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Spontaneous Resolution of a Posterior Fossa Arachnoid Cyst Following a Closed Head Injury: A Case Report

Norman I. Bamber[1] and Vikram C. Prabhu[2*]

[1]*St Joseph Neurosurgical Associates, Kansas City, MO*

[2]*Department of Neurological Surgery, Loyola University Medical Center / Stritch School of Medicine, Maywood, IL*

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ABSTRACT

Introduction: Arachnoid cysts of the posterior fossa are rare. Controversy exists regarding the management of asymptomatic or minimally symptomatic arachnoid cysts found incidentally following closed head injury.

Case Report: A previously healthy 8 year-old girl presented following a moderate closed head injury. The patient complained of mild headache and nausea and had one episode of vomiting but was without neurologic deficit. Computed tomography demonstrated a left parieto-occipital epidural hematoma as well as a posterior fossa arachnoid cyst. Neither lesion caused clinically significant mass effect. In the absence of neurologic deficits, the patient was managed conservatively without surgical intervention. Follow-up imaging demonstrated complete resolution of both lesions.

Conclusion: This case represents a rare spontaneous resolution of a posterior fossa arachnoid cyst following a closed head injury and lends credence to the conservative management of incidentally found, asymptomatic arachnoid cysts. However, further discussion is needed regarding the management of asymptomatic arachnoid cysts found in young, active individuals who may be at increased risk of associated hemorrhage following closed head injury.

Keywords: Posterior cranial fossa, Arachnoid cyst, Cranial epidural hematoma, Head injury

INTRODUCTION

Arachnoid cysts account for about 1% of all intracranial mass lesions and are considered congenital abnormalities [1,5, 9-12,16]. Approximately 50% of arachnoid cysts occur in the middle cranial fossa with less common locations including the convexity, the parasellar region, the quadrigeminal plate, the cerebellopontine angle cisterns, the intraventricular space and the posterior cranial fossa. The prevalence of arachnoid cysts in the general population though may be higher as asymptomatic cysts are being increasingly diagnosed with modern imaging. Hemorrhage and hematoma formation may occur with arachnoid cysts following even minor head trauma. Large and symptomatic cysts are generally treated successfully by surgical intervention [1,10,13]. Decompression of the cyst and associated hematoma via a burr-hole or craniotomy has been reported [1,10,11,13]. Serial observation is the norm for cysts without mass effect, hemorrhage, or clinical signs or symptoms.

Arachnoid cysts have been linked to hematoma, hemorrhage, and subdural effusion formation following head trauma. Specifically, middle cranial fossa arachnoid cysts have a tendency to form subdural hematomas and hygromas [1,10,13]. Conversely, spontaneous resolution of arachnoid cysts has been reported – both following head injury or in the absence of any cranial trauma [5,9,11,12,15]. This phenomenon is primarily reported for cysts in the anterior and middle cranial fossa with only one spontaneous resolution of a posterior fossa cyst noted in an infant [1,5,9-13,15]. The case reported here is unique in that it represents a posterior fossa arachnoid cyst (PFAC) identified in a young, active child, that bled following a moderate closed head trauma but spontaneously decompressed without surgical intervention. It is believed that this is the only such case present in the literature.

Corresponding author: Vikram C. Prabhu, MD, MS, FACS, FAANS, Professor, Department of Neurological Surgery & Radiation Oncology, Loyola University Medical Center, 221 160 S. First Ave., Maywood, IL 60153, Tel: (708) 216-0005; Fax (708) 216-4948; E-mail: vprabhu@lumc.edu

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CASE REPORT

This eight year-old, previously healthy Caucasian female fell down approximately 10 steps, striking her head upon a concrete floor without loss of consciousness. She complained of headache and nausea and had one episode of non-projectile vomiting. She had no neurologic deficits. Cranial CT scan demonstrated a small, biconvex, left parieto-occipital epidural hematoma (EDH, **Figure 1a**) without evidence of overlying fracture or significant underlying mass effect. In addition, an iso-dense extra-axial fluid collection with a focal high-density region was noted in the left posterior fossa (**Figure 1b).** On magnetic resonance imaging (MRI), the cyst located in the posterior aspect of the left posterior fossa measured 38 x 25 x 17 mm in size and had moderate mass effect, effacing but not occluding the adjacent fourth ventricle **(Figure 1c).** No radiographic evidence of hydrocephalus was appreciated. The patient was observed in the pediatric intensive care unit for 72 hours without neurologic decline and with gradual resolution of her symptoms. She was managed non-operatively because of the absence of neurologic deficit or symptoms and the minimal mass effect associated with both the supratentorial and infratentorial lesions.

