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Subarachnoid Hemorrhage Following Cervical Medial Branch Radiofrequency Ablation: A Case Report

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Background: Facet-mediated neck pain following motor vehicle collision is a common component of whiplash-associated disorder. Facet-mediated neck pain is suspected based on a combination of history, physical examination, and imaging findings. Third occipital nerve (TON) and cervical medial branch radiofrequency ablation (RFA) are effective and safe approaches to facet-mediated pain. Serious complications are rare but can include nerve root, spinal cord, and vascular injury.

Case Report: This report describes a case of subarachnoid hemorrhage (SAH) that occurred within 24 hours following TON and cervical medial branch RFA. The patient was admitted for symptom management, blood pressure control, and follow-up imaging. His hemorrhage stabilized, and he returned home without residual deficits after 12 days.

Conclusions: This case serves as an example of how prolonged nausea, headache, and ataxia can be indicators of SAH, following TON and cervical medial branch RFA.

Key words: Cervical, medial branch, third occipital nerve, radiofrequency ablation, subarachnoid hemorrhage, case report

BACKGROUND

Neck pain and headache are common components of whiplash-associated disorder (WAD), following motor vehicle collisions (MVCs) (1). As many as 83% of those involved in MVCs will have some element of WAD (1). In those with chronic neck pain after MVCs, 54% to 60% of cases can be attributed to facet-mediated pain (2).

The identification of facet-mediated pain is achieved through a combination of history, physical examination, imaging, and local anesthetic blocks (2,3). Historical findings that support the diagnosis include headache and pain that is distributed within the typical referral patterns for the facet joints (2,3). Physical examination features that suggest the diagnosis are provocation with cervical range of motion, a positive extension-rotation test, and tenderness with palpation of the articular pillars and overlying paraspinal musculature (2). Radiographic evidence of facet arthropathy is controversial in the diagnosis of cervical facet-mediated pain (2,3). Since history, physical examination, and imaging findings are neither highly sensitive nor specific, the use of prognostic local anesthetic blocks is viewed as the most reliable way to identify facet-mediated pain that will respond to radiofrequency ablation (RFA) (2,3).

The initial treatment of facet-mediated pain includes physical therapy, acetaminophen, and nonsteroidal anti-inflammatory drugs (2). In the chronic stage (> 3 months), the addition of cognitive behavioral therapy and other adjunctive medications are often indicated (1,2). According to recent guidelines (2), conservative management should be trialed for 6 weeks in those with pain > 3 months prior to offering prognostic local anesthetic blocks.

The innervation of the facet joints has been well

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established (2,3). The C2-C3 facet joint is innervated by the third occipital nerve (TON) and the remaining cervical facets are innervated by the medial branches of the nerve above and below the joint (e.g., the C4-C5 facet joint is innervated by the medial branches of the C4 and C5 nerve roots) (2,3).

Patients who respond favorably to prognostic local anesthetic blocks are typically offered RFA (2,3). The degree of pain relief that designates a positive response is a topic of debate; however, recent guidelines (2,3) suggest that ≥ 50% pain relief constitutes a positive block. Additionally, these guidelines recommend that a single positive block be utilized prior to offering RFA, although in some jurisdictions 2 positive blocks may be required (2,3).

RFA of the nerves supplying the cervical facet joints is an effective procedure for facet-mediated pain, confirmed with local anesthetic blocks (2,3). Major complications are rare but may include nerve root, spinal cord, and vascular injury (2,3). More common complications include pain, numbness, and ataxia (2,3). Ataxia is especially prevalent in TON RFA (3). Subarachnoid hemorrhage (SAH) related to cervical RFA has not been reported in the literature, which makes this case unique.

CASE PRESENTATION

A 50-year-old man had an MVC in 2017 that resulted in chronic neck and left arm pain. Informed written consent was obtained directly from the patient. In 2020, he had clinical findings of a left C6 and C7 radiculopathy. His magnetic resonance imaging revealed C5-C6 foraminal stenosis and a C6-C7 disc herniation impinging on the left C7 nerve root. He underwent successful C5-C6 and C6-C7 anterior cervical discectomy and fusion (ACDF). His left arm pain and weakness improved following ACDF; however, he had ongoing axial neck pain and associated cervicogenic headache. His other comorbidities included major depressive disorder (MDD) and post-traumatic stress disorder.

