

## A 57-year-old man with a spontaneous carotid artery dissection

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*From the Case Records of the Alpert Medical School of Brown University Residency in Emergency Medicine*

**DR. PAUL COHEN:** Our patient is a 57-year-old male who presented to the emergency department complaining of acute onset left-arm heaviness, parathesias, and weakness while typing on his computer. The initial symptoms lasted for approximately 20 minutes, and the patient activated emergency medical services (EMS), who administered aspirin while en route. By the time the patient arrived to the emergency department his symptoms had mostly abated. Review of systems was positive for two days of mild shortness of breath and intermittent tinnitus in his right ear. The patient's past medical history includes hypertension and hyperlipidemia for which he takes felodipine and simvastatin. He uses tobacco and has a family history of heart disease and stroke.

The patient's physical exam was unremarkable. His temperature was 36.8°C, HR 71, BP 154/96 mmHg and oxygen saturation 97% on room air. His lung, cardiac and abdominal exam were normal, and pulses were 2+ in the bilateral radial and posterior tibial arteries. The patient had a normal neurologic examination. He was alert and oriented, there was no apraxia or neglect appreciated, and his speech was fluent and without aphasia. His cranial nerves II-XII were intact, his tone was normal and no fasciculations were noted. Sensation was intact to light touch, temperature, and proprioception bilaterally. There was no dysmetria with finger to nose. The patient had no ataxia.

**DR. LAURA MCPEAKE:** What was your primary consideration for this patient and what was done?

**DR. COHEN:** Our main concern included a primary neurologic event such as an ischemic or hemorrhagic stroke, TIA, cervical artery dissection, hemiplegic migraine, and radiculopathy. ACS was briefly considered given the patient's shortness of breath and left arm heaviness. Other neurologic mimics such as hypoglycemia and post-ictal paralysis were viewed as unlikely given the patient's history, exam, and normal blood sugar.

The patient's ECG, laboratory work-up, and non-contrast CT of the brain were unremarkable. Given the suspicion



**Figure 1.** Patient's CT scan showing a dissection of the right internal carotid artery.

for dissection, a CTA of the head and neck was performed, which demonstrated a high-right cervical internal carotid artery dissection. (Figure 1). CTA and MRA have replaced angiography for the diagnosis of cervical artery dissections.<sup>1</sup> While there is no clear benefit of one imaging modality over the other, CTA is often easier to obtain, demonstrates intraluminal abnormalities, and has been reported to have a greater accuracy in diagnosing vertebral artery dissections.<sup>2</sup> On the other hand, MRI/MRA does not involve ionizing radiation and provides better visualization of the brain in acute ischemic stroke.

**DR. CATHERINE CUMMINGS:** Did the patient have a history of recent trauma or have other risk factors? How common is a spontaneous dissection?

**DR. COHEN:** In the United States, the annual incidence of spontaneous carotid artery dissection is believed to be

2.5–3/100,000, although this number is probably underestimated as some patients are asymptomatic.<sup>3,4</sup> It is slightly more common in men than women. The Cervical Artery Dissection and Ischemic Stroke Patients (CADISP) consortium, established in 2009, has attempted to elucidate risk factors for spontaneous dissections. Reasons for arterial injury are believed to be multifactorial. Some recent small studies suggest that predisposing hereditary connective tissue disorders may be highly prevalent in patient with spontaneous cervical artery dissections, but recognizable phenotypes such as fibromuscular dysplasia (most commonly implicated), Ehlers-Danlos syndrome type IV, and Marfan syndrome are noted in only approximately 5% of cases.<sup>5,6</sup>

Cervical carotid artery dissections can be due to major or minor trauma. Whereas penetrating and significant blunt trauma are obvious causes of a dissection, seemingly innocuous events may be responsible for an injury to the internal carotid artery. Almost 1/3 of patients do not describe an inciting mechanical event.<sup>7</sup> Carotid artery dissections have been reported after engaging in such activities as amusement park rides, playing basketball, coughing and sneezing, scuba diving, sexual intercourse, volleyball, as well as other activities. Chiropractic manipulation has also been implicated as a cause for a carotid artery dissection.<sup>4,7</sup>

While our patient did not have any known trauma, he did report a recent bout of bronchitis several days prior to presentation, and stated he had paroxysms of coughing and sneezing over the past week. Although it is certainly not typical for patients with minor trauma to develop a dissection, it is possible that our patient may have had an underlying inflammatory process or structural abnormality leading to arterial injury.<sup>8,9</sup>

**DR. WILLIAM BINDER:** Your patient reported left-arm heaviness. Are carotid artery dissections a common cause of stroke and/or a transient cerebral ischemia?

