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ABSTRACT

Background: Parafalcine subdural empyema, a collection of pus in the space between the dura and arachnoid alongside the falx cerebri, is a rare type of intracranial suppuration. The surgical management of subdural empyema has been an evacuation of the pus through a bone flap after a craniectomy, or craniotomy, or its aspiration by a burr hole. Meanwhile, the parafalcine location of the empyema, makes its evacuation tricky and need a simple and more safe surgical procedure.

Observations: We report a case of a 25-year-old man with a past medical history of sinusitis, admitted for parafalcine subdural empyema that was successfully managed by stereotactic aspiration of the pus.

Lessons: The Leksell stereotactic management of a parafalcine subdural empyema is a way forward as an adequate, safe, costless, and replicable surgical procedure allowing a complete evacuation of the pus.

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I. INTRODUCTION

Subdural empyema is defined as a purulent collection between dura mater and arachnoid, occupying the inner surface of the dura mater and the outer surface of the arachnoid layer. It is a rare but potentially life-threatening disease. It is called parafalcine when the purulent collections accumulate between the falx cerebri and the medial surface of the cerebral hemisphere spreading most time to the brain convexity (1–3). This is a quite rare phenomenon caused most commonly by sinusitis, otitis media, meningitis, operative infection, head trauma, and bacteremic seeding of previous subdural hematoma.

Parafalcine - located subdural empyema can present without presence of clear localizing symptoms or signs like meningeal irritation and increased intracranial pressure (4). There is no specific clinical presentation but the patient's immediate past medical history can help to strongly suspect the disease. The aim of this paper is to report an unusual case of parafalcine sub- dural empyema and discuss the clinical features and treatment options with the aid of a literature review.

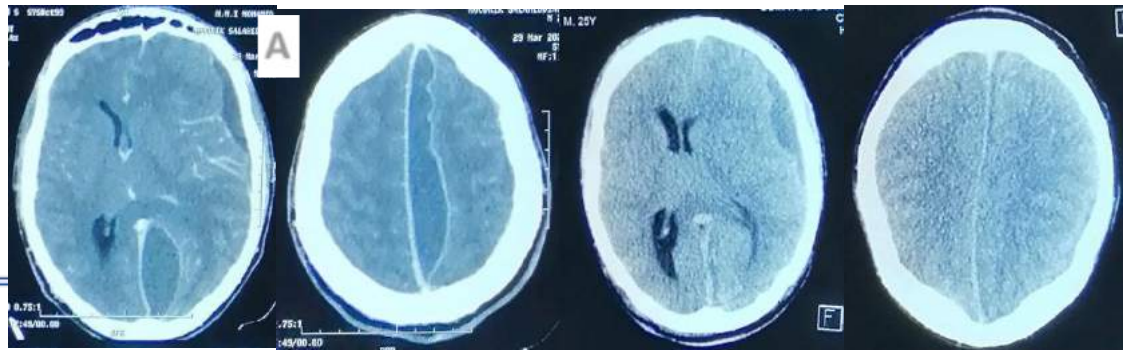
II. CASE PRESENTATION

A 25 years old man was admitted for severe headache, diplopia, and vomiting. The patient was treated, three weeks earlier, in the department of ENT for sinusitis. Physical examination revealed hyperthermia (T= 38.6°C), and right sided hemiparesis of 3/5. The blood sample result was WBC 18.000, CRP 200.

Cerebral CT-Scan showed a parafalcine collection extending to the left tentorial cerebelli and measuring 10 mm of maximum thickness exerting a discreet mass effect with the midline shift of 6.6mm (Fig1 A/).

