DOWNLOAD PDF INTRACRANIAL COMPLICATIONS OF SINUSITIS.

Chapter 1 : Sinusitis Understood: Complications of Sinusitis (Orbital and Intracranial)

Background:Intracranial complications of paranasal sinusitis have become rare due to widespread and early use of antibiotics. Potentially life-threatening intracranial complications of sinusitis include subdural empyema, epidural and intracerebral abscess, meningitis, and sinus thrombosis.

Some brief instructions on reading sinus CT scans: The following review describes what can go wrong, what some of the signs and symptoms are, and when you need to seek medical help, like right now. Seriously, people buy them. There are now several websites devoted to the B9 robot and the Lost in Space series. Complications of Sinusitis Intracranial Complications of Sinusitis: The ethmoid, frontal, and sphenoid sinuses are separated from the brain by only a thin layer of bone. If infection â€" sinusitis â€" passes through these bones it can infect the fluid and tissues that surround the brain, resulting in meningitis 1. If the infection enters the brain tissue it can cause an abscess 2 , or walled-off infection. Inflammation of the intracranial blood vessels can result in abnormal clotting thrombosis of blood vessels inside the skull 3. This, in turn, can cause blindness, brain swelling, stroke, and death. You can see from the photo on the right that his forehead looks like he is hiding a golf ball. This abscess is very tender. Forehead Abscess That Extends Through Skull to Form Brain Abscess This young man required emergency surgery to drain both his forehead abscess and his brain abscess, as well as to remove all of the infected tissue mostly polyps within his sinuses that caused the problem in the first place. Any of these infections â€" meningitis, brain abscess, thrombosis blood clot â€" can be life threatening. They require urgent and aggressive treatment. When these complications are suspected, an MRI is usually obtained, sometimes in addition to a CT scan. These patients require hospitalization, with possible consultation of multiple specialists including neurosurgeon, ophthalmologist, otolaryngologist ENT , and infectious disease experts. Many will require urgent surgery. Anyone with sinusitis who exhibits changing mood or mental abilities, sudden and severe irritability, lethargy, or difficulty speaking, walking, or managing fine motor skills, must be evaluated by a physician. Orbital Complications of Sinusitis: Again, these sinuses are separated from the orbits by only a thin layer of bone. If infection from sinusitis in these sinuses passes through these bones, orbital abscess 4 or infection orbital cellulitis, 5 in the orbit can result in blindness. Over the past 24 hours his right eye is drooping, he complains of double vision. On exam, his eye does not move easily, seems to be looking down, as you might detect in this photo. This often requires surgery to cure. Her eye actually looks worse, with redness and swelling so that she cannot easily open her left eye. The MRI shown on the right shows a life-threatening complication of sinusitis. This complication is also a risk for blindness. It shows an MRI from a teenage girl with severe sinusitis. The complication is clotting of the veins of her left eye, and clotting of a large venous area inside the skull â€" the cavernous sinus orange arrows. She was hospitalized for intravenous antibiotics for severe sinusitis, and otitis. When she began to complain of vision changes this MRI was obtained. Visual testing revealed that she was losing the sight in her left eye. She was taken to emergency surgery for sinus surgery, mostly to decompress her left orbit to relieve pressure on her eye and optic nerve. Although she had a very difficult hospitalization and required several surgeries and long-term antibiotics, and anti-clotting medications, she recovered fully. Her vision is perfect, and unchanged. These patients usually require hospitalization, with consultation of ophthalmologist, otolaryngologist, neurosurgeon, and infectious disease experts. Anyone with sinusitis who experiences ANY change in vision double vision, blurring of vision, difficulty seeing in any way , or bulging of one or both eyes, must be evaluated by a physician. Local Complications of Sinusitis: Chronic inflammation from sinusitis can be associated with sinus and nasal polyps. These are abnormal swellings of the lining. Polyps can cause nasal obstruction, making nasal breathing difficult or impossible. Polyps can also block the sinus openings, causing worsening of sinusitis. Chronic growth of polyps can push bone out of place and cause distortion of the nasal profile â€" how the nose looks from the outside. Obstruction from polyps can also cause loss of smell. Finally, recurrent and chronic sinusitis can cause permanent loss of smell due to injury of the olfactory nerves. Children with cystic fibrosis are at increased risk for sino-nasal polyps. Obstruction of the sinus opening from chronic inflammation can result in formation of a sinus mucocele. As mucus continues to be produced by the

lining of the sinus, the mucocele gradually enlarges. This can result in erosion and remodeling of surrounding bone. Mucoceles are benign, but can cause significant problems, especially if they spread into the orbits or skull. Most mucoceles are not a problem, but if they become infected they can cause severe bacteremia â€" bacteria in the bloodstream. That can be life-threatening. Infection of the Bone Recurrent and chronic sinusitis can cause infection of the surrounding bone. This may be how the intracranial or intra-orbital infections of sinusitis travel. Bone infections can be extremely difficult to cure. They often require long-term intravenous antibiotic therapy, and possibly surgery to remove the infection. Any of these complications of sinusitis can become true emergencies. Some of these complications require immediate surgery in order to save a life, or to prevent permanent brain injury or blindness. These complications are not limited to children â€" they can threaten your life too. If your child has recurrent and chronic rhinosinusitis, be alert. This short list of sinusitis complications is not complete, but touches on the most dangerous complications, and some of the common complications. If you suspect that you or your child has any of these complications of sinusitis, get medical attention. Here are some articles related to causes and remedies of sinusitis. Consider possible causes of sinusitis, such as:

Chapter 2 : Imaging findings of the orbital and intracranial complications of acute bacterial rhinosinusitis

Intracranial extensions of sinusitis are infrequent in the antibiotic era, and occur in about 4% of patients hospitalized with acute or chronic sinusitis (15). However, they are the second most common complication of acute sinusitis.

