

Internal Carotid Artery Pseudoaneurysm After Chiropractic Manipulation In a Patient With Eagle Syndrome

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Keywords

Eagle syndrome, Internal carotid artery, cerebrovascular stroke, chiropractic, pseudoaneurysm, endograft

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Makarem: Discussed the issue, contributed to the final version; Ashraf Elnaggar; the operator, facilitate the diagnostic workup, reviewed, and approved the final version. All authors discussed and revised the manuscript and gave final approval for the version to be published.

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The authors have confirmed that patient consent has been signed and collected in accordance with the journal's patient consent policy.

Manuscript

Abstract:

Spinal Manipulation Therapy (SMT) is a technique used to treat musculoskeletal conditions such as back pain and neck pain by applying force to the spinal joints. The idea of (SMA) is to reduce pain, restore the spine's structural integrity, and initiate the body's natural healing processes. Here, we report a rare but devastating complication of spinal manipulative therapy, where a young male patient, 22 years old, with asymptomatic Eagle syndrome, had a huge pseudoaneurysm from the internal carotid artery after spinal manipulative therapy; treated successfully with endograft.

Keywords

Eagle syndrome, Internal carotid artery, cerebrovascular stroke, chiropractic, pseudoaneurysm, endograft

Introduction:

Spinal manipulation entails a range of manual maneuvers that stretch, mobilize, or manipulate the spine, paravertebral tissues, and other joints to relieve spinal pain (1). Manipulation of the spine differs from mobilization, as it involves a sudden applied thrust that the patient generally cannot resist. In contrast, mobilization involves a low-velocity, passive movement that can be limited or even halted by the patient (2). Numerous absolute and relative contraindications of spinal manipulative therapy (SMT) have been proposed (3–5). The safety of SMT requires rigorous control. In particular, manipulation of the upper spine has been associated with serious adverse events such as cerebrovascular accidents, paraplegia, rib fractures, and death (6–9). The reported cerebrovascular insults were primarily due to vertebral artery dissection (8). The cervical internal carotid artery (ICA) is less frequently injured during chiropractic maneuvers, probably

because it lies in the soft tissue of the neck and is thus more mobile. The ICA has seven segments: cervical, petrous, lacerum, cavernous, clinoid, ophthalmic, and communication (10). The cervical segment begins at the carotid bifurcation) usually at the level of C3 (and ends at the skull base and usually has no branches (11). It is assumed that ICA dissection during chiropractic manipulation results from artery compression against either the transverse processes or the bony mass of the upper cervical vertebrae (12). Flexion-extension trauma is more likely to injure the carotid arteries, whereas rotational trauma more often damages the vertebral arteries (13,14). Eagle syndrome was first described in 1937 by the German otorhinolaryngologist Watt Eagle, whose clinical and radiological definition of the condition is still in use. Eagle's syndrome is a complex symptom assortment produced by provocation of the carotid space structures by anomalies of the styloid process (15), including an elongated styloid of 30 mm or larger (16), insulting angulation, calcification of the stylohyoid or stylomandibular ligaments, and/or approximation of the styloid to C1 transverse process, commonly seen with a styloid of normal length (17). Institutional Review Board approval was waived, and informed consent was obtained from the patient to publish the case details and images.

Case report:

A 22-year-old male patient presented with a history of neck pain for ten days, for which he had muscle relaxants and SMT, which was followed immediately by exacerbation of neck pain and swelling. Ten days later, he had torticollis and recurrent bleeding attacks from nose and mouth, after which he sought otorhinolaryngologist advice, who requested CT angiography, which revealed hematoma in the nasopharynx and pseudo-aneurysm from the distal cervical segment of the left ICA just below the skull base (**Fig.1**). The patient was anemic but hemodynamically stable. The right CFA was percutaneously accessed under local anesthesia with (5ml xylocaine 2%), and while the anesthesiologist continuously monitored the patient's vital signs. Flexor shuttle sheath (COOK® 6Fr. 90cm) was navigated over 0.035-in. diameter soft glide wire (Terumo, Tokyo, Japan) together with bern (Cook, Inc., Bloomington, IN, USA) catheter till the left CCA—diagnostic angiography with manual hand injection of 10ml of iopromide (**Ultravist®**) over 5sec. Confirmed the site of tear(**Fig.2**). BeGraft (Bentley InnoMed GmbH, Germany) (6mmX38mm) covered stent graft was then advanced till the end of the straight part of the cervical segment of ICA; guided by the help of roadmap, and deployed via inflating of its balloon with 8atm pr. for 30sec. Nitroglycerine was then injected, and completion angiography revealed good sealing of the tear and restoration of the antegrade flow to the brain (**Fig.3**). The patient was discharged on the following postoperative day on broad-spectrum antibiotics, clopidogrel, and LMWH. After three days, the last one was discontinued to be continued on clopidogrel. Postoperative duplex days and 30; showed patent stent-graft with normal ICA-waveform (**Fig.4**) and confirmed by CTA(**Fig.5**). The patient's neck pain was resolved, and he regained his normal tone of voice and stopped experiencing spitting blood anymore.

