Case Report: Navigating the Complexities of Postoperative Paraparesis: A Case of Transient Ischemic Attack due to ACA stenosis following OPLL decompression

Adisak Tanpun, MD*, Preedee Kanjanapongkul, MD**, Varodom Sukcharoenchit, MD*

**Neurosurgery Division, Department of Surgery, Phrapokkklao hospital, Chanthaburi 22000 Thailand*

***Department of Medicine, Phrapokklao hospital, Chanthaburi 22000 Thailand*

Abstract

Ossification of the posterior longitudinal ligament (OPLL) is a condition where abnormal bone growth occurs within the spinal ligament. While often asymptomatic, OPLL can lead to spinal cord compression, resulting in neurological symptoms. A 66-year-old Thai man with progressive upper extremity weakness was diagnosed with OPLL and underwent cervical decompression surgery. Despite the surgery, the patient developed postoperative lower extremity weakness (paraparesis). Further investigation revealed reduced blood flow during surgery, and a subsequent CT brain scan demonstrated pre-existing bilateral anterior cerebral artery infarction. This case highlights the complexity of managing OPLL and the importance of a comprehensive approach involving multiple medical specialties.

Keywords: Ossification of the posterior longitudinal ligament (OPLL), Lateral Mass Screw Fixation, Laminectomy, Postoperative Paraplegia, Anterior Cerebral Artery (ACA) Infarction

(J Thai Stroke Soc. 2025;24(2): 14-22)

Corresponding author: ***Adisak Tanpun, MD*** *(Email: totae1987@cpird.in.th)*

Received 21 October 2024 Revised 10 April 2025 Accepted 17 April 2025

ภาวะอ่อนแรงครึ่งล่างเฉียบพลันหลังการผ่าตัดเส้นประสาทไขสันหลังบริเวณคอส่วนหลัง ซึ่งเกิดจากการขาดเลือดของหลอดเลือดแดงสมองส่วนหน้า (Anterior Cerebral Artery – ACA) ทั้งสองข้าง

นพ.อดิศักดิ์ แทนปั้น*, นพ.ปรีดี กาญจนพงศ์กุล**, นพ.วโรดม สุขเจริญจิต*

**ประสาทศัลยแพทย์ โรงพยาบาลพระปกเกล้า จันทบุรี 22000 ประเทศไทย*

***กลุ่มงานอายุรกรรม โรงพยาบาลพระปกเกล้า จันทบุรี 22000 ประเทศไทย*

บทคัดย่อ

ภาวะกระดูกงอกในเอ็นตามยาวด้านหลังของกระดูกสันหลัง (Ossification of the Posterior Longitudinal Ligament: OPLL) เป็นภาวะที่เกิดการสร้างกระดูกผิดปกติภายในเอ็นของกระดูกสันหลัง แม้ว่าส่วนใหญ่มักไม่มีอาการ แต่ OPLL สามารถนำไปสู่การกดทับไขสันหลัง ส่งผลให้เกิดอาการทางระบบประสาท ผู้ป่วยชายไทยอายุ 66 ปี มีอาการอ่อนแรงของแขนขาลุกลาม ได้รับการวินิจฉัยว่าเป็น OPLL และเข้ารับการผ่าตัดเพื่อลดแรงกดทับไขสันหลังบริเวณคอ (cervical decompression) อย่างไรก็ตาม ภายหลังการผ่าตัด ผู้ป่วยกลับมีอาการอ่อนแรงของขาทั้งสองข้าง (paraparesis) ซึ่งทำให้เกิดความกังวลเกี่ยวกับภาวะแทรกซ้อนจากการผ่าตัด จากการสืบค้นเพิ่มเติมพบว่ามีภาวะเลือดไหลเวียนลดลงระหว่างการผ่าตัด และผลการตรวจเอกซเรย์คอมพิวเตอร์สมองพบภาวะสมองขาดเลือดเก่าบริเวณหลอดเลือดแดงสมองส่วนหน้าทั้งสองข้าง กรณีนี้เน้นย้ำถึงความซับซ้อนในการจัดการภาวะ OPLL และความสำคัญของการเข้าถึงแบบองค์รวมที่เกี่ยวข้องกับผู้เชี่ยวชาญทางการแพทย์หลายสาขาและความสำคัญของแนวทางที่ครอบคลุมโดยเกี่ยวข้องกับแพทย์ผู้เชี่ยวชาญหลายสาขา

