CASO CLÍNICO/CASE REPORT

Posterior Fossa Subdural Empyema: A Severe and Usually Late Diagnosed Complication

Empiema Subdural da Fossa Posterior: Uma Complicação Severa e Tardiamente Diagnosticada

Antunes CM[1,*]; Nogueira JF[2]; Oliveira LC[3]; Filipe MA[4]
1-https://orcid.org/0000-0001-5517-8824 / Serviço de Neurocirurgia / Hospital de Braga, Braga, Portugal.
2-https://orcid.org/0000-0003-2768-410X / Serviço de Neurocirurgia / Hospital de Braga Braga, Portugal.
3-https://orcid.org/0000-0003-1230-3925 / Serviço de Neurocirurgia / Hospital de Braga Braga, Portugal.
4-https://orcid.org/0000-0003-2500-094X / Serviço de Neurocirurgia / Hospital de Braga Braga, Portugal.

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***Autor Correspondente / Corresponding Author:**
Cristiano Martins Antunes
Hospital de Braga
Serviço de Neurocirurgia
Sete Fontes – São Victor
4710-243 Braga, Portugal
cristianoantunesneuroc@gmail.com
cristiano_antunes@live.com.pt

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Abstract

Subdural Empyema is usually associated with paranasal sinusitis and otitis media/mastoiditis. Posterior fossa subdural empyema is uncommon and late diagnosis is frequent. A 23-years-old male case with a posterior fossa subdural empyema associated with otitis media is reported. Emergent craniectomy, followed by a later stage tympanomastoidectomy, and long duration intravenous antibiotics were performed. Cultures revealed a polymicrobial infection. An ipsilateral temporal abscess occurred on a later stage and required multiple punctures for drainage. Due to brain temporal edema with mass effect, a decompressive craniectomy was required. Left-side hemiparesis was reverted with rehabilitation. Complete recovery was achieved with right-side hypoacusis. Magnetic resonance imaging is critical for diagnosis and follow-up. Surgical treatment englobes two stages: Empyema drainage and focus control - the first on an emergent basis, the second as soon as safely possible. Since subdural empyema is a severe condition, early diagnosis is essential to reduce morbidity and mortality.

Resumo

O empiema subdural associa-se geralmente a sinusite paranasal e/ou otite média/mastoidite. O empiema subdural na fossa posterior é raro e o diagnóstico tardio é frequente. Descreve-se um caso de um homem de 23 anos de idade com um empiema subdural da fossa posterior associado a uma otite média. Foi tratado com uma craniectomia emergente, seguida de timpanomastoidectomia numa fase ulterior, e antibioterapia endovenosa de longa duração. As culturas revelaram uma infeção polimicrobiana. Um abcesso temporal ipsilateral ocorreu em um estágio posterior e exigiu múltiplas punções para drenagem. Devido ao edema cerebral com efeito de massa, foi necessária uma craniectomia descompressiva. A hemiparesia do lado esquerdo sequelar foi revertida após a fisioterapia. A recuperação completa foi obtida com hipoacusia direita residual. A ressonância magnética é fundamental para o diagnóstico e seguimento. O tratamento cirúrgico engloba dois estágios: drenagem de empiema e controle de foco - o primeiro em uma base emergente, o segundo logo que possível com segurança. Dado que o empiema subdural é uma condição severa, o diagnóstico precoce é fundamental para reduzir a morbilidade e a mortalidade.

Introduction

Intracranial suppurative infections incidence increased with human immunodeficiency virus emergence. Brain abscess has an incidence of 0.3-1.3 cases per 100 000 per year in United States, five times higher than subdural empyema (SEmp).[1] SEmp is not an uncommon pathology, accounting to 15% - 20% of intracranial infections.

SEmp associates to paranasal sinuses infections and otitis media/mastoiditis in up to 80%.[2-4] For this reason, a current or recent history of sinusitis/otitis on a septic patient with neurological signs requires an investigation to exclude SEmp. In fact, complimentary tests aimed for these otorhinolaryngological conditions may also diagnose SEmp - computed tomography (CT) and/or magnetic resonance imaging (MRI).

