Bilateral Internal Carotid Artery Spasms Triggered by Elongated Styloid Processes: A Case Report

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Elongated styloid processes that interact with the internal carotid arteries (ICAs) have been documented to lead to carotid artery stenosis, occlusion, or dissection, resulting in transient ischemic attack (TIA) or cerebral infarction. This study reports a unique case of bilateral ICA vasospasms triggered by elongated styloid processes and neck movements during physical activity, highlighting a potential vasospastic origin. A 52-year-old man experienced TIAs with visual disturbances while playing golf. Diagnostic imaging, including magnetic resonance angiography (MRA) and dynamic cerebral angiography, was performed to evaluate carotid artery involvement. MRA was used to assess ICA stenosis, while dynamic cerebral angiography was conducted to observe changes in the ICA during neck rotation. Imaging revealed bilateral ICA stenosis and an elongated styloid process. The resolution of the ICA stenosis on follow-up MRA suggested a potential vasospastic origin. Dynamic assessment using cerebral angiography showed narrowing of the right ICA during neck rotation. The vasospasm was likely induced by neck movement during golf.

Key words: elongated styloid process, internal carotid artery, vasospasm, transient ischemic attack, neck movement

INTRODUCTION

Eagle syndrome, also known as styloid process elongation, is characterized by various symptoms resulting from an elongated styloid process or calcification of the stylohyoid ligament. This syndrome was initially described in 1937 by otolaryngologist Watt W. Eagle [1]. It manifests as pharyngeal pain, dysphagia, facial pain, and neck pain due to compression or constriction of the lower cranial nerves. Moreover, mechanical compression of the extracranial internal carotid artery can induce carotid artery stenosis, occlusion, or dissection, leading to a transient ischemic attack (TIA) or cerebral infarction. In this report, we present a case of TIA involving bilateral internal carotid artery spasms caused by elongated styloid processes.

CASE REPORT

A 52-year-old man has been experiencing transient scintillating scotomas, mainly in the left eye, for the last five years. Each episode resolves spontaneously within half a day to a day. While playing golf, he suddenly developed a visual disturbance in the left eye and a kaleidoscope-like visual distortion in the right eye. He sought medical attention at a local clinic, where magnetic resonance imaging (MRI) revealed severe bilateral stenosis of the internal carotid arteries (ICA). This finding led to his transfer to our hospital for additional evaluation.

Neurological examination revealed patchy scotomas in the left eye and scintillating scotomas in the right eye. Brain MRI did not show acute infarction; however, magnetic resonance angiography (MRA) revealed severe stenosis at the origin of the bilateral internal carotid arteries (ICAs) (Fig. 1A, B). Suspecting TIAs due to bilateral ICA stenosis, dual antiplatelet therapy with aspirin and clopidogrel was initiated. Visual field defects gradually improved during hospitalization, and a follow-up MRA on day 5 indicated resolution of the ICA stenosis (Fig. 1C). The reversible and bilateral nature of this condition suggests a vasospastic etiology. The serological tests for antinuclear antibodies (ANA), anti-DNA antibodies, anti-myeloperoxidase antibodies (anti-MPO-ANCA), and anti-proteinase 3 antibodies (anti-PR3-ANCA) were negative, ruling out their association with vasculitis. Horizontal slice contrast-enhanced computed tomography (CT) showed elongated styloid processes near the stenotic ICA regions, indicative of Eagle's syndrome (Fig. 2A, B). Three-dimensional CT angiography (3D-CTA) showed bilateral ICA stenosis adjacent to the elongated styloid process (Fig. 2C, D). Angiographic studies were conducted to explore the relationship between the elongated styloid processes and ICA vasospasm. Multiple images were obtained while manipulating the neck to assess the interaction between the right ICA and the styloid process through flexion, extension, and rotational movements similar to the golf swing. Although no significant compression of the ICA by the styloid process was observed, mild vasospasm was identified at the same location as the

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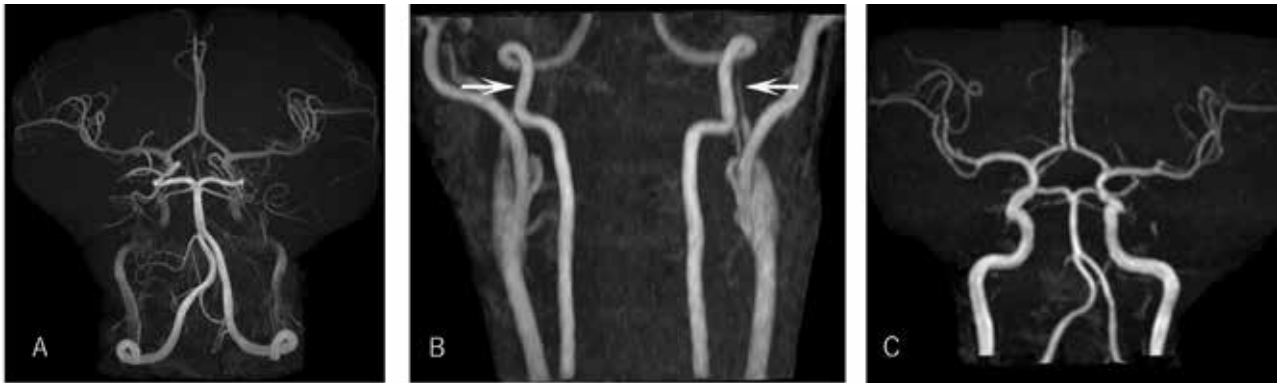

Fig. 1 Head MRA on admission (A, B): Severe stenosis observed at the origin of both ICAs (arrows). Follow-up MRI on day 5 of hospitalization (C): Complete resolution of bilateral ICA stenosis.