He was conservatively managed with physical therapy, online cognitive behavioral therapy, cannabidiol, and acetaminophen with codeine, as needed. The patient was also taking venlafaxine for MDD. His only other prescribed medication was testosterone enanthate 500 mg intramuscularly every 2 weeks, which was started by his family physician for mood symptoms. He smoked dried cannabis for reported pain, mood, and sleep benefits. Alcohol intake was reportedly minimal, and he did not report cigarette smoking. During his admission to the hospital, he disclosed a remote history of cocaine use.

Given his ongoing axial neck pain and cervicogenic headache, despite conservative management, he underwent multiple cervical interventions, including bilateral C3-C4 and C4-C5 intraarticular facet injections and one previous round of left and right C3-C5 medial branch RFA. The rationale for proceeding from intraarticular facet injections to RFA is not entirely clear, as these procedures were performed by a different service. Regardless, he had a positive response to RFA but had some ongoing cervicogenic headaches, which prompted us to add the TON. One month prior to the case procedure, he underwent successful TON and C3-C5 medial branch RFA, on the right. The patient returned to have the procedure repeated on the left.

Left TON and C3-C5 medial branch RFA were carried out using a lateral approach (Fig. 1), strict antiseptic technique, and fluoroscopic guidance. No procedural sedation was used. A total of 10 mL of 1% lidocaine was used to anesthetize the needle tracts and target nerve. The RFA was carried out using 5 cm and 10 cm RF Trident cannulae (Diros Technology, Markham, ON, Canada), with 5 mm active tips. Prior to ablation, motor stimulation was utilized. Multifidus twitch was observed, and no pain or muscle contraction occurred in the upper extremity. Ablation was carried out at 85 °C for 3 minutes. A total of 10 mg of dexamethasone and 3 mL of 0.25% bupivacaine was divided evenly between each RF cannula, following the ablation.

During, and following the procedure, the patient experienced nausea and emesis. The initial working diagnosis was vasovagal syncope. An intravenous (IV) line was started, and he was supported with IV fluids and IV antiemetics. He was monitored for approximately 5 hours, at which point he felt well enough to return home. The patient was supervised by family for the following 24 hours and return-to-care instructions were provided. A phone follow-up, the following day, prompted emergent imaging. He was reporting nausea, headache, and ataxia. He underwent computed tomography (CT) of the head and CT angiogram (CTA) of the head and neck. These were ordered primarily to rule out iatrogenic vascular injury.

The carotid and vertebral arteries were normal on CTA. However, the CT revealed intraventricular hemorrhage, blood in the basal cisterns, and mild hydrocephalus (Fig. 2). These findings were in keeping with SAH. Neurosurgical consultation was requested, and no operative treatment was required. He was admitted under Internal Medicine for symptom man-

agement, blood pressure control, and repeat imaging. His follow-up CT scan, the following day, showed redistribution of the hemorrhage and decreased hydrocephalus. Five days later, he had an increase in headache and nausea, which prompted a third CT. The CT revealed an increase in the extra-axial area of hemorrhage along the posterior falx. This was followed-up with a fourth CT scan, which showed expected evolution of the previously identified areas with no new findings. The patient was initiated on amlodipine 10 mg po once daily in addition to perindopril 8 mg po once daily during his hospital stay. His symptoms improved and he left against medical advice after 12 days of symptom management. He had no residual neurologic deficits at the time of discharge.

DISCUSSION

This case report presents a rare complication following TON and cervical medial branch RFA. TON and cervical medial branch RFA are well-established procedures for chronic axial neck pain and cervicogenic headache that improve with local anesthetic test blocks (2,3). Vasovagal episodes are known to occur in some individuals during or following the procedure (2,3). Additionally, those undergoing TON RFA often experience ataxia, typically resolving within 30 minutes (3).

