

Chronic Ossified Epidural Hematoma After Ventriculoperitoneal Shunt Insertion: A Case Report

Ventriküloperitoneal Şant Uygulanmasından Sonra Gelişen Kronik Kemikleşmiş Epidural Hematom: Olgu Sunumu

ABSTRACT

Chronic calcified/ossified epidural hematoma is an uncommon complication of ventricular shunt surgery. There are only 4 cases related to valve-regulated shunt operations in the literature. It may be seen especially in young patients with chronic hydrocephalus, probably due to craniocerebral disproportion. The precise mechanism of the calcification or ossification of the hematoma is not known, however, the dura mater seems to play a part in this process. A 17-year-old girl with triventricular hydrocephalus was treated with a ventriculoperitoneal shunt system including a medium pressure flow control valve. She was admitted with a complaint of severe headache after three years and a bifrontal calcified/ossified epidural hematoma was seen. The calcifying hematoma was removed and the patient's headache resolved. Although the use of high or medium pressure valves, valves with an antisiphon device, adjustable pressure valves or flow control valves have been recommended to prevent this complication in previous reports, it was seen that our case had been treated with a medium pressure flow control valve.

KEYWORDS: Chronic epidural hematoma, Complication, Ventriculoperitoneal shunt, Epidural hematoma

ÖZ

Kronik kalsifiye/kemikleşmiş epidural hematom ventriküler şant ameliyatlarının nadir bir komplikasyonudur. Literatürde pompalı şant uygulanmasından sonra gelişmiş sadece 4 olgu bildirilmiştir. Olasılıkla kranyoserebral uyumsuzluk nedeniyle kronik hidrosefali olan genç hastalarda daha sık görülür. Hematomun kalsifikasyonu ya da kemikleşmesinin mekanizması tam olarak bilinmese de, bu süreçte olasılıkla dura materin rolü vardır. Bifrontal kalsifiye epidural hematomu olan ve baş ağrısıyla başvuran triventriküler hidrosefali olan 17 yaşında bir kız çocuğuna orta basınçlı akım kontrollü valvi olan ventriküloperitoneal şant sistemi uygulandı. Hasta 3 yıl sonra şiddetli baş ağrısıyla başvurdu ve bifrontal kalsifiye/kemikleşmiş epidural hematom saptandı. Kalsifiye hematom çıkarıldıktan sonra hastanın baş ağrısı geçti. Daha önceki yayınlarda bu komplikasyonun önlenmesi için yüksek ya da orta basınçlı valvler, sifon etkisini önleyici cihazlar, ayarlanabilir basınçlı ya da akım kontrollü valvler kullanılması önerilmişse de, orta basınçlı akım kontrollü valv kullandığımız olguda da geliştiği görülmüştür.

ANAHTAR SÖZCÜKLER: Komplikasyon, Kronik epidural hematom, Ventriküloperitoneal şant, Epidural hematom

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INTRODUCTION

Posttraumatic ossified and/or calcified epidural hematomas have been published as isolated cases in literature after trauma since the introduction of computerized tomography (CT) scanning (1,2,11,13,14,16). Subdural hematomas following ventricular drainage due to shunting or intracranial surgery are usual and may undergo calcification and ossification. However, epidural hematoma (EDH) after ventricular drainage is unusual. There are only 18 cases of EDH after valve regulated shunt placement in the literature (3,5-9,12,15,17,18,20-22), and only 4 of these cases are calcified/ossified chronic EDH (12,15,18).

We reported a 20-year-old female with a bifrontal epidural ossified EDH detected 3 years after ventriculoperitoneal shunt surgery.

CASE REPORT

A 17-year-old girl was admitted with complaints of severe headache for 2 years, and decrease of vision for three months to our outpatient clinic. Her neurological examination revealed normal findings except a decrease of vision on her left eye, and bilateral optic disc edema. Triventricular hydrocephalus and aqueductal stenosis were shown on the computed tomography (CT) scan and magnetic resonance imaging (MRI) (Figure 1). A ventriculoperitoneal shunt with a medium pressure flow control valve (Medtronic) was inserted from a right temporooccipital burr-hole. The patient's clinical condition was uneventful, her headache

resolved, her visual field deficit improved, and she was discharged 1 week later.

She had no complaints for a long period but a headache developed three years after surgery and gradually increased. Her neurological examination was normal, and her shunt valve was functioning with palpation.