The patient underwent a stereotactic evacuation of the intracranial collection. He was taken to the CT-Scan where we first did the head scan with injection of contrast (Iodine saline), then different

measurement was done in the three-dimensional plan X, Y, Z to stereotactically localized the lesion to be punctured without causing damage to other functional brain structures (Fig1 C/). This draws the passage of the stereotactic percutaneous needle biopsy. The patient is then taken to the operating room for the procedure. The Leksell frame was manually fixe to the patient's head according to the previous coordinates, and the entering point was choosing followed by the adjustment of the dept of the stereotactic needle biopsy. Once the needle got into the lesion, they were a reflux of pus-like material that pup into the siring attached to the other end of the system. Seventy milliliters of a light brown collection were evacuated (Fig1 D - E/). The post - operative CT-Scan shows a complete evacuation of the parafalcine empyema (Fig1 B/). The frontal subdural empyema was evacuated much later through a burr hole, when the patient's signs and symptoms have subsided. The material was sent to the laboratory for analysis and the bacteriological examination and culture isolated a staphylococcus aureus which is resistant to penicillin G only. In the post operative period, the patient was treated with a third generation of cephalosporin (Rocephine[r]) 3g/24H infusion with good outcome. The antibiotic therapy was given for 3 months (five weeks in-hospital infusion followed by height weeks oral amoxicillin + clavulanic acid) with a short-time follow-up imaging and infection parameters in blood. There was no recurrence and the patient resumed his daily duty a month later.



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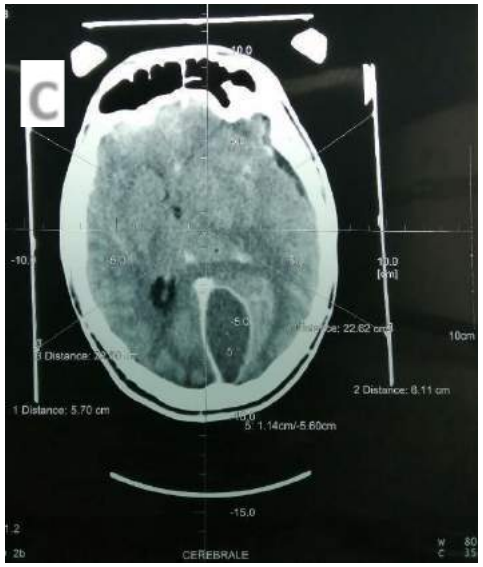

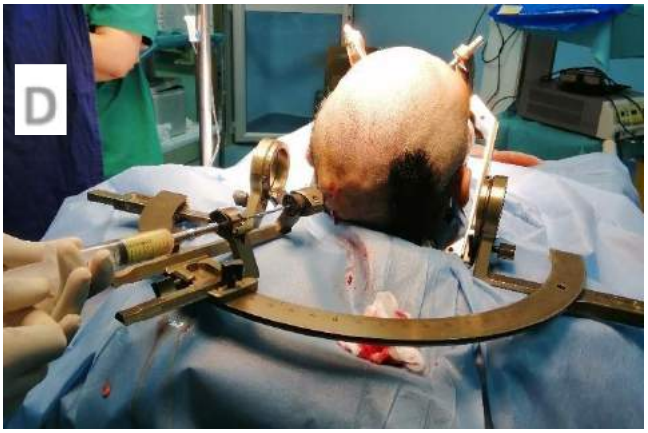

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Figure 1: A/ Enhanced computed tomography showing left longitudinal hypodensity area, the parafalcine collection with enhancing rim about 10 mm thickness (white arrow). B/ Complete evacuation of the pus. C/ Stereotactic navigation planning. D/ Stereotactic aspiration of the parafalcine empyema with a very gentle draw-back effort on the syringe. E/ About 70 ml of pus was withdrawn and send to the laboratory.

