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Epidemiology and Management of Orbital Cellulitis Complicated by Cerebrospinal Disease

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Abstract: Orbital cellulitis is defined as an inflammation of the cellulo-fatty tissue of the orbit. Consecutive to an attack by an infectious agent, they are responsible for serious ocular, venous and especially cerebral complications. Cerebral or intracranial complications are responsible for 5 to 25% of mortality cases. The objective was to reveal the seriousness of cerebral complications of orbital cellulitis to contribute to better patient care in our context. Observation: We report three cases of orbital cellulitis received in ophthalmological consultation whose evolution was marked by the occurrence of cerebral complications which involved the functional and vital prognosis of patients. Discussion: Brain damage from orbital cellulitis is rare but remains the most serious complication. Computed tomography confirms the diagnosis. Their management is multidisciplinary and requires close collaboration between ophthalmologists, radiologists, otolaryngologists, and neurosurgeons. It must be rapid and adapted because the delay in consultations and patient care explains the evolution of the pathology towards these fatal outcomes. Orbital cellulitis is an ophthalmological emergency whose medical management should not suffer from any delay. Conclusion: Orbital cellulitis are rare but serious pathologies and responsible for many complications, particularly cerebral. Antibiotic therapy associated with rapid surgical management can considerably improve the vital and functional prognosis.

Keywords: Orbital Cellulitis, Diagnosis, Emergencies, Treatment

1. Introduction

Orbital cellulitis is defined as an inflammation of the cellulo-fatty tissue of the orbit following an attack by an infectious agent [1, 2]. These are rare but potentially serious pathologies, responsible for cerebral complications that involve the functional prognosis of the eye and the vital prognosis [3-5]. Cerebral or intracranial complications are responsible for 5 to 25% of mortality cases [6]. This is an emergency whose medical management is multidisciplinary. we report three cases of orbital cellulitis complicated by brain damage. The objective of this study was to reveal the seriousness of cerebral complications of orbital cellulitis to contribute to better patient care in our context.

2. Observations

2.1. Case 1

KV, a 2.5-year-old girl with no particular history, was sent to our medical department for a right peri-orbital swelling (post-traumatic), this is due to a domestic accident that

occurred 6 days earlier. During her bath given to her by her babysitter, the patient fell down and landed her right hemiface on the edge of the toilet seat. There was no initial loss of consciousness. The gradual onset of right periorbital swelling, painful associated with many body temperatures and generalized tonic-clonic convulsive led to a consultation in a primary health center. What required a treatment made of amoxicillin-clavulanic acid syrup (one dose-weight, in the morning and in the evening) and child niflumic acid 400 mg suppository (one suppository in the morning and one in the evening) which would not have improved symptoms. Admitted to our department on day 6 post-trauma, the general examination revealed a febrile meningeal syndrome associated with generalized tonic-clonic seizures and a vigilance disorder. The ophthalmological examination, at the entrance revealed in the right eye an inflammatory periorbital swelling with a chemosis, a wound linear about 1 cm from the tarsal conjunctiva, necrosis of the upper half of the bulbar conjunctiva, extending to the upper tarsal conjunctiva, a pinpoint pupil, nonexistence of the photomotor reflex associated with ophthalmoplegia (figure 1). Visual acuity and fundus could not be assessed in this patient with consciousness troubles and significant chemosis.

Figure 1. *Inflammatory swelling of the right orbit.*

The examination of the other eye was without particularity. The loco-regional examination was normal Faced with this list of symptoms and pathological signs, paraclinical examinations were carried out. Biological examination revealed neutrophilic polymorphonuclear leukocytosis with an accelerated sedimentation rate. The orbito-cerebral CT scan performed revealed grade III right proptosis, associated with inflammatory thickening of the oculomotor muscles and optic nerve with right frontal cerebral hypodensity (figure 2 and 3). These clinical and paraclinical investigations led to the conclusion of post-traumatic right orbital cellulitis, with conjunctival entry complicated by meningoencephalitis. The neurosurgeons did not pose an indication for surgery. We undertook, in collaboration with stomatologists, a parenteral medical treatment, consisting of SSI 250 ml × 2/day, ceftriaxone 1 g/day, metronidazole 250 mg × 2/day, paracetamol 165 mg × 4/day, solumedrol 30 mg/day, ofloxacin 100 mg × 2/day, daily saline dressing. This tri antibio-therapy was carried out in pre, per and post-operative. Surgical treatment consisted of incision-drainage with necrosectomy (figure 4). During the intervention, a sample of pus was taken, followed by a cytobacteriological examination which revealed the germ (Enterobacter sp). Locally, care was made of Fluoroquinolone eye drops: 1 drop ×6/day; Tobramycin ointment: 1 application/day in the evening, Dexamethasone associated with neomycin: 1 drop × 8/day, Indometacyne eye drops: 1 drop × 4/day, Tropicamide eye drops: 1 drop × 3/day and a daily dressing in physiological saline. Despite this correctly followed treatment, the evolution was marked by a right corneal perforation with the occurrence of tetra ventricular hydrocephalus. In front of these complications, the indication for an External Ventricular Derivation (EVD) was made by the neurosurgeons. Despite all this treatment undertaken and correctly followed, the death of the patient occurred one month later.