Skull films showed a bifrontal oval radiopaque lesion with a curving double line of calcification. CT showed an isodense bifrontal intracranial mass under the skull with an inner surface bordered by a thick hyperdense layer. The ventricles were not large, and the ventricular catheter was in place (Figure 2A). The calvarium over the lesion was normal. T1-weighted MR images disclosed a hyperintense extraaxial mass just beneath the skull compressing the frontal lobes. This lesion was interpreted as a calcified chronic epidural hematoma (Figure 2B).

A bifrontal craniotomy was performed. The mass was located extradurally and adhered to the overlying bone as a tortoise shell. The inner surface of the lesion was adherent to the outer layer of the dura mater. It contained a thick organized fibrocollagenous mass with about 10 ml of dark yellow fluid.

Pathologically, a thick fibrotic hematoma capsule and a small hematoma cavity were identified. Ossification and calcification areas were seen on the dural side (Figure 3).

The postoperative course was uneventful, and postoperative CT showed that complete removal of the hematoma with the associated ossification had been achieved. The patient was asymptomatic when she was discharged. Her headache resolved completely. There were no complaints or neurological findings, and her shunt was functioning 36 months later.

DISCUSSION

Subdural collection due to rapid lowering of intracranial pressure is a well-known complication of ventricular drainage, especially in patients with craniocerebral discrepancy due to chronic hydrocephalus. Epidural hematomas are much rarer after ventricular drainage because the dura is generally adhered to the inner surface of the skull (12). Perhaps the skull-dura adhesions are less significant than the dura arachnoid adhesions in some patients and an EDH may form instead of the more common subdural hematoma (12). Sengupta and Hankinson



Figure 1: Axial CT section before ventriculoperitoneal shunt operation.

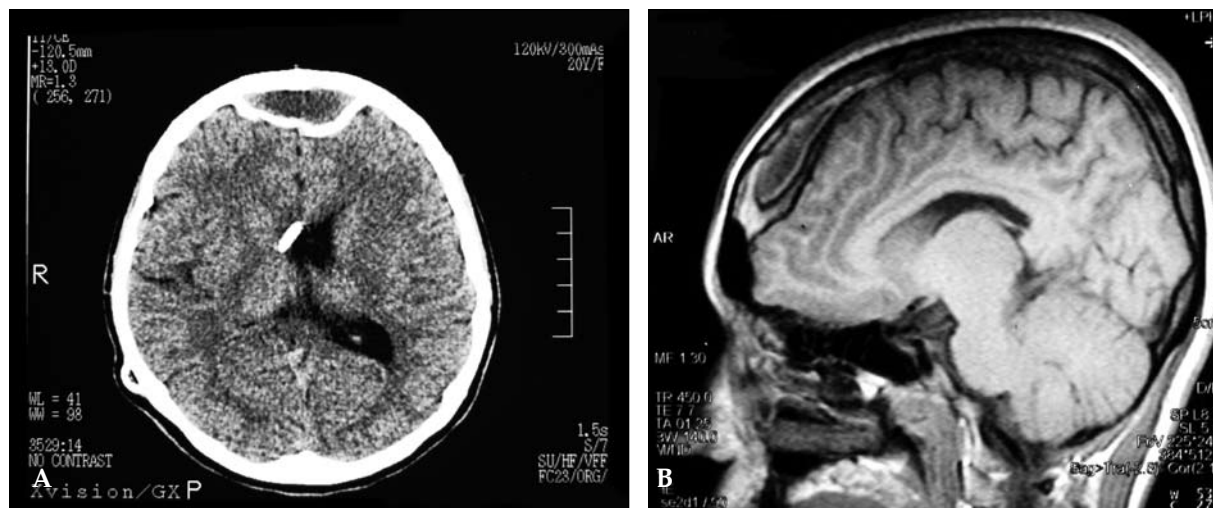


Figure 2: Axial CT section (A), and T1-weighted sagittal MRI section (B) showing bifrontal chronic calcifying epidural hematoma.

