2022년도 제1차
급성뇌경색치료연구회(ASTRO)

Stroke Conference & New Device Update

일시 : 2022년 4월 29일(금)

장소 : 대전 인터시티 호텔 5층 에메랄드홀

주최 : 대한뇌혈관내치료의학회

주관 : 대한신경외과학연구재단

INVITATION

코로나의 위세가 아직도 전세계를 뒤덮고 있음에도, 전국 각지에서 급성 뇌경색 치료에 최선을 다하고 계시는 대한뇌혈관내치료의학회 회원 및 급성뇌경색치료연구회 회원 여러분 !
모두 건강 하신지요?

2021년 4월 출범한 급성뇌경색연구회에서 2022년도를 맞이하여, New device에 대한 update 및 Stroke case conference 를 준비하였습니다. 기계적 혈전제거술이 급성기 뇌경색 치료의 가장 중요한 무기로 사용된 지도 벌써 많은 시간이 흘렀습니다. 과학이 발전하면서, 의료기기의 발전이 눈부십니다. 매일매일 새롭게 출시되는 device에 대한 새로운 식견을 드리고, 급성 뇌경색을 치료하시면서, 힘들었거나, 너무 감격하였던 case에 대해 공유를 하고자 학술대회를 개최하게 되었습니다.

2022년도 급성뇌경색치료연구회의 첫모임을 대한민국의 중심 대전에서 개최하고자 하오니, 회원님들의 많은 참여를 부탁드립니다. 전국 각지의 훌륭한 연자들을 모셨습니다. 많은 도움이 될 것입니다.

급성뇌경색치료연구회가 출범할 수 있도록 물심양면 도움을 주신 전임 대한뇌혈관내치료의학회 윤석만 회장님, 박석규 총무이사님, KoNES 전임회장단, 장철훈 회장님, 권순찬 부회장님, 김영우 총무이사 및 상임이사회에도 감사의 말씀을 올립니다.

이번 학술대회를 준비하느라 수고하여 주신, 권현조 부회장, 진성철 총무이사, 강동훈 학술이사, 윤원기 수련교육이사께 감사의 말씀을 전합니다.

2022년 4월

급성뇌경색치료연구회 회장 **신승훈** 드림

PROGRAM

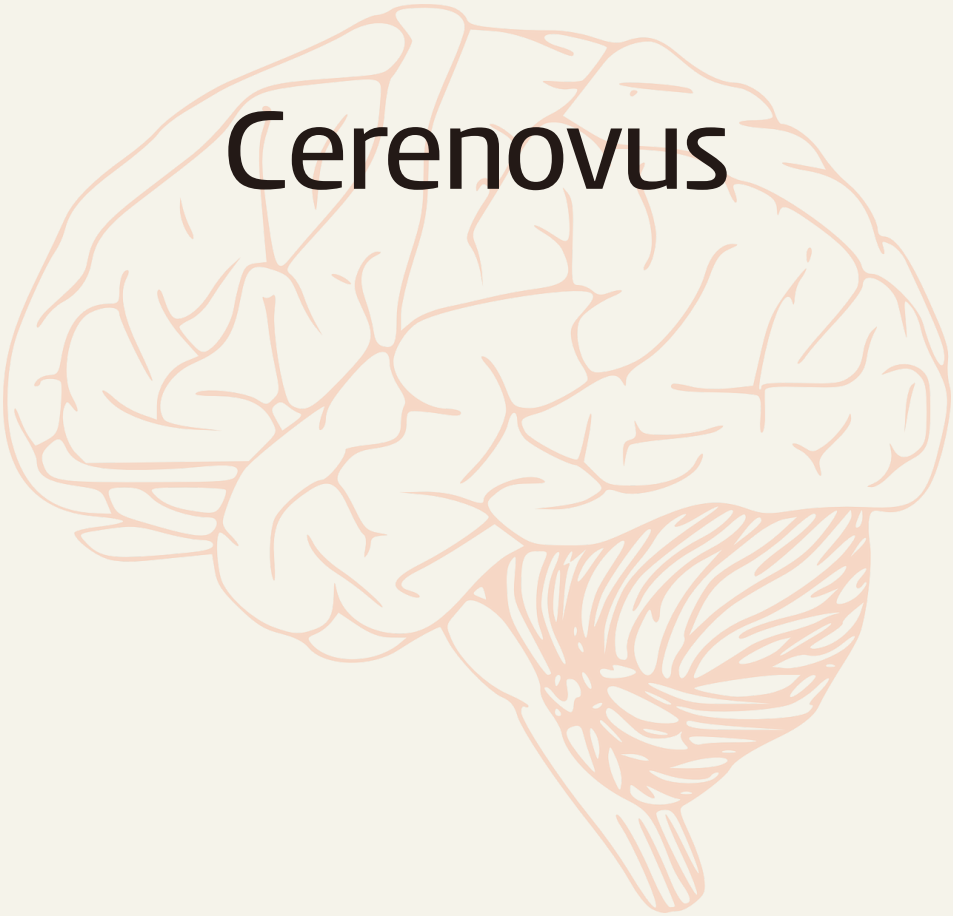
일시 : 2022년 4월 29일(금)

장소 : 대전 인터시티 호텔 5층 에메랄드홀

15:00-15:10	**Opening remark** **Congratulatory Address** **Conference introduction**	**신승훈**(급성뇌경색치료연구회 회장) **장철훈**(대한뇌혈관내치료의학회 회장) **강동훈**(급성뇌경색치료연구회 학술이사)	
15:10-16:30	**New device update for mechanical thrombectomy and other AIS intervention**	**좌장: 윤석만(순천향대), 장철훈(영남대)**	
15:10-15:20	Cerenovus	**이동훈**(가톨릭대 성빈센트병원)	04
15:20-15:30	Acandis	**박정현**(한림대 동탄성심병원)	14
15:30-15:40	Penumbra	**이종영**(한림대 강동성심병원)	17
	Q & A		
15:50-16:00	Microvention	**홍대영**(에스포항병원)	20
16:00-16:10	Medtronic	**정영진**(영남대병원)	29
16:10-16:20	Stryker	**신동성**(순천향대 부천병원)	34
	Q & A		
16:30-18:00	**Case/Experience share for mechanical thrombectomy and other AIS intervention**	**좌장: 권순찬(울산대), 박석규(순천향대)**	
16:30-16:45	Rescue treatment of intracranial stenting plus chemical thrombolysis with antiplatelet medication in the failed IA thrombectomy	**진성철**(인제대 해운대백병원)	39
16:45-17:00	Effectiveness of Solumbra technique using Solitaire X 4-40 for the treatment of AIS with large thrombus burden	**하상우**(조선대병원)	41
17:00-17:15	Benefit of remote aspiration in the BGC setting during IA thrombectomy for acute intracranial ICA occlusions	**김병준**(경북대병원)	47
17:15-17:30	Spontaneous supraclinoid ICA dissection causing flow limitation in a young man	**정은오**(충남대병원)	50
17:30-17:45	Pseudoaneurysm formation caused by stenting for intracranial atherosclerotic stenosis	**김영수**(에스포항병원)	52
17:45-18:00	Recurrent infarction with severe proximal ICA stenosis	**조병래**(가톨릭대 인천성모병원)	54
18:00-	**Closing remark**	**권현조**(급성뇌경색치료연구회 부회장)	

SESSION 1

Cerenovus



이 동 훈

가톨릭대 성빈센트병원

Cerenovus

Department of Neurosurgery, St. Vincent's Hospital
The Catholic University of Korea

Lee Dong Hoon

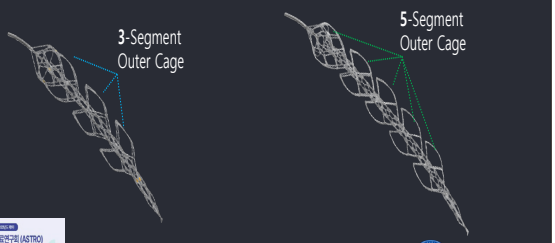
가톨릭대학교 성빈센트병원
THE CATHOLIC UNIV. OF KOREA ST. VINCENT'S HOSPITAL

EMBOTRAP®II
revascularization device
20211107 Updated

CERENOVUS
PART OF THE Johnson & Johnson FAMILY OF COMPANIES

Device Overview

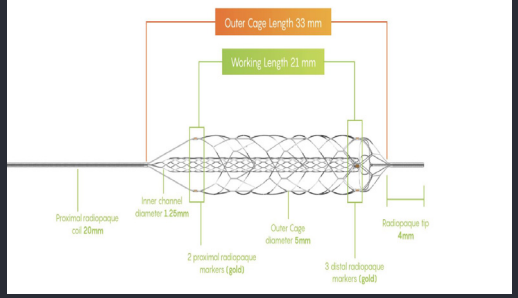
EMBOTRAP®II revascularization device	NAME	CATALOG #	RECOMMENDED VESSEL DIAMETER	MICRO CATHETER COMPATIBILITY	DIAMETER	WORKING LENGTH	DEVICE LENGTH	TIP LENGTH
	5x21	ET009521	1.5-5.0 mm	0.021" ID - 0.027" ID	5.0 mm	21 mm	194 cm	4 mm
	5x33	ET009533				33 mm	195 cm	

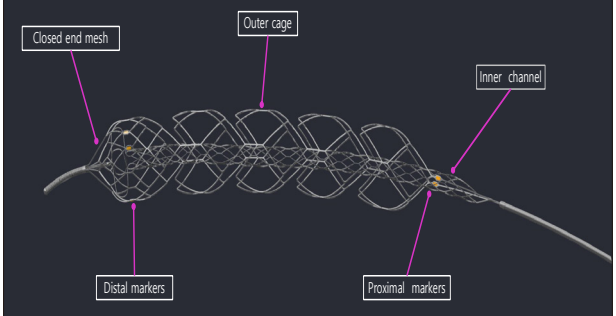


EMBOTRAP®II

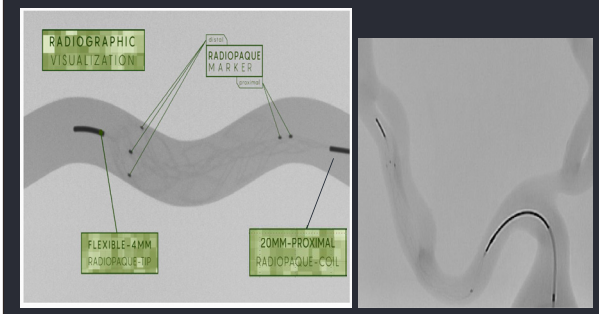
revascularization device

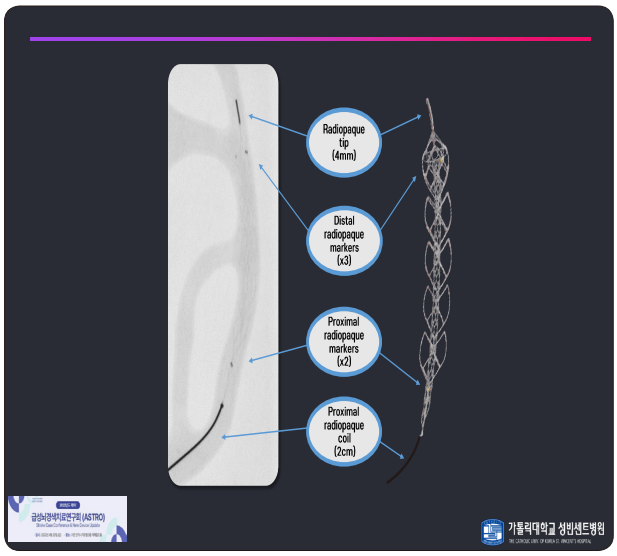
Device Specifications

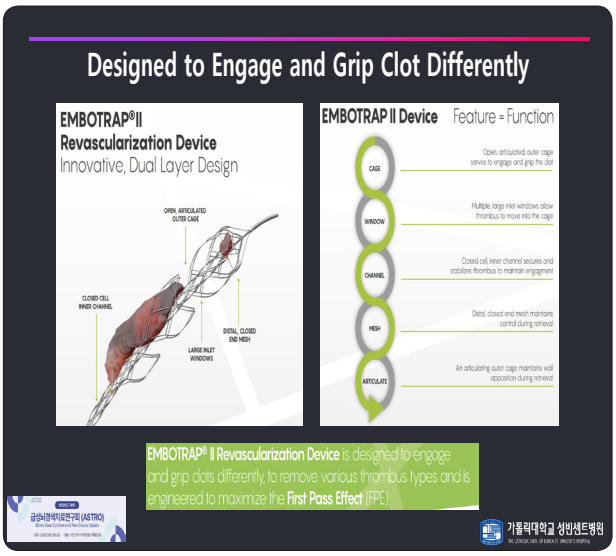


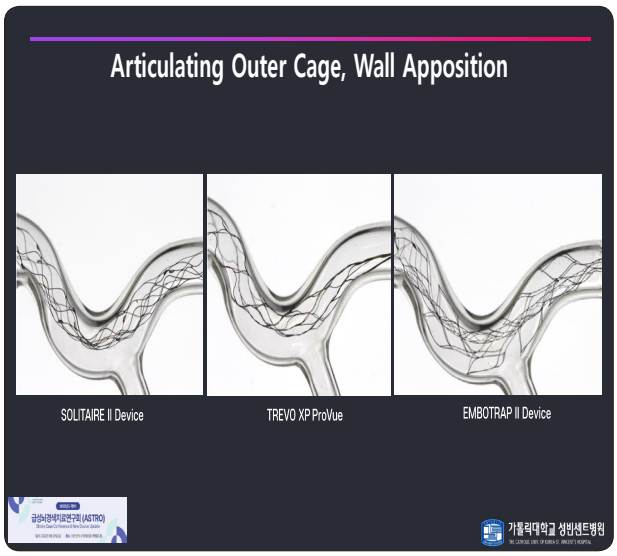


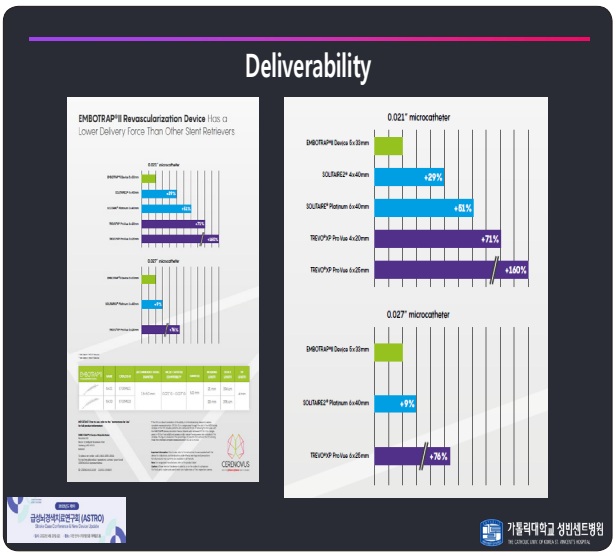
Fluoroscopy

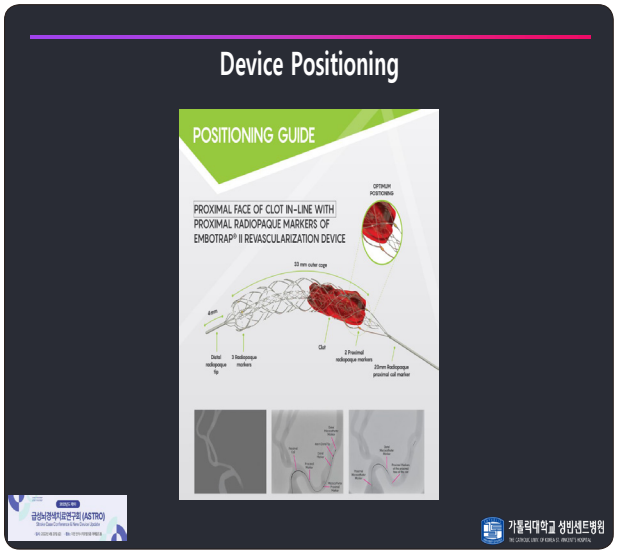


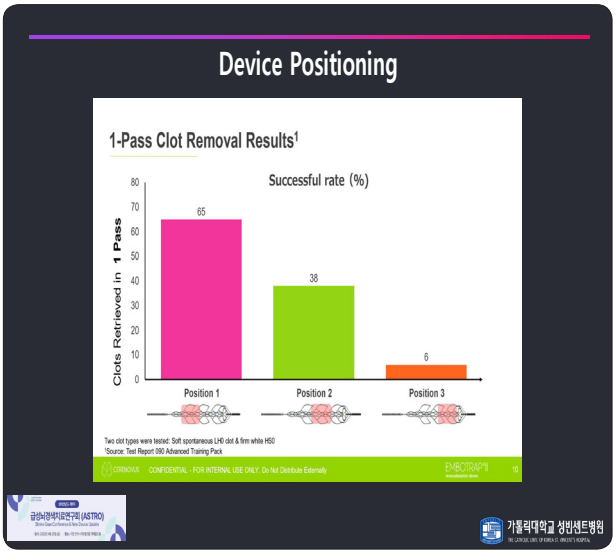

Radiopaque tip (4mm)
Distal radiopaque markers (x3)
Proximal radiopaque markers (x2)
Proximal radiopaque coil (2cm)


Designed to Engage and Grip Clot Differently
EMBOTRAP®II Revascularization Device
Innovative, Dual Layer Design
EMBOTRAP II Device
Feature = Function
CAGE
WINDOW
CHANNEL
MESH
ARTICULATE
EMBOTRAP® II Revascularization Device is designed to engage and grip clots differently, to remove various thrombus types and is engineered to maximize the First Pass Effect (FPE)


Articulating Outer Cage, Wall Apposition
SOLITAIRE II Device
TREVO XP ProVue
EMBOTRAP II Device

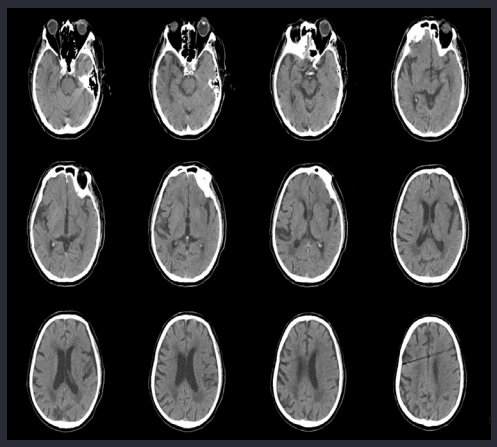

Deliverability
EMBOTRAP®II Revascularization Device Has a Lower Delivery Force Than Other Stent Retrievers
0.021" microcatheter
0.027" microcatheter


Device Positioning
POSITIONING GUIDE
PROXIMAL FACE OF CLOT IN-LINE WITH PROXIMAL RADIOPAQUE MARKERS OF EMBOTRAP® II REVASCULARIZATION DEVICE

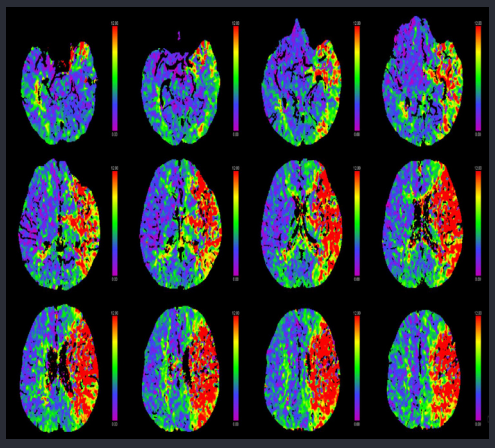

Device Positioning
1-Pass Clot Removal Results¹
Successful rate (%)
Clots Retrieved in 1 Pass
65
38
6
Position 1
Position 2
Position 3

Case

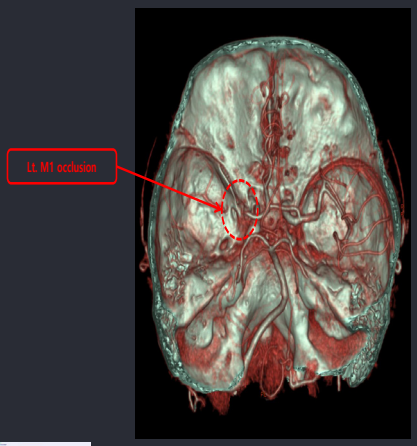
- M/73
- NIHSS : 10, aphasia, Rt side weakness



