The use of the three-pronged Mayfield head clamp resulting in an intracranial epidural hematoma in an adult patient

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Received: 12 October 2009 / Accepted: 31 January 2010 / Published online: 14 February 2010
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Abstract Complications from the use of a three-pronged Mayfield head clamp have been reported in the pediatric population, usually in children with intracranial pathology or hydrocephalus resulting in a thinner skull. We report the occurrence of an intracranial epidural hematoma in an adult patient without any prior intracranial pathology after the use of a Mayfield head clamp during posterior cervical spine surgery. The purpose of the study was to report an occurrence of epidural hematoma from the use of a Mayfield head clamp in an adult patient and to review the literature. The diagnosis of intracranial epidural hematoma should be considered in the presence of persistent headache and nausea after the use of a head clamp in spinal or intracranial surgery.

Keywords Mayfield head holder · Epidural hematoma · Cervical spine

Introduction

In the course of maintaining and stabilizing the position of the head of a patient in intracranial or posterior cervical spine surgeries, a three-pronged head holder is often utilized. In the adult patient, 60–80 lb of force is applied

across the three-point clamp to provide adequate fixation. Pin fixation in the young pediatric population is generally not recommended because of the thinness of the skull and the risk of intracranial injury. In the older pediatric population, there are risks of skull fracture, epidural hematoma, and scalp laceration and air embolism. In an adult patient without prior history of intracranial pathology, complications from a three-prong head holder are rare. We report a case of an intracranial epidural hematoma and subsequent pneumocephalus resulting from the use of a three-prong head holder in an adult patient.

Case report

A 38-year-old woman who had undergone an anterior C4–6 anterior cervical discectomy and fusion 1 year ago presented with a history of recurrent left neck, shoulder, and extremity pain for several months. Her previous medical history was only significant for endometriosis and nephrolithiasis. Flexion and extension cervical spine X-rays revealed motion at C5–6. A CT myelogram demonstrated an obvious pseudarthrosis at C5–6 and a possible pseudarthrosis at C4–5. The patient underwent a posterior C4–6 instrumented fusion with left-sided C4–5 and C5–6 foraminotomies. A three-pronged Mayfield head clamp was used to position the head in the usual fashion at the accepted anatomic landmarks, and 60 lb of force was applied across the clamp to acquire fixation. The surgery proceeded uneventfully and the head holder was removed with no evidence of drainage or bleeding from the pin sites.

Immediately post-operatively, the patient was noted to be neurologically intact. On the first post-operative day, the patient did report headache and some nausea; however, she was cognitively and neurologically intact without focal

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neurological deficits. This headache and nausea persisted on post-operative day 2, and a head CT was obtained. It demonstrated a left-sided temporal epidural hematoma with mass effect. Bony windows demonstrated a notably thinner left-sided skull thickness with a fracture at the pin site.

A neurosurgical consultation was immediately obtained and the patient was taken to the OR for an emergent left temporal craniotomy. During this procedure, the thickness of the skull at this site was noted to be extremely thin. Epidural hematoma and arterial bleeding were noted at the middle meningeal artery. The hematoma was cleared, and hemostasis was obtained.

The patient did well post-operatively and was discharged home 6 days after the initial posterior spine procedure. Over the next 10 days, the patient reported recurrent headaches. A repeat CT scan of the head demonstrated a left posterior fossa pneumocephalus. The patient underwent a revision left craniotomy for repair of cranial defect with placement of a muscular and dural graft. The surgery proceeded uneventfully and the patient has since had a complete recovery with resolution of pre-operative neck and arm symptoms and no residual sequelae from the epidural hematoma.

Discussion

In posterior cervical spine surgery, the Mayfield head clamp may be used to provide a rigid, stable position of the head throughout the procedure. The use of the Mayfield head clamp has been associated with skull fractures, lacerations, air embolisms and epidural hematoma in children [1–5]. Intracranial epidural hematoma after use of a Mayfield head clamp has been reported in the pediatric population; however, to our knowledge, it has not been reported in an adult patient.

For the adult patient, 60–80 lb of force is applied across the clamp. Because of the thinner skull, lesser force is generally recommended in the pediatric population. In the very young pediatric population, pin fixation may not be recommended at all. Patients with intracranial pathology resulting in longstanding increased intracranial pressures and hydrocephalus may also have thin skulls and may be at risk for injury with pin fixation.

Yan [5] reported an intracranial epidural hematoma from a Mayfield clamp in a 15-year-old boy with a posterior fossa midline tumor and associated hydrocephalus. A force of 60 lb was applied across the clamp during the procedure, and the mass was resected. Six hours post-operatively, the patient's GCS was noted to be six, and the blood was noted to be draining from one of the pin sites. A CT scan showed an epidural hematoma in the fronto-

Fig. 1 Left-sided temporal epidural hematoma (arrow)

temporal parietal region (Fig. 1) and a skull fracture at one of the pin sites (Fig. 2). This patient underwent a craniotomy and regained consciousness.

Baerts et al. [1] reported an epidural hematoma beneath the pin site in a 10-year-old girl who was treated surgically for a glioma in the frontal lobe. Ten days post-operatively, she presented with headaches and vomiting. A CT scan

Fig. 2 Bone window demonstrating left-sided skull fracture (left dotted circle). The skull at the fracture site is notably thinner than the contralateral side

showed a right parieto-occipital epidural hematoma. This patient underwent a craniotomy and was in good general health 4 weeks later.

A skull fracture and subsequent hematoma from a three-pronged head clamp in a normal adult patient is extremely rare and has not been previously reported to our knowledge. This patient's left-sided skull thickness was notably thinner than the contralateral side. The etiology of this decreased bone thickness is unclear. Given the lack of a prior history of intracranial or hydrocephalus pathology, it appears that the decreased skull thickness at this pin site may be a normal anatomic variant.

We present a case report of a rare complication of an epidural hematoma from the use of a three-pronged Mayfield head clamp in an adult patient. In this case, the primary presenting symptoms from this complication were headache and nausea. A routine head CT scan before using pin fixation in the head in a normal patient is probably not warranted because of the infrequency of this finding. However, strong consideration for a head CT scan should

be given in the presence of persistent headache and nausea after the use of a head clamp in spinal or intracranial surgery.

Conflict of interest statement None of the authors has any potential conflict of interest.

References

1. Baerts WD, de Lange JJ, Booij LH, Broere G (1984) Complications of the Mayfield skull clamp. *Anesthesiology* 61(4):460–461
2. Grinberg F, Slaughter TF, McGrath BJ (1995) Probable venous air embolism associated with removal of the Mayfield skull clamp. *Anesth Analg* 80(5):1049–1050
3. Lee M, Rezai AR, Chou J (1994) Depressed skull fractures in children secondary to skull clamp fixation devices. *Pediatr Neurosurg* 21(3):174–177
4. Pang D (1982) Air embolism associated with wounds from a pin-type head holder. Case report. *J Neurosurg* 57(5):710–713
5. Yan HJ (2007) Epidural hematoma following use of a three-point skull clamp. *J Clin Neurosci* 14(7):691–693