

Subtentorial Subdural Empyema: Report of Two Cases and Review of the Literatures

Subtentoriyal Subdural Ampiyem: Farklı İki Olgu Sunumu ve Literatür Taraması

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ABSTRACT

Subtentorial subdural empyema is a rare form of intracranial suppuration. We present two cases treated at our department within the last 11 years. The common source was an ear infection. Both patients presented with headache, fever, vomiting and stiff neck. Only one patient had disturbed consciousness. Both patients received aggressive antibiotic therapy. The first patient was treated with suboccipital craniectomy and evacuation of pus collection, while the second patient was treated conservatively with antibiotics and ventriculoperitoneal shunt for his associated supratentorial hydrocephalus. Both blood cultures and empyema collection were sterile. Neuroimaging with computed tomography and magnetic resonance imaging permitted accurate diagnosis and localization of the purulent collections. At follow up of 11 years for the first case and 10 months for the second, both patients had complete neurological recovery except for right mild sixth nerve palsy in the patient with conservative treatment.

KEYWORDS: Subtentorial, Subdural empyema, Surgery, Hydrocephalus

ÖZ

Subtentoriyal, subdural ampiyemler kafa içi iltihabi oluşumların yerleşimi açısından nadir bir yerdir. Son 11 yıl içinde bu şekilde tedavi ettiğimiz 2 ayrı olgu sunulmaktadır. Kulak infeksiyonları iltihabi oluşumun en sık nedenlerinden birisidir. Her iki hastada baş ağrısı, ateş, kusma, ve ense sertliği vardı, birinde ise bilinç bulanıklığı da gelişmişti. Her iki hastaya etkin antibiyotik tedavisi başlandı. İlk hastamıza suboksipital kraniyektomi yapıldı ve ampiyemi boşaltıldı, diğer hastaya ise antibiyotik tedavisinin yanı sıra hidrosefalisi geliştiği için ventriküloperitoneal şant takıldı. Her iki hastadan alınan ampiyem örnekleri ve kan kültür sonuçları negatifti. Bilgisayarlı tomografi ve manyetik rezonans görüntüleme çalışmaları ile iltihabi birikimin yeri saptandı. Hastalar 11 yıl izlendi. İzlem sürecinde 10. ayda olguların her ikisinde de tam bir nörolojik düzelme görüldü, ancak şant takılan hastada orta düzeyde sağ 6. sinir felci gelişti ve öyle kaldı.

ANAHTAR SÖZCÜKLER: Subtentoriyal, Subdural ampiyem, Cerrahi, Hidrosefali

INTRODUCTION

Infratentorial empyema represents a highly lethal and uncommon form of intracranial purulent collections with only 41 cases reported in the literature (1). It usually arises from neglected otogenic infection, head trauma, bacterial meningitis or hematogenous dissemination of systemic infection (4). Common clinical features include fever, headache, vomiting, disturbed consciousness and meningism while cerebellar signs and lower cranial nerve deficits are uncommon in most cases (2). The subtentorial variety of posterior fossa empyema is extremely rare with only one case report published under this title in the English literature (16). We present two cases with subtentorial subdural empyema treated at our department with antibiotics and surgical evacuation in the first patient and ventriculoperitoneal shunt only for the associated hydrocephalus in the other patient and compare our findings with other cases of infratentorial and subtentorial subdural empyema reported in the literature.

CASE REPORT (1)

A 9 year- old girl with recurrent bilateral chronic suppurative otitis media and pus discharge per ear presented with 4 days of fever, headache, confusion and repeated vomiting. The patient was admitted to the pediatric department with provisional diagnosis of meningitis on presentation. The patient had a temperature of 38.5°C, heart rate of 90 beats/min and blood pressure of 90/60 mmHg with purulent drainage from both ears. We were consulted for her disturbed consciousness. Neurological examination revealed a stiff neck and confusion. Her score was 13 on the Glasgow coma scale. Funduscopic examination was normal. There were no symptoms suggesting lower cranial or cerebellar involvement. CSF, ear swab and blood cultures were sent for gram stain and were found sterile. Her blood profile showed leucocytosis of 15700/mm³. Empirical antimicrobial therapy was started with ceftriaxone, metronidazole infusion and crystalline penicillin. Computed tomography of the brain revealed two

loculi of hypodense collection under the tentorium with rim enhancement after contrast administration. MRI brain confirmed the subtentorial empyema collection as shown in Figure 1A-C. The patient was operated with suboccipital craniectomy in semisitting position. Yellowish pus was drained from the superior surface of the left cerebellar hemisphere and sent for microbiological examination with no organisms grew in pus culture. Patient regained full consciousness one day after surgery. The patient continued the empirical antibiotic therapy for 8 weeks. Follow up CT brain one week after surgery showed no residual pus. The patient was treated conservatively by the otolaryngology doctors and no signs of recurrence were detected during her follow up.