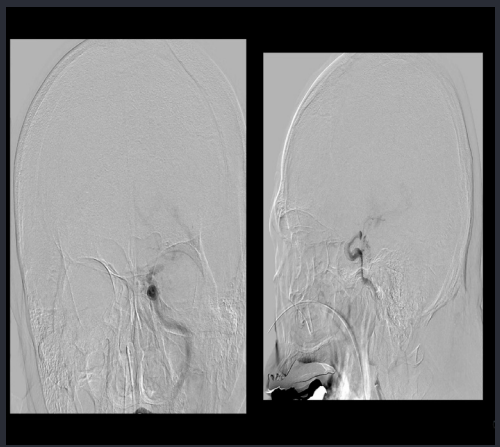
Initial Brain CT



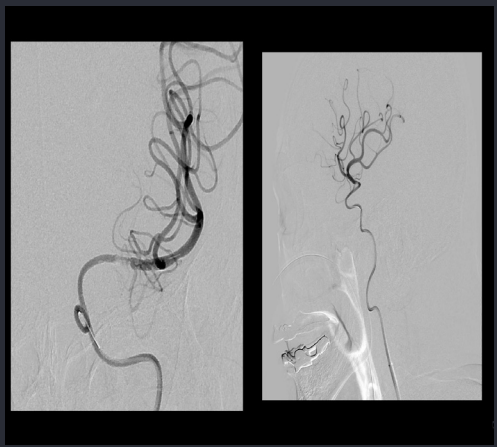
perfusion CT



3D angio CT



Initial angiography

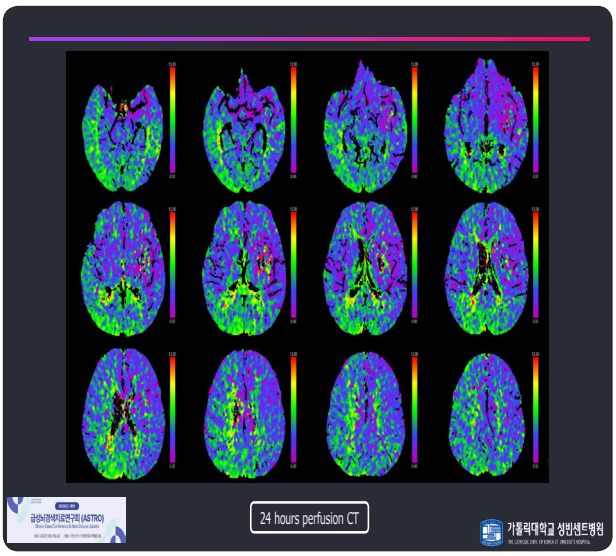


Retrieval stent deployment

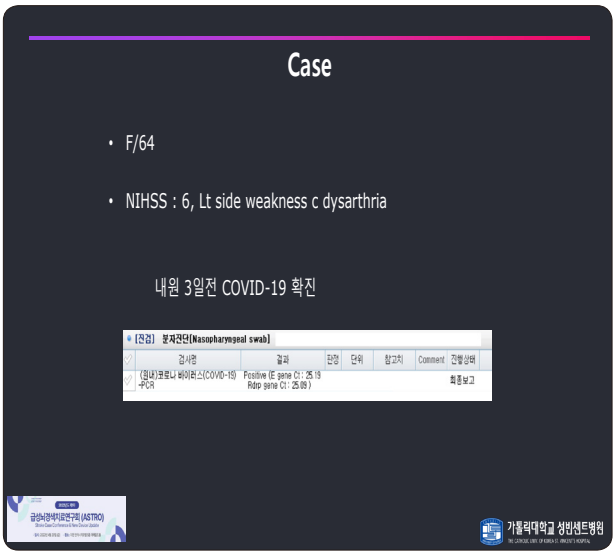

Final angiography
가톨릭대학교 성빈센트병원


Diffusion MRI
가톨릭대학교 성빈센트병원

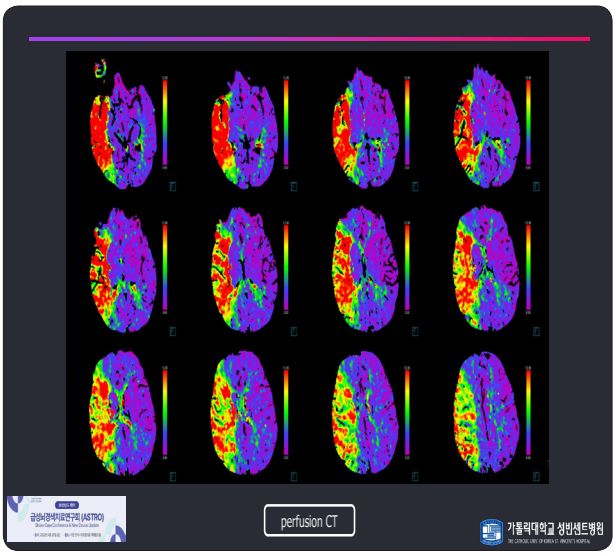

24 hours CT
가톨릭대학교 성빈센트병원

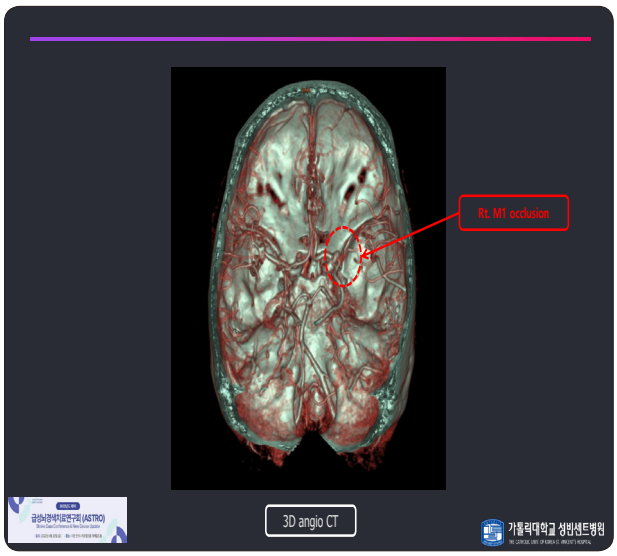

24 hours perfusion CT
가톨릭대학교 성빈센트병원

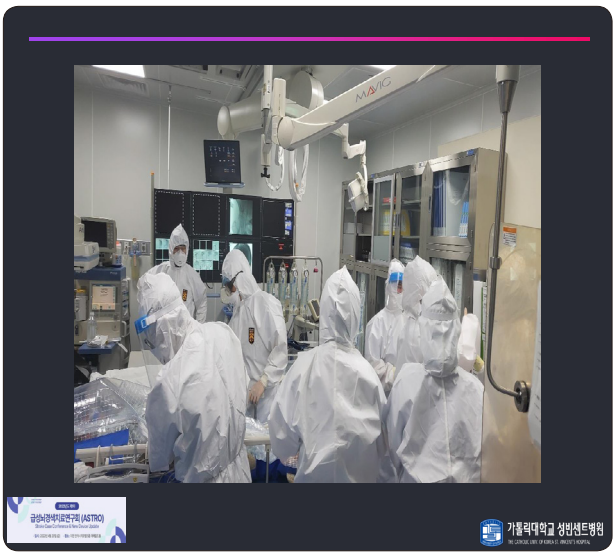

24 hours angio CT
가톨릭대학교 성빈센트병원


Case
• F/64
• NIHSS : 6, Lt side weakness c dysarthria
내원 3일전 COVID-19 확진
【전검】 분자진단[Nasopharyngeal swab]
검사명 결과 판정 단위 참고치 Comment 진행상태
(정성)코로나 바이러스(COVID-19) -PCR
Positive (E gene Ct : 25.19 Rdrp gene Ct : 25.09)
최종보고
가톨릭대학교 성빈센트병원