Courville[5] described how infection spreads to subdural space - directly by bone/dura erosion and indirectly by thrombophlebitis in middle-ear mucosa veins with dural sinuses and veins involvement (which may result in venous thrombosis). Microbial flora, as in sinusitis, embraces aerobic streptococci, staphylococci, gram-negative bacilli and anaerobic streptococci.[6-8] Other causes include cranial trauma or surgery, chronic subdural hematoma's infection and bacteremic spread from a distant focus, generally from a pulmonary source.[9] Bacterial meningitis is an important predisposing condition in children, rarely preceding SEmp in adults.

Mauser et al studied the factors affecting the SEmp outcome in 102 patients and they found that the likelihood of survival without severe disability was 81% in alert patients whereas it decreased to less than 38% for those in coma at the time of presentation.[10] This fact highlights the importance of an early diagnosis. Posterior fossa (PF) SEmp is particularly uncommon. A high clinical suspicion shall be present beyond a patient complaining from malaise, headache, nausea and vomiting, with meningeal irritation signs and a recent history of sinusitis/otitis. Hydrocephalus is common. Cranial nerves deficits may result from pus in cerebellopontine angle or from mass effect compression. Seizures are uncommon in PF SEmp.[4]

Generally, antibiotics directed to sinusitis/otitis allow a transient clinical improvement followed by an acute deterioration. CT has limitations in posterior fossa - partial volume averaging effects and normal tentorial enhancement may hamper the diagnosis.[11] MRI is better and provides a finest soft tissue definition which is crucial for diagnosis and treatment planning.

Initial treatment is generally surgical and emergent. The goal is a proper PF decompression.

A case of a 23-years-old immunocompetent male with a PF SEemp is reported. A literature review on the subject is performed. Knowledge on the condition is critical to early diagnosis which is important on prognosis.

Case Report

A 23-years-old male complaint from malaise, rightside otalgia and purulent otorrhea, fever (39.5ºC) with chills, headache, nausea and vomiting for two days. During the six months previously to this episode, patient had several episodes of purulent otorrhea on rightside being treated conservatively with oral antibiotics. He was never evaluated by Otorhinolaryngology. Despite being a smoker, he had no other medical conditions, namely, immunosuppressive diseases. Patient was diagnosed with otitis media and initiated amoxicillin/clavulanic acid and topic ofloxacin on ambulatory. Patient reported partial symptoms relief but, after two days, he regained fever and developed headache, cervicalgia, nausea and vomiting. He returned to the hospital and a head CT was performed being reported as normal - despite a small collection over the right cerebellar hemisphere could already be identifiable - (**Fig. 1a**). Lumbar cerebrospinal fluid was compatible with meningitis (3802 leucocytes – 88.8% polymorphonuclear, hyperproteinorrachia 181 mg/dL and glucose 62 mg/dL). After 12 hours of observation, a headache intensification, nausea and inability to tolerate recumbency was observed. CT was repeated (**Fig. 1b**) and revealed a mass effect PF collection (44x11 mm).

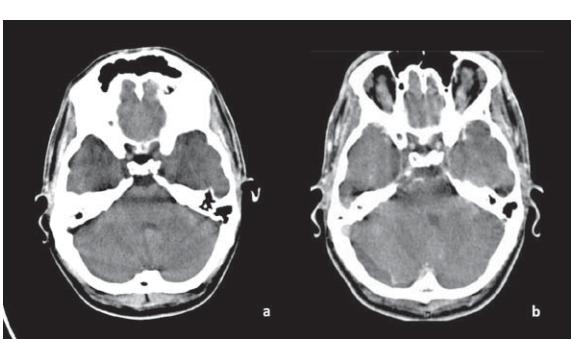

Fig. 1. Figure 1a - Initial Head CT which was reported as normal. A small crescentic extraxial hypodense collection on right-side posterior fossa was already identifiable. **Figure 1b** - Head CT after clinical deterioration. Right-side posterior fossa collection growth (44x11 mm) with mass effect over right cerebellar hemisphere and fourth ventricle.