Table 1: Epidemiological, clinical and management profile of parafalcine subdural empyema in the literature

1st author/ year	Age/ Sexe	Entry route	Clinical presentation	Laboratory finding	Micro-organisms	Treatment	Outcome
Calik et al./2012 [5]	13/M	History of sinusitis	Headache, multiple cervical micro lymphadenopathy	WBC = 15 X 10^3/µL, CRP = 76 mg/L	Not identified	Left frontal sinusotomy, Craniotomy and drainage of the empyema/ Ceftriaxone, metronidazole	Improved
Bouziri et al./2011 [6]	7/F	History of poor oral hygiene	Fever, vomiting, lethargic with cool, neck stiffness.	Not found	Streptococcus constellatus, Actinomyces Viscosus	Vancomycin, Metronidazole, ampicillin	Died
Shen et al./2018 [3]	13/F	History of sinusitis	Fever, headache and drowsiness	WBC = 12.5 X 10^3/µL, CRP = 98.47 mg/L	Not identified	Broad-spectrum antibiotics.Refused surgery	Coma
Arifianto et al./2018 [7]	17/M	History of allergic rhinitis	Decrease in consciousness, difficulties in speech, and paresis of the left side of his body	WBC = 23.5 X 10^3/µL, CRP = 286 mg/L	Staphylococcus epidermidis	Craniotomy/ ceftriaxone 2 g b.i.d., metronidazole 500 mg t.i.d., and gentamycin 160 mg q.d.	Improved
Nicoli et al./2016 [8]	12/F	History of sinusitis	Headache, fever, vomiting	CRP = 195 mg/L	Microaerophilic Streptococcus	Craniotomy/ Ceftriaxone, Metronidazole	Improved
Patel et al./2016 [9]	10/F	History of sinusitis	Fever, headache, vomiting, and seizure	ESR = 95 mm/h, CRP = 1,2 mg/dL	Group A β-hemolytic Streptococcus	Craniotomy + bilateral maxillary antrostomy + total ethmoidectomy + sphenoidotomy/ Vancomycin, linezolid, metronidazole	Improved

Bruneret al./2012[10]	16/M	History of sinusitis	Fever, headache, seizure,	WBC = 17,300 cells/mm	Not identified	Ceftriaxone, Vancomycin	Improved
Mueller et Myseros/2017 [11]	10/M	None	Headache	WBC = 12.89 X 10^3/µL, CRP = 0.11 mg/dL	No specific pathogens	Craniotomy/ vancomycin, metronidazole, and ceftriaxone	Improved
Handa et al./1975[12]	14/F	History of sinusitis	Headache, nausea and anorexia	WBC count of 9.8 X 10^3/µL	No specific pathogens	Craniotomy/ Broad-spectrum antibiotics	Improved
Mauser et al./1985[13]	21/M	History of sinusitis	Fever and headache	WBC count of 16.0 X 10^3/µL, ESR = 63 mm/h	No specific pathogens	ampicillin, 2 gm/4 hrs; chloramphenicol, 1 gm/6 hrs; and flucloxacillin, 2 gm/4 hrs	Improved
Niklewski et al./2013[14]	12/M	Headache and sinusitis	Right sided hemiparesis	Not found	Not identified	Craniotomy/ antibiotics	Improved
Niklewski et al./2013[14]	8/F	History of sinusitis	Fever, headache, and seizures	Not found	Streptococcus intermedius	Craniotomy/ antibiotics and levetiracetam	Improved
Sammartinoet al./2016[15]	13/M	None	Fever and headache	WBC = 24.770 X 10^3/µL, CRP = 33.4 mg/ dL	Streptococcus intermedius	Craniotomy + flexible endoscope (KARL STORZ, Tuttlingen, Germany/ meropenem and ampicillin	Improved
Pandey et al./2015 [16]	8/F	History of purulent otitis media	Fever, headache, and seizures	WBC = 27.100 X 10^3/µL, CRP = 26 mm/h	Staphylococcus aureus	Craniotomy/ ampicillin-cloxacillin, gentamycin, and metronidazole	Improved
Yüksel et al./2016[4]	17/F	None	Left sided hemiplegia	WBC = 16 X 10^3/µL, CRP = 7.8 mg/L	No identified	Craniectomy/ Ceftriaxone (100 mg/kg/day), metronidazole (7.5 mg/ kg every 6 hours), and vancomycin (15 mg/ kg every 6 hours) were given empirically for 3 weeks	Improved
Prieto et Ortega/2019[2]	21/F	History of endoscopic sinonasal surgery	Fever, headache, seizures, and left-side hemiparesis	WBC = 13.510 X 10^3/µL, CRP = 194.80 mg/L	Prevotella oris	Craniotomy/ cefepime, metronidazole, and vancomycin	Improved
Van der Stel et al./2015 [1]	28/M	None	Fever, headache		Streptococcus milleri	Craniotomy/ Benzylpenicillin 12 million entities per 24 hours for 10 weeks intravenously and another 4 weeks orally (amoxycillin)	Improved