คำสำคัญ: ภาวะกระดูกงอกในเอ็นตามยาวด้านหลัง (OPLL), การยึดตรึงด้วยสกรูด้านข้างกระดูกสันหลังส่วนคอ, การผ่าตัดเลาะกระดูกสันหลังส่วนคอ, อัมพาตครึ่งท่อนล่างหลังผ่าตัด, ภาวะสมองขาดเลือดจากหลอดเลือดแดงสมองส่วนหน้า (ACA) (J Thai Stroke Soc. 2025;24(2): 14–22)

Introduction

Ossification of the Posterior Longitudinal Ligament (OPLL) is a condition where the spine's posterior longitudinal ligament turns to bone. This can narrow the spinal canal, causing nerve compression and neurological issues. While it often affects the neck, it can occur elsewhere in the spine. Men are more likely to develop OPLL, which usually appears between 40 and 60 years old. It's more common in Asian countries than in North America and Europe.[1, 2, 4]

Many people with OPLL have no symptoms and the condition is found by chance. However, when symptoms do appear, they can include nerve pain (radiculopathy), spinal cord compression (myelopathy), or spinal cord injury. The underlying process involves abnormal bone growth due to cell proliferation, leading to a type of bone formation called endochondral ossification. While the exact genetic role is unclear, certain genes, such as BMP4, COL11A2, and COL6A1, have been linked to familial cases of OPLL.[1, 4, 7]

Lateral mass screw fixation with posterior decompression is a type of surgery used to treat a condition called cervical spinal stenosis. This condition happens when the spinal canal in the neck narrows, often due to bone growth. While this surgery can be very helpful, there are some risks involved: Screw Problems: The screws used to hold the spine in place can sometimes loosen or break. They might also be placed incorrectly, which could damage nerves. Infection: The surgical site can get infected, either on the surface of the skin or deeper within the body. Dural Tear: The dura, a protective covering around the spinal cord, can be accidentally torn during surgery. This can lead to leakage of spinal fluid and potential nerve damage. Neurological Issues: After surgery, patients may experience worsening of their pre-existing symptoms or develop new neurological problems. Adjacent Segment Disease: Over time, the spinal segments above and below the fused area can become worn down, leading to new problems in the future.[5, 6, 7, 8]

In this case report, we discuss the challenges of treating cervical myelopathy and the possible complications after surgery. It highlights the importance of thorough neurological exams and appropriate imaging to manage postoperative issues effectively.

Case report

A 66-year-old man who worked as a durian gardener and had high blood pressure started experiencing weakness and numbness in his hands and legs. It began in his right hand, making it hard to grip things, and then spread to his legs and left hand. This made it difficult for him to walk and do everyday tasks. He didn't have neck pain or problems with bowel or bladder control.

Upon neurological examination, signs of cervical myelopathy were observed, including a positive Hoffman's sign, inverted radial reflex, and finger escape sign. Muscle power of myotome level was graded IV at the C6, C8, T1, L2, and L3 levels on both sides, while the rest was grade V. Spastic muscle tone was present in both upper and lower extremities. Pinprick sensation was decreased bilaterally, more severely on the right side. Deep tendon reflexes were exaggerated in the lower extremities. Babinski's sign and Clonus sign were not tested.

Further investigation through magnetic resonance imaging (MRI) revealed cervical spondylosis with spinal canal stenosis, spinal cord, and nerve root compression at the C3/4 to C6/7 and L3/4 to L5/S1 levels. Abnormal calcification, possibly ossification of the posterior

longitudinal ligament (OPLL), was seen on computer tomography (CT) **(Figure 1A, 1B)**.

