A case of unruptured ICPC aneurysm which was treated with simultaneous ipsilateral carotid endarterectomy

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[Introduction]
Proximal control during aneurysm clipping is essential. Although in case of severe atherosclerosis of parent artery the exposure of cervical carotid artery is needed, cervical carotid exposure should be carefully performed because a patient with severe atherosclerosis of parent artery has relatively high incidence of cervical carotid atherosclerotic stenosis.

[Case]
67-year-old female with right unruptured ICPC aneurysm.
Preoperative CTA showed severe atherosclerosis with calcification at supraclinoid ICA and ipsilateral cervical ICA stenosis (NASCET: 60%). Carotid endarterectomy was performed prior to neck clipping for a safe proximal control during clipping aneurysm.

[Surgical procedure]
At first, external carotid, internal and common carotid artery were exposed by cervical dissection. Subsequently, front-temporal craniotomy was performed. After sufficient hemostasis of the epidural space, 3,000 IU heparin was infused and CEA was performed. Afterward, ICPC aneurysm was exposed through transsylvian route as an anterior temporal approach. The aneurysm was clipped safely under proximal control at cervical carotid artery without touching intradural proximal ICA. Patient discharged with mRS 0.

[Discussion]
Coexistence of cerebral aneurysm and ipsilateral cervical ICA stenosis is not common. This is the first report of single-stage cerebral artery aneurysm clipping and ipsilateral CEA. Although the risk of distal embolism can be considered even after carotid endarterectomy during temporary clamping cervical carotid artery, tentative occlusion of cervical carotid artery without endarterectomy may cause more severe distal embolism by plaque rupture.

[Conclusion]
CEA and neck clipping aneurysm could be performed safely with a proper management of hemostasis.
Surgical strategy for A1 aneurysm of Anterior cerebral artery

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Background:
Aneurysms of A1-segment (A1A) are considered to be rare (<1%). They demonstrate unique characteristics with complex morphology. They often occur as multiple aneurysms and pose surgical challenge due to A1-perforators, variability of collateral circulation and fusiform nature. This study aims to set a surgical strategy, based on experience in treating such aneurysms.

Methods:
A total of 16 consecutive patients with A1A were treated in our hospital from April.2013 – January.2018. Clinical data and radiographic results were analyzed with emphasis on aneurysm location (proximal, distal), collateral circulation and clinical outcome, using modified Rankin Scale (mRS).

Results:
From a total of 16 cases with A1A, 6 (37,5%) were located proximal and 10 (62,5%) appeared distal (Acom junction). 4 A1As (25%) were multiple aneurysm cases and 2 (12,5%) were ruptured.
In unruptured cases outcome was excellent in 13 cases (92,9%) with 1 case with visual field deficit (mRS1) after 90 days. 1 ruptured A1A (H&K II°) showed a favourable outcome (mRS0), where the other case (H&K III°) had a poor one (mRS4).

Discussion:
Analysis of surgical method and outcome helped setting an algorithmic strategy when facing A1As. In cases of proximal A1A with sufficient collateral flow, simple trapping is feasible. In case of hypoplastic or aplastic contralateral A1 portion, EC-IC bypass to either side of A2 or A3 segment is needed in order to protect bilateral ACA territory. If A1A involves anterior communicating artery, A3-A3 side-to-side bypass is needed instead of sacrificed anterior communicating artery by trapping A1A. Additionally, in case of poor superficial temporal artery, radial artery short graft between superficial temporal artery trunk and anterior cerebral artery as EC-IC bypass or in between proximal A1 segment and A2 segment distal to the aneurysm as IC-IC bypass will be needed.
Conclusion:
The strategy to treat A1A safely should be considered by the location of the A1A whether anterior communicating artery is involved or not, size of contralateral A1 segment, and superficial temporal artery.
Surgical clipping of posterior communicating artery aneurysms with low-riding internal carotid artery- operative nuances

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Object. In surgical clipping of posterior communicating artery (PCoA) aneurysms, low-riding internal carotid artery (ICA) may complicate the surgery by limiting the working space. The purpose of this study is to elucidate operative nuances of PCoA aneurysms with low-riding ICA, focusing on necessities of adjunctive surgical procedures.