Hemorrhagic complications of interventional spine

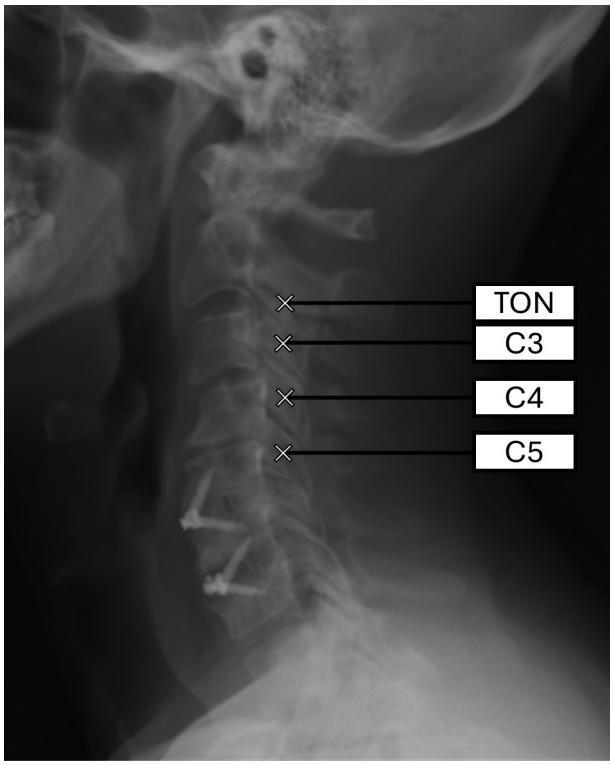

Fig. 1. A lateral cervical spine radiograph demonstrating the injection targets that were utilized for the TON and C3-C5 medial branch RFA. TON, third occipital nerve; RFA, radiofrequency ablation.

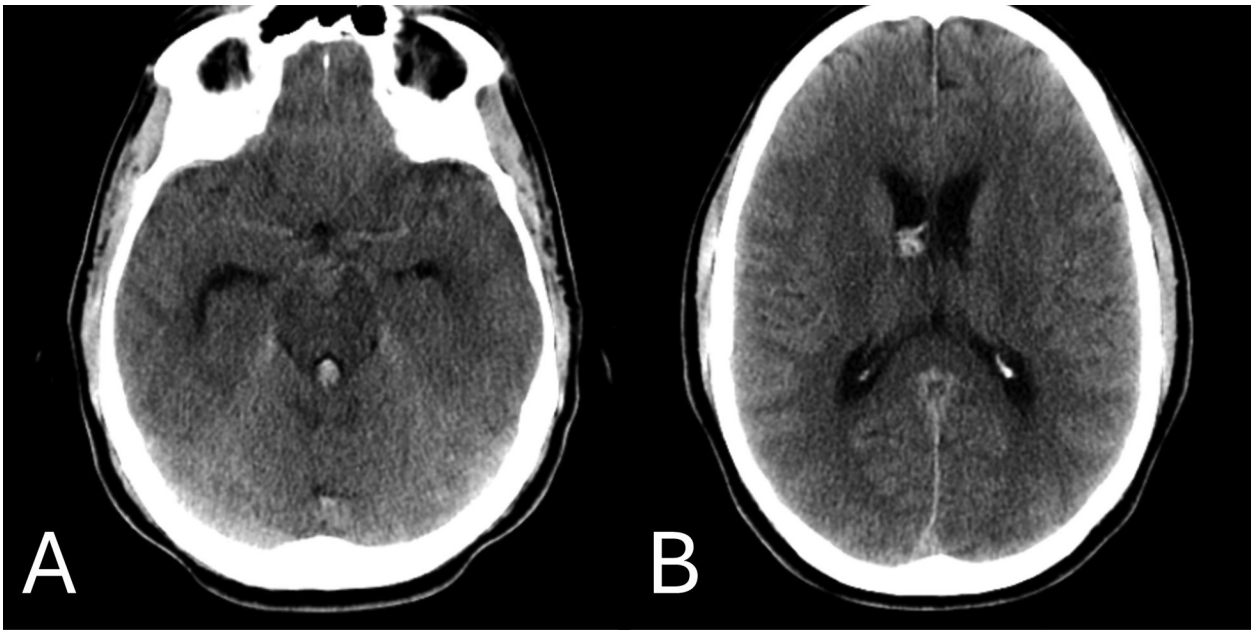

Fig. 2. Initial CT scan revealing blood in the basal cisterns (A) and ventricular system (B), with mild hydrocephalus (B).CT, computed tomography.

procedures are rare (4,5). A large observational study (4) reported no hemorrhagic complications in 4,766 patients who underwent interventional spine procedures, despite being on anticoagulants. However, guidelines by the American Society of Regional Anesthesia classify cervical medial branch RFA as an intermediate hemorrhage risk due to the proximity to the vertebral artery (5).

