



2021 대한뇌혈관내치료의학회 정기학술대회 및 총회

Theme: KoNES, the Leading Endovascular Surgery Society

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장소 | 인천 파라다이스시티호텔 그랜드볼룸

존경하는 대한뇌혈관내치료의학회 회원 여러분!



안녕하십니까?

2021년은 대한뇌혈관내치료의학회가 창립된 지 25주년이 되는 해입니다. 우리 학회는 그동안 양적, 질적으로 성장을 거듭하여 정회원수가 500명을 넘는 다학제학회로 발전하였으며, 명실공이 우리나라 혈관내 치료를 선도하는 중추적인 학회가 되었습니다.

올 한해 우리 학회는 코로나-19의 어려움 속에서도 그 어느 해보다 다양한 학술 행사를 개최하였고, 회원들의 교육을 위하여 온라인 평생교육 홈페이지를 제작하고 수많은 동영상 강의를 업로드 하는 등 많은 사업을 추진하였습니다.

또한 전임회장때부터 심혈을 기울여 준비해 왔던 대한의학회 가입을 위한 노력이 결실을 맺어 금년 5월 대한의학회 회원학회로 인준되는 쾌거를 이루었습니다. 이 모든 것이 회원 여러분의 관심과 성원으로 인해 가능했다고 생각합니다. 앞으로 우리 학회는 대한의학회 회원학회로서 우리나라 뇌혈관내치료 분야의 발전을 위해서 더욱더 노력해야 할 것입니다.

이번 학술대회의 주제는 “KoNES, the Leading Endovascular Surgery Society” 로 정했습니다. 대한의학회 회원학회로서 우리 학회가 나아가야 할 방향과 뇌혈관질환 관련 인증제도에 대해 대한의학회 및 유관학회 이사를 모시고 논의해 보는 시간을 마련하였습니다.

또한 뇌동맥류, 급성 뇌경색 등에 대한 뇌혈관내치료의 새로운 추세에 대한 강의를 통해 우리가 주로 치료하고 있는 질환이 향후 어떤 방향으로 갈지 조망해 보는 시간을 준비하였습니다.

어려운 환경에서도 2021 정기학술대회 및 총회를 준비하느라 수고해 주신 총무, 학술이사를 비롯한 임원진 여러분께 감사드리며, 학회를 위해 물심양면으로 지원해 주신 후원기업 관계자 여러분께도 감사드립니다.

모쪼록 건강 관리에 유의하시고 건강한 모습으로 회원 여러분들을 인천 파라다이스시티에서 뵙기를 고대합니다.

감사합니다.

2021.10

대한뇌혈관내치료의학회 회장 윤 석 만

2020~2021 대한뇌혈관내치료의학회 임원진

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Dr. Mario Martínez-Galdámez graduated in Medicine and Surgery in 2004 from the Complutense University of Madrid. He trained as a Radiology Specialist at the Puerta de Hierro Hospital, Universidad Autónoma de Madrid, with training in Interventional Neuroradiology between 2004 and 2009. He obtained the American certification by the “Educational Commission of Foreign Medical graduates” (ECFMG) in 2013. He is Head of the Neuroradiology Unit at the Valladolid Clinical Hospital from 2012 implementing endovascular care of the Stroke Code, and Radiology Chairman at Hospital La Luz QuironSalud in Madrid. From a research and teaching point of view, he is the author of more than 60 articles in national and international scientific journals and has been a regular principal investigator of clinical trials since 2007. He has made more than 100 presentations in national and international congresses, being also a regular reviewer of the main national and international journals of the speciality. He is member of the main national and international medical societies, member of the Evaluation Committee Madrid-MIT M+Vision Consortium and has completed his executive leadership training at ESADE Business school. Since 2018, he has been recognized as “Fellow of the European Board of Neurointervention” and currently serving as Chair of the “Ad-hoc Skills Training Committee” at ESMINT.

초청연자



Vincent Costalat

Department of Neuro-Vascular Unit, CHU Montpellier -
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[Education]

1997	First Cycle medical studies Exam, University of Medicine(Montpellier)
2007	Medical Doctor Diploma, University of Medicine(Montpellier)
2011	Ph.D, University of Medicine(Montpellier)

[Professional Experience]

2008 - 2011	Senior Registrar, CHU Montpellier
2011 - 2014	Hospital practitioner, CHU Montpellier
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2016 - Present	Head of Neuroradiology Department, CHU Montpellier

08:00-08:45	Registration	
	Opening Remark	윤석만 (대한뇌혈관내치료학회 회장)
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2021 대한뇌혈관내치료의학회 정기학술대회 및 총회

| 2021년 11월 27일(토) | 인천 파라다이스시티호텔 그랜드볼룸

09:00-10:20

Free paper I

Aneurysm

좌장: 고준석 (경희대)
박석규 (순천향대)



Association of the aortic arch calcification on chest X-ray with procedural thromboembolism after coil embolization of cerebral aneurysm

Seung Hwan Kim, Taek Min Nam, Ji Hwan Jang

Department of Neurosurgery, Samsung Changwon Hospital

Objective: Procedural thromboembolism after coil embolization of cerebral aneurysms can occur due to fragmented atherosclerotic plaques in the aortic arch. The purpose of this study was to investigate the relationship between aortic arch calcification (AoAC), observed using preoperative chest X-ray, and procedural thromboembolism after coil embolization of cerebral aneurysms.

Methods: From January 2019 to December 2020, 66 patients underwent coil embolization of cerebral aneurysms at our hospital. AoAC was assessed based on the presence of calcification using a preoperative chest X-ray. Procedural thromboembolism was defined as a new positive lesion on diffusion-weighted imaging within 7 days after the procedure.

Result: Procedural thromboembolism occurred in 34 (51.5%) patients. It was associated with AoAC (calcification [52.9%] vs. no calcification [6.3%], $p < 0.001$), aneurysm type (aneurysm with incorporated branches [63.9%] vs. sidewall aneurysm [36.7%], $p=0.047$), and longer procedural time (100.2 ± 34.1 min vs. 79.7 ± 24.9 min, $p=0.007$). On multivariable logistic regression analysis, AoAC (adjusted odds ratio [OR]: 23.566, adjusted 95% confidence interval [CI]: 3.921–141.654, $p=0.001$) and aneurysm type (adjusted OR: 5.501, adjusted 95% CI: 1.455–20.799, $p=0.012$) were independent risk factors for procedural thromboembolism.

Conclusion: AoAC on preoperative chest X-ray seemed to be associated with a significant increase in the procedural thromboembolism rate. Our study suggested that procedural thromboembolism after coil embolization of cerebral aneurysms might result majorly from the fragmented atherosclerotic plaques in the aortic arch, and preoperative chest X-ray could be a useful tool to predict the risk of procedural thromboembolism.

Endovascular treatment of 1253 middle cerebral artery aneurysms

Hyun-Seung Kang, Kang Min Kim, Sung Ho Lee, Won Sang Cho, Dong Hyun Yoo, Young Dae Cho, Jeoung Eun Kim

Department of Neurosurgery, Seoul National University Hospital

Objective: The middle cerebral artery (MCA) is one of principal sites of intracranial aneurysms, where open surgical treatment and endovascular treatment are available. We aimed to study on the outcomes of endovascular treatment in patients with MCA aneurysms, including both ruptured and unruptured, in a single tertiary referral hospital.

Methods: During the period from December 1997 to June 2021, 1253 MCA aneurysms were treated with endovascular means, including 134 ruptured (10.7%) and 1119 unruptured aneurysms (89.3%). 450 aneurysms (35.9%) were treated in the setting of multiple aneurysms which were treated in the same treatment session. Among the patients with ruptured MCA aneurysms, Hunt and Hess grades were Grade I in 7, Grade II in 68, Grade III in 38, Grade IV in 19, and Grade V in 2.

Result: Various technical treatment methods were used including double microcatheter technique and microcatheter protection technique. Stent assistance were required in 337 aneurysms (26.9%) and sole stenting was used in 5 among them. Balloon remodeling was used in 12. Trapping or segmental occlusion was used in 14 with or without bypass.

Procedure-related events occurred 29.3% (annual range, 0 to 66.7%) in ruptured aneurysms and 6.0% (annual range, 0 to 16.0%) in unruptured aneurysms ($P < 0.00001$). Among patients with ruptured MCA aneurysms, good recovery was achieved in 100% in Grade I patients, 93% in Grade II, 71% in Grade III, 53% in Grade IV, and 0% in Grade V. Among patients with unruptured aneurysms, excellent clinical outcome could be achieved in 99% of patients. One patient with giant MCA aneurysms died after stent-assisted coiling. Among cases where adequate follow-up imaging was available 6 months or more after treatment ($n = 1015$), stable aneurysm occlusion was maintained in 89.0% and major recurrence and/or retreatment occurred in 5.1%.

Conclusion: With proper case selection, endovascular treatment could achieve excellent clinical outcome with an acceptable retreatment rate for patients with unruptured MCA aneurysms. Stricter case selection is required in patients with ruptured MCA aneurysms.

Comparison of prognosis between stent assisted coil embolization and non-stent assisted coil embolization in SAH patient with vasospasm

Jae Won Park

Department of Neurosurgery, Cheonan Chungmu Hospital

Objective: From March to October 2021, 32 coil embolization was performed. Among them, symptomatic vasospasm requiring pharmacologic angioplasty occurred in 5 cases, and when the prognosis was analyzed, it was considered that there was a difference between stent assisted coil embolization and non-stent coil embolization.

Methods: Due to the risk of using a dual antiplatelet in the treatment of SAH caused by ruptured aneurysm, it is a general trend that stent insertion gives psychological resistance to neurosurgeons. Remote site ICH is fatal while using anti platelet agent. Vasospasm management did not artificially lower MAP to maintain CPP, and angioplasty using nimodipine was performed when neurologic symptoms occurred. Among the 5 cases, 4 patients underwent non stent coil embolization and 1 patient underwent stent assisted coil embolization. The prognosis was recorded in 2 patients with mRS 6, 1 with mRS 2, and 2 with mRS 0.

Result: Case 1 patient was treated with non stent coil embolization with Ruptured PcoA an. and Rt. Case 2 patient underwent non stent coil embolization with ruptured ICA bifurcation an., Rt. and angioplasty 3 times. mRS 0 was recorded. In Case 3, stent assisted coil embolization was performed with Ruptured PcoA An., Rt., and angioplasty was performed twice, and the current prognosis was recorded as mRS 2. Case 4 patient underwent non-stent coil embolization with ruptured DACA An., Rt. and angioplasty 6 times, but died. Case 5 patient underwent non stent coil embolization with ruptured PcoA an., Rt. and angioplasty twice, but died.

Conclusion: There is no reason to avoid using stents in the treatment of young age, ACA aneurysm, and ruptured aneurysm patients with high Fisher grade.

Avatar, the digital twin : application in neuroendovascular surgery

Wonki Yoon

Department of Neurosurgery, Guro Hospital, Korea University

Objective: The complexity of cerebro-vasculature anatomy frequently makes it difficult to understand what is happening during endovascular treatment in spite of technological development of angiography machine.

Methods: The procedure completely depends on and follow the guide of the images displayed on the 2-dimensional (2-D) high-end flat monitor. Vessels and the target lesion hide and overlap each other. These features diminish the surgeon's confidence about the safety and procedural success. 3-dimensional (3-D) images are also helpful but they are limited on the 2-D screen.

Result: Mixed reality is a new technology as a combination of virtual reality and augmented reality. Holographic 3-D vascular avatar, the digital twin vascular model is loaded on the transparent visor and it looks like real 3-D model in front of human eyes with the real world.

Conclusion: Here, a case series of coil embolization of unruptured intracranial aneurysms performed with aid of holographic mixed reality is presented. The merits of application of mixed reality would be briefly discussed.

Morphological and clinical risk factors for the rupture of posterior communicating artery aneurysms: significance of fetal-type posterior cerebral artery

Ahmed Alsanbari, Yong Sam Shin, Jai Ho Choi

Department of Neurosurgery, Seoul St Mary's Hospital, The Catholic University of Korea

Objective: Posterior communicating artery (PcomA) aneurysm can be classified into sidewall or bifurcation types based on the anatomical variation of fetal-type posterior cerebral artery (fPCA). The aim of this study was to investigate the significance of fPCA as an independent risk factor for the rupture of PcomA aneurysm and to evaluate other associated morphological and clinical risk factors.

Methods: We retrospectively reviewed clinical and radiological findings of 255 patients with PcomA aneurysms, which were treated in a single tertiary institute between January 2009 and December 2016. Univariate and multivariate analyses were performed to evaluate the associations between morphological and clinical variables and rupture status. Subgroup analysis was also performed based on the aneurysms with and without fPCA.

Result: Fifty-five out of 255 PcomA aneurysms (21.6%) were associated with fPCA. Multivariate logistic regression analysis showed that the superior direction of aneurysm dome (OR 9.106, $p=0.007$), the presence of a bleb (OR 4.780, $p<0.001$), a high aspect ratio (OR 1.878, $p=0.045$), and fPCA (2.101, $p=0.040$) were significantly associated with PcomA aneurysm rupture. In the fPCA group, only the presence of a bleb varied significantly between ruptured and unruptured PcomA aneurysms. However, in the non-fPCA group, larger aneurysms, the superior direction of dome, the presence of a bleb, and a high aspect and dome-to-neck ratio were significantly higher in the ruptured aneurysm group than in the unruptured aneurysm group.

Conclusion: The results demonstrate that fPCA may be an independent risk factor for rupture, especially together with the presence of a bleb.

Evaluation of stent apposition in the LVIS Blue stent-assisted coiling of distal internal carotid artery aneurysms: correlation with clinical and angiographic outcomes

Min-Yong Kwon, Young San Ko, Sae Min Kwon, Chang-Hyun Kim, Chang-Young Lee

Department of Neurosurgery, Keimyung University Dongsan Hospital

Objective: To evaluate the stent apposition of the LVIS Blue in distal internal carotid artery (ICA) aneurysms, examine its correlation with clinical and angiographic outcomes, and determine the predictive factors of ischemic adverse events (IAE) related to stent-assisted coiling.

Methods: We retrospectively analyzed a prospectively maintained database of 183 consecutive patients between January 2017 and February 2020. The carotid siphon from cavernous ICA to ICA terminus was divided into posterior, anterior, and superior bends. The anterior bends were categorized into angled (V) and non-angled types (C, U, and S) depending on morphology and measured angles. Complete (CSA) and incomplete stent apposition (ISA) were evaluated using unsubtracted angiography and flat-panel detector computed tomography. Dual antiplatelet therapy (aspirin 200mg and clopidogrel 75mg) was administered. Clopidogrel resistance was defined as less-responder ($\geq 10\%$, $< 40\%$) and non-responder ($< 10\%$) based on the percentage inhibition (%INH) of the VerifyNow system. IAE included intraoperative in-stent thrombosis, transient ischemic attack, cerebral infarction, and delayed in-stent stenosis. Multivariate logistic regression analysis was used to determine the predictive factors of ISA and IAE.

Result: There were 33 ISAs (18.0%) and 27 IAEs (14.8%). The anterior bend angle was narrower in ISA ($-4.16 \pm 25.18^\circ$) than in CSA ($23.52 \pm 23.13^\circ$) ($p < 0.001$). The V- and S-type were independently correlated with ISA ($p < 0.001$). However, treatment outcomes including IAE (15.3% vs 12.1%), aneurysmal complete occlusion (91.3% vs 88.6%), and recanalization (none of them) did not differ between CSA and ISA ($p > 0.05$). The %INH of 27 IAEs ($13.78 \pm 14.78\%$) was significantly lower than that of 156 non-IAEs ($26.82 \pm 20.23\%$) ($p < 0.001$). The non-responder for clopidogrel was rather the only significant predictive factors for IAE ($p = 0.001$).

Conclusion: The angled and tortuous anatomical peculiarity of carotid siphon caused ISA of the LVIS device, however it did not affect clinical and angiographic outcomes, while the non-responder for clopidogrel affected the IAE related to stent-assisted coiling.

Mass effect after using a flow diverter for symptomatic unruptured large and giant cavernous or paraclinoid internal carotid artery aneurysms

Jung Cheol Park, Gung Ju Kim, Eun Ji Moon, Won Hyoung Park, Joon Ho Byun, Deok Hee Lee, Jae Sung Ahn

Department of Neurosurgery, University of Ulsan College of Medicine, Asan Medical Center

Objective: Mass effect associated with large or giant intracranial aneurysms is one of the problems for traditional endovascular treatments. The flow diverter (FD) is a new device that avoids the need for dense coiling. This study was performed to investigate whether use of FDs can relieve the aneurysmal mass effect caused by aneurysmal compressional symptoms.

Methods: We retrospectively evaluated patients with compressional symptoms caused by unruptured aneurysms who underwent endovascular treatment with an FD at our center from January 2014 to June 2021. Follow-up neurological examinations were performed to observe variations of symptoms.

Result: In total, 46 patients with 46 large or giant cavernous (n=35) and paraclinoid (n=11) aneurysms were treated by FDs during the periods. Among 46 patients, technical success of FD placement was achieved in 45 patients. Initial presentation of compressional symptoms was observed in 22 patients (5 visual field defect, 15 diplopia with/without ptosis, 2 facial hypesthesia). All 45 patients underwent the last clinical follow-up at least 6months. Regarding compressional symptoms of optic compression, 3 (60.0%) patients showed improvement, 2 were fully recovered, and 1 showed incomplete improvement. However, two (40.0%) patients showed no change, and one showed newly developed worsening symptoms without preoperative visual symptom. Of these 15 patients with diplopia, the improvement of symptoms showed in 9 (60.0%), no significant change in 4 (26.67%) and aggravation of the symptoms in one. The two patients with facial sensory change were all showed improvement of symptoms. The size of the aneurysm, a duration of symptoms, association with partial thrombosis and recanalized growing after first coil embolization might contribute to unfavorable outcomes of mass effect-related symptoms.

Conclusion: Use of the FD in large of giant aneurysms might help to alleviate the compressional symptoms caused by intracranial aneurysms.

Results of double Low-Profile Visualized Intraluminal Support (LVIS) Blue stenting for treatment of fusiform cerebral aneurysms

Seung Pil Ban, O-Ki Kwon, Young Deok Kim, Jang Hun Kim

Department of Neurosurgery, Seoul National University Bundang Hospital

Objective: The Flow diversion technique is increasingly used for reconstructive endovascular treatment of fusiform cerebral aneurysms. In the computational fluid dynamics, the double Low-profile Visualized Intraluminal Support (LVIS) Blue stenting resulted in a better flow diverting effect than a single flow diverter. The aim of this study was to describe the clinical and angiographic outcomes of LVIS Blue double stenting for fusiform cerebral aneurysms.

Methods: Between March 2016 and July 2020, the double LVIS Blue stenting was attempted in 25 fusiform cerebral aneurysms. The patient's medical records and radiological images were carefully reviewed.

Result: The technical success rate was 100% (25/25). Six aneurysms (24.0%) were located in the anterior circulation and 19 aneurysms (76.0%) were in the posterior circulation. Intraprocedural thromboembolic complications occurred in 1 patient (4.0%). During the follow-up period (26.1 ± 14.8 months), there were no deaths and delayed complications. The mean angiographic follow-up duration was 24.8 ± 13.3 months. The final follow-up complete occlusion rates were 88.0%. One (4.0%) patient experienced continued filling of the aneurysm required retreatment. There was no significant in-stent stenosis and branch occlusion covered by stents.

Conclusion: The double LVIS Blue stenting technique is a feasible and relatively safe endovascular treatment for fusiform cerebral aneurysms. Further study in a larger population may be warranted.

2021 대한뇌혈관내치료의학회 정기학술대회 및 총회

| 2021년 11월 27일(토) | 인천 파라다이스시티호텔 그랜드볼룸

10:40-12:00

Symposium I

New leap of KoNES as a member of KAMS

좌장: 김범태 (순천향대)
윤석만 (순천향대)



KoNES 대한의학회 가입과정 및 향후과제

장 철 훈

의학회 이사, 영남대

대한 의학회 가입 과정 및 향후 과제

KoNES 부회장/의학회 이사
영남의대 장 철 훈

목 차

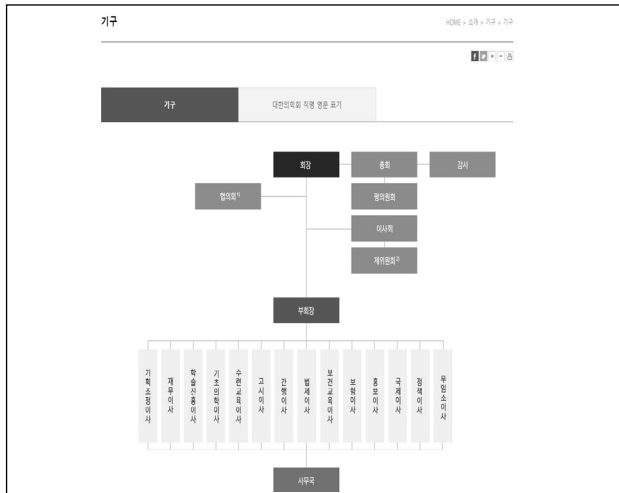
- 대한의학회
- 회원학회 인준 필요성
- 인준 경과 보고
- 향후 과제

• 대한의학회

- 회원학회 인준 필요성
- 인준 경과 보고
- 향후 과제

대한의학회





대한의학회 목적

• 의학 발전에 기여

- 1) 의학 연구기반 조성
- 2) 학술활동 지원 (online 정기학술대회 지원)
- 3) 의학의 전문성 강화
- 4) 교육 및 정책개발

대한의학회 활동

- 회원 학회 가입 승인
- 가입 학회 명칭(전문 과목) 및 회칙 개정 승인
- 전문의자격시험 관장
- 전공의 수련 실태 조사
- 세부 / 분과 전문의 제도 인증
- 전문 학회 지도 전문의 교육
- 임상진료지침 개발 및 평가
- 일차의료용 근거기반 디지털 의료기기 가이드라인 제정
- Journal of Korean Medical Science 발간
- 의학회 임원 아카데미 / 대한의학회 명예의 전당 운영

• 대한의학회

• 회원학회 인준 필요성

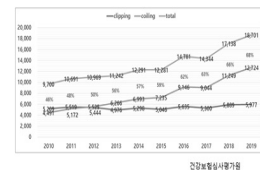
- 인준 경과 보고
- 향후 과제

대한의학회 회원 인준 필요 ?

기계적 혈전제거술 현황



뇌동맥류 치료 추세



대내외적 대표성 인정 !!

• 대한의학회

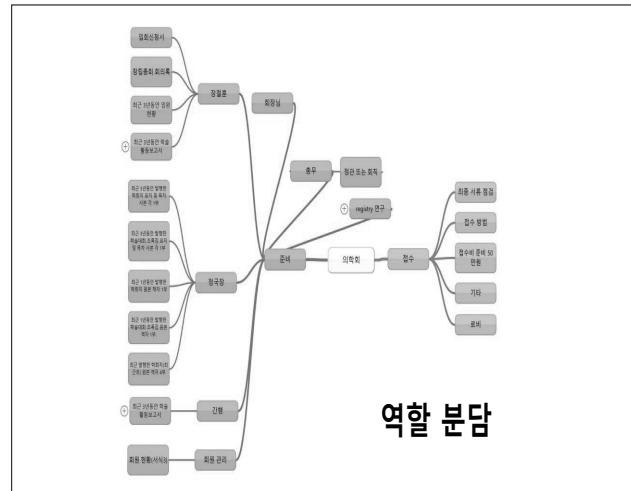
• 회원학회 인준 필요성

• 인준 경과 보고

- 향후 과제

준비 경과

날 짜	내 용
2019. 12월	고준석 전임 회장의 제언 (2019년도 SKEN 정기학술대회)
1월 3~4일	KoNES 신년 이사회 ==> 2020 의학회 가입 신청 추진 결정
2월 ~7월	회장, 총무, 인증의 제도
	총무, 정관 및 회칙, 2017~ 임원 현황
	다기관임상, registry 연구 (과거 ~ 향후)
	간행, 2017~ 학회지 발간
	회원관리, 회원 현황 (다학제 회원 등록)
	의학회, 입회 신청서, 창립총회 회의록, 학회 현황, 학술 활동 보고서
	정국장, 서류 전반
07월 30일	offline 최종 점검 회의 (회장, 총무, 학회지 편집, 회원관리, 의학회, 정국장)
08월 21일	총무 이사 확인 후 의학회 가입 신청 서류 발송
09월 11일	의학회 서류 보충 요구 (JCEN서 KSCVS vs KoNES 논문 구분 / KoNES를 통한 편집위원 수)
09월 14일	의학회를 통한 유관 / 유사 학회의 의견 수렴 요청 메일 발송
10월 07일	의학회 서류 보충 요구 (KoNES 의견서, 합의문)
10월 16일	의학회 심사



입회 서류 제출 (2020. 8. 21.)

- 대한 의학회 입회 신청서
- 구비 서류
 1. 정관 또는 회칙 1부.
 2. 창립총회 회의록 1부.
 3. 학회 현황(서식2) 1부.
 4. 회원 현황(서식3) 1부.
 5. 최근 3년동안 임원 현황(서식4) 각 1부.
 6. 최근 3년동안 학술활동보고서(서식5) 각 1부.
 7. 최근 3년동안 발행한 학회지 표지 및 목차 사본 각 1부.
 8. 최근 3년동안 발행한 학술대회 초록집 표지 및 목차 사본 각 1부.
 9. 최근 1년동안 발행한 학회지 원본 책자 1부.
 10. 최근 1년동안 발행한 학술대회 초록집 원본 책자 1부.
 11. 최근 발행한 학회지(최근호) 원본 책자 4부.

유관 / 유사 학회 의견서 (2020. 9. 14.)

- 대한신경외과학회
- 대한뇌혈관외과학회
- 대한뇌졸중학회
- 대한신경중재치료의학회

보완 사항 I (2020. 9. 11.)

※ 통합(연합)학술지 최소 기준(아래의 모든 요건을 충족하여야 함)

① 발행처를 공동으로 기재 또는 공동으로 발행한 공식 학술지임을 명기

② 색선택 편집위원 또는 편집위원의 균형적인 참여 (20 / 20)

(참여학회가 N일 경우 : *전체편집위원수 / N *의 50% 이상, 최소 1인 이상)

③ 색선택 편집과 각 참여학회 해당 논문이 최소 연 8편(중설, 원지)이상 게재

- 단, 여러 나라가 공동으로 발행하는 국제 학술지의 경우는 참여학회가 N일 경우 : *연간 전체논문편수 / N *의 50% 이상 또는 해당학회 국내 연구자의 논문이 8편(중설, 원지) 이상

- 간행이사가 정리

보완 사항 II (2020. 10. 07.)

- KSIN과의 통합 학회를 위한 KoNES의 노력 여부
- 총무, 회장님이 정리 ; 2020. 10. 7. 의학회로 보충 자료 제출
KSIN과의 통합 추진을 위한 KoNES의 노력
이전 SKEN-KSIN 합의서
유사 학회와의 차별성

- 2020. 10. 16.



- 대한의학회
- 회원학회 인준 필요성
- 인준 경과 보고
- **향후 과제** (준회원 인정기간, 3년)

정회원 학회로의 승격 준비

知彼知己百戰不殆

- 정회원 보류 사유 해결
- 대한의학회의 요구(회원 학회 평가 항목)를 고려한 전략적 접근

대한의학회 평가 항목

[학회지 평가] <95점 ~ 30점>	
기본항목 (70점 ~ 30점)	추가항목 (25점 ~ 0점)
1. 년간 발간 횟수(20~35점) ~ 1~2회 (20점) ~ 3~4회 (25점) ~ 5~6회 (30점) ~ 7회 이상 (35점) 2. 년간 게재논문편수(10~20점) ~ 19편 이하 (10점) ~ 20~39편 (15점) ~ 40편 이상 (20점) 3. 게재 논문 심사제도(5점) ~ 유(5점), 무(0점) 4. 의학영 발간 의학논문 출판윤리 가이드 라인 존중 지키(5점) ~ 유(5점), 무(0점) 5. 학회지 및 고 규정에 대한의사회의 발간 최신 용어집을 존중한다는 것을 알기 (5점) ~ 유(5점), 무(0점)	6. 코리(리베드) 등재(20점) ~ 유(20점), 무(0점) 7. Index Medicus(Medline/PubMed), SCI, SCI-E, Scopus 등 등재(5점) ~ 유(5점), 무(0점)

학회지

- 학회지 승급을 위한 KSCVS와의 협력

대한의학회 평가 항목

[국제 학술활동 및 국제활동 역량강화] <35점 ~ 0점>	
기본항목 (20점 ~ 0점)	추가항목 (15점 ~ 0점)
1. 영문 홈페이지 운영(10점) ~ 유(10점), 무(0점) 2. 영문 잡지 발간(10점) ~ 유(10점), 무(0점)	3. 국제 학술대회 개최(1~5점) ~ 개최 유(1~5점), 무(0점) 4. 그 외 국제학회 강연노력(10점) • 영어 진행 / 연구 결과 영어 발표 세션 ~ 유(5점), 무(0점) • 외국학자 초청 강연 ~ 유(5점), 무(0점)

국제 학술 활동 (2021)

- 취약점
- 5.29 BNS SYMPOSIUM (부산 파크하얏트)
국내 71, 해외 128, 총 227명
- 영어 홈페이지 운영 / 영어 발표 session 신설
- WFITN 유치 노력

국내 학술 활동 (2021 under pandemic)

간지년월일 (간지년-간지월)		음력월 (음년-음월)
1. 음력 5월 10일 (음5월10일) 간지5월 음력 5월 10일 1-4월 23일 5월-10월 23일 11월-20월 23일 21월-1월 14일 2월-3월 14일 4월-5월 14일	5. 음력 5월 10일 (음5월10일) 음력 5월 10일 음력 5월 10일 음력 5월 10일 1-4월 23일 7. 음력 5월 10일 (음5월10일) 간지5월	
2. 음력 5월 11일 (음5월11일) 간지5월 음력 5월 11일 1-4월 24일 5월-10월 24일 11월-20월 24일 21월-1월 15일 2월-3월 15일 4월-5월 15일	5. 음력 5월 11일 (음5월11일) 음력 5월 11일 음력 5월 11일 음력 5월 11일 1-4월 24일 7. 음력 5월 11일 (음5월11일) 간지5월	
3. 음력 5월 12일 (음5월12일) 간지5월 음력 5월 12일 1-4월 25일 5월-10월 25일 11월-20월 25일 21월-1월 16일 2월-3월 16일 4월-5월 16일	5. 음력 5월 12일 (음5월12일) 음력 5월 12일 음력 5월 12일 음력 5월 12일 1-4월 25일 7. 음력 5월 12일 (음5월12일) 간지5월	
4. 음력 5월 13일 (음5월13일) 간지5월 음력 5월 13일 1-4월 26일 5월-10월 26일 11월-20월 26일 21월-1월 17일 2월-3월 17일 4월-5월 17일	5. 음력 5월 13일 (음5월13일) 음력 5월 13일 음력 5월 13일 음력 5월 13일 1-4월 26일 7. 음력 5월 13일 (음5월13일) 간지5월	
5. 음력 5월 14일 (음5월14일) 간지5월 음력 5월 14일 1-4월 27일 5월-10월 27일 11월-20월 27일 21월-1월 18일 2월-3월 18일 4월-5월 18일	5. 음력 5월 14일 (음5월14일) 음력 5월 14일 음력 5월 14일 음력 5월 14일 1-4월 27일 7. 음력 5월 14일 (음5월14일) 간지5월	
6. 음력 5월 15일 (음5월15일) 간지5월 음력 5월 15일 1-4월 28일 5월-10월 28일 11월-20월 28일 21월-1월 19일 2월-3월 19일 4월-5월 19일	5. 음력 5월 15일 (음5월15일) 음력 5월 15일 음력 5월 15일 음력 5월 15일 1-4월 28일 7. 음력 5월 15일 (음5월15일) 간지5월	
7. 음력 5월 16일 (음5월16일) 간지5월 음력 5월 16일 1-4월 29일 5월-10월 29일 11월-20월 29일 21월-1월 20일 2월-3월 20일 4월-5월 20일	5. 음력 5월 16일 (음5월16일) 음력 5월 16일 음력 5월 16일 음력 5월 16일 1-4월 29일 7. 음력 5월 16일 (음5월16일) 간지5월	
8. 음력 5월 17일 (음5월17일) 간지5월 음력 5월 17일 1-4월 30일 5월-10월 30일 11월-20월 30일 21월-1월 21일 2월-3월 21일 4월-5월 21일	5. 음력 5월 17일 (음5월17일) 음력 5월 17일 음력 5월 17일 음력 5월 17일 1-4월 30일 7. 음력 5월 17일 (음5월17일) 간지5월	
9. 음력 5월 18일 (음5월18일) 간지5월 음력 5월 18일 1-4월 31일 5월-10월 31일 11월-20월 31일 21월-1월 22일 2월-3월 22일 4월-5월 22일	5. 음력 5월 18일 (음5월18일) 음력 5월 18일 음력 5월 18일 음력 5월 18일 1-4월 31일 7. 음력 5월 18일 (음5월18일) 간지5월	
10. 음력 5월 19일 (음5월19일) 간지5월 음력 5월 19일 1-4월 32일 5월-10월 32일 11월-20월 32일 21월-1월 23일 2월-3월 23일 4월-5월 23일	5. 음력 5월 19일 (음5월19일) 음력 5월 19일 음력 5월 19일 음력 5월 19일 1-4월 32일 7. 음력 5월 19일 (음5월19일) 간지5월	
11. 음력 5월 20일 (음5월20일) 간지5월 음력 5월 20일 1-4월 33일 5월-10월 33일 11월-20월 33일 21월-1월 24일 2월-3월 24일 4월-5월 24일	5. 음력 5월 20일 (음5월20일) 음력 5월 20일 음력 5월 20일 음력 5월 20일 1-4월 33일 7. 음력 5월 20일 (음5월20일) 간지5월	
12. 음력 5월 21일 (음5월21일) 간지5월 음력 5월 21일 1-4월 34일 5월-10월 34일 11월-20월 34일 21월-1월 25일 2월-3월 25일 4월-5월 25일	5. 음력 5월 21일 (음5월21일) 음력 5월 21일 음력 5월 21일 음력 5월 21일 1-4월 34일 7. 음력 5월 21일 (음5월21일) 간지5월	
13. 음력 5월 22일 (음5월22일) 간지5월 음력 5월 22일 1-4월 35일 5월-10월 35일 11월-20월 35일 21월-1월 26일 2월-3월 26일 4월-5월 26일	5. 음력 5월 22일 (음5월22일) 음력 5월 22일 음력 5월 22일 음력 5월 22일 1-4월 35일 7. 음력 5월 22일 (음5월22일) 간지5월	
14. 음력 5월 23일 (음5월23일) 간지5월 음력 5월 23일 1-4월 36일 5월-10월 36일 11월-20월 36일 21월-1월 27일 2월-3월 27일 4월-5월 27일	5. 음력 5월 23일 (음5월23일) 음력 5월 23일 음력 5월 23일 음력 5월 23일 1-4월 36일 7. 음력 5월 23일 (음5월23일) 간지5월	
15. 음력 5월 24일 (음5월24일) 간지5월 음력 5월 24일 1-4월 37일 5월-10월 37일 11월-20월 37일 21월-1월 28일 2월-3월 28일 4월-5월 28일	5. 음력 5월 24일 (음5월24일) 음력 5월 24일 음력 5월 24일 음력 5월 24일 1-4월 37일 7. 음력 5월 24일 (음5월24일) 간지5월	

