Reminder of important clinical lesson

In situ free-floating craniectomy: an unusual cause of chronic post-traumatic cephalalgia

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Summary

We describe a case of post-traumatic cephalalgia in a 54-year-old man with chronic right parieto-occipital headache 3 years posthead injury. At the initial presentation, his Glasgow Coma Scale (GCS) was 13/15 and CT brain revealed an acute subdural haematoma with fronto-temporal contusions. After 24 h his GCS dropped to 8/15 and subsequently he underwent a right-sided craniotomy and evacuation of the subdural haematoma and contusionectomy and intracranial pressure monitoring. To manage the cerebral oedema, the cranial bone flap was left in situ free-floating and was managed in an intensive care setting. He made good clinical recovery and 3 months postoperatively he complained of right-sided headache not relieved with medication and occipital nerve block. Three years later he underwent an exploration of the previous craniotomy scalp wound and the free-floating bone flap under the scalp was immobilised. The headache completely resolved following the procedure and is currently asymptomatic.

BACKGROUND

Decompressive craniectomy is performed in a setting of traumatic brain injury to control the intracranial pressure. In our case, the patient had an acute subdural haematoma and diffuse cerebral contusions that needed neurosurgical intervention. After a good clinical recovery from the initial head injury, the patient was left with unilateral chronic cephalalgia. Post-traumatic cephalalgia is not uncommon. Three years of relentless management with poly pharmacy and regional pain relief did not provide symptomatic relief. Surgical exploration of the trigger area in the scalp revealed a free-floating bone flap after 3 years with exposed underlying duramater. Following immobilisation of the bone flap the headache completely resolved. This is very unusual and this rare cause should be considered in the management of post-traumatic cephalalgia.

CASE PRESENTATION

A 54-year-old man presented sustained head injury following a fall from the stairs under the influence of alcohol. His Glasgow coma scale (GCS) at admission was 13/15 with significant retrograde amnesia and mild right-sided hemiparesis. CT brain at admission revealed a 5 mm acute subdural haematoma with diffuse fronto-temporal contusions with no skull fracture (figure 1). CT cervical spine showed no fracture. Following this, he was admitted for close neuro-observation. Twenty-four hours later he dropped his GCS to 8/15 with a right-sided pupillary dilatation to 7 mm not reacting to light. Repeat CT brain demonstrated increase in the size of the cerebral contusions, and the mid-line shift was 8 mm.

His medical history included bronchial asthma with no significant family history. He was not allergic to any medications. He had no history of headache or migraine prior to the trauma. He smoked 20 cigarettes a day and

consumed alcohol in moderation. He was married with three children and worked as a butcher.

Following the change in his clinical picture, he was intubated and received 200 ml of 20% mannitol to relieve the intracranial pressure. He subsequently underwent a right-sided craniotomy (in a bevelled manner) and evacuation of the acute subdural haematoma and temporal lobe contusionectomy. Preoperatively, the brain was oedematous and intracranial pressure was more than

Figure 1 CT brain demonstrating right-sided acute subdural haematoma with temporal brain contusion and contralateral contusions on the left side.

30 mm Hg. Based on this, the duramater was left unsutured and the craniectomy flap was left as a free-floating flap. As the craniotomy flap was made in a bevelled fashion, the flap would move out to accommodate the brain swelling but would not sink inside the cranial defect.

An intracranial pressure monitor was inserted and he was managed in the intensive care setting. Postoperative scan after 4 days demonstrated a good cerebral decompression (figure 2). Two weeks postoperatively he was weaned off the ventilatory support and was transferred to the ward. He recovered well and had no focal neurological deficits apart from mild retrograde amnesia. On a 3-month postoperative follow-up, he complained of right parieto-occipital headache, constant and dull over the posterior aspect of the scalp wound with no aggravating or specific relieving factors. His headache did not fit with migraine or tension type headache. He had no associated neck pain. At this stage he was reassured and was managed with analgesics.

The headache persisted over a period of 3 years post-head injury with minimal response to medications. After multiple visits with the same symptom, trigger point injection and greater occipital nerve block was tried which provided transient pain relief. He had no fever or any stigmata of local (scalp) or systemic infection during the follow-up.

INVESTIGATIONS

Haematological investigations, including his C reactive protein and erythrocyte sedimentation rate, were normal. Skull x-ray (figure 3) revealed no signs of osteomyelitis. CT brain performed 24 and 36 months (figure 4) post-brain injury ruled out any intraparenchymal and skull pathology. MRI brain and MR venogram were performed

Figure 2 Postoperative CT brain demonstrating cerebral decompression and free-floating bone flap.

Figure 3 Plain lateral skull x-ray demonstrating large craniotomy flap with no evidence of osteomyelitis.

to rule out any vascular (venous) pathology and it was normal.

DIFFERENTIAL DIAGNOSIS

- ▶ Post-traumatic cephalgia
- ▶ Osteomyelitis of the bone flap
- ▶ Post-traumatic stress disorder (PTSD)
- ▶ Somatoform disorder

Figure 4 CT brain 3 years postoperative demonstrating bone flap and hypodense gliotic changes (encephalomalacia) in the temporal lobe.

