



Characteristics and Management of Orbital and Intracranial Complications in Acute Rhinosinusitis

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Abstract

Objective: Orbital and intracranial complications in acute rhinosinusitis are not rare but can be serious. This study aimed to investigate the characteristics and management of those complications.

Materials and Methods: A retrospective analysis of orbital and intracranial complications of acute rhinosinusitis was conducted between April 2019 and April 2024. Data on age, sex, date of admission, presence of symptoms, physical examination, laboratory results, radiological imaging, intravenous antibiotics, surgery, bacterial culture results, and prognosis were investigated.

Results: Fifteen patients were included, nine patients had orbital complications and six patients had intracranial complications. Four cases of orbital complications and six cases of intracranial complications received surgery because of no improvement by conservative treatment. Fortunately, most of the patients recovered well. Only one patient got loss of right vision for both bad visions preoperatively.

Conclusion: Orbital and intracranial complications are not rare but can be serious if not recognized early and treated effectively. Multidisciplinary treatment and enhanced imaging play important roles in the course of orbital and intracranial complications.

Keywords: Acute rhinosinusitis; Orbital complication; Intracranial complication; Characteristics; Management

Introduction

According to the EPOS 2020, acute rhinosinusitis is defined as the sudden onset of two or more symptoms in less than 12 weeks; one of the main symptoms is nasal blockage or discharge [1]. Orbital and intracranial complications, most commonly associated with acute bacterial rhinosinusitis, may spread directly to the thin and often dehiscent lamina papyracea or skull base when the infection is too strong to be fought by the patient's immune system [2]. In some cases, this may result in both orbital and intracranial complications which can lead to vision loss or death [3]. The rate of orbital complications in acute rhinosinusitis increased from 8.9% to 19.3% from 2006 to 2016, and that of intracranial complications increased from 2.2% to 4.3%; cases of children with both complications increased from 0.5% to 1.0% [4]. Those complications are remained potentially severe and may lead to death.

Based on a retrospective study of orbital and intracranial complications at our institution, we will focus on characteristics and management of such patients, for better understanding of such complications.

Materials and Methods

This retrospective study was conducted in the Department of Otolaryngology of the Third Hospital of Sun Yat-sen University. Orbital and intracranial complications caused by acute rhinosinusitis between April 2019 and April 2024 were included. Electronic medical records including age, sex, date of admission, presence of symptoms, physical examinations, laboratory results, imaging, intravenous antibiotics, surgery, bacterial culture results, and prognosis were investigated. This study was approved by the Ethics Review Board of our hospital (II2024-177-01).

Orbital and intracranial complications were classified using enhanced Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) [5,6]. Patients received multidisciplinary treatment and

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intravenous broad spectrum, full dose antibiotics, even can cross the blood-brain barrier. Patients also received regular medical treatment for acute rhinosinusitis, including intranasal corticosteroids and mucolytics. When symptoms did not improve or worsen with conservative treatment for 24 h, surgery was considered. Abscess was located and drained, excretions were gathered for bacterial culture and drug sensitivity tests. Then patients received treatment until well recovered by examinations again [7]. Patients were discharged and their recovery was followed up at regular intervals.

Results

General patient data

Fifteen patients (twelve males and three females) were included in this study. Patient ages ranged from 6 to 67 years with a mean age of (26.53 ± 20.78) years. In orbital complications, four patients had orbital cellulitis, three had subperiosteal orbital abscesses, and two had an orbital abscess. Six cases involved the left eye and three involved the right eye. Meanwhile, two patients had Pott’s puffy tumor, one patient had subdural abscess, one patient had brain abscess, two patient hand both epidural abscess and brain abscess, in intracranial complications group.

Symptoms

Patients presented with nasal obstruction (n = 14), rhinorrhea (n = 15), epistaxis (n = 2), fever (n = 8), headache (n = 10), pain in the orbit (n = 9), eye swelling (n = 10), ophthalmoplegia (n = 2), loss of visual acuity (n = 2) in both groups. However, there were 3 patients with disturbance of consciousness, 4 patients with nausea or vomiting, and 1 patient with convulsive seizure in intracranial complications group.

Most patients had a history of acute upper respiratory tract infection. One case in orbital complications had a history of Sino nasal infraction one month prior, with infarction of the left lamina papyracea observed on CT. The other patient had a history of low vision in both eyes over many years, which had a negative influence on the prognosis. Meanwhile, two cases with Pott’s puffy tumor had both history of head injury and one had endoscopic sinus surgery before, as we described before [8].

