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CASE REPORT **OPEN ACCESS**

OUTCOME OF ANEURYSMAL SUBARACHNOID HAEMORRHAGE AT POSTERIOR COMMUNICATING ARTERY WITH OBSTRUCTIVE HYDROCEPHALUS POST SUCCESSFUL SURGICAL CLIPPING AND EXTERNAL VENTRICULAR DRAINAGE: A CASE REPORT

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ABSTRACT

Background: Approximately 25% of patients with SAH die before hospital admission. Proper posterior communicating artery (PCoA) aneurysm-related SAH is rare, with an incidence of about 1%. It is typically treated with coil embolization via digital subtraction angiography (DSA). In this case, decompressive craniectomy and external ventricular drainage (EVD) were performed, followed by aneurysm clipping, resulting in an excellent outcome.

Case: A 63-year-old woman presented with a sudden severe headache, vomiting, somnolence, and right-sided limb weakness. Head CT angiography revealed SAH from a ruptured saccular aneurysm with a daughter aneurysm on the PcoA, Modified Fisher scale 2, and intraventricular hemorrhage (IVH) with a modified Graeb score of 3. The patient underwent decompressive craniectomy, EVD placement, and aneurysm clipping. On postoperative day two, she was alert but had left oculomotor nerve palsy and global aphasia. Head CT showed an acute infarction. Nicardipine was administered for a hypertensive emergency. Intravenous ceftazidime and gentamicin were used to treat nosocomial pneumonia. Nutritional support, physiotherapy, and speech therapy were provided.

Discussion: Clipping was chosen for higher aneurysm obliteration rates and better oculomotor nerve recovery, despite a higher risk of postoperative cerebral ischemia than coiling. Due to high Modified Fisher and Graeb scores, EVD was necessary. Hemodynamic management and pneumonia treatment were critical. Early intervention, multidisciplinary care, and close postoperative monitoring are essential to reduce mortality and improve outcomes in PcoA aneurysm-related SAH.

Conclusion: Decompressive craniectomy, EVD, and clipping combined with optimal hemodynamic management and complication control resulted in satisfactory outcomes in this rare PcoA aneurysm SAH case.

Keywords: brain aneurysm, clipping, outcome, proper posterior communicating artery, SAH

Introduction

The intracranial aneurysm rupture causes eighty-five percent of cases of subarachnoid hemorrhage (SAH).[1] SAH is a life-threatening event with an in-hospital mortality rate of 30%. The worldwide incidence of aneurysmal SAH is estimated to be 6.1 per 100.000 person-years.[2] Although mortality rates seem to be declining due to improved prehospital and hospital care, still only a third of all patients achieves a

good functional outcome, typically defined as a Modified Rankin Scale (MRs) < 2.[3] Aneurysm in the posterior communicating artery (PCoA) is considered rare, account for 25% of total intracranial aneurysms.[4] 1.3% of all intracranial aneurysms were true PCoA aneurysms. Due to their location and sometimes complex anatomy, treating PCoA aneurysms can be technically challenging.[4,5]

Recent research has shown a reduction in mortality rates, attributed to advancements in devices and techniques for treating ruptured aneurysms, as well as improvements in neurocritical care. However, the outcomes following SAH management can vary significantly based on individual patient factors such as age, sex, and clinical condition. Additionally, hospital-level factors, including the surgeon's experience, hospital volume, and the presence of a dedicated stroke unit, also play a crucial role in influencing outcomes.[6,7] Management of a ruptured wide-neck PCoA aneurysm requires individualized, multidisciplinary decision-making. Surgical clipping remains the gold standard for specific anatomical variants and when endovascular options are limited. However, advanced endovascular techniques, including stent-assisted coiling and flow diversion, are increasingly effective and often preferred, especially in high-risk surgical candidates.[3]