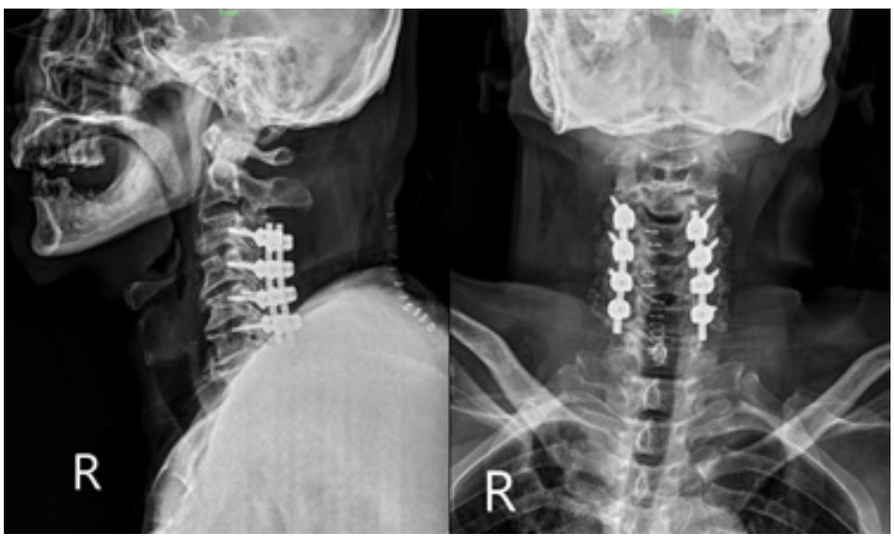
Figure 1A. *Preoperative MRI scan of cervical spine showed cervical spondylosis with spinal canal stenosis, spinal cord and nerve root compression at C3/4 to C6/7 levels.*

Figure 1B. *The CT cervical spine lateral view shows cervical spondylosis and OPLL C5-6 that compress the spinal canal.*

Due to the severity of the condition and the impact on the patient's quality of life, surgery was performed. Specifically, lateral mass screw fixation at C3-6 with laminectomy and posterolateral fusion was carried out. Postoperatively, the patient experienced clinical improvement, feeling increased strength in both hands and legs. Analgesics and intravenous fluids were prescribed. **(Figure 2)**

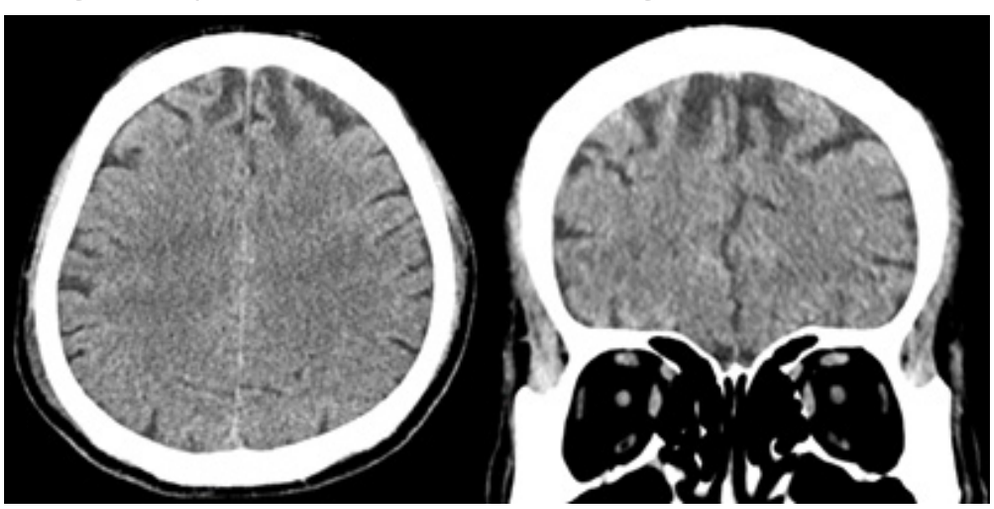
However, on the night following surgery, the patient complained of weakness in all extremities and difficulty with defecation. Neurological examination revealed muscle weakness graded at 0/5 in both lower extremities, the right C7-T1 level, and the left C8-T1 level. Muscle power was graded III in the left C7 level. The remaining upper extremities demonstrated muscle power graded IV. The bulbocavernosus reflex was intact, and lower extremity muscle tone was spastic. "Pinprick sensation was decreased from the umbilical level to both lower legs, which was more severe on the right side. It was noted that sensory deficit is improved in comparison with pre-operative evaluation. There was no fever or hypotension.

