Complications of Otitis Media

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I will limit my presentation to acute otitis media (AOM), although chronic otitis media is also a problem and superimposed AOM over chronic otitis media can be a serious issue.

Such a seemingly innocuous disease, that is very prevalent and common, that sometimes, and more and more is being treated just by observation has a very ugly side and can be devastating to children and parents.

We can divide the complications of otitis media into two groups: the **intratemporal** and the **intracranial**. The objective of this chapter is to make you aware of these complications, to recognize them, and to have an idea of the highlights of treatments. It is not my objective to go in detail into any of these complications, so I will be going through many conditions.

How do you get complications? **Thrombophlebitis**. You have an idea about the complication being from thrombophlebitis because it occurs within ten days of an acute infection, practically no prodromial period.

And, of course this area is a very rich network of veins. **Bony erosion** is most common, but always in cases where there has been some kind of dehiscence.

It is more common in chronic ear infections, and direct extension occurs through previously formed areas such as oval window, round window, or fractures from previous trauma.

Acute mastoiditis is one of the most common things you are going to see. Nearly all patients with acute otitis media will have fluid in the mastoid. The two mechanisms in which mastoiditis will occur is either periosteitis, which is thrombophlebitis to the periosteum, or the so-called coalescent mastoiditis which is still being used a lot and this is when you have a breakdown of the septations and the mastoid.

The rate of development has declined significantly, that is, in the pre-antibiotic era it was 25% to 50% of children developing this complication. Now, after the 80's when everybody was treated with antibiotics, the rate is going down to 0,02% to 0,004%.

We are starting to notice, more and more, that with poor treatment of withholding of drug treatment, the incidence is going higher.

What we see in acute mastoiditis? There is a symptom triad of otalgia, postauricular pain, fever, prinna protrusion and of course a CT scan that will show a problem.

How do you treat it? Myringotomy and tube insertion, IV antibiotics, mastoidectomy if you have bony destruction or poor treatment response to antibiotics. The intra-venous antibiotic should be directed mostly against strep and Group A *Streptococcus pyogenes* (GAS). **Subperiosteal abscess** is further progression of the mastoiditis. It can occur in three locations. You have the usual postauricular area, which is the most common; you have the so-called Bhezold abscess, we still see it, it is rare, and it occurs because of infection breaking through the digastric groove, and very rarely you see it through the Zygomatic root. It can form up to 50% of the children developing mastoiditis, especially if they were called late or if they were not adequately treated.

CT scan is the best way to manage this, to diagnose this. And you could see here, there is an abscess and this is on a bony window. How do you treat it? Myringotomy and tympanostomy tube. Incision and drainage. Complete mastoidectomy. Sometimes you have some small abscesses and you could treat with antibiotics alone. There are some people who advocate incision and drainage without mastoidectomy in younger children under four years of age. We tried it for a couple of years, it didn't work well, we had even more major complications and we stopped doing that. Treatment, as I mentioned, myringotomy and tube, incision - aspiration first and then incision and drainage.

Every now and then you do your mastoidectomy and the child does not improve. These are usually a bit older children, and this is because of **Petrous Apicitis**. This will occur in children who have penumatized air cells in petrous apex, and only around one in three may have that and we are talking about all the children. This is a very serious complication. It will lead, I am sure you have all heard it, Gradenigo, where you are going to have retro-orbital pain and nerve VI paralysis. There is otorrhea, there is deep otalgia. CT scans and MIR are very essential in treatment, continuous treatment and management, and you need to do surgical exploration and complete removal of all the infected cells - both the perilabyrinthine, supra and infra, and the apical.

Labyrinthitis. You have two groups: serous, which is the mild, and suppurative, the bacterial one. Serous is secondary to inflammation products in the inner ear; suppurative is secondary to direct infection of the inner ear. The difference is that in serous vertigo is transient, senso-neural hearing loss is mild. In bacterial, vertigo is severe, eventually will compensate, but senso-neural hearing loss is permanent and severe. Treatment, with acute infection, is myringotomy with tympamostomy tube and of course antibiotics. If there is chronic otitis media you need to suspect a fistula.