CASE REPORT (2)

A 23-year-old male patient was admitted to the hospital with 6 days of fever, headache and malaise. CSF analysis after lumbar puncture revealed normal cytology and chemistry. Initial computed tomography of the brain was normal apart from right mastoiditis. The patient received appropriate antibiotics and advised an otolaryngology consultation for his ear infection. The patient was discharged home after improvement of his general condition. One month later, the patient was examined at our outpatient clinic because of headache. His neurological examination revealed stiff neck and right sixth nerve palsy. A new brain computed tomography showed supratentorial hydrocephalic changes with right subtentorial subdural hypodense collection and right intraaxial cerebellar hypodense area suggesting cerebritis or ischemic changes as shown in Figure 2A-E.

MRI brain with intravenous contrast showed a well-defined extraaxial subdural collection related to both tentorial leaflet more on the right side measuring about 2.5x4x2.5cm along its maximum AP, transverse and coronal dimensions respectively. It was hypointense in T1WI and bright in T2WI with intense homogenous thick uniform marginal

enhancement in post contrast series, with a well defined right cerebellar space-occupying mass measuring about 2x2x2 in its maximum diameters respectively. A marked mass effect was observed in the form of compression of the 4th ventricle with subsequent supratentorial hydrocephalic changes. Right subtentorial subdural empyema with right cerebellar abscess was postulated. Routine laboratory investigations revealed a leucocyte count of 23.000/mm³, ESR of 67 mm/h with sterile blood culture and ear swabs. The patient had continuous fever of 38 to 40°C. Our decision was suboccipital craniectomy with supracerebellar evacuation of the subtentorial collection and excision of the right cerebellar abscess. However, the patient and his family refused our intervention and chose conservative treatment. The patient received cefotaxime 1 gm every 8 hours IV, metronidazole 500 mg intravenous infusion with amoxicillin-sulbactam 1.5 gram every 12 hours. The patient was followed with serial complete blood count, ESR, computed tomography of the brain and clinically with consciousness level and body temperature. Serial computed tomographic scans showed gradual diminution of the size of the cerebellar abscess and subdural collection. Follow-up MRI of the brain 2 months later showed complete resolution of the intracranial suppuration but still supratentorial hydrocephalus. The patient still has sixth nerve palsy and mild headache in comparison with his initial complaint. A ventriculoperitoneal shunt was performed with a clear intraoperative CSF sample. The patient was discharged home with no fever, leucocyte count of 6.400/mm³ and no headache. The patient was advised oral antibiotics for 2 months and regular follow-up at our outpatient clinic. At 10 months follow-up, the patient had complete neurological recovery apart from mild right sixth nerve palsy.

DISCUSSION

Infratentorial subdural empyema is a rare intracranial suppuration that is associated with significant morbidity and

