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Case Report

Mechanical thrombectomy combined with stenting for radiation-induced carotid stenosis-related stroke with high-load embolization: A case report ☆,☆☆

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ABSTRACT

Radiation therapy in patients with nasopharyngeal carcinoma can cause chronic progressive carotid artery injury, but acute ischemic stroke caused by carotid artery high-load thrombosis rarely occurs in patients with tandem lesions. We performed carotid mechanical thrombectomy combined with angioplasty in a 57-year-old man who received radiotherapy for nasopharyngeal carcinoma more than 10 years before presentation. He presented with acute-onset left hemiplegia, confusion, and mixed aphasia. Head CT revealed a hyper-dense sign in the right middle cerebral artery M1 region, and angiography disclosed occlusion in the right internal carotid artery C5 region with extremely severe stenosis in the middle C1 region. Intra-arterial mechanical thrombectomy with carotid stenting was performed, and re-canalization was achieved. Re-examination angiography after 3 months revealed worsening of ulcerative plaques and pseudoaneurysms in the left common carotid artery. Consequently, we performed carotid stenting over the left common carotid artery, and the patient recovered well postoperatively. Our experience suggests that early detection of large blood vessel damage and intervention are necessary to prevent large-vessel ischemic stroke in patients who received radiotherapy for nasopharyngeal carcinoma.

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Introduction

As a common malignant tumor of the head and neck, nasopharyngeal carcinoma is highly sensitive to radiotherapy, which can cause arterial damage in the radiation area. Stenosis of the carotid artery in the neck is a late sequela of radiotherapy for nasopharyngeal carcinoma that can increase the incidence of ipsilateral cerebral ischemic events [1,2]. A number of clinical studies and case reports have assessed ischemic stroke caused by chronic carotid artery stenosis or occlusion after cervical tumor radiotherapy [3–6]. However, there are no reports of ischemic stroke involving tandem lesions of the acute carotid artery and high-load thrombosis after radiotherapy for nasopharyngeal carcinoma. In this study, we encountered a case in which mechanical thrombectomy combined with angioplasty was used to treat a patient with tandem lesions of the acute carotid artery that progressed to high-load embolism after radiotherapy for nasopharyngeal carcinoma in our center, and good clinical results were achieved.

Case report

A 57-year-old man was admitted to the emergency department by his family 1.5 hours after sudden-onset left hemiplegia, confusion, restlessness, irritability, and mixed aphasia. His National Institutes of Health Stroke Scale (NIHSS) score was 13, his before-onset modified Rankin score (mRS) was 0, his Glasgow Coma Scale score was 9, and his Alberta Stroke



Fig. 1 – CT of the head revealed a hyper-dense sign in the right middle cerebral artery M1 segment.