- 1.21 신년집담회 (온라인) 93명 접속
- 2.27 춘계보수교육 및 ASTRO발기인 대회 (차바이오) 학회장 80, 온라인 60
- 3.11 월례 집담회 (온라인) 89명
- 3.13 베이직코스1 (차바이오) 64명 수강생 20명
- 4.03 베이직코스2 (대웅제약배허울) 40명, 수강생 32명
- 4.09 부울경지회 학술대회 (부산파라다이스) 현장 32명, 온라인 20
- 4.23 ASTRO창립 심포지엄 (차바이오) 현장 49, 온라인 31
- 5.04 대한의학회 인준서 수령 및 감담회

국내 학술 활동 (2021 under pandemic)

- 6.25-26 ASCENT (강릉 세인트존스)
- 7.16 TSC 인증 패널 토의 (뇌졸중학회, 온라인)
- 7.23-24 광주전라지회 학술대회 (익산 웨스턴 라이프 호텔) WEB training course(원광대병원)
- 8.14 Advanced training course (오송 메드트로닉 이노베이션센터) - Pipeline 10 명 참가
- 9.4 대전충청지회 학술대회 (대전 오노마호텔) 유나이티드 심포지엄
- 10.1 KoNES-KSCVS 합동연수교육 및 추계보수교육 (ARCS) (차바이오)
- 10.14 베이직코스3 (송도 컨벤시아) - KNS 추계학술대회 워크샵
- 10.29 인천지회 학술대회 (쉐라톤 그랜드) 대웅바이오 심포지엄
- 11.13-14 오즈가 Prevent symposium (용산 드래곤시티)
- 11.26-27 전기학술대회 및 추계

국내 학술 활동 (2021)

- 우수 발표 논문 시상 (ASCENT, 정기학술대회)
- 우수 논문 시상 (ASCENT(young neurosurgeon), 정기학술대회)
- 우수 연구 과제 지원

대한의학회 평가 항목

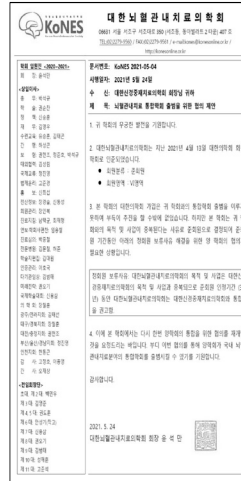
[학회 운영 및 사회기여] <35명~0명>	
기본항목 (20명~0명)	추가항목 (15명~0명)
1. 학회 상근 직원 채용(10명) - 위(10명), 무(0명) 2. 학회 홈페이지 개설과 운영(10명) - 위(10명), 무(0명)	3. 학회 사무실 보유(5명) - 위(5명), 무(0명) 4. 의학발전과 사회기여 활동실적(10명) (실적 3명)

학회 운영 및 사회 기여 (대국민 홍보 사업)

- 대국민 홍보: 신경외과 신사부 (YouTbe)

정회원 학회로의 승격 준비

- 학회 역사 정리의 중요성
(연보 발행, KoNES registry(<https://www.konesregistry.com/>))
- KSIN과의 관계 재정립 (정회원 보유 사유)

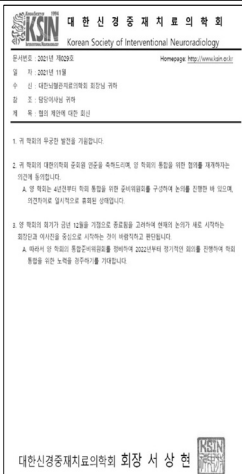


1) KoNES → KSIN

2021. 05. 24.

대한학회회 준회원 인준 (2021. 04. 13.)

KSIN과의 통합을 논의하기 위한 위원회 구성 제안



2) KoNES → KSIN

2021. 10. 중순

양학회 현직/차기 핵심 집행부간의
"가벼운 만남" 제의

3) KSIN → KoNES

2021. 11. 초순

2021. 12.기점 현집행부 임기 종료

차기집행부와 2022년부터 통합준비위원회를
구성하고 정기적 회의 진행을 기대합니다

정회원 학회로의 승격 준비

- 회원 역량 강화
(연수/보수 교육, KoNES CME program)
- 회원 정도 관리
(<https://www.konesonline.or.kr/certification>, 인증의, 240명 / 인증기관, 86개소)
- 뇌혈관 전문병원(4병원) 확충 및 회원들의 일자리 창출
- 선도적이고 주도적 국가 정책 개발 및 정책 결정 과정 참여



KoNES CMEprogram

PC: <https://cme.konesonline.or.kr/>
Mobil: <https://m-cme.konesonline.or.kr/>

96개 강의

정회원 학회로의 승격 준비

- 회원 역량 강화
(연수/보수 교육, KoNES CME program)
- 회원 정도 관리
(<https://www.konesonline.or.kr/certification>, 인증의, 240명 / 인증기관, 86개소)
- 뇌혈관 전문병원(4병원) 확충 및 회원들의 일자리 창출
- 선도적이고 주도적 국가 정책 개발 및 정책 결정 과정 참여
- ➔ 체계적이며 고품격 학회 / 회원이 자부심을 느끼게 하는 학회

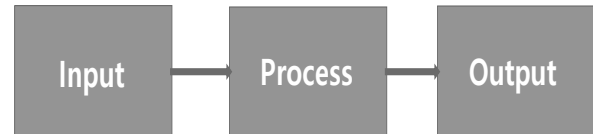
KoNES

대한의학회 준회원 인준

➔ 정회원 학회로 !!

Not Result, But Jump-Up

KoNES



회원 모두의
관심, 기여, 지도/편달

집행부의 리더십
학회 역량 강화

성과

대한의학회의 사업 및 역할 (세부전문의 및 인증제도에 대한 고찰)

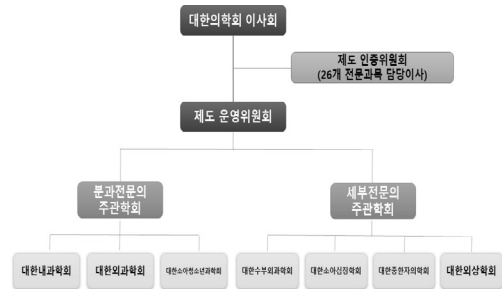
염 호 기

대한의학회 정책이사, 인제대

대한의학회의 사업 및 역할 (세부전문의 및 인증제도에 대한 고찰)

대한의학회
세부,분과전문의제도 운영위원회
정책이사 염 호 기
인제대학교 서울백병원 호흡기내과

대한의학회 세부 분과전문의 제도 조직도



세부/분과전문의 제도 (재)인증 신청절차

- ① 주관학회
 - 분과학회 신청, 주관학회 의견청취
 - 이사회 상정, 평의회 또는 총회 승인 및 규정 개정
 - 대한의학회 신청
 - ② 대한의학회
 - 신청서 검토 (서류검토, 절차검토, 준비상황 확인, 주관학회면담)
 - 신청서 접수 (서류확인, 절차확인, 연관학회 의견조회, 수련기관확인, 실사)
 - 세부/분과전문의 운영위원회 - 이사회 - 세부분과전문의제도위원회 승인
 - ③ 세부/분과전문의 제도 주관학회 인증서 교부 - 대한의학회
 - 초기 2년간 매년 실사 실시 또는 첫 인증 후 차기 년도 실사 실시
 - 이후 매 5년 주기로 재인증
 - ④ 재인증 절차
 - 재인증 절차 고지 인증 만료 6개월 전
 - 재인증을 위한 서류 제출 및 검토 : 인증만료 3개월 전
 - 재인증을 위한 실사 : 인증 만료 2개월 전
 - 재인증을 위한 운영위원회-이사회-제도위원회 승인
- ※ 재인증 심사의 판정 (중복 가능)
- ① 5년 승인 ② 서류 보완 ③ 제도 보완, 수정 후 결과 보고
 - ④ 1년 후 재심사

제도 인증 필수 사항 - 수련과 자격인정에 관한 규정 -

1. 수련 및 자격 인정에 관한 규정
2. 학술 및 연수교육에 관한 시행 규정
(수련교과과정, 수련지침, 교육지침 등 포함)
3. 자격인정시험에 관한 시행 규정
4. 수련병원 또는 수련기관 지정에 관한 시행 규정
5. 지도전문의의 자격에 관한 기준
6. 제도운영에 필요한 업무를 관장하는 위원회 등의 조직에 관한 규정
7. 기타 위원회가 필요하다고 정한 규정

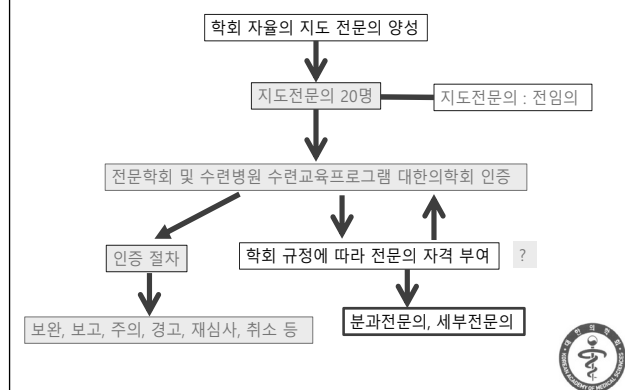
분과/세부 전문의 제도 도입 타당성 검증

- **필요한가?**
 - 세부 및 분과전문의 필요성에 대한 근거 제시
 - 인증제도 도입 절차 및 원칙 준수
 - 세부 및 분과 전문의 수요
 - 전문의와 전임의 현황 및 변화
 - 재정 건전성 및 지속가능성 근거 제시
- **체계가 있고 관리되고 있는가?**
 - 수련 교육 체계와 프로그램
 - 자격 인증 기준 및 재인증 기준
 - 연구, 교육, 수련 프로그램
 - 자격, 고시, 재인증 관리
 - 선진 교육 목표 설정
 - 수련 교육 기관 및 지도전문의 자격 관리

주관학회 관리 문제

- **분과전문의 주관학회와 분과학회**
 - 실무와 권한에 대한 규정과 절차
 - 전문성과 행정적 관리 업무 규정
 - 재정 및 인적 자원의 문제
- **세부전문의의 문제 : 개별 학회간의 융합**
 - 학회간 소통 문제, 학회 회무의 연속성
 - 윤번제 학회장의 관심도를 제도적으로 보장
 - 재정 및 인적자원의 문제
- **전문의 양성 과정에서 전담 의료기관의 문제**
 - 지도전문의 관리의 문제
 - 전임의 교육프로그램 관리의 문제

분과전문의, 세부전문의 신규도입 절차



분과/세부전문의제도의 목적

- **전문분야의**
 - 우수한 자질과 능력을 갖춘 임상의를 양성
 - 학문(교육, 연구)과 의료기술의 발전에 공헌
 - 의사 개인의 자기 발전을 도모
 - 국민보건향상에 기여함

관리 되고 있는가?

- **Professionalism**
 - A specialized body of knowledge that its members must teach and expand; by a code of ethics and a duty of service that in medicine, puts patient care above self-interest; and by the privilege of self-regulation granted by society.

분과전문의와 세부전문의 현황

- **분과전문분야**
 - 26개 전문과목학회 1개의 전문과목 분야 범위 내에서 분과된 전문분야
 - 내과9(1992)/소아과8(2006)/외과5(2012)
- **세부전문분야**
 - 2개 이상의 전문과목 분야가 참여한 세부전문분야
 - 수부외과(2005)/소아청소년심장(2007)
 - 중환자의학(2009)/ 외상학(2011)

대한의학회 분과전문의 제도인증 현황

2018. 11 현재

학회명	분과 전문분야명	최초 인증일	전문의수	인증기간
대한내과학회 (9개 분과)	내과 소화기 분과	2004. 7. 14	3110	2004. 7. 14 - 2024. 6. 30
	내과 순환기 분과		1238	
	내과 호흡기 분과		702	
	내과 내분비·대사 분과		623	
	내과 심장 분과		803	
	내과 혈액종양 분과		977	
	내과 감염 분과		274	
	내과 알레르기 분과		152	
	내과 류마티스 분과		394	
대한소아과학회 (8개 분과)	소아청소년과 감염 분과	2006. 3. 9	87	2006. 3. 9 - 2026. 3. 8
	소아청소년과 내분비 분과		130	
	소아청소년과 소화기영양 분과		98	
	소아청소년과 신장 분과		127	
	소아청소년과 신생아 분과		198	
	소아청소년과 신장 분과		62	
	소아청소년과 혈액종양 분과		148	
	소아청소년과 혈액종양 분과		105	
	소아청소년과 혈액종양 분과		293	
대한외과학회 (5개 분과)	외과 대장항문 분과	2012. 11. 13	649	2017. 11. 13 - 2022. 11. 12
	외과 소아 분과		57	
	외과 위장관 분과		228	
	외과 흉부외과 분과		479	
	외과 소아 분과		57	

* 인증기간은 5년이며, 인증기간 만료 3개월 전에 재인증절차에 의해 재인증을 받아야 한다.

대한의학회 세부전문의 제도인증 현황

2018. 11 현재

학회명	세부전문분야명	최초 인증일	전문의수(2018.11)	인증기간
대한수부외과학회	수부외과	2005. 6. 14	262	2005. 6. 14 - 2025. 6. 13
대한소아심장학회	소아청소년심장	2006. 3. 9	147	2006. 3. 9 - 2022. 3. 8
대한중환자의학회	중환자의학	2008. 4. 15	1584	2008. 4. 15 - 2023. 4. 14
대한외상학회	외상학	2010. 3. 9	258	2010. 3. 9 - 2020. 3. 8

* 인증기간은 5년이며, 인증기간 만료 3개월 전에 재인증절차에 의해 재인증을 받아야 한다.

목적에 위배되는 사항

1. 전문 또는 진료과목의 표방
(분과전문과목, 세부전문과목의 표방)
2. 타 전공의사의 의료행위 제한이나 업무독점
3. 경제적 수익증대
병·의원의 선전, 환자유치의 수단, 의료수가의 반영 등
4. 학회의 위상 강화 및 회세 확장

의료법 제77조 (전문의)

- ① 의사·치과의사 또는 한의사로서 전문의가 되려는 자는 대통령령으로 정하는 수련을 거쳐 보건복지부장관에게 자격 인정을 받아야 한다. <개정 2008. 2. 29., 2010. 1. 18.>
- ② 제1항에 따라 전문의 자격을 인정받은 자가 아니면 전문과목을 표시하지 못한다. 다만, 보건복지부장관은 의료체계를 효율적으로 운영하기 위하여 전문의 자격을 인정받은 치과의사와 한의사에 대하여 종합병원·치과병원·한방병원 중 보건복지부령으로 정하는 의료기관에 한하여 전문과목을 표시하도록 할 수 있다. <개정 2008. 2. 29., 2009. 1. 30., 2010. 1. 18.>
- ③ 삭제 <2016. 12. 20.>
- ④ 전문의 자격 인정과 전문과목에 관한 사항은 대통령령으로 정한다. <개정 2011. 4. 28.>

전문의의 수련 및 자격 인정 등에 관한 규정

제3조(전문의의 전문과목) 전문의의 전문과목은 내과, 신경과, 정신건강의학과, 외과, 정형외과, 신경외과, 흉부외과, 성형외과, 마취통증의학과, 산부인과, 소아청소년과, 안과, 이비인후과, 피부과, 비뇨의학과, 영상의학과, 방사선종양학과, 병리과, 진단검사의학과, 결핵과, 재활의학과, 예방의학과, 가정의학과, 응급의학과, 핵의학 및 직업환경의학과로 한다. <개정 2011. 11. 23., 2017. 11. 21.>

= 26개 전문과목

- 세부/분과 전문과목의 표방 ?

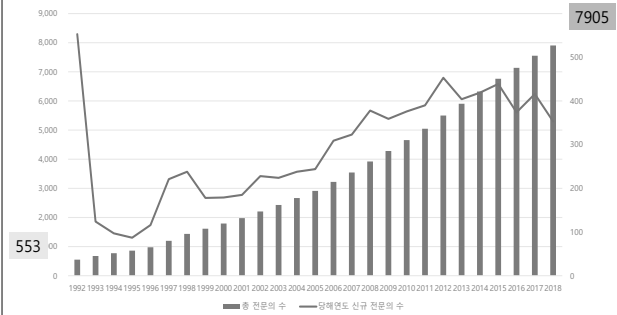
의료법 제5장 의료광고 제56조(의료광고의 금지 등)

14. 각종 상장·감사장 등을 이용하는 광고 또는 인증·보증·추천을 받았다는 내용을 사용하거나 이와 유사한 내용을 표현하는 광고. 다만, 다음 각 목의 어느 하나에 해당하는 경우는 제외한다.
- 가. 제58조에 따른 의료기관 인증을 표시한 광고
 - 나. 「정부조직법」 제2조부터 제4조까지의 규정에 따른 중앙행정기관·특별지방행정기관 및 그 부속기관, 「지방자치법」 제2조에 따른 지방자치단체 또는 「공공기관의 운영에 관한 법률」 제4조에 따른 공공기관으로부터 받은 인증·보증을 표시한 광고
 - 다. 다른 법령에 따라 받은 인증·보증을 표시한 광고
 - 라. 세계보건기구와 협력을 맺은 국제평가기구로부터 받은 인증을 표시한 광고 등 대통령령으로 정하는 광고

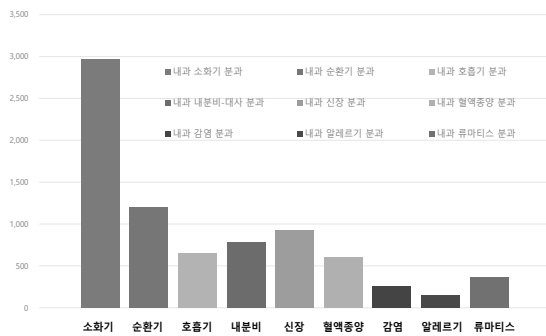
전문병원으로 지정받은 바 없음에도 '○○전문병원' 광고
「의료법」 제56조 제3항(거짓광고) 위반행위

- ① 질환별 전문병원(10개) 분야 : 관절, 뇌혈관, 대장항문, 수지접합, 심장, 알코올, 유방, 척추, 화상, 주산기
- ② 진료과목별 전문병원(8개) 분야 : 산부인과, 외과, 소아청소년과, 신경과, 이비인후과, 안과, 재활의학과
- ③ 한방 전문병원(3개) 분야 : 한방중풍, 한방척추, 한방부인과

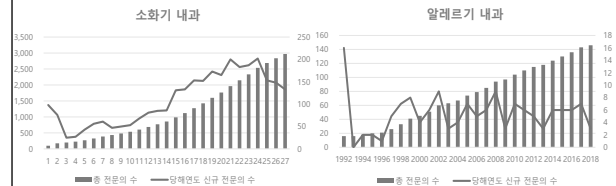
내과 분과전문의 현황 (2018.11. 현재)



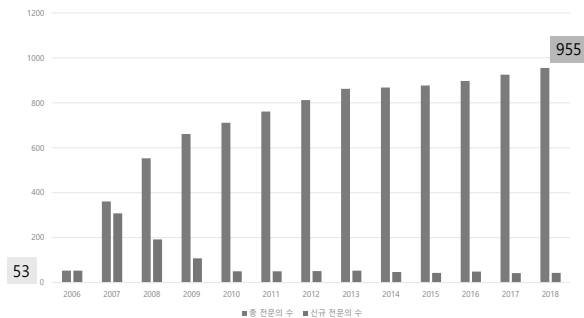
내과분과전문의 분과별현황 (2018.11. 현재)



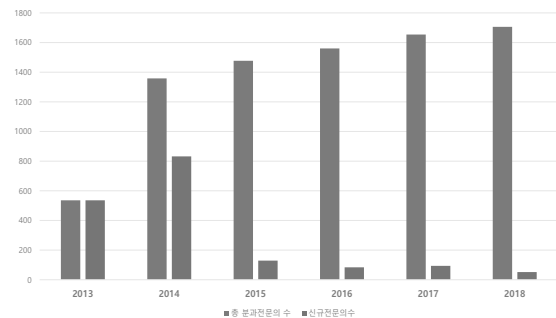
내과분과전문의 경향



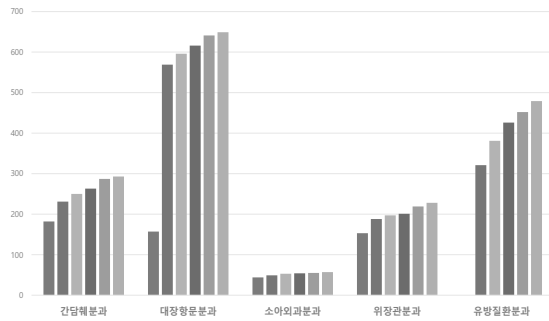
소아청소년과 분과전문의현황 (2018.11. 현재)



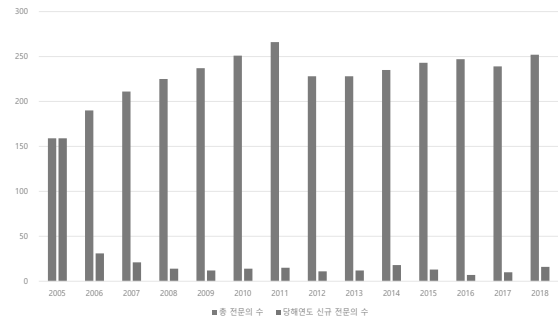
외과분과전문의 연도별현황



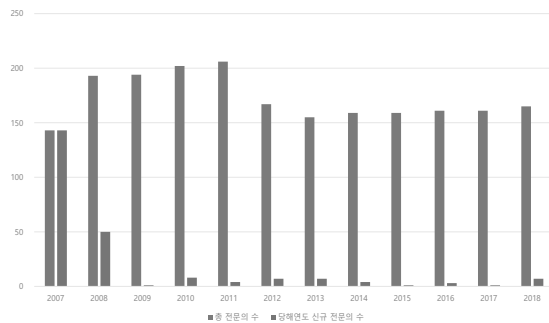
외과분과전문의 분과별 추이 (2013-2018)



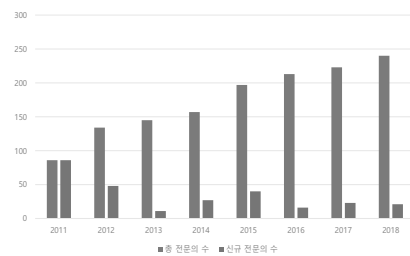
수부외과세부전문의 연도별 현황



소아심장세부전문의 연도별 현황

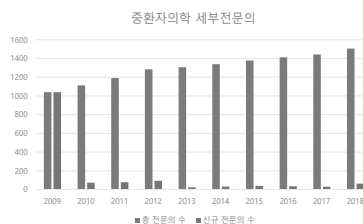


외상학 세부전문의 현황



• 자격상실 : 32명

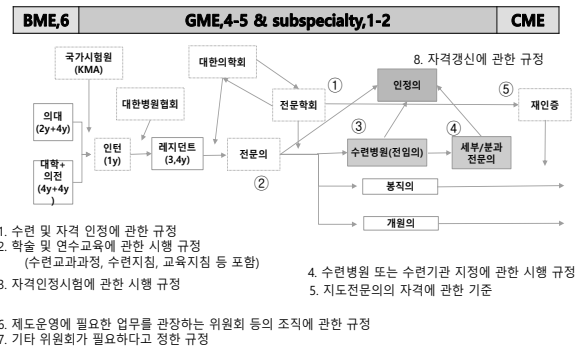
중환자의학 세부전문의 현황



- 자격상실 : 482명, 자격정지 34명
- 연간 : 30-60 명

의학 교육으로 본 전문의 제도

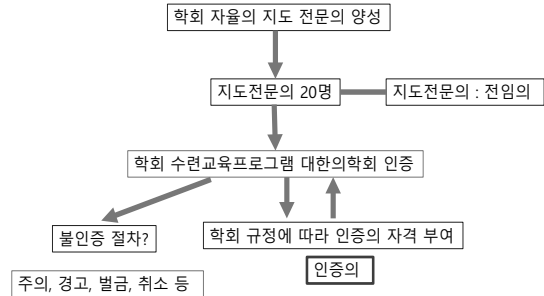
세부분과전문의 제도인증 신청서 1부, 세부전문의 제도인증 신청 동의서 1부.



인정의 (certified, accredited, qualified)

- 인증의 : 일정기간 일정 교육을 받고 자격을 부가적으로 인정받는 의사
- 대한의학회 인증의 정의 : 일반이나 전문의나 관계 없이 특정 진료 분야의 특정 지식이나 술기 기술을 습득하기 위해 의학회 회원학회가 대한의학회의 인가를 얻어 시행하는 교육 프로그램을 통해 일정 수준이상의 지식과 기술을 습득하였음을 인증하는 제도
- 현행 인증의 규정 : 자의적 기준
- 예) 내시경 인증의 ? 중재시술인증의 ?

인정의 제도 도입 절차



※ 대한내과학회 노년내과 인증의 서류심사 제출 안내 1) 서류심사 제출 안내

노년내과 교육 취득평점	제출 서류
10평점 이상 취득	1) 노년내과 인증의 서류심사 신청서 (별첨 2)
5평점 이상 10평점 미만 취득	1) 노년내과 인증의 서류심사 신청서 (별첨 2) 2) 학문적 성과 증빙자료 * 첨부파일 제출: 파일명은 본인 성명으로 저장 - 포스터발표: 대한내과학회 추계학술대회 초록집 게재본 (대한내과학회 홈페이지 다운로드 가능) - 논문게재: 인정학술지 게재본 전문

- ※ 노년내과 교육 취득평점 확인: 대한내과학회 홈페이지-마이페이지
2) 제출마감: 2019년 4월 5일(금)까지
3) 제출처 e-mail: kaim4364@kams.or.kr
4) 추후 노년내과 인증의 대상자 중 인정증 발급 신청 시 소정의 정회비(20만원) 정수 예정

임의 시행 인증의(인증의) 제도현황 (27학회, 30종)

번호	회원학회	시행여부	개인 인증(인증) 명칭	단체 인증(인증) 명칭
1	대한간학회	○	복부초음파 지도인증의	
2	대한근전도·전기진단의학회	○	근전도 전기진단의학 전문의시험	
3	대한남성과학회	○	남성건강 인증의	
4	대한내과학회	○	초음파지도인증의	임상초음파학회
5	대한내분비학회	○	전공의 초음파교육 지도인증의	
6	대한노인병학회	○	노인병 인증의	
7	대한당뇨병학회	○	당뇨병 교육자 자격인증	
8	대한법의학회	○	법의학회 인증의	
9	대한부정맥학회	○	부정맥 중재시술인증의	
10	대한소아응급의학회	○	소아응급 세부전문의	
11	대한소화기내시경학회	○	소화기내시경 세부전문의	
12	대한스포츠의학회	○	스포츠의학 인증전문의	
13	대한신경중재치료학회	○	신경중재치료 인증의	신경중재치료 인증병원
14	대한신장학회	○	투석 전문의	
15	대한심혈관중재학회	○	중재시술 인증의	중재시술 인증기관
16	대한의료정보학회	○	정보의학 인증의	
17	대한의학유전학회	○	임상유전학인증의/ 유전의학전문가 임상유전학시험/유전상담사	임상유전학검사실
18	대한임상약리학학회	○	KSCPT 임상약리학 인증의	
19	대한중양외과학회	○	대한중양외과학회 인증의	
20	대한초음파의학회	○	초음파인증의	
21	대한폐경학회	○	폐경전문 인증의	
22	대한혈관외과학회	○	혈관전문의로인	
23	한국심초음파학회	○	심초음파 인증의	
24	한국정맥경장영양학회	○	임상외과 인증의	영양질환지원팀(NST) 인증
25	한국정신신체의학회	○	정신신체인증의	
26	한국항공무주학회	○	항공 전문의사	
27	한국로스스스-원화의료학회	○	로스스스-원화의료 인증의	

향후 과제

- 국가 자격, 공인민간자격증 제도 인증
 - 세부분과전문의 표방
 - 의료정책, 건강보험 등 활용
 - 환자의 선택권 보장
- 세부분과전문의 제도 표준 기준 제시
- 세부분과전문의 제도 관리 플랫폼 수립
- 인증의 제도 양성화 또는 자율규제
 - 의료의 발전과 전문의 권위

KoNES 뇌졸중시술 인증제 9년의 역사

신 희 섭

인증관리위원회, 경희대



KoNES 뇌졸중시술 인증제 9년의 역사

대한뇌혈관내치료의학회
뇌졸중시술 인증관리위원회

목차

- I. 인증제 연혁
- II. 인증제 현황 및 개요
- III. 인증제 발전 방향



인증제 태동 2010-2012

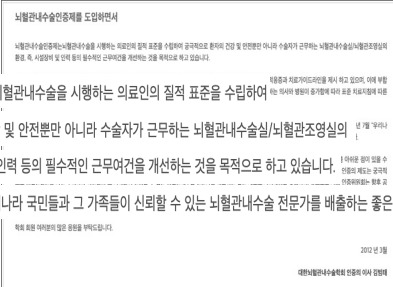


- 2010년 8월 _ 뇌혈관내수술 인증제 TFT 구성 (이사: 김범태)
_ TFT 회의, 전문가 공청회, 워크샵
- 2012년 7월 _ '우리나라 뇌혈관내수술 인증의 인증기관 수련기관 규정 연구결과 보고서' 발간
- 2012년 10월 _ 대한신경외과학회 제52차 추계학술대회 런칭세미나
_ 뇌혈관내수술 인증제도, 의의 및 세부사항 : 백민우 (가톨릭대)
_ 다과 전문분야의 인증제도 소개 (심혈관중재술): 권운선 (경희대)
_ 우리나라 뇌혈관내수술 인증제도, 준비 및 경과보고 : 김범태 (순천향대)
- 2012년 11월 _ '대한뇌혈관내수술학회 산하 뇌혈관내수술 인증위원회' 구성 (인증위원장: 김범태)

인증제 1기 2013-2014



- 2013년 3월 _ 제1회 대한뇌혈관내수술학회 뇌혈관내수술 인증제 공고



인증제 1기 2013-2014

• 2013년 3월 ~ 6월 _ 제1회 대한뇌혈관내수술학회 뇌혈관내수술 인증제 접수 / 심사

인증제 1기 2013-2014

• 2013년 6월 _ 제1회 대한뇌혈관내수술학회 뇌혈관내수술 인증제 합격 발표

- _ 인증의 127명 / 인증기관 55개소 합격
- _ 뇌혈관내치료 유관 학회 최초 인증제 / 최초 인증의 / 최초 인증기관

• 2013년 10월 _ 대한신경외과학회 제53차 추계학술대회 런칭세미나

일본뇌혈관내수술의 현황과 전망: Tamoaki Terrada (Wakayama Medical College)
 일본뇌혈관내치료학회 인증의 제도의 현황: Tamoaki Terrada (Wakayama Medical College)
 대한뇌혈관내수술학회 인증의 제도의 현황: 김범태 (순천향대)

• 2014년 3월 _ 제2회 대한뇌혈관내수술학회 뇌혈관내수술 인증제 시행

6월 _ 인증의 10명 / 인증기관 2개소 합격

인증제 1기 2013-2014

인증의 137명 / 인증기관 57개소

www.jkms.or.kr http://dx.doi.org/10.3349/jkms.2014.15.3.117
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Standards for Endovascular Neurosurgical Training and Certification of the Society of Korean Endovascular Neurosurgeons 2013

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Certification Committee of Society of Korean Endovascular Neurosurgeons¹

