TITLE: CSF RHINORRHOEAE SECONDARY TO MAYFIELD HEAD CLAMP

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Abstract

We report a unique case of frontal sinus fracture and Cerebral-Spinal Fluid (CSF) leak due to the Mayfield head clamp screws used during a frontal craniotomy and debulking of glioblastoma multiforme. The CSF leak settled with conservative management and no intervention was necessary. Clinicians therefore need to be aware that in patients with large frontal sinuses such a complication is possible.

Keywords: Mayfield head clamp, Craniotomy, Complication, Frontal sinus fracture
INTRODUCTION

Many neuro-surgical procedures may require the head to be firmly supported so that pressure can be applied without the danger of any movement. During intracranial microsurgical procedures, the Mayfield head holder is widely used for head-fixation. We report a case of a frontal sinus fracture and Cerebral-Spinal Fluid (CSF) leak following application of a Mayfield head holder during a frontal craniotomy.

CASE REPORT

A 70 year-old male was admitted to the hospital with increasing headaches and left sided weakness. He had been started on Dexamethasone in the hospital with complete resolution of his symptoms. Neurological examination was unremarkable. A CT followed by an MRI showed a craggy looking heterogeneously enhancing lesion in the right fronto-parietal lobe, very suspicious of a malignant intrinsic brain tumour (Fig 1). He was keen to pursue full and active treatment, so he underwent right frontal craniotomy for biopsy and debulking of the lesion. During the procedure, the patient was in supine position, with his head turned 45° to the left and firmly stabilized by the Mayfield head clamp. These were applied in the usual fashion tightened to forehead and occipital area. At the end of the procedure, the pin sites were examined. The skin overlying the pin site on the forehead was slightly depressed and was oozing blood. This was controlled with 4.0 Ethilon suture. The procedure was uneventful and histological findings confirmed a glioglastoma multiforme.
Five days post procedure, the patient developed CSF rhinorrhoea from his left nostril. The CSF leak was confirmed by the presence of $\beta_2$ transferrin. An urgent CT scan was performed which showed CT scan showed large frontal sinuses, and an associated fracture with a displaced bony defect in the anterior table of the left frontal sinus (Fig 2a) and a small breach of the inner table (Fig 2b). There was a fluid level in the left frontal sinus and partial opacification of the left frontal recess. He was managed conservatively with a lumbar drain and the CSF leak resolved spontaneously at 5 days post drain. The patient was discharged from hospital after 10 days without any further sequelae.

DISCUSSION

Fronto-parietal craniotomies are one of the commoner neurosurgical approaches. The Mayfield head clamp is a well-established method for firmly stabilizing the head during neurosurgery (Fig 3). This device can effectively secure the cervical spine and head without restricting surgical access. Extreme care must be used in positioning the Mayfield head holder screws. Scalp pins are positioned in such way to assist exposure of the operative field and to avoid important anatomical structures. Usually they are tightened to 60lbs/sq inch.\(^1\)

Some of the complications from this device include systemic and intracranial hypertension, venous air embolism, skin necrosis, scalp laceration, loosening of the pins and the head slipping out of the clamp\(^2,3\). Other complications relate to the depth of the intracranial structures penetrated, such as extradural hematoma and meningitis have been
documented⁴. Two cases of venous air embolism⁵ and a case of unilateral blindness⁶ have also been documented whilst using the Mayfield head holder.

We describe another potentially dangerous complication due to the Mayfield head clamp. In our case the patient had well developed frontal sinuses. Fracture of the frontal sinuses can be managed conservatively or surgically depending on the degree of displacement of the fragments and the presence of complications, such as CSF leak. Uncomplicated fractures with minimal displacement of the inner table and intact sinonasal mucosa do not require treatment per se⁷. If however there is significant displacement of a fragment within the inner table with its associated risk of epilepsy, surgical management is essential⁸. In the presence of CSF leakage for more than 7-10 days, there is a significant risk of infections such as meningitis⁹.

Management of inadvertent injury to the frontal sinus is a controversial when the sinus mucosa is injured. Some surgeons prefer total mucosal exenteration, followed by irrigation, packing with antibiotic soaked gel foam and placement of a pericranial graft over the frontal recess¹⁰. Others may treat it with an osteoplastic flap and obliteration¹¹. However, in some cases where the mucosa is damaged, conservative management was equally effective.

This is the first case been reported in the literature describing fracture of both, the inner and outer tables of the frontal sinus following use of the Mayfield head clamp. Therefore there is no urgent need to alter our practice. However, we suggest that if possible the screws should be placed higher up on the skull above the surface landmarks of the frontal sinuses whenever possible. Neurosurgeons can review preoperative CT scans to assess
the anatomy of the skull including pneumatisation of the frontal sinus. We recommend that if on CT scan the frontal sinuses appear to extend to a higher level, (see figure 4), then a plain X-ray or coronal views on CT may delineate the size and extent of these frontal sinuses. This may help to prevent inadvertent injury to the frontal sinus. It is also important that surgeons are aware of CSF rhinorrhoea postoperatively and consider investigations on an urgent basis.
REFERENCES


LEGENDS

Figure 1. Axial CT scan of the head. Obvious tumour in the right fronto-parietal lobe with surrounding oedema, distortion of lateral ventricles and midline shift. Frontal sinuses appear prominent.

Figure 2. Axial CT of the head on bone settings.

2 a) - Shows a fracture of the outer table of the skull and displacement of the fragment. There is also opacification of the left frontal sinus.
2 b) - there is a small fracture of the inner table of the skull and opacification of the left frontal sinus.
Figure 3. Picture of the Mayfield head clamp.

Figure 4. Coronal CT scan of sinuses on bone settings. Obvious well developed frontal sinuses (also note right sided deviated septum, right concha bullosa and widened frontal recess.)