Menu Orbital and Intracranial Complications of Acute Sinusitis This article addresses the imaging considerations for subtle early studies of imaging findings in sinusitis, focusing on early detection by the radiologist, which depend on dedicated imaging protocols and a careful, thorough search pattern. Pathogenesis and key imaging findings for orbital complications are discussed, followed by the intracranial complications of sinusitis. It is typically readily treated with nasal decongestants, with or without oral antibiotics. Rarely, sinus infection can result in vision loss or even life-threatening orbital and intracranial complications. Orbital extension of acute infection most commonly occurs in pediatric patients who typically present with proptosis, periorbital swelling, and erythema. When found in immunocompromised patients, such as those with diabetes, lymphoreticular malignancies, human immunodeficiency virus infection, chronic renal failure, or liver failure, intracranial infection is more likely to be secondary to acute invasive fungal sinusitis. Although the consequences of sinogenic infections can be catastrophic, the imaging findings may be extremely subtle. Early detection of orbital and intracranial complications by the radiologist requires dedicated imaging protocols, knowledge of key imaging findings, and an understanding of disease pathogenesis. Imaging considerations Although radiographs may still be used to confirm the clinical impression of sinusitis, computed tomography CT is more accurate for making this diagnosis. Indeed, whenever orbital or intracranial complications of sinusitis are suspected, contrast-enhanced CT should be the initial imaging modality of choice. In the current era of more actively minimizing radiation exposure, particularly for pediatric patients, it is imperative that the study be performed with the lowest radiation dose possible, although this must not be at the expense of a diagnostic study. Sinogenic complications, especially in children and immunocompromised patients, may rapidly progress. It is imperative that referring clinicians indicate their concern for complications or clinical features that might suggest orbital or intracranial infection so that the scan protocol is correct. Most of the published reports evaluating the role of CT for diagnosing orbital complications of sinusitis were based on CT imaging with what is now outdated technology. In addition to technologic constraints, such as slower acquisition times, decreased resolution, and nonvolumetric imaging, another limitation included the lag time between performing the CT and subsequent progression of symptoms in many of the reported cases. Despite these limitations, CT was still found to improve diagnostic accuracy relative to clinical judgment alone, a conclusion that certainly remains true today with improved CT technology. With the continuous advancement of imaging, there are no prospective studies comparing current generation multidetector CT scanners with magnetic resonance MR imaging for the detection of orbital complications of sinusitis. Nevertheless, if follow-up imaging is deemed necessary to assess clinical deterioration or treatment response, MR imaging should be considered to spare the patient additional radiation exposure. In evaluating the orbits, contrast-enhanced helical CT is best acquired in the axial plane using submillimeter collimation for isotropic voxels to allow for high-quality image reconstruction in the coronal and sagittal planes. Image data should be rendered using both soft tissue and bone algorithms to optimally assess the orbital contents as well as the thin osseous structures in the orbital and sinonasal regions. This multiplanar approach allows for more effective detection and localization of intraorbital pathology particularly thin subperiosteal collections along the orbital roof or floor, which are more easily overlooked in the axial plane and simultaneously provides a high-quality sinus CT that is equally necessary in this clinical context. With increased public awareness of iatrogenic radiation exposure, CT vendors are now offering radiation reduction options that include active dose modulation and improved iterative reconstruction techniques, both of which can maintain image quality while reducing dose. Although we typically use bismuth shielding to the orbits for head CT scans, this is not used at our institution for sinus CT studies because it prevents the use of the CT scan as an intraoperative stereotactic guide, and the patient would require additional scanning and thus further radiation. Orbital MR imaging seems to be more sensitive for the detection of fungal sinusitis, with or without orbital or intracranial complications.

In performing orbital MR imaging, specific imaging parameters vary based on equipment manufacturer and field strength. In general, axial and coronal T1-weighted sequences best depict the relevant orbital anatomy, and any infiltration or stranding of the normal high-intensity orbital fat should be sought as a sign of inflammation. A short tau inversion recovery STIR or T2-weighted fat-suppressed series should be included to evaluate for inflammatory edema and focal purulent fluid collections. Multiplanar postcontrast T1-weighted sequences with fat suppression should be acquired to search for inflammatory enhancement, as well as rim-enhancement patterns that may distinguish phlegmon from abscess. Although the local magnetic field is frequently inhomogeneous from dental hardware and air-bone interfaces in the face, it is helpful to carefully evaluate these fat-suppressed sequences in more than one plane to help distinguish high signal from failure of fat suppression versus true abnormal enhancement. In addition, the field of view for orbital MR imaging readily includes the parasellar region so the cavernous sinus should be assessed for thrombosis. For suspected intracranial complications of sinusitis, contrast-enhanced head CT is useful as an initial screening test. Despite its limitations, CT can readily identify features that would immediately triage the patient for neurosurgical management such as significant mass effect, space-occupying brain lesions, large extraaxial collections, and hydrocephalus. Once contraindications have been ruled out, lumbar puncture can be safely performed to evaluate for meningitis while the patient awaits MR imaging to evaluate the intracranial contents with greater sensitivity and specificity than can be achieved with CT. The usefulness of different MR imaging pulse sequences is illustrated in greater detail through examples of specific intracranial complications. Orbital complications of rhinosinusitis Epidemiology and Pathogenesis of Orbital Spread of Infection Largely because of proximity, orbital infection is the most common complication from acute sinusitis. Because the frontal and sphenoid sinuses develop at a later age, it is not surprising that involvement of the ethmoid sinuses is seen most often, followed in frequency by the maxillary sinuses. Because of anatomic, immunologic, and environmental factors, pediatric patients suffer from acute rhinosinusitis more frequently than adults, and account for the greater proportion of complicated cases. Recent series suggest that the average age of children with orbital complications is 6 to 8 years, although the median age tends to be slightly younger. Acute and chronic sinus disease, likewise, accounts for most cases of orbital cellulitis in adults, in whom there is a trend toward declining frequency with advancing age. Sinusitis-related orbital infection is the most common cause of unilateral proptosis in children and the third most common cause in adults after thyroid orbitopathy and pseudotumor. For unclear reasons, a male predominance is universally reported. From an anatomic perspective, there are many predisposing factors that allow for spread of paranasal sinus infection to the orbit. In terms of physical proximity, the thin bony roof, floor, and medial wall of the orbit serve to separate the orbital contents from the frontal, maxillary, and ethmoid sinuses, respectively. Clearly, aggressive infections causing osteitis might directly extend from the sinus to the orbit, but this is rare and there are multiple other potential routes for the spread of infection that do not require transgression of intact bone. The orbit is formed from 7 separate bones, and this is most relevant in considering the medial wall, which is comprised of a small portion of the sphenoid body, the ethmoid lamina papyracea, the lacrimal bone, and the frontal process of the maxilla. The union of these bones results in the presence of 3 vertical sutures appropriately termed the sphenoethmoidal, lacrimoethmoidal, and lacrimomaxillary fissures. In addition, the anterior and posterior ethmoidal foramina allow transmission of vessels and nerves along the frontoethmoidal suture line. Focal osseous defects in the orbital walls can occur secondary to areas of congenital or acquired dehiscence, with the latter including sequela from both trauma and surgery. The veins of the orbit also play a significant role in the pathogenesis of sinusitis-related complications, as it is a valveless system that allows 2-way communication between the veins of the face, paranasal sinuses, nasal cavity, orbit, pterygoid plexus, and cavernous sinus. The dominant venous drainage of the orbit is via the superior and inferior ophthalmic veins, although there are numerous smaller vessels forming a rich venous network. Most orbital and intracranial complications of sinusitis are secondary to transmission of infection via retrograde thrombophlebitis. Despite the aforementioned features that predispose the spread of infection from the sinus to the orbit, a protective barrier exists in the form of the periorbita ie, the periosteum of the orbit , which is analogous to the layer of dura lining the inner table of the calvarium. The periorbita is a robust fibrous membrane that can be stripped from

the bone except at suture lines where it is contiguous with the periosteum on the other side. It not only serves as a barrier to the spread of infection from the sinuses to the orbit but also forms the anterior orbital septum as it reflects into the tarsal plates anteriorly. This creates a delineation between periorbital preseptal and intraorbital postseptal tissues, shielding the orbital contents from potential pathology. Pathology and Imaging Detection Chandler and colleagues eloquently described the role of the orbital anatomic structures in complications of sinusitis 4 decades ago. This formed the basis for their revised classification system that consists of the following groups:

Chapter 3 : Orbital and Intracranial Complications of Acute Sinusitis | Radiology Key

OBJECTIVE: The aim of this study was to discuss the presenting signs and symptoms important for the early diagnosis and to review the medical and surgical management of patients presenting with intracranial complications of sinusitis.

