

Intracranial Empyemas: Experience of the Neurosurgery Department of Conakry University Hospital

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Abstract

Introduction: Intracranial empyemas are rare intracranial suppurations but carry serious and potentially fatal prognosis in the absence of adequate treatment. The objective of our study was to determine the epidemiological, clinical features, therapeutic and evolutionary characteristics of these suppurations in our department. **Materials and methods:** It was a descriptive retrospective study of 88 intracranial empyemas files collected over a period of 5 years (January 2014-December 2018) in the archives of the neurosurgery department of Conakry University Hospital. **Results:** The frequency was 43.1% for all intracranial suppurations. The mean age was 14.6 years (2-42 years) with a sex ratio of 1.8 (57 males/31 females). The port of infection was dominated by otorhinolaryngological infections, 76.5% and unknown in 19%. The clinical manifestations were dominated by fever (90%), intracranial hypertension (66%) and focal signs (45%). The site was subdural in 59 cases and extradural in 29 cases. Surgical treatment involved 91% of patients and 9% were treated with antibiotic therapy alone. The evolution was favorable in 68.1% of cases with a mortality rate of 13.6%. **Conclusion:** Intracranial empyemas are medical and surgical emergency. The forms of otorhinolaryngology origin are more frequent. Despite the therapeutic difficulties, the prognosis remains acceptable in our study with 13.6% of deaths.

Key words: Antibiotic Therapy; Empyema; Extradural; Neurosurgery; Subdural

Introduction

Intracranial empyemas are the suppurations collected extracerebral (extra or subdural).¹ They are rare intracranial suppurations (ICS), but have a serious and potentially fatal prognosis in the absence of adequate treatment.² In developing countries of the South, particularly in Black Africa, empyema remains a current problem.³ In terms of diagnosis, modern imaging techniques are still not available, and in terms of prognosis, the difficulties of treatment and the conjunction of complications inherent to a delay in diagnosis explain the seriousness of these suppurations.⁴ We report our experience in order to evaluate this pathology from an epidemiological,

clinical features, therapeutic and evolutionary point of view in our department.

Methods

It was a descriptive retrospective study of 88 intracranial empyemas files collected over a 5-year period (January 2014-December 2018) in the archives of the neurosurgery department of Conakry University Hospital. The diagnosis was made by CT scan. Follow-up was 6 to 12 months. The parameters studied were frequency, age, sex, clinical features, imaging, microbiology, treatment and evolution. We excluded all incomplete files, all empyemas of tuberculosis origin and all empyemas associated with abscesses.

Our study had been approved by the ethics committee of the Conakry University Hospital. Data were collected and analyzed using SPSS 21.0 software.

Results

Out of 204 cases of ICS collected, intracranial empyemas represented 88 cases, or 43.1%. The average age was 14.6 years (2 years-42 years) with a sex ratio of 1.8 (57 males / 31 females). Port of bacterial infection was dominated by otorhinolaryngological infections, 76.5% and unknown in 19% (Table 1).

The time to diagnosis varied from 3 days to 3 months.

Table 1: Infection entry route

Entry route	Percentage
Otorhinolaryngology	76.5%
Sinusitis	64%
Otitis	10%
Otomastoiditis	2.5%
Posttraumatic	3%
Meningeal	1%
Post-operative	0.5%
Unknown	19%

Clinical data are summarized in Table 2. Microbiology study showed hyperleukocytosis in 90%, C-reactive protein positive in 80%. The bacteriology was 80% negative, the germ was found in 18 cases (Table 3).

In terms of imaging, the empyemas were subdural in 59 cases: hemispherical in 42 cases (Figure 1), interhemispherical in 16 cases (Figure 2) and one case of the tent of the cerebellum, and extra dural 29 cases (Figure 3).

Table 2: Clinical data

Signs	Percentage
Intracranial hypertension	66%
Bergman Triad	25%
Fever	90%
Coma	42%
Disturbance of consciousness	32%
Focal sign	45%
Meningeal syndrome	35%

Therapeutically, a probabilistic tri-antibiotic therapy, combining a 3rd generation cephalosporin (100 mg / kg weight), metronidazole (40 mg / kg weight) and combined in 54% with gentamycin (4 mg / kg weight) or thiamphenicol in 46% (50 mg / kg weight) was instituted for 3 weeks parenterally and continued orally for 4 to 8 weeks. It was then adapted according to pus culture report. The treatment was 9% exclusive medical for the collections measuring less than 2 cm, in 91% of the cases the surgery was associated with a delay ranging from 24 hours to 3 months. For the majority of cases, it was performed within the first 24 hours with 74 cases of trepanation, 11 cases of flaps and 3 cases of craniectomies. It was justified on the basis of size and clinical tolerance criteria, in particular disorders of consciousness associated with a compressive collection. The main source of infection was treated in 60% of cases. Anticonvulsant therapy (42%), corticosteroid therapy (13%) for intracranial hypertension associated with cerebral edema and heparin therapy (3%) for cerebral thrombophlebitis.