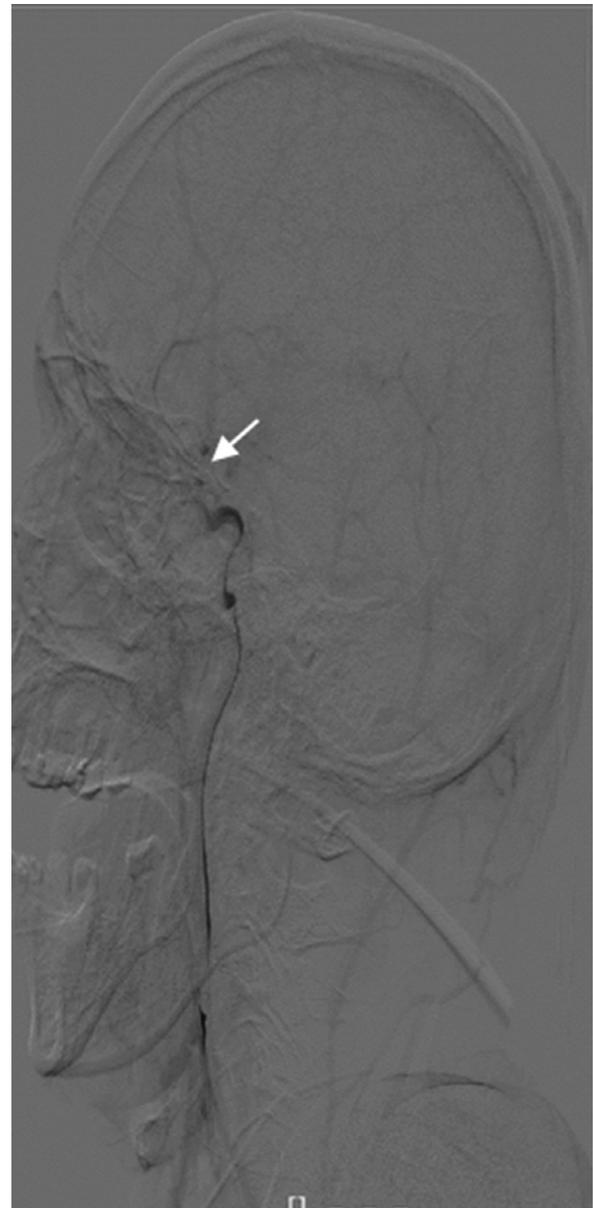


Fig. 2 – Carotid angiography revealed plaque formation in the middle C1 segment of the right internal carotid artery with extremely severe stenosis. The stenosis rate was approximately 90%, and no development was observed above the RC5 segment.

Program Early CT score was 8. He previously received concurrent radiotherapy for nasopharyngeal carcinoma 15 years before admission. He also received antiepileptic drugs for epilepsy. He did not experience recurrence of either condition. Conversely, he had no vascular risk factors, including hypertension, diabetes, and hyperlipidemia. Blood glucose levels were normal in a fingertip test, and electrocardiography revealed normal sinus rhythm. Head CT revealed a hyper-dense sign in the right middle cerebral artery M1 region (Fig. 1).

The findings suggested that the patient's right cerebral arterial blood supply area was seriously disturbed,



Fig. 3 – Ulcerative plaque and pseudoaneurysm formation with diffuse stenosis in the middle and distal segments of the left common carotid artery.

and interventional therapy after intravenous thrombolysis was urgently administered. Carotid angiography disclosed plaque formation in middle C1 region of the right internal carotid artery with extremely severe stenosis and C5 occlusion in the right external carotid artery (Fig. 2). Other findings included ulcerative plaque and pseudoaneurysm formation with diffuse stenosis in the middle and distal segments of the left common carotid artery (Fig. 3).

We performed endovascular thrombectomy via femoral artery catheterization over the right C5 segment to the end of the M1 segment of the right middle carotid artery (MCA) with a thrombectomy stent (Reco, 5–30 mm). The Solitarie FR/stent With Intracranial support catheter for Mechanical thrombec-

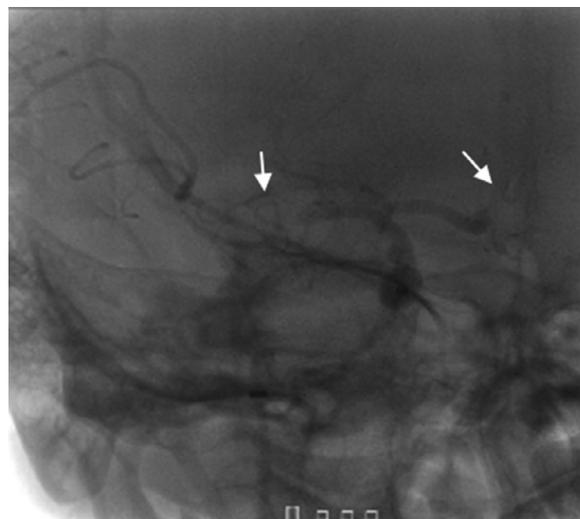


Fig. 4 – The upper trunk of the right middle carotid artery M1 segment and anterior carotid artery A2 segment were occluded after the first thrombectomy.

