Carotid stenting plays an important role for the treatment of carotid stenosis. The evolution in the field of carotid stenting (approach, imaging technique, stent design, protective devices and perioperative management) wrought improved clinical outcome. Precise details and examples of clinical application will be discussed in this lecture.
SYVI-2

Advantage of Carotid endarterectomy and carotid artery stenting: In terms of hybrid neurosurgeon

Kentaro Hayashi

Department of Neurosurgery, Sasebo City General Hospital

Objective: Carotid endarterectomy (CEA) is employed for the carotid artery stenosis all over the world. Surgical procedure has been established. However, there are some severe complications and pitfalls. Carotid artery stenting (CAS) in high-surgical-risk patients is considered as an effective alternative to CEA. We report our clinical experience of CEA and CAS, and discuss the advantage and disadvantage of the each treatment.

Materials and Methods: For 13 years, we performed CEA for 133 patients (135 lesions) and CAS was performed for 127 patients with carotid artery stenosis (129 lesions). Perioperative imaging studies and post-operative condition were evaluated especially in terms of complication.

Results: In our CEA series, ischemic stroke occurred in 3 cases, myocardial infarction in one, cranial nerve palsy in 2, internal carotid artery occlusion in 1, wound hematoma in 2, hyperperfusion syndrome in 3. The procedure was halted because of internal-shunt problem. All CAS was successfully performed. Ischemic stroke occurred in 7 cases, hyperperfusion syndrome in 2, stent occlusion in 2 and puncture site hematoma in 2.

Conclusions: CEA is a first-line treatment for the carotid artery stenosis. However, the complication of CEA may result in severe situation. Recognizing pitfalls, careful perioperative management is required. The result of CAS is as comparable as that of carotid endarterectomy. The radiological evaluation for the quality of plaque and appropriate selection of the embolus protection device are important.
INTRODUCTION:
Intra-cranial hemorrhage caused by hyperperfusion syndrome (HPS) is rare but well-known fatal complication after carotid artery stenting (CAS). To prevent this complication, we have introduced staged angioplasty (SAP) for the high risk patient of HPS since 2008. We analyzed the result of CAS comparing with before and after introduction of SAP.

MATERIALS & METHODS:
Between 2002 and 2017, a total 235 cases of CAS were performed in our institution. Sixty-three patients were included in pre-SAP period, and 172 were in SAP period. In SAP period, HPS high risk patients were assessed by using quantitative SPECT evaluation with Acetazolamide challenge. SAP method was initially performed angioplasty only using 3mmm balloon for carotid stenosis, followed by delayed CAS (2-4 weeks later).

RESULTS:
SAP was performed in 21 patients (12.1%) among 173 cases during SAP period. One patient suffered from intracranial hemorrhage due to HPS in pre-SAP period, but none was in SAP period. Periprocedural complication rates were 3/63 (4.7%) in pre-SAP period, 8/173 (4.6%) in SAP period, and 1/21 (4.7%) in SAP group retrospectively.

CONCLUSION:
Since SAP introduction, no HPS hemorrhage has occurred. Periprocedural complication rates were no difference between SAP and regular CAS group. SAP is useful method for the patients at high risk of HPS.
Symposium VI  Current topics in managing carotid stenosis

SYVI-4

Update on carotid artery stenting versus carotid endarterectomy

Jun Seok Koh

Department of Neurosurgery, Stroke & Neurological Disorders Centre / Kyung Hee University Hospital at Gangdong, Seoul, Korea.

Stroke is the third leading cause of death in Korea. Extracranial carotid artery disease is responsible for 10~20% of all ischemic stroke. Management of carotid stenosis consist of best medical treatment(BMT) and carotid revascularization, including carotid endarterectomy(CEA) and carotid artery stenting(CAS). Carotid stenosis is one surgically amenable disease that has been meticulously studied with robust prospective multicenter randomized trials. The subsequently emerging endovascular intervention has given physicians another options for treating carotid stenosis. Thus a series of randomized trials have been conducted to compare CEA and CAS and to select an ideal option which may benefit from one over the other. Although CAS and CEA has their own procedural risk, several randomized trials established the benefits over BMT in both symptomatic and asymptomatic patients.

According to the database of Korean Health Insurance Review and Assessment(HIRA) Service, about 500~600 CEA and 2500~3000 CAS per year were performed in Korea recently. Considering the number of institutions(more than 100 hospitals for CAS and less than 50 hospitals for CEA) dealing with carotid revascularization, each institution could perform relatively small number of carotid revascularizations, about 10 CEA and 25-30 CAS per year in one medical institution arithmetically, necessitating thorough patients selection and proper revascularization option for their own quality control.

The author reviewed medical records of 293 revascularization procedures(194 CAS & 99 CEA) performed at Kyung Hee University Hospital at Gangdong, Seoul, Korea during recent 11 years. Patient and lesion characteristics, peri-procedural risk of stroke/death and procedure related complications were investigated. The PubMed database for large-scaled multicenter randomized trials published in English which compare CAS to CEA; CAVATAS, SAPHIRE, EVA-3S, SPACE, CREST, ICSS, and ACT-1 were also searched and reviewed. The lesson learned from personal experiences and caveats from world-wide randomized trials will be discussed.
Carotid Endarterectomy - Technique and Outcome -

Masaaki Uno

Department of Neurosurgery, Kawasaki Medical School

Carotid endarterectomy (CEA) is recommended in symptomatic and asymptomatic patients with severe carotid artery stenosis. CEA is an essential surgical technique for neurosurgeons. In this paper, I provide an outline of the CEA technique to be used according to the anatomical findings, including how to dissect the distal internal carotid artery in the high position stenosis. Since carotid patch angioplasty is preferred technique for primary closure, therefore, I describe in detail how to perform patch angioplasty.
Carotid Artery Stenting Progress to Date and Next Steps

Yasuhiko Akiyama, Takeshi Miyazaki, Shinya Hagiwara, Fumio Nakagawa, Hirotake Eda, Tsutomu Yoshikane, Masahiro Uchimura, Shinichi Yasuda, Hidemasa Nagai

Department of Neurosurgery, Shimane University Faculty of Medicine

Carotid artery stenting (CAS) is alternative to carotid endarterectomy (CEA) with promised long-term efficacy. Patients indicated for carotid revascularization often have systemic atherosclerotic disease, therefore CAS has advantage to reduce the periprocedural systemic complications including myocardial infarction via its less invasiveness. However, recent large randomized control trials have revealed CAS has higher potential risk of periprocedural ischemic stroke. The main factor to participate this event will be incomplete embolic protection during balloon or stent angioplasty, and post-procedural thrombus emerges on the stented area associate to the protrusion material through bare metal stent. In this article, we present an outline of recent randomized control trials of SPACE, EVA-3S, ICSS, CREST and ACT-1 focused on cerebral ischemic complications of these trials, and describe the detail of the mechanism of periprocedural thromboembolic events and their countermeasure. Reduce of periprocedural ischemic complication is the task to date, and active utilization of proximal balloon embolic protection to unstable plaque on Taylor-maid manner and newly developed Micro Mesh-Covered stent may affect the efficacy of CAS as we go forward.