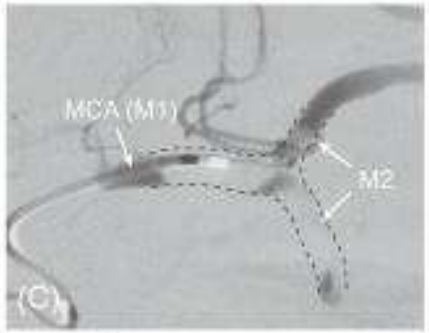
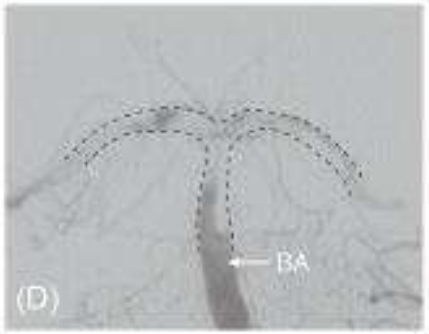
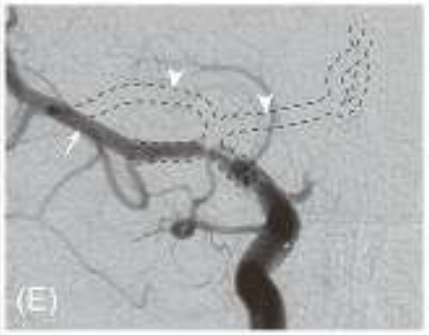
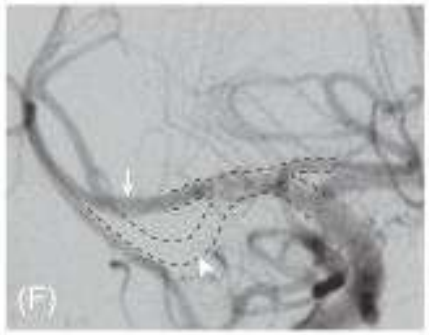
Trunkal tip oklüzyon

- Arteriyal bifurkasyon ve oklude segment ötesinde distal dallar korunmuş ise Trunkal tip oklüzyon… IKAS-O ile ilişkili
- 318 inme hastasının ele alındığı bir başka çalışmada* %17.6 sında trunkal tip oklüzyon saptanmış.. IKAS tanımlanmış

- Hastalar standart stentretriever ile tek başına rekanalizasyon oranları %28,9
- Daha fazla kurtarıcı tedavilere geçiş mevcut (80.4 vs.88.5%; p = 0.097)
- Ancak uzun dönem fonksiyonel iyi sonlanım açısından fark yok (46.4% vs. 46.9; p = 0.944)

*Baek JH. Outcomes of endovascular treatment for acute intracranial atherosclerosis–related large vessel occlusion. Stroke. (2018) 49:2699–705.

Braching-site occlusion

Failure of advancement of collateral flow through ACOM on contralateral ICA angiogram			
Y- or T-shaped filling defect *on stent retriever deployment, on microcatheter angiogram, or after minimal recanalization*			
Branch-missing sign *on stent retriever deployment*			

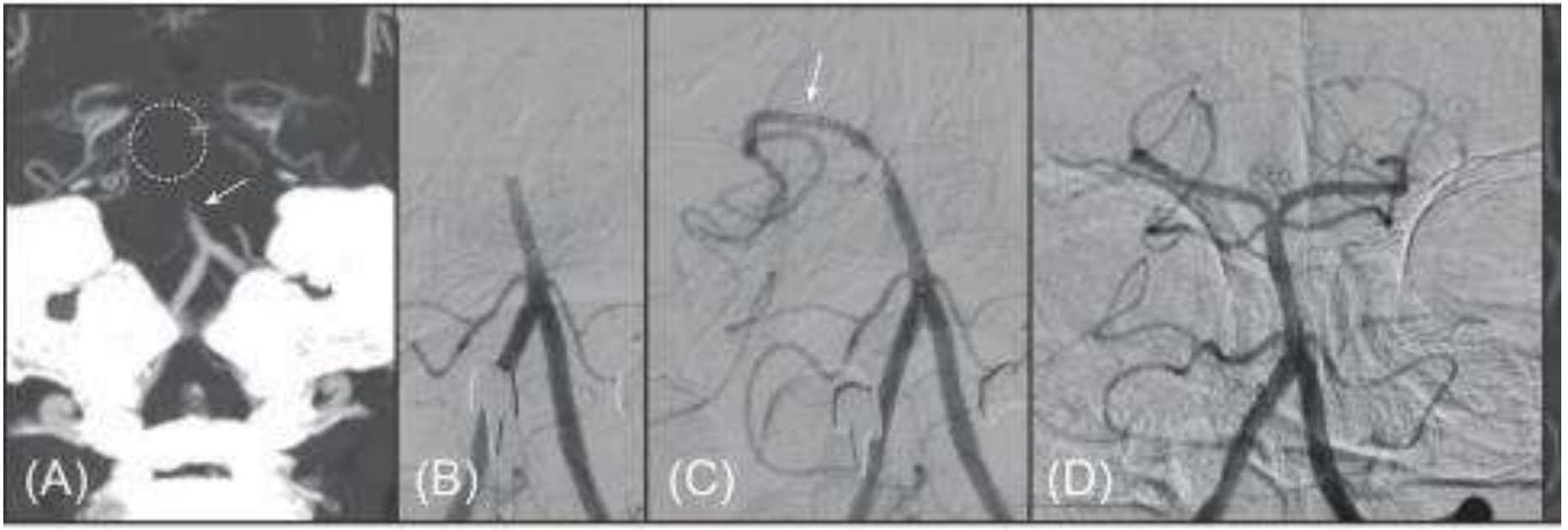
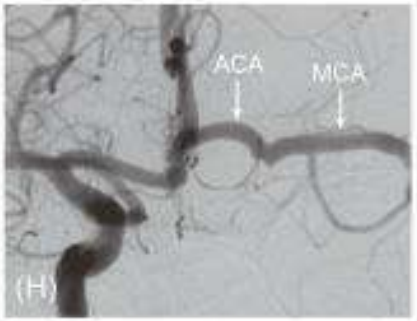
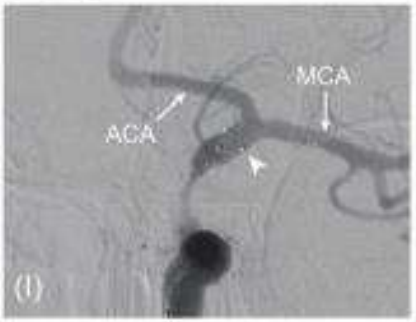
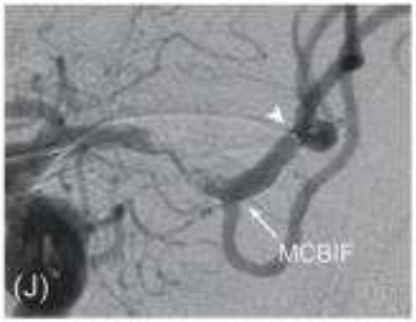
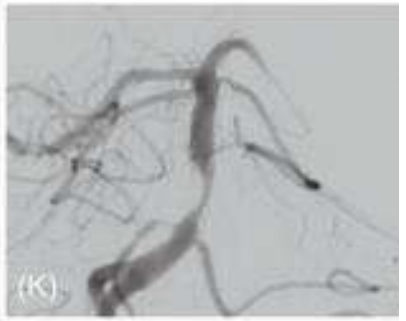
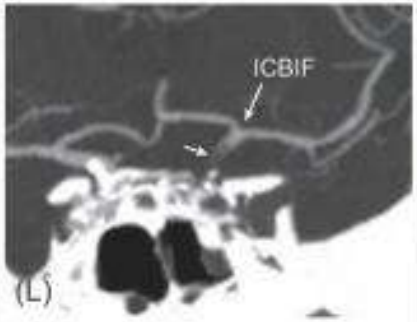
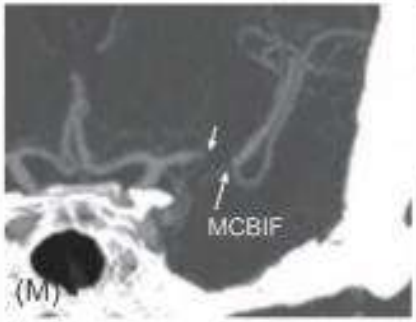
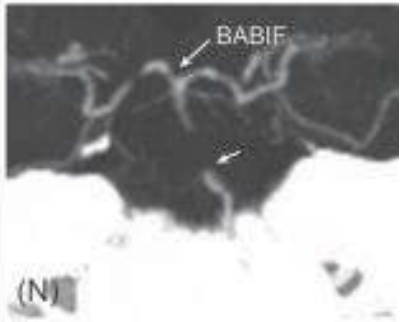


FIGURE 1 | A representative example of 67-year old male patient with branching-site occlusion. **(A,B)** Basilar artery (BA) occlusion was noted on preprocedural computed tomography angiography (**A**, coronal view of maximal intensity projection image; arrow) and digital subtraction angiography (**B**, anteroposterior view). BA bifurcation site was not clearly seen on preprocedural computed tomography angiography (dotted circle). **(C)** Post-deployment angiogram showed only unilateral posterior cerebral artery was observed, which could be considered as a finding of branching-site occlusion (branch-missing sign). Distal marker of the stent retriever was seen on the angiogram (arrow). **(D)** With 1 stent retriever thrombectomy, the BA was completely recanalized. **(E)** On follow-up magnetic resonance angiography (time-of-flight image) performed 1 day after procedure, the recanalized BA was patent. **(F)** Only multiple tiny acute infarctions were noted in bilateral cerebellum and occipital lobe on diffusion-weighted magnetic resonance images. The patient discharged without any neurologic deficits, whose modified Rankin Scale score was 0 at 3 months after stroke.

Truncal-type occlusion

Advancement of collateral flow through ACOM on contralateral ICA angiogram			
Clearly-visible all major branches and its birufcation site *on stent retriever deployment, on microcatheter angiogram, or after minimal recanalization*			
Clearly-visible all major branches and its birufcation site *on CTA images*			

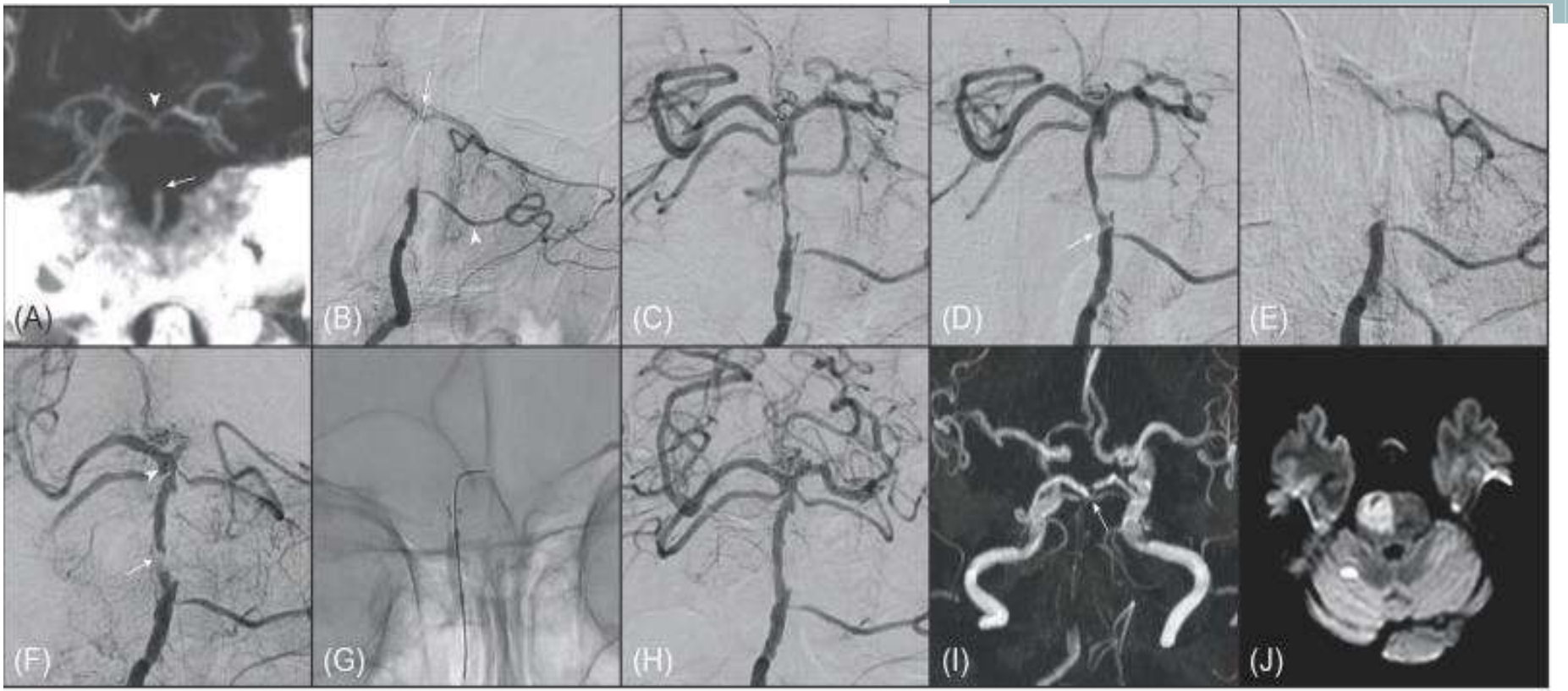


FIGURE 2 | A representative example of 80-year old female patient with truncal-type occlusion. **(A)** On preprocedural computed tomography angiography (coronal view of maximal intensity projection image), occlusion of basilar artery (BA) was noted (arrow). On the computed tomography angiography, BA bifurcation was clearly seen (arrowhead). **(B)** On digital subtraction angiography (anteroposterior view), BA occlusion was also noted. BA bifurcation (arrow) and bilateral posterior cerebral arteries were seen by collateral flows through left anterior inferior cerebellar artery (arrowhead). **(C)** BA bifurcation and bilateral posterior cerebral arteries were definitely verified by stent-through flow. **(D)** By 1 stent retriever thrombectomy, BA occlusion was recanalized, however, focal stenosis with angiographical haziness was noted

Endovascular Therapy of Cerebral Arterial Occlusions: Intracranial Atherosclerosis versus Embolism

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Journal of Stroke and Cerebrovascular Diseases, Vol. 24, No. 9 (September), 2015: pp 2074-2080

Table 4. *Imaging and revascularization treatment results among the groups*

	IAD	Embolism				
	In situ thrombotic	Subtotal	Cardiogenic	Cryptogenic	Artery to artery	*P* value
Onset-to-door time (min)	122 ± 70	97 ± 65	95 ± 62	104 ± 82	92 ± 31	.086
Onset-to-puncture time (min)	257 ± 75	232 ± 69	229 ± 66	248 ± 86	219 ± 30	.113
Occlusion in posterior circulation	9 (37.5)	14 (10.4)	7 (6.7)	6 (24.0)	1 (20.0)	.001
Intravenous thrombolysis	15 (62.5)	102 (76.1)	82 (78.8)	16 (64.0)	4 (80.0)	.161
Endovascular treatment	17 (73.9)	102 (76.1)	78 (75.0)	21 (84.0)	3 (60.0)	.819
Angioplasty	8 (33.3)	7 (5.2)	7 (6.7)	0 (0)	0 (0)	<.001
Intracranial stenting	4 (16.7)	5 (3.7)	4 (3.8)	1 (4.0)	0 (0)	.012
No revascularization treatment	3 (12.5)	6 (4.5)	5 (4.8)	1 (4.0)	0 (0)	.118
Successful reperfusion rate (TICI 2b-3)	15 (62.5)	84 (63.6)	60 (58.8)	20 (80.0)	4 (80.0)	.915
NIHSS score at discharge	9 (2-16)	10 (3-17)	11 (3-18)	5 (.5-13.5)	7 (2-14)	.781
Modified Rankin Scale 0-2 at 3 mo	10 (41.7)	42 (31.3)	27 (26.0)	13 (52.0)	2 (40.0)	.322
Mortality at 3 mo	2 (8.3)	33 (24.6)	26 (25.0)	7 (28.0)	0 (0)	.077

Abbreviations: Embolism, angiographically defined occlusion due to embolism; IAD, angiographically defined occlusion due to intracranial atherosclerotic disease; NIHSS, National Institutes of Health Stroke Scale; TICI, thrombolysis in cerebral infarction.

Arka dolaşım IKAD-BDO

- IKAS-O ile genelde anterior dolaşımla ilgili veri mevcut..posterior dolaşım?? IKAS sık??
- Posterior dolaşım tutulumu IKAS-O için bağımsız risk faktörü
- Bu nedenle de IKAS-O larındaki tedavi stratejisini değerlendirmek posterior dolaşım iskemilerinde ayrıca önemli

Endovascular and Clinical Outcomes of Vertebrobasilar Intracranial Atherosclerosis-Related Large Vessel Occlusion

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frontiers in Neurology

ORIGINAL RESEARCH
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- Baek ve ark. çalışmasında 77 posterior dolaşım infarktı olanlarda IKAS-O yaklaşık %31 saptanmış
- Benzer olarak yine Güney Korede VB infarktlarda IKAS-O %37 bildirilmiş.
- BA darlıkları ise %23.2

- BA oklüzyonlarında proksimal / orta hat trombuslarında distal trombuslara göre daha yüksek mortalite bildirilmiş *
- Başka bir çalışmada aterotromboza bağlı proksimal / orta BA lokasyonlu oklüzyonlarında yüksek mortalite bildirilmiş**
- ?? Olası mekanizma pons perforatörlerinin etkilenmesi

*Cross DT 3rd, et al. Relationship between clot location and outcome after basilar artery thrombolysis. AJNR Am J Neuroradiol. (1997) 18:1221–8.
** Eckert B Endovascular therapy of acute vertebrobasilar occlusion: early treatment onset as the most important factor. Cerebrovasc Dis. (2002) 14:42–50. doi: 10.1159/000063722

TABLE 1 | Comparison of variables between patients with and without vertebrobasilar intracranial atherosclerosis-related acute large vessel occlusion (ICAS-LVO).

	Total patients ($n = 77$)	ICAS (+) ($n = 24$)	ICAS (–) ($n = 53$)	*P*-value	Odds ratio* (95% CI)
Age, years	73.2 (±12.8)	72.7 (±13.8)	73.5 (±12.5)	0.800	0.99 (0.96–1.03)
Sex, male	41 (53.2)	14 (58.3)	27 (50.9)	0.547	1.34 (0.51–3.57)
Hypertension	62 (80.5)	21 (87.5)	41 (77.4)	0.366	2.05 (0.52–8.06)
Diabetes	30 (39.0)	6 (25.0)	24 (45.3)	0.091	0.40 (0.14–1.17)
Dyslipidemia	19 (24.7)	6 (25.0)	13 (24.5)	0.965	1.03 (0.34–3.13)
Smoking	10 (13.0)	7 (29.2)	3 (5.7)	0.008	6.86 (1.59–29.6)
Coronary artery disease	24 (31.2)	5 (20.8)	19 (35.8)	0.188	0.47 (0.15–1.46)
Atrial fibrillation	36 (46.8)	7 (29.2)	29 (54.7)	0.037	0.34 (0.12–0.96)
Initial NIHSS score	13.0 [7.0; 24.0]	14.5 [9.0; 21.5]	12.0 [7.0; 25.0]	0.624	1.00 (0.95–1.05)
Basilar artery occlusion	69 (89.6)	16 (66.7)	53 (100.0)	<0.001	N/A
Use of IV tPA	18 (23.4)	10 (41.7)	8 (15.1)	0.011	4.02 (1.33–12.1)
Onset-to-puncture, min	262.0 [146.0; 435.0]	207.0 [158.0; 307.8]	285.0 [140.0; 475.0]	0.253	0.94 (0.87–1.02)†

TABLE 2 | Procedural and clinical outcomes of patients with and without vertebrobasilar intracranial atherosclerosis-related acute large vessel occlusion (ICAS-LVO).

	Total patients ($n = 77$)	ICAS (+) ($n = 24$)	ICAS (–) ($n = 53$)	*P*-value	Odds ratio* (95% CI)
ENDOVASCULAR OUTCOMES					
Successful recanalization	64 (83.1)	19 (79.2)	45 (84.9)	0.529	0.68 (0.20–2.33)
Conventional modalities	52 (81.2)	7 (36.8)	45 (100.0)	<0.001	N/A
Stent retriever	38 (59.4)	5 (26.2)	33 (73.3)		
Contact aspiration thrombectomy	10 (15.6)	1 (5.3)	9 (20.0)		
Urokinase	4 (6.2)	1 (5.3)	3 (6.7)		
ICAS-specific modalities	12 (18.8)	12 (63.2)	0 (0.0)		
GPI	8 (12.5)	8 (42.1)	0 (0.0)		
PTA	1 (1.6)	1 (5.3)	0 (0.0)		
Stenting + PTA + GPI	3 (4.7)	3 (15.8)	0 (0.0)		
Procedural Events					
Reocclusion during the procedure	18 (23.4)	15 (62.5)	3 (5.7)	<0.001	27.8 (6.66–115.9)
Puncture-to-recanalization, min	46.5 [27.8; 93.2]	52.0 [25.5; 117.5]	45.0 [28.0; 77.0]	0.837	1.07 (0.80–1.44)†
Onset-to-recanalization, min	351.0 [207.5; 497.2]	325.0 [243.0; 437.5]	383.0 [201.0; 529.0]	0.791	0.97 (0.90–1.06)†
CLINICAL OUTCOMES					
Favorable outcome	31 (40.3)	9 (37.5)	22 (41.5)	0.740	0.85 (0.32–2.28)
Death	16 (20.8)	4 (16.7)	12 (22.6)	0.763	0.68 (0.20–2.39)
Symptomatic ICH	4 (5.2)	3 (12.5)	1 (1.9)	0.087	7.43 (0.73–75.5)

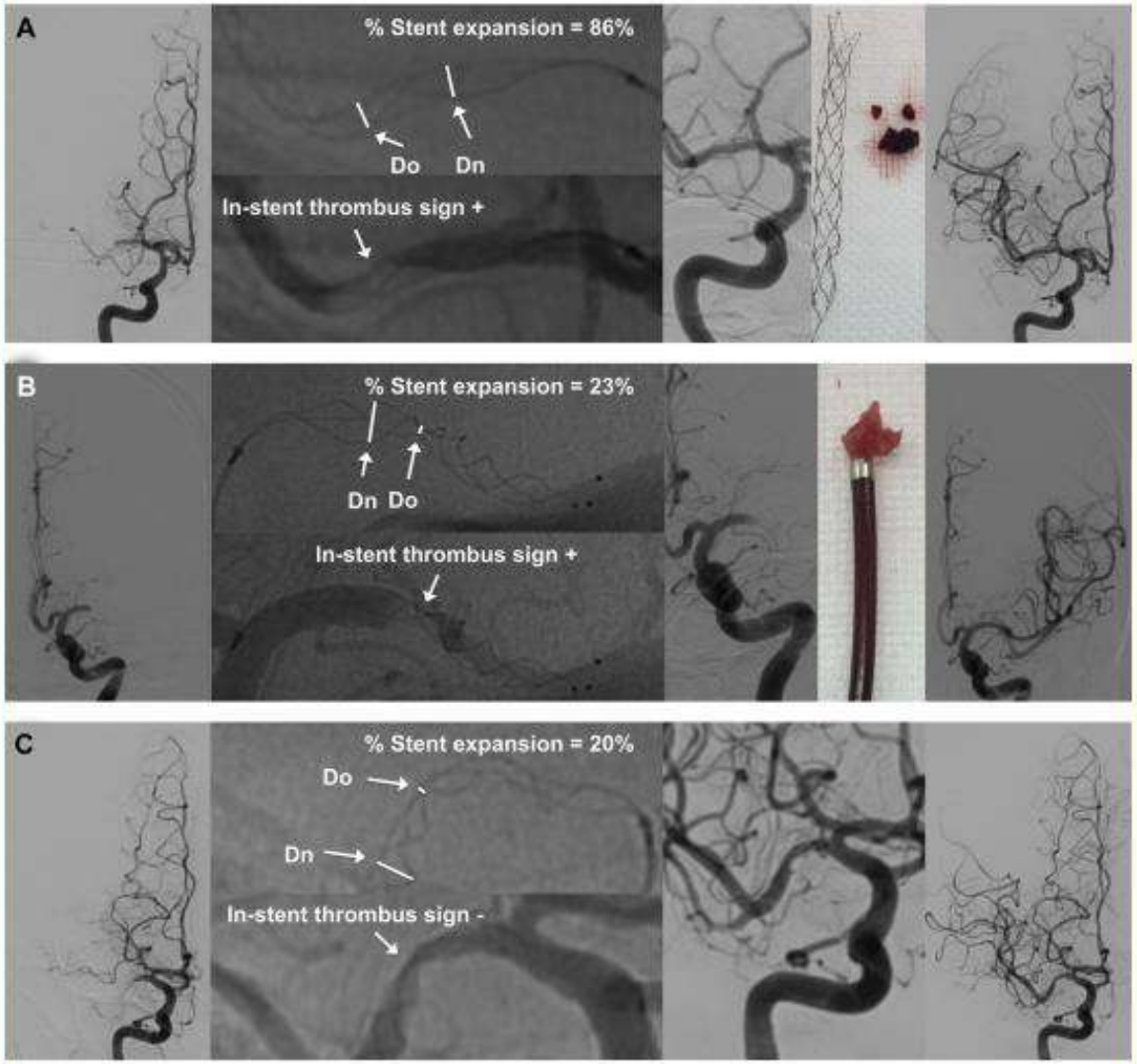
IKAS-O'larında Stentretriever Trombektomi

- Stent retriever ile trombektomi emboliklerde olduğu kadar IKAS-BDOlarında da etkilidir.

- Ancak İşlem esnasında reoklüzyon bu hastalarda sıktır (%57.1-77.3)

- Mikrotel ve mikrokatater ile lezyonun geçilerek yapılan işlemin riskli olabileceği düşünülse de çoğunlukla işlem sorunsuz ve kolay uygulanır.

- Ancak reoklüzyonun bir kere gelişmesiyle tekrarlanan SR trombektomilerde etkinlik düşer ve komplikasyonlara (damar hasarı, vazospasm, diseksiyon..vb) zemin gelişir…



Degree of stent expansion (%) = [1- (Docclusion/Dnormal)] x 100

In-stent thrombus sign = Filling defect of the thrombus in the strut

Figure 1. Representative cases. (**A**) Case showing great stent expansion with in-stent thrombus sign. Angiographic image obtained during deployment of the Trevo shows 86% stent expansion with in-stent thrombus sign. Recanalization was achieved after the pass with retrieval of a soft clot. (**B**) Case showing poor stent expansion with in-stent thrombus sign. Angiographic image obtained during deployment of the Trevo shows 23% stent expansion with in-stent thrombus sign. Recanalization was not achieved after the pass with no retrieval of clot. After an additional procedure using an aspiration catheter, recanalization was achieved with retrieval of a hard clot. (**C**) Case showing poor stent expansion without in-stent thrombus sign. Angiographic image obtained during deployment of the Trevo shows 20% stent expansion without in-stent thrombus sign. Recanalization was achieved after the pass with no retrieval of clot. Residual stenosis was considered underlying atherosclerotic stenosis. Do, diameter of the stent strut at the occlusion; Dn, diameter of the stent strut at the nearby normal vessel.

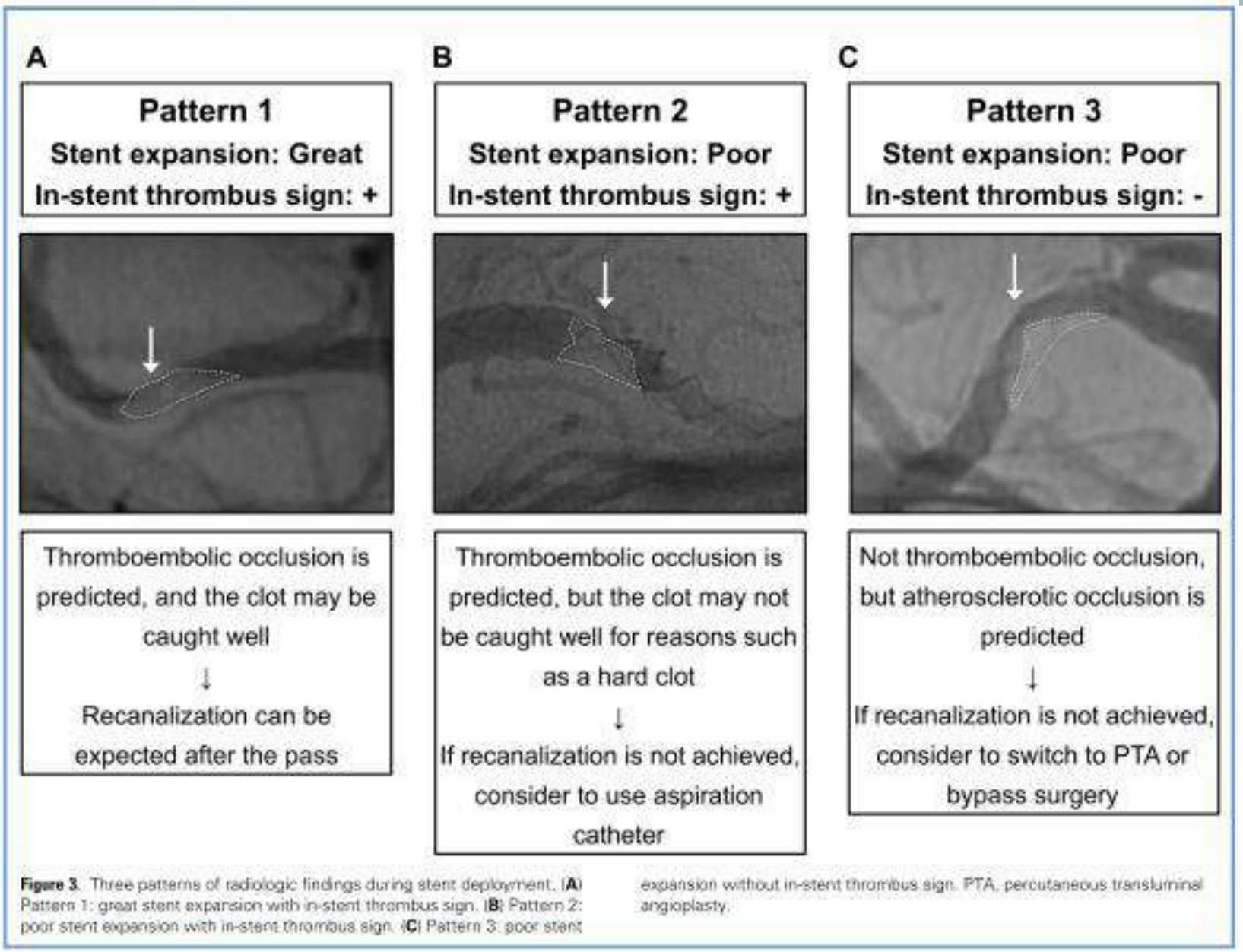


Figure 3. Three patterns of radiologic findings during stent deployment. (**A**) Pattern 1: great stent expansion with in-stent thrombus sign. (**B**) Pattern 2: poor stent expansion with in-stent thrombus sign. (**C**) Pattern 3: poor stent expansion without in-stent thrombus sign. PTA, percutaneous transluminal angioplasty.

- Tekrarlanan mikrotel mikrokatater SR inflame plak hasarı ve daha fazla platelet aktivasyonu ve hatta diseksiyona zemin hazırlar

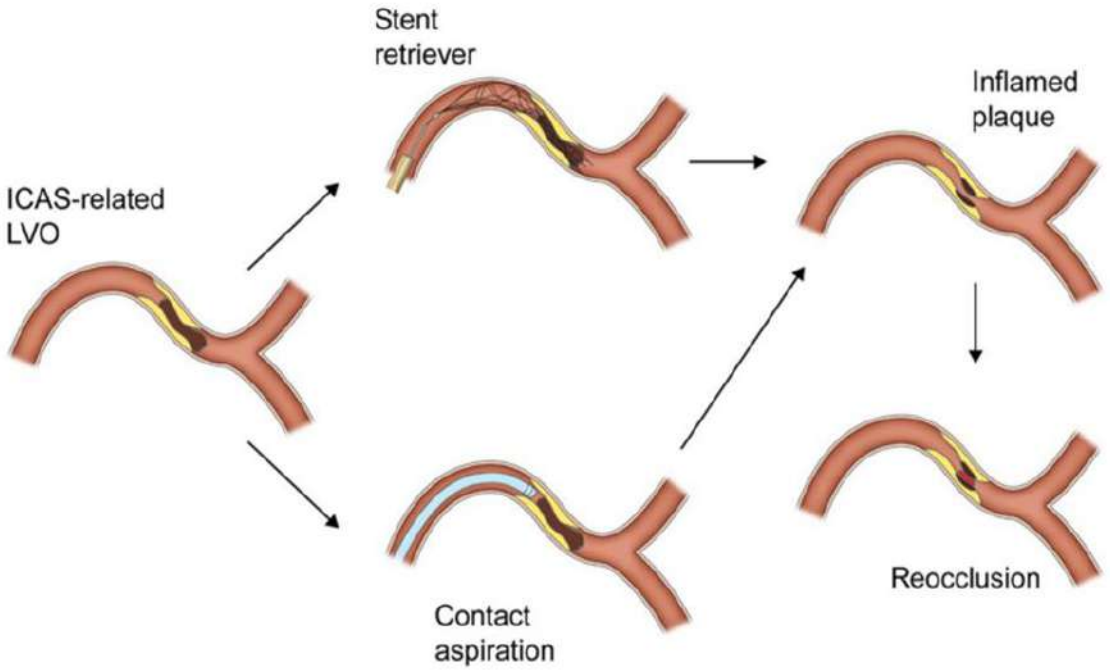


FIGURE 1 | A schematic drawing of reocclusion mechanism after stent retriever or contact aspiration thrombectomy for intracranial atherosclerotic stenosis-related large vessel occlusion.

TABLE 3 | Comparison between stent retriever and contact aspiration thrombectomy in practice.

	Stent retriever	Contact aspiration
Delivery to the target lesion	Not difficult	Occasionally difficult
Help in differentiation in ICAS-related from embolic LVO during the procedure (7, 13)*	Yes	No
First-pass recanalization success (23)	Higher	Lower

*, *by disclosing occlusion type (truncal-type or branching-site occlusion). Truncal-type is suggestive of intracranial atherosclerosis related large vessel occlusion.*

*Park H, (2019)Endovascular Treatment of AcuteStroke Due to Intracranial Atherosclerotic Stenosis–Related Large Vessel Occlusion.Front. Neurol. 10:308. doi: 10.3389/fneur.2019.00308

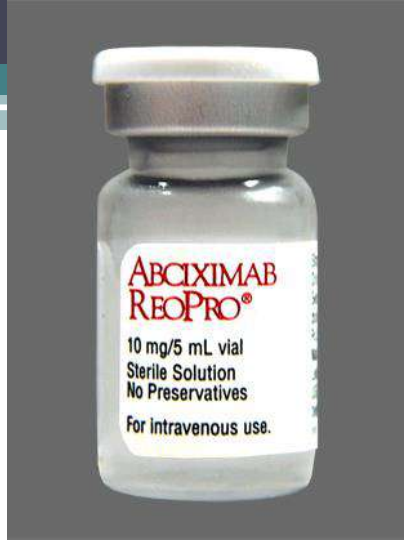
Aspirasyon ve IKAD-O

- Embolik BDO'larında aspirasyon SR kadar etkili olmakla birlikte IKAS-O etkin olmayabilir.
- 146 IKAS-BDO hastada SR ve aspirasyon karşılaştırılmış.
- Alternatif trombektomi tekniğine geçiş katater aspirasyon grubunda belirgin daha fazla (%40 vs %4.7, p<0,001)*
- Bunun nedenleri arasında da
  - IKAS damar yapısının daha ziyade tortiyoz ve uca doğru kalibrasyonunun incelmesinden kaynaklı olduğu belirtilmiş.
  - Aspirasyon kataterinin distal ucu pıhtıya daha az oturacaktır.

- Reoklüzyon oranları SR ile benzer
- Mikrotel ve mikrokatater ile lezyonun geçilerek DAC yerleşmesinde tekrarlayan işlemler yine inflame plağı irrite edecektir……. Platelet aktivasyonu ve reoklüzyon…

*Gascou G, Stent retrievers in acute ischemic stroke: complications and failures during the perioperative period. AJNR Am J Neuroradiol. (2014) 35:734–40.

Kurtarma tedavileri

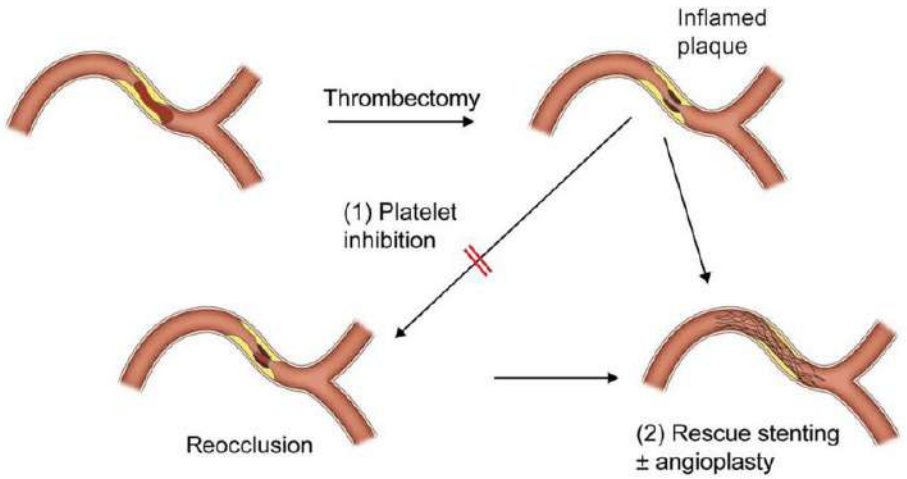


- Primer trombektomi rekanalizasyonda başarısız kaldıysa kurtarma tedavileri düşünülür
- SR / CA
- IA trombolitik
- IA/IV glikoprotein IIb/IIIa inh
- Stentleme +/- balon anjioplasti

- Reoklüzyon platelet aktivasyonu ve kritik reziduel darlık ile ilişkilidir

- Tirofiban bazı yayınlarda öne çıkar
- IA/IV düşük doz GPI (Tirofiban, 0.5–1.5 mg veya Reopro, 3–10 mg)

- GPI endoteliumu daha stabil yaparak insitu trombotik reoklüzyona yatkınlığı tersine çevirebilir
- Merkezlerde farklı yaklaşımlar olabilir..
- 0.3–0.5 mg of Tirofiban (veya Reopro, 3–5 mg) IA verildikten sonra işlem esnasında her 10dkda bir en az 2 kere kontrol görüntü alınması önerilir
- Reoklüzyon geçmediyse ilave 0.3–0.5 mg Tirofiban (veya Reopro, 3–5 mg) totalde 1.5 mg geçmeyecek şekilde verilebilir
- GPI dozunun IV rtPA kullanımına bağlı olmadığı belirtilmiş.*



*Park Hyungjong, et al. Endovascular Treatment of Acute Stroke Due to Intracranial Atherosclerotic Stenosis–Related Large Vessel Occlusion. Frontiers in Neurology Doi 10.3389/fneur.2019.00308

Stentleme +/- anjioplasti

- Mekanik trombektomi ile açılamayan olgularda reoklüzyonun ve rekanalizasyonun sağlanması için stentleme ve balon anjioplasti kurtarıcı metodlardır.

- Genelde işlemi yapan hekimin tercihi önemli
- Stent /stent+balon/balon anjioplasti/ pre-post stent balon anjioplasti…vb

- MT veya stentleme ile rekanalizasyon sağlanan hastalarda mRS 3 ay sonunda benzer başarı göstermekte..
- Veriler kurtarıcı stentleme olan hastaların çoğunun IKAS-O olduğunu göstermekte
- Çalışmalar hem GPI + stentlemenin IKAS-O olanlarda etkin ve güvenilir olduğu yönünde*

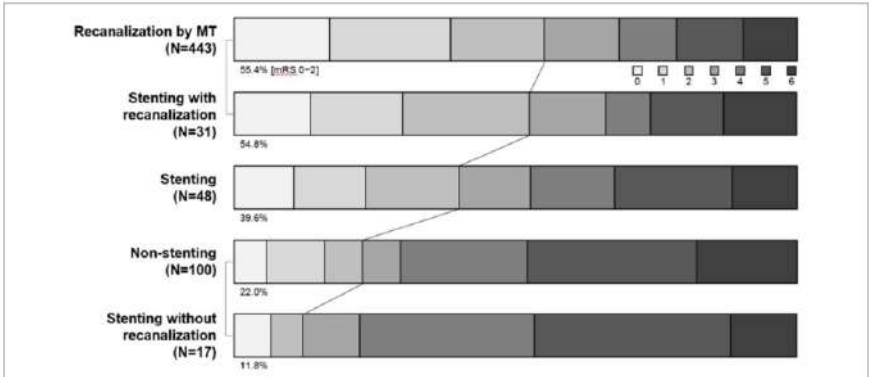


FIGURE 3 | Comparison of modified Rankin scale score among mechanical thrombectomy success, rescue stenting, and non-stenting groups. MT, mechanical thrombectomy.

*Kang DH, Endovascular treatment for emergent large vessel occlusion due to severe intracranial atherosclerotic stenosis. J Neurosurg. (2018) 1:1–8.doi: 10.3171/2018.1.JNS172350

- Antitrombotik ile stentleme yapılması akut inmede güvenilir olduğuna dair veriler mevcut

- İşlemde intrakranial/servikal karotis arter stentleme + antitrombotik medikasyon… *semptomatik intrakranial hemoraji gelişiminini arttırmadığı* hatta *fonksiyonel sonlanımı iyileştirdiği*

- İşlem sonrası antiplatelet işlem sonrası reoklüzyonu önlemede önemli
- Kontrol çalışma olmamasına karşılık IV GPI infüzyonu 6-12 saat süreyle …ardından oral antiplatelet tedaviye geçiş önerilir.

- Bu yayınlar retrospektif olduğu için antitrombotik medikasyon tipi değişkenlik göstermekte
  - IA/IV GPI yükleme sonrası 6-8 saat idame ve sonra dual antiplateler
  - Oral dual antiplateletlerin yüklenmesi ve idamesi (aspirin 85–500 mg and clopidogrel 300 mg)
  - Oral monoantiplatelet (clopidogrel, 75–300 mg),
  - Antiplatelet kontrol MR/CT sonrasında başlanılması

- Kang ve ark ciddi reziduel stenozu olan hastalarda tek başına IA tirofiban kullanımının intrakranial stentleme ile karşılaştırıldığında eşit güvenilirlik ve etkiye sahip bulmuşlar *

- Diğer bir çalışmada da özellikle %70 üzeri darlıklarda tirofiban kullanımı ile darlık derecesinin belirgin düştüğü gözlemlenmiş **

- Sonuçta IKAS-O bağlı inme hastalarında tirofiban %70den fazla reziduel stenozu olanlarda kullanılabilir.

* Kang DH, Instant reocclusionfollowing mechanical thrombectomy of in situ thromboocclusion and therole of low-dose intra-arterial tirofiban. Cerebrovasc Dis. (2014) 37:350–5.
**Zhizhong Yanet al. Journal of Stroke and Cerebrovascular Diseases, Vol. 29, No. 4 (April), 2020: 104619
***Baek JH, Endovascular and Clinical Outcomes of Vertebrobasilar Intracranial Atherosclerosis-Related Large Vessel Occlusion. Front Neurol. 2019 Mar 19;10:215.

Sonuçta IKAS-BDO hastalarında endovaskuler strateji

- Rekanalizasyon durumu ve işlem süresi! Oklüzyon etyolojisinden daha önemli
- Hızlı ve başarılı rekanalizasyon hedeflenmeli
- MT ye başlamadan önce
  - AF saptanmamış olması
  - CT de hiperdens arter /MRda blooming artifaktının olmaması
  - Tapered görünüm
  - Trunkal tip oklüzyon MRA/CTA

    durumunda IKAS-BDO düşünülmeli
- EVT esnasında
  - Trunkal tip oklüzyon
  - Oklüzyon bölgesinde ilk rekanalizasyon sonrası sabit fokal stenoz

    durumunda IKAS-BDO düşünülmeli

- Eğer IKAS-BDO hastalarında strateji daha erken belirlenmeli….. Hedef kısa işlem süresi
- Bu hastalarda kurtarıcı tedavi yaklaşımlarına daha hızlı başvurmak gerekir.
- SR ile IKAS-O tespiti daha kolay olabilir … trunkal/dallanmanın olduğu bölgeyi göstermesi açısından
- Bu nedenle SR trombektomi ilk metod tercihi olabilir

- Şüphelenilen hastalarda ilk rekanalizasyon sağlanıldıktan sonra 10dk da bir (en az 30dk süreyle) kontrol anjio ile reoklüzyon değerlendirilmeli

- Reoklüzyon gelişirse hafif-orta derece rezidu stenozda GPI stentleme öncesi öncelikle önerilir.

- Rekanalizasyon sağlanılamıyorsa veya reoklüzyon kritik rezidü stenozla ilişkili izlenirse kurtarıcı tedavi olarak stent/balon anjioplasti düşünülmelidir.

sonuçta…

- Rekanalizasyon başarısı ve ponksiyon rekanalizasyon işlem süresi prognozu etkileyen iki önemli faktör

- Benzer rekanalizasyon oranlarına ve işlem sürelerine bakıldığında IKAS-O emboliklerden farklı değil.

- Başarılı rekanalizasyonun hızlı ve yüksek oranlarda sağlanılması için IKAS-O olan hastalarda spesifik EVT stratejileri geliştirilmesine ihtiyaç vardır.

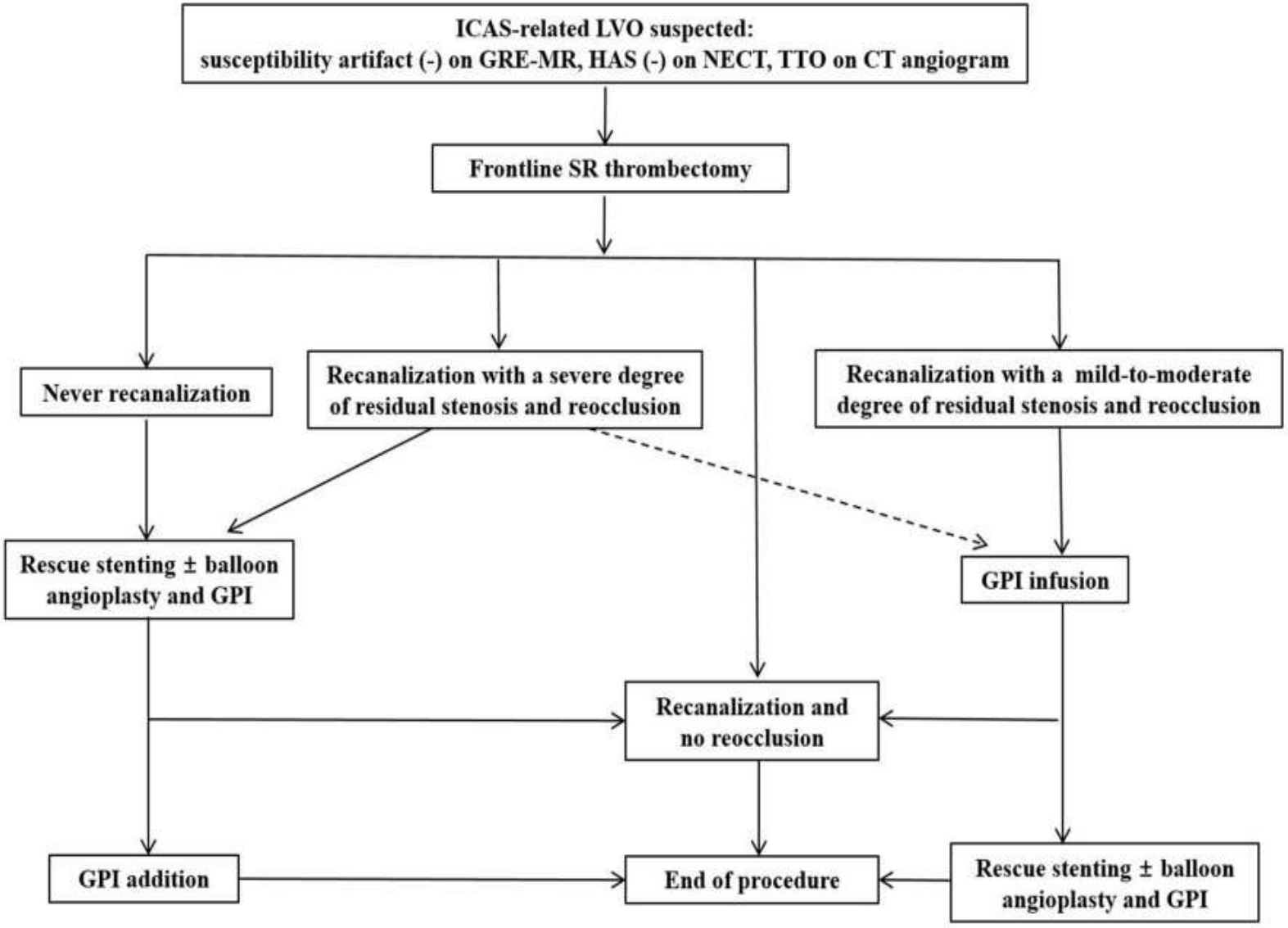
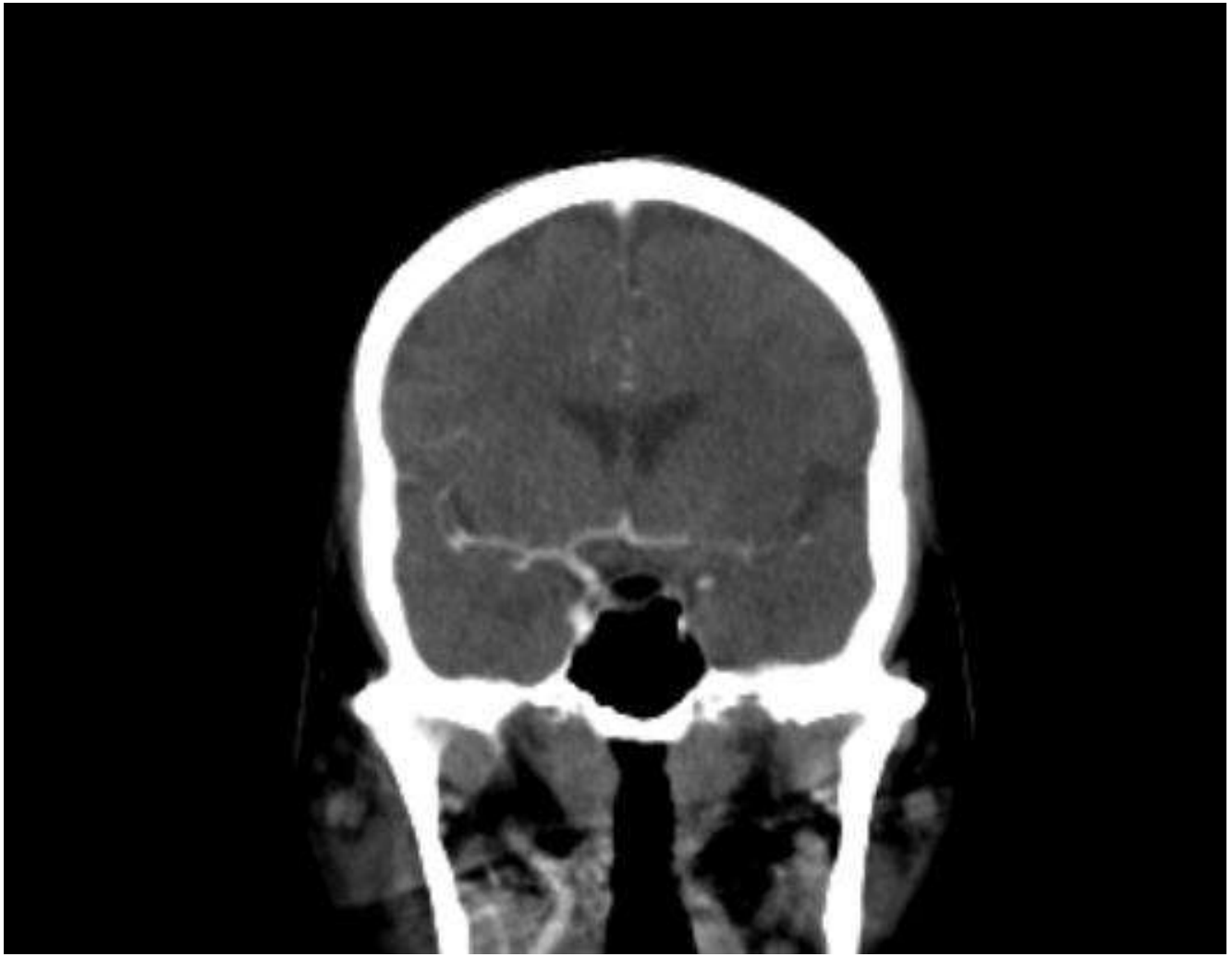


FIGURE 4 | The stepwise endovascular strategy appropriate for intracranial atherosclerotic stenosis-related large vessel occlusion. ICAS, intracranial atherosclerotic stenosis; LVO, large vessel occlusion; GRE-MR, gradient echo magnetic resonance imaging; HAS, hyperdense artery sign; NECT, non-enhanced computed tomography; TTO, truncal type occlusion; CT, computed tomography; SR, stent retriever; GPI, glycoprotein IIb/IIIa inhibitor.

Olgu

- 58y, E
- 2 saat önce başlayan sağ hemipleji NIHSS16
- BTA sol MCA M1 oklüzyon

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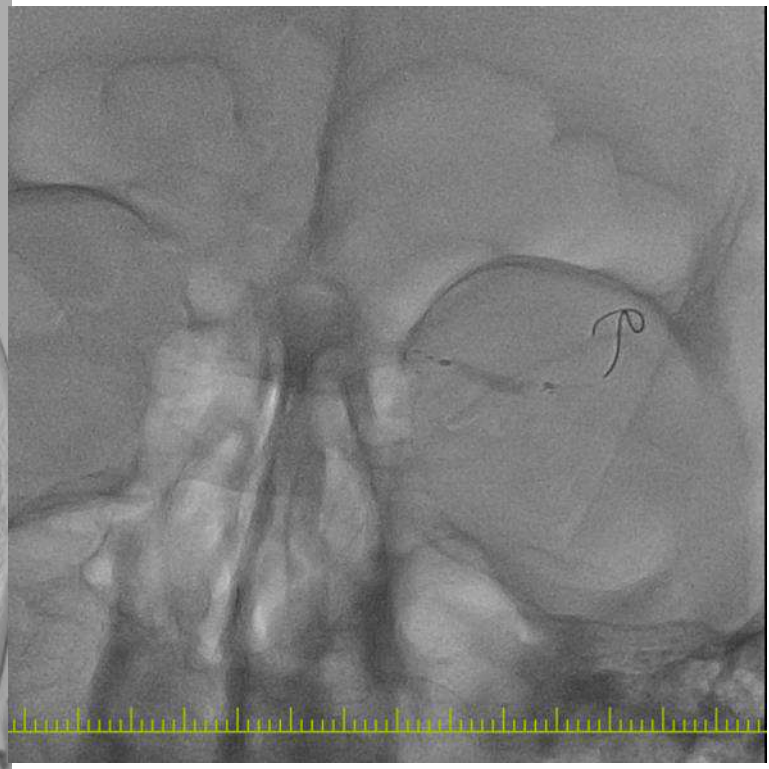
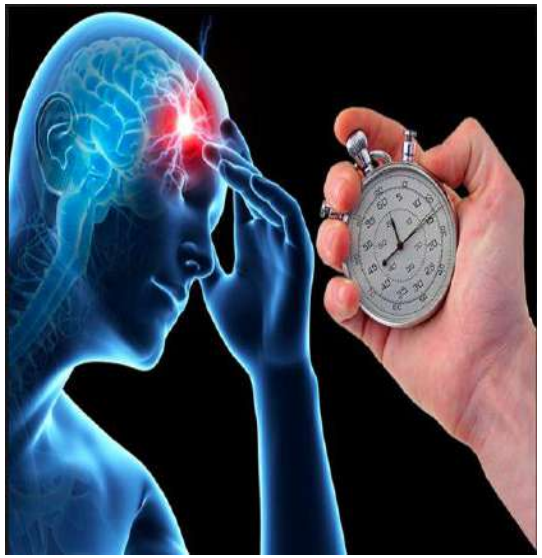


Bilinç açık koopere
Dizartrik
Sağ hemiparezi

EKO : mekanik protez Aort kapak
aort kapak ventriküler yüzde
13 x3 mm boyutunda hareketli
trombus
PFO saptandı


teşekkürler

Kombine Teknikler: Geri Çekilen Stent ve Nöroaspirasyon



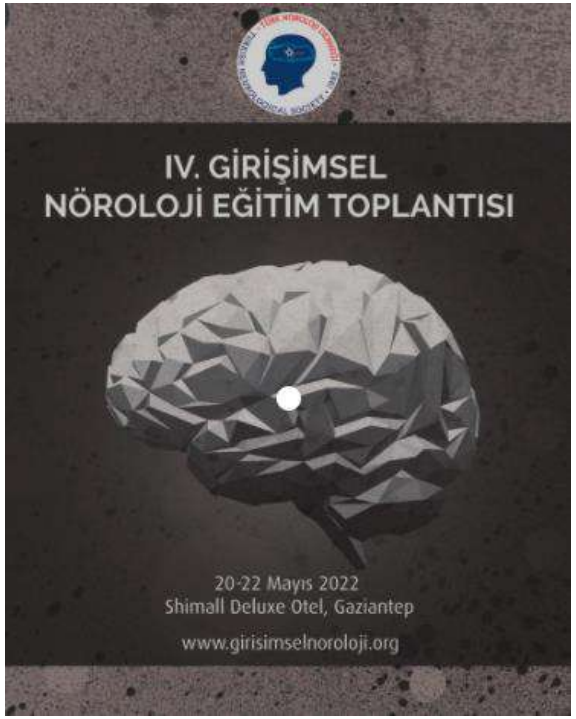
Çetin Kürşad AKPINAR

22.05.2022

Samsun Üniversitesi, Samsun Eğitim ve Araştırma Hastanesi

Girişimsel Nöroloji

İnme Merkezi



INR INTERVENTIONAL NEURORADIOLOGY

Interv Neuroradiol. 2021 Apr; 27(2): 249–256. PMCID: PMC8044626
Published online 2020 Nov 9. doi: 10.1177/1591019920961883 PMID: 33167756

A short history of thrombectomy – Procedure and success analysis of different endovascular stroke treatment techniques

B Friedrich,[1] T Boeckh-Behrens,[1] V Krüssmann,[1] S Mönch,[2] J Kirschke,[1] K Kreiser,[1] M Berndt,[1] M Lehm,[3] S Wunderlich,[4] C Zimmer,[1] J Kaesmacher,[5,6,7] and C Maegerlein[1]

- 1.Jenerasyon cihazlar

***MERCI, Phenox Clot Retriever, Penumbra Separator, and intra-arterial rtPA.

- 2.Guiding Katater + Stent Retriever (distal erişim veya aspirasyon katateri yok)

***NeuronMAX 088 (Penumbra), ***VISTA BRITE TIP (Cordis, Milpitas, CA, USA).

***pREset (Phenox, Bochum, Germany), ***Solitaire (EV3, Irvine, CA, USA), ***TREVO/TREVO XP (Stryker, Kalamazoo, MI, USA).

