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Cerebral abscess and empyema complicating pansinusitis in an 11-year-old child: report of a case to the pediatrics of the Mali Hospital.

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Abstract: Introduction: Brain abscess is an intracranial suppuration producing a newly formed cavity. Otorhinolaryngological infections are one of the main causes. We report a case of cerebral abscess and empyema complicating pansinusitis in an 11-year-old adolescent treated at the Mali Hospital.

Observation: He was an 11-year-old adolescent with a history of chronic headache who was admitted for left hemiplegia. The onset dates back to around 15 days marked by an unquantified fever, headache and then coma. A brain scan performed during hospitalization revealed a brain abscess and empyema, hence its reference to the Mali Hospital. At the entrance he had a fever of 38.5 ° C and a poor general condition. He was aware, well oriented and consistent. He had flaccid left hemiplegia with preservation of peripheral sensitivity. Cardiorespiratory examination and oto-rhinolaryngological were normal.

Surgical drainage associated with medical treatment including ceftriaxone 100 mg/kg/d direct intravenous for 15 days, gentamycin; 3 mg/kg/d intramuscular for 3 days, metronidazole : 10 mg/kg /12 hours intravenously slowly for 15 days, paracetamol: 15 mg/kg /6 hours intravenously slowly, glucose serum 10%: 100 ml/kg /day infused and red blood cell concentrate group O+: 20 ml/Kg intravenously slowly have been introduced. The relay was done with ciprofloxacin 10mg/Kg/12 hours for 6 weeks by oral route. The postoperative follow-up was simple. He was discharged on the 15th day of hospitalization.

Conclusion: Intracranial complications of sinusitis are serious and common in children in developing countries. The brain scanner is an indispensable tool for its diagnosis. Management is multidisciplinary. Prophylaxis is based on the correct treatment of otorhinolaryngological and oral infections.

Keywords: brain-abscess-child-hospital of Mali

INTRODUCTION

The abscess is an intracranial suppuration creating a neoformed cavity. This characteristic differentiates it from a subdural or extradural empyema, which is defined as intracranial suppuration developing in a pre-existing cavity [1,2].

Otorhinolaryngologic infections are one of the main causes about 50% of cases, especially in older children and adolescents. This gateway has become rare in Western countries [3]. In these countries the epidemiological and clinical characteristics of brain abscesses and empyema are well established and their prognosis has been improved thanks to a better knowledge of the microorganisms responsible and the development of antibiotics with good cerebral diffusion and a well-adapted spectrum, but also by the appearance of diagnostic tools that are less or not invasive (CT scan, stereotactic biopsy, magnetic resonance imaging [2-4].

Similarly, mortality, which was close to 100% at the beginning of the century, reflecting the ineffectiveness of the immune system in defending against this type of infection, is currently between 5 and 10% [2]. Neurological sequelae can affect between 30 and 50% of patients, especially those who have required resuscitation. They are often minor, but 15 to 20% of patients present disabling sequelae, among them epilepsy [2].

However, in developing countries, their frequency is high in children. This predominance in children is linked to the unfavorable socio-economic conditions that are a favorable factor in these pathologies [5].

The nature of the causal agent varies according to the gateway. Thus, cerebral abscesses with an ear, nose and throat starting point are due to enterobacteria or Pseudomonas aeruzinosa [2]. Empyemas are caused by the same bacteria as abscesses with a polymicrobial flora composed mainly of staphylococcus [6].

We report a case of cerebral abscess and empyema with Staphylococcus aureus complicating a pansinusitis in an 11-year-old adolescent in the care of the Mali Hospital.

OBSERVATION

N.M. was an 11 year old teenager who was admitted with fever and left hemiplegia. His parents worked in the informal sector. They had no known medical or surgical history. N.M. was the first child of a sibling group of 6, and his siblings were doing well. He came from a low-income