Treatment

In orbital complications group, four patients with orbital cellulitis were cured just by conservative treatment. One patient with orbital

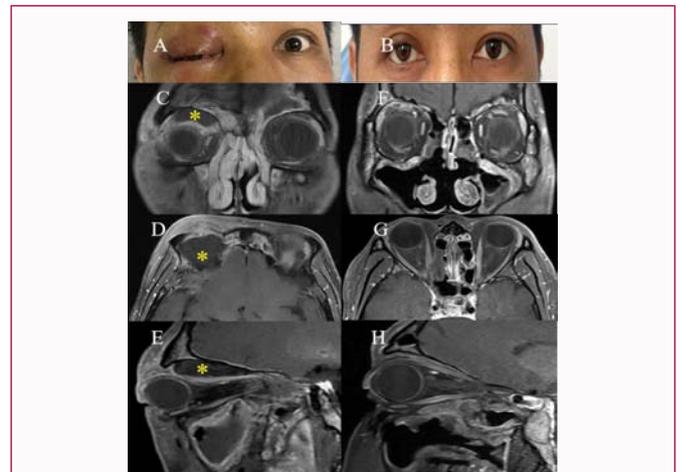


Figure 2: (A). A forty-year-old man admitted with subperiosteal orbital abscess in right eye, (B) he had rapid loss of vision for one day without improvement in spite of timely endoscopic sinus surgery and abscess drainage. (C, D, E). MRI show the subperiosteal orbital abscess (*) before surgery (F, G, H) and disappeared after surgery.

cellulitis developed to orbital abscess despite appropriate medical treatment (Figure 1). When focusing on patients with subperiosteal orbital abscess, one patient showed no symptom improvement in another hospital, and the other one had rapid loss of vision for one day with low vision in both eyes (Figure 2). Yet these four patients underwent endoscopic sinus surgery and drainage of orbital or subperiosteal orbital abscesses in the emergency department.

In intracranial complications group, one patient with both epidural abscess and brain abscess was sent into ICU because of convulsive seizure, and he was recovered and discharged well just by conservative treatment. Other patients with intracranial complications all received endoscopic sinus surgery combined external surgery (Figure 3 and Figure 4).

Prognosis

All excretion was performed for bacterial culture during surgery, with antibiotics adopted by the results. Inflammatory markers and

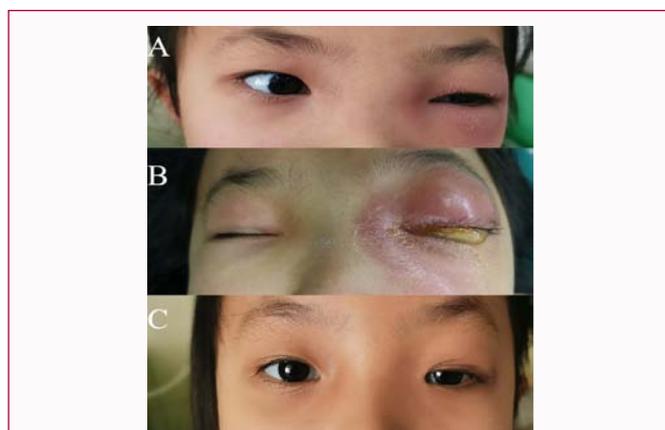


Figure 1: (A). A six-year-old girl admitted with orbital cellulitis (B) developed to orbital abscess (C) despite appropriate medical treatment, and recovered by endoscopic sinus surgery and abscess drainage.

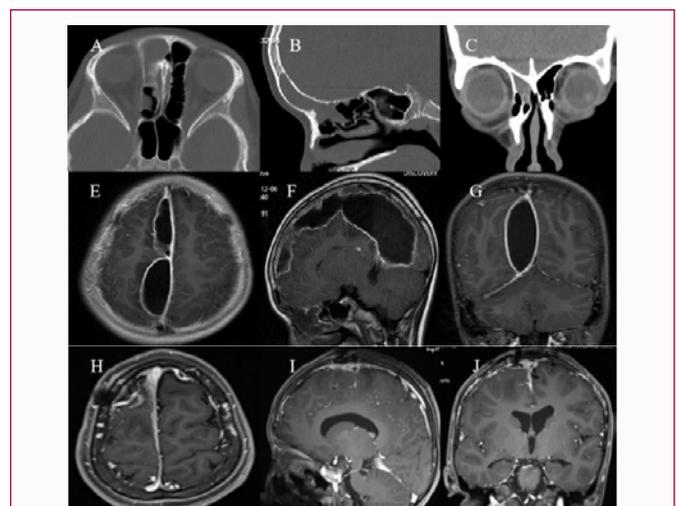


Figure 3: (A, B, C). A eleven-year-old boy diagnosed as acute rhinosinusitis (E, F, G), by CT developed to subdural abscess as described in MRI. (H, I, J). Fortunately, he recovered well after abscess drainage by endoscopic sinus surgery combined external surgery.