- 3. Guiding Katater + **Distal Access Katater** + Stent Retriever:

***DAC (Concentric), ***Navien Intracranial Support Catheter (Covidien, Dublin, Ireland), ***NeuroBridgeIntermediate Catheter (Acandis GmbH, Pforzheim, Germany), ***ReFlex (Reverse Medical Corporation, Irvine, CA, USA).

- 4. Guiding Catheter + **Aspiration Catheter** + Stent Retriever:

***5MAX ACE, ***ACE 64, ***ACE 68 (Penumbra)/**SOFIA**, ***SOFIA Plus (MicroVention, CA, USA), ***Catalyst 6 (Stryker)

- 5. Guiding Catheter + Aspiration Catheter without stent retriever application (ADAPT).
- 6. BGC + Stent Retriever:

***Cello (Medtronic, Dublin, Ireland), ***Flowgate/Flowgate2 (Stryker), ***Merci (Stryker).

frontiers in Neurology

ORIGINAL RESEARCH
published: 29 September 2021
doi: 10.3389/fneur.2021.677630

Trevo 6 × 25 mm vs. 4 × 30 mm in Mechanical Thrombectomy of M1 LVO

Marion John Oliver[1], Emily Brereton[2], Muhib A. Khan[3], Alan Davis[3] and Justin Singer[3]*

[1] Department of Neurology, University of Toledo, Toledo, OH, United States, [2] College of Human Medicine, Michigan State University, East Lansing, MI, United States, [3] Spectrum Health, Grand Rapids, MI, United States

TABLE 2 | Outcomes.

	4 x 30 mm stent retriever	6 x 25 mm stent retriever	*p*-value
90 day mortality	8/50 (16.0%)	10/36 (27.8%)	0.185
Successful recanalization*	48/50 (96.0%)	33/36 (91.7%)	0.645
SAH	2/50 (4.00%)	1/36 (2.80%)	>0.999
ICH	1/50 (2.00%)	0/36 (0.00%)	>0.999
Dissection	0/50 (0.00%)	0/36 (0.00%)	>0.999
Vasospasm	0/50 (0.00%)	0/36 (0.00%)	>0.999
Groin hematoma	0/50 (0.00%)	1/36 (2.80%)	0.419
Re-occlusion	0/50 (0.00%)	0/36 (0.00%)	>0.999
Vessel perforation	1/50 (2.00%)	0/36 (0.00%)	>0.999
Discharge NIHSS†	6 (1, 11.5)	5 (2, 14)	0.550
Delta NIHSS†,‡	8 (3, 14)	13 (2, 18)	0.135

SAH, Subarachnoid hemorrhage; ICH, Intracerebral hemorrhage; TICI, Thrombolysis in cerebral infarction; NIHSS, National Institutes of Health Stroke Scale.

* *TICI of 2b or 3.*

† *median (25th percentile, 75th percentile).*

‡ *Initial NIHSS – Discharge NIHSS.*

ORIGINAL RESEARCH

Longer stent retrievers enhance thrombectomy performance in acute stroke

Diogo C Haussen, Alhamza R Al-Bayati, Jonathan A Grossberg, Mehdi Bouslama
Clara Barreira, Nicolas Bianchi, Michael R Frankel, Raul G Nogueira

Primary outcome			
First-pass reperfusion	138 (62%)	101 (50%)	0.01
Secondary outcomes			
First-pass full reperfusion	91 (41%)	66 (33%)	0.10
Parenchymal hematoma type 2	5 (2%)	6 (3%)	1.00

- **Uzun stentretriever seçimi önemli!!!**

The Push and Fluff Technique

Optimizating Clot Retrieval in Acute Stroke

The Push and Fluff Technique for Closed-Cell Stentrievers

Diogo C. Haussen, MD; Leticia C. Rebello, MD; Raul G. Nogueira, MD

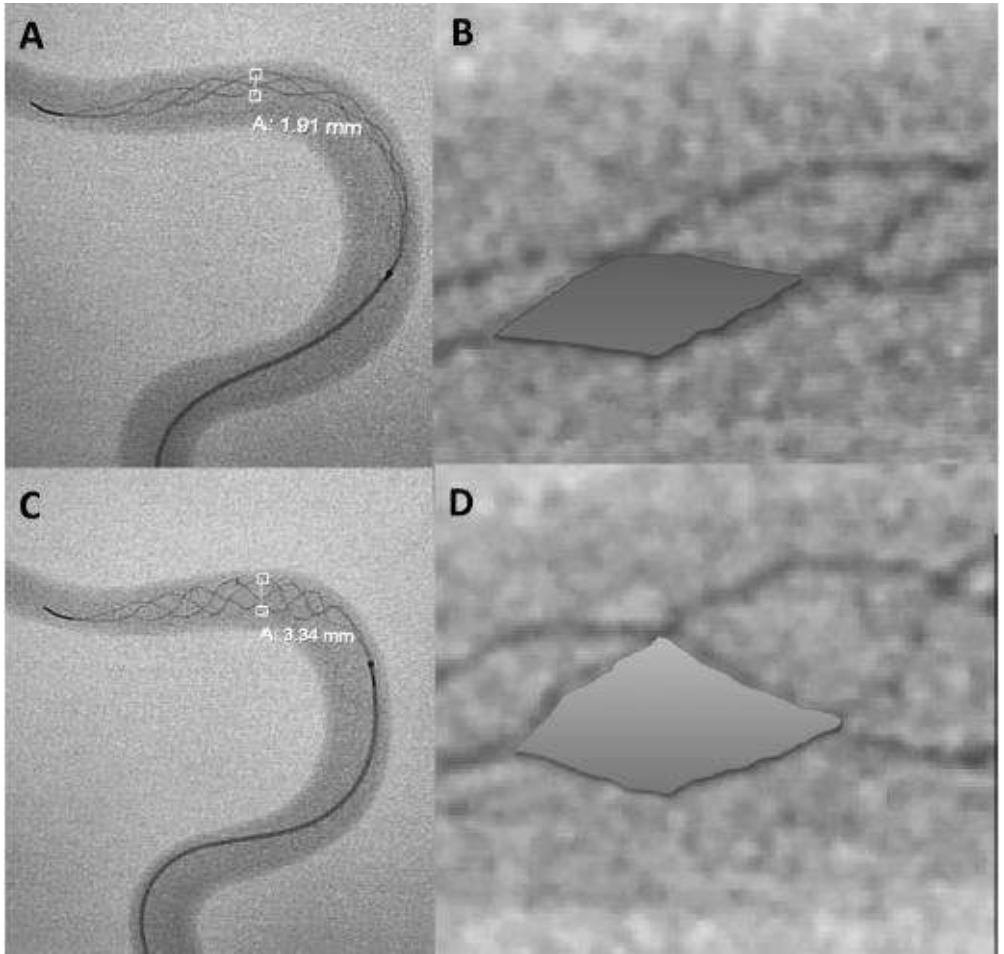


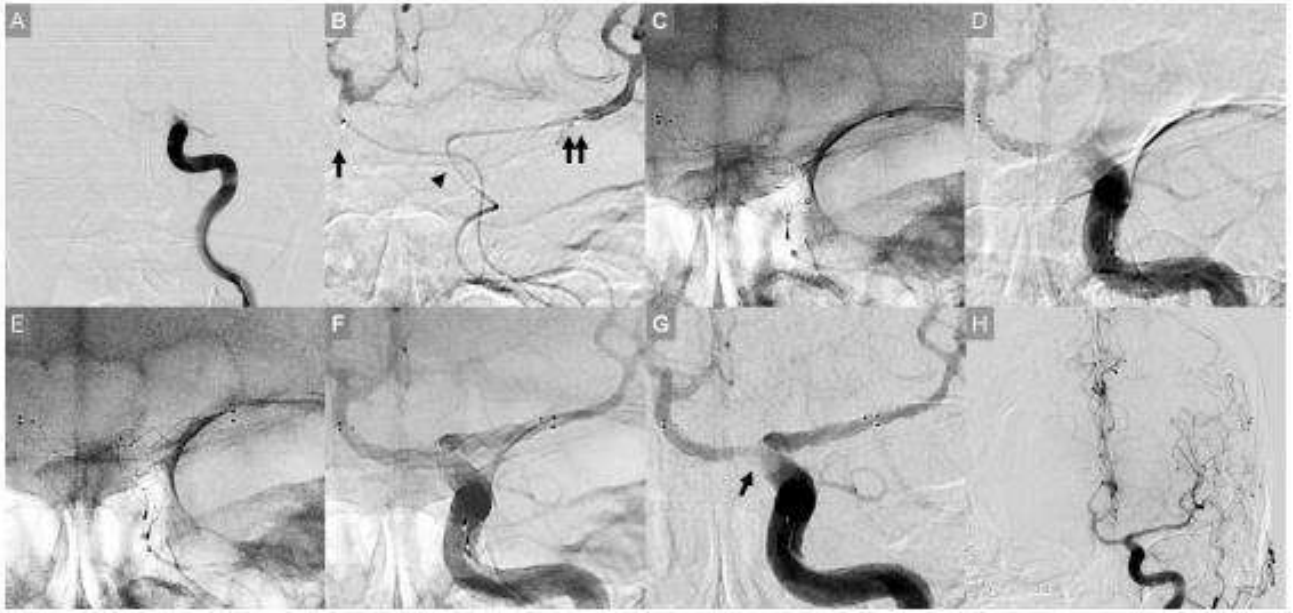
Table 2. Multivariate Analysis for Predictors of First-Pass Reperfusion, Complete Reperfusion, and Number of Passes

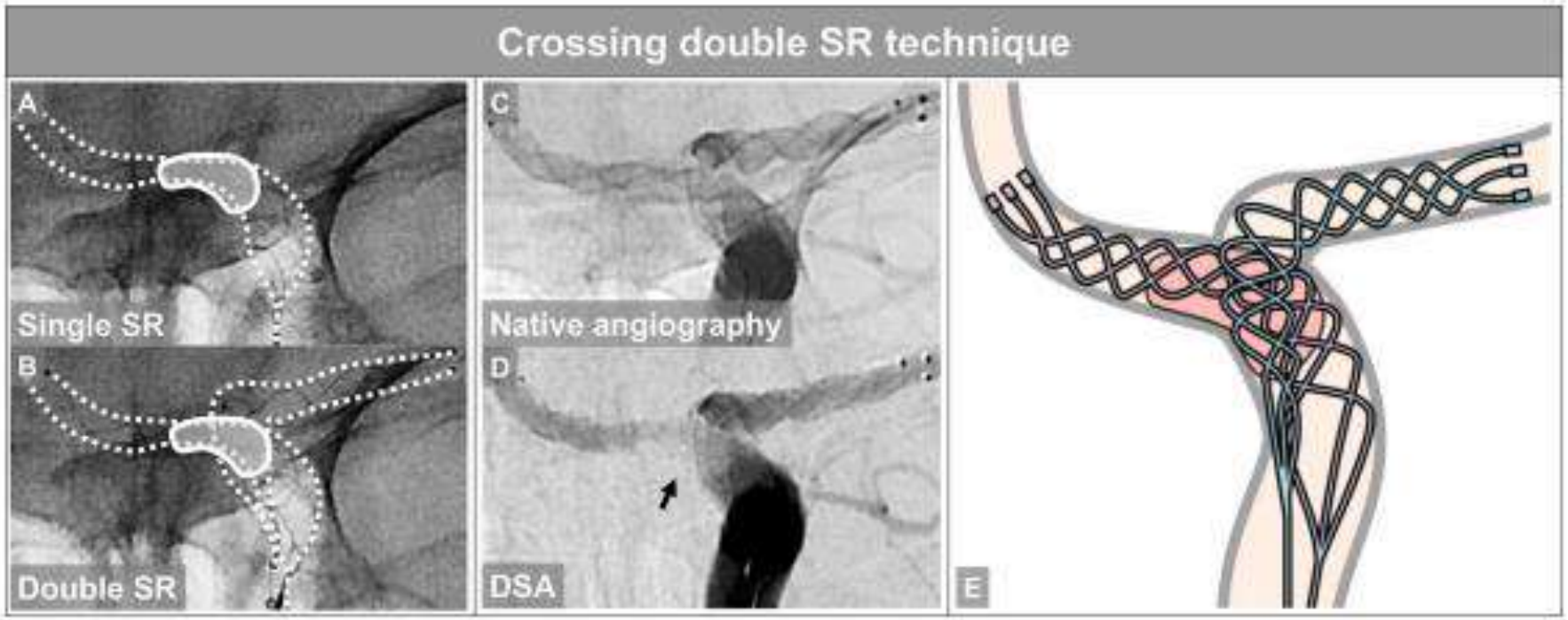
	OR	Standardized β	95% CI	*P* Value
First-pass reperfusion				
Time to reperfusion	0.96		0.94 to 0.98	<0.01
Push and Fluff technique	2.79		1.19 to 6.51	0.01
Any parenchymal hemorrhage	0.27		0.05 to 1.38	0.11
Flow control	1.57		0.61 to 4.03	0.34
Good outcome	0.91		0.37 to 2.20	0.83
Complete reperfusion				
Push and Fluff technique	3.00		1.43 to 6.30	<0.01
IV tPA	2.10		1.01 to 4.53	0.04
Time from last normal to puncture	0.99		0.99 to 1.00	0.07
Number of passes				
Push and Fluff technique		−0.20	−0.70 to −0.06	0.01
Any parenchymal hemorrhage		0.17	0.15 to 1.03	0.04
Sex (male)		−0.16	−0.65 to 0.06	0.06
Dyslipidemia		0.12	−0.12 to 0.58	0.20
Hypertension		0.86	−0.23 to 0.62	0.36
Age		0.04	−0.01 to 0.14	0.59

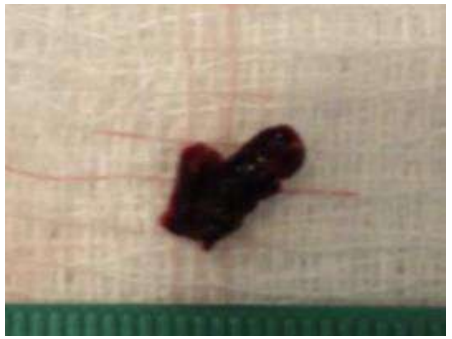
Case report

Crossing double stent retriever technique for refractory terminal internal carotid artery occlusion ☆

Isao Sasaki, MD, MBA[a], *Taichiro Imahori, MD, PhD*[a,b,*], *Tatsuya Yano, MI*







CASE SERIES

Tandem stents thrombectomy as a rescue treatment for refractory large vessel occlusions

Haowen Xu,[1] Shanling Peng,[2] Tao Quan,[1] Yongjie Yuan,[1] Zibo Wang,[1] Xiaojie Fu ,[1] Kaihao Han,[1] Guo Liu,[1] Sheng Guan,[1] Panxing Li[1]

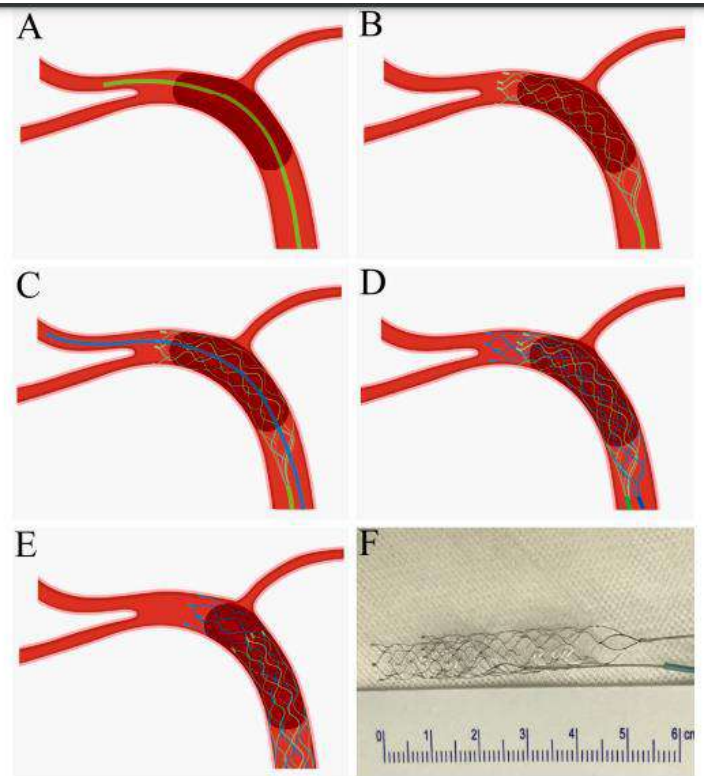
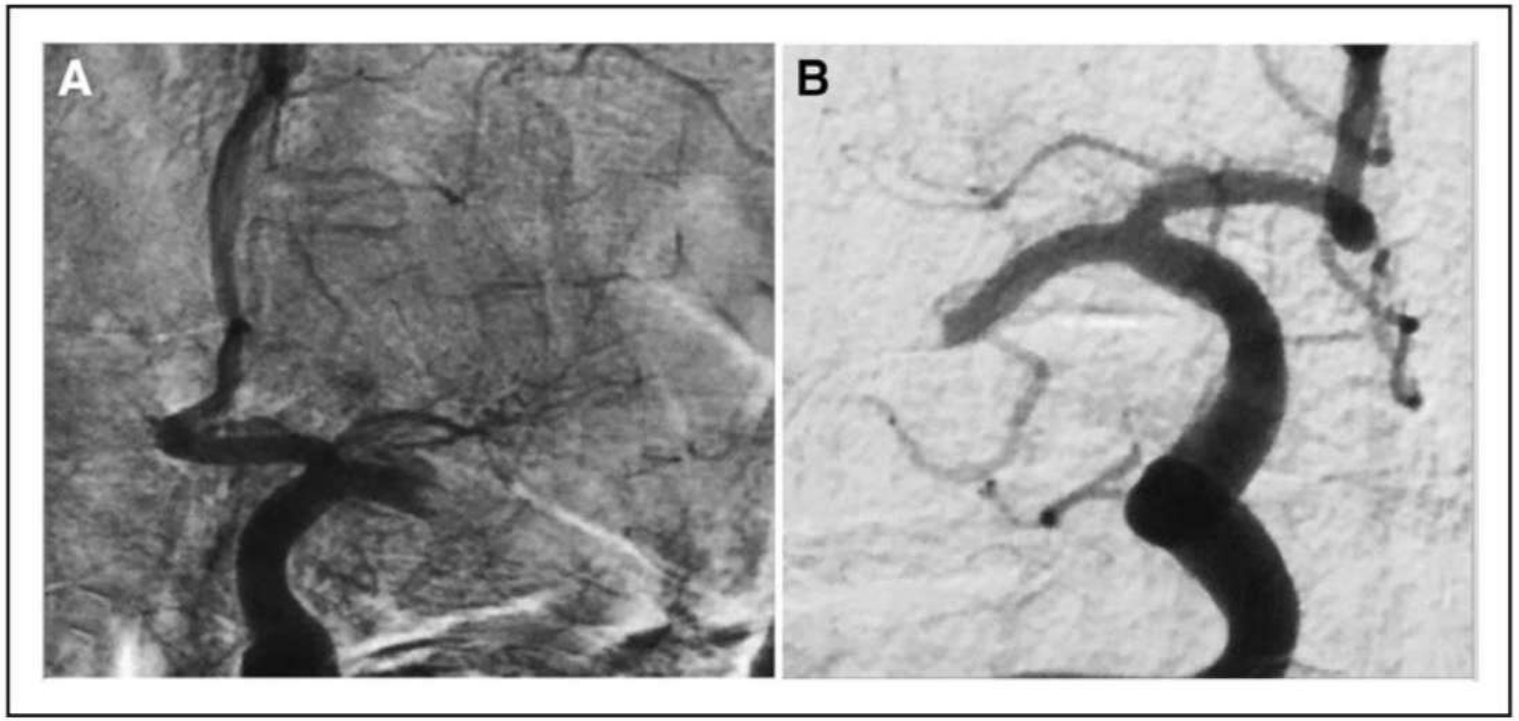


Figure 1 Schematic illustration of the tandem stents thrombectomy technique to depict the procedure. (A) A Rebar 27 microcatheter was navigated into the occluded vessel. (B) A 6×30 mm Solitaire Fr was deployed across the thrombus. (C) A Rebar 18 microcatheter was navigated into the occluded vessel, passing through the first deployed Solitaire stent. (D) A 4×20 mm Solitaire Fr was deployed with the distal portion 5–10 mm beyond the thrombus and the tip of the first stent, with both stents placed in tandem, allowing the proximal portion of the second device to overlap with the first device. (E) Both stents were slowly recovered by simultaneously pulling them together into the guide catheter under continuous aspiration. (F) Photograph of the tandem Solitaire stent retrievers in place.

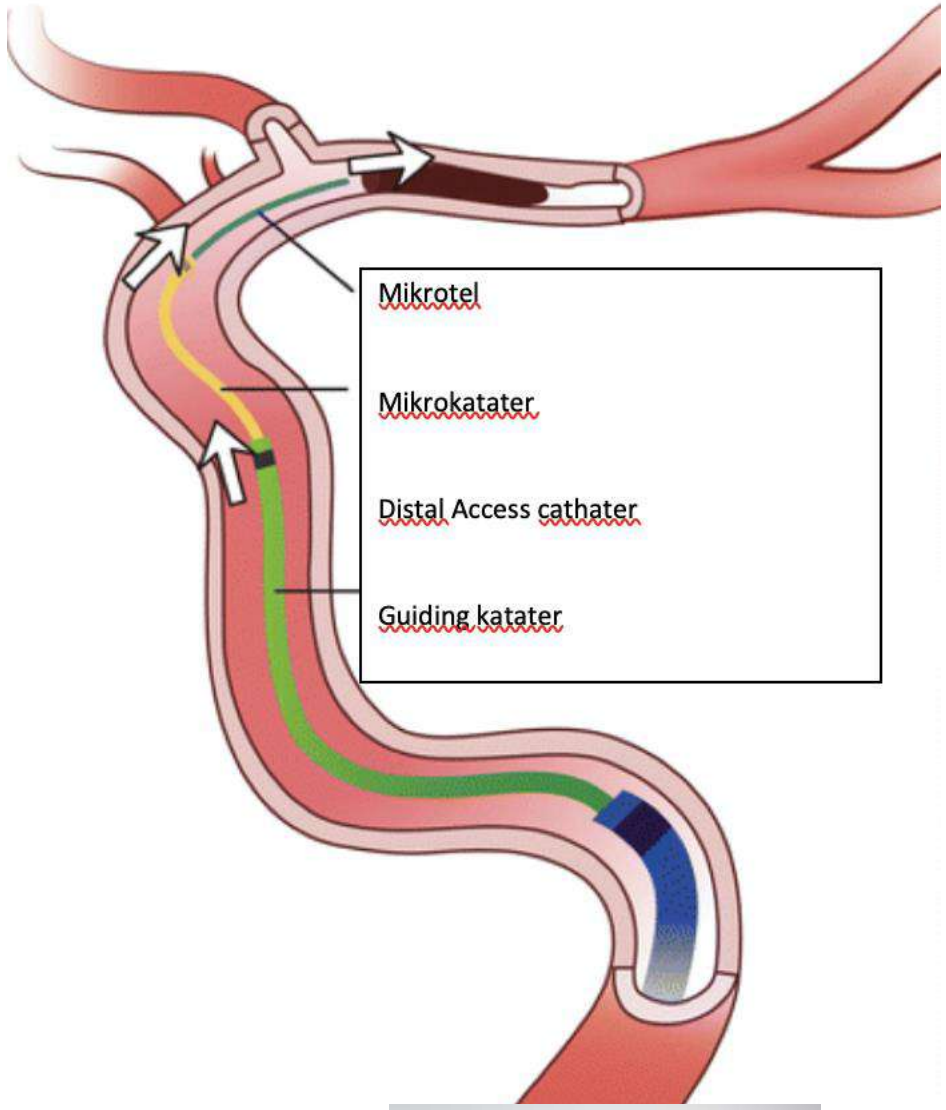


- Stent retriever should be the first choice in irregular occlusion
- Direct aspiration technique should be the first choice regular occlusion

Consoli A, 2018, Stroke

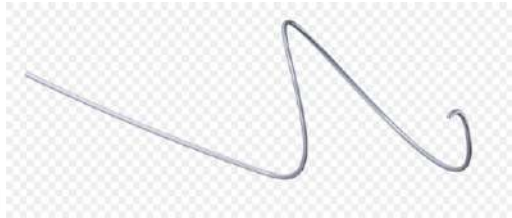
Co-axial system

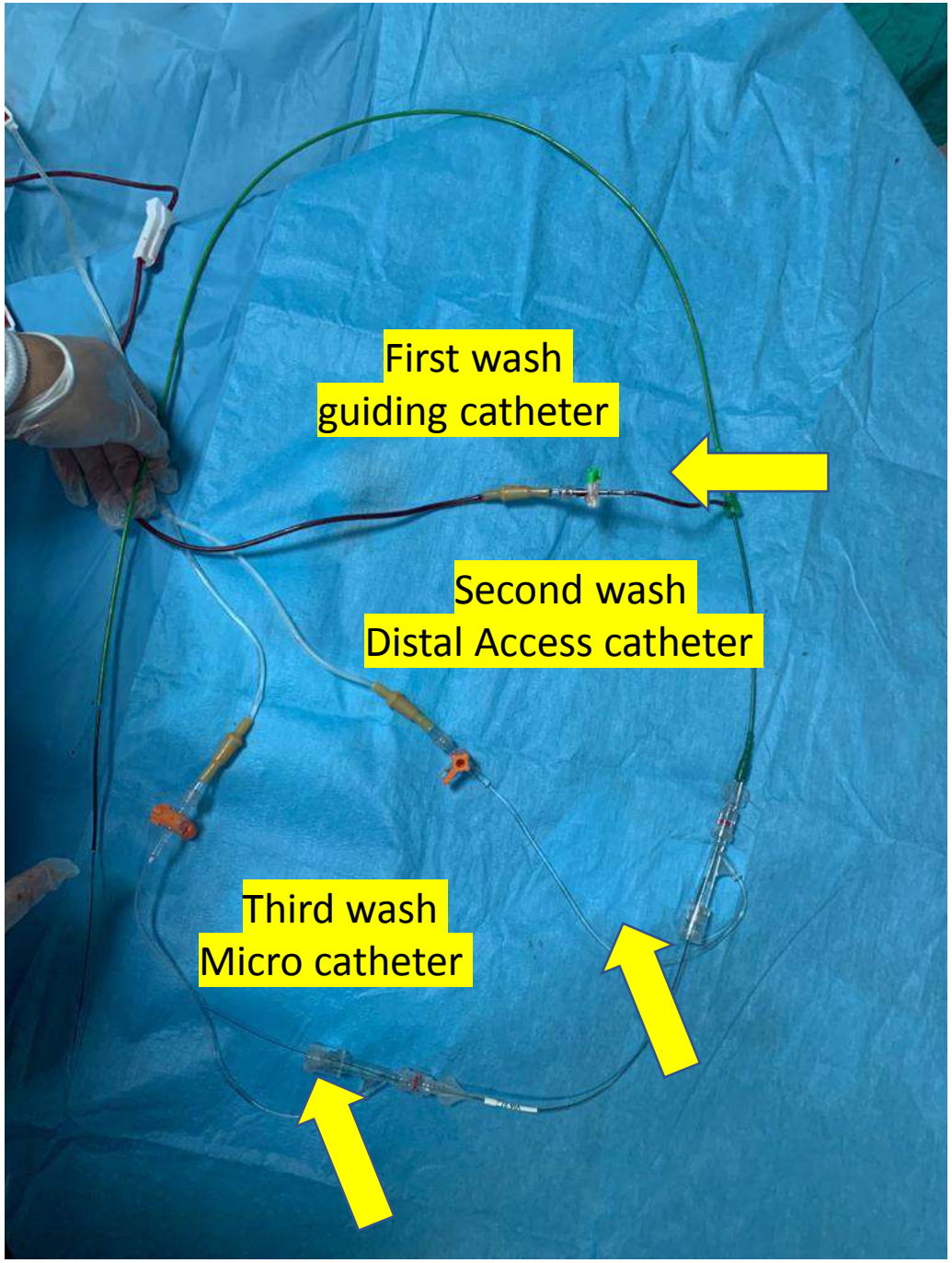
- Microguide wire
- Microcatheter
- Guiding catheter (With or without balloon)



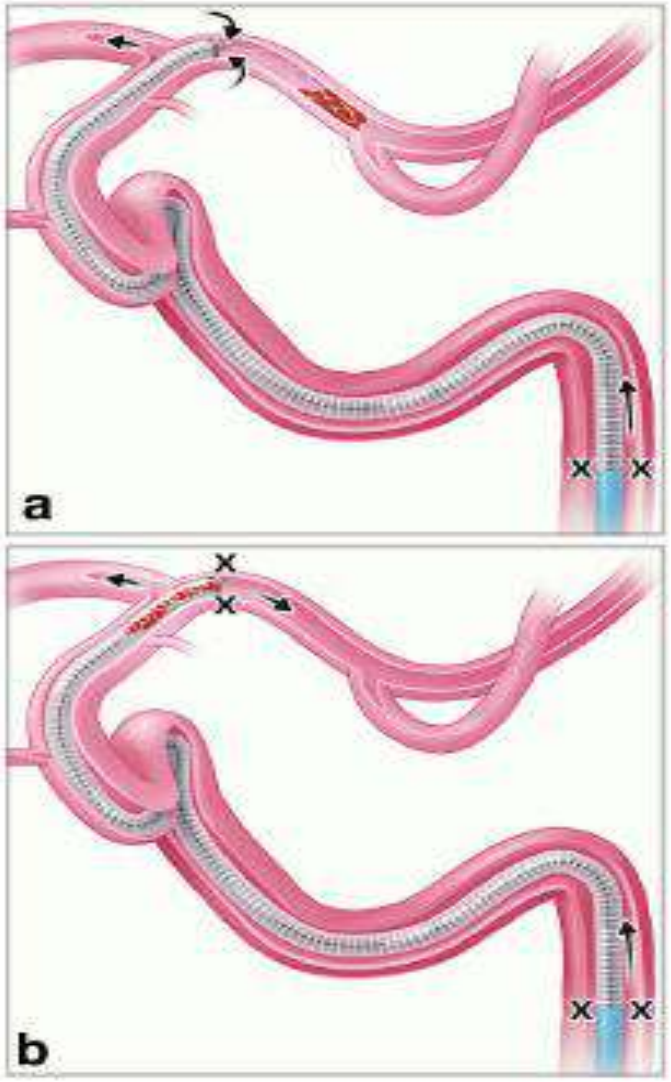
Triaxial system

- Microguide wire
- Microcatheter
- Aspiration or distal access catheter
- Guiding catheter (With or without balloon)



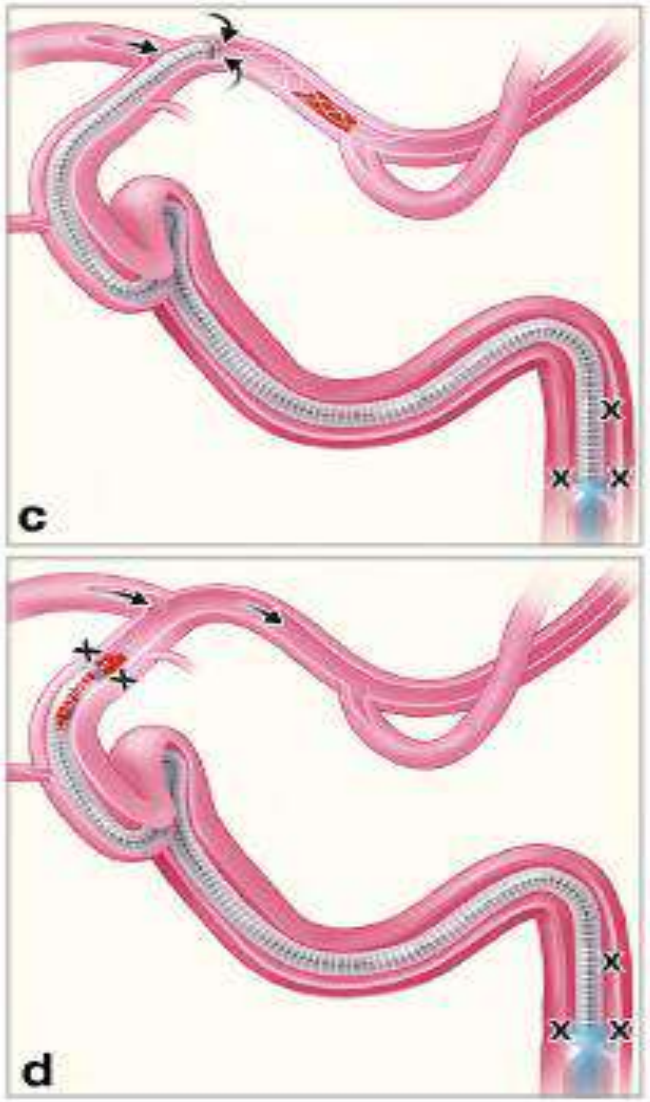

First wash
guiding catheter
Second wash
Distal Access catheter
Third wash
Micro catheter

"SOLUMBRA" TECHNIQUE



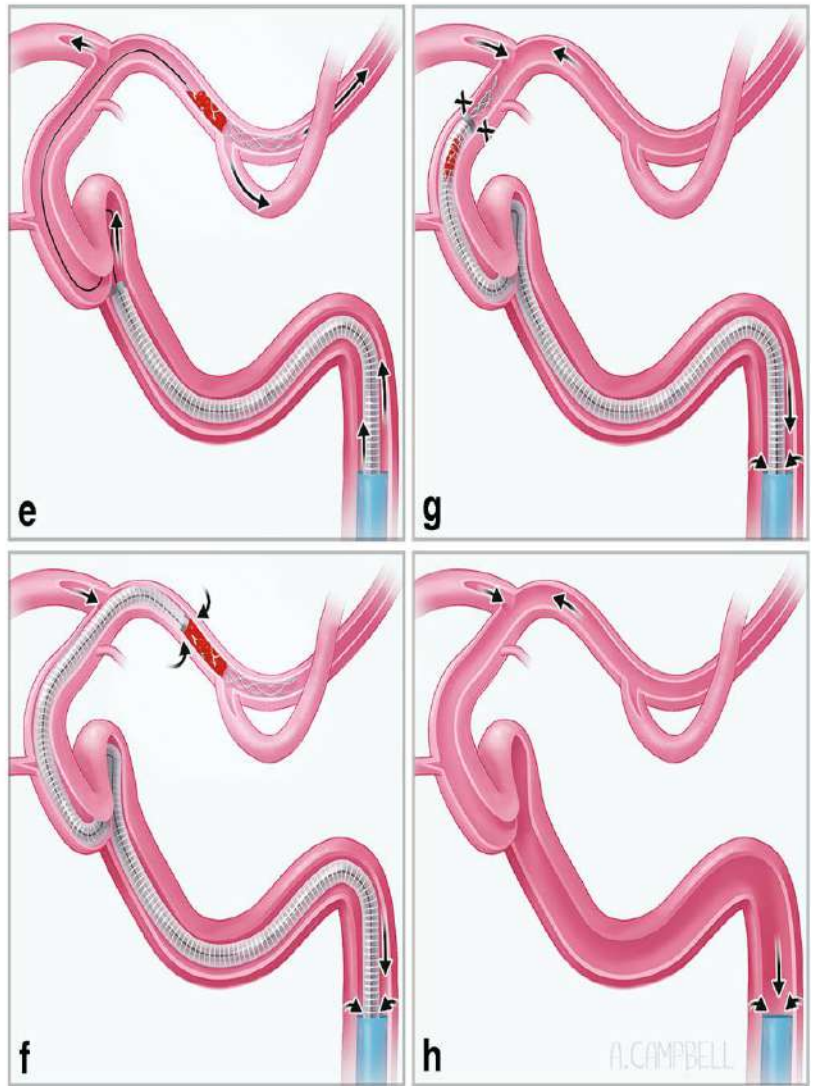
- DAC sabit. DAC içine stent alınıyor
- Proksimal aspirasyon yok

"ARTS" TECHNIQUE



- Proksimal aspirasyon yok
- <u>DAC ve stent birlikte çekiliyor</u>

"SAVE" TECHNIQUE

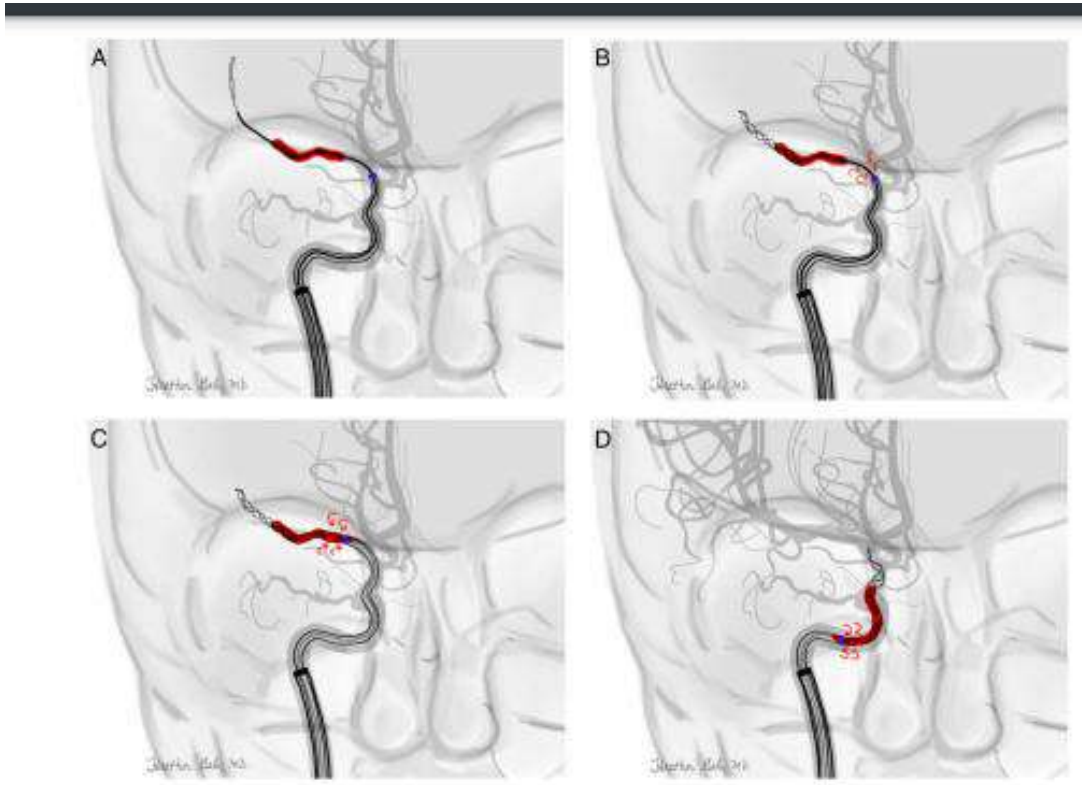


- <u>Proksimal aspirasyon var</u>
- <u>DAC ve stent birlikte çekilir.</u>

ORIGINAL RESEARCH

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

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



- Mikrokatater aspirasyon gücünü artırmak için kaldırılıyor
- Proksimal aspirasyon yok
- <u>DAC ve stent birlikte çekiliyor</u>

Figure 1 Continuous aspiration prior to intracranial vascular embolectomy (CAPTIVE) technique. Illustrative example of the use of the CAPTIVE technique to treat an M1 segment occlusion. We routinely place the large guiding sheath in the cervical internal carotid artery. (A) The triaxial system including the distal aspiration catheter, microcatheter, and microguidewire are advanced as a unit, with the microcatheter and guidewire traversing the occluded segment. (B) In the next step, local aspiration is turned on (red arrows) prior to deployment of the stent retriever. (C) The stent retriever is then completely deployed and the microcatheter removed in order to improve the aspiration force. After the microcatheter has been removed, the distal aspiration catheter is advanced over the stent retriever wire until the drip rate slows, indicating the thrombus has been 'engaged' or 'held captive' by the aspiration catheter. (D) In the withdrawal step, it is critical to remove the aspiration catheter and stent retriever as a single unit into the cervical sheath. (E) Gross specimen picture shows how the stent retriever has captured the embolus, with a portion held 'captive' within the distal aspiration catheter.

Original Article

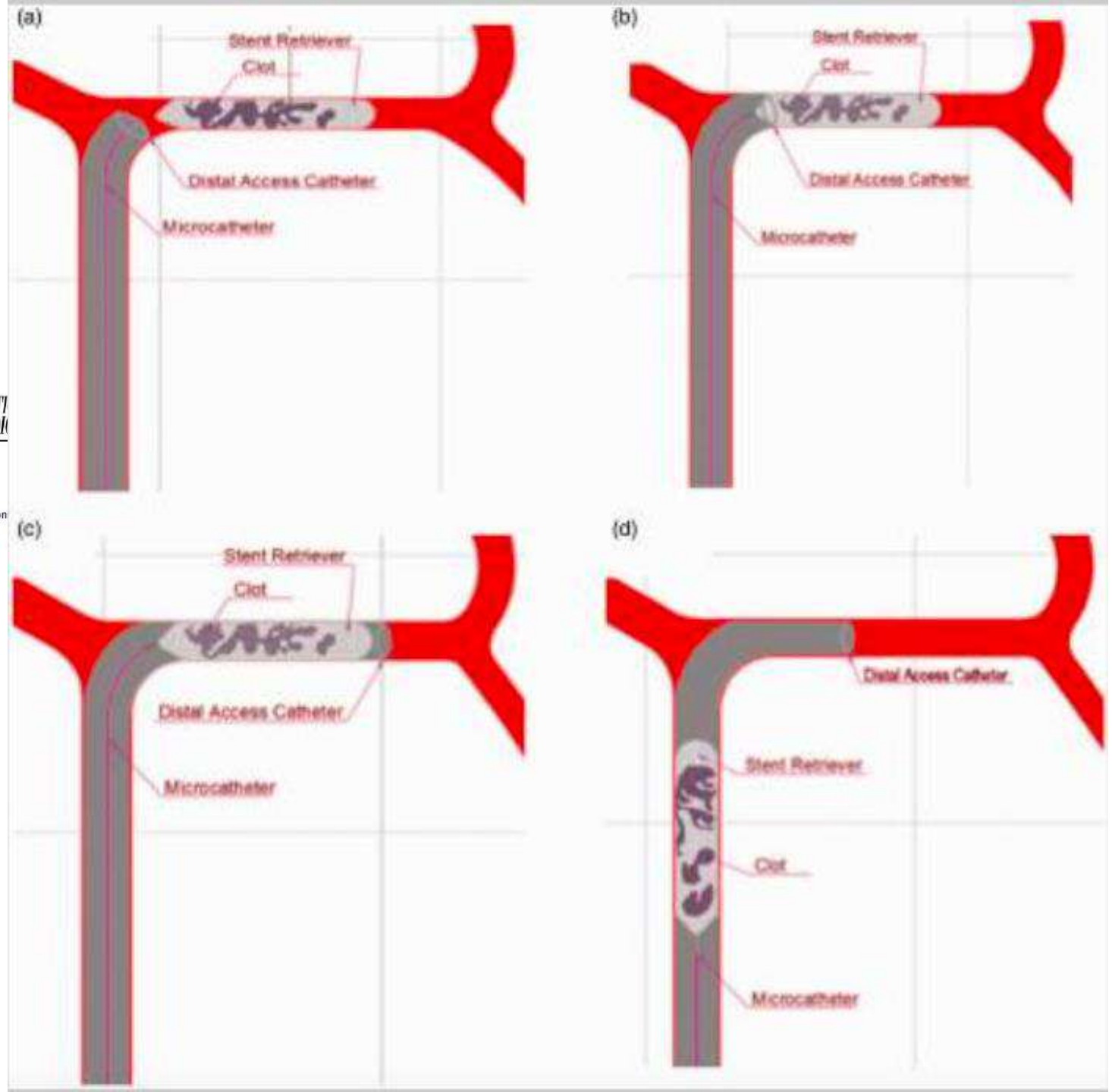
INR INTERVENTIONAL NEURORADIOLOGY

Interventional Neuroradiology
2017, Vol. 23(2) 166–172

DOI: 10.1177/1591019916682358
journals.sagepub.com/home/ine
SAGE

ADVANCE: An effective and feasible technique in acute stroke treatment

Erdem Gurkas[1], Cetin Kursad Akpinar[2] and Emrah Aytac[3]

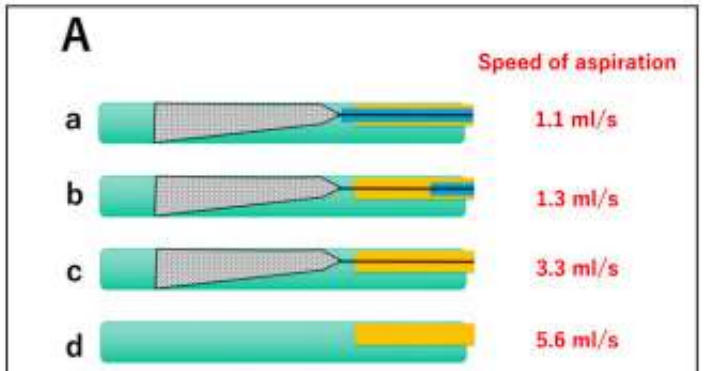


Safety and Effectiveness of a Modified ASAP Technique during Mechanical Thrombectomy for Acute Ischemic Stroke: Initial Clinical Experience

Tomotaka Ohshima[1], Reo Kawaaguchi[2], Naoki Matsuo[2], Shigeru Miyachi[1,2]

Abstract

Objectives: For patients with acute ischemic stroke, various endovascular approaches have been reported with high recanalization rates and good clinical outcomes. However, the best technique for the first attempt at mechanical thrombectomy remains a matter of debate. In this study, we evaluated the efficacy of a modified version of a stent-retrieving into an aspiration catheter with a proximal balloon (ASAP) technique. **Materials and Methods:** Modification 1: After stent deployment, the



B		Pressure at the tip of aspiration catheter (−inHg)
a	0.068 inch aspiration catheter	28
b	0.068 inch aspiration catheter 0.0165 inch microcatheter	27
c	0.068 inch aspiration catheter 0.021 inch microcatheter	26
d	0.068 inch aspiration catheter 0.027 inch microcatheter	26

Figure 3: (A) Comparison of the speed of aspiration in various situations. a-d: The removal of the microcatheter from the entire system© led to a dramatic increase in the speed of aspiration. (B) Measurement of the pressure at the tip of the 0.068-inch aspiration catheter. a-d: There were no significant differences between the presence or absence of the microcatheter inside the aspirator

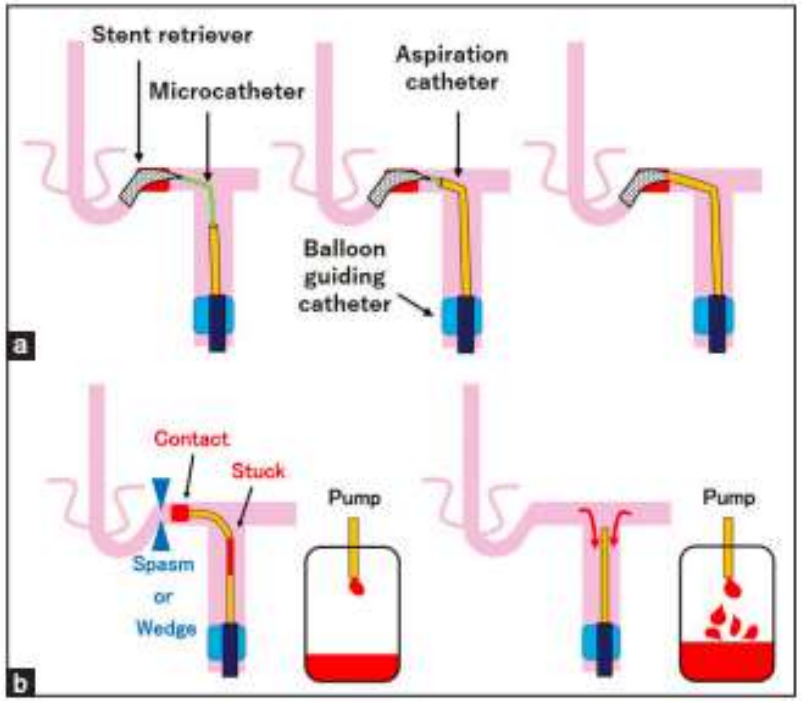


Figure 1: (a) Schematic diagram of modification 1. After stent deployment, the microcatheter is not removed from the entire system, in contrast with the original technique. The aspiration catheter is advanced together with the microcatheter as the deployed stent is used as an anchor. The tip of the aspirator is engaged at the proximal end of the clot. (b) Schematic drawing of modification 2. The draining fluid from the aspirator into the pump is usually stopped because of regional vasospasm, a wedge of the aspirator, contact with a clot, or the sticking of a clot inside the aspirator. The aspirator is slowly withdrawn until the fluid appears to continuously drain into the pump

Table 1: Summary of the patients treated with modified aspiration catheter with a proximal balloon technique in our institution

n	30
Age, years (range)	75.1±10.1 (43-91)
Location	
Internal carotid artery	7 (23.3)
Carotid T	3
Proximal M1	12 (40)
Distal M1	3 (10)
M2	8 (26.7)
Tissue plasminogen activator	16 (53.3)
ASPECTS-DWI (range)	7.3±2.0 (2-10)
NIHSS score (range)	14.7±6.4 (5-29)
Time from onset to puncture, minute (range)	122.7±37.8 (60-210)*
Time from puncture to recanalization, minute (range)	17.6±6.84 (9-39)
Number of passes	
1	25 (83.3)
2	4 (13.3)
3 or more	1 (3.3)
Thrombolysis in Cerebral Infarction score	
0-2A	1 (3.3)
2B	7 (23.3)
3	22 (73.3)
Embolization to the new territory	0 (0)
Intracranial hemorrhage	1 (3.3)
Modified Rankin Scale score	
0-1	17 (56.6)
0-2	23 (76.7)
3-6	7 (23.3)

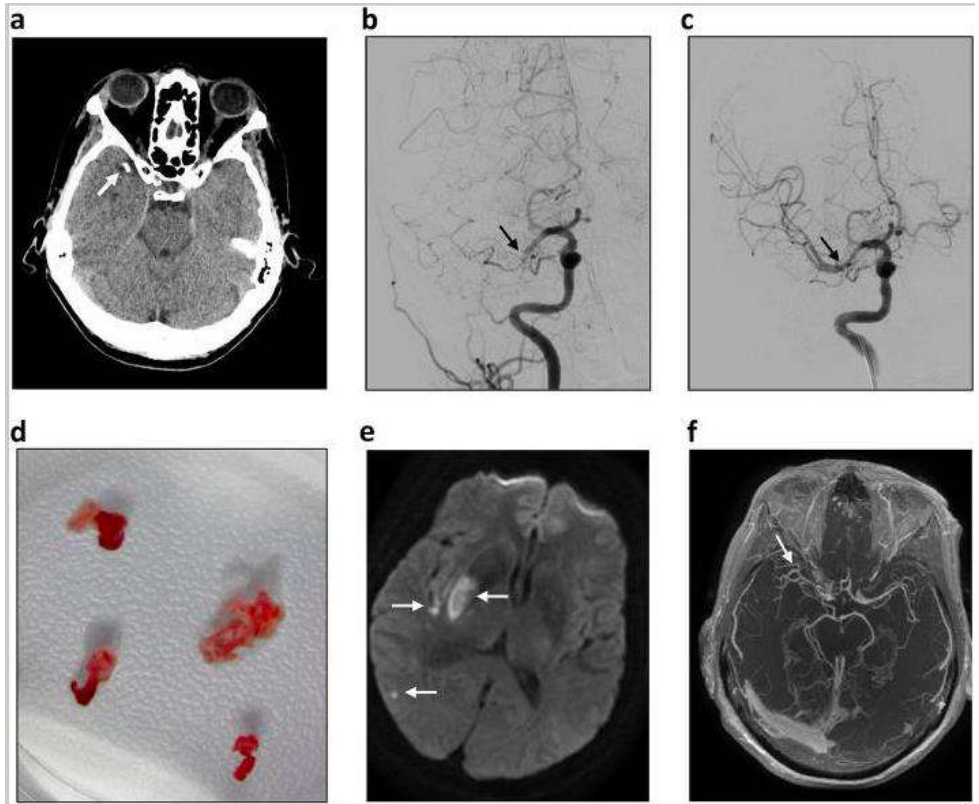
Staessens *et al. Thrombosis Journal* (2021) 19:11
https://doi.org/10.1186/s12959-021-00262-1

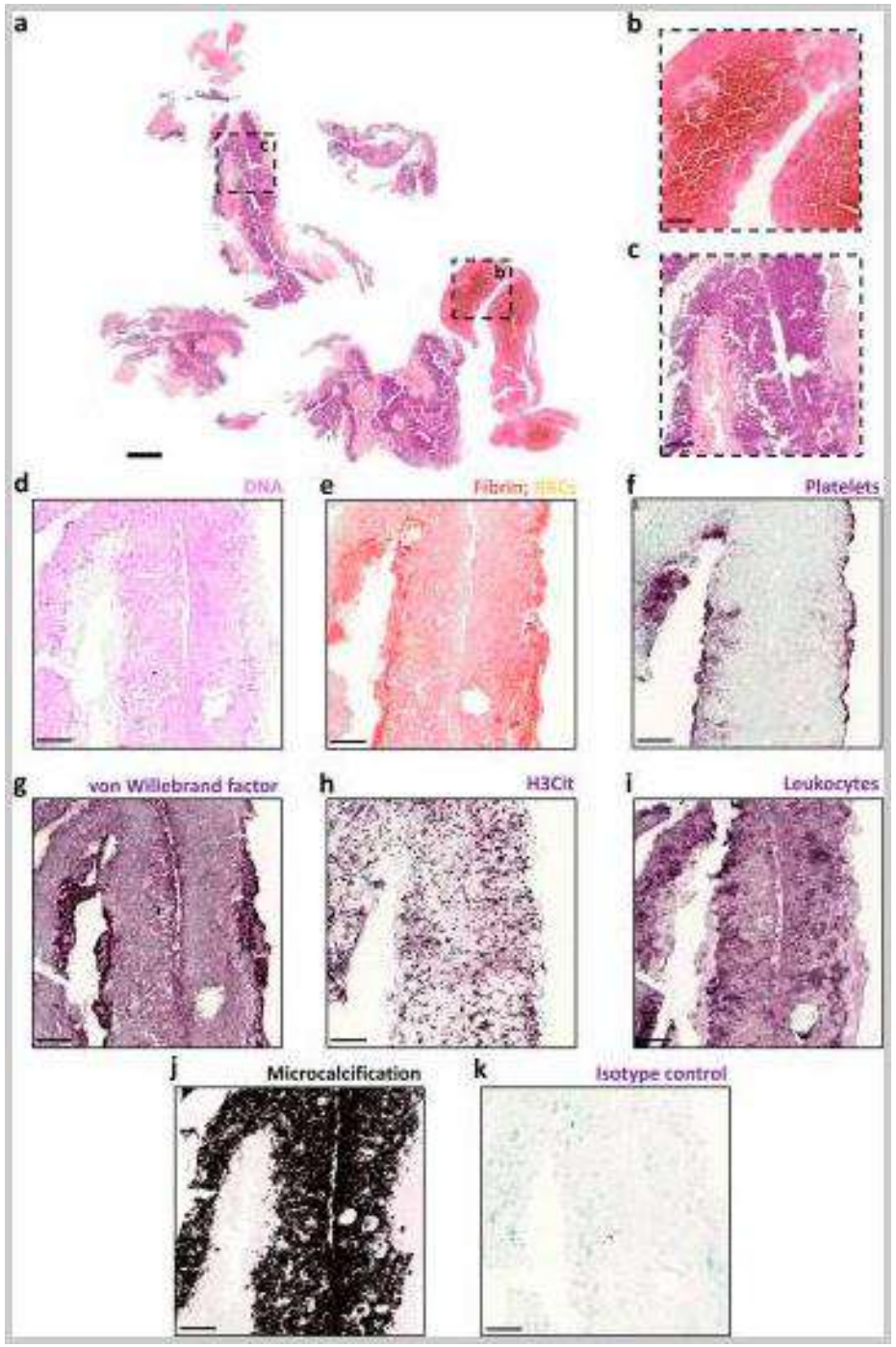
Thrombosis Journal

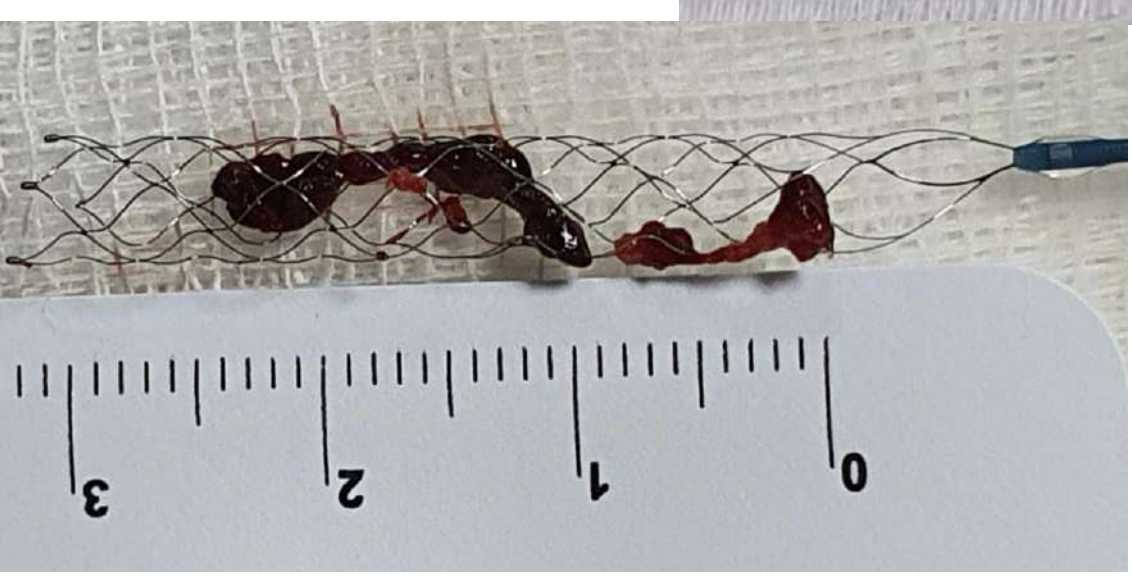
CASE REPORT Open Access

Detailed histological analysis of a thrombectomy-resistant ischemic stroke thrombus: a case report

Senna Staessens[1†], Olivier François[2†], Linda Desender[1], Peter Vanacker[3,4,5], Tom Dewaele[2], Raf Sciot[6], Karen Vanhoorelbeke[1], Tommy Andersson[2,7] and Simon F. De Meyer[1*]



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European Journal of Radiology 139 (2021) 109723

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Research article

Mechanical thrombectomy injury to the arterial wall: A comparison between catheter aspiration and stent retriever

Guangchen He [a, 1], Jiangshan
Yueqi Zhu [a, *]

Conclusion: Both devices had similar efficacy and caused minimal arterial wall damage in our dog models. SR was more likely to cause endothelium denudation, while CA had a greater risk of vasospasm.

