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Identification of Painful Post-Traumatic Trigeminal Neuropathy During the Management of Chronic Temporal Headache Following Traumatic Epidural Hematoma Surgery

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Keywords

Post-Traumatic Trigeminal Neuropathy, Chronic Temporal Headache, Epidural Hematoma Surgery, Pain Identification, Neuropathic Pain, Cranial Nerve Injury.

Introduction

Traumatic head injuries affect approximately 1,000,000 individuals annually in the United States and 7,000 individuals annually in Korea [1]. In cases of traumatic head injuries, craniotomy may be performed when a hematoma develops. This procedure is typically indicated for various conditions, including subdural hematoma, epidural hematoma, and intracranial tumors [2]. Post-craniotomy, patients may experience acute complications such as infection, hemorrhage, pain, cerebral edema, and seizures, as well as chronic sequelae including neurological deficits, persistent pain, and cognitive dysfunction. In this report, the author presents a case involving a patient who developed chronic lateral headache and masticatory dysfunction following surgical removal of a traumatic epidural hematoma. This case is presented alongside a review of the relevant literature.

Case

A 45-year-old male patient of Korean nationality and Asian descent presented to the emergency department with a traumatic head injury sustained from a fall of approximately 1 meter while working at a construction site. The patient exhibited a decreased level of consciousness, and computed tomography (CT) revealed a left temporal bone fracture and a left epidural hematoma, necessitating emergency surgery (Figure 1). The patient had no significant medical history or underlying conditions. The surgery, performed under general anesthesia, lasted 120 minutes and was completed without complications. Postoperative wound healing proceeded without notable side effects, and the patient was discharged following a 30-day hospitalization.

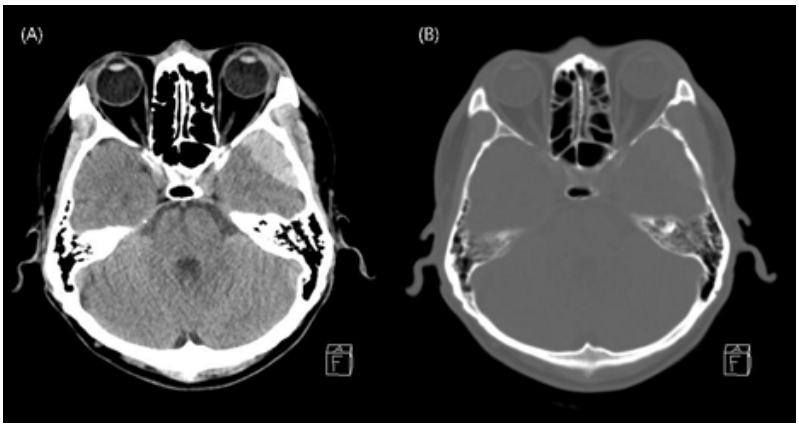

Figure 1: This is a transverse brain computed tomography(CT) image taken before surgery. (A) Hemorrhage can be observed inside the temporal bone. (B) A fracture of the tepmoral bone is observed in image.

During outpatient follow-up, the patient reported persistent postoperative temporal pain, rated at approximately 5 on the Numeric Rating Scale (NRS). Initially thought to be routine postoperative pain, the patient was prescribed pregabalin, tramadol, acetaminophen, and rehabilitation therapy. However, the temporal headache persisted for over six months despite these treatments, leading to a referral to a pain clinic.

Upon evaluation, the patient exhibited difficulty in opening his mouth wider than 2 cm due to pain, with stabbing pain episodes occurring on the side of his head every 5-10 minutes, dozens of times per day. Neuropathic pain symptoms were observed, including allodynia and hyperalgesia in the affected area, alongside significant sleep disturbances, with the patient unable to sleep for more than an hour at a time. Suspecting auriculotemporal nerve injury and temporalis muscle involvement from the surgical procedure, the patient underwent ultrasound-guided auriculotemporal nerve diagnostic block using 0.125% bupivacaine (1-2 ml) and trigger point injections into the temporalis muscle. In addition, oral medications including nortriptyline, nefopam, and diazepam were prescribed, and Nucynta 100 mg as needed (PRN) twice daily was added to address breakthrough pain and improve sleep.

The patient reported improvement in temporal pain, with a reduction to approximately 2 points on the NRS. Masticatory pain also diminished, allowing the patient to open his mouth sufficiently to consume solid foods. Consequently, the primary source of the pain was determined to be auriculotemporal nerve injury or damage to its peripheral branches. However, as the temporal symptoms improved, the patient developed dull pain in the left periorbital region. Given the involvement of the ophthalmic branch, a diagnostic block of the infraorbital and supraorbital nerves was performed using 0.125% bupivacaine under ultrasound guidance, resulting in pain relief around the eye. Subsequently, a more proximal diagnostic block of the trigeminal ganglion was conducted using 0.125% bupivacaine, which yielded additional pain relief. Follow-up CT scans did not reveal any lesions that could be identified as the primary cause of trigeminal neuralgia (Figure 2). The patient's pain was managed at an NRS score of 3-4 following multiple nerve blocks, and the patient continues to be monitored on a monthly outpatient basis.