Initial Brain CT


perfusion CT


Rt. M1 occlusion
3D angio CT

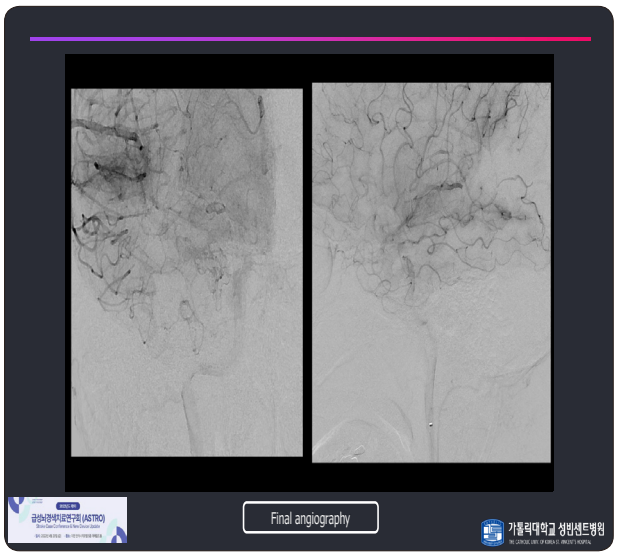


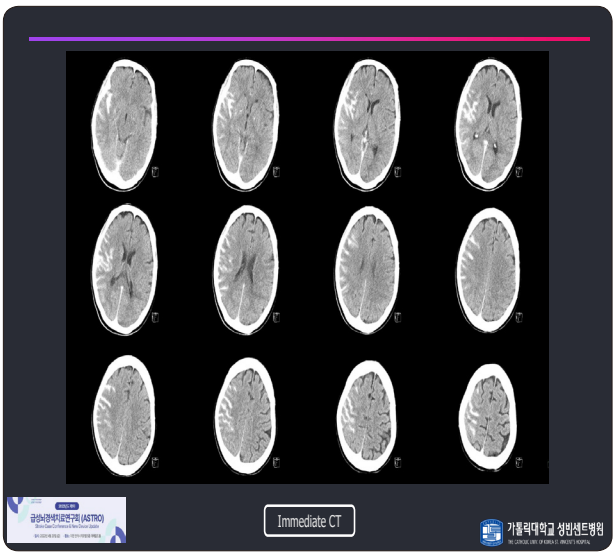

Initial angiography

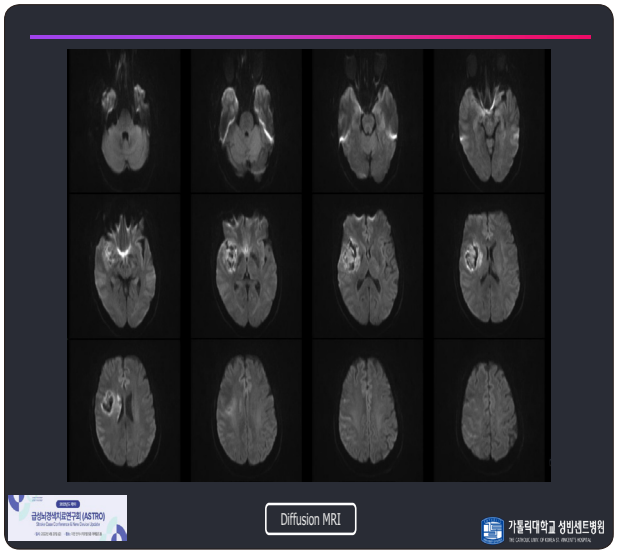

Retrieval stent deployment


post retrieval

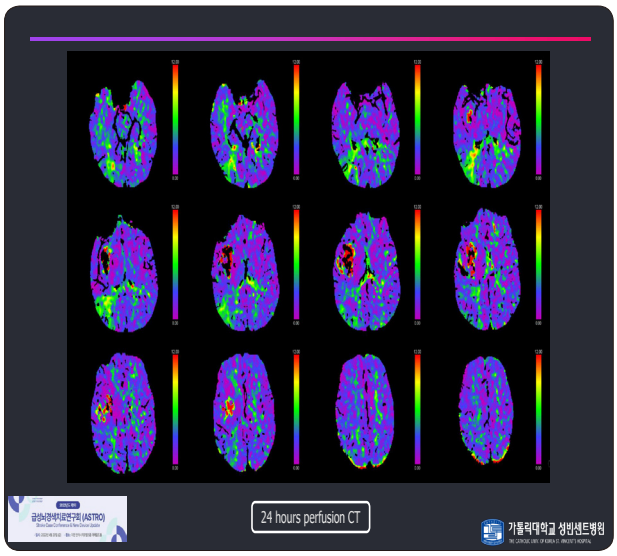

2nd. Retrieval stent deployment

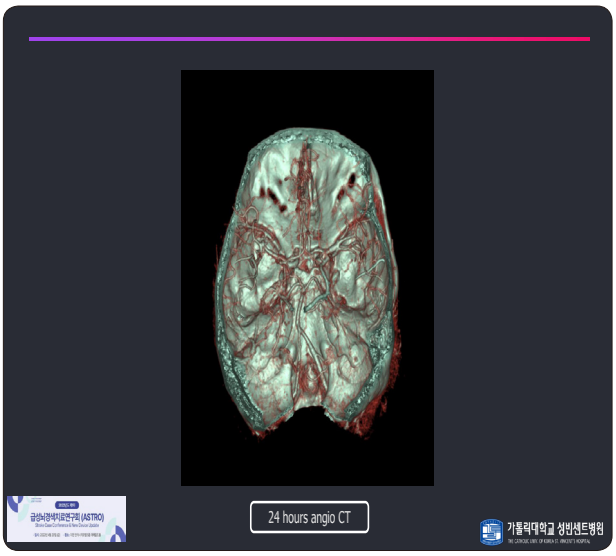

Final angiography

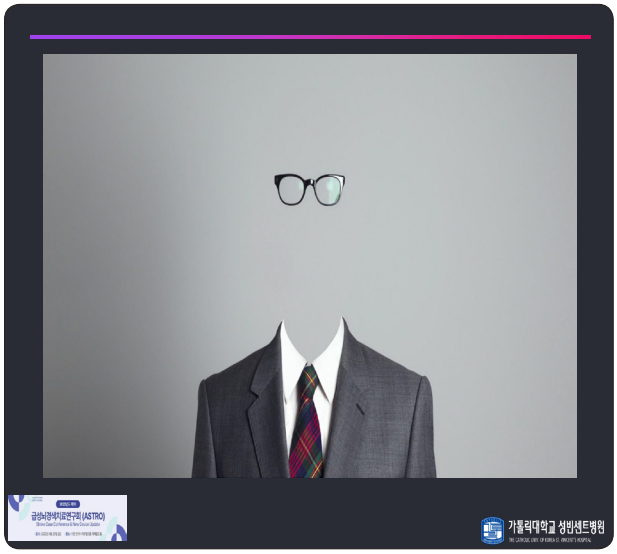

Immediate CT

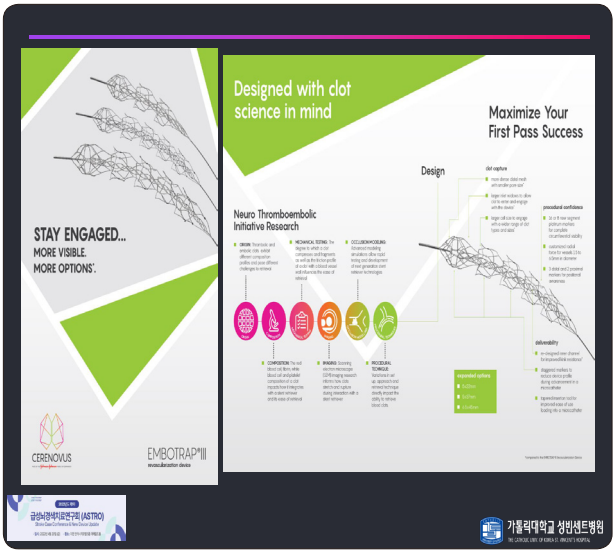

Diffusion MRI

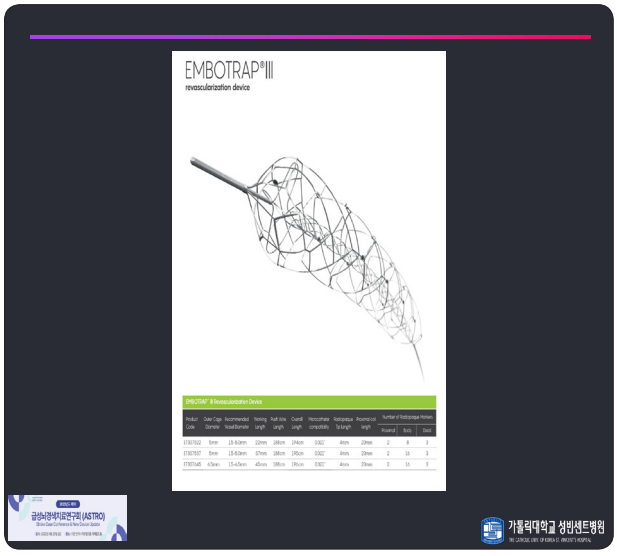

24 hours CT







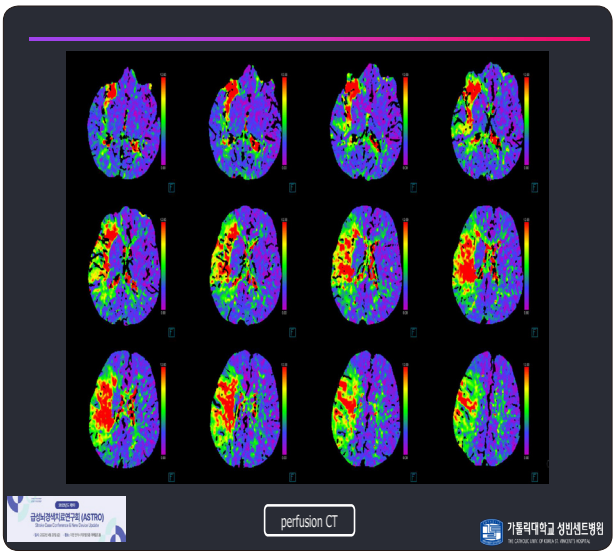


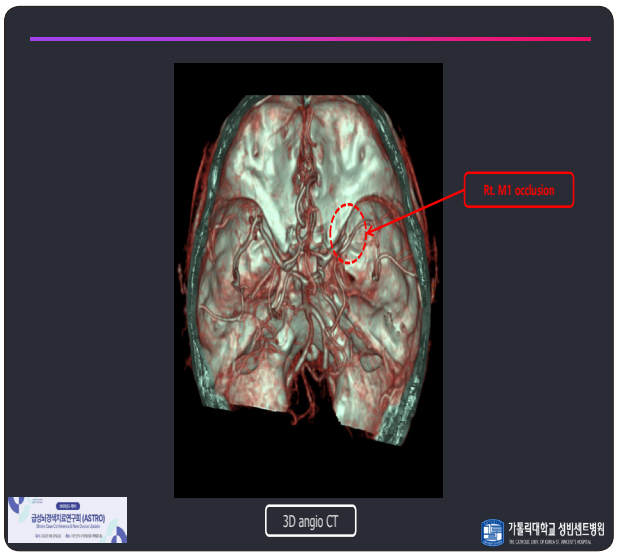


Case

- M/62
- NIHSS : 9, aphasia, Lt side weakness


Initial Brain CT


perfusion CT


Rt. M1 occlusion
3D angio CT

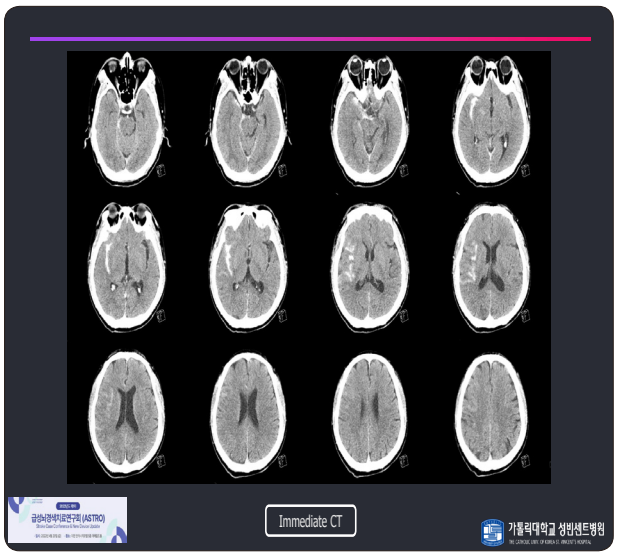

Initial angiography

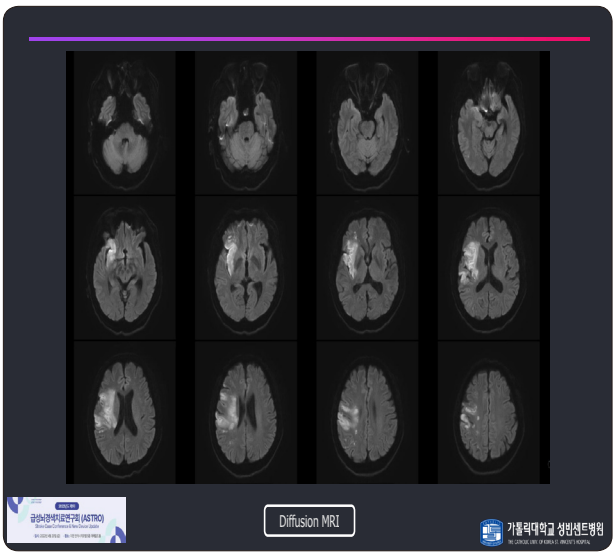

Retrieval stent deployment

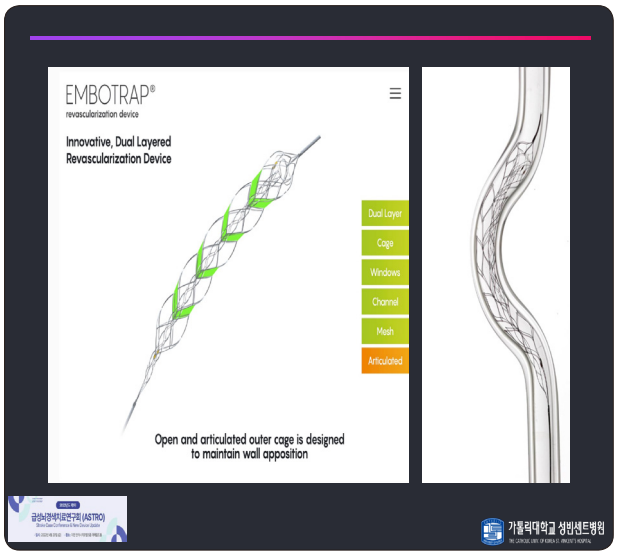

post retrieval

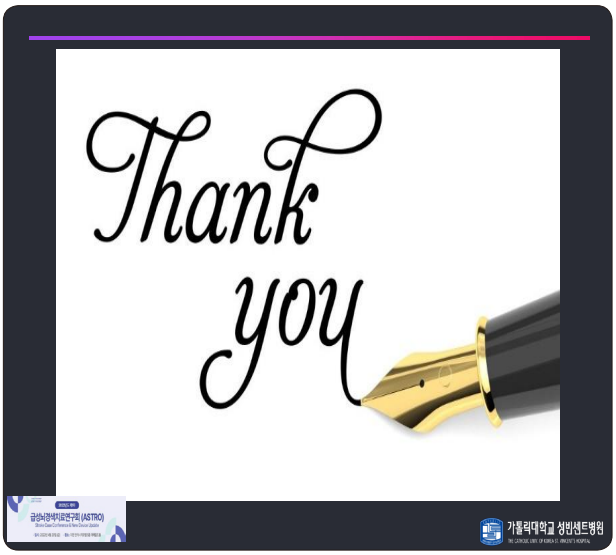

IA tirofiban 1.5mg
5min delayed angio


Intracranial stent deployment


Immediate CT

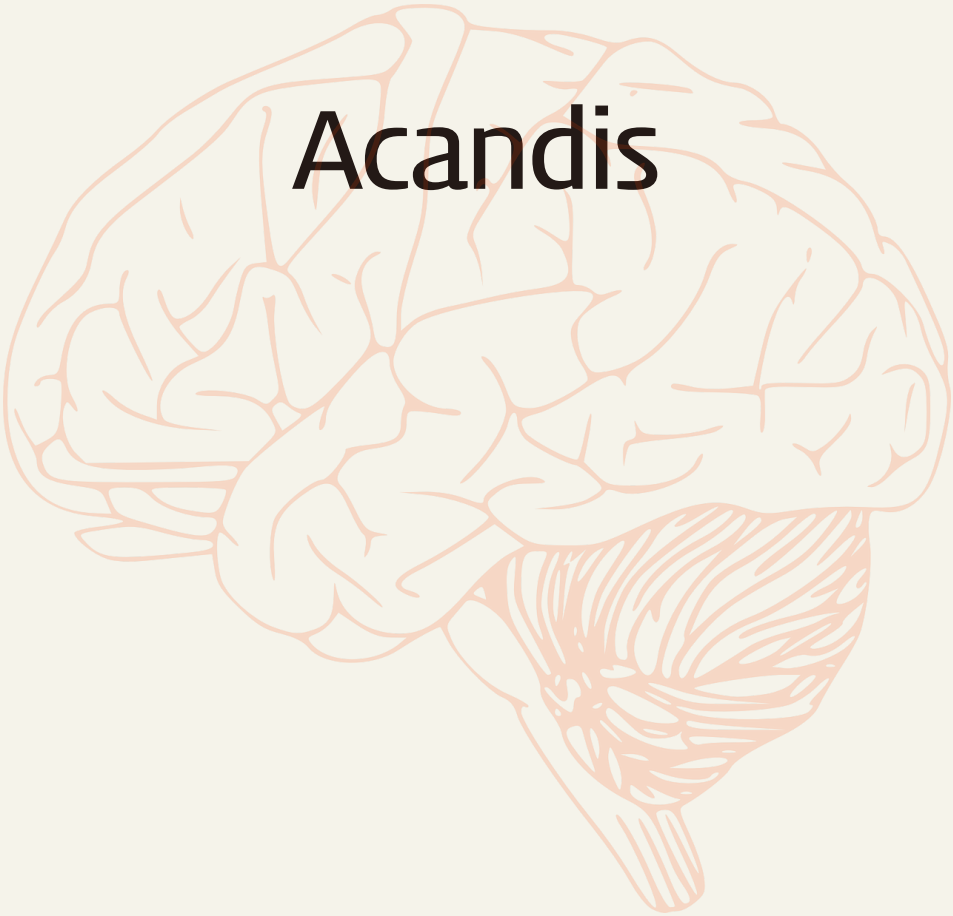

Diffusion MRI


EMBOTRAP®
revascularization device
Innovative, Dual Layered
Revascularization Device
Dual Layer
Cage
Windows
Channel
Mesh
Articulated
Open and articulated outer cage is designed
to maintain wall apposition


Thank you

SESSION 1

Acandis



박 정 현

한림대 동탄성심병원

New Device update for Mechanical Thrombectomy and other AIS intervention

HALLYM UNIVERSITY MEDICAL CENTER
Hallym University Dongtan Sacred Heart Hospital

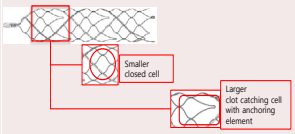
Acandis
APERIO® HYBRID STENT

Jung Hyun Park
E-mail: parkjunghyun0707@gmail.com

APERIO® Hybrid Thrombectomy Device

- APERIO® Hybrid Thrombectomy Device
- APERIO® Hybrid[17] Thrombectomy Device

3rd generation of Acandis® reliable and proven stent retriever featuring a hybrid cell design
– for fast flow restoration!

	Aperio	Aperio Hybrid	Aperio Hybrid 17
Image			
Angio image			
Size	3.5x28mm, 4.5x30mm / 4.5x40mm, 6.0x40mm	3.5x28mm, 4.5x30mm, 4.5x40mm, 4.5x50mm, 6.0x40mm, 6.0x50mm	3.5x28mm, 4.5x30mm
Compatible Microcatheter	0.0165" – 0.021" / 0.021" – 0.027"	0.021" – 0.027"	0.0165" – 0.021"
Vessel diameter	1.5 mm – 5.5 mm	1.5 mm – 5.5 mm	1.5 mm – 4.0 mm
Functional segments			
Markers	3 Distal markers, 2 transporter wire marker	3 Distal markers, 1 Proximal marker, 2 DFT wire loops	3 Distal markers, 2 Proximal marker, 2 DFT wire loops
Hybrid cell design			

APERIO® Hybrid Thrombectomy Device

	APERIO® Hybrid[17]		APERIO® Hybrid	
Device Diameter (mm)	3.5	4.5	6.0	6.0
Device Length* (mm)	28	30	40	50
Recommended Vessel Diameter	1.5 – 3.0	2.0 – 4.0	3.5 – 5.5	3.5 – 5.5
Required MC for Delivery	0.0165 – 0.021		0.021 – 0.027	

APERIO® Hybrid Thrombectomy Device

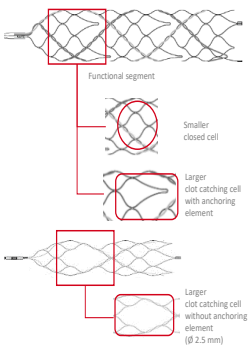
acandis® ENGINEERING STROKE SOLUTIONS

Hybrid Cell Design I

RELIABLE.

Effective hybrid cell design consisting of

- Smaller closed cells
  featuring higher radial force for good vessel wall apposition and improved expansion into the clot
- Larger clot cathcing cells
  ensuring good clot integration and efficient clot retention
- Integrated anchoring elements*
  featuring additional support in larger vessel diameters for confident and atraumatic retrieval even in tortuous anatomies



*except for device with Ø 2.5 mm

APERIO® Hybrid Thrombectomy Device

acandis® ENGINEERING STROKE SOLUTIONS

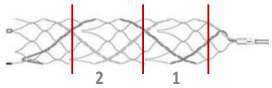
Adaptable Device Working Length I

VARIABLE.

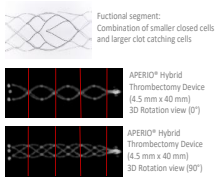
High versatility due to adaptable device working length without any loss of functionality

- Complete deployment for big proximal occlusions
- Partial deployment for smaller distal occlusions

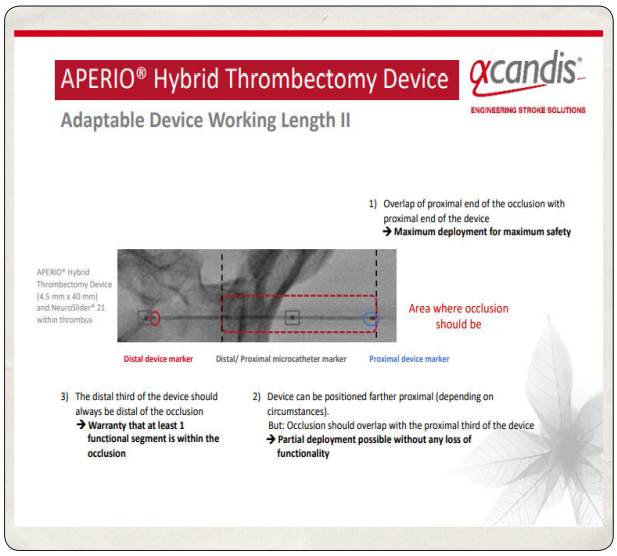
Repeating functional segments*

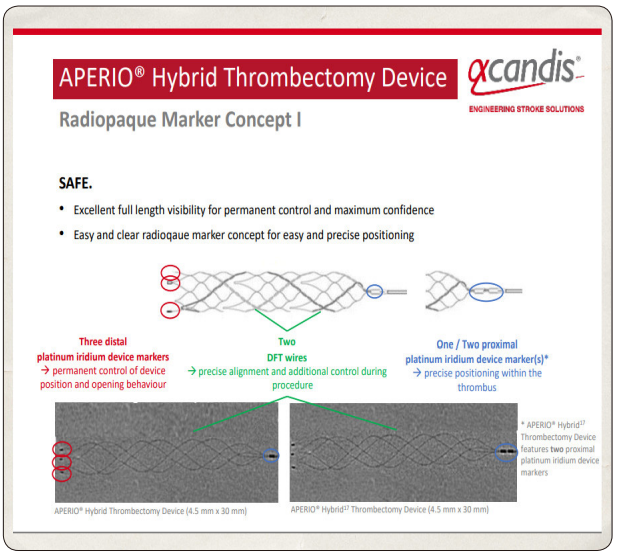


APERIO® Hybrid Thrombectomy Device (4.5 mm x 30 mm)



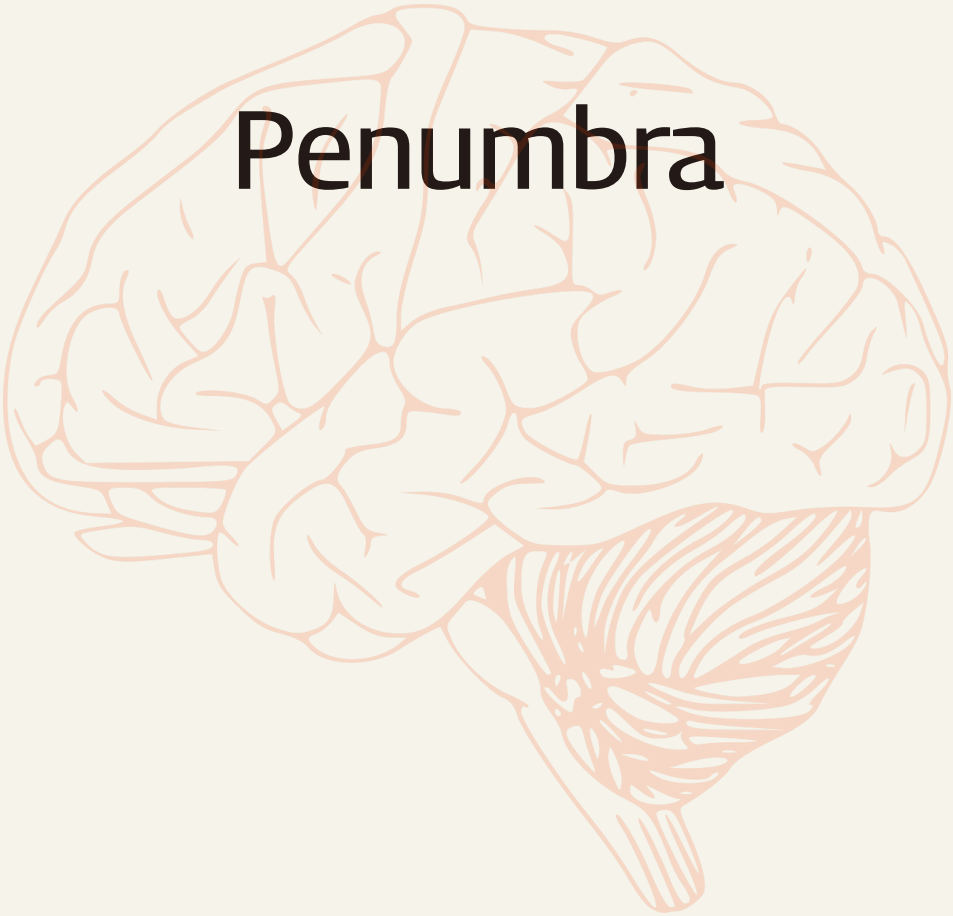
* Each device (except Ø 2.5 mm) has at least two functional segments


APERIO® Hybrid Thrombectomy Device
acandis
ENGINEERING STROKE SOLUTIONS
Adaptable Device Working Length II
1) Overlap of proximal end of the occlusion with proximal end of the device
→ Maximum deployment for maximum safety
APERIO® Hybrid Thrombectomy Device (4.5 mm x 40 mm) and NeuroSlider® 21 within thrombus
Area where occlusion should be
Distal device marker
Distal/ Proximal microcatheter marker
Proximal device marker
3) The distal third of the device should always be distal of the occlusion
→ Warranty that at least 1 functional segment is within the occlusion
2) Device can be positioned farther proximal (depending on circumstances).
But: Occlusion should overlap with the proximal third of the device
→ Partial deployment possible without any loss of functionality


APERIO® Hybrid Thrombectomy Device
acandis
ENGINEERING STROKE SOLUTIONS
Radiopaque Marker Concept I
SAFE.
• Excellent full length visibility for permanent control and maximum confidence
• Easy and clear radioqaue marker concept for easy and precise positioning
Three distal platinum iridium device markers
→ permanent control of device position and opening behaviour
Two DFT wires
→ precise alignment and additional control during procedure
One / Two proximal platinum iridium device marker(s)*
→ precise positioning within the thrombus
APERIO® Hybrid Thrombectomy Device (4.5 mm x 30 mm)
APERIO® Hybrid[2] Thrombectomy Device (4.5 mm x 30 mm)
* APERIO® Hybrid[2] Thrombectomy Device features two proximal platinum iridium device markers

SESSION 1

Penumbra



이 종 영

한림대 강동성심병원

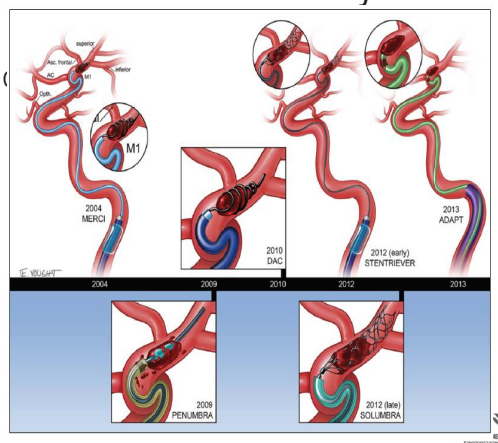
The Penumbra Stroke System

Jong Young Lee, MD. PhD.

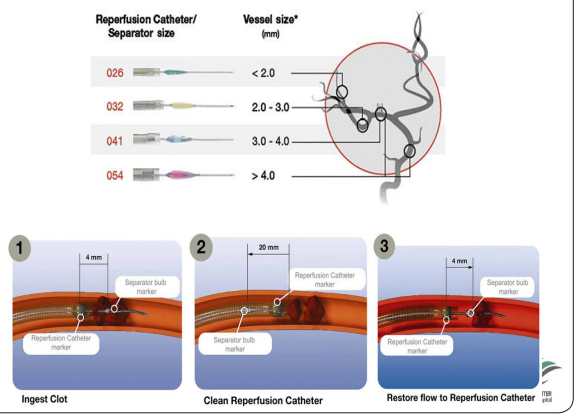
Department of Neurosurgery, Hallym University Kangdong Sacred Heart Hospital,
College of Medicine, Hallym Univserity, Seoul, Korea.

IA thrombectomy

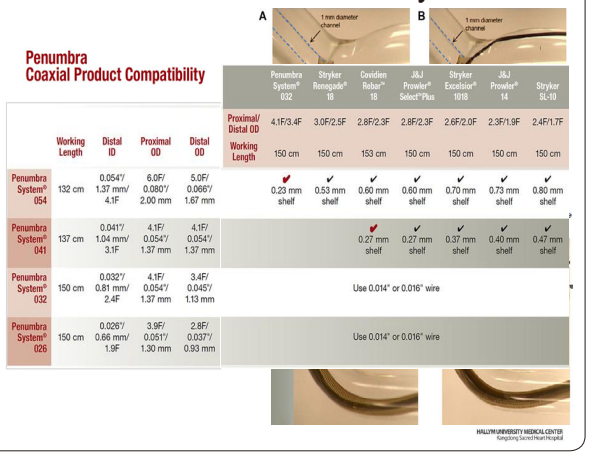
- (



The Penumbra Stroke System



The Penumbra Stroke System



Penumbra Coaxial Product Compatibility

	Working Length	Distal ID	Proximal OD	Distal OD	Penumbra System® 032	Stryker Renegade® 18	Covidien Rebar™ 18	J&J Prowler® Select™Plus	Stryker Excelsior® 1018	J&J Prowler® 14	Stryker SL-10
Proximal/ Distal OD					4.1F/3.4F	3.0F/2.5F	2.8F/2.3F	2.8F/2.3F	2.6F/2.0F	2.3F/1.9F	2.4F/1.7F
Working Length					150 cm	150 cm	153 cm	150 cm	150 cm	150 cm	150 cm
Penumbra System® 054	132 cm	0.054"/ 1.37 mm/ 4.1F	6.0F/ 0.080"/ 2.00 mm	5.0F/ 0.066"/ 1.67 mm	✔ 0.23 mm shelf	✔ 0.53 mm shelf	✔ 0.60 mm shelf	✔ 0.60 mm shelf	✔ 0.70 mm shelf	✔ 0.73 mm shelf	✔ 0.80 mm shelf
Penumbra System® 041	137 cm	0.041"/ 1.04 mm/ 3.1F	4.1F/ 0.054"/ 1.37 mm	4.1F/ 0.054"/ 1.37 mm			✔ 0.27 mm shelf	✔ 0.27 mm shelf	✔ 0.37 mm shelf	✔ 0.40 mm shelf	✔ 0.47 mm shelf
Penumbra System® 032	150 cm	0.032"/ 0.81 mm/ 2.4F	4.1F/ 0.054"/ 1.37 mm	3.4F/ 0.045"/ 1.13 mm	Use 0.014" or 0.016" wire						
Penumbra System® 026	150 cm	0.026"/ 0.66 mm/ 1.9F	3.9F/ 0.051"/ 1.30 mm	2.8F/ 0.037"/ 0.93 mm	Use 0.014" or 0.016" wire						

The Penumbra Stroke System

RESEARCH—HUMAN—CLINICAL STUDIES

Lessons Learned Over More than 500 Stroke Thrombectomies Using ADAPT With Increasing Aspiration Catheter Size

CONCLUSION: Refinement of ADAPT thrombectomy by incorporating reperfusion catheters with higher inner diameters and thus higher aspiration forces is associated with better outcomes, shorter procedure times, and lower likelihood of using additional devices without impacting complication rates.

KEY WORDS: Stroke, Thrombectomy, Aspiration

Neurosurgery 0:1–10, 2018 DOI:10.1093/neuros/nyy444 www.neurosurgery-online.com

The Penumbra Stroke System

Ischemic Stroke

ORIGINAL RESEARCH

Larger ACE 68 aspiration catheter increases first-pass efficacy of ADAPT technique

Josser E Delgado Almandoz,[1] Yasha Kayan,[1] Adam N Wallace,[1] Ronald M Tarrel,[2] Jennifer L Fease,[1] Jill Marie Scholz,[1] Anna M Milner,[1] Pezhman Rochani,[2] Maximilian Mulder,[3] Mark L Young[2]

J Neurointervent Surg 2019;**11**:141–146. doi:10.1136/neurintsurg-2018-013957

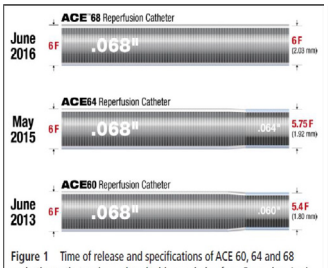


Figure 1 Time of release and specifications of ACE 60, 64 and 68 aspiration catheters (reproduced with permission from Penumbra, Inc.)

Table 4 Independent predictors of successful reperfusion

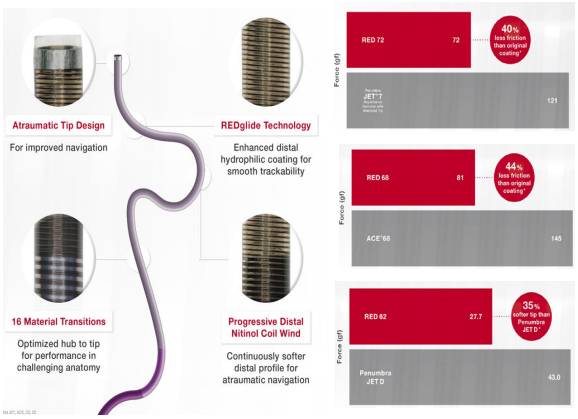
	Patients with successful reperfusion after first ADAPT pass (%)	Patients with successful reperfusion with ADAPT only (%)	P values*
ACE catheter used			0.016/0.0016
ACE 60, n=57	19 (33)	38 (67)	
ACE 64, n=35	13 (37)	31 (89)	
ACE 68, n=60	32 (53)	53 (88)	
Thrombus location			0.013/0.048
ICA, n=43	5 (12)	27 (63)	
MCA M1, n=78	47 (60)	70 (90)	
MCA M2, n=26	11 (42)	23 (88)	
MCA M3, n=5	1 (20)	2 (40)	

*P value from multivariate logistic regression analysis for successful reperfusion after first ADAPT pass/successful reperfusion with ADAPT only.
ICA, internal carotid artery; MCA, middle cerebral artery.