Patient was transferred to our center. He ameliorated from intracranial hypertension (ICH) symptoms after mannitol but presented minor ataxia and right-side nystagmus. MRI (**Fig. 2**) was performed which excluded other complications - cerebritis/abscess and transverse/sigmoid sinus trombosis. MRI confirmed, based on diffusion sequences, that the PF collection was compatible with an empyema and revealed an increase in its volume and mass effect. Also, MRI confirmed a right-side otomastoiditis and a cholesteatoma as the infection focus.

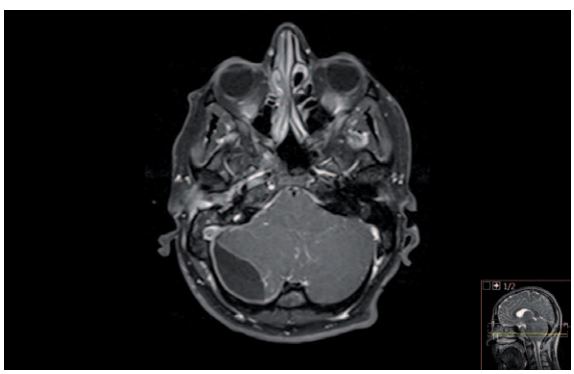

Fig. 2. MRI with gadolinium. Axial cut on posterior fossa. Hypointense collection with peripheral contrast enhancement. Mass effect over right-side cerebellar hemisphere and fourth ventricle. DWI sequences showed restriction compatible with an inflammatory collection.

An emergent PF craniectomy was performed with pus drainage. A drainage catheter was left for two days. Post-operative CT revealed complete empyema evacuation. Patient was transiently admitted in the Intensive Care Unit and sedation was tapered on the next day. Patient was stabilized and he was then observed by Otorhinolaryngology which scheduled, after four days, a radical tympanomastoidectomy and cholesteatoma removal to control infection focus. Facial nerve function was preserved. Post-operative period went well with ataxia and ICH symptoms resolution.

Pus cultures revealed a polymicrobial infection. Large spectrum antibiotics were initiated upon admission with vancomycin, ceftriaxone and metronidazole.

Follow-up MRI (**Fig. 3**) exhibited a resolution on SEmp (**Fig. 3a**) but a small 13 mm temporal abscess was diagnosed (**Fig. 3b**). Abscess grown to 25 mm and it was drained by Neuronavigation guided aspiration (which was repeated for 3 times). Pus cultures revealed the same agents identified in PF SEmp with similar antibiotic sensibilities. It was decided to escalate antibiotics by adding gentamycin and meropenem. Due to temporal oedema with mass effect causing left side hemiparesis and conscience level depression, a right-side decompressive craniectomy was required.

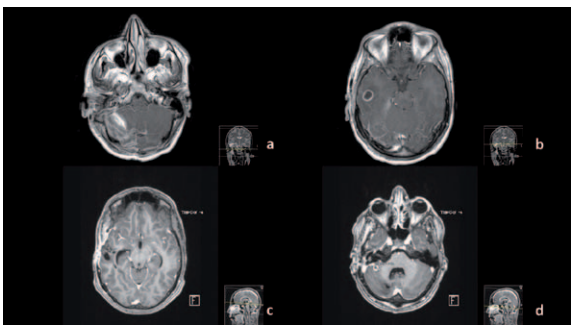

Fig. 3. Postoperative MRI. **Fig. 3a** shows resolution of subdural pus collection. A cerebellar hematoma was treated conservatively. **Fig. 3b** shown a temporal 13 mm abscess which was treated with 4 neuronavigation guided stereotactic punctures plus intravenous antibiotics. A decompressive craniectomy was made to deal with intracranial hypertension. **Fig.s 3c and 3d** shows last MRI control on temporal and cerebellar abscesses. A residual (and stable on multiple MRI controls) collection on right cerebellar hemisphere was treated conservatively.

A long cycle of intravenous antibiotics – 42 days of vancomycin, ceftriaxone and metronidazole plus 19 of days of gentamycin and meropenem – was completed.