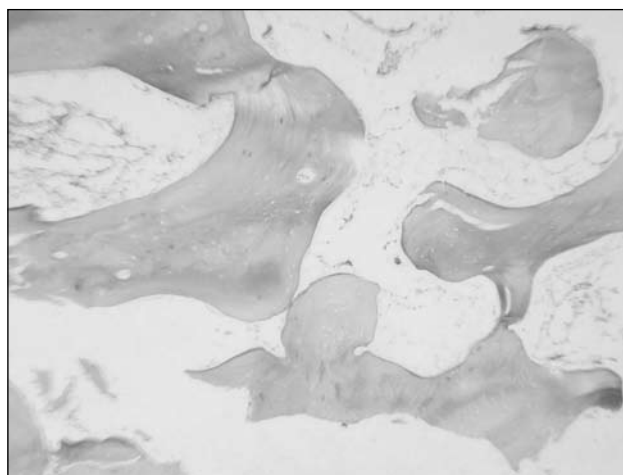


Figure 3: Histopathological section of the calcified dural side of the lesion showing lamellar bone formation (HE, 275x).

(19) reported three EDH cases due to CSF drainage and reviewed the details of further 22 patients. The common factors noted in these patients included age less than 20 years and evidence of chronic hydrocephalus (12,19). The cause of bleeding in EDH in those patients is generally thought to be a sudden drop in CSF pressure (3,19), and infants are especially at risk as the dura mater can be easily detached from the inner cranium at this young age (19).

Usage of valve-regulated shunt systems has lowered the incidence of subdural collections after ventricular drainage. The same mechanism is also true for EDH. Driesen and Elies (3) reported epidural bleeding after ventriculoatrial shunting in 5.6% of adult patients, and 0% of pediatric ones between 1965 and 1973. Fukamachi et al. (6) reported that

the incidence of EDH after ventricular drainage procedures including shunt operations as 0.4%. There are only 18 cases of epidural hematomas after valve-regulated shunt placement in the literature (3,5-9,12,15,17,18,20-22). Most of these cases had acute hematomas, and only 5 of them including our one had chronic calcified/ossified hematomas (12,15,18). These patients were 15 to 35 years old.

A postoperative epidural hematoma usually causes symptoms during or immediately after surgery (8). However, the diagnosis may be delayed in a case with VP shunt insertion because of a reduction in CSF volume in the ventricles via a properly functioning shunt (15). The most common initial symptom is a headache as in our case and there may be seizures in delayed cases (15).

The presence of calcification was identified at a variety of intervals, between 10 days and 50 years, after the primary bleeding in chronic calcified epidural hematomas, and most of them were posttraumatic hematomas (4,16). Iwakuma and Brunngraber (10) reported microscopic signs of ossification following hematoma on the 9th day after head injury in a 9-month-old baby. The interval between shunt placement and detection of hematoma was 5 weeks to 3 years in chronic EDH cases after shunt insertion.

The hematomas were unrelated to the burr-hole sites in most of the EDH cases due to a ventriculoperitoneal shunt. In a series of 5 cases with chronic hematomas, two hematomas in two

patients were related to the burr-hole sites while the hematomas in other three cases were far away from the burr-holes, and three of them were in the frontal region. This may be because the dura mater in the anterior half of the cranial vault adheres less to the bone than in the posterior half (19).

Surgery may be necessary if the symptoms and signs cannot be controlled with medical therapy, and if there is no shunt malfunction. Three of the 5 cases including our patient were operated but the pathological examination of the calcified hematoma could be performed in only two cases (15). Histopathological examinations showed normal and new bone in the inner shell of the hematoma in these cases.

The precise mechanism of an osseous transformation is still not well understood but it may be due to an inflammatory reaction to the damage of vascularized tissues such as dura mater or bone (4). Nagane et al. (16) postulated that cellular necrosis or hyalinization of the connective tissue continues within the capsule over a lengthy period under conditions of poor circulation or malabsorption of the hematoma content, resulting in calcium deposits. The calcification developed primarily on the dural side of the hematoma in all cases. This is similar to chronic subdural hematomas where calcification of the capsule is usually thicker in the outer layer under the dura (16). Therefore, calcification of chronic hematomas may be related to the dura mater. The outer layer of the dura mater is derived from the endosteum of the inner surface of the calvarium and stimulation of the hematoma could therefore also actively evoke extradural ossification between the capsule and the dura, and ossification may also be related to the dura (1,11).

A Hakim Cordis ventriculoperitoneal shunt had been used in the case reported by Kalia et al. (12) while a medium pressure flow control shunt valve (Medtronic) had been used in our case. The characteristics of shunt valves were not reported in the other three patients.

Some precautions are recommended to minimize the bleeding complications after ventriculoperitoneal shunting: minimal CSF spillage at the time of ventricular catheter insertion, meticulous surgical technique; use of high or medium pressure valves or differential pressure valves; slow return to upright

position and close follow-up even including a postoperative CT scan (12,21). An antisiphon device (7) or a flow rate limiting system (5) may also decrease the chance of this complication occurring. However, a hematoma developed despite the use of a medium pressure flow control valve in our patient.