These complications, even though rare, should always be watched for in patients with sinusitis. Pathogenesis Intracranial extension can occur directly or by retrograde thrombophlebitis. Direct extension can progress through necrotic areas of osteomyelitis in the posterior wall of the frontal sinus. Bacteria penetrate the dura along the course of transversing small vessels, dural thickening with inflammatory exudates and granulation tissue forms, and SE develops, which generates an arachnoidal inflammatory reaction. Direct extension is more commonly seen in chronic media otitis than in sinusitis The other route of extension is through the valveless venous system that interconnects the intracranial venous system with the sinus mucosal vasculature Thrombophlebitis that originates in the sinus mucosal veins can progress through this network to the emissary skull veins, dural venous sinuses, subdural veins, and cerebral veins. It is common in acute sinusitis and in acute exacerbations of chronic sinusitis. Intraparenchymal BA is seeded by the hematogenous route and therefore can be found in all regions of the brain, but predominantly the frontal lobes. In adults, however, the arachnoid forms a better barrier and bacterial meningitis rarely complicates SE Extensive cortical thrombophlebitis is also a common complication The hyperemia, edema, and small foci of infarction are common in the involved gyri Septic thrombosis of a dural sinus can also occur and induces bilateral cerebral edema and hemorrhagic infarction 19,20 , which generate local neurological deficits, seizures, and increased intracrancial pressure. The exact mechanism of brain infection is unclear. It may be secondary to an initial focus of ischemia or necrosis caused by cortical venous obstruction that enables the growth of microaerophilic and anaerobic bacteria The infection may thereafter progress deeper through the cerebral vessels into the white matter - causing cerebritis - which gradually liquefies as the perimeter is surrounded by a capsule made of an inner granulation tissue layer, middle layer of collagen, and an outermost glial cell shell. The process of abscess maturation takes weeks. Abscesses in the deeper white matter are less vascular than those in the cortex, their walls are thinnest when they are near the ventricle, and they often rupture into the ventricular system. The pus can form over the frontal parietal convexity, and can be located focally anywhere, but mostly over the frontal pole and occipital complex, or under the posterior fossa tentorium. Microbiology The organisms recovered from BA as a complication of sinusitis are anaerobic, aerobic, and microaerophilic bacteria. Anaerobes can be isolated in over two thirds of the patients, and include pigmented Prevotella and Porphyromonas spp. The most common aerobe is S. Four of the patients were children and all had SE. Five had Polymicrobial flora was found in 9 sinuses and 8 IA. A total of 26 isolates 2. Concordance in the microbiological findings between the sinus and the IA was found in all instances The predominant anaerobes were Fusobacterium spp. We described two children with periapical abscess in the upper incisors, ethmoid and maxillary sinusitis, and intracranial abscess SE occurred in both, and one of the children had also cerebritis and brain abscess. Anaerobic bacteria were isolated from the infected subdural empyemas. Peptostreptococcus intermedius and microaerophilic streptococci were recovered in one patient and Fusobacterium spp. Brook evaluated aspirates of pus from 8 infected sinuses associated with odontogenic infections and their corresponding IA A total of 27 isolates 3. The predominate anaerobic isolates were Fusobacterium spp. Management In the early stages of cerebritis before abscess encapsulation antimicrobial agents can prevent the formation of an abscess Once a BA has formed, surgical excision or drainage combined with a long course of antibiotics weeks remains the treatment of choice. Increased intracranial pressure may necessitate the use of mannitol, hyperventilation, or dexamethasone preoperatively. To establish a microbiological diagnosis is important in planning the appropriate antimicrobial therapy. Needle aspiration guided by CT may provide this important information and enable adjustment of empirical antimicrobial therapy when necessary. Frequent scans are essential to monitor treatment response. Although surgical intervention remains an essential treatment, selected patients may respond to high-dose antibiotics alone that are given for an extended period of time Corticosteroid use is controversial. Steroids can retard the encapsulation process, increase necrosis,

reduce antibiotic penetration into the abscess, and alter CT scans. Steroid therapy can also produce a rebound effect when discontinued. If used to reduce cerebral edema, therapy should be of short duration. The appropriate dosage, the proper timing, and any effect of steroid therapy on the course of the disease are unknown. Initial empirical antimicrobial therapy is based on the expected etiological agents according to the likely primary infection source. Penicillin penetrates well into the abscess cavity and is active against non-beta-lactamase-producing anaerobes and aerobic organisms. For coverage of Pseudomonas aeruginosa, ceftazidime or cefipime is given. Aminoglycosides do not penetrate well into the CNS. Vanccomycin is effective against MRSA. The agents effective against anaerobes include metronidazole, chloramphenicol, a penicillin plus beta-lactamase inhibitor, and a carbapenem e. Penicillin should be added to metronidazole to cover aerobic and microaerophilic streptococci. Although appropriate selection of antimicrobial therapy is of primary importance in the management of intracranial infections, surgical drainage may be required. Delay in surgical drainage and decompression can be associated with high morbidity and mortality Surgical drainage may be necessary in many patients to ensure adequate therapy and complete resolution of infection. Surgical drainage of the concomitant sinus infection and any orbital collection of pus should also be performed concomitantly. Some of these referrals are of urgent nature, especially when complications are present or suspected, and the patient should be examined and treated after only minimal delay. The indications for referral are: Deterioration of clinical condition despite medical therapy. Frontal or sphenoid sinusitis. Treatment failure of chronic infection without urgent complication. History of recurrent episodes of sinusitis 9more than 3 per year. Complications of sinusitis in children. Intracranial complications of paranasal sinusistis: Dolan RW, Chowdhury K. Diagnosis and treatment of intracranial complications of paranasal sinus infection. J Oral Maxillofac Surg. The pathogenesis of orbital complications in acute sinusitis. Oktedalen O, Lilleas F. Septic complications to sphenoidal sinus infection. Scand J Infect Dis. Cavernous sinus thrombosis complica ting sinusitis. Pediatr Crit Care Med. Blindness from orbital complications of sinusitis. Otolaryngol Head Neck Surg. Subperiosteal abscess of the orbit: Diagnosis and management of lateral sinus thrombosis. Role of anaerobic bacteria in sinusitis and its complications. Ann Otol Rhinol Laryngol Suppl. Brook I, Frazier EH. Microbiology of subperiosteal orbital abscess and associated maxillary sinusitis. Subdural empyema and other suppurative complications of paranasal sinusitis. Visual loss associated orbital and sinus disease. Intracranial complications of paranasal sinusitis: Brain Abscess in Children: Suppurative complications of frontal sinusitis in children. Aust NZ J Surg. Intracranial complications of pediatric sinusitis.

