

2023년도 제2차
급성뇌경색치료연구회(ASTRO)

Stroke Conference & New Device Update

일시 : 2023년 4월 28일(금) 15:00-18:45

장소 : 대전 유성호텔(킹홀)

주최 : 대한뇌혈관내치료의학회

주관 : 대한신경외과학연구재단



INVITATION

Mechanical thrombectomy era에서 오늘도 불철주야 고생하시는 대한뇌혈관내치료의학회 회원 및 급성뇌경색치료연구회 회원 여러분!

2023년도 2월 25일 개최된 2023년 뇌졸중 재개통 심포지움(ARCS) 및 대한뇌혈관내치료의학회 춘계보수교육은 여러 회원님들의 참석하여 훌륭한 강의 및 열띤 토론을 진행하였습니다. 다시한번 회원님들의 참여에 깊은 감사의 말씀을 드립니다.

2023년도 급성뇌경색치료연구회가 개최하는 두번째 학술대회를 말씀드리고자 합니다. 올해에는 ASTRO HEROES (ASTRO Hybrid conference of Cases' Share and New Devices Update)라는 Title로 학술대회를 진행하고자 합니다. mechanical thrombectomy는 device가 매우 중요한 분야입니다. 하루가 다르게 새로운 device가 개발되는 분야로 새로운 device의 특장점을 파악하는 것은 매우 중요한 일로 사료됩니다. 또한 mechanical thrombectomy expert를 초청하여 강의를 듣는 기회도 마련하였습니다. 마지막으로 그동안 치료하시면서 느꼈던 여러 case를 공유하는 시간도 가집니다.

진료, 연구 등으로 많이 바쁘시겠지만, 좋은 자리를 마련하였으니, 많은 회원님들의 참여를 부탁드립니다.

이번 학술대회를 준비에 도움을 주신 대한뇌혈관내치료의학회 장철훈 회장님, 권순찬 부회장님, 김영우 총무이사님께 감사드리며, 준비를 진행하신 급성뇌경색치료연구회 권현조 부회장, 진성철 총무이사, 정영진 학술이사님께 감사의 말씀을 드립니다.

2023년 4월

급성뇌경색치료연구회 회장 **신승훈** 드림

PROGRAM

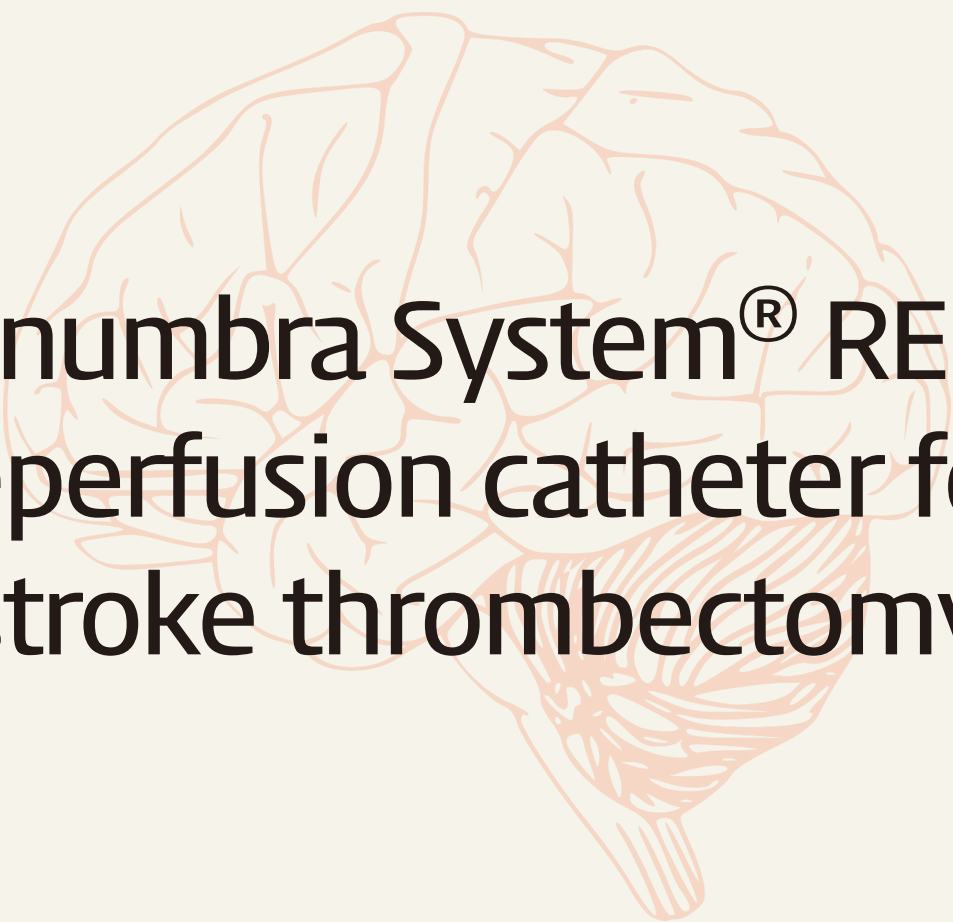
일시 : 2023년 4월 28일(금)

장소 : 대전 유성호텔(킹홀)

15:00-15:05	Opening remark Congratulatory Address	신승훈 (급성뇌경색치료연구회 회장) 장철훈 (대한뇌혈관내치료의학회 회장) 김범태 (대한신경외과학회 회장)	
	Conference introduction	정영진 (급성뇌경색치료연구회 학술)	
15:05-15:30	Session 1. New device update for mechanical thrombectomy and other AIS intervention 좌장: 윤석만(순천향대), 권순찬(울산대)		
15:05-15:10	Penumbra System® RED® reperfusion catheter for stroke thrombectomy	Penumbra	05
15:10-15:15	BOBBY™ balloon guiding catheter for flow arrest during thrombectomy	Microvention	09
15:15-15:20	Medtronic AIS solution: 3mm SOLITAIRE™ X and REACT™	Medtronics	13
15:20-15:25	Introduction of AXS Vector 46 for MeVO thrombectomy	Stryker	17
15:25-15:30	AIS solution: Esperance™ reperfusion catheter & pRESET thrombectomy device	Wallaby/Phenox	19
15:30-16:45	Session 2. Expert's Set up and Pitfalls for mechanical thrombectomy 좌장: 장경술(연세에스병원), 김영우(가톨릭대)		
15:30-16:00	Contact Aspiration Thrombectomy	심유식(인하대병원)	23
16:00-16:30	Stent Retriever Thrombectomy	박정현(한림대 동탄성심병원)	33
16:30-16:45	Q & A, Coffee and Photo time		

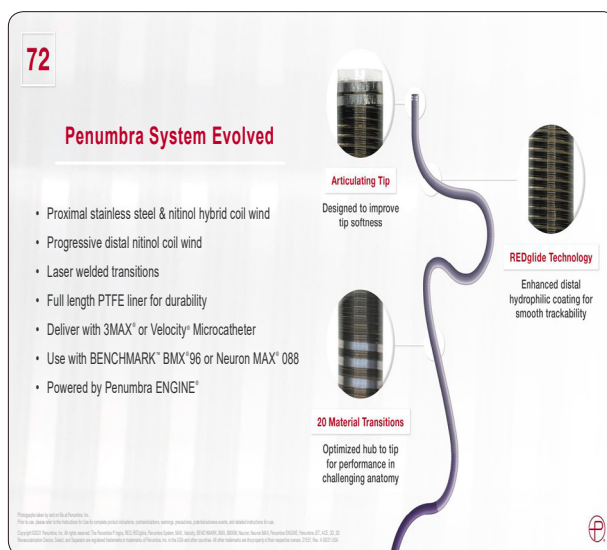
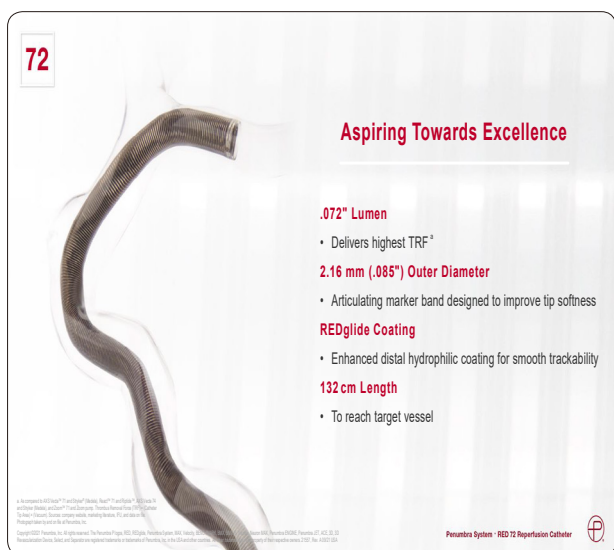
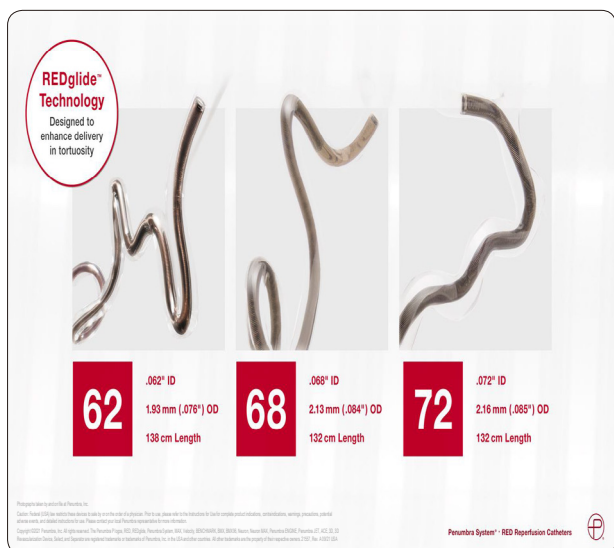
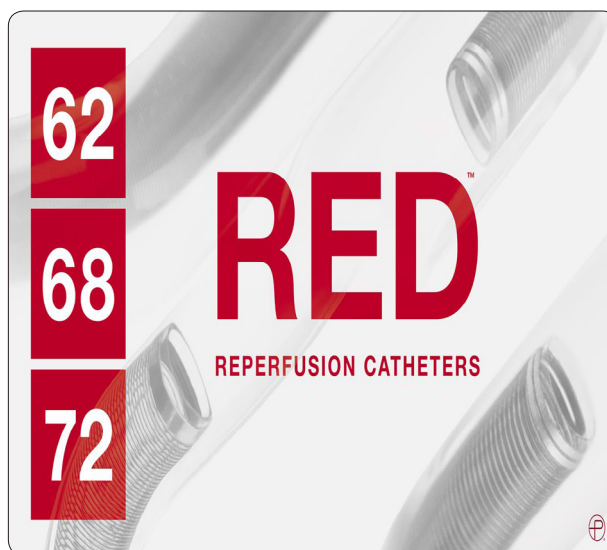
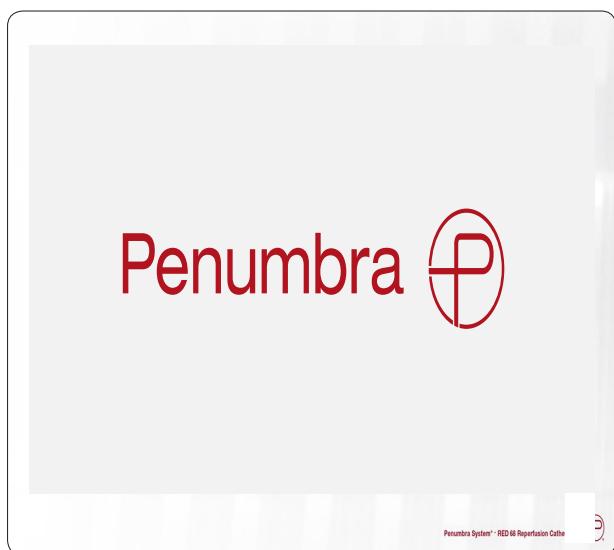
PROGRAM

16:45-18:45	Session 3. Case/Experience share for mechanical thrombectomy and other AIS intervention 좌장: 권현조(충남대), 홍대영(에스포항병원)		
16:45-17:00	[Case 1] Hemorrhagic complication after M1 thrombectomy with Wingspan stenting	박현욱(부산 부민병원)	39
17:00-17:15	[Case 2] Delayed ICH after staged carotid stenting in an elderly patient	성승언(동래봉생병원)	43
17:15-17:30	[Case 3] Fatal vessel perforation in endovascular thrombectomy	최연주(에스포항병원)	48
17:30-17:45	[Case 4] Simultaneous bilateral MCA occlusion: Undetermined cases of thrombus	송승윤(가톨릭대 성빈센트병원)	57
17:45-18:00	[Case 5] Unexpected experience of tandem ICA-MCA occlusion by carotid artery dissection	고덕호(대구굿모닝병원)	65
18:00-18:15	[Case 6] Successful stent insertion after mechanical thrombectomy for MCA and ICA dissection	정은오(충남대병원)	69
18:15-18:30	[Case 7] Fail of salvage bypass surgery after re-occlusion in the IAT for ICAS beyond 24h of symptoms onset	이준원(인제대 해운대백병원)	78
18:30-18:45	[Case 8] Expectations vs. Disappointments: My third experience with the Tromba retriever stent	정영진(영남대병원)	82
18:45-	Closing remark	권현조(급성뇌경색치료연구회 부회장)	

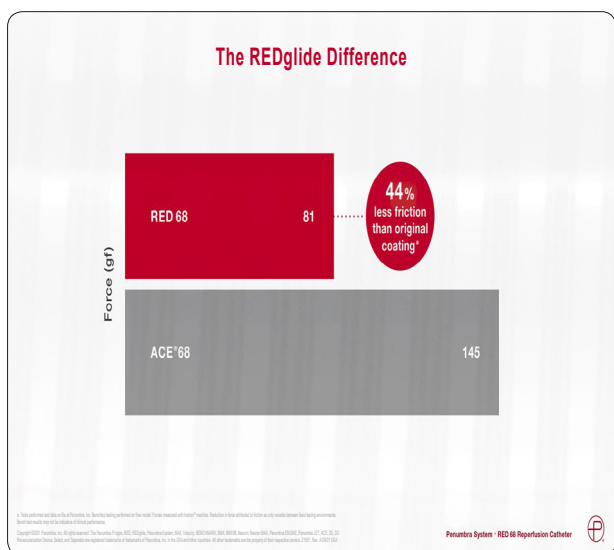
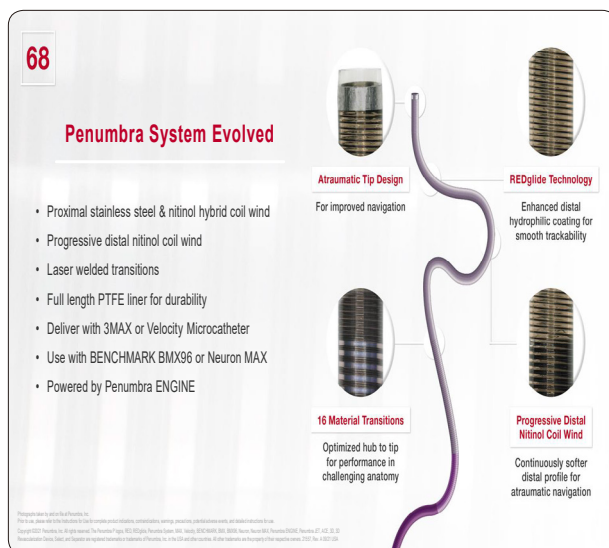
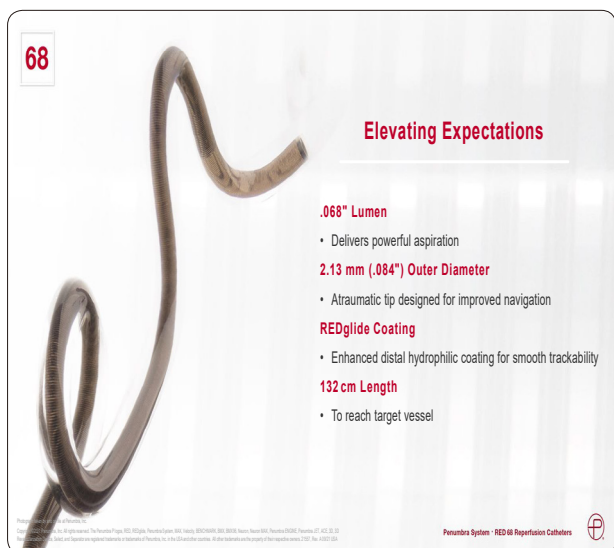
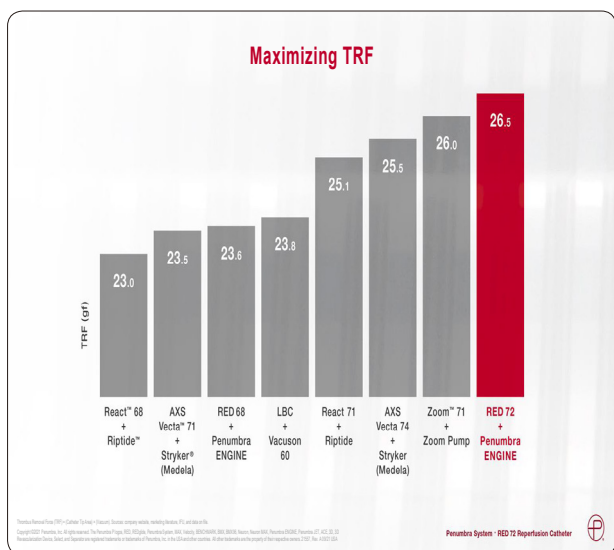


Penumbra System[®] RED[®] reperfusion catheter for stroke thrombectomy

Penumbra



제2차 급성뇌경색치료연구회(ASTRO) Stroke Conference & New Device Update



62

Adapt to the Situation



- .062" Lumen**
 - Delivers powerful aspiration
- 1.93 mm (.076") Outer Diameter**
 - Low profile for easy access
- Atraumatic Design**
 - Engineered to effortlessly navigate tortuous anatomy
- 138 cm Length**
 - To reach target vessel

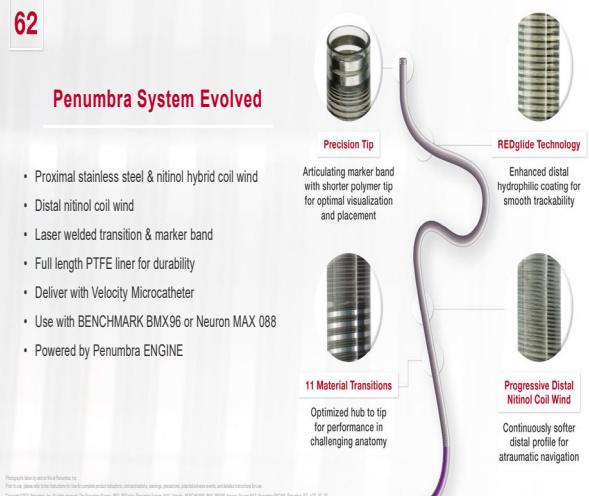
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Penumbra System - RED 62 Reperfusion Catheter

62

Penumbra System Evolved

- Proximal stainless steel & nitinol hybrid coil wind
- Distal nitinol coil wind
- Laser welded transition & marker band
- Full length PTFE liner for durability
- Deliver with Velocity Microcatheter
- Use with BENCHMARK BMX96 or Neuron MAX 088
- Powered by Penumbra ENGINE



Precision Tip
Articulating marker band with shorter polymer tip for optimal visualization and placement

REDglide Technology
Enhanced distal hydrophilic coating for smooth trackability

11 Material Transitions
Optimized hub to tip for performance in challenging anatomy

Progressive Distal Nitinol Coil Wind
Continuously softer distal profile for atraumatic navigation

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Penumbra System - RED Reperfusion Catheters

A Complete Range of Low-Profile Catheters

1.27 mm OD .035" ID 160 cm Length 3MAX	1.42 mm OD .041" ID 139 cm Length 4MAX	1.65 mm OD .054" ID 138 cm Length Penumbra JET D	1.80 mm OD .060" ID 132 cm Length ACE60	1.93 mm OD .062" ID 138 cm Length RED 62

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Penumbra System - RED 62 Reperfusion Catheter

Upgraded Penumbra Aspiration Tubing

Original Tubing .067" Choke Point Penumbra Hi-Flow Aspiration Tubing Flow Switch	Updated Tubing .110" Throughout Penumbra Aspiration Tubing Flow Switch	Larger Flow Switch ID Eliminate the Choke Point

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Penumbra System - RED Reperfusion Catheters

Powered by Penumbra ENGINE



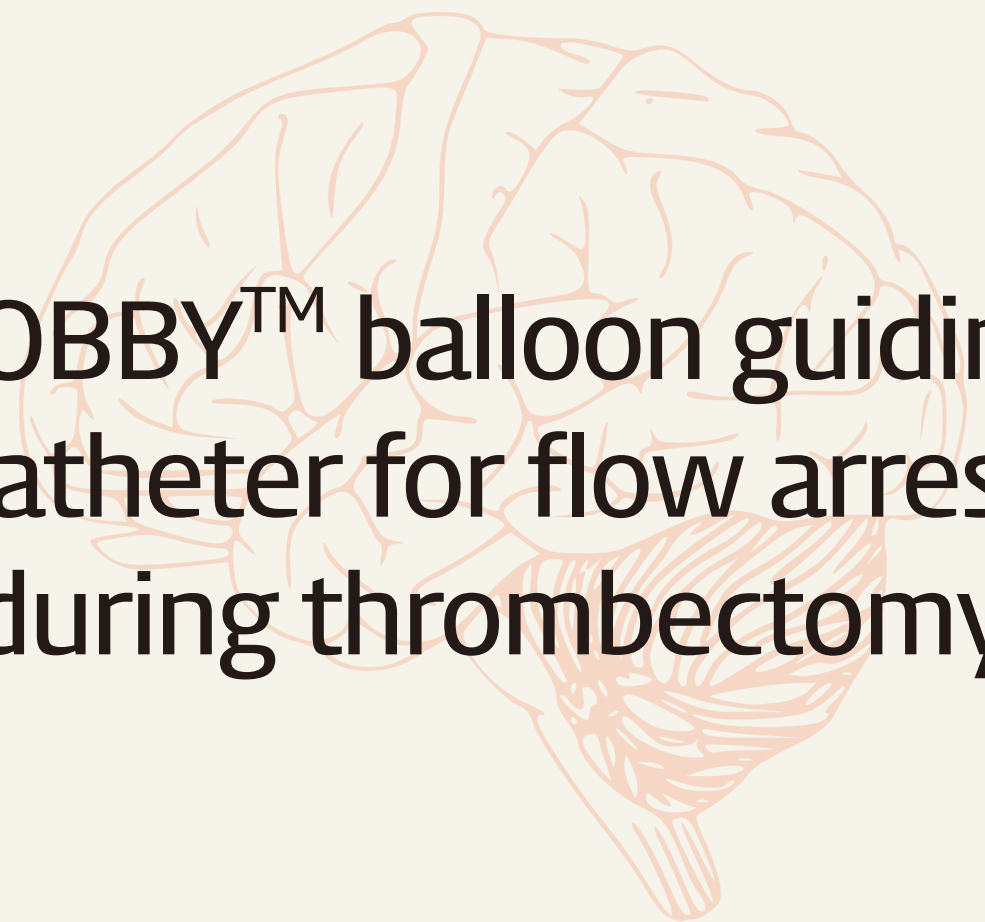
- Sleek, Simple Design**
 - One touch for maximum aspiration
- Four Bar LED Lighting**
 - Easily displays maximum vacuum
- Integrated Clot Catcher**
 - Enhances visibility and easy clot removal

-29.2 inHg Deep Vacuum*

* As tested per ASTM F2059-17. Penumbra, Inc. does not make any representation or warranty regarding the performance of this device.

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Penumbra System - RED Reperfusion Catheters



BOBBY™ balloon guiding catheter for flow arrest during thrombectomy

Microvention

BOBBY

Balloon Guide Catheter

Ref #CAZ01320027



MicroVent
TERUMO

Internal Use Only – Do Not Distribute

BOBBY Specifications

Product Code	ID	OD	Catheter Length	Tip Length	Balloon Diameter	Balloon Length
One unit per box, includes peel away introducer sheath and inflation compliance card						
BOB-895	0.086" / 2.18mm	0.110" / 8.4F	95cm	1.5mm	10mm	10mm

MicroVent
TERUMO

For MV Internal Use Only. Do Not Distribute.

BOBBY Indications

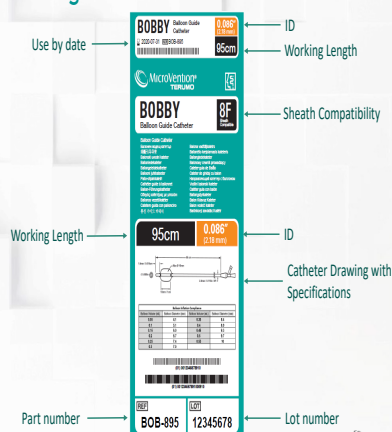
The BOBBY Balloon Guide Catheter is intended:

- For use in facilitating the insertion and guidance of an intravascular catheter into a selected blood vessel in the peripheral and neuro vascular systems. The balloon provides temporary vascular occlusion during these and other angiographic procedures. The Balloon Guide Catheter is also indicated for use as a conduit for retrieval devices.

MicroVent
TERUMO

For MV Internal Use Only. Do Not Distribute.

Product Labeling



MicroVent
TERUMO

For MV Internal Use Only. Do Not Distribute.

BOBBY Balloon Compliance Chart

BALLOON INFLATION COMPLIANCE	Inflation Volume* (cc)	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55**
	Balloon Diameter (mm)	4.1	5.1	6.0	6.7	7.4	7.9	8.4	8.9	9.3	9.7	10.0

* After Priming Catheter ** Maximum Injection Volume

Sterile Inflation Card

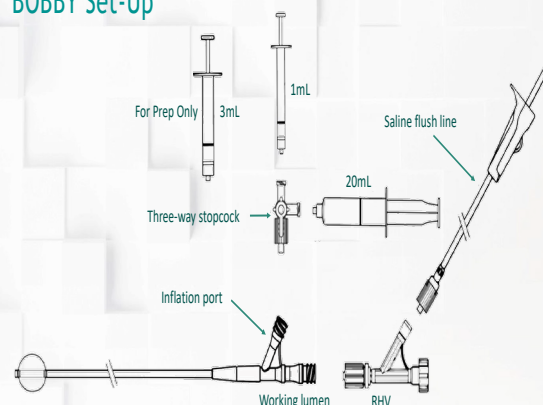
- Included in packaging
- To be used during procedure



MicroVent
TERUMO

For MV Internal Use Only. Do Not Distribute.

BOBBY Set-Up



MicroVent
TERUMO

For MV Internal Use Only. Do Not Distribute.

Technology Integrated from SOFIA & Scepter

SOFIA Technology

- SS Braid and Coil Construction
- Multiple Anatomy Optimized Material Transitions
- Hydrophilic Coating

Scepter/Scepter MINI Technology

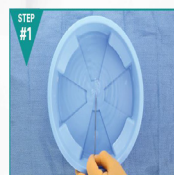
- Soft Compliant Balloon Material
- Self Sealing Prep Valve
- Multiple Anatomy Optimized Material Transitions
- Simplified Prep Method



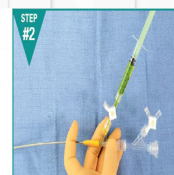
Internal Use Only – Do Not Distribute



Quick Prep Guide



STEP 1: Remove the BOBBY Balloon Guide Catheter from its packaging. Submerge the distal portion, including the balloon, in a saline solution for 10 seconds. While submerged, use a syringe with saline solution to flush the working lumen. After flush is completed, detach the syringe.



STEP 2: Fill a 3cc syringe with 50/50 contrast saline solution and attach to a 3-way stopcock. Purge the stopcock and syringe of air. Connect the 3-way stopcock to the inflation port. Ensure there are no bubbles in the syringe and 3-way stopcock prior to attaching the hub.



STEP 3: Hold distal tip of balloon upright with one hand. Hold attached syringe with other hand. Apply pressure on the syringe pusher with your thumb. Maintain constant pressure and do not tilt balloon until contrast reaches the distal purge hole and the contrast has completely filled balloon.

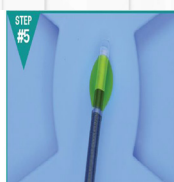


For MV Internal Use Only. Do Not Distribute.

Quick Prep Guide



STEP 4: Once the balloon is fully purged of air with contrast, inspect the balloon for any bubbles, irregularities, or leaks. Do not use if any inconsistencies are observed. If contrast leakage is observed, discard the unit.



STEP 5: Deflate with 3cc syringe while the distal tip is submerged in saline. Let the pressure within the catheter equalize. Remove the 3cc syringe.



STEP 6: Prime a 1cc syringe filled half way with the recommended 50/50 contrast saline solution and attach to the 3-way stopcock. Attach a 20cc syringe pre-filled with approximately 2cc of recommended 50/50 contrast saline solution to the other port of the 3-way stopcock for deflation. With the catheter hydrated and balloon completely prepped the BOBBY Balloon Guide Catheter is ready for use.

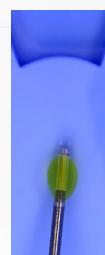
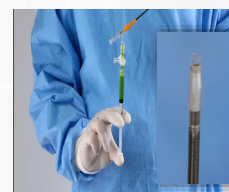
Dead space of guidewire lumen – proximal hub	3.921 milliliters
Dead space of inflation lumen	0.662 milliliters



For MV Internal Use Only. Do Not Distribute.

BOBBY Benefits

- **Streamlined Prep**
 - Designed with Scepter Mini's self-sealing purge valve to simplify and decrease balloon prep time
- **Quick Inflation & Deflation**
 - Dual lumen reinforcement provides fast, consistent balloon inflation and deflation
- **Trackable & Stable**
 - The SOFIA-inspired, multiple transition zones creates a smooth, trackable and stable experience



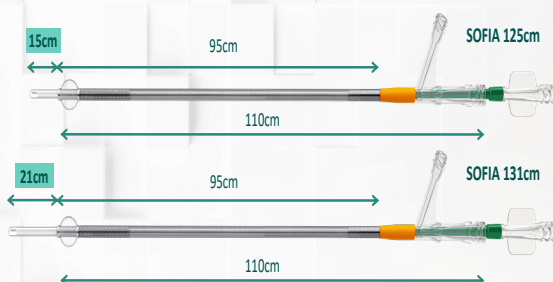
50/50 contrast with 20cc syringe.
Timer for reference only.

00:09



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BOBBY & SOFIA Length Considerations



Data on File at MicroVenture

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BOBBY Development Testing in Tortuous Aortic Arch

BOBBY BGC



LONG SHEATH



Data on File at MicroVenture

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BOBBY PPT Learnings

Introducer Sheath

- 8F Terumo Pinnacle
- 2.92mm / 0.115in ID or larger

Select Catheter

- 5F or 6F of choice

Guidewire

- 0.035in or 0.038in

PREP

- Do not prep inside of patient
 - Prep method differs from competitor BGCs

Sheath Introduction

- Use peel away introducer provided when introducing into groin sheath

SOFIA Compatibility

- Use with SOFIA 5F 125cm or SOFIA Flow Plus 6F 125cm/131cm OD Optimized Units (Orange Label)



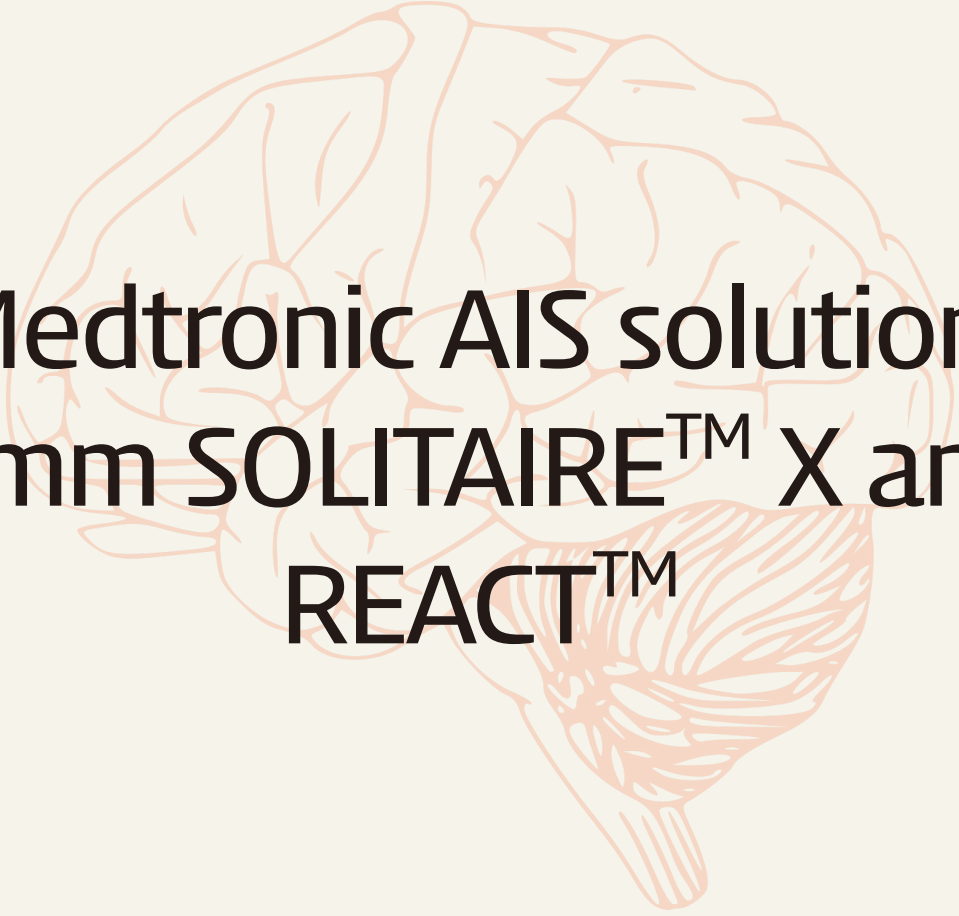
Data on File at MicroVention

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Thank You



Internal Use Only – Do Not Distribute



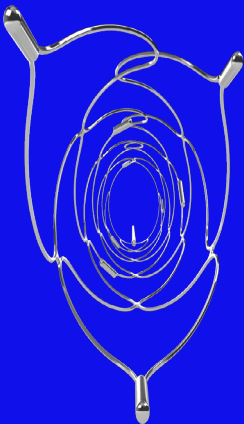
Medtronic AIS solution: 3mm SOLITAIRE™ X and REACT™

Medtronic

제2차 급성뇌경색치료연구회(ASTRO) Stroke Conference & New Device Update

Medtronic
Engineering the extraordinary

Solitaire™ X
Revascularization Device
3mm



Summer Park
NV Marketing

[illegible]

New Product: Solitaire™ X 3mm

Deploy with **Safety**.

Designed to safely treat vessels down to **1.0mm** with ultra-precision and maintain vessel integrity with a flexible parametric design. ^{1,2}

Solitaire™
X Device
3mm

65%
Overlap

1mm Vessel

36%
Overlap

2mm Vessel

27%
Overlap

3mm Vessel

Treat vessels as small as **1.0mm**¹⁻³



1. M050800002 2. 20140101 Rev A 3. 20150404 Rev A

* Ultra-precision as defined by 3mm compared to 3mm, 3mm

3

Medtronic

New Product: Solitaire™ X 3mm

Retrieve
with **control**.

Minimized vessel movement.
Designed to safely treat distal
occlusions out to M2.^{1,2,3}

The image contains three visual elements. On the left is a schematic diagram of a blood vessel with a blue occlusion; a yellow-green device is shown within the vessel, with a dashed circle highlighting its position. To the right are two circular angiogram images. The left angiogram shows the device at a 3x20 magnification, and the right angiogram shows it at a 3x40 magnification. Both images include a green label 'Solitaire™ X' and their respective magnification levels.

¹ N005852002C12 ² D08415763 Rev A: 3. D08204445 Rev A

4 Solitaire 3mm | February, 2022

Medtronic

New Product: Solitaire™ X 3mm

Deliver
With **choice.**

Greater procedural versatility helping you operate nimbly in small vessels!

Designed for a lower clot crossing profile with 0.017" microcatheters.^{1,2}

Compatible Access Options

Lower Clot Crossing Profile

Outer Diameter (F)

Delivery Force (N)

Lower delivery force

* Average clot crossing profile and delivery force of 0.017" microcatheters.