Discussion:

Eagle's syndrome, categorized initially by Dr. Watt Eagle, divides patients into two groups based on the structures compressed or irritated by the styloid complex. The classic form involves cranial nerves 5-trigeminal, 7-facial, 9-glossopharyngeal, and/or 10-vagus, where many providers believe this neuralgia is a type of entrapment syndrome involving the cranial nerves, commonly after tonsillectomy (18). The vascular form involves the internal carotid artery (ICA), external carotid artery (ECA) (15), periarterial sympathetic nerve plexus (19), and the internal jugular vein (IJV) (20,21).

In our patient, we assume that the muscle relaxant weakened the normal muscle tone and weakened its share in neck support. On the other hand, SMT, even in the hands of experienced practitioners, has well-known complications, particularly for the upper cervical segment. Lastly, and the most important, from our perspective, is the presence of an anomalous styloid process that caused the injury to ICA. So, SMT acted as the trigger, firing the anomalous styloid process that acted, in turn, as the bullet, causing injury in the ICA.

Many patients who unknowingly have Eagle's syndrome pursue physical therapy, massage, medical management, injections, and surgery (22). In fact, practitioners of manipulation, irrespective of their professional

training, have consistently claimed that the risk of stroke after manipulation is so small that it should be considered insignificant (23,24). However, three studies described carotid artery dissection and/or stroke after massage (25–27). Another three studies described exercise produced adverse symptoms/events, including arterial dissection (28–30). Another research recommends the avoidance of thrust manipulation, along with relative contraindications for combined flexion/rotation in patients with styloid anomalies, as this has led to carotid dissection in several cases (31).

Our patient presented to us ten days after SMT, and this delay in presentation is also noticed in other studies (6,32–36). Moreover, due to the relative inaccessibility of the distal ICA, we chose the endovascular choice as the endovascular management of carotid artery injury had been previously studied and proved to be safe, effective, and maybe even superior to surgery, particularly in zone I and III neck injuries (37–40).

Conclusions:

Patients undergoing spinal manipulative therapy should be informed of the risk of stroke or vascular injury that could cause significant morbidity or even mortality from this procedure. Furthermore, we recommend increasing the awareness of the public about the potential complications from SMT and updating the International Federation of Orthopedic Manipulative Physical Therapists (IFOMPT) framework to incorporate Eagle's syndrome in a comprehensive assessment, and palpation of the stylohyoid complex to help safe practice.

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Figure legends

Figure 1

(The green arrow points to the pseudo-aneurysm, and the red arrow points to the distal part of the C2 segment of the left ICA.)



Figure 2
(Diagnostic angiography confirming the site of the tear in the left ICA)



Figure 3
(Completion angiography confirming good sealing of the tear and restoration of antegrade flow to the brain)