Chapter 4 : Management of Intracranial Complications of Sinusitis

Suppurative intracranial complications of sinusitis in adolescence. Single institute experience and review of literature. British Journal of Neurosurgery, Vol. 21, Issue. 6, p.

This article has been cited by other articles in PMC. Abstract Abstract In patients with acute bacterial rhinosinusitis severe orbital and intracranial complications can occur. This review will illustrate the anatomic relationship between the paranasal sinuses and the orbital and intracranial compartments. Subsequently, the spectrum of orbital and intracranial complications of rhinosinusitis and related imaging findings will be discussed and illustrated by case material from daily practice. Paranasal sinuses, Acute bacterial rhinosinusitis, Cellulitis, Osteomyelitis, Abscess Introduction Acute bacterial rhinosinusitis frequently evolves from a viral upper respiratory infection URI. The most common bacterial agents causing this infection are streptococcus pneumoniae, haemophilus influenza and moxarella catarrhalis. Early identification of children with complications of acute bacterial rhinosinusitis is crucial since it can cause life-threatening illness by the spread of infection to the orbits and central nervous system. In clinical practice, orbital complications are encountered most frequently [2]. If left untreated, orbital complications can result in permanent blindness of the affected side [3]. Clinical symptoms include a swollen eye with or without proptosis or impaired function of the extraocular muscles i. Intracranial complications are less common but have a higher morbidity and mortality rate [1]. They typically occur in previously healthy adolescent males presenting with rhinosinusitis in combination with severe headache, photophobia, seizures, or other focal neurologic findings [4]. If there is clinical suspicion of orbital or intracranial complications, cross-sectional imaging of the orbit and brain is mandatory [5]. This review will focus on the complications of acute bacterial rhinosinusitis by firstly reviewing the anatomic relationship of the paranasal sinuses to the orbital and intracranial compartments. Secondly, the various complications and their imaging characteristics will be discussed and illustrated using examples from daily practice. Anatomic relationship of the paranasal sinuses to the orbital and intracranial compartments [6 , 7] The three most vulnerable anatomic compartments that lie adjacent to the paranasal sinuses are the two orbital and the intracranial compartments Fig. The ethmoid sinuses are situated between the nasal cavity and the orbit. Cranially, the ethmoid sinuses border the anterior cranial fossa, separated by the skull base, which is a relatively thick barrier. The medial orbital wall is a very thin bony separation between the orbit and the ethmoid sinuses, termed the lamina papyracea. The lamina is not only very thin but also has numerous natural dehiscences and perforating vessels and nerves [8]. Therefore, infection can easily spread from the ethmoid sinus to the orbit. On the orbital side of the lamina there is a periosteal layer termed the periorbita, which serves as barrier against the early spread of disease. Infectious spread from the ethmoid sinus to the orbit therefore initially results in subperiosteal abscess formation before spreading to the orbit itself [9]. In the orbit, intraorbital fat lies directly adjacent to the periorbita. Anteriorly, the intraorbital fat and the other structures within the orbit are separated from the extraorbital structures by the orbital septum Fig. This septum, also termed the palpebral ligament, arises from the periosteum of the orbital rim, and inserts into the superior levator palpabrae, and the lower edge of the tarsal plate. It forms a barrier that prevents spread of infection into the orbit [10]. For this reason, infectious processes around the eye are often classified in relation to the orbital septum as either being preseptal, only involving the eyelid, or postseptal, involving the structures of the orbit. Within the orbit lies the orbital cone, which contains the eyeball and the rectus muscles surrounded by a fascia Fig. Intraorbital pathology can, therefore, also be divided in intraconal within the cone , and extraconal pathology.

Chapter 5 : Dangerous Complications of Sinusitis

Background: Of patients admitted to hospital with sinusitis, about 3% have an intracranial complication. We describe the clinical features, laboratory data, imaging findings, and outcomes of.

Intracranial and Orbital Complications of Sinusitis: Because of widespread use of antibiotics, intracranialextension of paranasal sinusitis is rarely seen today. Nevertheless, the clinician must be aware of the potential of these complications, as laterecognition of this condition and delay in treatment can increase morbidity and mortality rates. An interesting case series of sinusitis withorbital and intracranial complication is presented, which was radiologically evaluated, and was managed by endoscopic sinus surgery withdrainage of subdural empyema by appropriate neurosurgical technique. The radiological tools played a very important role in both assessmentand timing of surgical intervention. Unparallel role of radiological investigations cannot be overemphasized. The key to successful treatmentis aggressive management and the timing for surgical intervention should not be deferred. The patients made full recovery at the time ofdischarge. Intraorbital complication, Intracranial suppurative complication, Cavernous sinus thrombosis, Superior sagittal sinus thrombosis. Because intracranial extension of sinus disease is infrequently seen today, the clinician may be unfamiliar with the evaluation and management of this potentially devastating complication. Despite recent advances in treatment and diagnostic imaging, intracranial extension is often not recognized early enough to prevent delays in treatment aimed at reducing morbidity and mortality. Superior sagittal sinus thrombosis is relatively a rare dural venous sinus complication than cavernous sinus thrombosis both of which were seen in one of the cases. A kaleidoscopic neurological presentation and full recovery made by all the patients at the time of discharge made these cases more interesting. Intracranial complications are most often associated with infections of the frontal, ethmoidal and sphenoidal sinuses. Maxillary sinusitis rarely extends intracranially; however, odontogenic maxillary sinusitis has shown an increased tendency for intracranial spread. In this case series we have discussed the clinical presentation, which can be quite misleading, the progression of the disease and the vital role played by the radiological investigations in assessing the extent of the disease and surgical treatment. He gave a history of recurrent episodes of headache with yellowish color, foul smelling postnasal discharge of 2 months duration, for which he took painkillers. On clinical examination, the patient was lethargic but responsive and appeared toxic. He was febrile, his left eyeball was pushed outwards and downwards with lid edema and conjunctival congestion. Extraocular movements of left eye were restricted in all directions but vision was normal. Diffuse swelling of left frontoparietal region was seen and left frontal and ethmoid sinuses were tender on palpation. Examination of nose revealed left alar and vestibular collapse, gross deviated nasal septum DNS to left, mucopus in bilateral nasal cavities, and all paranasal sinuses PNS were tender. There were no signs of meningeal irritation or any neurological deficits. Fundoscopic examination was normal. Preliminary blood investigations showed elevated total blood counts withneutrophil predominance. Orbital abscess drained both internallyand externally. Lumbar puncture was inconclusive. Magnetic resonanceimaging MRI and magnetic resonance venogram MRV at this juncture demonstrated minimal subdural collectionin left temporoparietal region and partial thrombosis ofsuperior sagittal sinus near the confluence Fig. Spikes of fever,headache with motor weakness persisted. Patient made full recovery over the nextone month. He was regularly followed up for 6 months andshowed no signs of recurrence or neurological deficit. An International Journal, May-August ;4 2: CT scan image coronal cut on admission showing sinusitiswith gross DNS to right with orbital abscess air fluid level withhypodense opacity displacing the eyeball downward and outward. Intracranial air shadow seen in the left frontal region indicatingpneumocephalus Fig. CT scan image axial cut showing left orbital cellulitis withextraperiosteal abscess displacing the eyeball anterior and laterally Fig. MRV scan showing filling defect in superior sagittal sinus white arrow Fig. A Case Series and Review of Literature Case 2 year-old male patient presented to the ENT OPD with complaints of continuous unilateral nasal obstruction with recent onset of headache and high grade fever of 2 weeks duration. There was associated foul smelling anterior nasal discharge and episodes of frontal headache in the past but none were so severe. Fever was high grade intermittent type with chills. On

