ABSTRACT

Objective: To report the first case of an isolated posterior table frontal sinus fracture complicated by recurrent meningitis in a pediatric patient successfully repaired by minimally invasive techniques.

Study Design: Case report and review of literature.

Methods: A detailed clinical history, pre-operative CT imaging, intra-operative photographs demonstrating a minimally invasive technique is presented and the current literature is reviewed.

Results: A 7 year-old male presented to Columbus Children’s Hospital after suffering head trauma resulting in an isolated posterior frontal sinus fracture which transnasal endoscopic reduction was attempted; however, five of these patients required endoscopic-assisted trephination to gain adequate reduction. In frontal sinus surgery, image guided trephination can minimize the risk of complications by localizing the site of a sinus lesion, avoiding the morbidity of bicoronal craniotomy repair and preserved frontal sinus function.

Conclusions: This is the first reported case of minimally invasive repair of an isolated posterior table fracture in a pediatric patient. Frontal trephination with endoscopic assistance may be used to successfully repair frontal sinus fractures with intracranial complications such as meningitis and CSF leak. Such an approach may help to avoid the morbidity of bicoronal craniotomy repair and intracranial injuries is the first priority.

Life-threatening intracranial complications can result from frontal sinus fractures. These include meningitis, encephalitis, brain abscess, persistent CSF leak, and meningoencephalocele. In a retrospective review by Whatley et al., three of eleven adults with frontal sinus fractures had initial or delayed CSF leaks; all of these were repaired with craniotomy and frontal sinus craniolization.

Minimally invasive techniques for repair of anterior table frontal sinus fractures in adults have been reported. Endoscopic brow-lifting techniques have been suggested to treat isolated anterior frontal sinus fractures; this can decrease the risk of parahistereum, scarring, and alopecia associated with a bicoronal incision. Steiger et al. reported a series of six adult patients which had isolated anterior frontal sinus fractures which transnasal endoscopic reduction was attempted; however, five of these patients required endoscopic-assisted trephination to gain adequate reduction. In frontal sinus surgery, image guided trephination can minimize the risk of complications by localizing the site of a sinus lesion, avoiding potential complications of entering the orbit or brain, and help to preserve sinus mucosa. There are no reports of minimally invasive repair of frontal sinus fractures in the pediatric literature to date.

INTRODUCTION

The pediatric population accounts for approximately 5% of maxillofacial trauma and a majority of these are nasal and mandibular fractures. Frontal sinus fractures are very rare in children due to the under-pneumatization of the sinus. The amount of force needed to fracture the frontal sinus is between 850 to 1600 foot-lbs, and therefore concomitant intracranial injuries are often present. These associated intracranial injuries are more common in pediatric patients than adults. The craniofacial ratio which is 1:1 at birth decreases to 2.5:1 in adults combined with less pneumatization may result in greater force transferred to the base of skull and intracranial structures. In the acute setting, management of these associated intracranial injuries is the first priority.

The Laryngoscope

CASE PRESENTATION

A 7 year-old white male presented to Columbus Children’s Hospital after suffering head trauma from a motor vehicle accident. A complete trauma evaluation was performed. Maxillofacial CT showed fracture isolated to the posterior table of the frontal sinus (Figure 1). The patient was admitted to a neurosurgical service and otolaryngology was consulted. Clinical exam showed no evidence of a CSF leak and conservative management of the fractures was indicated at that time.

The patient failed to follow up and was next seen after presenting to an outside hospital approximately one month later with emesis, nausea, frontal headache, and progressive lethargy. Lumbar puncture cultures again grew streptococcus pneumoniae. Hospital admission and medical management for meningitis was provided and tentative surgical repair as an outpatient was scheduled, however, the patient again failed to follow up.

Approximately fourteen months later the patient was again admitted with the presenting symptoms of headache, fever, photophobia, and neck pain. The CSF grew out streptococcus pneumoniae. Neurosurgery offered craniotomy as a surgical option to fix the posterior table defect. The otolaryngology service was consulted for alternatives.

At 9 years of age, the patient underwent endoscopic-assisted trephination approach as shown at Results. A sub-clinical CSF leak was discovered upon raising the mucosal-periosteal flap within the left frontal sinus. Intraoperative CT image guidance was used to assist in identification of the previous fracture site. This procedure was performed as an outpatient. Nine months post-operatively, the patient has had no further episodes of meningitis and is doing well.

IMAGING

SURGICAL REPAIR

We present the first case of an isolated posterior table frontal sinus fracture in a pediatric patient, that was successfully repaired using a minimally invasive technique. Endoscopic-assisted trephination with intraoperative image guidance was used. Frontal sinus function was preserved and cosmesis was excellent. This technique may be useful in select frontal sinus fractures to avoid the morbidity of a bicoronal craniotomy repair.

CONCLUSION

REFERENCES