Table 1
Thrombectomy safety comparison of stent retriever and catheter aspiration.

	SR group	CA group	Number	P-value
Injury Score	0.5 ± 0.19	0.67 ± 0.19	12	0.54
Endothelium denudation score	1.17 ± 0.24	0.42 ± 0.15	12	0.01
Vasospasm score	0.25 ± 0.13	0.67 ± 0.14	12	0.04
Dissection score	0 %	16.7 %	12	0.21
Thrombus deposition score	2 ± 0.77	0.5 ± 0.34	6	0.11
Side branch occlusion	54.2 %	33.3 %	24	0.24
Thrombectomy times	2.67 ± 0.56	1.67 ± 0.33	6	0.15
Thrombectomy period (minutes)	28.33 ± 3.26	17.83 ± 1.96	6	0.02

Note: SR = stent retriever; CA = catheter aspiration; data are provided as the mean ± SD or percentage.

Laboratory Investigation
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https://doi.org/10.3340/jkns.2020.0303
pISSN 2005-3711 eISSN 1598-7876

The Protective Effects of Statins towards Vessel Wall Injury Caused by a Stent Retrieving Mechanical Thrombectomy Device : A Histological Analysis of the Rabbit Carotid Artery Model

Seung Hwan Lee,[1] Hee Sup Shin,[1] Inho Oh[2]

Department of Neurosurgery,[1] Kyung Hee University Hospital at Gangdong, College of Medicine, Kyung Hee University, Seoul, Korea
Department of Neurosurgery,[2] Veterans Health Service Medical Center, Seoul, Korea

Table 1. Study schedule and animal groups

	Day 1–7	Day 7	Day 8–14	Day 15
Group 1 (negative control, n=4 arteries of 2 rabbits)	-	-	-	Euthanized
Group 2 (positive control, n=8 arteries of 4 rabbits)	-	MT	-	Euthanized
Group 3 (statin before MT, n=8 arteries of 4 rabbits)	Atorvastatin 20 mg/day	MT	-	Euthanized
Group 4 (statin after MT, n=8 arteries of 4 rabbits)	-	MT	Atorvastatin 20 mg/day	Euthanized

Group 1 is the negative control group without mechanical thrombectomy (MT). MT was performed on experimental day 8 for the group 2, group 3, and group 4 rabbits. Group 2 is the positive control group without statin administration. We administered 20 mg atorvastatin daily to the group 3 (7 days before MT, day 1–7) and group 4 (7 days after MT, day 8–14) rabbits. On day 15, the rabbits of all groups were euthanized

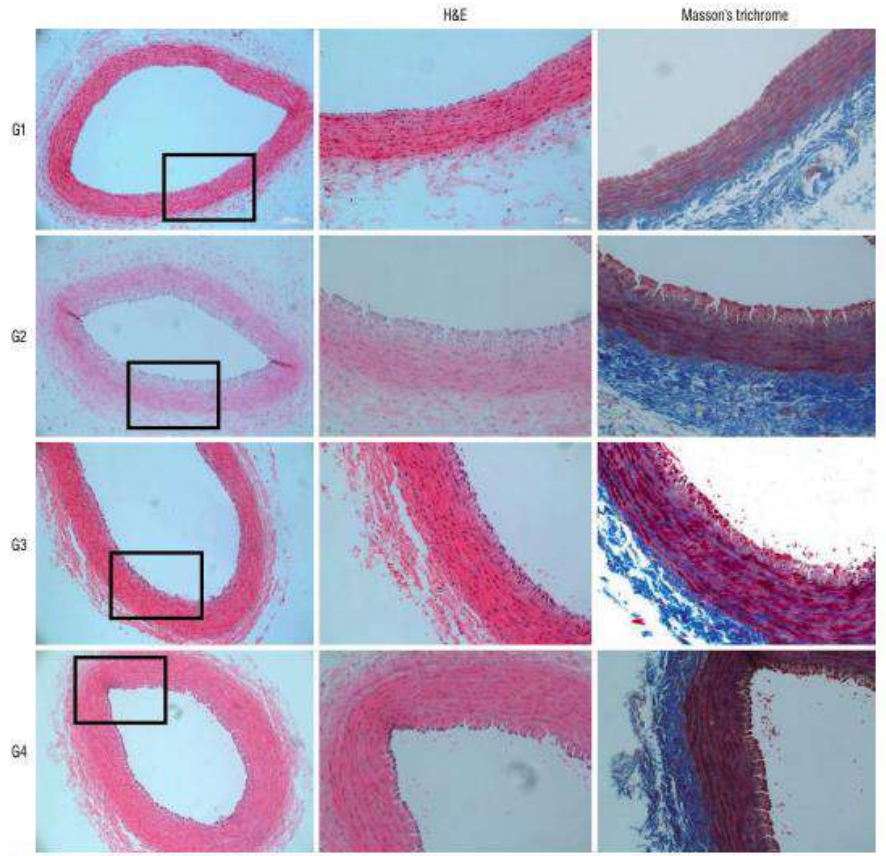

Fig. 3. Microscopic view of the H&E and Masson's trichrome stained tissues. The tunica intima of the negative control group (group 1) shows a single thin layer of endothelial cells. Marked thickening of tunica intima can be observed in the positive control group (group 2). In the statin-administered groups 3 and 4, a significant decrease in intimal thickening can be observed (magnification ×20 on 1st column, magnification ×200 on 2nd and 3rd columns). H&E : hematoxylin and eosin, G1 : group 1, G2 : group 2, G3 : group 3, G4 : group 4.

- Statinlerin pleiotropik etkisinin endotel fonksiyonunu iyileştirmekte
- Plak stabilizasyonu artırmakta
- Oksidatif stresi ve inflamasyonu azaltmakta ve
- Trombojenik yanıtı inhibe etmektedir.

Table 2: Summary of the results of the reported representative literatures

References, year	Devices (strategy)	Micro catheter	Contact aspiration	Withdrawing SR and aspiration catheter	Number of patients	Time from puncture to recanalization (minutes)	Number of passes	Thrombolysis in cerebral infarction score 2B and 3 (%)	Embolization to the new territory (%)	Intracranial hemorrhage/ symptomatic intracranial hemorrhage (%)	Modified Rankin Scale 0-2 after 3 months (%)
ESCAPE,[1] 2015	SR + BGC				165	33	NR	72.4	NR	NR/3.6	53
STRATIS,[2] 2017	SR				984	45.6	NR	87.9	0.8	2.9/1.4	56.5
ADAPT FAST,[3] 2014	Asp (ADAPT)		+		98	37	NR	95	0	NR/0	40
Delgado Almandoz *et al*.,[4] 2016	Asp + SR (Solumbra)	Remove	−	As a unit	55	51	NR	84	2	47/13	31
Humphries *et al*.,[5] 2015	Asp + SR (Solumbra)	Remove	−	As a unit	105	54	NR	88	3.8	NR/4.6	44.1
McTaggart *et al*.,[6] 2016	Asp + SR (CAPTIVE)	Remove	+	As a unit	39	14	1.7	100	5	NR	49
Maus *et al*.,[7] 2017	Asp + SR (SAVE)	Remove	+	As a unit	32	44.5	1.2	100	0	NR/3.1	59
Massari *et al*.,[8] 2016	Asp + SR + BGC (ARTS)	Remove	+	As a unit	42	65	2.2	97.6	2.4	2/0	65.7
Goto *et al*.,[9] 2018	Asp + SR + BGC (ASAP)	Remove	+	Step by step	42	21.5	1.3	95.2	4.8	0/0	76.2
Present cases	Asp + SR + BGC (modified ASAP)	Not remove	+	Step by step	30	17.6	1.2	96.7	0	1/0	76.7

+: Contact aspiration is needed. -: Contact aspiration is not needed. SR - Stent retriever; NR - Not reported; BGC - Balloon guiding catheter; Asp - Aspiration catheter; ADAPT - A direct aspiration first pass technique; CAPTIVE - Continuous aspiration prior to intracranial vascular embolectomy; SAVE - Stentretriever assisted vacuum-locked extraction; ARTS - Aspiration-retriever technique for stroke; ASAP - Aspiration catheter with a proximal balloon

Journal of
Clinical Medicine

MDPI

Article

Mechanical Thrombectomy in Stroke. Experience from Switching from Stent Retriever Only to Stent Retriever Combined with Aspiration Catheter

Grzegorz Meder [1,*], Paweł Żuchowski [2], Wojciech Skura [1], Violetta Palacz-Duda [3], Milena Świtońska [3,4], Magdalena Nowaczewska [5] and Paweł Sokal [4]

Kombine teknik daha faydalı…

Table 2. Results of the study endpoints analysis.

Goal	SO	CA	OR (95% CI)	*p* Value
First pass mTICI 3	6 (18%)	17 (46%)	3.83 (1.28–11.44)	0.016
Procedure success—mTICI 2b-3	28 (84.8%)	35 (94.6%)	3.13 (0.56–17.34)	0.193
Total number of passes needed	2.09	1.76	N/A	0.114
Mean duration of the procedure (minutes ± SD)	64 ± 34	49 ± 21	N/A	0.017
90-day mRS: median, (IQR)	4, (2–6)	2, (1–4)	N/A	0.031
Δ NIHSS (± SD) (excluding deaths)	6.7 ± 4.0	9.3 ± 5.1	N/A	0.025
Post interv SAH	2	1	0.43 (0.04–4.98)	0.499
sICH	3	5	1.56 (0.34–7.11)	0.564
ENT	4	2	0.41 (0.07–2.43)	0.328

SO = stent retriever only; CA = Combined approach; OR = odds ratio; CI = confidence interval; mTICI = modified Thrombolysis in Cerebral Infarction scale; SD = standard deviation; IQR = interquartile range; mRS = modified Rankin Scale; NIHSS = National Institutes of Health Stroke Scale; SAH = subarachnoid hemorrhage; sICH = symptomatic intracranial hemorrhage; ENT = embolization to a new territory.

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DOI: 10.1177/17474930211019204
journals.sagepub.com/home/wso
SAGE

Stent-retriever alone vs. aspiration and stent-retriever combination in large vessel occlusion stroke: A matched analysis

Mahmoud H Mohammaden[1,2], Diogo C Haussen[1,2], Leonardo Pisani[1,2], Alhamza R Al-Bayati[1,2], Aaron Anderson[1,2], Bernardo Liberato[1,2], Daniel Schachter[1,2], Digvijaya Navalkele[1,2], Michael R Frankel[1,2] and Raul G Nogueira[1,2]

Conclusions: Our findings reinforce the findings of ASTER-2 trial in that the first-line thrombectomy with a combined technique did not result in increased rates of first-pass reperfusion or better clinical outcomes. However, the addition of contact aspiration after initial stent-retriever failure might be beneficial in achieving earlier reperfusion.

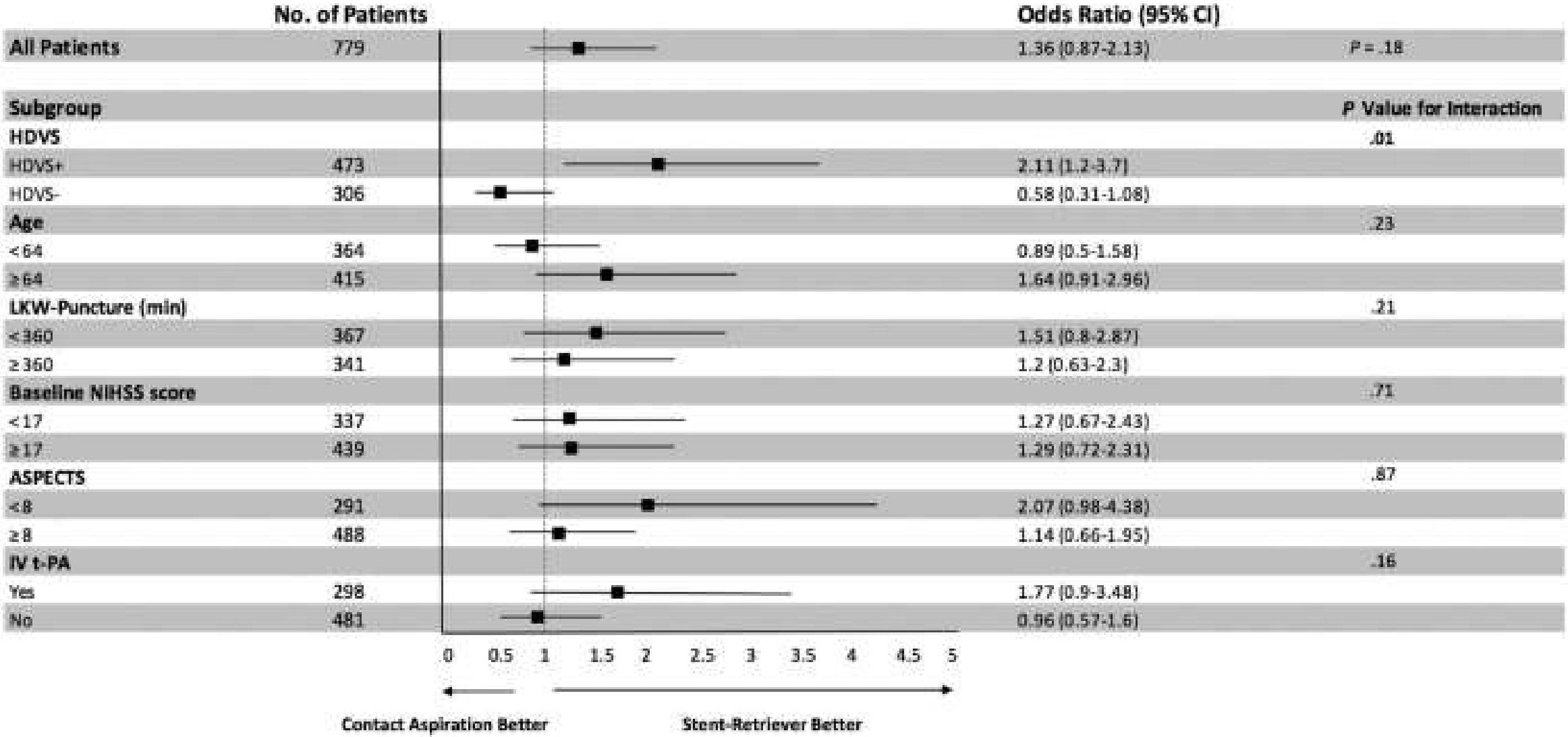


Figure 1 Forest plot graph shows the effect size in the primary outcome variable (odds ratio for first-pass effect) across the different subgroups. Last known well (LKW) to puncture, baseline National Institutes of Health Stroke Scale (NIHSS) score, the Alberta Stroke Program Early Computed Tomography Score (ASPECTS), and pre-mechanical thrombectomy use of intravenous alteplase (IV-tPA). Age, baseline NIHSS score, and ASPECTS were divided into two groups based on their median values. HDVS, hyperdense vessel sign.

Tortuosity Index Predicts Early Successful Reperfusion and Affects Functional Status After Thrombectomy for Stroke

Santiago Gomez-Paz, Yosuke Akamatsu, Akashleena Mallick, Noah J. Jordan, Mohamed M. Salem, Alejandro Enriquez-Marulanda, Ajith J. Thomas, Christopher S. Ogilvy, Justin M. Moore

OBJECTIVE: **The literature is scarce for studies evaluating the anatomy of cervical vessels in patients with stroke. We sought to investigate the effect of vessel tortuosity in procedural, angiographic, and functional outcomes in patients with acute ischemic stroke treated with mechanical thrombectomy (MT).**

METHODS: **Patients with an emergent large vessel oc-**

predictor of functional independence (most recent modified Rankin Scale score 0–2) (OR, 4.1; 95% CI, 1.62–10.53; adjusted $P = 0.003$).

CONCLUSIONS: **Patients with a TI <10 are significantly more likely to achieve early successful reperfusion after MT for the treatment of acute ischemic stroke.**

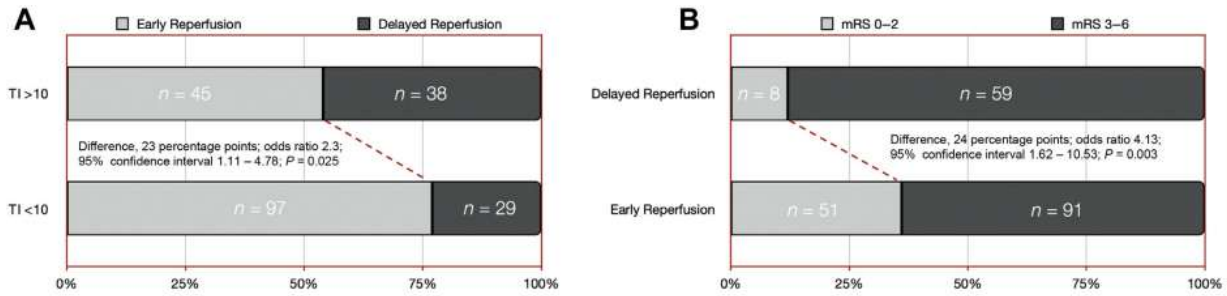


Figure 3. Distribution of early reperfusion and functional independence by tortuosity index (TI) and puncture to reperfusion time. (**A**) The distribution of early reperfusion by tortuosity index. (**B**) The distribution of functional independence by puncture to reperfusion time. mRS, modified Rankin Scale.

Figure 1. Tortuosity index (T. Index) measurement. (**A**–**C**) The anteroposterior view of the diagnostic angiography performed in 3 patients of the present cohort. The *orange dotted lines* correspond to the actual distance of the internal carotid artery measured in millimeters. The *blue dotted line* corresponds to the straight distance of the target vessel.

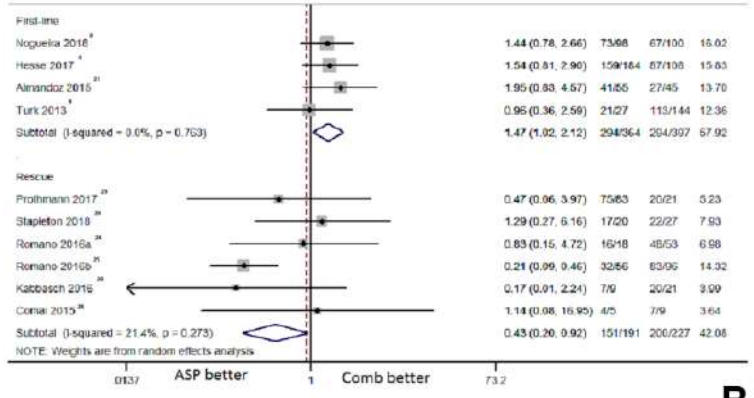
REVIEW

Mechanical Thrombectomy in Acute Ischemic Stroke: A Meta-Analysis of Stent Retrievers vs Direct Aspiration vs a Combined Approach

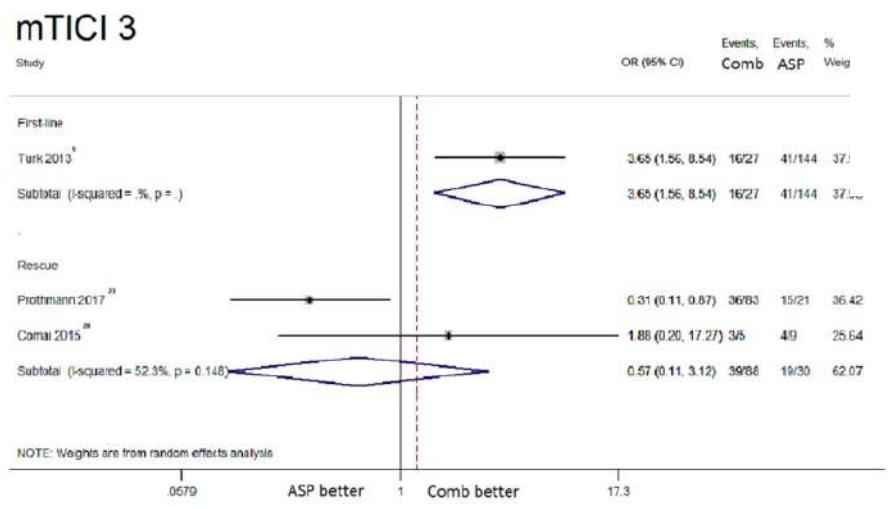
Pavlos Texakalidis, MD*
Stefanos Giannopoulos, MD†
Theofilos Karasavvidis, MS‡
Leonardo Rangel-Castilla, MD‡
Dennis J. Rivet, MD||
John Reavey-Cantwell, MD||

BACKGROUND: Recent randomized control trials (RCTs) established that mechanical thrombectomy is superior to medical therapy for patients with stroke due to a large vessel occlusion.
OBJECTIVE: To compare the safety and efficacy profile of the different mechanical thrombectomy strategies.
METHODS: A random-effects meta-analysis was performed and the I^2 statistic was used to assess heterogeneity according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines.

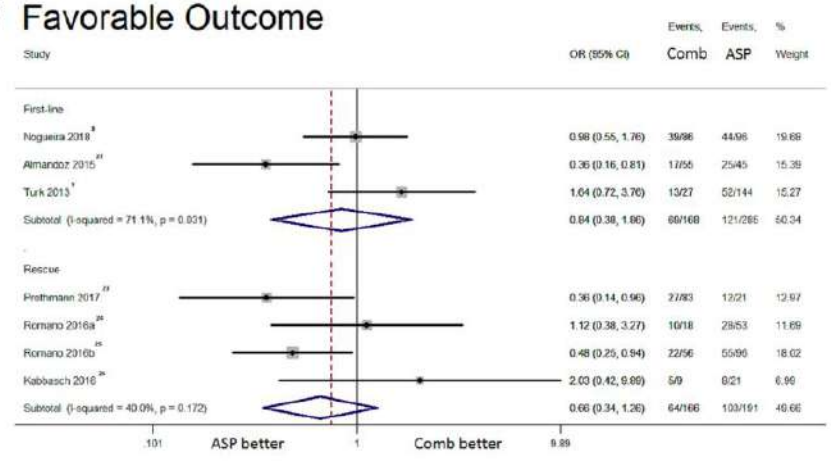
A mTICI 2b/3



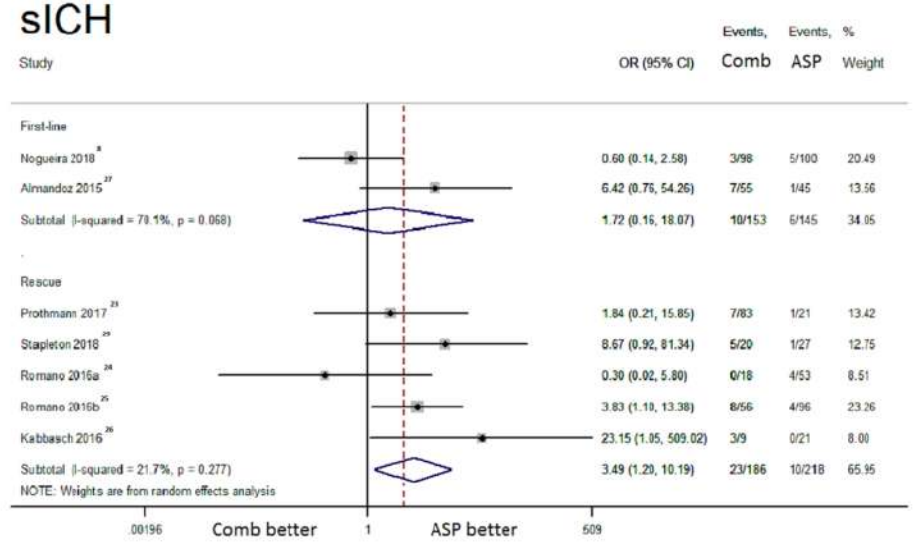
B mTICI 3



C Favorable Outcome



D sICH



JAMA. 2021 Sep 28; 326(12): 1158–1169.
Published online 2021 Sep 28. doi: 10.1001/jama.2021.13827
PMCID: PMC8479584
PMID: 34581737

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

The ASTER2 Randomized Clinical Trial

Bertrand Lapergue, MD, PhD,[✉ 1] Raphaël Blanc, MD, [2] Vincent Costalat, MD, PhD, [3] Hubert Desal, MD, PhD, [4]

First-pass effect (eTICI 2c/3 after first pass)	83 (40.9)	68 (33.7)	7.4 (–2.1 to 16.6)	1.38 (0.91 to 2.08)	.12
Modified first-pass effect (eTICI 2b50/2c/3 after first pass[c])	109 (53.7)	90 (44.6)	9.4 (–0.01 to 19.1)	1.48 (0.99 to 2.20)	.056
eTICI 3 after first pass	49 (24.1)	36 (17.8)	6.6 (–1.1 to 15.0)	1.51 (0.92 to 2.48)	.10
Use of rescue treatment[d]	39 (19.2)	54 (26.7)	–7.6 (–14.8 to 0)	0.61 (0.37 to 1.00)	.048

Primary and Secondary Efficacy Outcomes

	Contact aspiration and stent retriever (n = 203)	Stent retriever (n = 202)	Adjusted absolute difference (95% CI)	Adjusted odds ratio (95% CI)	*P* value
Primary efficacy outcome					
Reperfusion (eTICI 2c/3) at end of procedure[a,b]	131 (64.5)	117 (57.9)	6.6 (–3.0 to 16.2)	1.33 (0.88 to 1.99)	.17
Secondary angiographic efficacy outcomes					
Reperfusion outcomes at end of procedure[b]					
eTICI 2b50/2c/3	183 (90.2)	173 (85.6)	5.0 (–1.6 to 11.1)	1.62 (0.86 to 3.04)	.13
eTICI 3	65 (32.0)	56 (27.7)	4.5 (–4.3 to 13.7)	1.24 (0.80 to 1.92)	.32
Reperfusion outcomes after the assigned initial intervention alone[b]					
eTICI 2b50/2c/3	175 (86.2)	146 (72.3)	14.2 (5.8 to 21.8)	2.54 (1.51 to 4.28)	<.001
eTICI 2c/3	121 (59.6)	100 (49.5)	10.3 (0.8 to 20.1)	1.52 (1.02 to 2.27)	.04
eTICI 3	62 (30.5)	50 (24.8)	9.4 (–0.01 to 19.1)	1.35 (0.86 to 2.11)	.18

2021 yılı

- %9,6 başarısız trombektomi
- %54,5 Tek pass
- %90,4 mTICI2b-c-3
- (%45 mTICI3, %29 mTICI2b, %16,3 mTICI2b)

- %17,7 ADVANCE
- %45 MidADVANCE

- %1.8 Advance teknik yapmamıza rağmen rekanalizasyon sağlanamadı

G.Y.
75y, K
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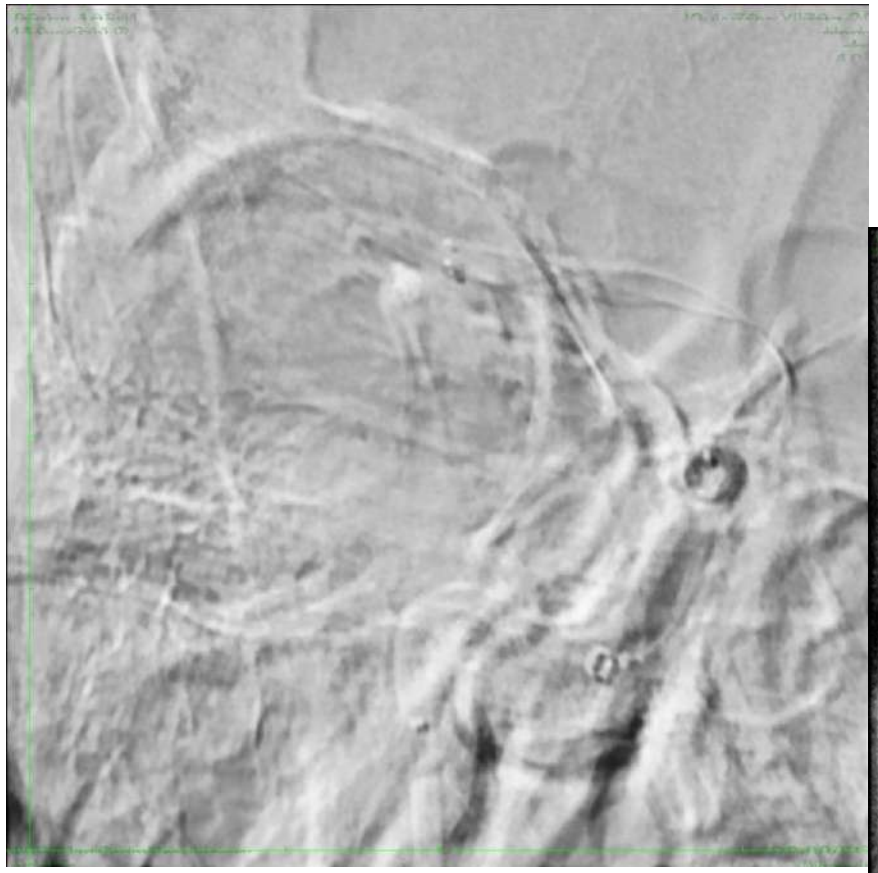
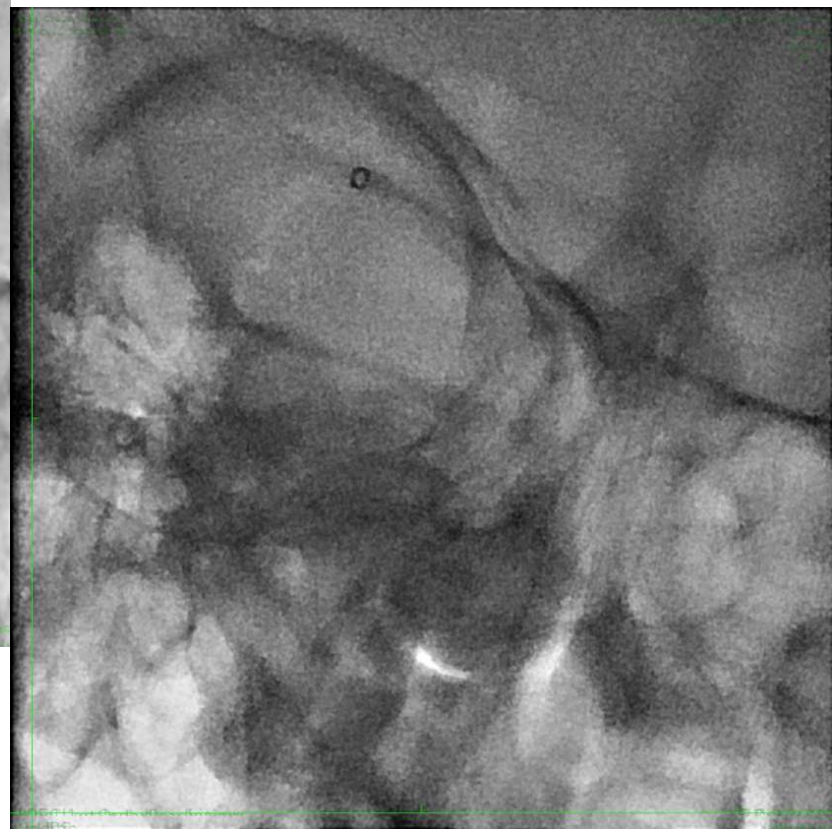
ADVANCE TEKNİK





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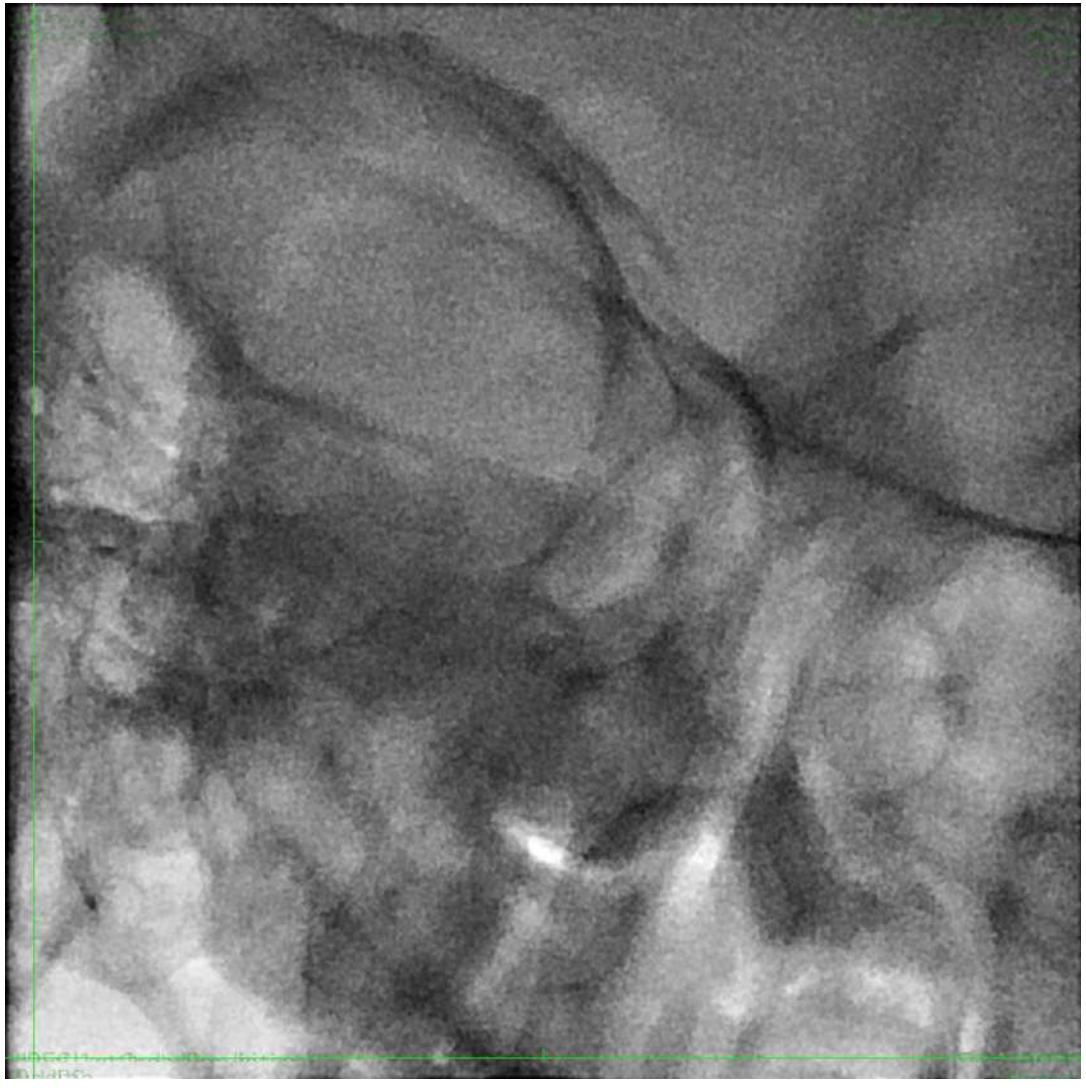
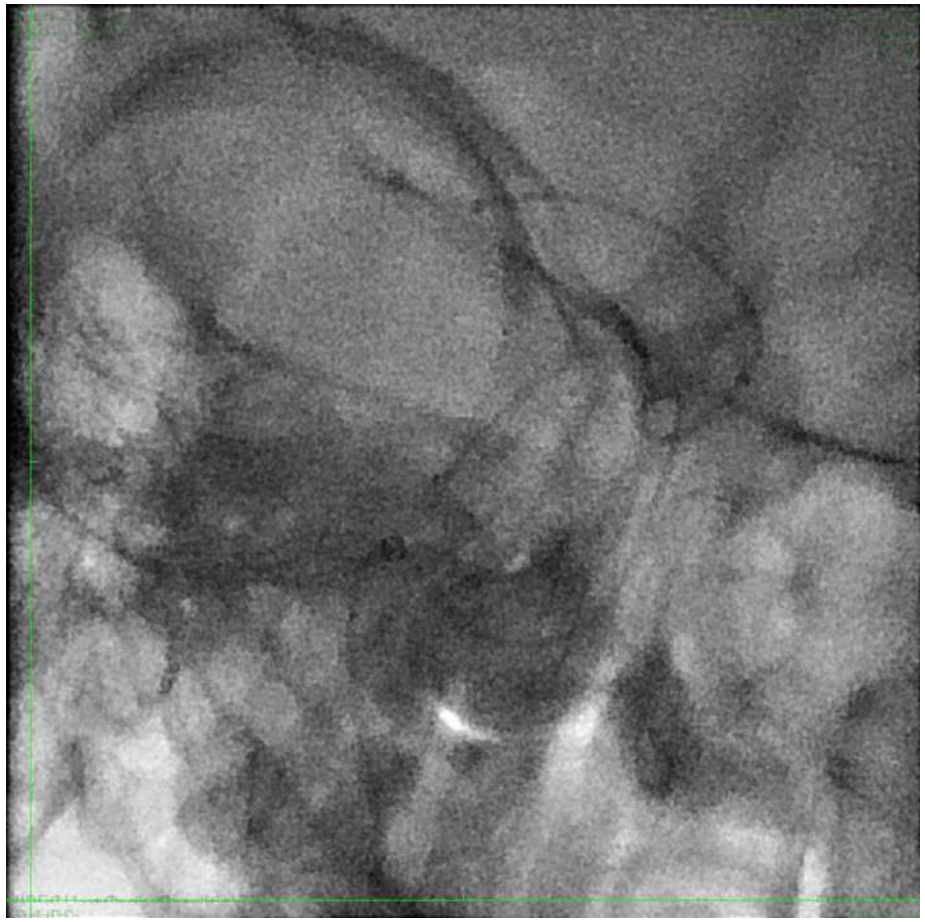
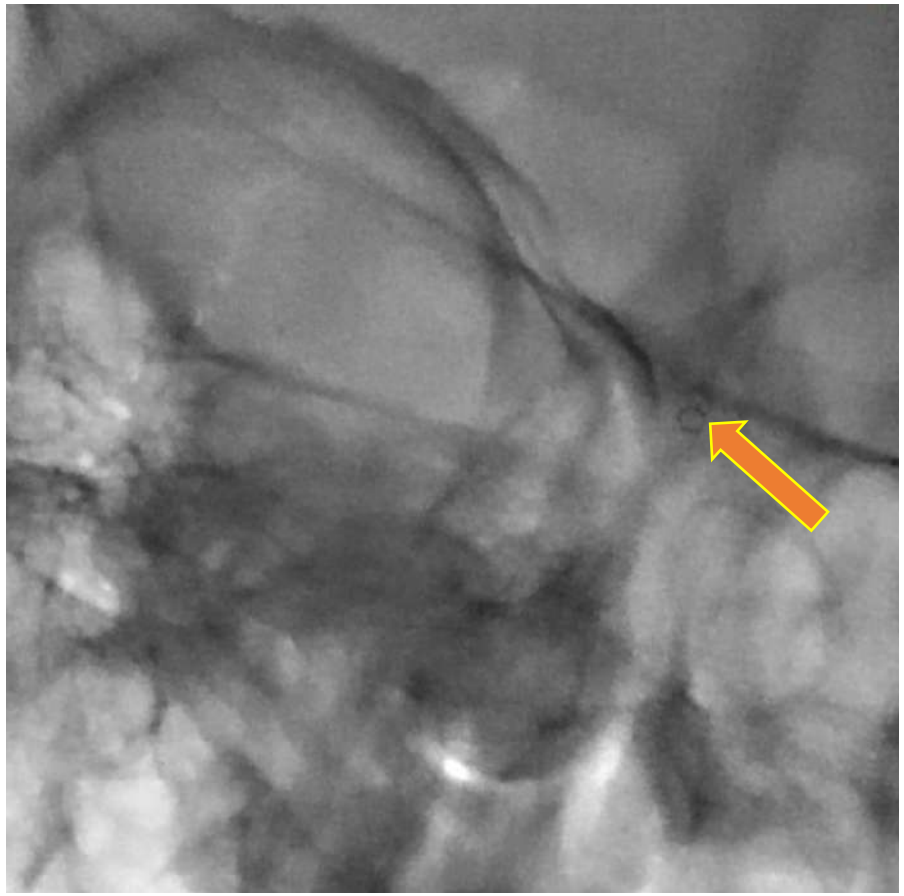


DPAT TEKNİK

SOLUMBRA TEKNİK





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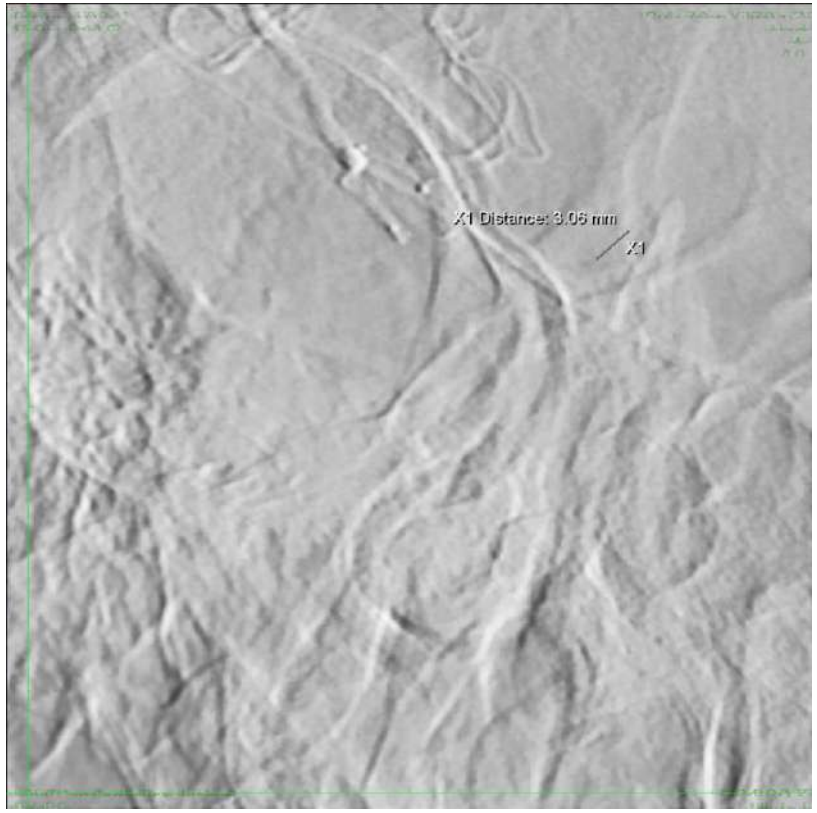

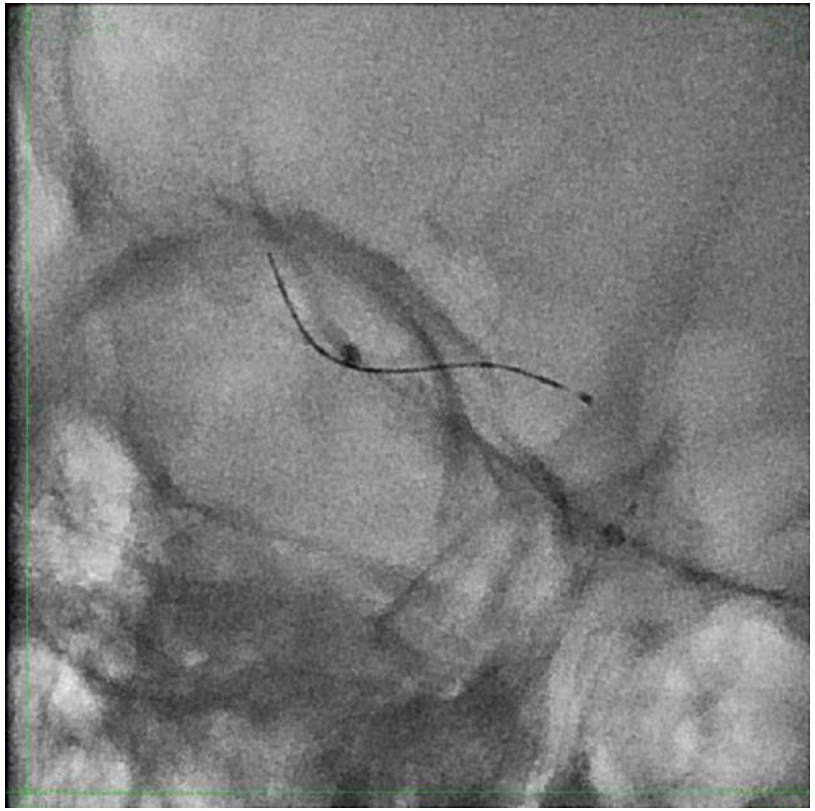

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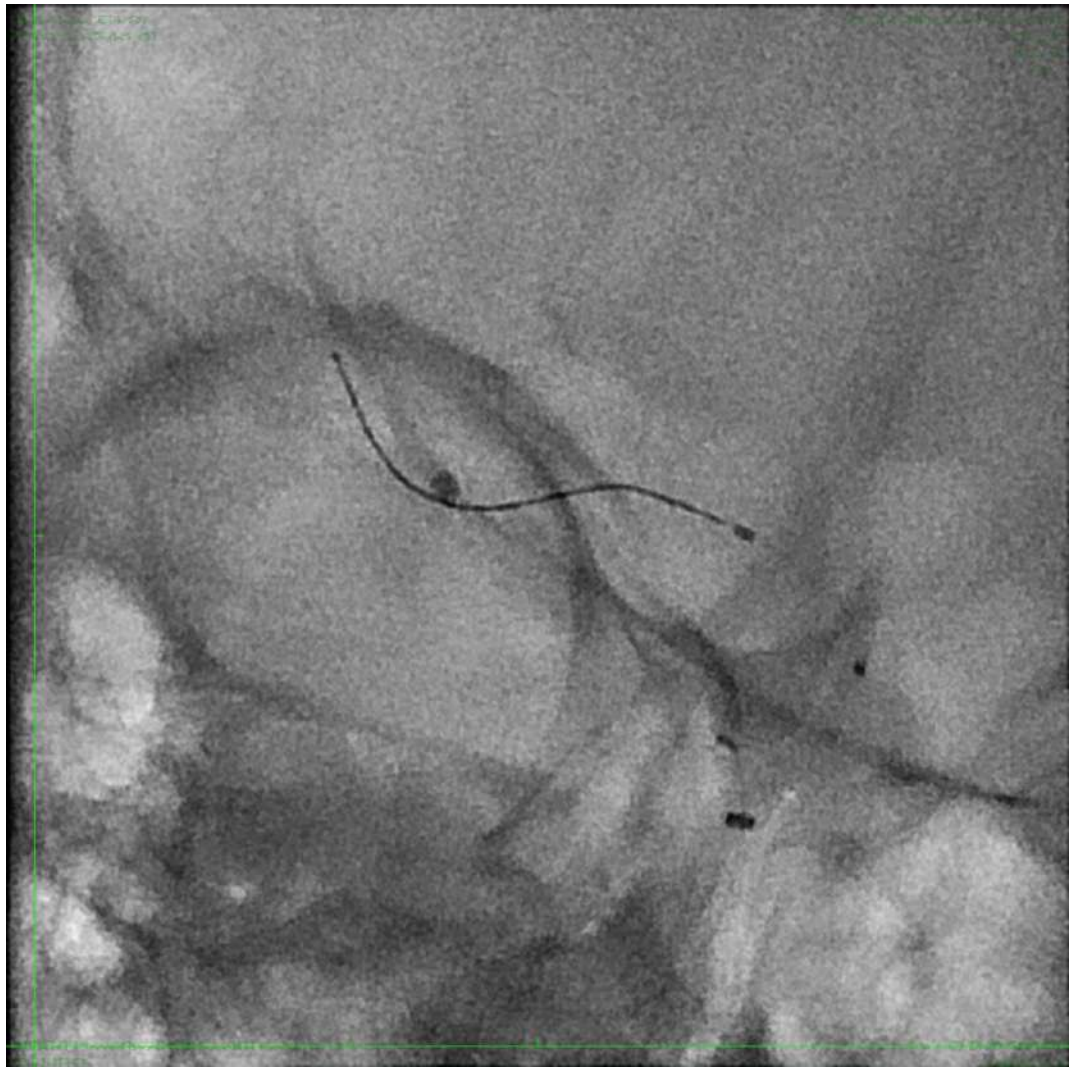
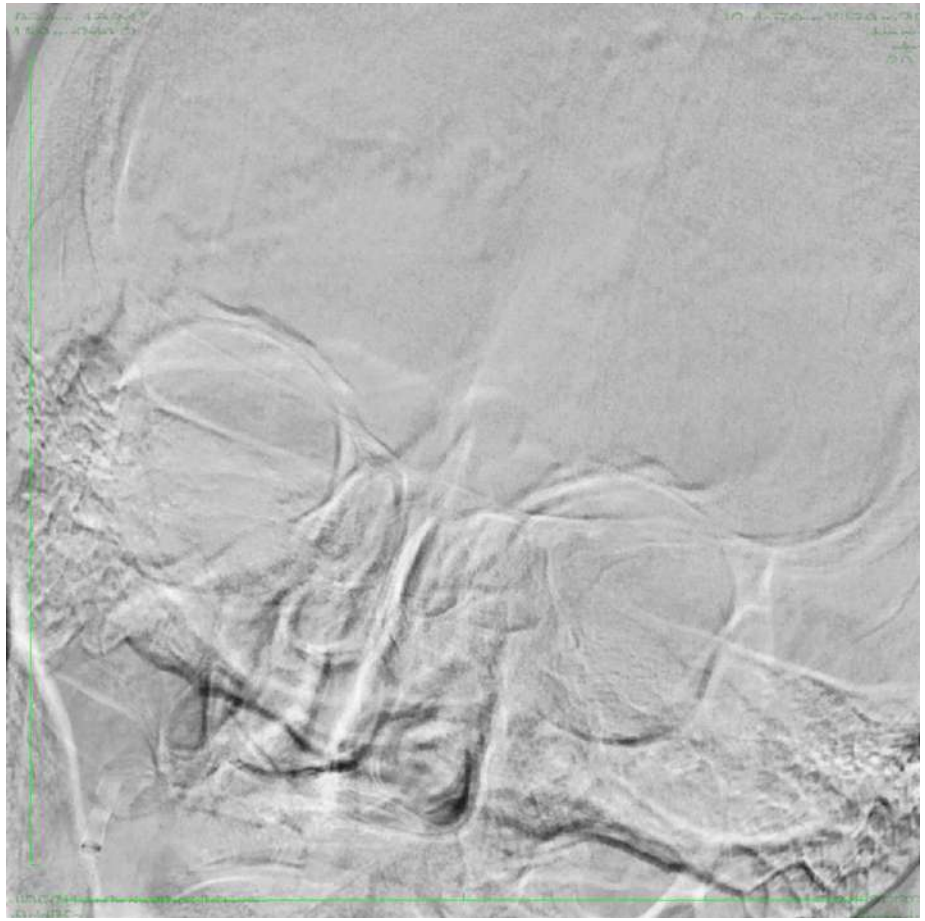
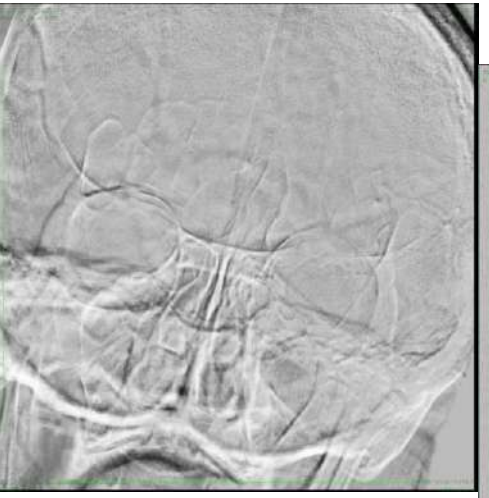
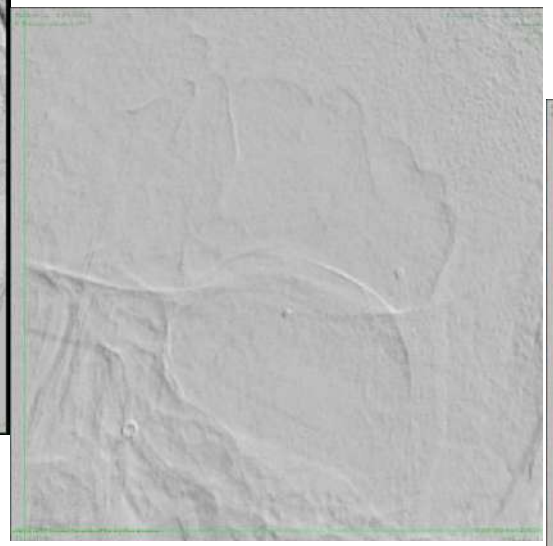
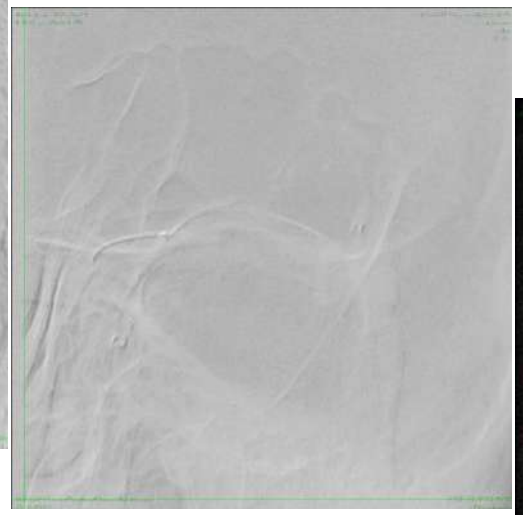
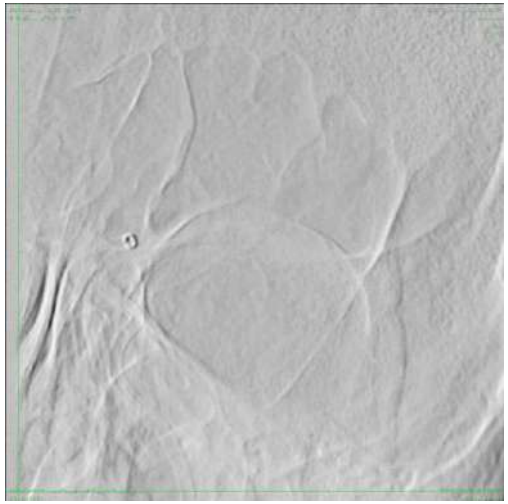
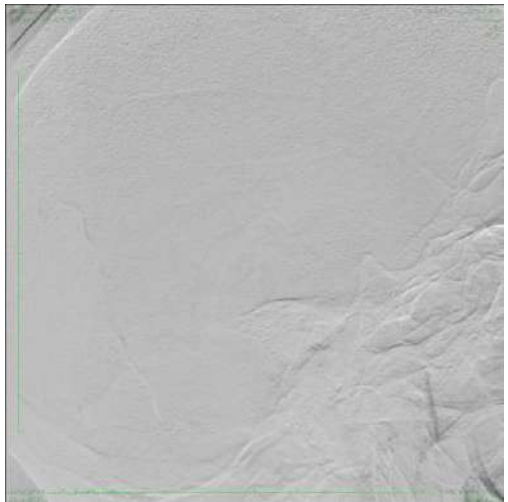




mTICI2b

MidAdvance

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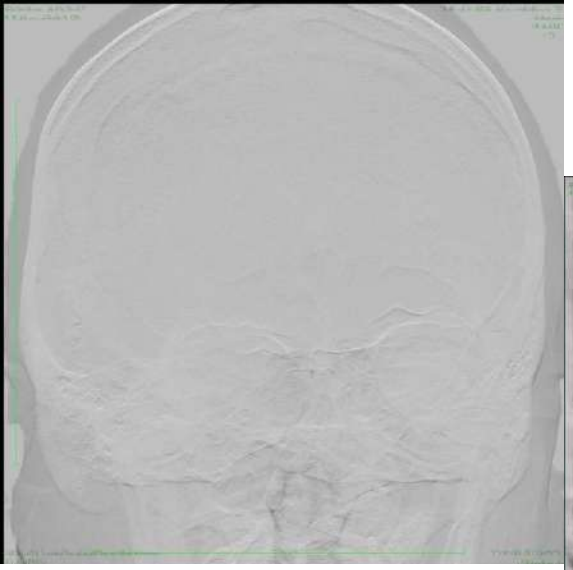
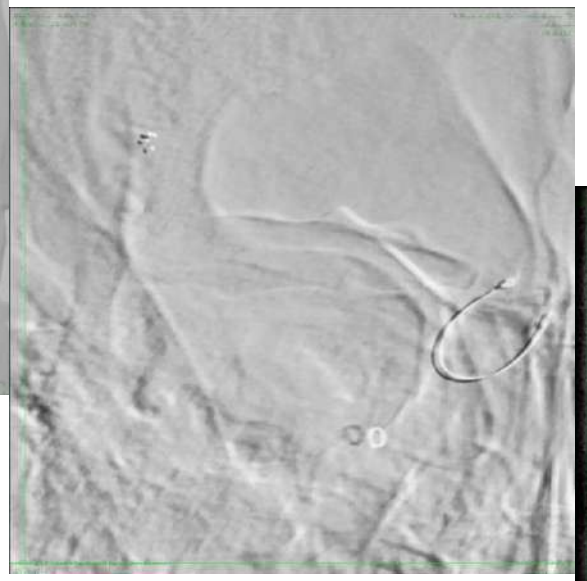
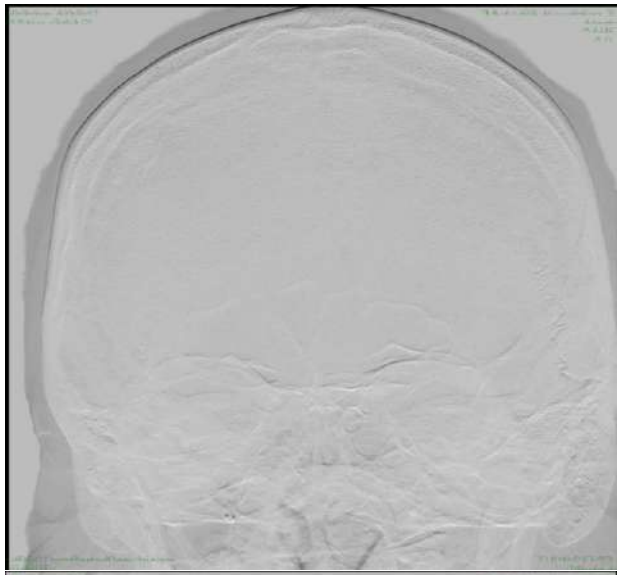