Compatibility testing of the 3mm Solitaire™ X has been performed with the Headway™ 17 Advanced (0.017") and Trevo™ Pro-14 (0.017") microcatheters.³⁻⁵

Recommendation
Phenom™ 21 160cm

1. MED5000002 2. 2004191004 3. 2003081004 4. Phenom 14 compatibility with 3x02 and 3x01 5. 2000020004 6. Phenom 17 compatibility with 3x02 and 3x01 5. 2004020444 7. Headway™ 17 Advanced compatibility with 3x01 (m)

5 UCC000000 MY Solitaire X 3mm Launch Deck for Regional Update | FY23 | Confidential, for Internal Use Only

Medtronic

New Product: Solitaire™ X 3mm

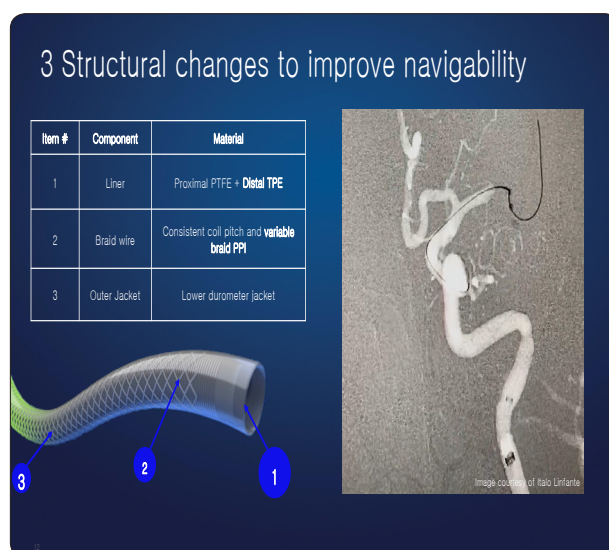
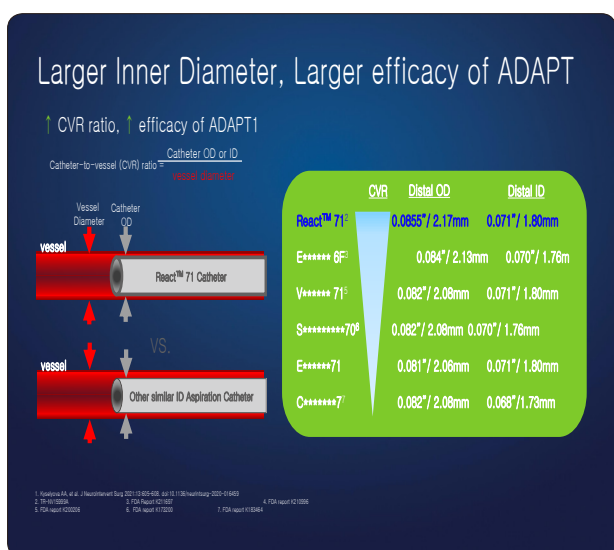
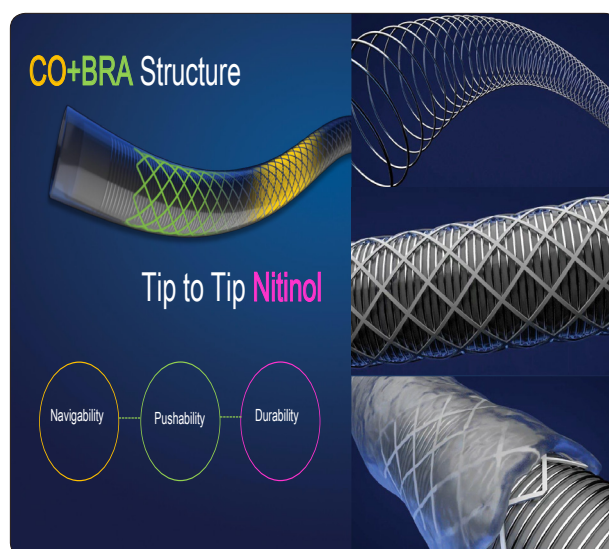
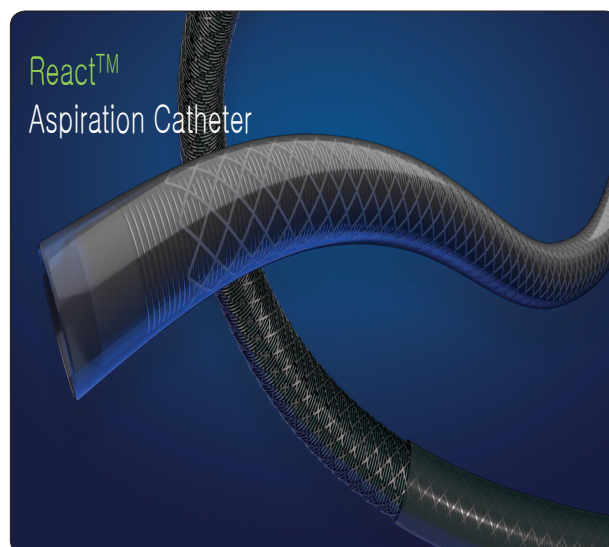
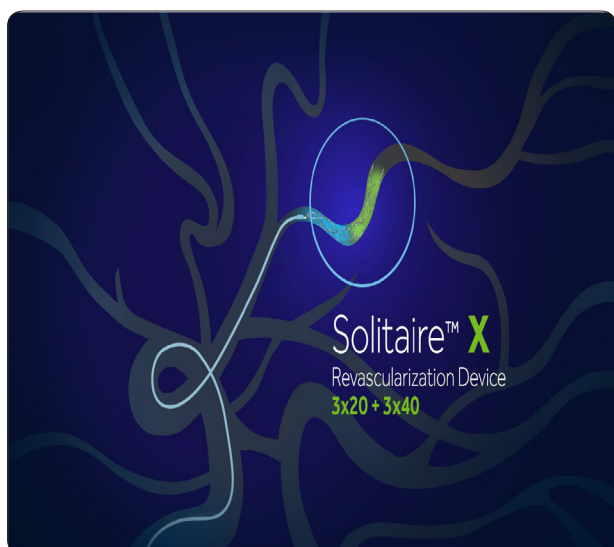
Specifications¹

The diagram illustrates the Solitaire X 3mm catheter with two configurations of body markers. The top configuration shows 2 rows of evenly spaced body markers every 10mm, with a 3x20 working length and a 3x40 non-working length. The bottom configuration shows 4 rows of evenly spaced body markers every 10mm, with a 3x20 working length and a 3x40 non-working length. Both configurations include a tapered introducer sheath and a proximal marker.

Model	Recommended Vessel Diameter* (mm)	Monocatheter ID Range (min-max)	Push Wire Length (cm)	Start Diameter (mm)	Usable Length (mm)	Start Length (mm)	Length from Distal Tip to Pousseur's Marker (cm)	Radioopaque Markers	Radioopaque Start Markers	Spacing (mm)
SFRA-3-20-10	1.0 3.0	0.017"-0.027" 0.43mm-0.69mm	200	3.0	20.0	30.6	<150	3	1	10
SFRA-3-40-10	1.0 3.0	0.017"-0.027" 0.43mm-0.69mm	200	3.0	40.0	51.6	<150	3	1	10

1. MEDTRONIC
© UC80000000 MW Solitaire X 3mm Launch Deck for Regional Update | P123 | Confidential, for Internal Use Only

Medtronic



Proven Compatibility
with Solitaire™ X React™
Tested for reliable performance for up to
3 passes without damage

Medtronic

React™ with Engineering Data

React™ 71 Catheter has superior trackability and durability¹

Figure 1. Navigation force measurement (mean $\pm$ SD) for aspiration catheters in the sinusoidal model (guidewire and microcatheter); (inset) Post-hoc statistical analysis for peak navigation force between the ACs.

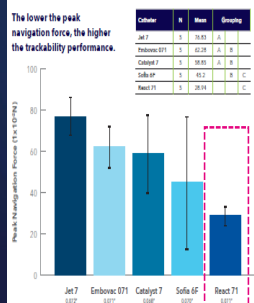
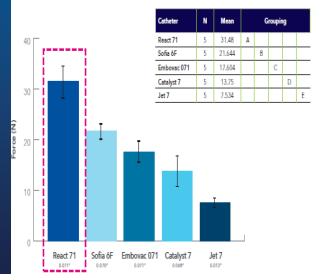


Figure 3. Measurement of peak tensile force to failure for the distal section of the ACs. Post-hoc statistical analysis for peak tensile force to failure between the ACs.



* In terms of the lowest peak navigation force defined in the study
** In terms of mechanical resistance or tensile force required to track in the distal segment of the catheter

1. Riquelme P, et al. Journal of Neurointerventional Surgery. 2022; April 14. 10.1093/neuros/nyab007. 1077. <https://doi.org/10.1093/neuros/nyab007>
2. Li J and Park M. Neurointervention. 2022;17(1):71. doi:10.5469/neuroint.2022.16025

React™ with Clinical Evidence
102 patients treated with combined MT technique
using React™ and Solitaire™.

Combined technique as first approach
in mechanical thrombectomy. Efficacy and safety
of REACT catheter combined with stent retriever

Manuel Requena^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102}, Carlos Pilián^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102}, María Oliver-Gadea^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102}, David Hernández^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102}, Sandra Baeza^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102}, María de los Angeles Rodríguez^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102}, Elia Rivera^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102}, María Rodríguez^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102}, Álvaro García-Torres^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102}, Laura Ladrón de Guebara^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102}, Carlos Molero^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102}, Marc Ribó^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102} and Alejandro Tena-Sempere^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102}

Clinical Outcomes

89.2% Successful Recanalization (mTICI 2b-3)

53.9% Modified First Pass Effect

2% Complications

93.6% Successful Recanalization Class I-A Indication patients (N=47)

Combined use of React and Solitaire is effective.

Basilar, 5.93%

ICA-T, 25.50%

M1, 52%

M2, 16.70%

React™ 68, 22.5%

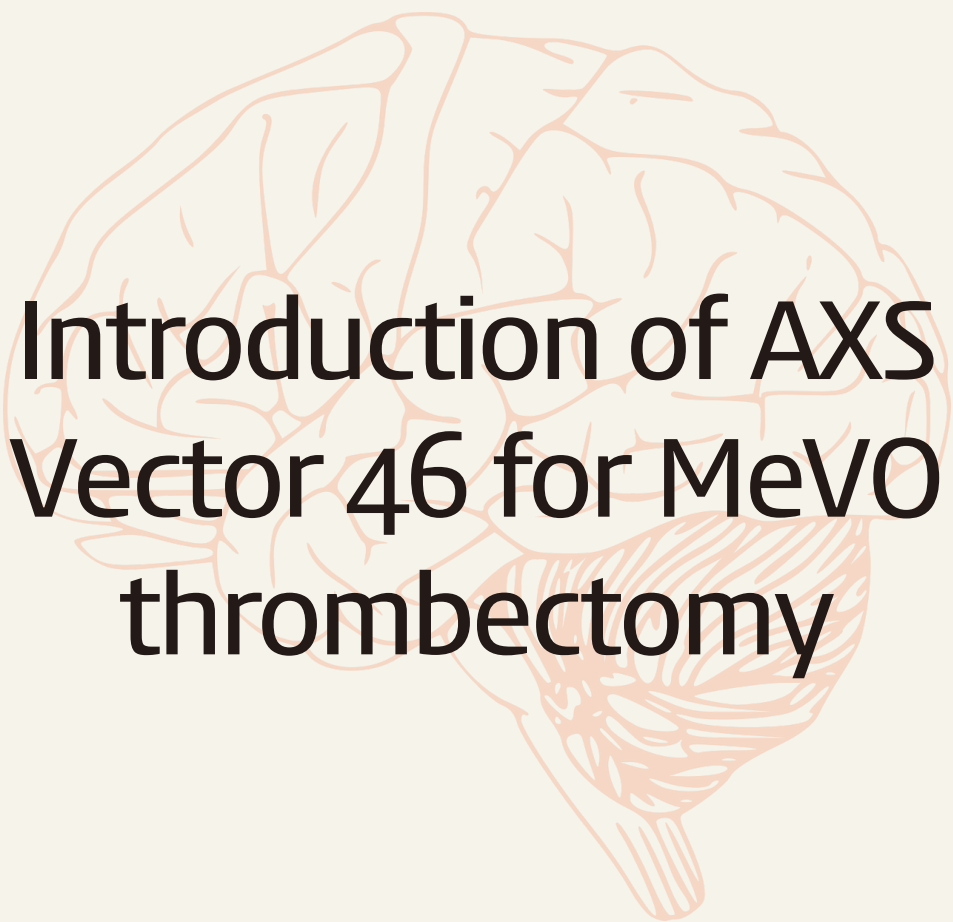
React™ 71, 77.5%

Others, 28.4%

Solitaire™ X, 70.25%

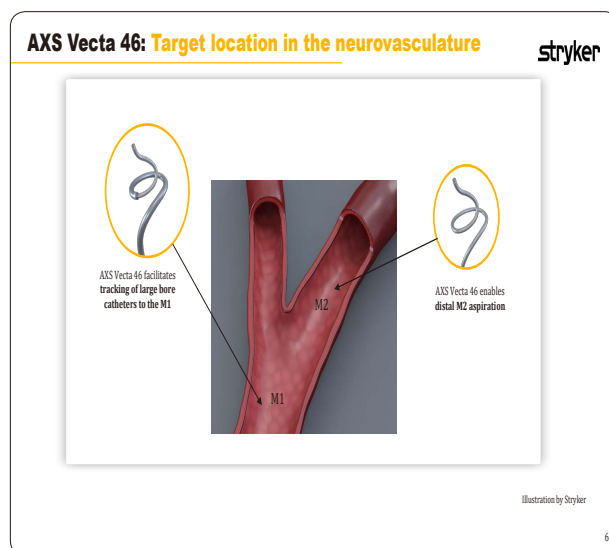
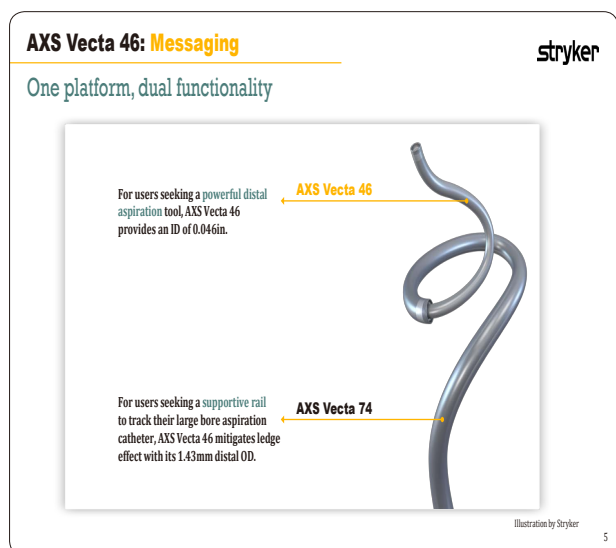
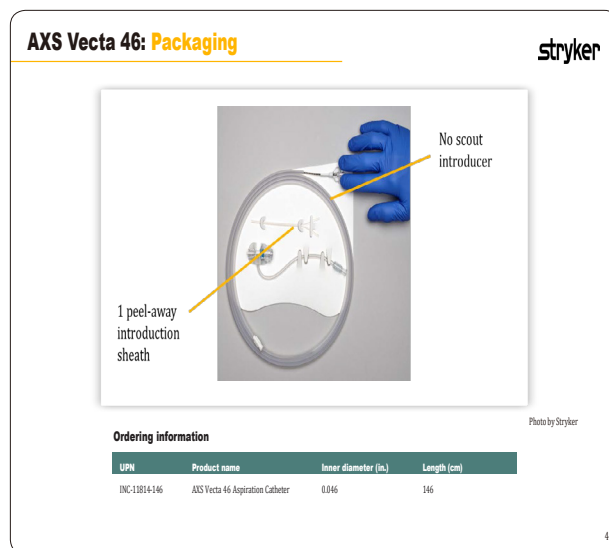
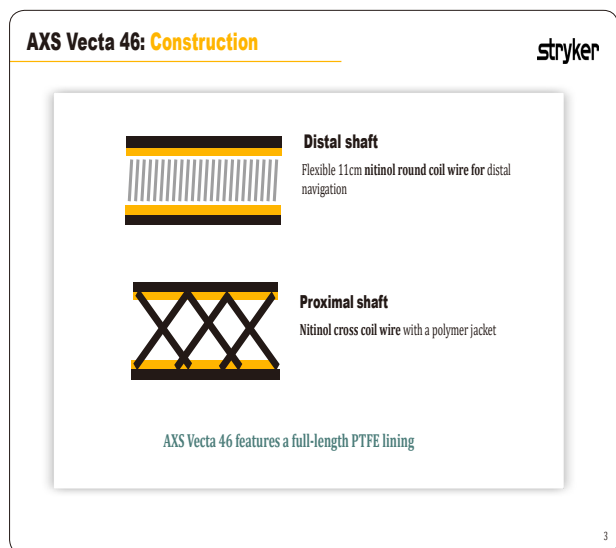
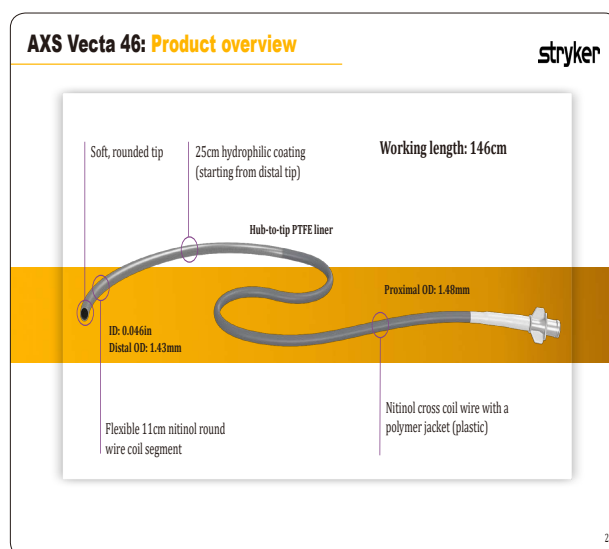
Medtronic
Engineering the extraordinary

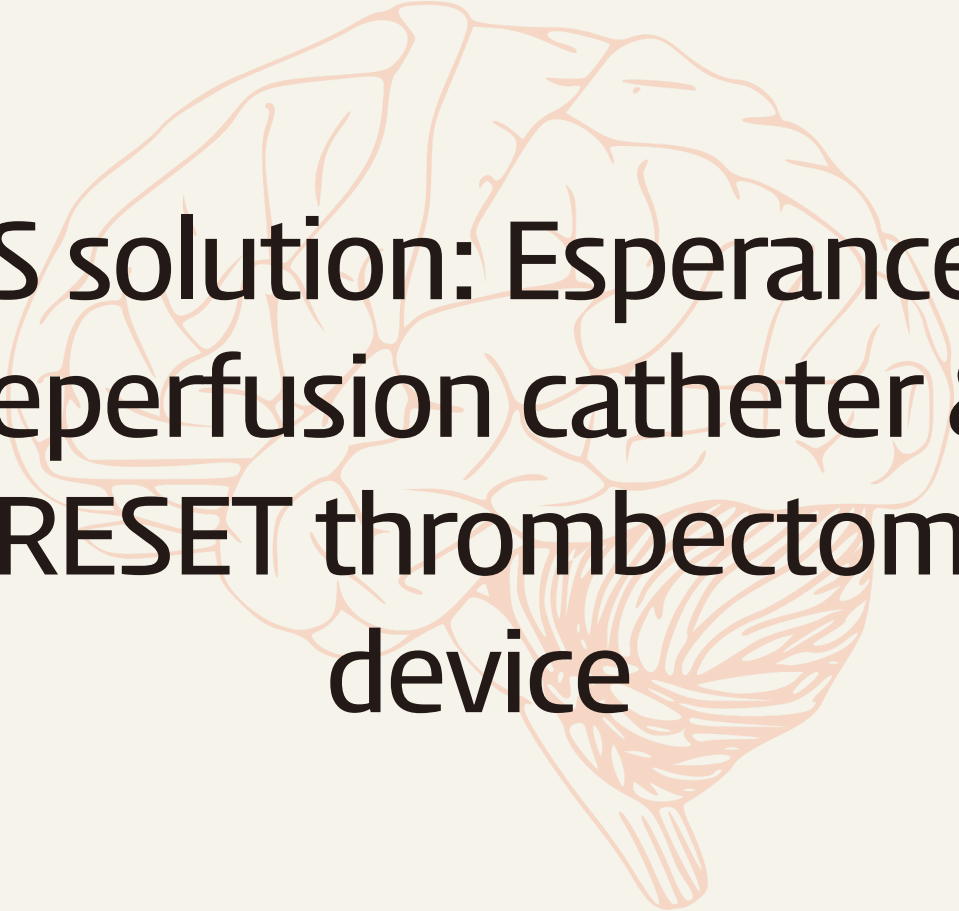
Your Total
Stroke Solution
Partner



Introduction of AXS Vector 46 for MeVO thrombectomy

Stryker





AIS solution: Esperance™ reperfusion catheter & pRESET thrombectomy device

Wallaby/Phenox

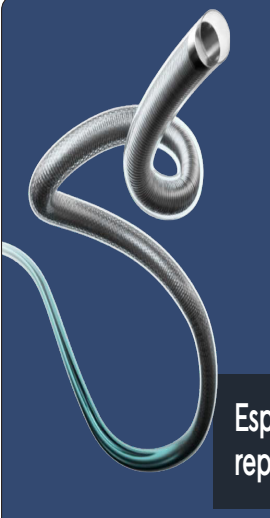


AIS Solution : Esperance™ reperfusion catheter & pRESET thrombectomy device

Esperance™
reperfusion catheter

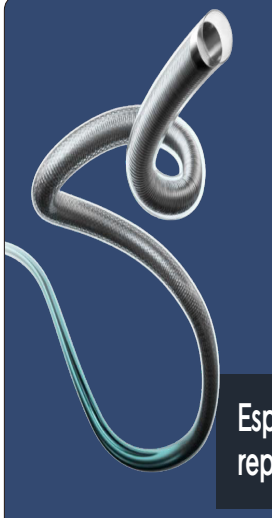


pRESET
thrombectomy device

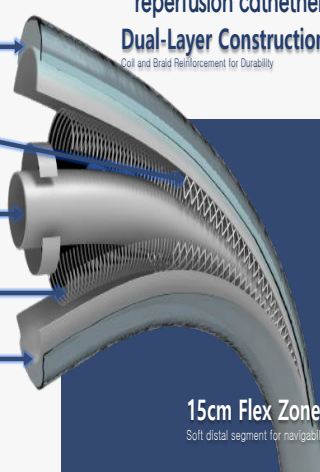
Product Model	Working Length [cm]	Distal Inner Diameter [inch]	Outer Diameter (Proximal/Distal) [inch]	Coating Length [cm]
ASP6F131KIT	131			60
ASP6F125KIT	125	0.071	0.082/0.081	
ASP6F115KIT	115			
ASP5F131KIT	131			
ASP5F125KIT	125	0.055	0.066/0.062	
ASP5F115KIT	115			

**Esperance™
reperfusion catheter**




- Large ID. ID=0.071". Provide adequate suction to suck the clot out successfully
- Small OD. OD=0.081". The aspiration catheter is able to enter the small vessels in the brain.

**Esperance™
reperfusion catheter** 6F



**Esperance™
reperfusion catheter**
Dual-Layer Construction
Coil and Braid Reinforcement for Durability

Unique Hydrophilic Coating Process
Longer 60cm coated segment for smooth deliverability

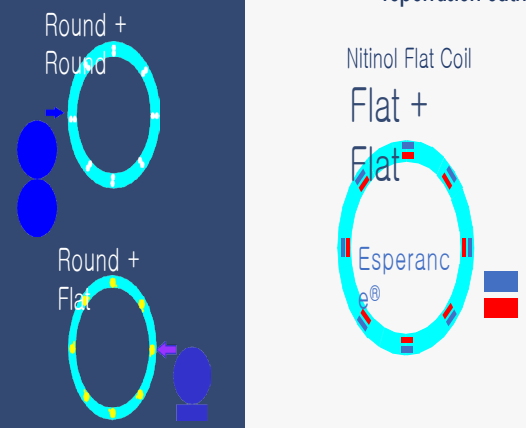
Nitinol Flat Coil
Flat coil for maximum lumen patency

.071" Inner Diameter
Large lumen for increased aspiration power

2cm Coil Only
Ultra-Soft Distal Tip

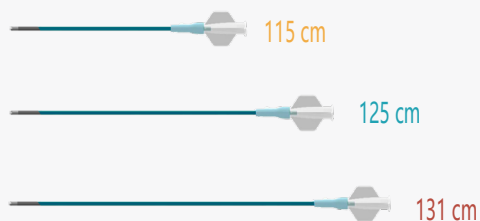
.011" Thin Wall
Reduces the ledge effect

15cm Flex Zone
Soft distal segment for navigability



**Esperance™
reperfusion catheter**

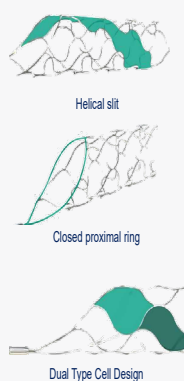
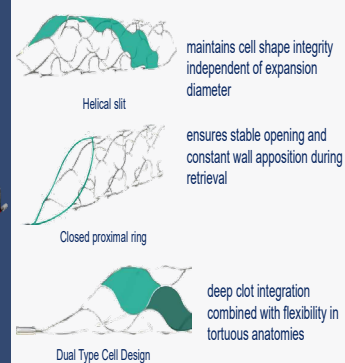
Nitinol Flat Coil
Flat + Flat
Esperance™

Esperance™
reperfusion catheter

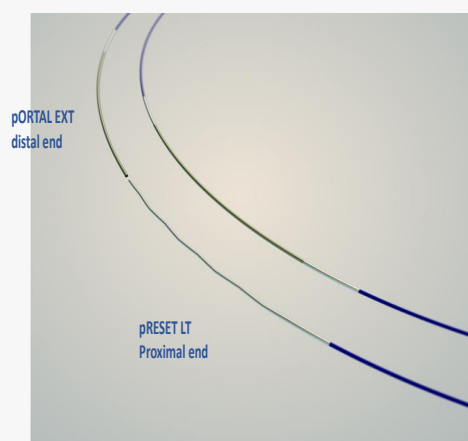
Available in a variety of lengths, meets different clinical requirements.

pRESET
thrombectomy device

REF	Shaft Diameter [mm]	Working Length [mm]	Shaft Length [mm]	Microcath. [inch]	vessel diameter [mm]
PRE-LT-3-20	3	20	30	0.0165	> 1.5
PRE-LT-4-20	4	20	30	0.0165	> 1.5
PRE-4-20	4	20	30	0.021	> 2
PRE-6-30	6	30	48	0.021	> 3
PRE-5-40	5	40	52	0.021	> 2

pRESET
thrombectomy devicepRESET
thrombectomy device

Docking procedure

pRESET
thrombectomy device

pRESET LT + EXT Wire

pRESET
thrombectomy device

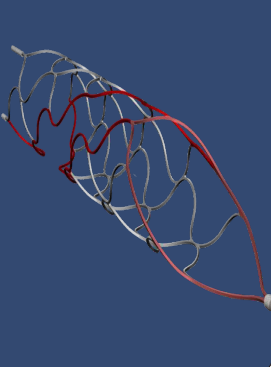
A: Shaft Diameter [mm]	B: Shaft Length [mm]	C: Insertion Wire Length [mm]	D: Marker Distance [mm]	E: Working Length [mm]	Microcatheter Compatibility [inch]	Min. Vessel Diameter [mm]	A Diameter
3	30	2000		20	0.0165 / 0.017	1.5	0.36 mm / 0.014"
							B Total Length
							115 cm
							with pRESET
							315cm

ARTESp
- Acute Recanalization of Thrombo Embolic Stroke with pRESET

pRESET thrombectomy device

Characteristics I	Intervention
no. of patients	100
no. of treated vessels	109
age yr. mean (SD)	68.3 (13.8)*
age min-max yr.	20-90*
female sex (%)	55
NIHSS score at admission median (n, range)	15 (99; 5-29)**
Prestroke mRS	%
0	83.0
0-1	91.0
0-2	96.0
>2	4.0
Medical History	% (n/n)
atrial fibrillation	57.1 (58/98)
systemic hypertension	67.3 (66/98)
diabetes	17.2 (17/99)
former stroke	16.3 (13/80)

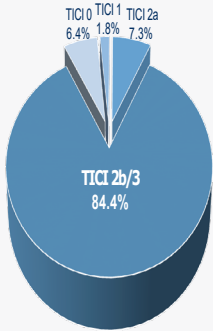
*Three patients were > 95 years old
**Three patients had a NIHSS < 5



pRESET thrombectomy device

ARTESp Study Results

Recanalization



TICI Grade	Percentage
TICI 0	6.4%
TICI 1	1.8%
TICI 2a	7.3%
TICI 2b/3	84.4%

pRESET thrombectomy device

ARTESp Study Results

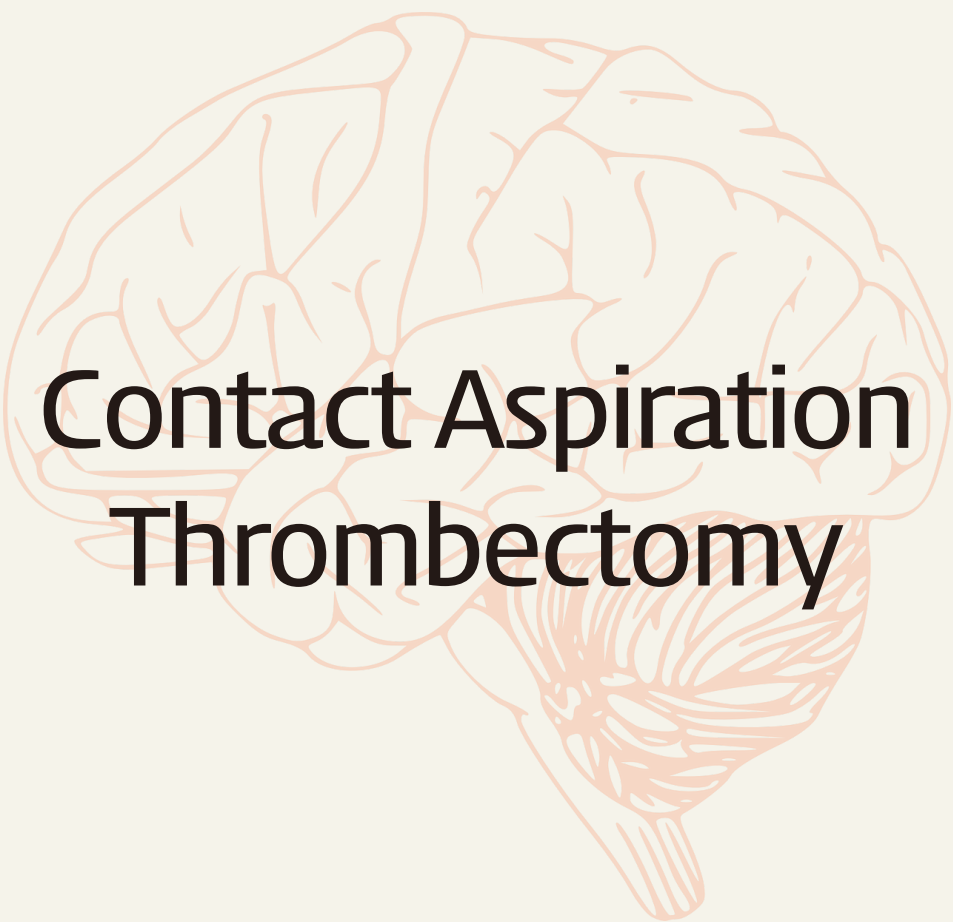
mRS 0-2 at 90 days: 62.5%

	ARTESp	MR CLEAN	SWIFT-PRIME ²	EXTEND-IA ³	ESCAPE ⁴
mRS 0-2 90days	62.5%	32.6%	60%	71%	53%
TICI 2b/3	84.4%	58.7%	88%	86%	72.4%

Sources:
Prothmann et al., Acute Recanalization of Thrombo-Embolic Ischemic Stroke with pRESET (ARTESp): the impact of occlusion time on clinical outcome of directly admitted and transferred patients; J Neurointerv Surg 2016; doi:10.1136/neurintsurg-2016-012556. | Berkhemer et al., A Randomized Trial of Intraarterial Treatment for Acute Ischemic Stroke; N Engl J Med 2014; DOI: 10.1056/NEJMoa1411587.
Saver et al., Stent-Retriever Thrombectomy after Intravenous t-PA vs. t-PA Alone in Stroke; N Engl J Med 2015; DOI: 10.1056/NEJMoa1415061.
Campbell et al., Endovascular Therapy for Ischemic Stroke with Perfusion-Imaging Selection; N Engl J Med 2015; DOI: 10.1056/NEJMoa1414702.
Goyal et al., Randomized Assessment of Rapid Endovascular Treatment of Ischemic Stroke; N Engl J Med 2015; DOI: 10.1056/NEJMoa1414605.
Study did not include pRESET LITE.
The pRESET Thrombectomy Device is not approved for sale nor is it available for sale or use in the United States.

KF-0032C

Thank you!



Contact Aspiration Thrombectomy

심 유 식
인하대병원

Contact Aspiration Thrombectomy: Comprehensive Review & Practice

Yushik Shim
Inha University

Historical RCTs in Acute ischemic stroke Treatment

Year	Events	Trials
~1995	Search for <i>Thrombolytics</i>	ECASS, MAST-I, MAST-E, ASK
1995	Choice of <i>Optimal IV Thrombolytics</i>	<i>NINDS</i>
2008	Expansion of Time Window	ECASS-3
2013	EVT - not superior to IV tPA	IMS-3, MR-RESCUE, SYNTHESIS
2015	<i>EVT – standard methods</i>	<i>MR CLEAN, ESCAPE, EXTEND-IA, SWIFT PRIME, REVASCAT</i>
2018	Expansion of Time Window	DAWN, DEFUSE-3
2022 -	<i>EVT for Large core stroke</i>	<i>RESCUE-JAPAN LIMIT, SELECT2, ANGEL-ASPECT (... TESLA, TENSION, IN EXTREMIS-LASTE</i>

International Stroke Conference (ISC) 2023

February 08 - 10, 2023
Dallas, Texas and Virtual

Tirofiban Superior to Aspirin in Stroke Without Large Occlusion

Medscape Medical News, March 2, 2023 □ 1

Endovascular Therapy Benefits Large Infarction: ANGEL-ASPECT

Medscape Medical News, February 16, 2023

Thrombolysis Not Necessary in Mild Nondisabling Stroke: ARAMIS

Medscape Medical News, February 16, 2023

Similar Effect of Early, Late BP Reduction in Stroke: CATIS-2

Medscape Medical News, February 15, 2023

Novel Celery Seed-Derived Drug May Improve Stroke Outcomes

Medscape Medical News, February 15, 2023 □ 5

Tenecteplase Noninferior to Alteplase for Ischemic Stroke: TRACE-2

Medscape Medical News, February 13, 2023

Blood Pressure-Lowering After Thrombectomy May Be Harmful

Medscape Medical News, February 10, 2023 □ 2

Thrombectomy Benefits Stroke With Large Core Volumes: SELECT2

Medscape Medical News, February 10, 2023 □ 1

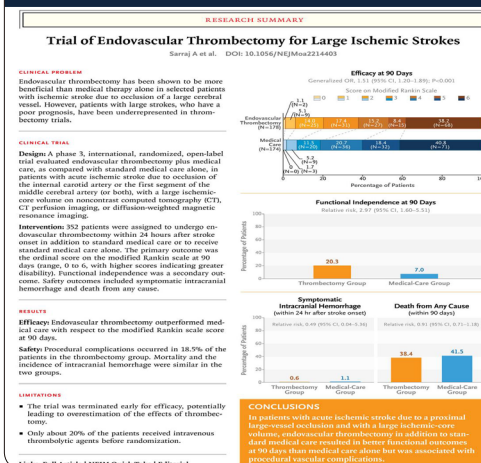
Stroke Ready Program Doesn't Increase Thrombolysis Rate

Medscape Medical News, February 10, 2023 □ 1

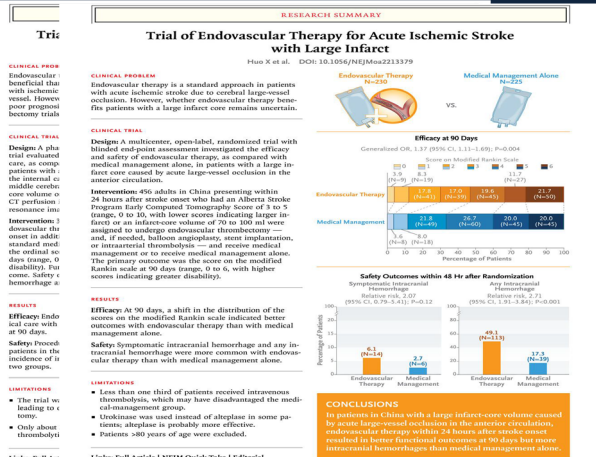
STROKE AF at 3 Years: High AF Rate After Atherosclerotic Stroke

Medscape Medical News, February 9, 2023

This Will Change Practice !