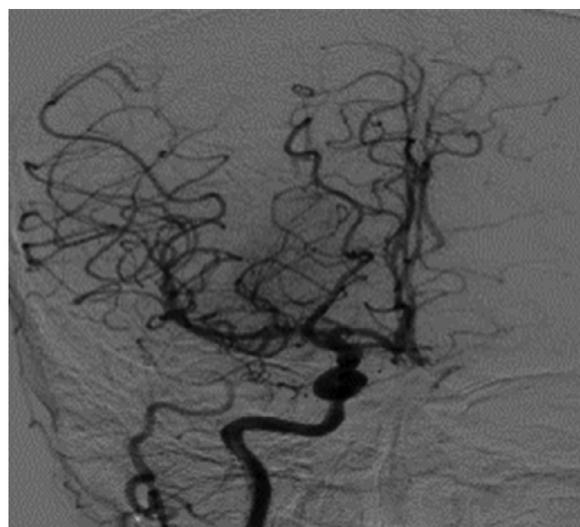


Fig. 5 – The right middle carotid artery upper trunk M1 segment and anterior carotid artery A2 segment were re-canalized after thrombectomy.

tomy (SWIM) technique was applied for thrombus extraction, but no thrombus was found in the stent and aspiration fluid. Then, angiography revealed occlusion of the upper trunk of the right MCA M1 segment and the right anterior cerebral artery (ACA) A2 segment (Fig. 4). Finally, the thrombus was successfully captured, and angiography revealed complete recanalization of the right MCA and ACA (Fig. 5). Carotid stenting over the right internal carotid artery (ICA) was then performed.

After surgery, tirofiban was continuously pumped for 48 hours. Afterward, dual antiplatelet therapy with aspirin and clopidogrel was administered. Pathologic analysis disclosed lots of red blood cells and fibrinoid inflammatory exudate



Fig. 6 – Carotid arteriography revealed worsening of ulcerative plaques and pseudoaneurysms in the middle and distal segments of the left common carotid artery.

(Fig. 7). The patient's symptoms had significantly improved, and he was discharged after a 1-week rehabilitation course. His NIHSS score was 0, and his mRS was 1. The 90-day NIHSS score and mRS were both 0.

Repeat angiography after 3 months demonstrated the right ICA C1 stent was properly placed, and blood flow was smooth. However, worsening of ulcerative plaques and pseudoaneurysms in the middle and distal segments of the left common carotid artery (CCA) were identified (Fig. 6). Consequently, we performed carotid stenting over the left CCA with a distal protector, and no postoperative complications were detected (Fig. 8). Dual-antiplatelet therapy with aspirin and clopidogrel was administered, and the patient was discharged after 5 days. The patient has remained healthy after 1.5 years of follow-up.

Patient consent was obtained to publish this report, and institutional review board approval was not required.

Discussion

Cervical vascular stenosis is a late sequela of radiotherapy for nasopharyngeal carcinoma that can increase the incidence of ipsilateral cerebral ischemic events, and it is a cause of decreased patient survival [1]. The incidence of >50% stenosis in carotid arteries ranges 36.7%-78.9% 10 years after radiotherapy [7].

It generally believed [8,9] that endothelial cell dysfunction and inflammatory responses play key roles in local vascular injury caused by radiotherapy. In the initial stage, radiotherapy damages vascular endothelial cells, resulting in endothelial cell dysfunction. Injured endothelial cells secrete large amounts of adhesion factors, chemokines, and inflammatory factors, leading to excess lipoprotein accumulation in plasma, which results in activation of the lysosomal system, endothelial cell proliferation, adherent thrombus, and fibrous plaque formation. Endothelial cell proliferation and extensive fibrosis results in reduced elasticity of the arterial wall, wall narrowing, and decreased blood flow velocity.

Radiation-induced carotid artery stenosis (RICAS) has a similar pathology as spontaneous atherosclerosis, but its unique features include atypical vascular involvement, longer

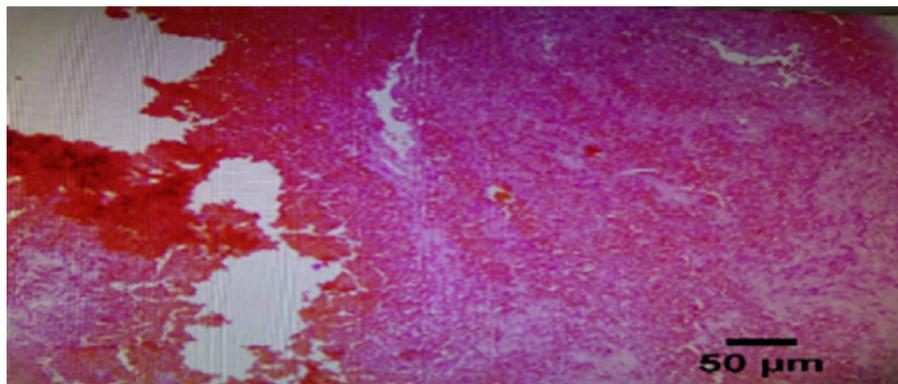


Fig. 7 – Pathologic analysis disclosed red blood cells and fibrinoid inflammatory exudate.