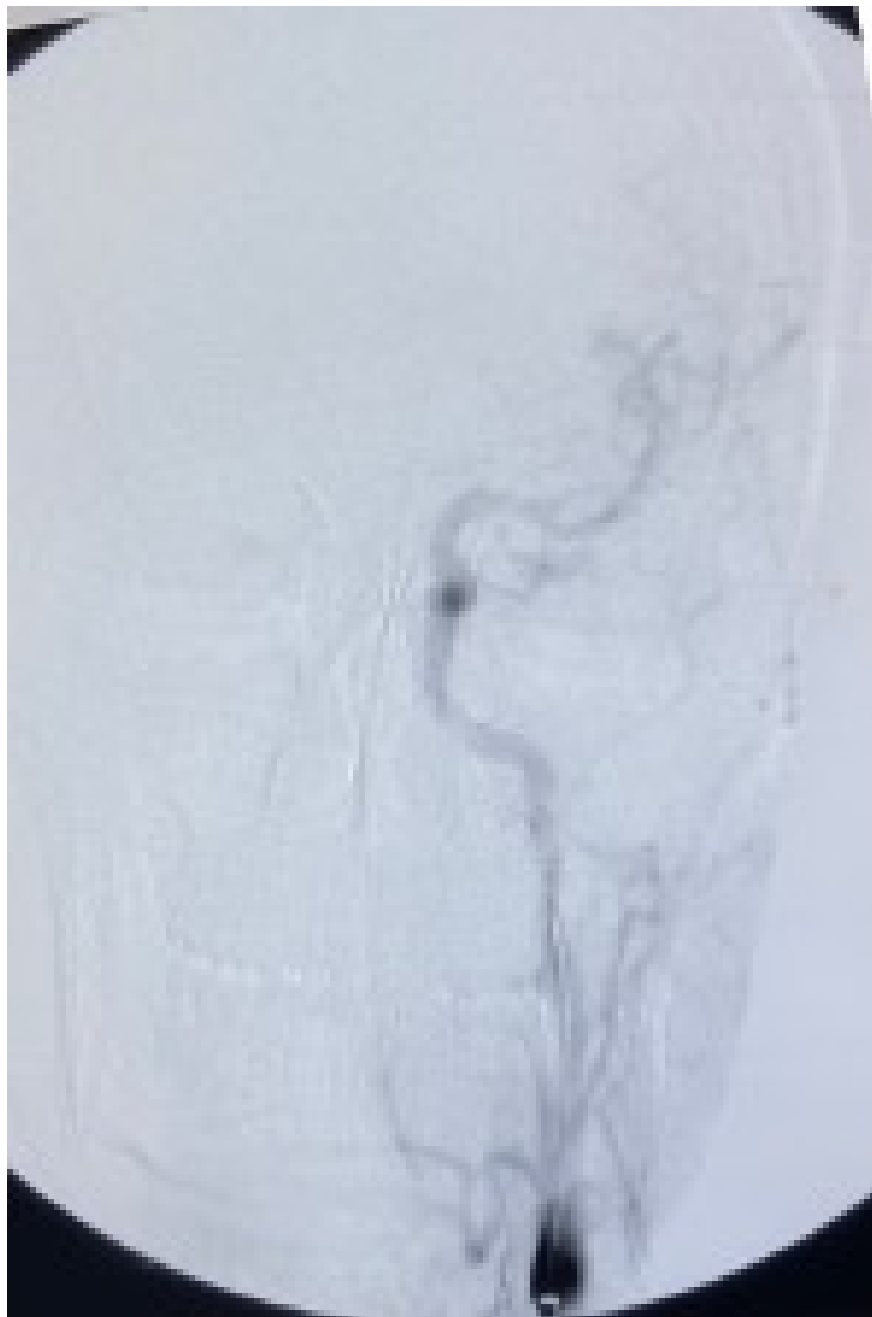


Figure 4
(Follow-up duplex showing patent stent with normal ICA waveform)