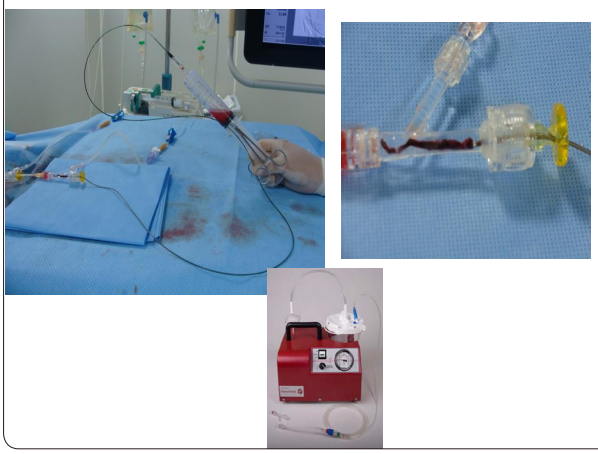
The Penumbra Stroke System

RED reperfusion catheter

The Penumbra Stroke System



Suction pump vs Syringe

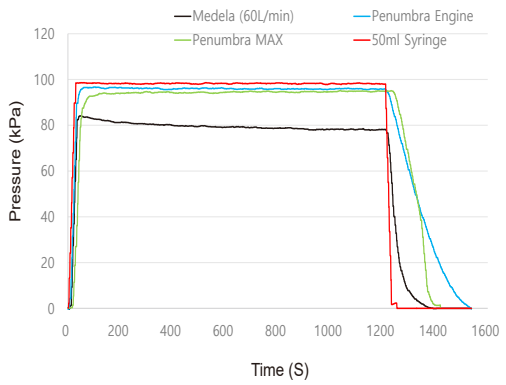


Automatic Pumps

Penumbra Jet Penumbra 2 Medela

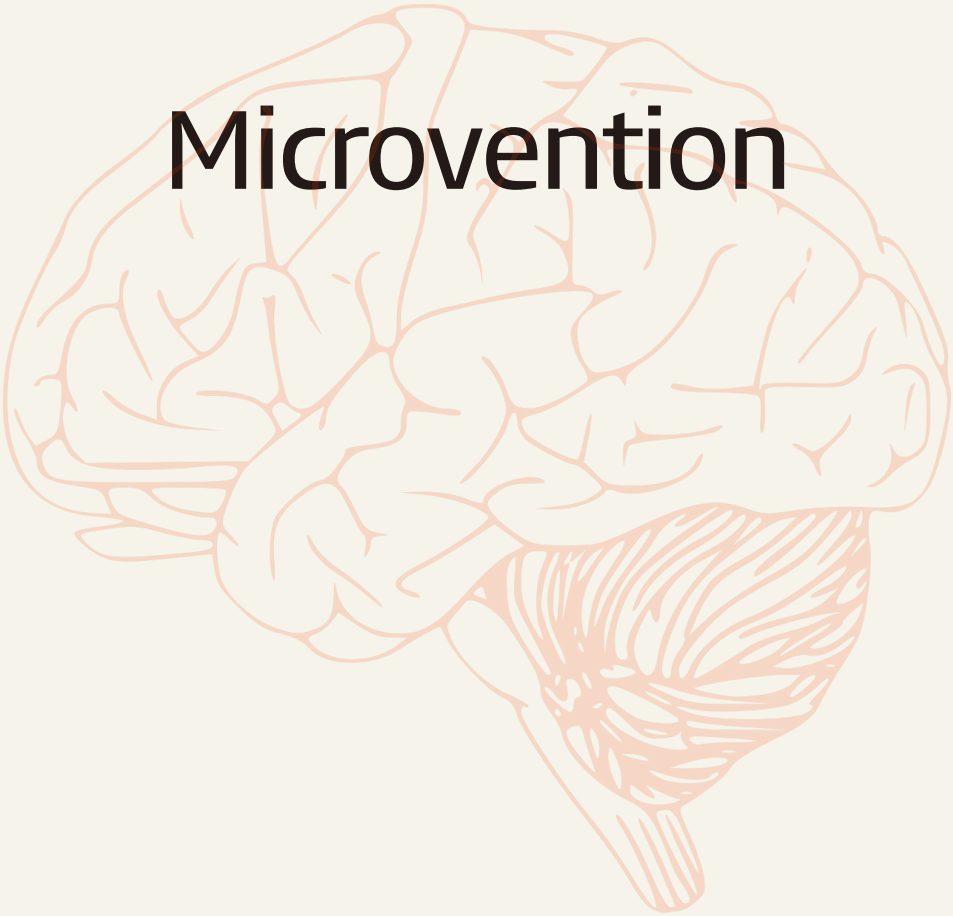
		Penumbra JET	Penumbra2	Medela
제조사		Penumbra	Penumbra	Stryker/Medela
제품명		Engine	MAX	AXS Universal Aspiration set
최대압력 (kPa)	제조사제공	>91.1(>26.9inHg)	98.2 (29.0inHg)	95.0 (28.1inHg)
	참고문헌	97.5(28.8inHg)	90.8 (26.8inHg)	90.4 (26.7inHg)
Flow rate (L/min)		23	23	40, 50, 60

Results



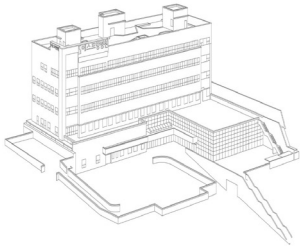
SESSION 1

Microvention



홍 대 영
에스포항병원

에스포항병원



New Device Update Microvention

2022.04.29

에스포항병원 신경외과 홍대영

에스포항병원

- **Stent Retriever : ERIC**
- Contact aspiration : Sofia

ERIC™

Embolus Retriever with Interlinked Cages

INTRODUCTION – EVOLUTION IN THROMBECTOMY

For
Easier
Faster
More Secure
Thrombectomy

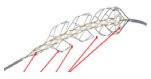


Technology	Interlinked Cage (3rd Generation)	Stentriever (2nd Generation)	Helix Loop (1st Generation)
Clot Integration Time	Not Required	3-5 minutes	Minimum
Clot Interaction	Intraluminal & Lateral	Lateral	Intraluminal
Delivery System Profile	1.7F	2.5F	2.5F
Radial Force Per Surface	Consistent & Low	Variable	Variable

MicroVention TERUMO

COMPETITION – PRODUCT COMPARISON

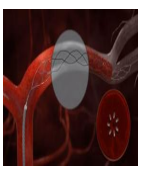
MERCI (Stryker)



EmboTRAP (Neuravi)

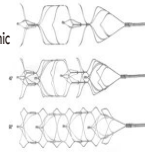
Solitaire FR (Covidien) Medtronic

Mindframe Capture (Covidien) Medtronic



Trevo ProVue (Stryker)

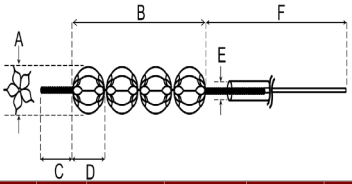
pREset (Phenox)



Penumbra 3D (Penumbra)

MicroVention TERUMO

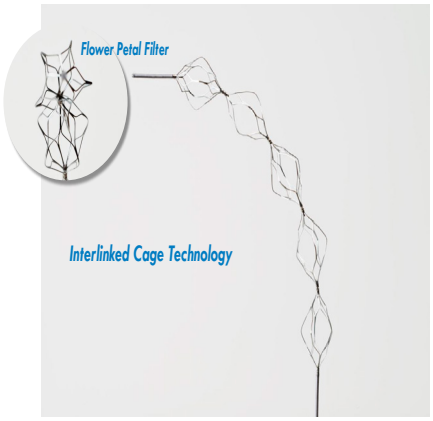
PRODUCT DESIGN – SPECIFICATIONS



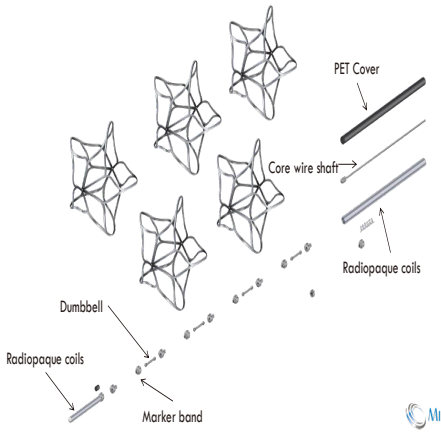
Product	Product Code	# of Sphere	A Diameter (mm)	B Working Length (mm)	C Distal Tip Length (mm)	D Vessel Location	E Min. Catheter ID (inch)	F Pusher Length (cm)
ERIC 3	ER173020	4	3.0	20	5.0	Distal M2/M3	0.017	203
ERIC 4	ER174024	4	4.0	24	5.0	M1/M2	0.017	203
ERIC 4	ER174030	5	4.0	30	5.0	M1/M2	0.017	203
ERIC 6	ER176035	4	6.0	35	5.0	Prox. M1/ICA	0.017	203
ERIC 6	ER176044	5	6.0	44	5.0	Prox. M1/ICA	0.017	203

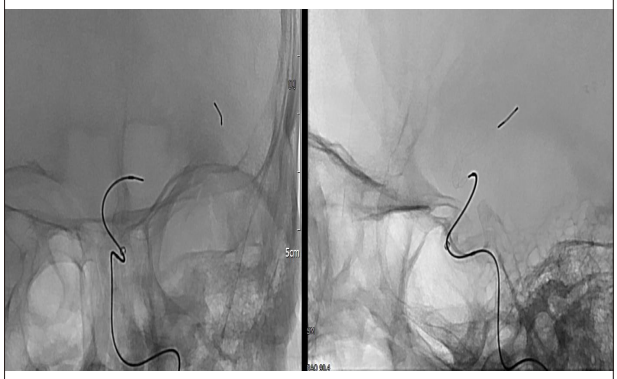
MicroVention TERUMO

PRODUCT DESIGN – COMPONENTS



PRODUCT DESIGN – COMPONENTS

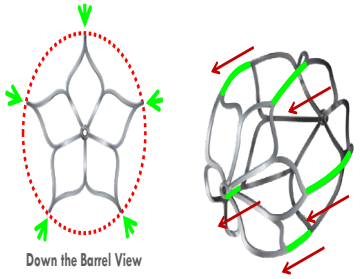




PRODUCT DESIGN – FEATURES & BENEFITS

Interlinked Cage:

- Minimum & Parallel Contact
  - Surface of the struts contacting vessel is minimum (0.8% with the ERIC® 4x24 in 3mm vessel)
  - Arrangement of the struts contacting vessel is designed to be parallel to device pull just like skiing

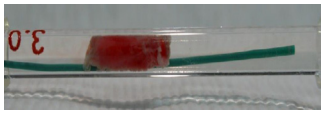


Down the Barrel View

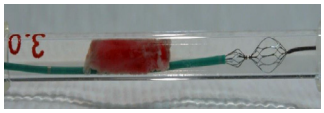
PRODUCT DESIGN – FEATURES & BENEFITS

Ready to pull immediately after deployment

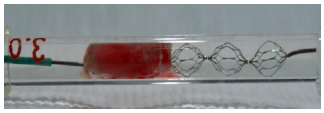
- No waiting time required
- Proximal end of device is deployed in the proximal end of the clot

1 

Deploy the proximal end of the ERIC® device in the proximal part of the clot

2 

Pass through the clot using the delivery system (Headway® 21 or 17 Advanced)

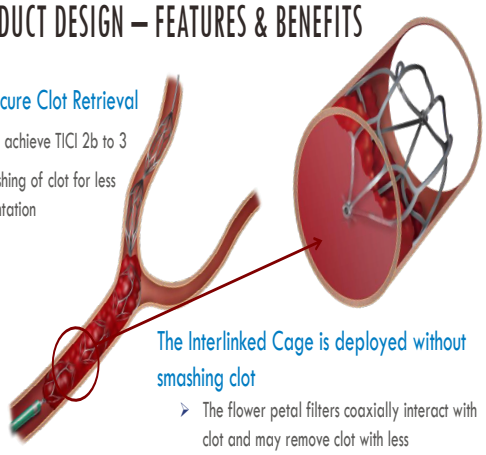
3 

No smashing of clot and ready for retraction immediately after deployment

PRODUCT DESIGN – FEATURES & BENEFITS

More Secure Clot Retrieval

- Helps to achieve TICI 2b to 3
- No smashing of clot for less fragmentation

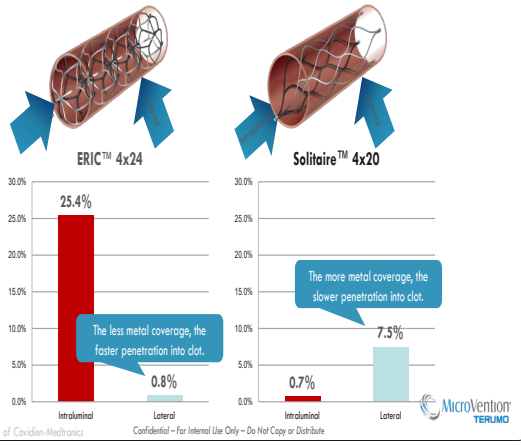


The Interlinked Cage is deployed without smashing clot

- The flower petal filters coaxially interact with clot and may remove clot with less fragmentation

COMPETITION – METAL COVERAGE COMPARISON

% Metal Coverage in 3 mm Vessel

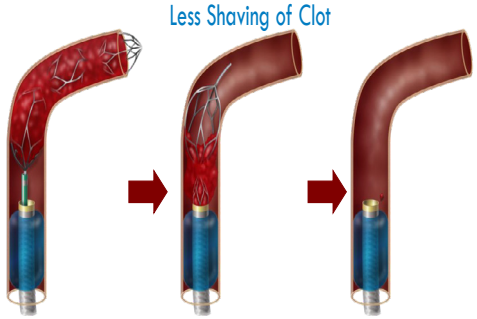


MicroVention TERUMO

Solitaire is trademark of Covidien-Medtronic

PRODUCT DESIGN – FEATURES & BENEFITS

Less Shaving of Clot



- Clot is retained inside or in between the cages
- Clot may be retracted into the guiding catheter with less clot sheared off around the tip

MicroVention TERUMO

	Sex/age	location	Balloon Guiding	Instrument	Retrieval number	TICI Gr	Cause	3 month MRS	Perioperative Cx	Remark
16.8.6	F/36	Lt T-occlusion	X	Eric 6*44 #2 (실패)	#2	2a	PFO	1	Distal migration Spam SAH	2년 뒤 동일부위 Reocclusion → IAT
16.9.14	F/49	Rt MCAB	X	Eric 4*24 #3 (실패) Solitaire 4*20 #4 Penumbra 4 Max #2 Tazuna PTA balloon	#7	2b	ICAS	3	X	6개월 뒤 동일 부위 Occlusion
17.2.23	F/57	Lt ICA ophthalmic occlusion	X	Sofia plus asp #3 Eric 4*24 #1 (성공) ICAS lesion - > Genosis BMS 2.75x13	#4	2b	ICAS	2	Hx transformation	
17.3.13	F/73	Lt M2	X	Eric 4*24 #2 (성공)	#2	3	AF	0	Distal migration	
17.10.16	M/45	Lt ICA ophthalmic occlusion	O	Sofia Plus asp #2 Eric 4*24 #1 (성공) ICAS lesion -> Energy Stent 4.5*13	#3	3	ICAS	3	X	6개월 뒤 다시 좁아져 PTA 1년 뒤 완전 막혀 Bypass
17.12.12	F/86	Lt p-ICA occlusion	O	Sofia Plus asp #2 Eric 6*44 #1 (성공)	#3	3	AF	모름	X	2년 전 동일부위 Occlusion → IAT (+)
19.2.2	F/73	Rt M2	X	Solitaire 4*20 #3 Eric 4*24 #1 (실패) ICAS lesion -> Energy Stent 2.5*13	#4	2b	ICAS	모름	Hx transformation	

Take Home message (Eric)

- New generation Stentretriever
- Slightly more visible band marker
- But personally, No def advantage compared to Solitaire
- Need upgrade Device

- Stent Retriever : ERIC
- **Contact aspiration : Sofia**

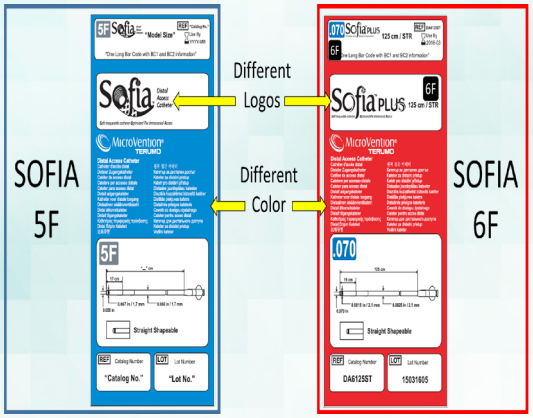
SOFIA Product Applications by Size

Disease	Aneurysm			AVM	Stroke w/Stentriever			
Customer Segment	Flow Diversion	Coil Assist Stenting	Balloon Remodeling	AVM	Solumbra	BGC		Standard Sheath (instead of BGC)
						8F BGC + SOFIA	9F BGC + SOFIA	
Recommended Size	Sofia 5F 115	Sofia 5F 115 for stent support or 6F 125 for dual catheters to stent + coil	Sofia 6F 125 for dual catheter technique	5F 125, 115	Sofia 6F 125, 131	Sofia 5F 125	Sofia 6F 125, 131	Sofia 6F 125, 131

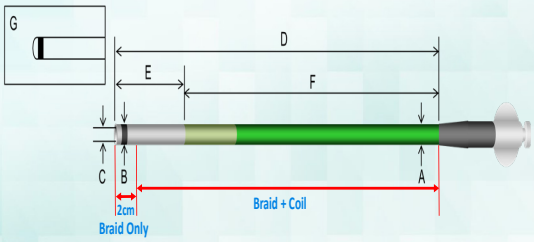
Sofia PLUS Sofia

MicroVention TERUMO

SOFIA Labeling



SOFIA 5F Product Offering & Specifications



Product Code	Name	Catheter Size (french)	A Proximal OD (inch/mm)	B Distal OD (inch/mm)	C ID (inch)	D Working Length (cm)	E Distal Length (cm)	F Proximal Length (cm)	G Distal Tip Shape
DA5115ST	Sofia DAC	5	0.068 / 1.7	0.067 / 1.7	0.055	115	17	98	Straight
DA5125ST	Sofia DAC	5	0.068 / 1.7	0.067 / 1.7	0.055	125	17	108	Straight

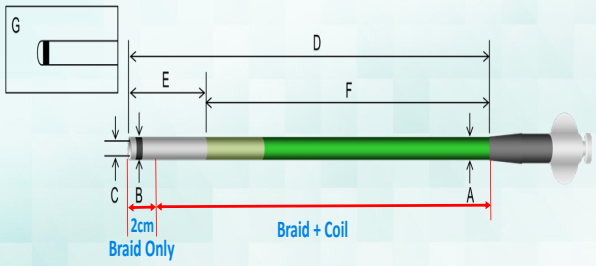
SOFIA 5F Proximal Catheter Compatibility

Sofia Distal Access Catheter — Soft torquable catheter Optimized For Intracranial Access

5F Guiding Catheter or Balloon Guide Catheter must have an ID of **0.070"** or larger for SOFIA catheter to fit.

PRODUCT TYPE	COMPANY	PRODUCT NAME	ID" (in)	Compatible with SOFIA™
Guiding Catheters	Codman	Envoy® DA & DAXB	0.071	YES
	MicroVention	Chaperon® 6F	0.071	YES
	Penumbra	Benchmark™	0.071	YES
	Penumbra	Neuron™ 070	0.070	YES
Balloon Guide Catheters	Stryker/Concentric	Merci® 8F	0.078	YES
	Stryker/Concentric	Merci® 7F	0.059	NO
	Covidien/Medtronic	Cello™ 8F	0.075	YES
	Covidien/Medtronic	Cello™ 7F	0.067	NO

SOFIA 6F Product Offering & Specifications



Product Code	Name	Catheter Size (french)	A Proximal OD (inch/mm)	B Distal OD (inch/mm)	C ID (inch)	D Working Length (cm)	E Distal Length (cm)	F Proximal Length (cm)	G Distal Tip Shape
DA6125ST	Sofia 6F	6	0.0835 / 2.1	0.0815 / 2.1	0.070	125	19	106	Straight
DA6131ST	Sofia 6F	6	0.0835 / 2.1	0.0815 / 2.1	0.070	131	19	112	Straight

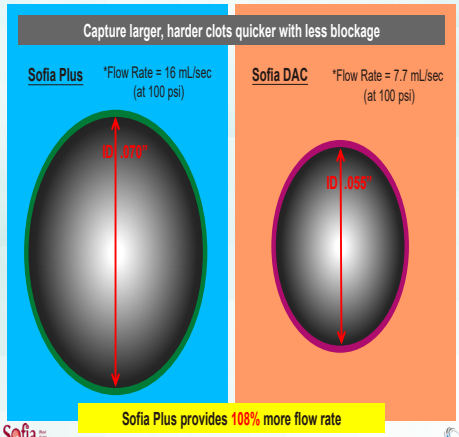
SOFIA PLUS 6F Proximal Catheter Compatibility

Sofia PLUS — Soft torquable catheter Optimized For Intracranial Access

6F Guiding Sheath or Balloon Guide Catheter must have an ID of **0.085"** or larger for SOFIA to fit.