This Will Change Practice !



Which is better ? Contact Aspiration vs. Stent Retriever

J Neurointerv Surg. 2017 Feb;9(2):142-146. doi: 10.1136/neurintsurg-2015-012235. Epub 2016 Apr 21.

A survey of neurointerventionalists on thrombectomy practices for emergent large vessel occlusions

Kyle M Fargen¹, Adam S Arthur², Alejandro M Spiotta¹, Jonathan Lena³, Iman Chaudry³, Raymond D Turner³, Aquilla S Turk³

17. For an intracranial EVO, our practice patterns are to begin thrombectomy with	Retrievable stent without balloon guide or aspiration 5.1%	Retrievable stent with balloon guide or aspiration 23.1%	Retrievable stent with aspiration at distal (Solitaire) 28.2%	ADAPT technique 39.7%	Intra-arterial thrombolytic or other 3.8%
20. How successful are you with your primary thrombectomy technique (TICI 2b or 3) with 3 passes or less, or before switching to a different technique?	0-50% 0.0%	50-70% 25.6%	70-90% 44.9%	>90% 25.5%	

Which is better ? Contact Aspiration vs. Stent Retriever

> J Neurointerv Surg. 2019 Sep;11(9):884-890. doi: 10.1136/neurintsurg-2018-014614. Epub 2019 Feb 13.

Institutional and provider variations for mechanical thrombectomy in the treatment of acute ischemic stroke: a survey analysis

Tapan Mehta¹, Shalish Mehta¹, Coridon Quinn¹, David F Kallmes², Adnan H Siddiqui³, Aquilla Turk⁴, Andrew Walker Grande¹, Ramachandra Prasad Tummala¹, Bharathi Dasan Jagadeesan¹

Table 1 Baseline characteristics of mechanical thrombectomy techniques

	N	Solendra technique without BGC (%)	Direct aspiration without BGC (%)	Solendra technique with BGC (%)	Stent retriever with BGC (%)	Direct aspiration with BGC (%)	P value
What is your background training?							
Neurointervention	41	31.7	51.2	9.8	4.9	2.4	0.02
Neurosurgery	11	45.5	18.2	0.0	27.3	9.1	
Neurology	12	25.0	33.3	33.3	0.0	8.3	
Other	4	25.0	25.0	0.0	50.0	0.0	
How many years have you been in practice?							
<1 year	3	0.0	33.3	33.3	33.3	0.0	0.15
1-2 years	4	0.0	0.0	50.0	25.0	25.0	
2-5 years	15	33.3	46.7	6.7	13.3	0.0	
5-10 years	15	40.0	40.0	0.0	13.3	6.7	
>10 years	31	35.5	45.2	12.9	3.2	3.2	
What stent retrievers do you use during the 'Solendra technique'? (Please select all applicable options)							
Solitaire	52	32.7	34.6	13.5	13.5	5.8	0.39
Trevo	48	35.4	37.5	10.4	10.4	6.3	
3D Separator	16	18.8	75.0	0.0	0.0	6.3	
Other	1	0.0	100.0	0.0	0.0	0.0	
What intermediate or aspiration catheter do you use during the 'Solendra technique'? (Please select all applicable options)							
Sofia/Sofia plus	14	28.6	35.7	7.1	14.3	14.3	0.04
ACE 68	56	35.7	44.6	8.9	7.1	3.6	
Arc	3	0.0	0.0	33.3	66.7	0.0	
Catalyst	11	18.2	18.2	36.4	27.3	0.0	
Revive IC	0	0.0	0.0	0.0	0.0	0.0	
Other	7	42.9	28.6	14.3	0.0	14.3	

2021년 KoNES 통계 (출처: KoNES 연보)

IA Thrombectomy (N=3,384)			
Catheter-based	784	24.2%	
Stent-based	1,016	31.3%	
Combined	1,444	44.5%	
Location	ICA	883	27.1%
	ACA	78	2.4%
	MCA	1873	57.6%
	VBA	420	12.9%

Which is better ? Contact Aspiration vs. Stent Retriever

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

Use of stent retrievers is indicated in preference to the Mechanical Embolus Removal in Cerebral Ischemia (MERCRI) device.

I A

2019 급성 허혈뇌졸중 환자에서 혈관내재개통치료 진료지침 개정

ERT 방법으로 스텐트혈전제거술을 우선적으로 권고한다(근거수준 Ia, 권고수준 A).

Contact Aspiration : Non-inferior Technique

- Faster reperfusion
- Higher rates of successful reperfusion (TICI ≥ 2b)
- Lower rates of major complications (including fewer distal emboli and vessel wall damage)
- Superior cost effectiveness

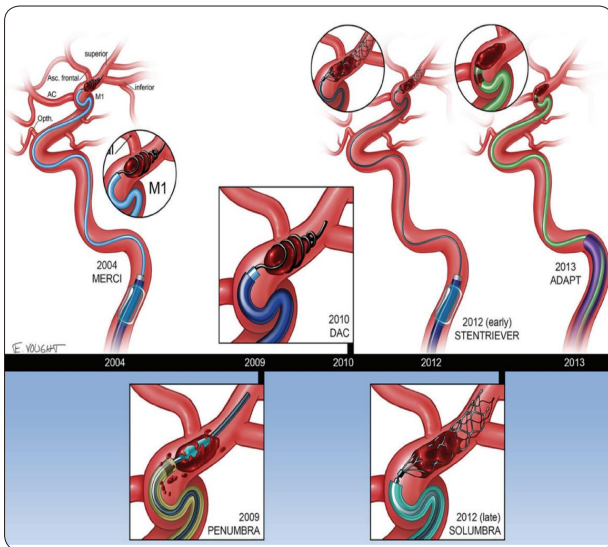
Randomized Controlled Trial > JAMA. 2017 Aug 1;318(5):443-452. doi: 10.1001/jama.2017.9644.
Effect of Endovascular Contact Aspiration vs Stent Retriever on Revascularization in Patients With Acute Ischemic Stroke and Large Vessel Occlusion: The ASTER Randomized Clinical Trial

Randomized Controlled Trial > Lancet. 2019 Mar 9;393(10175):998-1008. doi: 10.1016/S0140-6736(19)30297-1.

Aspiration thrombectomy versus stent retriever thrombectomy as first-line approach for large vessel occlusion (COMPASS): a multicentre, randomised, open label, blinded outcome, non-inferiority trial

Evolution of Contact Aspiration

- Penumbra System (FDA 2007)
- FAST (Forced Arterial Suction Thrombectomy) (2011)
- ADAPT (A Direct Aspiration first-Pass Technique) (2013)
- * SNAKE Technique



Factors influencing the success of Contact Aspiration

- Technical Factors
 - ① larger ID of aspiration catheter
 - ② vacuum aspiration system with higher aspiration force
 - ③ cyclical aspiration force
- Anatomical Factors
 - ① site of arterial occlusion
 - ② angle of interaction b/w aspiration catheter and clot
- Patient Factors
 - ① younger age
 - ② shorter time from stroke onset to clot contact

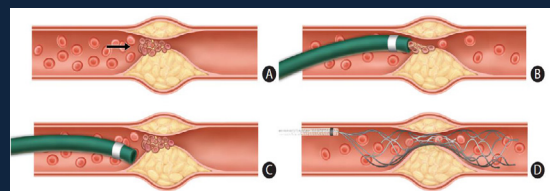
Factors influencing the success of Contact Aspiration

- Clot Related Factors
 - Clot composition (Fibrin / RBC)
 - Fibrin-rich clots : CT-low density / MR-SVS (-)
 - Contact aspiration
 - RBC-rich clots : CT-high density (CT) / MR-SVS (+)
 - Stent Retriever



Refractory Recanalization (ICAS)

- Stent Retriever, the first
- in situ thrombotic occlusion underlying ICAS
- “plaque rupture and re-thrombosis”

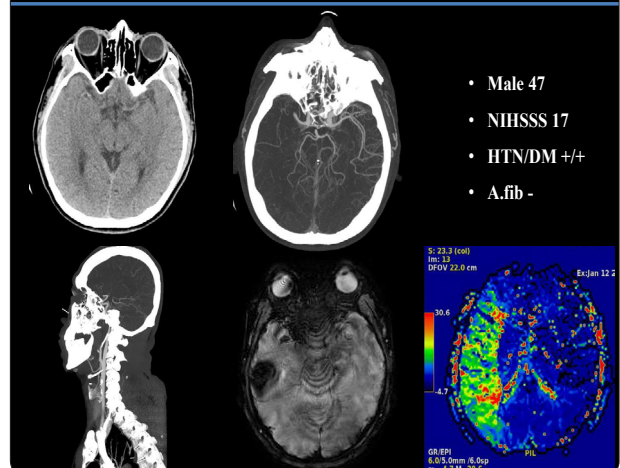


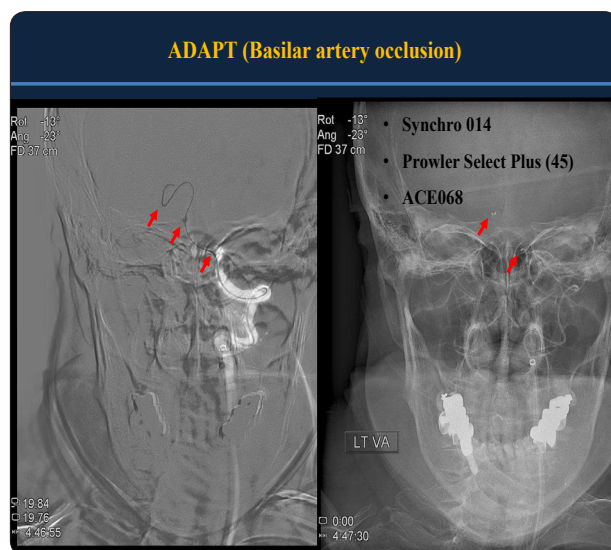
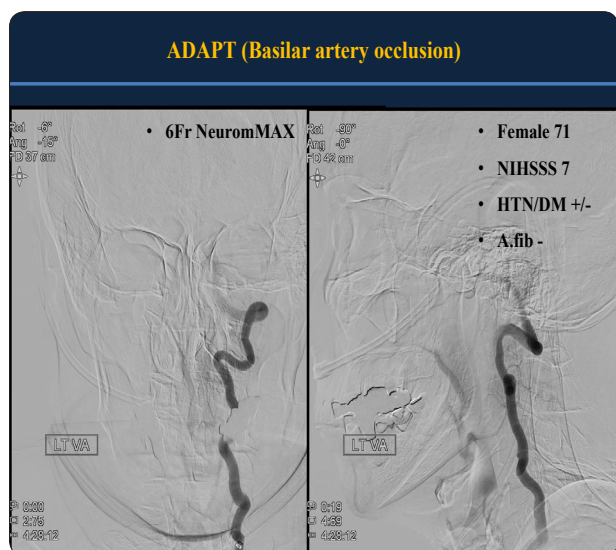
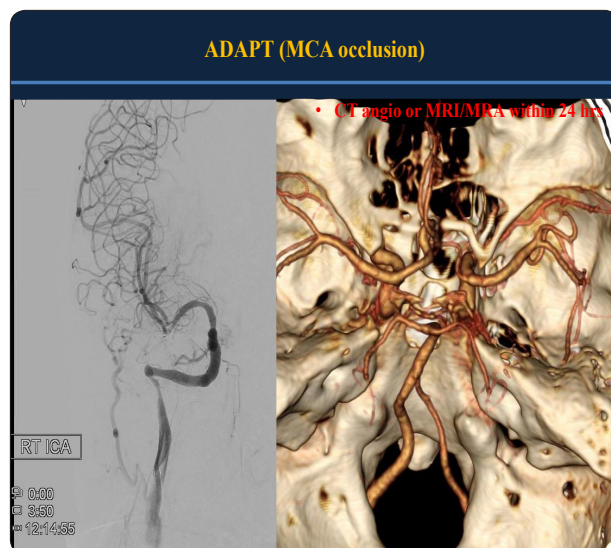
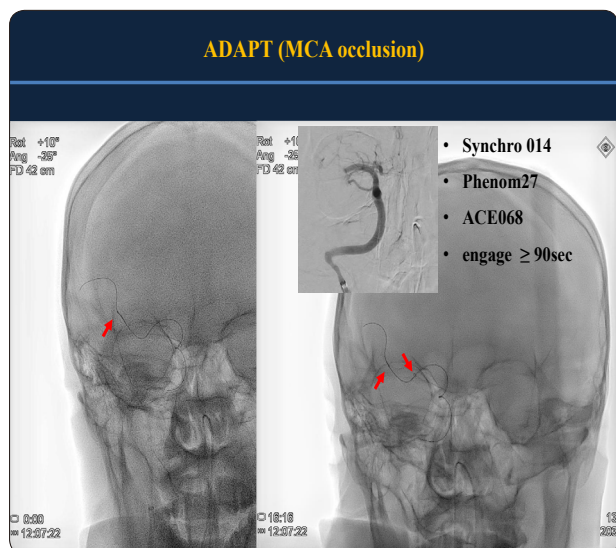
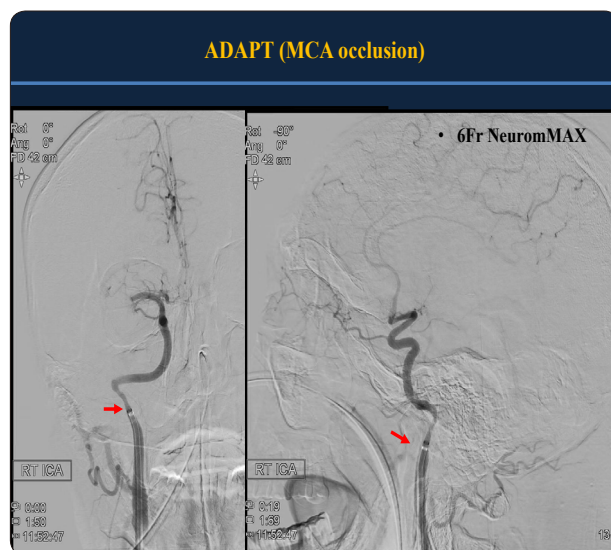
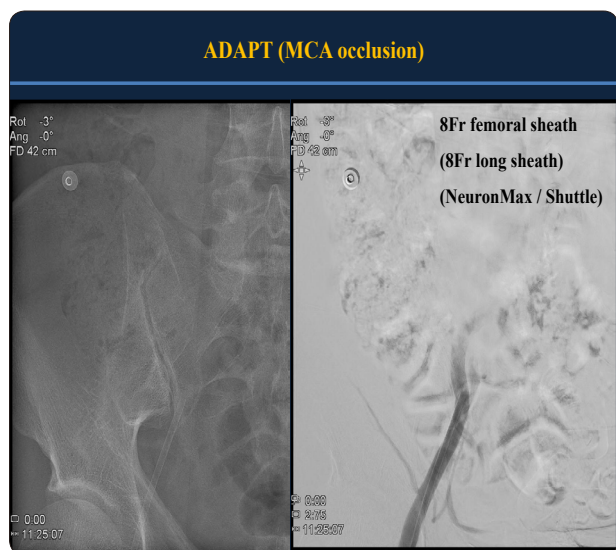
Kang DH, Hwang YH. Frontline Contact Aspiration Treatment for Emergent Large Vessel Occlusion: A Review Focused on Practical Techniques. *J Stroke*. 2019 Jan;21(1):10-22.

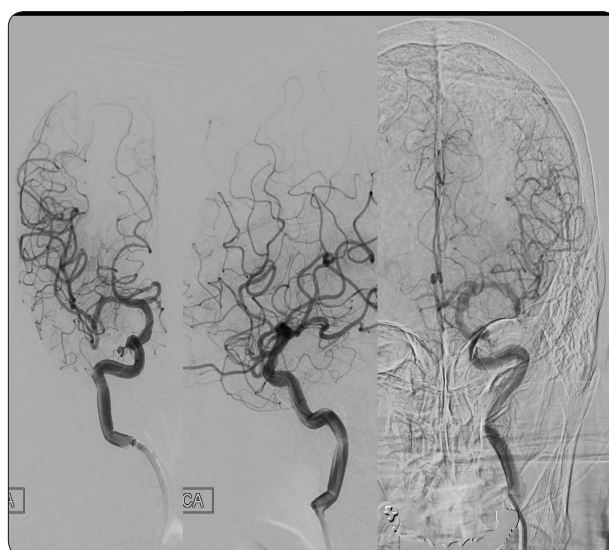
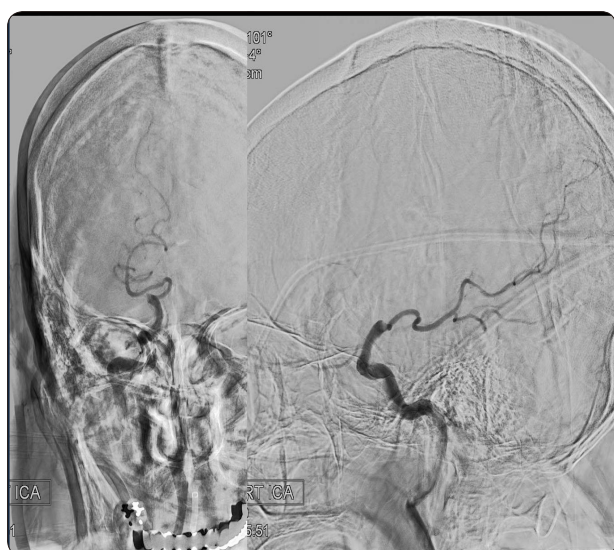
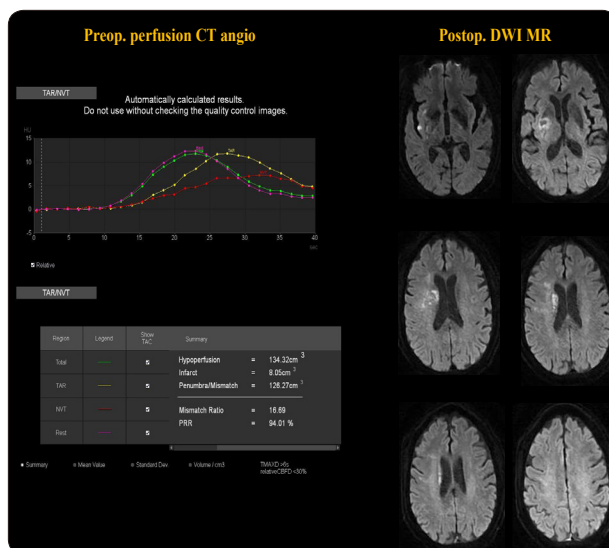
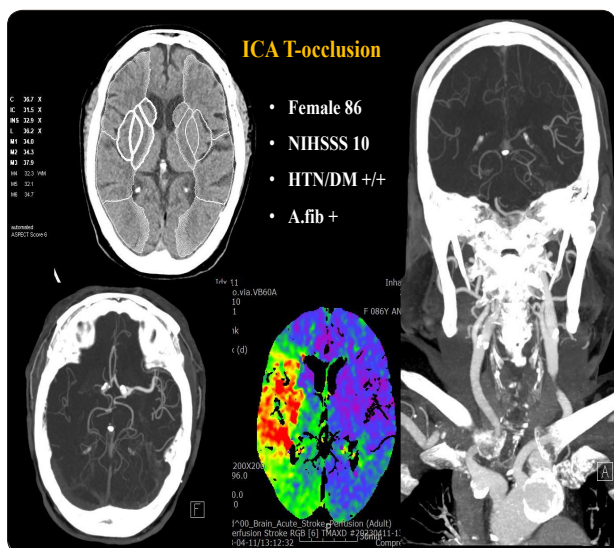
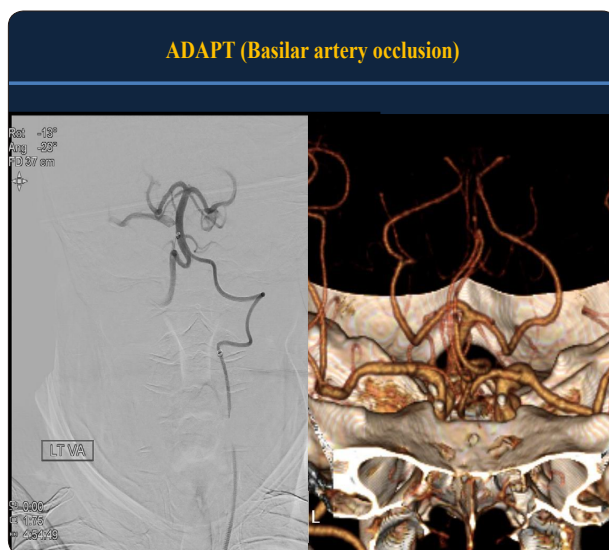
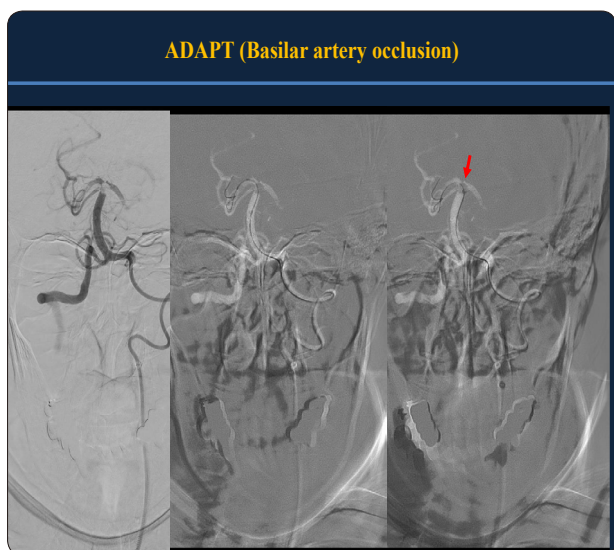
Incheon Regional Cerebrovascular Center (Inha Univ)

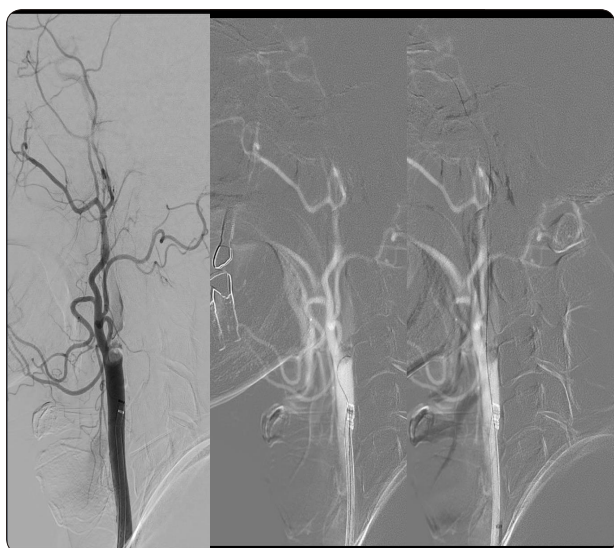
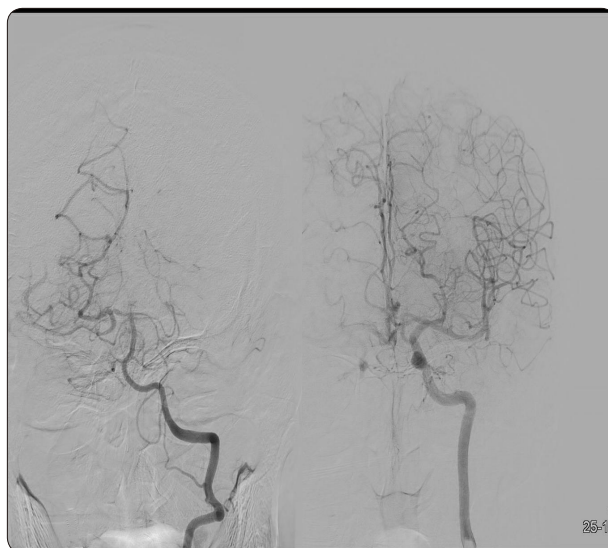
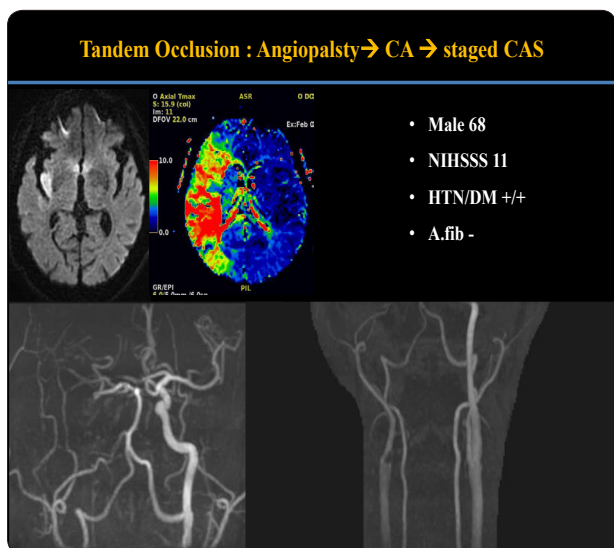
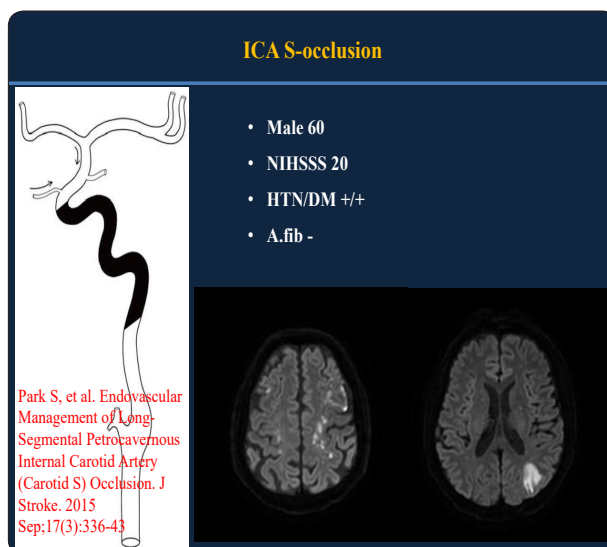
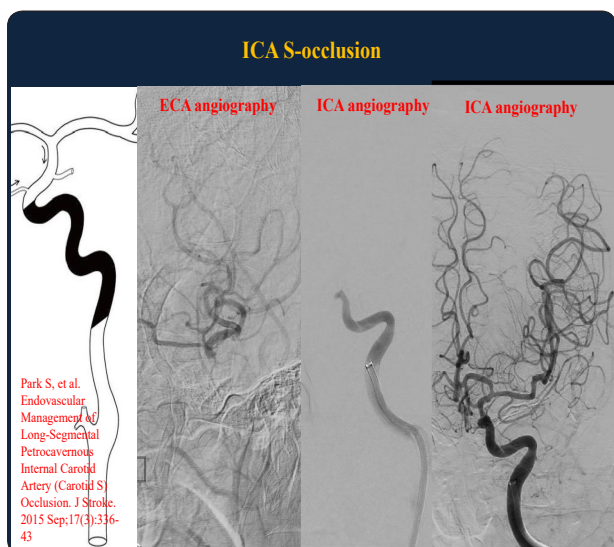
- 2019, 52 cases (NS 41, NR 11, TIC1 $\geq 2b$ 88.5%)
 - SR 42 / Combine (Solumbra) 2 / Others 8
- 2022, 85 cases (NS 74, NR 11, TIC1 $\geq 2b$ 86.5%)
 - CA first 51 / Combine (23) / Others 11

ADAPT (MCA occlusion)

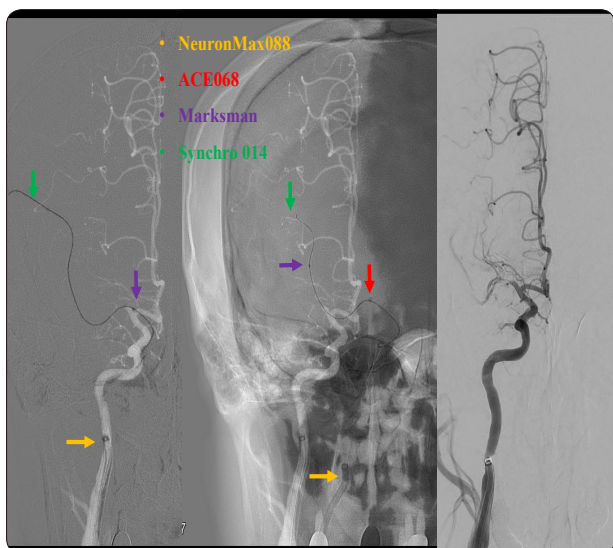
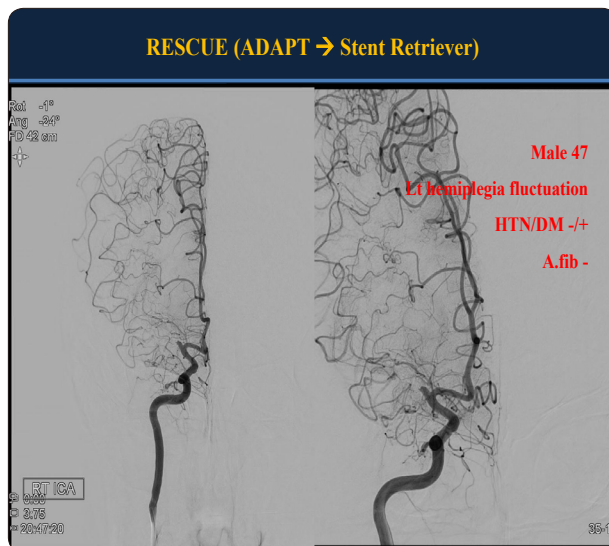


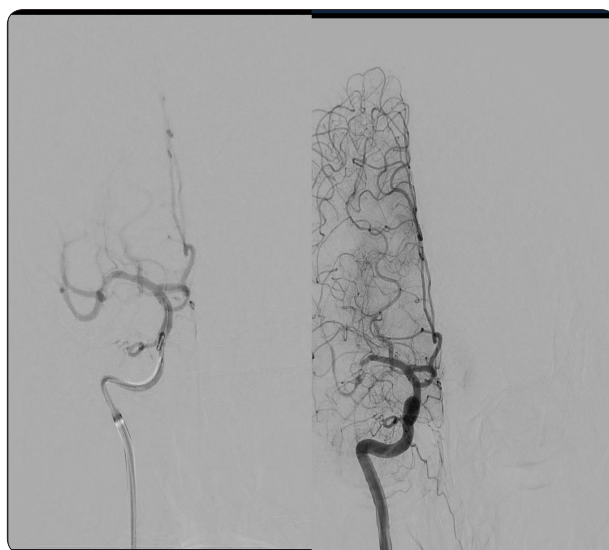
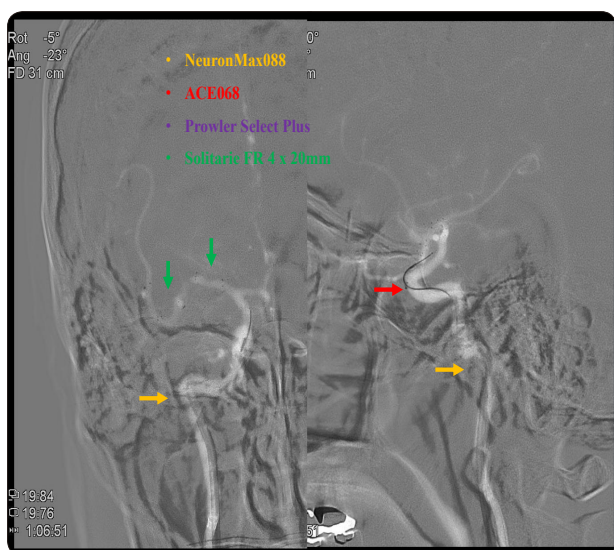
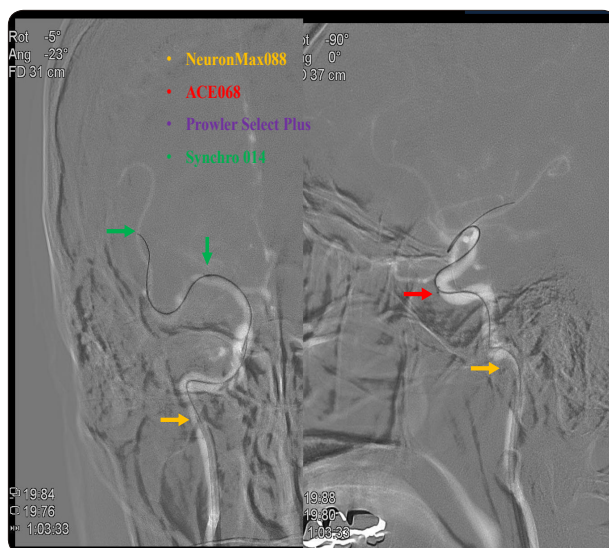
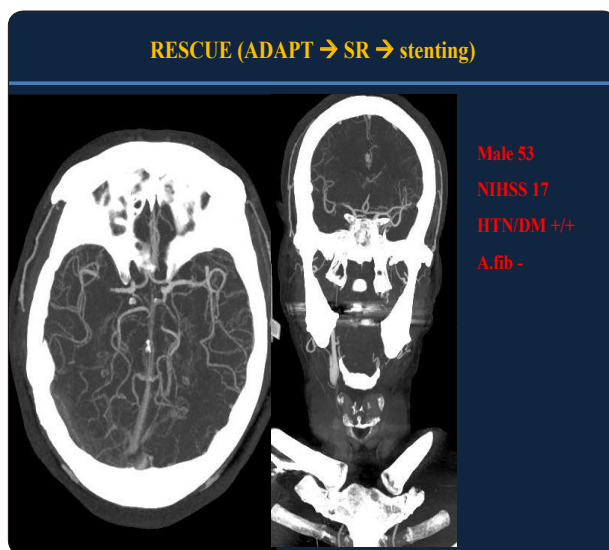




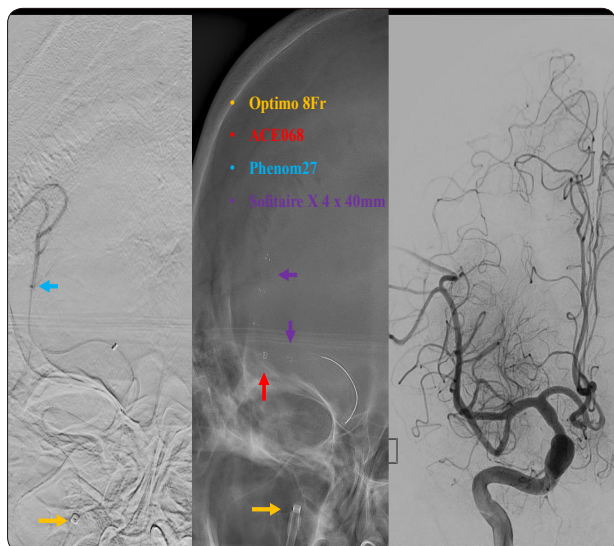
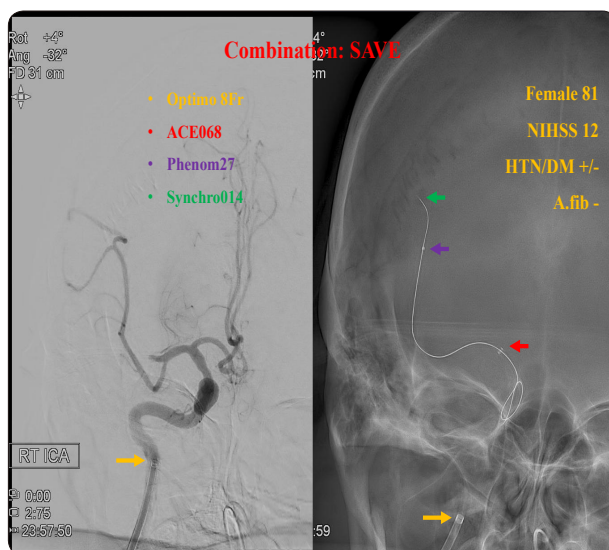
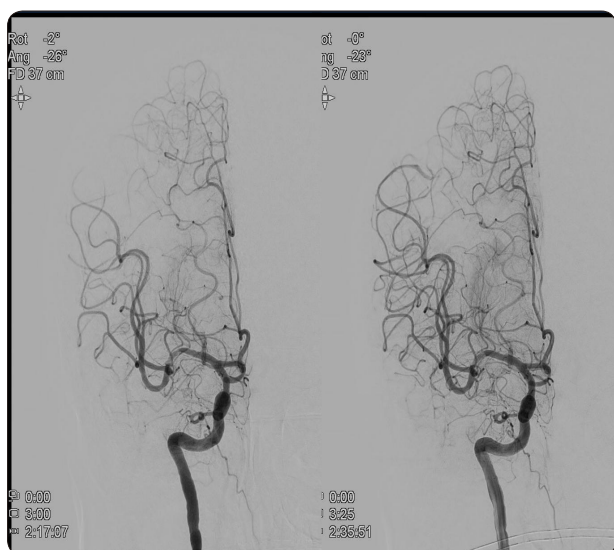


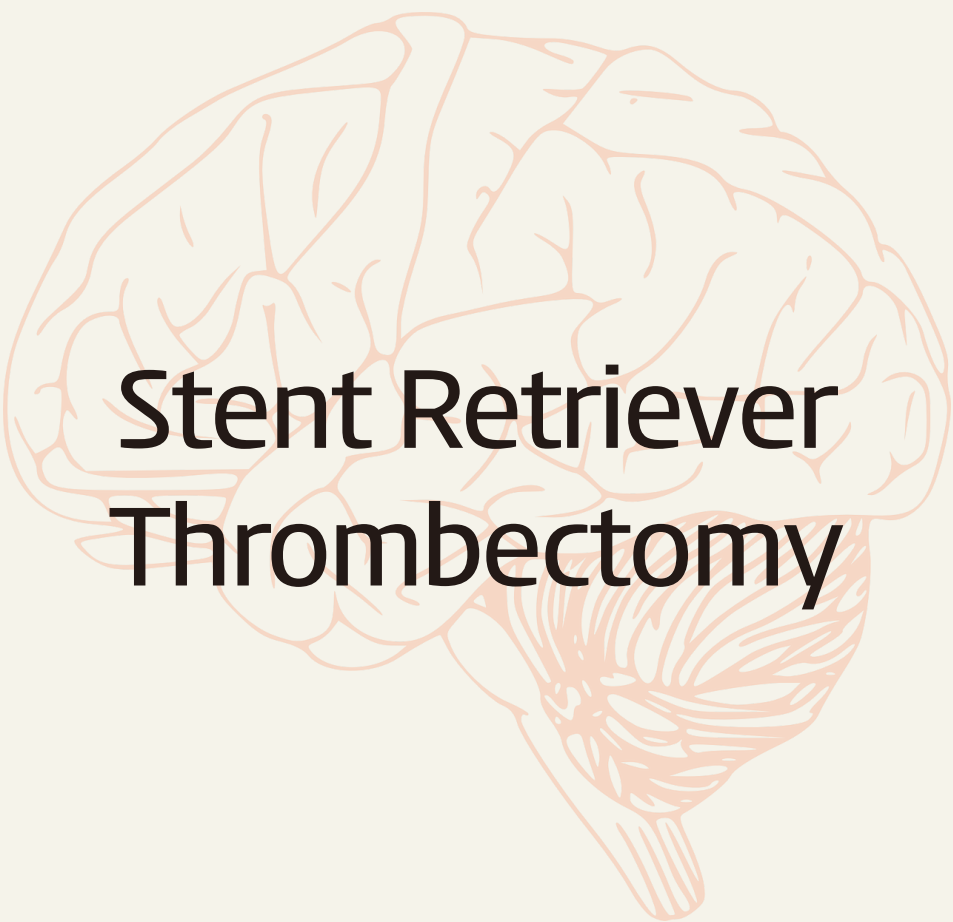
제2차 급성뇌경색치료연구회(ASTRO) Stroke Conference & New Device Update





제2차 급성뇌경색치료연구회(ASTRO) Stroke Conference & New Device Update





Stent Retriever Thrombectomy

박 정 현

한림대 동탄성심병원



Speaker

**Jung Hyun
Park**

E-mail:

parkjunghyun0707@gmail.com

Stent Retriever Thrombectomy

FRI, 28th APR, 2023

ASTRO Stroke Case Conference & New Device Update

No conflict

Not expert

FRI, 28th APR, 2023

ASTRO Stroke Case Conference & New Device Update

Dongtan Set up for SRT

1. ICA ~ M1
2. ~ distal, ACA
3. Post. Circulation - contact aspiration with SOFIA 5

FRI, 28th APR, 2023

ASTRO Stroke Case Conference & New Device Update

I prefer...