family. He was dropped out of school by his parents. In his history we noted chronic headache. The onset of the illness was about 15 days ago marked by an unquantified fever, intense diffuse headache with early post prandial food vomiting. His family took him to their local health center where he was treated for malaria. He was put under ambulatory treatment including artemether 40 mg /lumefantrine240 mg: 1 tablet morning and evening for 3 days, paracetamol tablet 500 mg/8 hours if pain and/or fever. Faced with the persistence of symptoms and the intallation of a coma he was hospitalized in the center of their locality for better management. The rapid diagnostic test for malaria carried out in the emergency room came back negative. He was then put under empirical antibiotic therapy based on ceftriaxone: 100 mg/Kg/day direct intravenous in a single injection, gentamycin: 3 mg/Kg/day intramuscular in a single injection, metronidazole: 10 mg/Kg/12 hours slow intravenous. The evolution was marked by the emergence and appearance of left hemiplegia. To explore this motor deficit, a cerebral scanner was performed. It revealed a right hemispherical subdural empyema of an intracerebral abscess left basal junction with significant peri lesionaloedema (Figure 1A and B) on a pansinusitis (Figure 2 A and B), hence his referral to the Mali Hospital. At the entrance, he weighed 25 kg for a height of 138 cm and a body mass index of 13 corresponding to underweight. He had a fever of 38.5°C. Neurologically, he was conscious, well oriented and coherent. He had a flaccid left hemiplegia with conservation of peripheral tenderness. Cardiorespiratory, gastrointestinal, and ear, nose and throat examinations were normal. The biological examinations performed on admission were :

– The haemogram which showed anaemia at 6.7 g/dl microcyte and hyperleukocytosis at 19000/mm3 with predominantly neutrophils. Platelets were 419000/mm3 ;
– C-reactive protein was positive at 145 mg/l ;

Prothrombin level was 75% and activated partial thromboplastin time was 32.9 seconds.

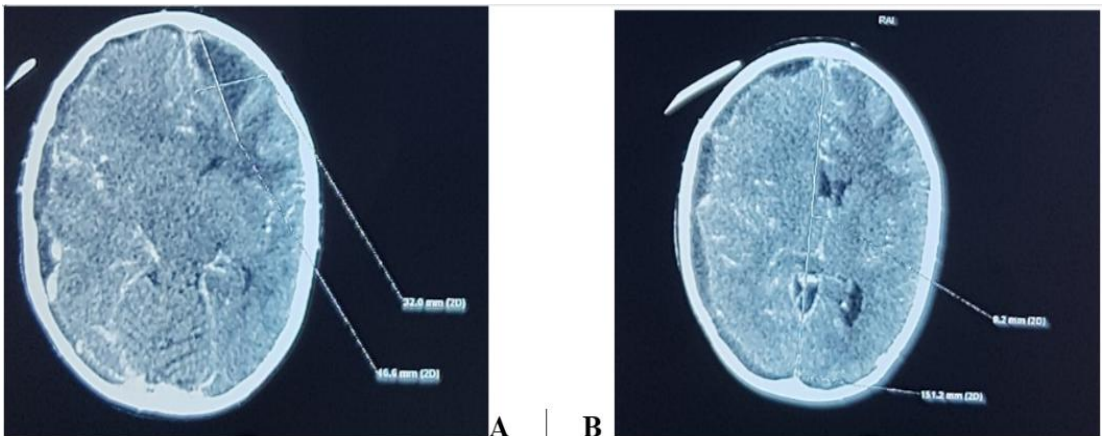

Figure 1: Brain scan axial section in parenchymal window after injection of contrast medium shows :

– a 4X32 mm left frontal cortical abscess collection with intense annular enhancement associated with peri-lesional edematous hypodensity and discrete mass effect on the frontal horn of the homolateral ventricle ;
– right hemispherical subdural empyema (reaching 27 mm at the upper parietal level) responsible for mass effect on the adjacent parenchyma and midline.