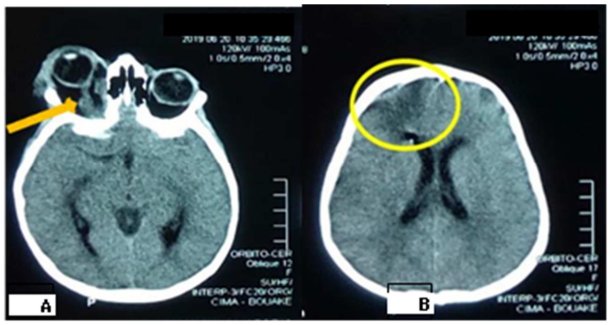

Figure 2. *(A) Right proptosis (grade III); (B) Right frontal encephalitis Case n°1.*

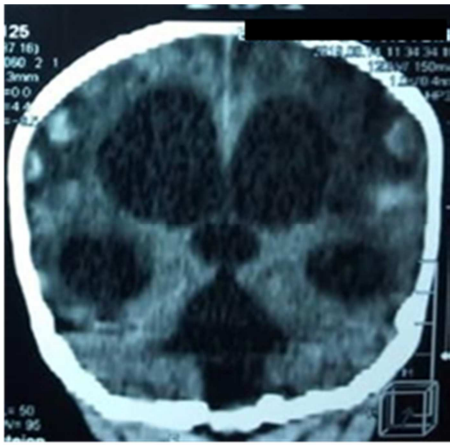

Figure 3. *Tetra ventricular hydrocephalus.*

Figure 4. *Appearance of the eye after incision-drainage.*

2.2. Case 2

AK, a 17-year-old male student with a history of recurrent rhinosinusitis, whom we received for right periorbital swelling with impaired alertness. The symptomatology would have started 11 days before his admission with right frontal headaches radiating into the right temporal region, associated with unquantified hyperthermia. The patient would have consulted in a health center where he would have received treatment of an unspecified nature, which would not have improved the symptoms. The evolution was marked by the progressive installation of an upper right palpebral swelling associated with vigilance disorders.

The general (neurological) examination revealed a febrile meningeal syndrome with disturbance of vigilance (Glasgow score of 10/15), a left hemibody pyramidal syndrome, an infectious syndrome and generalized convulsive seizures during the examination.

The ophthalmological examination carried out that day (01/30/2020), at the entrance revealed an inflammatory upper palpebral swelling in the right eye, approximately 8 cm in diameter. The skin next to it was desquamated and fistulised temporally, letting nauseous pus well up. The conjunctivae were hyperaemia, the anterior segment normal. The left eye examination was normal. Visual acuity and fundus could not be assessed in this patient with vigilance disorders.

Locoregional examination revealed purulent right anterior rhinorrhea. Faced with this list of symptoms and pathological signs, paraclinical examinations were undertaken. NFS showed anemia at 10.4 g/dl and hyperleukocytosis at 22730 GB/mm3 with a predominance of neutrophils. Orbito-cerebral CT also showing naso-sinus slices revealed right upper eyelid suppuration, grade I right proptosis, bilateral ethmoido-maxillary sinusitis, intracranial suppuration with right fronto-parieto-temporal empyema (figure 5).

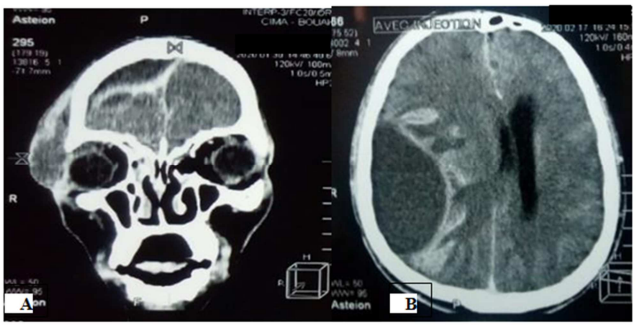

Figure 5. *Right orbital cellulitis + right frontal empyema; Right temporal extradural suppuration + mass effect.*

These clinical and paraclinical investigations led to the conclusion of right orbital cellulitis, at the naso-sinus portal, complicated by meningoencephalitis.

The instructed neurosurgeons did not pose an indication for surgery. Nasal lavage with saline has been instituted by otolaryngologists.