Figure 2. *Plain film of AP, Lateral cervical spine views after surgery with lateral mass screws C3-6 fixation and decompression.*



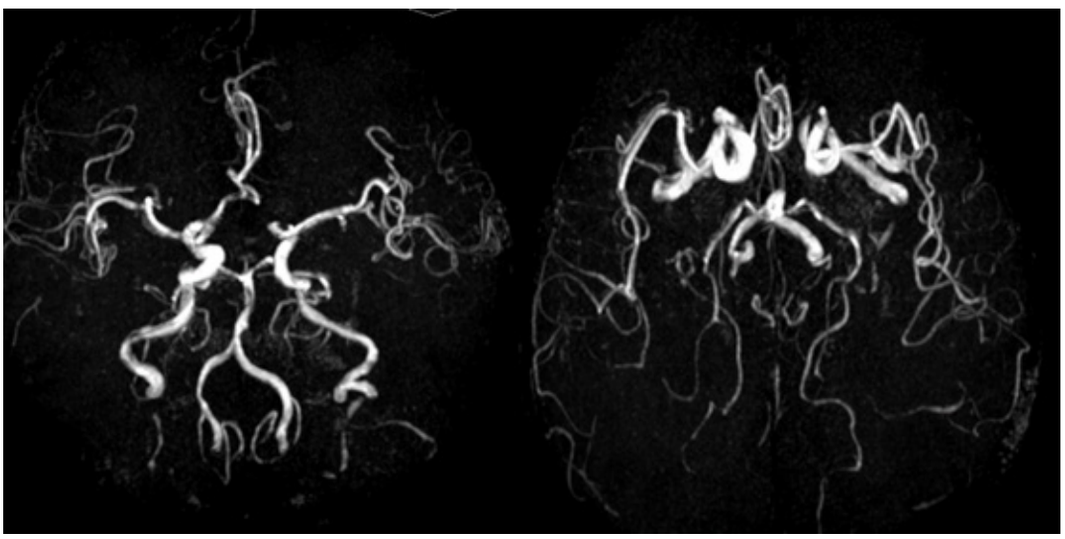
A non-contrast computed tomography (CT) scan of the brain revealed old bilateral frontal lobe infarcts with diffuse brain atrophy but no acute large territory infarction or intracranial hemorrhage. (Figure 3)

Figure 3. *CT scan of brain at postoperative day 1 showed old infarction at bilateral frontal lobes without acute large territory infarction or intracranial hemorrhage.*



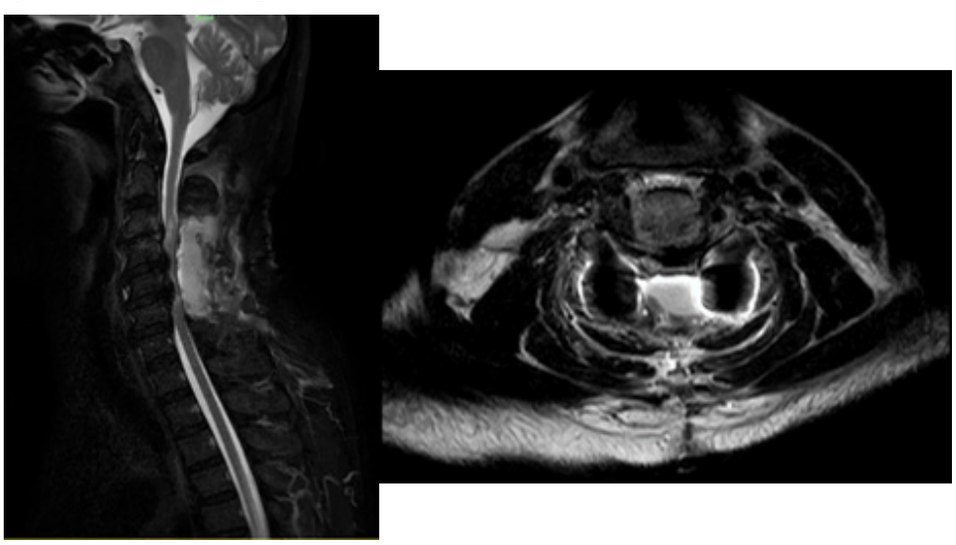
Further investigations using magnetic resonance angiography (MRA) showed agenesis of the A1 segment of the left anterior cerebral artery, along with short segmental stenosis at the basilar artery, M2 segment of bilateral middle cerebral arteries, A1 segment of the right anterior cerebral artery, and C5 segment of bilateral internal carotid arteries. Additionally, chronic infarctions were present in bilateral frontal lobes, the left cerebellar hemisphere, and chronic lacunar infarction in the left thalamus. (Figure 4)