인증제 2기 2015-2020

• 2014년 11월 _ 뇌혈관내수술 인증위원회 신임위원장 이호국

• 2015년 3월 _ 제3회 대한뇌혈관내수술학회 뇌혈관내수술 인증제 시행

_ 재인증 시행 (제1회 인증의/인증기관 중 일부)

6월 _ 인증의 13명 (재인증 32명) / 인증기관 6개소 (재인증 10개소) 합격

• 2016년 6월 _ 제4회 인증제 _ 인증의 9명 (재인증 20명) / 인증기관 1개소 (재인증 9개소) 합격

• 2017년 6월 _ 제5회 인증제 _ 인증의 6명 (재인증 22명) / 인증기관 2개소 합격

• 2018년 6월 _ 제6회 인증제 _ 인증의 20명 (재인증 36명) / 인증기관 3개소 (재인증 29개소) 합격

인증 지원 / 재인증 증가 + 지원/심사의 편의성 증대 자료의 효율적 보관 인증제도의 연속성 확보 = 온라인 시스템 구축

인증제 2기 2015-2020

• 2019년 3월 _ 인증제 (인증의 부문) 온라인 접수/심사 시스템 개발 완료 (유관기관 최초)

• 2019년 6월 _ 제7회 인증제 _ 인증의 20명 (재인증 10명) / 인증기관 2개소 (재인증 3개소) 합격

• 2020년 3월 _ 인증제 (인증기관 부문) 온라인 접수/심사 시스템 개발 완료

• 2020년 1월 _ '뇌졸중시술 인증제'로 명칭 변경

6월 _ 제8회 인증제

_ 인증의 22명 (재인증 38명)

_ 인증기관 11개소 (재인증 14개소)

인증제 연혁 2013-2021

연도	인증제	인증의 (명)		인증기관 (개소)	
		신규인증	재인증	신규인증	재인증
2013	제1회 인증제	127	-	55	-
2014	제2회 인증제	10	-	2	-
2015	제3회 인증제	13	32	6	10
2016	제4회 인증제	9	20	1	9
2017	제5회 인증제	6	22	2	-
2018	제6회 인증제	20	36	3	29
2019	제7회 인증제	20	10	2	3
2020	제8회 인증제	22	38	11	14



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II. 인증제 현황 및 개요

III. 인증제 발전 방향



인증제 현황 2021.11

• 인증의 _ 인증 승인 (2013~2021) : 251 명 _ 인증 만료 및 유고 : 11 명 _ 2021년 11월 현재 인증의 : 240 명	• 인증기관 _ 인증 승인 (2013~2021) : 90 개소 _ 인증 만료 및 기관 폐쇄 : 4 개소 _ 2021년 11월 현재 인증기관 : 86 개소
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인증제 목적

<제1회 인증제 공고문 발췌>

- 뇌혈관내수술인증제는 뇌혈관내수술을 시행하는 의료인의 질적 표준을 수립
- 궁극적으로 환자의 건강 및 안전 뿐 만 아니라
- 수술자가 근무하는 뇌혈관내수술실/뇌혈관조영실의 환경, 즉, 시설장비 및 인력 등의 필수적인 근무여건을 개선하는 것을 목적



인증제 평가 항목 _ 인증의 지원 자격

- **인증의 _ 수련프로그램 수련의**
 - _ 대한민국 법정전문과목 전문의 자격을 취득한 후
 - _ 뇌졸중시술 및 뇌혈관내치료를 시행하는 전문의가 상근하는 병원에서 해당 의료기관이 지정한 수련프로그램에 따라 뇌졸중시술 및 뇌혈관내치료에 대한 수련을 1년 이상 받은 자
- **인증의 _ 단독 시술의**
 - _ 대한민국 법정전문과목 전문의 자격을 취득한 후
 - _ 수련프로그램을 수료하였거나 이에 준하는 수련을 받은 후, 1년 이상 주수술자로 뇌졸중시술 및 뇌혈관내치료를 단독으로 시행하고 있는 자



인증제 평가 항목 _ 인증의 진료 실적 요건

- **뇌혈관 조영술**
 - _ 주수술자로 150례 이상의 진단적 뇌혈관 조영술을 시행
- **뇌졸중 시술 및 뇌혈관내 치료**
 - _ 주수술자 또는 제1조수로 뇌졸중시술 및 뇌혈관내치료를 80례 이상의 증례를 시행
 - _ 80례 중 최소 40례 이상은 다음의 수술이 포함
 - 뇌동맥류 색전술
 - 뇌혈관기형(뇌동정맥기형 및 동정맥류) 색전술
 - 두개강내의 혈관성형술 및 스텐트 설치술
 - 동맥내 색전용해술 및 색전제거술



인증제 평가 항목 _ 인증의 학술 활동 요건

- **연수 평점**
 - _ 대한뇌혈관내치료의학회가 인정하는 연수강좌 또는 학술대회에 참가하여 '인증제 평점 인정 규정'에 따라 10점 이상의 연수평점을 이수
- **논문 및 학술 발표 (아래 내용중 1개 이상 충족)**
 - _ JCEN 또는 타 학술지에 뇌졸중시술 및 뇌혈관내치료에 관련된 내용으로 1편 이상의 논문을 발표
 - _ 대한뇌혈관내치료의학회가 인정하는 학술대회에서 뇌졸중시술 및 뇌혈관내치료에 관련된 내용으로 1편 이상의 연재를 구연 또는 포스터 발표

인증제 평가 항목 _ 인증기관 지원 자격



• 인증기관

- _ 대한뇌혈관내치료의학회에서 인정한 뇌졸중시술 인증의가 상시 근무
- _ 대한뇌혈관내치료의학회에서 요구하는 진료실적, 시설과 장비 및 인력 등을 갖추어야 한다.

현제	변경 2020.12.28
제 4 조 (인증기관 지정의 요건) 인증기관으로 인증 받기 위한 요건은 다음과 같으며, 인증관리위원회는 필요에 따라 신청 기관에 대한 현장조사를 실시할 수 있다. 1. 인증기관으로 지정 받을 수 있는 의료기관은 상급종합병원 혹은 인증위원회에서 인정한 종합병원이어야 한다. 해당 기관은 대한뇌혈관내치료의학회에서 인정한 뇌졸중시술 인증의(이하 '인증의')가 상시 근무하여야 하며 대한뇌혈관내치료의학회에서 요구하는 진료실적, 시설과 장비 및 인력 등을 갖추어야 한다.	제 4 조 (인증기관 지정의 요건) 인증기관으로 인증 받기 위한 요건은 다음과 같으며, 인증관리위원회는 필요에 따라 신청 기관에 대한 현장조사를 실시할 수 있다. 삭제 1. 인증기관으로 지정 받을 수 있는 의료기관은 상급종합병원 혹은 인증위원회에서 인정한 종합병원이어야 한다. 해당 기관은 대한뇌혈관내치료의학회에서 인정한 뇌졸중시술 인증의(이하 '인증의')가 상시 근무하여야 하며 대한뇌혈관내치료의학회에서 요구하는 진료실적, 시설과 장비 및 인력 등을 갖추어야 한다.

인증제 평가 항목 _ 인증기관 시설/인력/실적 요건



• 인증기관 시설 및 장비

- _ 1개소 이상의 혈관조영실 및 1개 이상의 혈관조영장비가 설치
- _ 뇌혈관질환 개두술이 가능한 수술실 및 뇌혈관질환 환자를 치료할 수 있는 중환자실
- _ 1개 이상의 CT/MRI 보유

• 인증기관 인력

- _ 인증의 자격을 갖춘 전문의가 1명 이상 상시 근무
- _ 뇌혈관질환 개두술이 가능한 신경외과 전문의가 1명 이상 상시 근무
- _ 1개소의 혈관조영실 당, 혈관조영실 전담 방사선사 1명 이상, 간호사가 1명 이상 상시 근무

• 인증기관 진료실적

- _ 연간 40례 이상의 뇌졸중시술 및 뇌혈관내치료를 시행

KoNES 인증의 / 인증기관 지역별 현황 (2021.11)



	인증의	인증기관
서울	44	13
인천	16	5
경기	53	20
대전	11	5
세종	2	0
충남	9	2
충북	8	4
광주	4	2
전북	6	4
제주	4	2



	인증의	인증기관
강원	8	3
대구	18	4
경북	20	6
부산	16	7
울산	8	3
경남	13	6

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- 인증제 연혁
- 인증제 현황 및 개요
- 인증제 발전 방향



I. 인증기관 수 증대 및 지역 편중 해결



• 인증의/인증기관

- _ 유관 학회 최다
- _ 인증의 : 240 명 / 인증기관 : 86개소

• 지역별

지역	인증병원
서울	13
경기	20
인천	5
강원	3
충북, 세종	4
대전, 충남	7
대구, 경북	10
부산, 울산, 경남	16
전북	4
광주, 전남	2
제주	2

I. 인증기관 수 증대 및 지역 편중 해결



• 인증기관

- _ 뇌혈관질환 전문병원 또는 이에 준하는 병원의 인증기관 신청 가능

제 4 조 (인증기관 지정의 요건) 인증기관으로 인증 받기 위한 요건은 다음과 같으며, 인증관리위원회는 필요에 따라 신청 기관에 대한 현장조사를 실시할 수 있다. 1. 인증기관으로 지정 받을 수 있는 의료기관은 상급종합병원 혹은 인증위원회에서 인정한 종합병원이어야 한다. 해당 기관은 대한뇌혈관내치료의학회에서 인정한 뇌졸중시술 인증의(이하 '인증의')가 상시 근무하여야 하며 대한뇌혈관내치료의학회에서 요구하는 진료실적, 시설과 장비 및 인력 등을 갖추어야 한다.	제 4 조 (인증기관 지정의 요건) 인증기관으로 인증 받기 위한 요건은 다음과 같으며, 인증관리위원회는 필요에 따라 신청 기관에 대한 현장조사를 실시할 수 있다. 1. 인증기관으로 지정 받을 수 있는 의료기관은 상급종합병원 혹은 인증위원회에서 인정한 종합병원이어야 한다. 해당 기관은 대한뇌혈관내치료의학회에서 인정한 뇌졸중시술 인증의(이하 '인증의')가 상시 근무하여야 하며 대한뇌혈관내치료의학회에서 요구하는 진료실적, 시설과 장비 및 인력 등을 갖추어야 한다.
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II. 평가 항목 개선 - 기술 항목 조정



• 인증의

_ 150례 이상의 뇌혈관조영술

_ 80례 이상의 뇌졸중시술/뇌혈관내치료

(40례 이상은 뇌동맥류 색전술, 뇌혈관기형 색전술, 두개강내외 혈관성형술 및 스텐트 설치술, 동맥내 색전용해술 및 색전제거술)

• 인증기관

_ 연간 40례 이상의 뇌졸중시술/뇌혈관내치료

_ 재인증은 5년간 연간 평균 40례

⇒ 1) 연간 시술 증례 수 상향

2) 40례 중 뇌동맥류 색전술,

동맥내 색전제거술의 최소 증례 건수 지정

III. 평가 항목 개선 - 치료 대상 (뇌출혈) 질환 규정



• 뇌졸중

_ 국가 기관의 기준은 지나치게 뇌경색 위주

_ 뇌출혈 치료의 중요성에 대한 인식 개선

: 뇌지주막하출혈 / 뇌동맥류

: 뇌내출혈에 대한 개두술

• 인증기관

_ 치료 대상 질환의 규정 없음

⇒ 1) 질병코드 규정 (I60, I61, I62, I63, I65, I66, I67)

2) 뇌출혈, 뇌경색의 질환 구분

뇌출혈 치료 최소 증례 수 규정

3) 뇌혈관질환 개두술 가능 신경외과 전문의

뇌혈관질환 개두술 증례 수 지정

IV. 평가 방법 개선 -점수제, 질관리, 모니터링 지표



• 항목별 점수제

_ 4개 항목, 14개 세부 지표에 대한 세부 지표별 점수화

ex) 조영술 증례 수, 혈관내치료 증례 수, AngioMachine 대수 (뇌혈관내치료 전용),

CT/MR 대수, 중환자실 전용병상수, 상급 인증의 수, 전담방사선사, 간호사 수 등

_ 질관리/모니터링 지표

: 치료 적정성

ex) door to groin puncture, procedure time, IV-tPA, first pass,

procedure후 약물/영상질사, 가이드라인에 적합한 치료

: 프로토콜, 적절한 교육,

뇌졸중시술 신규 인증기관 심사기준지표	
구분	검정 항목
1. 시설 및 장비	1. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)
	2. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)
	3. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)
	4. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)
	5. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)
	6. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)
	7. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)
	8. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)
	9. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)
	10. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)
2. 인력	1. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)
	2. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)
	3. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)
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	5. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)
	6. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)
	7. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)
	8. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)
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	10. 뇌혈관조영술기 1대 이상 보유 및 운영가능 (점수 10/10)

V. 인증제 세분화



• 인증의 수련지도 전문의

_ “뇌졸중시술 인증의 수련지도 전문의”

_ 인증의 취득 후 일정 기간 경과

_ 일정기간 뇌졸중시술 증례 수 기준

_ 근무하는 기관이 인증기관

⇒ 향후 “수련지도 전문의”에게

수련을 받아야 인증의 지원이 가능하도록

• 인증기관 세분화

_ 시설 항목/치료질환에 따라

: 뇌출혈 특화센터 or 급성 뇌경색 특화센터

_ 뇌졸중시술 인증의 수련 기관

_ 점수제에 따라

: 권역, 지역 인증기관

⇒ 신중히 접근하여야 (인증기관의 서열화 우려)

지나친 세분화에 따른 인증제 희소성 저하

VI. 교육/수련 강화 - 의료인, 환자



• 인증의 수련 및 교육

_ 연간 이수 평점 강화 (현재 10점)

_ KoNES 학회, 연수교육, training course

필수 참여 필수 규정

_ KoNES CME 필수 교육 이수

• 전담 방사선사/간호사

_ 필수 이수 교육

_ 교육 프로그램 개발 (CME)

• 환자 대상 교육 프로그램 개발

VII. 진료 환경/안전 개선



• 안전요 기계

_ 진단용 방사선 발생장치 신고증명서 제출

_ 특수의료장비 등록 증명서 제출

_ 영상장비 유지보수 및 품질관리 기록서 제출

• 방사선 관리

_ 의료인 연간방사선 피폭선량 (TLD) 제출

_ 방사선 피폭량 초과시 적절 대처 여부

• 의료인 근무 시간

_ 4주간 평균 근무 시간

_ 휴일 및 야간 일수

_ 연간 응급 시술 건수

_ 당직 구성인원

뇌혈관질환 관련 인증제도에 대한 고찰

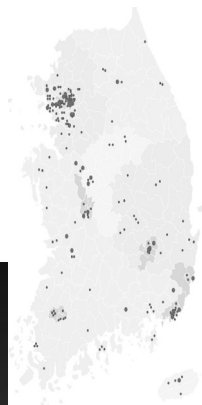
강 지 훈

대한뇌졸중학회, 서울대

뇌졸중센터 인증제도 (Stroke Center Certification)

강지훈

질향상위원회 & 뇌졸중센터인증위원회, 대한뇌졸중학회
분당서울대학교병원 신경과
경기 권역심뇌혈관센터
분당서울대학교병원 공공의료본부
심뇌혈관 중앙지원단



차례

뇌졸중센터인증제도 목적

외국사례

대한뇌졸중학회 뇌졸중센터 인증제도 발전

뇌졸중센터인증

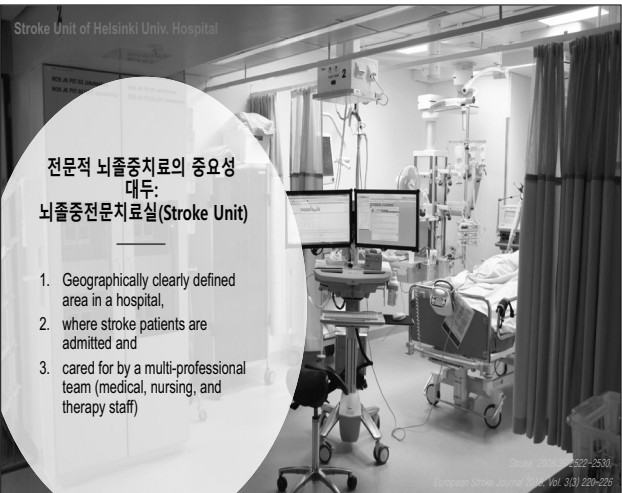
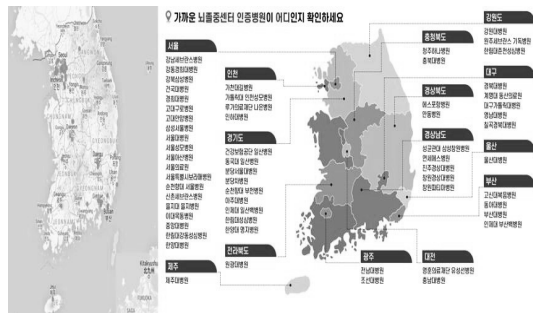


뇌졸중센터 (Stroke Center)

대한뇌졸중학회 뇌졸중센터 인증사업

- 보편적인 뇌졸중안전망 구축을 목적으로 한다.
- 양질의 뇌졸중진료를 제공하는 의료기관을 선정한다.
- 참여한 의료기관의 지속적인 질향상을 도모한다.
- 지역기반의 전문적인 뇌졸중진료체계 구축을 목적으로 한다.

뇌졸중센터 인증 사업



Stroke unit: 신속, 명확한 효과

- Consistent, clear lowering mortality in acute stroke patients

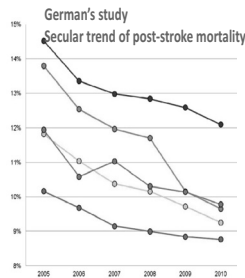


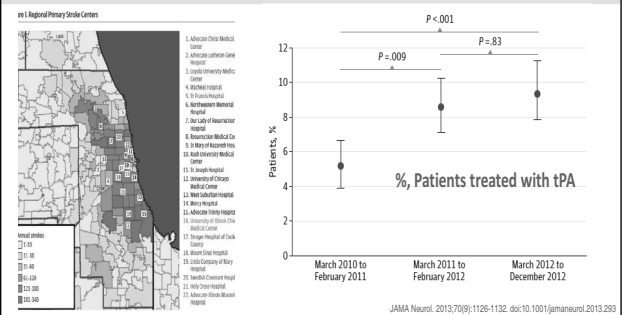
Table 3. Mortality at Designated Stroke Centers and Nondesignated Hospitals

	No. (%)	Adjusted Mortality Difference (95% CI) ^a	P Value
Designated Stroke Center (n = 15,267)			
1 d	90 (0.6)	-0.3 (-0.6 to -0.0)	.04
7 d	665 (4.3)	-1.3 (-2.1 to -0.6)	.001
30 d	1643 (10.1)	-2.5 (-3.6 to -1.4)	<.001
1 y	3412 (22.3)	-3.0 (-4.4 to -1.5)	<.001
Nondesignated Hospital (n = 15,650)			

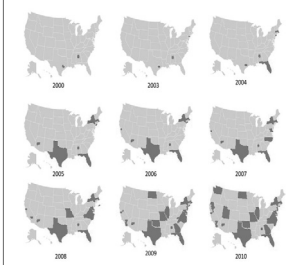
JAMA 2011 (4): 373-380, US 2013, 9(3):260-265

Stroke unit

- 뇌졸중 치료 전반에 영향
- tPA use: 3.8% → 10.1%
- Time to treatment: 171.7 → 145.7 minutes
- Regional system 으로 확대



Regional triage system: Routing to PSC



- Structural transformation
- Stroke Center 로의 by routing protocols이 적용되는 인구 비율은 비약적으로 상승 (1.5% in 2000 → 53% of the US population by the end of 2010)

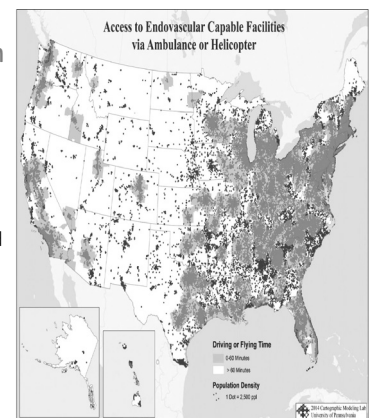
Regional care system: Triage to Right hospitals

Stroke. 2012;43:1975-1978. Stroke. 2016;47:1381-1384. Stroke. 2019;50:e187-e210.

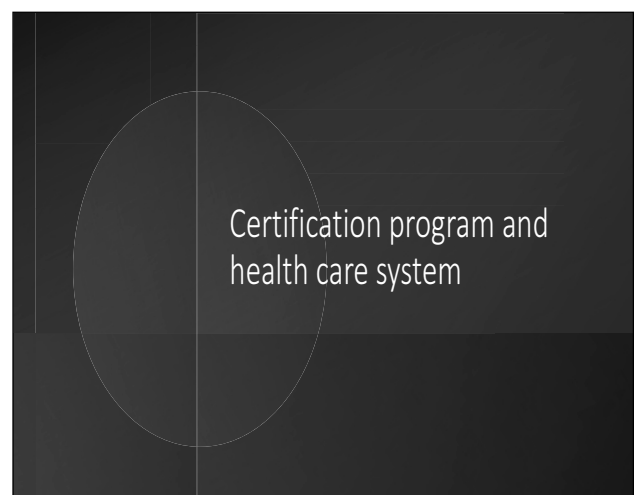
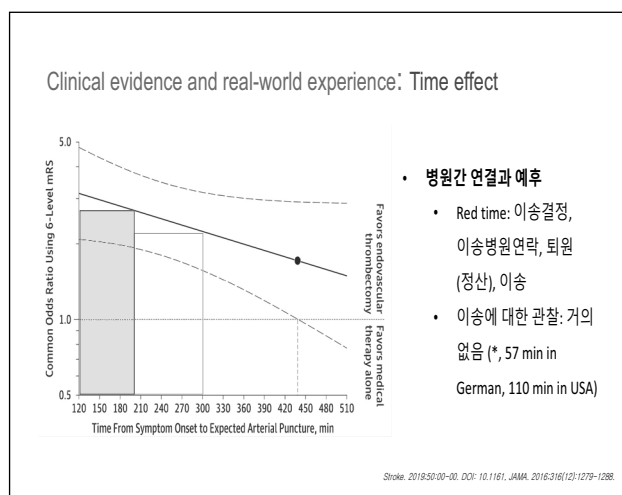
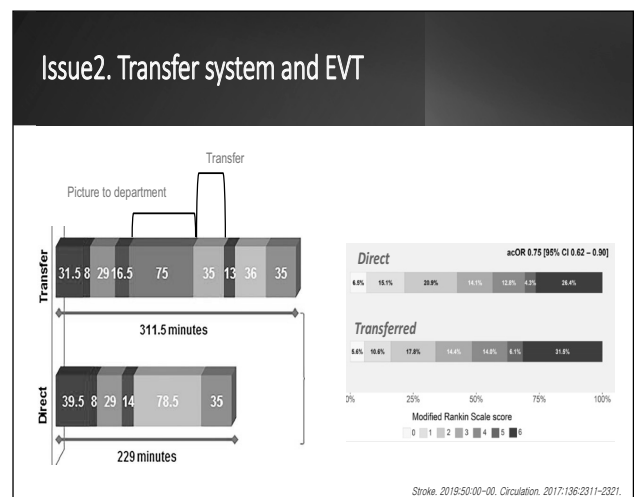
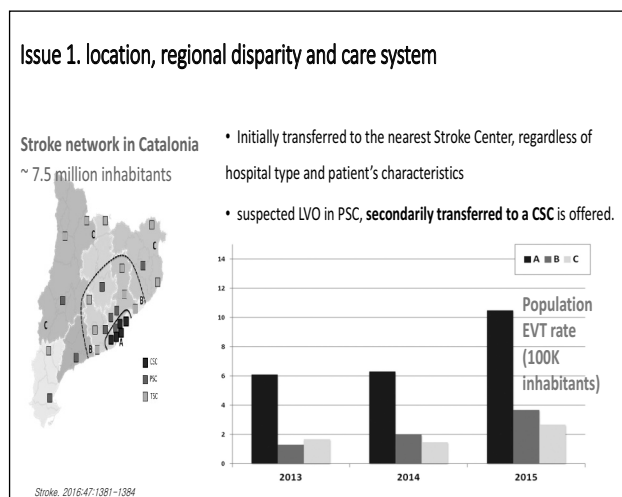
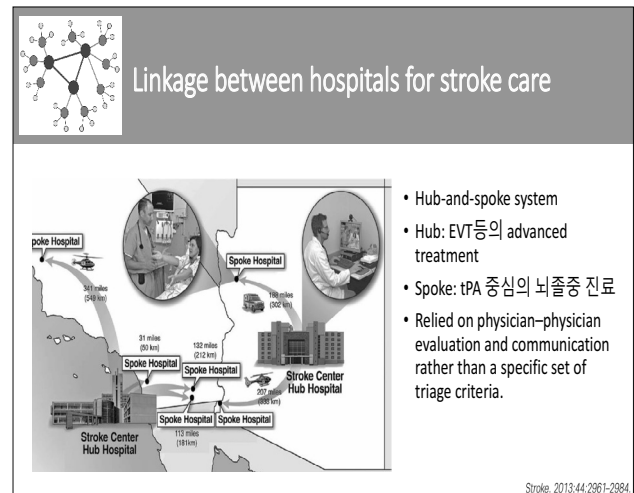
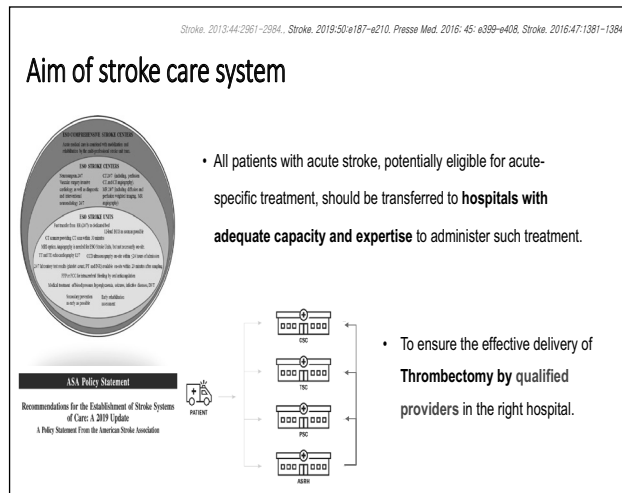
Organized hospital system

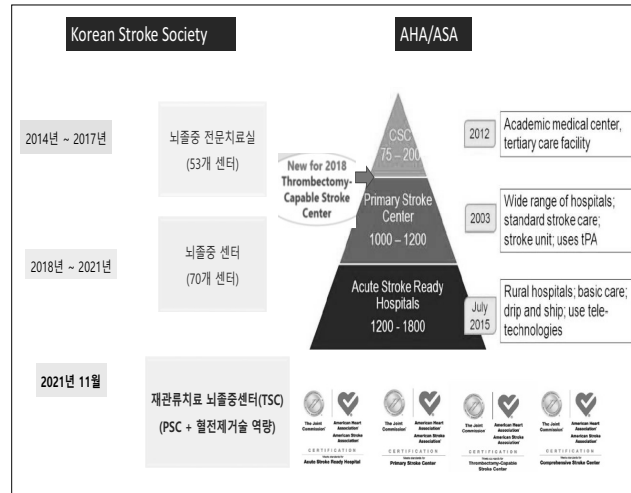
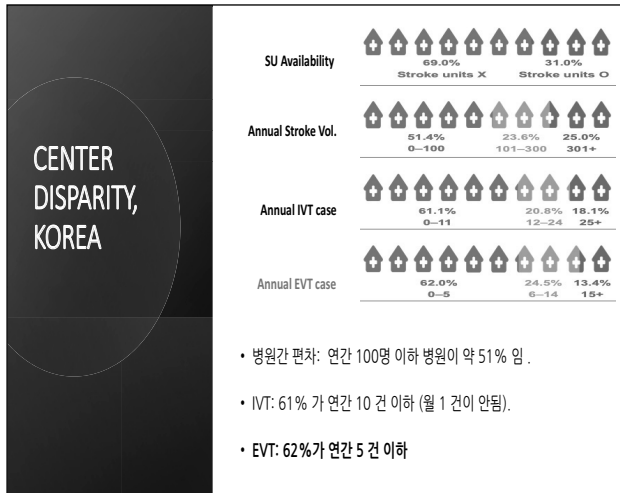
Policy state, Recommendation

- All levels of stroke centers should work within their region in an integrated fashion, providing and sharing best practice. (New)



Stroke. 2012;43:1975-1978. Stroke. 2016;47:1381-1384. Stroke. 2019;50:e187-e210.





Key differences

	TSC	CSC
Mechanical Thrombectomy	15/y	15/y
SAH	N/A	20/y
Intervention for Aneurysm	N/A	15/y
Intravenous thrombolysis	NA	25/y
Interventionist Competency	CAST-certified 15MT/yr	CAST-certified 15MT/yr
SU /ICU	Yes Critical Care services	Yes Neuro-Critical Care services
24/7 Neurosurgical Services	Not Mandatory	Mandatory
Research	N/A	required
Guidelines	AHA/ASA, Joint Commission	AHA/ASA, Joint Commission 2005 Brain attack Coalition

SVIN 2018

The Joint Commission Stroke Certification Programs - Program Concept Comparison

Program Concept	ASRH	PSC	TSC	CSC
Eligibility	General eligibility requirements: use of a standardized method of delivering care centered on evidence-based guidelines for stroke care.	General eligibility requirements: use of a standardized method of delivering care centered on evidence-based guidelines for stroke care.	General eligibility requirements: use of a standardized method of delivering care centered on evidence-based guidelines for stroke care. *Organization must have performed mechanical thrombectomy and post-procedure care for at least 15 patients with ischemic stroke over the past 12 months (or 30 over past 24 months). *Neurointerventionists who perform mechanical thrombectomy at the organization applying for certification must perform 15 mechanical thrombectomies over the past 12 months (or 30 over past 24 months) (procedures performed at hospitals other than the one applying for TSC certification can be included).	General eligibility requirements: use of a standardized method of delivering care centered on evidence-based guidelines for stroke care. *Treatment of 20 SAH caused by aneurysm annually (40 over 2 years). *Capable of treating aneurysms by performing 15 endovascular coiling or microvascular clipping procedures annually (30 over 2 years). *Administering 10 thrombolytic therapy 25 times annually (50 times over 2 years). *Organization must have performed mechanical thrombectomy and post-procedure care for at least 15 patients with ischemic stroke over the past 12 months (or 30 over past 24 months) (procedures performed at hospitals other than the one applying for TSC certification can be included). *Neurointerventionists who perform mechanical thrombectomy at the organization applying for certification must perform 15 mechanical thrombectomies over the past 12 months (or 30 over past 24 months) (procedures performed at hospitals other than the one applying for TSC certification can be included).

The Joint Commission. The Stroke Certification Programs - Program Concept Comparison is used by American Heart Association/American Stroke Association with permission. Current as of 08/01/19

뇌졸중센터 (Stroke Center) / 재관류치료 뇌졸중센터 (Thrombectomy-capable Stroke Center, TSC)

기준	조사항목	개수
1 응급/급성기 적정 진료	1.1 급성뇌졸중환자에 대한 담당의료진의 적절한 연락체계가 운영된다.	6
	1.2 급성뇌졸중환자를 위한 다학제 진료팀이 구축되어있다.	
	1.3 급성뇌졸중환자에 대해서 적절한 평가가 이루어진다.	
	1.4 표준진료지침(CP)에 따른 급성기 검사와 시술을 수행한다.	
	1.5 정맥내 혈전용해술 시행 환자의 데이터를 구축하고 관리한다.	
	1.6 (TSC) 정맥내 혈전용해술 및 혈전제거술 시행 환자의 데이터를 구축하고 관리한다.	
2 뇌졸중집중치료실 (Stroke Unit)	2.1 급성기 뇌졸중환자를 위한 의료기관 또는 구급대원의 네트워크를 운영한다.	2
	2.2 뇌졸중 집중치료실(unit)을 운영한다.	
3 (TSC) 중환자 진료	3.1 뇌졸중 집중치료실에 필요한 인력, 시설, 운영지침을 준수한다.	2
	3.2 (TSC) 중환자실 (ICU)을 운영하고 뇌졸중 환자 진료에 활용한다.	
	3.3 (TSC) 중환자실은 적절한 시설과 인력을 갖추어야 한다.	

기 준		조사항목	개수
4	뇌졸중팀	4.1 의료기관내 뇌졸중 환자 진료로 위한 뇌졸중센터가 구성되어 있다.	4
		4.2 뇌졸중팀의 의뢰진은 다한뇌졸중환자를 포함한 학회 활동에 참여한다.	
		4.3 뇌졸중팀은 환자 진료 및 뇌졸중센터 관리와 개선활동을 위해 정기적으로 회의를 개최한다.	
		4.4 뇌졸중팀 구성원들에게 직무수행에 필요한 교육을 시행한다.	
5	(TSC) 중재시술의뢰진	5.1 신경중재시술의사가 뇌졸중환자에게 적합한 시술을 시행한다.	2
		5.2 신경중재시술은 숙련된 의사가 시행한다.	
6	뇌졸중 레지스트리 운영과 질 향상 활동	6.1 뇌졸중 환자의 체계적인 데이터 관리를 한다.	2
		6.2 데이터 항목에 필수 질지표를 설정하고, 지속적인 접근과 활동을 한다.	
		7.1 표준진료지침에 따른 CP 를 구축하고, 운영한다.	
7	적정진료 및 시설	(TSC) 표준진료지침에 따른 EVT CP를 구축하고 운영한다.	3
		CP에 따라 nVT를 시행하고 있다.	
		7.2 (TSC) CP에 따라 EVT를 시행하고 있다.	
		7.3 적정 수준의 장비가 운영된다.	
		(TSC) EVT를 위한 적정 수준의 장비가 운영된다.	