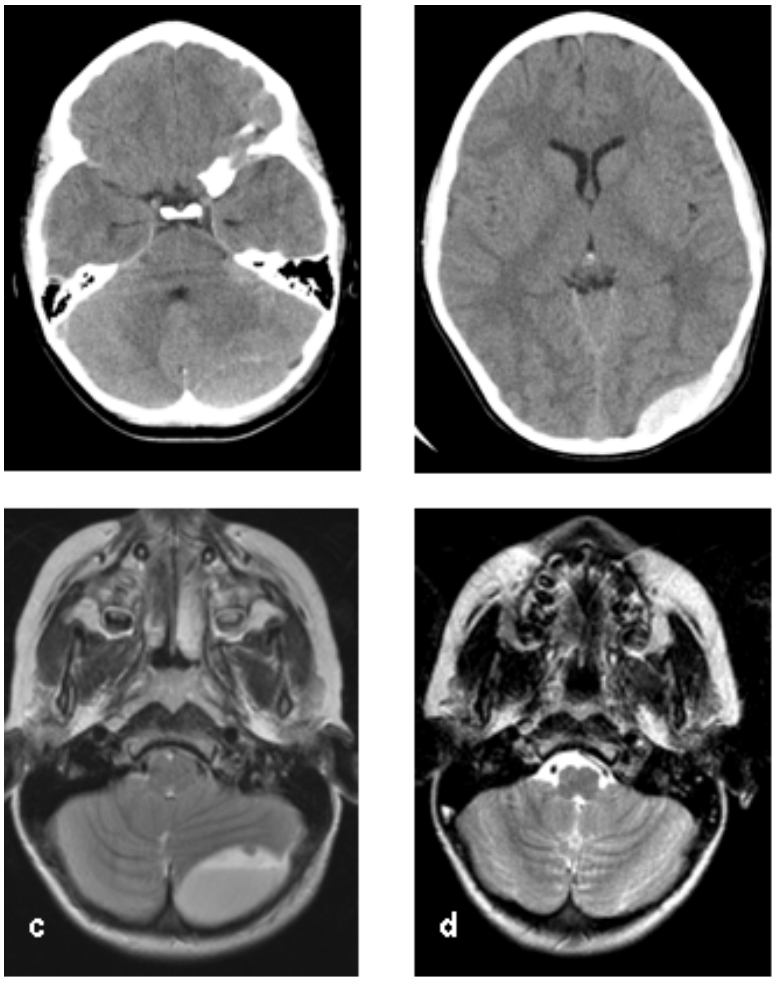

Figure 1. (a) Non-contrast CT head from admission demonstrates an isodense posterior fossa arachnoid cyst (PFAC) (black arrow). (b) Same CT demonstrating a more cephalad left parieto-occipital EDH (black arrow). (c) Initial axial T2-weighted MRI following admission illustrates fluid layering within the PFAC. (d) Axial T2-weighted MRI obtained 2 months later clearly demonstrates complete resolution of the PFAC.

At 1 week follow-up, the patient reported occasional, mild headaches that were relieved by over-the-counter medications. She denied any nausea, vomiting, or diplopia, and had no neurological deficits. The headaches were aggravated when she bent over, minimally exerted, or strained. Cranial CT scan showed no change in the left-sided posterior arachnoid cyst, but the left parieto-occipital epidural hematoma was slightly smaller. No new pathology was identified. The fourth ventricle was open and the ventricular system was midline and without enlargement.

While they considered this option, nausea and dizziness prompted another cranial CT scan three weeks later that demonstrated complete resolution of the left parieto-occipital epidural hematoma and the posterior fossa arachnoid cyst. Resolution of the cyst and hematoma was verified by MRI at the two month follow-up visit **(Figure 1d).** The child was released to full activities without restrictions six months after the initial injury. As of 2-year follow-up, she is doing well at a full level of activity including participation in sporting events without restrictions.