PRODUCT TYPE	COMPANY	PRODUCT NAME	ID" (in)	Compatible with SOFIA™ PLUS
Guiding Sheaths	Cook	Shuttle® 6F	0.087	YES
	Terumo	Destination® 6F	0.087	YES
	Cordis	Vista Brite Tip®	0.088	YES
	Penumbra	Neuron™ MAX 088	0.088	YES
Balloon Guide Catheters	Stryker/Concentric	Merci® 9F	0.085	YES
	Stryker/Concentric	Merci® 8F	0.078	NO
	Stryker/Concentric	FlowGate® 8F	0.084	NO
	Covidien/Medtronic	Cello™ 9F	0.835 – 0.084	NO
	Covidien/Medtronic	Cello™ 8F	0.075	NO

Advantange of .070 ID



Sofia™ Distal Access Catheter

5F

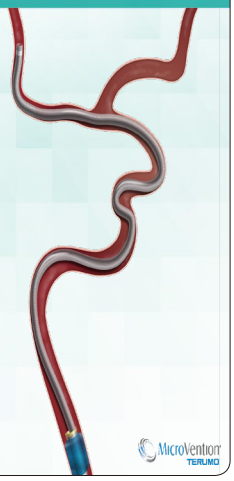
Soft torqueable catheter Optimized For Intracranial Access

Extremely Trackable Highly Torquable Distal Access Catheter

SOFIA 5F Advantages

TRACKABILITY

- Braid + coil design provides excellent torquability combined with pushability to navigate past the ICA/MCA & ophthalmic bifurcations
- 11 smooth transitions ensure superb kink resistance
- Super soft distal segment helps minimize vasospasm
- Extremely flexible distal braided tip makes it easier to pass wide neck aneurysms



Sofia PLUS Sofia

MicroVention TERUMO

SOFIA 5F Advantages

IMPROVES LIQUID EMBOLIC DELIVERY

- Provides support to injection catheter close to treatment site
- May improve ease of retraction of injection catheter from liquid embolic cast
- May reduce force on vessels during injection catheter retraction

Sofia PLUS Sofia

MicroVention TERUMO

SOFIA 5F Advantages

IMPROVES THROMBECTOMY

- Provides extremely distal stentriever support at site of occlusion
- Hybrid braid and coil reinforcement helps maintain inner lumen integrity
- Optimized OD allows SOFIA 5F to be compatible with all 8F Balloon Guide Catheters

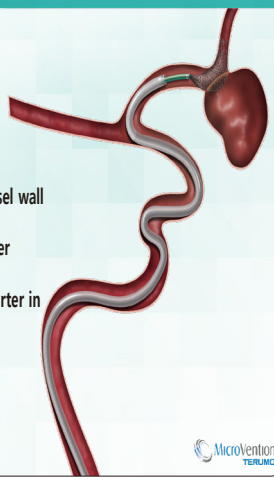
Sofia PLUS Sofia

MicroVention TERUMO

SOFIA 5F Advantages

IMPROVES FLOW DIVERTER & STENT DEPLOYMENT

- Transfers microcatheter force from the vessel wall to the inner lumen of SOFIA
- Can reduce twisting of stent or flow diverter during deployment
- May improve opening of stent or flow diverter in tortuous bends



Sofia PLUS Sofia

MicroVention TERUMO

Sofia™ PLUS

6F

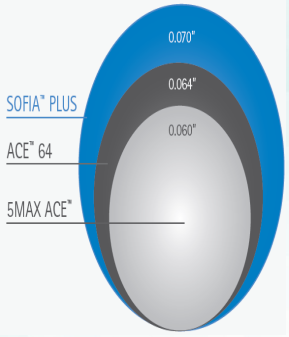
Soft torqueable catheter Optimized For Intracranial Access

Extremely Trackable Large Lumen Distal Access Catheter

SOFIA PLUS 6F Advantages

LARGER LUMEN

SOFIA™ PLUS Catheter has an 18% larger lumen than ACE™ 64 and a 31% larger lumen than 5MAX ACE™

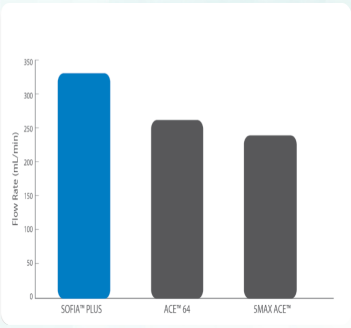


SOFIA PLUS 6F Advantages

HIGHER FLOW RATE

SOFIA™ PLUS Catheter has a 23% higher flow rate[1] than ACE™ 64 and a 29% higher flow rate than 5MAX ACE™

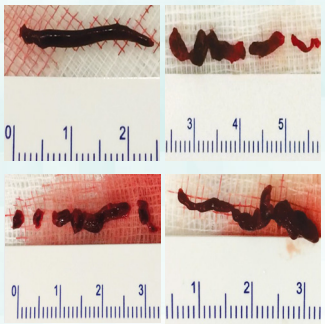
[1]Contrast Injection



SOFIA PLUS 6F Advantages

A LARGER LUMEN CAPTURES LARGER CLOTS[2]

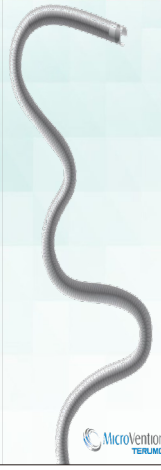
[2] When used to support stentriever thrombectomy, as applicable per cleared/approved thrombectomy device



SOFIA PLUS 6F Features & Benefits

Features	Benefits
0.070" Straight Lumen	Wider inner lumen for increased flow rate[1]
Exceptionally Soft Distal Tip	Allows smooth bypass of the ophthalmic artery
Hybrid Braid & Coil Design	Provides superior 1:1 push response
Long 131cm Working Length Available	Ability to reach distal occlusions
Steam Shapeable Tip and Torqueable Shaft	Ability to steer distal tip past difficult bifurcations
Enhanced Kink Resistance	Maintains distal & proximal lumen integrity

[1]Contrast Injection



ADAPT is not inferior to SRT

- The ASTER Randomized Clinical Trial
- Aspiration thrombectomy versus stent retriever thrombectomy as first-line approach for large vessel occlusion (COMPASS)

Years of Commitment

2016 — 2018 — 2019 — 2020 — 2021

Möhlenbruch MA, Kabbasch C, Kowoll A, et al. Multicenter experience with the new SOFIA Plus catheter as a primary local aspiration catheter for acute stroke thrombectomy. JNIS 2016. 10.1136. 012812

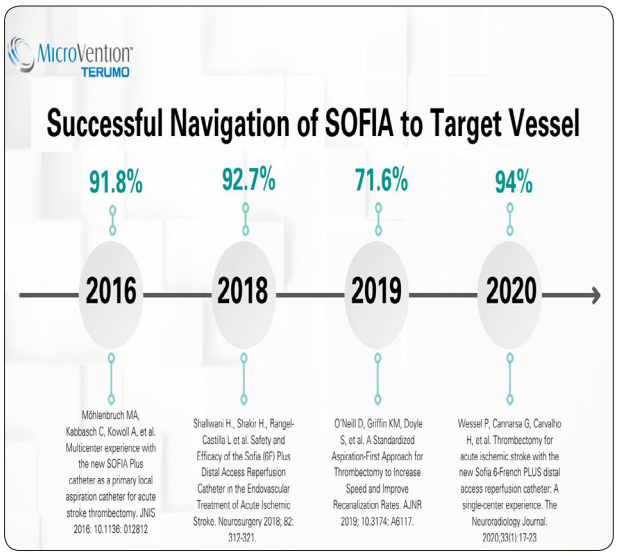
Shallwani H., Shakir H., Rangel-Castilla L. et al. Safety and Efficacy of the Sofia (6F) Plus Distal Access Reperfusion Catheter in the Endovascular Treatment of Acute Ischemic Stroke. Neurosurgery 2018; 82: 312-321.

O'Neill D, Griffin KM, Doyle S, et al. A Standardized Aspiration-First Approach for Thrombectomy to Increase Speed and Improve Recanalization Rates. AJNR 2019; 10.3174: A6117.

Wessel P, Cannarsa G, Carvalho H, et al. Thrombectomy for acute ischemic stroke with the new Sofia 6-French PLUS distal access reperfusion catheter: A single-center experience. The Neuroradiology Journal. 2020;33(1):17-23

Brinjikji W, Raz E, De Leacy R, et al. MRS SOFIA: a multicenter retrospective study for use of Sofia for revascularization of acute ischemic stroke. J NeuroIntervent Surg 2021;0:1–5

This clinical evidence summary is not a systemic review. It is only an example of SOFIA-related literatures.


MicroVention
TERUMO
Successful Navigation of SOFIA to Target Vessel
91.8%
92.7%
71.6%
94%
2016
2018
2019
2020
Möhlenbruch MA, Kabbasch C, Kowoll A, et al. Multicenter experience with the new SOFIA Plus catheter as a primary local aspiration catheter for acute stroke thrombectomy. JNIS 2016; 10.1136: 012812
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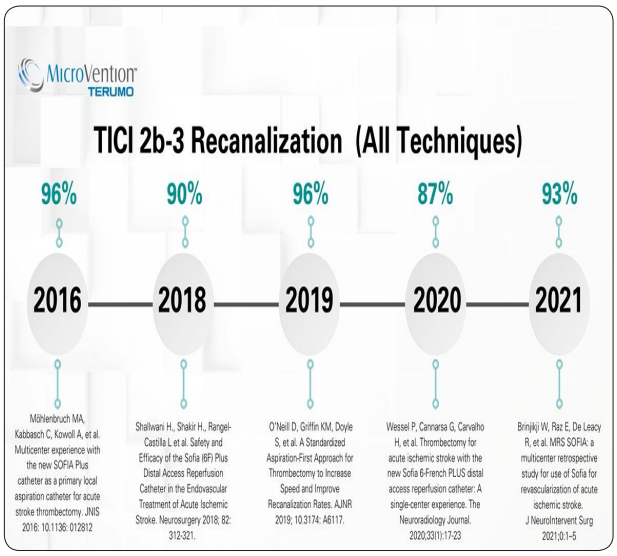
MicroVention
TERUMO
TICI 2b-3 Recanalization (All Techniques)
96%
90%
96%
87%
93%
2016
2018
2019
2020
2021
Möhlenbruch MA, Kabbasch C, Kowoll A, et al. Multicenter experience with the new SOFIA Plus catheter as a primary local aspiration catheter for acute stroke thrombectomy. JNIS 2016; 10.1136: 012812
Shallwani H., Shakir H., Rangel-Castilla L et al. Safety and Efficacy of the Sofia (6F) Plus Distal Access Reperfusion Catheter in the Endovascular Treatment of Acute Ischemic Stroke. Neurosurgery 2018; 82: 312-321.
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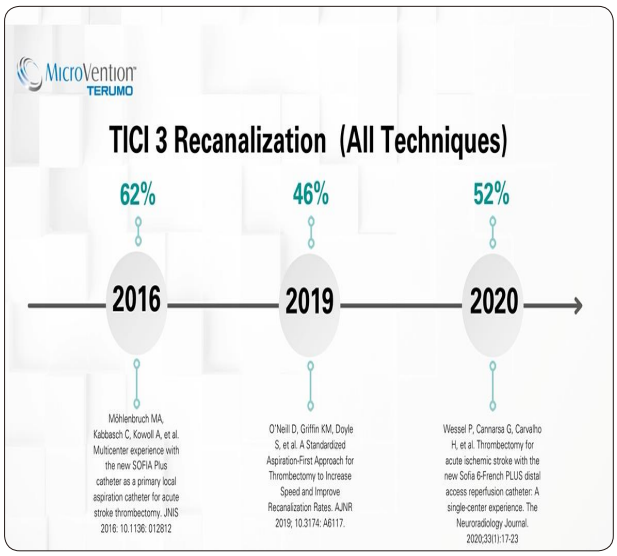
MicroVention
TERUMO
TICI 3 Recanalization (All Techniques)
62%
46%
52%
2016
2019
2020
Möhlenbruch MA, Kabbasch C, Kowoll A, et al. Multicenter experience with the new SOFIA Plus catheter as a primary local aspiration catheter for acute stroke thrombectomy. JNIS 2016; 10.1136: 012812
O'Neill D, Griffin KM, Doyle S, et al. A Standardized Aspiration-First Approach for Thrombectomy to Increase Speed and Improve Recanalization Rates. AJNR 2019; 10.3174: A6117.
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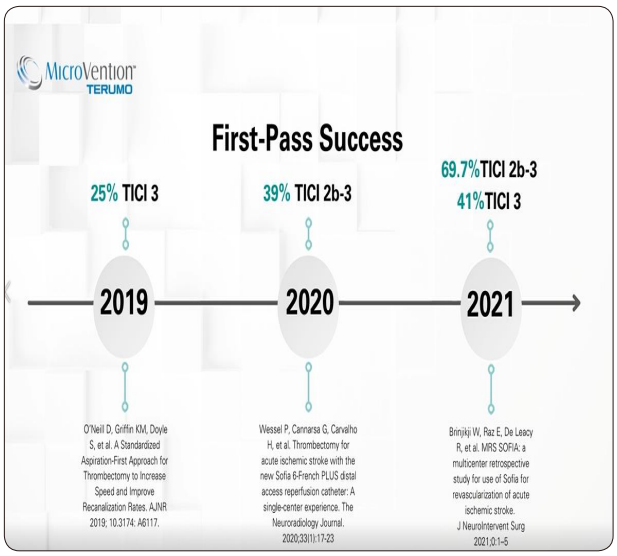
MicroVention
TERUMO
First-Pass Success
25% TICI 3
39% TICI 2b-3
69.7%TICI 2b-3
41%TICI 3
2019
2020
2021
O'Neill D, Griffin KM, Doyle S, et al. A Standardized Aspiration-First Approach for Thrombectomy to Increase Speed and Improve Recanalization Rates. AJNR 2019; 10.3174: A6117.
Wessel P, Cannarsa G, Carvalho H, et al. Thrombectomy for acute ischemic stroke with the new Sofia 6-French PLUS distal access reperfusion catheter: A single-center experience. The Neuroradiology Journal. 2020;33(1):17-23
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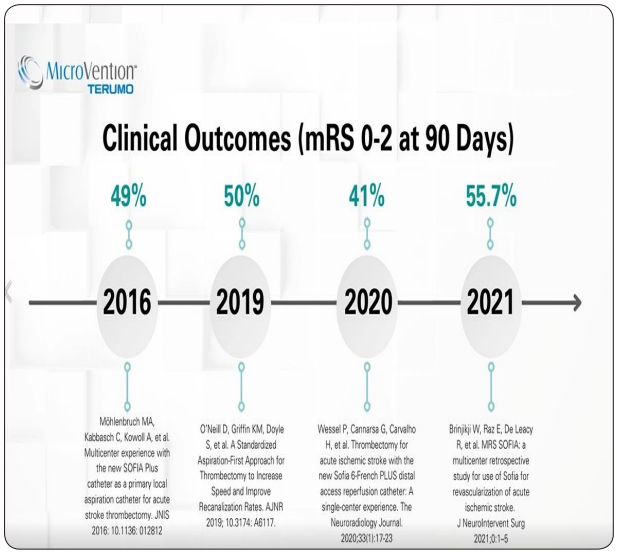
MicroVention
TERUMO
Clinical Outcomes (mRS 0-2 at 90 Days)
49%
50%
41%
55.7%
2016
2019
2020
2021
Möhlenbruch MA, Kabbasch C, Kowoll A, et al. Multicenter experience with the new SOFIA Plus catheter as a primary local aspiration catheter for acute stroke thrombectomy. JNIS 2016; 10.1136: 012812
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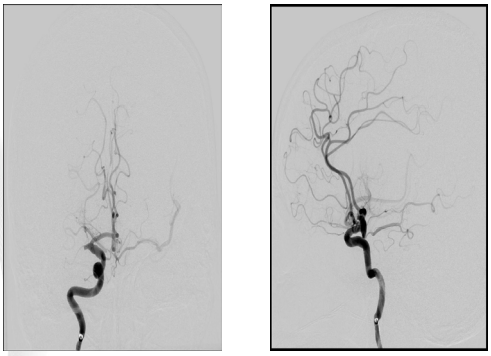
Brinjikji W, Raz E, De Leacy R, et al. MRS SOFIA: a multicenter retrospective study for use of Sofia for revascularization of acute ischemic stroke. J NeuroIntervent Surg 2021;0:1–5


Take Home message (Sofia)
• High efficiency - very fast procedure times
• Catheter only - painless procedure
• Fast reaccess to the occlusion site
• Combination with stentretriever

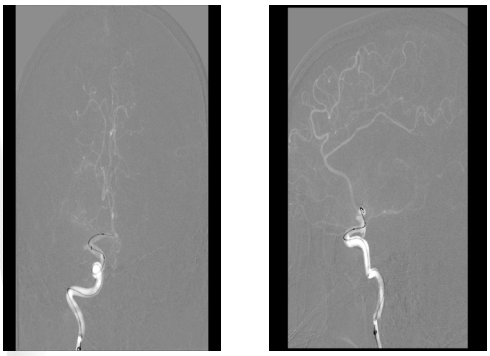
Take Home message (Sofia)

- 1st Device for IAT with/without ICAS
  - ADPT(#1-2) → Solumbra → IA tirofiban or rescue Stent
- MCA/ACA/Basilar lesion – 5F Sofia + 50cc syringe suction
- ICA lesion – 6F Sofia plus + balloon guiding catheter
- Thrombus No-Touch Technique – Very important

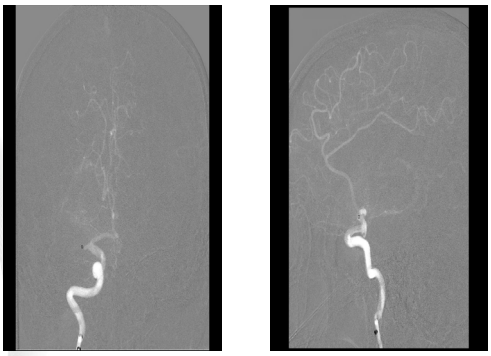
Thrombus No-Touch Technique



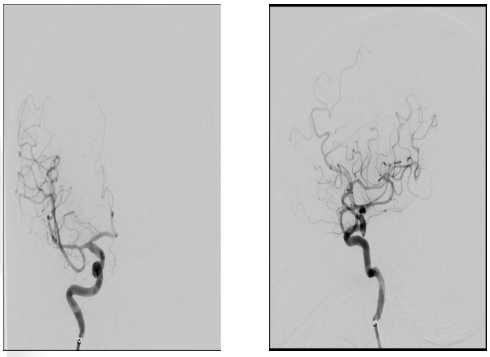
Thrombus No-Touch Technique

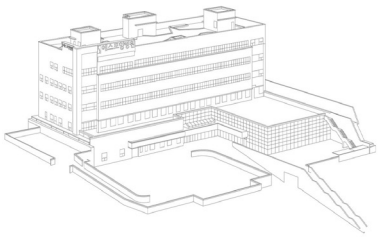


Thrombus No-Touch Technique



Thrombus No-Touch Technique

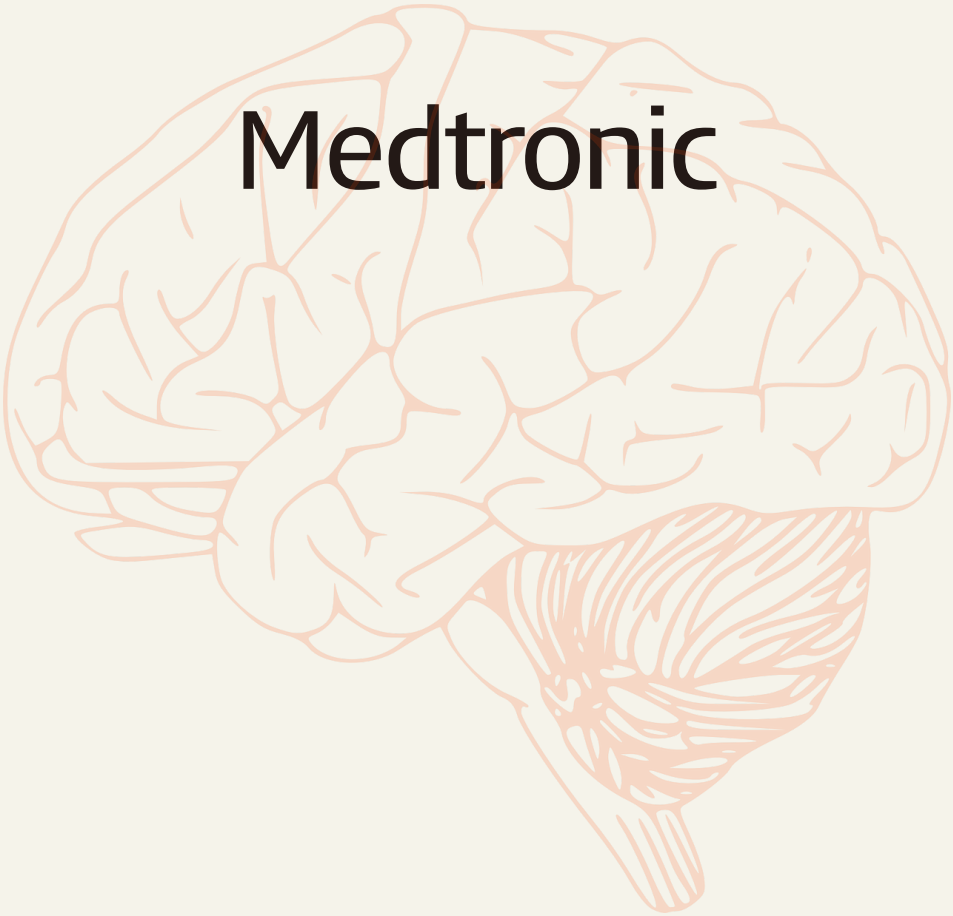




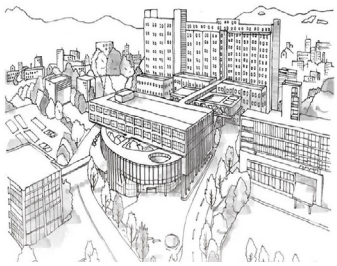
Thank you for your attention

SESSION 1

Medtronic



정 영 진
영남대병원



DEVICE UPDATE, Medtronic

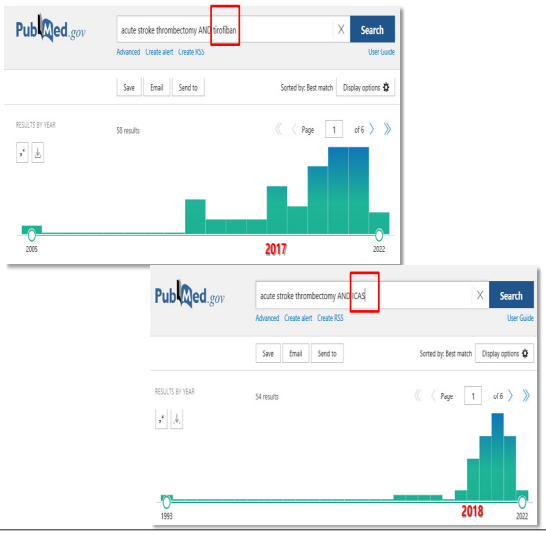
YJ JUNG M.D.