We have undertaken, in collaboration with infectiologists, a parenteral medical treatment, consisting of ceftriaxone 2 g, metronidazole 500 mg, paracetamol, ofloxacin 200 mg, Diazepam 10 mg for seizure prevention, Tramadol 100 mg. Locally, care was made of Fluoroquinolone eye drop, Tobramycin ointment, Dexamethasone associated with neomycin, Indometacyne eye drops, Tropicamide eye drops. The surgical treatment consisted of an incision-drainage (figure 6). The cytobacteriological examination of the pus taken during the intervention could not identify any germ.

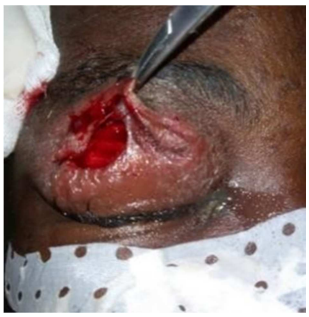

Figure 6. *Appearance after incision-drainage.*

During hospitalization, the patient presented (on Day 19) convulsive seizures which prompted the performance of a new orbito-cerebral CT scan at the request of the neurosurgical team. This examination objectified a voluminous right temporal extradural suppuration with a significant mass effect. Evacuation of the pus was carried out by the neurosurgeons and the current treatment was maintained. The postoperative course was unfavorable with the death of the patient one month after surgery.

2.3. Case 3

SM, 21-year-old fisherman with a history of chronic rhino-sinusitis, whom we received for left upper eyelid swelling with vigilance disorder.

The symptomatology would have started 3 weeks before his admission with frontal headaches, tearing, an unquantified fever and ocular redness.

The patient would have undertaken a traditional treatment without success.

Faced with the persistence of the symptoms and the worsening of the clinical picture, the patient would have consulted in a health center where he received a treatment made of Tramadol,

Amoxicillin-clavulanic acid, without amendment of signs. The evolution was marked by the progressive installation of an upper left eyelid swelling associated with vigilance disorders.

On general examination, the patient showed with a vigilance disorder (Glasgow score of 13/15) with a moderate infectious syndrome.

On admission, the ophthalmological examination carried out that day (05/05/2021), in the right eye revealed a limitation of ocular motility, an inflammatory swelling of the upper eyelid, significant chemosis associated with purulent secretions. Examination of the anterior segment revealed a tight miosis with a photomotor reflex present.

Examination of the left eye revealed a limitation of ocular motility, an inflammatory swelling of the upper eyelid, fluctuating, extending to the left hemifront. There was also diffuse conjunctival hyperaemia associated with significant chemosis (figure 7).

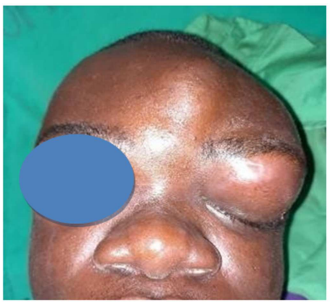

Figure 7. *Inflammatory swelling upper eyelids.*

The examination of the anterior segment objectified a pupil in tight miosis with a photomotor reflex present.

Visual acuity and fundus could not be assessed in this patient who presented with vigilance disorders.

ENT examination revealed bilateral purulent anterior rhinorrhea.

Orbito-cerebral computed tomography showing naso-sinus slices revealed left upper eyelid suppuration, bilateral grade II proptosis, bilateral ethmoido-maxillary sinusitis, right frontal extradural (intracranial) suppuration (figure 8).

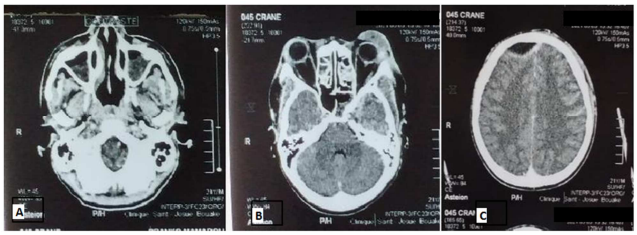

Figure 8. *(A) Bilateral ethmoido-maxillary sinusitis; (B) Left upper eyelid suppuration; (C) Right frontal empyema.*

We concluded that there was left orbital cellulitis, at the naso-sinus portal, complicated by encephalitis.

The patient received parenteral medical treatment, consisting of ceftriaxone 2 g/day, metronidazole 500 mg × 3/day, paracetamol 1 g × 3/day, ofloxacin 200 mg × 2/day, methylprednisolone 120 mg, Tramadol 100 mg × 3/day, SSI 500ml × 3/day. Nasal washing with saline was instituted by doctors.

Locally, care was made of Fluoroquinolone eye drops: 1 drop ×6/day; Tobramycin ointment: 1 application/day in the evening, Dexamethasone associated with neomycin: 1 drop × 8/day, Indometacyne eye drops: 1 drop × 4/day, Tropicamide eye drops: 1 drop × 3/day and a daily dressing in physiological saline.