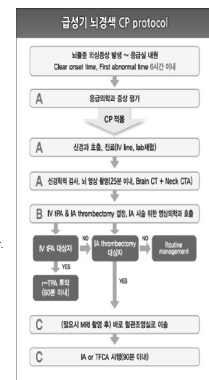
응급/급성기 적정진료 및 역량

[illegible]

- ◆ 급성기 뇌졸중 진료의 다학제 대응을 통한 최적의 진료체계를 구축한다.
 - 응급실 상주 의사 또는 당직 의사가 뇌졸중 의심 환자를 선별할 수 있어야 한다.
 - 근무 또는 당직 시간에 따라 일관성 있는 연락체계가 있으며 담당 뇌졸중 진료 의사가 누구인지 명확해야 한다.
 - 뇌졸중 담당 진료 의사는 발진응급출소 및 발진제거술의 적응증 및 금기증을 정확히 숙지하고 발진제거술이 필요한 경우 신속 상담
의사에게 시술을 결정할 근거를 설명할 수 있어야 한다.
 - 뇌졸중 담당 진료 의사는 재발원료비도 안이라 전반적인 급성기 뇌졸중 환자 처치에 대한 내용을 정확히 숙지하고 이를 적용할 수 있어야 한다.
 - 발진제거술, 두개골제개 등을 포함한 응급 수술이 필요한 경우 수술 가능 연제 시스템 또는 연락 체계가 있거나 수술이 가능한 병원으로 이송을 유도할 수 있어야 한다.

일관성 있고 표준화 된 진료 흐름도 유지
(진료과 무관 / 일원화된 진료 체계)

- ❖ 뇌졸중 환자를 위한 CP 프로그램을 구비하고 있다.
 - 급성기 뇌졸중 환자 치료 시 연약 체계, 감각 시스템 및 환자의 통증을 고려된 체계적이고 표준화된 프로그램을 마련해야 한다.
 - 뇌영상 검사의 종류나 승인 등은 각 센터 상황에 맞추어 결정되되 시간 지연을 최소화할 수 있도록 협력으로 구성되어야 한다.
 - 프로그램에 발전해줄 필요 및 환자계사를 신장와 생명을 위한 필수 검사자 반드시 포함되어 있어야 한다.
 - 프로그램은 지속적인 질의피드백을 통해 모든 수검자에게 개선 작업이 이루어져야 한다.



효율성 / 일관성 / 정확성

ME	구분	유	무	NA
1	상행역 안내역			
	내부	☐	☐	☐
2	상행역 승강역			
	승하차	승하차	승하차	승하차
	승하차	승하차	승하차	승하차
	승하차	승하차	승하차	승하차
	승하차	승하차	승하차	승하차
3	상행역 승강역			
	승하차	승하차	승하차	승하차

승하차 승하차 승하차 승하차 승하차
 승하차 승하차 승하차 승하차 승하차
 승하차 승하차 승하차 승하차 승하차
 승하차 승하차 승하차 승하차 승하차
 승하차 승하차 승하차 승하차 승하차

IVT/EVT 대상자가 아님에도 시행하는 case
 IVT/EVT 대상자 선택 필수 검사 여부

IVT/EVT 대상자임에도
 시행하지 않은 case 확인

- ▶ 준비서류
 - 당당 의료진 연락체계 및 최근 3개월간 의료진 명단 및 당직표
 - 3개월 이내 응급실을 통해 입원한 급성기 뇌졸중 (onset 1주일 이내 내원) 환자 명단 및 의무기록
 - 문서화 된 CP 프로토콜
 - 정맥내 혈전용해술 및 혈전제거술을 받은 환자 명단 및 관련 데이터 확인
 - 응급환자 네트워크 관련 문서
 - 연계 병원 리스트 및 연락처 및 환자 이송 현황 또는 명단 등 근거 문서
 - 또는 닥터헬릭스 연락처 및 119 급구급대 연계 관련 근거 문서

시험사업 결과 예시 (에스포항 병원)

항목	내용	확인	
항목1	급성 의뢰진 연락체계 및 당직표 (세부평가)	Y	Y
항목2	급성기 뇌졸중 진료의 다학제 운영	Y	Y
항목3	뇌졸중환자 NHSS 평가 (뇌졸중의 경우 NHSS 또는 GCS평가)	Y	Y
항목4	뇌졸중환자를 위한 CP (IVT, EVT 선택/TSO)	Y	Y
항목5	응급환자 네트워크 시스템 운영	Y	Y
카테고리 점수		Y	Y
카테고리 의견	면역 체계 및 당직의, 시술 당직의, 수술 당직의 형태로 당직이 이뤄지고 있으며 뇌졸중 전문의사가 당직이 아니더라도 적절한 연락체계를 통해 진료가 이루어지고 있음. 당직의 알음 한자가 입원하거나 시술의 알음으로 입원을 해서 다학제 진료가 원활하게 이루어지고 있다고 판단됨. FAT 기준 6시간 이내로 CP가 이뤄지며 MRI 프로토콜로 진행되나 시간 지연 없이 돌아가고 있음		

항목1	신용보증회 연혁자료 및 임직원	발행 182	V7	시행 적용할 불가	확인	KSR 대체
신용보증회	연혁 및 현재 체계가 완성되고 실제 운영	세부1	28년 V7 시행자료가 준비됨			KSR 항목
항목2	신용보증회 운영규정(NHGS 개정)	V7 시행자료 1	V7 대상성, 감사자료가 적용됨			KSR 신성
항목3	NHGS 신용보증회기 (신용보증회 운영규정 개정)	V7 시행자료 2	V7 대상성, 감사자료가 적용됨			KSR 신성
항목4	NHGS 신용보증회기 (신용보증회 운영규정 개정)	V7 시행자료 3	V7 대상성, 감사자료가 적용됨			KSR 신성
항목5	신용보증회 운영규정 제 29조 V777					

핵심 질지표

조사항목

조사항목 (Measurable Element)		조사결과		
1	뇌졸중 환자의 별도 database(DB)를 구축하고 데이터를 관리한다.*	□유	□무	
2	뇌졸중 환자의 DB에 필수 항목이 포함되어 있다	□유	□무	
3	뇌졸중 질 향상 지표 (핵심지표 포함)를 설정하고 지속적인 권리를 한다.	□유	□무	
4	질 향상을 위한 개선 활동을 수행한다.	□상	□중	□하
5	조사항목 1~4에 대하여 한국뇌졸중등록사업(KSDB)에 연계한다.	□참여등급A	□참여등급B	□미참여
카테고리 점수		□상	□중	□하

해심 질지표

핵심 질지표		PSC Primary Stroke Center	TSC Thrombectomy-capable stroke center
	Performance measurement	4 Standard Measures	8 Standard Measures
ST-02	경맥내 혈전용해제 시작 시간 모니터링	V	V
ST-03	tPA 60분 이내 투여율 모니터링	V	V
TST-01	퇴원 시 수경 렌진 척도 모니터링		V
TST-02	재관류치료 후 3일 이내 출혈변화사건 확인을 위한 뇌영상 시행 모니터링		V
TST-03	동맥내 재관류치료 시작 시간 모니터링 (Arrival Time to Skin Puncture)		V
TST-04	동맥내 재관류치료 후 Thrombolysis in Cerebral Infarction (post TIC) 모니터링		V

조서표

항목4	뇌졸중센터	확인		KSR 대체
KSR 연계		☐ 유	☐ 무	KSR 항목
세부1	tPA Door-to-needle 모니터링 (필수)	☐ 유	☐ 무	KSR 항목
세부2	tPA 60분 이내 사용 모니터링 (필수)	☐ 유	☐ 무	KSR 항목
세부종합	지표를 수집하고, 지속적인 질향상활동을 수행한다.			☐ 상 ☐ 중 ☐ 하
항목4	재관류치료 뇌졸중센터 (질량평가)	확인		KSR 대체
세부3	Door-to-puncture time	☐ 유	☐ 무	KSR 항목
세부4	POST-TICI grade (재관류치료결과 모니터링)	☐ 유	☐ 무	KSR 항목
세부5	중환자선환자전 (HT) 확인 (재관류치료결과 모니터링)	☐ 유	☐ 무	KSR 항목
세부6	퇴원시 mRS	☐ 유	☐ 무	KSR 항목
세부종합	지표를 수집하고, 지속적인 질향상활동을 수행한다.			☐ 상 ☐ 중 ☐ 하

- 뇌졸중 환자의 별도 database (DB)를 구축하고 데이터를 관리한다.
- 뇌졸중 환자의 DB에 필수 항목이 포함되어 있다
 - 대한뇌졸중학회 뇌졸중센터인원_KSR 임상병리영 뇌졸중 DB (신: 신경병리 영문 담당자 제출)
 - 대한뇌졸중학회 뇌졸중센터인원_KSR 임상병리영 뇌졸중 DB (H: KSR 사무국 계승)

[illegible]

- **니콜중 질 향상 지표 (핵심지표 포함)를 설정하고 지속적인 관리를 한다.**
- **질 향상을 위한 개선 활동을 수행한다.**
 - 질 향상 지표 데이터 수집: 제출한 니콜중 레지스트리 DB에서 자료 관련 데이터 수집을 확인함 (핵심지표)
 - 질향상 모니터링 & 개선활동:
 1. KSR QI 모니터링 자료 또는 병원 자체의 모니터링 자료 (그래프 표)
 2. 질향상 활동: 회의록 등



- 뇌출중 질 향상 지표 (핵심지표 포함)를 설정하고 지속적인 관리를 한다.
- 질 향상을 위한 개선 활동을 수행한다.
 - 질향상 모니터링 & 개선활동:
 1. KSR QI 모니터링 자료 또는 병원 자체의 모니터링 자료 (그래프 표)
 2. 질향상 활동: 회의록 등

[illegible]

간호사교육

학회참석

원내교육

2020년 Stroke Unit 간호사 교육 프로그램		
Stroke Recognition CP 30분 (In Hospital CP 포함)	신경과 집중진료 과목	11월 25일(월) 14:00
뇌졸중의 위험 인자 및 예방 방법 (In Hospital CP 포함)	신경과 집중진료 과목	12월 10일(목) 14:00
뇌졸중의 위험 인자 및 예방 방법 (In Hospital CP 포함)	신경과 집중진료 과목	12월 10일(목) 14:00
뇌졸중의 위험 인자 및 예방 방법 (In Hospital CP 포함)	신경과 집중진료 과목	12월 10일(목) 14:00
Stroke Unit에서 일하는 간호사는 어떻게 해야 할까	신경과 집중진료 과목	12월 10일(목) 14:00

온라인교육

K-mRS 교육 이수증명서

성명: 박수진

한국간 뇌졸중 평가도구(Modified Rankin Scale)

교육 과정을 성실히 이수하고 통과하였기에 이 수료증을 드립니다.

2021년 08월 10일

대한뇌혈관내치료학회 회장

중재시술의료진

항목	내용	확인
항목1	숙련된 신경중재술의사가 있다.	☐ 유 ☐ 무
항목2 (모니터링)	항시 EVT 시행 여부 [365일 24시간]	☐ 유 ☐ 무

중재시술의료진

항목1	숙련된 신경중재술의사 보유 여부		
세부1	시행 전문인력 _____명		
시술자 1	1년간 최대 시행건수 _____건		
	전문과목: 학회인증:		
시술자 2	1년간 최대 시행인력의 시행건수 _____건		
	전문과목: 학회인증:		
시술자 3	1년간 최대 시행인력의 시행건수 _____건		
	전문과목: 학회인증:		
시술자 4	1년간 최대 시행인력의 시행건수 _____건		
	전문과목: 학회인증:		

적정진료 및 시설

요약

항목	내용	확인
7 적정진료 및 시설	표준진료지침에 따른 CP를 구축하고 운영한다.	☐ 유 ☐ 무
	(TSC) 표준진료지침에 따른 EVT CP를 구축하고 운영한다.	☐ 유 ☐ 무
	CP에 따라 EVT를 시행하고 있다.	☐ 유 ☐ 무
	(TSC) CP에 따라 EVT를 시행하고 있다.	☐ 유 ☐ 무
	적정 수준의 장비가 운영된다.	☐ 유 ☐ 무
	(TSC) EVT를 위한 적정 수준의 장비가 운영된다.	☐ 유 ☐ 무

조사항목

항목	내용	확인
항목1	표준진료지침에 따른 CP/CPG를 구축하고 운영한다.	☐ 유 ☐ 무
	(TSC) 표준진료지침에 따른 EVT CP를 구축 및 운영한다.	☐ 유 ☐ 무
항목2	CP에 따라 EVT 시행과 EVT 선별 및 이송을 적절히 하고 있다.	☐ 유 ☐ 무
	(TSC) CP에 따라 EVT를 시행하고 있다.	☐ 유 ☐ 무
항목3	적정 수준의 장비가 운영된다.	☐ 유 ☐ 무
	(TSC) EVT를 위한 적정 수준의 장비가 운영된다.	☐ 유 ☐ 무

적정진료 조사표

항목 1&2	표준지침에 따른 CP 구축과 IVT / EVT (TSC) 치료를 수행한다.	확인	
세부1	현재의 뇌졸중학회의 권고에 따른 CP가 운영된다.	☐ 유	☐ 무
세부2	평가는 질지표, 급성기 진료 및 역량 부분을 참고하고, 추가 의견 및 평가를 기술한다.		

시설 조사표

항목3	적정수준의 장비가 운영된다 (뇌졸중센터).	확인	
	CT	☐ 유	☐ 무
	MRI	☐ 유	☐ 무
	ECG	☐ 유	☐ 무
	Echocardiography	☐ 유	☐ 무
	Holter	☐ 유	☐ 무
	Transcranial Doppler Sonography	☐ 유	☐ 무
	Carotid Doppler Sonography	☐ 유	☐ 무
항목3	EVT를 위한 적정 수준의 장비가 운영된다 (TSC).	확인	
	CTA or MRA for 24 hours	☐ 유	☐ 무
	CT perfusion or DWI for 24 hours	☐ 유	☐ 무
	Angiography suite for 24 hours (모니터링항목)	☐ 유	☐ 무

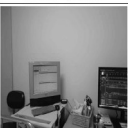
뇌혈관조영기 사진등록	CT사진등록	설치 장비	대수	단가	사진첨부 ¹⁾
		1-계세동기	1	8,695,000	
		3-심전도 (ECG)	1	12,400,000	
		8-심혈관촬영기	1	844,633,992	
		Transcranial doppler			

그림. 뇌혈관촬영 장비 사진

2021 대한뇌혈관내치료의학회 정기학술대회 및 총회

| 2021년 11월 27일(토) | 인천 파라다이스시티호텔 그랜드볼룸

12:10-13:10

Luncheon Seminar

좌장: 권순찬 (울산대)
권현조 (충남대)



Challenges and perspectives in neurorecovery: Multi-modal drug

박 근 영

연세대

CHALLENGES AND PERSPECTIVES IN NEURORECOVERY: MULTI-MODAL DRUG

Neuroprotection & Neurorecovery after Stroke

KEUN YOUNG PARK

SEVERANCE HOSPITAL

YONSEI UNIV. COLLEGE OF MEDICINE

STROKE AND BRAIN INJURY

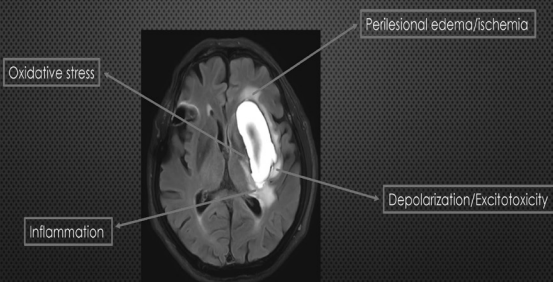
- PRIMARY INJURY
- SECONDARY INJURY
 - PERILESIONAL EDEMA AND ISCHEMIA
 - EXCITOTOXICITY
 - INFLAMMATION
 - OXIDATIVE STRESS
 - APOPTOSIS

Neuroprotection

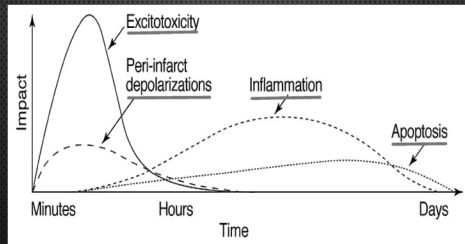
PERILESIONAL EDEMA AND ISCHEMIA



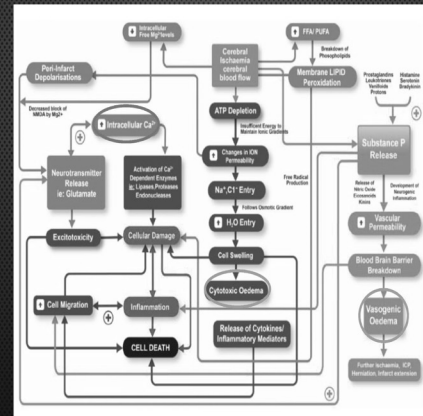
- ICH CATHETERIZATION
- MANNITOL
- GLYCEROL
- DESMOPRESSIN



Main mechanisms of neuronal death



From Dimagi, Iadecola, Moskowitz Trends Neurosci, 1999



From Renee JT, Robert V. Brain Sciences, 2013

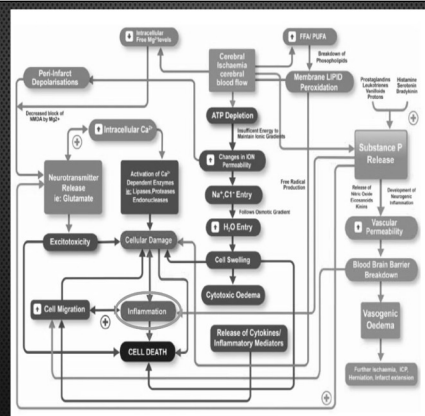
Ca²⁺

- INTRACELLULAR Ca²⁺ ↑ → EXCITOTOXICITY
- Ca²⁺ - DEPENDENT ENZYME ↑
- NIMODIPINE, (NICARDIPINE, FLUNARIZINE, ISRADIPINE)
- WELL-ESTABLISHED IN SAH, BUT NOT IN OTHER STROKE

Nimodipine for AIS

Nimodipine versus placebo for acute ischemic stroke					
Patient or population: people with acute ischemic stroke					
Settings: inpatients					
Intervention: nimodipine					
Comparison: placebo					
Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No. of participants (studies)	Quality of the evidence (GRADE)
	Assumed risk	Corresponding risk			
	Placebo	Nimodipine			
Death or dependency at end of follow-up	403 per 1000	464 per 1000	RR 1.16 (0.97 to 1.34)	6203 (28)	Moderate ^a
Death at the end of treatment	125 per 1000	137 per 1000	RR 1.10 (0.88 to 1.38)	5163 (35)	Moderate ^a
Death at the end of follow-up	210 per 1000	218 per 1000	RR 1.05 (0.94 to 1.16)	4312 (24)	Moderate ^a
Recurrence of stroke at the end of follow-up	32 per 1000	30 per 1000	RR 0.96 (0.94 to 1.01)	3671 (6)	Moderate ^a
Adverse events during treatment period	64 per 1000	73 per 1000	RR 1.13 (0.74 to 1.74)	4604 (21)	Moderate ^a
Hypotension during treatment period	12 per 1000	16 per 1000	RR 1.30 (0.92 to 1.84)	3648 (5)	Moderate ^a

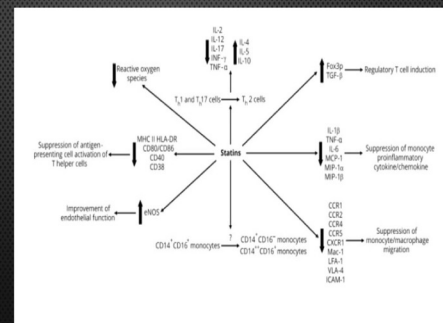
Jing Z et al. Cochrane Database of Systematic Reviews, 2016



From Renee JT, Robert V. Brain Sciences, 2013

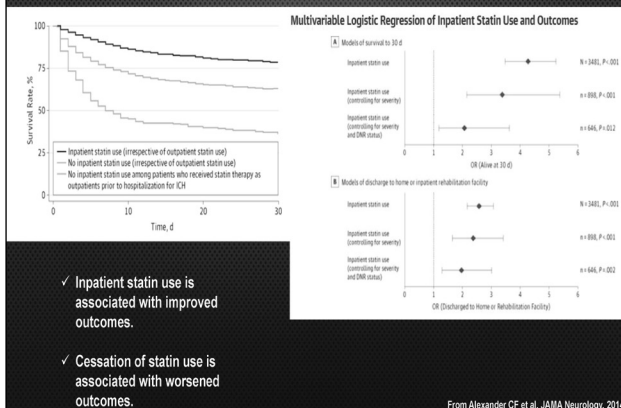
INFLAMMATION

- STEROID X
- STATIN
- DOWNREGULATION OF MEVALONATE AND ITS DERIVATIVES
- TARGETING KEY CELL SIGNALING PATHWAYS



From Chen CJ et al. Neurology, 2019

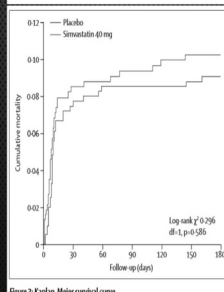
STATIN FOR ICH



STATIN FOR SAH

Simvastatin in aneurysmal subarachnoid haemorrhage (STASH): a multicentre randomised phase 3 trial

Peter J Kirkpatrick, Carole L Turner, Christopher Smith, Peter J Hutchinson, Gordon D Murray, for the STASH Collaborators



✓ No benefit in the use of simvastatin for long-term or short-term outcome in patients with aneurysmal SAH

STATIN AND RISK OF ICH

Statin Therapy and the Risk of Intracerebral Hemorrhage: A Meta-Analysis of 31 Randomized Controlled Trials

James S. McKinney, MD; William J. Kostos, PhD, MD

Background and Purpose—Statin therapy decreases the risk of ischemic stroke. An increased risk of intracerebral hemorrhage (ICH) has been observed in some studies. To investigate this issue, we performed a meta-analysis of randomized controlled trials using statins that reported ICH.

Methods—We performed a literature search of Medline, Web of Science, and The Cochrane Library through January 25, 2012, and identified additional randomized controlled trials by reviewing reference lists of retrieved studies and prior meta-analyses. All randomized controlled trials of statin therapy that reported ICH or hemorrhagic stroke were included. The primary outcome variable was ICH. Thirty-one randomized controlled trials were included. All analyses used random effects models and heterogeneity was not observed in any of the analyses.

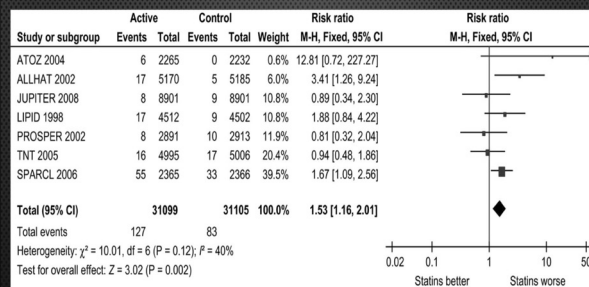
Results—A total of 91,588 subjects were included in the active group and 91,215 in the control group. There was no significant difference in incidence of ICH observed in the active treatment group versus control (OR, 1.08; 95% CI, 0.88–1.32; $P=0.47$). ICH risk was not related to the degree of low-density lipoprotein reduction or achieved low-density lipoprotein cholesterol. Total stroke (OR, 0.84; 95% CI, 0.78–0.91; $P<0.0001$) and all-cause mortality (OR, 0.92; CI, 0.87–0.96; $P=0.0007$) were significantly reduced in the active therapy group. There was no evidence of publication bias.

Conclusions—Active statin therapy was not associated with significant increase in ICH in this meta-analysis of 31 randomized controlled trials of statin therapy. A significant reduction in all stroke and all-cause mortality was observed with statin therapy. (Stroke. 2012;43:2149–2156.)

✓ OVERALL STATIN THERAPY WAS NOT ASSOCIATED WITH RISK OF ICH.

✓ HIGH DOSE STATIN?

HIGH-DOSE STATIN AND RISK OF ICH



INFLAMMATION

• FINGOLIMOD

• SPHINGOSINE-1-PHOSPHATE RECEPTOR

• USED IN MS

Cell type	Type of receptor	Function
Neuron	S1P1 = S1P3 > S1P2 = S1P5	Neurogenesis, neural progenitor migration, cell survival, and neurotransmission
Oligodendrocyte	S1P5 > S1P1 = S1P2 > S1P3	Oligodendrocyte precursor cell survival, migration, differentiation, and morphology
Astrocyte	S1P3 > S1P1 > S1P2 > S1P5	Proliferation, migration, gap function communication, and growth factor production
Microglia	S1P1 > S1P2 > S1P3 = S1P5	Pro-inflammatory cytokine production

From Wentao Li et al. Frontiers in Neurology. 2016

FINGOLIMOD

Combination of the Immune Modulator Fingolimod With Alteplase in Acute Ischemic Stroke

A Pilot Trial

Zhong Zhu, Ying Fu, Decai Tian, Na Sun, Wei Han, Guoqiang Chang, Yinhua Dong, Xiaolin Xu, Qiang Liu, DeRen Huang, and Fu-Dong Shi

Originally published 22 Jul 2015 | <https://doi.org/10.1161/CIRCULATIONAHA.115.016371> | Circulation. 2015;132:1104–1112

Fingolimod for the Treatment of Intracerebral Hemorrhage

A 2-Arm Proof-of-Concept Study

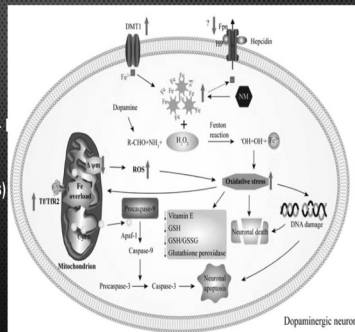
Ying Fu, MD¹; Junwei Hao, MD, PhD¹; Ningnan Zhang, MD, PhD²; et al.

► Author Affiliations | Article Information

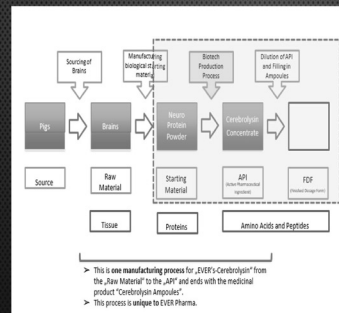
JAMA Neurol. 2014;71(9):1092–1101. doi:10.1001/jamaneurol.2014.1065

IRON

- RBC LYSIS → HEME → HEMIN →
- ROS (REACTIVE OXYGEN SPECIES)
- DEFEROXAMINE, MINOCYCLINE



CEREBROLYSIN



Neurorecovery

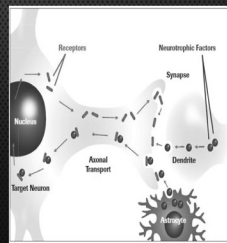
NEURORECOVERY

- NEUROTROPHIC FACTORS (NTFs)

: A FAMILY OF BIOMOLECULES THAT SUPPORT THE GROWTH, SURVIVAL, AND DIFFERENTIATION OF NEURONS.

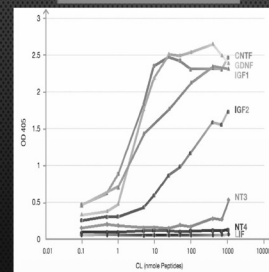
- ✓ NEUROTROPHINS (BDNF, NGF, NT-3,4)

- ✓ CNTF
- ✓ GDNF
- ✓ IGF



ENDOGENOUS NTFs LIKE PEPTIDES FOUND IN CEREBROLYSIN

Cerebrolysin mimics NTFs

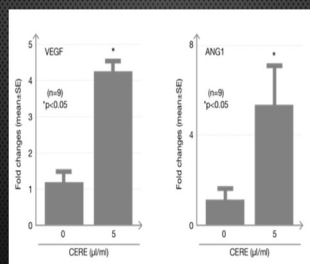


Detection of NTF-like neuropeptides in Cerebrolysin by immunoassay (ELISA)

Chen H. et al., Trophic factors counteract elevated FGF-2-induced inhibition of adult neurogenesis, Neurobiol Aging, 2007 Aug;28(8):1148-62

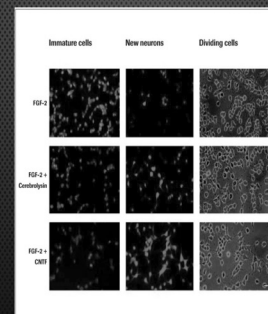
CEREBROLYSIN STIMULATES NTF PRODUCTION IN CNS

Cerebrolysin modulates endogenous NTFs



Cerebrolysin increases VEGF and ANG-1 expression in cerebral endothelial cells (graphs show mRNA levels in an in vitro experiment)

Cerebrolysin mimic activity of CNTF

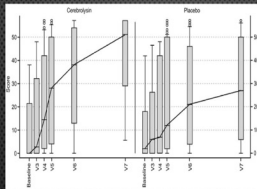


Cerebrolysin increases the number of new neurons in a cell culture model (like CNTF)

Chen H. et al., Trophic factors counteract elevated FGF-2-induced inhibition of adult neurogenesis, Neurobiology of Aging 2007; 28(8):1148-1162

PRIMARY EFFICACY CRITERION – ARAT SCORE

MITT POPULATION, LOCF, NON-PARAMETRIC ANALYSES

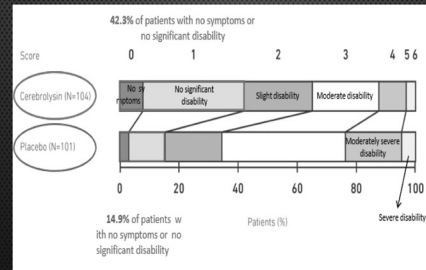


Study visits:
V1: Screening
V2: Baseline
V3: 7 days post-baseline
V4: 14 days post-baseline
V5: 21 days post-baseline
V6: 42 days post-baseline
V7: 90 days post-baseline
(N = Study endpoints)

	Baseline	D 90 (V7)	Change from baseline
Cerebrolysin, N=104			
• mean±SD	10.1±15.9	40.7±20.2	30.7±19.9
• median	0.0	51.0	32.0
• IQR	21.5	28.0	36.5
Placebo, N=101			
• mean±SD	10.7±16.5	26.5±21.0	15.9±16.8
• median	2.0	27.0	11.0
• IQR	18.0	44.0	22.0

SECONDARY EFFICACY CRITERIA – MRS

MITT POPULATION, LOCF, NON-PARAMETRIC ANALYSES



SAFETY

SAFETY POPULATION, N=208

	Cerebrolysin N=104				Placebo N=104				
	N	%	freq	N	%	freq	N	%	freq
Duration of exposure (mean, d)	208	20.4	-	104	20.5	-	104	20.3	-
Patients with TEAEs	146	70.2	400	72	69.2	201	74	71.2	199
Drug related ¹	44	21.2	63	22	21.2	28	22	21.2	35
Leading to withdrawal	7	3.4	-	2	1.9	-	5	4.8	-
Patients with TSEAEs	10	4.8	16	3 ²	2.9	3	7	6.7	13
Drug related ¹	0	0.0	0	0	0.0	0	0	0.0	0
Leading to withdrawal	6	2.9	-	1	1.0	-	5	4.8	-
Patients who died	4	1.9	-	0	0.0	-	4	3.8	-

N, number of patients; %, percentage of patients; freq., frequency of events; TEAE, treatment-emergent adverse event; TSEAE, treatment-emergent serious adverse event, coded according to MedDRA 13.1

¹Drug related = definite, probable, possible, not assessable, missing; not drug related = unlikely, not related
²Severe peripheral ischemia; moderate renal colic; acute myocardial infarction; all resolved during study period

N...number of patients; %...percentage of patients; freq...frequency of event; TEAE...treatment-emergent adverse event; TSEAE...treatment-emergent serious adverse event; coded according to MedDRA 13.1

¹Drug related = definite, probable, possible, not assessable, missing; not drug related = unlikely, not related

²Severe peripheral ischemia • moderate renal colic • acute myocardial infarction • all resolved during study period

IN CONCLUSION

- THE STUDY PROVIDES EVIDENCE FOR BENEFICIAL EFFECTS OF DUAL INTERVENTION WITH CEREBROLYSIN AND REHABILITATION ON FUNCTION AND GLOBAL OUTCOME PATIENTS AFTER STROKE
- THE LONG-TERM TREATMENT OVER 21 DAYS WITH A DAILY DOSAGE OF 30 ML CEREBROLYSIN SEEMS TO BE ADEQUATE AND MOST LIKELY SUPERIOR TO PREVIOUSLY TESTED 10-DAY TREATMENT REGIMENS

SUMMARY

- STATIN FOR STROKE
- FINGOLIMOD FOR STROKE
- CEREBROLYSIN FOR STROKE

Updates in neurorecovery after stroke: EAN Guideline

신 승 훈

차의과학대

2021 KoNES 경기기술대학및 총회

Updates in neurorecovery after stroke: EAN Guideline

Seung Hun Sheen, M.D., PhD.