Methods. A total of 24 patients with PCoA aneurysms who underwent surgical clipping were retrospectively analyzed from a single center, observational cohort database in this study. The aneurysms were categorized into those with low-riding ICA (6 cases) and those with normal ICA (18 cases) groups depending on the angle of the ICA against the skull base bone. Characteristics and operative findings of PCoA aneurysms with low-riding ICA were identified. We also evaluated any correlation of low-riding ICA with the use of adjunctive surgical techniques including anterior clinoidectomy and anterior temporal approach, as well as procedure-related complications.

Results. Low-riding ICA was associated with low-positioned aneurysmal neck (p = 0.004, Mann-Whitney U test) and narrower retrocarotid surgical window (p = 0.001). PCoA aneurysms with low-riding ICA were associated with increasing use of anterior clinoidectomy (p = 0.007, chi-squared test) and anterior temporal approach (p = 0.006). Although intraoperative aneurysmal rupture occurred more frequently in the surgery of low-ICA group (p = 0.02), no significant difference was observed in the frequency of symptomatic procedure-related complications.

Conclusions. Adjunctive techniques including anterior clinoidectomy and anterior temporal approach may be required for safe and effective surgery for the PCoA aneurysms with low-riding ICA.
Surgical microanatomy of occipital artery for suboccipital muscle dissection and intracranial artery reconstruction

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Introduction
The occipital artery (OA) is an important donor artery for posterior fossa revascularization. Harvesting the OA is not easy compared to superficial temporal artery because OA runs between suboccipital muscles. Hence, the anatomical knowledge of suboccipital muscles and OA is essential. Present study analyzed running pattern of OA and its anatomic variations by using intraoperative and preoperative findings.

Method
From April 2012 to March 2018, we surgically treated 162 patients with suboccipital muscle dissection with OA dissection for the treatment of intracranial aneurysm or tumor or MVD. The running pattern and relationship between suboccipital muscles and OA was retrospectively analyzed in operation video and preoperative enhanced computed tomography (CT).

Result
The anatomic variation of running pattern of OA were identified around the longissimus capitis muscle. The running pattern of OA was classified in two types, such as running lateral to the longissimus capitis muscle and running medial. The medial pattern were observed in 107 (66%) and lateral pattern were observed in 54 (33.3%). One (0.6%) showed running between longissimus capitis muscles.

There were no difference between intraoperative findings and preoperative CT findings.

Discussion
Present study revealed the effectiveness of the preoperative CT to determine the running course of the OA. To know the running pattern of the OA preoperatively is important to harvesting OA safely. Because there are risk of OA injury in case of lateral pattern during splenius capitis muscle elevation. In addition, this is the first report that the OA rarely running in between longissimus capitis muscles.
Surgical strategy and clinical results of direct surgery for paraclinoid aneurysms

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Direct surgery for paraclinoid aneurysms (PA) requires manipulation of the dural ring, optic nerve, ophthalmic artery, and anterior clinoid process. The procedure raises different concerns depending on the aneurysm origin and projection. Despite advancements in endovascular treatment, direct surgery remains valuable considering safety and complete obliteration. Therefore, establishing the methodology and verifying clinical result is essential. Clipping with curved clips allows for an ideal closure line, orthogonal to the internal carotid artery (ICA). The aneurysm orifice is closed circumferentially, thereby, preventing stenosis and allowing complete obliteration. Ideal clip insertion depends on sufficient optic nerve unroofing, anterior clinoidectomy, and dural ring opening to free the ICA and aneurysm. For giant aneurysms or dissection, trapping or proximal occlusion with high- or low-flow bypass is administered (with the sequence being important). The clinical results and surgical strategy of direct surgery for PA were investigated in 103 cases (April 2005 to March 2017) at the Department of Neurosurgery, Hokkaido University. Eighty-two patients with unruptured aneurysms and 21 with ruptured aneurysm (mean age, 54.9 years; range, 21-79 years) were investigated. Surgery included neck clipping (57 cases), high-flow bypass (36), and low-flow bypass (10). Postoperative imaging confirmed aneurysm obliteration, and no cases of recurrence were observed. The postoperative mortality rate was 0%, with morbidity (impaired vision) in 2 cases (1.9%).