SAH is most commonly due to the rupture of a cerebral aneurysm (6). Long-term risk factors for cerebral aneurysm rupture include hypertension, smoking, alcohol consumption, and cocaine use (6,7). There is also evidenced that cannabis smoking can increase the risk of rupture (8). His history of cannabis smoking and remote cocaine use may have contributed to his SAH. The patient was not known to have chronic hypertension and there was no evidence of left ventricular hypertrophy on chest x-ray.

Transient increases in systolic blood pressure may trigger the rupture of cerebral aneurysms (6,9,10). This has been reported in the pathophysiology of SAH during high-intensity physical activity and following sexual intercourse (9,10). Acute pain is known to transiently increase blood pressure, mediated by the release of catecholamines and cortisol (11). In this case, transient elevation in systolic blood pressure may have been caused due to procedural pain and may have contributed to his SAH. Although, it is possible that his SAH occurred spontaneously and was unrelated to the procedure itself.

To our knowledge, this is the first published case of an SAH following an interventional spine procedure. It should be included in the differential diagnosis of ongoing nausea, headache, and ataxia, following TON and cervical medial branch RFA. Special attention should be paid to those with risk factors for cerebral aneurysm rupture. This is notable, as both nausea and ataxia can occur following TON RFA, but this typically resolves shortly after the procedure (2,3).

CONCLUSIONS

SAH should be on the differential diagnosis for patients with prolonged headache, nausea, and ataxia, following TON and cervical medial branch RFA, especially in those with risk factors for cerebral aneurysm rupture. These symptoms may initially be misattributed to known side effects of TON and cervical medial branch RFA. This case demonstrates the importance of close follow-up and diligent return-to-care instructions, in patients who have prolonged symptoms after spinal RFA procedures.

REFERENCES

1. Yadla S, Ratliff JK, Harrop JS. Whiplash: Diagnosis, treatment, and associated injuries. *Curr Rev Musculoskelet Med* 2008; 1:65-68.
2. Hurley RW, Adams MCB, Barad M, et al. Consensus practice guidelines on interventions for cervical spine (facet) joint pain from a multispecialty international working group. *Reg Anesth Pain Med* 2022; 47:3-59.
3. Bogduk N (ed). *Practice Guidelines for Spinal Diagnostic and Treatment Procedures*, International Spine Intervention Society, San Francisco, CA 2013.
4. Endres S, Shufelt A, Bogduk N. The risks of continuing or discontinuing anticoagulants for patients undergoing common interventional pain procedures. *Pain Med* 2017; 18:403-409.
5. Narouze S, Benzon HT, Provenzano D, et al. Interventional spine and pain procedures in patients on antiplatelet and anticoagulant medications. *Reg Anesth Pain Med* 2018; 43:225-262.
6. Thilak S, Brown P, Whitehouse T, et al. Diagnosis and management of subarachnoid haemorrhage. *Nat Commun* 2024; 15:1850.
7. Ostergaard JR. Risk factors in intracranial saccular aneurysms: Aspects on the formation and rupture of aneurysms, and development of cerebral vasospasm. *Acta Neurol Scand* 1989; 80:81-98.
8. Catapano JS, Rumalla K, Srinivasan VM, et al. Cannabis use and delayed cerebral ischemia after aneurysmal subarachnoid hemorrhage. *Stroke* 2022; 53:e42-e43.
9. Anderson C, Mhurchu CN, Scott D, et al. Triggers of subarachnoid hemorrhage: Role of physical exertion, smoking, and alcohol in the Australasian cooperative research on subarachnoid hemorrhage study. *Stroke* 2003; 34:1771-1776.
10. Reynolds MR, Willie JT, Zipfel GJ, Dacey RG. Sexual intercourse and cerebral aneurysmal rupture: Potential mechanisms and precipitants. *J Neurosurg* 2011; 114:969-977.
11. Rivasi G, Menale S, Turrin G, Coscarelli A, Giordano A, Ungar A. The effects of pain and analgesic medications on blood pressure. *Curr Hypertens Rep* 2022; 24:385-394.