Department of Neurosurgery,
NeuroVascular Center, Bundang CHA Medical Center,
CHA University College of Medicine

Stroke

WHO Global Stroke Fact Sheet 2020 (2016 data)
Stroke Fact Sheet in Korea 2018 (2014 data)
*Yellin et al. 2014

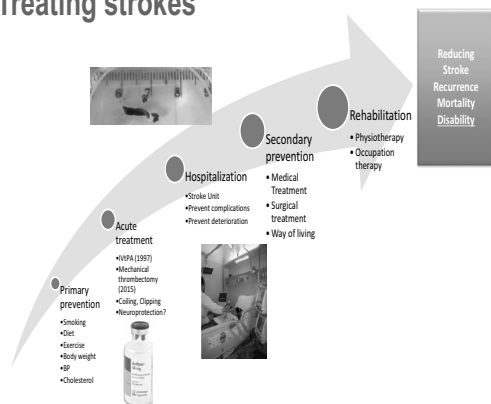
	Global	Korea
Incidence	13,700,000	105,000 (2004)
Prevalence	80,000,000	690,000
Death	86/per 100,000	30/per 100,000
Permanent Disability	5,000,000*	
DALYs (Disability-adjusted life years)	116,445,136 year 63% of healthy life <=70 18% of healthy life <=44	

- Stroke is among the leading causes of serious, long-term disability worldwide
- 15 million people suffer a stroke each year
- Annually five million people have permanent disability due to stroke

DALY



Treating strokes



AHA/ASA Guideline

Guidelines for Adult Stroke Rehabilitation and Recovery A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

Endorsed by the American Academy of Physical Medicine and Rehabilitation and the American Society of Neurorehabilitation

- Early mobilization after stroke is recommended in many clinical practice guidelines worldwide. The AVERT findings should affect clinical practice by refining present guidelines, but clinical recommendations should be informed by future analyses of dose-response associations

Recommendations: Rehabilitation Interventions in the Inpatient Hospital Setting	Class	Level of Evidence
It is recommended that early rehabilitation for hospitalized stroke patients be provided in environments with organized, interprofessional stroke care.	I	A
It is recommended that stroke survivors receive rehabilitation at an intensity commensurate with anticipated benefit and tolerance.	I	B
High-dose, very early mobilization within 24 hours of stroke onset can reduce the odds of a favorable outcome at 3 months and is not recommended.	III	A

Stroke. 2016;47:e98–e169.

Importance of stroke rehabilitation guidelines



- Over the past few years, the number of **high-quality scientific studies in neurorehabilitation** has significantly increased
- Strong focus on stroke rehabilitation guidelines in many countries - important standard of Good Clinical Practice
- The aim is to start with rehabilitation already in the acute treatment

Source: Mills, Aggar, E., and Doherty, C. "Stroke recovery: Scoping influences and initial consequences." *Advances in medicine* 2014(2014).

Cerebrolysin® included in stroke rehabilitation guidelines of top reference countries and EAN guideline



Austrian stroke rehabilitation guideline 2018



Class 2, Level B

With regards to a specific peptide preparation, there is evidence of positive effects in rehabilitation (Cerebrolysin® [30 ml over 3 weeks or longer] [Class 2, Level B]) can improve rehabilitation of the upper extremity after a stroke.

There is no convincing evidence for food supplements or vitamins. Stem cell therapies are still being studied, and trials will be completed in the years to come.

German stroke rehabilitation guideline 2020



Evidence 1b, Recommendation B

6. Recommendations

Cerebrolysin can be considered for (sub) acute stroke patients with relevant arm paresis when treatment targets are motor function recovery of the hand / arm function and overall functional recovery (evidence 1b, assessment of effects: moderate quality; recommendation grade 0; strong consensus).

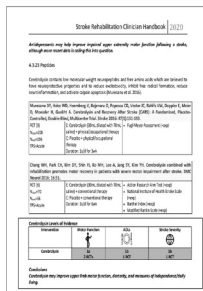
If used, the drug should be started as quickly as possible (from 24 to 72 hours after the stroke) and, if tolerated, prescribed for 21 days, once a day, intravenously, in addition to rehabilitation [evidence 1b, assessment of effects: moderate quality; recommendation grade B; strong consensus]. Specific information by the manufacturer must be taken into consideration.

Canadian stroke rehabilitation guideline 2020

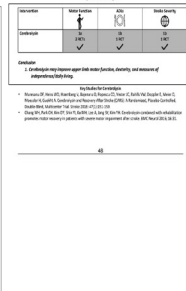
Evidence Review



Clinician's Handbook



Executive Summary



Canadian stroke rehabilitation guideline 2020



Cerebrolysin Levels of Evidence			
Intervention	Motor Function	ADLs	Stroke Severity
Cerebrolysin	1a 2 RCTs	1b 1 RCT	1b 1 RCT

Conclusions:
Cerebrolysin may improve upper limb motor function, dexterity, and measures of independence/daily living.

Please note that an error occurred here! Stroke Severity should be mentioned instead of dexterity. Correction requested!

Overview about medications in guideline Cerebrolysin® – the best ranked drug in the guideline

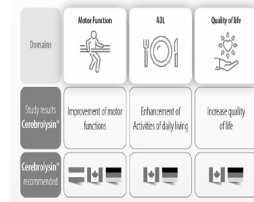


Medication	Motor function	Dexterity	Activities of daily living	Spasticity	Range of Motion	Proprioception	Stroke severity	Muscle strength	Conclusion
Cerebrolysin	1a		1b				1b		Cerebrolysin may be beneficial
Levodopa	1b	1b						1b	Evidence is mixed
Atorvastatin			1b					1b	Evidence is mixed
Antidepressants	1a*	1a*	1b*				1a*	1a*	Antidepressants may be beneficial
Steroids					1b				Steroid injections may not be beneficial
Botulinum Toxin	1a 2 2	1a 1b 1b	1a 1b 2 2	1a 2 1b 1b 1b 1b 1b 1b 1b 1b	1a 1b 1b 1b 1b 1b 1b 1b 1b 1b			1b	Botulinum A likely improves spasticity

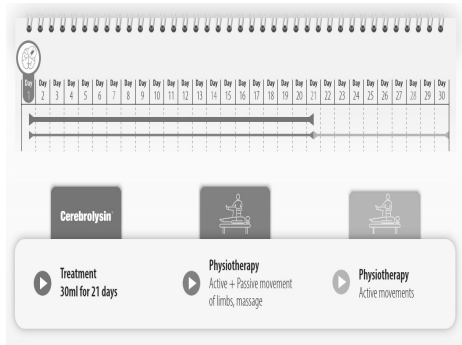
* 3 new studies which are negative → information will follow!

All 3 guidelines recommend Cerebrolysin in

- Improvement of motor functions
- Improvement of Activities of daily living (ADL)
- Improvement of quality of life (QoL)



CARS treatment concept in guidelines recommended Pharmacological treatment starting in acute phase + Rehabilitation



1st EAN Guideline in neurorehabilitation

Received: 3 April 2021 | Accepted: 17 May 2021
DOI: 10.1111/ene.14936

European Journal of Neurology

GUIDELINES

European Academy of Neurology and European Federation of Neurorehabilitation Societies guideline on pharmacological support in early motor rehabilitation after acute ischaemic stroke

Ettore Beghi¹ | Heinrich Binder² | Codruta Birle³ | Natan Bornstein⁴ | Karin Diserens⁵ | Stanislav Groppa⁶ | Volker Homberg⁷ | Vitalie Lisnic⁸ | Maura Pugliatti⁹ | Gary Randal¹⁰ | Leopold Saltuari¹¹ | Stefan Strikluc¹² | Johannes Vester¹³ | Dafin Muresanu¹¹

1st EAN Guideline in neurorehabilitation

Results: Upon manually screening 17,969 unique database entries (of 57,001 original query results), interventions underwent meta-analysis. Cerebrolysin (30 ml/day, intravenous, minimum 10 days) and citalopram (20 mg/day, oral) are recommended for clinical use for early neurorehabilitation after acute ischaemic stroke. The remaining interventions identified by our systematic search are not recommended for clinical use: amphetamine (5, 10 mg/day, oral), citalopram (10 mg/day, oral), dextroamphetamine (10 mg/day, oral), Di-Huang-Yi-Zhi (2 × 18 g/day, oral), fluoxetine (20 mg/day, oral), lithium (2 × 300 mg/day, oral), MLC6013 (400 mg/day, oral), phosphodiesterase-5 inhibitor PF-03049423 (6 mg/day, oral). No recommendation 'for' or 'against' is provided for selegiline (5 mg/day, oral). Issues with safety and tolerability were identified for amphetamine, dextroamphetamine, fluoxetine and lithium.

Conclusions: This guideline provides information for clinicians regarding existing pharmacological support in interventions for neurorecovery after acute ischaemic stroke. Updates to this material will potentially elucidate existing conundrums, improve current recommendations, and hopefully expand therapeutic options for stroke survivors.

KEYWORDS
early motor rehabilitation, ischaemic stroke, neurorehabilitation

Joint-Guideline with the EFNR



Three ways how the EAN develops guidelines

1. The EAN develops their own guidelines
2. The EAN endorses guidelines originally created by other European Medical Societies, provided they follow the same/similar methodologies like GRADE
3. The EAN also endorses the creation of guidelines in collaboration with other other medical societies.

This EAN-Guideline is a **joint guideline** with the EFNR and has been developed by a task force consisting of members of EAN and EFNR.

Importance of EAN guideline

- PAN-European Recommendation
- Largest neurological society worldwide
- Globally acknowledged - Outreach to all other global regions (e.g. USA)
- Go-To-Guideline – First choice for decision-making



Creation of the EAN Guideline

- Searching and selecting studies, data collection, risk of bias assessment, statistical analysis, was done by:

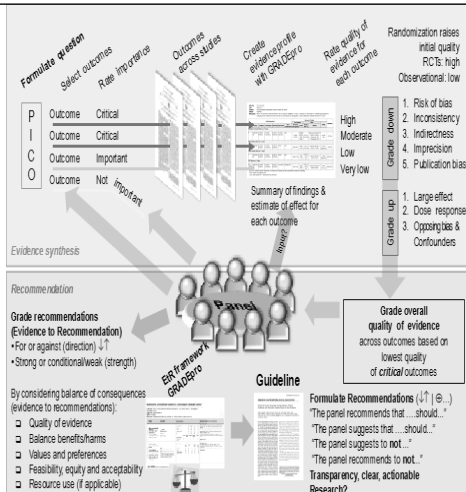
- Systematic Reviews and Meta-Analyses (PRISMA)
- Cochrane Handbook for Systematic Reviews of Interventions



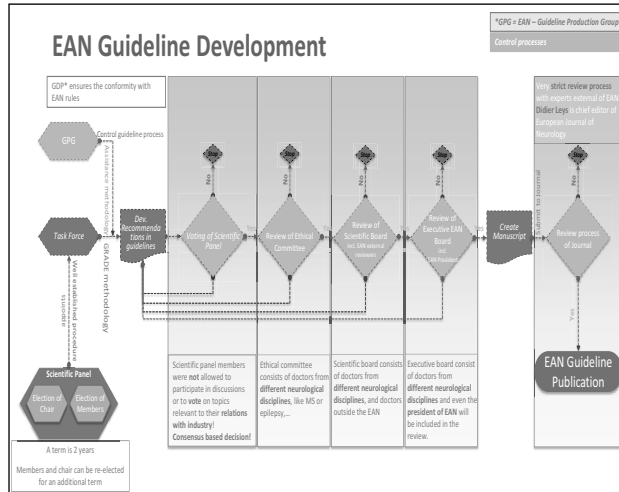
- Statistical analysis and scaling of recommendations were made by
- GRADE (= Grading of Recommendations, Assessment, Development and Evaluations)



GRADE Methodology



EAN Guideline Development



RESULTS

Guideline research questions

In patients with **early motor rehabilitation** after acute ischemic stroke, does a **pharmacological treatment** impact patient

- early motor performance (1 and 3 months after stroke)
- neurological function (1 and 3 months after stroke)
- global functional outcome (1 and 3 months after stroke)
- safety (serious adverse events)

compared with standard/usual care?

PICO Questions

Patient/problem: Acute ischemic stroke

Intervention: Pharmacological intervention in the first 7 days after stroke

Comparison: Neurorehabilitation alone

Outcomes (N = 4): early motor performance, neurological function, global functional outcome, safety

Setting: Early motor rehabilitation after acute ischemic stroke

Highest quality evidence for Cerebrolysin®

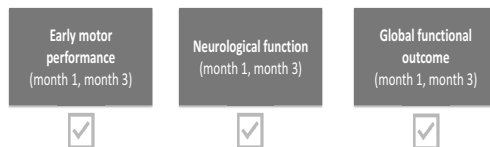
Cerebrolysin® is the best evaluated drug in the EAN guideline

- 4 x high-quality evidence
- 1 x moderate quality evidence
- 1 x low quality evidence

High-quality evidence means the results can be expected in clinical practice

Cerebrolysin Early motor performance (month 1, month 3) The randomized trial (N = 200) compared cerebrolysin with standard care and a 1-month follow-up using the Action Research Arm Test (ARACT). The mean scores for the control group were 12.5 (SD 4.6) and 18.5 (SD 4.6) at month 1 and month 3, respectively. The mean scores for the cerebrolysin group were 14.5 (SD 4.6) and 20.5 (SD 4.6) at month 1 and month 3, respectively. The difference between the groups was statistically significant at both time points (p < 0.05). Neurological function (month 1, month 3) Four randomized trials (N = 102) compared cerebrolysin with standard care and a 1-month follow-up using the National Institutes of Health Stroke Scale (NIHSS). The mean scores for the control group were 14.5 (SD 4.6) and 18.5 (SD 4.6) at month 1 and month 3, respectively. The mean scores for the cerebrolysin group were 12.5 (SD 4.6) and 16.5 (SD 4.6) at month 1 and month 3, respectively. The difference between the groups was statistically significant at both time points (p < 0.05).	Global functional outcome (month 1, month 3) The randomized trial (N = 200) compared cerebrolysin with standard care and a 1-month follow-up using the modified Rankin Scale (mRS). The mean scores for the control group were 4.5 (SD 2.5) and 5.5 (SD 2.5) at month 1 and month 3, respectively. The mean scores for the cerebrolysin group were 3.5 (SD 2.5) and 4.5 (SD 2.5) at month 1 and month 3, respectively. The difference between the groups was statistically significant at both time points (p < 0.05).
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Effects in all relevant stroke rehabilitation domains Best results for Cerebrolysin®



Cerebrolysin® shows beneficial effects in all domains!
CARS trials, ECOMPASS, Bornstein Meta-Analysis and some other studies triggered inclusion into EAN guideline!

Proven safety



NO difference between Cerebrolysin® and Control Group regarding SAEs*

*SAE = Serious Adverse Events

Recommendation FOR USE for Cerebrolysin®

Pharmacological intervention	Daily dose	Recommendation
Amphetamine	5 mg, 10 mg	Against use
Cerebrolysin	30 ml	FOR USE
Citalopram	10 mg	Against use
Citalopram	20 mg	For use
Dextroamphetamine	10 mg	Against use
Di-Huang-Yi-Zhi	36 g	Against use
Fluoxetine	20 mg	Against use
Lithium	600 mg	Against use
MLC601 (NeuroAid)	1200 mg	Against use
Phosphodiesterase-5 inhibitor	6 mg	Against use
Selegiline	5 mg	No recommendation

Evaluation of Citalopram 20 mg

Citalopram Early motor performance (month 1, month 3) The randomized trial (N = 200) compared citalopram with standard care and a 1-month follow-up using the Action Research Arm Test (ARACT). The mean scores for the control group were 12.5 (SD 4.6) and 18.5 (SD 4.6) at month 1 and month 3, respectively. The mean scores for the citalopram group were 14.5 (SD 4.6) and 20.5 (SD 4.6) at month 1 and month 3, respectively. The difference between the groups was statistically significant at both time points (p < 0.05). Neurological function (month 1, month 3) Four randomized trials (N = 102) compared citalopram with standard care and a 1-month follow-up using the National Institutes of Health Stroke Scale (NIHSS). The mean scores for the control group were 14.5 (SD 4.6) and 18.5 (SD 4.6) at month 1 and month 3, respectively. The mean scores for the citalopram group were 12.5 (SD 4.6) and 16.5 (SD 4.6) at month 1 and month 3, respectively. The difference between the groups was statistically significant at both time points (p < 0.05).	Global functional outcome (month 1, month 3) The randomized trial (N = 200) compared citalopram with standard care and a 1-month follow-up using the modified Rankin Scale (mRS). The mean scores for the control group were 4.5 (SD 2.5) and 5.5 (SD 2.5) at month 1 and month 3, respectively. The mean scores for the citalopram group were 3.5 (SD 2.5) and 4.5 (SD 2.5) at month 1 and month 3, respectively. The difference between the groups was statistically significant at both time points (p < 0.05).
--	---

Evidence quality

- 4 x moderate quality evidence
- 1 x low quality evidence

Results

- "small difference..."
- "no indication for beneficial effects..."

Safety

- "No reliable information on SAEs"

Talos-Study with Citalopram 20mg – Borderline Significance

Title: Neuroregeneration and Vascular Protection by Citalopram in Acute Ischemic Stroke (TALOS)
A Randomized Controlled Study

Originally published: <https://doi.org/10.1161/STROKEAHA.117.020067> Stroke. 2018;49:2568–2576

Objective: detect improvement in functional outcomes and cardiovascular protection in non-depressed, first-ever ischemic stroke

Key Facts

- Placebo-controlled, randomized, double-blind RCT with 642 patients (citalopram n=319 and placebo n=323)
- Onset of treatment: within 7 days after stroke
- 2 co-primary outcomes
 - Changes in functional disability (measured by mRS)
 - Composite vascular endpoint – transient ischemic attack, myocardial infarction, vascular mortality within 6 months
- Study medication was given as add-on to standard medical care and treatment duration and follow-up was 6 months.

Results

Early Citalopram treatment did not improve functional recovery in nondepressed ischemic stroke patients within the first 6 months, although a **borderline statistical significant effect** was observed in the analysis population. The risk of cardiovascular events was similar between treatment groups, and citalopram treatment was well tolerated.

Two evaluated drugs FOR USE

Cerebrolysin

Cerebrolysin® is the best evaluated drug in the EAN guideline – rated as follows:

4 x high quality evidence
1 x moderate quality evidence
1 x low quality evidence

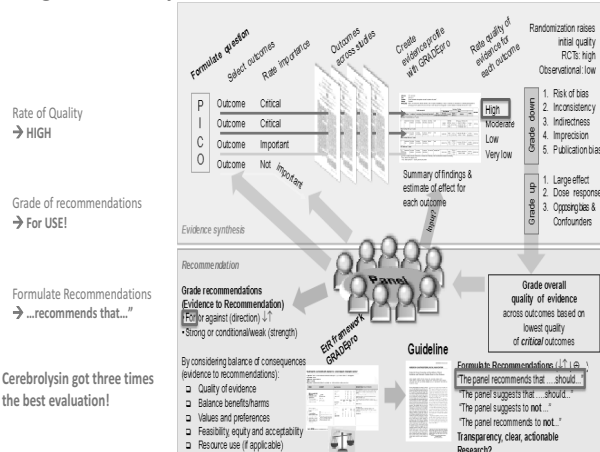
Citalopram 20 mg

Citalopram 20 mg is rated as follows:

4 x moderate quality evidence
1 x low quality evidence

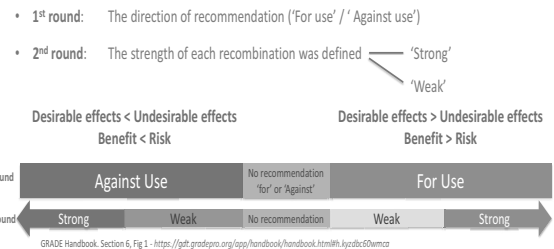
"small difference..."
"no indication for beneficial effects..."
"No reliable information on SAEs"

Rating of Cerebrolysin in GRADE

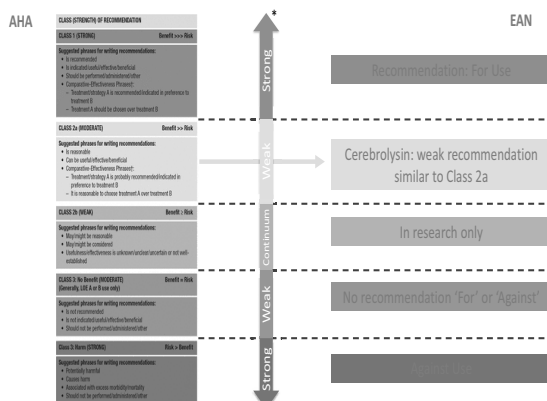


Formulating recommendations in EAN guideline

A two-round approach was used:

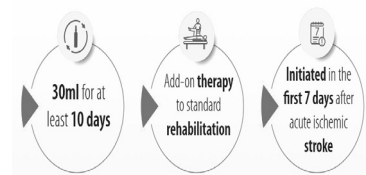


Comparing AHA & EAN Guidelines



*GRADE Handbook. Strength of recommendation on a continuum: Categorical terminology - <https://gdt.gradepro.org/app/handbook/handbook.html#ix2dc0wmcia>

Treatment recommendation Cerebrolysin®



Very similar to CARS treatment

Strongest recommendation for Cerebrolysin®

*"This guideline found **sufficient evidence** to recommend use of **Cerebrolysin** in moderate-severe cases, as an **add-on therapy to standard rehabilitation**, when initiated in the first 7 days after acute ischaemic stroke."*

*"...Cerebrolysin add-on treatment **should be prioritized** in moderate-severe stroke cases (NIHSS ≥ 8)."*

Key Messages

- 1st EAN guideline for neurorehabilitation after stroke
- **Strongest recommendation** for Cerebrolysin®
 - Highest quality evidence
 - Best results in all domains
 - Proven safety

Conclusion

1. Cerebrolysin recommended by **guidelines** of top reference countries and EAN Guideline
2. The **best drug** for stroke recovery in the guidelines
3. Highest evidence in **motor functions, ADL and quality of life**
4. Start from **acute phase** up to **21 days (At least 10days)** with 30ml

THANK YOU!

2021 대한뇌혈관내치료의학회 정기학술대회 및 총회

| 2021년 11월 27일(토) | 인천 파라다이스시티호텔 그랜드볼룸

13:40-14:40

Plenary Session

좌장: 성재훈 (가톨릭대)
김문철 (에스포항병원)



Is 3 years adequate for tracking completely occluded coiled aneurysms?

Eung Koo Yeon, MD,¹ Young Dae Cho, MD, PhD,² Dong Hyun Yoo, MD,² Su Hwan Lee, MD,³ Hyun-Seung Kang, MD, PhD,⁴ Jeong Eun Kim, MD, PhD,⁴ Won-Sang Cho, MD, PhD,⁴ Hyun Ho Choi, MD,⁵ and Moon Hee Han, MD, PhD⁶

¹Department of Radiology, KyungHee University Medical Center, KyungHee University College of Medicine;

²Department of Radiology, Seoul National University Hospital, Seoul National University College of Medicine, Seoul; ³Department of Neurosurgery, Dongguk University Ilsan Hospital, Dongguk University College of Medicine, Ilsan; ⁴Department of Neurosurgery, Seoul National University Hospital, Seoul National University College of Medicine; ⁵Department of Neurosurgery, Chung-Ang University Hospital, Chung-Ang University College of Medicine; and ⁶Department of Radiology, Veterans Health Service Medical Center, Seoul, Korea

J Neurosurg 133(3):758-764, 2020

Objective: The authors conducted a study to ascertain the long-term durability of coiled aneurysms completely occluded at 36 months' follow-up given the potential for delayed recanalization.

Methods: In this retrospective review, the authors examined 299 patients with 339 aneurysms, all shown to be completely occluded at 36 months on follow-up images obtained between 2011 and 2013. Medical records and radiological data acquired during the extended monitoring period (mean 74.3 ± 22.5 months) were retrieved, and the authors analyzed the incidence of (including mean annual risk) and risk factors for delayed recanalization.

Results: A total of 5 coiled aneurysms (1.5%) occluded completely at 36 months showed recanalization (0.46% per aneurysm-year) during the long-term surveillance period (1081.9 aneurysm-years), 2 surfacing within 60 months and 3 developing thereafter. Four showed minor recanalization, with only one instance of major recanalization. The latter involved the posterior communicating artery as an apparent de novo lesion, arising at the neck of a firmly coiled sac, and was unrelated to coil compaction or growth. Additional embolization was undertaken. In a multivariate analysis, a second embolization for a recurrent aneurysm (HR = 22.088, $p = 0.003$) independently correlated with delayed recanalization.

Conclusions: Almost all coiled aneurysms (98.5%) showing complete occlusion at 36 months post-embolization proved to be stable during extended observation. However, recurrent aneurysms were predisposed to delayed recanalization. Given the low probability yet seriousness of delayed recanalization and the possibility of de novo aneurysm formation, careful monitoring may be still considered in this setting but at less frequent intervals beyond 36 months.

Keywords: aneurysm; coiling; follow-up; recanalization; vascular disorders

Discrepancy between MRA and DSA in identifying the shape of small intracranial aneurysms

Youngseok Kwak, MD,¹ Wonsoo Son, MD,² Yong-Sun Kim, MD, PhD,³ Jaechan Park, MD, PhD,² and Dong-Hun Kang, MD²

¹Department of Neurosurgery, School of Medicine, Catholic University of Daegu; and Departments of ²Neurosurgery and ³Radiology, School of Medicine, Kyungpook National University, Daegu, Republic of Korea

J Neurosurg 134:1887-1893, 2021

Objective: The authors evaluated the sensitivity and accuracy of MRA in identifying the shape of small-sized unruptured intracranial aneurysms.

Methods: Small (< 7 mm) unruptured intracranial aneurysms initially detected by MRA and confirmed by DSA between January 2017 and December 2018 were morphologically reviewed by neuroradiologists. Regularity or irregularity of aneurysm shape was analyzed by two independent reviewers using MRA without DSA results. DSA findings served as the reference standard for aneurysm shape. Irregular shape, which in small aneurysms is associated with a higher likelihood of rupture, was defined as positive, and MRA sensitivity, specificity, and accuracy were determined by using evaluations based on location, size, and MRA magnetic strength (1.5T vs 3T MRA). Multivariate analysis was performed to determine risk factors for false-negative MRA results for irregularly shaped aneurysms.

Results: In total, 652 unruptured intracranial aneurysms in 530 patients were reviewed for this study. For detecting aneurysm shape irregularity, the overall MRA sensitivity was 60.4% for reviewer 1 and 60.9% for reviewer 2. Anterior cerebral artery aneurysms had the lowest sensitivity for location (36.7% for reviewer 1, 46.9% for reviewer 2); aneurysms sized < 3 mm had the lowest sensitivity for size (26.7% for both reviewers); and 1.5T MRA had lower sensitivity and accuracy than 3T MRA. In multivariate analysis, location, size, and magnetic strength of MRA were independent risk factors for false-negative MRA results for irregularly shaped aneurysms.

Conclusions: MRA had a low sensitivity for detecting the irregular shape of small intracranial aneurysms. In particular, anterior cerebral artery location, aneurysm size < 3 mm, and detection with 1.5T MRA were associated with a higher risk of irregularly shaped aneurysms being misjudged as regular.

Keywords: magnetic resonance angiography; intracranial aneurysm; aneurysm shape; digital subtraction angiography; sensitivity; accuracy; vascular disorders

우수 연제 1 (Aneurysm 부문)

Multiple overlapping stent treatment for symptomatic unruptured intracranial vertebral artery dissecting aneurysms

Yong Cheol Lim

Department of Neurosurgery, Ajou University Hospital

Objective: To evaluate the outcomes of multiple overlapping stent (MOS) treatment for symptomatic unruptured intracranial vertebral artery dissecting aneurysms (uis-VADAs).

Methods: This retrospective study evaluated 35 patients with 35 uis-VADAs who were treated using multiple overlapping stent between March 2016 and July 2021. Clinical and radiographic data, including procedure-related complications and clinical outcomes assessed using the modified Rankin Scale (mRS) at the time of the last follow-up, were collected and reviewed.

Result: There were 13 (37%) female and 18 (63%) male patients, and the mean patient age was 45.56 years. The mean follow-up duration was 26.7 months. Mainly, double stents were used to treat patients with uis-VADAs, including LVIS stent within Enterprise in 23 patients, double Enterprise stents in 8 patients, Solitare within Enterprise in 2 patient, Alpha stent within Enterprise, and double LVIS in 1 patient respectively. There were 1 (0.3%) patients who had peri-procedural minor stroke. Angiography at the 12-month follow-up in 28 patients showed favorable occlusion (OKM grade C3 + D). All of the patients had no symptoms at all (modified Rankin Scale 0) at the last follow-up. No re-treatment or delayed aneurysm rupture occurred during the follow-up period.

Conclusion: Reconstructive technique with MOS is a feasible and effective modality for the treatment of uis-VADAs, showing excellent occlusion rate and clinical outcome.

Machine Learning-based Three-months Outcome Prediction in Acute Ischemic Stroke: A Single Cerebrovascular-specialty Hospital Study in South Korea

Doug ho Park, Su Yun Lee, Eun Hwan Jeong, Hae Jong Kim, Hae Wook Pyun, Hae Min Kim, Yeon-Ju Choi, Young Soo Kim, Sun Tak Jin, Dae Young Hong, Dong Woo Lee, Mun-Chul Kim

Department of Neurosurgery, Pohang Stroke And Spine Hospital

Objective: Functional outcome after acute ischemic stroke is of great interest to patients and their families as well as physicians and surgeons making clinical decisions. This study aimed to develop machine learning (ML)-based functional outcome prediction models in patients with acute ischemic stroke.

Methods: This is a retrospective study using a prospective cohort database (Korean Stroke Registry). Patients admitted to single-center with acute ischemic stroke from January 2019 to March 2021 were included. We utilized variables at the time of admissions, such as demographic factors, stroke-related factors, laboratory findings, and comorbidities. Five ML algorithms were applied to predict a favorable functional outcome (modified Rankin scale 0 or 1) at 3-months after stroke onset. Model performance was evaluated mainly by the area under the receiver operating characteristic curve (AUC).

Result: A total of 1,066 patients were finally enrolled, and 745 (69.9%) of them showed a favorable outcome. Regularized logistic regression showed the best performance with an AUC of 0.86 (95% confidence interval [CI], 0.82–0.90). Support vector machines represented the second-highest AUC of 0.85 (95% CI, 0.81–0.89) with the highest F1-score of 0.86. All the ML models applied showed AUC > 0.8. National Institute of Health Stroke Scale at admission and age were consistently the top two important variables for generalized logistic regression, random forest, and extreme gradient boosting models.

Conclusion: ML-based functional outcome prediction models in acute ischemic stroke were validated, readily applicable, and are useful. In particular, regularized logistic regression represented the best model performance.

2021 대한뇌혈관내치료의학회 정기학술대회 및 총회

| 2021년 11월 27일(토) | 인천 파라다이스시티호텔 그랜드볼룸

15:00-16:00

Symposium II

New trends in Neuroendovascular Surgery

좌장: 신용삼 (가톨릭대)
권오기 (서울대)



KoNES WEB registry: Procedural characteristics

강 현 승

서울대

2021.11.27. KoNES 정기학술대회

Symposium II. New Trends in Neuroendovascular Surgery

KoNES WEB registry: Procedural Characteristics

강현승 (서울대)

KoNES WEB investigators

KoNES 치료재료평가위원회

KoNES WEB investigators

- 신용삼, 강현승, 박근영, 정해웅, 박석규, 최재호
- 김병문, 신희섭, 권순찬, 홍대영, 김준기
- 김창현, 장동규

WEB introduction in Korea

- (2019.10.) 3 aneurysms, treated with WEB in Korea
- (2021.8. ~ 2021.11.) 52 aneurysms, treated with WEB in Korea
- 13 physicians, 11 hospitals
- Data collected as of November 2021....
- 49 patients, 51 aneurysms
- 11 physicians, 9 hospitals

KoNES WEB registry: Demographics

- 49 patients (31 females, 18 males) f:m = 1.7:1
- Mean age, **62.7** (range, 43 to 80)
- 51 aneurysms; Unruptured
- Location: MCA [**22** (43%)], Basilar tip [**16** (32%)], ACoAA [**13** (25%)]
- Mean width, **5.9** mm (range, 2.9 to 10)
- Mean height, **5.3** mm (range, 2.8 to 10.1)
- Mean neck, **4.6** mm (range, 2.3 to 8.6)

KoNES WEB registry: Demographics

- 49 patients (31 females, 18 males) f:m = 1.7:1
- Mean age, **62.7** (range, 43 to 80)
- 51 aneurysms; Unruptured
- Location: MCA [**22** (43%)], Basilar tip [**16** (32%)], ACoA [**13** (25%)]

KoNES WEB registry: Aneurysm dimensions

- Mean width, **5.9** mm (range, 2.9 to 10)
- Mean height, **5.3** mm (range, 2.8 to 10.1)
- Mean neck, **4.6** mm (range, 2.3 to 8.6)
- ✓MCA An. of **W2.9** H5.3 N3.8
- ✓MCA An. of W3.7 **H2.8** N2.8
- ✓MCA An. of **W10.0** H7.0 N7.5
- ✓BA tip An. of W8.3 **H10.1** N5.3

KoNES WEB registry: Antiplatelet medication

- | | |
|-------------------------------------|--|
| ▪ Pre-medication | ▪ Post-medication |
| • CPG/ASA [38] (1wk preop) | • CPG/ASA [34] (1 mo to 3 mo) |
| • PSG/ASA [12] (1d preop) | • CPG [4] |
| • CPG/ASA/CSZ [1] | • ASA [7] |
| | • Changed to ASA/CPG on POD#4 [1] |
| | • PSG/ASA [3] (1 wk to 1 mo) |
| | • none [1] |

KoNES WEB registry: Access

- Distal access catheters
- **6Fr. Sofia** [**38**]
- 5Fr. Sofia [12]: BA tip (5), MCA (4), ACoA (3)
- 6Fr. Navien [1]
- Microcatheters
- **VIA-17** [**35**]; VIA-27 → VIA-17 [1]
- VIA-27 [10]; VIA-17 → VIA-27 [1]
- VIA-33 [4]

KoNES WEB registry: WEB

- | | |
|-----------------------------------|------------------------|
| • WEB SL 10 [3] | • WEB SL 6 [8] |
| • 11/7 → 10/6 | • WEB SL 5 [7] |
| • WEB SL 9 [3] | • WEB SL 4.5 [5] |
| • WEB SL 8 [7] | • WEB SL 4 [5] |
| • 8/5 → 8/4; 9/4 → 8/4; 7/3 → 8/3 | |
| • WEB SL 7 [12] | ▪ WEB SLS 4 [1] |
| • 8/3 → 7/3; 7/4 → 7/3 | |

- WEB device changes in 6 instances [**12%**]

KoNES WEB registry: WEB Plus

- **N=6 (12%)**
- Microcatheter protection [3]
- Stent assistance [2]
- Balloon assistance [1]

KoNES WEB registry: **Procedural events**

- Sticky detachment [4]
- Inadvertent partial branch compromise [4]
- Inadequate expansion of WEB [2]
- Rotation of WEB [2]
- Thromboembolism [1]
- **Cerebral infarction [1] (2.0%)** → Good recovery (sensory symptoms)
- No bleed

KoNES WEB registry: **Post-procedural events**

- **Cerebral infarction [2] (3.9%)**
 - POD #4
 - POD #54
- Good recovery

KoNES WEB registry: Summary

- Well-applicable in bifurcation aneurysms
- Antiplatelet medication!
- Occasional device changes
 - VIA microcatheters, 3.9%
 - WEB, 12%
- Acceptable symptomatic procedure-related events
 - Procedural, 2.0%
 - Post-procedural, 3.9%
 - No mortality; Rare significant morbidity
- Anticipating follow-up results

Safety and Efficacy of Shield technology: aneurysm size or location matters?