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

Results in Recent Randomized Endovascular Trials

Name	sNIHSS	Patients	mRS (0-2, 90d)	TICI ≥ 2b, Final Procedure time	TICI ≥ 2b, 1st Pass	TICI ≥ 2b, ≤ 3passes	Add-On Therapy	sICH	Mortality, 90d
SWIFT, 2010 (Solitaire)	17.3	58 pts	36% (20/55)	89% (48/54) 36min	NA	89% (48/54)	*20.7% (12/58)	2% (1/58)	17% (10/58)
TREVO2, 2011 (Trevo)	18.3	88 pts	40% (34/85)	92% (81/88) 47.8 min	NA	77.3% (68/88)	†18% (16/88)	4% (4/88)	33% (29/88)
ARISE II, 2015 (EmboTrap)	15.8	227 pts	67.3% (146/217)	92.5% (210/227) 35min	NA	80.2% (182/227)	‡19.4% (44/227)	5.3% (12/227)	9% (20/222)
Aperio, 2017 (Retro)	14.0	82 pts	34.1% (28/82)	85.3% (70/82) 52.3min	43.9% (36/82)	NA		7.3% (6/82)	18.3 %(15/82)
ClinicalTrials Aperio, 2020		430 pts	https://clinicaltrials.gov/ct2/show/NCT04457479						

* ia tPA alone (1), another mechanical device alone (9) (Pneumbra 1/Merci 3/Angioplasty±Stenting with or without Penumbra or Merci 5), with ia tPA (2)
† ia tPA alone (2), another mechanical device alone (6), with ia tPA (6)
‡ ia tPA alone (2), another mechanical device alone (37), mechanical pump alone (7), Stenting (2), Other (8)



Medtronic

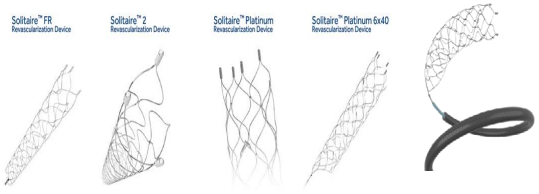
Your Total Stroke Solution Partner

Solitaire has been at leading position in AIS market globally with #1 market share and its legacy of 10 years innovation with unique parametric design

Device history of Solitaire Generation

10 Years of Continuous Evolution

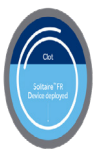
SOLITAIRE FR 1ST GEN	SOLITAIRE 2 2ND GEN	SOLITAIRE PLATINUM 3RD GEN	SOLITAIRE X 4TH GEN
▪ Parametric Design ▪ Detachment (off-label) ▪ Clinically Proven with 5 RCTs ▪ CE Mark Received in 2009 ▪ FDA Approved in 2012	▪ Redesigned Delivery system (Non-Detachable) ▪ Complete Stroke Zone 40mm from ICA to M2	▪ Improved Visibility (Platinum marker by 10mm) ▪ Redesigned delivery system ▪ 6x40 Larger and Longer Size	▪ Lower Delivery Force ▪ All Size Compatible with Phenom 21 ▪ 10 Years of Innovation



Solitaire™ X

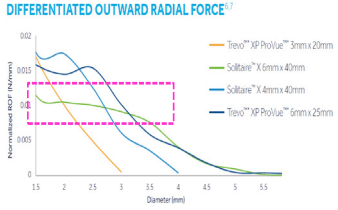
Parametric Design and Effective Clot Engagement

One and only technology ...

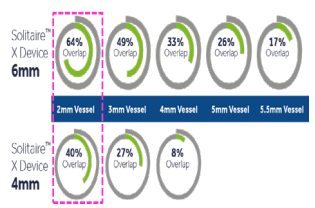


Depiction of 4 x 20 Solitaire™ FR Device in a 2mm vessel

DIFFERENTIATED OUTWARD RADIAL FORCE[6,7]



Consistent Cell Size
Effective Clot Engagement
with multiple plane contact
FDA Approved for Minimum 2mm
vessel diameter



Feature and Benefit of Solitaire™ X

Lower Delivery Force

Driven by Push Wire Modification

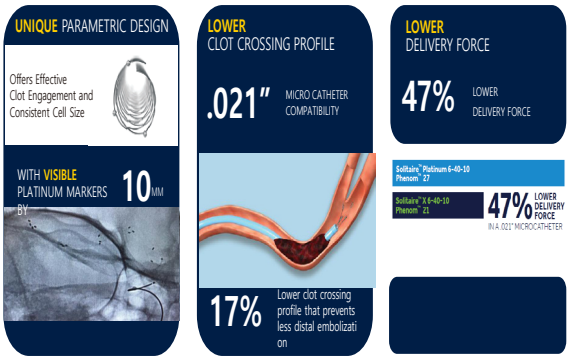
SFR3 6-40-10 Phenom 27 (n=10)

SFR4 6-40-10 Phenom 21 (n=25)

54% LOWER DELIVERY FORCE IN AN .021" MICROCATHETER

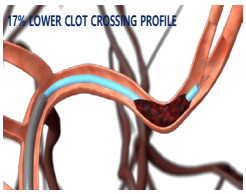
Solitaire™ X Key Messages

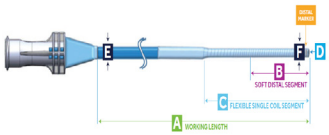
Advancing Access Enables Improved Outcomes



Solitaire™ X Phenom™ Microcatheter

.021" Microcatheter Compatibility with All Size



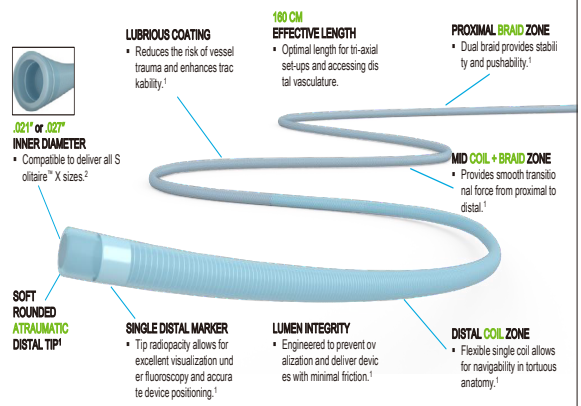


Solitaire™ X 6x40 Deliverable Now With Phenom 21

PHENOM™ 21 / 27 MICROCATHETER

Microcatheter	Part Number	A Working Length (cm)	B Soft Distal Segment (cm)	C Flexible Single Coil Segment (cm)	D Inner Diameter (in)	E Proximal Outer Diameter (F)	F Distal Outer Diameter (F)
Phenom™ 21	FG15160-0615-15	160	6	15	0.021	2.6	2.3
Phenom™ 27	FG15160-0615-15	160	6	15	0.027	3.1	2.8

Phenom™ Microcatheter Features



Optimized Delivery for AIS Devices

The Phenom™ 21 Catheter 160cm is optimized to deliver all sizes of the Solitaire™ X Revascularization Device.[2]

LOWER DELIVERY FORCE

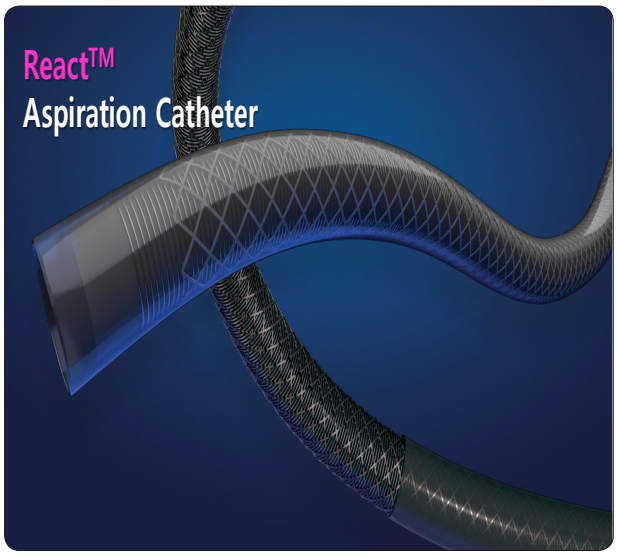
SFR3 6-40-10 Phenom 27 (n=10)

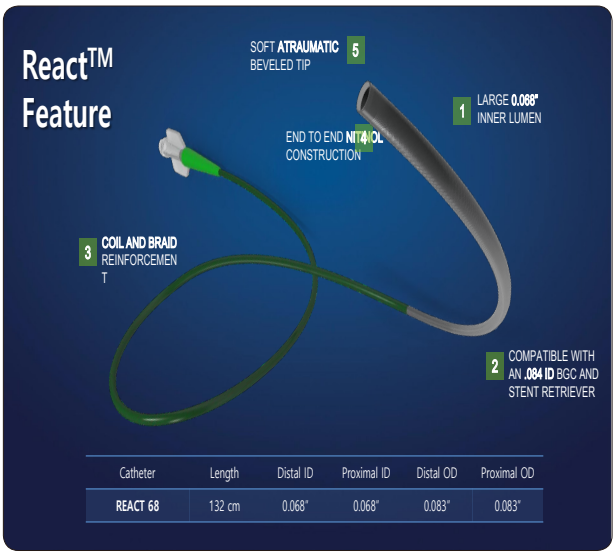
SFR4 6-40-10 Phenom 21 (n=25)

54% LOWER DELIVERY FORCE IN AN .021" MICROCATHETER

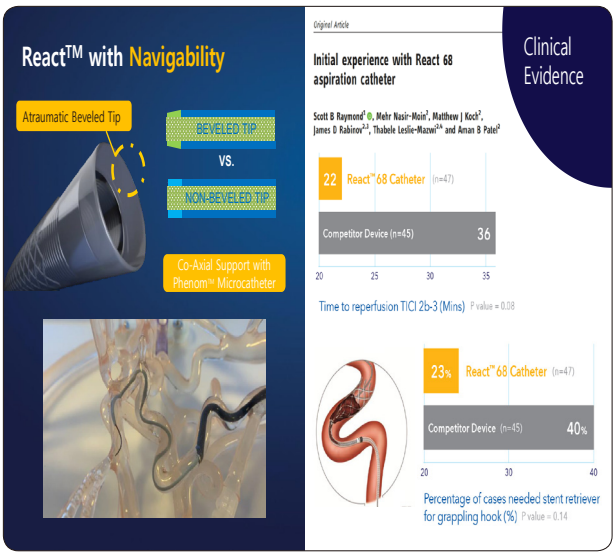
Phenom™ Microcatheter Key Messages

Optimized delivery system for AIS

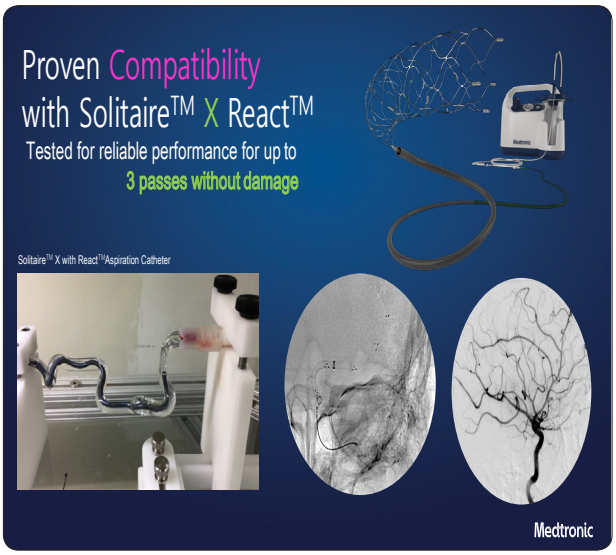

React™
Aspiration Catheter


React™
Feature
SOFT ATRAUMATIC BEVELED TIP 5
1 LARGE 0.068" INNER LUMEN
END TO END NITINOL CONSTRUCTION
3 COIL AND BRAID REINFORCEMEN T
2 COMPATIBLE WITH AN .084 ID BGC AND STENT RETRIEVER
Catheter | Length | Distal ID | Proximal ID | Distal OD | Proximal OD
REACT 68 | 132 cm | 0.068" | 0.068" | 0.083" | 0.083"


React™ with COBRA structure
FEATURING
COBRA
COIL+BRAID
TECHNOLOGY
An overlapping coil + braid construction
NAVIGABILITY OF A COIL
PUSHABILITY OF A BRAID
DURABILITY OF NITINOL


React™ with Navigability
Atraumatic Beveled Tip
BEVELED TIP
VS.
NON-BEVELED TIP
Co-Axial Support with Phenom™ Microcatheter
Clinical Evidence
Initial experience with React 68 aspiration catheter
22 React™ 68 Catheter (n=47)
Competitor Device (n=45) 36
Time to reperfusion TICI 2b-3 (Mins)
23% React™ 68 Catheter (n=47)
Competitor Device (n=45) 40%
Percentage of cases needed stent retriever for grappling hook (%)

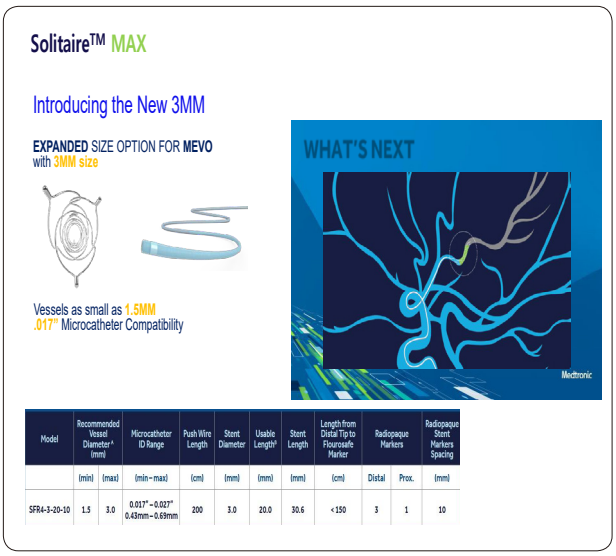

React™ with Durability
"Nitinol wires can be bent 10 x more than stainless-steel wire s without permanent deformation"
Pinch Test
REACT (100% NITINOL)
Crush Test
React Pre-Crush Distal, 1cm from tip
React during crushing Distal, 1cm from tip
React Post-Crush Test Bouncing back in 2 second
Kinking Test
Pre-Test
Test
Recovery
6 cm
12 cm
50 cm


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


React™ Fast, React™ Now
React with Navigability
COBRA
COIL+BRAID
React with Durability
Nitinol
End to End
React with Compatibility
STAT
Solitaire Thrombectomy + Aspiration Therapy

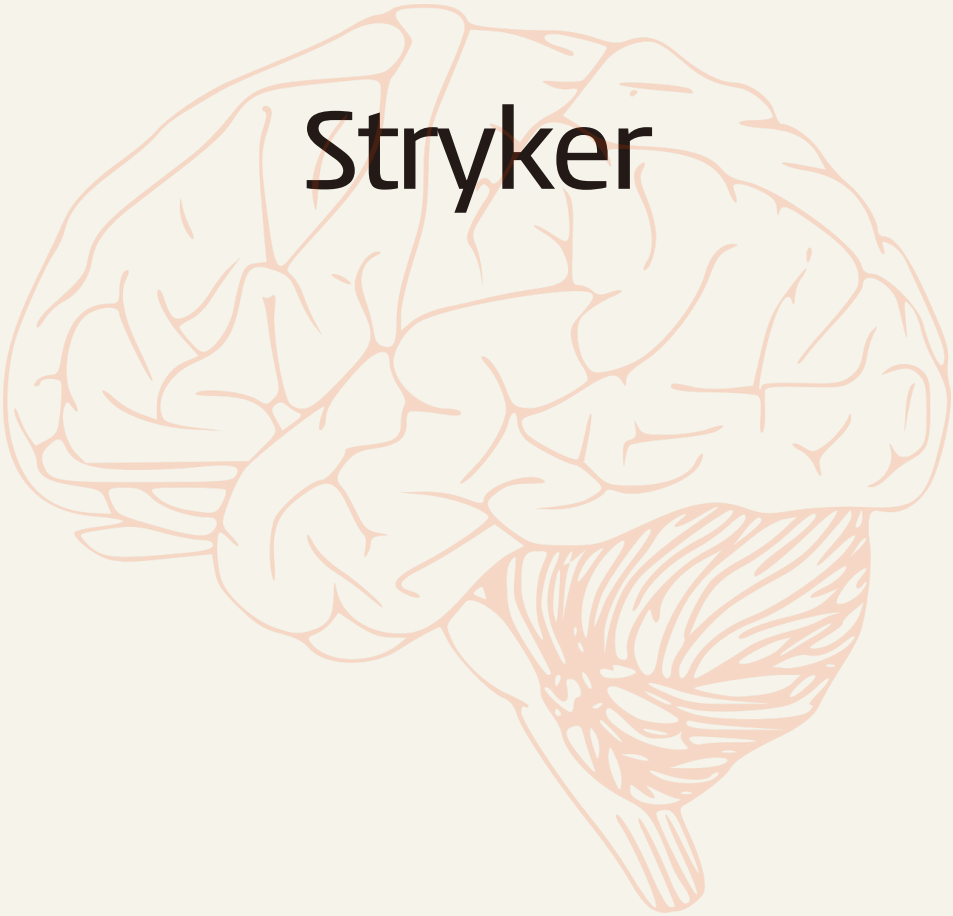

Riptide™ Aspiration System
Rapid ON/OFF Feature
450˚ Rotation Dial
Wider 10" Handle
Larger Vacuum Gauge
Multi-level Dampeners to Reduce Vibration
Riptide™ Aspiration Pump
Medtronic
Riptide™ Collection Canister
Riptide™ Aspiration Tubing


REACT™ BECOMES AN ASPIRATION
It's time to REACT!
FEATURING COBRA TECHNOLOGY
An Overlapping Coil + Braid Construction
Durable and Navigable Large Bore
Aspiration Catheter is Coming Soon..
WHAT'S NEXT
Medtronic
Catheter
Length
Distal ID
Proximal ID
Distal OD
Proximal OD
REACT 71
132 cm
0.071"
0.071"
0.0855"
0.0855"


Solitaire™ MAX
Introducing the New 3MM
EXPANDED SIZE OPTION FOR MEVO
with 3MM size
Vessels as small as 1.5MM
.017" Microcatheter Compatibility
WHAT'S NEXT
Medtronic
Model
Recommended Vessel Diameter (mm)
Microcatheter ID Range
Push Wire Length
Stent Diameter
Usable Length
Stent Length
Length from Distal Tip to Flourosafe Marker
Radiopaque Markers
Radiopaque Stent Markers Spacing
(min)
(max)
(min–max)
(cm)
(mm)
(mm)
(mm)
(cm)
Distal
Prox.
(mm)
SFR4-3-20-10
1.5
3.0
0.017" – 0.027"
0.43mm – 0.69mm
200
3.0
20.0
30.6
< 150
3
1
10

SESSION 1

Stryker



신 동 성

순천향대 부천병원

stryker

Trevo Stroke Solutions™

ACCESS. RETRIEVE. ASPIRATE.