1. Large & Long stent, 6-40mm stent
2. Deploy stent as far as possible
3. Inflation balloon before passage occlusion site
4. Do not wait after deploying stent
5. Strip microcatheter when retrieve the stent
6. Use large bore aspiration catheter instead of intermediate
7. A little push intermediate while pulling stent

FRI, 28th APR, 2023

ASTRO Stroke Case Conference & New Device Update

ICA ~ M1

- ◆ BGC + Aspiration Cath + 6mm stent
(strip microcatheter, retrieved without m.catheter)
- Optimo 9Fr + REACT 71 + Stent 6x40
- FlowGate 8Fr + REACT 68 + Stent 6x40
- FlowGate 8Fr + Catalyst 7Fr + Stent 6x37

FRI, 28th APR, 2023

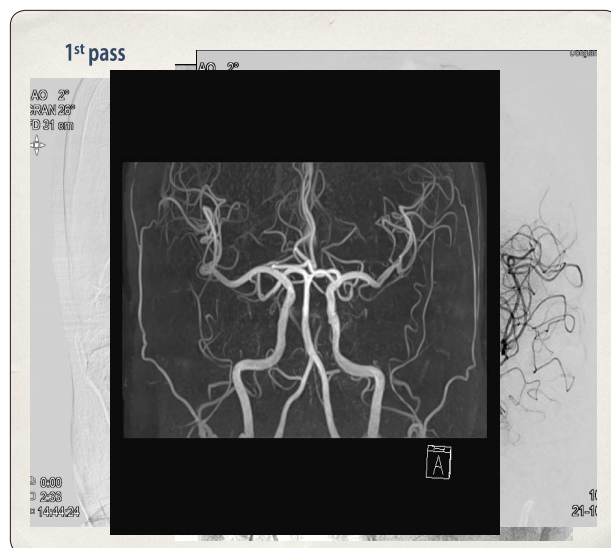
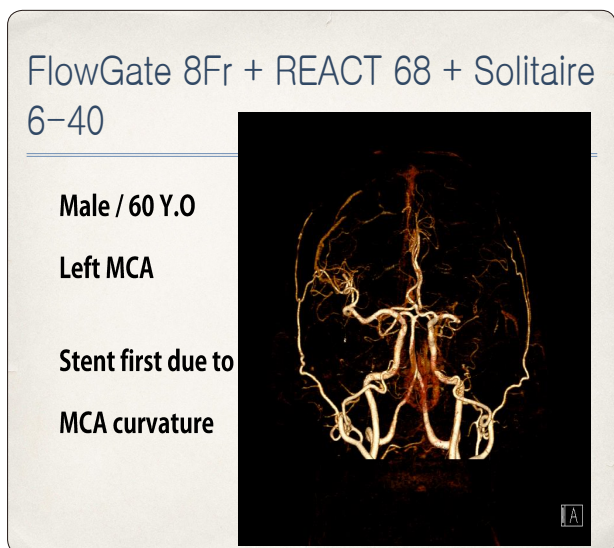
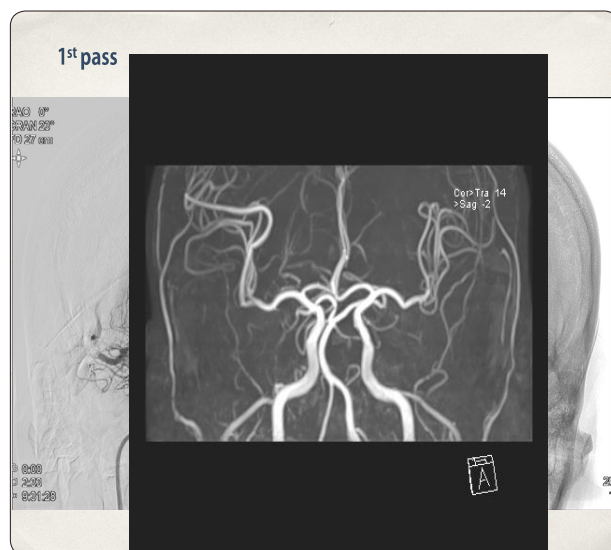
ASTRO Stroke Case Conference & New Device Update

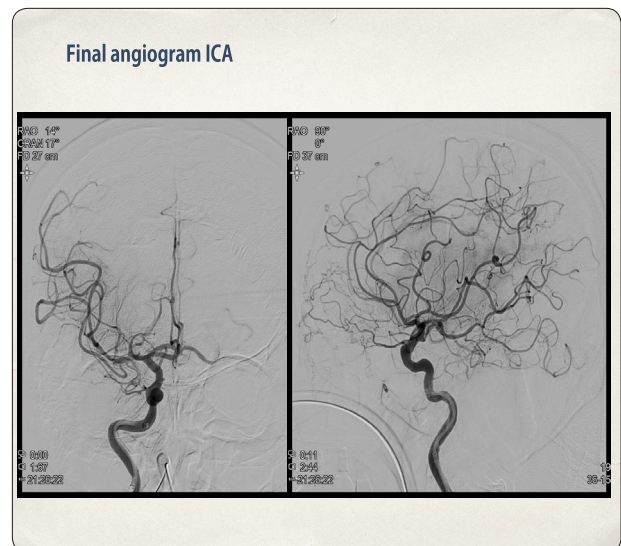
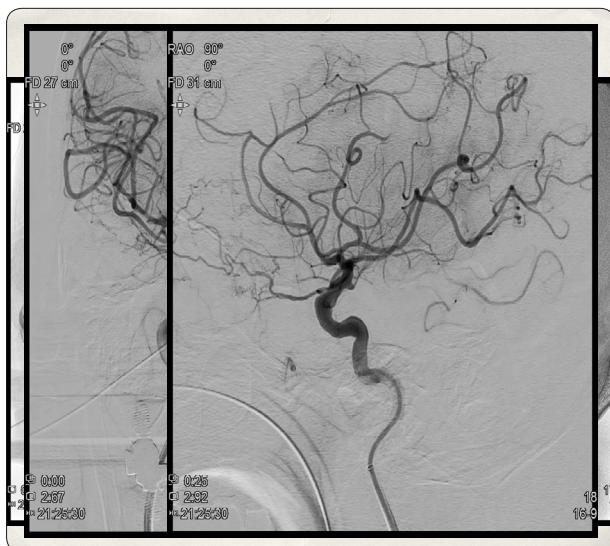
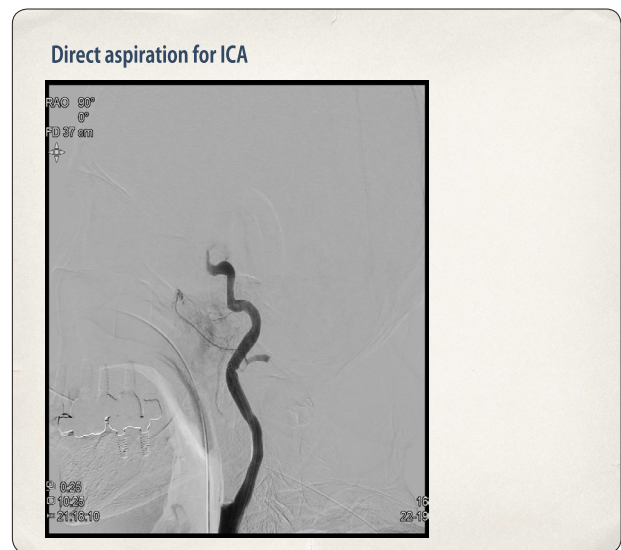
Optimo 9Fr + REACT 71 + Solitaire 6-40

Male / 71 Y.O

Right ICA / MCA







~distal or ACA

- ◆ BGC 8Fr + Intermediate (CAT6) + 4 or 6mm stent
(strip microcatheter, retrieved without m.catheter)

FRI. 28th APR. 2023

ASTRO Stroke Case Conference & New Device Update

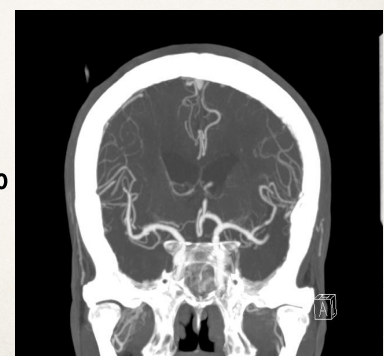
FlowGate 8Fr + Catalyst 6Fr + Trevo 6-37

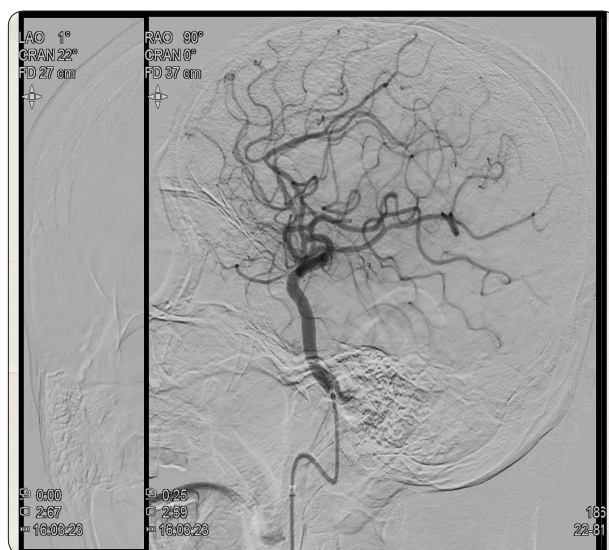
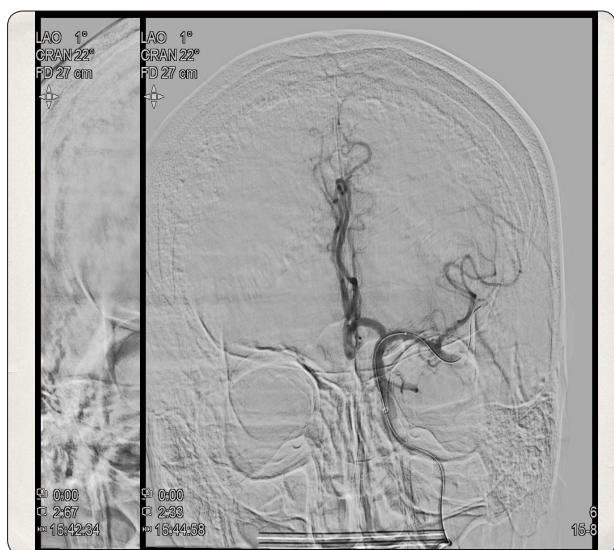
Male / 62 Y.O

Left MCA

Stent first due to

Distal occlusion

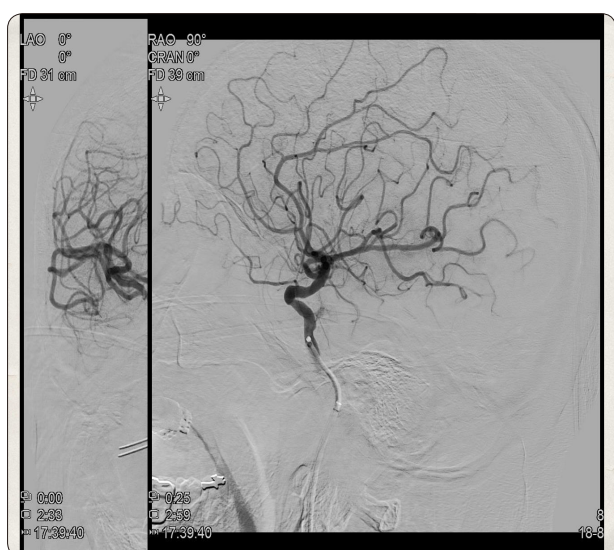
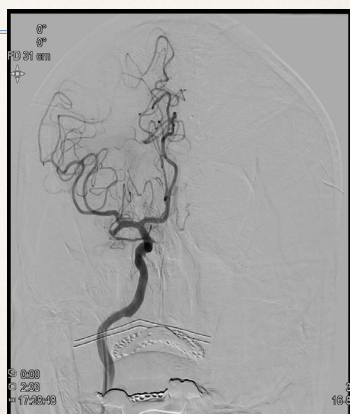




FlowGate 8Fr + Catalyst 6Fr + Trevo 6-37

Male / 67 Y.O

Right MCA

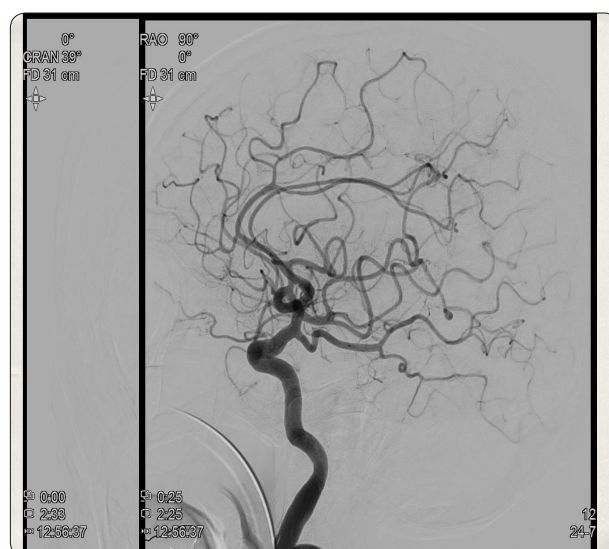
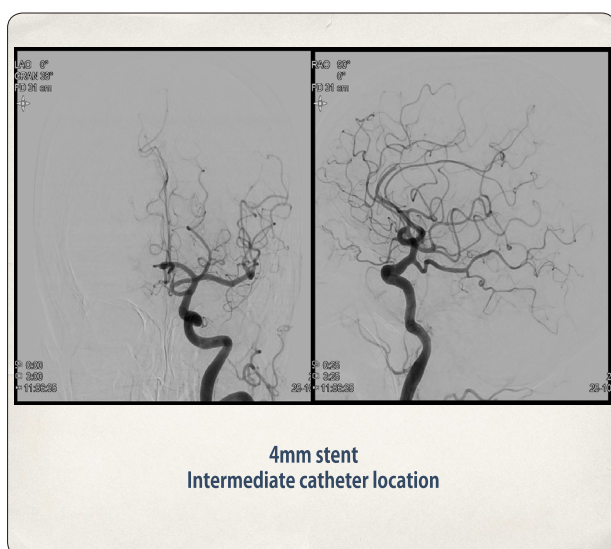


FlowGate 8Fr + Catalyst 6Fr + Solitaire 4-20

Female / 90 Y.O

Left ACA





I prefer...

1. Large & Long stent, 6-40mm stent
2. Deploy stent as far as possible
3. Inflation balloon before passage occlusion site
4. Do not wait after deploying stent
5. Strip microcatheter when retrieve the stent
6. Use large bore aspiration catheter instead of intermediate
7. A little push intermediate while pulling stent

FRI, 28th APR. 2023 ASTRO Stroke Case Conference & New Device Update

FRI, 28th APR. 2023 ASTRO Stroke Case Conference & New Device Update

[Case 1]
**Hemorrhagic
complication after M1
thrombectomy with
Wingspan stenting**

박 현 욱
부산 부민병원

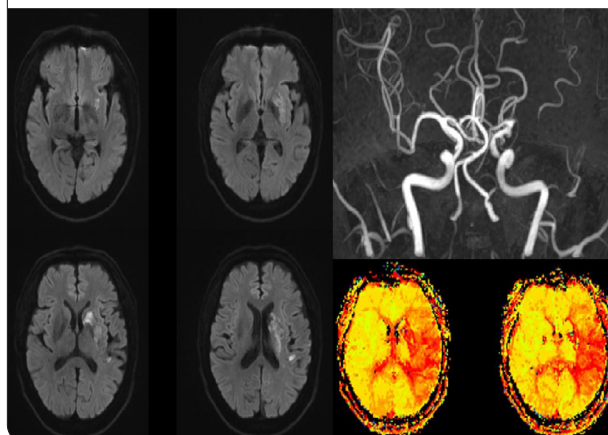
Beyond the Excellence 2020

Hyperperfusion syndrome

부산 부민병원

김형동 최창화 박현욱 조봉기

61/M Rt. Hemiparesis Gr II & Dysarthria
DM/ HTN (+/+)



Solitaire 4X40 Thrombectomy



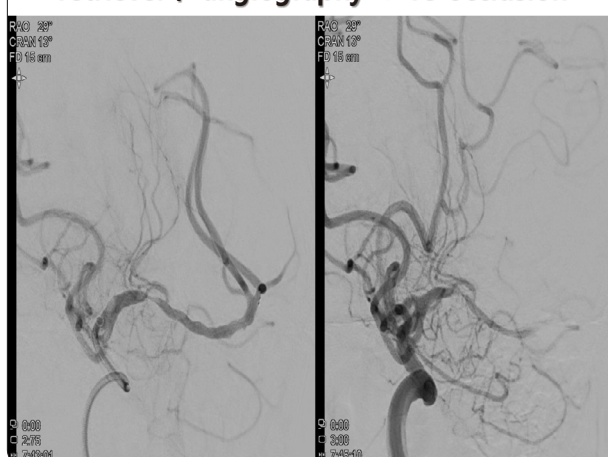
Recanalization 20분후 angiography → Re-occlusion



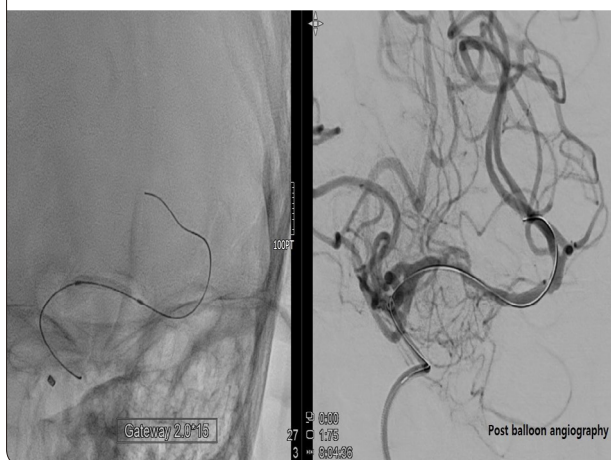
Trevo NXT 4X41 stenting & angiography (Infarction pattern & stent strut → ICAS)



Trevo stenting 상태에서 0.5mg Tirofiban IA & retriever후 angiography → re-occlusion



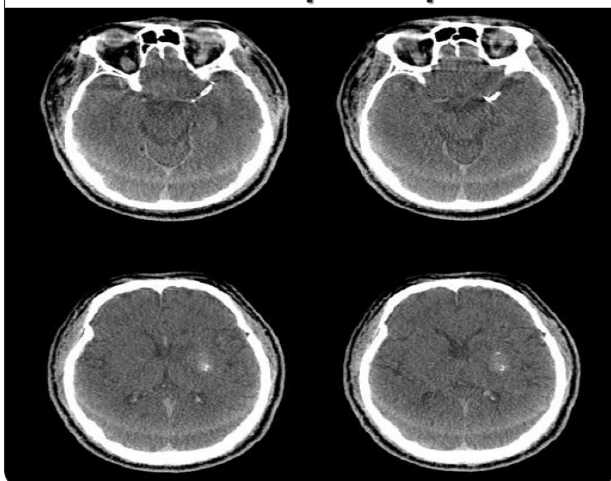
Gateway 2X15 balloon angioplasty



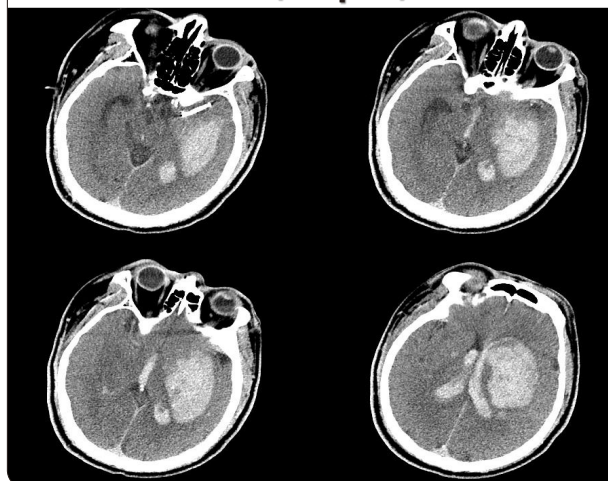
Wingspan 3X20 stenting



Immediate post Op. CT



수술 2시간뒤(stupor) Brain CT



REVIEW

Update on cerebral hyperperfusion syndrome

Yen-Heng Lin ,¹ Hon-Man Liu^{2,3}

CEREBRAL HYPERPERFUSION SYNDROME IN SPECIFIC CONDITIONS Intracranial angioplasty and stenting(INCS)
Intracranial atherosclerosis

Intracranial atherosclerosis

Following the Stenting and Aggressive Medical Management for Preventing Recurrent Stroke in Intracranial Stenosis trial, stent use to treat intracranial atherosclerotic disease was reduced, given its stringent indications. This reduction means that less data are available in the literature about CHS in patients after INCS. Furthermore, most studies of complications after INCS report few cases and provide scant descriptions of the clinical symptoms and the conditions for developing hemorrhage. In the nine studies of INCS with over 50 patients, the average incidence of non-technical related intracranial hemorrhage was about 2.6% (0–7%), and the onset was immediate or within a few hours after the procedure.

Although predefined CHS is not reported, the current reported data on ICH after INCS range from 0% to 3.4%. Risk factors for CHS and its hemorrhagic consequence (figure 4) after INCS were similar to those involved in extraaxial procedures. Because no surgical manipulation of the cervical baroreceptor occurs in INCS, the pathophysiological explanation for the development of CHS is more likely impairment of cerebral autoregulation rather than baroreceptor reflex breakdown or induction of free radicals by the surgical procedure. Because of limited data, the management and prevention of CHS after INCS have not specifically been recommended. **Periprocedural strict blood pressure control is reasonable.** Further research on CHS under these circumstances is warranted.

Preventive measures and management

In a meta-analysis by Bouiri *et al.*,¹⁰ the cumulative incidence of CHS after CEA increased appreciably above a postoperative systolic blood pressure of 150 mm Hg. The efficacy of intensive blood pressure control to decrease the risk for hyperperfusion CAS was also evident. **Most CAS studies recommended maintaining postoperative blood pressure at <140/90 mm Hg.** In patients at high risk of CHS and ICH, blood pressure was maintained at <120/80 mm Hg. High risk criteria included factors previously described in patients following CAS, including hypertension at baseline, treated carotid stenosis of ≥90%, and poor collateral blood flow. The latter was defined by contralateral carotid occlusion or stenosis ≥80%, indicating an isolated ipsilateral carotid circulation. **The lower limit of blood pressure was 90/60 mm Hg, except in those with concomitant cardiovascular disorders.** Blood pressure should be monitored continuously via an arterial line or checked every 15 min or less, during and at least 24 hours after the procedure. Intravenous short acting antihypertensive agents should always be available. **Antihypertensive agents, including labetalol and clonidine, are proposed because of their reducing effect on CBF.** However, intravenous nicardipine is more convenient for titrating, despite its potential effect on cerebrovascular vasodilatation.

Post-intervention management

TICA / IAT 후 이어서 PCCC 진행함. → PCCC 종료후 delay angio 상 Lt MCA re-occlusion 관찰됨.

07:37 NBP 159/96 mmHg checked. -> Dr. 박원욱, 페르디핀 10mg 5@+SDW 500ml mix fluid 20mids stop(파자람) was done.

07:38 티로피판 0.5mg +n/s 20ml IC Trevo NXT 4X41 stenting state

08:00 11u angle 에서 Lt MCA re- occlusion 토크 보이지 않아 wingspan(3.0*20) stenting 시행함

00:15 0.000000 4.32mg +n/s 100ml max fluid 12reds start 시합중

NBP 175/101 mmHg checked. → Dr. 박원욱 레프티딘 10mg 5@ + 50W 500ml mix fluid 20inds start was done.

K116과 K117가 각각 K116과 K117에 위치함

위 사람 및 BP target 120이안으로 유지. 티로피반 fluid 12시간

△ 간호일지 중환자실 / 우은경

2023-03-05 08:50

TFCA IAT, 크릴 색전술) 후 간포
D

오른쪽 대퇴동맥을 통해 TFCA 시정함.

100

활석징주 국정준. (BP:153/96, PR:77, RR: 16, BT: 36.6, SpO2:

BST 측정값: 181mg/dl
 혈액중의 총지질은 181mg/dl로 정상 범위인 150mg/dl 이하에 속함

통합평가 시장점. → NRS: 0점

지남력 사정함. → 시간/장소/사람/+/+/+ 관찰됨

오른쪽 발가락 S/M/C 확인함. → S/M/C(+ / + / +)

사치근력 정도를 사경할. → 오른쪽 상치 G2점, 왼쪽 G5점

^ 간호원지 중환자실 / 우은경

2023-03-05 10:00

중환자실 순회할
오류률 상향 3.3% 중환자실 투과 비파괴적 연구나

질문에 대답하지 않고 obey 전혀 되지 않으며 원할로 유치도

본은 또나부 맞을 견해 언필
12.02.103.023.30.30 E.10 0-00.000% 송정리

V/S:190/87-75-36.5-18, Sp02:36% 4월말

- IV Tirofiban infusion(12hrs) after IAT

- BP(SBP<120) was controlled with IV Perdipine

Metallic Hyperdensity Sign(>90HU)

Metallic Hyperdensity Sign on Noncontrast CT Immediately after Mechanical Thrombectomy Predicts Parenchymal Hemorrhage in Patients with Acute Large-Artery Occlusion

C. Xu, Y. Zhou, Q. Zhang, W. Chen, W. Zhong, X. Gong, X. Ding, and M. Lou

Positive predictive value 76.3%
Negative predictive value 95.7%

IV Tirofiban postinterventional management decision

ABSTRACT

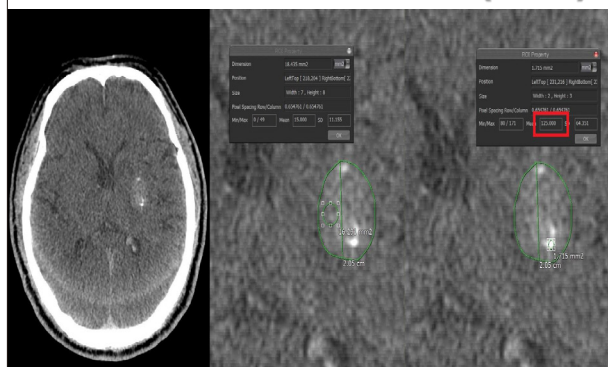
BACKGROUND AND PURPOSE: Parenchymal hemorrhage is a severe complication following mechanical recanalization in patients with acute ischemic stroke with large-vessel occlusion. This study aimed to assess whether the metallic hyperdensity sign on noncontrast CT performed immediately after mechanical thrombectomy can predict parenchymal hemorrhage at 24 hours.

MATERIALS AND METHODS: We included consecutive patients with acute ischemic stroke with large-vessel occlusion who underwent noncontrast CT immediately after mechanical thrombectomy between January 2014 and September 2016. The metallic hyperdensity sign was defined as a nonperipheral intracerebral hyperdense lesion (diameter >1 cm) in the basal ganglia and a maximum CT density of >90 HU. The sensitivity, specificity, positive and negative predictive values of the metallic hyperdensity sign in predicting parenchymal hemorrhage were calculated.

RESULTS: A total of 188 patients were included. The metallic hyperdensity sign was found in 59 (31.4%) patients, and 51 (27.1%) patients had parenchymal hemorrhage at 24 hours. Patients with the metallic hyperdensity sign are more likely to have parenchymal hemorrhage than those without (76.3% versus 4.3%, $P < .001$). The sensitivity, specificity, positive predictive value, and negative predictive value of the metallic hyperdensity sign in predicting parenchymal hemorrhage were 88.2%, 95.5%, 76.3%, and 95.7%, respectively.

CONCLUSIONS: The presence of the metallic hyperdensity sign on noncontrast CT performed immediately after mechanical thrombectomy in patients with large-vessel occlusion could predict the occurrence of parenchymal hemorrhage at 24 hours, which might be helpful in postinterventional management within 24 hours after mechanical thrombectomy.

Hounsfield unit 125 (>90)



Post-interventional management

1. No antiplatelet (Tirofiban) management.
2. Strict BP control (SBP 100 mmHg미만 Hyperperfusion state).

Pathophysiology and management of reperfusion injury and hyperperfusion syndrome after carotid endarterectomy and carotid artery stenting

Muhammad Ali Farooq, Christopher Gargioli, Jangyong Min, and Philip B. Gorelick

Abstract
Cerebral hyperperfusion is a relatively rare syndrome with significant and potentially devastating clinical consequences. The pathophysiology of cerebral hyperperfusion syndrome (CHS) involves dysregulation of the cerebral vascular system and hyperperfusion. In the setting of a stroke, the early recognition of CHS is important to prevent complications such as intracerebral hemorrhage. This review will focus on CHS following carotid endarterectomy and carotid artery stenting. We will discuss the typical clinical features of CHS, risk factors, pathophysiology, diagnosis, and management. Although there are no specific guidelines for the management of CHS, identification of patients at risk for CHS and aggressive treatment of hyperperfusion are recommended.

Keywords: Carotid endarterectomy, Carotid artery stenting, Cerebral blood flow, Cerebral hyperperfusion, Hyperperfusion injury, Risk factors and treatment of cerebral hyperperfusion syndrome

One should be cautious when selecting a drug for blood pressure control in these patients as some of the anti-hypertensives with vasodilatory effects may worsen the outcome. Medications in the latter group include calcium channel blockers, sodium nitropruside, glycerol trinitrate, and angiotensin II inhibitors. Beta-blockers reduce arterial blood pressure and have little effect on the intracranial pressure within the autoregulatory range. Therefore, beta-blockers potentially can be used to treat hypertension in patients with brain injury. A limitation to some of the early generation beta-blockers is that they may be associated with blood pressure variability. However, other medications which may be more suitable for these patients include mixed alpha-adrenergic antagonists and beta-adrenergic antagonists such as **labetalol**. These medications help reduce cerebral perfusion pressure and mean arterial pressure without any direct effect on CBF. Patients with CHS may have elevated catecholamine concentrations. Therefore, medications like **clonidine**, a centrally acting sympatholytic, may be useful. Blood pressure in patients with CHS should be controlled with either labetalol or clonidine, which do not increase CBF.

Strict BP control(Labetalol)

- CCB → Vasodilation → CBV ↑
- CBF ↑ → Hyperperfusion ↑

CCB ↑ = CBV ↑ (vasodilation)
MTT ↓ (recanalization)

Vessel wall (vasoconstriction, endothelial dysfunction) ↔ **Platelets** (primary hemostasis → platelet plug)

CCB 페르디핀 → **Vessel injury & Hemostasis cascade** → **Tirofiban**

Coagulation cascade (secondary hemostasis → fibrin mesh) → **Heparin**

HR reduction on different vascular outcome was observed 120/80-80 VS 120/80-50 (Pulsatile vessel wall stress)

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STATE-OF-THE-ART PAPER

Vascular Pathophysiology in Response to Increased Heart Rate

Florian Custodis, MD,* Stephan H. Schirmer, MD, PhD,* Magnus Baumhäkel, MD,* Gerd Heusch, MD,† Michael Böhm, MD,* Ulrich Laufs, MD*
Homburg/Saar and Essen, Germany

Vascular effects associated with heart rate reduction

Custodis et al. 2008 ⁴²	Reduction of vascular oxidative stress (mouse)	Risk factor ↓ Endothelial Dysfunction ↓ Atherosclerosis ↓ Plaque rupture ↓ Vascular Event
Custodis et al. 2008 ⁴²	Restoration of endothelial function (mouse)	
Drouin et al. 2008 ⁴³	Restoration of erectile function (mouse)	
Baumhäkel et al. 2010 ⁴⁴	Reduction of vascular wall stress (rat)	
Beere et al. 1984, 1992 ^{42,43}	Inhibition of atherogenesis (monkey, mouse)	
Custodis et al. 2008 ⁴²	Stimulation of angiogenesis (rat, pig)	
Zheng et al. 1999 ¹¹⁵	Reduction of myocardial ischemia (pig, human)	
Li et al. 1997 ¹¹⁶	Reduction of hospital admission for angina, MI and coronary revascularization (human, heart rate ≤ 70 bpm)	
Heusch et al. 2008 ⁹⁹		
Borer et al. 2003 ¹⁰²		
Tardif et al. 2005 ¹⁰¹		
Fox et al. 2009, 2008 ^{18, 126}		

B-Blocker (BP ↓ & HR ↓)

약물정보

라베탈로수 20mg/4ml (라벨)

라베탈로수 20mg/4ml (라벨)
labetalol hydrochloride (18023081) 20mg / 4ml / amp
C07A01-00003

제형 라베탈로수 20mg (labetalol hydrochloride 20mg)

표본 정보 고압압착제

표본 효과 항신장고혈압을 포함한 중등도고혈압, 급성상관관계에 의한 고혈압, 마취시 혈압강하

작용 기전 이 약은 심혈관계의 동맥수축으로 작용하며, 이의 현저한 배위 또는 지속적 방출을 나타내지 않습니다.