WBC = white blood cell count, CRP = C-Reactive Protein

III. DISCUSSION

The 17 cases of parafalcine subdural empyema we review from the literature are all pretty young patient with age range from 7 to 28 years old. Ten had a history of sinusitis. The clinical presentation was nonspecific and made of fever and headache in 6 cases and seizure was found in 5 of them (Table 1). These finding are exactly the past medical history and the clinical presentation of the case we reported. In that same review, most authors do not reveal how they treated the seizures but a broad-spectrum antibiotics have been used to treat the patient once the diagnosis is suspected. This may explain the reason why in 8 cases out of the 17, the antibacterial culture of the pus was sterile. From the 9 other cases from which a pathogen was isolated, six was Streptococcus species. Meaning our case is also rare in this aspect of being caused by staphylococcus species, found in only two patients. In most of the cases, the antibacterial therapy was adjusted to the antibiogram result according to the sensitivity of the isolated pathogen. The question about how long do the treatment last to get the patient read of the infection, did not found answers. The duration of antibiotic therapy is very diverse and varied from 6 to 12 weeks.

Most patient recovered after craniotomy (13/17) with evacuation of the pus (Table 1). Nonetheless, the tendency of pus to extend along the length of the falx below the longitudinal sinus and bridging veins makes parafalcine, or interhemispheric, subdural empyema relatively difficult-to-reach collections. The parafalcine empyema surgery is a great challenge and the controversy remains over their treatment strategy (17). We went for the stereotactic-guided drainage of the pus. Our preoperative planning led to a spectacular result both clinically and imaging with the almost complete evacuation of pus. The patient then underwent a craniotomy with evacuation of the frontoparietal subdural empyema. The patient presented an immediate good outcome and the management continued with the antibiotics adapted to the findings of the bacteriologic analysis. According to surgical strategy, several techniques are available. Prieto et al. (2) reported a case of large parasagittal craniotomy with a good outcome, and Sammartino et al. (15) proposed a burr hole followed by an endoscopic aspiration. Even if the craniotomy is the surgical strategy more often used to treat parafalcine empyema, we propose according to our experience to consider the option of stereotactic-guided drainage. It is also important, regarding the critical analysis of Salunke et al. (18) and Mauser et al. (13) to consider that a nonsurgical strategy might be considered for patients with a good clinical condition and no major midline shift on neuroradiological studies.

IV. CONCLUSION

Stereotactic management of a parafalcine subdural empyema is doable independently of the neurological status of the patient and it is a precise and focused-to-lesion surgical procedure with a good evacuation of the pus; speeding patient recovery.

Ethics and reporting guidelines

This article respects both the Consensus-based Clinical Case Reporting Guideline and the Recommendations for the Conducting, Reporting, Editing, and Publication of Scholarly Work in Medical Journals.

Disclosure

The authors did not receive any funding for the preparation of this case report.

This article is an original work that is not being considered or reviewed by any other publication, and has not been published elsewhere in the same or a similar form.

All authors of the manuscript have read and agreed to its content and are accountable for all aspects of the accuracy and integrity of the manuscript;

Informed Consent: The patient gave his informed consent to publish his case.

Conflicts of Interest: The authors declare that they have no conflicts of interest.

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