Shin Dong-Seong,

Dept. Neurosurgery, Soonchunhyang University Bucheon Hospital, South Korea,

SCH

Intra-arterial thrombectomy (IAT) devices

- **Guiding**
  - Balloon Guiding catheter
- **Access**
  - Intermediate catheter
  - Aspiration catheter
  - Offset catheter
- **Thrombectomy**
  - Microcatheter
  - Retrieval stent
  - Aspiration pump

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SCH

Review Article

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Role of Balloon Guide Catheter in Modern Endovascular Thrombectomy

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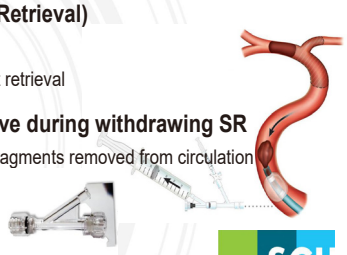
Department of Neurosurgery and Radiology,[2] School of Medicine, Kyungpook National University, Daegu, Korea
Department of Radiology,[3] Severance Stroke Center, Severance Hospital, Yonsei University College of Medicine, Seoul, Korea

- **Inflation of BCG (Stent Retrieval)**
  - Antegrade flow arrest
  - Direct aspiration during stent retrieval
- **Remove hemostatic valve during withdrawing SR**
  - Flow reversal and sheared fragments removed from circulation



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SCH

- **BCG (Direct aspiration with aspiration catheter)**
  - Compromised efficacy of aspiration
  - Limitation of inner diameter of BGC (Not enough free space for aspiration through the BGC)
  - But real practice, some **positive reports** for using BGC in direct aspiration)
- **Benefits of BCG**
  - Lower risk of distal embolization
  - Shorter procedure time
  - Higher rate of first pass success
  - Better clinical outcomes

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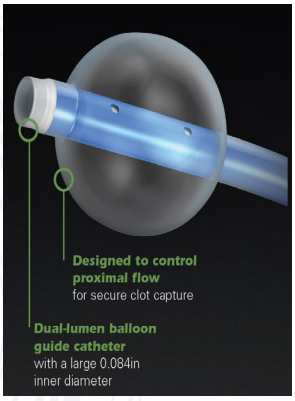
SCH

FlowGate 2 Balloon Guide Catheter

FlowGate²™ Balloon Guide Catheter

Reference Number	Description
90485	8F OD, 0.084in ID, 85cm length
90495	8F OD, 0.084in ID, 95cm length



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SCH

FlowGate 2 Balloon Guide Catheter

- **Accessories**

Tuohy Borst Valve with sideport

Guiding assist Catheter

Luer-active flow valve

SCH

AXS Catalyst 6 distal access catheter

AXS Catalyst™ 6 Distal Access Catheter

Reference Number	Description
IC060132A0	6.0F prox/5.4F dist, 0.060in ID, 132cm length

Intermediate catheter

Adjunctive aspiration

Adjunctive aspiration* has been shown to result in:

Fewer passes

Shorter procedure time

AXS Catalyst™ Distal Access Catheter

Navigate to the clot with ease and provide powerful adjunctive aspiration to enhance retrieval with the Trevo™ XP ProVue Retriever.

for aspiration in unique anatomies

CAT 6: 0.060in ID

Tuohy Borst Valve with sideport

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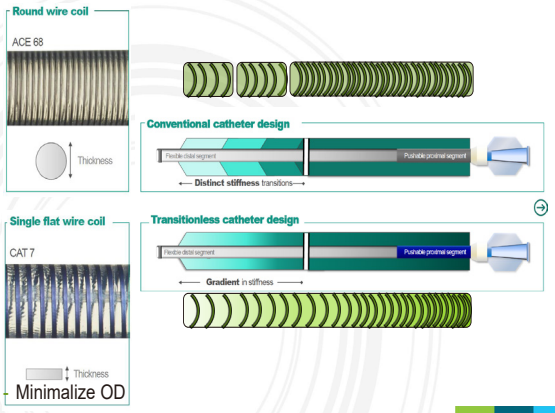
AXS Catalyst 7 distal access catheter

Aspiration catheter

Device	ID (in)	Distal OD[1] F (in) [mm]	Proximal OD [1] F (in) [mm]	Effective Lengths (cm)
AXS Catalyst 7	0.068	6.2F (0.082) [2.08]	6.3F (0.0825) [2.10]	115 125 132

Page

AXS Catalyst 7 distal access catheter



- Minimalize OD
- Maximize ID

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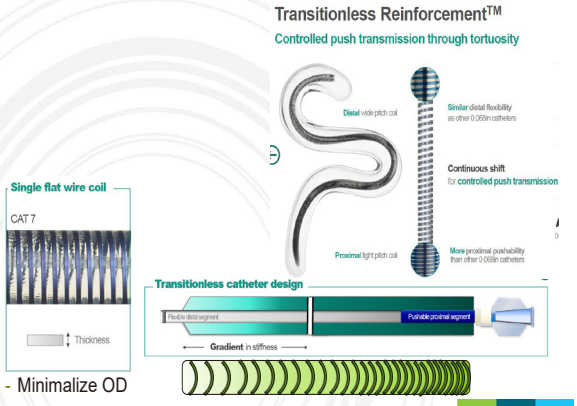
AXS Catalyst 7 distal access catheter



- Minimalize OD
- Maximize ID

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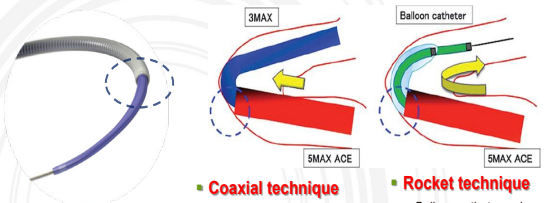
Offset® delivery assist catheter

AXS Offset™ Delivery Assist Catheter

Reference Number	Catalog number	ID	Distal tip OD	Distal tip taper	Bulb OD	Bulb length	Effective length
M003DC0501500	DC050150	0.021in (0.5mm)	0.036in (0.9mm) (2.7F)	2cm	0.050in (1.3mm) (3.8F)	28cm	150cm

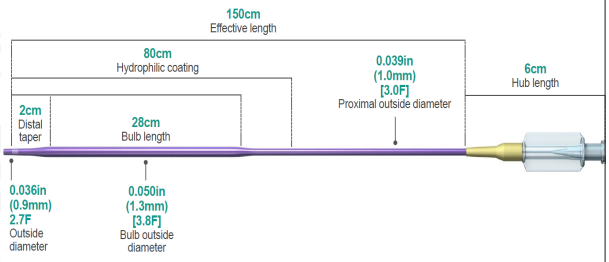


- Minimalize of shoulder (Gap)
- Maintain catheter's characteristics

- **Coaxial technique**
  - Smaller inner catheter
  - Create a shoulder between two catheter
- = Ledge effect (턱)
- Risk of vessel wall damage

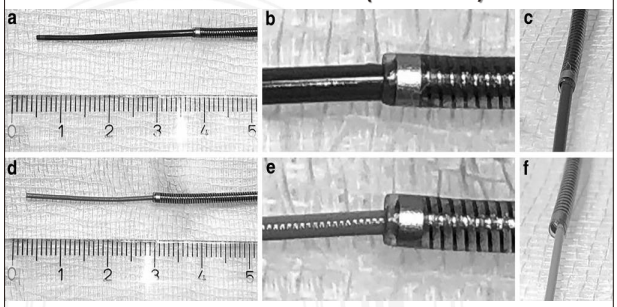
- **Rocket technique**
  - Balloon catheter as inner catheter
  - No shoulder between two catheter
- Preparation, introduction
  - Non-comparable to a normal microcatheter
  - balloon preparation
- more rigid compare 2.1F microcatheter

Offset® delivery assist catheter



- Same length with SL-10
- Bulb: reduce ledge, maintain microcatheter characteristics
- Distal tip taper (same as microcatheter)
  - flexibility, softness, trackability

Offset® VS Rebar 18 (with Cat6)



- Distal length difference (3.5cm vs 2.8cm)
- **Shoulder difference (0.365mm vs 0.775mm, 51% minimum)**
  - Bulb: offset (3.8F), Rebar 18(2.4F)
- Distal tip diameter (2.7F vs 2.4F)

Microcatheters

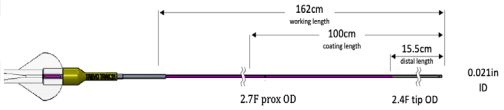
Description
Trevo Pro 14 Microcatheter (2.4F prox/2.0F dist, 0.017in ID, 150cm effective length)
Trevo Pro 18 Microcatheter (2.7F prox/2.4F dist, 0.021in ID, 150cm effective length)
Excelsior XT-27 Microcatheter (2.9F prox/2.7F dist, 0.027in ID, 150cm effective length)

3x20mm Trevo XP ProVue Retriever
4x20mm Trevo XP ProVue Retriever
6x25mm Trevo XP ProVue Retriever

Trevo Trak™ 21 Microcatheter

Longer 162 cm length

Designed to track more distal to reach the clot



- **Directions for use**
  - Deigned for for Trevo NXT ProVue Retriever
  - Distal artery occlusion

Stent Retriever

Trevo™ XP ProVue Retrievers

Reference Number	Description
90183	3x20mm Trevo XP ProVue Retriever
90182	4x20mm Trevo XP ProVue Retriever
90185	4x30mm Trevo XP ProVue Retriever
90186	6x25mm Trevo XP ProVue Retriever

Trevo NXT™ ProVue Retriever

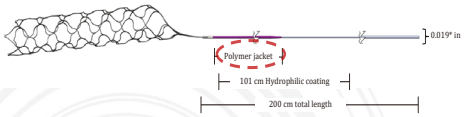
- It is provided in four sizes to meet specific anatomical and procedural needs

3x32 4x28 4x41 6x37

Simplified compatibility
All stent sizes deliver smoothly through a new Trek 21 162cm 021 microcatheter

Trevo NXT™ ProVue Retriever

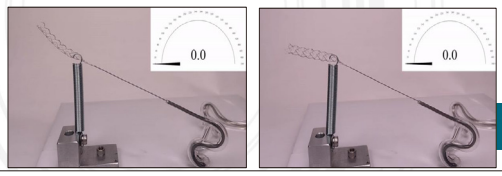
Enhanced feel and control during use with intermediate catheters



Redesigned delivery wire

Polymer jacket with a hydrophilic coating reduces friction between stent retrievers and catheters

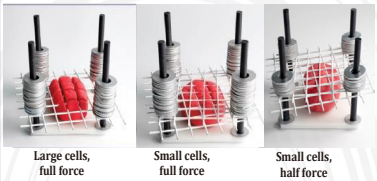
65% less retraction force than Trevo XP Retriever



Trevo NXT™ ProVue Retriever

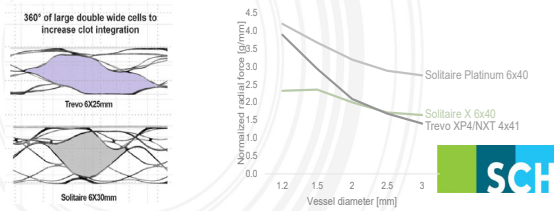
Integration = Cell size + Radial force

Integration (융합, 통합, 조화= 엉킴)



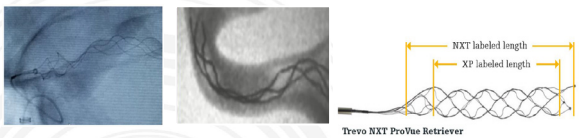
Clot integration

Large non-overlapping cells lead to greater integration compared to smaller overlapping cells when force is equivalent

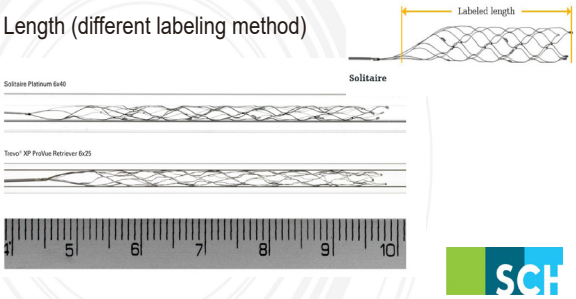


Trevo NXT™ ProVue Retriever

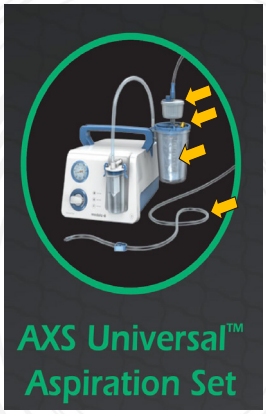
Visibility for real-time procedure feedback



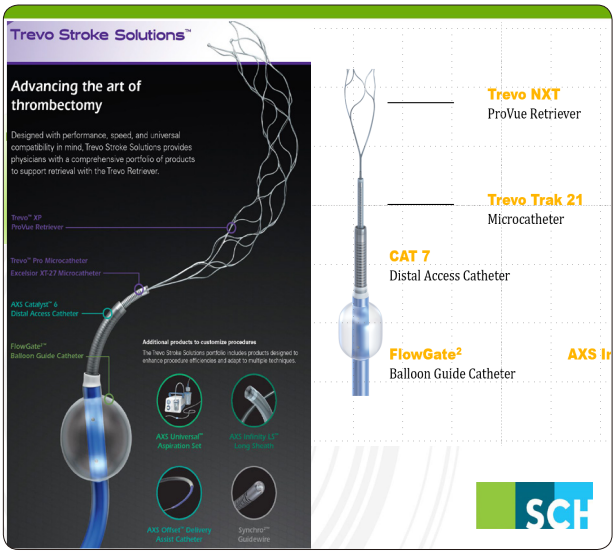
Length (different labeling method)



Aspiration Tube set



- **Directions for use**
  - Universal connection for any kind of aspiration catheters
  - Non-disposal plastic can
  - Disposable filter, plastic bag, plastic cork, suction tube
  - 3 on/off buttons
  - 1 on/off foot paddle



Device for IAT

Trevo Stroke Solutions™

Trevo NXT™ ProVue Retriever
Trevo Trak™ 21 Microcatheter

Everything is there

SESSION 2

Rescue treatment of intracranial stenting plus chemical thrombolysis with antiplatelet medication in the failed IA thrombectomy

진 성 철
인제대 해운대백병원

Rescue treatment of intracranial stenting plus chemical thrombolysis with IV antiplatelet medication in the failed IA thrombectomy

Sung-Chul Jin, MD

Department of Neurosurgery, Inje University Haeundae Paik Hospital, Busan, Republic of Korea

41 years old male patient was suffered from global aphasia with right hemiplegia on unclear onset time. Initial NIHSS score of the patient was 20. Brain CT angiography and CT perfusion showed left proximal ICA occlusion with preservation of left MCA cortical volume. IA thrombectomy was decided for preservation of left MCA cortical penumbra. Hybrid mechanical thrombectomies using trevo plus intermediate catheter were failed to successful recanalization. Salvage operation of STA-MCA bypass would not be possible to injury of previous traumatic craniotomy. Therefore, I decided to treat this patient with intracranial stenting using Lvis junior plus IA thrombolysis using tPA and IV aggrastat. After full dose of IA tPA like the method of IV tPA (0.6mg/kg) control angiogram showed the patency of deployed stent with preservation of cortical function. 1 months later after IAT and intracranial stenting plus IA tPA with IV aggrastat, the patient recovered to the partial motor aphasia with Rt hemiparesis (motor grade III).

Conclusively, after rescue treatment of intracranial stenting, for stabilizing the vulnerable plaque, IA tPA use should be carefully considered.

SESSION 2

Effectiveness of Solumbra technique using Solitaire X 4-40 for the treatment of AIS with large thrombus burden

하 상 우
조선대병원

Effectiveness of Solumbra technique using Solitaire 4-40 for the treatment of AIS with large thrombus burden

조선대학교병원
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하상우 김재호 김학성

급성뇌경색치료연구회 ASTRO Acute Stroke Treatment Research Organization

CHOSUN UNIVERSITY HOSPITAL

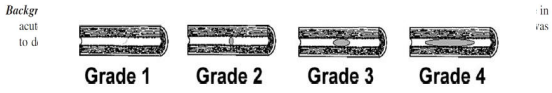
Introduction

- Large thrombus burden
- ICA terminus occlusion
- Solumbra technique (Penumbra ACE68 + Solitaire X 4-40)
- Case review
- Conclusion

Large thrombus burden

Thrombus Burden Is Associated With Clinical Outcome After Intra-Arterial Therapy for Acute Ischemic Stroke

Andrew D. Barreto, MD; Karen C. Albright, DO, MPH; Hen Hallevi, MD; James C. Grotta, MD; Elizabeth A. Noser, MD; Aslam M. Khaja, MD; Hashem M. Shaltoni, MD; Nicole R. Gonzales, MD; Kachi Illoh, MD, MPH; Sheryl Martin-Schild, MD, PhD; Morgan S. Campbell III, MD; Raymond U. Weir, MD; Sean I. Savitz, MD



Modified TIMI grading scale for thrombus grade

- Grade 0 : no angiographic characteristics of thrombus
- Grade 1 : possible thrombus present
- Grade 2 : small thrombus present
- Grade 3 : moderate thrombus present
- Grade 4 : large thrombus present

Large thrombus burden

Table 1. Baseline Characteristics of Patients

	Thrombus Grade		
	Grades 0–3 n=61	Grade 4 n=74	*P* Value
Age, mean±SD, y	61.1±13.9	62.6±13.6	0.532
Men, No. (%)	32 (53)	42 (57)	0.618
Baseline NIHSS score, median, range	17, 1–39	19, 7–39	0.012
Hypertension, No. (%)	36 (59)	43 (58)	0.915
Diabetes mellitus, No. (%)	8 (13)	16 (22)	0.198
Coronary artery disease, No. (%)	15 (24.6)	10 (13.5)	0.099
Hyperlipidemia, No. (%)	10 (16)	17 (23)	0.342
TOAST classification, No. (%)			0.456
Cardioembolic	29 (48)	37 (50)	
Large-artery atherosclerotic	19 (31)	28 (38)	
Unknown	9 (15)	5 (7)	
Other	4 (6)	4 (5)	
Thrombus location, No. (%)			
MCA	50 (82)	31 (42)	<.0001
Terminal ICA	5 (8.2)	30 (41)	
Basilar artery	6 (9.8)	13 (18)	

- 135 Pts
- Baseline NIHSS : G4 > G 0 to 3 (19 vs 17)
- Longer times for IAT (G4 : 113, 37 to 415 min vs G0~3 : 74, 22 to 215 min.)
- Higher rates of mechanical clot disruption (G4 : 76% vs G0~3 : 53%, P=0.005)
- sICH (no difference, 6.6% vs 4.1%, P=0.701)
- Recanalization (no difference, 50% vs 61%, P=0.216)
- Grade 4 thrombi → poor outcome (odds ratio : 2.4)

Large thrombus burden

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SCIENTIFIC REPORTS

OPEN

Predictive value of thrombus volume for recanalization in stent retriever thrombectomy

Received: 15 May 2017
Accepted: 9 November 2017

Jang-Hyun Baek[1,4], Joonsang Yoo[2,5], Dongbeom Song[3], Young Dae Kim[1], Hyo Suk Nam[1], Byung Moon Kim[1], Dong Joon Kim[3], Hye Sun Lee[3] & Ji Hoe Heo[1]

- 165 Pts → First pass : 68(58%) / 2-3 passes 43(31.6%) / 4 passes 이상 25(18.4%)
- Thrombus volume : smaller → Recanalization rate ↑
  larger → Number of passes ↑
- Thrombus volume : independent predictor of first-pass recanalization
  (odds ratio 0.93 per per 10 mm3, 95% confidence)
- Use of BGC : independent predictor of first-pass recanalization
  (odds ratio 2.59, 95% confidence)

ICA terminus occlusion

- lead to adverse neurological outcomes & Poor Prognosis

1. large thrombus burden precluding sufficient recan.
2. role of collaterals is unique

→ limit the initial infarct core size and subsequent infarct growth

→ better clinical outcome and lower risk of Hemorrhagic Transf.