TREATMENT

In the initial period of cephalalgia, he was treated with NSAID's, Gabapentin and tramadol. This provided a brief relief of his symptoms and he was referred to pain specialists. He was treated with occipital nerve block and scalp block and instillation of local analgesia to the trigger point (right parieto-occipital region). Transcutaneous electrical stimulation was also tried but did not relieve his headache. Psychiatry input to rule out any psychosomatic disorder or post-traumatic stress disorder.

After discussing the pros and cons, the patient opted for surgical exploration. After ruling out bone flap osteomyelitis with inflammatory markers and skull x-ray, he underwent scalp wound exploration. Intraoperatively, free-floating parietal bone was noted with irregular dural margins from previous durotomy along with a normal brain parenchyma. Local anaesthesia was instilled on the dural surface. Dural repair was not attempted. The free-floating bone margin was immobilised using a titanium miniplate.

OUTCOME AND FOLLOW-UP

Immediately following the surgery he had no headache and he remains asymptomatic on a 6-month follow-up.

DISCUSSION

Headache is one of the most common complaints in patients with traumatic brain injury. Post-traumatic headache (PTH) or cephalalgia is defined as headache developing within 1 week after trauma or within 1 week after regaining consciousness.¹ Although most PTH resolves within 6–12 months after injury, approximately 18–33% of PTH persists beyond 1 year.¹ PTH remains a very controversial disorder, particularly in relation to chronic PTH following mild closed-head injury. PTH is one of several symptoms of postconcussion syndrome (PCS), and therefore may be accompanied by additional cognitive, behavioural and somatic problems. PTH also is an important public health issue due to its associated disability and often-refractory clinical course.² Moderate-to-severe PTH that is often disabling may be classified as migraine or probable migraine and is found in substantial numbers of individuals. Recent data from civilian adult, paediatric and military populations all find that PTH may be more of a chronic problem than previously thought, with a prevalence of close to half of the injured population.³

Headaches following traumatic brain injury are defined primarily by their temporal association to injury, but have no defining clinical features. Lucas *et al*⁴ in their study found migraine to be the most frequent headache type occurring in up to 38% of participants who reported headaches. Probable migraine occurred in up to 25%, tension-type headache in up to 21%, then cervicogenic headache in up to 10%. PTH is also known to have a female preponderance.⁴ Nampiaparampil,⁵ in her review concluded that PTH is independent of psychological disorders such as PTSD and depression and is common even among patients with apparently minor injuries to the brain. There is a paucity of prospective longitudinal studies of the incidence and prevalence of headache in a sample with a range of injury severity. Another study involving

452 patients suggested 71% had headache during the first year after head injury. Further, the study also found that people with a preinjury history of headache ($p<0.001$) and women ($p<0.01$) were significantly more likely to report headache.⁶ In our case, the patient was referred to psychiatrist to rule out any PTSD, depression or somatoform disorder. There was no objective evidence to state there was an underlying psychological reason for the chronic headache. All the laboratory investigations ruled out any latent or active infection that may have a role in the pathogenesis of the PTH.

Decompressive craniectomy to relieve cerebral oedema and intracranial hypertension due to traumatic brain injury is a generally accepted practice; however, the procedure remains controversial because of its uncertain effects on outcome, specific complications such as the syndrome of the sinking skin flap, and the need for subsequent cranioplasty.⁷ Another study has compared the technique of hinge craniotomy with decompressive craniectomy and concluded that the former technique to be at least as good as decompressive craniectomy in providing postoperative ICP control at a similar therapeutic index.^{7,8} In situ free-floating craniectomy is another technique recently adapted for treating an infant post-traumatic brain injury.⁹ This technique was followed in our patient prior to this study published recently, and was quite effective in treating the increased intracranial pressure and he made a good clinical recovery.

PTH in our case was secondary to the neurosurgical procedure and one may argue that this can be classified as a complication secondary to surgery. It is difficult to establish this fact in a setting of traumatic brain injury due to the spectrum of other factors responsible for PTH. Free-floating bone flap, in this instance has possibly led to meningeal irritation causing chronic headache. Exploration of the scalp wound, though not commonly followed, was resorted to as there was no other objective evidence for the headache ruling out chronic wound or bone flap infection. Subsequent immobilisation of the cranial bone flap led to symptomatic relief.

Learning points

- ▶ *In situ* free-floating craniectomy is a rare cause of post-traumatic cephalgia.
- ▶ Chronic headache following decompressive craniectomy with poor or no response to medical management may warrant surgical exploration of the scalp wound.
- ▶ Dural irritation from the free-floating bone flap may probably attribute to cephalgia in this clinical circumstance.
- ▶ Cranial bone flap immobilisation may be necessary to prevent dural irritation and for symptomatic relief.

Competing interests None.

Patient consent Obtained.

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