REFERENCES

1. Chang JH, Choi JY, Chang JW, Park YG, Kim TS, Chung SS: Chronic epidural hematoma with rapid ossification. *Childs Nerv Syst* 18:712-716, 2002
2. Domenicucci M, Signorini P, Strzelecki J, Delfini R: Delayed posttraumatic epidural hematoma: A review *Neurosurg Rev* 1995, 18: 109-122, 1995
3. Driesen W, Elies W: Epidural and subdural hematomas as a complication of internal drainage of cerebrospinal fluid in hydrocephalus. *Acta Neurochir* 30:85-93, 1974
4. Erdogan B, Sen O, Bal N, Cekinmez M, Altinors N: Rapidly calcifying and ossifying epidural hematoma. *Pediatr Neurosurg* 39:208-211, 2003
5. Fujimoto Y, Aguiar PH, Carneiro JDA, Martins RS, Ciquini O Jr, Andrade AF, Manreza LA: Spontaneous epidural hematoma following a shunt in an infant with congenital factor X deficiency. *Neurosurg Rev* 22:226-229, 1999
6. Fukamachi A, Koizumi H, Nagaseki Y, Nukui H: Postoperative extradural hematomas: Computed tomographic survey of 1105 intracranial operations. *Neurosurgery* 19:589-593, 1986
7. Gulliksen G, Haase J: Epidural hematoma following a shunt revision. *Acta Neurochir* 36:107-109, 1977
8. Hamlat A, Heckly A, Doumbouya N, Seigneuret E, Brassier G: Epidural hematoma as a complication of endoscopic biopsy and shunt placement in a patient harboring a third ventricle tumor. *Pediatr Neurosurg* 40:245-248, 2004
9. Iplikcioglu AC, Bayar MA, Kokes F, Yıldız B, Gökçek C, Buharalı Z: A fluid level in an acute extradural haematoma. *Neuroradiology* 36:31-32, 1994
10. Iwakuma T, Brunngraber CV: Chronic extradural hematomas: a study of 21 cases. *J Neurosurg* 38:488-493, 1973
11. Iwakuma T, Brunngraber CV: Extradural ossification following an extradural hematoma. *J Neurosurg* 41:104-106, 1974
12. Kalia KK, Swift DM, Panz D: Multiple epidural hematomas following ventriculoperitoneal shunt. *Pediatr Neurosurg* 19:78-80, 1993
13. Kaye EM, Cass PR, Dooling E, Rpsman NP: Chronic epidural hematomas in childhood: Increased recognition and nonsurgical management. *Pediatr Neurol* 1:255-259, 1985
14. Kotil K, Akçetin MA: Asymptomatic chronic ossified epidural hematoma in a child: A rare entity. *Turkish J Trau Emerg Surg* 12:164,166, 2006
15. Mathuriya SN, Kak VK, Banerjee AK: Ossified epidural hematomas: Report of two cases. *Clin Neurol Neurosurg* 91:269-272, 1989
16. Nagane M, Oyama H, Shibui S, Nomura K, Nakanishi Y, Kamiya M: Ossified and calcified epidural hematoma incidentally found 40 years after head injury: Case report. *Surg Neurol* 42:65-69, 1994
17. Parkinson D, Reddy V, Taylor J: Ossified epidural haematoma-case report. *Neurosurgery* 7:171-173, 1980

18. Pereira CU, Porto MW, de Holanda RR, de Andrade WT: Epidural hematoma after ventriculoperitoneal shunt surgery. Report of two cases. *Arq Neuropsiquiatr* 56 (B):629-632, 1998
19. Sengupta RP, Hankinson J: Extradural haemorrhage- A hazard of ventricular drainage. *J Neurol Neurosurg Psychiatry* 35: 297-303, 1972
20. Tjan TG, Aarts NJM: Bifrontal hematoma after shunt operation and posterior fossa exploration. Report of a case with survival. *Neuroradiology* 19:51-53, 1980
21. Yue CP, Mann KS: Fluid chronic epidural haematoma: A rare complication of ventriculoperitoneal shunt (letter). *J Neurol Neurosurg Psychiatry* 48:953-955, 1985
22. Weiss RM: Massive epidural hematoma complicating ventricular decompression. Report of a case with survival. *J Neurosurg* 21:235-236, 1964