A grade 4 left-side hemiparesis resolve after rehabilitation. A residual right-side mechanical hypoacusis was observed. MRI controls revealed temporal lobe abscess resolution (**Fig. 3c**). A residual collection on right cerebellar hemisphere was treated conservatively (**Fig. 3d**). Patient was discharged home with regular follow-up in ambulatory. He is currently waiting for a cranioplasty **Fig. 4**.

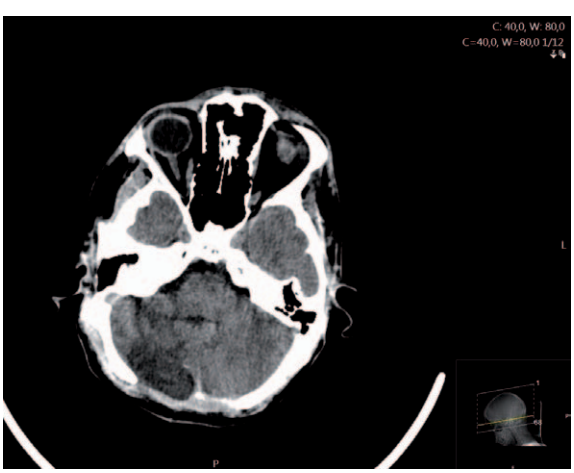

Fig. 4. Last CT control performed for supratentorial cranioplasty planning (9 months after initial surgery), without contrast, shows a sequelar hypodensity on the right cerebellar hemisphere. No image suggesting cerebellar abscess was observed.

Discussion

Despite SEmp being uncommon, it is not a rare condition and its severity requires a prompt recognition

and treatment to avoid neurological disability or even mortality. Since empyema is not capsule contained, it spreads over intracranial spaces making it an emergent condition. Most of SEmp occur as an extension from a local infection[4] and, especially in patients with previous otitis/sinusitis, clinical suspicion shall be high. Most of the infratentorial SEmp occur as a result otogenic infections. In posterior fossa mass effect lesions, patient deterioration may occur abruptly due brainstem compression or hydrocephalus.[11,12]

CT is the most accessible exam, but MRI is critical for diagnosis due better soft tissue definition. Diffusion-weighted sequences are useful to identify inflammatory collections.[11]

Mortality rates on SEmp are currently close to 10.8% in supratentorial and 3.7% in PF. PF mass effect producing lesions tend to be diagnosed earlier – this fact highlights the importance of early diagnosis to avoid morbimortality.

SEmp treatment englobes two stages: empyema drainage and infection focus control. Conservative treatment has been described for small collections. However, antimicrobial therapy alone does not reliably sterilize empyema collections.[14]

SEmp drainage is required on an emergent basis aiming posterior fossa decompression and hydrocephalus resolution, collection to microbiological cultures and bacterial and toxin clearance to avoid their effect over the nervous tissue and its blood supply. Surgical modality is controversial and may differ from burr-hole to wide craniectomies. Studies have demonstrated a lower mortality in craniectomy treated patients.[15] Multiple burr-holes are required to allow extensive evacuation and irrigation. We usually irrigate with saline plus antibiotic (ex: gentamicin). For patients undergoing craniotomy/craniectomy, wide exposure is required for an effective drainage. Pus/membranes adherent to cortex shall be left untouched to avoid infarction/epilepsy. A second drainage procedure was required in 50% of patients treated by burr-hole compared to 20% of those treated by craniotomy.[10]

Early focus infection control is of paramount importance for treatment success. On supratentorial SEmep associated with paranasal sinusitis, we defend simultaneous surgery for SEmp drainage and for focus control – sinus drainage. In SEmp associated with otitis/mastoiditis and cholesteatoma, the complexity of the approach and its hazards must be weighted in order to decide the proper moment to approach the infectious focus. Tympanomastoidectomy in an acute inflammatory phase is associated with higher bleeding and risk to facial nerve injury.[16] For this reason, SEmp shall be emergently evacuated and focus control shall be performed soon after reuniting the proper conditions – stabilized patient, otolaryngology support, facial nerve monitoring, neuronavigation, proper microscope. This conduct was also described by Zanetti and Nassif[17] in pediatric population.