examination, patient was febrile with no neurological signs. Diffuse edema was noticed over the left frontal region, on anterior rhinoscopy gross DNS to left with mucosal congestion with mucopus in left middle meatus seen. All sinuses were tender. Thick mucopurulent postnasal discharge was present. Initial blood investigations revealed leukocytosis with neutrophil predominance. CT PNS showed extensive disease of left maxillary ethmoidal sinuses with no bony defect or erosion Fig. He was admitted and started on empirical treatment. Like the previous case there was no evidence of intracranial spread, on subsequent serial CT scans a definite epidural abscess in the left frontal lobe was seen Fig. His medication was immediately changed to 2nd line antibiotics. Surgical decompression of sinuses with evacuation of abscess was done as a staged procedure. He did not have any neurological symptoms or deficits while being in hospital. Patient made full recovery on discharge and remains asymptomatic on subsequent follow-up. White arrowsare indicating the extent of disease process Fig. CT brain axial cut showing epidural collection whitearrow with minimal soft tissue swelling Case 3 A male patient in his late teens presented to the ENT OPD with complaints of bilateral nasal obstruction and high grade fever of 1 week duration. On examination, patient was lethargic but responsive and was febrile. Past history of infrequent nasal obstruction associated with headache secondary to rhinitis was noted. External framework of nose appeared normal. Minimal conjuctival congestion was seen but the vision and extraocular movements were normal. On anterior rhinoscopy, mucopus was present in bilateral nasal cavities both medial and lateral to middle turbinate. There was no septal deviation or any gross anatomical obstruction. Nasal mucosa was congested. Postnasal discharge was present. Immediate CT PNS showed pansinusitis with small extradural abscess in the right frontal lobe unlike the previous cases where the intracranial spread developed later Figs 5A and B. No obvious bony defect was noticed. He was admitted and started on 2nd line antibiotics. FESS was performed and the sinuses were decompressed. Wait and watch policy was adopted for the extradural collection as per neurosurgical advise. However, the extradural collection failed to resolve and eventually surgical evacuation was done one week later. Very small pus pocket was seen intraoperatively. Patient made full recovery and was asymptomatic on further visits. Despite the advent of newer antibiotics, diagnostic procedures and recent advances in management, it still precipitates with life-threatening intracranial complications. CT brain axial cut showing a small doubtful epiduralcollection white arrow. This lesion was not noticed in later scansafter the cranial surgery Orbital cellulitis and abscess are mainly diseases of children and adolescents, with a peak incidence during the first 15 years of age. In older ages, the disease is more severe and more predisposed to anaerobic infection. In case of orbital infection, clinical examination and prompt treatment are important, since any delay can result in serious complications which include visual loss, intracranial and dural venous sinus spread. Visual loss is thought to be secondary to elevation of the intraorbital pressure caused by the accumulated pus, resulting in retinal ischemia due to central artery occlusion or thrombophlebitis along the valveless orbital veins. Visual loss may also occur because of optic neuritis due to extension of infection. Clinically, it is difficult to differentiate between preseptal cellulitis and abscess, in such conditions CT scan and MRI constitute important diagnostic aids. On CT scan, the presence of abscess is suggested by a low density mass effect without enhancement, while the presence of air fluid level is a more specific finding of this condition. The medial displacement of medial rectus or the displacement of the periosteum away from the lamina papyracea constitute other characteristics of the abscess, while the swelling of the medial rectus muscle usually indicates orbital cellulitis. MRI is used mainly when intracranial spread is suspected. Prevalence of only 3. Direct spread is by osteomyelitis and coexists with underlying epidural abscess. Subdural empyema with epidural abscess would most commonly involve the frontal lobe secondary to direct spread from frontal sinus as a result of osteomyelitis of posterior table. Indirect spread or commonly the retrograde thrombophlebitis is via the valveless diploic veins. The infection can pass retrogradely into cavernous sinus and other dural venous sinuses. If the infection reaches the subdural spaces, it spreads easily over the convexities of brain owing to lack of septations. Most complicated sinusitis occurs in young men in the second or third decade of life as the frontal sinus continues to develop and the vascularity of diploic veins is maximum in that period. In most of the studies, ICS are more commonly seen in males, with sex ratio ranging from 1. Nasal symptoms are prominent in case of gross septal deviations or any other obstructive cause. Suppuration from paranasal

sinuses would commonly cause meningitis but meningitis per se is not commonly due to sinus infection, as it is involved by hematogenous spread. Sphenoid and ethmoid air cell infection are commonly associated with meningitis. Headache and neck stiffness are universal complaints, patients appear toxic and febrile with nuchal rigidity, often lumbar puncture clinches the diagnosis. Mental status at the time of diagnosis and the type of bacteria causing meningitis are the two most useful prognostic indicators in determining the final outcome. Sensorineural hearing loss and mild mental deficits are frequently observed late sequel. A Case Series and Review of Literature Brain abscess occurs in frontal and parietal lobes seen with frontal and ethmoid sinus infection. Mental status and degree of orientation at the time of diagnosis are important prognostic indicators as our patients were well oriented and responsive at the time of presentation, it lead to favorable outcome. Clinical features were nonspecific, headache was the most common symptom, early symptoms were due to increased intracranial pressure and often associated with seizures. Cerebritis is the initial stage in the development of brain abscess, which is intense focal intraparenchymal infiltration of inflammatory cells. If left untreated, cerebritis will develop into frank abscess in one or two weeks time.

Chapter 6 : Jaypee Journals | Show Contents

Intracranial complications of sinusitis are even more common in adolescents than in childr en, and there is a male preponderance. (6,16,17) Because intracranial complications can evolve into major infections, they are potentially life-threatening and immediate attention is critical.

