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Cerebrospinal fluid leak secondary to chiropractic manipulation

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Abstract

Background: There is a paucity of quality data on the incidence of adverse outcomes of chiropractic manipulation. Spontaneous intracranial hypotension (SIH) subsequent to cervical spinal manipulation has been documented. However, no imaging correlates have previously been presented demonstrating a clear causal relationship to manipulation with follow-up and correlating with clinical symptomatology.

Case Description: We present a case of subacute cervical cerebrospinal fluid (CSF) leak resulting from chiropractic manipulation of the cervical spine. The patient is a 29-year-old female who received manipulation one week prior to developing symptoms of severe orthostatic headache, nausea, and vomiting. Magnetic resonance imaging (MRI) revealed a new C5-C6 ventral CSF collection. Symptomatic onset corresponded with the recent cervical chiropractic adjustment. We present serial imaging correlating with her symptomatology and review the pertinent literature on complications of chiropractic manipulation.

Conclusion: Our case of ventral CSF leak with symptoms of intracranial hypotension demonstrated spontaneous symptomatic resolution without permanent neurological sequelae.

Key Words: Cerebrospinal fluid leak, chiropractic manipulation, intracranial hypotension

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INTRODUCTION

Chiropractics is a well-established facet of modern healthcare.[13,15,23] However, treatment is highly operator-dependent. Therefore evidence supporting the efficacy of manipulation is largely equivocal.[8,13] The reported incidence of complications varies widely, largely due to near-complete underreporting of adverse outcomes.[7,13,15,16,18] There is a growing body of evidence of spontaneous intracranial hypotension (SIH) subsequent to cervical spine manipulation.[10,15,23] However, this evidence lacks both good imaging correlates and follow-up and thus fails to address long-term outcomes. We present the first case report of a clinically subacute ventral cerebrospinal fluid (CSF) leak secondary to cervical spinal manipulation. We include good imaging correlates at presentation and at follow-up after symptom resolution.

CASE REPORT

This 29-year-old Asian female, who was otherwise in previously good health, presented with recurrent episodes of severe headache, nausea, and vomiting. She

described the headache as "pulling" downward, triggered by standing, and resolving when supine. She reported having had axial tension and rotatory manipulation of her neck one week prior to the onset of her symptoms but denied immediate symptoms afterward. She experienced increasingly painful headaches over the 2 weeks following her chiropractic manipulation. She had no known prior history of trauma, dural structural pathology, or connective tissue disease.

Physical exam was normal with no neurological deficits. Previous cervical magnetic resonance imaging (MRI) with and without contrast had been unremarkable. Cervical MRI at presentation revealed only a CSF-isodense ventral extradural fluid collection in the lower cervical spine and upper thoracic spine without any mass effect on the thecal sac [Figure 1]. There was no meningeal enhancement, perineural cyst, dural ectasia, or abnormal venous engorgement.

The patient was managed conservatively with bed rest for 2 weeks and made a complete spontaneous recovery. Follow-up cervical MRI at 6 months demonstrated decreased size of ventral extradural fluid collection [Figure 2]. The patient is doing well presently (1 year subsequent to chiropractic procedure).

DISCUSSION

Though widely accepted as benign, chiropractic manipulation can lead to many complications. Major complications are uncommon but can result in significant morbidity and mortality. Vascular events such as stroke, pseudoaneurysm formation, and epidural hematoma represent the most common major complications.[5,8,19,21] Other serious neurological and musculoskeletal sequelae include phrenic nerve palsy, para-and quadriparesis, central cord syndrome, cauda equina syndrome, atlantoaxial dislocation, and pathologic fractures.[6,15,17] Minor adverse outcomes such nuchal stiffness, radiculopathy, and vertigo are quite common, though intracranial hypotension is rarely reported. However, since the literature on complications of chiropractic manipulation is almost entirely case report-based, it impossible to accurately quantify the associated risks.[2,7-9]