Mario Martinez-Galdamez

Department of Interventional Neuroradiology, Hospital Clínico Universitario de Valladolid, Spain



“Safety and Efficacy of Shield technology” aneurysm size or location matters?

Mario Martínez-Galdámez, MD, FEBNI

Director, INR Unit, Hospital Clínico Universitario de Valladolid
Chairman, Radiology Department, Hospital La Luz, Madrid
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Received: April 19, 2017
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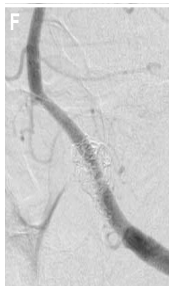


**ONLINE
ELECTRONIC
VERSION**

NEW TECHNOLOGY

DEFINITIVE RECONSTRUCTION OF CIRCUMFERENTIAL, FUSIFORM INTRACRANIAL ANEURYSMS WITH THE PIPELINE EMBOLIZATION DEVICE

2008



OBJECTIVE: The Pipeline embolization device (PED; Cerebral Medical, Menlo Park, CA) is a new endovascular construct designed to occlude aneurysms from the parent vasculature. We report the results of the first two human implantations of this device in North America.

CLINICAL PRESENTATION: Two patients presenting with large, symptomatic, circumferential, fusiform intracranial saccular artery aneurysms were treated with the PED. In both cases, more traditional open microsurgical and neuroendovascular treatment strategies had either failed or were associated with unacceptably high risk.

INTERVENTION: Three PEDs were placed across the aneurysms in each of the patients to achieve reconstruction of a new parent vessel through the center of a circumferential aneurysm. In the first patient, who had previously been treated with stent-supported coil embolization, the PED construct alone was sufficient to achieve parent vessel reconstruction and exclusion of the recurrent aneurysm. In the second patient, a microcatheter was jailed within the saccular portion of the aneurysm and the parent vessel was reconstructed with three telescoped PEDs. Although the PED construct dramatically reduced flow into the aneurysm, the lesion remained patent. Coiling of the saccular portion of the aneurysm was subsequently performed via the jailed microcatheter. Follow-up angiography performed 72 hours after the procedure demonstrated occlusion of the aneurysm with cylindrical reconstruction of the affected vascular segment. Neither patient has experienced any complication in the postoperative period (30 d) or during subsequent long-term (>1 year) follow-up.

CONCLUSION: The PED represents an important advance in the endovascular therapy of cerebral aneurysms, targeting primary parent vessel reconstruction rather than endovascular occlusion as a means by which to achieve exclusion of the parent artery.

KEY WORDS: Cerebral aneurysm, Reconstruction, Pipeline

Neurosurgery 62:1173-1177, 2008 DOI: 10.1226/NEU.0000000000000000 www.neurosurgeryonline.com

ORIGINAL RESEARCH

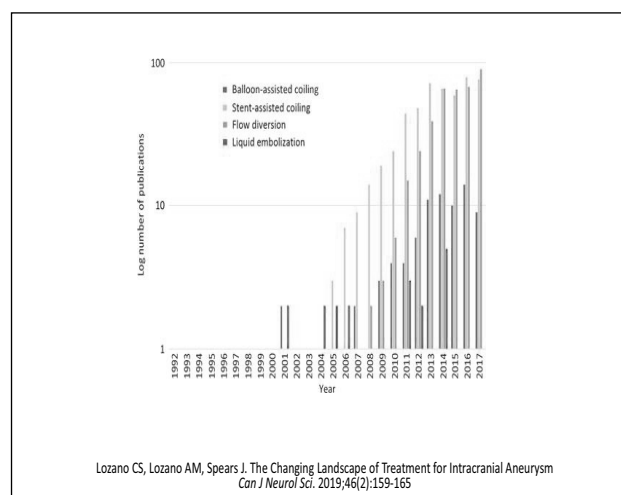
Marked decrease in coil and stent utilization following introduction of flow diversion technology

Emanuela Crobbedu,¹ Giuseppe Lanzino,¹ David F. Kallmes,² Harry J. Cloft²

ABSTRACT

OBJECTIVE: The purpose of this study was to evaluate the impact of the introduction of flow diversion technology on the utilization of intracranial aneurysm treatment devices. We performed a retrospective analysis of the National Neurological Cooperative Study (NNCNS) database from 2000 to 2015. We evaluated the number of cases treated with coil, stent, and flow diversion technology. We also evaluated the number of cases treated with coil and stent technology. We found a marked decrease in the number of cases treated with coil and stent technology following the introduction of flow diversion technology. This suggests that flow diversion technology may be a more effective and safer treatment option for intracranial aneurysms.

KEY WORDS: Intracranial aneurysm, Flow diversion technology, Coil, Stent



Matched Comparison of Flow Diversion and Coiling in Small, Noncomplex Intracranial Aneurysms

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Robert M. Starke, MD¹
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BACKGROUND: Flow diversion is typically reserved for large, giant, or morphologically complex aneurysms. Coiling remains a first-line treatment for small, morphologically simple aneurysms.

OBJECTIVE: To compare coiling and flow diversion in small, uncomplicated intracranial aneurysms typically amenable to coiling.

METHODS: Forty patients treated with the pipeline embolization device (PED) for small (<10 mm), morphologically simple aneurysms that would have also been amenable to coiling were identified. These patients were matched in a 1:1 fashion with 40 patients with comparable aneurysms treated with coiling. Matching was based on age, gender, aneurysm size, and aneurysm morphology.

RESULTS: The 2 groups were comparable with regard to baseline characteristics including age, gender, and aneurysm size. The complication rate did not differ between the 2 groups (25% with coiling vs 5% with PED, $P = .6$). Multivariate analysis did not identify any predictor of complications. Complete occlusion (100%) at follow-up was significantly higher in patients treated with PED (70%) than coiling (42.5%, $P = .04$). In multivariate analysis, treatment with PED predicted aneurysm obliteration ($P = .04$). A significantly higher proportion of coiled patients (32.5%) required retreatment compared with flow diversion (5%, $P = .02$). In multivariate analysis, coiling predicted retreatment ($P = .006$). All patients achieved a favorable outcome (modified Rankin Scale 0-2) regardless of group.

CONCLUSION: This matched analysis suggests that flow diversion provides higher occlusion rates, lower retreatment rates, and no additional morbidity compared with coiling in small, simple aneurysms amenable to both techniques. These results suggest a potential benefit for flow diversion over coiling even in small, uncomplicated aneurysms.

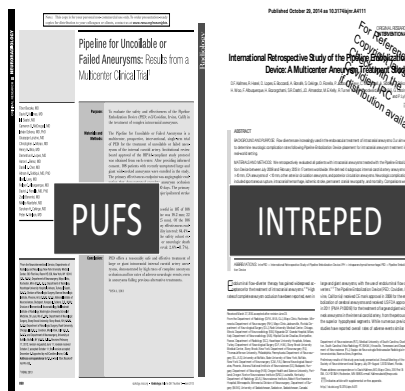
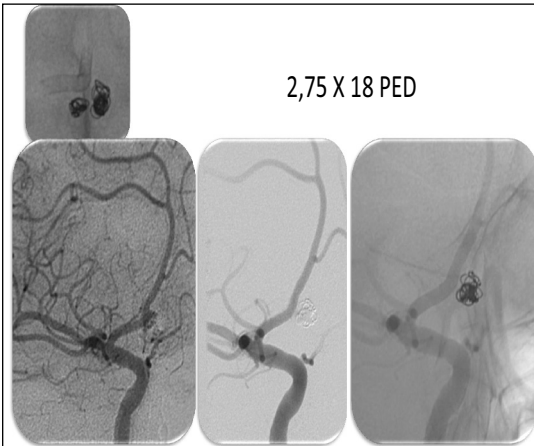
KEY WORDS: Aneurysm, Coiling, Flow diversion, Pipeline embolization device

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2 years



2,75 X 18 PED



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Long-Term Clinical and Angiographic Outcomes Following Pipeline Embolization Device Treatment of Complex Internal Carotid Artery Aneurysms: Five-Year Results of the Pipeline for Uncoilable or Failed Aneurysms Trial

BACKGROUND: Early and mid-term safety and efficacy of aneurysm treatment with the Pipeline Embolization Device (PED) has been well demonstrated in prior studies.

OBJECTIVE: To present 5-yr follow-up for patients treated in the Pipeline for Uncoilable or Failed Aneurysms clinical trial.

METHODS: In our prospective, multicenter trial, 109 complex internal carotid artery (ICA) aneurysms in 107 subjects were treated with the PED. Patients were followed per a standardized protocol at 180 d and 1, 3, and 5 yr. Aneurysm occlusion, in-stent stenosis, modified Rankin Scale scores, and complications were recorded.

RESULTS: The primary endpoint of complete aneurysm occlusion at 180 d (73.6%) was previously reported. Aneurysm occlusion for those patients with angiographic follow-up progressively increased over time to 86.8% (79/91), 93.4% (71/76), and 95.2% (60/63) at 1, 3, and 5 yr, respectively. Six aneurysms (5.7%) were retreated. New serious device-related events at 1, 3, and 5 yr were noted in 1% (1/96), 3.3% (3/85), and 0% (0/81) of subjects. There were 4 (3.7%) reported deaths in our trial. Seventy-eight (96.3%) of 81 patients with 5-yr clinical follow-up had modified Rankin Scale scores ≤ 2 . No delayed neurological deaths or hemorrhagic or ischemic cerebrovascular events were reported beyond 6 mo. No recanalization of a previously occluded aneurysm was observed.

CONCLUSION: Our 5-yr findings demonstrate that PED is a safe and effective treatment for large and giant wide-necked aneurysms of the intracranial ICA, with high rates of complete occlusion and low rates of delayed adverse events.

KEY WORDS: Central aneurysm, Flow diversion, Pipeline embolization device, PUFs

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TABLE 1. Aneurysm Occlusion at Follow-up Time Points*

Occlusion type	Follow-up time point			
	180 d	1 yr	3 yr	5 yr
Complete occlusion	79.9% (70/106)	86.9% (79/91)	88.9% (79/90)	85.3% (80/95)
Residual neck	7.5% (6/80)	5.3% (5/95)	2.6% (2/76)	1.6% (1/63)
Residual aneurysm	5.7% (6/106)	5.5% (5/91)	2.6% (2/76)	3.2% (2/63)
Other	10.2% (14/106) ^b	2.2% (2/91) ^c	1.3% (1/76) ^c	0.0% (0/63)

*Based on angiographic imaging at each follow-up.

^bIncludes 3 canted occlusions.

^cNew canted occlusions.

TABLE 6. Clinical Outcomes Based on the Modified Rankin Scale (mRS)

mRS	3 yr	5 yr
0	60	62
1	19	14
2	2	2
3	1	2
4	2	1
5	0	0
6 ^d	4	4
No mRS	19	22

^dmRS score of 6 assigned to subjects who had died (all deaths occurred within 3 yr).

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	Anterior (n = 372)	Posterior (n = 14)	Anterior (n = 309)	Posterior (n = 30)	Anterior (n = 52)	Posterior (n = 10)	
Mean aneurysm size (mm)	5.1 ± 2.2	6.0 ± 2.6	14.8 ± 4.0	15.0 ± 4.3	28.8 ± 5.3	29.1 ± 7.2	10.7 ± 7.7
Spontaneous rupture	0 (0%)	0 (0%)	2 (0.5%)	0 (0%)	3 (5.8%)	0 (0%)	5 (0.6%)
Intraparenchymal hemorrhage	7 (1.9%)	0 (0%)	8 (2.6%)	0 (0%)	3 (5.8%)	1 (10.0%)	19 (2.4%)
Ischemic stroke	10 (2.7%)	1 (7.1%)	16 (5.2%)	1 (3.3%)	7 (13.5%)	2 (20.0%)	37 (4.7%)
Parent artery stenosis	1 (0.3%)	0 (0%)	1 (0.3%)	0 (0%)	0 (0%)	0 (0%)	2 (0.3%)
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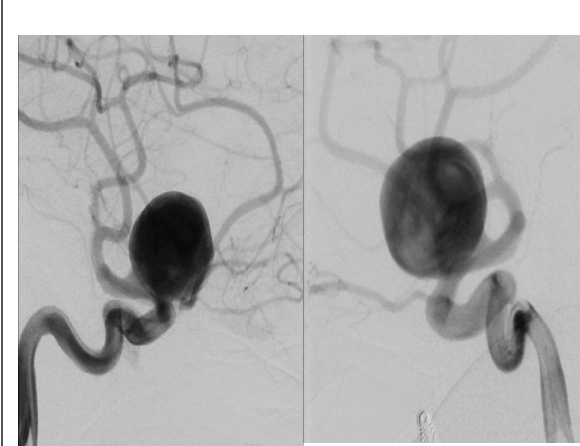
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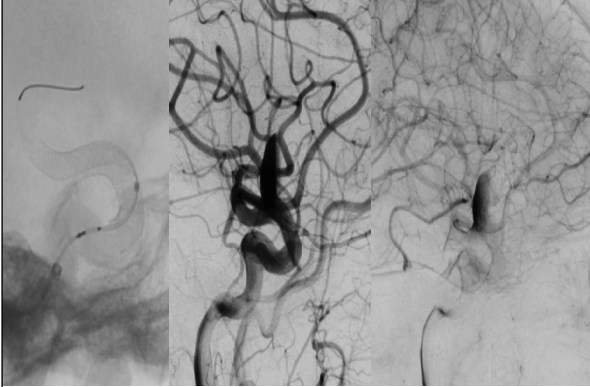
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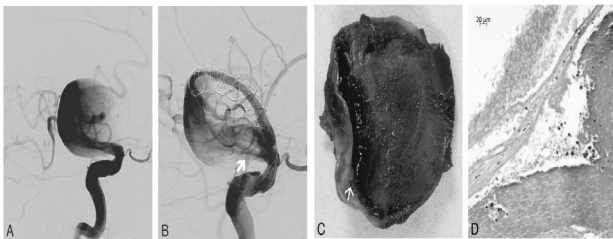


Normoresponder to aspirin/clopidogrel
Discharged on steroids



7 days after embo: sudden death at home
No CT/MRI performed.
Family denied autopsy

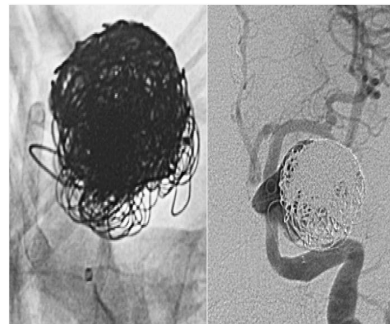
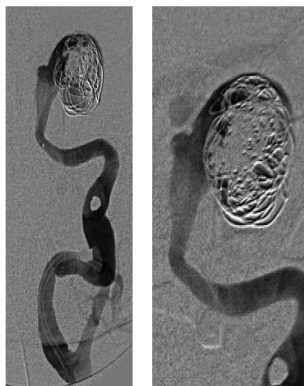
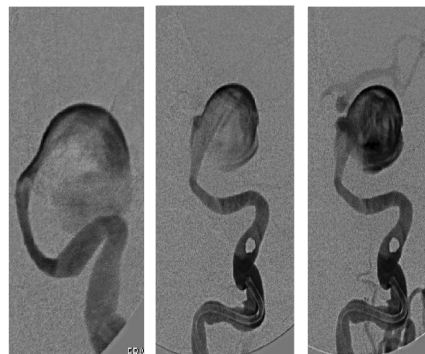
"Coils may exhibit favorable effects in stabilizing thrombus"
My approach in Giant aneurysms: if possible 2 staged proc: 1st Coil, 2nd FD

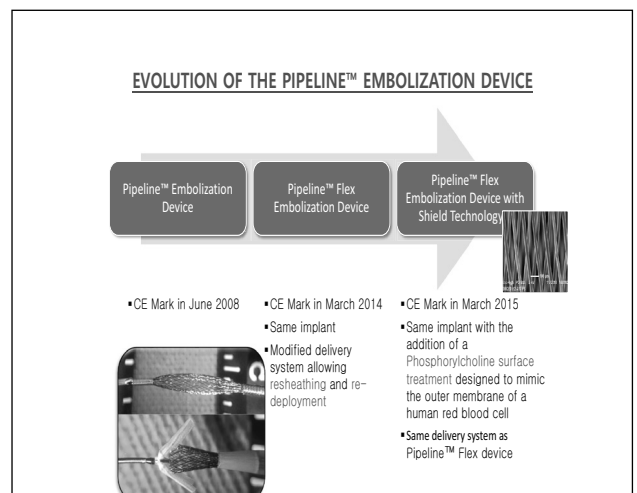
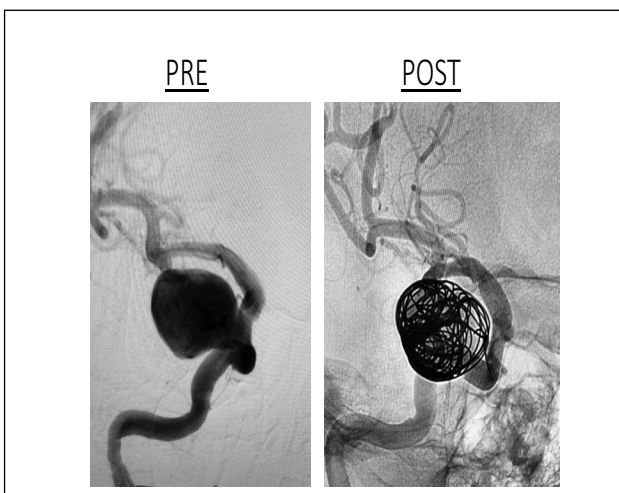
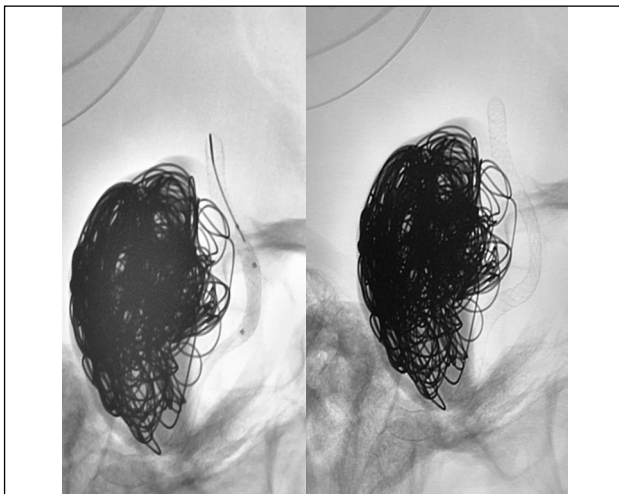
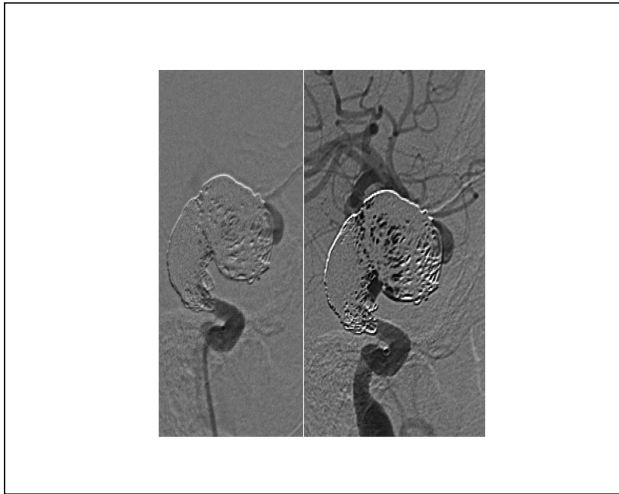


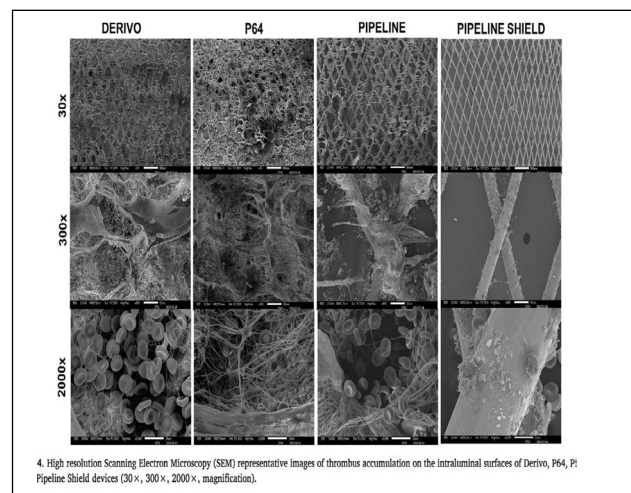
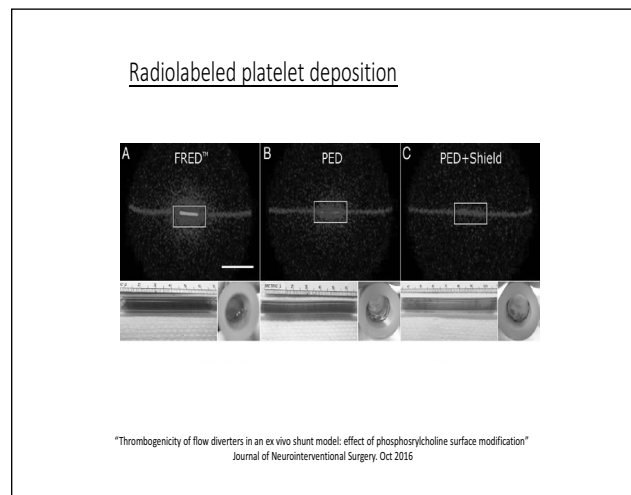
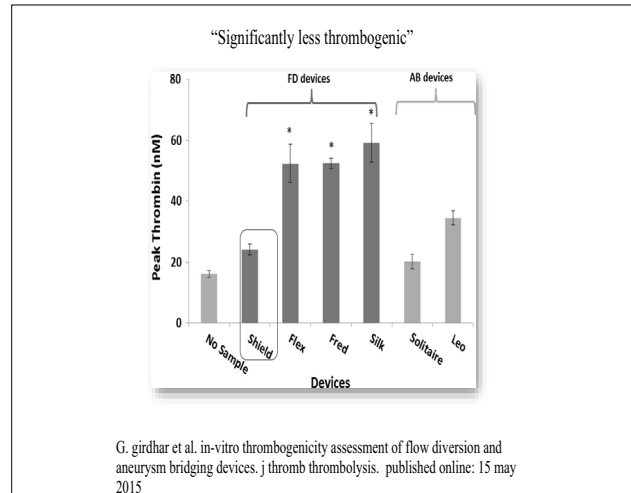
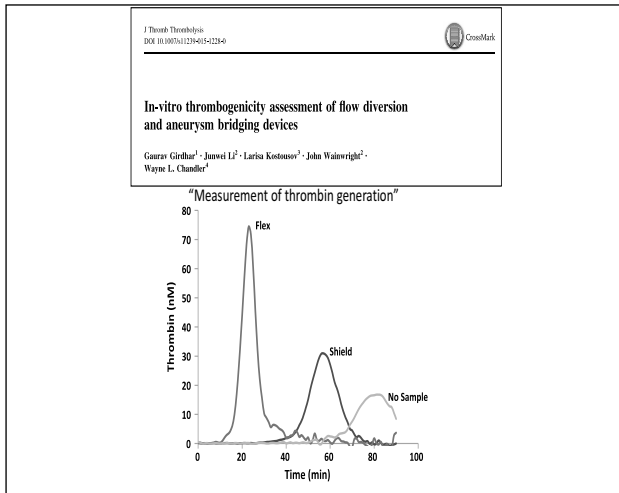
Massive organizing intraluminal thrombus and mural thinning at the site of rupture. Aneurysm wall extremely thin with mural necrosis, loss of fibrous tissue and medial smoothmuscle cells, and infiltration by macrophages from the adventitial surface

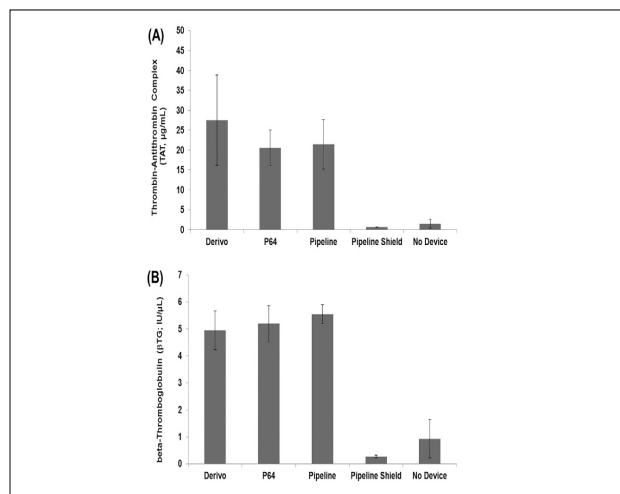
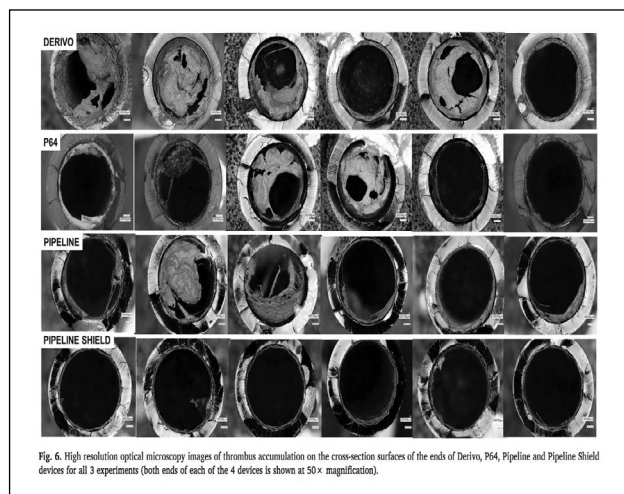
Kulcsár Z, Houdart E, Bonafé A, et al. Intra-aneurysmal thrombosis as a possible cause of delayed aneurysm rupture after flow-diversion treatment. *AJNR Am J Neuroradiol.* 2011;32(1):20-25.

AP view









ORIGINAL RESEARCH
INTERVENTIONAL

Diffusion-Weighted Imaging-Detected Ischemic Lesions following Endovascular Treatment of Cerebral Aneurysms: A Systematic Review and Meta-Analysis

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DWI documented ischemic lesions:

- 45% Simple coiling
- 44% BAC
- 43% SAC
- 67% Flow diversion

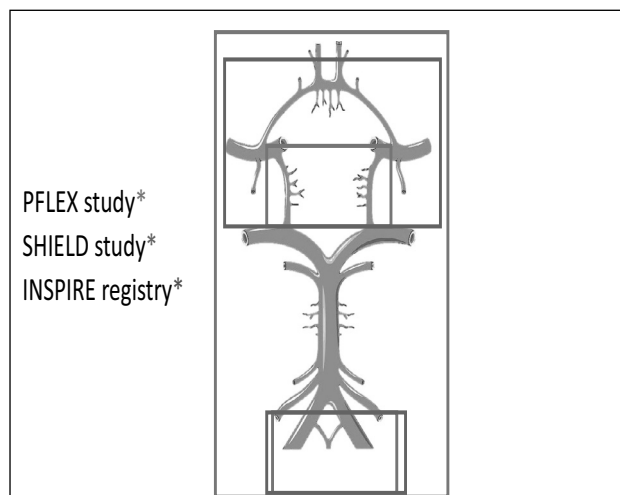
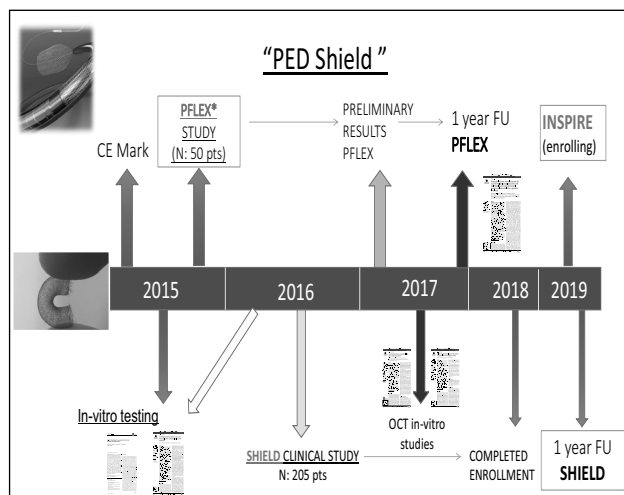
Ischemic Stroke

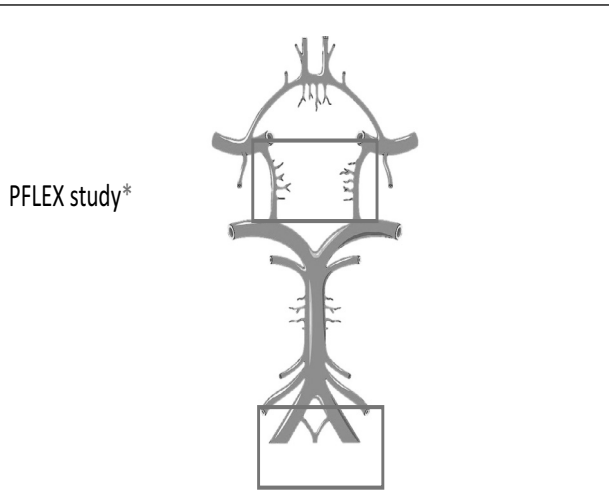
CASE SERIES

Diffusion weighted image documented cerebral ischemia in the postprocedural period following pipeline embolization device with shield technology treatment of unruptured intracranial aneurysms: a prospective, single center study

Stylianos Piki¹, Georgios Mantziaris¹, Vasileios Marmalis², Konstantinos Barkas¹, Antonios Tsanis³, Stavroula Lyra², Kiriakos Karkoulas¹, Tigran Petrosyan¹, Efthychios Archontakis⁴

18% DWI ischemic lesions



PFLEX

OPEN ACCESS
2017

CASE SERIES

Periprocedural outcomes and early safety with the use of the Pipeline Flex Embolization Device with Shield Technology for unruptured intracranial aneurysms: preliminary results from a prospective clinical study

Mario Martínez-Galdamez,¹ Saleh M Lamin,² Konstantinos G Lagios,³ Thomas Liebig,⁴ Elsa F Ciceri,^{5,6} Rene Chapot,⁷ Luc Stockx,⁸ Swarupsinh Chavda,² Christoph Kabbasch,⁹ Giuseppe Farago,⁵ Hannes Nordmeyer,⁷ Thierry Boulanger,⁸ Mariangela Piano,⁹ Edoardo P Boccardi⁹

OPEN ACCESS
2018

ORIGINAL RESEARCH

Treatment of intracranial aneurysms using the pipeline flex embolization device with shield technology: angiographic and safety outcomes at 1-year follow-up

Mario Martínez-Galdamez,¹ Saleh M Lamin,² Konstantinos G Lagios,³ Thomas Liebig,⁴ Elsa F Ciceri,^{5,6} Rene Chapot,⁷ Luc Stockx,⁸ Swarupsinh Chavda,² Christoph Kabbasch,⁹ Giuseppe Farago,⁵ Hannes Nordmeyer,⁷ Thierry Boulanger,⁸ Mariangela Piano,⁹ Edoardo P Boccardi⁹