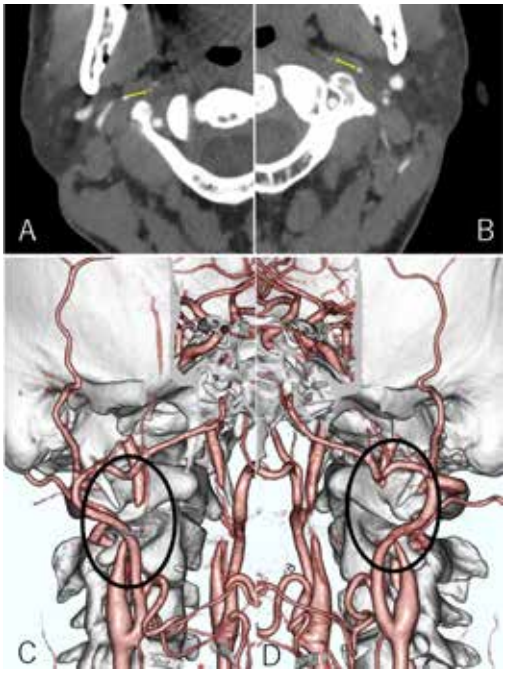

Fig. 2 Contrast-enhanced CT (Right: A, Left: B): The close proximity between the spastic regions and styloid processes suggested a potential association with styloid process elongation syndrome. The distance between the spastic regions and styloid processes (between yellow arrowheads) was 7.6 mm(rt) and 7.8 mm (lt), respectively. 3D-CTA (Right: C, Left: D): Bilateral elongation of the styloid processes (27–28 mm) was observed along with stenosis of the ICAs near the styloid processes on both sides.

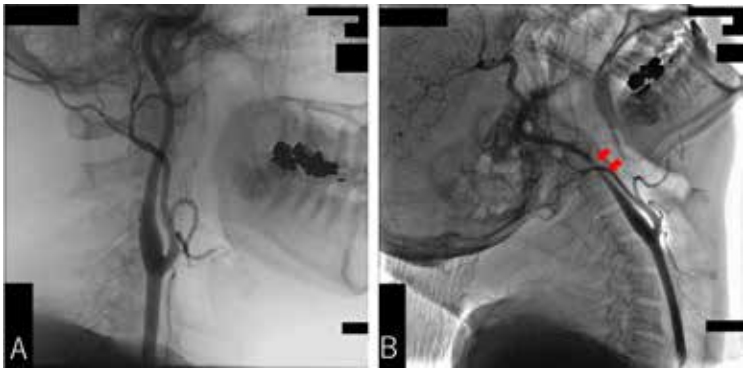

Fig. 3 Digital subtraction angiography: To evaluate the interference between the right ICA and the styloid process, imaging was performed during lateral neck rotation combined with flexion and extension. Panel A shows the ICA in the resting state, while panel B demonstrates mild vasospasms at the same location during neck motion (arrowheads). No significant compression of the ICA by the styloid process was observed.

stenosis noted on admission (Fig. 3A, B).

DISCUSSION

Previous reports have documented instances where elongated styloid processes make contact with the bilateral ICAs causing dissection [2–4]. However, to the best of our knowledge, no previous case reports have documented bilateral ICA vasospasms induced by elongated styloid processes.

Reports on the typical length of the styloid process vary, although average length in Japanese people was reported to be 18.8 mm [5]. In addition, elongations exceeding 25–30 mm are generally considered abnormal. Eagle noted that styloid processes longer than 25 mm were found in about 4% of adults, with symptomatic cases accounting for approximately 4% of these [6]. A case-control study investigating the association between ICA dissection and elongation of the styloid process indicated that the greater the length and proximity of the styloid process to the carotid artery, the increased risk of dissection [7]. Muthusami *et al.* indicated that when the distance was ≤ 5 mm, the odds ratio for

the onset of arterial dissection was 7.58 [7]. Our assessment suggests that the distance is nearly equivalent to Muthusami's criteria, as the vessel diameter would likely be larger in a relaxed state, resulting in a shorter distance. Consequently, we proposed a possible link to mechanical impingement of the ICA.

In the present case, the styloid processes were not excessively long and contact distance was not very close, potentially accounting for the lack of arterial dissection and spasms. Cerebral angiography revealed a mild right ICA spasm and proximity of the styloid process to the ICA.

Movements potentially linked to ICA dissection include neck rotation during dancing [2], boxing [8], neck massages [4], and prolonged neck flexion during phone use [9]. In this case, the neck rotation during golf may have been a contributing factor.

Antithrombotic therapy is commonly used to prevent the recurrence of ischemic cerebrovascular events; however, a risk of hemorrhagic complications has been reported [10]. In this case, clopidogrel was initially administered but discontinued after the improvement of vascular spasms to minimize the risk of bleeding. The patient was advised to avoid vigorous neck movements, particularly those associated with golf. Surgical interventions, such as styloidectomy, have been suggested as a preventive measure in cases of recurring ischemic symptoms [8]. Styloid process elongation syndrome should be considered as a differential diagnosis when bilateral spasms occur in both carotid arteries.

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