약의 작용 이 약은 약 3시간 이내에 혈압이 감소, 심박 기압을 저하하여 나타낼 수 있으므로 주의합니다.

1. 고혈압
(1) 라벨 약제: 신장 질환이 없는 환자에서 투여량 50mg을 1회 이상에 1회 투여시킴으로써, 혈압이 100/160 mmHg 이하로 감소하며, 24시간 동안 혈압이 100/160 mmHg 이하로 유지될 수 있다. 보통 최대효과는 투여 후 2시간 이내에 나타나며, 약효는 투여 후 4시간 정도 지속된다.

(2) 라벨 약제: 이 약을 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

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19. 고혈압
(1) 라벨 약제: 신장 질환이 없는 환자에서 투여량 50mg을 1회 이상에 1회 투여시킴으로써, 혈압이 100/160 mmHg 이하로 감소하며, 24시간 동안 혈압이 100/160 mmHg 이하로 유지될 수 있다. 보통 최대효과는 투여 후 2시간 이내에 나타나며, 약효는 투여 후 4시간 정도 지속된다.

(2) 라벨 약제: 이 약을 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

20. 급성상관관계에 의한 고혈압
이 약은 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

21. 고혈압
(1) 라벨 약제: 신장 질환이 없는 환자에서 투여량 50mg을 1회 이상에 1회 투여시킴으로써, 혈압이 100/160 mmHg 이하로 감소하며, 24시간 동안 혈압이 100/160 mmHg 이하로 유지될 수 있다. 보통 최대효과는 투여 후 2시간 이내에 나타나며, 약효는 투여 후 4시간 정도 지속된다.

(2) 라벨 약제: 이 약을 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

22. 급성상관관계에 의한 고혈압
이 약은 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

23. 고혈압
(1) 라벨 약제: 신장 질환이 없는 환자에서 투여량 50mg을 1회 이상에 1회 투여시킴으로써, 혈압이 100/160 mmHg 이하로 감소하며, 24시간 동안 혈압이 100/160 mmHg 이하로 유지될 수 있다. 보통 최대효과는 투여 후 2시간 이내에 나타나며, 약효는 투여 후 4시간 정도 지속된다.

(2) 라벨 약제: 이 약을 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

24. 급성상관관계에 의한 고혈압
이 약은 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

25. 고혈압
(1) 라벨 약제: 신장 질환이 없는 환자에서 투여량 50mg을 1회 이상에 1회 투여시킴으로써, 혈압이 100/160 mmHg 이하로 감소하며, 24시간 동안 혈압이 100/160 mmHg 이하로 유지될 수 있다. 보통 최대효과는 투여 후 2시간 이내에 나타나며, 약효는 투여 후 4시간 정도 지속된다.

(2) 라벨 약제: 이 약을 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

26. 급성상관관계에 의한 고혈압
이 약은 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

27. 고혈압
(1) 라벨 약제: 신장 질환이 없는 환자에서 투여량 50mg을 1회 이상에 1회 투여시킴으로써, 혈압이 100/160 mmHg 이하로 감소하며, 24시간 동안 혈압이 100/160 mmHg 이하로 유지될 수 있다. 보통 최대효과는 투여 후 2시간 이내에 나타나며, 약효는 투여 후 4시간 정도 지속된다.

(2) 라벨 약제: 이 약을 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

28. 급성상관관계에 의한 고혈압
이 약은 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

29. 고혈압
(1) 라벨 약제: 신장 질환이 없는 환자에서 투여량 50mg을 1회 이상에 1회 투여시킴으로써, 혈압이 100/160 mmHg 이하로 감소하며, 24시간 동안 혈압이 100/160 mmHg 이하로 유지될 수 있다. 보통 최대효과는 투여 후 2시간 이내에 나타나며, 약효는 투여 후 4시간 정도 지속된다.

(2) 라벨 약제: 이 약을 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

30. 급성상관관계에 의한 고혈압
이 약은 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

31. 고혈압
(1) 라벨 약제: 신장 질환이 없는 환자에서 투여량 50mg을 1회 이상에 1회 투여시킴으로써, 혈압이 100/160 mmHg 이하로 감소하며, 24시간 동안 혈압이 100/160 mmHg 이하로 유지될 수 있다. 보통 최대효과는 투여 후 2시간 이내에 나타나며, 약효는 투여 후 4시간 정도 지속된다.

(2) 라벨 약제: 이 약을 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

32. 급성상관관계에 의한 고혈압
이 약은 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

33. 고혈압
(1) 라벨 약제: 신장 질환이 없는 환자에서 투여량 50mg을 1회 이상에 1회 투여시킴으로써, 혈압이 100/160 mmHg 이하로 감소하며, 24시간 동안 혈압이 100/160 mmHg 이하로 유지될 수 있다. 보통 최대효과는 투여 후 2시간 이내에 나타나며, 약효는 투여 후 4시간 정도 지속된다.

(2) 라벨 약제: 이 약을 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

34. 급성상관관계에 의한 고혈압
이 약은 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

35. 고혈압
(1) 라벨 약제: 신장 질환이 없는 환자에서 투여량 50mg을 1회 이상에 1회 투여시킴으로써, 혈압이 100/160 mmHg 이하로 감소하며, 24시간 동안 혈압이 100/160 mmHg 이하로 유지될 수 있다. 보통 최대효과는 투여 후 2시간 이내에 나타나며, 약효는 투여 후 4시간 정도 지속된다.

(2) 라벨 약제: 이 약을 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

36. 급성상관관계에 의한 고혈압
이 약은 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

37. 고혈압
(1) 라벨 약제: 신장 질환이 없는 환자에서 투여량 50mg을 1회 이상에 1회 투여시킴으로써, 혈압이 100/160 mmHg 이하로 감소하며, 24시간 동안 혈압이 100/160 mmHg 이하로 유지될 수 있다. 보통 최대효과는 투여 후 2시간 이내에 나타나며, 약효는 투여 후 4시간 정도 지속된다.

(2) 라벨 약제: 이 약을 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

38. 급성상관관계에 의한 고혈압
이 약은 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

39. 고혈압
(1) 라벨 약제: 신장 질환이 없는 환자에서 투여량 50mg을 1회 이상에 1회 투여시킴으로써, 혈압이 100/160 mmHg 이하로 감소하며, 24시간 동안 혈압이 100/160 mmHg 이하로 유지될 수 있다. 보통 최대효과는 투여 후 2시간 이내에 나타나며, 약효는 투여 후 4시간 정도 지속된다.

(2) 라벨 약제: 이 약을 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

40. 급성상관관계에 의한 고혈압
이 약은 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

41. 고혈압
(1) 라벨 약제: 신장 질환이 없는 환자에서 투여량 50mg을 1회 이상에 1회 투여시킴으로써, 혈압이 100/160 mmHg 이하로 감소하며, 24시간 동안 혈압이 100/160 mmHg 이하로 유지될 수 있다. 보통 최대효과는 투여 후 2시간 이내에 나타나며, 약효는 투여 후 4시간 정도 지속된다.

(2) 라벨 약제: 이 약을 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

42. 급성상관관계에 의한 고혈압
이 약은 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

43. 고혈압
(1) 라벨 약제: 신장 질환이 없는 환자에서 투여량 50mg을 1회 이상에 1회 투여시킴으로써, 혈압이 100/160 mmHg 이하로 감소하며, 24시간 동안 혈압이 100/160 mmHg 이하로 유지될 수 있다. 보통 최대효과는 투여 후 2시간 이내에 나타나며, 약효는 투여 후 4시간 정도 지속된다.

(2) 라벨 약제: 이 약을 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

44. 급성상관관계에 의한 고혈압
이 약은 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

45. 고혈압
(1) 라벨 약제: 신장 질환이 없는 환자에서 투여량 50mg을 1회 이상에 1회 투여시킴으로써, 혈압이 100/160 mmHg 이하로 감소하며, 24시간 동안 혈압이 100/160 mmHg 이하로 유지될 수 있다. 보통 최대효과는 투여 후 2시간 이내에 나타나며, 약효는 투여 후 4시간 정도 지속된다.

(2) 라벨 약제: 이 약을 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

46. 급성상관관계에 의한 고혈압
이 약은 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

47. 고혈압
(1) 라벨 약제: 신장 질환이 없는 환자에서 투여량 50mg을 1회 이상에 1회 투여시킴으로써, 혈압이 100/160 mmHg 이하로 감소하며, 24시간 동안 혈압이 100/160 mmHg 이하로 유지될 수 있다. 보통 최대효과는 투여 후 2시간 이내에 나타나며, 약효는 투여 후 4시간 정도 지속된다.

(2) 라벨 약제: 이 약을 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

48. 급성상관관계에 의한 고혈압
이 약은 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

49. 고혈압
(1) 라벨 약제: 신장 질환이 없는 환자에서 투여량 50mg을 1회 이상에 1회 투여시킴으로써, 혈압이 100/160 mmHg 이하로 감소하며, 24시간 동안 혈압이 100/160 mmHg 이하로 유지될 수 있다. 보통 최대효과는 투여 후 2시간 이내에 나타나며, 약효는 투여 후 4시간 정도 지속된다.

(2) 라벨 약제: 이 약을 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면, 이 약 200mg을 용해한 용액 100ml에 라벨 약제 100mg을 혼합하여 사용한다. 이 용액 100ml을 투여하면, 약 2시간 이내에 혈압이 100/160 mmHg 이하로 감소할 수 있다.

50. 급성상관관계에 의한 고혈압
이 약은 10mg/ml의 용도가 라벨 약제와 혼합하여 사용한다. 예를 들면

[Case 2]
**Delayed ICH after staged
carotid stenting in an
elderly patient**

성 승 언
동래봉생병원

Delayed ICH after staged carotid artery stenting in an elderly patient

Sung Seng Oun

**Department of Neurosurgery
Dongrae Bongseng Hospital**

Carotid artery stenting

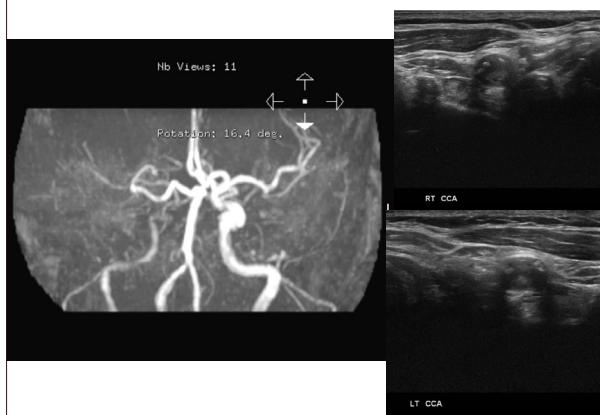
Most popular treatment of symptomatic or asymptomatic patients with severe stenosis of proximal ICA in CC-IC.

This procedure seemd to be a relatively more easier procedure than aneurysmal or vascular anomaly case.

But. Fatal morbidity or mortality

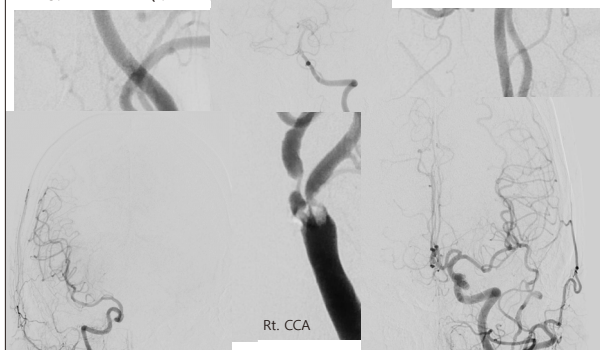
Intermittent encounter in acute ischemic cases with **tandem occlusion** despite of almost chronic ischemic lesion

84/F. Fall down c LOC. 외부병원 입원중. No def.
뇌혈관이 막혔다



Cerebral c coronary angiogram showed proximal ICA severe stenosis in CC-IC (stenotic ratio 70%). Stenosis of VAO.

PCI on LAD-ISR(In-stent restenosis)



Old age

충분히 work up. 복부초음파: Pancreatic mass.

Malignancy가능성 있다. 대학병원 소화기 내과 진료 권유.

Benign lesion->f/u 권유 받았다.

나이에 비해서 건강해 보임. 그럼합시다.

Guiding : Vista brite tip 8Fr. Avigo 0.014 m/G.W
But.Spider Fx 4.0mm protection device catheter가 통과 못함.
: Transend Ex 300 m/G.W+Excelsiro SL-10 m/cath를 같이 passing
다시 spider m/cath 접근시도 하였으나 통과못함.



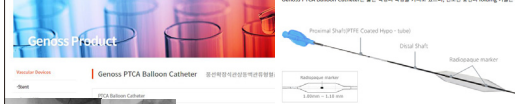
제2차 급성뇌경색치료연구회(ASTRO) Stroke Conference & New Device Update

System을 바꾸자. MOMA는 사용해본적 없음.

Flow Gate2 BGC 8Fr+ Genoss 1.5mmX20mm balloon(Temporary balloon)을 수차례 시행한 다음 힘겹게 Spider m/cath를 distal cervical portion에 거치한 다음 기존의 방식으로 submarine ballooning을 시행하였음.

Not manual aspiration, Only manual regurgitation

Genoss PTA Balloon Catheter는 발판의 특징을 가지고 있으며, 전방의 balloon holding 기능을 우수한 성능을 발휘합니다.



형명

Balloon length (mm)	Balloon Length					
	1.5mm	2.0mm	2.5mm	3.0mm	3.5mm	4.0mm
1.50	Genoss 1.5x15	Genoss 1.5x20	Genoss 1.5x25	Genoss 1.5x30	Genoss 1.5x35	Genoss 1.5x40
2.00	Genoss 2.0x15	Genoss 2.0x20	Genoss 2.0x25	Genoss 2.0x30	Genoss 2.0x35	Genoss 2.0x40
2.50	Genoss 2.5x15	Genoss 2.5x20	Genoss 2.5x25	Genoss 2.5x30	Genoss 2.5x35	Genoss 2.5x40
3.00	Genoss 3.0x15	Genoss 3.0x20	Genoss 3.0x25	Genoss 3.0x30	Genoss 3.0x35	Genoss 3.0x40
3.50	Genoss 3.5x15	Genoss 3.5x20	Genoss 3.5x25	Genoss 3.5x30	Genoss 3.5x35	Genoss 3.5x40
4.00	Genoss 4.0x15	Genoss 4.0x20	Genoss 4.0x25	Genoss 4.0x30	Genoss 4.0x35	Genoss 4.0x40

Spider Fx 거치한 다음

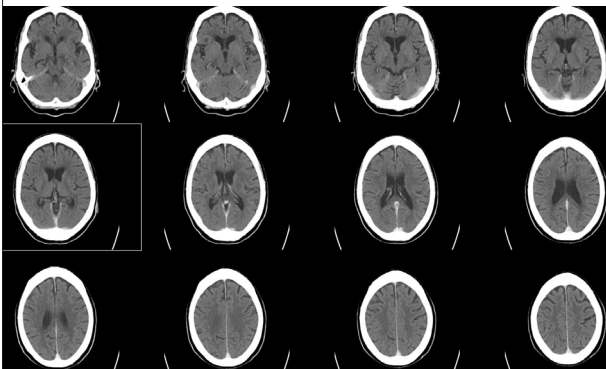
사이즈별로 gradual Submarine ballooning with temporary balloon



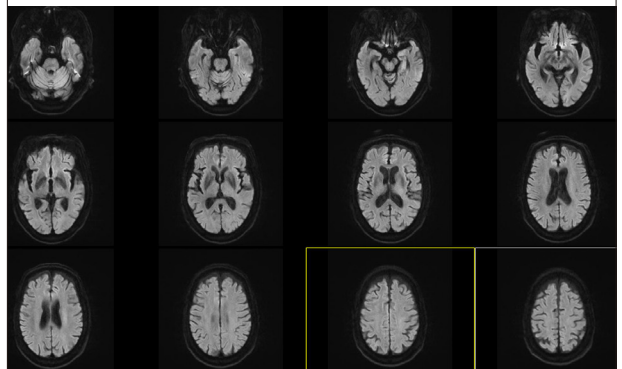
Protégé 6/8X40mm. Post ballooning: Sumarine 5X30(8 ATM)

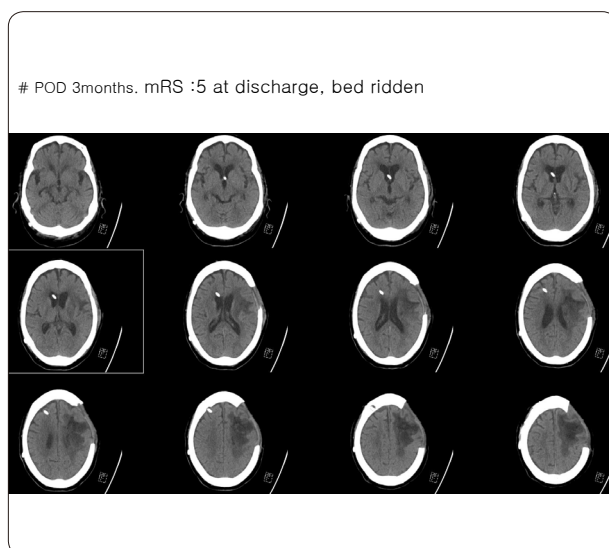
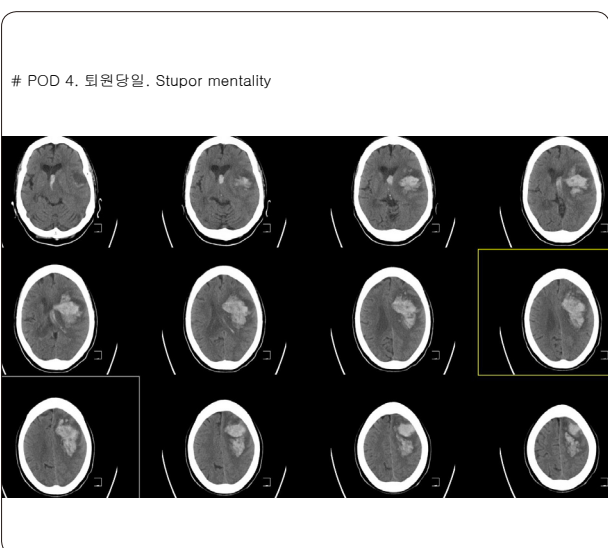
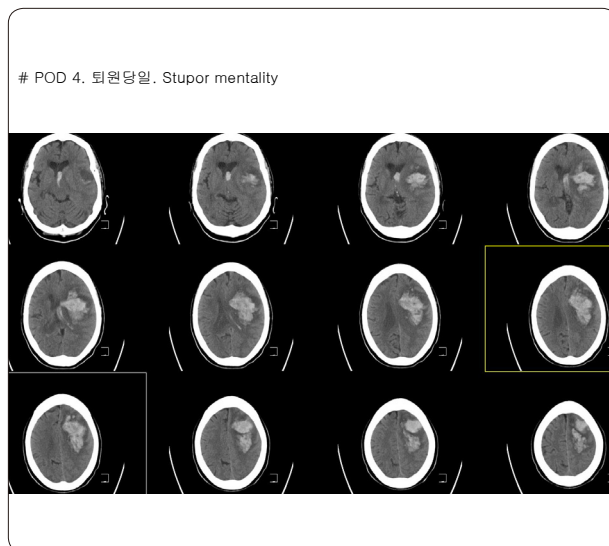
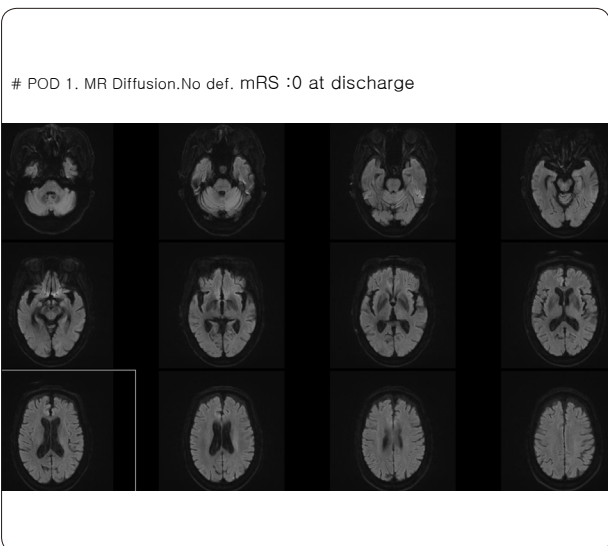
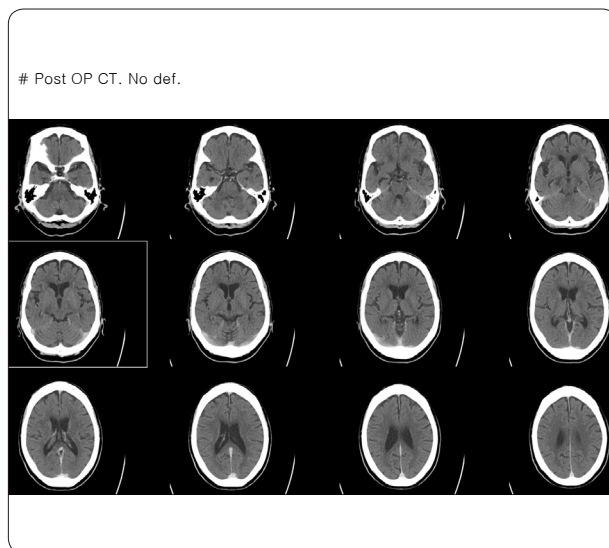
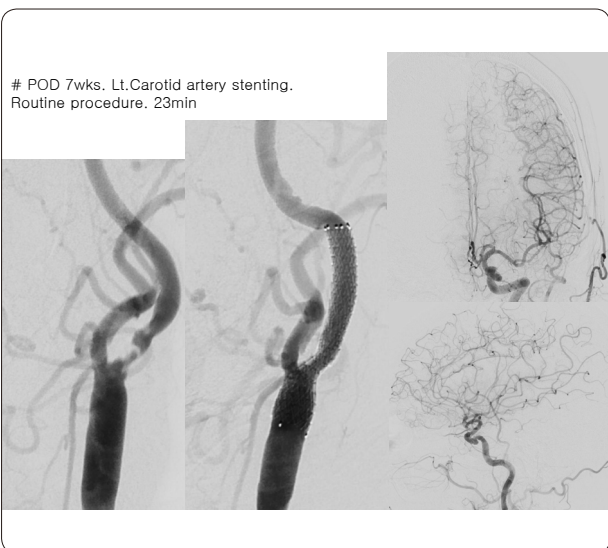


Post OP CT. No def.



POD 1. MR Diffusion.No def. mRS :0





2020-01-09 #업

▲ 입원경과기록지 신경외과1 성승언

환자 보호자(딸/아들)내원하여 현 상태에 대한
적인 여부 질의함.
: 두번째 수술 시기가 너무 빠르지 않는가?
퇴원시기가 너무 빠르지 않는가?
입원당시에 하루종일 잠 잔것도 있고
두통 있었는데 놀란것 없느냐??

->고령이어서 수술 시기/적응중에 대해서 상당히
신중하게 판단하였음. 그 부분에 있어서는 보호자분들이
오히려 더 답답할 정도로 신중하게 판단하다고 생각하지
않았나?? (혈장암 의증으로 양산부산대병원 진료 본 경우
보호자가 원하지 않는다더라도 여명기간/환자상태/수술
여부 판단위에 끝까지 진료보게했지 않느냐? 심지어 본원
소화기나과 윤지훈 과장님이 따로 양산 부산대병원 교수님
에게 따로 연락해서 진료일정 앞당겨 주지 않았느냐)

퇴원하는 당일까지 환자상태는 편마비/언어장애등의 신경학적
이상소견 없었으며 혈압이 높게 유지되지도 않았음. 따라서
술전에 약속한 대로 술후 4일까지 퇴원했음.

상기 출혈은 첫번째로 과혈류 증후군에 의한 뇌출혈의 가능성과
일반적으로 뇌혈관의 동맥경화성 병변으로 인한 자발성 뇌출혈의
두 가지 가능성이 있음. 하지만 과혈류 증후군에 의한 뇌출혈은
수술 직후부터 술후 24시간안에 주로 발생하였으며 이때에는
혈압
이 높게 유지되면서 신경학적 이상소견(편마비/구움장애/경련/
극심한 두통)의 증상이 동반되면서 출혈이 주로 발생함. 또한
술후
4일까지 발생하는 경우는 극히 드물며 퇴원하는 당일에도 신경학적
이상소견이 전혀 없었던 상태여서 과혈류 증후군에 의한
뇌출혈로
단정짓기에는 다소 우리가 있으나 술후 4일까지 발생한 상태여서
과혈류 증후군과는 완전히 연관성 없다고 단정짓기에는 힘들다.
또한 술전 동의서 작성시/면담시 과혈류증후군에 의한 뇌출혈의
합병증/위험성에 대해 충분히 설명하였고 이에 대해 숙지하고
동의서
에 서명하지 않았느냐? 따라서 동맥경화에 의한 자발성 뇌출혈의
가능성도 충분히 있는상태임.

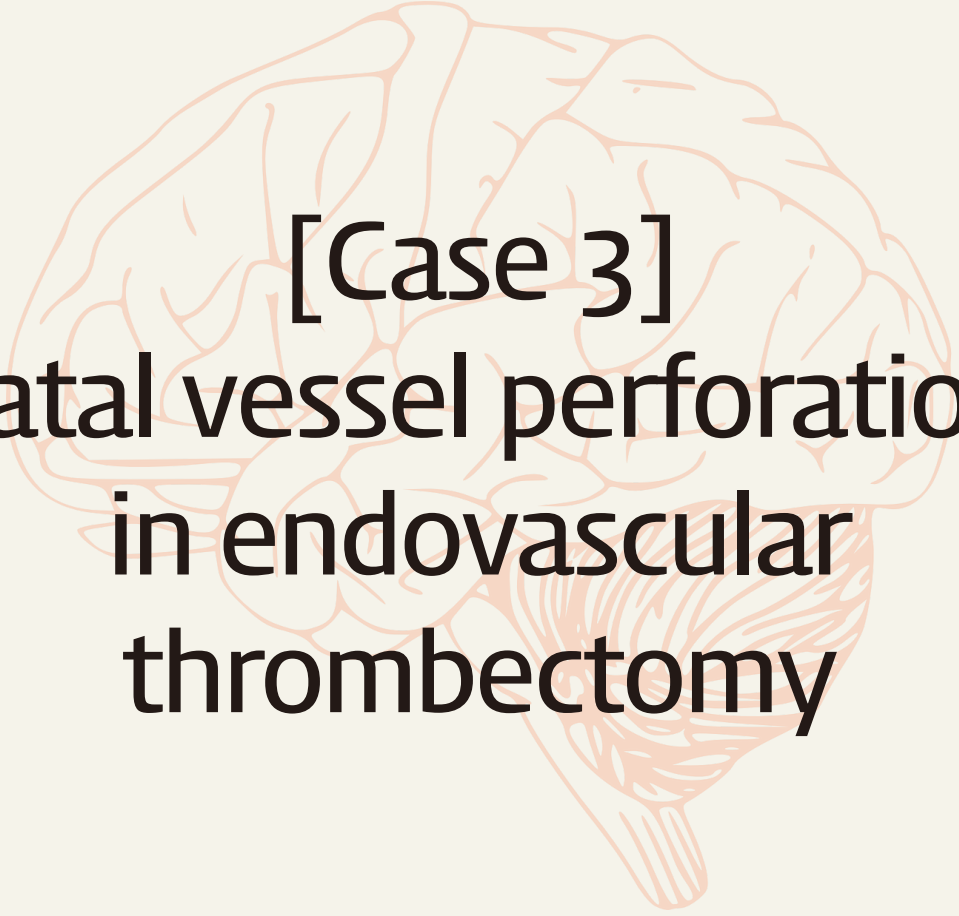
환자분, 환자의 머리리, 따님이 술자한테 진료보고 술후 관리
보았을때
자나도 소홀히 진료보거나 태만하게 진료 보았다고
생각하느냐? 최소한
술자한테 그날에 예기는 훗날 거라 생각 되며 최선을 다해서
진료를
했다. 하지만 환자 상태가 혼미, 의식 및 위중한 상태여서 매우
간단하고 유감스럽게
생각하나 원 상태가 수술적 실수/주의의무/설명부족 위반등의
의료진과 과실들은
의료사고로 주장하여 책임을 묻는다면 이에 대해서는 법적인
책임여부에
있어서는 인정할 수 있으며 안타깝지만 불가항력적인 사실이라고
볼것함.

신경외과 성승언.

In my opinion

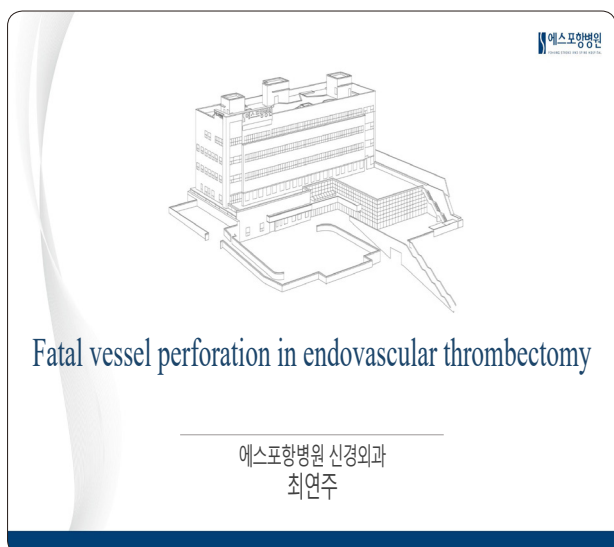
- 1) Carotid stenting vs Carotid endarterectomy
- 2) Emboic protection device가 passing하지 않을때 Proximal temporary ballooning catheter가 도움이 될 수 있다. 아니면 다른 rescue methods?
- 3) ICH 원인 : Spontaneous vs Hyperperfusion?
- 4) Staged Carotid stenting 수술 간격?

Thank you for your attention



[Case 3] Fatal vessel perforation in endovascular thrombectomy

최연주
에스포항병원



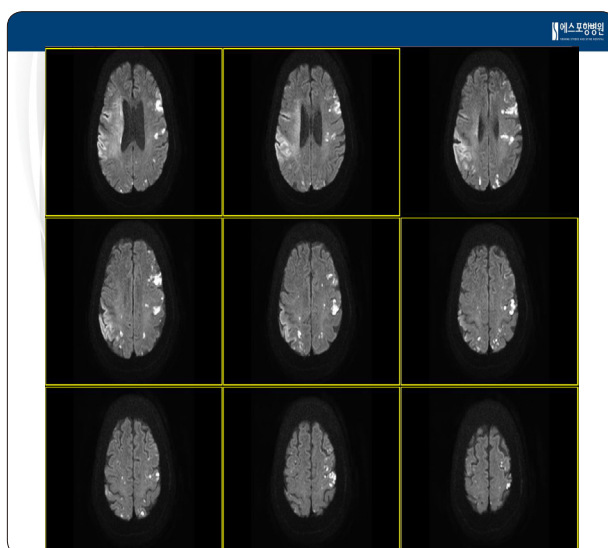
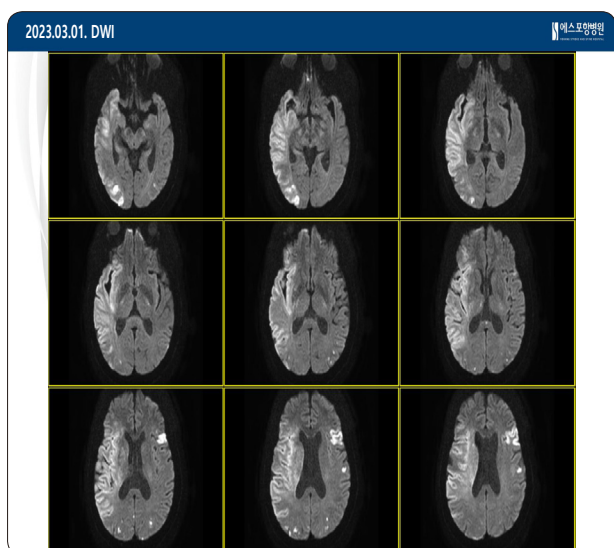
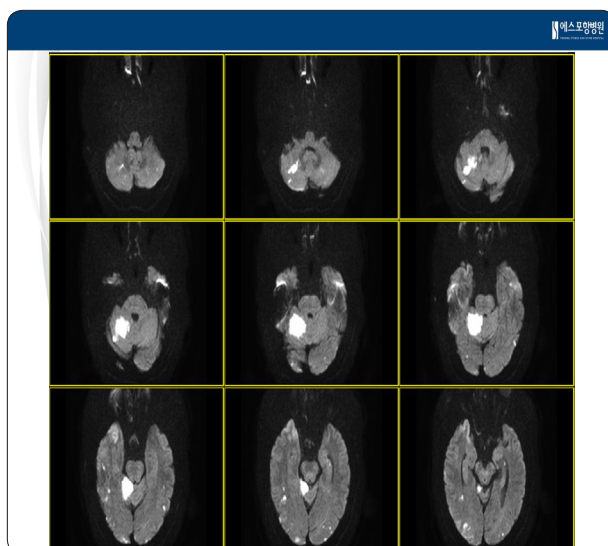
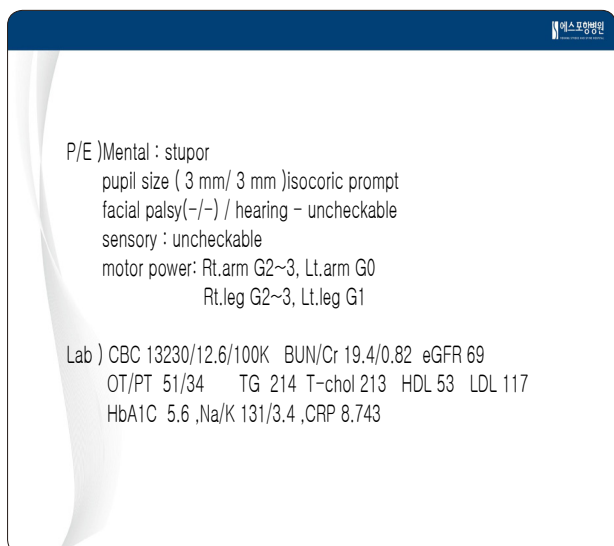
CASE 1