Table 3: Bacteriological data

STAPHYLOCOCCUS	
Aureus	2
Saprophyticus	3
Coagulase	2
Streptococcus pneumoniae	10
Klebsiella pneumoniae	1
Negative bacteriology	70

The evolution was marked by healing without sequelae in 60 cases (68.1%), healing with sequelae in 16 cases (18.1%), 6 cases (6.8%) of recurrence,

requiring re-intervention and 12 cases (13.6%) of death. Table 4 summarizes the neurological sequel.

Table 4: Neurological sequelae

Hemiparesis	6
Coma	8
Convergent strabismus	2

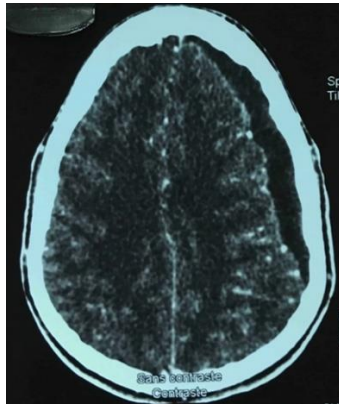


Figure 1: Empyema subdural left hemispherical

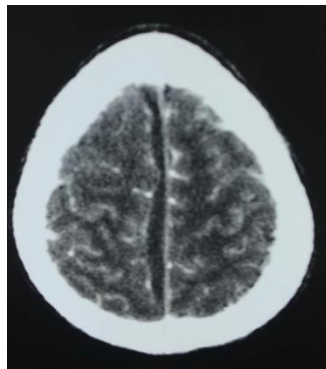


Figure 2: Interhemispheric empyema

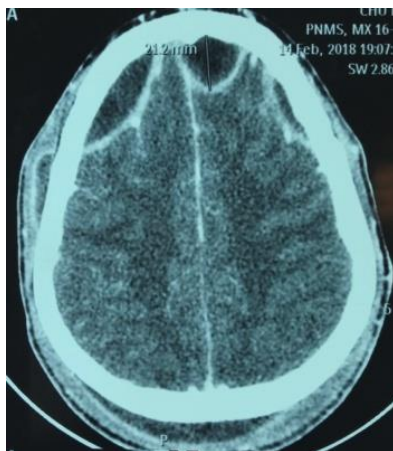


Figure 3: Extradural empyema

Discussion

The management and prognosis of empyemas have evolved considerably in recent decades with the advent of CT scan in Guinea, allowing early diagnosis and a more precise and less aggressive treatment.

The frequency of this pathology is certainly underestimated in developing countries, especially in sub-Saharan Africa, due to under-equipment in medical imaging.⁵ It was 43.1% in our series over a period of 5 years and 44.4% in Senegal over a period of 4 years.⁴

The male predominance found here is classic regardless of the gateway and the type of ICS.^{4,6,7,8} As for the age (mean: 14.6 years), it is consistent with the data in the literature^{4, 9, 10, 11} and is explained by the higher incidence of sinus and otomastoid infections at this time period of life¹², which remained predominant in our study with 76.5% of cases. The entrance door is unknown in 2 to 29% depending on the series^{4,13} and in 19% in our series.

Clinically, the fever is inconstant^{8,14,15} but present in 90% in our series ranging from 39 to 40° C. Intracranial hypertension varies from 69 to 100% of cases¹⁶, 66% in our series. It is thought to be linked to the underlying cerebral edema and thrombophlebitis of the superior sagittal sinus.^{16,17,18} The signs of focusing are present in 75 to 100% of patients^{10, 13,19} against 45% in our series. The seizures vary from 22.2 to 44% of cases^{18, 20, 21} and 42% in our series. Meningeal syndrome was found in 14 to 75% of cases^{10, 15, 18} is 35% in our series. Consciousness disorders represent 32% in our series against 63% in the Senegalese series.⁴ The delay in diagnosis would explain these disorders of consciousness. The patients are admitted most often at a very advanced stage.