Case Report

Mrs. M, a 63-year-old woman who experienced a new-onset thunderclap headache, vomiting, and then she was unconscious (E2V2M4). She had a history of uncontrolled hypertension. She was admitted to the emergency unit at the district hospital. From physical examination, there was an oculomotor nerve palsy with weakness in the right extremities. A Head Computed Tomography Scan-Non Contrast (HCT-NC) demonstrated a diffuse SAH with obstructive hydrocephalus. The patient was given 125 cc of mannitol, then regained consciousness (somnolence) with headache, oculomotor nerve palsy, and right lateralization persisted. She was referred to DR. Sardjito's hospital. Head-CT Angiography revealed an actual saccular type with a daughter aneurysm at the left PCoA. The neck was like. 4.1 mm, and the dome was like. 8.9 mm in size. The Modified Fischer scale was 2. Besides, there was diffuse cerebral edema with ventriculomegaly at the lateral ventricle bilaterally and the 3rd ventricle (Modified Graeb Score 3) (Figure 1).

The patient underwent external ventricular drainage (EVD) followed by a successful decompressive craniectomy combined with surgical clipping of the aneurysm. In addition, decompression and release of the compressed oculomotor nerve were performed during the procedure (Figure 2).

HCTS-NC postoperative was performed, and an acute infarction was found in the left internal capsule, left thalamus, left occipital lobe, left posterior horn, and lateral paraventricular. The patient received intravenous nicardipine titration to control emergency hypertension and oral nimodipine 60mg/4 hours to prevent vasospasm. Hospital-acquired Pneumonia (HAP) as a complication was treated with intravenous ceftazidime 1gr/8h and gentamicin 240mg/24h. The patient underwent nutritional consultation related to malnutrition, physiotherapy, and speech therapy. The patient was discharged from the hospital 19 days after surgery. The primary parameter indicating successful surgical clipping is complete aneurysm occlusion confirmed by postoperative angiographic imaging, with stable or improved clinical status and no evidence of rebleeding on follow-up. The patient was compos mentis; there were sequelae of oculomotor nerve palsy, right lateralization, and global aphasia.

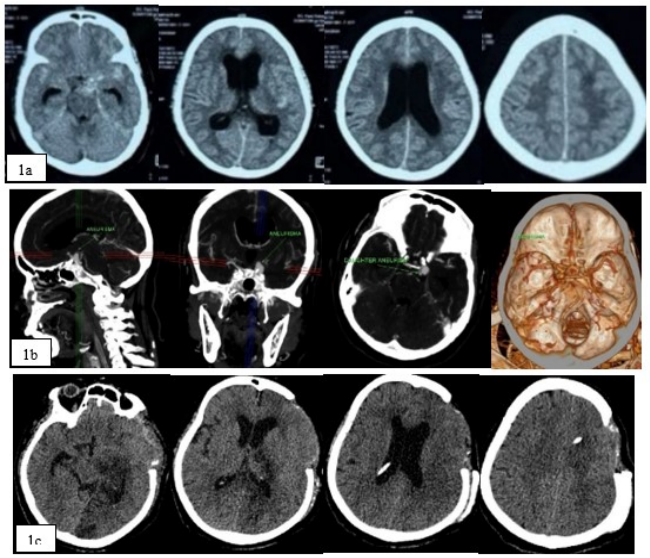

Figure 1a. Pre-op HCTS-NC revealed SAH, minimal IVH lateralis bilateral, non-communicating hydrocephalus, suspect obstruction at the level of sylvian fissure, and diffuse cerebral edema. 1b. Post-op HCTS-NC showed an os frontotemporoparietal sinistra defect with cephal hematom. Transcalvaria herniation frontotemporoparietal sinistra as far as lk. 1.13 cm. Diffuse cerebral edema. Acute infarction in the left internal capsule, left thalamus, left occipital lobe, and left posterior horn lateral periventricular. EVD insertion through the left frontalis and the tip of the distal tip is in the right lateral ventricle. Attached is the clip to the left suprasphenoid wing region. 1c. Pre-op HCTA showed a saccular type aneurysm with a daughter aneurysm in the left PcoA, with a neck width of 1.5. 4.1 mm and dome width lk. 8.9mm