조○○ F/69

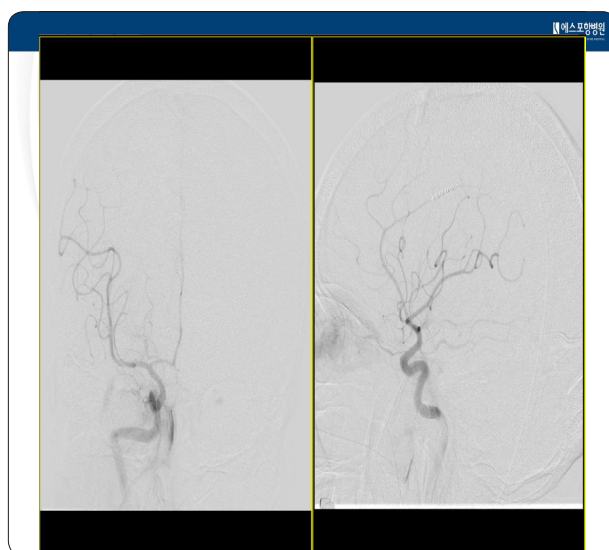
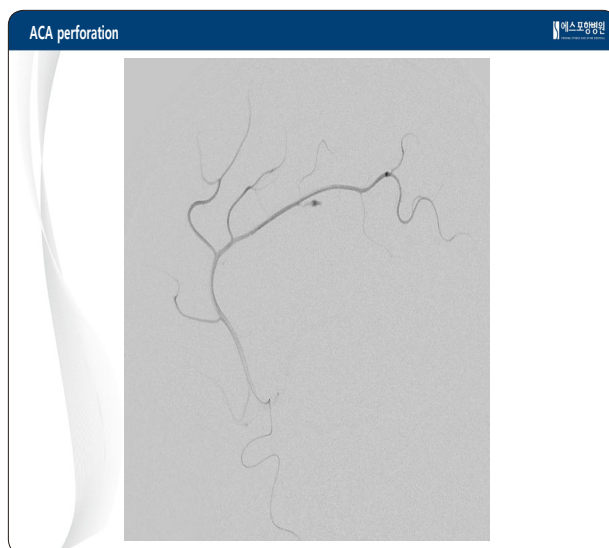
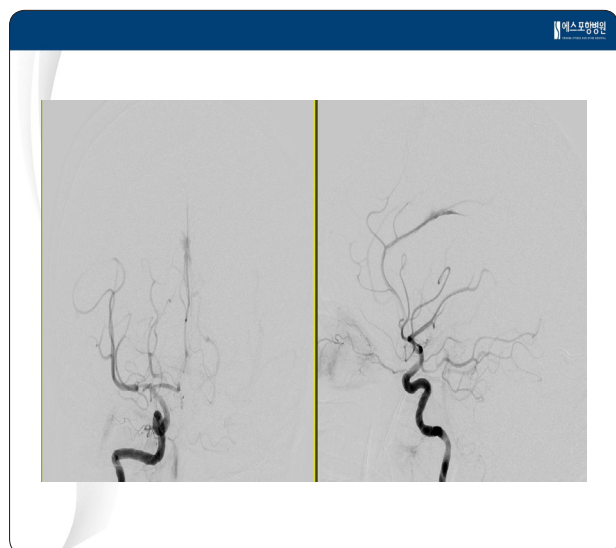
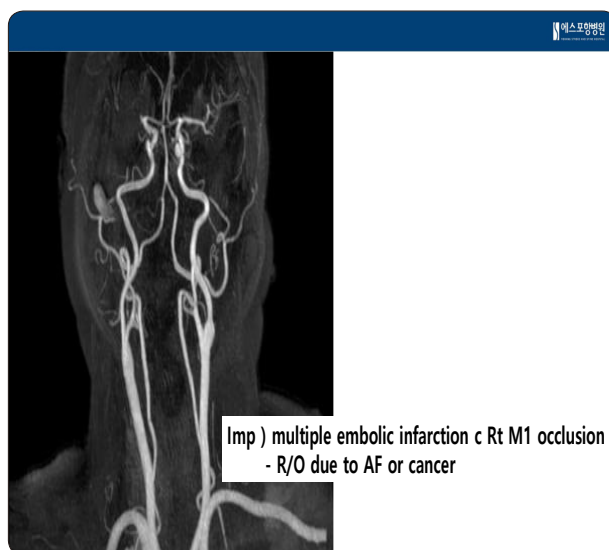
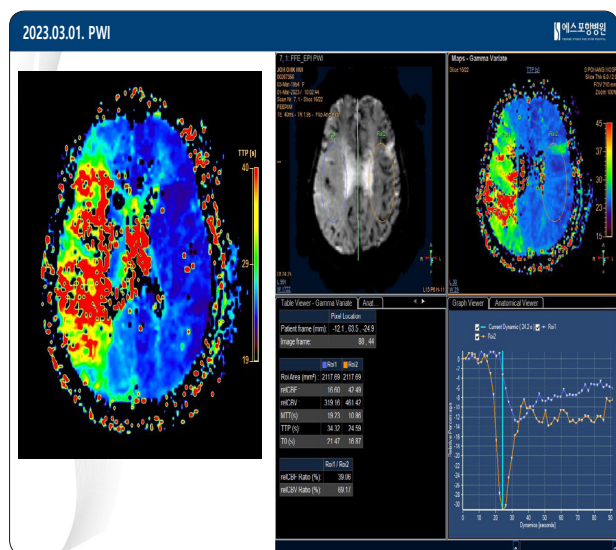
C/C) mental change

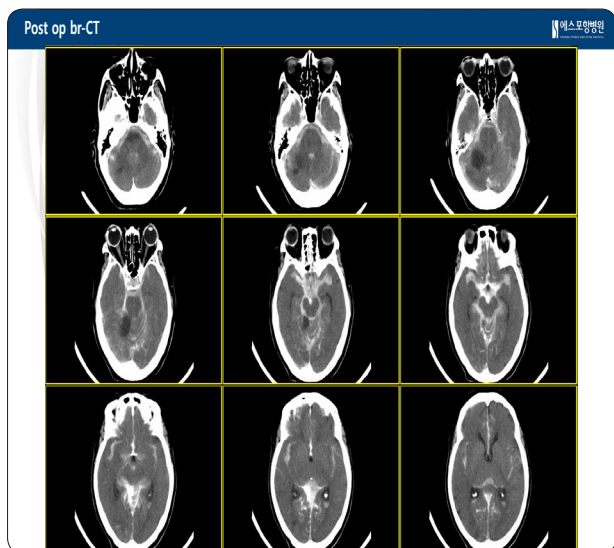
P/I) 2023/3/1 7:50am경 식사 중에 mental change 발생하여 내원
(2/27~ general weakness, abdomen pain 있어 LMC 입원중)

P/H) HTN/DM/Dyslipidemia -/-/+
Smoking/Alcohol -/-
ovarian cancer 말기- 2년전 OP, 항암치료 시행중



제2차 급성뇌경색치료연구회(ASTRO) Stroke Conference & New Device Update





CASE 2

최○○ F/57

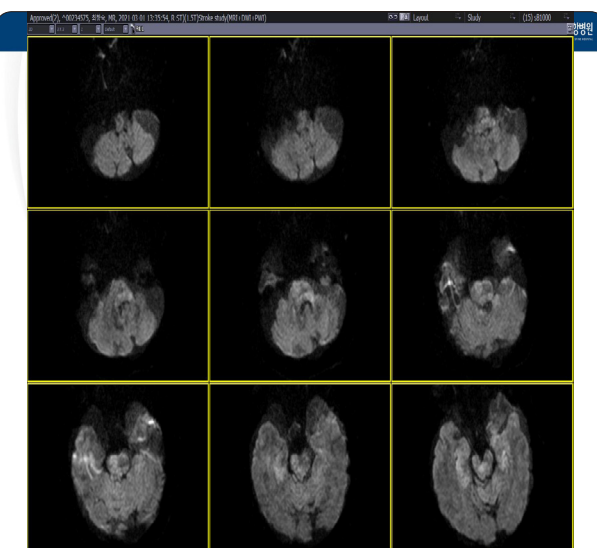
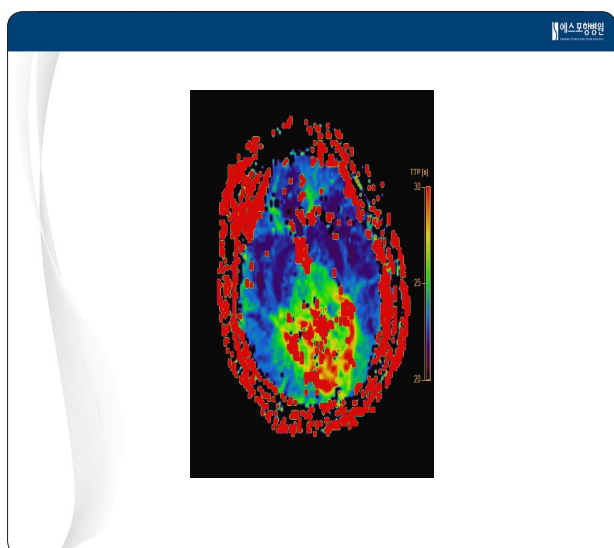
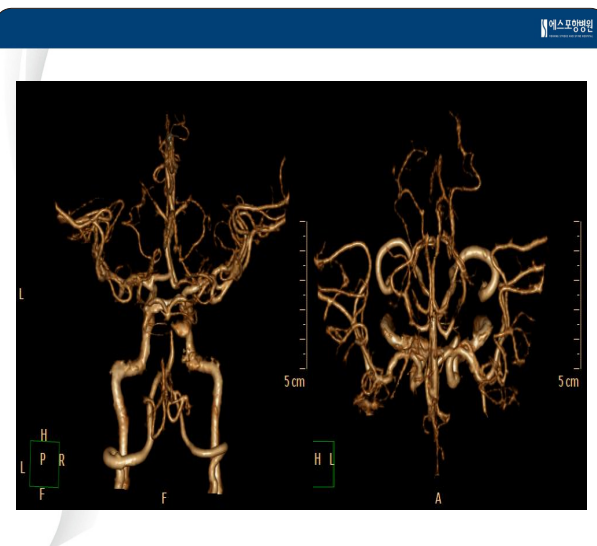
C/C) mental change

P/I) 2021/3/1 13시경 식사하려고 앉아있는데
갑자기 양 손이 오그라들면서 의식 잃은 후 내원함

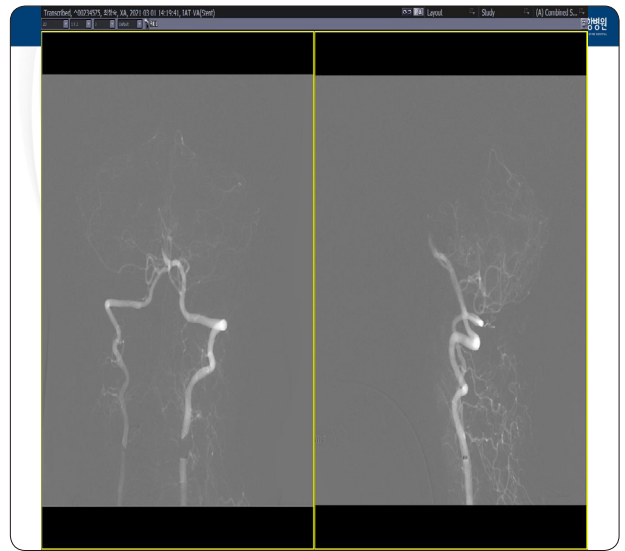
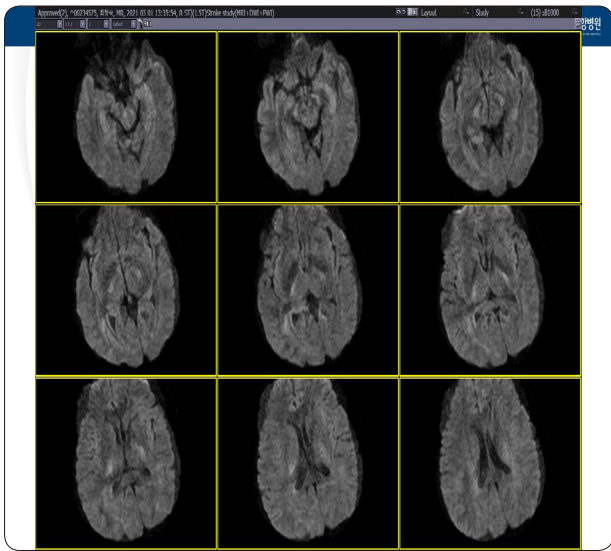
P/Hx) HTN/DM/Dyslipidemia -/-/+
Smoking/Alcohol -/+

P/E)Mental : semicomatose
pupil size (5 mm/ 4 mm) anisocoric prompt
facial palsy(+/-) / hearing - uncheckable
sensory : uncheckable
motor power: Rt.arm G0, Lt.arm G0
Rt.leg G0, Lt.leg G0

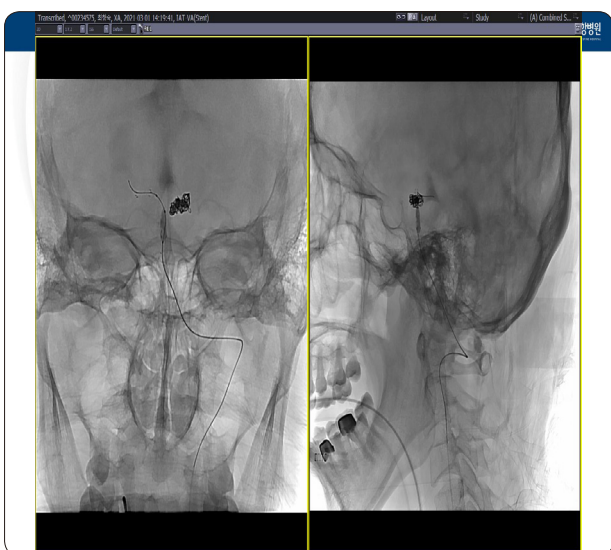
Lab) CBC 8370/13.4/186K BUN/Cr 8.6/0.5 eGFR 137
OT/PT 25/18 TG 135 T-cho 182 HDL 61 LDL 94
HbA1C 5.4 ,Na/K 138/3.1 ,CRP 8.743



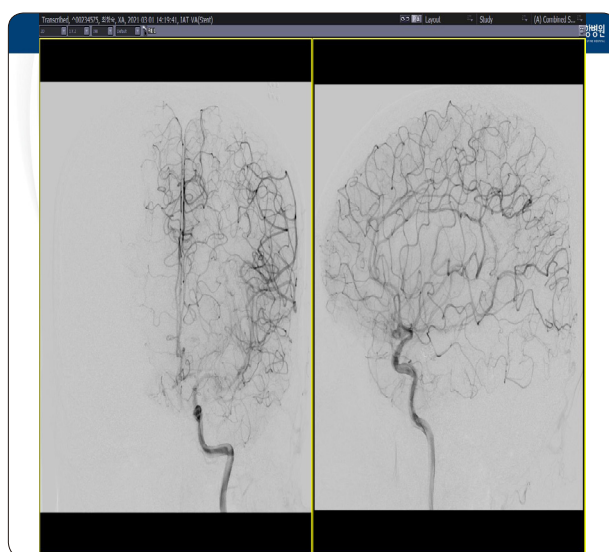
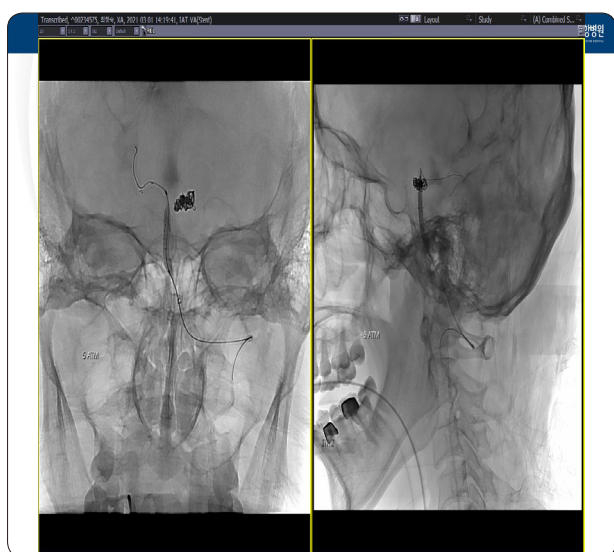
제2차 급성뇌경색치료연구회(ASTRO) Stroke Conference & New Device Update



제2차 급성뇌경색치료연구회(ASTRO) Stroke Conference & New Device Update



제2차 급성뇌경색치료연구회(ASTRO) Stroke Conference & New Device Update



INTERNATIONAL STROKE CONFERENCE POSTER ABSTRACTS
SESSION TITLE: ACUTE ENDOVASCULAR TREATMENT POSTERS II

Abstract T P18: Incidence and Management of Intracranial Wire Perforation During Acute Stroke Endovascular Therapy

Deepak Gulati, Amin Aghaiebrahimi, Amer Malik, Andrew Ducruet, Brian Jankowitz, Tudor Jovin and Ashutosh Jadhav
Originally published 9 Feb 2015 | <https://doi.org/10.1191/09487445.2015.01710> | Stroke 2015;46:ATP18

Abstract

BACKGROUND: Wire perforation during endovascular thrombectomy for acute stroke is a rare but devastating complication. Understanding the incidence and mechanism of this adverse event may further identify preventive strategies and improvements in management during perforation.

METHODS: Retrospective review of a prospectively maintained database of acute stroke interventions at our institute identified 1035 patients. Of these, 46 patients were noted to have contrast extravasation during the procedure concerning for wire perforation (4%).

RESULTS: A majority of the cases involved the anterior circulation (76%). Sites of perforation included: ICA (12), MCA (23), ophthalmic (1), anterior choroidal (2), PCA (4), PICA (1), SCA (1) and vertebral artery (2). Successful hemostasis was achieved with onyx embolization (39%), coil embolization (13%), onyx/coil combined embolization (5%), microcatheter occlusion (2%) and balloon inflation (7%). Thirty one percentage of the cases occurred during intracranial stenting or angioplasty. Despite high rates of mortality (72%), rapid recognition of extravasation and hemostasis led to good outcomes in 9% of patient.

CONCLUSION: Intra-procedural wire perforation with leakage of contrast is associated with catheterization of small caliber vessels such as distal MCA branches (M3), anterior choroidal artery and diminutive posterior circulation vessels as well as intracranial angioplasty/stenting. Devastating outcomes can potentially be averted with appropriate hemostatic control.

Rate of Perforation		4.0%
Death		72%
Rate of good outcome		9%
	Site of Involvement	
1)	ICA	26%
2)	MCA	50%
3)	Basilar	17%
	Management Strategies	
1)	Onyx	39%
2)	Coil	13%
3)	Onyx/Coil	4%
4)	Sacrifice vessel	2%
5)	Occluded with catheter	2%
6)	Balloon	7%
7)	None	30
8)	Stenting/Plasty	26

Original Paper

DOI: 10.5468/neuroint.2011.6.1.17

Vascular Perforation During Coil Embolization of an Intracranial Aneurysm: the Incidence, Mechanism, and Clinical Outcome

Chang-Woo Ryu, MD, Chul-Young Lee, MD, Jun Seok Koh, Seok Keun Choi, MD, Eui Jong Kim, MD

Purpose: The occurrence of a vascular perforation during an endovascular procedure is an unexpected and feared complication which can be fatal. However, the incidence, risk or the mechanism of vascular perforation which can occur in the endovascular management of aneurysms remains unclear. The purpose of the present study was to evaluate the incidence of vascular perforation during endovascular coil embolization of a cerebral aneurysm, and to reveal characteristics and clinical outcomes.

Materials and Methods: We reviewed the endovascular coil embolization procedures performed for the treatment of 459 aneurysms. Incidence and clinical, radiological and technical data of patients concerning the vascular perforation were reviewed from medical records and radiological findings.

Results: The incidence of procedure-related vascular perforation in our patient group was 0.87% (4/459). For all four occurrences, the cause of vascular perforation involved the guidewire or microcatheter. Clinical outcome was poor in 2 cases and favorable in 2 cases.

Conclusion: Although rare, the occurrence of vascular perforation during coil embolization for treatment of an aneurysm may be fatal. Therefore, careful management of the guidewire is suggested for the prevention of vascular rupture during an endovascular procedure.

Key Words: Vascular perforation; Intracranial aneurysm; Coil embolization

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Neurointervention 2011;6:17-22

DISCUSSION

Vascular perforation during an endovascular procedure is an unexpected complication of concern, because it can lead to serious results. Iatrogenic hemorrhage resulting from vascular perforation can abruptly increase the intracranial pressure, resulting in death. In our series, the rate of vascular perforation during endovascular management of an aneurysm was 0.78%. The reported percentage of vascular perforations that were complicated with intracranial endovascular procedures varies among studies. The rate of reports about mechanical thrombectomy for an acute stroke showed relative high incidence of vascular perforation (4–9%) (9–10). In our results, all cases of vascular perforation were related to the guidewire. However, the stent itself or balloon for the remodeling of aneurysmal neck, in rare cases, could be the cause of the vascular perforation. Coronary arterial perforation

To try to reduce the rate of vascular perforation, it is important to determine which factors affect the rate of occurrence. In the present study, the guidewires were advanced too far distal to select aneurysms located in the distal arteries, navigate to the stent, or manage the thrombus that migrated distally. Then, the guidewire would perforate the smaller distal vessels, which had thinner walls, rather than the proximal arteries. The more distally guidewires navigate, the more it can pass the tortuous curve of intracranial artery. Therefore, the guidewire that locates to a distal artery can keep the strong physical tension and is difficult to control. In particular, the exchange catheter technique with long exchange wire can have risk of a "forward jump". To reduce the risk of iatrogenic vascular perforation, the procedure that selects a distal artery with a guidewire should be performed more carefully.

Vascular perforation by a guidewire may result in self-sealing, particularly if it is a puncture rather than a tear. However, anticoagulation during the procedure may disturb the self-sealing. Unlike the rupture of the aneurysm itself, most of our cases (3/4) consist of the vascular perforation did not show the leakage contrast media on angiography, and not present the increase of blood pressure. Although the vessel rupture induces a treacherous slow leakage which may lead to a progressively life-threatening large bleeding, the vessel rupture during procedure may be difficult to identify. Perforation of the small distal artery may be only seen as the stagnation of the contrast media or the focal

vascular spasm without extravasation in contrast media (11, 13, 14). Therefore, when guidewire has been placed within the distal branch of the cerebral artery during procedure, vascular injury should be ruled out through an angiography with large field of view.

Our results presented the high rate of mortality and morbidity of vascular perforation during the coil embolization of an aneurysm. Therefore, when vascular perforation is detected during procedure, this may be fatal, and the treatment should be rapid. After identifying of the vascular perforation in endovascular procedure, treatment of the vascular perforations is started with the immediate reversal of anticoagulants. Then, the operator should consider permanent occlusion of the perforation site. Closure of the perforation can be achieved with coils, liquid adhesives, or a tamponade with balloons (6).

In conclusion, although rare occurrence of vascular perforation during coil embolization of the aneurysm, the clinical outcome may be fatal. Then, the decision to treat should be rapid. The vascular perforation by guidewire may be difficult to detect and this results in improper treatment. Therefore, the prevention of the vascular rupture should be considered during the endovascular procedure, especially, guidewire navigation to distal arteries.



Case report

Extravasation control with preserved vessel patency after wire perforation during neurothrombectomy: Case report and literature review

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ABSTRACT

Parallel to a more widespread application of endovascular neurothrombectomy in acute ischemic stroke, it is critical to understand the nature and management of associated complications, including wire perforation of the middle cerebral artery (MCA). Sacrifice of the perforated vessel may be necessary to avoid fatal intra-cranial hemorrhage. Here we describe a case of right MCA distribution ischemia complicated by a right MCA perforation. Using super selective injection of contrast through a microcatheter, the point of extravasation was located and sealed with liquid embolic agent (Onyx) while preserving patency of the MCA. By avoiding vessel sacrifice, blood perfusion to distal areas was preserved and therefore the patient was discharged with minimal neurological impairment. Causes of perforation and technical aspects to control extravasation are further discussed.

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1. Introduction

Vessel perforation is probably the most feared complication of mechanical neurothrombectomy. It is catastrophic and associated with in-hospital mortality and poor clinical outcome [1].

There is a paucity of publications on rescue techniques to avoid vessel sacrifice [1], but if contrast extravasation persists the concern for ongoing hemorrhage leaves vessel sacrifice as the only viable option, which not only defeats the purpose of vessel recanalization, but in cases of more proximal vessel injury exacerbates the ischemic insult.

We report a method to control arterial extravasation by selective microcatheter injection of liquid embolic agent (Onyx) and therefore improving clinical outcome by preserving arterial patency.

Perforation during neuroendovascular procedures requires immediate action given the high risk of subarachnoid hemorrhage and clinical deterioration. Vessel perforation is further complicated by recent or ongoing infusion of thrombolysis agents. Some reports have discussed repeating angiograms to assess if the perforated site has spontaneously occluded. In case the offending hardware is retained in the vessel wall, a delayed and gentle withdrawal is recommended to allow formation of thrombus [9]. Intravenous protamine to reverse intra-procedural heparin and induced hypotension have been applied to control contrast extravasation [10]. If extravasation continues on delayed angiograms a period of delayed balloon inflation for 5–10 min maybe attempted, but if this fails a vessel sacrifice with coil [11,12] or liquid embolic agent [3,4,13] is the only remaining option. Subsequent vascular imaging is warranted to monitor late complications including pseudoaneurysm formation [14].

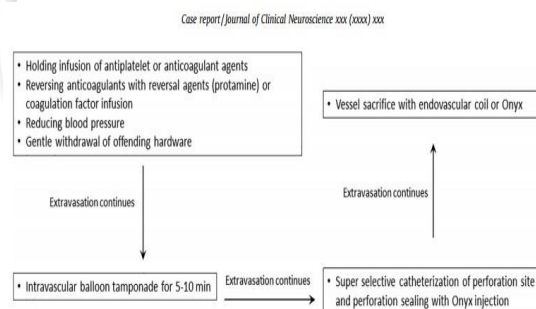
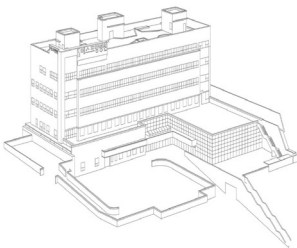


Fig. 2. Schematic representation of the approach to cerebral vessel perforation during neuroendovascular procedures.



**Take
home message*

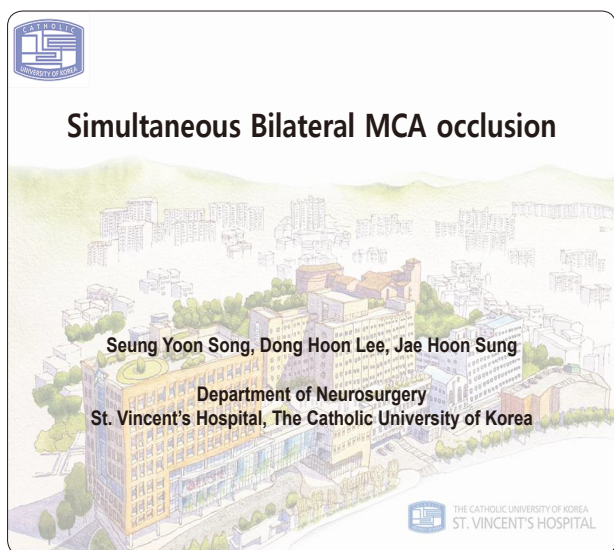
- Distal access 할 때 guidewire 주의해서 다룰 것
- Vascular perforation 이 angiography에서 확인된다면 mortality and mobility 높음.
- 발견 즉시 혈압 낮추고, Anticoagulants reversal drug 사용
- Perforation site 치료 방법에 대해 빠른 결정 필요
→ tamponade with balloons → coil or liquid adhesives



Thank you for attention

[Case 4]
Simultaneous bilateral
MCA occlusion:
Undetermined cases of
thrombus

송 승 윤
가톨릭대 성빈센트병원



Case#1

60/F

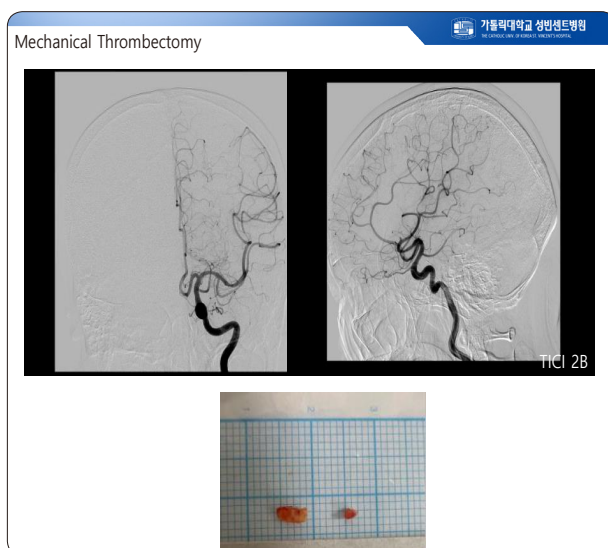
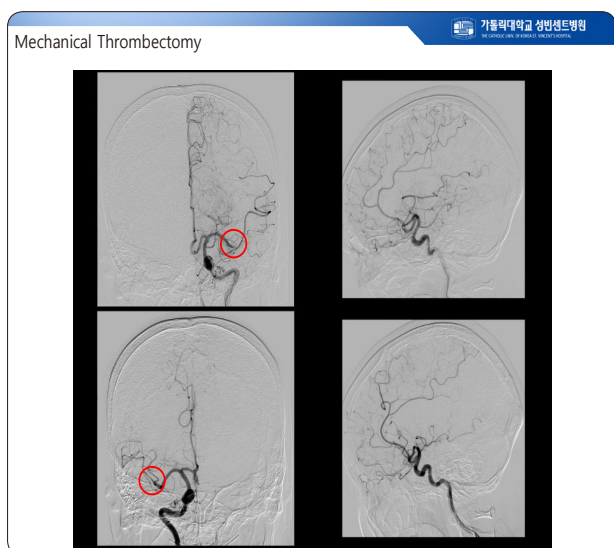
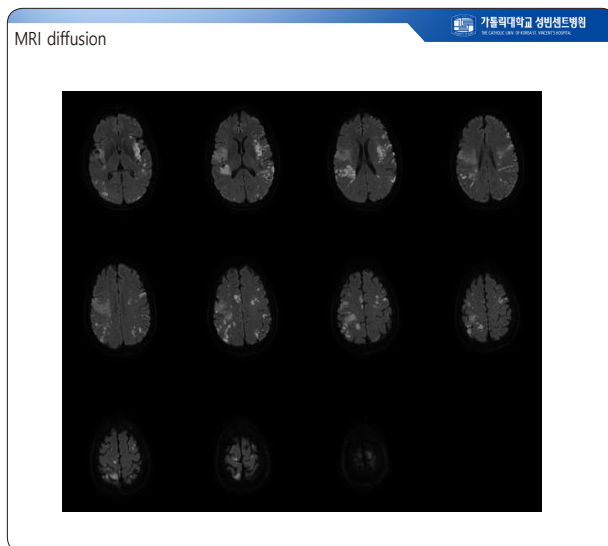
C/C : Stuporous mentality

P/Hx : Autoimmune hypothyroidism
Lymphadenitis

12.02 dyspnea 및 lymphadenopathy 에 대해 호흡기내과 입원하여 evaluation 중이던 분으로, 12.04 10:00am stuporous mentality 있어 B-star activation

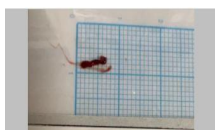
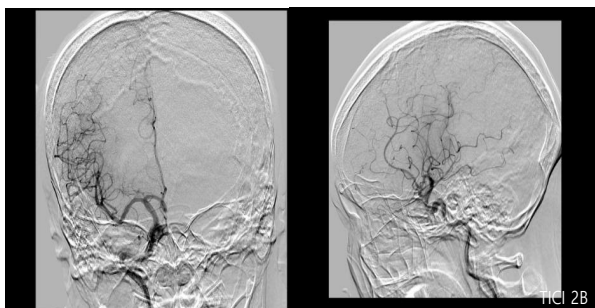
GCS 225
Motor 4/3 3/3

NIHSS 18

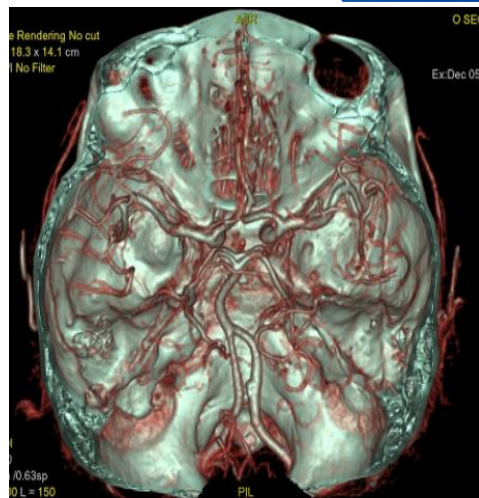


제2차 급성뇌경색치료연구회(ASTRO) Stroke Conference & New Device Update

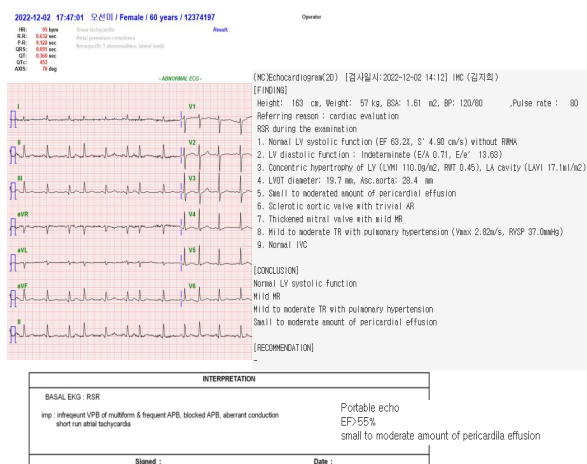
Mechanical Thrombectomy



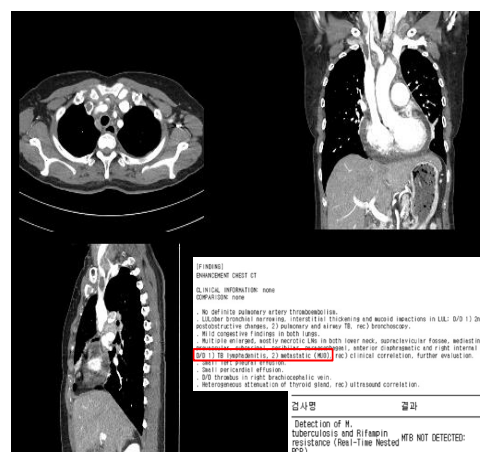
Post CT



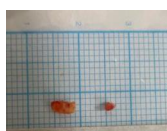
Cardiac evaluation



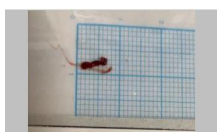
Evaluation



Biopsy



서유경 : Lt. MCA occlusion thrombus
[GROSS DESCRIPTION]
The specimen consists of two pieces of tan-colored tissue, measuring up to 0.3x0.2cm.
(in toto x1)
(Block 1 개)
[DIAGNOSIS]
Blood vessel, "left MCA occlusion thrombus", excision:
Consistent with organizing thrombi.
[CF]
022-029553, C16-016182, S12-005988



서무결제 : Rt. MCA occlusion thrombus
[GROSS DESCRIPTION]
The specimen consists of a fragment of tan-colored tissue, measuring 0.3x0.1cm.
(in toto x1)
(Block 1 개)
[DIAGNOSIS]
Blood vessel, right MCA, "occlusion thrombus", excision:
Thrombi.
[CF]
S27-029555 016-016180 512-009690

- Large-artery atherosclerosis (embolus/thrombosis)*
- Cardioembolism (high-risk/medium-risk)*
- Small-vessel occlusion (lacune)*
- Stroke of other determined etiology*
- Stroke of undetermined etiology

- a. Two or more causes identified
 - b. Negative evaluation
 - c. Incomplete evaluation
- Stroke

TOPICAL REVIEW

Cancer and Embolic Stroke of Undetermined Source

Babak B. Navi , MD, MS; Scott E. Kasner , MD, MSCE; Mitchell S.V. Elkind , MD, MS; Mary Cushman , MD, MS; Oh Young Bang , MD, PhD; Lisa M. DeAngelis, MD

ABSTRACT: Evidence to date on the use of systemic therapies has not established mechanism after standard diagnostic evaluation and classification as emblematic of undifferentiated sarcoma (EUS). Failure of randomized trials to demonstrate a benefit of direct oral anticoagulants over aspirin for the treatment of EUS as a single homogeneous entity has led to renewed interest by medical societies to divide EUS into subgroups. Emerging data suggest that active cancer, which is present in 5% to 10% of patients with EUS, is a distinct and important subgroup of EUS with unique clinical characteristics, underlying pathogenesis, and prognosis. This review examines the evidence for the use of systemic therapies in EUS, with a particular emphasis on the expected to increase as patients with cancer, even those with distant metastases, survive longer due to improvements in cancer treatments. In this topical review, we examine the epidemiological link between EUS and cancer, the clinical features of EUS with cancer, the evidence for the use of systemic therapies in EUS with cancer, the evidence for the use of systemic therapies in recurrent stage and/or thromboembolic events, and the potential treatment strategies for cancer-related EUS. We include a clinical trial of a dynamic data and ongoing or planned clinical trials of different antithrombotic approaches. As a result, clinical EUS is a systemic disease, and the management of our patients, we recommend close collaboration between neurologists and oncologists for the management of these patients.