MidAdvance+PsödoDPAT

Pediatrik Vakalarda Trombektomi

IV. GİRİŞİMSEL NÖROLOJİ EĞİTİM TOPLANTISI

21-22 MAYIS 2022 ,GAZİANTEP

Prof. Dr. Eşref AKIL

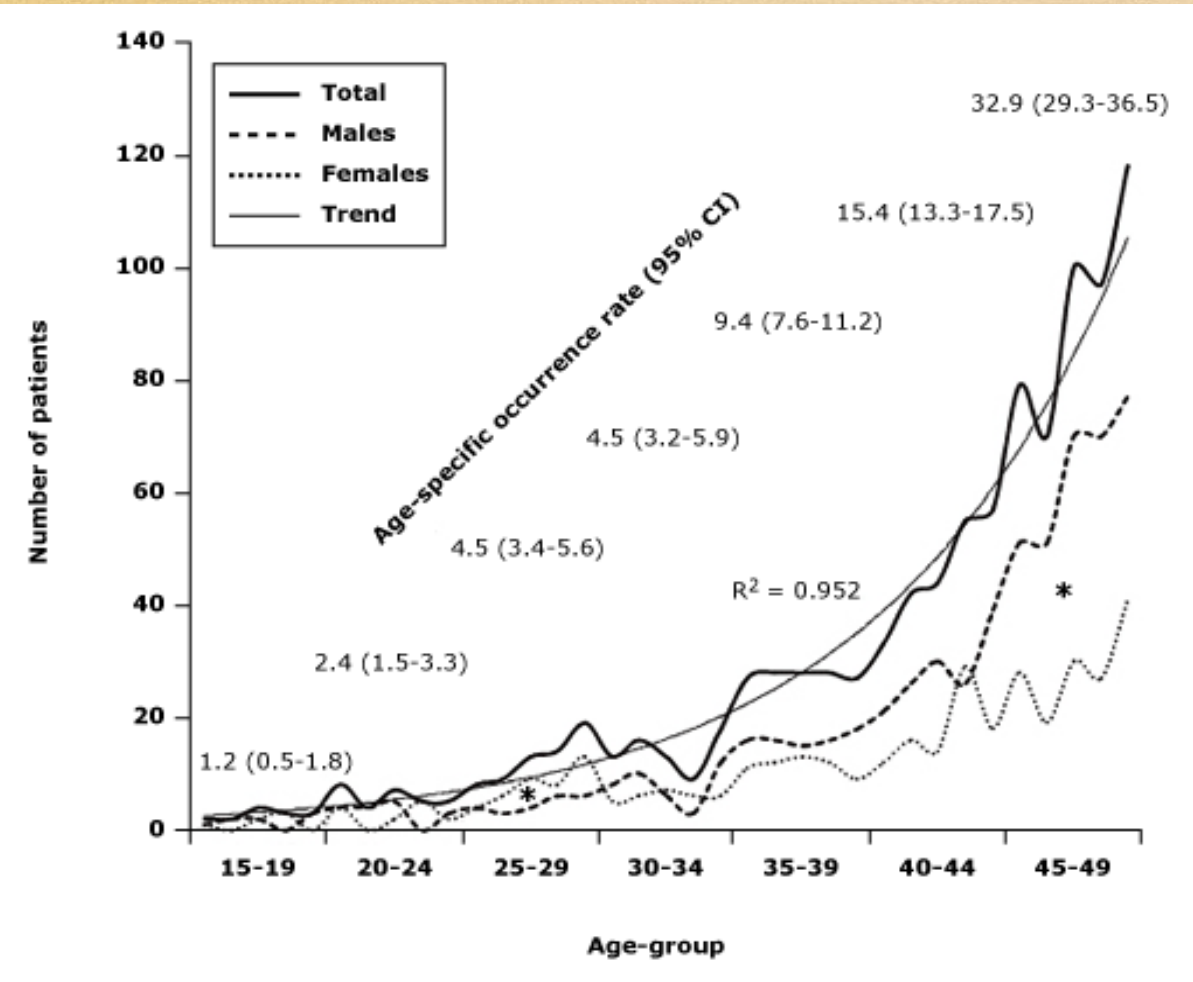
Dicle üni. Tıp Fak. Nöroloji AD

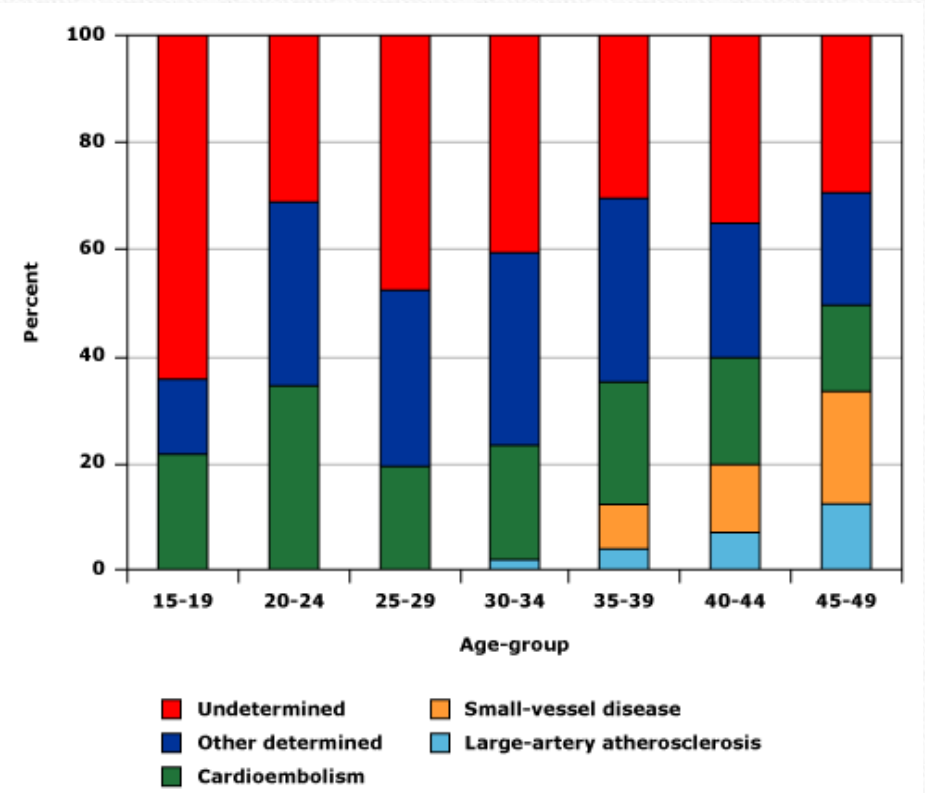
Çocukta inme

- Çocuklarda inme sıklığı göreceli olarak nadirdir.
- Çocuk ve bebekte iskemik inme insidansı 0.6-7.9/100000
- Çocuklarda, iskemik inme sıklığı son yıllardar göreceli bir artış görülmektedir, madde kullanımın artması beslenme değişiklikleri ve nörogörüntülemenin yaygınlaşması
- K/E :2/3

ETYOLOJİ

- Yaş grubuna göre çocukta inme etyolojisi değişir
- Yaygın olarak hematolojik hastalıklar(orak hücre hastalığı), kalp hastalıkları, baş boyun travmaları, enfeksiyonlar, genetik hastalıklar ancak çoğunda alta yatan bir sebep yok





Ischemic stroke in children and young adults: **Epidemiology, etiology and risk factors Author:** Christine Fox md vs

AKUT İSKEMİK İNMEDE TEDAVİ

Erişkinler büyük çocuklardır

Ancak çocuklar küçük erişkinler değildir!!!!!

AKUT İSKEMİK İNMEDE TEDAVİ

- Volumu korumak
- Hipertermiden korumak 37.5℃'in altında tut
- Hiperglisemiden korumak
- Saturasyon %94 tutmak
- Hipertansiyon!! Dikkat hipotansif yapma
- Nöbet tedavi et, nonkonvulsif çocukta sık

IV tPA TREATMENT PROTOCOL

IV tPA CANDIDATE
< 4.5 hrs from onset, age ≥2 years, persistent focal deficit, no contraindications, **BOTH** proven infarct **AND** arterial occlusion on MR or CT/CTA

Yes

ED Pharmacy prepares tPA infusion with stat release to ED or MSICU.
Bolus dose: 10% of total dose IV over 5 min
Infusion dose: remaining 90% IV over 1 hour
Total dose: 0.9 mg/kg IV
Nurse/MD double checks dose with pharmacy

Maintain cardiorespiratory and BP monitoring. If age-based tPA parameters acceptable (see green box to right) begin tPA infusion as soon as available (in ED or en route to MSICU).
Note: dedicated IV for tPA required to proceed.

Systolic BP should be maintained between 50th %ile for age and 15% above 95th %ile for age (see below)

Treat to lower BP if > 15% above 95th %ile for age for more than 1 hr.
OR
If > 20% above 95th %ile for age at any time
SEE CHART BELOW

Labetalol 0.2 mg/kg IV push over 2-3 min, repeat q15 minutes prn; consider nicardipine drip, 1 mcg/kg/min, titrate to desired BP
Use with caution in patients with asthma or underlying cardiac disease

Systolic Blood Pressure Parameters - Female

Age	50%	95%	>15% above 95%	>20% above 95%
1 – 4 years	90	111	128	133
5 years	94	113	130	136
6 – 10 years	96	121	139	145
11 – 18 years	105	131	151	157
>18 years	110	140	161	168

Systolic Blood Pressure Parameters - Male

Age	50%	95%	>15% above 95%	>20% above 95%
1 – 4 years	90	112	129	134
5 years	95	113	130	136
6 – 10 years	96	121	139	145
11 – 18 years	105	140	161	168
>18 years	110	140	161	168

Pediatric Neurology 2016 568-17DOI: (10.1016/j.pediatrneurol.2016.01.016)

Updated 5/27/14

Boston Children's Hospital

Tedavi

3.5. IV Alteplase (Continued)	COR	LOE	New, Revised, or Unchanged
6. IV alteplase for adults presenting with an AIS with known sickle cell disease can be beneficial.	**IIa**	**B-NR**	New recommendation.
A case-control analysis using the population from the AHA GWTG-Stroke registry, including 832 cases with sickle cell disease (all adults) and 3328 age-, sex-, and race-matched controls without sickle cell disease with similar severity of neurological deficits at presentation, showed that sickle cell disease did not have a significant impact on the safety or the outcome at discharge of treatment with IV alteplase.[148]			See Table XXXVII in online Data Supplement 1.
7. Abciximab should not be administered concurrently with IV			Recommendation revised from 2013 AIS

İntraarteriyel trombolitik

- Erişkinlerde inme başlangıcından 6-12 saat içinde intrarteriel trombolitik verildiğinde İV TPA dan üstün bulundu. *
- çocuklarda çeşitli serilerde İA TPA verilebileceğini belirtiyor
- Diseksiyon, intrakanial hemoraji ve rekurens inme nedeniyle sadece tecrübeli nörogirişimsel uzmanlarınca yapması öneriliyor
  - *The Pediatric Stroke Code: Early Management of the Child with Stroke, http://dx.doi.org/10.1016/j.jpeds.2015.03.051

Trombektomi

- Çocuklarda proksimal ana damar oklüzyonu olan akut inme tedavisinde endovaskuler tedavi (trombektomi) uygulanabilir ve güvenlidir. Randomize çalışma yok ancak data havuzlardan rekanalizasyon tedavisinin çok faydalı olduğu kabul ediliyor*

*Feasibility, Safety and Outcome of Recanalisation Treatment in Childhood Stroke, Annals of Neurology : doi: 10.1002/ana.25242

- Günümüzde 18 yaş altındaki iskemik inme hastalarında nöroendovasküler tedavinin uygulanabilirliği ile ilgili herhangi bir randomize çalışma mevcut değildir. Bu sebeple şu an için 18 yaş altı hastalarda nöroendovasküler tedavi rutin olarak önerilmez. Pediatrik popülasyondaki proksimal ana damar oklüzyonu olan akut iskemik inme hastalarında nöroendovasküler tedavi kararı ancak hasta bazında, hasta yakınları ile riskler tartışılarak verilebilir.*

*Akut iskemik inme tani tedavi rehberi 2020

Open access Original article

SVN Stroke and Vascular Neurology

Mechanical thrombectomy in children and adolescents: report of five cases and literature review

Pervinder Bhogal,[1] Victoria Hellstern,[2] Muhammad AlMatter,[2] Oliver Ganslandt,[3] Hansjörg Bäzner,[4] Marta Aguilar Pérez,[2] Hans Henkes[2,5]

To cite: Bhogal P, Hellstern V

ABSTRACT

BRIEF COMMUNICATION

American Heart Association.

Thrombectomy in Childhood Stroke

Peter B. Sporns, MD, MHBA; André Kemmling, MD, MHBA; Uta Hanning, MD; Jens Minnerup, MD; Ronald Sträter, MD; Thomas Niederstadt, MD; Walter Heindel, MD; Moritz Wildgruber, MD, PhD

Background—Several randomized trials have shown the efficacy of thrombectomy for large intracranial vessel occlusions in adults. However, the safety and efficacy of thrombectomy in children are unknown. We aimed to investigate the feasibility and outcome of thrombectomy in pediatric patients.

Methods and Results—We performed a retrospective analysis of all children (<18 years of age) who presented with large-vessel occlusion and were treated with mechanical thrombectomy at 3 German tertiary-care stroke centers. Interventional results and clinical outcomes were assessed using the Pediatric National Institutes of Health Stroke Scale at 24 hours and on day 7 after thrombectomy as well as after 3 months (modified Rankin Scale). After screening of local registries for all performed thrombectomies, 12 children were included. Median Pediatric National Institutes of Health Stroke Scale score on admission was 12.5 (interquartile range 8.0-21.5). Angiographic outcomes for thrombectomy were good in all patients (6×modified Treatment in Cerebral Infarction Score 3, 6×modified Treatment in Cerebral Infarction Score 2b). Moreover, most patients showed an improvement of neurological outcome after thrombectomy with a median Pediatric National Institutes of Health Stroke Scale of 3.5 (interquartile range 1-8) at day 7 and a modified Rankin Scale of 1.0 (interquartile range 0-2.0) at 3 months. No major periprocedural complications were observed.

Conclusions—In our retrospective study thrombectomy was safe in childhood stroke, and treated children had good neurological outcomes. (*J Am Heart Assoc.* 2019;8:e011335. DOI: 10.1161/JAHA.118.011335.)

Key Words: ischemic stroke • thrombectomy • ischemic stroke • childhood stroke • pediatric stroke • endovascular

Ischemic stroke

REVIEW

Mechanical thrombectomy for pediatric acute ischemic stroke: review of the literature

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[2]Sidney Kimmel Medical School, Philadelphia, Pennsylvania, USA
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[4]Boston Children's Hospital/Harvard Medical School, Boston, Massachusetts, USA

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Dr Sudhakar R Satti, Department of Neurointerventional Surgery, Christiana Care Health Center, Suite 1e10, Newark, DE 19713, USA; ssatti@christianacare.org

Received 26 February 2016
Revised 29 June 2016

ABSTRACT
Objective Given recent strongly positive randomized controlled adult mechanical thrombectomy trials, we sought to perform a comprehensive review of available literature on IA pediatric stroke intervention, with a focus on modern mechanical devices.
Methods PubMed search for pediatric patients undergoing IA treatment of acute ischemic stroke (AIS) using modern devices between 2008 and 2015. 29 patients were included in this analysis.
Results Average age was 10.3 years, 74.1% male, middle cerebral and basilar arteries represented 89.6% of 36 occluded vessels, and average pediatric stroke scale score of 18.1. Average time from symptom onset to intervention was 8.8 hours and 13.8% of patients received IV tissue plasminogen activator prior to mechanical thrombectomy. Stent retrievers were used in 58.6% of cases, the Penumbra system in 34.5%, and

Supportive medical management specific to the underlying etiology of AIS is considered the standard of care in the pediatric population. Thrombolytic and IA therapy are rarely mentioned in the American Heart Association Stroke Council's Management of Stroke in Infants and Children and are only recommended as a last resort due to lack of level I evidence.[6] In light of recent consecutive strongly positive randomized controlled mechanical thrombectomy adult trials in the setting of emergent large vessel occlusion (ELVO) and a better understanding of patient selection, IA treatment of AIS in the pediatric population is increasingly being considered.[7–12]

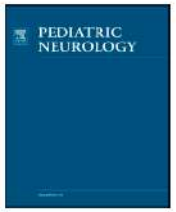
As a next step in better understanding IA therapy in the pediatric population, we reviewed available published experience with mechanical thrombectomy using modern devices between 2008 and

Feasibility, Safety and Outcome of Recanalisation Treatment in Childhood Stroke

Running head: Recanalisation Treatment in Childhood Stroke

Sandra Bigi, MD, MSc,[1*] Andrea Dulcey, MD,[1*] Jan Gralla, MD, MSc,[2] Corrado Bernasconi, MD, PhD,[3] Amber Melliger, MD,[1] Alexandre N. Datta, MD,[4] Marcel Arnold, MD,[3] Johannes Kaesmacher, MD,[3] Joel Fluss, MD,[5] Annette Hackenberg, MD,[6] Oliver Maier, MD,[7] Johannes Weber, MD,[8] Claudia Poloni, MD,[9] Urs Fischer, MD, MSc,[3#] and Maja Steinlin, MD[1#]

Accepted Manuscript



Thrombectomy for acute stroke in childhood: a case report, literature review, and recommendations

Maria Celeste Buompadre, MD, Kathleen Andres, MN, NP-Paediatrics, Lee-Anne Slater, MD, Hadi Mohseni-Bod, MD, FMGEMS, USML, MRCPCH, Anne-Marie Guerguerian, MD, FAAP, FRCPC, Helen Branson, BSc, MBBS, FRANZCR, Suzanne

Stroke

CLINICAL AND POPULATION SCIENCES

Endovascular Thrombectomy for Pediatric Acute Ischemic Stroke

Alis J. Dicpinigaitis, BA; Chirag D. Gandhi, MD; Jared Pisapia, MD; Carrie R. Muh, MD, MS; Jared B. Cooper, MD; Michael Tobias, MD; Avinash Mohan, MD; Rolla Nuoman, MD; Philip Overby, MD; Justin Santarelli, MD; Simon Hanft, MD; Christian Bowers, MD; Shadi Yaghi, MD; Stephan A. Mayer, MD; Fawaz Al-Mufti, MD

BACKGROUND: Evidence regarding the utilization and outcomes of endovascular thrombectomy (EVT) for pediatric

https://www.ahajournals.org/doi/10.1161/STROKEAHA.121.036361

Figure 1.

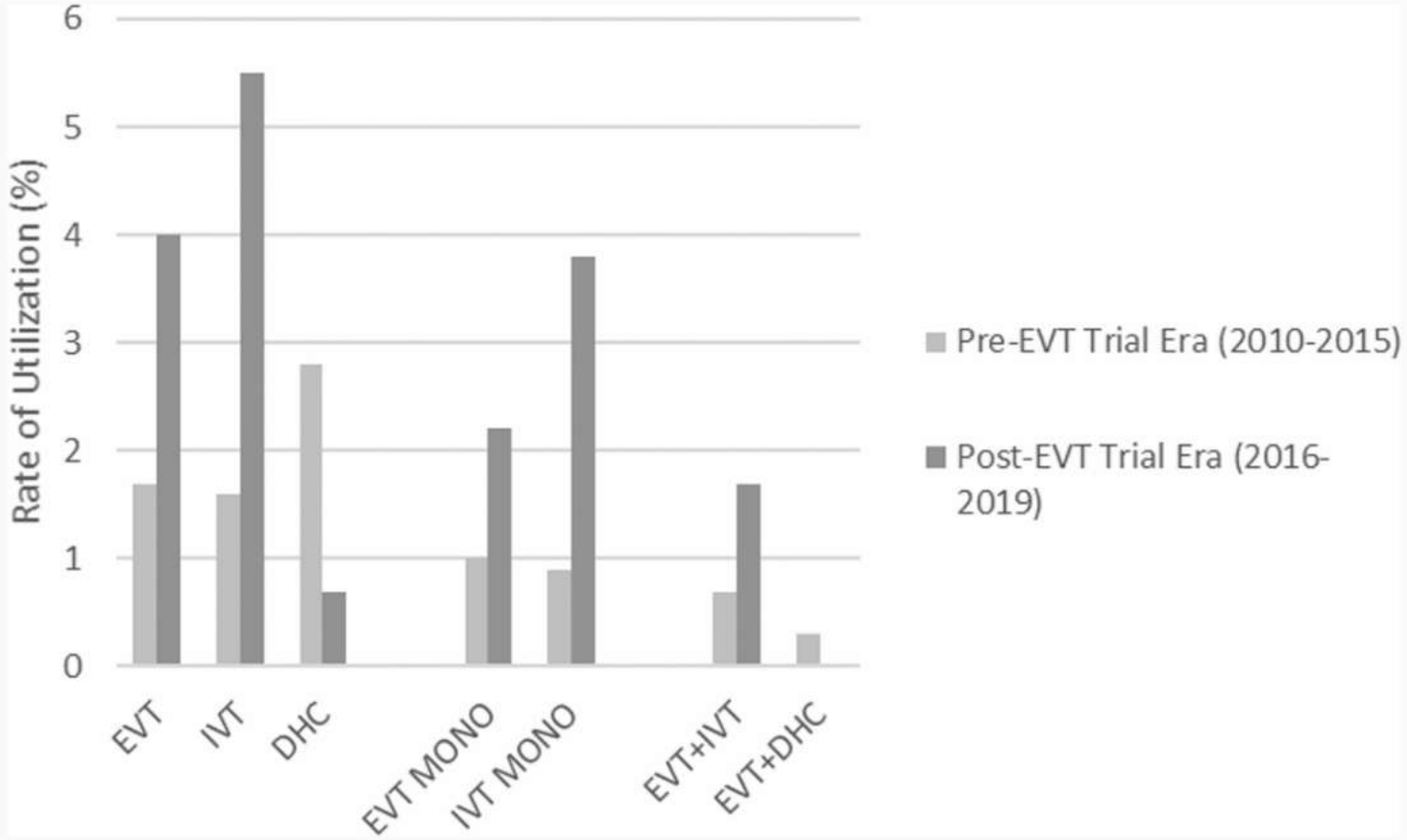


Table 2. Overview of Baseline Demographic and Clinical Characteristics, Complications, and Outcomes for Pediatric Ischemic Stroke Patients Treated With Endovascular Thrombectomy or Medical Management Only

	Total cohort (n=7341)	Endovascular thrombectomy (n=190)	Medical management only (n=7151)
Baseline demographic and clinical characteristics			
Age (mean years; SEM)	8.6 (0.1)	13.7 (0.3)	8.4 (0.1)
0–5 y	---	NR (<5.0)	2684 (37.5)
6–12 y	2125 (28.9)	35 (18.4)	2090 (29.2)
13–17 y	2522 (34.4)	145 (76.3)	2377 (33.2)
Female	3293 (44.9)	79 (41.6)	3214 (44.9)
Non-White race and ethnicity	3199 (43.6)	50 (26.3)	3149 (44.0)
Hospital—urban/teaching	6903 (94.0)	180 (94.7)	6723 (94.0)
Primary payer—medicare/medicaid	3413 (46.5)	79 (41.6)	3334 (46.6)
APR-DRG illness severity subclass >3 (extreme)	1520 (20.7)	105 (55.3)	1415 (19.8)
Concomitant thrombolytic therapy	233 (3.2)	79 (41.6)	154 (2.2)
Location of occlusion			
Cerebral circulation	6650 (90.6)	150 (78.9)	6500 (90.9)
Precerebral circulation	567 (7.7)	40 (21.1)	527 (7.4)
Internal carotid artery	305 (4.2)	15 (7.9)	290 (4.1)
Basilar artery	114 (1.6)	25 (13.2)	89 (1.2)
Vertebral artery	69 (0.9)	0 (0.0)	69 (1.0)
Stroke cause			
Congenital cardiac abnormality	1236 (16.8)	30 (15.8)	1206 (16.9)
Congenital circulatory abnormality	193 (2.6)	0 (0.0)	193 (2.8)
Arteriopathy	753 (10.3)	51 (26.8)	702 (9.8)
Coagulopathy	486 (6.6)	20 (10.5)	466 (6.5)
Sickle cell disease	526 (7.6)	0 (0.0)	526 (7.7)
Malignancy	274 (3.9)	0 (0.0)	274 (4.0)
Infective endocarditis	45 (0.7)	0 (0.0)	45 (0.7)
Precerebral (carotid or vertebral) artery dissection	413 (5.6)	41 (21.6)	372 (5.2)
Infection	972 (13.2)	25 (13.2)	947 (13.2)
Comorbidities			
Diabetes	40 (0.5)	0 (0.0)	40 (0.6)
Hypertension	696 (9.5)	15 (7.9)	681 (9.5)
Dyslipidemia	438 (6.0)	20 (10.5)	418 (5.8)
Renal disease	298 (4.1)	15 (7.9)	283 (4.0)
Acute stroke severity indices			
Aphasia	1910 (26.0)	125 (65.8)	1785 (25.0)
Cerebral edema	737 (10.0)	84 (44.4)	653 (9.1)
Coma	385 (5.2)	25 (13.2)	360 (5.0)
Paresis/plegia	285 (3.9)	0 (0.0)	285 (4.0)
Herniation	334 (4.5)	25 (13.2)	309 (4.3)
Mechanical ventilation	1006 (13.7)	60 (31.7)	946 (13.2)
Baseline NIHSS score (mean score; SEM)*	5.8 (0.2)	11.4 (0.7)	4.8 (0.3)
Neurological complications			
Intracranial hemorrhage	383 (5.2)	35 (18.4)	348 (4.9)
Decompressive hemicraniectomy	145 (2.0)	15 (7.9)	130 (1.8)
Iatrogenic (perioperative) ischemia or hemorrhage	15 (0.2)	0 (0.0)	15 (0.2)
Contrast-induced kidney injury	<11 (<0.1)	0 (0.0)	<11 (<0.01)

(Continued)

- This study presents a cross-sectional evaluation of the treatment of pediatric IS with EVT and is the first study to track treatment modalities over nearly a decade-long interval. **Favorable findings with respect to clinical course and short-term functional outcomes suggest that EVT is likely a safe and useful treatment modality for pediatric patients with stroke.** Randomized, controlled clinical trials are warranted to further evaluate the immediate and long-term outcomes of EVT in this patient population.

Çocuklarda Anjio

- **Sheat:** mümkünse mikro ponksiyon kit ile nazik dilatasyon, vazospazm için intraarteriyel kalsiyum kanal bloker(verapamil 30-60 u/kg),
- **Kasık basmak:** kolayca arter akımı tamamen kesilir, yakın periferik nabız takibi
- **Kontrast volümü:** 70 kg erişkinde 6-8 ml internal karotis enjeksiyonu 10kg çocukta 1-1.2 ml vermek uygun olur

- Akut iskemik inmede vaka serilerinde erişkinlerden çok farklı malzeme kullanılmamış
- Sheat 6/8 f
- DAC: 5-6 F
- Microkateter 21/18
- Stentriever 3/4mm
- Anestezi de hipotansiyona dikkat

ÜA,7

İşlem tarihi

- Özet klinik sendrom : wake up, Sol TACS, NIHSS:21 sağ hemipleji, afazik
- NIHSS:21
- Giriş DWI : sol bazal ganglionda akut enfakt
- DWI ASPECT skoru:8
- Giriş MRA: sol MCA M1 oklude

	saat		
Onset	uyanma		
Farkedilme	05:00		
Door	11.30(10.40 tele ile hastadan haberdar olduk)		
CT/MRI	09.30(dış merkez)11.20 BT		
IV TPA	-		
Anjio ünitesi	11.45		
anestezi	12.00		
Femoral ponksiyon	12.01		
Diagnostik anjıo	12.05		
First pass	12.18		
Final Run	12.25		
Kapı -ponksiyon	30		
Ponksiyon-revaskulasyon	18		
Başlangıç-revaskulasyon	**435**		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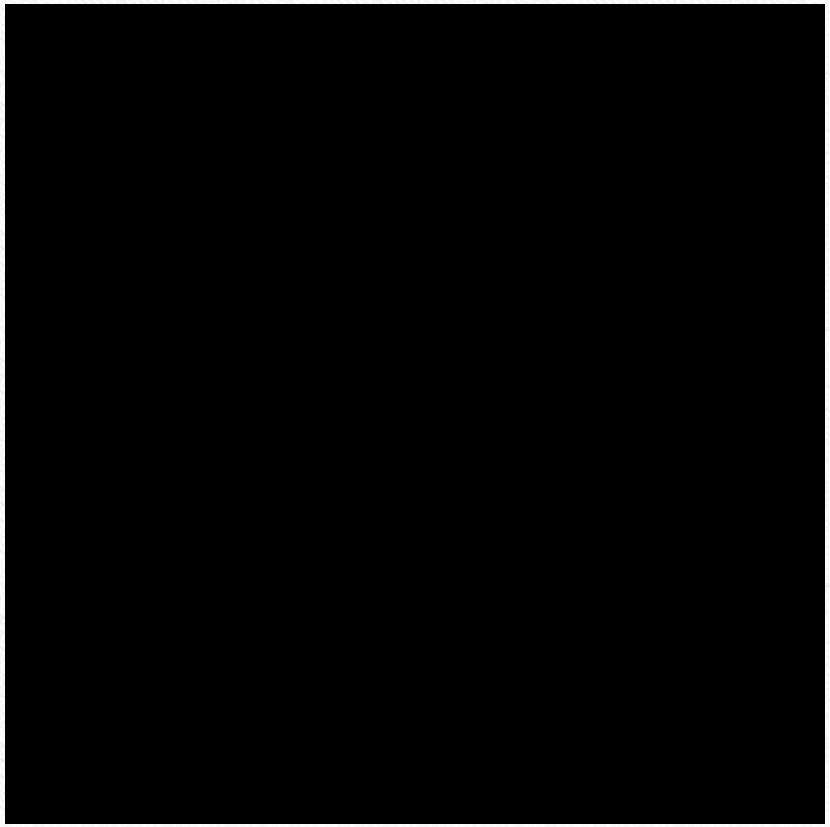
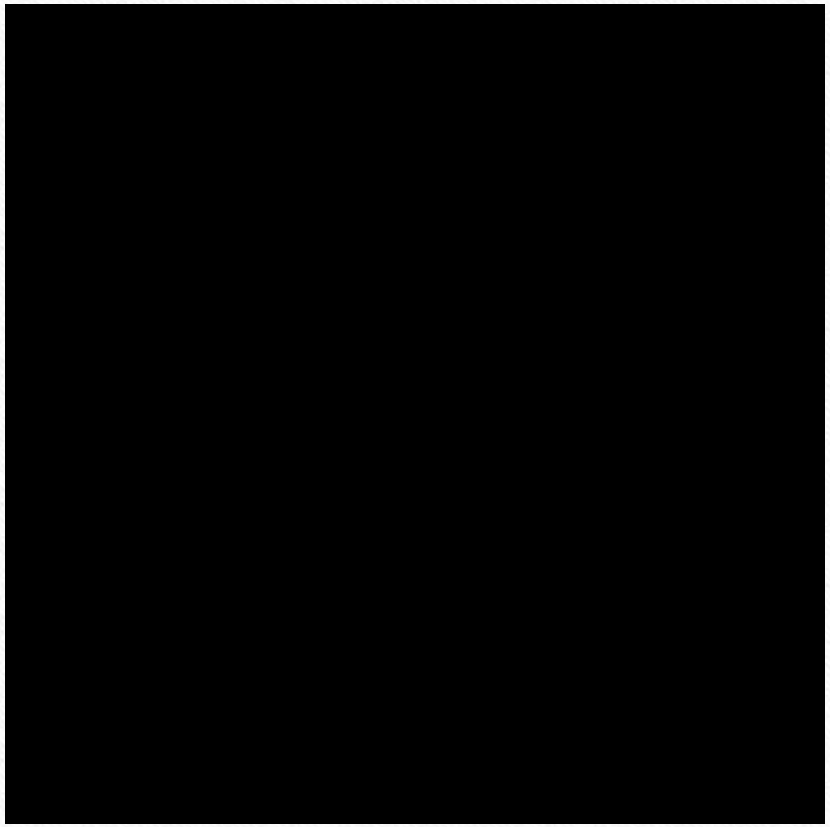
I


usion Coefficient (mm2/s)
A
P

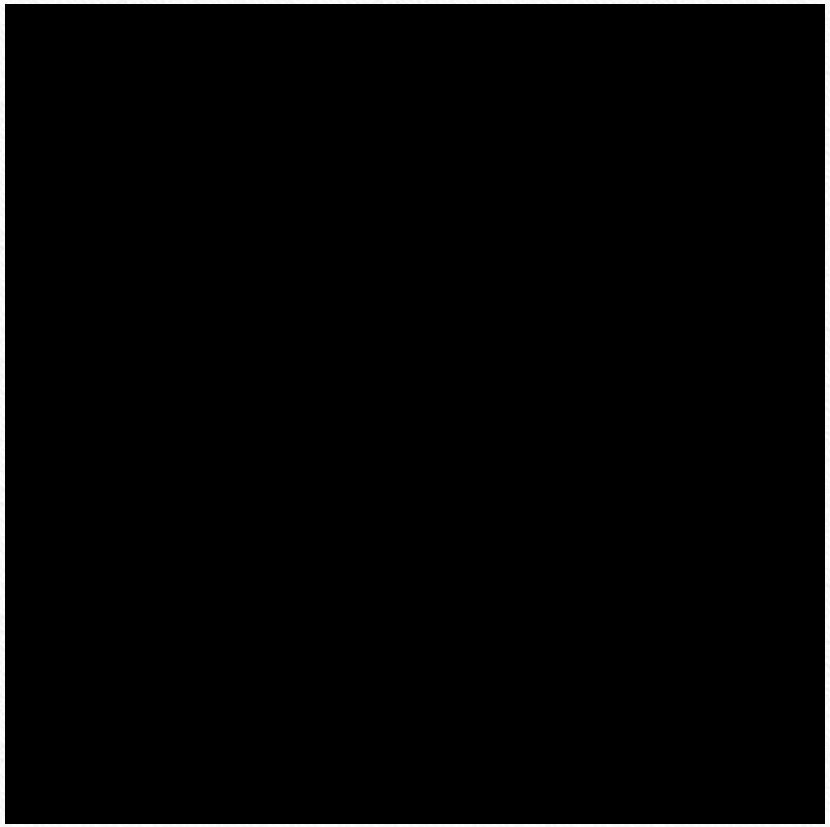
DSA işlem öncesi görüntüsü

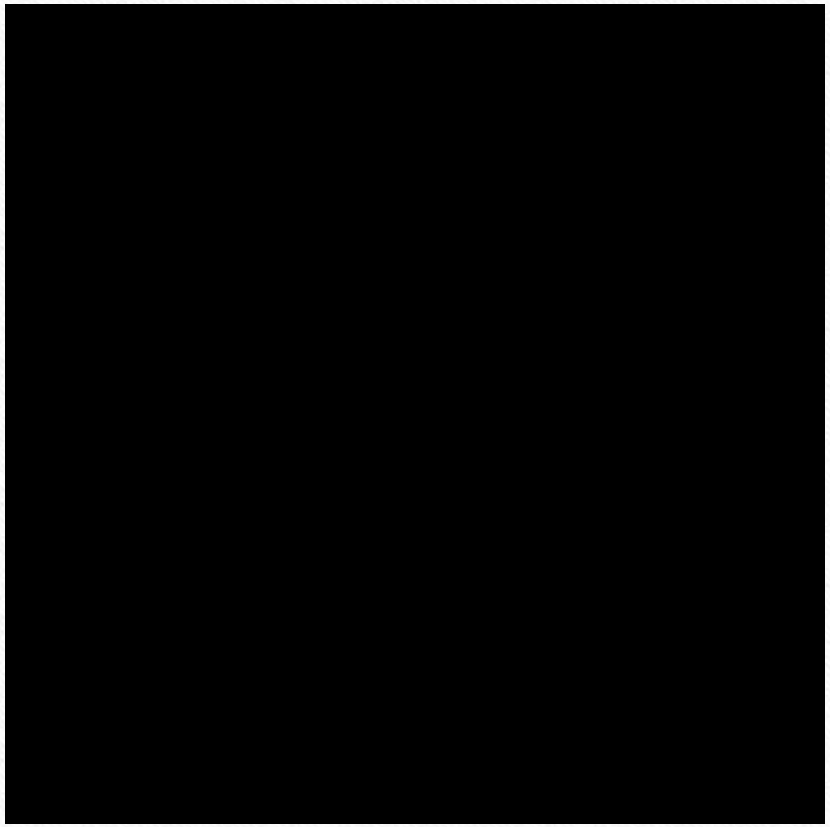


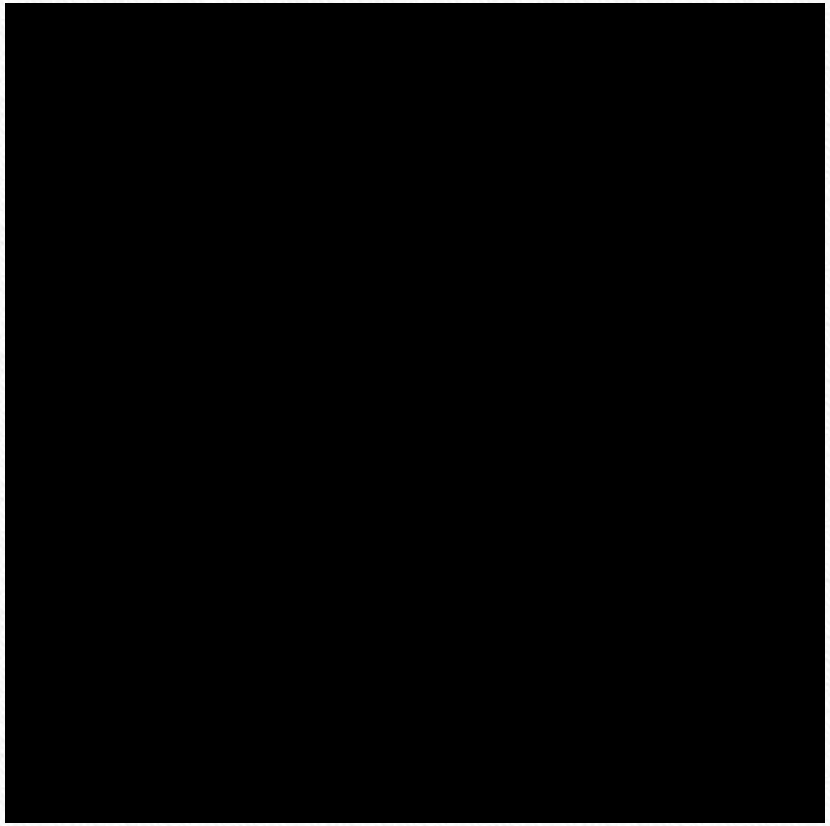
DSA işlem görüntüsü

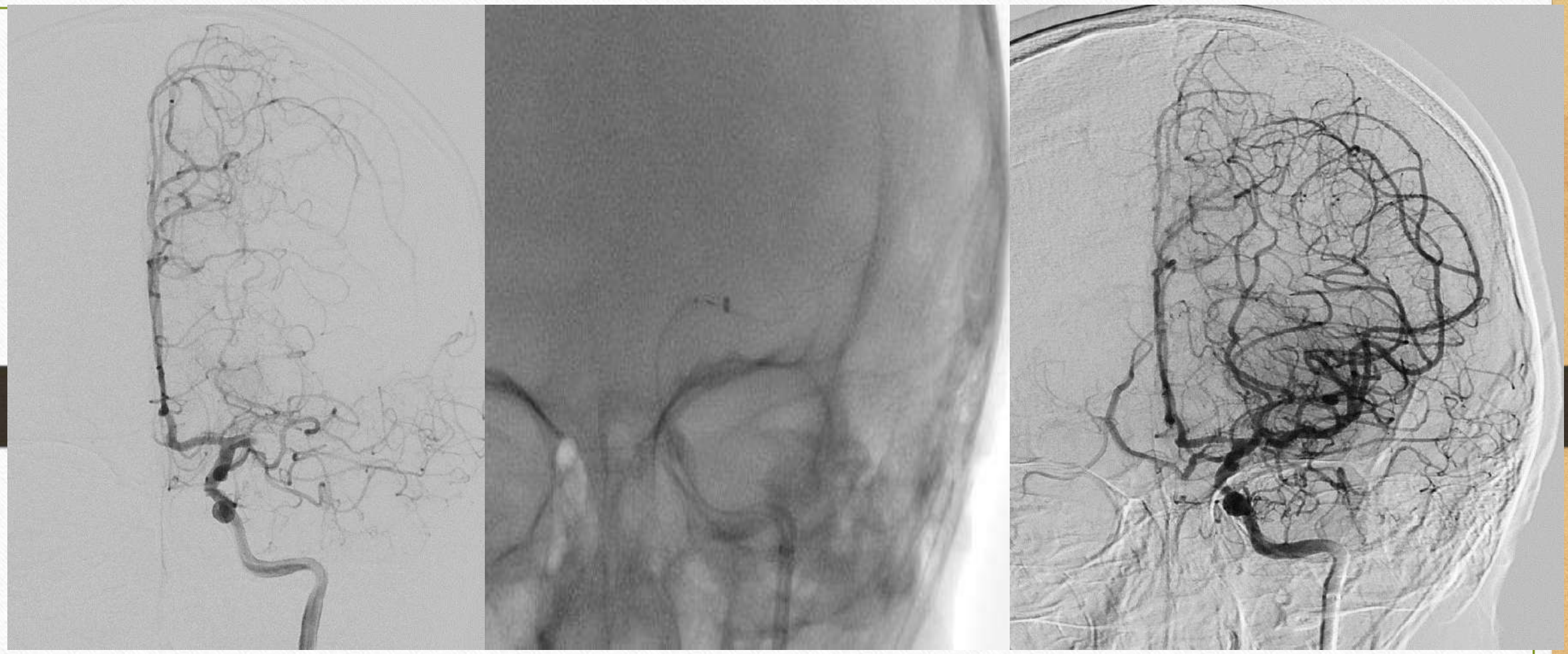


DSA işlem sonrası görüntüsü









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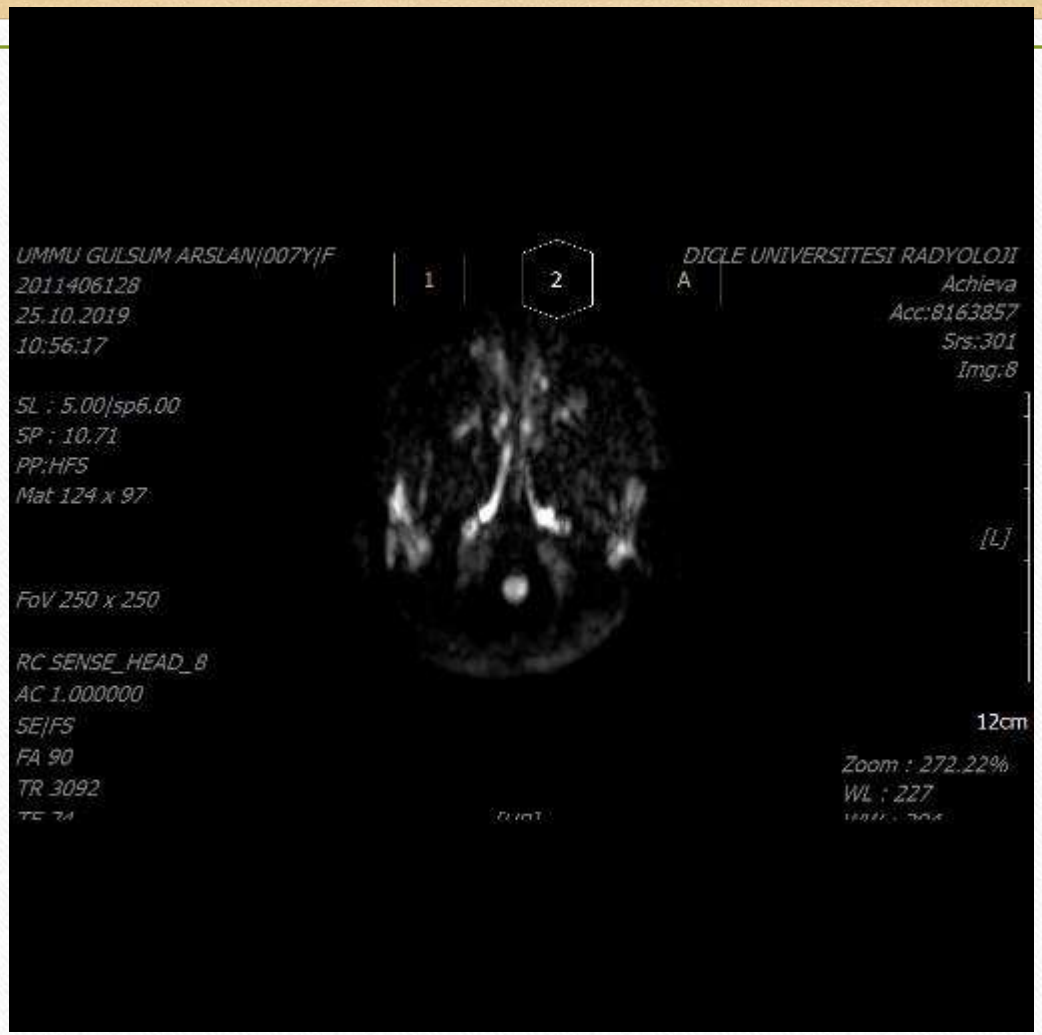
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Malzeme

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- synchro
- Trevo XP 3x20mm

Kontrol 24 h radyoloji
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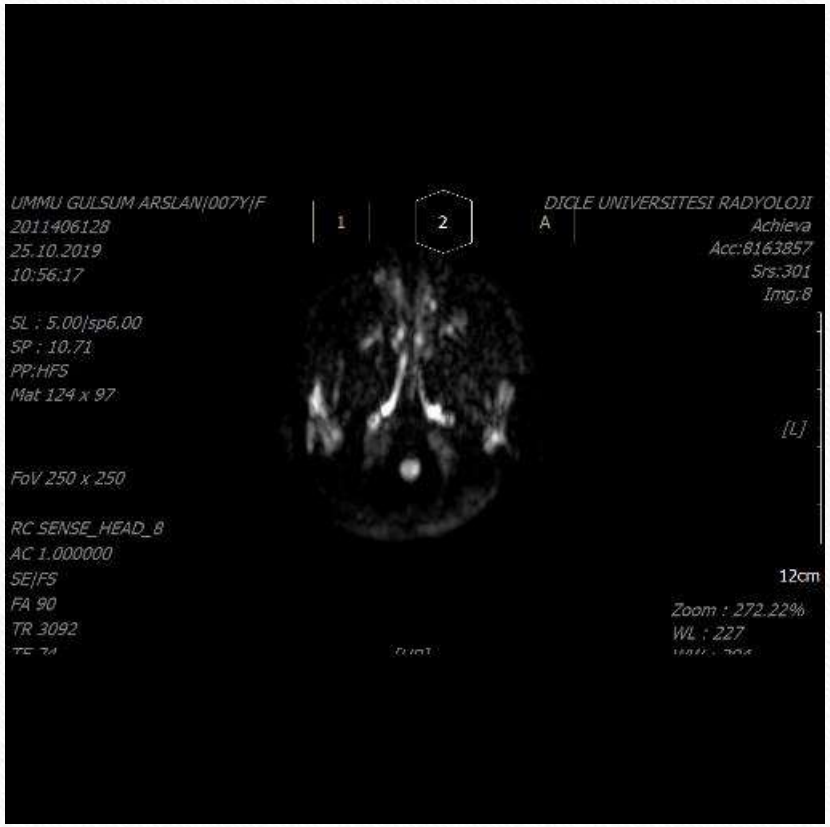

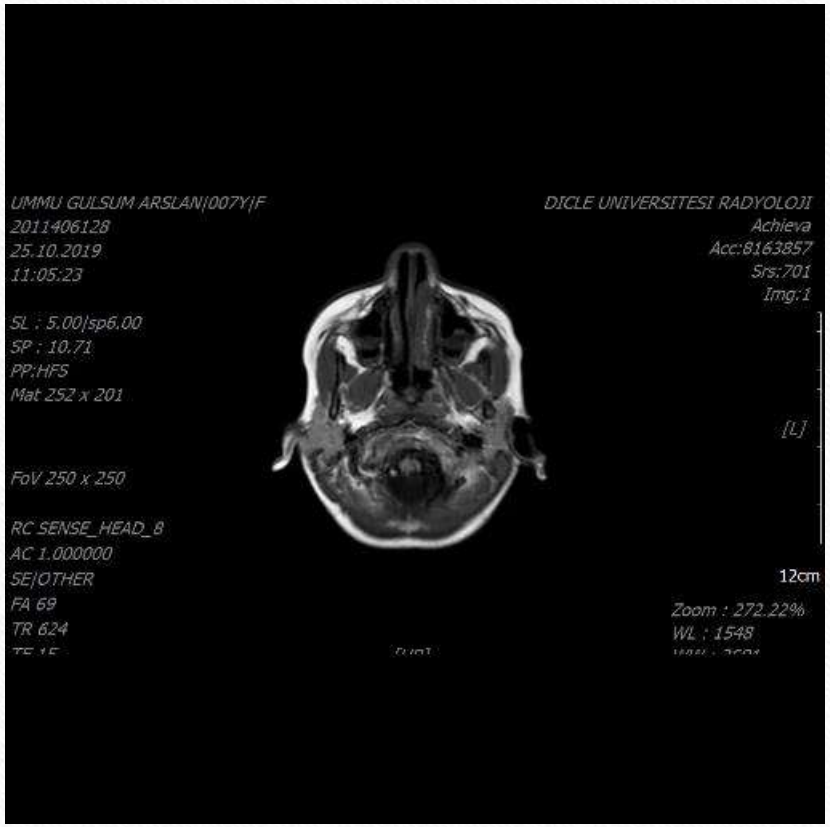
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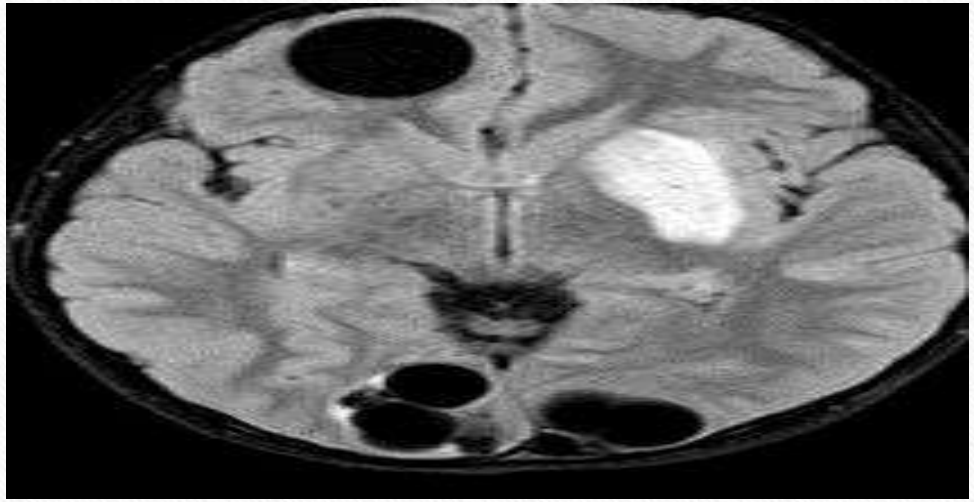
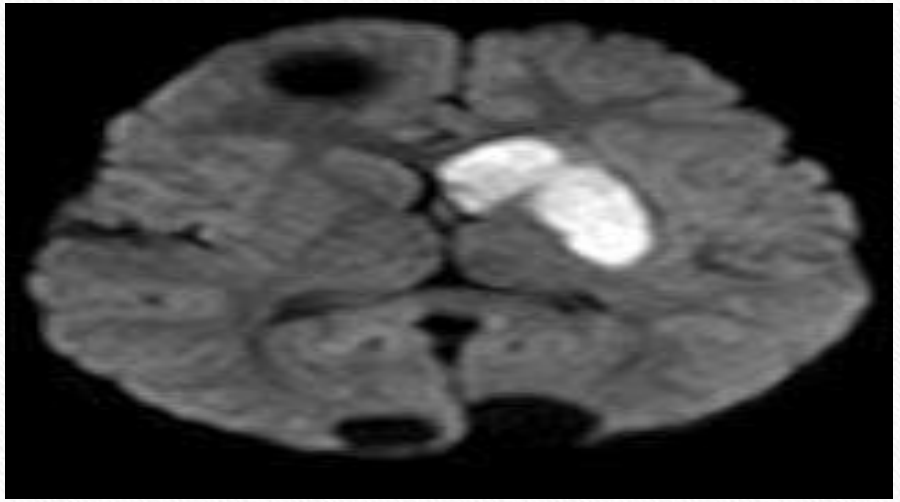
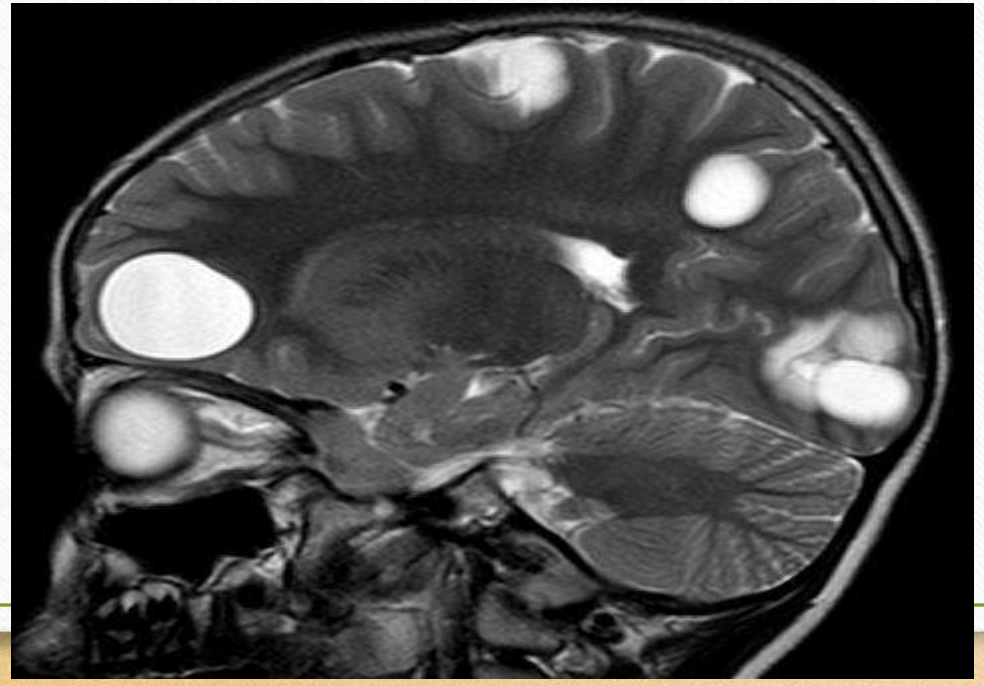
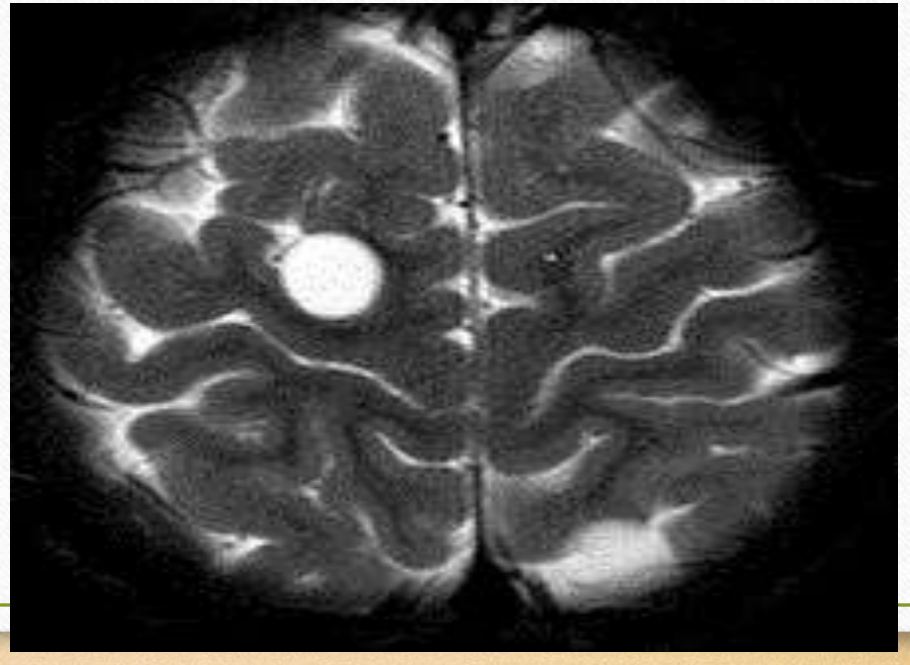

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Case Report

Middle Cerebral Artery Occlusion Due to Hydatid Cysts of Myocardial and Intraventricular Cavity Cardiac Origin

Two Cases

Ali Benomar, MD; Mohamed Yahyaoui, MD; Nazha Birouk, MD; Marie Vidailhet, MD; Taib Chkili, MD

Background Hemispheric strokes of hydatid origin are very rare. We describe two cases of middle cerebral artery occlusion by a cyst of cardiac origin.