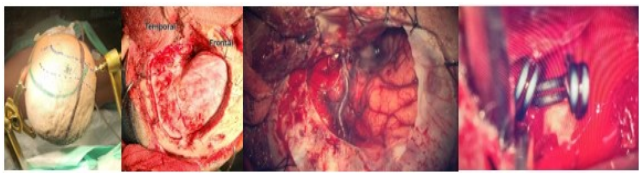

Figure 2. Decompressive craniectomy with clipping of an aneurysm in process

Discussion

This patient has uncontrolled hypertension, which causes weakness in the arteries, increasing the possibility of aneurysm formation. Besides, this patient is 63 years old. Older people have a higher incidence of aneurysm rupture (66.0%) in the elderly and (60.7%) in the non-elderly.[3]

Clipping has advantages, such as a low recurrence rate, but it has shortcomings, as it requires a craniotomy. The prognosis of aneurysm clipping is still considered good. A recent study found that the clipping intervention resulted in lower death rates, reoperation rates, and postoperative complications compared to endovascular coiling. Meanwhile, endovascular coiling results in a lower rebleeding rate than clipping.[8] Endovascular advancements, including coiling with the assistance of stents and balloons, have reduced morbidity.[9] However, in these cases, the necessity of microsurgical clipping cannot be avoided because the cost-effective insurance only allows for two clips per vascular intervention.

Both endovascular coiling and surgical clipping share cerebral ischemia as a potential complication.[10] The occurrence of postoperative cerebral ischemia is more prevalent in patients with PCoA aneurysms compared to other intracranial sites.[11] Postoperative cerebral ischemia following aneurysm clipping or coiling varies widely, ranging from 2.9% to 61%. This variability is attributed to differences among studies regarding patient demographics, aneurysm features, treatment methods, and the criteria used to define cerebral ischemia.[10]

Post-operative HCTS showed there was a cerebral infarction. The incidence of post-operative cerebral ischemia or infarction was higher in the clipping group. The recent study showed that the proportion of patients with an mRS score of 2 or higher was significantly higher in the clipping group at discharge, but not 6 months after discharge. In the clipping group, the mean age was significantly higher in patients who developed cerebral ischemia than in those who did not. In the coiling group, modified Fisher grade and incidence of fetal PCoA were significantly higher in patients who developed ischemia.[11] The results of the International Subarachnoid Hemorrhage Trial (ISAT) research indicate that endovascular coiling has a lower risk of disability within 1 year (23.5%) compared to open clipping surgery (30.9%). However, these two techniques have no difference in mortality.[12]

This patient has a ruptured wide-neck PCoA aneurysm with a daughter aneurysm, which involves either stent-assisted coiling or microsurgical clipping, with choice guided by aneurysm anatomy, patient factors, and institutional expertise. Both approaches aim to achieve complete aneurysm occlusion while preserving parent artery and perforator flow to minimize ischemic complications and improve clinical outcomes. In cases of SAH caused by a wide-neck PCoA aneurysm with a daughter aneurysm, surgical craniectomy with clipping is generally preferred over endovascular coiling. This preference is due to the higher risk of incomplete occlusion and aneurysm recurrence associated with coiling in wide-neck aneurysms, where coils may prolapse into the parent vessel. Clipping allows for more complete aneurysm obliteration while preserving the PCoA and its critical perforators, which is especially important given the complex anatomy and presence of daughter blebs. Additionally, surgical clipping offers better chances of recovery from oculomotor nerve palsy, a common complication in PCoA aneurysms. Although coiling remains an option for elderly or high-risk patients, clipping is favored for its superior efficacy and durability in managing wide-neck PCoA aneurysms with daughter sacs.

EVD is required in 20% of cases with a grade greater than two on the Graeb score. A higher Graeb score indicates a more severe IVH, which is generally associated with a worse clinical outcome; meaning a higher score is linked to a poorer prognosis for the patient.[17,18]

The prognosis of SAH depends on the speed and accuracy of diagnosis and management.[2] Mortality in SAH patients if not treated is 65%, and decreases significantly to 18% if proper and fast diagnosis and treatment are carried out.[19] Symptoms of sequelae after spontaneous SAH can vary, such as cranial nerve paresis, hemiparesis, aphasia, and vegetative conditions.[16,20] This depends on how extensively the location of the brain is affected by SAH, or the result of complications of late-onset brain damage from SAH. Prognosis of a patient with SAH due to PCoA aneurysm after clipping and craniectomy depends on multiple factors, including age, hypertension, neurological status at presentation, intraoperative events, postoperative management, blood thickness >1 mm, and blood in the cerebral cisterns on head CT scan results.[21]