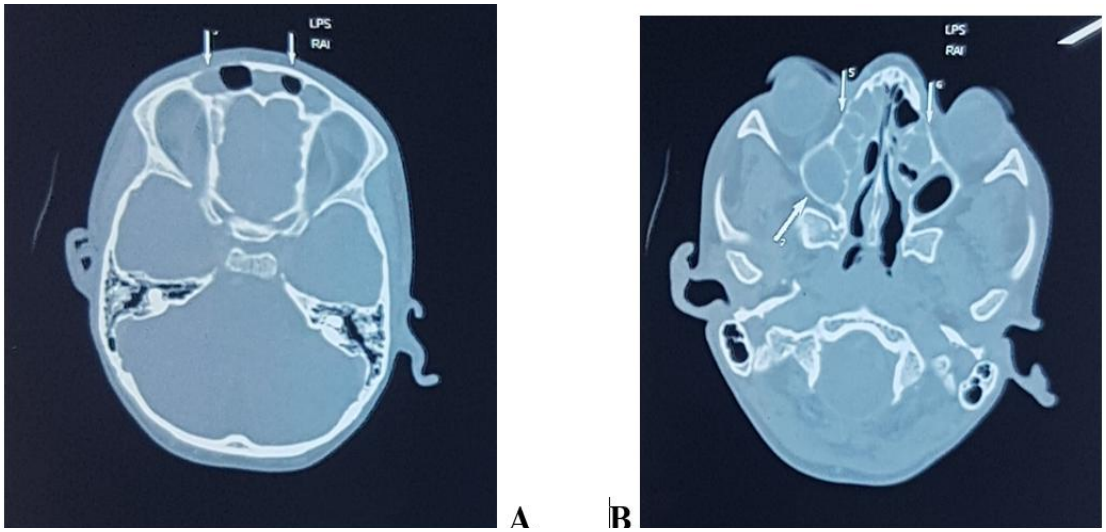

Figure 2: Brain scan bone window passing through the frontal and ethmoidal sinuses showing partial sinus filling, more marked on the right.

A medical treatment comprising ceftriaxone 100 mg/kg /day direct intravenous in a single injection for 15 days, gentamycin; 3 mg/kg /day intramuscular in a single injection for 3 days, metronidazole : 10 mg /kg /12 hours in slow intravenous for 15 days, paracetamol: 15 mg /kg /6 hours in slow intravenous, glucose serum 10%: 100ml /kg /d as an infusion and group O+ globular concentrate: 20 ml/Kg in slow intravenous over 1 hour have been introduced. The antibiotic therapy was relayed with ciprofloxacin 10mg/Kg/12 hours for 6 weeks orally.

On the tenth day of hospitalization, he was operated on. The operating technique used was: right temporo-parieto-occipito-frontal incision, craniotomy, crosswise opening of the dura mater, evacuation of frank pus under high pressure. Bacteriological examination of the pus from the abscess isolated Staphylococcus aureus sensitive to cephalotin, ofloxacin, ceftriaxone, doxycycline, ciprofloxacin and gentamycin. It was resistant to erythromycin, lincomycin and azithromycin. The postoperative period was calm. Seven days after the operation we observed apyrexia and regression of hemiplegia. The cerebral CT scan performed 2 weeks after the operation showed a small, slightly compressive right frontal extradural empyema on the cortical opposite associated with a hypodense cortico-sub cortical frontal contralateral area with atrophy of the parenchyma (Figure 3).

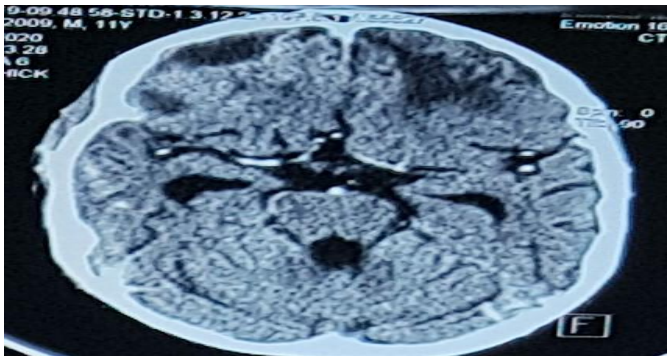

Figure 3: Cerebral CT scan performed 15 days after the operation, axial section with contrast injection showing a small, slightly compressive right frontal extradural empyema on the facing cortical associated with a contralateral frontal cortico-sub cortical hypodense area with atrophy of the parenchyma.

DISCUSSION

Intracranial suppurations are neoformed purulent collections, including, in decreasing order of frequency, cerebral abscesses, subdural empyemas and extradural empyemas [3]. Their incidence is constantly below 1/100,000 inhabitants in developed countries and can be explained in part by the better management of otorhinolaryngologic and stomatologic infections of which they represented a possible complication [2]. Abscesses and empyema are more frequent in males with a sex ratio of about four men for every two men. Abscesses can be found at any age despite a high frequency before the age of 40, 25% of cases occur before the age of 15. Extra dural empyema accounts for 15% of focal suppurations and mainly affects young subjects or children [7]. The potential modes of contamination are varied:

- Contamination by contiguity (50% of abscesses). These abscesses develop from infectious foci in the otorhinolaryngologic sphere, either sinusal with frontal abscesses, or petrous with temporal abscesses;
- Contamination by blood-borne pathogens (50% of cases). These abscesses are located in the territory of the lenticulostriated arteries. When these abscesses are multiple, it is necessary to look for a cardiac malformation;
- Direct contamination (5-10%) occurs after surgery or trauma;
- In the 5-10% of cases the mode of contamination is not known [6].