May 26, Accepted: June 30, Published: July 07, Citation: J Otol Rhinol 5: Intracranial complications consist of meningitis, epidural abscess, subdural abscess, intracerebral abscess, cavernous sinus thrombosis and superior sagittal sinus thrombosis. We present a series of 3 cases of intracranial complications of acute paranasal sinusitis treated in our department of oto-rhino-laryngology from January to December and review the literature. Acute Sinusitis, ear, nose and throat disease, headache Download PDF Introduction Sinusitis is a common ear, nose and throat disease which develops from viral or bacterial upper respiratory airway infection. Case Presentations The first case: A 44 year-old caucasian man was admitted to the emergency department with acute headache associated with fever, neck stiffness and lowering of the conscious state. Several days before admission he complained about headache without further symptoms. He had no previous medical or surgical history. The clinical examination showed few rhinologic symptoms. The patient was lethargic, but could respond correctly. He was oriented to person and place. A computed tomography CT showed an extended leftsided pansinusitis with subdural empyema of the left convexity and thrombosis of the superior sagittal sinus Figure 1. Preoperative axial and coronal CT-Scan case 1 shows an extended left-sided pansinusitis with subdural empyema of left convexity and thrombosis of the superior sagittal sinus black arrow. The patient underwent an immediate left-sided fronto- temporoparietal craniotomy with evacuation of the empyema, as well as a left-sided maxillary antrostomy and anterior ethmoidectomy by endoscopic approach combined with frontal sinus drainage by external approach Figure 2. An intra-venous antibiotic treatment was introduced Piperacillin, 4. Antithrombotic treatment by Heparin IE per day was introduced in reason of the thrombosis of the superior sagittal sinus. The bacterial analyses of the subdural empyema showed Fusobacterium nucleatum, Parvimonas micra, Prevotella intermedia and Enterococcus faecalis. A lumbar puncture was performed for suspicion of meningitis but showed no bacterial growth. Post-operative electroencephalogram was abnormal and showed reduced diffuse hemispheric activity with irritative focus in the left-sided centro- temporal areas. Antiepileptic treatment Levetiracetam, mg 3 times per day was started. Intraoperative surgical draining case 1 by endoscopic approach for the maxillary and ethmoid sinuses and external approach for the frontal sinus. Post-operative CT-Scan 7 days later showed a progression of the empyema with a mid-line shift of 10 mm. The patient underwent an immediate surgery of the inter-hemispheric abscess. Control cranial CT the following day showed few residual collections. The intravenous antibiotic treatment was continued. No signs of progression or complication were noted. The patient was hospitalized for 37 days. The antibiotic treatment was then administrated orally for a total of 3 months. The neurological and oto-rhino-laryngological evolution was acceptable with persistent Broca Aphasia. The follow up at one year showed no signs of recurrence of infection, but unfortunately the patient died of pulmonary cancer that was discovered by incidental finding. A 37 year-old caucasian man presented to the emergency department with acute headache and severe somnolence since several days. He was substituted by Methadone and Acenocoumarol. He had a history of severe cranio-facial trauma related to a car accident without sequels. The clinical examination showed a large right-sided frontal mass. The patient was lethargic, but could be aroused with verbal stimulation. He was oriented only to person and place. His neck was supple. Preoperative sagittal and axial CT-Scan case 2 shows a frontal osteitis red arrow , a voluminous frontal cerebral abscess with a mass effect on the lateral ventricle and deviation of the mid-line, as well as a full rightsided maxillary opacity. The patient underwent immediate osteoplastic frontal craniotomy and gross total excision of a frontal abscess. A surgical draining of the right maxillary sinus was performed by endoscopic approach Figure 4. An intra-venous antibiotic treatment was introduced Ceftriaxon, 2 g 2 times per day and Metronidazol, mg 3 times per day. Bacterial culture of the cerebral abscess grew Staphylococcus haemolyticus, Streptococcus constellatus, mixed anaerobic bacteria and Prevotella oris. The antibiotic

treatment was not modified regarding the antibiogram. Intraoperative surgical draining case 2 by endoscopic approach for the right maxillary sinus. Repeated cranial CT-Scan 10 days post-operatively showed no residual collections. An electroencephalogram was slightly abnormal and showed little reduced frontal right-sided response. The intravenous antibiotic treatment was followed and the patient was observed in intensive care unit. The patient was hospitalized for 46 days. The antibiotic treatment was administrated orally for a total of 3 months. The neurological and oto-rhino-laryngological evolution was good with persistent encephalomalacia of the frontal lobe on CT and MRI up to one year post-operatively. The patient has no persisting sequels, could go back to work and resume all normal activities. A 20 year-old caucasian man was admitted to another hospital with acute headache, nasal obstruction and anterior nasal discharge. Few days before he had presented odynodysphagia and was treated by anti-inflammatory medication for a viral angina. There is no previous medical or surgical history. An initial cranial CT-Scan showed an extensive left-sided Pansinusitis without complications. Intravenous antibiotic treatment by a Carbapenem Ertapenem, 1 g per day was introduced. Two days later he developed left-sided retro-orbital pain and more intense headache. He was transferred to our hospital and admitted to intensive care unit. The clinical examination showed few symptoms. The patient was well oriented to person and place. The patient underwent an immediate left-sided maxillary antrostomy, anterior ethmoidectomy and frontal sinus drainage by endoscopic approach Figure 6. No surgical draining for the intracerebral abscess has been performed. The intra-venous antibiotic treatment was changed to a Cephalosporin of third generation Ceftriaxone, 2 g 2 times per day and a Nitroimidazol Metronidazole, mg 3 times per day. A prophylactic anti-coagulative therapy by Enoxaparin was introduced. The bacterial analyses of the pus of the sinuses grew Fusobacterium necrophorum and saprophytic Flora. A lumbar puncture was done for suspicion of meningitis but showed no bacterial growth. Postoperative encephalogram was normal. Preoperative coronal and axial CT-Scan case 3 shows an extensive left-sided Pansinusitis and a subdural abscess circle in contact with the left frontal bone. Intraoperative surgical left-sided sinus draining case 3 by endoscopic approach in a first step and external approach for frontal sinus fenestration in a second step for residual collection. One week post-operatively the patient presented two epileptic episodes forcing for re-intubation. According to the neurosurgeons there was no indication for a craniotomy and evacuation of the abscess. The patient underwent therefore a frontal sinus fenestration by external access for residual collection of the frontal sinus Figure 6. A drain was left inside and daily rinsed by saline irrigation. An anti-epileptic treatment of Levetiracetam dose of mg 3 times per day was introduced. There was no further epileptic episode until the end of the treatment 3 months later. The patient was hospitalized for a total of 23 days. The antibiotic treatment was completed orally for a total of 3 months. The neurological and oto-rhino-laryngological evolution was normal without persistent sequels. The follow up at one year showed no signs of recurrence of infection. Discussion Sinusitis is a common ear, nose and throat disease which develops from viral or bacterial upper respiratory airway infection. Complications of rhinosinusitis vary from relatively benign to fatal and severe. They have been classified into three types: Orbital complications consist of inflammatory edema, orbital cellulitis, subperiosteal abscess and orbital abscess. Intracranial complications are rare, but may be severe complications of rhinosinusitis. These are meningitis, epidural abscess, subdural abscess, intracerebral abscess, cavernous sinus thrombosis and superior sagittal sinus thrombosis. Main causes of epidural, subdural and intracerebral abscesses are sinusitis of the frontal sinuses [4 - 6]. Sphenoid and ethmoid sinuses are more predisposed to provoke meningitis and cavernous sinus thrombosis [2 , 3]. Meningitis can be acute and rapidly progressive, with fever and headache, as well as with changes in mental status. Epidural abscesses are known to be slowly expanding with less acute pain onset and more local pain and tenderness, whereas subdural abscesses rapidly progress, are often associated to meningitis and rise of intracranial pressure and can lead to focal neurological defects and coma within 24 to 48 hours. Intracerebral abscesses elsewhere have an asymptomatic phase followed by an acute phase of headache, fever and lethargy [2]. Cavernous sinus thrombosis presents often by subacute delay with periorbital swelling, proptosis and ophtalmoplegia [3]. Very specific is retro orbital pain. Patients with superior sagittal sinus thrombosis are extremely ill with high fevers and global neurological defects. This shows the need of a rapid diagnosis and management of the disease. More than one focus of infection are common [3]. All patients in our series were young male.