**DR. NICHOLAS MUSISCA:** Although cervical artery dissections are estimated to account for approximately 2% of all ischemic strokes in all ages, they account for nearly 20% of strokes in young and middle-aged patients.<sup>10</sup> The average age of those presenting with stroke secondary to dissection are about 46 years old, and they often do not have the usual risk factors for atherosclerotic strokes.<sup>11,12</sup> In fact, cerebral ischemia – TIA or infarct – is one of the most common presenting symptoms of dissection, occurring in up to 67% of all patients.<sup>13</sup> It is also notable that subarachnoid hemorrhage may develop from intracranial artery dissection.<sup>14</sup>

The symptoms seen in carotid artery dissections are often related to the arterial injury sustained. Dissections of the carotid artery can be a result of an intimal tear or disruption of the vasovasorum. A tear in the intima can lead to the formation of a fibrin thrombus and result in an artery-to-artery embolism or occlusion, causing hypoperfusion and ischemic

symptoms. Subadventitial lesions (between the media and adventitia) usually result in aneurysm (and pseudoaneurysm) formation and compression neuropathies.<sup>15, 16</sup>

**DR. JAMES MONTI:** What clinical features should we be on the lookout for? Does carotid dissection present differently than vertebral artery dissection?

**DR. MUSISCA:** In addition to cerebral ischemia, which occurs more frequently with vertebral artery dissection (77% vs 60%),<sup>11</sup> the most common initial symptoms of dissection is head and neck pain (80%).<sup>13</sup> Neck pain is typically more common in vertebral artery dissections, while pain in the eye, ear, or face is more commonly found in carotid artery dissection.<sup>11,17,18</sup> Headache is noted to be approximately equal in both types of dissection and tend to present ipsilateral to the dissection. Concomitant presence of a carotid bruit in carotid artery dissections has a poor sensitivity of 33%.<sup>4, 13</sup>

Ischemia from carotid dissections generally affects MCA and ACA territories, thereby causing contralateral hemiparesis, hemisensory loss, aphasia, hemineglect, pulsatile tinnitus and/or monocular vision loss. Horner's syndrome (and partial Horner's) is seen in carotid artery dissection less frequently and typically presents without anhidrosis as the ischemia is secondary to localized compression of the sympathetic fibers travelling in the internal carotid artery plexus.<sup>4</sup> Ischemia due to a vertebral artery dissection may affect the brainstem and cerebellum, leading to symptoms such as ataxia, dysmetria, dysphagia, and vertigo and may cause anhidrosis.

**DR. WHIT FISHER:** Should the treatment of acute cerebral ischemia change based on whether it is secondary to dissection?

**DR. COHEN:** Acute ischemic stroke in the Emergency Department should be treated according to standard stroke practice. This includes treating eligible patients with thrombolytic therapy in the acute period instead of withholding it due to hypothetical concern for possible cervical artery dissection and worsening expansion of the dissection. Numerous studies note that the efficacy and complications of thrombolysis for patients with ischemic stroke associated with cervical artery dissection are comparable to patients with ischemic stroke from other causes.<sup>19–23</sup>

**DR. ANDREW NATHANSON:** What is the standard of care for treatment of carotid artery dissection?

**DR. COHEN:** Stroke prevention with antithrombotic therapy remains the basis for the treatment of patients with dissection. The AHA/ASA recommends that patients with ischemic stroke or TIA with concomitant cervical artery dissection be treated with either antiplatelet or anticoagulant

therapy for at least 3 to 6 months. However, no clear benefit has been established when comparing these therapies.<sup>24-26</sup> Antithrombotic treatment should begin immediately except for those who received thrombolysis or sustained significant trauma. Patients who received thrombolysis can generally be started on therapy after 24 hours. The timing of initiating antithrombotic therapy in trauma patients varies and depends on the specific injuries present; however, it is generally believed that these patients should be started early given the significant stroke rates without treatment.<sup>27</sup> One important caveat is that in patients who do not present with a neurologic event, or if the carotid lesion is found incidentally, the risk of stroke is low, suggesting that patients who present later in the course of the disease are at lower risk for an ischemic event.<sup>16</sup>

**DR. AMY BASS:** When is endovascular therapy used?

**DR. COHEN:** Endovascular interventions such as thrombectomy, intra-arterial thrombolysis, angioplasty, and stent placement may be employed in specific circumstances. The Society for Vascular Surgery guidelines recommend that medical therapy be employed as first-line treatment, and that those remaining symptomatic or with significant progression of the dissection on medical therapy be considered for intervention.<sup>28-30</sup> Interestingly, several studies have found endovascular therapy as an acute therapeutic intervention for ischemic stroke due to carotid dissection to be safe and efficacious.<sup>31</sup>

While some reports suggest that patients who develop a pseudoaneurysm have a mostly uneventful course, other studies suggest that there is a risk of thromboembolic disease. A single institution study in a series of 120 patients with pseudoaneurysms found that 13.8% enlarged with interval studies, and that > 3% had recurrent TIAs and 14% had non-ischemic symptoms. The authors citing this study intervene on enlarging pseudoaneurysm because they likely represent non-healing dissections leading to false lumen filling, and can cause discomfort and neuropathy due to mass effect.<sup>32</sup>

**DR. MELANIE LIPPMAN:** How was this patient treated and what was his outcome?

**DR. COHEN:** Our patient was initiated on 325mg aspirin daily and on his three-month follow-up was noted to only have intermittent tinnitus that had decreased in severity. The patient's good outcome is consistent with the favorable prognosis typically seen with cervical artery dissections.

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