Case Descriptions Cerebral angiography demonstrated occlusion of the initial segment of the middle cerebral artery. Myocardial and pericardial cysts were diagnosed by echography and pathological examination. Subsequent development of hydatid cysts within the necrotic area of the infarcted hemisphere suggests cerebral hydatid embolism of cardiac origin.

Conclusions In endemic areas, embolism of hydatid cysts should be considered in the diagnosis of stroke in young patients. (*Stroke*. 1994;25:886-888.)

Key Words • echinococcosis • embolism • young adults

Although hydatid cysts are common,[1-3] particularly in Morocco,[4,5] where hydatidosis is endemic, only three cases involving large blood vessels have been reported.[6-8] We describe two cases in which occlusion of the middle cerebral artery (MCA) was secondary to embolism of myocardial cysts, with subsequent development of ventricular myocardium, and pericardium) and the brain (right temporal lobe) were surgically removed. Scolices and hooks of *Echinococcus* were found in the cyst fluid. Two years later a new cyst in the pons was removed. The patient died shortly thereafter; autopsy was not performed.

SHORT REPORTS

Year : 2003 | **Volume** : 51 | **Issue** : 1 | **Page** : 120-121

Stroke: A rare presentation of cardiac hydatidosis

Singh NP, Arora SK, Gupta A, Anuradha S, Sridhara G, Agarwal SK, Gulati P

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7 (5), 2004 [Epub September 2004]
doi:10.1532/HSF98.20041056

Online address: www.hsforum.com/vol7/issue5/2004-1056.html

A Rare Presentation of Cardiac Hydatid Cyst: Stroke and Acute Aortic Occlusion

Hafize Yaliniz, Acar Tokcan, Tümer Ulus, Bülent Kisacikoglu, Orhan Kemal Salih, Mehmet Sah Topcuoglu, Hakan Poyrazoglu, Cumhur Alhan

University of Çukurova, Faculty of Medicine, Department of Cardiovascular Surgery, Adana, Turkey

Dr. Yaliniz

Child's Nerv Syst (1998) 14:697–699

BRIEF COMMUNICATION

Mehmet Turgut
Kemal Bayülkem

Cerebrovascular occlusive disease: hydatidosis

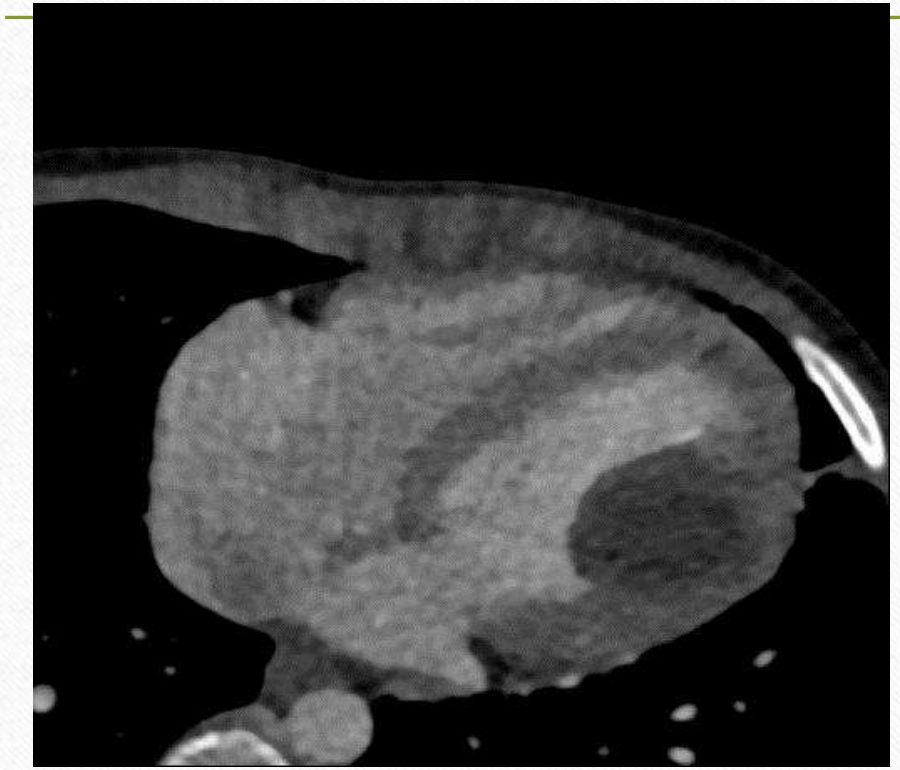
Recurrent cardiac hydatidosis in a child presenting as acute stroke

Sandeep Kumar, MD, Roumina Hasan, MBBS
Department of Radiodiagnosis, Sanjeevni Mri Centre, Moradabad, UP

Abstract

Cardiac echinococcosis is a rare but potentially life threatening condition, with surgery being the definitive treatment. We present the case of a 4 year boy who was diagnosed with concurrent pulmonary and left intraventricular hydatid cysts. He was operated for the same and advised prophylactic albendazole. After a

Eko: Sol ventrikül lateral duvarda papiller kas komşuluğunda yaklaşık 25 x 18 mm boyutlarında içerisinde yer yer yağ dansiteleri içeren düzgün konturlu IVKM sonrası kontrast tutulumu göstermeyen kistik lezyon izlenmektedir(kist hidatik ?). Kist süperiorda mitral kapak düzeyine kadar uzanım göstermektedir.



Dalak üst pol anteriorda 9 mm çapında düzgün konturlu hipodens kistik lezyon izlendi (tip 1 kist hidatik ?)

TEDAVİ

- Albendazol 10-15 mg/kg/gün
- Mebendazol
- Düşük moleküllü heparin
- KVC operasyon önerdi(14.11.2019 Hacettepe de yapıldı)
- 1. ay mrs: 0-1
- Kvc operasyondan sonra mrs: 1-2
- Krainal lezyonları geriledi beyin cerrahisi operasyona gerek duymadı

- Hidatik kist hastalığı dünyada geniş coğrafi yayılım gösteren zoonozlardan biridir.
- Ekinokok granulosus'un larva formunun insanda neden olduğu parazitik kistik bir enfeksiyonudur.
- Özellikle koyun yetiştiriciliğinin yaygın olduğu bölgelerde endemiktir
- E. granulosus yaşam siklusunu tamamlayabilmek için iki konağa gereksinim duyar. Erişkin formun bulunduğu köpek ve diğer yırtıcı etoburlar ana konak, yumurtadan larva formuna dönüştüğü koyun, keçi gibi otobur canlılar ara konağı oluşturur

Tutuğu organlar

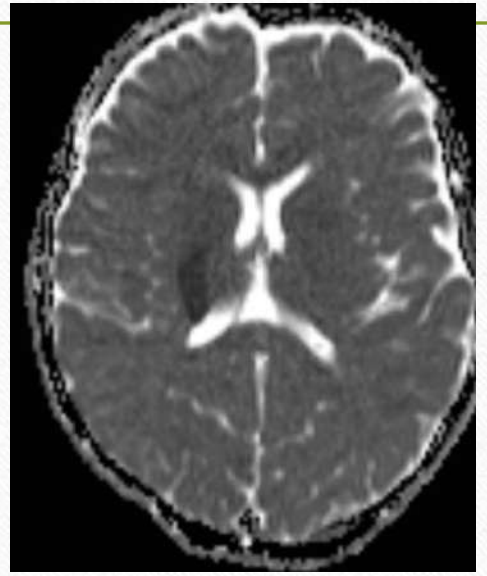
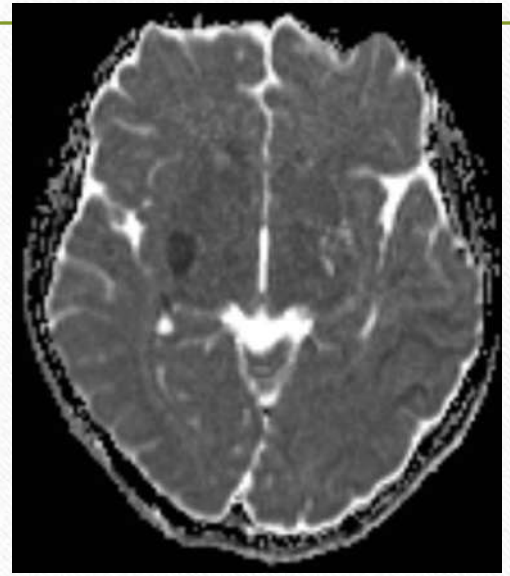
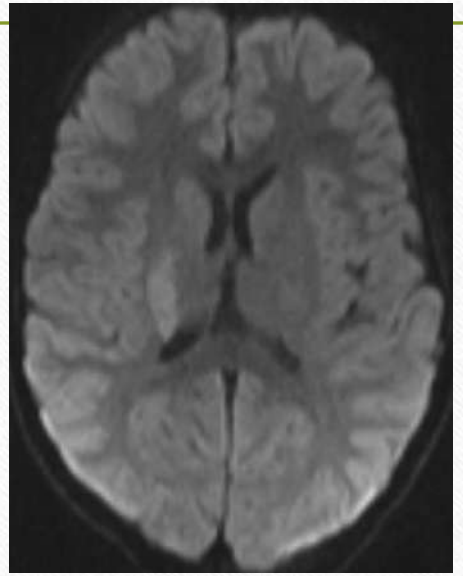
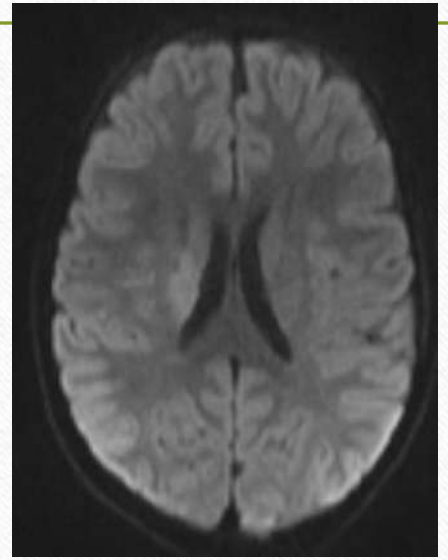
- Tutuğu organlar
  - Karaciğer
  - Akciğer
  - **Beyin**
  - **Kalp**
  - **Dalak**
  - Periton
  - Böbrek
  - Kemik
  - Göz

- Kalpte lokalize hidatid kistler çok nadir olup tüm hidatik kistlerin yaklaşık % 0,5-2'si kadardır
- En sık rastlanan lokalizasyonlar sol ventrikül serbest duvarı (% 50-77) ve interventriküler septumdur
- Vakaların çoğunda tek kardiyak kist mevcuttur. Hastaların çoğu (%55-85) multivisseral tutulum gösteri
- Kistin kalp boşluklarına veya perikarda ruptürü gibi ciddi komplikasyonları veya ani ölüm nedeniyle genel olarak kabul edilen tedavi, acil cerrahidir

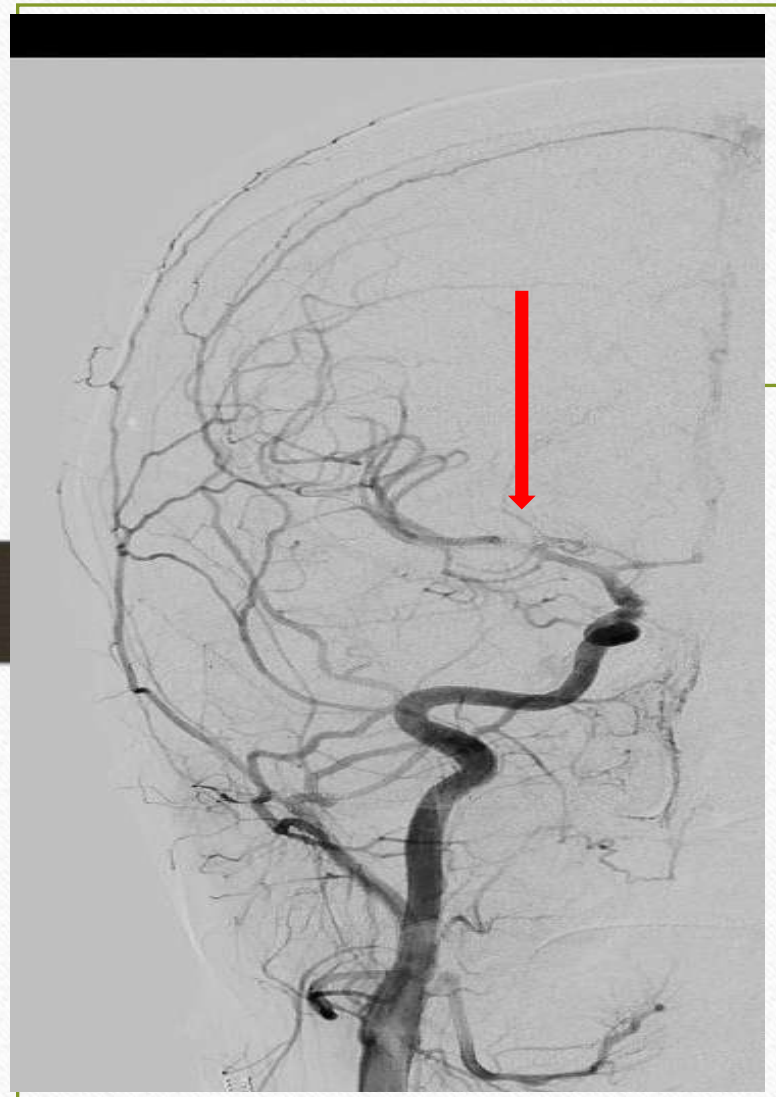
- Kist hidatik olgularında merkezi sinir sistemi tutulumu nadirdir ve tüm olguların yaklaşık %1,6-%5,2'sini oluşturmaktadır
- Kistler tek ya da multipl, uniloküler ya da multiloküler, ince ya da kalın duvarlı olabilir
- Serebral kist hidatikler genellikle yuvarlak, uniloküler ve soliterdir
- Kistler büyük boyutlara ulaşana kadar ciddi semptom vermezler. Klinik semptomlar, santral sinir sistemindeki lezyonun lokalizasyonuna ve boyutuna bağlıdır. Baş ağrısı ve kusma en sık görülen semptomlardır
- Temel tedavi yaklaşımı cerrahidir
- Medikal tedavide albendazol veya mebendazol kullanılmaktadır.

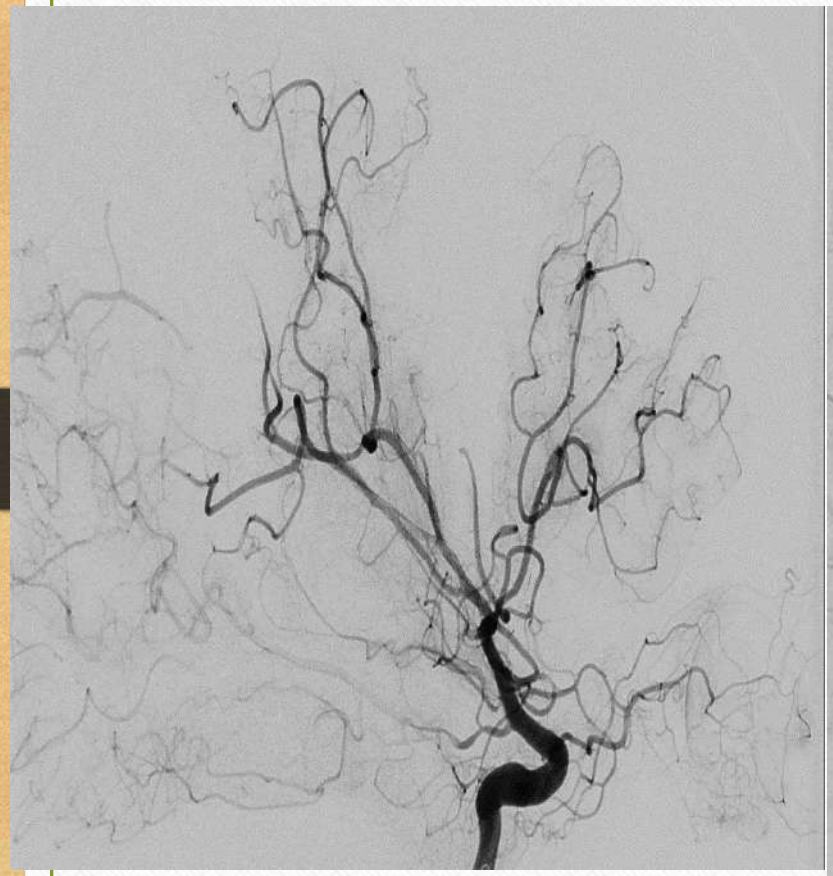
OAO,E 13

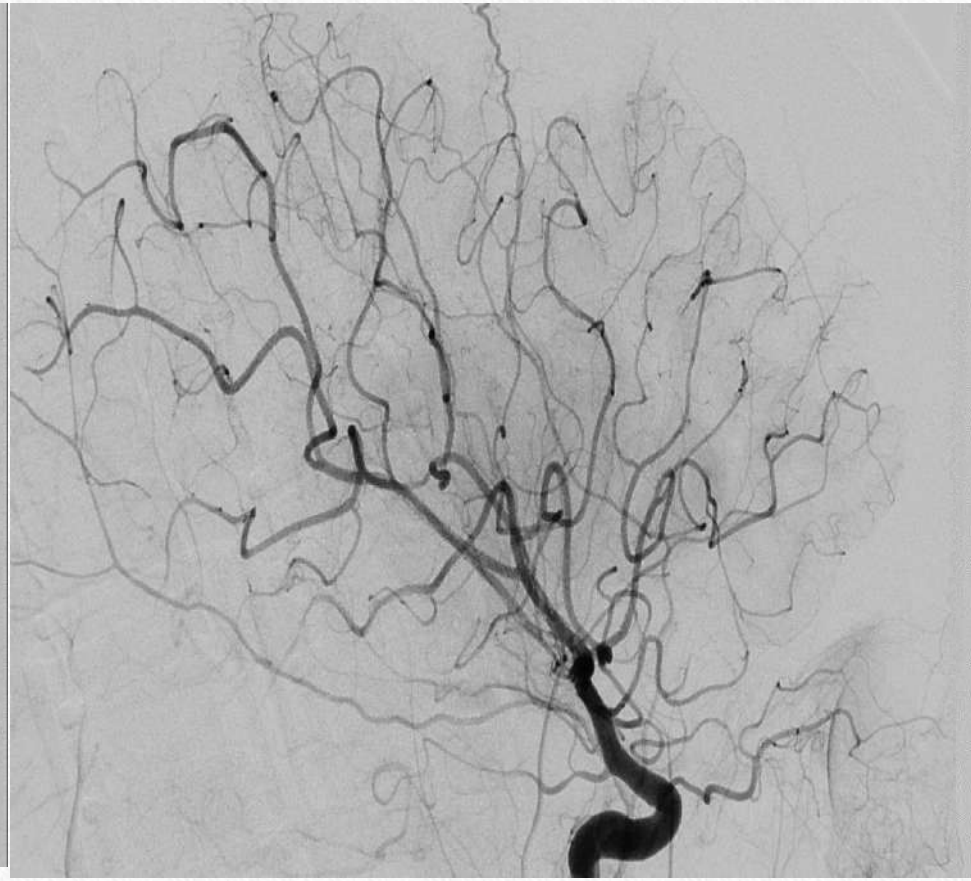
- Özet klinik sendrom : baş ağrısı , NIHSS:13 sol hemiparezi ,hipoestesi
- Giriş DWI : sağ bazal ganglionda akut enfakt
- DWI ASPECT skoru:9
- Giriş MRA: sağ MCA M1 ?
- Ateş:36.5
- TA:120/85
- SS:18
- EKG:sinüs
- Glukoz:80

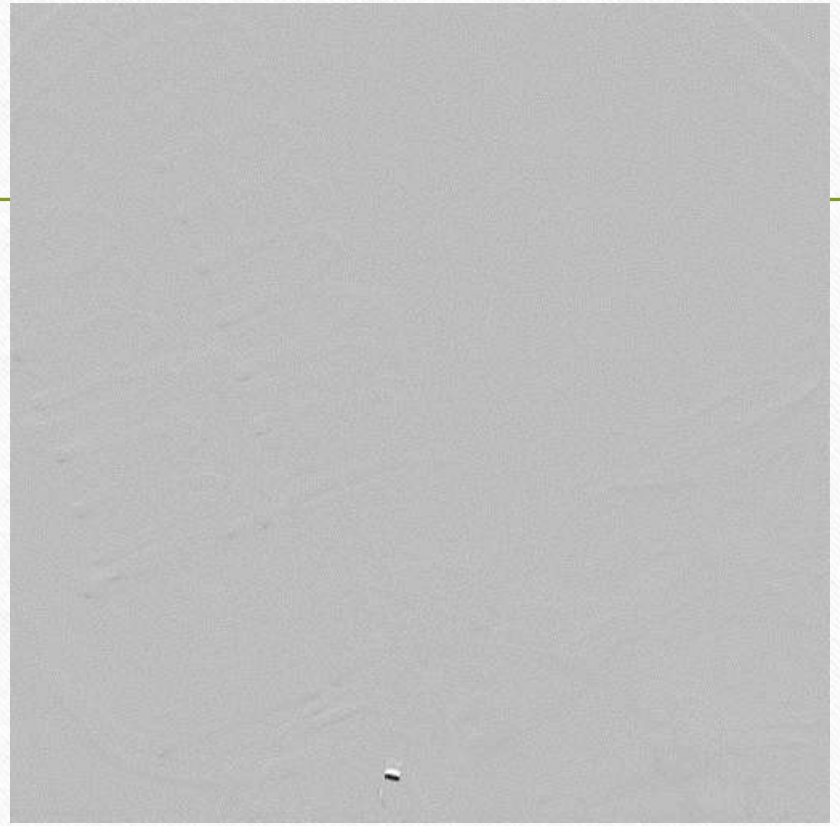






	saat	Time (min.)	
Onset	15.10		
Farkedilme	15.10		
Door	20.20(diş merkez 19.30 civarında)		
CT/MRI	???, 17.20??		
IV TPA	-		
Anjio ünitesi	20.50		
anestezi	21.00		
Femoral ponksiyon	21.05		
Diagnostik anjıo	21.10		
First pass	21.40?		
Final Run	22.00		
Kapı -ponksiyon	45		
Ponksiyon-revaskulasyon	35		
Başlangıç-revaskulasyon	**390**		









- Neuron max
- ACE 64
- Trevo pro 18
- Trevo 4x20
- synchro

- 24. saat
- Sağ üst ve alt 4/5 ,yürüyebiliyor
- Sfp+
- Hipoestezi
- Hemianopsi?

- 3. ay
- mRS:1
- İçine kapanık

Asa 100 devam ediyor

Etyoloji bilinmiyor

Enfektif, vaskülit?

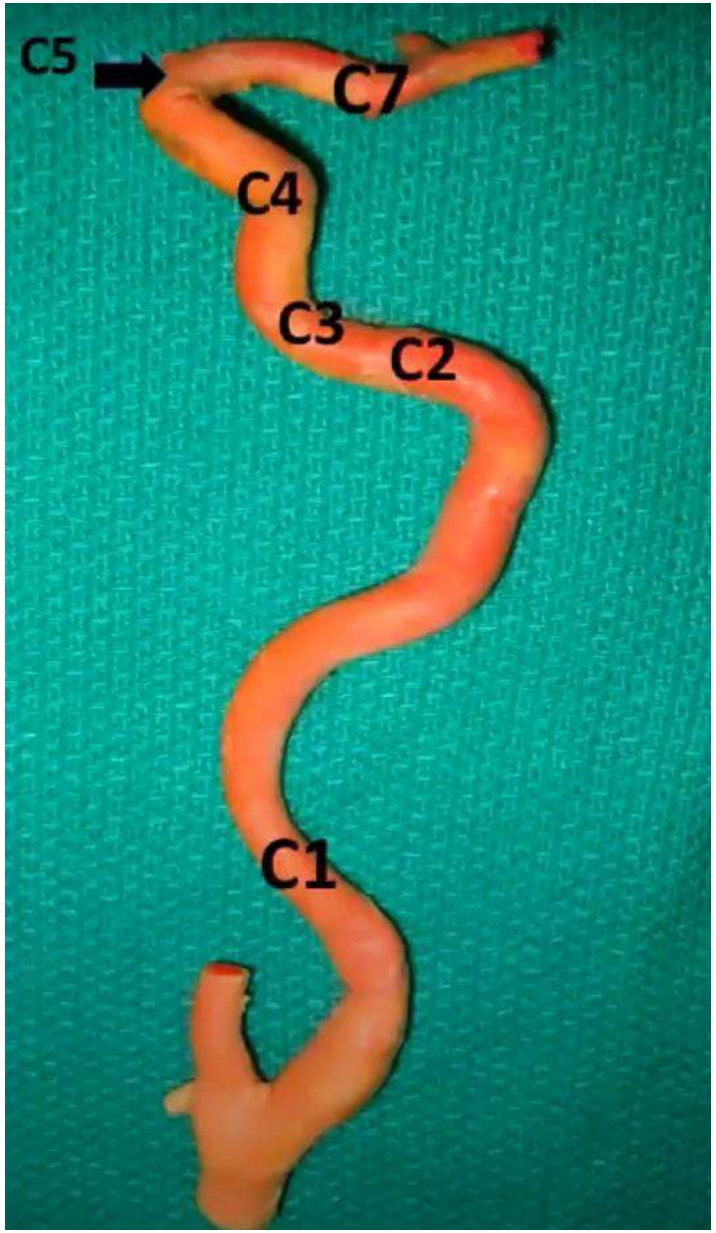
2. Yıl mRS : 2

TEŞEKKÜRLER

İnternal Karotid Arter Anatomisi

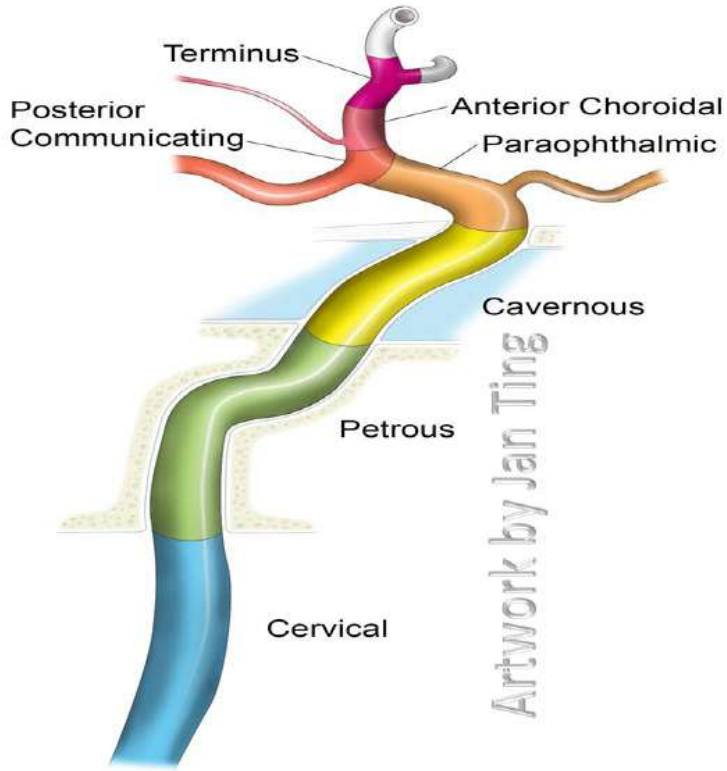
Özcan KOCATÜRK

Balikesir Atatürk Şehir Hastanesi

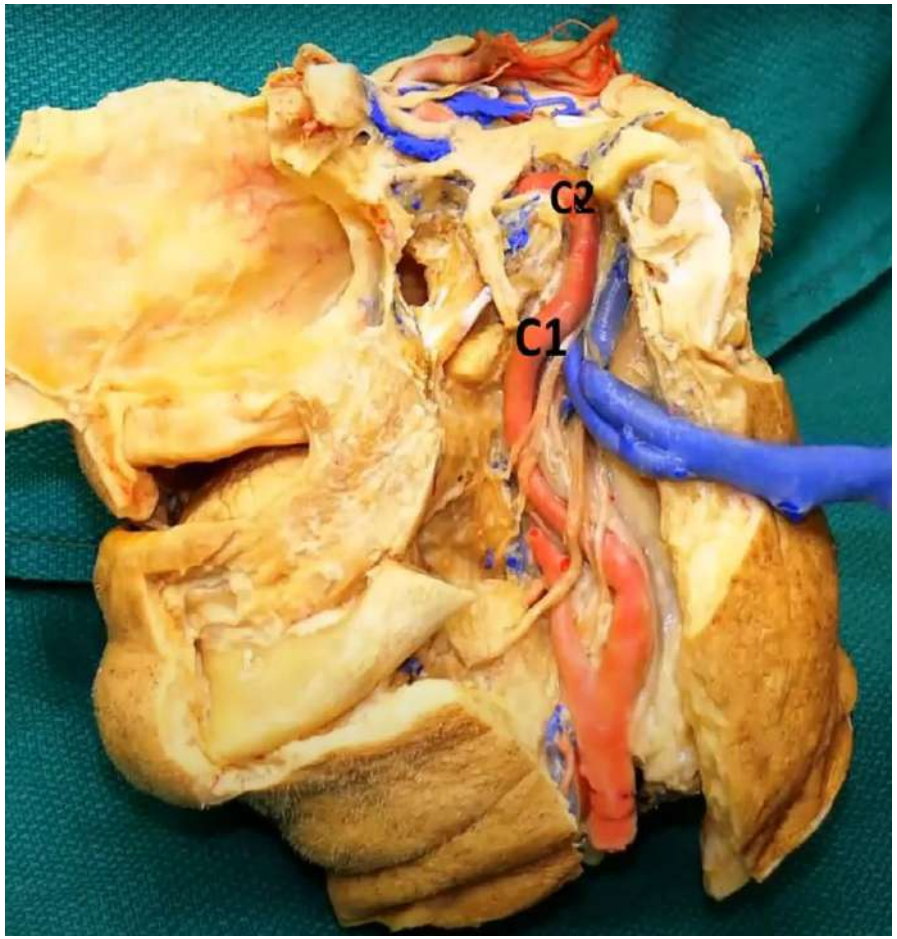


- Kommon karotid arter genelde C3-C4 vertebra seviyesinde internal karotid arter ve eksternal karotid arter şeklinde iki dala ayrılır.
- Nadiren T2-3 seviyesinden de ayrılabilir.
- Yüksek yerleşimli bifürkasyon karotid enderterektomi için dezavantajtır ancak stent için değil

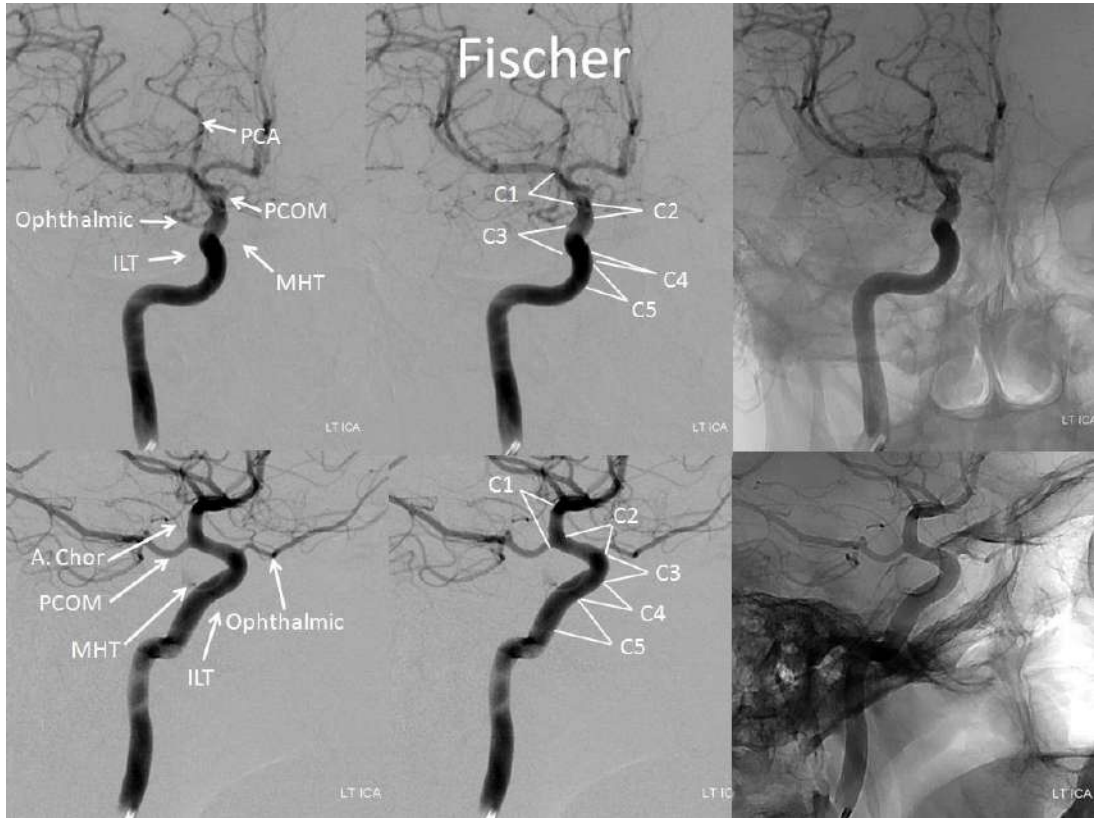
- İnternal karotid arter anatomisi segmentler halinde tanımlanmıştır
  - Servikal
  - Petrous
  - Kavernöz
  - Oftalmik
  - Supraklinoid



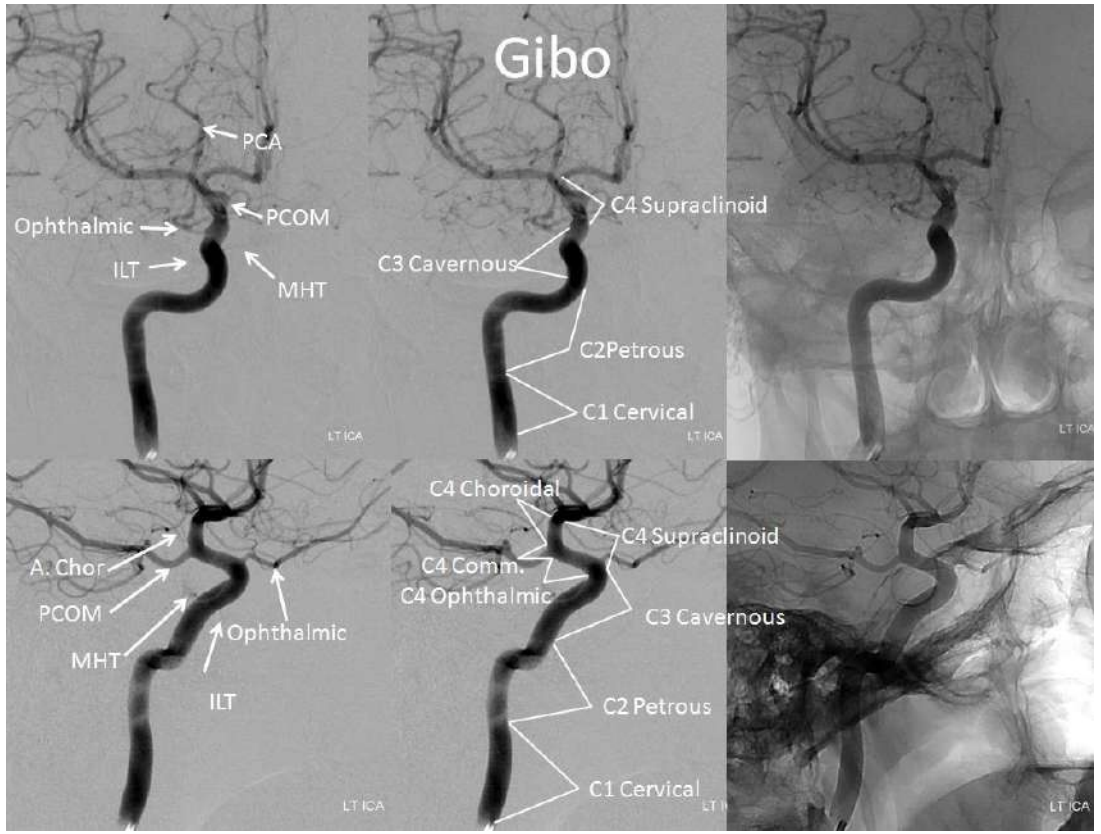

C4
C3
C2
C1
ICA


C2
C1

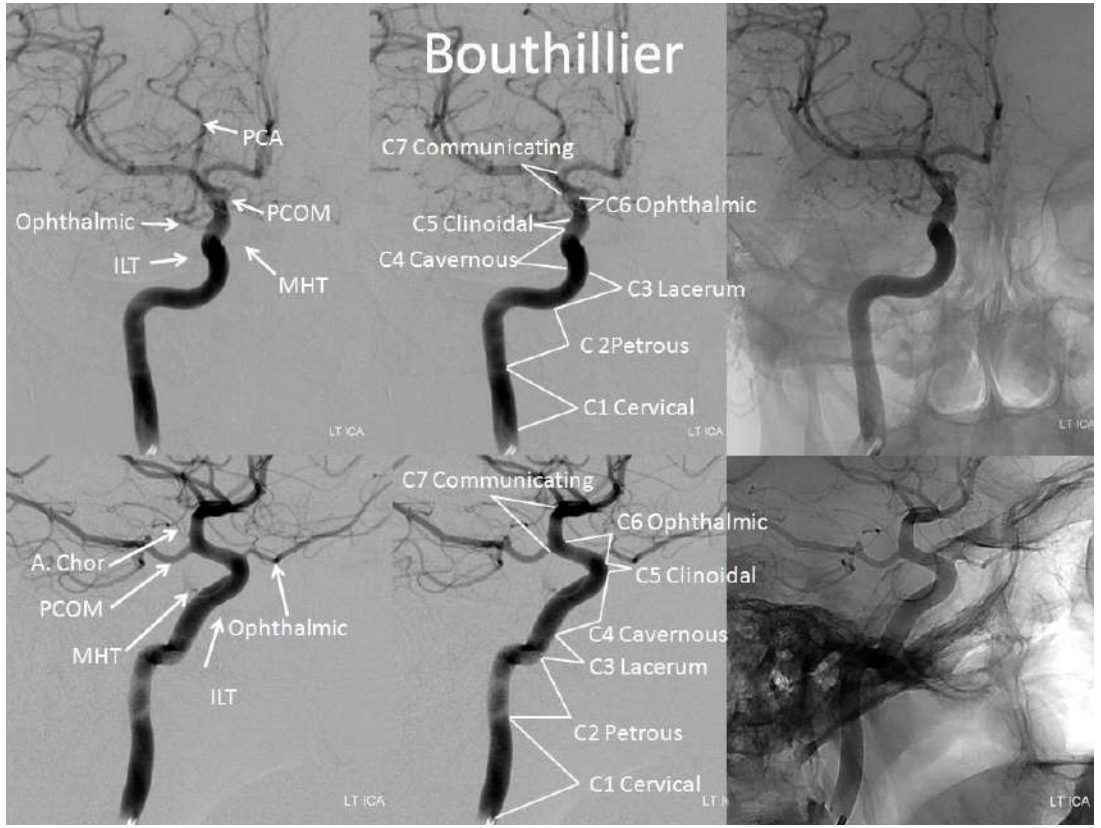
- İlk sınıflandırma 1938 yılında Fisher tarafından kan akımının tersi yönünde C1-C5 şeklinde yapıldı
- X-ray angiogram kullanılmıştır
- C1: komminikan
- C2:oftalmik
- C3:klinoidal
- C4:kavernöz
- C5:petröz
  - ICA eksrakraniyel kısmı isimlendirilmemiş



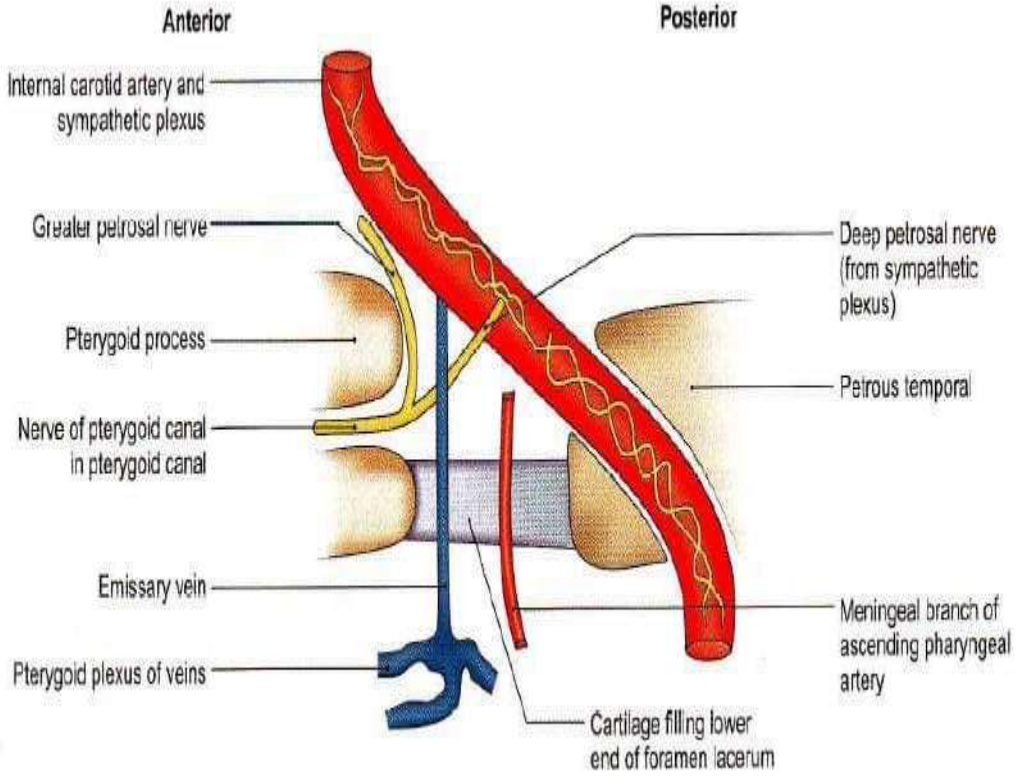
- 1981 de Gibo, kan akımı yönünde C1-C4 şeklinde sınıflandırmıştır. Özellikle intakraniyel kısma odaklanılmıştır
- C1:servikal
- C2:petröz
- C3: kavernöz
- C4:supraklinoid
  - Oftalmik
  - Komminikan
  - Koroidal
  - Ortalama uzunluğu 19 mm, en uzun oftalmik en kısa komminikan



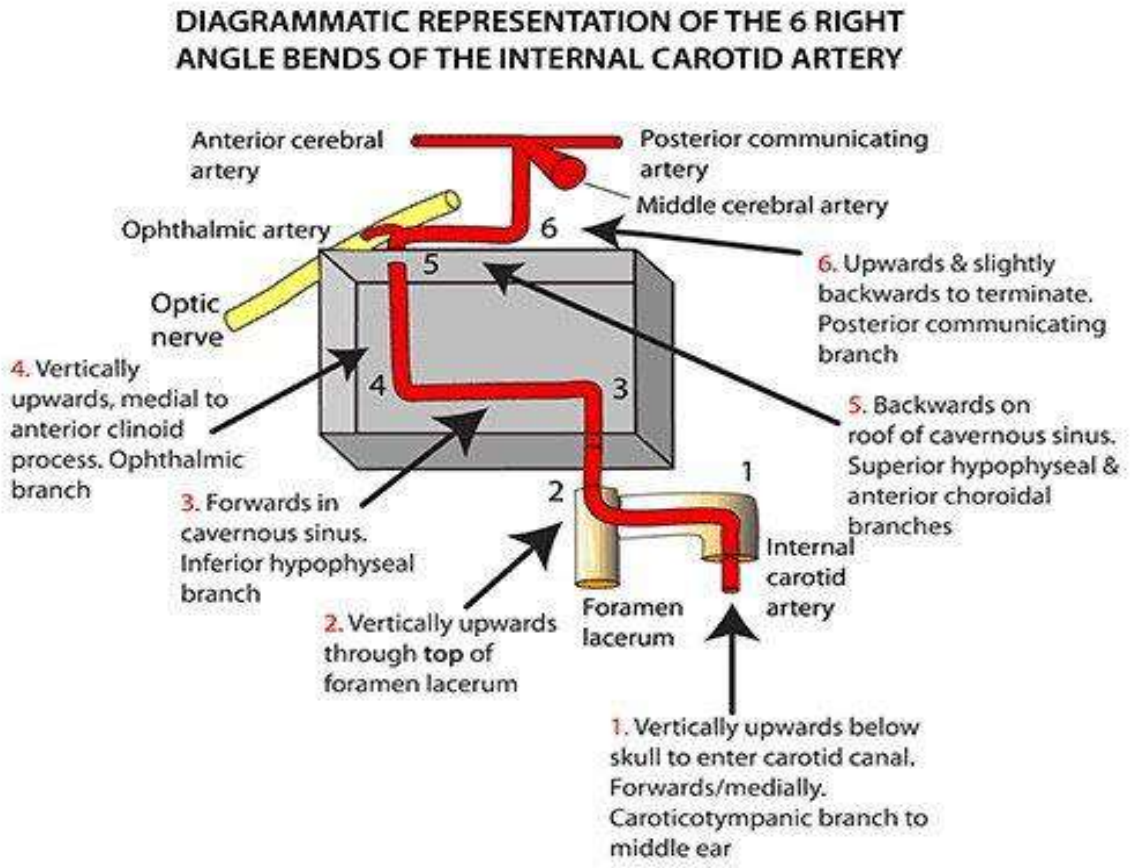
- 1996 da Bouthillier tarafından modifiye fisher sınıflandırması önerilmiştir. Kan akımı yönünde C1-C7 ye kadar toplam 7 kısma ayrılmıştır.
  - C1: servikal
  - C2: petröz
  - C3: laserum
  - C4: kavernöz
  - C5: klinoid
  - C6: oftalmik
  - C7: kominikan



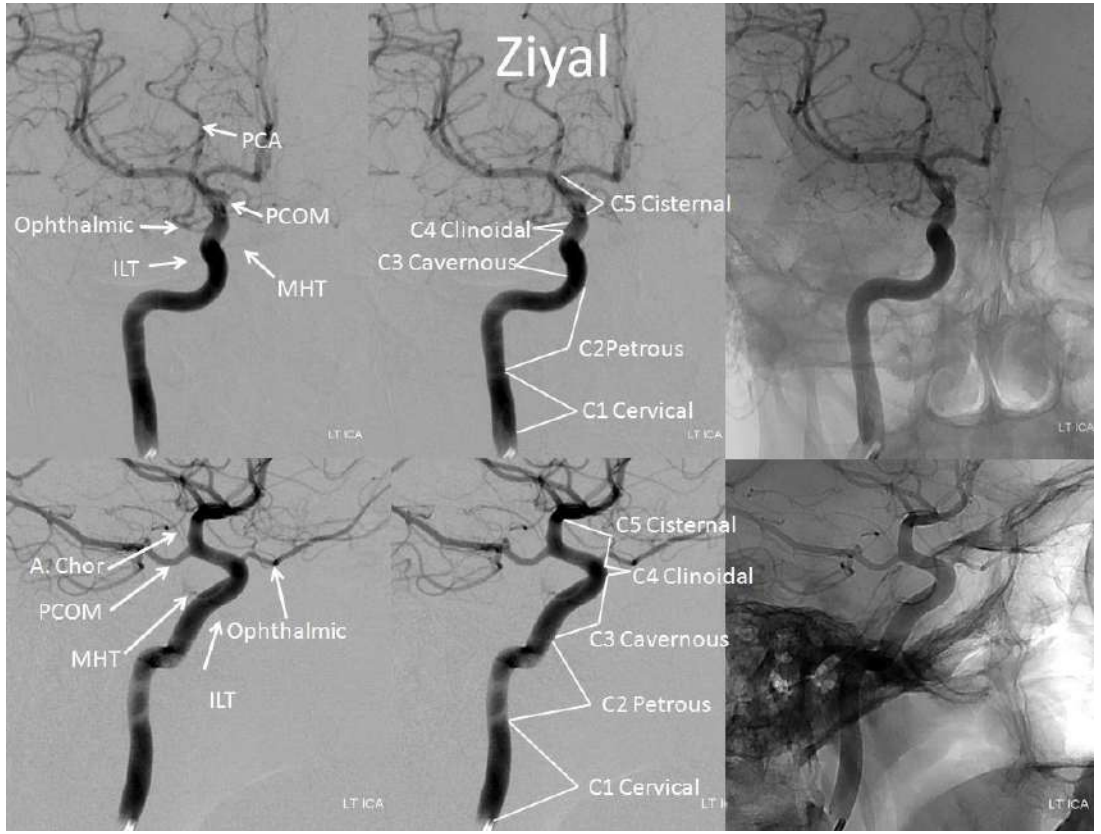
Ayrı bir laceral segmentte bahsedilir. Bu biraz kafa karaşıklığına yol açabilir. ICA foremen laserum içinde geçmiyor, üzerinde geçiyor



Structures related to the foramen lacerum



- 2005 yılında İbrahim Ziyal C1-C5 şeklinde yeni bir sıfınlandırma önermiştir.
  - C1:servikal
  - C2:petröz
  - C3:kavernöz
  - C4:klinoid
  - C5: sisternal
- Ayrı bir lacerum segmentini çıkarmış, oftalmik ve kominikan segmentleri birleştirip siternal segment şeklinde isimlendirmiştir
- ICA ‘in foramen lacerumdan geçmediği net bir şekilde ortaya koymuş.



Neurol Med Chir (Tokyo) 45, 184 ~ 191, 2005

Proposed Classification of Segments of the Internal Carotid Artery: Anatomical Study With Angiographical Interpretation

Ibrahim M. ZIYAL, Tunçalp ÖZGEN, Laligam N. SEKHAR**,
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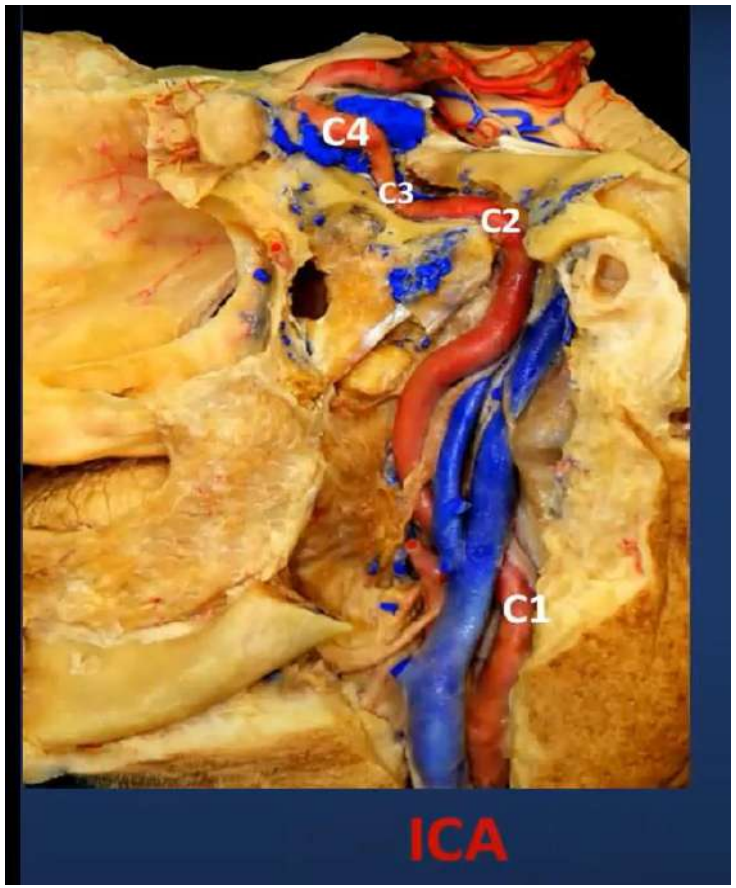
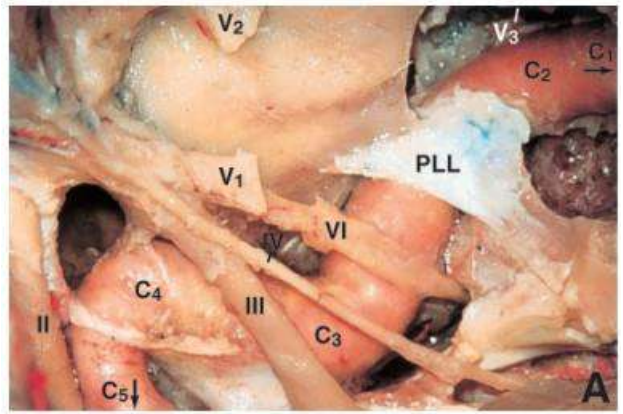
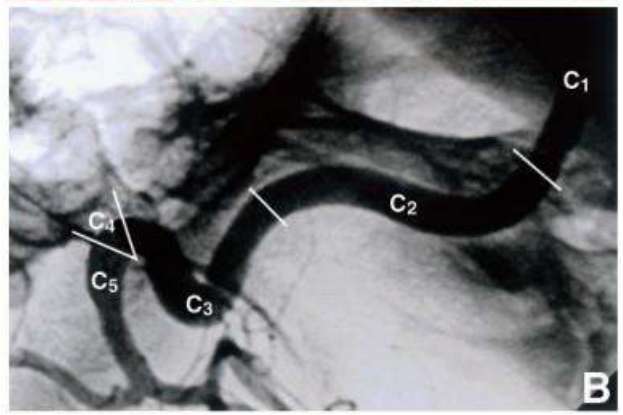
*Departments of Neurosurgery and *Radiology, Hacettepe University School of Medicine, Ankara, Turkey; **Department of Neurosurgery, University of Washington, Seattle, Washington, U.S.A.*

Abstract

The nomenclature and borders of the segments of the internal carotid artery (ICA) remain confusing. A classification of segments of the ICA is proposed based on constant anatomical structures, such as the carotid foramen and canal, the petrous bone, the petrolingual ligament (PLL), and the proximal and distal dural rings. The bilateral ICAs were dissected in 15 cadaveric head specimens using different neurosurgical approaches. The bilateral lacerum foramina were studied in five dry skulls. The bilateral segments of the ICA were also examined on carotid angiograms of 10 normal patients and another with the ophthalmic artery originating from the intracavernous portion of the ICA. The present classification divides the ICA into five segments in the direction of the blood flow. The cervical segment is extradural and extracranial, the petrous segment is extradural and intraosseous, the cavernous segment is interdural and intracavernous, the clinoidal segment is interdural and paracavernous, and the cisternal segment is intradural and intracisternal. The ICA did not pass through the lacerum foramen in any specimen. In all specimens, 1/8 to 5/8 of the lacerum foramen was under the deep dural layer of the cavernous sinus. The term 'lacerum segment' as used previously and called the 'trigeminal segment' by us cannot be justified. The PLL is the posterolateral border of the cavernous sinus and the lacerum and trigeminal segments should be included in the cavernous and petrous segments. The ophthalmic artery may originate from the clinoidal ICA, from the cavernous ICA, or from the middle meningeal artery. Instead of using the term 'ophthalmic segment,' the term 'cisternal segment' should be used for the anatomically distinct ICA in the subarachnoid space. This classification should be minimally affected by anatomical variations.