The Modified Fisher Scale is a valuable tool to estimate vasospasm risk and hemorrhage severity in aneurysmal SAH, including PCoA aneurysms. The patient has a Modified Fisher score of 2, which indicates a low risk of vasospasm and hemorrhage severity. However, transcranial Doppler (TCD)

monitoring was not performed on this patient, so the presence or absence of vasospasm is unknown. However, there is no new onset of headache or worsening neurological deficit clinically. Older age and hypertension are associated with worse outcomes in aneurysmal SAH. Hypertension increases the risk of aneurysm rupture and postoperative complications. The severity of SAH, as graded by scales such as the Hunt-Hess scale, correlates strongly with prognosis. Patients with lower grades (e.g., Hunt-Hess I or II) have better outcomes post clipping, while those with higher grades III-V) have a higher risk of deterioration and mortality. In this patient with older age and hypertension, but a Hunt-Hess score of II, there is a better outcome.[17,22]

Clipping of PCoA aneurysm generally achieves high complete occlusion rates (~90%) with relatively low immediate retreatment rates compared to coiling. However, postoperative neurological deterioration occurs in a subset, especially in higher-grade cases. Neurophysiological monitoring (MEP/SSEP) during clipping can predict postoperative neurological deficits. Temporary clipping of the parent artery beyond 4.5 minutes increases the risk of neurological dysfunction.[17]

Maintaining systolic blood pressure below 160-180 mmHg before and during clipping reduces the risk of rebleeding. If the patient is younger, has controlled hypertension, and presents with a lower Hunt-Hess grade, the prognosis is generally favorable, with a high likelihood of good functional recovery (GOS 4-5). This patient has emergency hypertension after surgery. The patient was given nicardipine IV. Optimal management of hemodynamics is crucial in the initial phase following SAH. Patients experiencing SAH often experience hemodynamic instability due to issues with cerebral blood flow autoregulation and cardiac function. The goal of volume resuscitation is to ensure a sufficient preload, which is necessary for maintaining cardiac stability and optimal cerebral blood flow (CBF) and oxygenation. Hemodynamic deficiencies caused by low blood volume or inadequate cardiac output significantly contribute to secondary brain injuries and delayed cerebral ischemia (DCI), which are linked to higher mortality rates and poor neurological outcomes.

It is equally vital to prevent fluid overload and pulmonary edema, particularly in patients with severe SAH, where both hypovolemia and cardiac dysfunction are prevalent. Such patients may need aggressive resuscitation initially to prevent hypovolemia and low blood pressure, but are also at heightened risk for fluid overload.[13,14] Pulmonary complications are the most common non-neurological medical cause of comorbidity after SAH.[16,23] This patient also has hospital-acquired pneumonia managed with IV ceftazidime 1g every 8 hours and gentamicin 240 mg daily. Another recent study identified that more than 25% of patients after SAH develop postoperative aspiration pneumonia, which was associated with a significant (9.7%) risk of mortality.[20,24]

Nimodipine is the sole preventive medication recognized for lowering the risk of cerebral ischemia and enhancing neurological recovery following SAH. The effectiveness of other calcium channel blockers remains uncertain. Recent research has focused on discovering additional medications that could mitigate the risk of cerebral vasospasm and enhance neurological outcomes after SAH.[14,15]

This patient is scheduled to repeat CT angiography after 6 months post-operation and will be given anticoagulants at that time to prevent ischemia that.[25,26] Early aneurysm repair, close monitoring in a dedicated neurological intensive care unit, prevention, and aggressive management of medical and neurological complications are the most essential strategies to improve outcomes.

Conclusion

Subarachnoid haemorrhage outcomes are related to the timing of treatment and the multidisciplinary team that handles them. To achieve better outcomes following an aneurysm, the most critical steps are prompt repair and a strong focus on preventing and aggressively managing any associated medical or neurological complications.

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