Chapter 7 : Intracranial complications of sinusitis.

Intracranial complications of sinusitis can result in significant morbidity and mortality. Mortality can occur by elevated intracranial pressure, transtentorial herniation, propagation of thrombosis, infarction, and overwhelming sepsis.

We reviewed our experience with ICS in children and adolescents. Abscesses were primarily located in the frontal or frontoparietal regions. Magnetic resonance imaging was extensively used and was superior to contrast computed tomography in diagnosis. All patients received intravenous antibiotics, 21 underwent endoscopic sinus surgery, and 13 underwent neurosurgical drainage. Overall, neurologic outcome was excellent. Only 2 patients had permanent neurologic sequelae. Among ICS, epidural abscess appeared to be a distinct clinical entity. Epidural abscesses typically presented without specific neurologic symptoms or signs, were more often associated with orbital complications, and had outcomes considerably better than the other ICS. Suppurative complications of sinusitis are uncommon but carry the potential for significant morbidity and mortality. Among these, the intracranial complications of sinusitis ICS are particularly challenging conditions. They have been reported in 0. Intracranial spread of infection is generally believed to occur mainly by progression of septic thrombi or transmission of septic emboli through the valveless diploic veins of the skull base that penetrate dura. The frontal skull appears to be particularly vulnerable to spread of infection, likely because of its rich network of diploic veins, the frequency of frontal and anterior ethmoid sinusitis, and in adolescents, the rapid growth of the frontal sinuses and their blood supply. Despite better diagnosis and management since the introduction of computed tomography CT , broad spectrum antibiotics, and aggressive endoscopic sinus and neu rosurgical procedures, the morbidity and mortality rates for ICS remain considerable. In the present study, to our knowledge the largest pediatric series to date, we review our experience with ICS in children and adolescents to gain insight into patterns of presentation, imaging, microbiological aspects, therapy, disease course, and outcome. The relationships among the type of intracranial complication, presenting features, simultaneous extracranial complications, and subsequent neurologic outcome are analyzed. Epidural abscess was identified as a distinct entity among ICS, having a distinct manner of presentation and a considerably more favorable prognosis. Methods A consecutive sample of 25 children with ICS was identified, who were treated between January 1, , and April 30, From the institutional databases of inpatient admissions and otolaryngology consultations, patients whose admission or discharge diagnoses included central nervous system infection which includes intracranial abscesses, meningitis, encephalitis, and dural sinus thrombophlebitis , were crossed with procedure codes for sinus surgery endoscopic or external or for diagnoses of either acute or chronic sinusitis. Screening of inpatient records to confirm intracranial complications yielded 25 subjects. Data were then collected from complete inpatient records, as well as postdischarge outpatient visits, procedures, and admissions. Results Twenty-five consecutive children with ICS were identified during the study period. The mean age was The average length of stay was 10 days range, days. There was 1 death in our series, and of the 24 survivors, only 1 was lost to follow-up. All of the remaining patients had at least 2 months of follow-up data range, months; mean, Complications There were 35 intracranial complications in the 25 patients Table 1. Epidural abscess was the most common, and 12 of the 13 epidural abscesses were frontal. Nine subdural empyemas occurred, all located anteriorly, and there were 2 intracerebral abscesses. Most were orbital infections. Presentation Presenting symptoms and history were available in 24 cases. All patients were previously healthy, with no conditions causing immunodeficiency. The mean duration of symptoms was 12 days range, days. Notably, only 4 patients had any history of sinusitis, and none had prior sinus surgery. Presenting examination findings were available in 22 patients. Because neurologic deficits at presentation have prognostic significance, 11 patients were divided into 2 groups based on neurologic findings Table 2. The presence of neurologic signs and symptoms correlated strongly with both the type of ICS and presence of extracranial complications. In the group lacking any central neurologic symptoms or signs, nearly all the patients had epidural abscesses. Their presentations were dominated by signs and symptoms referable to the eye and forehead. This was consistent with the high prevalence of concomitant extracranial, particularly orbital, complications in this group. By

contrast, in the group presenting with neurologic findings, every patient was diagnosed with at least 1 of the more serious complications meningitis, encephalitis, cerebral abscess, subdural empyema, and dural sinus thrombosis. Simultaneous extracranial complications were far less common in this group. Magnetic resonance imaging was very sensitive for meningeal enhancement, either alone in cases of meningitis or adjacent to the focal collections. Meningeal enhancement was demonstrated in 17 of the 19 studies. Of the 7 patients for which CT was nondiagnostic, there were 2 cases of meningitis with normal study results and 5 intracranial collections in which the CT result, while not diagnostic, was abnormal enough to prompt further studies all were later found on MRI. Frontal sinusitis was present in 19 of the 20 patients who had significant anatomic development of the frontal sinus. Positive cultures were obtained in all but 1 patient, for a total of 49 isolates. Staphylococci, particularly coagulase-negative species, were also common. No Bacteroides species were identified. We did not observe any relationships between organism type and the type of ICS or neurologic outcome. At discharge, all patients were maintained on intravenous antibiotics until completing 2 to 6 weeks of intravenous therapy. Anticoagulation was used in both patients with dural sinus thrombophlebitis. Twenty-one patients underwent endoscopic sinus surgery ESS Table 5. Of the 3 patients who did not, 2 had diffuse meningitis or disseminated encephalomyelitis that responded to medical therapy and 1 had bilateral frontal trephination alone. Revision sinus surgery was performed in 10 patients, mostly as planned procedures after discharge. Thirteen patients, all with intracranial abscesses, underwent neurosurgical drainage procedures. Pus was found in all cases. Cranialization of the frontal sinus was needed in only 1 patient. Neurosurgical procedures were not performed in 5 smaller intracranial abscesses.

Chapter 8 : Intracranial complications of acute sinusitis | Radiology Case | www.nxgvision.com

Most orbital and intracranial complications of sinusitis are secondary to transmission of infection via retrograde thrombophlebitis. Despite the aforementioned features that predispose the spread of infection from the sinus to the orbit, a protective barrier exists in the form of the periorbita (ie, the periosteum of the orbit), which is.