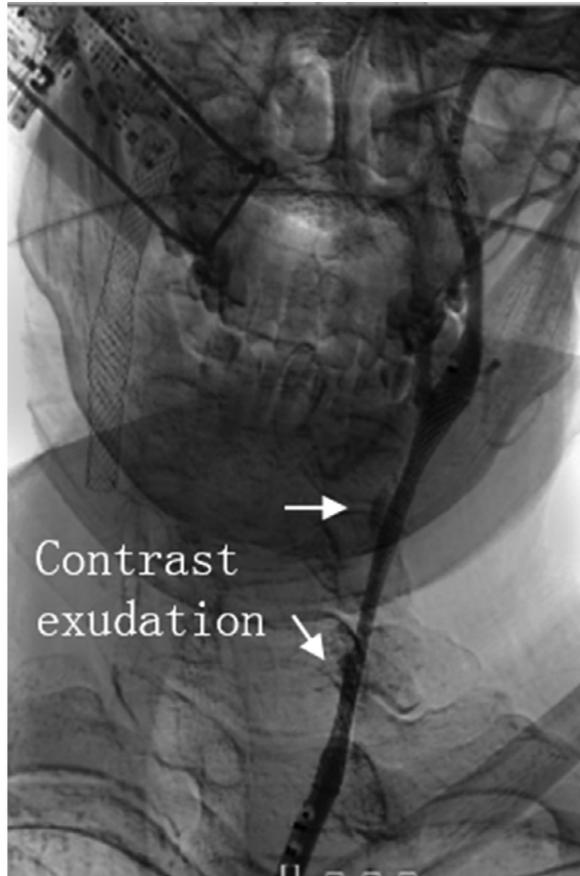


Fig. 8 – Under the placement of the distal protection device, the first carotid stent was successfully placed after balloon dilation. Angiography revealed that the stent was placed in a good position, the residual stenosis was approximately 50%, and the contrast medium extravasated in the mid-to-distal segments.

segments, severe fibrosis, and rapid progression of advanced plaques [10–12]. The arterial walls in the early stage of RICAS mostly feature stable fibrotic plaques with a thicker fibrous cap and no obvious necrotic core. However, the intra-plaque fibrous cap becomes thinner over time, and the necrotic core became larger, increasing the risk of rupture and the subsequent transformation to an unstable state [12,13]. The history of radiotherapy in this case was more than 10 years. Angiography revealed tandem lesions in the right ICA. It is speculated that stenosis plaque rupture in the right ICA C1 segment and caused high-load embolization of the ipsilateral C5 segment. Moreover, re-examination after 3 months disclosed significant worsening of the ulcer plaque of the left CCA and rapid progression of vascular disease, indicating that the vascular plaque was extremely unstable. Therefore, active intervention was required. Currently, carotid artery stenting (CAS) and carotid endarterectomy (CEA) are recognized as safe and effective treatments for RICAS. However, the optimal revascularization approach is unclear. A review and meta-analysis [14] suggested that CEA and CAS had similar outcomes regarding perioperative stroke, myocardial infarction, and mortality,

contrary to previous findings [4,15]. This may be related to the advancement of CAS materials and the continuous improvement of technology [14].

Conclusion

Radiotherapy in patients with nasopharyngeal carcinoma can cause vascular injury in the neck and significantly increase the risk of ischemic stroke. At present, there are limited reports on the use of acute mechanical thrombectomy for radiotherapy-induced vascular lesions. The outcome in our case illustrates that vascular lesions progress rapidly in the late stage of carotid artery injury after radiotherapy, and active intervention is required.

Patient consent

Written informed consent for the publication of this case report was obtained from the patient.

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