DISCUSSION

Spontaneous resolution or decompression of an arachnoid cyst generally occurs into the subarachnoid or subdural space and has been reported both following trauma and in the absence of any cranial injury [1,5,9-13,15]. Such resolution has also been reported in symptomatic and asymptomatic patients over a period of months to years [1,5,9-13,15]. The majority of cases of spontaneous resolution reportedly followed a head injury with associated subdural hematoma and hygroma formation that presumably communicated with the cyst cavity. The cases also commonly involved middle cranial fossa cysts, although this may simply reflect the preponderance of arachnoid cysts in this location as compared to other cranial compartments [1,10,11,13,19].

The formation of cysts in the middle cranial fossa is believed to be a consequence of malformation of the sylvian fissure during fetal development [19]. Subdural hematomas, hygromas, and subdural effusion formation in the presence of middle cranial fossa arachnoid cysts have been attributed to the tearing of the arachnoid cyst wall following head injury or spontaneously from rupture of bridging veins, unsupported blood vessels, and leptomingeal vessels at the base of the cyst [1,7,11,13]. Poor support of associated blood vessels may make them prone to rupture with formation of epidural and sudural hematomas subsequent to relatively minor trauma [4]. Surgical intervention in these cases generally includes burr-hole or twist-drill craniostomy irrigation or craniotomy evacuation to relieve mass effect [1,7,11,13]. Draining these mass lesions sometimes results in the decompression or dissolution of the accompanying cyst leading to either complete resolution of the cyst or significant decrease in its size. The physical relationship between the cyst and the subsequent phenomenon had an important role in the regression of the cyst. Refractory collections or cysts associated with significant mass effect may also be treated with a shunt into the peritoneal cavity.

Arachnoid cysts located in the posterior fossa are rare. In addition, there is only one reported case of spontaneous resolution of a PFAC. In that case, a PFAC was found in an infant who presented with hydrocephalus and an enlarged head circumference, full anterior fontanelle, and upgaze paresis [12]. Surgical drainage of the cyst was planned as it was presumed to be the source of ventricular obstruction but prior to the planned intervention, the cyst spontaneously decompressed and the hydrocephalus resolved without an obvious explanation. Other cases of arachnoid cysts spontaneously resolving have been reported in the middle cranial fossa and pre-pontine cistern [5,9,15]. Possible mechanisms to explain the resolution of cysts without surgical intervention include fistula formation between the cyst membrane and the subdural or subarachnoid spaces [6,20] leading to subdural hygroma formation with subsequent absorption of cyst fluid and communication between the cyst and the subarachnoid space [3,18] with the absorption of cyst fluid via the normal CSF pathways. Spontaneous resolution of a PFAC is rare, and the close confines of the posterior cranial fossa, makes surgical decision making in these instances critical.

Management of symptomatic arachnoid cysts includes simple fenestration and drainage with and without excision of membranes or shunting of cyst contents to the peritoneal cavity. These techniques have been the standard of care for these types of cases, and patients have experienced beneficial results with positive outcomes. The surgical morbidity associated with these procedures is also minimal. The common practice for asymptomatic cysts has been non-interventional with management including careful monitoring and serial imaging. Reports of spontaneous resolution of these types of cysts and the reluctance to pursue aggressive intervention have contributed to this management approach. However, there remains the risk of 0.1% to these patients of developing hemorrhage following a head injury with an untreated cyst as previously reported in the literature [13].

In the case report presented here, the cyst became filled with blood following the head injury. Prior to the head injury, the PFAC was undiagnosed and asymptomatic. The patient could have been treated surgically by fenestrating the cyst to decrease the risk of hemorrhage and allow her to return to full activity. Without surgical intervention, the question remained what risk would the patient face and what limitations would she have to observe in her school sports activities at present and in the future. Given the size of the cyst, the location in the posterior fossa, the fact that the cyst had bled with the previous trauma, and the inherent risk of future adverse events, particularly if the patient returned to full activity, we did consider the option of surgical fenestration. However, prior to that intervention, the cyst resolved spontaneously.