Figure 4. *MRA of brain and carotid arteries at postoperative day 2 showed multiple vascular stenoses with chronic infarcts in bilateral frontal lobes.*



The neurologist concluded that the patient experienced bilateral anterior cerebral artery (ACA) territory infarction due to a low-flow state following the surgery. To address this, intravenous dopamine was administered to maintain systolic blood pressure above 120 mmHg and heart rate above 50 beats per minute, leading to gradual improvement in weakness. Furthermore, an MRI of the whole spine was performed to rule out postoperative spinal injury or infarction, which did not reveal any new infarct or lesions. (Figure 5)

Figure 5. *MRI of cervical spine at postoperative day 6 showed bilateral laminectomy with granulation tissue at surgical bed with old spinal canal stenosis at C3/4 to C6/7 levels.*



By postoperative day 14–17, prior to referral back to the primary care hospital for physical therapy, the patient's muscle power had improved to grade IV in the upper extremities and grade I in the lower extremities. The patient was prescribed home medication with aspirin 300 mg and clopidogrel 75 mg daily. Intracranial Large Vessel Atherosclerosis and Right A1 Stenosis: A 90-Day Follow-Up.Intracranial large vessel atherosclerosis (ILVA) is a common cause of ischemic stroke. The right A1 segment is a particularly vulnerable site for atherosclerosis, and stenosis of this segment can lead to cerebral ischemia and infarction. In a recent study, researchers followed 90 patients with ILVA and right A1 stenosis for a period of 90 days. They found that the risk of ischemic stroke was significantly higher in patients with right A1 stenosis than in patients without this condition. The risk of stroke was also higher in patients with more severe stenosis. The researchers also found that the risk of stroke was higher in patients with other risk factors for ischemic stroke, such as hypertension, diabetes, and smoking. However, even after controlling for these risk factors, the risk of stroke was still significantly higher in patients with right A1 stenosis. These findings suggest that right A1 stenosis is an important risk factor for ischemic stroke. Patients with this condition should be treated aggressively with medical therapy to reduce their risk of stroke.[9, 10]

Discussion

The surgical treatment of OPLL is a challenging procedure that requires a high level of specialists' experience. Therefore, many postoperative complications have been reported, varying from 5.2% to 57.6%, with neurological deficits being one of the most common complications.[5] In previous studies, neurological problems such as paraplegia have occurred after spinal surgery at rates of approximately 2.17% and 1.11% in the anterior and posterior approach groups, respectively.[3] Despite insufficient research, some experts have proposed that paralysis may occur as a sequela of disproportionate spinal cord decompression, especially in most cases of OPLL with large and asymmetrical compression.6 Moreover, certain research has shown that posterior approach surgeries, which involve laminotomy and laminectomy with fusion, tend to result in fewer postoperative complications or morbidities compared to anterior approaches.[3] Iatrogenic spinal cord injury, while rare, is a significant concern following cervical spine surgery, with reported rates from 0.0% to 0.24%. These injuries can result in a broad spectrum of clinical outcomes, ranging from mild motor or sensory impairment to complete quadriplegia, involving the loss of sensation and control over bowel and bladder functions.[2]

In this case, the patient presented with quadriparesis following surgery, with greater weakness in the legs compared to the arms. Potential pathophysiological causes include spinal cord involvement or bilateral precentral gyrus lesions.

Notably, the patient's sensory symptoms, such as numbness, did not worsen postoperatively. Instead, there was a progressive increase in weakness. If the spinal cord were the primary site of pathology (e.g., cord ischemia, intraspinal hematoma), one would expect a concomitant worsening of both motor and sensory function. In contrast, lesions confined to the bilateral precentral gyrus can selectively produce motor weakness without sensory deficits.

Therefore, the observed pattern of motor weakness without corresponding sensory changes is more suggestive of a lesion involving the

bilateral precentral lobule. The patient had a pre-existing old infarction. Due to the repeat CT brain being performed shortly after the event, new pathological findings from a recent infarction might not be discernible. Furthermore, even if a new infarction did occur, if it was superimposed on the location of the old infarction, it would likely be indistinguishable on CT brain imaging.