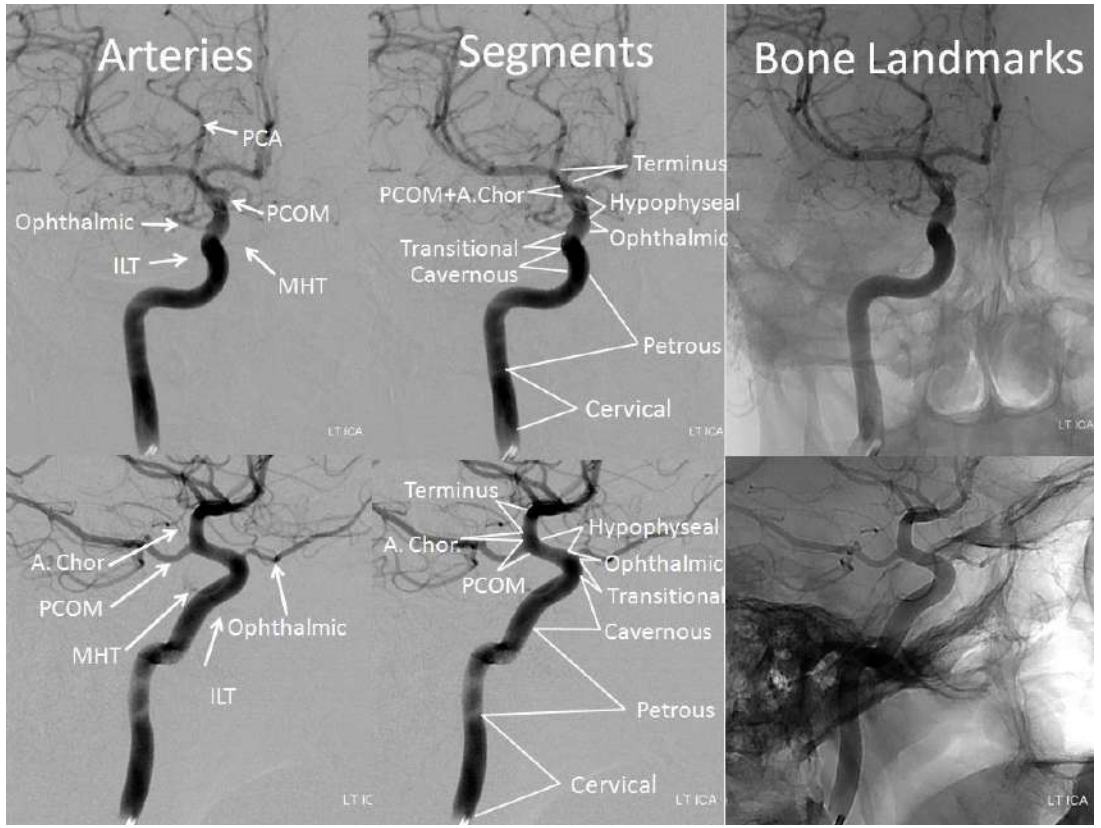






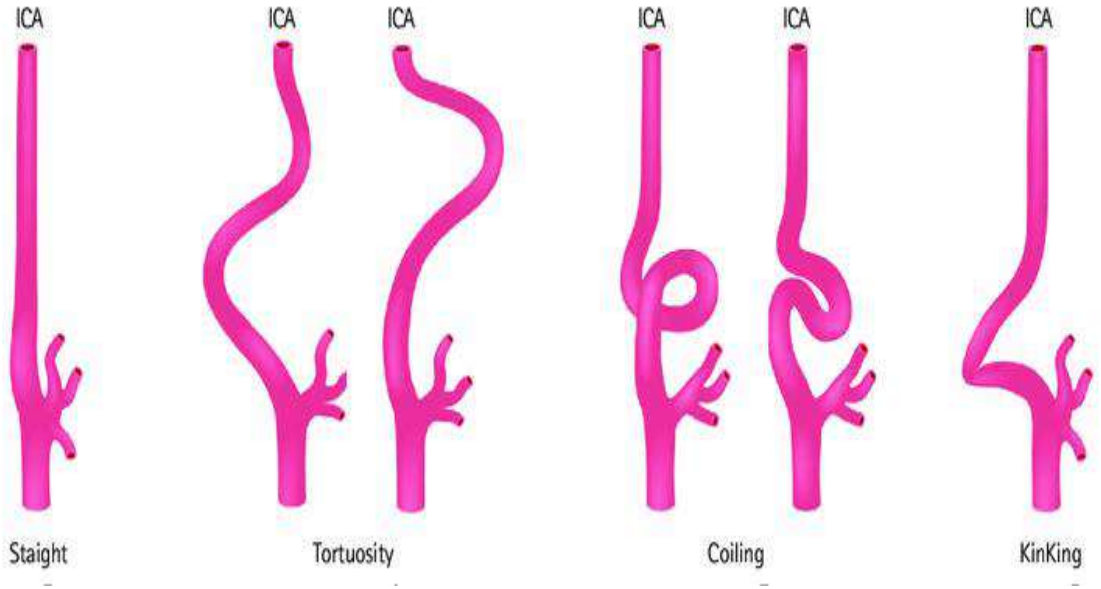
Shapiro sınıflaması

- 2014
- Tüm sınıflandırmalar içinde angiografik yönelimi en çok olan bu sınıflandırmadır.
  - Servikal
  - Petröz
  - Kavernöz
  - Paraoftalmik
  - Kominikan
  - Anterior koroidal
  - Terminal
- Arterlerin dallanma noktaları baz alınmıştır
- Serebral anjiografiye dayanır, cerrahi sınırları tanımlayamamaktadır.

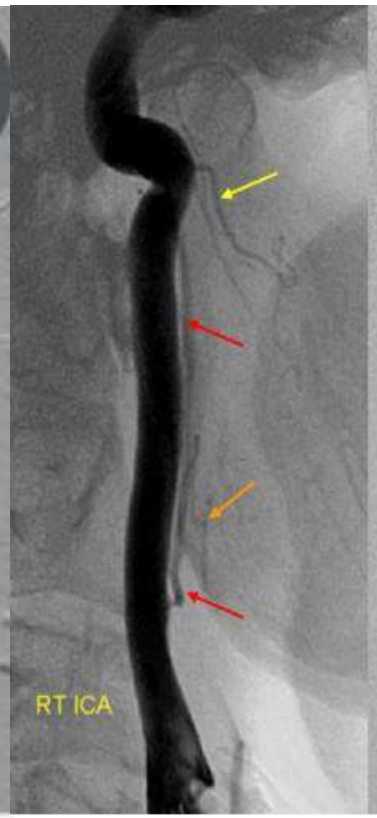


Servikal segment

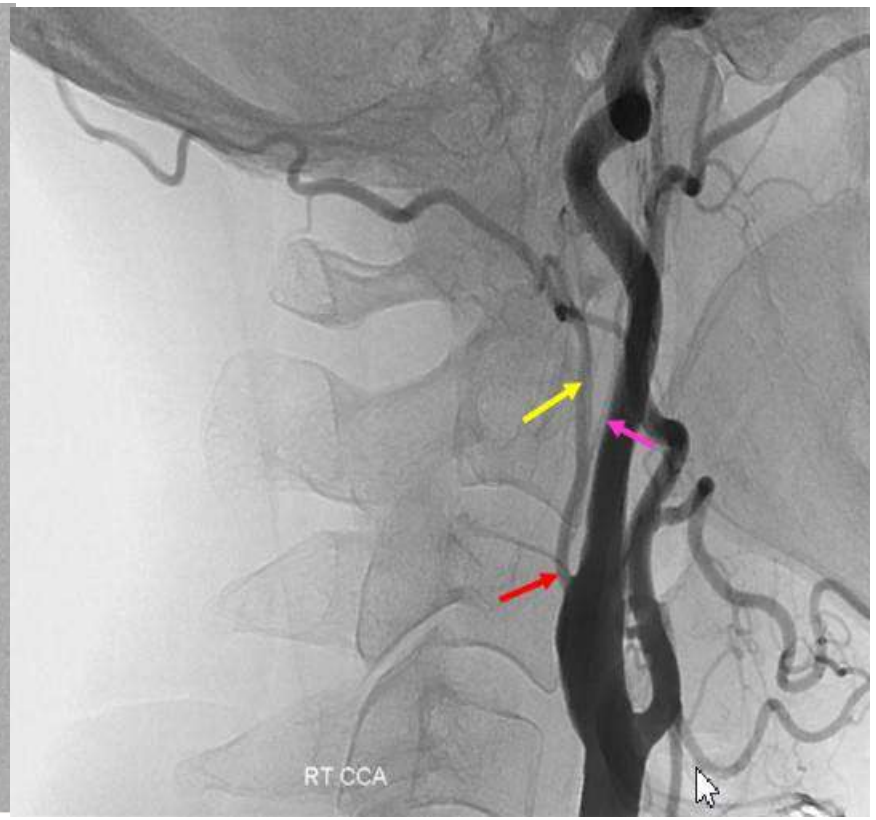
- Karotid bifürkasyondan kafa tabanına kadar olan kısım, bu kısımda dal vermez.
  - Persistant hypoglossal artery
  - Assending faringeal
  - Oksipital arter
- Tortuyosite görülür
  - İntrakraniyel lezyona ulaşmamızı
  - Karotis filtre koymayı engeller.




B


RT ICA


RT ICA


RT CCA

Internal Carotid Artery Tortuosity: Impact on Mechanical Thrombectomy

Junpei Koge, MD; Kanta Tanaka, MD, PhD; Takeshi Yoshimoto, MD; Masayuki Shiozawa, MD; Yuji Kushi, MD; Tsuyoshi Ohta, MD, PhD; Tetsu Satow, MD, PhD; Hiroharu Kataoka, MD, PhD; Masafumi Ihara, MD, PhD; Masatoshi Koga, MD, PhD; Noriko Isobe, MD, PhD; Kazunori Toyoda, MD, PhD

BACKGROUND: Although tortuosity of the internal carotid artery (ICA) can pose a significant challenge when performing mechanical thrombectomy, few studies have examined the impact of ICA tortuosity on mechanical thrombectomy outcomes.

METHODS: In a registry-based hospital cohort, consecutive patients with anterior circulation stroke in whom mechanical thrombectomy was attempted were divided into 2 groups: those with tortuosity in the extracranial or cavernous ICA (tortuous group) and those without (nontortuous group). The extracranial ICA tortuosity was defined as the presence of coiling or kinking. The cavernous ICA tortuosity was defined by the posterior deflection of the posterior genu or the shape resembling Simmons-type catheter. Outcomes included first pass effect (FPE; extended Thrombolysis in Cerebral Infarction score 2c/3 after first pass), favorable outcome (3-month modified Rankin Scale score of 0–2), and intracranial hemorrhage.

RESULTS: Of 370 patients, 124 were in the tortuous group (extracranial ICA tortuosity, 35; cavernous ICA tortuosity, 70; tortuosity at both sites, 19). The tortuous group showed a higher proportion of women and atrial fibrillation than the nontortuous group. FPE was less frequently achieved in the tortuous group than the nontortuous group (21% versus 39%; adjusted odds ratio, 0.45 [95% CI, 0.26–0.77]). ICA tortuosity was independently associated with the longer time from puncture to extended Thrombolysis in Cerebral Infarction ≥2b reperfusion (β=23.19 [95% CI, 13.44–32.94]). Favorable outcome was similar between groups (46% versus 48%; *P*=0.87). Frequencies of any intracranial hemorrhage (54% versus 42%; adjusted odds ratio, 1.61 [95% CI, 1.02–2.53]) and parenchymal hematoma (11% versus 6%; adjusted odds ratio, 2.41 [95% CI, 1.04–5.58]) were higher in the tortuous group. In the tortuous group, the FPE rate was similar in patients who underwent combined stent retriever and contact aspiration thrombectomy and in those who underwent either procedure alone (22% versus 19%; *P*=0.80). However, in the nontortuous group, the FPE rate was significantly higher in patients who underwent combined stent retriever and contact aspiration (52% versus 35%; *P*=0.02).

CONCLUSIONS: ICA tortuosity was independently associated with reduced likelihood of FPE and increased risk of postmechanical thrombectomy intracranial hemorrhage.

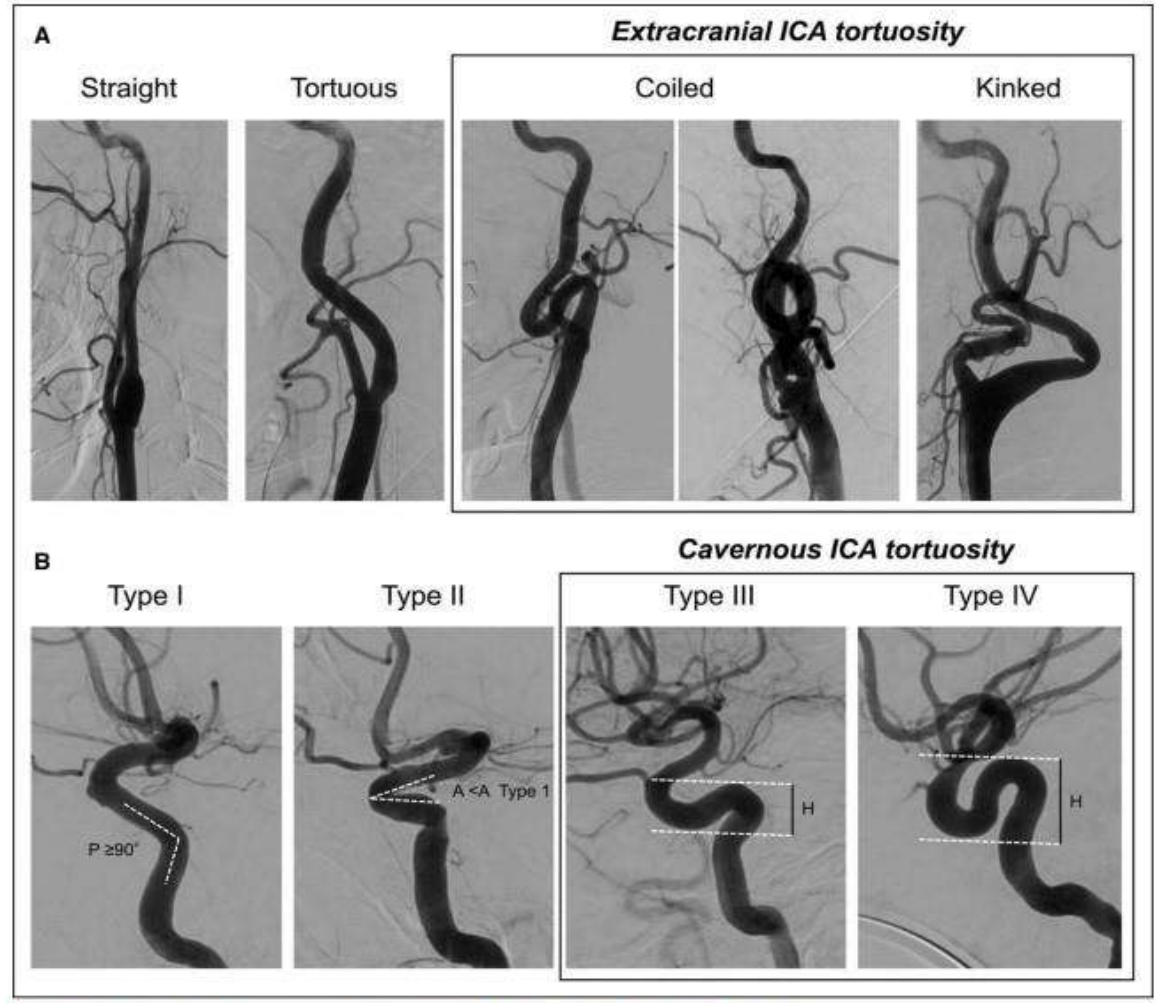
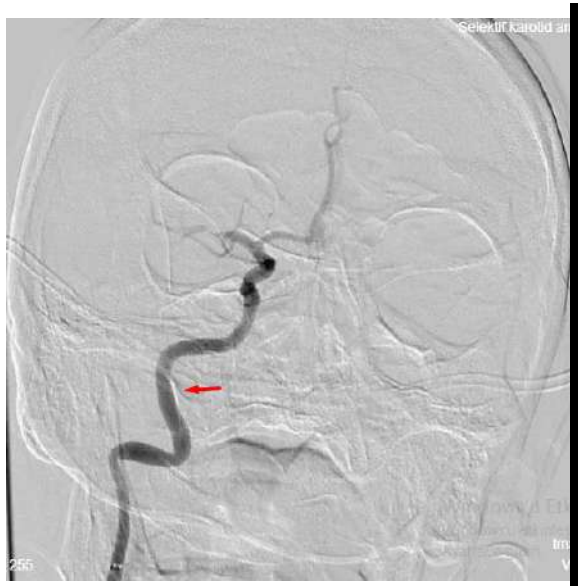
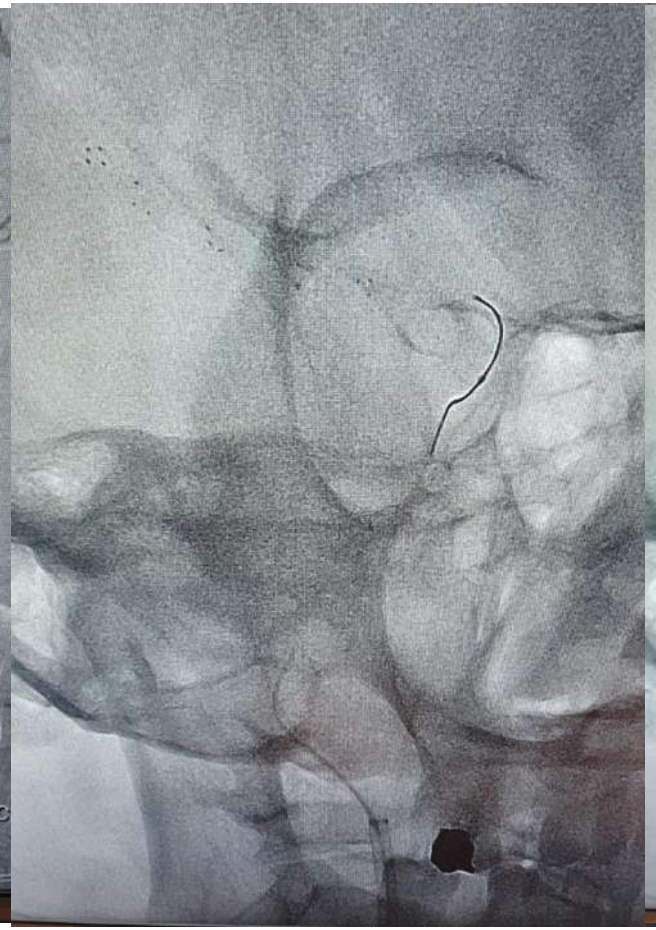


Figure 1. Classification of extracranial and cavernous internal carotid artery (ICA) tortuosity.
A, Tortuosity of the extracranial ICA was classified into 4 types as follows: straight (angle between the centerlines of the common carotid artery and the ICA was <15°), tortuous (angle between the common carotid artery and the ICA centerlines was >15; or S- or C-shaped course of the ICA), coiled (an exaggerated S-shaped curve or circular configuration of the ICA), and kinked (acute [<90°] angulation associated with stenosis).[11] The extracranial ICA was considered tortuous if it was coiled or kinked. **B**, Cavernous ICA tortuosity was classified into 4 types based on the geometry of the anterior and posterior genus. Type I has open configurations/angles of anterior and posterior genus (the posterior genu angle [P] ≥90°). Type II is characterized by a closed configuration of the anterior genu (more acute angle of the anterior genu [A] than type I). Type III is defined by posterior deflection of the posterior genu, which gives it a buckled appearance. Type IV is the most tortuous and has a shape characteristic of the Simmons-style angiography catheter where the posterior genu is buckled superiorly compared with the anterior genu.[12] H is the height difference of the anterior and posterior genus, measured from the peak of the posterior genu to the trough of the anterior genu. Types III and IV were considered tortuous cavernous ICA.

Aspirasyon kateteri kullanıldığında

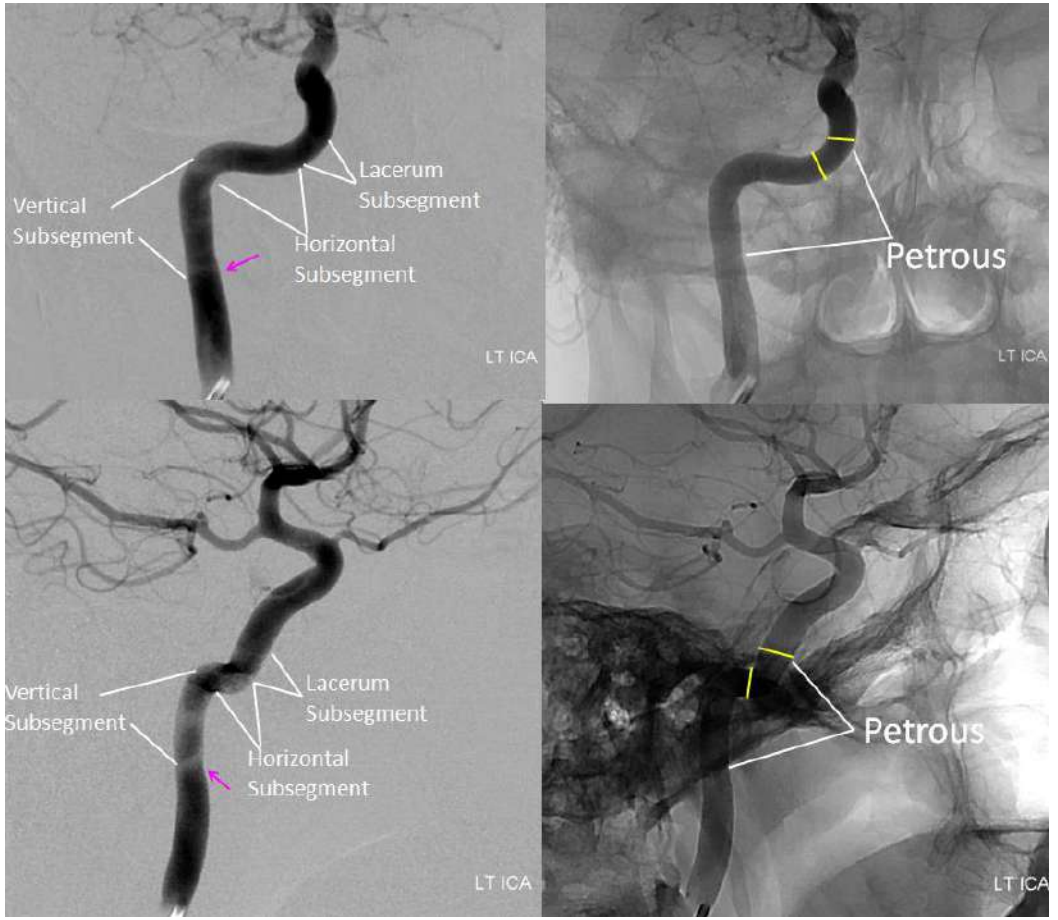


İzole stent retriver kullanıldığında



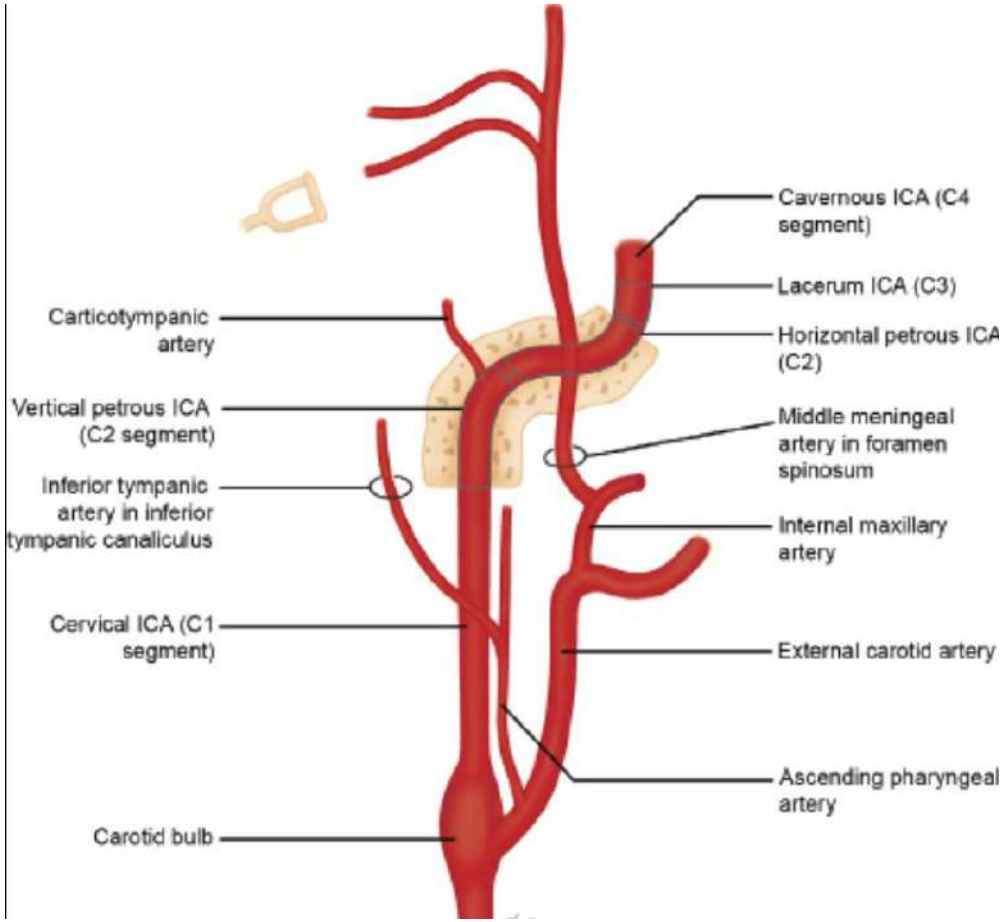
Petroz segment

- Vertikal, horizantal ve laceral kısmı vardır
- Karotid kanaldan kafa tabanına girer, petröz kemik içerisinde ilerler yaklaşık 1 cm sonra arteromedial dönüş yaparak horizantal kısmı oluşturur. Foramen lacerumdan çıkarak kafa içine girer.
- Anjiografik olarak verdiği dalların görünmesi nadirdir
  - Karotikotimpanik arter
  - Mandibulavidian arter



Karotikotimpanik arter

- Horizantal ve vertikal kısımların birleştiği yerden çıkar
  - Orta kulağı besler
- Anjioda görünmek için çok küçüktür
- Embriyonik hyoid arterin kalıntısıdır



Mandibulavidian dal

- Horizantal segmentin distal kısmından ayrılır
  - Nasofarinks, nasal septumu, mandibular kondili besler
- Normalde anjioda gözükmez
- ICA-ECA arasında anastomozdur.
  - Proksimal ICA oklüzyonunda ECA den distal ICA ya akım sağlayabilir

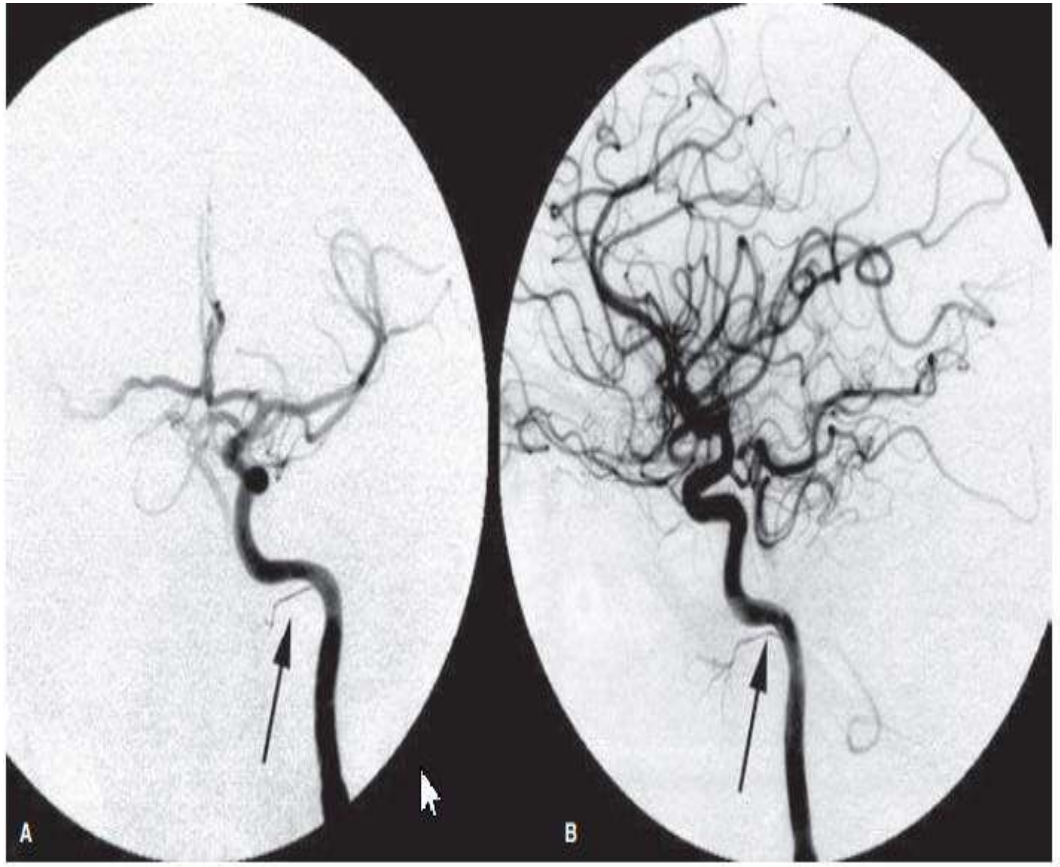
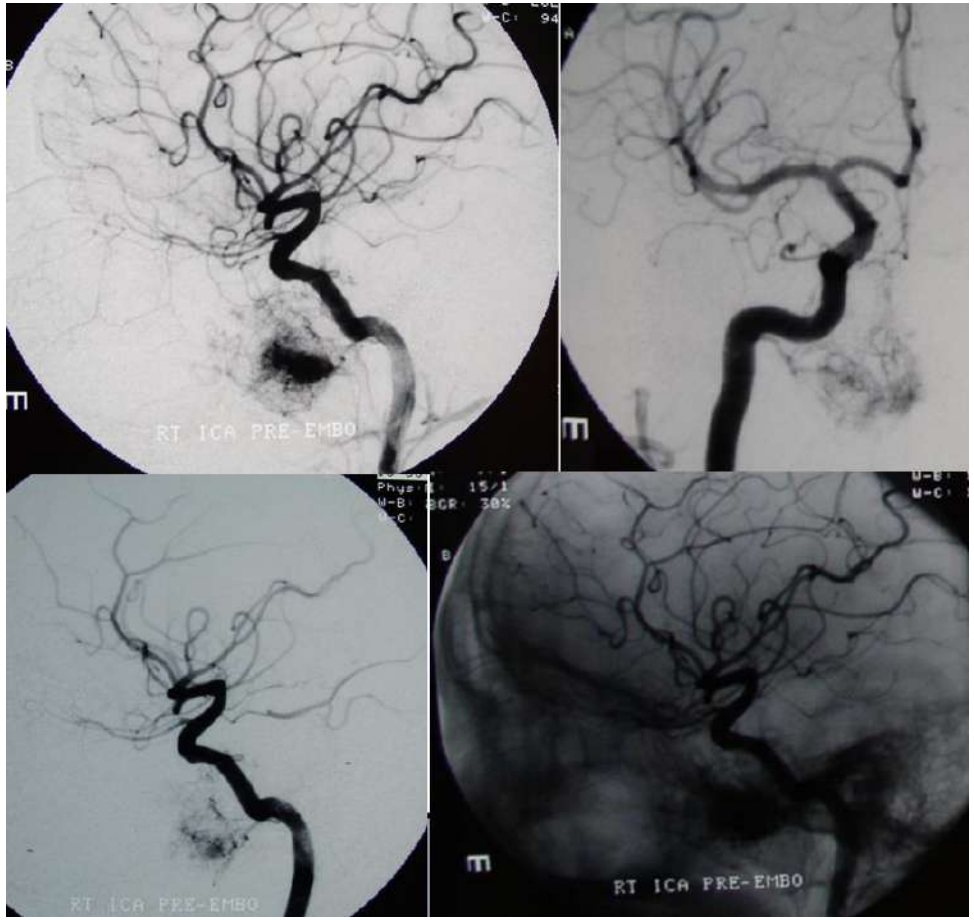


FIGURE 10-13. (**A–B**) **Persistent mandibulovidian trunk.** AP (**A**) and lateral (**B**) views of the left internal carotid artery in a child with a juvenile angiofibroma. An unusual branch of the petrous internal carotid artery (*arrows*) represents a persistent mandibular or mandibulovidian artery.

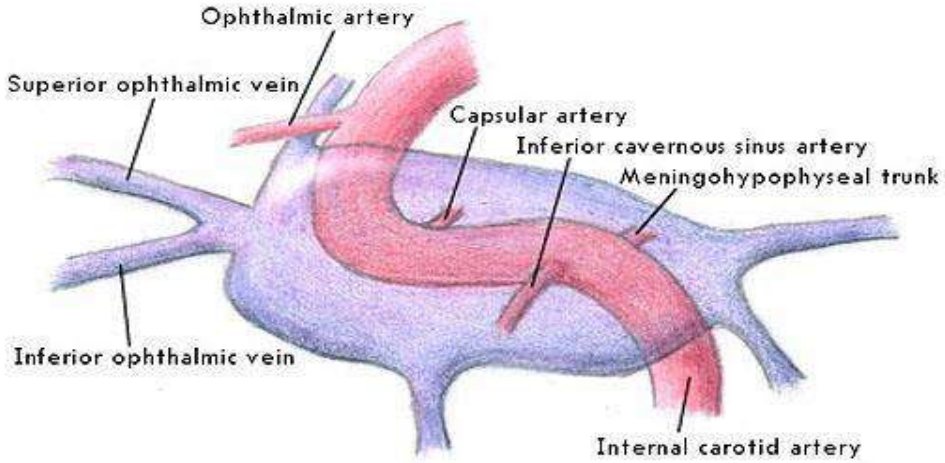
Juvenil anjiofibrom, vidian arter tarafından besleniyor.

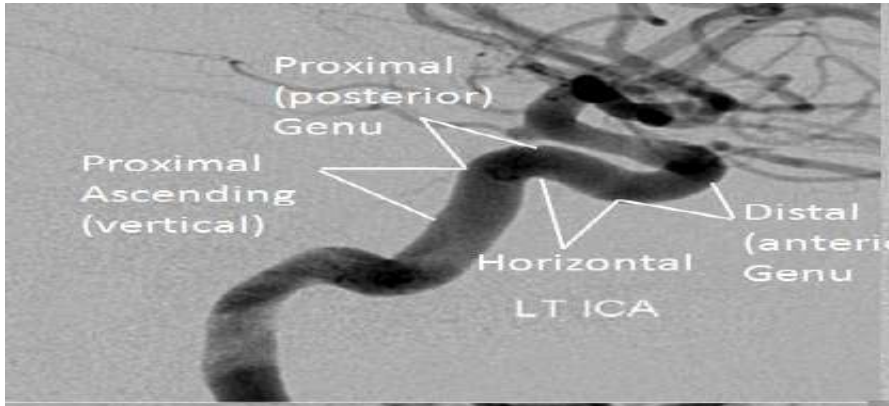


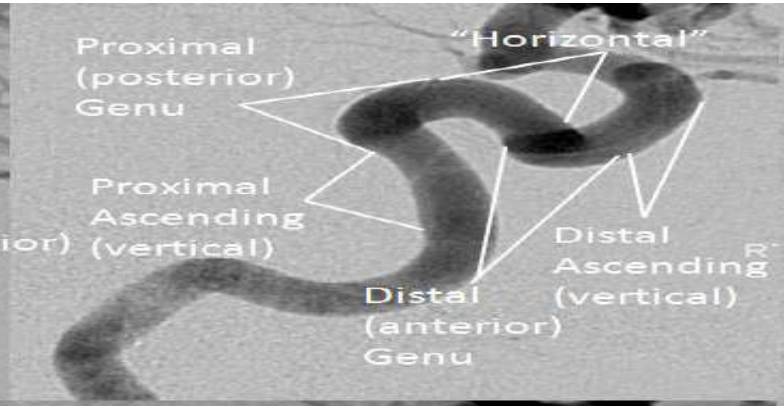
Kanarsa ne olur?

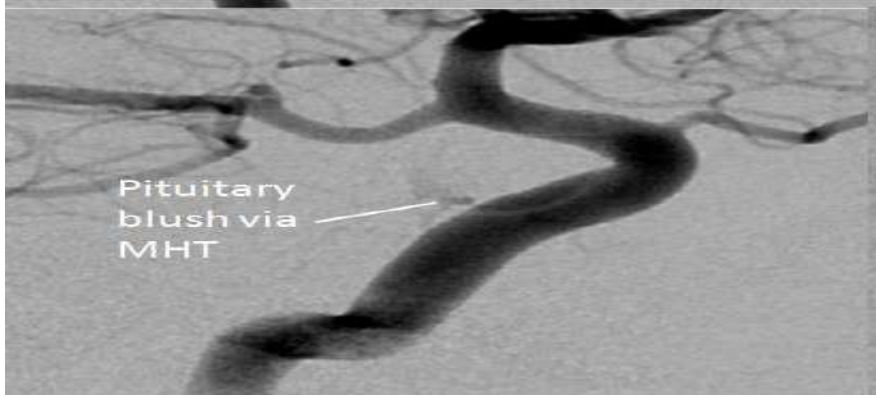
Kavernöz segment

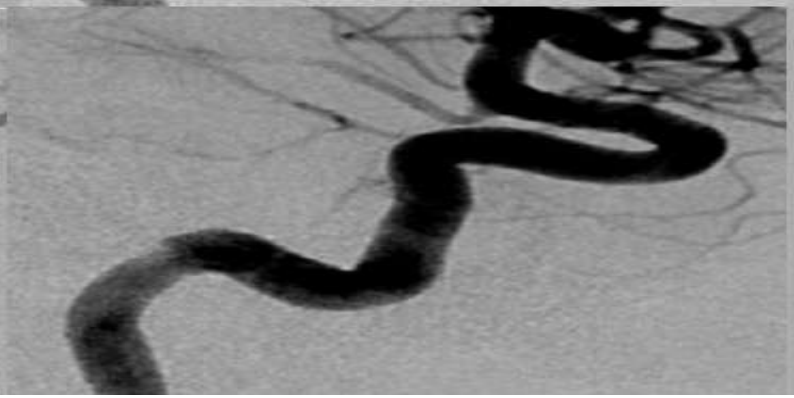
- Kavernöz sinüsün içinde yer alan ICA segmenti

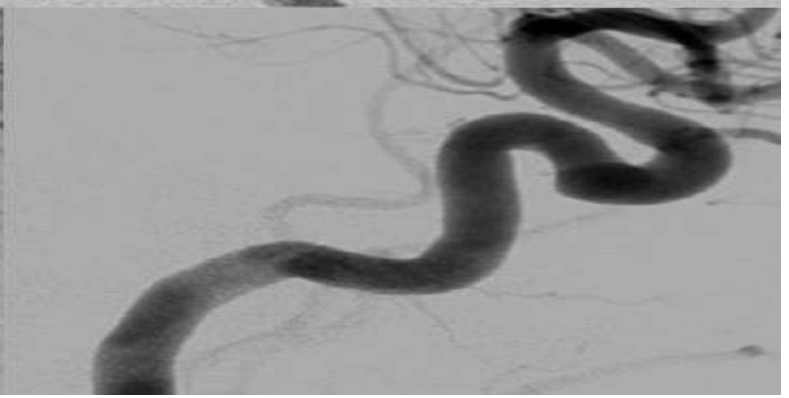






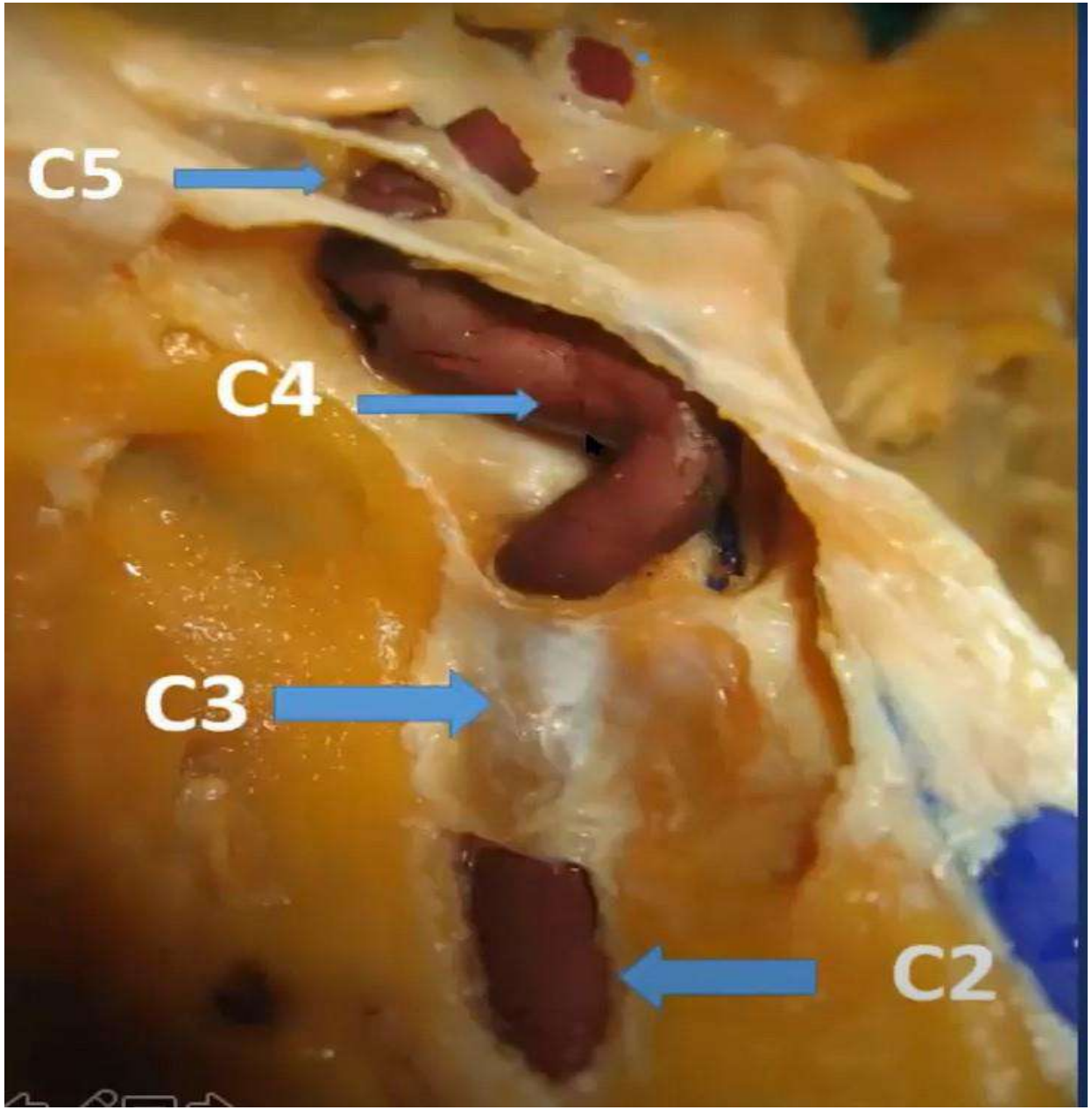






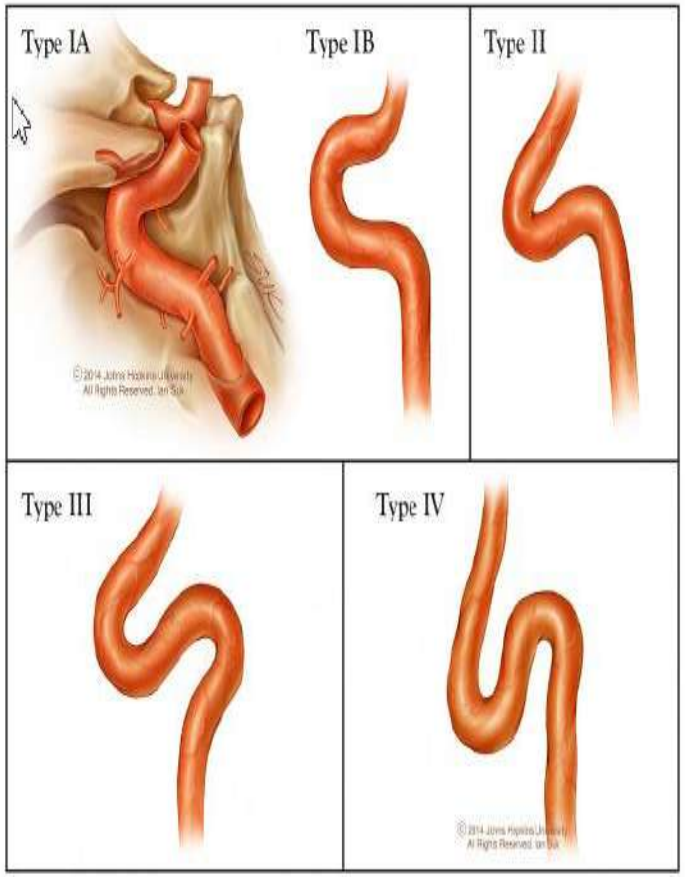
Kavernöz segment

- Foremen leserumdan çıktıktan sonra medial ve vertikal olarak sellaya doğru uzanır daha sonra anteriora doğru seyir eder ve 180 derece dönerek durayı delip kafa içine girer.
- C3: petrolingula ligamet
- C4: kavernöz segment
- C5: Klinoid segment

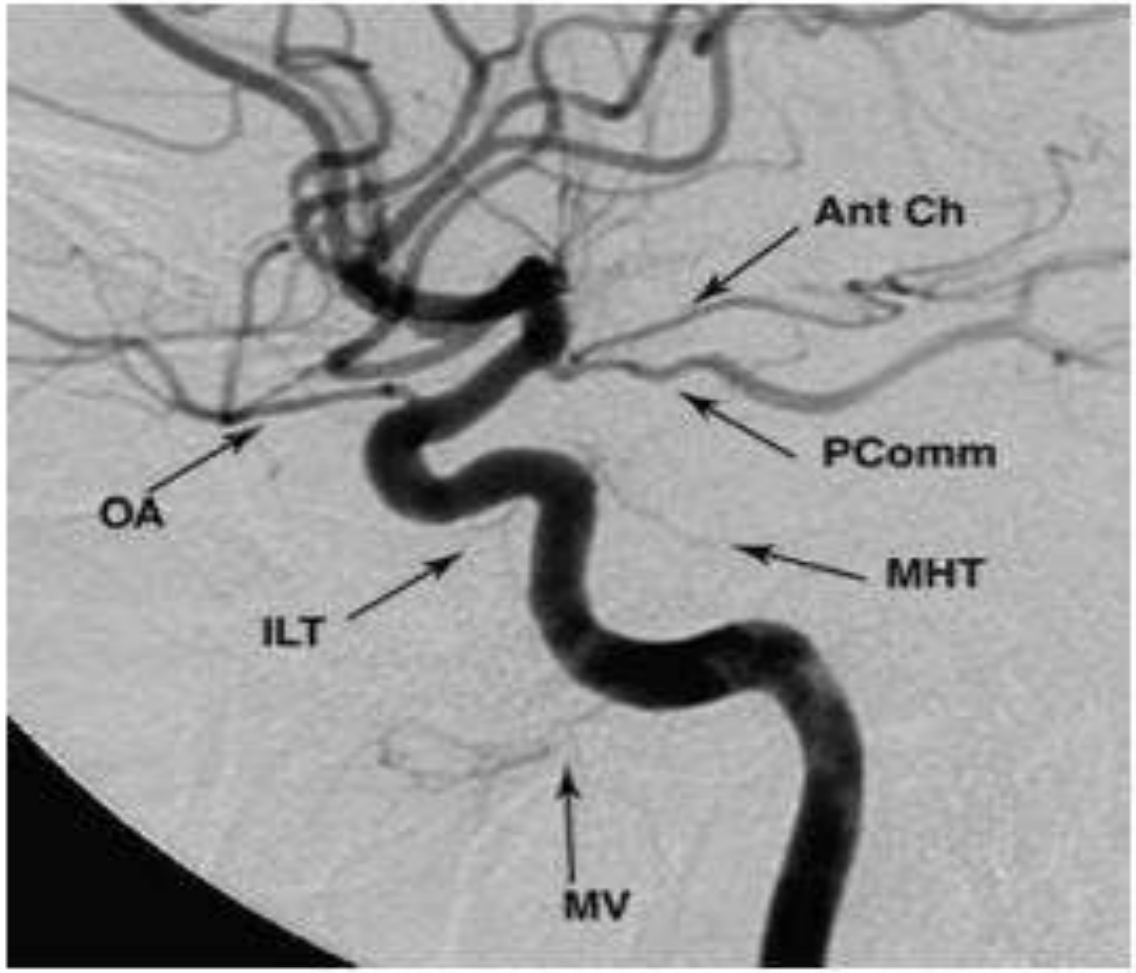


- Kavenöz sinüsteki seyri esnasında tortuyosite gösterebilir
- Yaşla birlikte tortuyosite artar

Figure 1 Classification of cavernous internal carotid artery (cICA) tortuosity. Type I has open configurations/angles of the genus with subcategory determined by the posterior genu angle, where IA is greater than 90° and IB is equal to 90°. Type II is characterized by closed configuration of the anterior genu reflected by a more acute angle of the genu compared with type I. Type III is defined by the posterior deflection of the posterior genu giving it a buckled appearance. Type IV is the most tortuous cICA with characteristic Simmons catheter shape, where the posterior genu is buckled superiorly compared with the anterior genu.

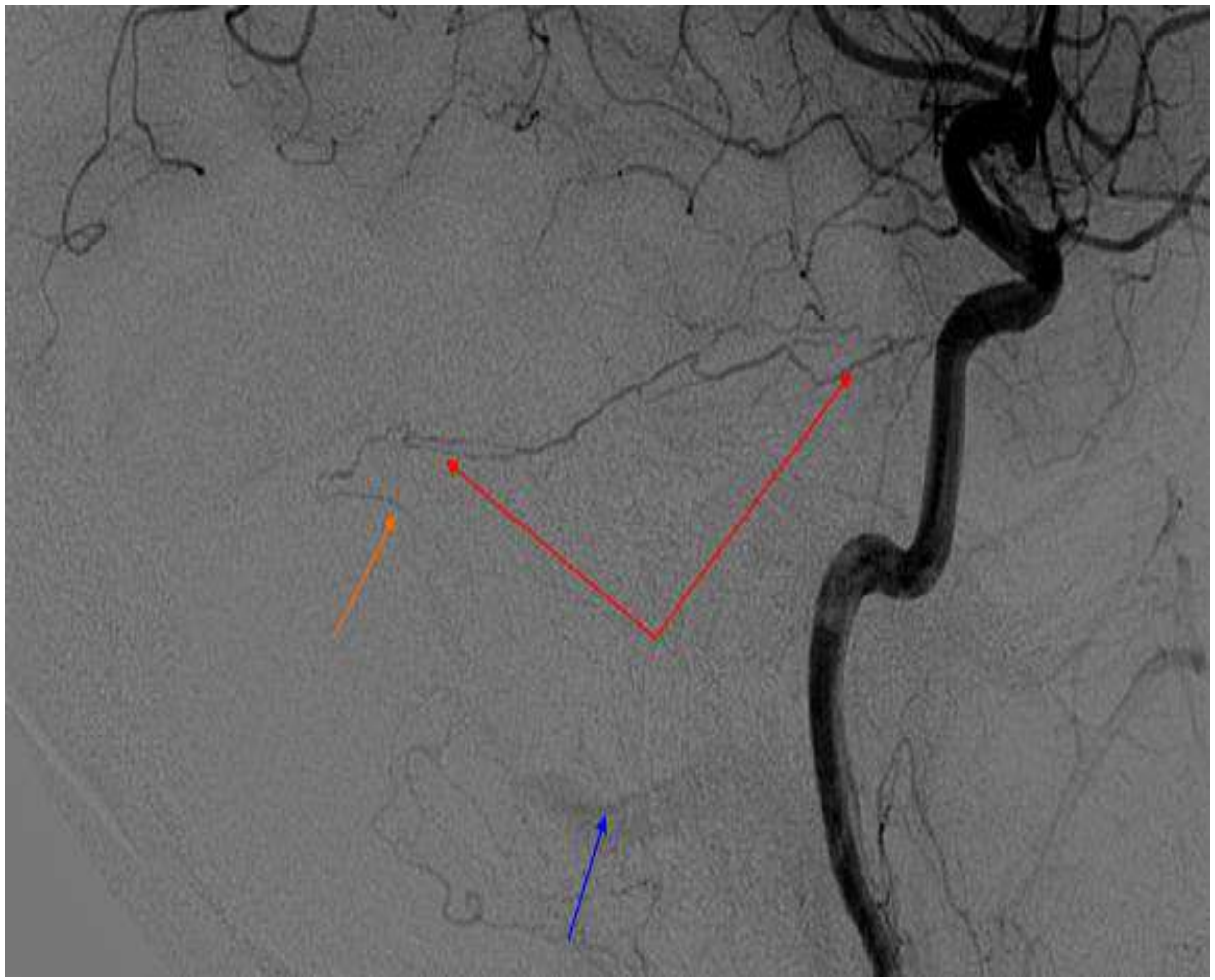


- Memingohipofiziyel trunk
- İnferolateral trunk
  - Genel olarak hipofiz bezini ve yakın komşulukta bulunan dura mater besler.
  - Bu iki dal ile internal karotid arter yoğun şekilde distal external karotid arter ile anastomoz yapar.
  - Bu anastomozlar normal sartlarda anjioda görülmese bile olmadığı anlamına gelmez.



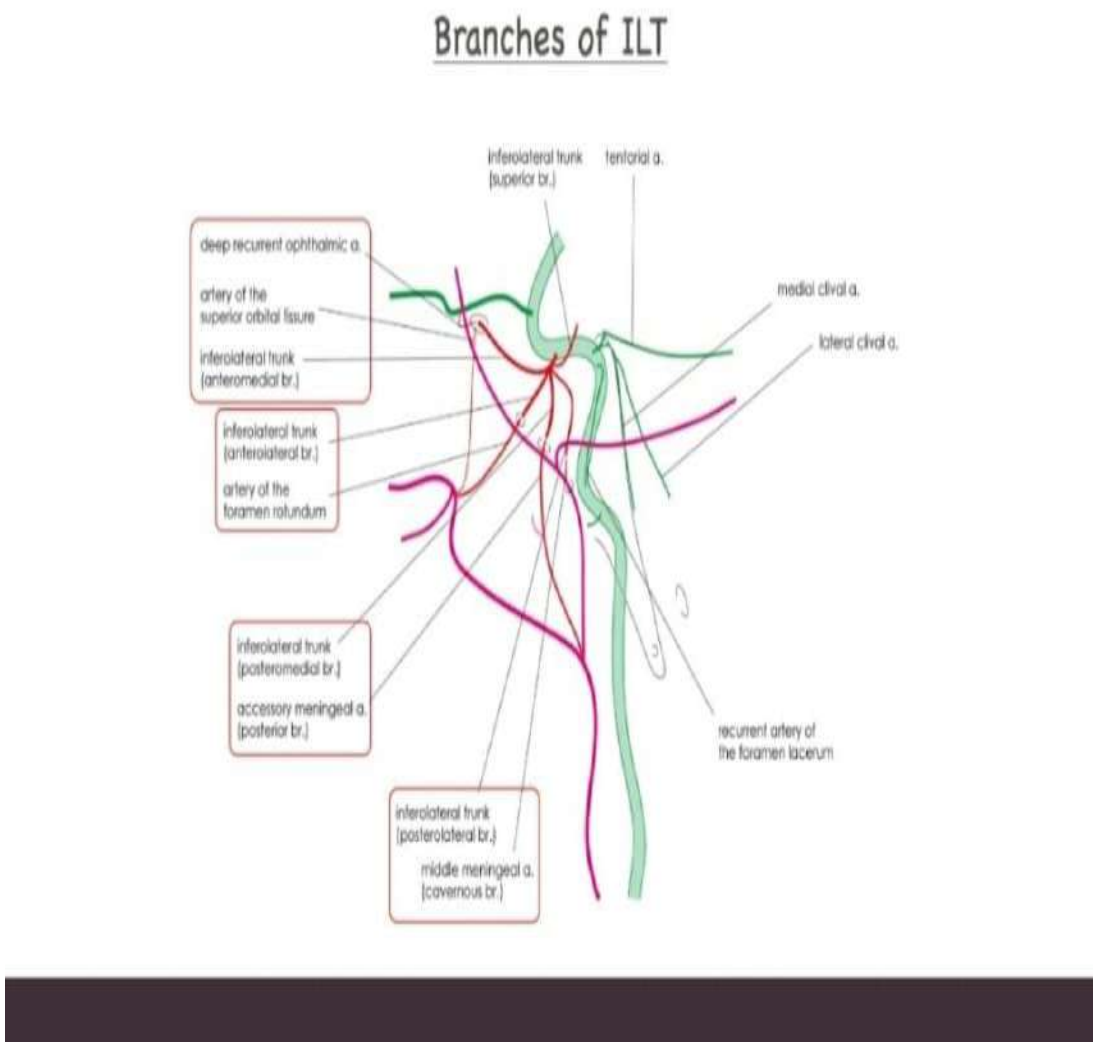
MHT

- Proksimal kavernöz ICA dan köken alır
- Bazen tek bir arter şeklinde bazen çoklu dallar şeklinde olabilir
- Posterior hipofiz, klivus, CN3,4,5,6, Tenterium serbelli ve durayı besler
- Patolojik durumlarda daha belirgin hala gelirler.