제2차 급성뇌경색치료연구회(ASTRO) Stroke Conference & New Device Update

가톨릭대학교 성빈센트병원

Table. Possible Underlying Mechanisms and Treatment Approaches in ESUS With Cancer

Mechanism*	Associated characteristics	Possible treatment approaches
Hypercoagulable		
Central intravascular coagulation	Elevated D-dimer, diffuse systemic and cerebral infarcts, disseminated cancer, sepsis	Direct oral or parenteral heparin-based anticoagulation, cytoreductive chemotherapy
Nonbacterial thrombotic endocarditis	Elevated D-dimer, diffuse systemic and cerebral infarcts, TCD microemboli, disseminated cancer, adenocarcinoma histology	Direct oral or parenteral heparin-based anticoagulation, cytoreductive chemotherapy
Paradoxical embolization	Elevated D-dimer, indwelling venous catheter, venous thromboembolism history, immobility	Direct oral or parenteral heparin-based anticoagulation, consider removing offending venous catheter, consider PFO closure
Nonhypercoagulable		
Aortic atheroma	Smoking, vascular risk factors, thoracic radiation	Dual antiplatelets, intensive statin therapy, vascular risk factor control
Atrial disease	Vascular risk factors, dilated left atrium, atrial ectopy, increased BNP	Anticoagulant vs. antiplatelet, cardiac rhythm and rate control
Cardiomyopathy	Antihistamine and trastuzumab chemotherapy, thoracic radiation, heart disease, cardiac symptoms	Avoid offending chemotherapy, anticoagulant vs. antiplatelet, atherosclerotic reduction
Infective endocarditis	Indwelling venous catheter, sepsis, recent invasive procedures	Intravenous antibiotics, avoid antithrombotics
Nonstenosing large artery atherosclerosis	Smoking, vascular risk factors, thoracic/neck radiation	Antiplatelet(s), intensive statin therapy, vascular risk factor control, consider endarterectomy/stent
Tumor embolism	Centrally located lung tumor, thoracic surgery subsequent metastasis at stroke site	Cytoreductive chemotherapy, surgical resection, anticoagulant vs. antiplatelet
Vasculitis	Immunotherapy, fungal or varicella infection, intravascular lymphoma	Treat underlying cause or trigger, antiplatelet

BNP indicates B-type natriuretic peptide; ESUS, embolic stroke of undetermined source; PFO, patent foramen ovale; and TCD, transcranial Doppler.

*Categorized by association with hypercoagulability and listed in alphabetic order.

Case#2

85/F

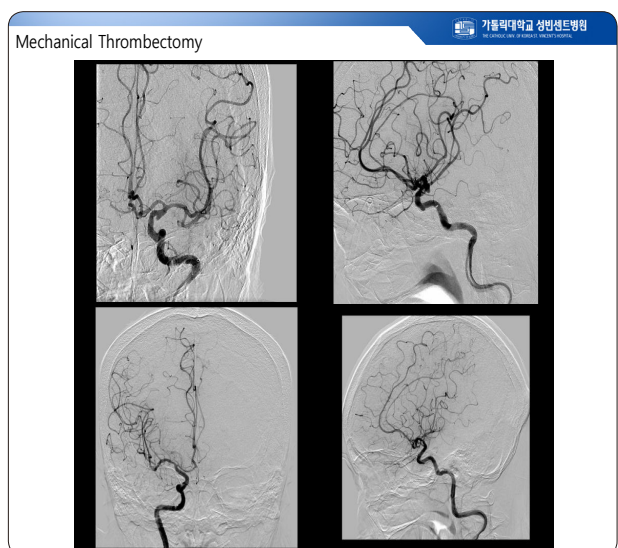
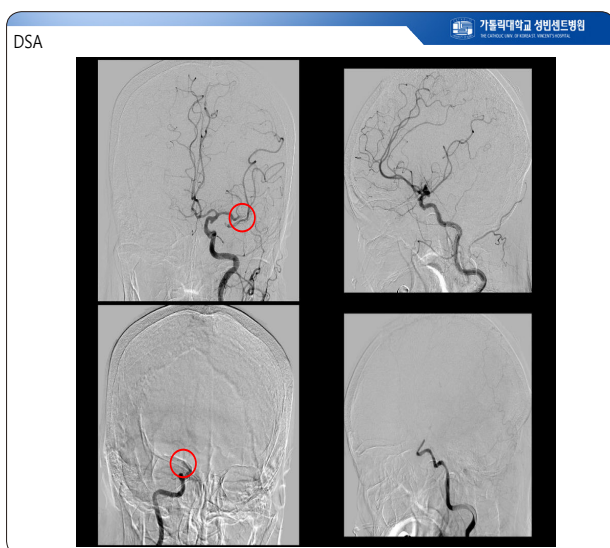
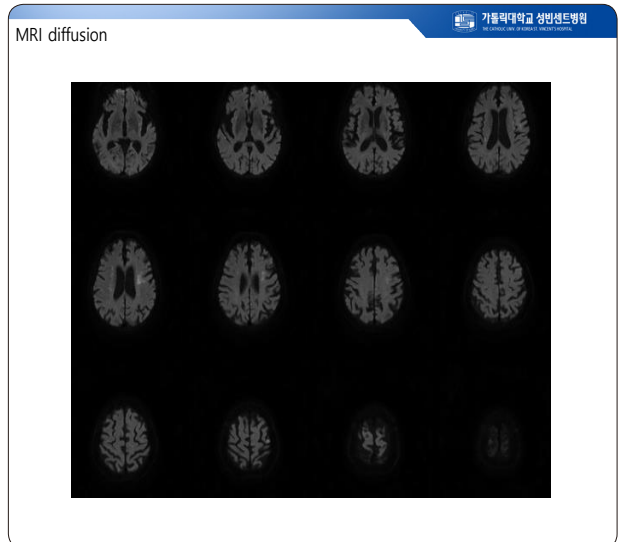
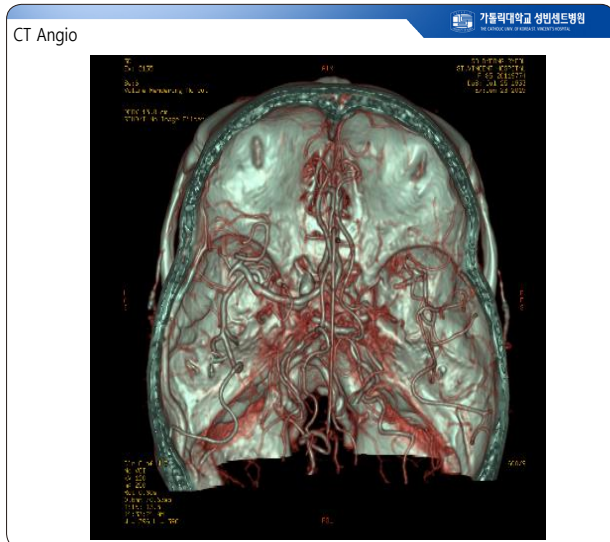
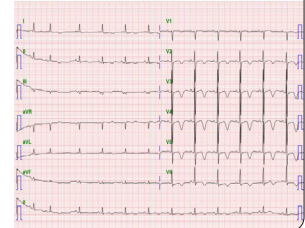
C/C : Stuporous mentality & Lt. side weakness

P/Hx : DM / HTN

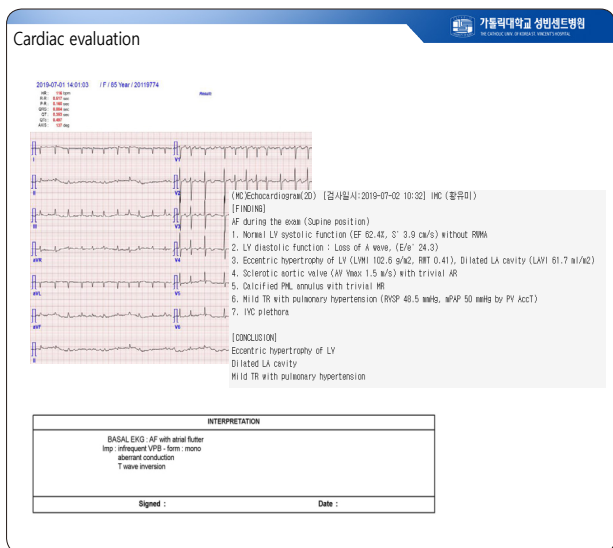
GCS 3/5

Motor 4/3 4/3

NIHSS 25



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Case#3

82/F

C/C : Stuporous mentality

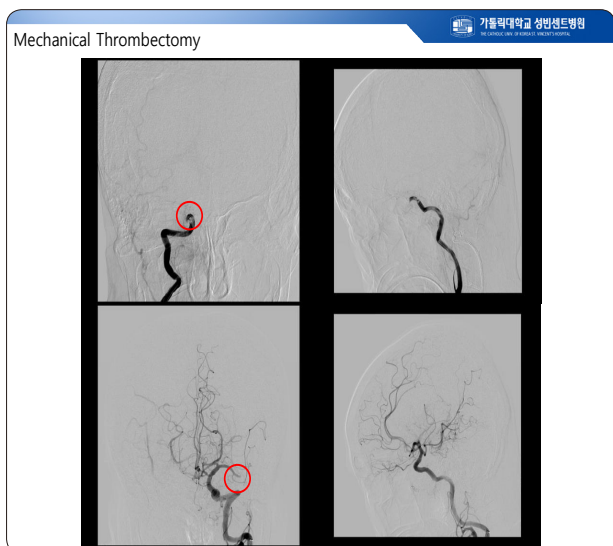
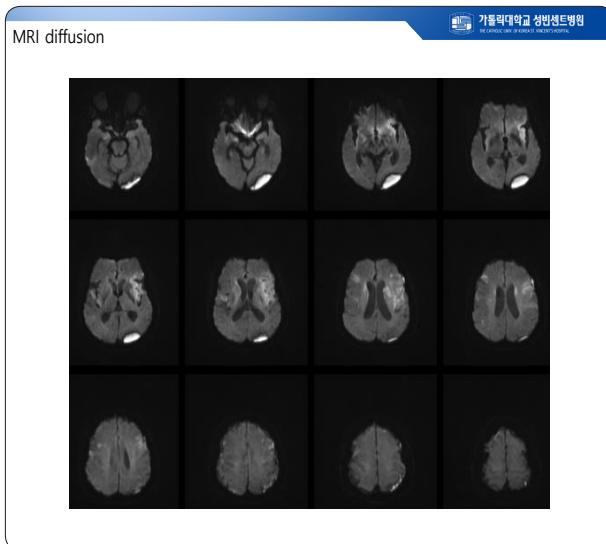
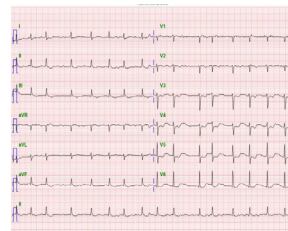
P/Hx : DM / A.fib

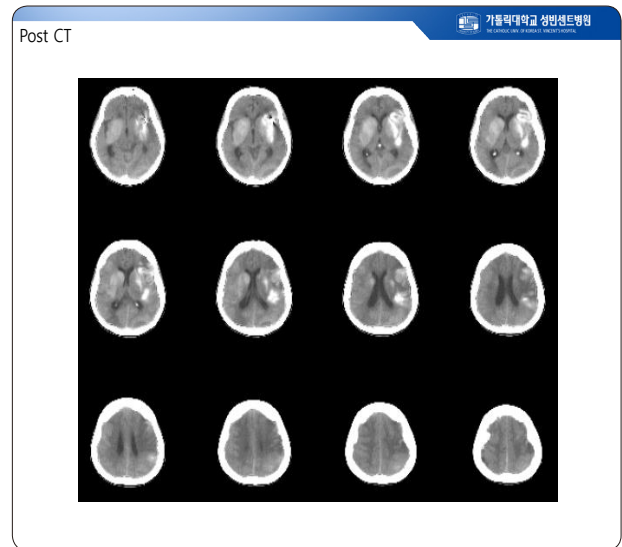
Lt T-O SDH -> warfarin hold

GCS 114

Motor all Gr 2

NIHSS 22





Case#4

72/F

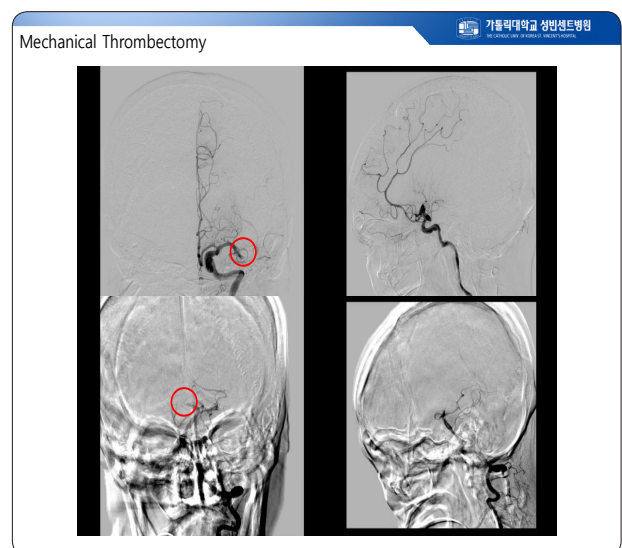
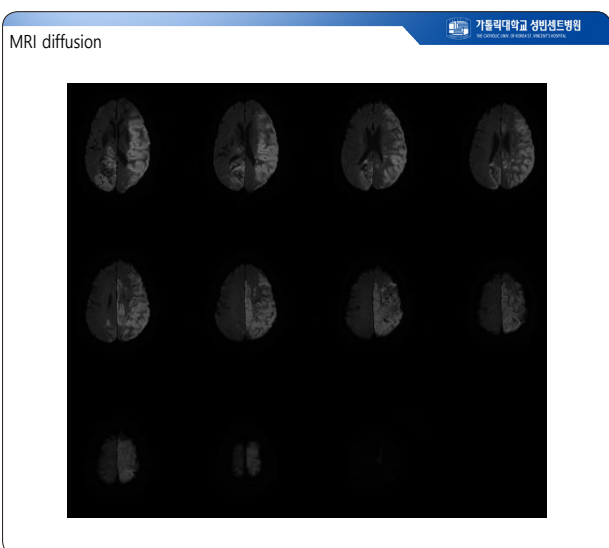
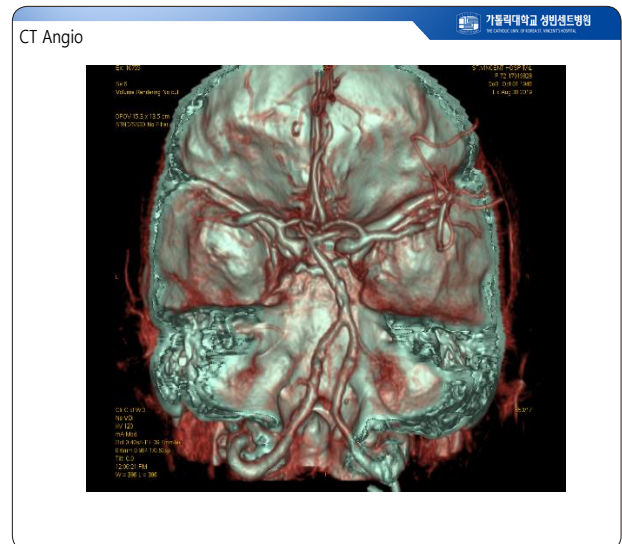
C/C : Stuporous mentality

P/Hx : A.fib on aspirin

GCS 115

Motor 1/3 2/3

NIHSS 20



제2차 급성뇌경색치료연구회(ASTRO) Stroke Conference & New Device Update

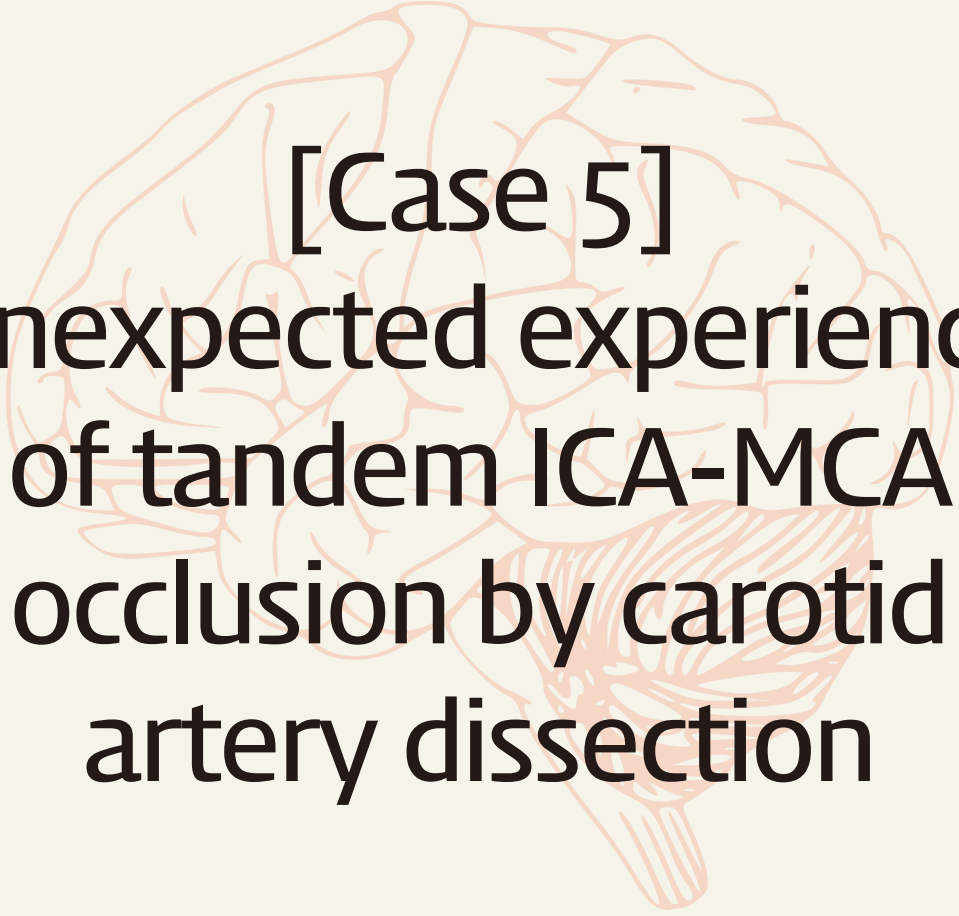
Baseline characteristics & outcome parameters	pMVO cohort (n=21)	Single ICA, M1, M2, and BA (n=1270)	P-Value
Median age (IQR)	72 (61-83.5)	74 (62-82)	0.83
Sex % (n), female	61.9 (13/21)	50.2 (638/1270)	0.38
Median NIHSS on admission (IQR)	22 (13.5-33)	15 (9-20)	<0.01
Median ASPECTS (IQR)	9 (8-10)	8 (6-9)	<0.01
IVT, % (n)	38.1 (8/21)	40.0% (508/1270)	>0.99
TOAST, % (n)			<0.01
• Large-artery atherosclerosis	15 (3/20)	11.5 (146/1266)	
• Cardio-embolic	70 (14/20)	43.2 (547/1266)	
• Small vessel occlusion	-	-	
• Other	10 (2/20)	6.6 (83/1266)	
• Undetermined	5 (1/20)	38.7 (490/1266)	
Median time from onset to groin, minutes (IQR)	228 (164.5-293)	239 (174-364)	0.34
General anesthesia % (n)	100 (21/21)	73.3 (929/1267)	<0.01
Successful reperfusion (TICI ≥2b) % (n)	85.7 (36/42)	84.7 (1075/1269)	>0.99
Median maneuver count (IQR)	2 (1-3)	1 (1-2)	<0.01
Favorable outcome (mRS≤2) % (n)	20 (4/20)	43.2 (516/1194)	0.04
(s)ICH % (n)	0 (0/21)	4.9 (62/1266)	0.62
Mortality at 90-days % (n)	60 (12/20)	27.3 (326/1194)	<0.01

Conclusion

- Multi-vessel occlusion
 - Very rare
 - Cardio-embolism or another cause
 - Broad evaluation & proper management
 - Poor prognosis

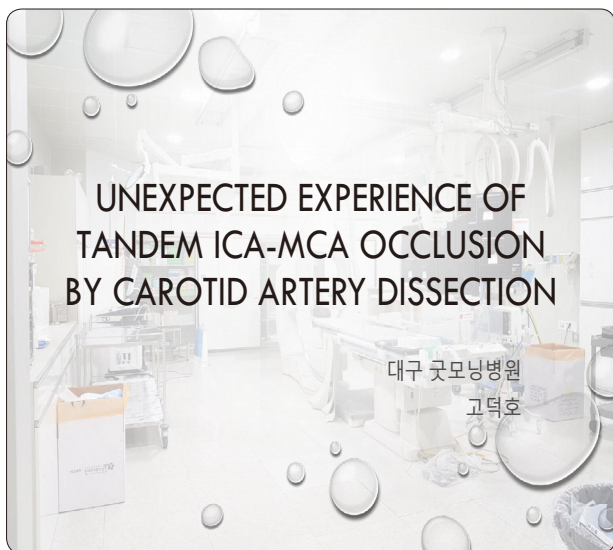
Thank you for your attention





[Case 5] Unexpected experience of tandem ICA-MCA occlusion by carotid artery dissection

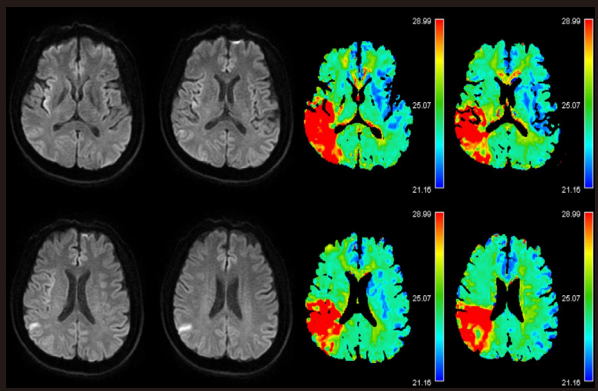
고 덕 호
대구굿모닝병원



Case Presentation

- M/47
- C/C: Lt. Hemiparesis (grade 4/4), Facial palsy, Dysarthria
- Initial NIHSS: 6
- Onset to Arrival : 5hr
- PHx: HTN/DM (-/-), Dyslipidemia, Current smoker, Heavy Alcoholics
- EKG: Afib (-)

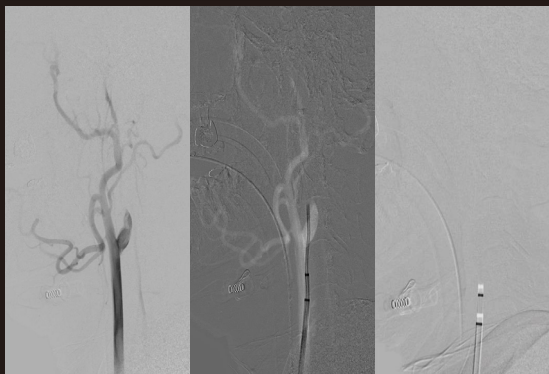
Initial Brain MR- DWI/TTP



Initial Brain & Carotid MRA

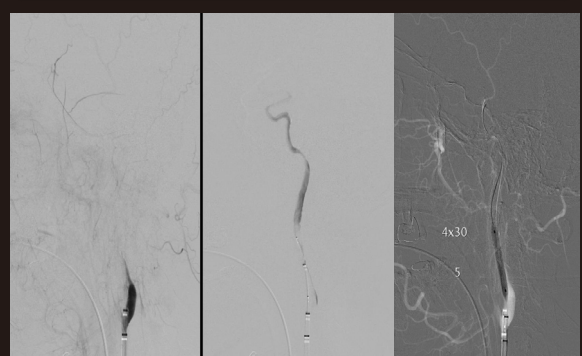


TFCA



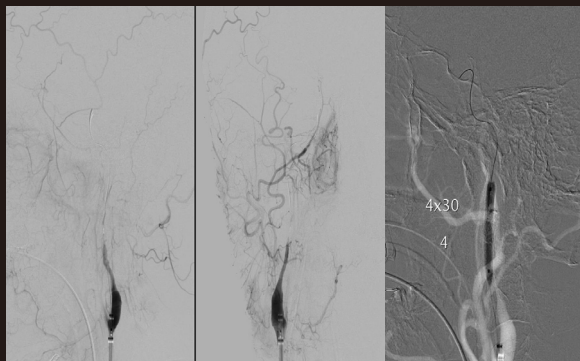
Suction aspiration with balloon guiding catheter

TFCA



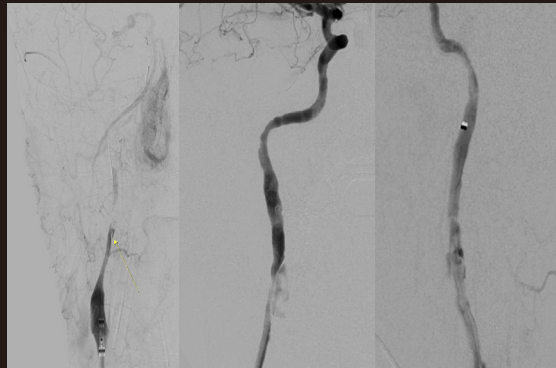
1st Balloon angioplasty with Submarine, 4 x 30mm

TFCA

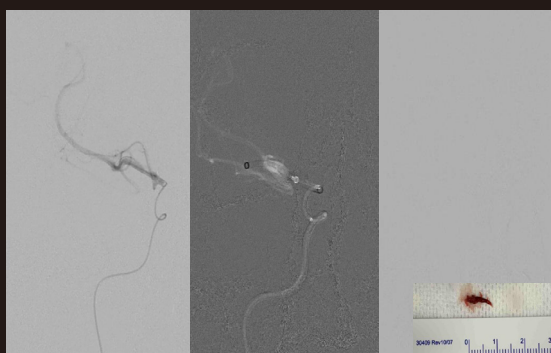


2nd Balloon angioplasty with Submarine, 4 x 30mm

TFCA



Thrombectomy



Contact aspiration thrombectomy with 5Fr Sofia

Carotid Stenting

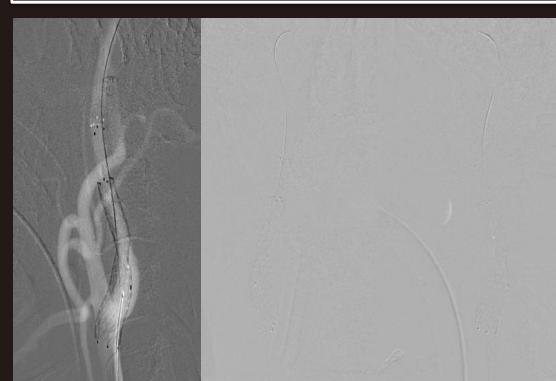


Carotid stenting with Solitaire FR 6 x 30mm

Carotid Stenting

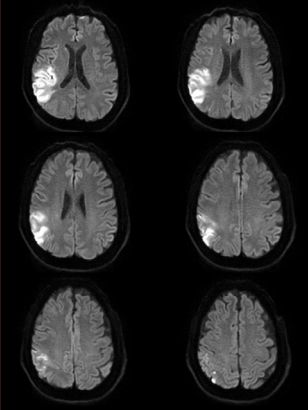


Carotid Stenting



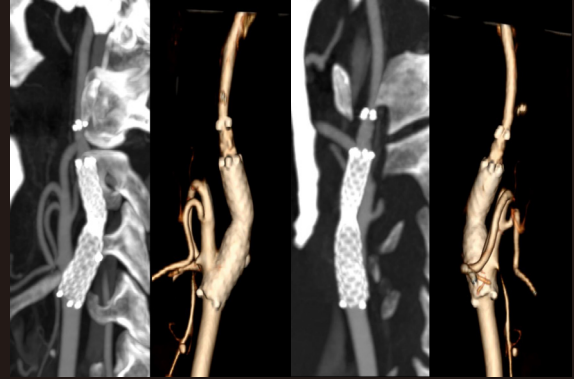
Overlap stenting with Protege 6 x 8 x 40mm

Post-OP MR



- Post-OP NIHSS 4
- 1month mRS 1
- Medication;
DAPT + Atorvastatin 40mg

Post-OP CT Angiography



Discussion

- Caution of Preconception
- Young aged carotid tandem occlusion
 - Atherosclerosis보다는 cardioembolic cause
또는 carotid dissection 가능성을 반드시 고려
- During procedure
 - Smooth wire passing
 - Careful image interpretation

경청해주셔서 감사합니다.

[Case 6]
**Successful stent insertion
after mechanical
thrombectomy for MCA
and ICA dissection**

정 은 오
충남대병원



국립건강을 지킨 50년
의료혁신을 위한 100년

Successful stent insertion after mechanical thrombectomy for MCA and ICA dissection

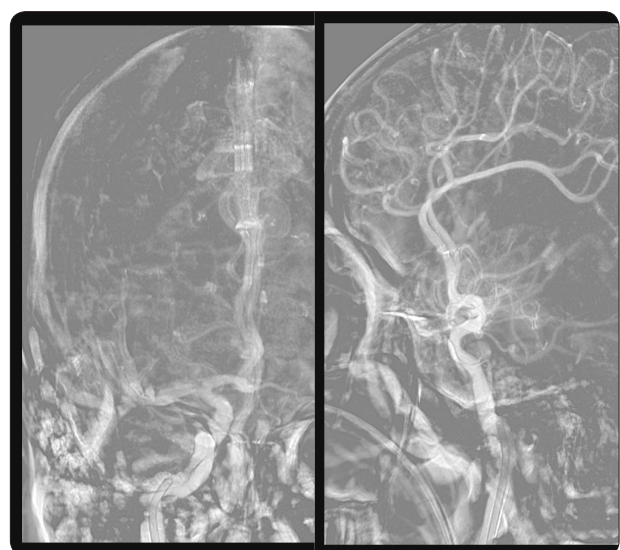
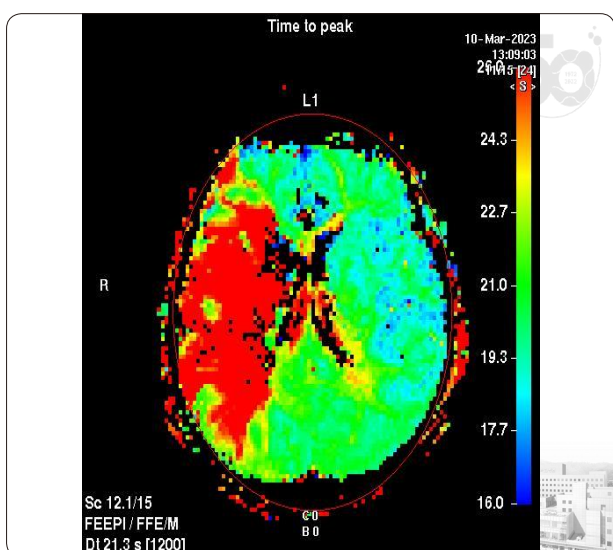
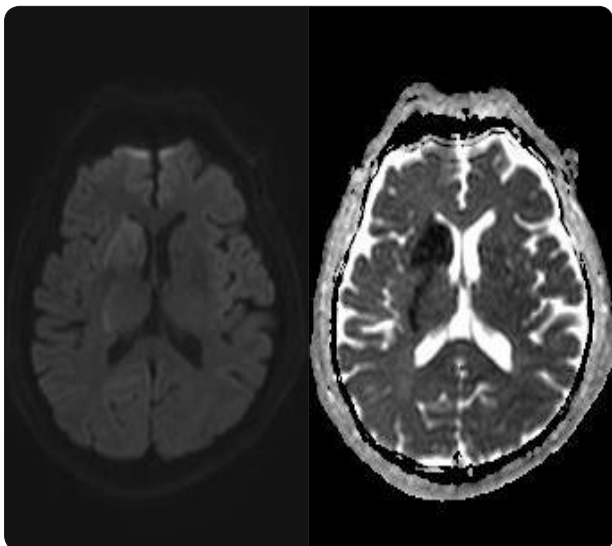
충남대학교 병원
정은오, 권현조, 고현승

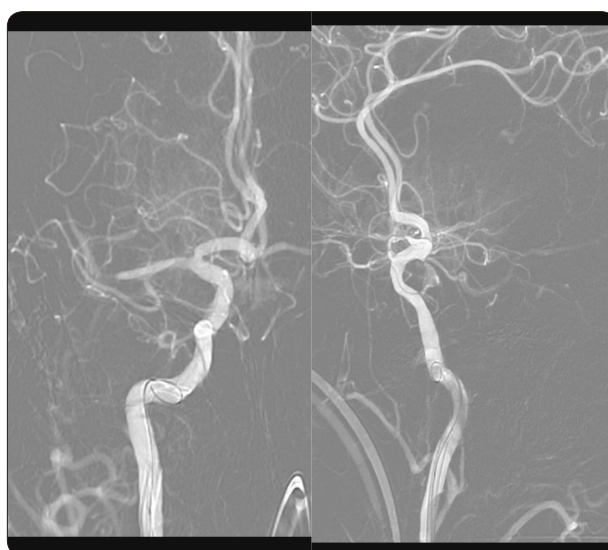
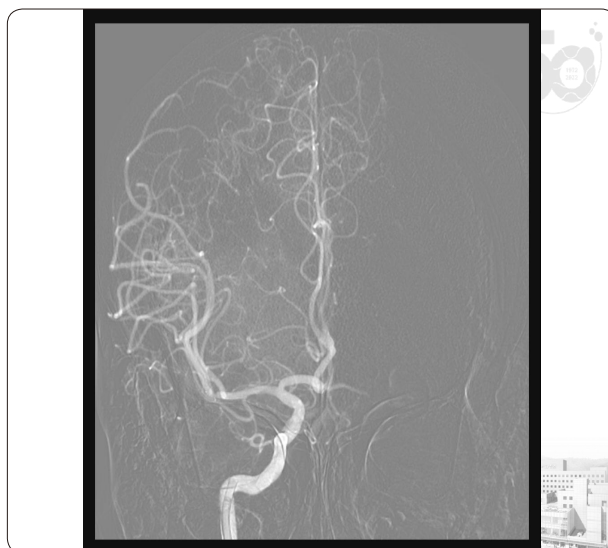
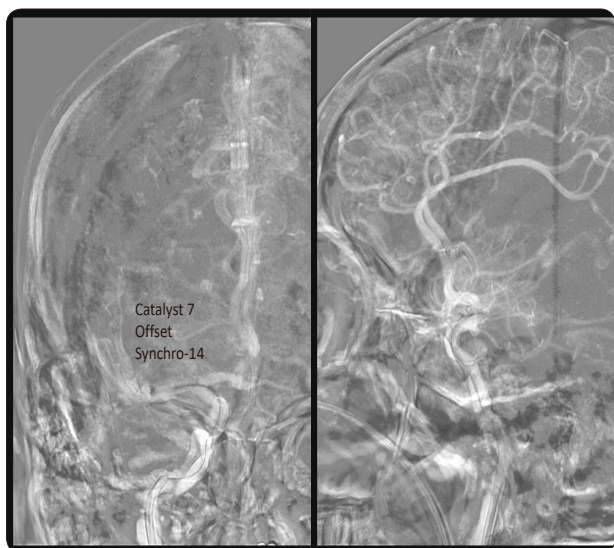
 충남대학교병원