Brain MRI revealed no acute infarction, supporting a diagnosis of transient ischemic attack (TIA). Cerebral angiography demonstrated agenesis of the A1 segment of the left anterior cerebral artery (ACA) and short segmental stenosis in the basilar artery, bilateral M2 segments of the middle cerebral arteries, the right A1 segment of the ACA, and bilateral C5 segments of the internal carotid arteries. The MRA findings indicated that the left ACA, from the A2 segment onwards, received collateral blood supply from the right ACA due to the agenesis of the left A1 segment. The combination of stenosis in the right A1 segment of the ACA and reduced blood flow secondary to hemodynamic changes likely resulted in a clinical presentation mimicking bilateral ACA stenosis.

Beyond spinal injuries, intracranial lesions must be considered in cases of postoperative paraparesis. Perioperative stroke, occurring in 0.01% to 1.0% of spinal surgeries,8 can mimic other complications, delaying diagnosis. In our patient, suspected parasagittal motor cortex involvement and the sudden onset of paraparesis, typically associated with anterior cerebral artery (ACA) involvement, prompted brain imaging. Neuroimaging revealed chronic ACA territory infarction with bilateral A1 segment stenosis. While no acute infarction was evident, perioperative hemodynamic fluctuations could have induced "low-flow" in this vulnerable patient with pre-existing vascular compromise. The patient exhibited bilateral anterior cerebral artery (ACA) infarction, attributed to right A1 segment stenosis in conjunction with left A1 segment agenesis. Consequently, a low flow state precipitated bilateral infarction, with the right A1 segment being particularly susceptible to hypoperfusion. This occurred independently of massive blood loss or a state of shock. Following neurological consultation, paraparesis was attributed to reduced cerebral blood flow superimposed on chronic ACA infarction. This case underscores the multifaceted nature of postoperative paraplegia, emphasizing the crucial need to evaluate both spinal and intracranial factors in assessing postoperative complications.

Conclusion

This case underscores the importance of a systematic approach to diagnosing and managing postoperative complications. Rather than assuming the most common cause, like surgical injury, clinicians should conduct thorough clinical and physical exams to investigate new problems that may arise after surgery. Additionally, our case highlights the value of interdisciplinary collaboration in improving diagnosis accuracy and patient outcomes.

References

1. Boody BS, Lendner M, Vaccaro AR. Ossification of the posterior longitudinal ligament in the cervical spine: a review Int Orthop. 2019;43(4):797-805.
2. Daniels AH., et al. Iatrogenic Spinal Cord Injury Resulting from Cervical Spine Surgery. Global spine journal 7.1 Suppl (2017): 84S-90S.
3. Kim DH., et al. The Clinical Implications and Complications of Anterior Versus Posterior Surgery for Multilevel Cervical Ossification of the Posterior Longitudinal Ligament; An Updated Systematic Review and Meta-Analysis. Neurospine 16.3 (2019): 530-41.
4. Le HV, Wick JB, Van BW, Klineberg EO. Ossification of the Posterior Longitudinal Ligament: Pathophysiology, Diagnosis, and Management. The Journal of the American Academy of Orthopaedic Surgeons 30.17 (2022): 820-30.

5. Li H, Dai LY. A systematic review of complications in cervical spine surgery for ossification of the posterior longitudinal ligament. The spine journal: official journal of the North American Spine Society 11.11 (2011):1049–57.
6. Morishita S., et al. Perioperative Complications of Laminoplasty in Degenerative Cervical Myelopathy –A Comparative Study Between Ossification of Posterior Longitudinal Ligament and Cervical Spondylotic Myelopathy Using a Nationwide Inpatient Database. Global spine journal 13.7 (2023): 1956–63.
7. Saetia K, Cho D, Lee S, Kim DH, Kim SD. Ossification of the posterior longitudinal ligament: a review. Neurosurgical focus 30.3 (2011):E1.
8. Yan X., et al. Perioperative stroke in patients undergoing spinal surgery: a retrospective cohort study. BMC musculoskeletal disorders 23.1 (2022):652.
9. Chimowitz MI., et al.; SAMMPRIS Trial Investigators. Stenting versus aggressive medical therapy for intracranial arterial stenosis. N Engl J Med. 2011 Sep 15;365(11):993–1003.
10. Derdeyn CP., et al; Stenting and Aggressive Medical Management for Preventing Recurrent Stroke in Intracranial Stenosis Trial Investigators. Aggressive medical treatment with or without stenting in high–risk patients with intracranial artery stenosis (SAMMPRIS): the final results of a randomised trial. Lancet. 2014 Jan 25;383(9914):333–41.