Surgical treatment consisted of incision-drainage by a multidisciplinary team. The cytobacteriological examination of the sample during the intervention could not reveal a causal germ. The clinical evolution was encouraging after one month of treatment. (figure 9).

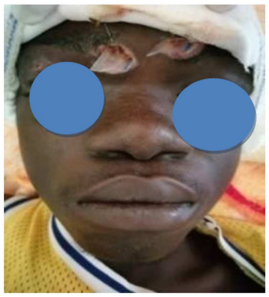

Figure 9. *Appearance after incision-drainage.*

Confirmation of the sinus (sinusitis) origin was also objectified on orbito-cerebral and naso-sinus (sinusitis) computed tomography, highlighting ethmoido-maxillary bilateral sinusitis. This complementary examination also allowed us to find intracranial suppuration, thus showing its importance in the search for complications of orbital cellulitis, as confirmed in certain studies [1, 2, 7]. This cerebral harm, highlighted by the cerebral scanner, was clinically reflected in our patients by neurological signs of localization with disorders of consciousness.

In view of our results, the observation of neurological disorders on the initial examination would constitute a fundamental argument leading any practitioner to request the orbito-cerebral CT scan as first intention in the face of any inflammatory proptosis.

As mentioned before, the mechanisms of appearance of orbital cellulitis are numerous. Periorbital skin infections and superinfected orbital wounds were also causing of orbital cellulitis in our patient (case 1).

3. Discussion

Orbital cellulitis is an infectious inflammation from the orbital contents. A male predominance would be found according to Ouaissi [8]. These are infrequent conditions in ophthalmology as described in the literature [1, 9, 10]. Infectious involvement of the orbit could be explained by several mechanisms. The invasion of the orbit by virulent germs can be done by contiguity from a loco-regional infectious focus. The most found loco-regional infectious extension is of sinusitis origin, in particular ethmoido-maxillary sinusitis. They represent the most common entry point for orbital infections according to various authors [10, 11]. Dental lesions have also been mentioned as responsible for cellulitis according to Bile [12]. Orbital cellulitis of sinus origin in our patients was clinically manifested by functional signs such as headaches, fever, sometimes intense periorbital pain, associated with purulent anterior rhinorrhea, as found in the work of Vroh Bi [13]. As for the physical examination, we noted fluctuating periorbital swelling associated with non-axile, irreducible and inflammatory proptosis. The orbital invasion of sinus infections was found in two of our patients (case n°2 and °3). The clinical picture of orbital cellulitis according to Konan is generally polymorphic with the presence of painful exophthalmos, inflammatory edema of the eyelids associated or not with a purulent collection [1].

The involvement of the orbital and periorbital seat in the occurrence of orbital cellulitis has also been found in the work of Alal [10]. On physical examination of our first patient, we noted a conjunctival wound and necrosis of the upper tarsal conjunctiva, indicating a conjunctival portal of entry with direct inoculation of the germ. According to the literature, the main germs found in the African context are streptococcus and staphylococcus [9].

Orbital cellulitis is an ophthalmological emergency whose medical management should not suffer from any delay. The extended consultation times, the scarcity of specialized structures and the lack of financial means are all factors that favor late consultations, which are the cause of many complications encountered in our patients. They (these complications) could involve both visual and vital functional prognosis. These complications are encountered in the pre-septal and retro-septal forms. However, the retroseptal forms are more prone to complications such as blindness, cerebral empyema and sometimes death [4]. In our context, consultation times according to long, variable from 7 to 30 days according to several authors [5, 12-14]. To avoid these complications, urgent and multidisciplinary care is required. The treatment in our patients consisted of triantibiotic therapy made of imidazole, third-generation cephalosporin and parenteral fluoroquinolone for three weeks. Local treatment with antibiotic eye drops and ointment was also instituted. This bi-antibiotic therapy provides broad-spectrum antibiotic coverage [4, 5].

By this well followed medical treatment in hospital, each patient also benefited from a surgical treatment which consisted of an incision-drainage of the orbital and peri-orbital abscess.

In the advanced stage of orbital cellulitis, the patient must always benefit from intensive medical and surgical care. This therapeutic attitude was adopted by Wane and Kangni, in whom the patients showed complicated orbital cellulitis [15, 16].

Despite the promptness in the multidisciplinary care, death occurred in two of our patients in a table of meningo-encephalitis with cerebral suffering thus testifying to the seriousness of this pathology.

4. Conclusion

Orbital cellulitis is a rare ophthalmological emergency. because of delays in consultation in our African context, their evolution is often interspersed with cerebral complications, which compromise the functional and vital prognosis. The medico-surgical management must be rapid and optimal in our patients to avoid reaching these final stages.

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