[Conclusion] Direct surgery for PA offers favorable complete obliteration, mortality, and morbidity rates with relatively low postoperative visual impairment rates. We will present the perioperative video, treatment strategies, and surgical methods.
Clipping of difficult ICA aneurysms in the endovascular era

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[Introduction] With the advancement of devices and techniques, indications of endovascular treatment of ICA aneurysms have been expanding. However, clipping is still the most reliable therapy in some cases. In this study, we studied the characteristics of clipping cases for ICA aneurysms in the endovascular era.

[Methods] Intracranial ICA aneurysm cases in recent 5 years are included in this study. We studied the reasons for the difficulty of endovascular treatment, and also analyzed the outcomes.

[Results] 70 aneurysms were treated by clipping, and 38 aneurysms (paraclinoid 13, IC-PC 13, C1 3, IC-AChA 2, blood blister 7) were judged as difficult for endovascular treatment. In paraclinoid aneurysms, 8 aneurysms with antero-superior projection seemed more suitable for neck clipping, which was performed relatively easily in all cases. On the other hand, 5 aneurysms with postero-medial projection were large and broad neck-types, which required anterior clinoidectomy and multiple clipping technique. In 18 distal ICA aneurysms (large/broad neck 14, fusiform 1, branching from the dome 3), 13 cases were treated by simple neck clipping, but 5 required multiple clipping technique. Blood blister-like aneurysms (anterior wall 5, posterior wall 2) were treated by wrap-clipping. Clinical outcomes were excellent in 34 aneurysms.

[Conclusion] Some difficult cases for endovascular treatment are even difficult for clipping; however, these aneurysms were treatable with multiple clipping or wrap-clipping technique.
Microsurgical Treatment of Recurrent Intracranial Aneurysms after Coil Embolization: A Report of 24 Cases

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Objective: In spite of the widespread use of endovascular treatment for intracranial aneurysms, concerns about endovascular treatment, such as possibility of incomplete coiling, low long-term durability, and rebleeding risk, still remain. In this study, we present cases of patients who experienced recurrent aneurysms after coiling and subsequently underwent surgical treatment and reviewed of the literature.

Methods: From June, 2012 to August, 2017, 957 consecutive patients who presented with aneurysms which incidental and ruptured were treated using endovascular treatment. We have experienced 24 cases of microsurgical retreatment after coil embolization.

Results: Incidence of microsurgical retreatment was 0.025% (24/957). We excluded that just followed up and additional endovascular treatment were used. Of the 24 patients, 10 cases were rebleeding, 1 case was remnant due to rupture during the procedure, and the remaining 13 cases were recanalization and regrowth of the aneurysm. Aneurysm locations were as follows; 12 on the anterior communicating artery; 5 on the posterior communication artery; 4 on the anterior cerebral artery (A2-3); 2 on the anterior wall of internal cerebral artery; 1 on the bifurcation of internal cerebral artery. Direct clipping was performed in 21 cases, and graft interposition bypass with internal trapping was performed 2 cases, last 1 case was performed coil extraction with clipping.

Conclusion: In our experience, patients who initially underwent subarachnoid hemorrhage showed a high recurrence rate (21/24) and Aneurysm of anterior communicating artery showed high rate of recurrent (12/24). The case of recurrent aneurysms that previously coiled, microsurgical treatment can be a viable treatment option.