The germs involved naturally depend on the mode of contamination. The most frequently found germs are streptococcus, enterococcus and anaerobia. Postoperatively, Proteus, Escherichia and Klebsiella are the most common germs involved. The flora is often polymicrobial [6]. Anatomopathologically, the infection begins with a presuppurative encephalitis whose partially necrotic center contains inflammatory cells and germs and which is surrounded by an inflammatory reaction made up of macrophagic cells and fibroblasts. In the periphery, there is a perivascular infiltration of polynuclear and neo-vessels. This encephalitis is surrounded by an extensive range of edema [6,7]. At the abscess stage, a collagen capsule develops from fibroblasts and macrophagic cells. Neovascularization is maximal. The center contains the debris of necrotic purulent melting, as well as numerous cells and cellular debris. From the initial affected cerebritis, a constituted abscess, the evolution takes about 20 days [6,7]. Clinically, brain abscesses can manifest themselves in a variety of ways. The seat of the abscess is an important element of symptomatology: frontal abscesses are long silent. Most often, the clinical symptomatology is that of an isolated mass syndrome with signs of intracranial hypertension (headache, vomiting), epileptic seizure, progressive focal neurological deficit. Infectious signs (fever, alteration of general condition, inflammatory signs) are often little marked or even absent [2,6-8]. Extradural empyema is often not very symptomatic. Infectious signs are little marked (no fever in particular) and neurological signs appear only when the mass effect generated by the collection is sufficiently important [6]. Subdural empyema is accompanied by fever and headache, which can impose them for a sinusitis that may be at the origin of these collections. During subdural empyema, the brain is clearly more exposed since it is no longer protected by the hard meninx and because of the possibility of thrombosis of the veins, which are numerous in the subdural space [6,7]. The

diagnosis of brain abscess is based on the brain scan before and after injection of contrast material. It remains the reference test for the diagnosis of brain abscess with an excellent sensitivity of 90 to 100%. Typically, it shows a rounded, hypodense image with a mass effect, and after injection of contrast agent a "cockade" image appears: central hypodensity (corresponding to a zone of suppuration and necrosis collected), contrast shot, annular, regular at the periphery (corresponding to the shell) and hypodensity at the periphery (corresponding to cerebral edema) [2,7]. This typical aspect is more or less complete depending on the stage of development of the abscess at the time of the CT scan. The scanner can also be used to guide the stereotactic biopsy or to search for the etiology of the abscess, by taking pictures centred on the sinus or on the rocks [2,7]. However, this examination may be defective in the early stages of uncollected cerebritis and in the case of empyema, small lesions or only under tentorielle, hence the interest of magnetic resonance imaging, which is sometimes more efficient in these conditions [2,6,7]. Microbiological diagnosis is based on blood culture and stereotactic biopsy puncture of the abscess contents. Blood cultures must be taken in the face of any fever, even moderate at 38°C, before any antibiotic therapy [2]. They can isolate the bacterial agent responsible especially in two situations: endocarditis with secondary cerebral abscess (where Staphylococcus aureus is often incriminated) and cerebro-meningeal listeriosis. They thus contribute to the etiological diagnosis of cerebral abscess in nearly 10% of cases [2]. Stereotactic puncture-biopsy allows the contents of the abscess to be cultured. Its yield is maximal if it is performed before any prior antibiotic treatment. Nevertheless, it remains an invasive procedure; therefore it is essential to ensure that the product obtained will be treated in an optimal way during the different stages of transport and treatment in the laboratory [2].

Their modalities of care depend on their presentation and characteristics; field, bacteriological, modality. According to most experts the treatment is medical and surgical in the majority of cases[2]. Medical treatment is based on prolonged antibiotic therapy taking into account suspected or isolated microorganisms, and pharmacokinetic data and antibiotic concentration in the cerebral parenchyma [2]. The doses are high and the route is parenteral for the first 2 and 3 weeks. Oral relay is possible for antibiotics with good bioavailability and cerebral diffusion if the patient's condition improves. The empirical duration of antibiotic therapy is a minimum of 6 to 8 weeks for documented abscesses with multi-sensitive pyogenes that have been evacuated, but can be as long as 3 to 6 months for complicated, undocumented, non-puncturable abscesses with slow resolution [2].