Solumbra technique

- **CAPTIVE** (Continuous Aspiration Prior To Intracranial Vascular Embolectomy)
- **ARTS** (Aspiration-Retriever Technique for Stroke)
- **SAVE** (The stent retriever Assisted Vacuum locked Extraction)
- **ASAP** (A stent retrieving into an aspiration catheter with prox. Balloon)

CAPTIVE

Ischemic stroke

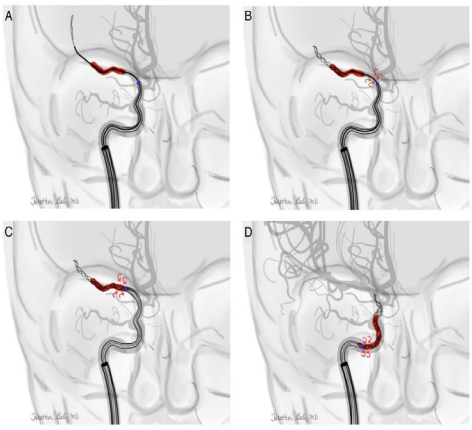
ORIGINAL RESEARCH

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

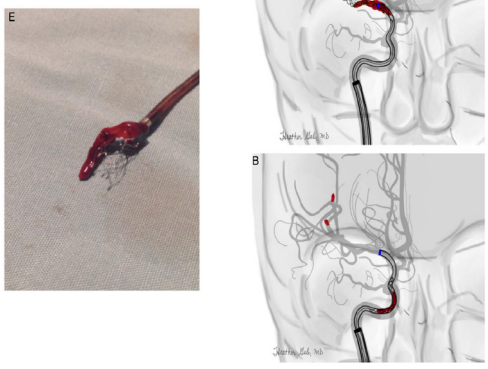
Ryan A McTaggart,[1,2] Eric L Tung,[1,2] Shadi Yaghi,[2,3] Shawna M Cutting,[2,3] Morgan Hemendinger,[2,3] Heather I Gale,[1] Grayson L Baird,[1,4] Richard A Haas,[1,2,5] Mahesh V Jayaraman[1,2,3,5]

- SR + Aspiration
- stent deployment 전 aspiration start
- remove Stent & Aspiration catheter as a single unit

CAPTIVE



CAPTIVE



ARTS

Original Article

INR INTERVENTIONAL NEURORADIOLOGY

Interventional Neuroradiology
2016, Vol. 22(3) 325–332

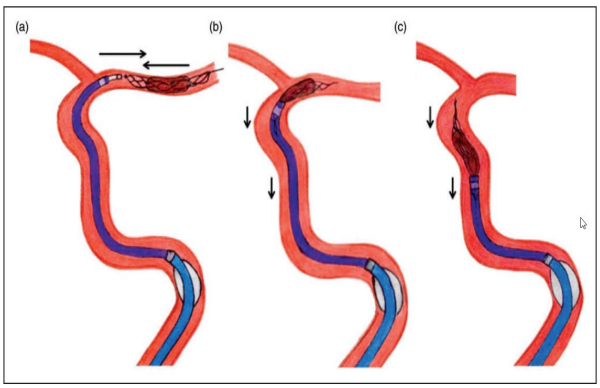
DOI: 10.1177/1591019916632369
ine.sagepub.com
SAGE

ARTS (Aspiration-Retriever Technique for Stroke): Initial clinical experience

Francesco Massari[1], Nils Henninger[2], Juan Diego Lozano[1], Anand Patel[2], Anna Luisa Kuhn[1], Mary Howk[1], Mary Perras[1], Christopher Brooks[1], Matthew J Gounis[1], Peter Kan[3], Ajay K Wakhloo[1] and Ajit S Puri[1]

- SR + Aspiration + (BGC : optional)
- stent deployment 후 aspiration start
- remove Stent & Aspiration catheter as a single unit

ARTS



SAVE

The SAVE Technique

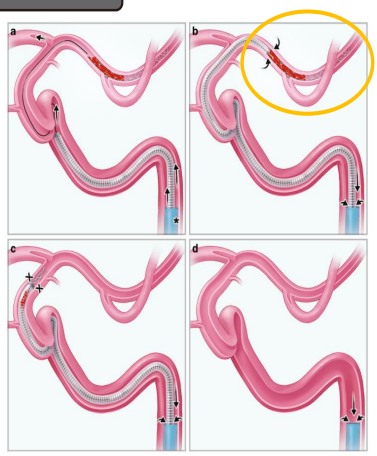
Large-Scale Experience for Treatment of Intracranial Large Vessel Occlusions

Volker Maus[1] · Silja Henkel[1] · Alexander Riabikin[2] · Christian Riedel[3] · Daniel Behme[1] · Ioannis Tsogkas[1] · Amelie Carolina Hesse[1] · Nuran Abdullayev[4] · Olav Jansen[3] · Martin Wiesmann[2] · Anastasios Mpotsaris[2] · Marios-Nikos Psychogios[1]

Received: 29 March 2018 / Accepted: 12 June 2018 / Published online: 19 July 2018

- SR + Aspiration
- stent deployment 후 aspiration start
- remove Stent & Aspiration catheter as a single unit
- Prox. Aspiration through guiding catheter

SAVE



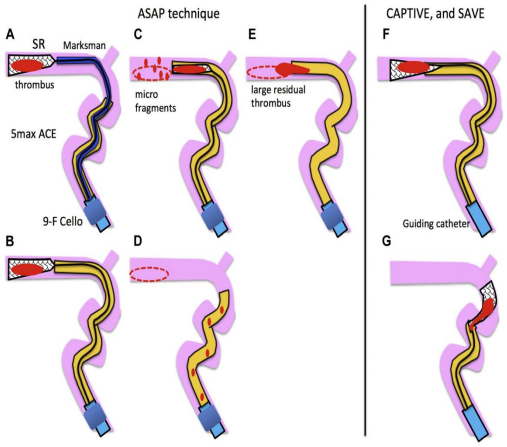
ASAP

A Stent-Retrieving into an Aspiration Catheter with Proximal Balloon (ASAP) Technique: A Technique of Mechanical Thrombectomy

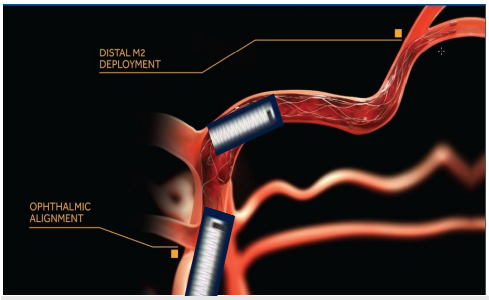
Shunsaku Goto, Tomotaka Ohshima, Kojiro Ishikawa, Taiki Yamamoto, Shinji Shimato, Toshihisa Nishizawa, Kyozo Kato

- SR + Aspiration + BGC
- stent deployment 후 aspiration start
- remove Stent first then aspiration

ASAP

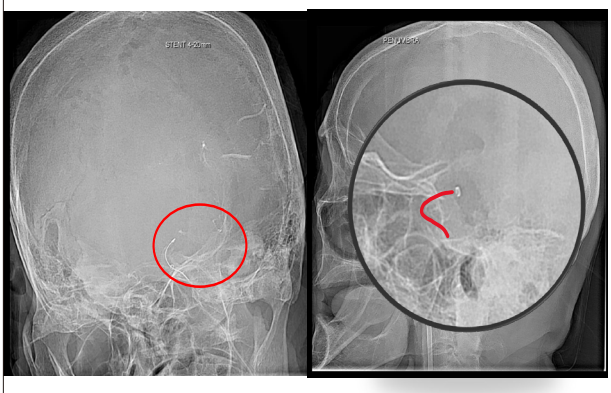


Solumbra using Solitaire 4-40 + Penumbra ACE68

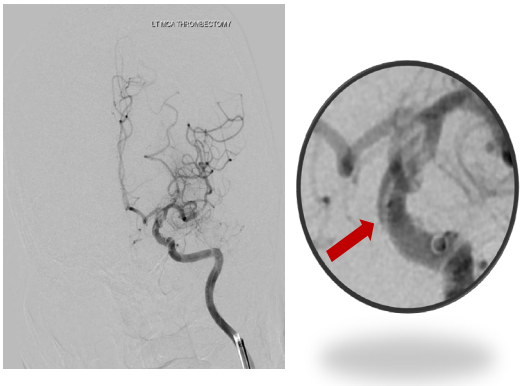


- Allow precise placement (Time reduction)
- Distal ICA ~ M2 , tandem occlusion 시에도 FPE
- anchoring effect (tortous anatomy)

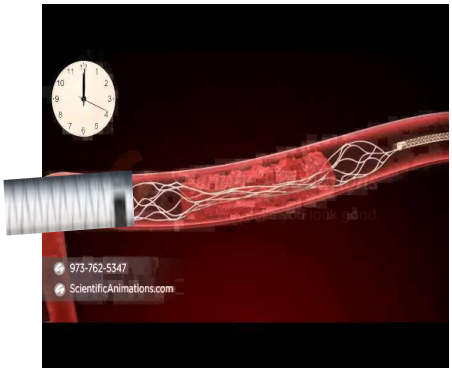
Solumbra using Solitaire 4-40 + Penumbra ACE68



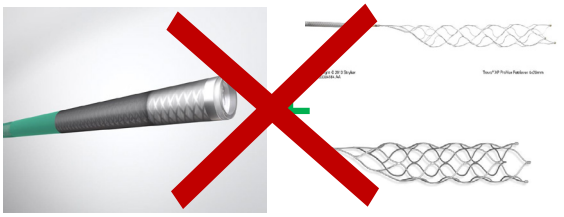
Solumbra using Solitaire 4-40 + Penumbra ACE68



Solumbra using Solitaire 4-40 + Penumbra ACE68



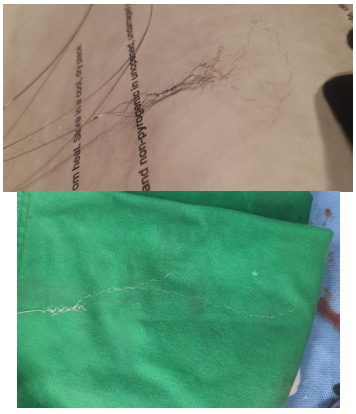
Solumbra using Solitaire 4-40 + Penumbra ACE68



Sofia 5Fr/ Cat 6/ 4max

Trevo or Solitaire (4mm diameter)

Solumbra using Solitaire 4-40 + Penumbra ACE68



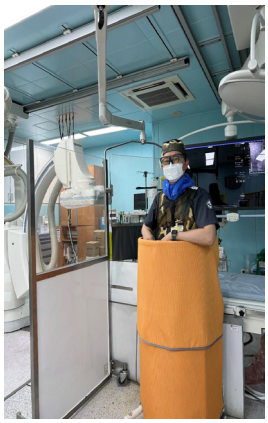
Solumbra using Solitaire 4-40 + Penumbra ACE68

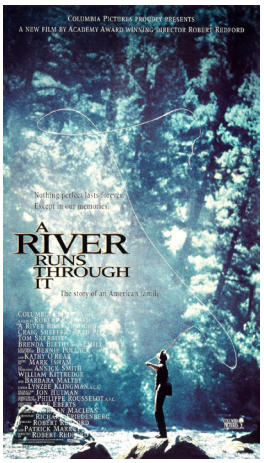
ACE68 / CAT7 / Sofia6

Trevo or Solitaire (6mm diameter)

CASE REVIEW

Conclusion





감사합니다

SESSION 2

Benefit of remote aspiration in the BGC setting during IA thrombectomy for acute intracranial ICA occlusions

김 병 준
경북대병원

Benefit of remote aspiration in the BGC setting during IA thrombectomy for acute intracranial ICA occlusions

Byoung-Joon Kim, Won-Soo Son, Dong-Hun Kang

Department of Neurosurgery, Kyungpook National University Hospital

Ischemic stroke attributable to acute intracranial internal carotid artery (ICA) occlusions can result in a large hemispheric infarction and it is known to have a high rate of mortality and poor outcome. Despite the advent of mechanical thrombectomy (MT) devices including stent retriever and large-bore aspiration catheter, the clinical and angiographic outcome is frequently worse in acute intracranial ICA occlusions than in other intracranial major vascular occlusions.

Although this generation of MT techniques has resulted in higher recanalization rates compared to previous generations, acute ICA occlusion with extensive clot-burden still can cause poor outcomes, perhaps as a result of difficult recanalization, higher complication rate, or non-involved-territory embolization.

There have been several attempts to introduce a method for re ¬ducing clot-burden by manual clot aspiration, either through a balloon-tipped guide catheter (BGC) or a non-BGC. In our stroke center, the aforementioned technique, so called remote proximal aspiration thrombectomy (r-PAT), is performed for clot-burden reduction in the cases of acute intracranial ICA occlusions through a BGC. Our method involved manual clot aspiration using a 50 cc syringe at the cervical segment of ICA through a 7 Fr coaxial large bore aspiration catheter (Sofia Plus or Catalyst 7), while the balloon of the outer 9 Fr BGC was inflated. In some cases, r-PAT is performed only through a BGC without a 7 Fr coaxial catheter. After a few attempts of r-PAT, standard MT using contact aspiration thrombectomy (CAT) and/or stent retrieval thrombectomy (SRT) is followed to recanalize the remaining occlusions.

Hereby we introduce our MT protocol for acute intracranial ICA occlusions which

comprised r-PAT and followed by standard CAT and/or SRT which may result in shorter puncture-to-reperfusion time and better angiographic outcome (Thrombolysis in Cerebral Infarction, TICI).

Case 1. Full recanalization after r-PAT

An 80-year-old female with previous history of dyslipidemia, atrial fibrillation (aspirin, clopidogrel dual medication) and ischemic stroke (mRS 0) developed right side weakness and dysarthria. On arrival, baseline National Institute of Health Stroke Scale (NIHSS) score was 7 with unclear onset. IV rt-PA was excluded and the CT angiography showed the left ICA total occlusion. MT procedure was then performed. Through a 9 Fr femoral sheath, a 9 Fr Optimo BGC was positioned on the left carotid bulb. After balloon inflation, r-PAT was performed only with a 50cc syringe through a 9 Fr BGC. First pass recanalization was achieved and the final angiography showed TICI of 3. Patient recovered to NIHSS score 0 without any neurological deficit.

Case 2. Partial recanalization (clot burden reduction) after r-PAT

An 82-year-old female with previous history of hypertension developed left hemiparesis. Baseline NIHSS score was 18 and the time from last known normal to puncture was 100 minutes, IV rt-PA was then administered. By the routine stroke risk factor work-up, new onset atrial fibrillation was identified. CT angiogram showed the right distal ICA to terminus occlusion. A 9 Fr short femoral sheath was inserted and a 9 Fr Cello BGC was positioned on the right carotid bulb. To perform a CAT, Catalyst 7 aspiration catheter was tried to advance to the occlusion site. However, due to a tortuosity of ICA anatomy, Catalyst 7 was short to make a contact to the thrombus of the occlusion. The final location of the Catalyst 7 was the cavernous segment of ICA. We decided to perform r-PAT after balloon inflation of BGC, which resulted in some clot burden reduction. The follow-up angiogram still showed the remnant occlusion on the terminal ICA. Repeated CAT using a small caliber catheter (Sofia 5) was taken for three times, full recanalization (TICI of 3) was achieved.

SESSION 2

Spontaneous supraclinoid ICA dissection causing flow limitation in a young man

정은오
충남대병원

Spontaneous supraclinoid ICA dissection causing blood flow limitation in young man

Eun-Oh Jeong, Hyon-Jo Kwon, Hyeon-Song Koh

Department of Neurosurgery, Chungnam National University Hospital

Spontaneous intracranial internal carotid artery (ICA) dissection is an uncommon cause of cerebral infarction. A 29 year old male patient presented with headache and left hemiplegia that occurred an hour and a half ago. On brain computed tomography (CT) angiography, right distal ICA was not visible, but middle cerebral artery (MCA) and anterior cerebral artery (ACA) were visible. On brain CT perfusion, mean transit time (MTT) was elevated and cerebral blood volume (CBV) was normal in the right MCA and ACA territories. Diffusion weighted image (DWI) showed right border zone infarction. Digital subtraction angiography was performed. On right ICA angiography, a flow that appeared to be dissection in the supraclinoid ICA was observed, resulting in severe stenosis. The Solitaire AB 6.0 mm x 40 mm stent was deployed, stenosis caused by dissection was improved. Delayed angiography was performed, and it was confirmed that the stenosis gradually improved to an almost normal vessel lumen. After resheathing the Solitaire stent, the Enterprise 4.0 mm x 23 mm stent was deployed and it was confirmed that the lumen was maintained normally. The intra-arterial infusion of Tirofiban was administered to prevent thrombus formation. After the procedure, the patient had a slight headache, but the left hemiplegia completely recovered. On magnetic resonance angiography performed the next day after the procedure, the in-stent signal reduction was observed, but it was confirmed that the flow to MCA and ACA was good. The border zone infarction previously seen on DWI disappeared. If spontaneous intracranial ICA dissection comes in early onset, it can be treated with a self-expandable stent. If you use a solitaire stent that can be retrieved even after full deployment, you can check in advance whether it can be treated with a self-expandable stent.

SESSION 2

Pseudoaneurysm formation caused by stenting for intracranial atherosclerotic stenosis

김 영 수
에스포항병원

Pseudoaneurysm formation caused by stenting for intracranial atherosclerotic stenosis : a case report

YS KIM, SY KIM, HM KIM, YJ CHOI, ST JIN, DW LEE, DY HONG, MC KIM

Pohang stroke and spine hospital 에스포항병원

This is a report of pseudoaneurysm formation after stenting Intracranial atherosclerotic stenosis (ICAS).

A 72-year old patient presented with ㅈdysarthria and right hemiparesis.

Brain diffusion-weighted image (DWI) revealed acute ischemic lesions in the internal watershed area of the left cerebral hemisphere.

Secondary prevention therapy was started according to guidelines for ischemic stroke treatment with aspirin, clopidogrel, and rosuvastatin.

After 14 days of admission, the patient had a nearly full clinical recovery, with residual slight motor deficit of the distal right upper limb.

Conventional angiography and sequential CT angiography revealed aggravation of severe stenosis (about 75%) at left distal ICA and proximal M2.

Also, perfusion-weighted image (PWI) showed increased the time to peak (TTP) and size of the lesion.

After 30 days of the attack, the patient underwent endovascular treatment for ICAS.

Under general anesthesia, a Wingspan stent (3.5×15 mm) was deployed. a 3.0×20 mm-sized Reurei balloon was used with step-wise inflation (4 atm 7 atm for 30 seconds each). Then Post-operative angiography showed good patency of the MCA, but severe stenosis of distal ICA. An Energy balloon mounts stent (4.0×15 mm) was deployed with 9 atm inflation pressure.

After stent placement, an abnormal pseudo sac appeared at the distal ICA. Pseudosac embolization was done with 3 detachable coils and additional Neuroform ATLAS stent immediately (Occluder-like way).

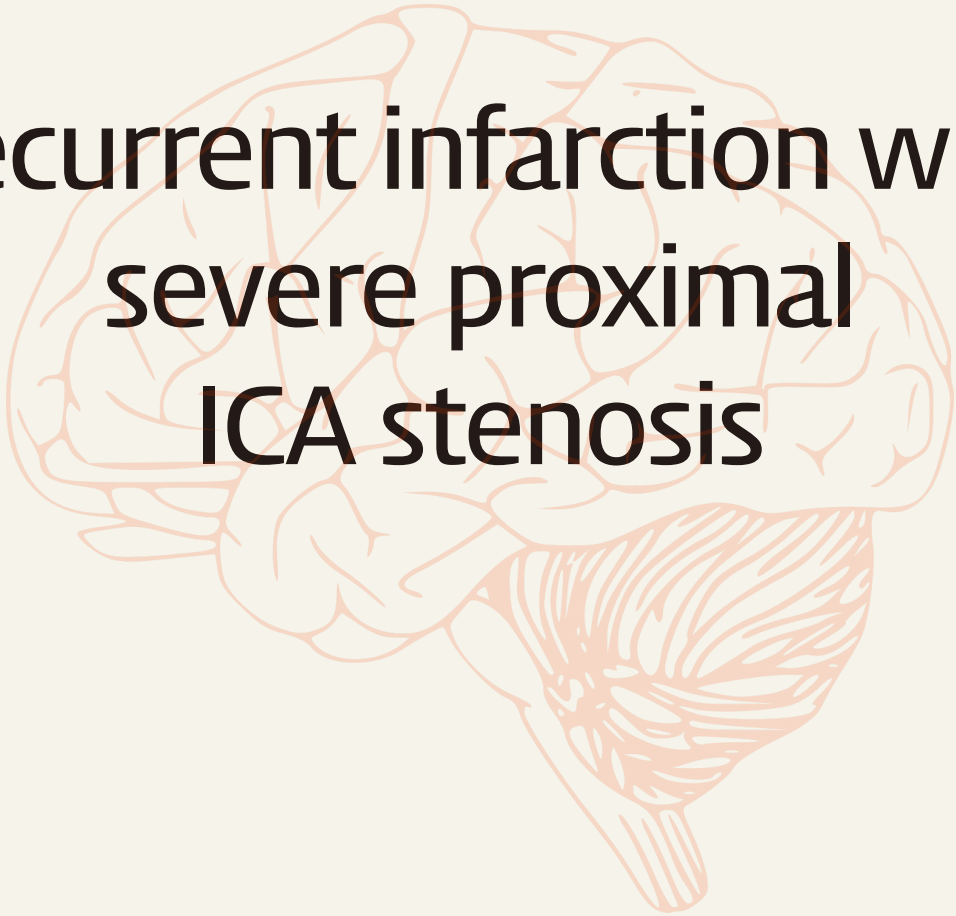
Postop CT showed no bleeding or acute complication. However, the patient had drowsy consciousness and right hemiparesis of grade 4 on the postoperative day.

After another a month later, the newly developed infarction was well resolved. The patient had minimal motor weakness on hand grasping at 3 month clinical follow-up.

This is report shows the pseudoaneurysm formation after stenting ICAS lesion which was successfully treated occluder-like way coil embolization.

SESSION 2

Recurrent infarction with severe proximal ICA stenosis



조 병 래

가톨릭대 인천성모병원

Recurrent infarction with severe proximal ICA stenosis

조병래, 김동섭, 장동규
가톨릭대학교 인천성모병원 신경외과

Purpose : We describe a patient with recurrent border zone infarction and severe proximal ICA stenosis treated by endovascular and surgical treatment.

Methods : A 79-year-old male presented with dysarthria and Rt. Side subjective weakness for 2 weeks. Head and neck computed tomography angiography (CTA) revealed a Lt. proximal ICA severe stenosis with calcification. Magnetic resonance imaging (MRI) showed Lt. MCA border zone infarctions. We performed 4 vessel angiography and planned carotid artery stenting at the same time. However, due to Lt. ICA severe stenosis accompanied by calcification, wire passage did not occur, so stent insertion failed. The next morning, the patient developed sudden global aphasia, an MRA was performed, and an additional infarction occurred. We performed an emergency procedure, and only balloon angioplasty was performed without stent insertion due to the ICA shape. After the procedure, the patient's sensory aphasia improved, but Wernicke's aphasia and dysarthria remained.

Result : On day 41 after the procedure, the patient had global aphasia and right arm weakness occurred and he was re-visited to the hospital. As a result of the examination conducted, Lt. MCA flow is reduced, and border zone infarction has additionally occurred. Additional endovascular treatment was considered difficult, so double-barrel STA-MCA anastomosis was performed. After surgery, the patient can obey, but Wernicke's aphasia persists, and right arm weakness remains. He was transferred to the Department of Rehabilitation Medicine and is undergoing rehabilitation treatment.

Conclusion : For patients with severe proximal ICA stenosis accompanied by calcification, when planning endovascular treatment, an appropriate treatment plan should be established and treated in consideration of the shape and branching angle of ICA and ECA.

2022년도 제1차 급성뇌경색치료연구회(ASTRO)

Stroke Conference & New Device Update

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