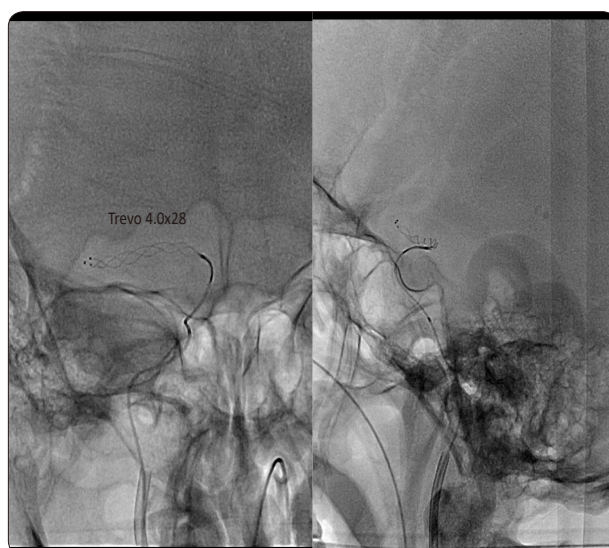
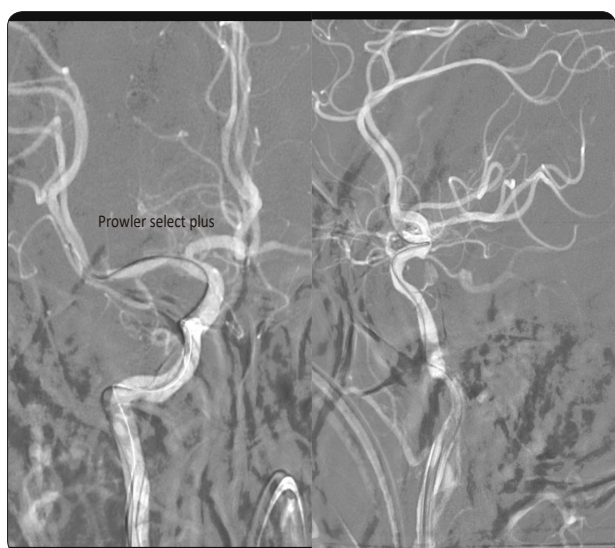
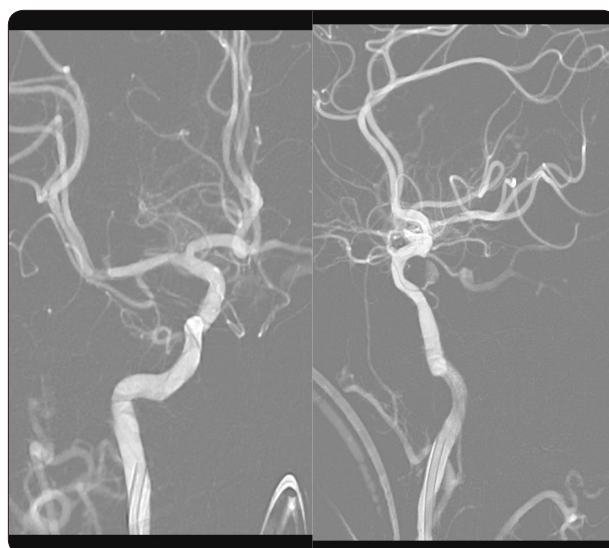
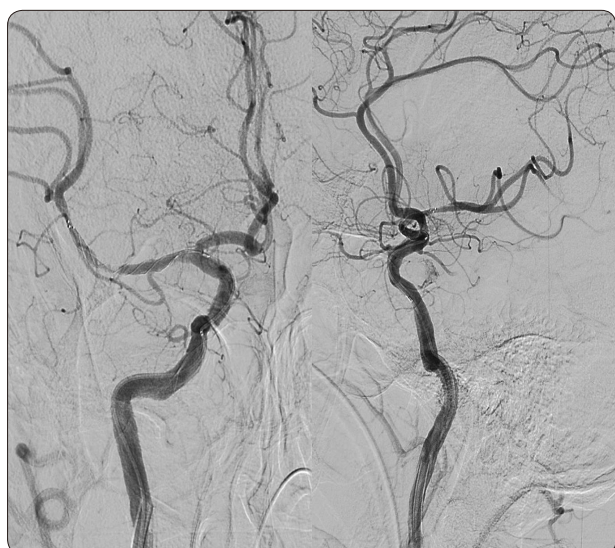
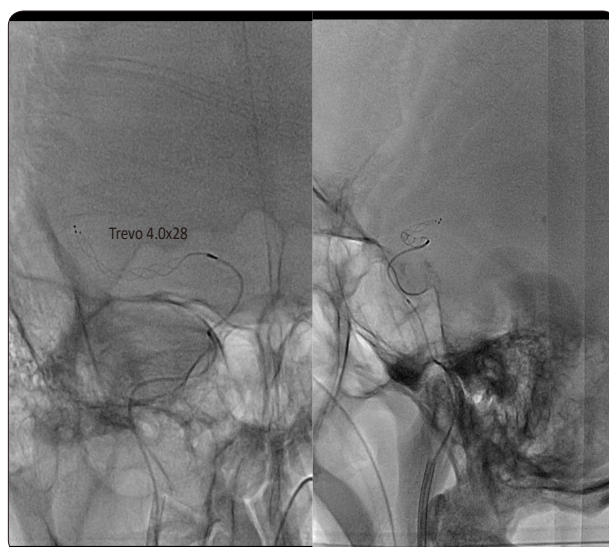
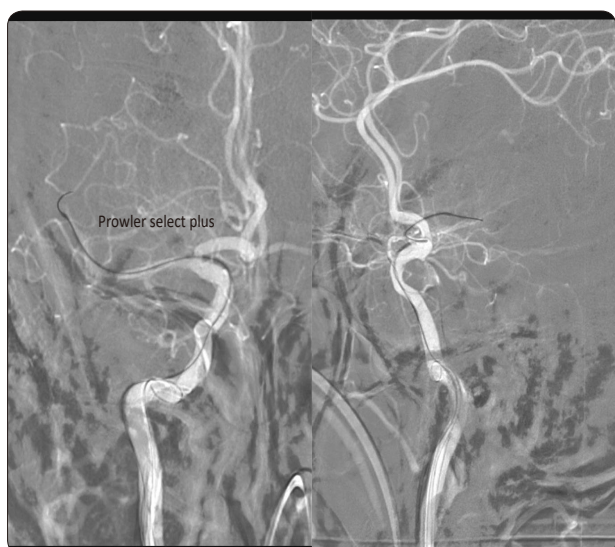


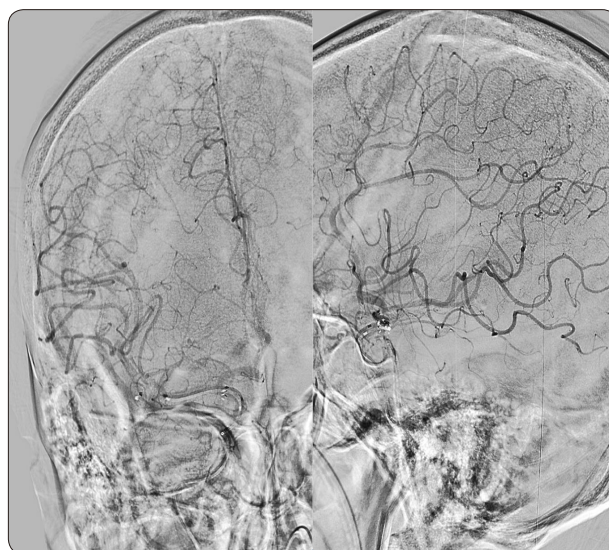
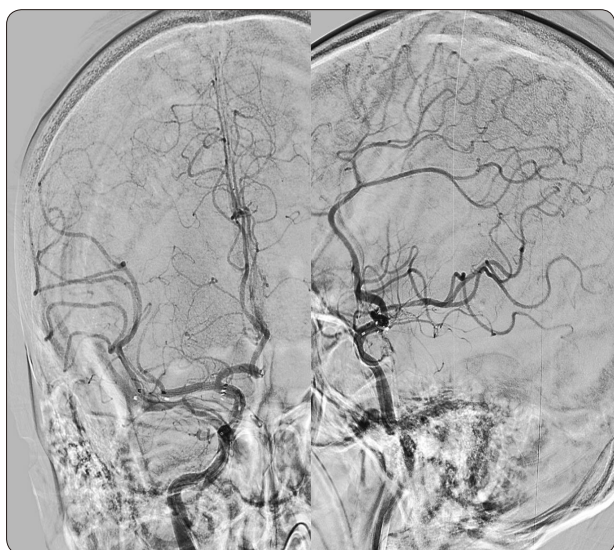
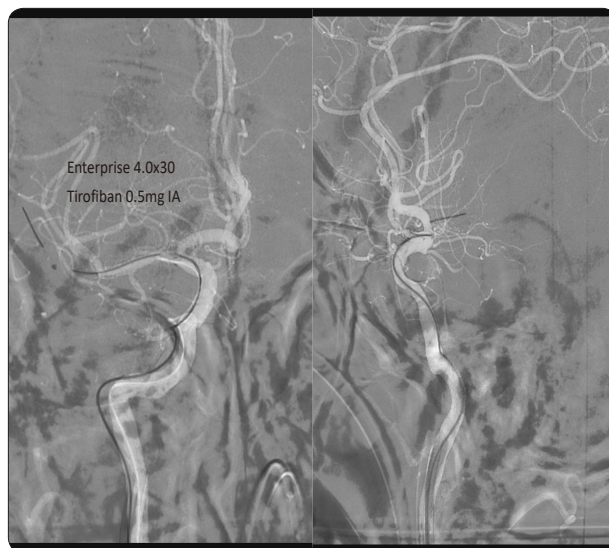
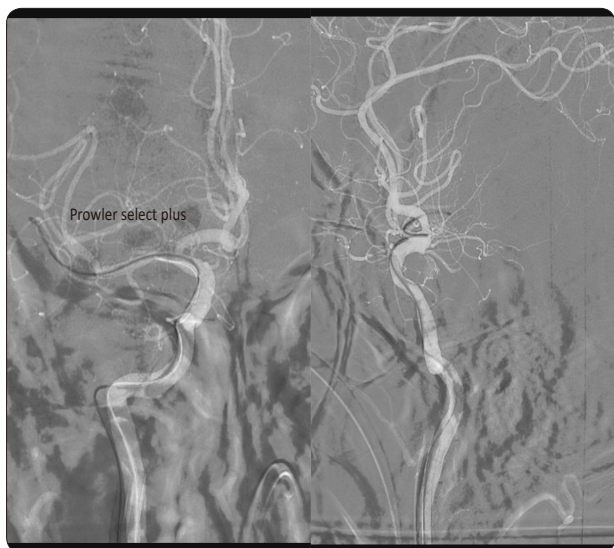
CASE 1

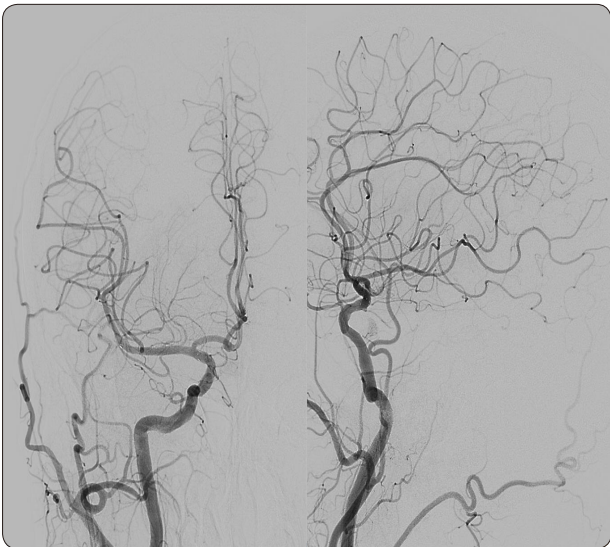
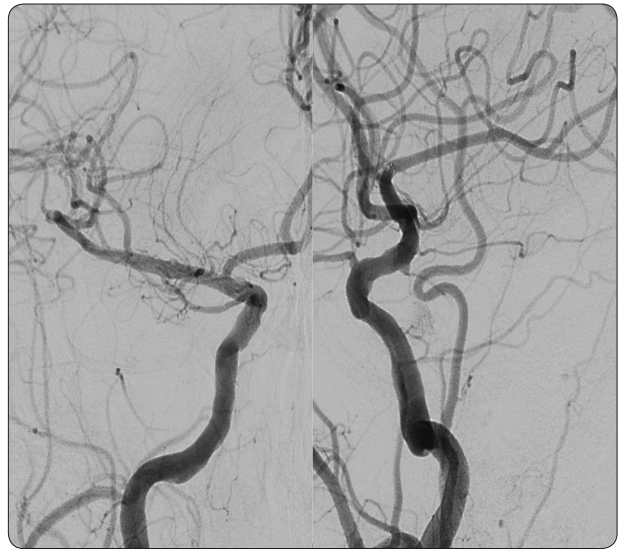
- 72/M
- Lt. side weakness
- NIHSS 8
- 타병원에서 tPA 투약 후 전원





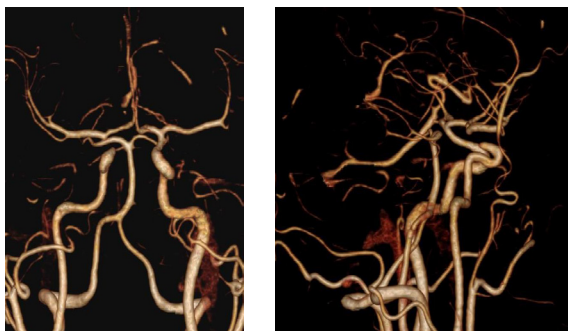




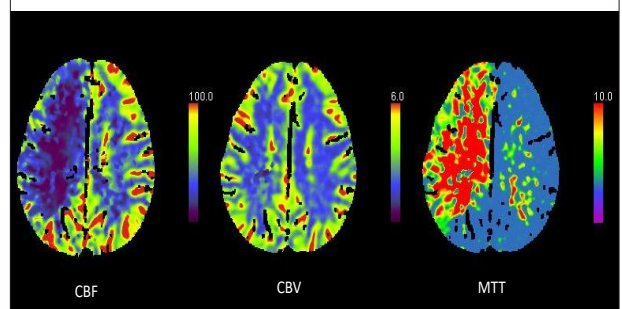
Case 2

- 29/M
- Headache, Lt. side weakness GIV+/GIV+

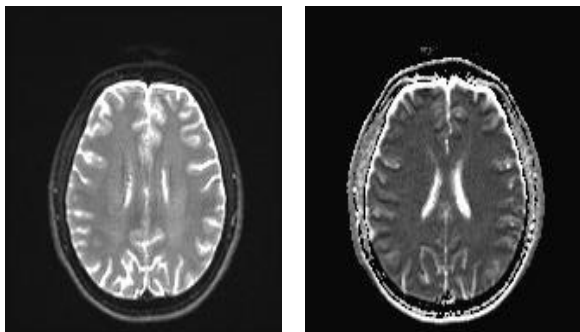
Brain CTA



Brain CT perfusion



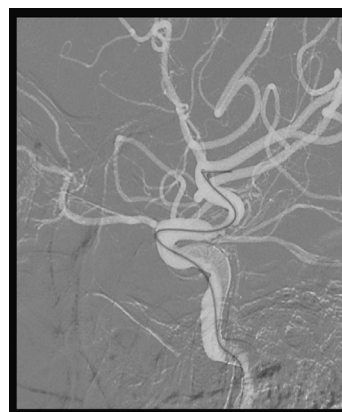
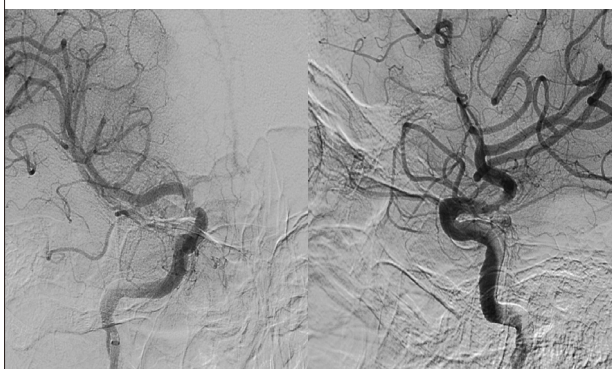
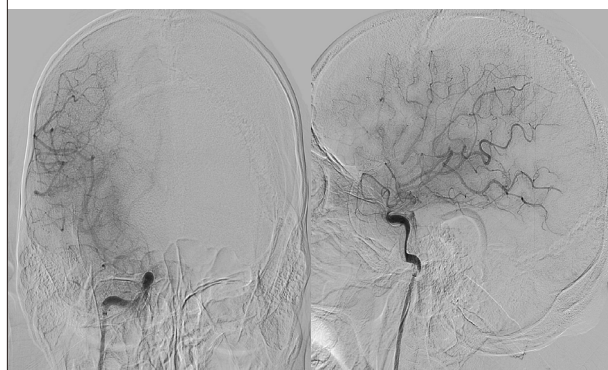
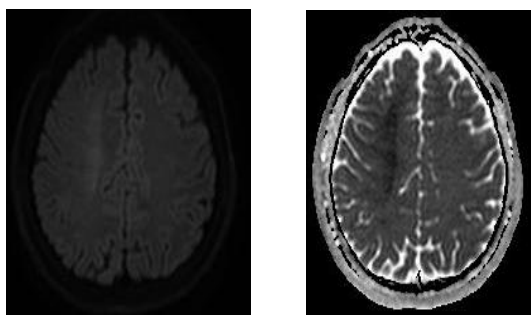
Brain DWI



본원 도착

- Lt. side weakness G0/GIII
- NIHSS 11 (partial gaze palsy 1, partial facial palsy 2, Lt. upper motor no movement 4, Lt. leg motor some effort against gravity 2, mild dysarthria 1, partial neglect 1)

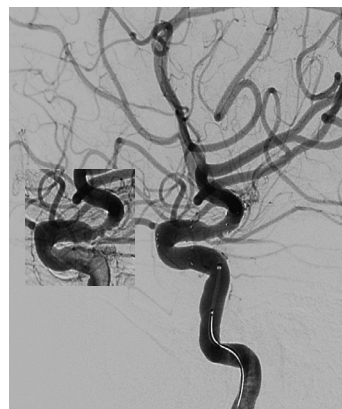
Brain DWI



Excelsior XT-27
Sychro-14



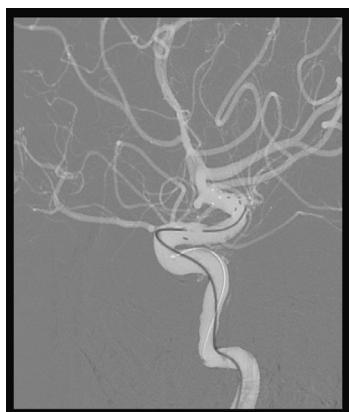
Solitaire
6.0mm x 40mm



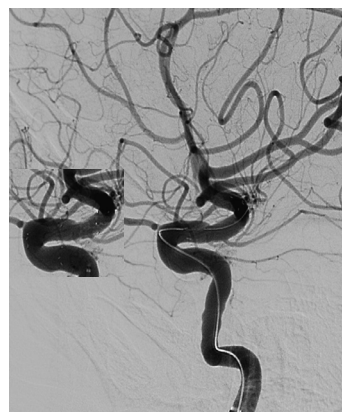
After 1min

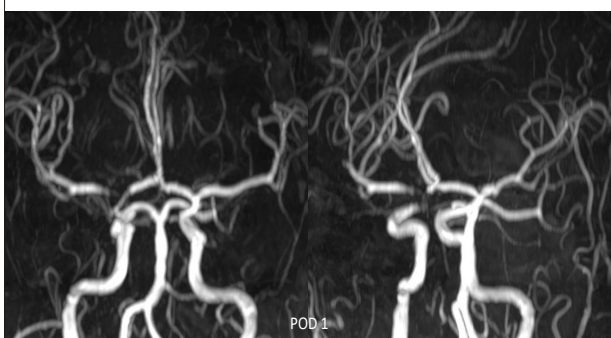
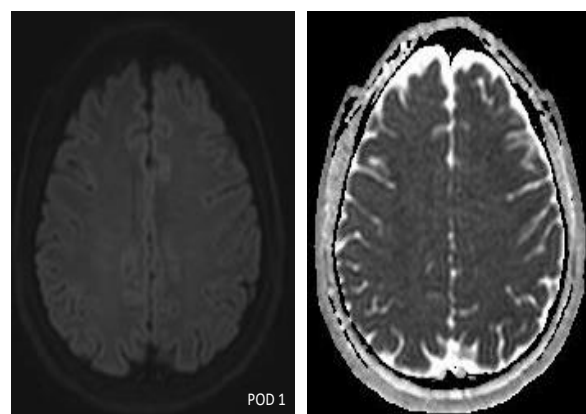
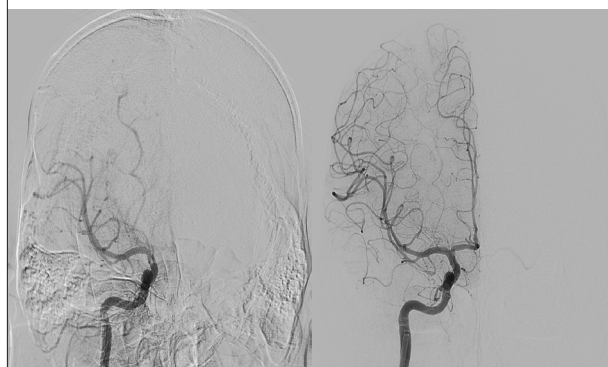


After 15min



Enterprise
4.0mm x 23mm





Thank you
for
your attention



[Case 7]
**Fail of salvage bypass
surgery after re-occlusion
in the IAT for ICAS beyond
24h of symptoms onset**

.....

이 준 원
인제대 해운대백병원

Fail of Salvage Bypass Surgery after Re-occlusion in the EVT for ICAS beyond 24hrs of Symptoms Onset

Haeundae Paik Hospital, Department of Neurology
Joonwon Lee

Case Presentation

- ▶ M/70
- ▶ 내원 전일 아침 정상적으로 일어나는 모습 관찰되었으나, 오후 2시부터 말을 잘 하지 못하고, 거동 불편한 모습을 보호자(아들)이 발견함
- ▶ 일시적인 증상이라 생각해 병원 방문하지 않았고, 내원일까지 증상 지속되어 응급실 내원함

Case Presentation

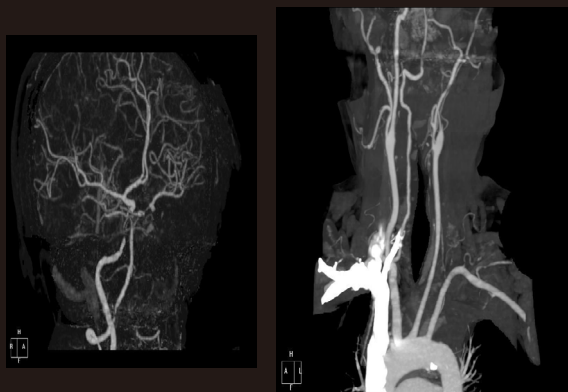
- ▶ LNT : 2023.03.12. 08:00
- ▶ FAT : 2023.03.12. 14:00
- ▶ ER arrival time : 2023.03.13. 09:55
- ▶ # h/o CVA (10YA) - PO self stop
- ▶ # MDD
- ▶ BP : 175/64 mmHg
- ▶ ECG : NSR

Case Presentation

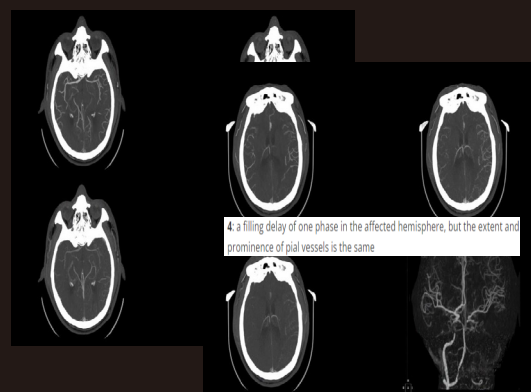
- ▶ NEx)
- ▶ Alertness (+)
- ▶ L/R (++)
- ▶ Mixed transcortical aphasia
 - ▶ Fluency (-) / Comprehension (-) / Repetition (+) / Naming (-)
- ▶ FP (+), Rt. central type
- ▶ DA (+)
- ▶ Motor : Rt. hemiparesis G4-4+
- ▶ Sensory : uncheckable
- ▶ B/S (-/-)

	내원	2시간째
1a. Level of Consciousness	0	0
1b. LOC Questions	1	1
1c. LOC Commands	1	1
2. Best Gaze	0	0
3. Visual Field testing	0	0
4. Facial palsy	1	1
5. Motor Function -Arm	Right 1 Left 0	Right 1 Left 0
6. Motor Function -Leg	Right 1 Left 0	Right 1 Left 0
7. Limb ataxia	0	0
8. Sensory	0	0
9. Best Language	1	1
10. Dysarthria	1	1
11. Extinction and Inattention	0	0
NHSS(Total)	7	7
mRS	4	4

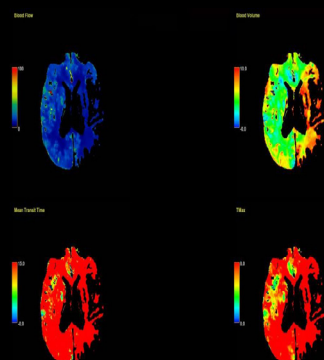
3/13 Multiphase CT Angiography



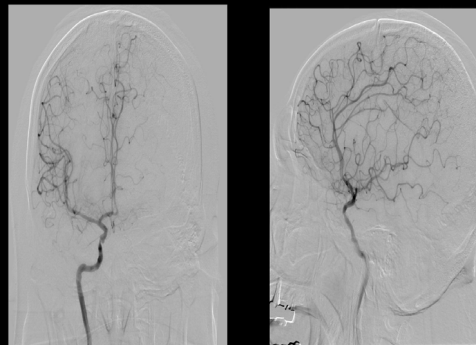
3/13 Multiphase CT Angiography



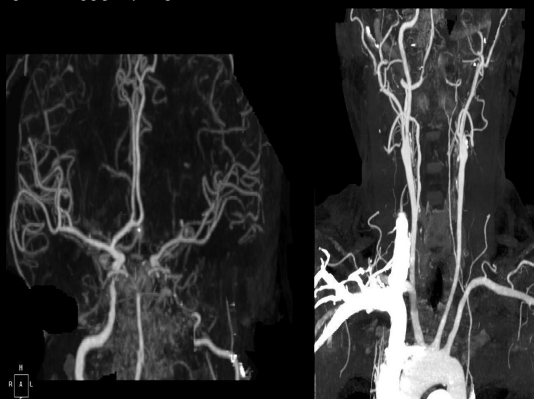
3/13 CT Perfusion



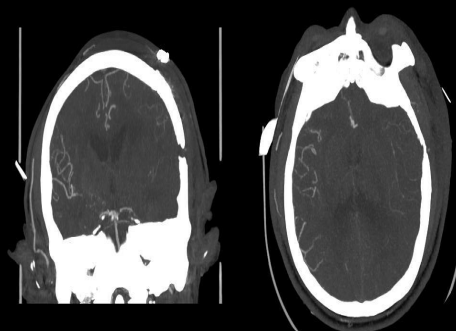
3/13 EVT



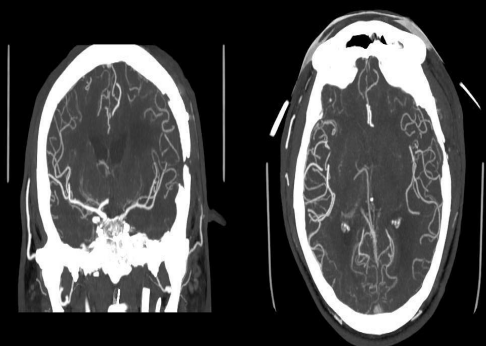
3/14 Post EVT CTA



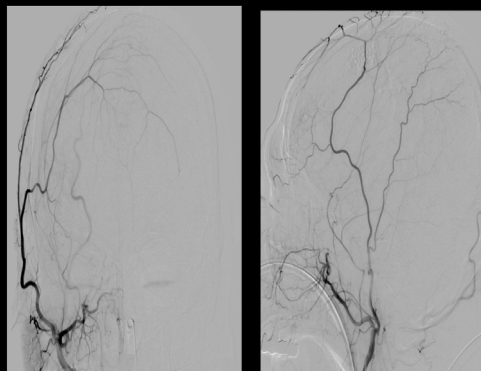
3/16 STA-MCA Bypass Surgery



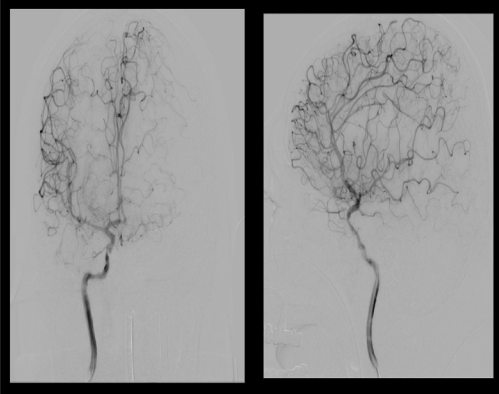
3/27 CTA



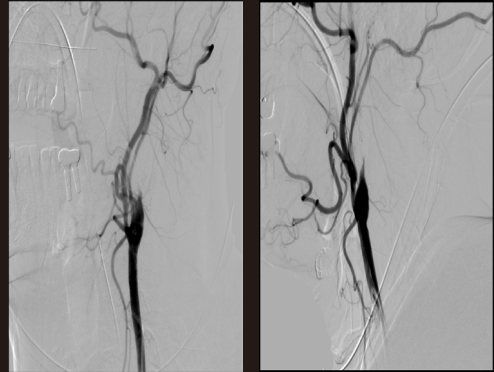
3/29 TFCA - Rt. ECA



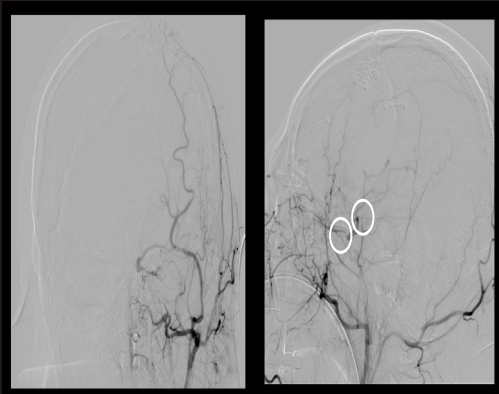
3/29 TFCA - Rt. ICA



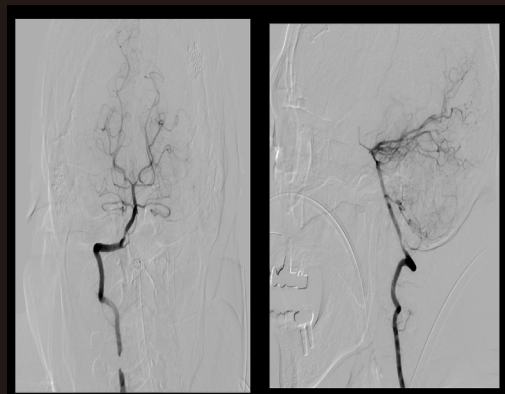
3/29 TFCA - Lt. CCA



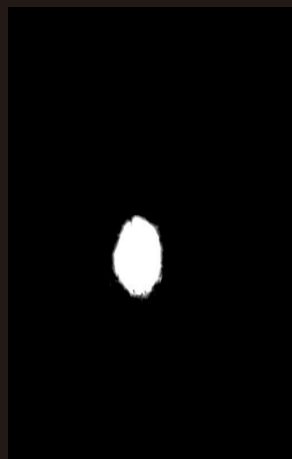
3/29 TFCA - Lt. ECA



3/29 TFCA - Rt. VA



4/10 Brain CT CE(-)



Case Presentation

- ▶ 4/13 Discharge to rehabilitation hospital
- ▶ Rt. hemiparesis G2-3
- ▶ mRS 5

[Case 8]
Expectations vs.
Disappointments: My
third experience with the
Tromba retriever stent

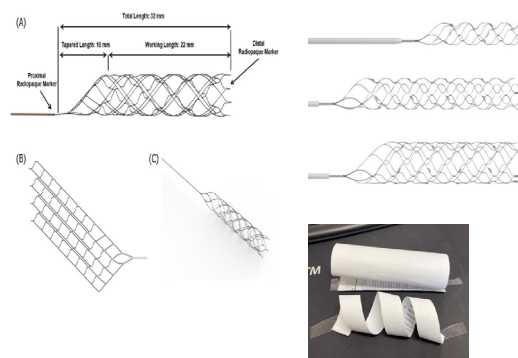
정 영 진
영남대병원

Expectations & Disappointments My 4th Experience with Tromba Retriever Stent

정 영 진

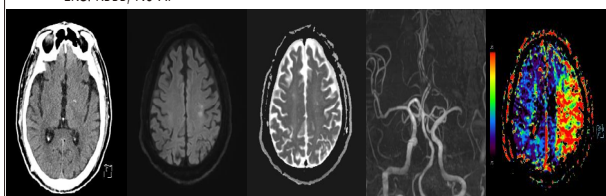
Neurosurgery, Stroke Center, YUMC, Daegu, S. Korea

Tromba CGBIO in Korea

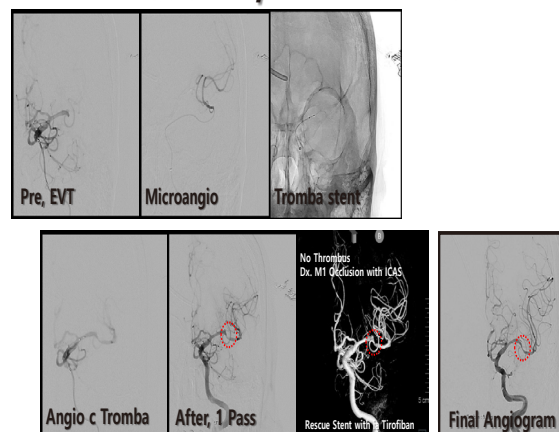


Case 1, 1st Tromba

- 2022.10.01
- 80 YOM
- C/C: Aphasia, Lt side weakness, NIHSS 9
 - Last normal time 07:00
 - Onset (?) 10:00 발견
 - ER department 14:11
- PMHx: s/p VP shunt
- EKG: RBBB, No Af

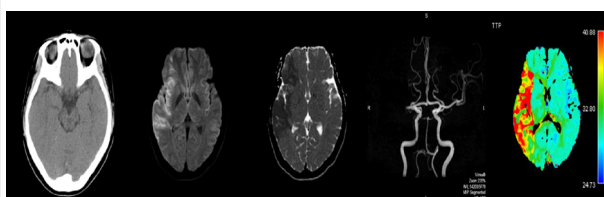


Case 1, 1st Tromba

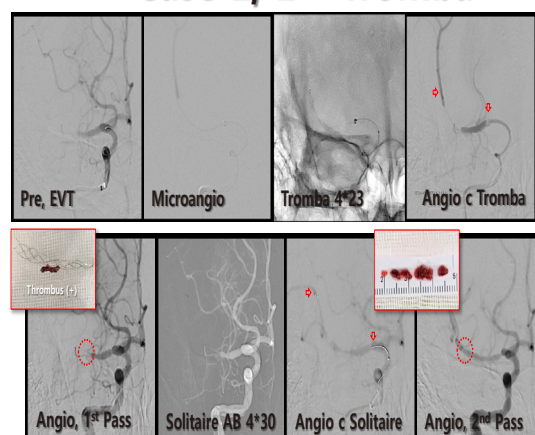


Case 2, 2nd Tromba

- 2022.10.04
- 40 YOF
- C/C: Dysarthria, Rt side weakness, NIHSS 2 (호전, LMC, NIHSS 15)
 - Onset 11:00
 - ER department 14:20
- EKG: Normal sinus rhythm

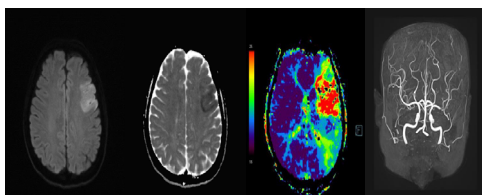


Case 2, 2nd Tromba

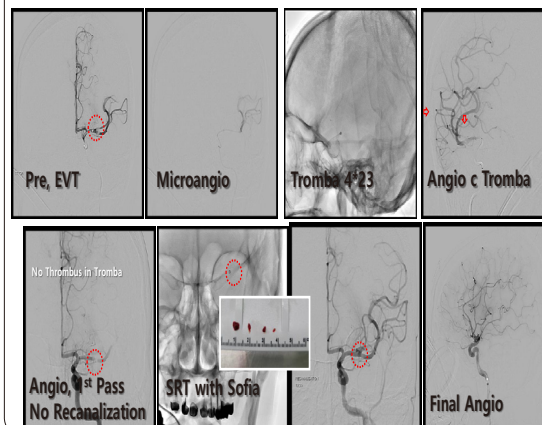


Case 3, 3rd Tromba

- 2022.11.21
- 49 YOF
- C/C: Motor Aphasia, Rt side weakness, NIHSS 7
 - Onset 14:00
 - ER department 17:36
- EKG: Normal sinus rhythm

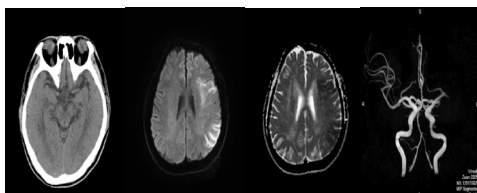


Case 3, 3rd Tromba

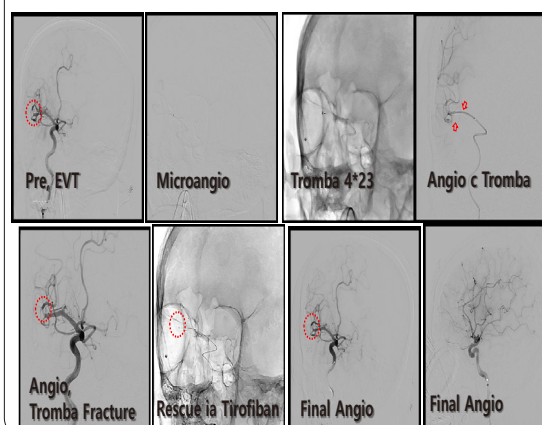


Case 4, 4th Tromba

- 2022.11.28
- 79 YOM
- C/C: Motor Aphasia, Rt side weakness, NIHSS 8
 - Onset 04:30
 - ER department 12:53
- EKG: Normal sinus rhythm



Case 4, 4th Tromba



Tromba

✓ Room for Improvement

2023년도 제2차 급성뇌경색치료연구회(ASTRO)

Stroke Conference & New Device Update

발 행: 2023년 4월 28일

발행처: 대한뇌혈관내치료의학회

급성뇌경색치료연구회

(06631) 서울 서초구 서초대로 350 (서초동, 동아빌라트2타운) 407호

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부회장: 권현조

총 무: 진성철

학 술: 정영진