Most cases of intracranial hypotension are thought to be caused by CSF leak resulting from traumatic dural tears.[14,20,22] Forceful cervical flexion and extension is an accepted mechanism.[12] In a retrospective review by Chung, *et al*. on the presentation of intracranial hypotension in 30 patients, 23% reported a history of trauma.[3] Dural tears may be further precipitated by underlying structural pathology such as meningeal diverticula or connective tissue disease. However, in a review of 80 cases of CSF leak by Schievink and Louy, trivial trauma alone without known dural pathology was reported in roughly one-third of the patients.[20]

Intracranial hypotension most commonly presents with orthostatic headache that is relieved when supine. Other symptoms include nausea, vertigo, and auditory and visual disturbances. Symptoms are thought to be due to traction on neurovascular structures as a result of intracranial hypovolemia and reduced brain buoyancy in the orthostatic position.[3,20] Symptoms often resolve spontaneously with rest, as in our patient, although 10% recurrence has been reported.[4]

In the literature, there have been only five reports of SIH associated with CSF leaks that were thought to be secondary to chiropractic manipulation.[1,10,12,22,23] However, these case reports unanimously lack adequate serial imaging before, during, and after the onset of symptoms and are therefore unable to definitively correlate the findings with the clinical symptomatology or a preceding event. Beck, *et al*. reported a case of SIH subsequent to cervical spinal manipulation that demonstrated a CSF-isodense effusion in the upper cervical spine as with our patient.[1]

To our knowledge, we present the first case of SIH secondary to cervical spinal manipulation with good serial imaging and clinical examination. We are thus able to demonstrate a good causal relationship to her preceding cervical spinal manipulation. Our patient experienced a characteristic orthostatic headache but

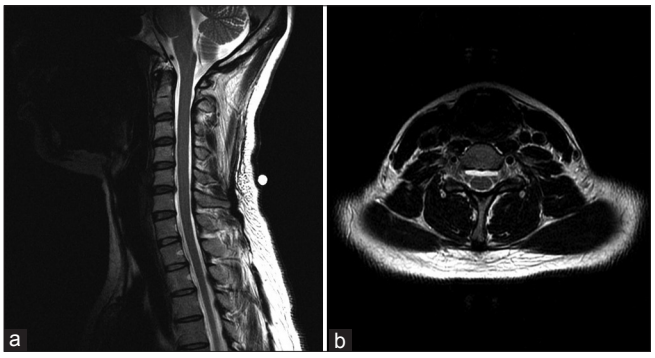

Figure 1: Presenting T2-weighted (a) sagittal and (b) axial cervical MRI renderings with ventral C6 epidural fluid

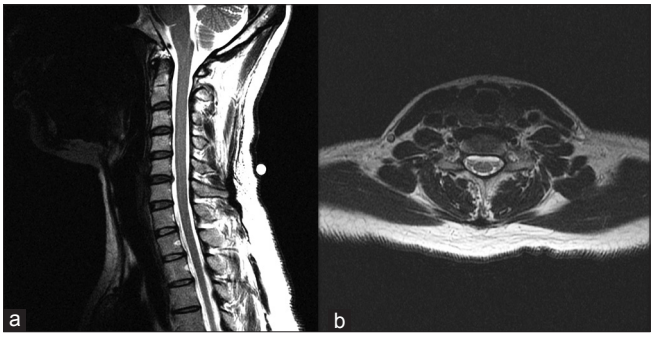

Figure 2: Six-month follow-up T2-weighted (a) sagittal and (b) axial cervical MRI renderings with interval decrease in ventral C6 epidural fluid

an uncharacteristic onset and progression over the 2 weeks following her manipulation. Kurbanyan, *et al*. reported a case of abducens nerve palsy with spontaneous resolution.[11] The only abnormality on MRI was contrast enhancement of the basilar meninges and elevated protein content. Our patient suffered no neurological sequelae, and her headache resolved spontaneously with conservative management. Follow-up was sufficient to demonstrate lasting resolution.

Long-term outcomes are poorly characterized due to the rarity of cases of SIH and the absence of follow-up with patients after the initial symptom resolution. However, an epidural blood patch can be considered for patients in whom headache resolution is not spontaneous.

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