Thir d generati on cephalosporin Figure 7. Making of a frontal bone flap after bicoronal approach. The outcome after treatment was favorable in 14 cases One patient operated for brain abscess has died in the postoperative pe- riod despite intensive care. On the other hand, we noted in 8 cases a persistent or a worsening of the neurologi- cal signs. This non improvement was due to a recurrence or persistence of empyema 6 cases, of which one has K. For all of them, antibiotherapy was prolonged to 10 weeks. Six patients among the 8 underwent neurosurgical drainage, associated with frontal sinus cranialization in 3 cases. Among these patients, evolution was favorable in 7 cases, and one patient has died 3 days after surgery because of multiple organ dysfunction syndrome sec- ondary to a septic shock. Among all patients wh o have heal e d, no recu rrence was n oted after lo ng-term follow-up. Discussion The frontal sinus is most commonly involved in intracranial complications of sinusitis, either alone or with an associated anterior ethmoiditis or pansinusitis [2] [3]. Intracranial complications of isolated posterior ethmoid sinusitis or sphenoiditis are rare [1] [4]. Cases of cavernous sinus thrombophlebitis often complicate acute sphenoiditis. These complications usually involve young subjects between 20 and 30 years, mainly male [1] [2] [5]-[7]. These epidemiological data are consistent with those of our series. Regarding the incidence, reference centers in developed countries report an average of three cases per year [1]. Major risk factors reported in the literature are diabetes, immune-suppression, renal failure, history of facial trauma or inadequate previous treatment [1] [2]. Other contributing factors are reported, such as history of chronic sinusitis which acts through a greater resistance to antibiotics induced by repeated treatments and through a less penetration of the antibiotic secondary to osteo-mucosal modifications [1] [2]. Aerobic bacteria are those found in acute sinusitis: Haemophilus influenzae, Streptococcus and Staphylococcus [1] [8]. The revelation mode of intracranial complications of sinusitis is very variable. It reflects the frontal sinusitis and also the presence of intra- cranial hypertension. Its evolution in 2 stages localized to the sinus then diffuse is highly suggestive [1]. Other suggestive signs include frontal syndrome, meningeal syndrome, consciousness disorders and seizures [1] [9]-[11]. Rarely, intracranial complications can be latent or have nonspecific signs. Sinonasal and cerebral CT with iodine contrast media injection is necessary to confirm the diagnosis. When meningitis is suspected, CT is essential before performing the lumbar puncture, in order to avoid the risk of ce- rebral herniation [1] [12]. CT must always be performed in case of unfavorable evolution. CT allows to visualize the sinus involved, to identify the type of complication empyema, abscess, throm- bophlebitis and its site often frontal, rarely frontoparietal or multiple [13]. MRI can better assess intracranial extension [14] [15], but it is rarely per- formed in emergency situations. In our series, the subdural empyema was the most common complication Since intracranial extens ion of sinusitis can be a life-threatening complication, treatment should be aggressive from the beginning [1] [5] [7] [16] [17]. Medical treatment should be initiated precociously as soon as possible. The empirical antibiotic th erapy essentially ai ms gram positive co cci, gram negative b acilli and ana erobic germs. Third-generation cephalosporins, fluoroquinolones, aminoglycosides, metronidazole and antistaphylococcals are recommended. This antibiotic therapy must secondarily be adapted to the antibiogram. Its duration is usually 4 to 8 weeks, in which 2 to 3 weeks intravenously [18]. In our study, given the frequent negativity of bacteriolog- ical samples, probabilistic antibiotic therapy was administrated in most cases. The use of corticosteroids for its anti-edematous effect is controversial because of the risk of infection ex- acerbation. Currently, the treatment is indicated only in cases of life-threatening intracranial hypertension and cerebral edema [1] [19]-[21]. Anticonvulsants are usually recommended prophylactically in all cases of intra- cranial collection [1] [19]. Some authors recommend them only after a first seizure or after surgery [10]. In our series, they have been used in cases of severe peri-lesional edema with mass effect because of increased seizure risk. On the other hand, the place of anticoagulation in cavernous sinus thrombophlebitis is discussed.

Anticoagu- lant therapy has for a long time been considered dangerous because of the risk of bleeding. Currently, it has been K. For some auth or s, heparin is routinely prescribed and relayed by antivitamin K for 6 weeks un- til repermeabilisation of the cavernous sinus [1]. The treatment of extra and subdural empyemas is neurosurgical drainage. Some series have shown the effica- cy of single antibiotic treatment for some carefully selected cases of extradural empyema with no neurological deficit, having limited purulent co llection on CT, and with rapid clinical improvement under antibiotics [22]. In our series, exclusive medical trea tment was su ff icient in 3 patients with extradural empyema. Surgical treatment of intra-parenchymal abscess includes two methods: Currently, puncture is preferred because of the low risk of contamination and of adjacent damage. Small abscesses less than 2 cm with a good neurological condition can be treated conservatively with antibiotics alone [1] [9] [12] [19] [22]. Treatment of the frontal sinus and of the possibly associated osteomyelitis represents an essential part of the therapeutic management. It helps to eliminate the causal lesion and therefore to avoid any source of treatment failure or relapse of intracranial complications. It is often performed at the same time of endocranial drainage and should be as simple and as minimalist as possible [1]. For drainage of the frontal sinus, we can perform either trephination by drilling or by using Lemoyne nail or a bone flap through Jacques approach. Frontal sinus can be also drained endoscopically by performing the Draf techniques. For the ethmoid and sphenoid, endoscopic ethmoidectomy and sphenoidotomy can be performed [1] [4]. Endonasal surgery was performed in 3 cases of our series. The limitation of this technique is that in can in- crease, in these inflammatory conditions, the risk of bleeding immediately and synechia in the long term. On the other hand, incomplete gesture in endonasal surgery would compromise the ventilation of the sinuses in some cases [1] [8] [23]. If the previous dr ainage techniques fail or if osteitis is e xtended or reaches the poste rior table, then exclusion of the frontal sinus should be considered [24] [25]. Two different approaches are possible: Then we fill the sinus with muscles and we close the nasofrontal ostium. Some authors realize this filling under endoscopic control after Jacques approach [26]. This is a less invasive approach and as effective as the con- ventional approach [26]. This technique is indicated for internal table osteitis [27]-[29]. It is the most appropriate technique in cases of intracranial complications of sinusitis, treating both the collection and its origin. In our series, this tech- nique was performed as first line treatment in 11 patients. The prognosis of intracranial complications of sinusitis depends heavily on the nature of neurological signs and on the diagnosis and management delay of time [1] [30] [31]. Morbidity and mortality are lower in the pe- diatric population [32]. Complications and deaths are related to cortical veins thrombosis and to cerebral infarc- tion. In our series, 2 patients have died 8. Conclusion Although rare, intracran ial complications of sinu sitis are severe and are source of high morbidity and mortality. They require multidisciplinary approach including otorhinolaryngologists, neurosurgeons and intensive care physicians. Management should be rapid and adequate, combining effective antibiotic therapy and eventually neurosurgical treatment. There are no conflicts of interest. References [1] Bayonne, E. Complications of Sinonasal Infections. Can They Be Prevented? The Laryngoscope, , Single Institute Experience and Review of Literature. British Journal of Neurosurgery, 21, Neurocritical Care, 7, Pediatric Infectious Disease Journal, 24, In ternational Journal of Pediatric Otorhinolaryngology , 66, American Journal of Rhi- nology, 13, Seminars in Pediatric Infectious Diseases, 14, Analysis of 41 Cases in Ten Years.