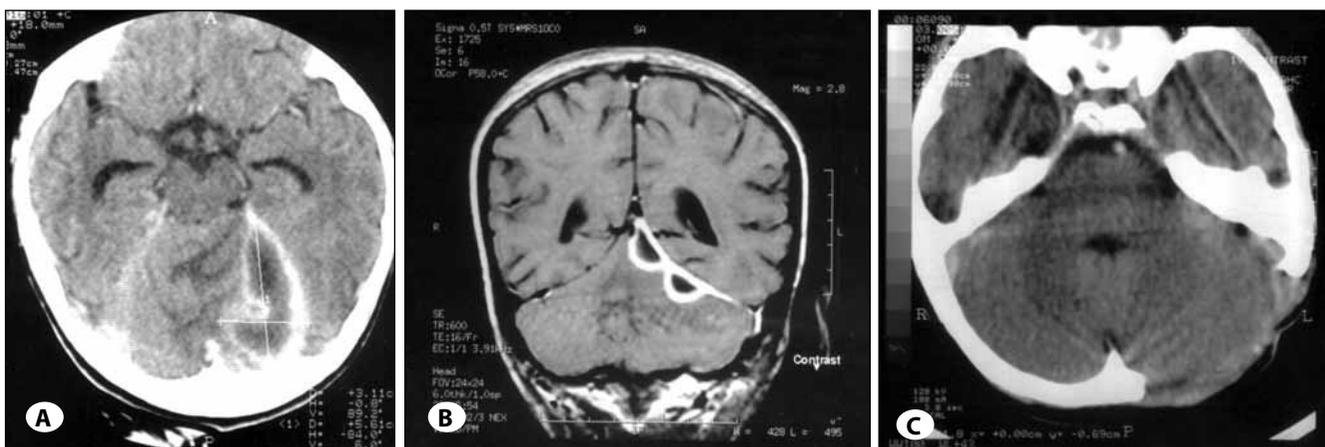


Figure 1: A) CT brain axial cut with IV contrast showed tentorial enhancement with left subtentorial empyema. **B)** MRI brain T1WI with Intravenous contrast coronal view showed a well-defined extraaxial hypointense subdural collection related to the left tentorial leaflet with intense homogenous thick uniform marginal enhancement with contrast. **C)** Follow-up CT brain axial cut showed the suboccipital craniectomy and evacuation of pus.