While waiting for the microbiological data of the neurosurgical puncture, a presumptive treatment is started which takes into account the presumed entry portal. It most often uses a 3rd generation cephalosporin (cefotaxime) at a high dose of 200 mg/Kg/day in direct intravenous injection for its action on streptococcus and gram-negative bacilli associated with imidazole active on anaerobes or phenicols which have a good cerebral diffusion [2,7].

In suppurative Staphylococcus aureus infections, penicillin M (oxacillin) is used if the staphylococcus is meti-sensitive or vancomycin or the combination cefotaxime - fosfomycin if resistance is suspected (post-surgical abscess). Then, depending on the antibiogram of the responsible bacteria, fluoroquinolones, rifampicin, clindamycin, cotrimoxazole or fusidic acid can be used[2].

Surgical treatment has a dual purpose: diagnostic and curative. The nature of the surgical procedure depends on the location and appearance of the lesions. The surgical puncture-biopsy with aspiration is performed with after stereotactic scan-scanning [2]. It allows both the evacuation of pus and bacteriological diagnosis. Complete excision of the abscess is a cumbersome procedure, presenting a significant risk of neurological aggravation, and therefore must be reserved for particular situations where puncture and/or antibiotic therapy has failed [2]. Adjuvant treatments include :

- Systematic antiepileptic treatment is indicated in intracranial hypertension is indicated because of the high risk of epileptogenic abscesses;
- Corticosteroids are indicated in cases of severe intracranial hypertension for a period not exceeding 7 days. Intravenous mannitol could be used as an alternative or in case of contraindications to corticosteroids.

Follow-up and prognosis are based on clinical and brain imaging and are initially performed in a neurosurgical setting. A CT scan or magnetic resonance imaging should be performed weekly for the first 15 days of antibiotic therapy, then monthly at the end of treatment if the clinical course is satisfactory[2]. CT images may not normalize after several months of effective treatment, and may slowly regress even when antibiotic therapy is stopped [2].

Our clinical case is an intracranial suppuration (abscess and cerebral empyema) complicating an untreated pan sinusitis in an 11 year old teenager. The high frequency of intracranial suppuration in this age category has been described by most authors, notably by Jérôme Meloundja et al [9] who found an average age of 13 years in his study carried out at the Omar Bongo Odimba Army Training Hospital. In our patient the clinical diagnosis was based on the classic clinical symptomatology of brain abscesses described in the literature: fever, headache, vomiting and hemiplegia [2,7]. In our patient the gateway was a direct spread from an otorhinolaryngologic infectious site (sinusitis) as reported by Laval. N et al [10] in his study. In our patient, the cerebral CT scan showed the association of subdural empyema and a cerebral abscess, specifying their location and size. This association between subdural empyema and cerebral abscess was reported by H. Passeron et al [3] in his study on intracranial suppurations with otorhinolaryngologic portal of entry in children in Senegal. Surgical drainage by aspiration puncture combined with antibiotic therapy including a 3rd generation cephalosporin, an aminoside and an imidazole were instituted in our patient. This therapeutic protocol is described in the literature [2,7]. Staphylococcus aureus was isolated in the pus of the abscess after drainage in our patient. The same pathogen has been isolated by others notably by B.S

Benjelloun-Dekhama et al [11] who isolated it from 3 children, H. Passeron et al [3] from 2 children and Jérôme et al [9] from one child. In the earliest work, Staphylococcus aureus was the most frequently encountered germ[7]. Currently, more than 50% of cases are found to be pus sterile and a few are polymicrobial [7]. The most frequent germs nowadays are streptococcus, enterococcus and anaerobic germs [7].

CONCLUSION

Intracranial complications of sinusitis are serious and common in children in developing countries. The brain scanner is an indispensable tool for its diagnosis. It should be performed systematically in all children with chronic otorhinolaryngologic infections and neurological disorders. Management is multidisciplinary, involving the neurosurgeon, the pediatrician and the resuscitator. Prophylaxis is based on the correct treatment of otorhinolaryngological and oral infections.

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