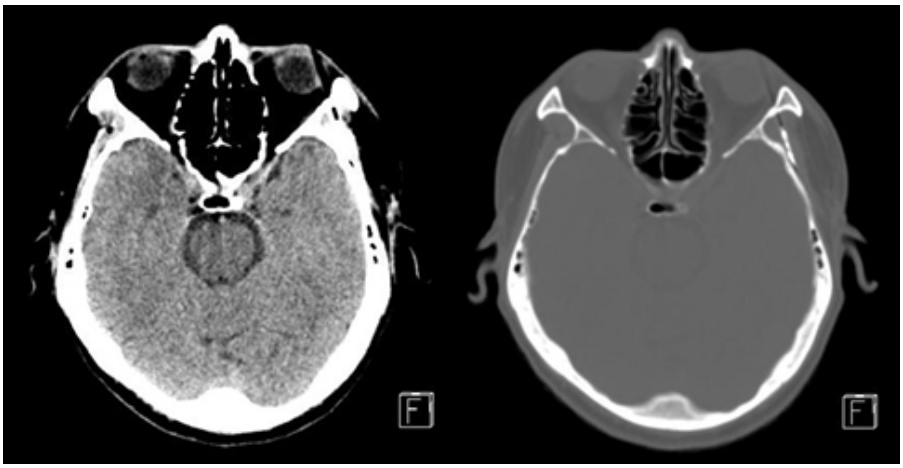

Figure 2: This is a trasverse brain CT image taken one year after surgery. Temporal bone fusion can be confirmed.

Discussion

Chronic postoperative pain is one of the most common complications following surgery, significantly impairing patients' quality of life [3,4]. Among the various types of chronic postoperative pain, the incidence of trigeminal neuralgia after cranial base surgery is reported to be approximately 10% [5]. However, no cases of trigeminal neuralgia following decompressive craniectomy have been documented until this case. Initially, the author and surgeon considered the patient's symptoms to be chronic postoperative pain secondary to surgery. However, during diagnostic nerve block procedures, the characteristic features of the patient's headache and facial pain were identified, leading to a clinical diagnosis of painful post-traumatic trigeminal neuropathy (PPTTN).

PPTTN is a clinical pain syndrome characterized by localized facial and oral pain along the distribution of the trigeminal nerve, typically following an identifiable traumatic event. The pain often presents with neuropathic characteristics such as hyperalgesia and allodynia, with variable pain duration [6]. The etiology of PPTTN is diverse. In a retrospective study by Benoliel et al., 67 of 91 patients developed PPTTN after dental procedures, while 24 patients reported PPTTN following major trauma, such as traffic accidents or physical assaults [6,7]. In this case, PPTTN may have been triggered by the initial traumatic event, including hemorrhage and skull fracture. Additionally, nerve damage could have resulted from the pressure of edema accompanying the trauma. Importantly, no additional causes of trigeminal neuralgia were identified in CT scans performed before and after surgery, nor in subsequent scans taken one years later.

The pathophysiology of PPTTN remains incompletely understood. It is hypothesized to involve a series of functional, biochemical, physical, and genetic changes in peripheral neurons. Following nerve injury, the release of inflammatory molecules may contribute to reversible nociceptive sensitivity [8]. Limitation of this case lies in the inherent uncertainty of clinical diagnosis. As no definitive

diagnostic test exists for PPTTN, diagnosis is primarily based on clinical impression. Furthermore, the rarity of this condition complicates the establishment of a clear causal link between trauma or surgery and the development of PPTTN. The natural history of PPTTN has not been fully elucidated. To the best of our knowledge, this is the first report of PPTTN following traumatic epidural hematoma (EDH). Thus, it remains unclear whether the patient's nerve injury occurred at the time of the initial trauma or during subsequent surgical intervention. More case reports are needed to better understand the characteristics of PPTTN and to develop optimal treatment strategies.

In this case, the patient was treated with anticonvulsants and tricyclic antidepressants for six months before a diagnosis of PPTTN was made, which may have delayed appropriate management. Considering the annual incidence of traumatic head injuries, it is plausible that many cases of undiagnosed PPTTN are being mistakenly treated as simple chronic postoperative pain. Of course, a prospective cohort study suggests that the response of PPTTN to current pharmacological treatments is limited. The role of surgical interventions in treating painful trigeminal neuropathy remains uncertain and requires further investigation [9].

This case highlights the possibility of trigeminal nerve injury in patients with traumatic epidural hematoma. When chronic pain persists after surgery, PPTTN should be considered in the differential diagnosis. In addition to standard neuropathic pain treatments such as anticonvulsants and tricyclic antidepressants, diagnostic nerve blocks may aid in the early recognition and management of PPTTN.

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