-PFLEX CLINICAL STUDY-

Downloaded from <http://jns.sagepub.com/> on April 26, 2017 - Published by group.bmj.com

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CASE SERIES

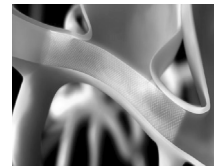
Periprocedural outcomes and early safety with the use of the Pipeline Flex Embolization Device with Shield Technology for unruptured intracranial aneurysms: preliminary results from a prospective clinical study

Mario Martínez-Galdamez,¹ Saleh M Lamin,² Konstantinos G Lagios,³ Thomas Liebig,⁴ Elsa F Ciceri,^{5,6} Rene Chapot,⁷ Luc Stockx,⁸ Swarupsinh Chavda,² Christoph Kabbasch,⁹ Giuseppe Farago,⁵ Hannes Nordmeyer,⁷ Thierry Boulanger,⁸ Mariangela Piano,⁹ Edoardo P Boccardi⁹

Study overview

Study Design:

- Prospective, single-arm, multicenter clinical study
- Up to 50 patients
- Follow-up at 30 days, 6 months, and 1 year



Study Objective:

- To assess the technical success and safety of the Pipeline™ Flex Embolization Device with Shield Technology™

Study population

INCLUSION CRITERIA

- Age 18-80 years
- Subject pre-selected for flow diversion therapy.
- Unruptured target aneurysm
 - Parent vessel diameter 1.5-5.0 mm distal/proximal to the target IA.
- Target aneurysm located in the:
 - Internal carotid artery (up to the carotid terminus) OR
 - Vertebral artery segment up to and including the posterior inferior cerebellar artery
- Written informed consent provided

EXCLUSION CRITERIA

- Subarachnoid hemorrhage or major surgery in the past 30 days
- Anatomy not appropriate for treatment (e.g. severe intracranial vessel tortuosity or stenosis), or history of intracranial vasospasm not responsive to medical therapy
- Known contraindication to Pipeline™ Shield device as per IFU
- Pregnant or breastfeeding women or women who wish to become pregnant during the length of study participation

Study endpoints

- Rate of device deployment success at the target site
- Incidence of major stroke in the territory supplied by the treated artery or neurological death at 30 days post-procedure due to procedural complications related to the Pipeline™ Flex Embolization Device with Shield Technology™.
- Rate of device resheathability and redeployment success
- Rate of device-related neurological adverse events at 30 days post-procedure

*InPrePED: the 30-day stroke rate was 2.7% in the subgroup of small aneurysms

Patient population

DEMOGRAPHICS

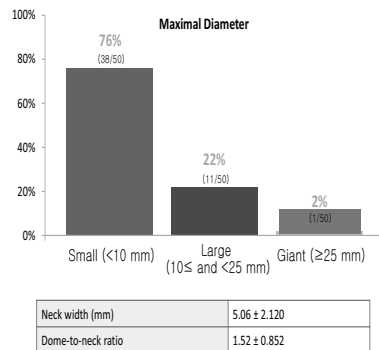
- Enrollment period: March to October 2015
- 50 patients with 50 target aneurysms
 - 2 cases in which device covered arterial segments that included an additional aneurysm, however only 1 target aneurysm was included in analysis
- Mean age: 53.0 ± 13.01 years
- Female: 82.0% (41/50)

ANTIPLATELET REACTIVITY TESTING

- Antiplatelet reactivity testing done at the discretion of investigator
- Reference values:

Platelet test	Test Result (N=21)	
PRU	162.5±79.69	
0 ≤ PRU < 60	1 (4.8%)	Clopidogrel hyper-responder
60 ≤ PRU ≤ 240	17 (81.0%)	
PRU > 240	3 (14.3%)	Clopidogrel hyporesponders
ARU	458.2±80.61	
ARU < 550	16 (76.2%)	
ARU ≥ 550	5 (23.8%)	Aspirin borderline hyporesponders

Patient population TARGET ANEURYSM CHARACTERISTICS



SHIELD STUDY

ORIGINAL RESEARCH

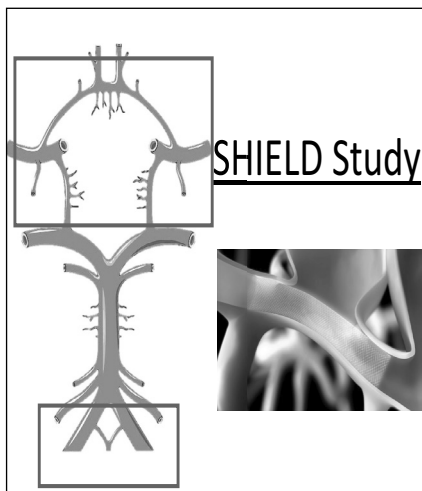
OPEN ACCESS

Hemorrhagic stroke

Periprocedural to 1-year safety and efficacy outcomes with the Pipeline Embolization Device with Shield technology for intracranial aneurysms: a prospective, post-market, multi-center study

Hal Rice,¹ Mario Martinez Galdamez,² Markus Holmannspötter,³ Laurent Spelle,⁴ Konstantinos Lajios,⁵ Maria Ruggiero,⁶ Pedro Vega,⁷ Hemant Sonwalkar,⁸ René Chapot,⁹ Saleh Lamin¹⁰

J Neurointerv Surg. First published as 10.1111



SHIELD STUDY

STUDY DESIGN	Post-market, prospective, observational, single-arm, multi-center
MAIN OBJECTIVE	To assess the performance of the Pipeline™ Flex Embolization Device with Shield Technology™ in a large real-world, post-market setting
DEVICES	Pipeline™ Flex Embolization Device with Shield Technology™
ENROLLMENTS	205 subjects in 21 centers

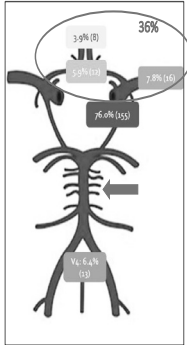
INCLUSION CRITERIA

1. Subject has provided written DRF or informed consent using the IRB/IEC-approved consent form and agrees to comply with protocol requirements.
2. At least 18 years of age.
3. Subject has already been selected for flow diversion therapy as the appropriate treatment.
4. Subject has a target IA that has a parent vessel with diameter 1.5–5.0 mm distal/proximal to the target IA.

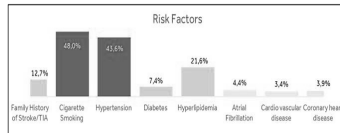
EXCLUSION CRITERIA

1. Major surgery within the past 30 days.
2. Target IA located in the basilar artery.
3. Subject with anatomy not appropriate for endovascular treatment.
4. Stent is in place in the parent artery at the target IA location.
5. Subject with an acutely (within 30 days) ruptured aneurysm with a H&H grade ≥ 4.
6. Any known contraindication to treatment per IFU.
7. Health of the subject may be compromised by the subject's enrollment.
8. Pregnant or breast-feeding women
9. Subject is currently enrolled in a potentially confounding drug or device trial
10. Legal incapacity

BASELINE CHARACTERISTICS



DEMOGRAPHICS	
Age	54.8 ± 12.8
Female	81.4%
ANEURYSM CHARACTERISTICS	
Never ruptured	81.4%
Acutely ruptured	1.5%
Previously treated	23.0%
Size	Small: 50.0% Medium: 33.8% Large: 13.7% Giant: 2.5%
Morphology	Saccular: 94.1% Fusiform: 4.9% Pseudo: 1.0%



EFFICACY ENDPOINTS AT 1 YEAR – CORE LAB ASSESSED

Complete Occlusion without parent artery stenosis (>50%) or retreatment (all locations)

71,7%

STENOSIS	6M	1Y	Last FUP
No (<50%)	99.2%	97.5%	98.9%
Yes (>50%)	0.77%	2.54%	1.06%

Table 3 Primary effectiveness endpoint through 1 year post-procedure by aneurysm location (FAS population with observed data)

Primary effectiveness endpoint†	Rate*	95% CI
All aneurysms	143/200 (71.7%)	(65.0% to 77.7%)
Intracranial ICA (C2-C7 including terminus)	109/144 (75.7%)	(67.9% to 82.4%)
Non-intracranial ICA	28/45 (62.2%)	(46.5% to 76.2%)
C1	1/2 (50.0%)	(1.3% to 98.7%)
Vertebral	8/13 (61.5%)	(31.6% to 86.1%)
MCA	7/13 (53.8%)	(25.1% to 80.8%)
ACA	6/8 (75.0%)	(34.9% to 96.8%)
AComm	6/9 (66.7%)	(29.9% to 92.5%)

SAFETY ENDPOINTS AT 1 YEAR – CEC ADJUDICATED

Major Stroke in the Territory supplied by the treated artery or Neurological Death

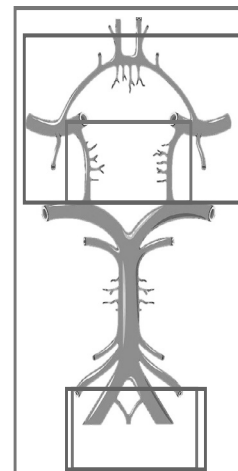
3.23%

SERIOUS EVENTS OF INTEREST			
Major Stroke	2.9%	Intra-parenchymal hemorrhage	2.9%
Minor Stroke	3.4%	Sub-Arachnoid hemorrhage	1.5%
Death	1.0%	Target aneurysm retreatment	2.0%

NO events in V4 aneurysms

INSPIRE Registry

PFLEX study*
SHIELD study*
INSPIRE registry*



INSPIRE: Background and design

MAIN OBJECTIVE	To evaluate product efficiency and safety in real-life data for large world-wide patient group
DESIGN	Post-market, prospective, observational, single-arm, multi-center, registry
DEVICES	Multiple devices, including Pipeline SHIELD
Core Laboratory	Yes
Clinical Events Committee	Yes
ClinicalTrials.gov Identifier	NCT02988128

→ Presented today: a first glance at the 1-year results of the first 100 patients treated with Pipeline Shield in the INSPIRE registry

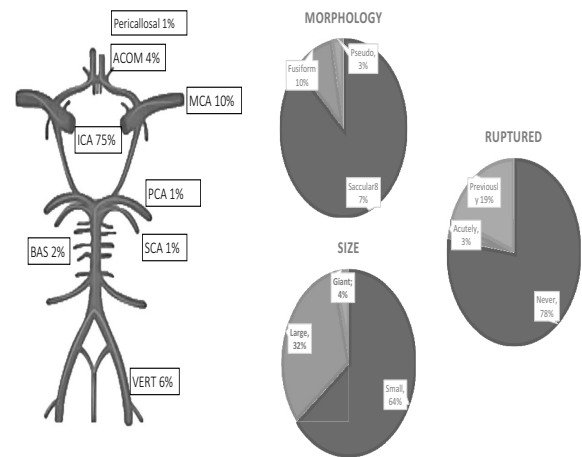
Endpoints

PRIMARY ENDPOINT	Complete aneurysm occlusion (R&R 1) without significant parent artery stenosis ($\leq 50\%$ stenosis) or retreatment
SECONDARY ENDPOINTS	- Aneurysm occlusion - Device and procedure related adverse events - Parent artery stenosis - Aneurysm retreatment - Anti-platelet regimen

Demographics

100 PATIENTS	
Age (y)	53.8 $\pm$ 12.8 (100)
Female	77.0% (77/100)

MAIN RISK FACTORS	
None	17.0% (17/100)
Hyperlipidemia	20.0% (20/100)
Cigarette Smoking	44.0% (44/100)
Hypertension (controlled)	48.0% (48/100)



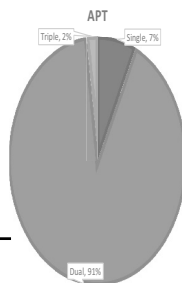
Procedural characteristics and APT

97.6% successful device implants (123/126)

- Total procedure time: 72 min ($\pm$ 42)
- Total microcatheter time: 16 min ($\pm$ 15)
- Cumulative fluoro time: 30 min ($\pm$ 19)

In 18% of patients, adjunctive coiling was used

SINGLE ANTI-PLATELET THERAPY	
Aspirin	3
Clopidogrel	2
Prasugrel	2
No TIA or stroke was reported in these patients	



Primary endpoint at 1 year

Complete Occlusion and full Parent Artery Patency without retreatment

71%

Core Lab adjudicated

Anterior, posterior and distal circulation

1 death, unrelated to device or procedure

3 patients lost to follow-up

Secondary Endpoints

COMPLETE ANEURYSM OCCLUSION			
LOCATION		MORPHOLOGY	
ICA	79% (50/63)	Saccular	74.3% (55/74)
Acom	50% (2/4)	Fusiform	60.0% (6/10)
MCA	67% (6/9)	Pseudo	100.0% (3/3)
VA	50% (3/6)		
BAS	50% (1/2)	SIZE	
PCA	100% (1/1)		72.9% (43/59)
SCA	0% (0/1)		72.0% (18/25)
Pericallosal	100% (1/1)		100.0% (3/3)

Core Lab adjudicated

Significant stenosis (>50%) in 1 patient

Aneurysm retreatment in 2 patients

Retreatments due to incomplete occlusion

Safety Outcomes

Site-reported Serious Adverse Events

MedDRA term	All Device Related Serious AEs	All Procedure Related Serious AEs
Carotid artery aneurysm	1/100 (1.0%) [1]	1/100 (1.0%) [1]
Cerebellar infarction	1/100 (1.0%) [1]	1/100 (1.0%) [1]
Ruptured cerebral aneurysm	1/100 (1.0%) [1]	1/100 (1.0%) [1]
Somnolence	1/100 (1.0%) [1]	1/100 (1.0%) [1]
Contrast media allergy		1/100 (1.0%) [1]
Abnormal Pedal Pulse		1/100 (1.0%) [1]
Headache		1/100 (1.0%) [1]
Carotid Artery Dissection		1/100 (1.0%) [1]

Rate (n/N) (%) (# of events)
Related means "Causal" and "Possible".

- Data are site-reported (CEC adjudication ongoing)
- CEC adjudicated one reported non-serious AE as major stroke in the treated area
- 1 death occurred, but was unrelated to device or procedure

DATA SUMMARY OF PIPELINE STUDIES

	PUFS 1Y	PREMIER 1Y	PFLX 1Y	SHIELD 1Y	INSPIRE 1Y
Device	Classic	Flex	Shield	Shield	Shield
# Subjects	108	141	50	204	100
Aneurysms	Large & Giant	Small & Medium	All	All	All
Locations	ICA	ICA	ICA & VA	All	All
Complete Occlusion w/o significant stenosis (≤50%) or retreatment	74%	79%	74%	72%	71%
Major stroke in treated territory or neurological death	5.6%	2.2%	0%	3.3%	2.0%

Safety and efficacy of Pipeline flow diverter with or without Shield technology are consistent across all studies and all aneurysm sizes and locations

Conclusions

Analysis of the first 100 patients treated with the Pipeline Shield in INSPIRE

- Final analysis will contain >500 patients

Core Lab adjudicated efficacy outcomes

- Complete aneurysm occlusion: 73%
- Parent Artery Stenosis >50%: 1%
- Complete occlusion and full parent artery patency without retreatment: 71%

Low incidence of stroke and neurological death: 2%

INSPIRE results show great consistency with previous Pipeline studies, in all sizes and locations of aneurysms

Still to come in full analysis:

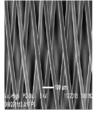
- Core lab adjudicated data of >500 patients (all patients in follow-up)
- All adverse events adjudicated by CEC

Single center analysis: 96 aneurysms

	Total occlusion RR1	Remnant RR2	Interstium RR 3	Parent artery occlusion	NO FU
≤ 3 mm Very small	88,9%	5,6%	5,6%		
>3-11 mm Small	70,5%	16,4%	4,9%	3,3%	4,9%
≥11-25 mm Large	53,8%	30,8%	0,0%	0,0%	15,4%
≥25 mm Giant	66,7%	0,0%	0,0%	0,0%	33,3%

Intraoperative complications

	None	Stent thrombi	Aneurysm rupture	Embolus branch
≤ 3 mm Very small	88,9%			11,1%
>3-11 mm Small	88,5%	8,2%	0,0%	3,3%
≥11-25 mm Large	92,3%	7,7%	0,0%	0,0%
≥25 mm Giant	100 %	0,0%	0,0%	0,0%



Conclusions-Shield

- Thromboembolic complications are the main problem with flow diversion in general.
- In vitro studies have shown than PED Shield is less thrombogenic than previous generations.
- PFLEX study has corroborated the safety and efficacy of the PED SHIELD for the treatment of intracranial aneurysms.

2021 대한뇌혈관내치료의학회 정기학술대회 및 총회

| 2021년 11월 27일(토) | 인천 파라다이스시티호텔 그랜드볼룸

16:00-17:20

Free paper II

Ischemia, AVM/AVF, others

좌장: 유승훈 (울산대)
허 준 (명지성모병원)



Coexistent coronary artery disease in patients with cerebral artery stenosis evaluated by simultaneous cerebral and coronary angiography

Jae Hyun Shim

Departments of Neurosurgery, PMC General Hospital

Objective: Cerebral artery stenosis (CAS), either extracranially or intracranially, shared the common pathogenesis with coronary artery disease (CAD). We conducted a study of simultaneous cerebral and coronary angiography to detect the rate of coexistent CAD in patients with CAS and a difference in accompanied CAD whether the location of the CAS.

Methods: Clinical data of patients from May 2019 to October 2021 were collected. The clinical characteristics, whether the location of the CAS was extracranially, intracranially or tandem stenosis, presence of significant (>50%) CAD, and whether percutaneous coronary intervention (PCI) was performed were retrospectively analyzed.

Result: A total of 195 patients (female 85, 43.6%; age 70 ± 10.9) received combined angiography. Among them, 33 patients (16.9%) had no obvious CAS, 58 (29.7%) had extracranial stenosis, 76 (39.0%) had intracranial stenosis, and 28 (14.4%) had tandem stenosis. Significant CAD was observed in 102 (52.3%, among them 61 (31.3%) underwent PCI), and coexistent CAD was significantly frequent in patients with CAS ($p < 0.002$, OR 2.917, 95% CI 1.488-5.717, $p = 0.002$), and tandem stenosis (OR 4.023, 95% CI 1.457-11.113, $p = 0.007$).

Conclusion: Simultaneous cerebral angiography and coronary angiography might be considered when patients with CAS were male, old age, previous stroke history, and tandem cerebral artery stenosis.

Intraprocedural flat-detector rotational angiography and image fusion technique for delivery of microcatheter into the targeted shunt pouch of dural arteriovenous fistulas

Jai Ho Choi¹, Bum-soo Kim², Yong Sam Shin¹

Department of Neurosurgery¹ and Radiology², Seoul St Mary's Hospital, The Catholic University of Korea

Objective: We aimed to investigate the efficacy of intraprocedural flat detector computed tomography-based rotational angiography and image fusion (FDCT-RA and IF) technique to aid the navigation of microcatheter and to confirm the placement of the microcatheter in the targeted pouch during transvenous embolization (TVE) for intracranial dural arteriovenous fistula (DAVF).

Methods: For FDCT-RA & IF, initial dual-rotation angiography was performed to obtain subtraction, mask, and native fill images. During the navigation of the microcatheter, we conducted single-rotation angiography with reduced FOV without contrast media and fused with initial subtraction image to identify the microcatheter going to the right direction or being placed in the targeted shunt pouch. We retrospectively reviewed clinical and radiological features of fifty-three DAVFs treated by TVE between January 2009 and February 2020 in a single institute.

Result: This technique was used in 18 out of 53 DAVFs. DAVF location ($p=0.001$), sinus occlusion status ($p=0.001$), and access route ($p=0.005$) were significantly different between the two groups with or without this technique. In DAVFs involving anterior condylar confluence and cavernous sinus with ipsilateral inferior petrosal sinus (IPS) occlusion, we mainly used this technique. We could easily navigate occluded IPS or an alternative access route including a facial or superficial temporal vein using our technique. Complete occlusion rate was higher in cases with this technique ($n=17$, 94.4%) than without this technique ($n=28$, 80%, $p=0.163$).

Conclusion: FDCT-RA and IF can be an effective and helpful technique for navigation of a microcatheter into the targeted shunt pouch.

Short- and long-term mortality after thrombolysis and thrombectomy for acute ischemic stroke: propensity score matching with 5-year follow-up using A nationwide big data

Jae Sang Oh, Sung Ho Lee, Ho Jun Lee, Dong Sung Shin, Sukh Que Park, Seok Mann Yoon, Bum Tae Kim

Department of Neurosurgery, College of Medicine, Soonchunhyang University

Objective: It remains unknown whether intravenous thrombolysis (IVT), thrombectomy, or post-stroke antithrombotic medication lower short- and long-term mortality in acute ischemic stroke (AIS). This study aimed to investigate the efficacy of IVT in AIS using propensity score matching with a nationwide big data, to determine whether acute management could reduce short- and long-term mortality, and to identify risk factors influencing short- and long-term mortality in AIS.

Methods: We analyzed data collected from 2013 to 2014 by the Acute Stroke Assessment Registry, prospectively collected database including a nationwide data from 216 pre-selected hospitals. We analyzed this AIS data and then tracked the administrative data of these patients with AIS. During a period of 6 months, 20,202 acute stroke patients were admitted to emergency departments. Of these, 18,691 patients were admitted for AIS. Patients with a diagnosis of acute ischemic stroke were included in this study. Overall, 14,394 ischemic stroke patients were enrolled after excluding 4,297 patients with no detailed record of IVT. We divided the patients into two groups: 1) Non-IVT group (13,071 patients) and 2) IVT group (1,323 patients). The IVT group was subdivided into two groups: IVT within 2 hours after symptom onset and IVT between 2 and 4.5 hours after symptom onset. We divided the National Institutes of Health Stroke Scale (NIHSS) score into 5 grades: 1–4, 5–7, 8–13, 14–21, and 22–42 by neurological status at the emergency department. Vascular risk factors, including smoking (current smoker, ex-smoker, and non-smoker) and atrial fibrillation, were collected. The Charlson Comorbidity Index (CCI) was determined by ICD-10 code and based on this, patients were divided into three groups: 0, 1, and ≥ 2 . Propensity score matching was used to match IVT and control cases with a 1:1 ratio. The primary outcome was survival up to 3 months, 1 year, and 5 years, as assessed using Kaplan–Meier estimates and Cox proportional hazards.

Result: In total, 14,394 patients with AIS were recruited from March–June 2013 and from June–August 2014. Of them, 1,323 (9.2%) received IVT with tPA (tissue plasminogen activator) and 229 had missing data for at least one variable required to calculate the propensity score. These patients were excluded from this study. Of the 2,634 remaining subjects, 1,317 patients treated with IVT were matched with 1,317 patients treated without IVT. Overall, 286 (10.9%) patients were treated with intra-arterial mechanical thrombectomy. Measures of balance diagnosis indicated that the sample was adequately matched, with standardized difference of mean propensity scores between groups of $< .01$. After propensity score matching, 1,317 patients treated with IVT were matched with 1,317 patients not treated with IVT. Survival was higher in the IVT group (median, 3.53 years) than in the non-IVT group (median, 3.37 years, stratified log-rank test, $p < .001$). Compared with the non-IVT group, thrombolysis performed within 2 hours significantly reduced the risk of 3-month mortality by 37%, and thrombolysis performed between 2 and 4.5 hours significantly reduced the risk of 3-month mortality by 26%. Thrombectomy significantly reduced the risk of 3-month mortality by 28%. Compared with no post-stroke medication, post-stroke antiplatelet medication was associated with 51%, 55%, and 52% decreases in 3-month, 1-year, and 5-year mortality risk, respectively. Post-stroke anticoagulant medication was associated with 51%, 54%, and 44% decreases in the risk of 3-month, 1-year, and 5-year mortality, respectively.

Conclusion: Compared to non-thrombolysis, thrombolysis reduced short-term mortality by 47%. Thrombolysis and thrombectomy are associated with improved short-term survival, although they did not significantly reduce long-term mortality. Post-stroke antithrombotic medication could significantly reduce both short- and long-term mortality of patients with AIS. Faster active management in the acute phase and post-stroke antithrombotic medication are important for good short- and long-term outcomes in patients with ischemic stroke.

Procedural and demographic factors for re-occlusion in intracranial atherosclerotic occlusion treated by mechanical thrombectomy plus balloon angioplasty or intracranial stenting

Hyun Gon Lee, Seung Hwan Kim, Sung-Chul Jin

Department of Neurosurgery, Dongnam Institute of Radiological & Medical Sciences

Objective: Re-occlusion will be potential to influence clinical outcome adversely after mechanical thrombectomy plus rescue treatment such as balloon angioplasty or intracranial stenting in acute intracranial atherosclerotic occlusion (ICAS). We retrospectively evaluated demographic and procedural factors for re-occlusion after mechanical thrombectomy plus rescue treatment in acute intracranial atherosclerotic occlusion.

Methods: From January 2013 to December 2020, 46 patients with ICAS who underwent mechanical thrombectomy and rescue treatment included our study. Patency of the lesion within 2 day after mechanical thrombectomy and rescue treatment was classified into patency group (n=31, 67.4%) and re-occlusion group (n=15, 32.6%). We compared the demographic and procedural factors of both groups.

Result: Intravenous tissue plasminogen activator (t-PA) of patency group (n=18/31 (38.3%)) was more than that of re-occlusion group (n=1/15 (7.7%)) with statistical significance (p=0.045). The number of thrombectomy attempt of re-occlusion group was significantly more than that of patency group (median(IQR), 2(1-3) vs 1(0-2), p=0.002). In multivariate logistic analysis, the independent predictor of re-occlusion was the number of thrombectomy attempts (odds ratio, 3.761 [95% CI, 1.416-9.990], p=0.008)

Conclusion: In our study, the number of thrombectomy attempts was an independent risk factor of re-occlusion in ICAS treated by mechanical thrombectomy and rescue treatment.

Effectiveness of anchoring with balloon guide catheter and stent retriever in difficult mechanical thrombectomy for large vessel occlusion

Ho Jun Yi, Bum-Tae Kim, Dong-Seong Shin

Department of Neurosurgery, Soonchunhyang University Bucheon Hospital

Objective: A distal navigation of a large bore aspiration catheter during mechanical thrombectomy (MT) is important. However, delivering a large bore aspiration catheter is difficult to a tortuous or atherosclerotic artery. We report the experience of anchoring with balloon guide catheter (BGC) and stent retriever to facilitate the passage of an aspiration catheter in MT.

Methods: When navigating an aspiration catheter failed with a conventional co-axial microcatheter delivery, an anchoring technique was used. Two types of anchoring technique were applied to facilitate distal navigation of a large bore aspiration catheter during MT. First, a passage of aspiration catheter was attempted with a proximal BGC anchoring technique. If this technique also failed, another anchoring technique with distal stent retriever was tried. Consecutive patients who underwent MT with an anchoring technique were identified. Details of procedure, radiologic outcomes, and safety variables were evaluated.

Result: A total of 67 patients underwent MT with an anchoring technique. Initial trial of aspiration catheter passage with proximal BGC anchoring technique was successful for 35 (52.2%) patients and the second trial with distal stent retriever anchoring was successful for 32 (47.8%) patients. Overall, navigation of a large bore aspiration catheter was successful for all (100%) patients without any procedure related complications.

Conclusion: Our study showed the usefulness of anchoring technique with proximal BGC and distal stent retriever during MT, especially in those with an unfavorable anatomical structure. This technique could be an alternative option for delivering an of aspiration catheter to a distal location.

Can computed tomographic angiography be used to predict who will not benefit from endovascular treatment in patients with acute ischemic stroke? The CTA-ABC score

Jung Soo Park, Ha Young Choi, Jong Myong Lee, Eun Jeong Koh

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Objective: The objective of this study was to develop a score to predict patients with acute ischemic stroke (AIS) who will not benefit from endovascular treatment (EVT) using computed tomographic angiography (CTA) parameters.

Methods: The CTA-ABC score was developed from 3 scales previously described in the literature: the Alberta Stroke Program Early CT Score (0–5 points, 3; 6–10 points, 0), the clot burden score (0–3 points, 1; 4–10 points, 0), and the leptomeningeal Collateral score (0–1 points, 2; 2–3 points, 0). We evaluated the predictive value of CTA parameters associated with symptomatic intracranial hemorrhage (sICH) or malignant middle cerebral artery infarction (MMCAI) after EVT and developed the score using logistic regression coefficients. The score was then validated. Performance of the score was tested with an area under the receiver operating characteristic curve (AUC-ROC).

Result: The derivation cohort consisted of 115 and the validation cohort consisted of 40 AIS patients. The AUC-ROC was 0.97 (95% confidence interval [CI], 0.94–0.99; $p < 0.001$).

Conclusion: Our CTA-ABC score reliably assessed risk for sICH and/or MMCAI in patients with AIS who underwent EVT. It can support clinical decision-making, especially when the need for EVT is uncertain.

In vitro comparison of vacuum pressures and suction forces generated by different pump system for aspiration thrombectomy

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Objective: Direct aspiration thrombectomy is an increasingly utilized technique in endovascular stroke treatment that relies on vacuum and suction force to remove the clot. This report assesses the pressures and forces generated by different pumps.

Methods: Vacuum pressures were measured using a vacuum gauge with closed tip for aspiration pumps (60-mL syringe, Penumbra Jet Engine, Penumbra Max, and Stryker Medela AXS). Using an artificial thrombus made from polyvinyl alcohol hydrogel, suction force generated on an artificial thrombus was assessed by 5Fr, 6Fr Sophia intermediate catheter and penumbra Jet Engine. Subsequently, calculated suction forces based on pressure and catheter tip size ($\text{force} = \text{area} \times \text{pressure}$) and measured suction force were compared.

Result: A 60-ml Syringe generated the highest maximum aspiration pressure (98.2 ± 0.2 kPa), following Penumbra Jet Engine (96.1 ± 0.2 kPa), Penumbra MAX (94.3 ± 0.2 kPa) and Stryker Medela AXS (76.4 ± 0.2 kPa). Using the Penumbra Jet Engine, a larger-bore catheter was associated with higher tip force. Measured suction force of 5Fr Sofia was 10.6 ± 0.5 , and 18.1 ± 2.4 gf for 6Fr Sofia. Calculated suction forces of 5Fr Sofia was 12.6 gf, and 22.2 gf for 6Fr Sofia.

Conclusion: A 60-ml syringe generates the highest vacuum pressure. Among commercially available pumps, Penumbra Jet Engine generates the highest vacuum pressure and it was comparable with a 60-ml syringe. A catheter with a larger inner diameter generates higher suction forces on aspiration. The data on measured suction force and calculated suction force were comparable.

Should we always retrieve? endovascular treatment outcomes in emergent large-vessel occlusion due to underlying intracranial atherosclerotic stenosis

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Objective: This study aimed to compare treatment outcomes between patients who received Stent-retriever thrombectomy (SRT) and those who received first stenting without retrieval (FRESH) for treating emergent large vessel occlusion (ELVO) due to underlying intracranial atherosclerotic stenosis (ICAS).

Methods: Consecutive patients with intracranial ELVO who underwent endovascular treatment at Yeungnam University Medical Center between January 2017 and December 2020 were retrospectively selected. ICAS-related ELVO was defined based on a remnant stenosis of >70% or a lesser degree of stenosis with a tendency toward reocclusion and/or flow impairment during endovascular treatment. The patients with ICAS-related ELVO were divided into two groups: SRT and FRESH.

Result: 62 consecutive patients with ELVO due to ICAS were enrolled in this study. Among the 62 patients, 32 (51.6%) underwent SRT, whereas 30 (48.4%) patients underwent FRESH. There were no significant intergroup differences in the rate of successful reperfusion. However, symptomatic intracranial hemorrhage was significantly more common in the SRT group than in the FRESH group (18.8% vs. 0%; odds ratio [OR]: 14.962, 95% confidence interval [CI]: 0.804–278.311, $p = 0.024$). Favorable functional outcomes were significantly more frequent in the FRESH group (93.3% vs. 40.6%, OR: 20.462, 95% CI: 4.137–101.21, $p < 0.001$). The multivariate logistic analysis showed that FRESH (OR: 7.243 [95% CI: 1.095–47.91]; $p = 0.040$) was an independent predictor of favorable functional outcomes.

Conclusion: FRESH could be a feasible solution when considering procedural simplicity and focusing on the cause of occlusion.

2021 대한뇌혈관내치료의학회 정기학술대회 및 총회

| 2021년 11월 27일(토) | 인천 파라다이스시티호텔 그랜드볼룸

17:20-17:40

e-Poster Presentation

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P-01

Short and long-term outcomes of subarachnoid hemorrhage treatment according to hospital volume in Korea: a nationwide multicenter registry

Jae Sang Oh, Sung Ho Lee, Ho Jun Lee, Dong Sung Shin, Sukh Que Park, Seok Mann Yoon, Bum, Tae Kim

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Objective: Subarachnoid hemorrhage is a potentially devastating cerebrovascular attack with a high proportion of poor outcomes and mortality. Recent studies have reported decreased mortality with the improvement in devices and techniques for treating ruptured aneurysms and neurocritical care. This study investigated the relationship between hospital volume and short- and long-term mortality in patients treated with subarachnoid hemorrhage.