A study reported by Swaine and Friedman revealed that children who sought care for a head injury in an emergency setting were more likely to have a subsequent head injury in the following 12 months than those reporting to the emergency room with no head injury [17]. The relative risk of having a subsequent head injury was found to be 2.6 with

a 95% confidence interval of 1.2 to 5.5 [17]. With an elevated risk of head injury to patients who had suffered trauma, activity restrictions are usually a part of the management. However, the literature lacks a standard or protocol following general head injury to determine what type of activities should be restricted and for how long.

Specific guidelines exist following sports injuries due to concussion with time frames for returning to sporting activities, but guidelines following general head trauma are based upon physician experience and suggestion. Certain youth sports or activities such as baseball, soccer or gymnastics, are reported to have a higher risk of head injury. Baseball/softball was found to have an injury rate of 0.057 injuries per 100 player hours and a severe injury rate of 0.008 per 100 player hours with 62% of injuries caused by being struck by the ball both on offence and defense [2]. Injuries from this sport occur more frequently with younger players because of their lower skill level, slower reaction time, and varying abilities [2]. Important to note is that players on offense usually wear helmets to protect their heads, but no such protection is used for players on defense. Basketball injuries were due to falls and being struck by or against objects mostly during school-related activities [2]. Acute subdural and epidural hematomas are observed with these injuries. Head injuries in gymnastics are due to falls, but represent only 1% of the total reported injuries for this sport [2]. Soccer related injuries result from collision between players, falls onto the ground or into goal post, or from players striking the ball with their head. Most injuries result from player-to-player collisions [2], but some evidence suggests a secondary sequelae from repeatedly striking the ball with one's head [13]. A previous case report described a child who developed a large subdural hemorrhage associated with a temporal fossa arachnoid cyst after being struck in the head by a soccer ball [14]. Soccer is one of the few sports that utilizes the head as a technique to play the game. "Heading" is used to strike the ball or passively receive it and control its flight and direction. Players head the ball 5 to 6 times on average during a regular soccer game and more frequently during practice sessions. Matser et al. reported that 27% of amateur soccer players had incurred 1 soccer related concussion, and 23% had experienced multiple concussions during their careers [8]. Over a ten-year career of playing soccer, there is a 50% likelihood of suffering a concussion. Popularity of the sport of soccer has not diminished, with an estimated 6 million children under age 12 who played on soccer teams within a year [2].

The case presented here is unique not only for its outcome, but also as a discussion point for patient management in this situation. Suggestions made by Swaine and Freidman for returning to activity following head injury include rest as needed and return to daily activities, but they advise against participation in gym activities, contact sports, and strenuous activities for 4 weeks [17]. A gradual return to physical activity is permitted after 4 weeks only if the patient has been symptom free for 1 week, and if new problems arise or previous ones recur, they can be treated symptomatically [17]. Another option, as evidenced in our reported case, is to make a decision for surgery based on the patient's symptoms and signs and the correlate that with the imaging findings, in particular the presence or absence of clinically significant mass effect. A relatively asymptomatic patient with a lesion causing minimal mass effect may be safely observed. Return to sporting activities may then be permitted without restrictions once the child is six months out from any surgical procedure that is successful in obliterating the cyst or from the last imaging study demonstrating complete resolution of the lesion. Persistence of the lesion in an otherwise asymptomatic person warrants serial imaging follow-up and prohibition of sporting activities that involve significant body contact or motion, or physical use of the cranium as in "heading" a soccer ball. Lesions that do resolve should be followed with cranial imaging for two to three years following the initial injury to ensure there is no re-accumulation of the cyst. While CT scanning may be adequate for follow-up, MRI may better define the lesion at initial assessment, especially if it is located in the posterior fossa.

CONCLUSION

Posterior fossa arachnoid cysts may spontaneously resolve in some instances either following a head injury or in the absence of any cranial trauma. Observation of incidentally found, asymptomatic arachnoid cysts or lesions causing minimal mass effect is reasonable. Return to sporting activities may be permitted once the child is six months out from any surgical procedure successful in obliterating a cyst or from the last imaging study demonstrating complete resolution of a lesion. Persistence of a lesion in an otherwise asymptomatic person warrants serial imaging follow-up and prohibition of sporting activities that involve significant head or body contact. While CT scanning may be adequate for follow-up, MRI may better define a lesion at initial assessment, especially if located in the posterior fossa.