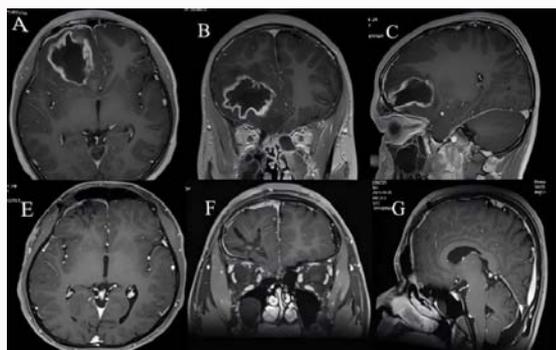


Figure 4: (A, B, C). A sixteen-year-old boy diagnosed as acute rhinosinusitis with brain abscess by MRI (E, F, G), he recovered well after abscess drainage by endoscopic sinus surgery combined external surgery.

images checked again for patients' discharge. Fortunately, all patients were well recovered with followed-up for one month to five years. None of the patients experienced recurrence, none was died because of those complications, and yet no had other complications such hemiplegia, epilepsy, dysphasia. However, only one patient got loss of right vision for both bad visions preoperatively.

Discussion

Orbital and intracranial complications are not rare despite the widespread use of antibiotics. In a retrospective cohort study, the incidence of admissions due to acute rhinosinusitis was 7.8 per 100,000 children per year (males: 9.2, females 6.2), and severe post septal orbital, intracranial, or osseous complications were present in 34% of admissions (post septal orbital, 28%; intracranial 6%; osseous 4%), resulting in an incidence of 2.6 severe complications per 100,000 children per year (males 3.6, females 1.6) [9,10]. Although only fifteen patients with complications were admitted to our hospital in the past 5 years, attention should be paid to as they can be severe if not recognized early and treated effectively.

Based on our retrospective study of orbital and intracranial complications, we advise enhanced CT or MRI for the assessment of those complications. CT scans may show the relationship between rhinosinusitis and orbital or intracranial infraction, as well as abscess formation and location. MRI can accurately assess inflammation, especially abscess [11]. Also enhanced CT or MRI was useful for disease progression such as persistent headache or fever, altered mental status, focal neurological signs occurred [12]. Meanwhile, inflammatory markers such as C-reactive protein, systemic immune inflammatory index and systemic inflammatory response index were adequate markers of inflammation to predict the development of complications in patients with pediatric rhinosinusitis [7].

Once orbital and intracranial complications are encountered, disease severity should be classified accordingly. At our institute, multidisciplinary treatment was routinely performed, involving otolaryngologists, ophthalmologists, infectious disease doctors, neurosurgeons, and neurological physicians. Individual and optimized treatments were then performed according to patient history, physical examination, laboratory results, and imaging. In clinical practice, better outcomes can be obtained through multidisciplinary treatment, as describe as other institution [13-15].

As orbital complications mentioned, most cases of orbital inflammatory edema and orbital cellulitis may be effectively managed

with intravenous antibiotics; cephalosporins are recommended first for more than one week, as most causative microorganisms are *S. aureus* or *Streptococcus* [13]. Surgery should be performed as soon as possible in cases of orbital abscess or retrobulbar optic neuritis. However, indications for subperiosteal orbital abscess surgery remain controversial. Some studies recommend that when symptoms worsen significantly within 48 h after appropriate antibiotic administration, such as a rapid decrease in visual acuity, increased proptosis and ophthalmoplegia, and abscess formation are all indications for emergent surgery for subperiosteal orbital abscess [16].

On the other hand, once intracranial complications were diagnosed, emergent surgery should be considered combined with broad spectrum, antibiotics that can cross the blood-brain barrier [17]. Aggressive management such as sinus and brain drainage, can limit mortality and the incidence of sequelae [18].

Fortunately, most of the patients recovered well after treatment. Only one patient in orbital complications showed no improvement in vision for preoperative low vision in both eyes. Although one patient in intracranial complications had symptom such as disturbance of consciousness, nausea or vomiting and convulsive seizure, he was sent to ICU for conservative treatment, which resulted a good prognosis. In our study, none was died. Also, there was no other complications such as hemiplegia, epilepsy, dysphasia [19].

This study had one limitation. This was just a single-institute retrospective study with a few cases with orbital and intracranial complications; prognosis of such situations should include a larger number of cases in future studies.

Conclusion

Acute rhinosinusitis is a common disease; orbital and intracranial complications are not rare but can be serious if not recognized early and treated effectively. Multidisciplinary treatment and enhanced CT or MRI play important roles in those situations, and antibiotics and surgery are critical in the management protocol.

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