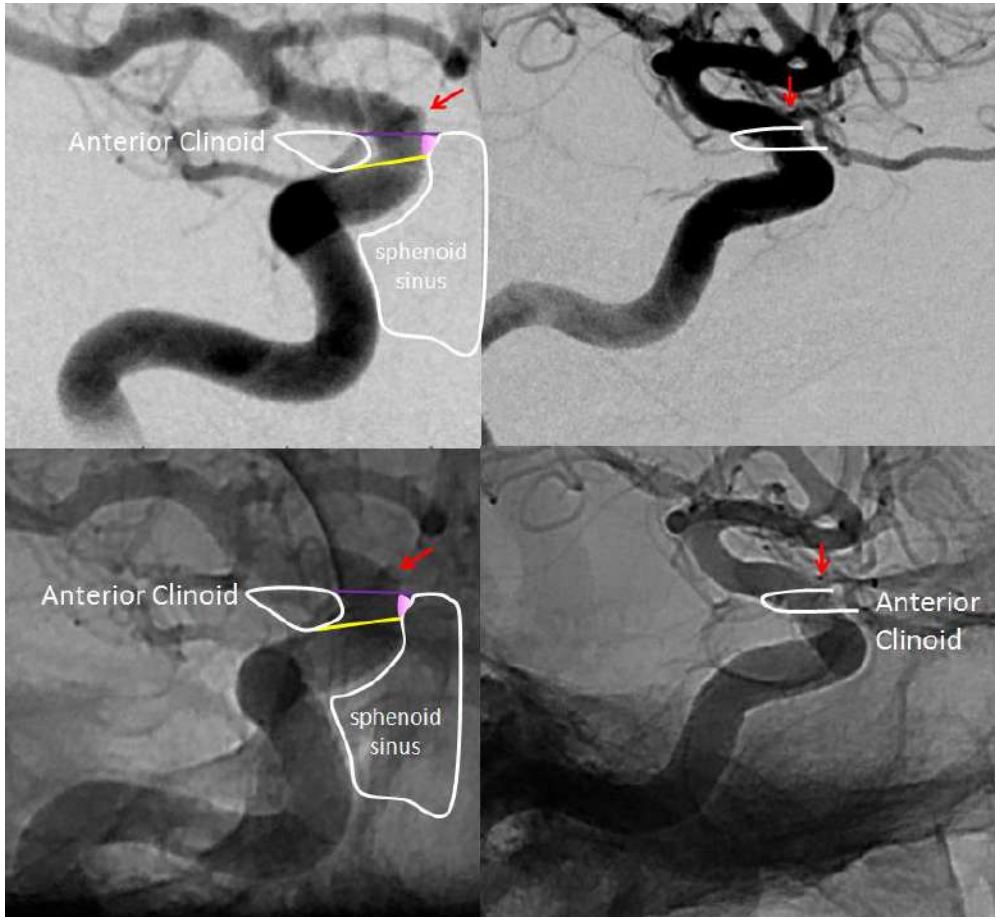
İnferiolateral trunk

- Orta kranial fossanın zeminin ve kavernöz sinüsteki kranial sinirleri besler
- Distal eksternal karotid arter ile yoğun anastomozları vardır. Özellikle MMA ve AMA

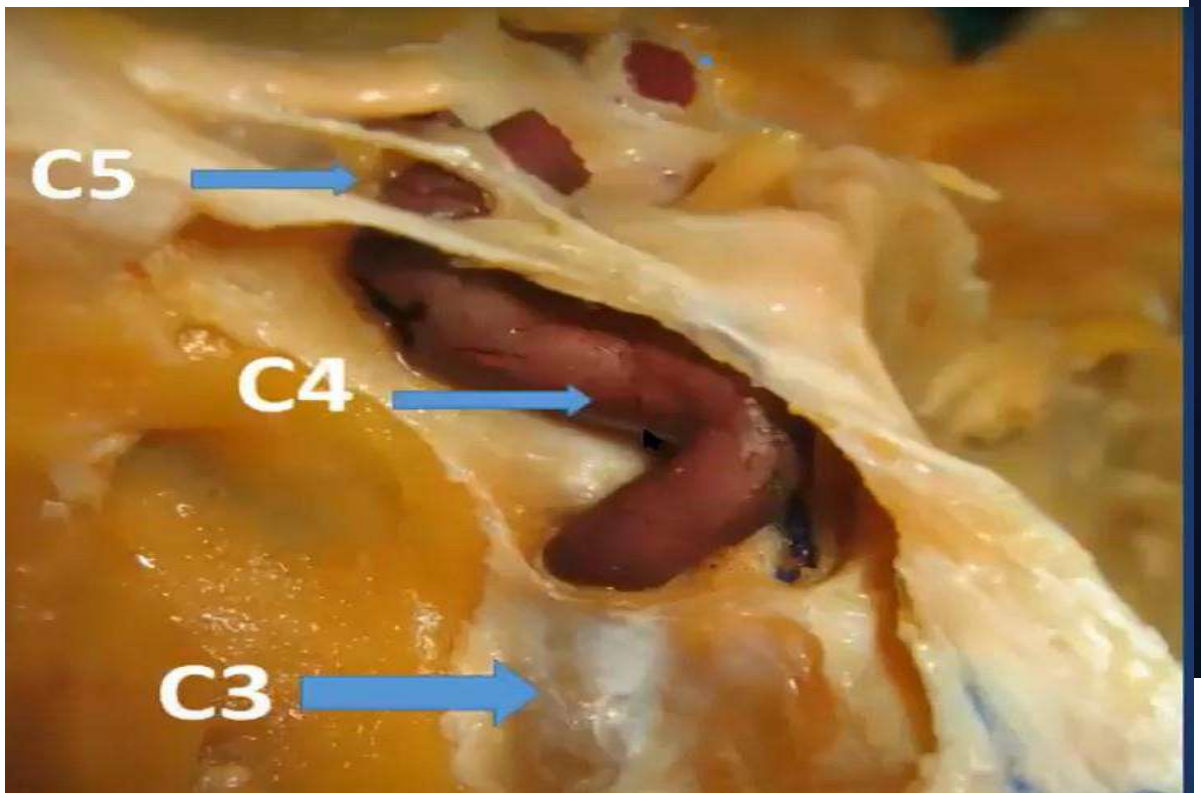


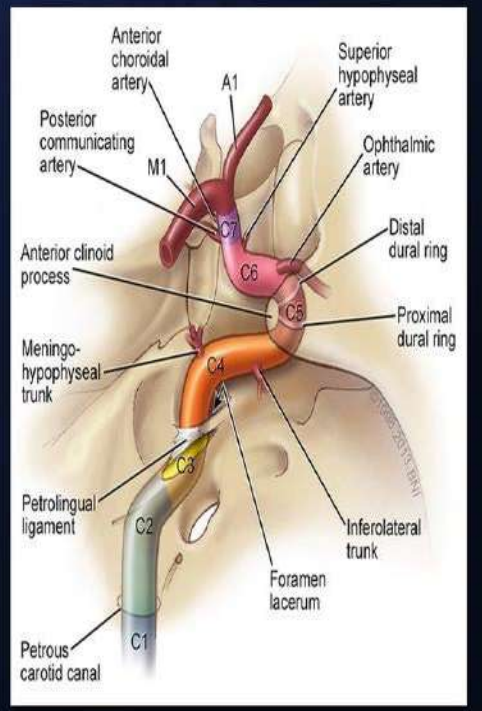
Klinoid segment

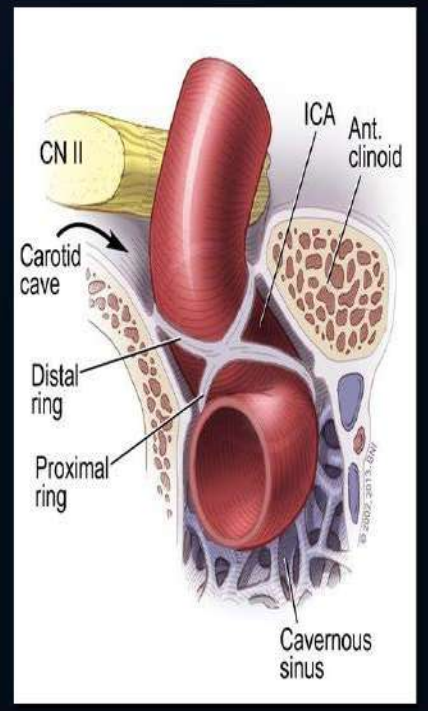
- Kavernöz segment ICA proksimal dural ringi geçtiği zaman sona erer ve distal dural ring ile arada kalan segmente klinoid segment denir, eksrakranielden intrakraniyel e geçiş zonudur.
- Anjiografik olarak ve herhangi bir radyolojik görüntüleme yöntemi ile kesin yeri gösterilemez, sadece cerrahi olarak bilinebilir

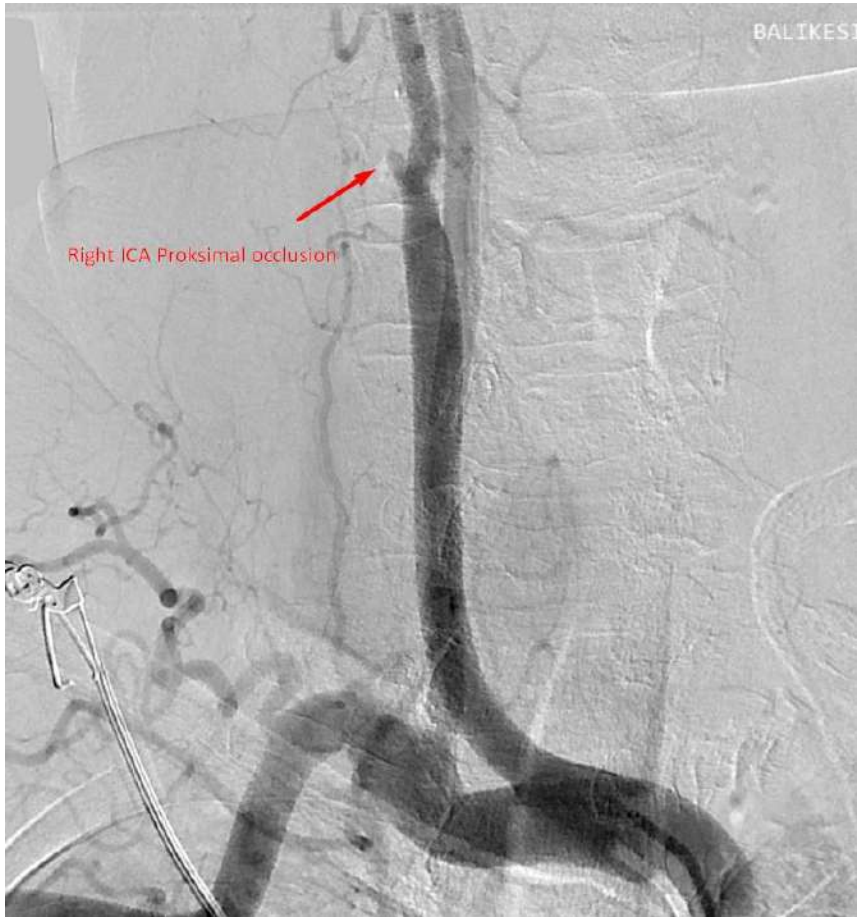


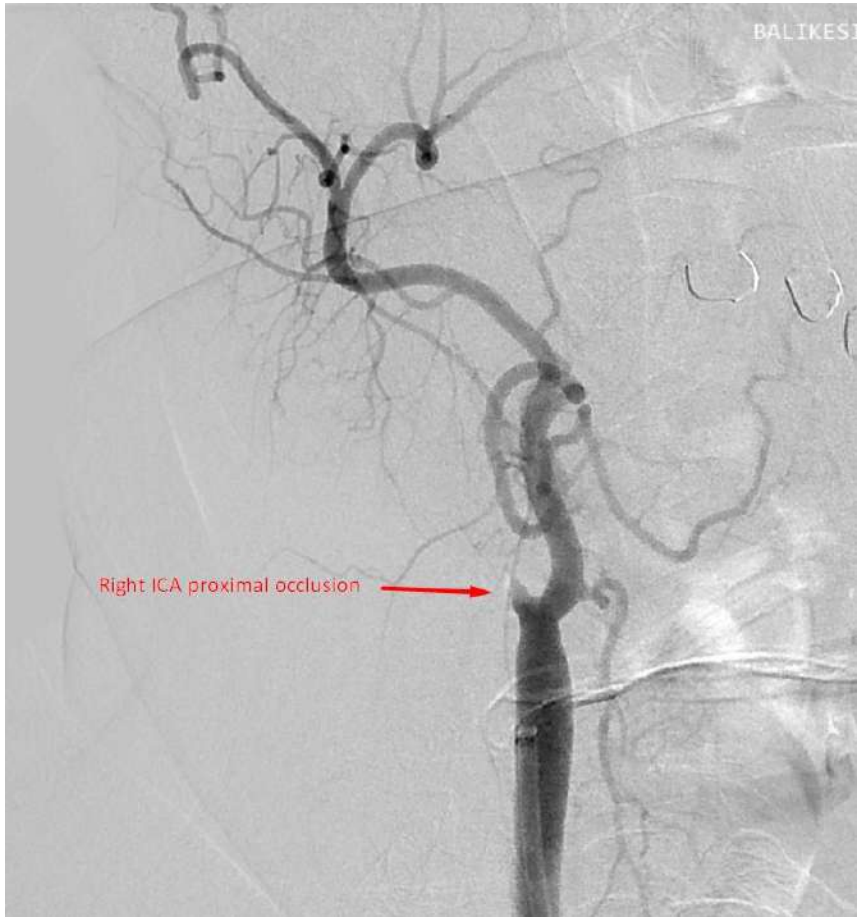
- Anjiografik olarak biz ICA ne zaman subaraknoid oluyor kesin olarak bilemeyiz.



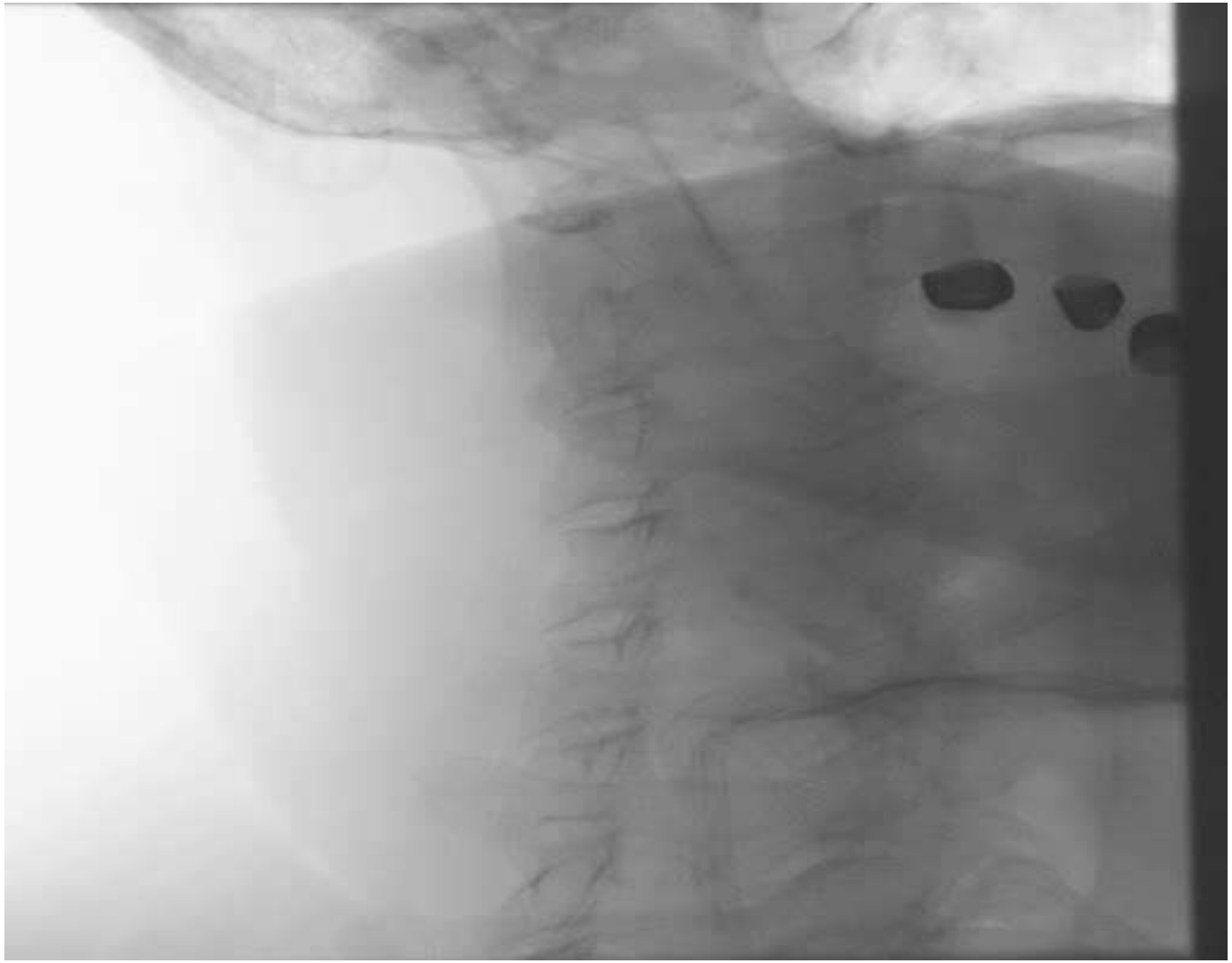


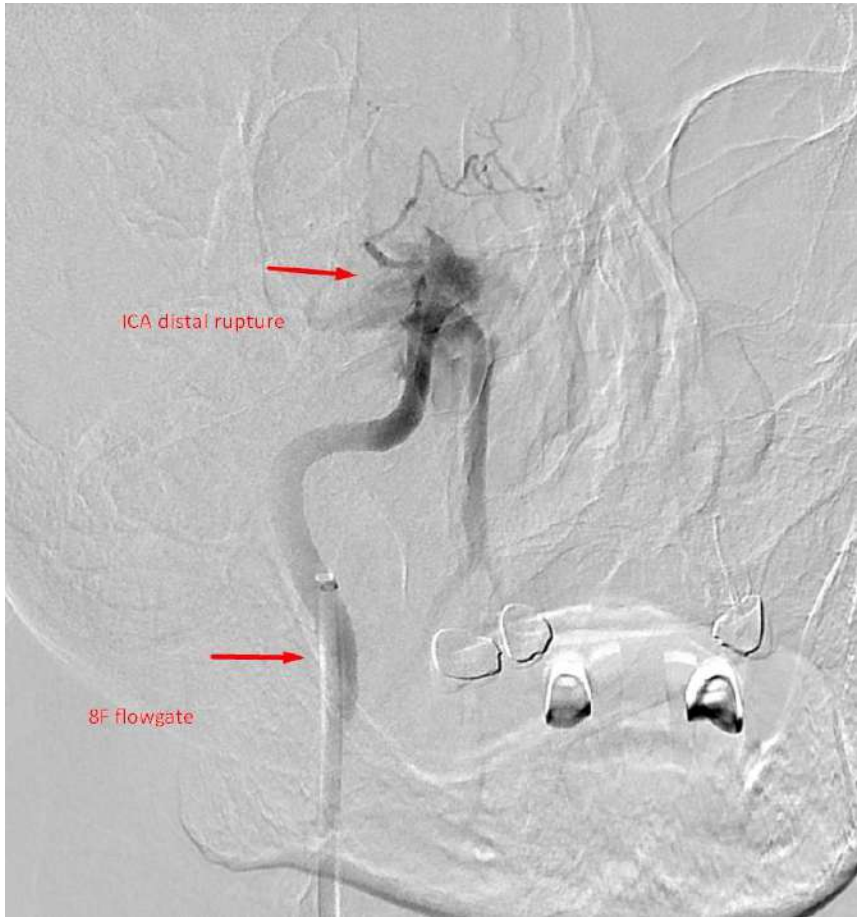


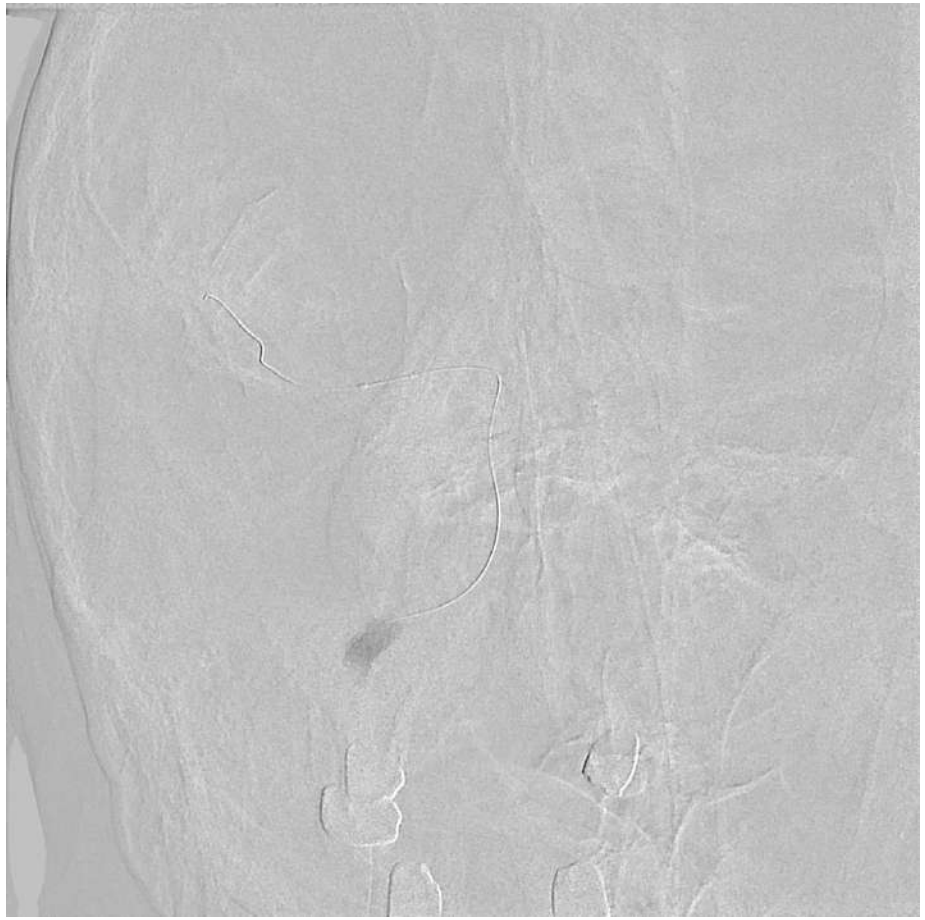

BALIKESI
Right ICA Proksimal occlusion


BALIKESI
Right ICA proximal occlusion

Dural ring kavramı ile tanışmam




ICA distal rupture
8F flowgate



Cardiovasc Intervent Radiol (2020) 43:1241–1243
https://doi.org/10.1007/s00270-020-02481-x

CIRSE

LETTER TO THE EDITOR

Remote Rupture of Intradural Carotid Artery During Mechanical Thrombectomy in a Carotid Tandem Occlusion

Elie Lteif[1] · Jean Darcourt[1,2] · Ivan Vukanisnovic[1] · Guillaume Bellanger[1] · Anne-Christine Januel[1] · Fabrice Bonneville[1,2] · Christophe Cognard[1,2]

Received: 1 December 2019 / Accepted: 4 April 2020 / Published online: 8 May 2020

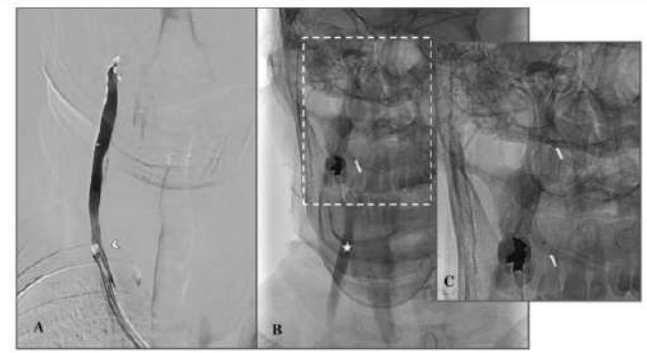


Fig. 1 Carotid bifurcation occlusion. **A** Digital subtraction angiography (DSA) in the CCA (arrow head) showing the carotid bifurcation occlusion (dash line). **B** Non-subtracted images showing the microcatheter markers (arrow) placed in the cervical ICA through the carotid occlusion better seen on the zoomed image (**C**). Contrast stagnation is visible in the cervical ICA due to the persistent occlusion of the ICA on both sides (arrow). *CCA* common carotid artery, *ICA* internal carotid artery

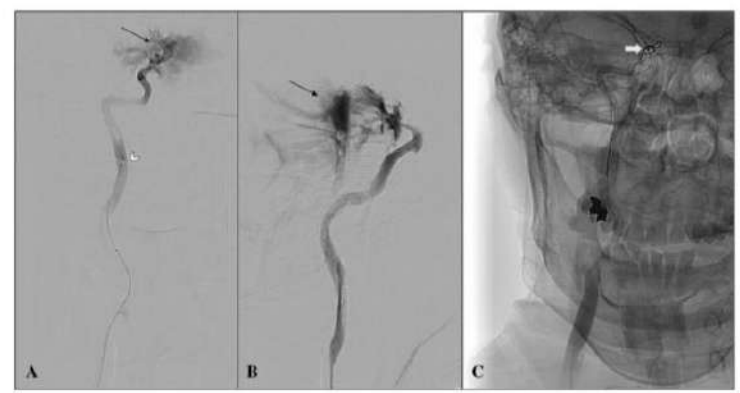
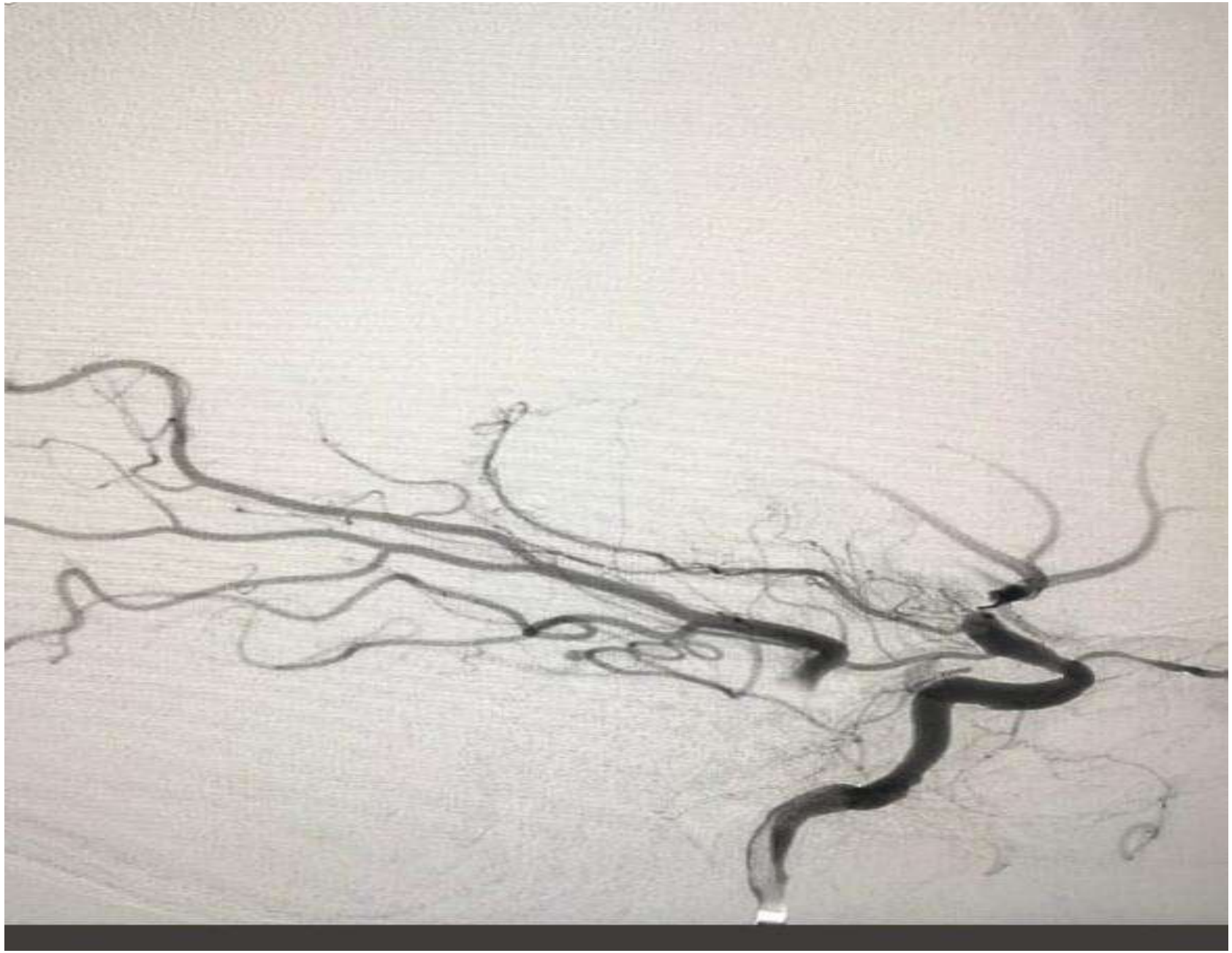


Fig. 2 Intradural ICA rupture. Digital subtraction angiography (DSA) by manual contrast injection of the cervical ICA through the microcatheter (arrow head) (antero-posterior (**A**) and lateral views (**B**)) shows a remote rupture of the intradural ICA (black arrow). A coil (white arrow) was used to control the bleed, but it was stripped and detached at the cervical occlusion (**C**). *CCA* common carotid artery, *ICA* internal carotid artery

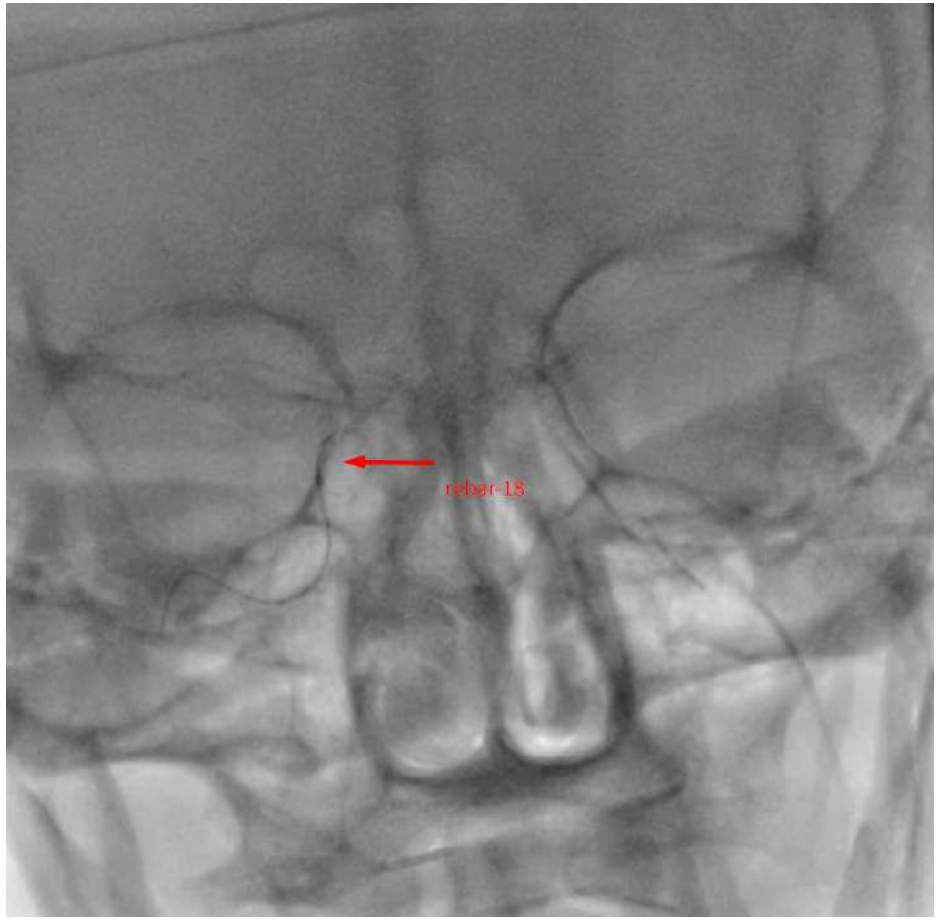
Oftalmik segment

- Oftalmik arter çıkışından Pcom çıkışına kadar olan kısımdır.
- Klasik olarak oftalmik arter distal dural ringten 1mm sonra çıkar ama her zaman böyle değildir.

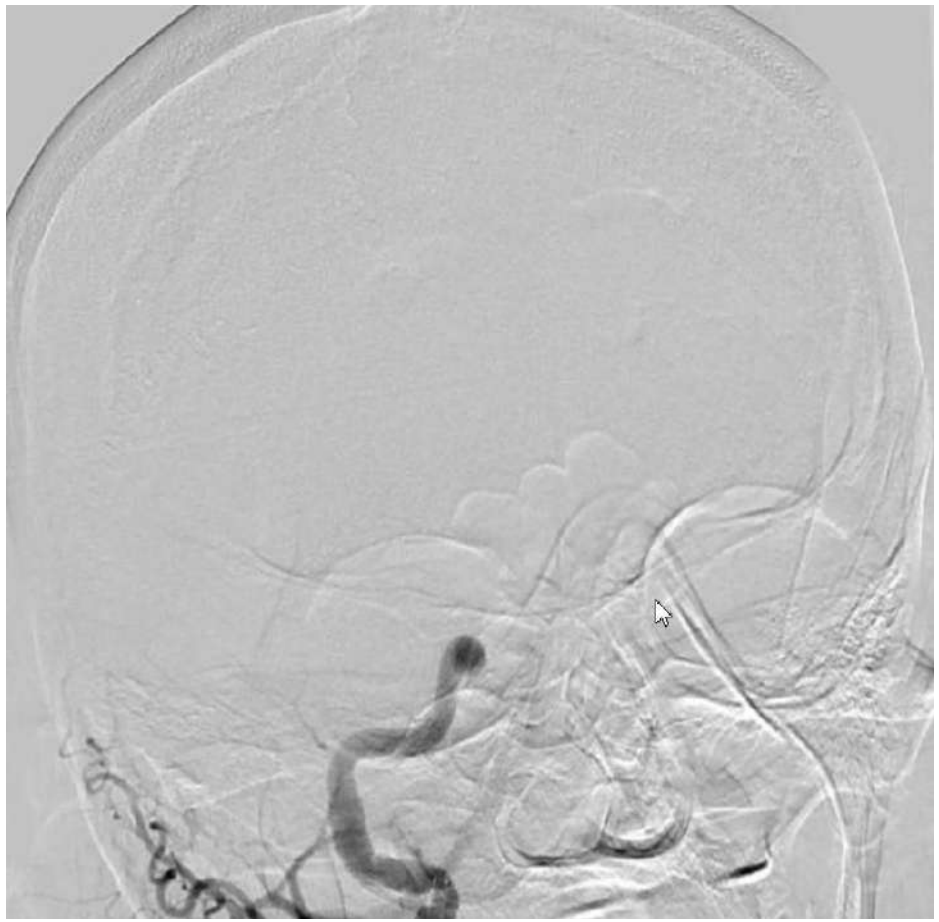


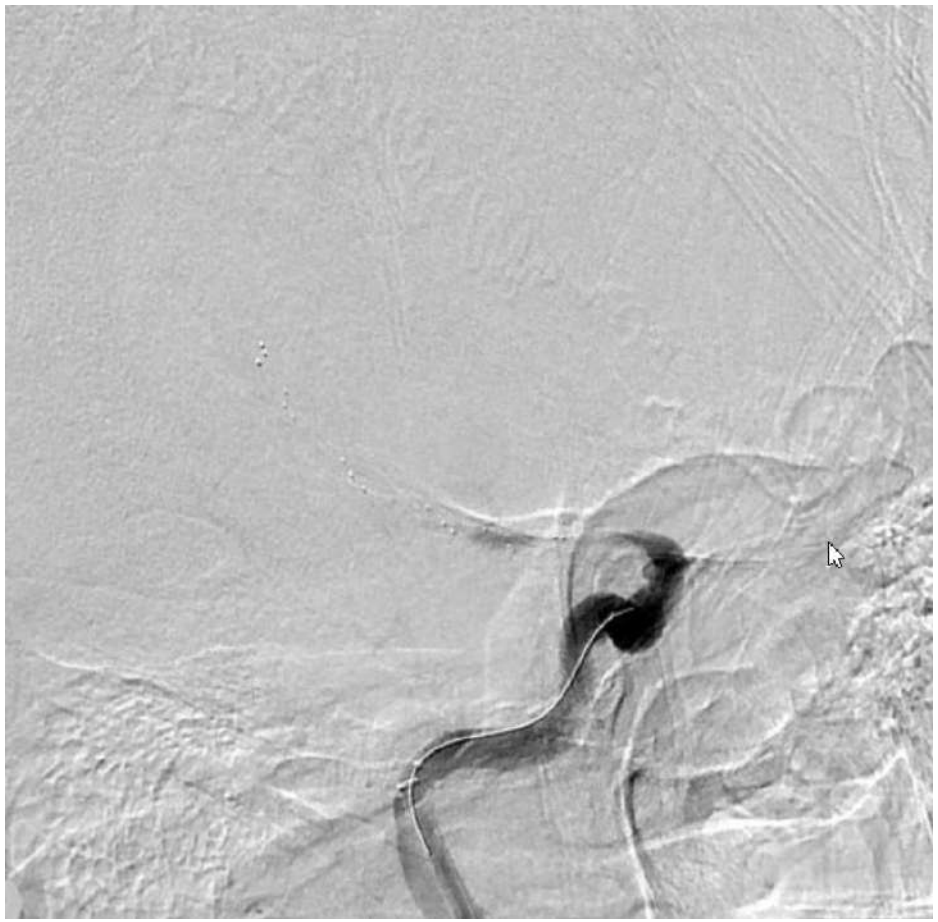

internal karotid arter


8F BGC

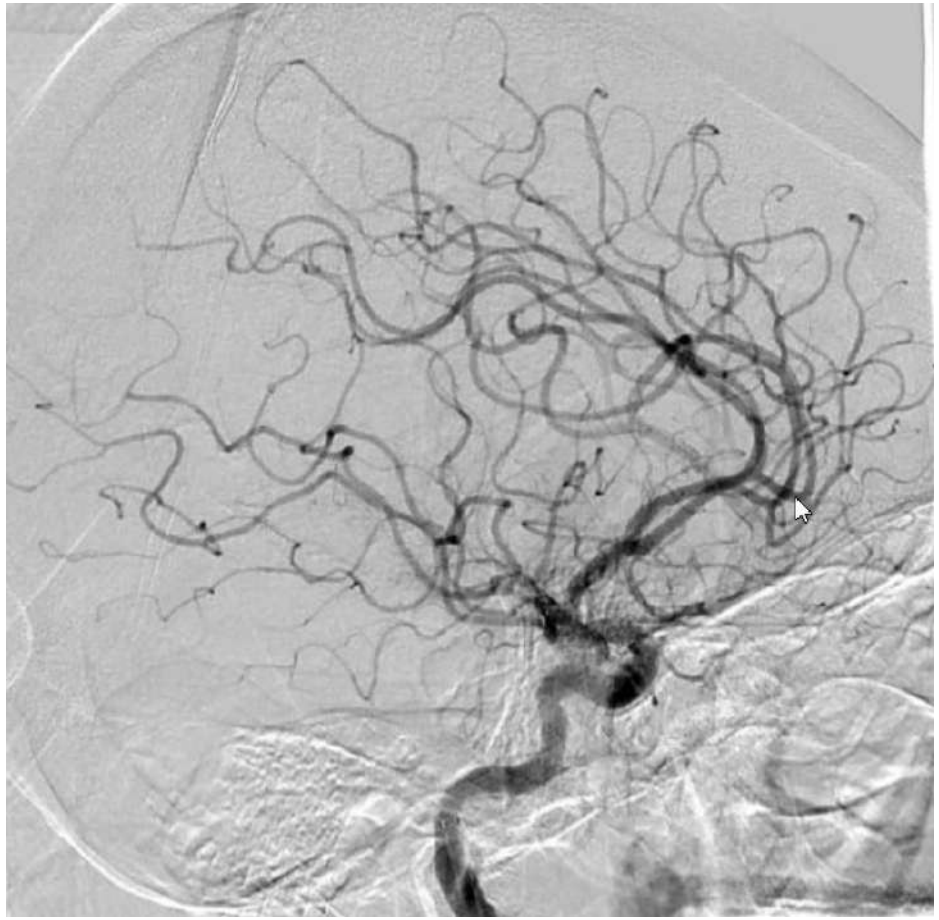

rebar 18


soliteire6*40

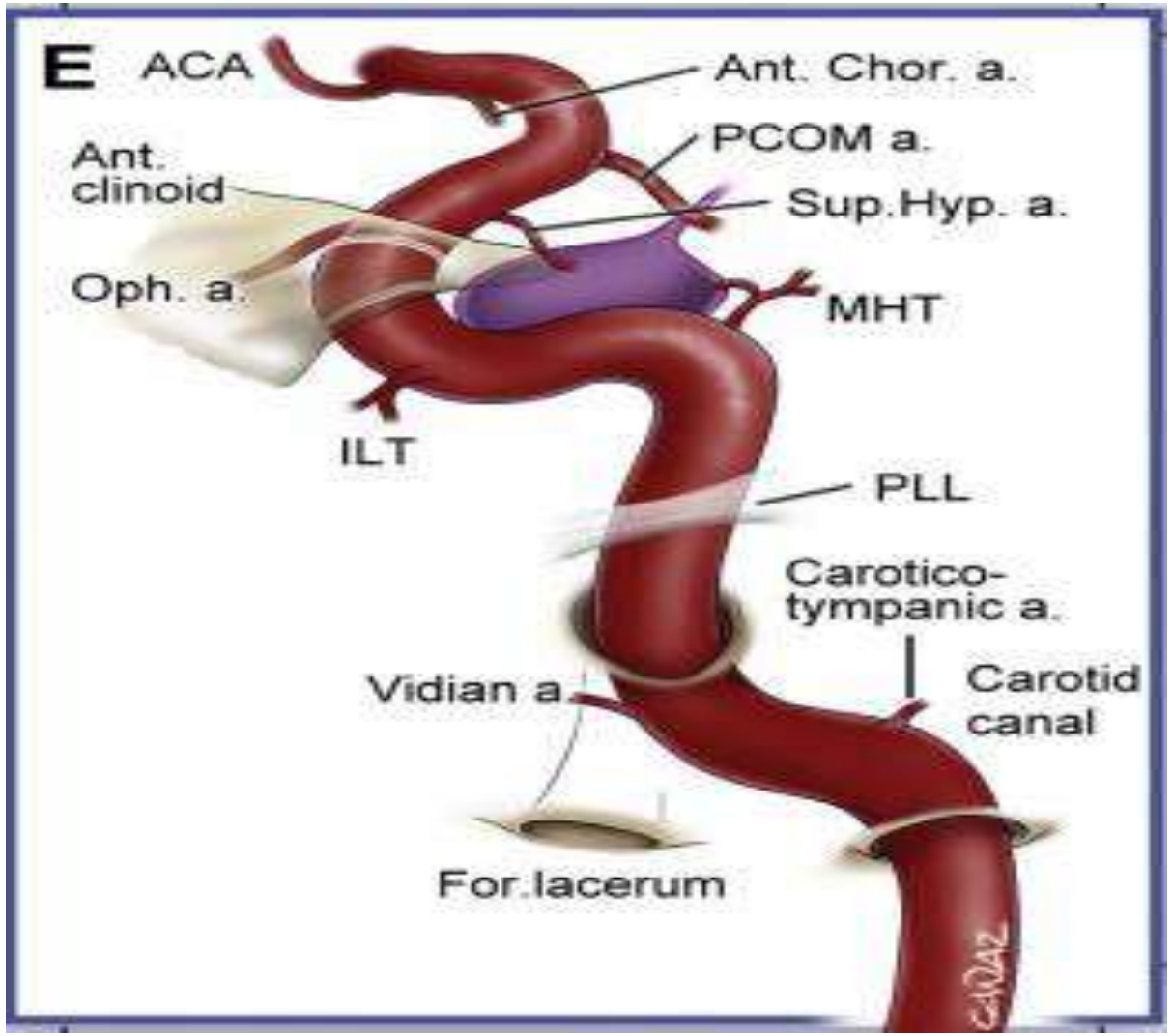


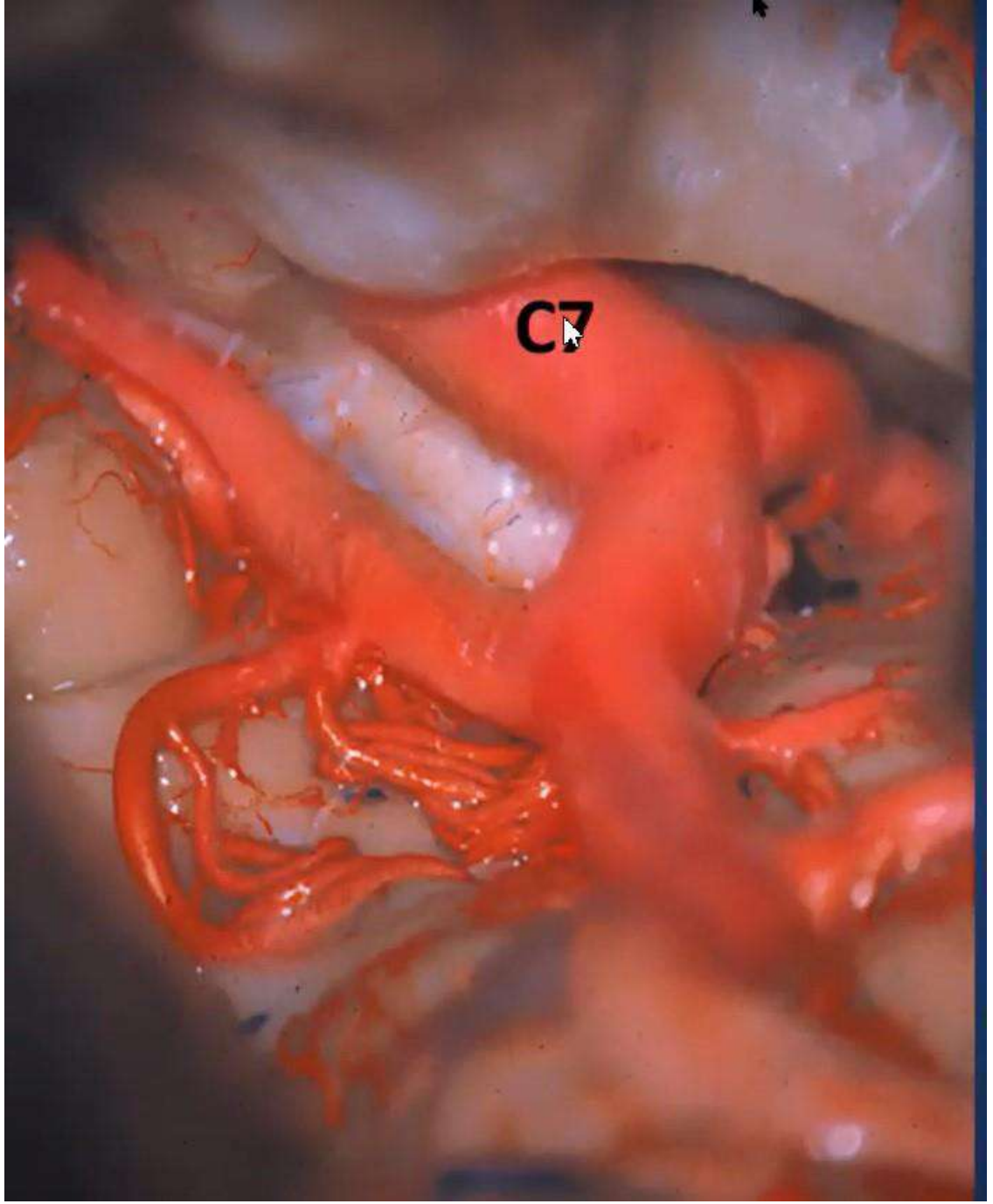


TICI-3
2. PASS



Özet


E
ACA
Ant. Chor. a.
PCOM a.
Ant. clinoid
Sup.Hyp. a.
Oph. a.
MHT
ILT
PLL
Carotico-tympanic a.
Vidian a
Carotid canal
For.lacerum


C7

NIHSS Düşük Serebral Ana Damar Oklüzyonlarında Ne Yapmalıyım?

Dr.Özlem Aykaç

22.05.2022

Nasıl tedavi edelim?

- 76 yaşında, sağ elli, kadın hasta
- Hafif hemiparezi ve afazi ile saat 14.00'de hastaneye getirildi
- Semptom başlangıcı 3 saat önce
- NIHSS 2
- Kontrastsız BT'de ASPECTS 10
- Başlangıç BT anjiyografisinde proksimal M1 oklüzyonu

▪ MRCLEAN		90 günlük mRS ↓	Fonksiyonel bağımsızlık yüksek *(%32.6-%19.1)*	İntrakranial kanama benzer	NNT :7.4
▪ ESCAPE		mRS ↓	Fonksiyonel Bağımsızlık yüksek *(%53/%29)*	İntrakranial kanama benzer *(%3.6/3.7)*	NNT:4
▪ SWIFT-PRIME		mRS ↓	Fonksiyonel Bağımsızlıkyüksek *(%60/%35)*	Mortalite ve intrakranial kanama aynı	NNT:4
▪ EXTEND-IA		mRS ↓	Fonksiyonel Bağımsızlık yüksek *(%71/%40)*	Mortalite aynı	NNT:3
▪ REVASCAT		mRS ↓	Fonksiyonel Bağımsızlık yüksek (%44/%28)	Mortalite ve kanama aynı	NNT:4

iv. rtPA, endikasyonu olan hastalara uygulanmalıdır

Sınıf 1; Kanıt A

Endovasküler tedavi için IV rt-PA klinik cevabı beklemek gereksizdir

Sınıf 1 ; Kanıt B

Endovasküler tedavi bütün kriterleri dolduruyorsa uygulanmalıdır

Sınıf 1; Kanıt A

1. ***Öncesi mRS 0-1***
2. ***İlk 4.5 saat içinde IV rtPA***
3. ***IKA veya M1 oklüzyonu***
4. ***Yaş ≧18***
5. ***NIHSS≧6***
6. ***ASPECT ≧6***

NIHSS

1a- Bilinç Düzeyi	Uyanık	0
	Hafif uyarıya hemen cevap veriyor	1
	Israrlı veya güçlü veya ağrılı uyarana cevap veriyor	2
	Cevapsız veya sadece refleks cevabı var	3
1b- Bilinç Düzeyi Soruları (Kaç yaşındasın ?, hangi aydayız ?)	İki soruya doğru cevap	0
	Bir soruya doğru cevap (veya entübe, dizatri, dilimizi bilmiyor)	1
	İki soruya yanlış cevap, afazik veya koma	2
1c- Bilinç Düzeyi Emirleri (Gözlerini aç kapa, sağlam eli aç kapa)	İkisini de yapıyor	0
	Birisini yapıyor	1
	Hiçbirisini yapamıyor	2
2- Bakış	Normal	0
	Parsiyel bakış parezisi, bir veya iki gözde bakış parezisi	1
	Gözlerde zorlu deviasyon, total parezi (okülosefalik refleks ile düzelme yok)	2
3- Görme Alanı	Vizüel kayıp yok	0
	Parsiyel hemianopsi	1
	Komplet hemianopsi	2
	Bilateral hemianopsi veya körlük (kortikal körlük dahil)	3
4- Fasiyal Parezi (Bilinç kapalı ise ağrılı uyarana grimas)	Yok, simetrik hareket ediyor	0
	Hafif parezi, nazolabial oluk silik, asimetrik gülümseme	1
	Alt yüz parsiyel parezi (tam/tama yakın)	2
	Yüzün üst ve altında tek taraflı tam parezi veya çift taraflı veya koma	3
5- Motor (Kollar) Oturarak 90°, yatarak 45° (10 sn. havada tutulur) 5a: Motor sol kol 5b: Motor sağ kol	Normal	0
	Tutuyor ama tam değil (düşse de yatağa çarpmaz	1
	Yerçekimine direnemiyor (yatağa düşer ve çarpar)	2
	Minimal hareket var	3
	Hiç hareket yok	4
	Ampute	X

6- Motor (Bacaklar) Yatarak 30°'de 5 saniye havada tutulur 6a: Motor sol bacak 6b: Motor sağ bacak	Normal	0
	Tutuyor ama tam değil (düşse de yatağa çarpmaz	1
	Yerçekimine direnemiyor (yatağa düşer ve çarpar)	2
	Minimal hareket var	3
	Hiç hareket yok	4
	Ampute	X
7- Ataksi	Yok	0
	Tek ekstremitede var	1
	Üst ve alt ekstremitede var	2
	Değerlendirilemiyor	X
8-Duyu	Normal	0
	Hafif-orta şiddette tek taraflı kayıp ama hasta dokunuşu hissediyor veya afazik veya uyanıklık bozukluğu	1
	Tek taraflı tam kayıp (hasta dokunuşu bile algılamıyor) veya iki taraflı duyu kaybı veya yanıt vermiyor veya kuadriplejik veya 1a=3	2
9- Konuşma	Normal	0
	Hafif-orta şiddette afazi (zor ama kısmen bilgi alışverişi var)	1
	Ağır afazi (hiç bilgi alış verişi yok)	2
	Sözel ifade ve anlama yok veya komada	3
10- Dizartri	Yok	0
	Hafif-orta şiddette dizartri, anlaşılıyor	1
	Anlaşılmaz artikülasyon, anartri veya mutizm	2
11- İhmal	Yok, değerlendirilemedi (görme kaybı varsa duysal söndürme olmamalı)	0
	Tek modalitede söndürme	1
	Birden fazla modalitede ihmal	2

Review > Stroke. 2017 Feb;48(2):513-519. doi: 10.1161/STROKEAHA.116.015434.
Epub 2017 Jan 11.

Using the National Institutes of Health Stroke Scale: A Cautionary Tale

Patrick Lyden [1]

Affiliations + expand

PMID: 28077454 DOI: 10.1161/STROKEAHA.116.015434

AHA/ASA Guideline

Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

2.1. Stroke Scales

2.1. Stroke Scales	COR	LOE
1. The use of a stroke severity rating scale, preferably the NIHSS, is recommended.	I	B-NR

Published in final edited form as:
Stroke. 2009 September ; 40(9): 2988–2993. doi:10.1161/STROKEAHA.109.555664.

NIHSS Score Is Poorly Predictive of Proximal Occlusion in Acute Cerebral Ischemia

Matthew B. Maas, MD[1], Karen L. Furie, MD, MPH[1], Michael H. Lev, MD[2], Hakan Ay, MD[2], Aneesh B. Singhal, MD[1], David M. Greer, MD, MA[1], Gordon J. Harris, PhD[2], Elkan Halpern, PhD[2], Walter J. Koroshetz, MD[3], and Wade S. Smith, MD, PhD[4]

NIHSS skorları ≥ 10

- Pozitif prediktif değer %81
- Sensitivite %48

Minör inme

Published in final edited form as:
Arch Phys Med Rehabil. 2020 July ; 101(7): 1243–1259. doi:10.1016/j.apmr.2019.12.013.

Inconsistent Classification of Mild Stroke and Implications on Health Services Delivery.

Pamela S. Roberts, PhD, OTR/L, SCFES, FAOTA, CPHQ, FNAP, FACRM[1,‡], Shilpa Krishnan, PT, PhD[2], Suzanne Burns, PhD, OTR[3], Debra Ouellette, MS, OTR/L, SCLV, BCPR[4], Monique R. Pappadis, MEd, PhD[5]

AHA/ASA Guideline

Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

Hafif inme semptomları: NIHSS 0–5

iv. rtPA, endikasyonu olan hastalara uygulanmalıdır

Sınıf 1; Kanıt A

Endovasküler tedavi için IV rt-PA klinik cevabı beklemek gereksizdir

Sınıf 1 ; Kanıt B

Endovasküler tedavi bütün kriterleri dolduruyorsa uygulanmalıdır

Sınıf 1; Kanıt A

1. ***Öncesi mRS 0-1***
2. ***İlk 4.5 saat içinde IV rtPA***
3. ***IKA veya M1 oklüzyonu***
4. ***Yaş ≧18***
5. ***NIHSS≧6***
6. ***ASPECT ≧6***

Minör iskemik inme

- Tüm iskemik inme hastalarının %50'si
- Tüm akut proksimal arter oklüzyonu hastalarının %30'u

Dhamoon MS, Moon YP, Paik MC, Boden-Albala B, Rundek T, Sacco RL, et al. Long-term functional recovery after first ischemic stroke: the Northern Manhattan Study. Stroke 2009;40:2805-2811.

- Proksimal arter oklüzyonu olan akut inme hastaları, her zaman yüksek NIHSS değerlerine sahip değildir
- Bu hastaların %20-40'ı klinik takiplerinde kötüleşir

- Altta yatan büyük damar oklüzyonu olan hastalarda nörolojik kötüleşmenin nedenleri heterojendir
- Bu hastaların yönetimi için dikkatli gözlem ve ayrıntılı değerlendirme gereklidir

Vasküler görüntüleme

AHA/ASA Guideline

Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

3. In patients with suspected intracranial LVO and no history of renal impairment, who otherwise meet criteria for mechanical thrombectomy, it is reasonable to proceed with CTA if indicated before obtaining a serum creatinine concentration.	IIa	B-NR	New recommendation.

OPEN ACCESS Freely available online

PLOS ONE

Proximal Arterial Occlusion in Acute Ischemic Stroke with Low NIHSS Scores Should Not Be Considered as Mild Stroke

Joon-Tae Kim[1,2*], Man-Seok Park[1*], Jane Chang[1], Ji Sung Lee[3], Kang-Ho Choi[1], Ki-Hyun Cho[1]

1 Department of Neurology, Cerebrovascular Center, Chonnam National University Hospital, Gwangju, Korea, 2 Research Institute of Medical Sciences, Chonnam National University Medical School, Gwangju, Korea, 3 Biostatistical Consulting Unit, Soonchunhyang University Medical Center, Seoul, Korea

- 378 hasta
- Arter tıkanıklığı olan 119 hastanın
- 20'sinde (% 17.9) şiddetli erken nörolojik kötüleşme
- 26'sında (% 24.5) erken nörolojik kötüleşme

Düşük NIHSS de büyük damar oklüzyonu erken kötüleşmenin bir belirteci

- Akut iskemik inme nedeniyle acil servise başvuran, ilk 6-8 saatteki her olguda vasküler yapılar noninvaziv görüntüleme yöntemleriyle değerlendirilmeli

- Proksimal damar oklüzyonu varlığında NIHSS değeri düşük olsa bile potansiyel kötüleşme riski nedeniyle uygun hastalara endovasküler tedavi yapılmalı

Journal of Cerebral Blood Flow & Metabolism (2013) 33, 1168–1172

www.jcbfm.com

ORIGINAL ARTICLE

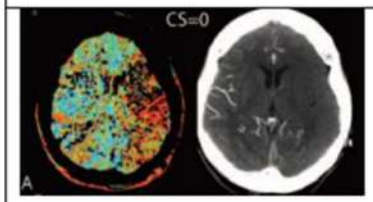
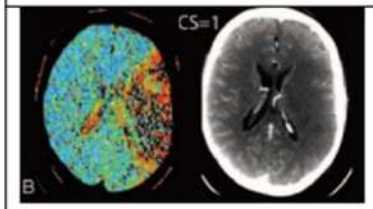
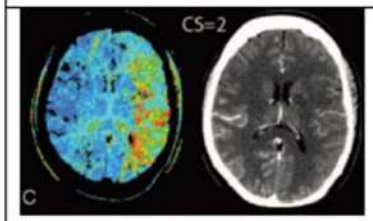
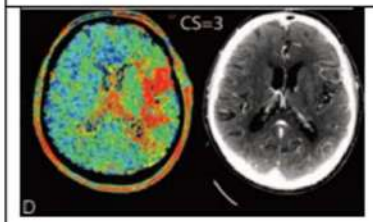
Failure of collateral blood flow is associated with infarct growth in ischemic stroke

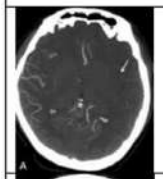
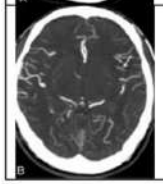
Bruce CV Campbell[1,2], Søren Christensen[2], Brian M Tress[2], Leonid Churilov[3], Patricia M Desmond[2], Mark W Parsons[4], P Alan Barber[4], Christopher R Levi[3], Christopher Bladin[5], Geoffrey A Donnan[6] and Stephen M Davis[1] for the EPITHET Investigators

- Kollateral durum
- Penumbra boyutu

- Proksimal arter oklüzyonu olan hastalarda NIHSS değerinin düşük olması kan basıncı değişikliği, kollateral durum ve klinik semptomlar arasındaki kompleks ilişki ile açıklanabilir
- Akut dönemde kollateral akım iyi olsa bile zamanla azalır
- Bu grup, reperfüzyon tedavileri için ideal bir hedeftir

TAN KOLLATERAL SKORU

BT-A GÖRÜNTÜSÜ	AÇIKLAMA Kollateral akım	PUAN
	%0	0
	% 1-50	1
	% 51-99	2
	% 100	3

Modifiye TAN			
BT-A GÖRÜNTÜSÜ		AÇIKLAMA Kollateral akım	PUAN
		% 0-50	0
		% 51-100	1

J Stroke Cerebrovasc Dis. 2019 Jul;28(7):1987-1992. doi: 10.1016/j.jstrokecerebrovasdis.2019.03.032. Epub 2019 Apr 26.