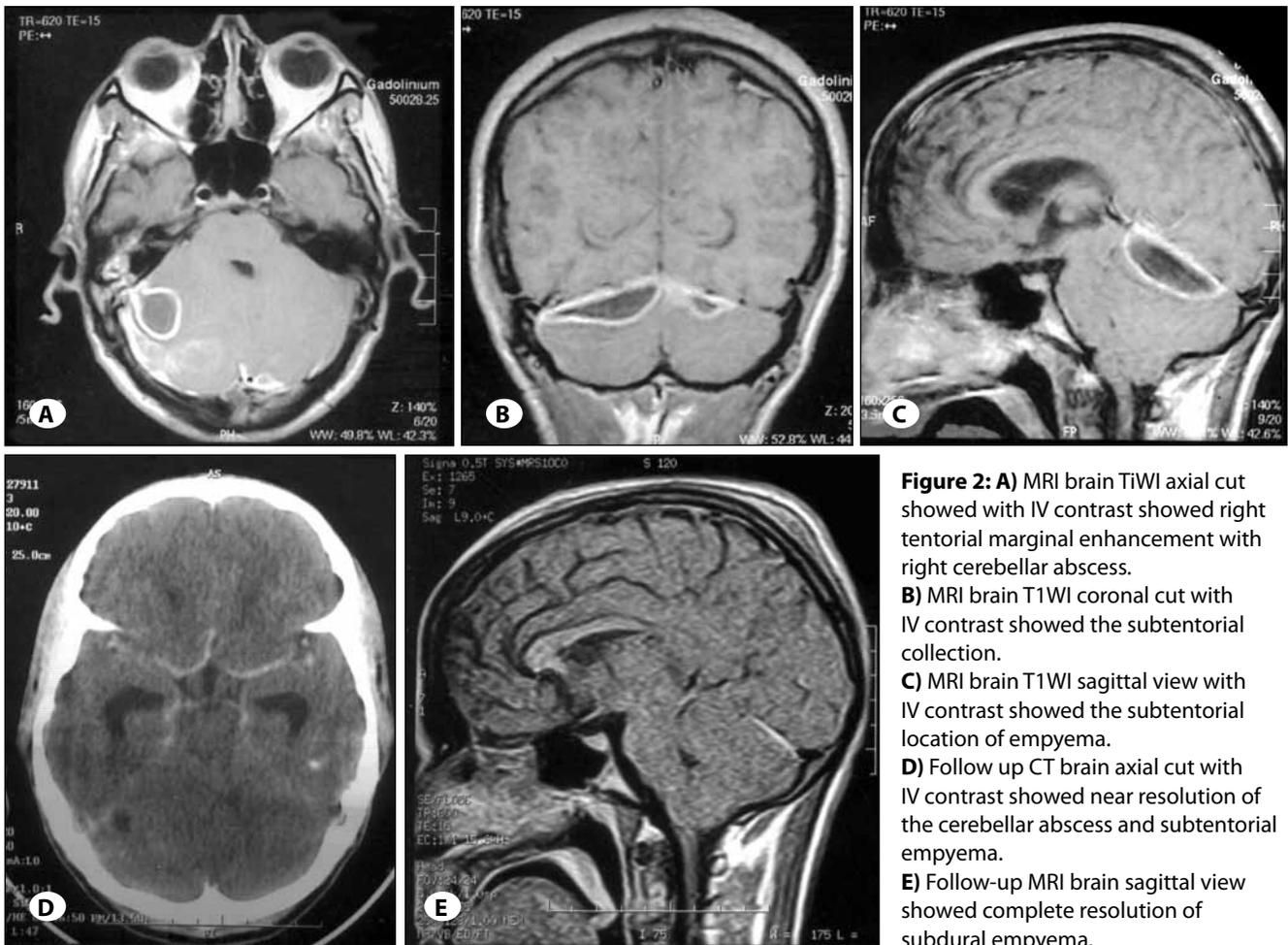


Figure 2: **A)** MRI brain T1WI axial cut showed with IV contrast showed right tentorial marginal enhancement with right cerebellar abscess. **B)** MRI brain T1WI coronal cut with IV contrast showed the subtentorial collection. **C)** MRI brain T1WI sagittal view with IV contrast showed the subtentorial location of empyema. **D)** Follow up CT brain axial cut with IV contrast showed near resolution of the cerebellar abscess and subtentorial empyema. **E)** Follow-up MRI brain sagittal view showed complete resolution of subtentorial empyema.

mortality with only few cases reported in the literatures (1). In the English literature, only one case report under the title of subtentorial subdural empyema was found (16). However, careful reading of other published series with infratentorial empyema revealed another 10 cases reported as shown in table (1, 2-6, 9,10,12, 16, 18). Nathoo and his colleagues in the largest series published till now reported 22 cases of infratentorial empyema representing 0.6% of total 3865 admissions of intracranial suppurations. However the authors presented both epidural and subdural empyemas. Only 13 cases were subdural empyema representing 0.4% of their intracranial suppurations (11). Borovich et al. published 3 cases of subdural empyema representing 3% of all cases of subdural empyema treated at their institution between 1979 and 1988 (2). It is worth mentioning that the majority of published cases were reported from developing countries in contrast to the few sporadic cases reported from developed countries. The largest series published so far represents patients from India and South Africa where intracranial suppuration remains a common neurosurgical problem (11, 18). It mainly arises as a consequence of poor socioeconomic condition for large proportions of the population. Marked male predominance was also noted in the previously published

cases of infratentorial empyema. 77.3% of the patients in the Nathoo et al. (11) series, and 64.3% in the pediatric patients of Venkatesh and others were male (18). This marked male predominance may be attributed to larger sinuses and more marked nose-blowing habits in male (11). Our two patients were diagnosed and treated in the summer and autumn. There is an established seasonal variation as reported by Venkatesh et al. (18). 64.3% of their patients presented in the summer. Nathoo and others found this seasonal variation with summer predominance to be significant (11).

The overwhelming majority of infratentorial empyema patients follow a neglected otogenic infection as in our two patients. It was 100%, 86.4% and 71.4% in the series of Borovich et al (2), Brydon and Hardwidge(3), Morgan and Williams (9) respectively. Acute mastoiditis was especially complicated with posterior fossa empyema due to the contiguity following bone destruction (6, 7). Although it spreads to the middle cranial fossa, the infratentorial location is more common due to osseous destruction in the Trautmann triangle over the sigmoid sinus plate or in the posterior cortex of the petrous pyramid (7). Our two patients were definitely diagnosed with computed tomography, as shown in Figure 1 and 2. However, failure to demonstrate infratentorial empyema with CT had

Table I: Cases of Infratentorial and Subtentorial Subdural Empyema Reported in the Literature