Methods: We selected subarachnoid hemorrhage patients treated with clipping and coiling from March–May 2013 to June–August 2014 using data from Acute Stroke Registry, and the selected subarachnoid hemorrhage (SAH) patients were tracked in connection with data of Health Insurance Review and Assessment Service to evaluate the short-term and long-term mortality. During a period of 6 months, 20,202 acute stroke patients were admitted to the emergency departments. A total of 5,047 (25%) patients suffered an acute hemorrhagic stroke. To analyze and compare the effect of treatment, patients who received conservative treatment for SAH were excluded. A total of 4,422 patients were excluded as their initial Glasgow Coma Scale (GCS) was either not recorded on admission, or they did not receive surgical treatment (clipping or coiling). Six hundred and twenty-five patients were treated with surgical clipping ($n = 355$, 57%) or endovascular coiling ($n = 270$, 43%). To avoid the intentional cut-off level bias, we divided patients into two groups according to the number of clipping and coiling procedures conducted in a hospital: high-volume hospitals (≥ 20 cases per year); and low-volume hospitals (< 20 cases per year).⁶ We divided the severity of clinical status into two groups according to GCS on admission: 1) severe clinical status ($GCS \leq 9$); and 2) mild clinical status ($GCS \geq 10$). To divide the severity of clinical status in patients with SAH, we determined a cut-off score of GCS 9 because it predicted poor outcome after SAH in a previous study.⁷ Economy status was divided into health insurance and medical aid. Based on smoking history, patients were divided into current smokers, ex-smokers, and non-smokers. The Charlson Comorbidity Index (CCI) was determined using the ICD-10 code and was divided into two groups: 0 and ≥ 1 . The use of emergency medical services (EMS) before arrival at

the hospital, onset-to-door time, and door-to-image time were also collected. The mortality rate after admission was divided into five categories: within 14 days; within one month; three months; one year; and five years.

Result: The in-hospital mortality within 14 days in the high-volume center was significantly lower than that at the low-volume center (9.0% vs. 16.7%, $P = 0.004$). The one-month mortality at the high-volume center was significantly lower than that at the low-volume center (14.1% vs. 24.4%, $P = 0.001$), and the three-month mortality at the high-volume center was significantly lower than that at the low-volume center (15.5% vs. 26.3%, $P = 0.001$). The one-year mortality at the high-volume center was significantly lower than that at the low-volume center (17.1% vs. 27.0%, $P = 0.003$), and the five-year mortality at the high-volume center was significantly lower than that at the low-volume center (20.0% vs. 30.0%, $P = 0.004$). On Cox regression analysis of death in patients with severe clinical status, low-volume hospitals had significantly higher mortality than high-volume hospitals during short-term follow-up. On Cox regression analysis in the mild clinical status group, there was no statistical difference between high-volume hospitals and low-volume hospitals.

Conclusion: In subarachnoid hemorrhage patients treated with clipping and coiling, low-volume hospitals had higher short-term mortality than high-volume hospitals. These results from a nationwide database imply that acute SAH should be treated by a skilled neurosurgeon with adequate facilities in a high-volume hospital.

P-02

Direct contact aspiration thrombectomy using large bored suction catheter: a single center's experience

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Objective: Direct aspiration thrombectomy has accepted a technique for acute ischemic stroke (AIS) after introducing A Direct Aspiration First Pass Technique (ADAPT). The ACE68 reperfusion catheter is a newly introduced large bore aspiration catheter. We report our initial experiences with ADAPT with ACE68 catheter as the first-line technique.

Methods: We retrospectively reviewed the stroke registry of our institute. We enrolled AIS patients who underwent mechanical thrombectomy (MT) using ADAPT with the ACE68 catheter from December 2019 to May 2021. Baseline characteristics, angiographic and clinical outcomes were analyzed.

Results: During the period, 56 patients were treated. Mean age was 67.8 years and mean baseline National Institutes of Health Stroke Scale score was 14.3. Successful recanalization (modified Thrombolysis in cerebral infarction score 2b or 3) could be achieved in 46 ADAPT (75.0%) and 52 stent retriever-combined procedures (92.9%). A first-pass effect was achieved in 28 procedures (50%). Mean puncture-to-recanalization time was 33.1 minutes with ADAPT (26.2 minutes with first-pass effect), and 39.4 minutes with stent retriever-combined procedures. Symptomatic intracranial hemorrhage occurred in 4 patients (7.1%). Favorable outcome (modified Rankin scale 0, 1, 2) was achieved 26.8% at discharge and 41.1 % at 3 months after discharge.

Conclusions: ADAPT with large bore catheter achieved high rate of reperfusion with first-pass effect, short reperfusion time, and acceptable clinical outcomes. Utilizing these technique and devices recommends as a safe and effective first-line strategy for AIS to require MT.

Case report: Trans-radial coil embolization of basilar tip aneurysm in patient with difficult aortic arch

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Objective: Transfemoral access is usually preferred to transradial access for ease of use and familiarity for most Korean neurointerventionist. Transradial access has some advantages in specific situations. Here we present a successful trans-radial coil embolization of basilar tip aneurysm case.

Methods: A 76-year-old female came to outpatient department with a chief complaint of headache. Eight-millimeter sized basilar tip unruptured aneurysm was diagnosed on computed tomography angiogram. In diagnostic transfemoral cerebral angiography session, proper right vertebral artery selection was impossible with lack of angiocatheter controllability (especially, torquability) owing to severe dolichosis of aorta. Left vertebral angiography was also insufficient due to direct arch origin and angiocatheter kickback. So, trans-radial coil embolization was planned. A 6-French sheath was placed in the right radial artery with Seldinger technique. Ulnar arterial patency was confirmed before guiding catheter delivery. A 6-French guiding catheter was placed in the right vertebral artery easily. The Y stent assisted coil embolization was successfully performed for saving ipsilateral posterior cerebral and superior cerebellar arteries.

Result: The patient was released from hospital on second postoperative day without any complications including radial artery problem.

Conclusion: Trans-radial access could be an effective and easy alternative corridor in the patient with difficult aortic arch.

P-04

Proximal carotid artery angioplasty and stenting considerations in a patient with anomalous right vertebral artery originating as a side branch from right internal carotid artery

Seong-Cheol Park

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Objective: Anomalous origin of a right vertebral artery originating from right internal carotid artery is a very rare anomaly. Because of the anomaly in which both internal carotid artery and vertebral artery is located distal to proximal internal carotid artery, distal protection during proximal carotid stenting may be more complex. Carotid stenting in a 73 years old male patient with this type of anomaly is reported.

Methods: The patient visited emergency department due to imbalance and frequent fall probably related to vascular dementia or other type of dementia. Obey command was possible and no focal weakness was evident. However, the patient showed imbalance and partial dysphagia. Multiple severe stenosis including right proximal internal carotid artery, right intracranial internal carotid artery and left vertebral ostium were found. Multiple previous infarctions were found and multiple tandem stenosis were found. Right proximal internal carotid artery showed more than 68.3% stenosis with residual lumen 1.7mm/5.35mm and another proximal carotid artery and the other intracranial tandem stenoses were present. Intracranial 75% severe stenosis was treated by balloon angioplasty three years ago. The patient showed clopidogrel resistance and clopidogrel changed to ticagrelor. Right proximal internal carotid artery angioplasty and stenting was planned with distal protection. Several distal protection options, internal carotid artery protection, vertebral artery protection or both artery protections were considered.

Result: Considering vessel angulations and intravascular approach difficulty, right internal carotid artery distal protection was done with Spider embolic protection. Right proximal internal carotid angioplasty and stenting were performed with balloons and Protege stents. Postprocedurally, 1.7mm stenosis was improved to 3.21mm and 68.3% stenosis was improved to 40% stenosis. Twenty days later, left vertebral ostium balloon angioplasty was also performed. Ily.

Conclusion: No neurologic change or additional stroke was found postprocedurally for 3 months. The patient was transferred to rehabilitation hospital. Anomalous original and branching of right vertebral and internal carotid artery can cause distal protection difficulty in a rare case. In literature review, both anomalous right vertebral artery origin from common carotid artery and internal carotid artery are rare anomalies. Probably anomalous right vertebral artery origin from right internal carotid artery is rarer type. Unlike common carotid artery origin, internal carotid origin vertebral artery may require additional concern during proximal carotid stenosis treatment.

Case report of unruptured aneryusm treatment by WEB system

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Objective: Conventionally, Platinum coils are inserted into the lumen of the aneurysm for treating an unruptured aneurysm. Endovascular therapy for cerebral aneurysms is evolving. New techniques continue to be developed for treating cerebral aneurysms like stent-assisted coiling, ballon-assisted coiling, and flow diverters, etc. Wide-neck bifurcation aneurysms (WNBAs) can be difficult to treat with either endovascular or open surgical methods. Woven EndoBridge (WEB) intrasaccular therapy for the treatment of wide Neck aneurysms is approved by The United States Food and Drug Administration (FDA) since 2018'. However, in Korea, the above technology has not yet been included in the insurance standards and has not been used in many clinical trials. The purpose of this cases report is to discuss WEB embolization's usefulness by looking into some cases treated by the WEB system.

Methods: We treated four patients with web embolization from August 2021 to November 2021. All 4 cases is MCAB unruptured aneurysms (Rt : 3, Lt : 1). Regular transfemoral cerebral angiography was performed on all cases before surgery, and dual antiplatelet was taken to every patients. It was performed as elective surgery, and brain magnetic resonance angiography was taken for all patients the next day after surgery.

Result: All patients treated by WEB embolization had wide-neck aneurysms and the average aspect ratio was 1.16. The average procedure time is 3minutes 26seconds. We didn't change devices for aneurysm embolization. Thromboembolic events were not observed in all patients during surgery, and residual aneurysms were not observed in brain magnetic resonance angiography performed the next day.

Conclusion: Aneurysms with wide neck remain a challenge for endovascular treatment. The WEB device is an effective therapy for wide-necked bifurcation aneurysms. This device is an important tool for the treatment of WNBAs, particularly for patients in whom surgical clipping carries high risks. the development of new techniques and materials in the treatment of aneurysms makes endovascular treatment of intracranial aneurysms safe and we think the WEB device can be an alternative for treating WNBAs.

Treatment result of anterior choroidal artery aneurysms mostly treated with coil embolization: a single-center experience

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Objective: The anterior choroidal artery (AchA) is relatively small in diameter and the AchA aneurysms are also usually small in size and often closely attached to the artery. Therefore, in many cases, it is often challenging to perform coil embolization because of its serious risks such as thromboembolic occlusion and perforation. So aneurysmal neck clipping has still been widely performed despite the increase in coil embolization for aneurysm treatment. We have treated 92.1% of AchA aneurysms with coil embolization and report the results.

Methods: We retrospectively analyzed the data base and medical records of patients who underwent coil embolization for AchA aneurysms. The clinical and imaging results, procedure related complications were investigated after coil embolization from January 2006 to October 2021 in Chungnam National University Hospital.

Result: A total of 93 AchA aneurysms were consisted with 63 (67.7%) unruptured and 30 (32.3%) ruptured aneurysms including 1 ruptured aneurysm (1.1%) re-embolized at the POD 192 due to coil compaction. There was no re-embolization in the unruptured aneurysm. After the initial coil embolization, complete occlusions were attained in 40 (43.0%), neck remnants 43 (46.2%) and sac remnants 10 (10.8%). Follow-up radiologic studies after 6 to 174 months were performed in 74 (79.6%) aneurysms. As a result, complete occlusions were noted in 51 (68.9%), neck remnants 20 (27.0%) and sac remnants 3 (4.1%). The only procedure-related complication (1.1%) was ipsilateral MCA territory ischemic insult caused by guiding catheter-induced blood flow arrest during procedure. After coil embolization, there was neither delayed rupture nor re-rupture.

Conclusion: Based on our results, treating anterior choroidal artery aneurysm with coil embolization is a safe and effective treatment option.

Outcome of ruptured anterior communicating artery aneurysm treatment comparing between surgical clipping and endovascular coiling – A single center analysis

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Objective: The optimal treatment modality of ruptured anterior communicating artery (ACoA) aneurysms is unclear. We aimed to evaluate the outcome of ruptured ACoA aneurysm treatment to compare the endovascular coiling and surgical clipping and investigate predictors for favorable outcome.

Methods: We conducted a retrospective analysis of consecutive 213 patients with ruptured ACoA aneurysm treated with endovascular coiling or surgical clipping in single tertiary neurosurgical center from January 2010 to December 2020. Patients were dichotomized into coiling and clipping groups. Baseline patient's demographics, aneurysm characteristics, clinical outcomes and complications were evaluated.

Result: 213 eligible patients were included in the study. 94 patients (44.1%) underwent surgical clipping and 119 patients (55.9%) underwent endovascular coiling. The mean age of patients in the coiling group was higher than the clipping group (60.3 ± 13.2 versus 53.5 ± 13.4 , P

Conclusion: Patients with ruptured ACoA aneurysms can be safely and effectively treated by both clipping and coiling modalities. But this study suggests, although collaboration of coiling and clipping is important, it may be beneficial to consider coiling as the first option for ruptured ACoA aneurysms.

Safety and efficacy of neuroform Atlas and LVIS stent for the treatment of unruptured Intracranial aneurysms

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Objective: Two self-expandable stents, Neuroform Atlas and LVIS stents have been widely used for the treatment of complex intracranial aneurysms because of their low profile design. However, the impact of two different stents on clinical and angiographic outcome of stent-assisted coiling (SAC) in patients with intracranial aneurysms has been debated. The purpose of this study is to compare the initial and follow-up angiographic outcomes and perioperative complications of SAC between Neuroform Atlas and LVIS stent groups.

Methods: Between May 2015 and June 2021, all patients treated with Neuroform Atlas or LVIS SAC for unruptured intracranial aneurysms at our institution were eligible for this study. Double overlapping stents or Y stent was excluded. A Time-of-flight magnetic resonance angiography, catheter angiography, or both were used to evaluate occlusion status after coiling. The clinical characteristics and angiographic results were reviewed.

Result: We evaluated 192 consecutive cases: 104 Atlas and 88 LVIS (including LVIS Jr) stents. Patient demographics and aneurysm morphology were not different between Atlas and LVIS groups. The mean follow-up durations were 10.91 ± 5.83 and 14.20 ± 9.21 months for Atlas stent and LVIS groups, respectively ($P=0.013$). The mean packing density was not significantly different between two groups; Atlas stent ($32.92 \pm 12.86\%$) vs. LVIS stent ($34.59 \pm 12.90\%$) ($P=0.372$). Immediate postoperative complete or near complete occlusion rate (Raymond I, and II) was not significantly different between two groups (61.5 % in Atlas group vs 67.1 % in LVIS group). Further occlusion of coiled aneurysms were evident during follow up in both groups. Final angiographic outcome of Raymond I or II was not significantly different between two groups (85.1 % in Atlas group vs 92.9 % in LVIS group). Peri-procedural event rate was significantly higher in the LVIS group (11/88, 12.5%) than Atlas group (4/104, 3.8%) ($P=0.026$). However, the permanent complication occurred in 1 case of LVIS group.

Conclusion: Even though peri-procedural event rate is higher in LVIS group, permanent complication rate is not different. SAC using Atlas or LVIS stent is safe and effective for the treatment of unruptured intracranial aneurysms. Most of the aneurysms with postoperative Raymond II was completely occluded during follow up after SAC. Immediate postoperative and follow up angiographic results were similar between two groups.

P-09

Is it safe to discontinue antiplatelet medication after stent-assisted coil embolization? If so, when is the best time?

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Objective: Antiplatelet maintenance after stent-assisted coil embolization (SACE) is generally considered essential to avoid post-procedural thromboembolic complications. However, there is still debate as to whether it is safe to discontinue antiplatelet drugs after SACE or when is the best time to do so. We investigate herein the clinical outcomes experienced by patients who discontinue antiplatelet agents after SACE.

Methods: From a prospective database, we retrieved the data for 120 consecutive patients (harboring 130 aneurysms) in whom antiplatelet agents were discontinued after SACE between January 2010 and December 2019. We defined thromboembolic complications associated with discontinuation as neurologic or radiographic ischemia that occurred within 6 months of discontinuation of antiplatelet agents; the lesion was required to be correlated with the stented artery.

Result: The mean time of discontinuation of antiplatelet medication was 31.4 ± 18.3 months after SACE (median, 26 months). The majority of patients stopped antiplatelet medication between 18 and 36 months after SACE (74 patients, 61.6%). Laser-cut closed-cell stent was most commonly applied in 91 aneurysms (70.0%), followed by braided closed-cell ($n=29$; 22.3 %) and laser-cut open-cell stent 10 (7.7 %). No patients experienced cerebral ischemia related to discontinuation of antiplatelet medication.

Conclusion: Our preliminary study suggests that it may be safe to discontinue antiplatelet medication after SACE in patients at low risk for ischemia. The optimal time to discontinue might be around 18 to 36 months after SACE. Large cohort-based studies or randomized clinical trials are warranted to confirm these results.

Is there a change of initial severity of subarachnoid hemorrhage (SAH) by ruptured intracranial aneurysm over time?

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Objective: The treatment of unruptured intracranial aneurysm is increasing every year. However, the change of initial severity of subarachnoid hemorrhage (SAH) by aneurysm rupture is unclear.

Methods: We include the patient who visited our emergency center with SAH by aneurysm rupture from 2003 to 2020. The initial Hunt-Hess grade and modified Fisher grade were obtained using previous medical records and image studies. We categorized Hunt-Hess grade I, II into mild group and Hunt-Hess grade III, IV and V into severe group. Also. We divided Fisher grade I, II into mild group and Fisher grade III, IV into severe group. We analyzed the change of the proportion of severe group from 2003-2020 over time. The Mann-Kendall analysis method was used for evaluating statistical significance of the initial severity trend over time.

Result: A total of 1023 patients with SAH by aneurysm rupture was identified. The proportion of severe group of Hunt-Hess grade was ranged from 15.4% to 39.1%. The Mann-Kendall test was revealed that there is no trend of the severity of Hunt-Hess grade over time (P-value 1.00). In the aspect of modified Fisher grade, the proportion of severe group was ranged from 56.7% to 92.3%. The trend of severity of modified Fisher grade was also not significant statistically (P-value 1.00). These means that there was no improvement or aggravation of the initial severity of Hunt-Hess grade and Fisher grade.

Conclusion: We found that there was no improvement of initial severity of SAH by aneurysm rupture over time despite increasing treatment of unruptured intracranial aneurysms.

The usefulness of hyperacute Stroke MRI protocol

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Objective: In patients with hyperacute stroke, time is a very important factor in determining the prognosis. In general, protocol using CT scan is used, but with the development of MRI technology, MRI imaging time has been shortened a lot compared to before, now there isn't much difference in doing a CT Scan or MRI. Moreover, as the time window for acute ischemic stroke increased to 24 hours, the importance of multimodal diagnostic images also increased.

Methods: Hyperacute stroke MRI protocol is composed of Diffusion + Flair + Gre + Carotid MRA(E) + Perfusion. Hyperacute stroke MRI sequences are implemented to shorten the scan time and it provides various information whether to perform Thrombectomy and at the time of performing Thrombectomy.

Result: Fast scanning techniques (Compressed sensing, Multiband sense) and selective MRI Sequence images were used. It takes a total of 05:54min scanning time with a Diffusion 01:07min, Flair 01:30min, Gre 01:10min, Carotid MRA(E) 37s, Perfusion 01:30min.

Conclusion: Despite shortening the scanning time through the Hyperacute stroke MRI protocol, information such as ischemic core volume, large vessel occlusion, diffusion / perfusion mismatch, diffusion / flair mismatch and susceptibility vessel sign can be obtained like Routine MRI.

Transvenous Onyx embolization assisted with coils for the treatment of cavernous sinus-dural arteriovenous fistula (CS-DAVF)

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Objective: A cavernous sinus-dural arteriovenous fistula (CS-DAVF) is an abnormal arteriovenous shunting lesion involving the dura mater within or near the CS wall. Endovascular treatment is generally considered to be the most effective treatment for CS-DAVF, and transvenous Onyx embolization has been found to be safe and effective. But, because of the risk of embolization of a normal draining vein and migration to an unwanted site, injecting Onyx against the flow of the fistula is technically challenging.

Methods: Herein we report a case of transvenous Onyx embolization assisted with platinum coils.

Result: A 79-year-old woman presented with ptosis of the right eye, diplopia, and severe headache. Cerebral angiography showed the right-sided CS-DAVF fed by multiple branches of the bilateral external carotid arteries. And it also revealed the dangerous reflux to deep venous drainage. We treated the CS-DAVF using transvenous Onyx embolization assisted with partial coil embolization of cavernous sinus for the purpose of some decrease in shunting flow and so the sophisticated Onyx cast formation. Complete angiographic obliteration has been achieved and there was no post-procedure complication.

Conclusion: Transvenous Onyx embolization assisted with coils is safe and effective treatment for CS-DAVF.

Deep-learning-based cerebral artery semantic segmentation in neurosurgical operating microscope vision using indocyanine green fluorescence videoangiography

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Objective: There have been few anatomical structure segmentation studies using deep learning. Numbers of training and ground truth images applied were small and the accuracies of which were low or inconsistent. For a surgical video anatomy analysis, various obstacles, including a variable fast-changing view, large deformations, occlusions, low illumination, and inadequate focus occur. In addition, it is difficult and costly to obtain a large and accurate dataset on operation video anatomical structures, including arteries. In the present study, we investigated cerebral artery segmentation using an automatic ground-truth generation method.

Methods: Indocyanine green (ICG) fluorescence intraoperative cerebral videoangiography was used to create a ground-truth dataset mainly for cerebral arteries and partly for cerebral blood vessels, including veins. Four different neural network models were trained using the dataset and compared automatically. Before augmentation, 35,975 training images and 11266 validation images were used. After augmentation, 260499 training and 90129 validation images were used.

Result: A Dice score of 79% for cerebral artery segmentation was achieved using the DeepLabv3+ model trained using an automatically generated dataset. Strict validation in different patient groups was conducted. Arteries were also discerned from the veins using the ICG videoangiography phase.

Conclusion: We achieved fair accuracy, which demonstrated the appropriateness of the methodology.

This study proved the feasibility of operating field view cerebral artery segmentation using deep learning and the effectiveness of the automatic blood vessel ground truth generation method using ICG fluorescence videoangiography. Using this method, computer vision can discern blood vessels and arteries from veins in a neurosurgical microscope field of view. Thus, this technique is essential for neurosurgical field vessel anatomy-based navigation. In addition, surgical assistance, safety, and autonomous surgery neurorobotics that can detect or manipulate cerebral vessels would require computer vision to identify blood vessels and arteries.

Contralateral collateral flow via anterior communicating artery, is it reliable influencer for acute internal carotid artery occlusion?

Dong Sub Kim, Seung Yoon Song, Dong Hoon Lee, Jae Hoon Sung

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

Objective: A presence of an anterior communicating artery (A-com) collateral flow is a good prognostic factor for revascularization in patients with anterior circulation ischemia. This retrospective study aimed to investigate the effectiveness of A-com collateral circulation in distal ICA occlusion by comparison with cases of M1 segment occlusion after mechanical thrombectomy (MT).

Methods: We analyzed patients with acute ischemic stroke who received endovascular interventions for distal ICA, M1 segment occlusions between January 2017 and December 2020. We divided patients into MCA and ICA occlusion groups, and latter group was subdivided into two groups according to the presence of definite A-com collateral which was defined when there was definite MCA distal flow at the occluded site on brain CT angiography. Favorable outcome was defined as a modified Rankin scale (mRS) score of 0-2.

Result: Total 164 patients (median age, 72 years), 66 with distal ICA, 98 with M1 segment occlusion, were included. Among distal ICA occlusion group, 17 patients had definite A-com collateral. The total intervention time was longer in ICA occlusions (median, 60 minutes, $p < 0.001$) compared to M1 group (44 minutes). The incidence of favorable outcomes of M1 occlusion group was significantly greater ($P < 0.001$) than that ICA occlusion group. But, there was no statistical difference in two ICA occlusion groups regardless of presence of definite A-com collateral on both procedure time and clinical prognosis. When ICA occlusion group with A com collateral is compared with M1 occlusion group, there was a tendency that mRS of M1 occlusion group was lower than that of the ICA occlusion with definite A-com collateral group, but there was no statistical difference.

Conclusion: The A-com collaterals from contralateral side cannot warrant or influence final outcome in acute ICA occlusion. Despite of presence of A-com collaterals, rapid recanalization procedure should be performed without delay.

Middle meningeal artery embolization treatment of chronic subdural hematoma after unruptured aneurysm clipping surgery

Haemin Kim

Department of Neurosurgery, Pohang Stroke and Spine Hospital

Objective: Chronic subdural hematoma is a rare complication of unruptured aneurysm clipping surgery. There are many studies on risk factors for chronic subdural hematoma after surgery, but not many studies on treatment. We report a case of a 60-year-old-male-patients.

Methods: A 61-year-old male patient has no specific medical history other than gastric cancer surgery in the past. He underwent clipping surgery on right middle cerebral artery unruptured aneurysm in April this year. About two months later, he visited the emergency room with a left weakness, and showed chronic subdural hemorrhage on the right. We performed one burr hole trephination. About 1 month later, we found a recurrence again. We performed right middle meningeal artery embolization.

Result: There is no recurrence after 4 months of middle meningeal artery embolization.

Conclusion: Middle meningeal artery embolization offers the potential for a minimally invasive, less morbid treatment in this case. We think this treatment could be an alternative to chronic subdural hematoma that repeats after aneurysm clipping surgery.

Outcomes of carotid artery stenting and carotid endarterectomy by a single neurosurgeon

Myung Ji Kim, Hyunjun Jo, Jong-il Choi, Sang-Dae Kim, Dong-Jun Lim, Sung-Kon Ha

Department of Neurosurgery, Korea University College of Medicine, Ansan Hospital

Objective: The prevalence of stroke in adults with carotid artery stenosis (CS) is known to range from 10% to 20%. Stroke following carotid revascularization is a serious consequence that has a significant impact on treatment options. Many randomized controlled trials (RCTs) and meta-analyses comparing carotid endarterectomy (CEA) and carotid artery stenting (CAS) have been conducted. A recent meta-analysis revealed that the increased risk of CAS is mostly due to a rise in periprocedural stroke in patients over the age of 70. Existing RCTs and meta-analyses included a large number of patients, but the subjects of diagnosis, treatment selection, and performance are heterogeneous. Thus, we retrospectively reviewed data and analyzed the treatment outcomes in patients with symptomatic or asymptomatic CS treated with CAS or CEA by a single neurosurgeon at a single institution.

Methods: A retrospective analysis was performed on all patients who underwent carotid revascularization between September 2016 and December 2020 at a single institution. Patients with a follow-up period of less than 6 months after CEA or CAS were excluded. Patients with a transient ischemic attack (TIA) or stroke within 180 days and with angiography confirmed $\geq 50\%$ carotid stenosis, according to method described by North American Symptomatic Carotid Endarterectomy Trial (NASCET) before carotid revascularization were deemed symptomatic. Patients with no recent (in the last 6 months) neurological events and carotid stenosis $\geq 60\%$ by angiography were considered asymptomatic. The primary outcomes were stroke, MI, and death during the periprocedural period. We also evaluated asymptomatic diffusion weighted image (DWI) hyperintense lesion, TIA within 30 days, ipsilateral intracerebral hemorrhage, cerebral hyperperfusion syndrome, cranial deficit, ipsilateral stroke or TIA after 30days, restenosis, and mobile thrombus during the follow-up period.

Result: A total of 61 patients (50 men and 11 women) who underwent CEA or CAS were enrolled in the present study. Among them, 36 (59%) underwent CEA and 25 (41%) underwent CAS. Of the 44 symptomatic patients (72.1%), 35 (79.5%) experienced infarction and 9 (20.5%) experienced TIA within 180 days before carotid revascularization. Seventeen (27.9%) had asymptomatic carotid stenosis. There was no significant difference in age between the two groups (CEA, 70.3 ± 8.1 vs CAS 68.9 ± 10.6 ,

$p = 0.582$). None of the patient-specific characteristics including medical comorbidities differed significantly between the two groups. Statistically significant differences were found between the two groups with respect to degree of carotid stenosis (CEA, 87.0 ± 9.1 vs CAS, 80.5 ± 9.3 , $p = 0.007$). All patients with confirmed plaque ulceration before carotid revascularization underwent CEA (CEA, 100% vs CAS 0%, $p < 0.0001$). Plaque hyperintense signal was found in 25 (69.4%) patients who underwent CEA and 9 (36.0%) patients who underwent CAS, which was significantly different between the two groups ($p = 0.018$). No periprocedural death or MI was reported in the present study. Two (2.3%) periprocedural strokes occurred, both of which occurred on the ipsilateral side. One (2.8%) was a disabling stroke that occurred immediately after surgery in the CEA group, the other one (4.0%) was a non-disabling stroke that occurred 6 days after the intervention in the CAS group. With respect to rates of periprocedural stroke, MI, and death, there was no significant difference between the two groups. There were no significant differences CEA and CAS for the event-free survival rate for stroke following carotid revascularization during the follow-up ($p = 0.806$).

Conclusion: In the present study, we analyzed treatment outcomes of patients who underwent CEA and CAS by a single neurosurgeon. Favorable results in terms of overall periprocedural complication rates were observed compared with previous RCT and meta-analyses. Since there was no significant differences in age between CEA and CAS group in the present study, when deciding which treatment to select, “accessibility” of whether CAS can be performed should be considered rather than age. A hybrid neurosurgeon can determines which treatment is safer and more feasible during diagnostic angiography and perform the selected treatment. If the selected treatment fails, the other treatment option can be immediately pursued. Further studies involving a larger number of cases and continuous follow-up are necessary to confirm our conclusions.

2021 대한뇌혈관내치료의학회 정기학술대회 및 총회

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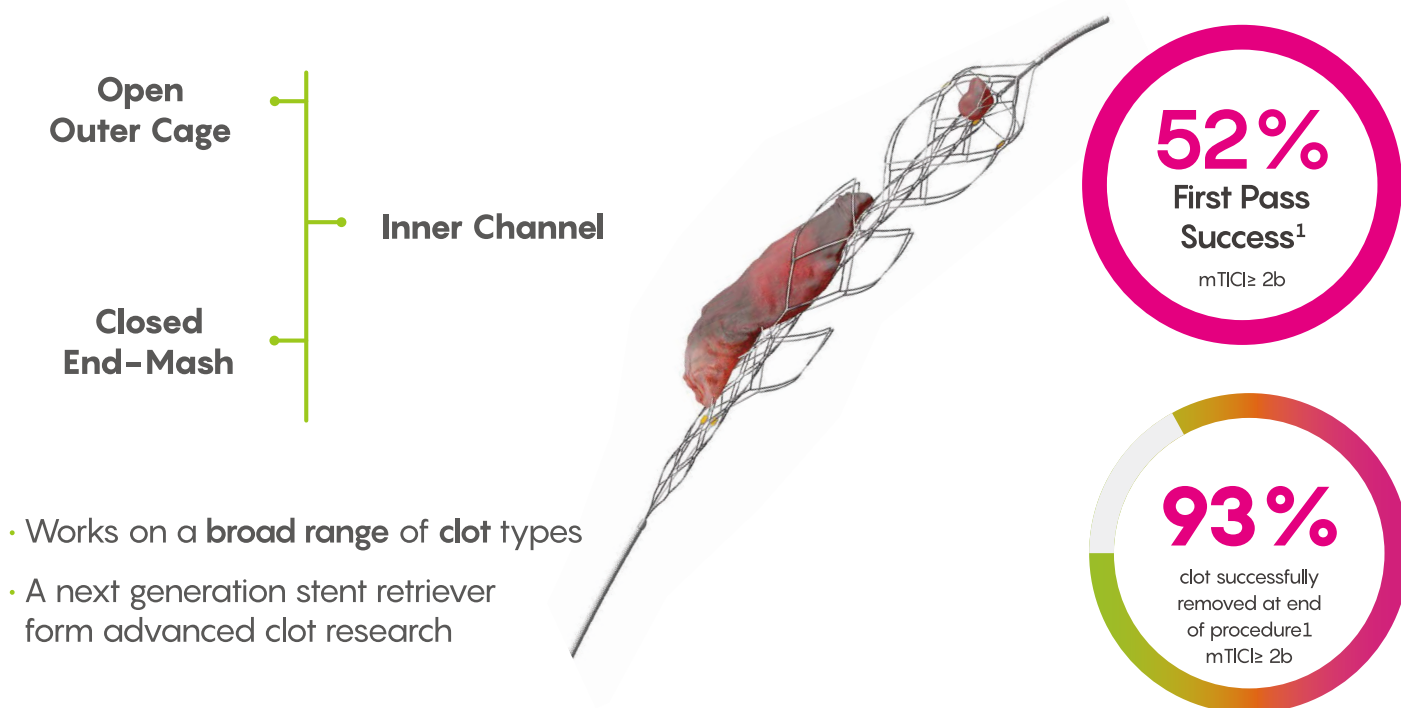
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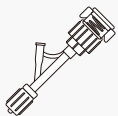
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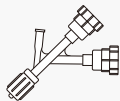
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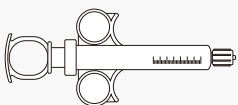
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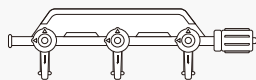
9 mini
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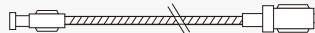
7 mini
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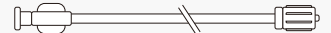
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A photograph of two medical professionals in a Philips Azurion interventional suite. They are wearing blue scrubs, purple bouffant caps, and white surgical masks. One professional is in the foreground, looking at a tablet, while the other is slightly behind, looking towards the patient. The patient is lying on a table, covered with blue drapes. A large monitor in the background displays multiple panels of medical imaging, including angiograms and a 3D reconstruction of a vessel. The Philips logo is visible on the machine's gantry.

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