Staphylococcus and Streptococcus predominated in our series, which is similar to the series by Ouiminga et al. in Senegal.⁴ The pus is sterile in 17 to 67% of cases^{8, 13, 17} against 80% in our series. Preoperative antibiotic therapy, conditioning of the sample in the event of anaerobic bacteria can be implicated.⁴

The subdural site of empyemas was predominant in our series (59 cases), which agrees with the data in the literature.^{7,22,23,24} Extradural empyema is rarer, occurs in most cases with the onset of osteitis or osteomyelitis

of the vault of the skull. It occasionally complicates sinusitis or otomastoiditis.⁴

The treatment is medical and surgical. Medical treatment is based on long-term antibiotic therapy with molecules diffusing well into the brain parenchyma.^{7, 23, 24, 25} The antibiotic treatment will be probabilistic from the outset, then secondarily adapted according to the germ detected in pus culture report. If there is no germ, treatment will be empirical depending on the clinical course of the patient. The combination of a third-generation cephalosporin with metronidazole seems to us to be an interesting choice both via the venous and oral routes. Americans prefer the combination of a third-generation cephalosporin (ceftriaxone or cefotaxime) and thiamphenicol (1g intravenous every 6 hours).¹ Intravenous treatment will be prescribed for 15 to 21 days and the relay orally for 15 days to 2 months.^{7, 23, 26} In our practice, the protocol was 21 days parenterally and 4 to 8 weeks oral bi-antibiotic therapy. Corticosteroid therapy is indicated in life-threatening intracranial hypertension¹⁹ and significant edema, as was the case in 13% of our patients. Anticonvulsant treatment can be combined with antibiotic treatment throughout its duration^{6, 22, 27}, it was associated in 42% in our series. The entrance door must be systematically treated to avoid recurrence.^{4, 20, 27, 28}

Surgically, single or multiple trepanations is less invasive and remains aesthetic but has certain drawbacks^{31, 24}: obstruction of the holes with thick pus or edema; limited exploration of the brain; a significant risk of recurrence.^{18, 19, 29} Drainage is performed for 3 to 5 days.¹⁶ The bone opening can be enlarged, which would allow almost all the collection to be removed and associated with abundant washing with physiological serum. The thick collections were thus easily evacuated without additional drainage because this material could have maintained the infection. This technique was performed in 74 of the patients in our series. Multiple trepanations would provide 77.8% cure.⁸ Craniectomy would allow complete evacuation of the empyema leading to rapid clinical and radiological improvement.⁷ This technique was effective for 3 patients in our series. However, it requires cranioplasty because of the aesthetic damage it causes, which limits its performance^{10, 26} The placement of an implant in a weakened bone site whose therapeutic difficulty has been proven can, even after recovery, be a source of

infection. For many authors, craniotomy using a bone flap remains the surgical technique of choice.^{11, 14, 26, 28} Performed in 11 of the patients in our series, it allows a wider exploration of the brain, looking for a possible residue of pus due to adhesions^{26, 27, 28} and re-expansion of the brain in the event of severe cerebral edema.^{33, 37} The survival rate is estimated to reach 77.8 to 91% when performed as a first-line treatment^{8, 27} compared to 52% for trepanation^{15, 18, 29} It is reserved for inter-hemispherical, sub-temporal, posterior fossa empyemas and multiple locations or when the collection is thick and viscous or in the event of the formation of a thick marginal capsule.³⁰

The course after treatment has improved considerably with the advent of antibiotics (80 to 100% mortality in the pre-antibiotic era)⁷ but also in recent decades with the progress of medical imaging for diagnosis early. Nowadays, healing without sequelae is the rule in more than half of the cases: 44 to 78% according to the series^{4, 6} and 68.1% in our series. Nevertheless, mortality remains significant, 13.6% in our series and 11% in the series by Ouiminga et al. in Senegal.⁴ The possible neurological sequelae are variable: 18.1% in our series, 8 to 44% for the other series.^{4, 13, 18, 27} They are classified into “minor” sequelae (monoparesis, epilepsy, visual field deficit, minor behavioral disorders) and “major” sequelae (hemiplegia, severe behavioral disorders).⁶ The timing of the procedure is more important than the surgical technique itself. The late surgery observed in our experience is related to diagnostic difficulties. Early diagnosis, proper treatment and prompt surgery give the patient a better chance of recovery with few neurological complications.^{15, 28, 29, 30}

CONCLUSION

Intracranial empyemas are the medical and surgical emergency. The forms of otorhinolaryngology origin are more frequent, and the difficulties of management from a diagnostic, therapeutic and economic point of view are the seriousness of this condition. Despite these hazards, the prognosis of our patients remains acceptable 13.6% of deaths. The combination of targeted antibiotic therapy and surgical treatment results in healing with fewer sequelae.

Conflict of Interest

The authors declare that they have no conflicts of interest and they have received no funding for this work.

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