REFERENCES

1. Albuquerque FC, Giannotta SL (1997) Arachnoid cyst rupture producing subdural hygroma and intracranial hypertension: case reports. Neurosurg 41: 951-956.
2. Bailes JE, Day A (2001) Neurological sports medicine: a guide for physicians & athletic trainers. American Association of Neurological Surgeons, Rolling Meadows, IL.
3. Beltramello A, Mazza C (1985) Spontaneous disappearance of a large middle fossa arachnoid cyst. Surg Neurol 24: 181-183.

4. Demetriades A, McEvoy A, Kitchen N (2004) Subdural haematoma associated with an arachnoid cyst after repetitive minor heading injury in ball games. Br J Sports Med 38: E8.

5. Dodd RL, Barnes PD, Huhn S (2002) Spontaneous resolution of a prepontine arachnoid cyst. Pediatr Neurosurg 37: 152-157.

6. Inoue T, Matsushima T, Tashima S, Fukui M, Hasuo K (1987) Spontaneous disappearance of a middle fossa arachnoid cyst associated with subdural hematoma. Surg Neurol 28: 447-450.

7. Koshinaga M, Whittemore SR (1995) The temporal and spatial activation of microglia in fiber tracts undergoing anterograde and retrograde degeneration following spinal cord lesion. J Neurotrauma 12: 209-222.

8. Matser EJ, Kessels AG, Lezak MD, D JB, Troost J (1999) Neuropsychological impairment in amateur soccer players. JAMA 282: 971-973.

9. McDonald PJ, Rutka JT (1997) Middle cranial fossa arachnoid cysts that come and go. Pediatr Neurosurg 26: 48-52.

10. Mori K, Yamamoto T, Horinaka N, Maeda M (2002) Arachnoid cyst is a risk factor for chronic subdural hematoma in juveniles: twelve cases of chronic subdural hematoma associated with arachnoid cyst. J Neurotrauma 19: 1017-1027.

11. Mori T, Fujimoto M, Sakae K, Sakakibara T, Shin H, Yamaki T, Ueda S (1995) Disappearance of arachnoid cysts after head injury. Neurosurgery 36: 938-942.

12. Pandey P, Tripathi M, Chandra PS, Singh VP, Mehta VS (2001) Spontaneous decompression of a posterior fossa arachnoid cyst: a case report. Pediatr Neurosurg 35: 162-163.

13. Parsch CS, Krauss J, Hofmann E, Meixensberger J, Roosen K (1997) Arachnoid cysts associated with subdural hematomas and hygromas: analysis of 16 cases, long-term follow up, and review of the literature. Neurosurgery 40: 483-490.

14. Prabhu VC, Bailes JE (2002) Chronic subdural hematoma complicating arachnoid cyst secondary to soccer-related head injury: case report. Neurosurgery 50: 195-197.

15. Przybylo HJ, Radkowski MA, Przybylo J, McLone D (1997) Spontaneous resolution of an asymptomatic arachnoid cyst. Pediatr Neurosurg 26: 312-314.

16. Rengachary S, Watanabe I, Brackett C (1978) Pathogenesis of intracranial arachnoid cysts. Surg Neurol 9: 139-144.

17. Swaine BR, Friedman DS (2001) Activity restrictions as part of the discharge management for children with a traumatic head injury. Head Trauma Rehabil 16: 292-301.

18. Weber R, Voit T, Lumenta C, Lenard H-G (1991) Spontaneous regression of a temporal arachnoid cyst. Child Nerv Syst 7: 414-415.

19. Wester K (1999) Peculiarities of intracranial arachnoid cysts: location, sidedness and sex distribution in 126 consecutive patients. Neurosurgery 45: 775-779.

20. Yamanouchi Y, Someda K, Oka N (1986) Spontaneous disappearance of a middle fossa arachnoid cysts after head injury. Child Nerv Syst 2: 40-43.