Absence of Collaterals is Associated with Larger Infarct Volume and Worse Outcome in Patients with Large Vessel Occlusion and Mild Symptoms

Eric R Kimmel [1], Sami Al Kasab [1], Jillian B Harvey [2], Girish Bathla [3], Santiago Ortega-Gutierrez [1], Gabor Toth [4], Emily M Jaksich [1], Ali Sheharyar [5], Jorge Roa [1], David M Hasan [6], Edgar A Samaniego [7]

- 41 hasta
  MCA 26
  İnternal karotid arter 14
  Anterior serebral arter 1

- Kollateral skoru ile nihai enfarktüs hacmi arasında negatif bir ilişki
- (−.3134, $P = .046$).

Vasküler görüntüleme yapamıyorsak...

- NIHSS düşük olan hastaların ayağa kaldırılmasıyla tekrarlanan nörolojik muayene, kollateral durumun değerlendirilmesinde ipucu verebilir
- Ortostazla kötüleşen nörolojik muayene kötü kollateral dolaşımı işaret edebilir
- Ancak, verilerimiz yoruma izin vermek için çok sınırlıdır.

Haussen DC, et al. Too good to intervene? Thrombectomy for large vessel occlusion strokes with minimal symptoms: an intentionto-treat analysis. Journal of neurointerventional surgery. 2017;9(10):917-21.

Open Access Original article

SVN Stroke and Vascular Neurology

Mechanical thrombectomy in patients with M1 occlusion and NIHSS score ≤5: a single-centre experience

P Bhogal,[1] P Bücke,[2] O Ganslandt,[3] H Bäzner,[2] H Henkes,[1,4] M Aguilar Pérez[1]

- NIHSS 0-5 arasında olan 41 hastanın incelendiği retrospektif bir çalışma
- Semptomatik kanama oranı %4.8 iken 90 günde iyi klinik sonuç oranı %75
- Trombektominin teknik olarak mümkün ve güvenlik profilinin yüksek

J Neurol. 2020 Jun;267(6):1651-1662. doi: 10.1007/s00415-020-09744-0. Epub 2020 Feb 15.

Outcome of patients with large vessel occlusion in the anterior circulation and low NIHSS score

Mirjam R Heldner [1], Panagiotis Chaloulos-Iakovidis [2], Leonidas Panos [2], Bastian Volbers [2], Johannes Kaesmacher [3 4], Tomas Dobrocky [3], Pasquale Mordasini [3], Marwan El-Koussy [3], Jan Gralla [3], Marcel Arnold [2], Urs Fischer [2], Heinrich P Mattle [2], Simon Jung [2]

- Anterior sirkülasyonda düşük NIHSS skoru ve büyük damar oklüzyonu olan hastalarda primer IVT ve/veya EVT'nin, konservatif tedaviden daha iyi
- Birincil EVT, ikincil EVT'den daha iyi.

Türk Beyin Damar Hastalıkları Dergisi 2018; 24 (2): 67-70
doi: 10.5505/tbdhd.2018.24483

Turkish Journal of Cerebrovascular Diseases 2018; 24 (2): 67-70

ARAŞTIRMA YAZISI **ORIGINAL ARTICLE**

BÜYÜK DAMAR OKLÜZYONU OLAN MİNÖR İNMELERDE (NIHSS <6) MEKANİK TROMBEKTOMİ

Çetin Kürşad AKPINAR*, Erdem GÜRKAŞ, Emrah AYTAÇ***, Murat ÇALIK***

***Samsun Eğitim ve Araştırma Hastanesi, Nöroloji Kliniği, SAMSUN**
****Gülhane Eğitim ve Araştırma Hastanesi, Nöroloji Kliniği, ANKARA**
*****Fırat Üniversitesi Tıp Fakültesi, Nöroloji Anabilim Dalı, ELAZIĞ**

ÖZET

GİRİŞ ve AMAÇ: Büyük damar oklüzyonu %30 varan oranda minör inme kliniği ile başvurabilir. Büyük damar oklüzyonu olan minör inmelerde National Institute of Health Stroke Scale (NIHSS<6) mekanik trombektominin etkinliği yapılan çalışmalarda gösterilsede, bu konu ile ilgili bir randomize klinik çalışma yoktur.
GEREÇ ve YÖNTEM: Minör inme kliniği (NIHSS<6) ile başvuran ve beyin-boyun tomografi anjiografi tetkikinde büyük damar oklüzyonu saptanan 8 hasta (3'ü kadın, 5'i erkek) çalışmaya dahil edildi. Trombolitik tedavi ilk 4.5 saat içerisinde başvuran 5 olguya verildi. Ardışık olarak ilk 3 hastaya geç dönemde, sonraki 5 hastaya ise erken dönemde (ilk 6 saat), mekanik trombektomi uygulandı. Başarılı damar rekanalizasyonu modified treatment in cerebral ischemia (mTICI) 2b-3 olarak ve klinik sonlanım 90. günde değerlendirildi.
BULGULAR: Yaşları 40 ile 81 arasında değişen 8 olgu çalışmaya dahil edildi. Tüm olgularda başarılı rekanalizasyon (mTICI 2b-3) sağlandı. Üç olguya sadece intravenöz trombolitik tedavi verildi. Bu olgularda takip sonrası klinik progresyon (NIHSS>6) gelişti ve mekanik trombektomi yapıldı. Geç dönemde trombektomi yapılan bir olgunun 90. gündeki mRS değeri 2 diğer iki olgunun ise sırasıyla 4 ve 5 idi. Erken dönemde mekanik tromimbektomi yapılan 5 olgunun da 90. gündeki modified Rankin Scale (mRS) değeri 0-2 idi.
TARTIŞMA ve SONUÇ: Çalışmamız az sayıda hasta içermesine rağmen literatürdeki çalışmalarla uyumlu olarak minör inmeli bu olgularda erken dönemde mekanik trombektomi yapılmasının daha iyi klinik sonlanım ile seyrettiğini desteklemektedir.

ORIGINAL RESEARCH
INTERVENTIONAL

Mechanical Thrombectomy in Patients with Acute Ischemic Stroke and Lower NIHSS Scores: Recanalization Rates, Periprocedural Complications, and Clinical Outcome

J. Pfaff, C. Herweh, M. Pham, S. Schönenberger, S. Nagel, P.A. Ringleb, M. Bendszus, and M. Möhlenbruch

- NIHSS değeri 8'in altında ve MCA M1 oklüzyonu olan 33 akut inme hastasına mekanik trombektomi yapıldı
- %63.6 hastanın 3. ay mRS 0-2 arasında
- Semptomatik kanama oranları ise %6'dır

Cerebrovascular disease
Research paper

Outcome of patients with occlusions of the internal carotid artery or the main stem of the middle cerebral artery with NIHSS score of less than 5: comparison between thrombolysed and non-thrombolysed patients

Mirjam R Heldner [1], Simon Jung [1, 2], Christoph Zubler [2], Pasquale Mordasini [2], Anja Weck [1], Marie-Luise Mono [1], Christoph Ozdoba [2], Marwan El-Koussy [2], Heinrich P Mattle [1], Gerhard Schroth [2], Jan Gralla [2], Marcel Arnold [1], Urs Fischer [1]

Correspondence to Professor Jan Gralla, Department of Diagnostic and Interventional Neuroradiology, Inselspital, University Hospital Bern and University of Bern, Freiburgstrasse 10, CH-3010 Bern, Switzerland jan.gralla@insel.ch

- Proksimal damar oklüzyonu olup NIHSS<5 olan intravenöz trombolitik tedavi, endovasküler tedavi veya her ikisiyle birlikte tedavi edilen 41 hasta ve tedavi edilmeyen 47 hasta
- 3 ayda daha iyi klinik sonlanım

Journal of Stroke and Cerebrovascular Diseases
Volume 31, Issue 3, March 2022, 106282

Mechanical Thrombectomy in Patients Presenting with NIHSS Score <6: A Safety and Efficacy Analysis

Rawad Abbas MD [a], Nabeel A. Herial MD, MPH [a], Kareem El Naamani MD [a], Ahmad Sweid MD [a], Joshua H. Weinberg MD [b], Karl John Habashy BS [c], Stavropoula Tjoumakaris MD [a], Michael R. Gooch MD [a], Robert H. Rosenwasser MD, MBA [a], Pascal Jabbour MD [a]

Show more

Table 1. *Demographics and baseline characteristics.*

	Mechanical thrombectomy(n=41)	Medical management(n=42)	*P*-value
Age	66.12 ± 15.37	59.6 ± 16.19	0.063
Male gender	25 (61%)	22 (52.4%)	0.43
Ischemic stroke	7 (17.1%)	6 (14.3%)	0.73
CAD	13 (31.7%)	9 (21.4%)	0.29
hypertension	27 (65.9%)	25 (59.5%)	0.55
DM	13 (31.7%)	7 (16.7%)	0.11
Atrial fibrillation	8 (19.5%)	9 (21.4%)	0.83
Smoking	8 (19.5%)	15 (35.7%)	0.099

Table 2. *Stroke characteristics and outcomes.*

	Mechanical thrombectomy (n=41)	**Medical management (n=42)**	***P*-value**
Infarct Location			
Left	15 (36.6%)	21 (50%)	0.13
Right	26 (63.4%)	19 (45.2%)	
Bilateral	0 (0%)	2 (4.8%)	
Vessel Occlusion			
ICA	**15 (36.6%)**	**4 (9.5%)**	**0.003**
M1/A1	**26 (63.4%)**	**38 (90.5%)**	
tPA administration	14 (34.1%)	20 (47.6%)	0.21
sICH	2 (4.9%)	1 (2.6%)	0.57
Length of stay (days)	**8.8 ± 1.59***	**5.33 ± 0.58***	**0.024**
Infarct size (cm^2)	**9.36 ± 1.84***	**14.6 ± 2.39***	**0.084**
Mortality	**1 (2.4%)**	**6 (14.3%)**	**0.052**
Readmission rate	4 (9.8%)	6 (14.3%)	0.53
No change or lower NIHSS score on discharge	26 (65%)	25 (65.8%)	0.94
90-day mRS 0-2	26 (72.2%)	13 (61.9%)	0.42

* Mean ± S.E.

Table 3. *Outcomes associated with mechanical thrombectomy in regression analysis.**

Efficacy and Safety Outcomes	**OR / β**	**95 % CI**	***P*-value**
Clinical improvement (NIHSS)	0.91	0.32 – 2.57	0.85
Functional improvement (90-day mRS, 0-2)	0.33	0.07 – 1.53	0.15
Mortality	0.05	0.004 – 0.77	**0.032**
Final infarct size†	β = -0.26	-12.96 – -0.19	**0.044**
Length of stay†	β = 0.23	-0.13 – 6.53	0.059

*Models adjusted for age, gender, smoking, IV tPA, and comorbid conditions (coronary artery disease, hypertension, hyperlipidemia, diabetes mellitus, and atrial fibrillation).

†Linear regression models.

Neurological Sciences (2022) 43:3105–3112
https://doi.org/10.1007/s10072-021-05771-5

ORIGINAL ARTICLE

Mechanical thrombectomy in acute ischemic stroke due to large vessel occlusion in the anterior circulation and low baseline National Institute of Health Stroke Scale score: a multicenter retrospective matched analysis

Andrea Maria Alexandre[1] · Iacopo Valente[1] · Alessandro Pedicelli[1] · Angelo Maria Pezzullo[2] · Francesca Colò[3] · Luca Scarcia[3] · Andrea Romi[3] · Mariangela Piano[4] · Antonio Macera[4] · Joseph Domenico Gabrieli[5] · Giacomo Cester[5] · Antonio Armando Caragliano[6] · Sergio Lucio Vinci[6] · Maria Ruggiero[7] · Christian Commodaro[7] · Andrea Saletti[8] · Guido Andrea Lazzarotti[9] · Mirco Cosottini[9] · Valerio Da Ros[10] · Luigi Bellini[10] · Emilio Lozupone[11] · Adriana Paladini[11] · Valerio Brunetti[12] · Roberta Morosetti[12] · Giovanni Frisullo[12] · Paolo Calabresi[3,12] · Giacomo Della Marca[3,12] · Aldobrando Broccolini[3,12]

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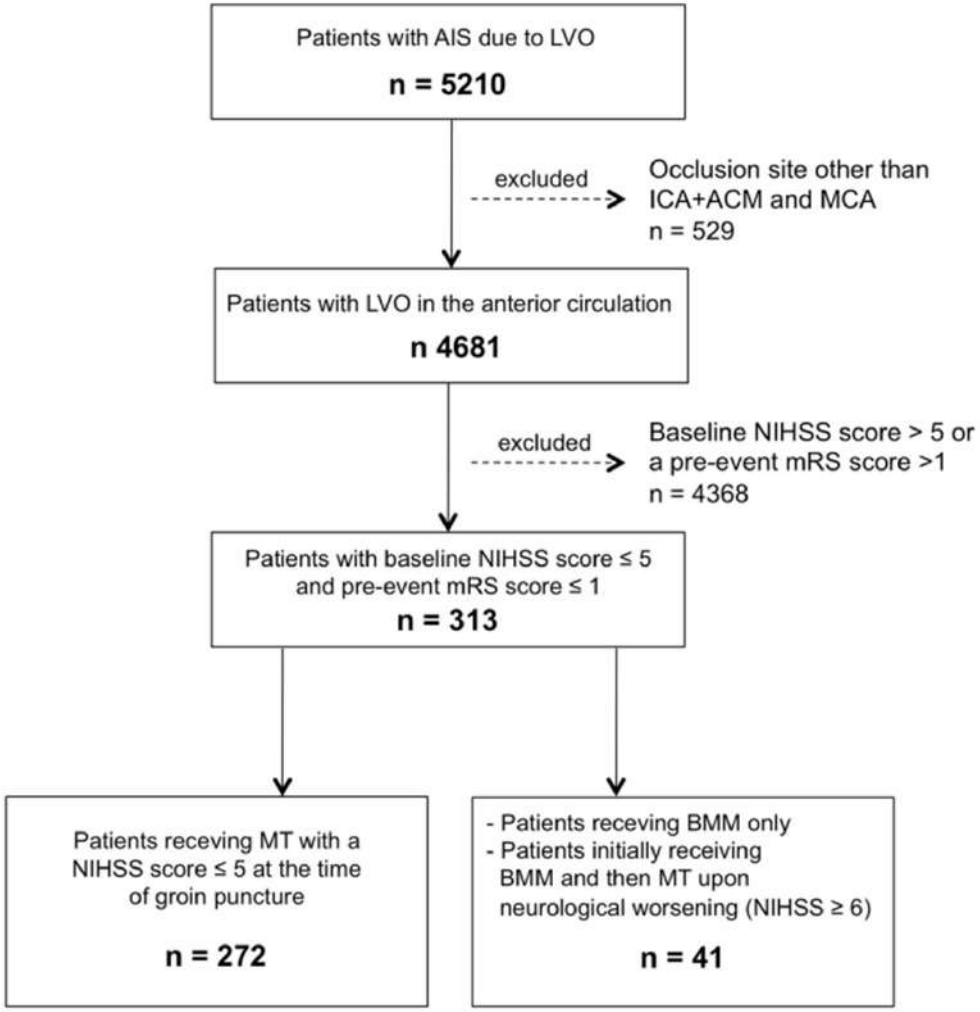
Patients with AIS due to LVO
n = 5210
excluded
Occlusion site other than ICA+ACM and MCA
n = 529
Patients with LVO in the anterior circulation
n 4681
excluded
Baseline NIHSS score > 5 or a pre-event mRS score >1
n = 4368
Patients with baseline NIHSS score ≤ 5 and pre-event mRS score ≤ 1
n = 313
Patients receving MT with a NIHSS score ≤ 5 at the time of groin puncture
n = 272
- Patients receving BMM only
- Patients initially receiving BMM and then MT upon neurological worsening (NIHSS ≥ 6)
n = 41

	MT	BMM/rescue MT	*p*-value
Number of patients	272	41	
Mean age (±SD)	69.9 (±14.35)	69 (±15.34)	0.73
Sex (female), # patients (%)	139 (51.1%)	24 (58.5%)	0.37
Atrial fibrillation, # patients (%)	70 (25.7%)	11 (26.8%)	0.88
Diabetes, # patients (%)	21 (7.7%)	7 (17.1%)	**0.05**
Dyslipidemia, # patients (%)	68 (25%)	12 (29.3%)	0.56
Coronary artery disease, # patients (%)	74 (27.2%)	13 (31.7%)	0.55
Carotid atherosclerosis, # patients (%)	51 (18.7%)	9 (22%)	0.63
Chronic obstructive pulmonary disease, # patients (%)	9 (3.3%)	1 (2.4%)	0.77
Previous stroke, # patients (%)	20 (7.3%)	5 (12.2%)	0.29
Previous antiplatelet therapy, # patients (%)	74 (27.2%)	14 (34.1%)	0.35
Previous anticoagulant therapy, # patients (%)	42 (15.4%)	5 (12.2%)	0.59
Left-sided stroke, # patients (%)	138 (50.7%)	20 (48.8%)	0.82
Median NIHSS score at baseline (IQR)	3 (2–5)	3 (2–5)	0.72
Occlusion site at mCTA			**0.05**
ICA + MCA/M1, # patients (%)	23 (8.5%)	5 (12.2%)	
ICA + MCA/M2, # patients (%)	8 (3%)	4 (9.8%)	
MCA/M1, # patients (%)	122 (44.9%)	11 (26.9%)	
MCA/M2, # patients (%)	119 (43.8%)	21 (51.2%)	
Median ASPECT score (IQR)	9 (8–10)	10 (9–10)	0.10
Median Menon score (IQR)	4 (4–5)	4 (4–5)	0.14
Intravenous thrombolysis, # patients (%)	109 (40.1%)	30 (73.2%)	**<0.001**
Mean onset-to-groin time, minutes (±SD)	342.9 (±247.2)	417 (±253.9)	0.21
Mean onset-to-recanalization time, minutes (±SD)	400.4 (±240.5)	334.3 (±132.8)	0.50
Mean groin-to-recanalization time, minutes (±SD)	57.8 (±45.2)	56.3 (±46.5)	0.94
mTICI score 2b-3, # patients (%)	237 (87.1%)	22 (88%) *	0.90

p-values by *t*-test for continuous variables and Chi2 test for binary/categorical variables

(*): 25 patients of the BMM/rescue MT group were subjected to rescue mechanical thrombectomy

Table 2 Clinical outcome

	MT	BMM/rescue MT	Total	*p*-value
mRS score of 0–1 (% of patients)	219 (80.5%)	27 (65.9%)	246 (78.6%)	**0.03**
mRS score of 0–2 (% of patients)	236 (86.8%)	33 (80.5%)	269 (85.9)	0.28
mRS score of 6 (% of patients)	13 (4.8%)	1 (2.4%)	14 (4.5%)	0.43
Parenchymal hematoma type 1 and 2, # patients (%)	9 (3.3%)	2 (4.9%)	11 (3.5%)	0.61

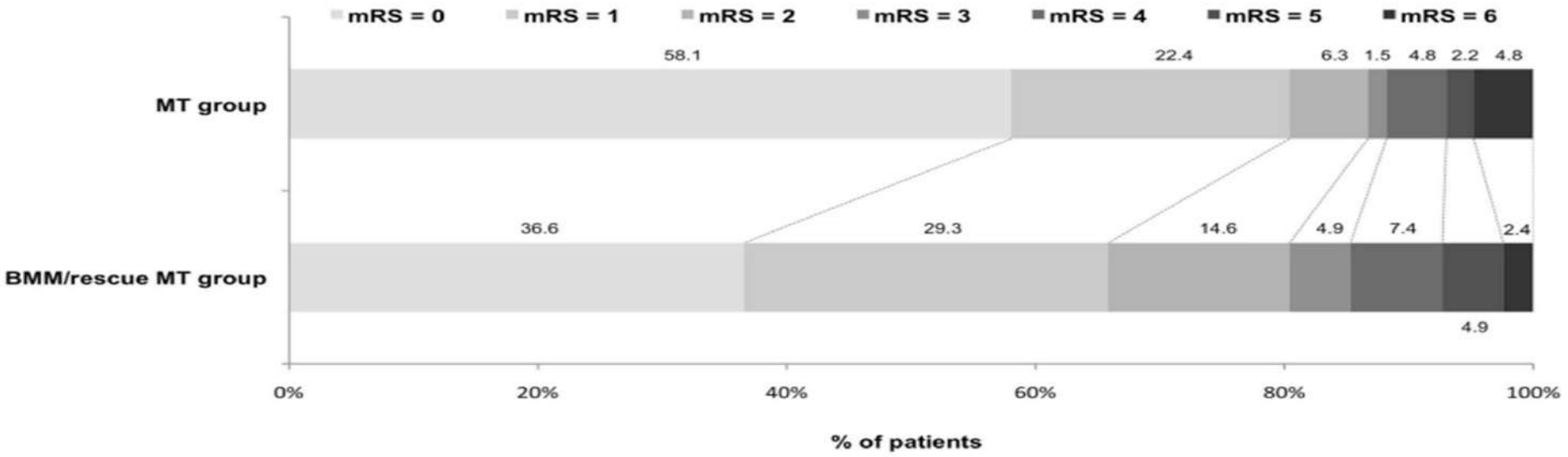

Fig. 2 Row distribution of the 90-day modified Rankin Scale scores in the two cohorts. Abbreviations: MT, mechanical thrombectomy; BMM, best medical management

Sağ hemisferik inme

SciMedCentral

Journal of Neurology & Translational Neuroscience

Research Article

Right Hemisphere Ischemia is more likely to Cause Falsely "Mild" Symptoms and Poor Outcomes without Thrombolysis

Carolyn A. Cronin[1]* and Lisa D. Hermann[2]

[1]Department of Neurology, University of Maryland School of Medicine, USA
[2]Department of Neurology, Vanderbilt University, USA

Abstract

Background: Rapidly improving or mild symptoms is the most common reason that acute stroke patients arriving within the approved time window are not treated with intravenous tissue-type plasminogen activator (IV tPA). We reviewed outcomes at discharge for patients excluded from IV tPA because of rapidly improving or mild symptoms, with the aim of being better able to identify patients who may benefit from thrombolysis.

Special Issue on
Cerebrovascular Disease

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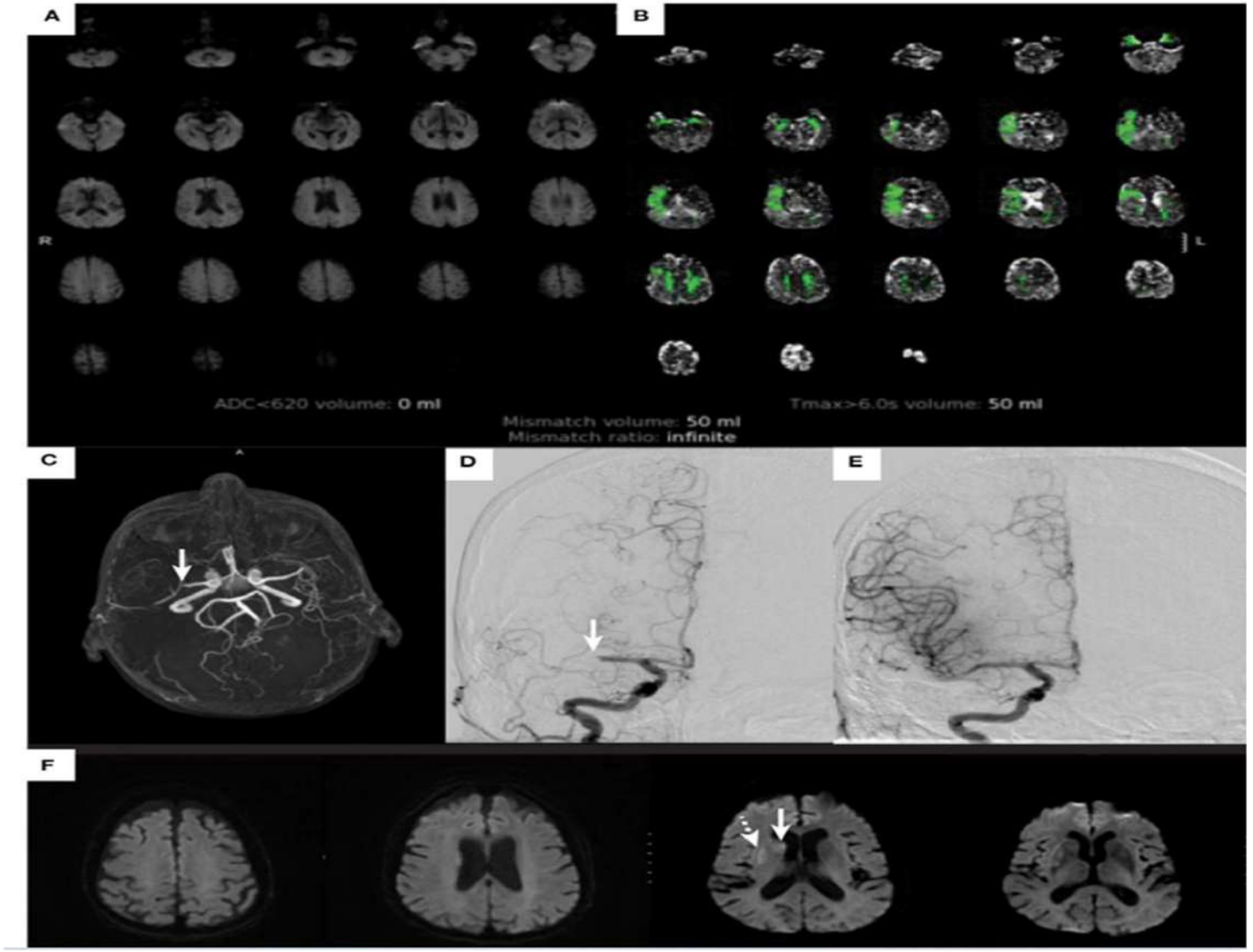
Submitted: 25 November 2013
Accepted: 20 January 2014
Published: 28 January 2014

Keywords
- Stroke
- Throbolytic therapy
- IV tPA



Front. Neurol., 07 September 2021 | https://doi.org/10.3389/fneur.2021.723637

ŞS
26 yaşında erkek hasta, sağ elli

Öykü: 11:10 sol tarafta uyuşukluk ve güçsüzlük
Özgeçmiş: Aort kapak replasmanı
Soygeçmiş: Özellik yok
İlaç kullanımı : Metoprolol, Varfarin (Düzensiz kullanıyor)

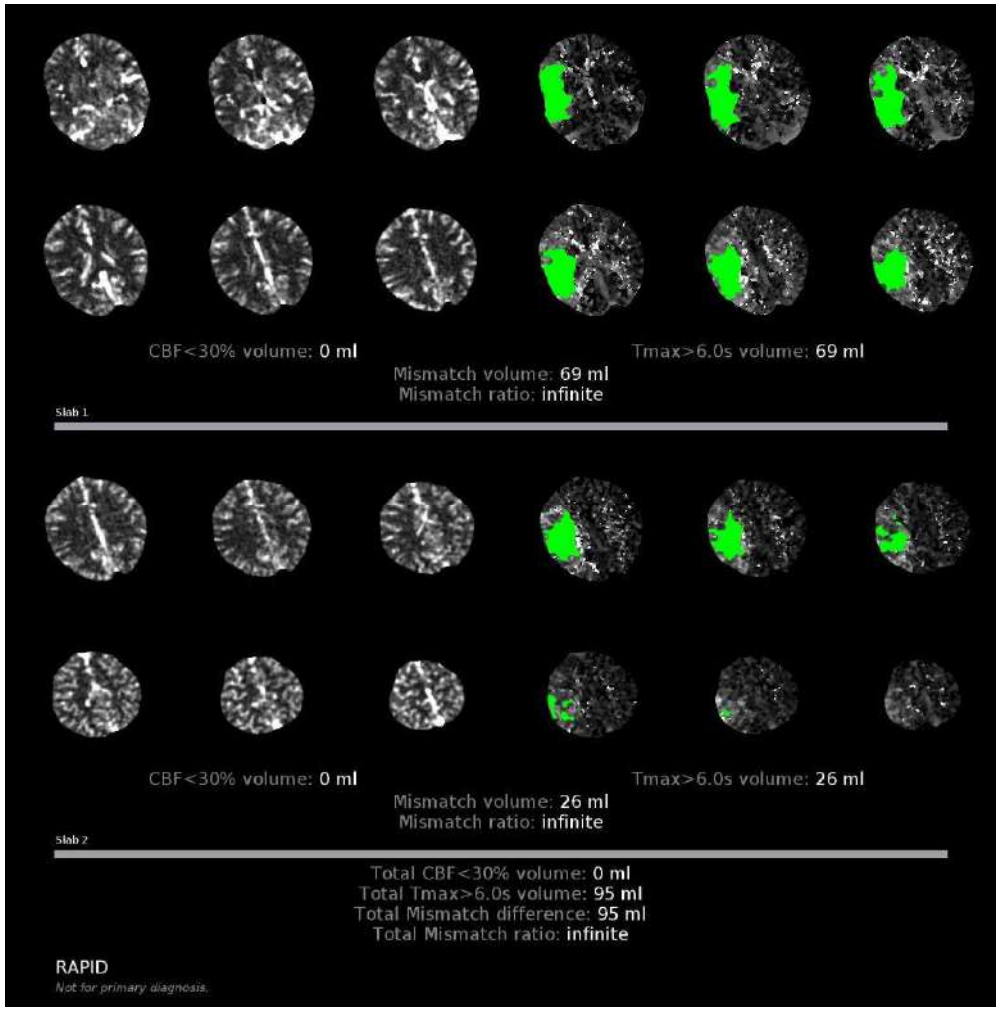
Kan basıncı	120/70 mmHg
EKG	NSR (Nabız 71/dk)
Vital bulgular	Stabil
Nörolojik muayene	•Bilinç açık, koopere, oryente •Sol santral fasial paralizi •Sol üst ekstremitede kas gücü 4/5, alt ekstremitede 5/5
NIHSS	3

1A: 0 1B: 0 1C:0 2: 0 3: 0 **4: 2** **5: 1**
6:0 7:0 8: 0 9: 0 10: 0 11: 0

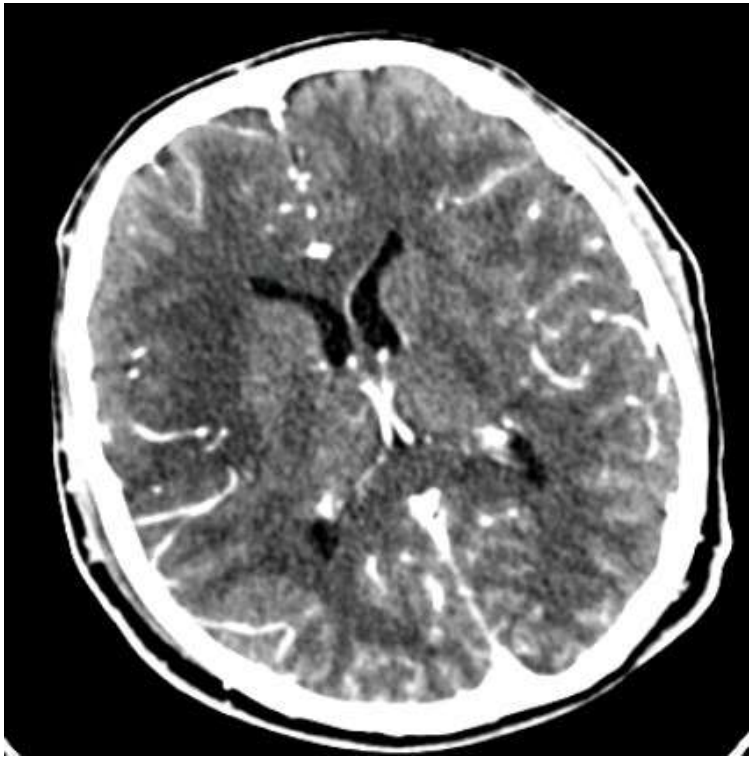
Beyin BT 02.07
ASPECT skoru 7

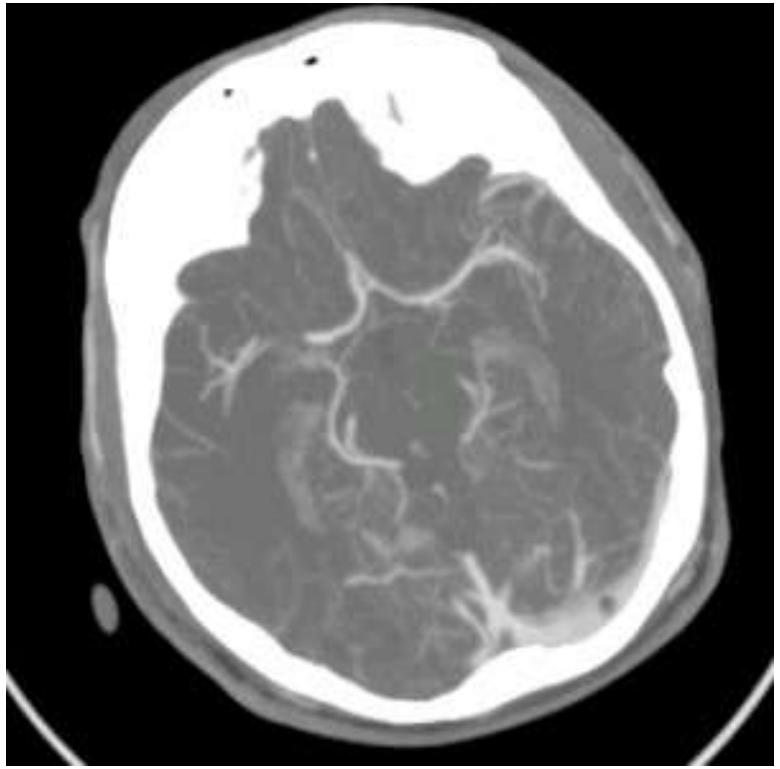
02.18 BT perfüzyon

RAPID software (iSchemaView, Menlo Park, CA),



Beyin-boyun BT anjiografi 02.26
Kontrastlı ASPECT skoru 6
Sağ M1 oklüzyonu





Introducer sheath 03.38

Malzemeler

9F introducer sheath

9F 95 cm, Concentric Balon Guiding kateter

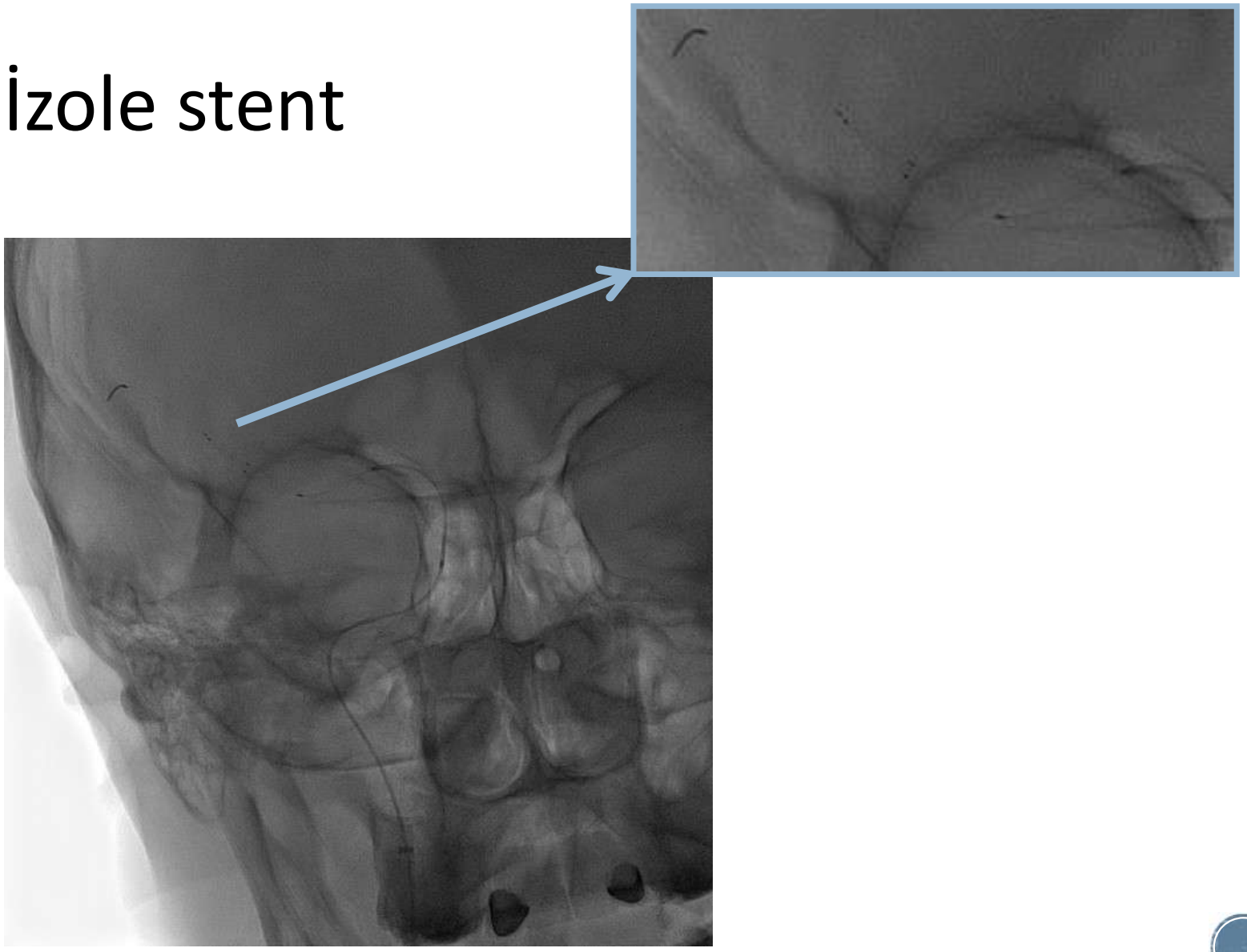
4F 125 cm vertebral kateter

Prowler select plus mikrokateter

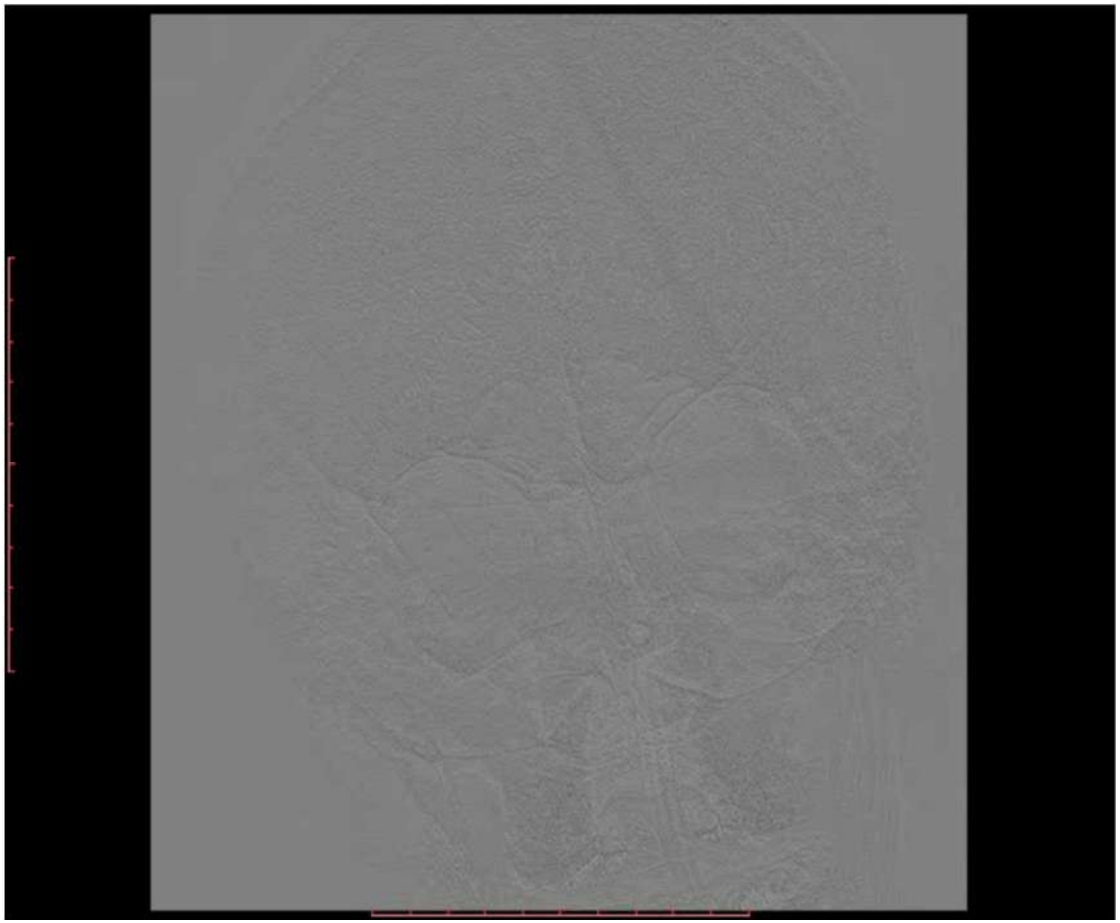
Syncro 0.014 200cm nörovasküler tel

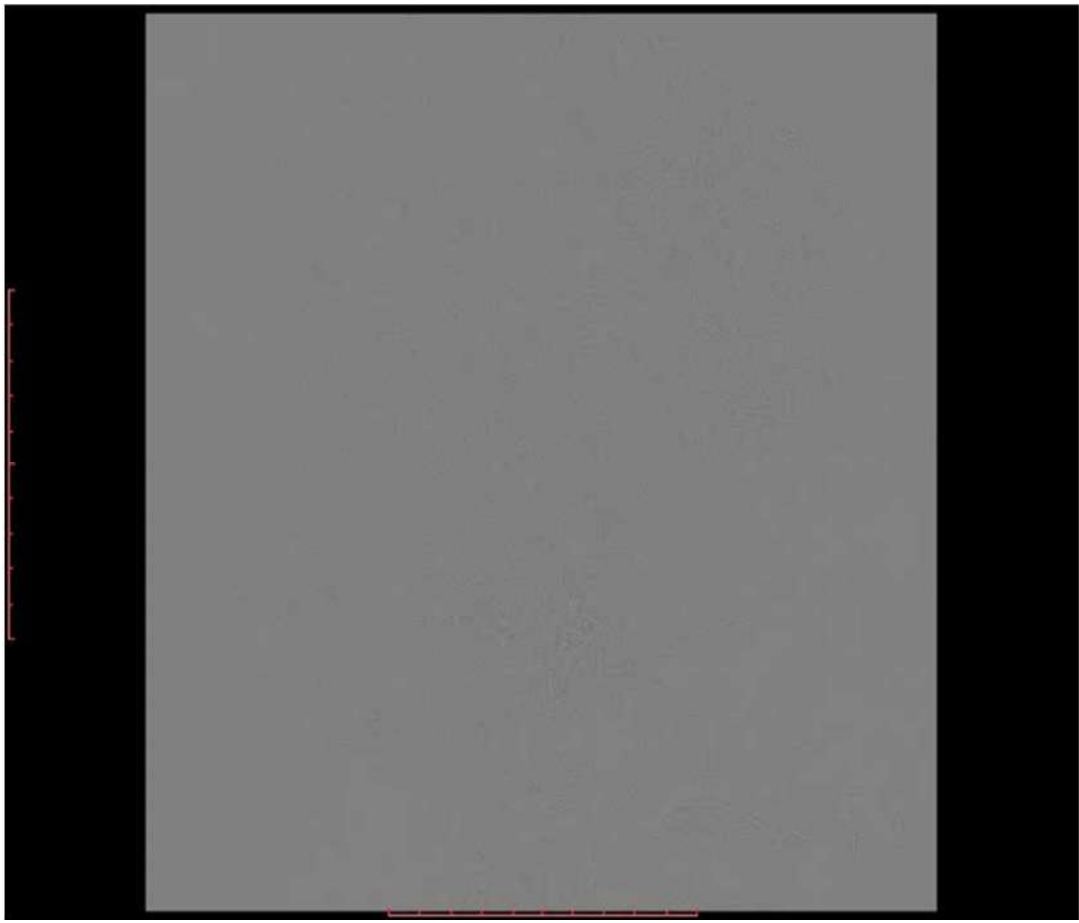
NEVA M1 geri çekilebilir stent 4x22 mm

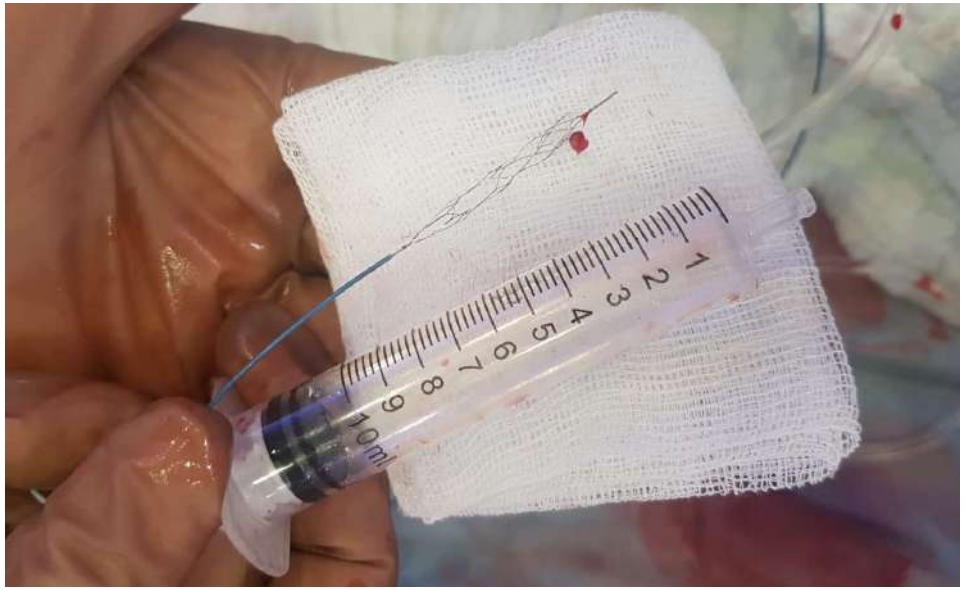
03.58 İzole stent



04.03 First Pass TICI3 rekanalizasyon

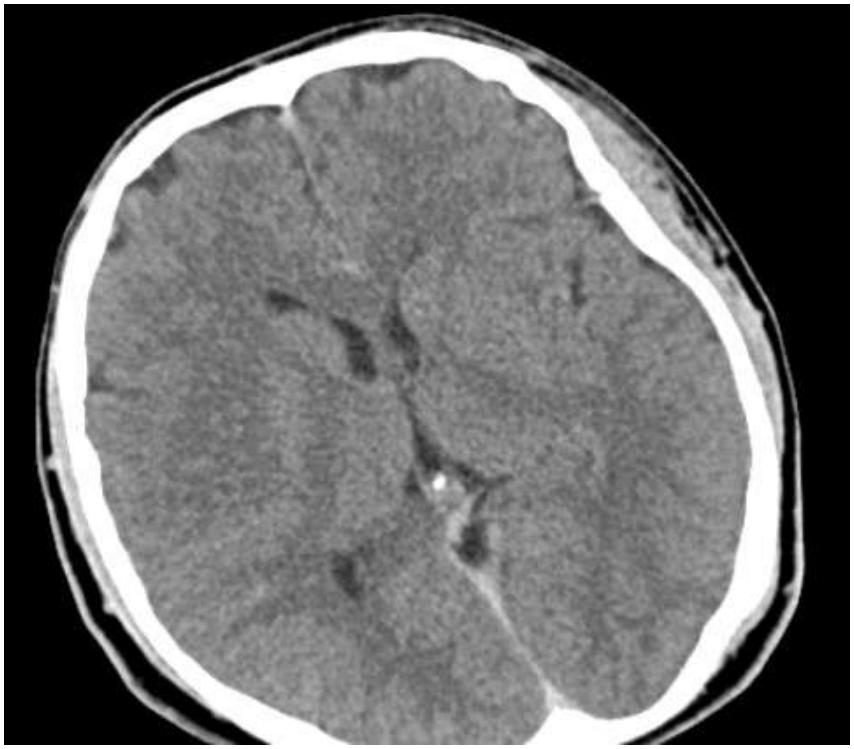





10ml


10ml

24 saat sonraki beyin BT



	Acil servis	24 saat	3 ay
NIHSS	3	0	0

Ekokardiyoloji	EF %58 Normal fonkiyonl protez kapak
TOAST	Kardiyoembolik inme

NIHSS düşük hastada trombektomi sırasında kan basıncına dikkat edilmeli!

- Serebral dolaşımın üzerinde önemli bir role sahip olan kan basıncı değişiklikleri genel anesteziyle artabilir
- Genel anestezinin indüksiyonu sırasında görülen hipotansiyonun norepinefrin ve fenilefrinle indüklenmesiyle daha iyi klinik sonuçlar alınabilir

Marzan AS, et al. Feasibility and safety of norepinephrine-induced arterial hypertension in acute ischemic stroke. Neurology. 2004;62(7): 1193-5.

Interventional Neuroradiology | Published: 15 February 2020

Endovascular treatment decision-making in acute ischemic stroke patients with large vessel occlusion and low National Institutes of Health Stroke Scale: insights from UNMASK EVT, an international multidisciplinary survey

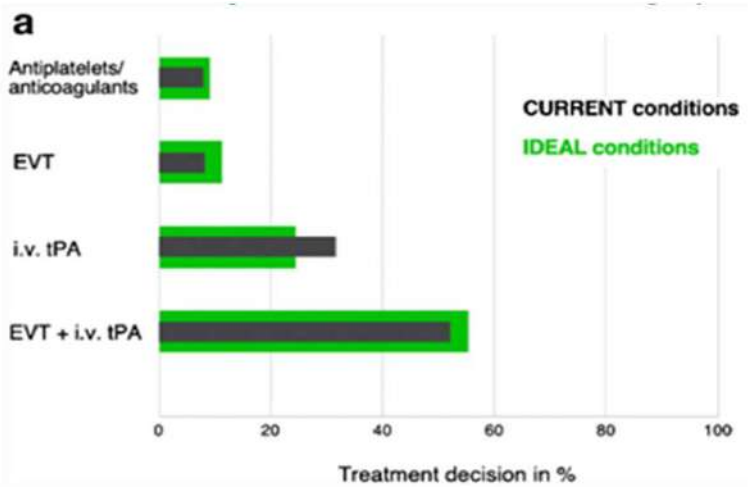
Johanna Maria Ospel, Byungmoon Kim, Ji-Hoe Heo, Shinichi Yoshimura, Nima Kashani, Bijoy Menon, Mohammed Almekhlafi, Andrew Demchuk, Michael Hill, Gustavo Saposnik & Mayank Goyal

Neuroradiology **62**, 715–721 (2020) | Cite this article

- 76 yaşında, sağ elli, kadın hasta
- Hafif hemiparezi ve afazi ile saat 14.00'de hastaneye getirildi
- Semptom başlangıcı 3 saat önce
- NIHSS 2
- Kontrastsız BT'de ASPECTS 10
- Başlangıç BT anjiyografisinde proksimal M1 oklüzyonu

- 33 ülke
- 275 katılımcı (150 nörolog, 84 girişimsel nöroradyolog, 30 beyin cerrahı, 11 diğer uzmanlıklara bağlı)
- Vaka senaryosuna tedavi yaklaşımları soruldu

- Doktorların çoğu ya intravenöz alteplaz ile kombine (varsayılan ideal altında %55.3 ve mevcut çalışma koşullarında %52.0) veya tek tedavi olarak (varsayılan ideal altında %11.3 ve mevcut koşullarda %8.4) endovasküler tedavi yaklaşımını tercih etti



Ülkelere göre düşük NIHSS vaka senaryosu için EVT lehine mevcut ve ideal karar oranları. Parlak renkli ülkeler ve çubuklar EVT lehine yüksek cari karar oranlarını temsil ederken, koyu renkli ülkeler ve çubuklar EVT lehine düşük cari karar oranlarını temsil etmektedir. Siyah noktalar, EVT lehine ülkeye özgü ideal karar oranlarını göstermektedir. Not: Düşük NIHSS senaryosu için 3'ten az yanıtı olan ülkeler bu resme dahil edilmemiştir.

AHA/ASA Guideline

Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

4. Although its benefits are uncertain, the use of mechanical thrombectomy with stent retrievers may be reasonable for patients with AIS in whom treatment can be initiated (groin puncture) within 6 hours of symptom onset and who have prestroke mRS score >1, ASPECTS <6, or NIHSS score <6, and causative occlusion of the internal carotid artery (ICA) or proximal MCA (M1).	IIb	B-R	Recommendation unchanged from 2015 Endovascular.

Endovascular Therapy for Low NIHSS Ischemic Strokes

ENDOLOW çalışması

NCT04167527

Brief Summary:

This study will test the hypothesis that patients presenting within 8 hours of onset with cerebral ischemia in the setting of proximal large vessel occlusions (LVO) and low baseline NIHSS scores (0-5) will have better 90-day clinical outcomes (mRS distribution) with immediate mechanical thrombectomy (iMT) compared to initial medical management (iMM).

Detailed Description:

Currently, the vast majority of these patients do not receive immediate vessel imaging with either CT- or MR-angiography. However, acute ischemic stroke patients with low NIHSS who harbor a large vessel occlusion (LVO) later decline in 20-40% of cases, and/or have underappreciated impairments related to their relatively mild strokes. Similarly, LVO patients presenting with a transient ischemic attack (TIA) are under increased risk of clinical deterioration. Such patients with apparent good collateral circulation, and hence a substantial perfusion of the vascular territory of the occluded large artery, likely have the most to gain from endovascular revascularization. At the same time, this collateral perfusion may allow for more frequent recanalization, either spontaneously or by intravenous (IV) rtPA. Experience with immediate mechanical thrombectomy (iMT) in the LVO mild stroke target population is limited.

This study will test the hypothesis that patients presenting within 8 hours of onset with cerebral ischemia in the setting of proximal large vessel occlusions (LVO) and low baseline NIHSS scores (0-5) will have better 90-day clinical outcomes (mRS distribution) with immediate mechanical thrombectomy (iMT) compared to initial medical management (iMM).

Minor Stroke Therapy Evaluation MOSTE çalışması

NCT03796468

Brief Summary:

Stroke represents the fourth leading cause of death in industrialized nations, after heart disease, cancer, and chronic lower respiratory disease. Approximately one-quarter of the patients suffering a stroke die within one year after the initial event and stroke is a leading cause of serious long-term disability. Although mechanical thrombectomy (MT) has become the standard of care for acute ischemic stroke with proximal large vessel occlusion (LVO) in the anterior circulation, the management of patients harboring proximal occlusion but presenting minor-to-mild stroke symptoms, has not yet been determined by these recent randomized clinical trials. However, patients with proximal occlusions may present with a low NIHSS, a proximal intraarterial occlusion being present in up to 28% when considering patients with an NIHSS ≤ 4.

The evidence of benefit from endovascular therapy (EVT) in large vessel occlusion stroke is demonstrated, STAIR IX (Stroke Treatment Academic Industry Roundtable) consensus recommendations were developed that outline priorities for future research in EVT.

A Randomized Controlled Trial of TNK-tPA Versus Standard of Care for Minor Ischemic Stroke With Proven Occlusion TEMPO-2 çalışması

NCT02398656

TEMPO2 is an multicentre, prospective randomized open label, blinded-endpoint (PROBE) controlled trial of thrombolysis with low dose Tenecteplase (TNK-tPA) versus standard of care. A total of 1274 patients will be enrolled, at approximately 50 sites worldwide.

TEMPO-2 will enroll patients within a 12 hour time window with a NIHSS score of <6 and an ASPECTS >7. All patients will be evaluated clinically and then undergo brain imaging using CT followed immediately by a CT angiogram. Patients must have an intracranial occlusion on CTA or CTP.

Randomization will be 1:1 to TNK-tPA (experimental) or standard of care antiplatelet agents (control).

Experimental: TNK-tPA (0.25mg/kg) given as a single, intravenous bolus immediately upon randomization. Experimental treatment will be administered as a single intravenous bolus over 1-2 minutes.

Control: Patients will be treated with standard of care based antiplatelet treatment - choice at the discretion of the investigator. Low dose aspirin (single agent) will be the choice of most physicians, some will chose to use the combination of aspirin and clopidogrel. The local investigator to chose which antithrombotic regime should be used

All patients will be treated within 90 minutes of the first slice of the baseline CT. Patients will undergo a study CT angiogram of the intracranial circulation between 4-8 hours after treatment to determine whether the occluded artery has recanalized or not. In sites where MRI/MRA is routinely used this can be substituted for CT/CTA. Any patient who has neurological worsening should have standard of care brain imaging completed to rule out intracranial hemorrhage.

All patients will have standard of care medical management on an acute stroke unit and undergo follow-up imaging at 24 hours with CT or MR. Use of MR will be encouraged.

Patients will be assessed at 24 hours and at Days 5 and 90. The Day 90 Outcomes will be performed by a blinded assessor.

Son söz…

- NIHSS düşük olan akut inmeli hastalarda majör damar oklüzyonu nörolojik bozulmayı ve dizabiliteyi kuvvetle öngörmektedir
- Akut iskemik inme geçiren her hasta için vasküler görüntüleme yapılmalı
- Majör damar oklüzyonuna bağlı minör inmelerde, mekanik trombektomi ve IV tPA daha iyi fonksiyonel sonlanımla ilişkilidir

Teşekkürler…