In the presented case, neurological stability and otorhinolaryngologic proper support delayed focus control in four days upon SEmp drainage which could have contributed to infection progression with temporal lobe abscess.

Conclusion

SEmp is a severe pathology in which early diagnosis and treatment are vital to avoid further complications and to maximize the outcome. For this reason, in a proper clinical context (septic patient with history of recent sinusitis/otitis), this diagnosis must be excluded. Immediate pus evacuation is imperative but, focus control is also of paramount importance. Long duration intravenous antibiotics and regular follow-up imaging controls are required to assure complete resolution. ■

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References / Referências

1. Calfee DP, Wispelwey B. Brain abscess. Semin Neurol. 20:353-360, 2000.
2. Nathoo N, Nadvi SS, van Dellen JR, Gouws E. Intracranial

subdural empyemas in the era of computed tomography: a review of 699 cases. Neurosurgery. 1999; 44:529-35.
3. Silverberg AL, DiNubile MJ. Subdural empyema and cranial epidural abscess. Med Clin North Am. 1985; 69:361-74.
4. Dill SR, Cobbs CG, McDonald CK. Subdural empyema: analysis of 32 cases and review. Clin Infect Dis. 1995; 20:372-86.
5. Courville CB. Subdural empyema secondary to purulent frontal sinusitis: a clinicopathologic study of forty-two cases verified at autopsy. Arch Otolaryngol.1944; 39:211-30.
6. Kaufman DM, Litman N, Miller MH. Sinusitis: induced subdural empyema. Neurology. 1983; 33:123-32.
7. Osborn MK, Steinberg JP. Subdural empyema and other suppurative complications of paranasal sinusitis. Lancet Infect Dis. 2007; 7:62-7.
8. Yoshikawa TT, Chow AW, Guze LB. Role of anaerobic bacteria in subdural empyema. Report of four cases and review of 327 cases from the English literature. Am J Med. 1975; 58:99-104.
9. Nathoo N, Nadvi SS, Van Dellen JR. Traumatic cranial empyemas: a review of 55 patients. Br J Neurosurg. 2000; 14:326-30.
10. Mauser HW, Van Houwelingen HC, Tulleken CA. Factors affecting the outcome in subdural empyema. J Neurol Neurosurg Psychiatry.1987; 50:1136-41.
11. van de Beek D, Campeau NG, Wijdicks EF. The clinical challenge of recognizing infratentorial empyema. Neurology. 2007; 69:477-81.
12. Venkatesh MS, Pandey P, Devi BI, Khanapure K, Satish S, Sampath S, Chandramouli BA, Sastry KV: Pediatric infratentorial subdural empyema: analysis of 14 cases. J Neurosurg 105:370-377, 2006.
13. Madhugiri VS, Sastri BV, Srikantha U, Banerjee AD, Somanna S, Devi BI, et al.Focal intradural brain infections in children: an analysis of management and outcome. Pediatr Neurosurg. 2011; 47:113-24. doi: 10.1159/000330542.
14. Yilmaz N, Kiymaz N, Yilmaz C, Bay A, Yuca SA, Mumcu C, et al. Surgical treatment outcome of subdural empyema: A clinical study. Pediatr Neurosurg. 2006; 42:293-8.
15. Mat Nayan SA, Mohd Haspani MS, Abd Latiff AZ, Abdullah JM, Abdullah S. Two surgical methods used in 90 patients with intracranial subdural empyema. J Clin Neurosci. 2009; 16:1567-71.
16. Mirza O, Varadarajan V, Youshani AS, Willatt DJ. Escherichia coli positive infratentorial subdural empyema secondary to mastoiditis and underlying cholesteatoma. BMJ Case Rep. 2014; 2014.
17. Zanetti D, Nassif N: Indications for surgery in acute mastoiditis and their complications in children. Int J Pediatr Otorhinolaryngol. 2016; 70:1175-82.