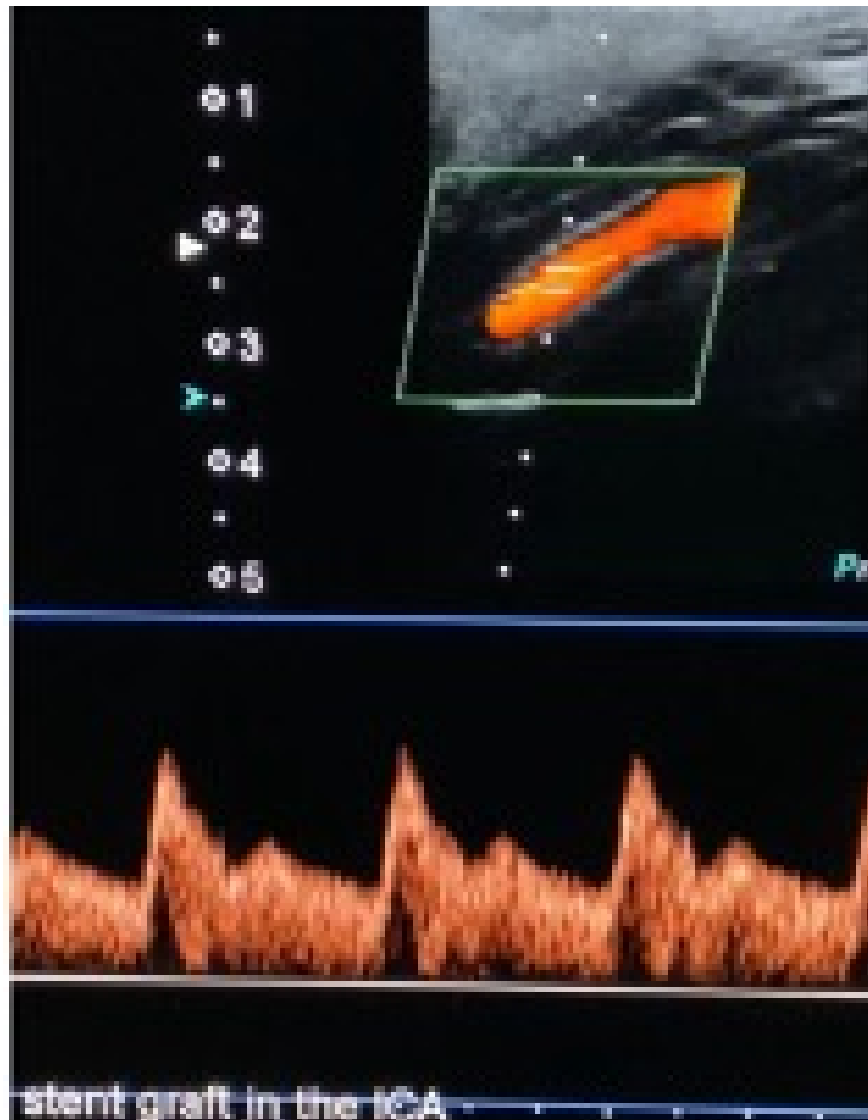
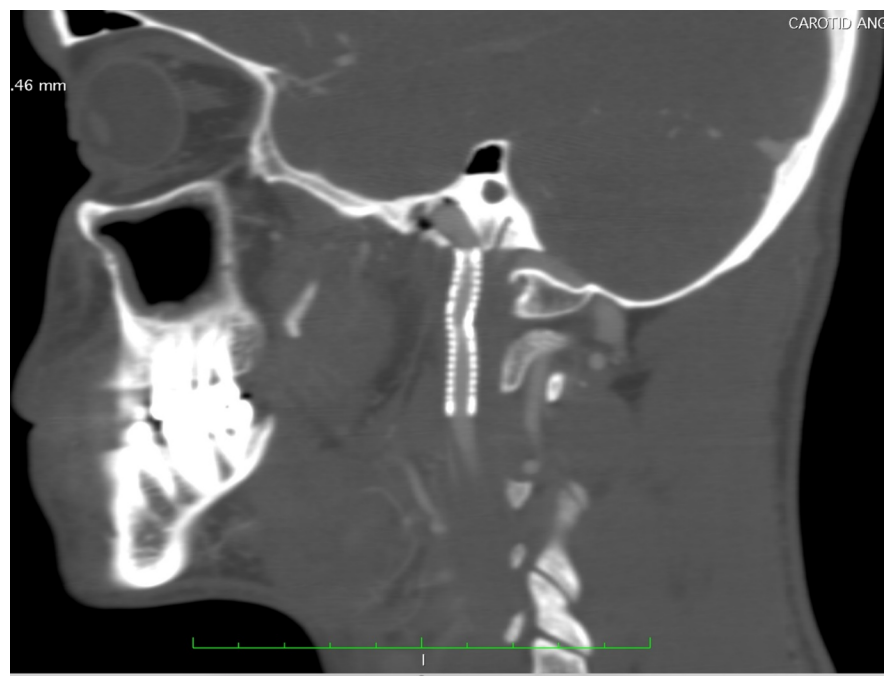


Figure 5
(One-month postoperative CTA revealing patent stent-graft)



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