Mortality	Conservative	Surgery	Source of infection	Age	SSDE	ISDE	Study
4/7	-	7/7	Otitis 6/7	15-44	1	7	Morgan 1985 ⁽⁹⁾
-	-	1/1	Colonization with E coli	Neonate	-	1	Tanaka 1989 ⁽¹⁵⁾
1/3	-	3/3	Otitis 3/3	17-58	3	3	Borovich 1990 ⁽²⁾
-	-	1/1	Otitis	46	1	1	Toth 1992 ⁽¹⁶⁾
-	-	1/1	Diabetes	66	-	1	Morikawa 1994 ⁽¹⁰⁾
1/1	-	1/1	Otitis	27	ND	1	Brydon 1994 ⁽³⁾
-	-	1/1	Sinusitis	26	-	1	Sahjpaul 1994 ⁽¹³⁾
5/13	-	13/13	Mastoiditis/Sinusitis	1-55	ND	13	Natho 1997 ⁽¹¹⁾
ND	-	1/1	Mastoiditis	ND	ND	1	Luntz 2001 ⁽⁶⁾
-	-	1/1	Septicemia	81	1	1	Kojima 2004 ⁽⁵⁾
-	-	1/1	Sinusitis	49	-	1	Polzoidis 2004 ⁽¹²⁾
-	1/1	-	Otitis	12	-	1	Jaggi 2005 ⁽⁴⁾
-	-	13/13	Otitis 13/14	4-18	4	14	Venkatesh 2006 ⁽¹⁸⁾
-	1/1	-	Otitis	22	1	1	Beek 2007 ⁽²⁾
-	-	1/1	Mastoiditis/Meningitis	15	1	1	Sengül 2009 ⁽¹⁴⁾
11	2	45			12	48	Total

ISDE: Infratentorial Subdural Empyema, **ND:** No Data, **SSDE:** Subtentorial Subdural Empyema.

been reported before and may be considered as an important factor in delayed management (1). This limitation is attributed to partial volume averaging effects and scanning artifacts due to complex posterior fossa osseous architectures. Currently MRI and DWI are the preferred imaging modality for subdural empyema (4, 17)

Emergent surgical evacuation, simultaneous management of the primary source of infection and intravenous long course of appropriate antibiotics are all recommended (1, 5). Only 3 patients were treated successfully with antimicrobial therapy without surgical intervention as in our second patient (1). The conservative treatment carries the disadvantage of not knowing the nature of the microorganism, requiring close monitoring of neurologically critical patient and the need for prolonged courses of empirical antibiotics and the possibility of infection relapse (1, 5).

Infratentorial subdural empyema usually carries a dismal prognosis (11, 14). Investigators from South Africa reported 45% mortality rate in their 13 patients with infratentorial subdural empyema. All their patients with cerebellopontine angle extension of purulent material died (11). Four of the seven patients reported by Morgan and Williams (9) died representing 57.1% of their patients, while in the series of Borovich and his colleagues one of their three patients with subtentorial empyema died (2). However, Venkatesh and his colleagues reported no fatalities in their 14 pediatric patients with infratentorial empyema, moreover, all their three patients with cerebellopontine extension had survived (18). This high mortality rate compared to 9% in the supratentorial

empyema (1, 8) may be attributed to the critical location of the purulent material in the posterior fossa which may lead to rapid deterioration of patient's condition, the delayed or incorrect diagnosis which may lead to delayed treatment, thrombophlebitis of vital brain stem perforators with subsequent infarction and the high incidence of associated hydrocephalus (1, 2, 11). Hydrocephalus was present in 92.5% of 14 pediatric patients recently published by Venkatesh and his colleague, 36% of the patients required external ventricular drainage during surgery or postoperatively. Shunt placement was required in 21% only (18). All fatalities reported by Nathoo and others had associated hydrocephalus (11). Mauser et al., reporting on a series of patients with subdural empyema, found that the level of consciousness at the moment of diagnosis, and the extent of subdural pus accumulation had a significant bearing on the chance of survival without severe disability (8). In contrast, Nathoo and others had not experienced these factors in their patients with subdural empyema. In fact, the majority of the patients in their series who died were fully conscious on admission (11). Borovich et al. (2), and Morgan and Williams (9) in their series also concluded that the level of consciousness was not correlated with the outcome.

In conclusion, subtentorial subdural empyema is a rare, life-threatening intracranial suppuration. The diagnosis is usually delayed and initially confused with meningitis. MRI with contrast is more sensitive for early detection of subtentorial empyema. The high mortality reported in the literature reflects the severity of infratentorial empyema if proper management is delayed.

LIST OF ABBREVIATIONS

- CSF;** Cerebrospinal fluid
CT; Computed tomography
DWI; Diffusion weighted image
ISDE; Infratentorial subdural empyema
MRI; Magnetic resonance imaging
T1WI; T1-weighted image
T2WI; T2-weighted image
SSDE; Subtentorial subdural empyema

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