Facial nerve paralysis. Early onset in acute otitis media. As you know, about 50% of the population have a dehiscence in the horizontal section of the facial nerve. And so infection will cause a facial nerve paralysis. You have to differentiate that with every now and then seeing a child with severe facial paralysis, and Ramsay Hunt or Herpes Zoster syndrome, where you will see that there are some lesions in the distribution of the nerve seven and the auricle. Usually these children have a much more severe nerve paralysis, treatment is completely different and there is pain.

So what do you do with facial paralysis?

Myringotomy with tympanostomy tubes, complete recovery expected – of course intra-venous antibiotics. If you find that the child is sick and there is a mastoiditis, you need to do a mastoidectomy. The operative strategy is not to decompress the facial nerve. We have reviewed our series and young children when the paralysis is severe you give antibiotics, you do Myringotomy, you will see progressive improvement to complete improvement. In older children, even if they have severe paralysis, same mode of treatment. In a review of 12 cases that we had over a period of 4 years, we had to do mastoidectomy only in four. We never had to do a facial nerve decompression.

The **intracranial complications** are usually the more severe, quite serious complications. Of course **meningitis**, diagnosed like any other meningitis, except that there would be either spread from bony erosion, direct spread via window or retrograde phlebitis. Acute otitis media is a more common source than chronic otitis media, and the mortality is higher with chronic otitis media. So if you have a child who has chronic otitis media, with or without cholesteatoma, with superimposed meningitis you have to worry about that.

The presentation is the same like any other meningitis, headache, fever, photophobia, etc. CT scan is done to evaluate the inner ear for any anomalies - patent cochlear aqueduct, fistulae. MRI is superior for visualizing the soft tissues of the CNS and of course a lumbar puncture is indicated after you have done your imaging to avoid herneation.

Treatment: broad spectrum antibiotics directed at *Haemophilus influenzae, Streptococcus pneumoniae*. And in chronic otitis media the group of bacteria is completely different, you have *Proteus sp , Klebsiella sp*, anaerobes. You stabilize these patients and then you do surgery if necessary.

Sigmoid sinus thrombosis is becoming something that we are seeing more and more, although it declined in the post-antibiotic era but in the past six months we have seen four cases, so it is becoming more and more common. Now, the mortality standard remains high, around 17% to 24%. Bony sigmoid plate is eroded and this leads to Perisinus abscess. The rest of the presentation is depicted as you see in the books you have all these things like Greisinger's sign to the fever and the "picket fence". But now since we have CT scan and MRI – and we usually go directly for CT sometimes followed by MRI, you don't wait to see if you have a picket fence, the child is quite sick, you do your imaging, in CT scan you see a delta sign, and we proceed to MRI (once you do an MRI, you find that the sigmoid sign is blocked).

One of my first cases in 1987, I had a child who presented with facial paralysis and fever and congenital oral atresia - I still have nightmares about this case -, we got the CT scan and the typical delta sign, the low void in the area of the sigmoid sinus. We ended up exploring the child. After removing all the area he did well.

Treatment, obviously antibiotics, complete mastoidectomy, you have to expose the diseased dura, if you don't get to the sigmoid sinus, you have done nothing, the child will progress into a much more serious condition. Once you reach the sigmoid sinus and you have drained the perisinus abscess you put a needle, a

small bore needle, in the sigmoid sinus. If you get blood, and the blood clots, then you are fine. It means that the sinus is recanalizing. If there is pus, you evacuate and you pack off the sinus. Now if there is no blood, and there is a presumed clot then you have a problem, because here you would not know whether you need to remove or leave it alone. And then you get into the issue of what to do next.

If this abscess is propagating – if you look here, you will find that the internal jugular vein is blocked also. So if this is propagating, you need to stop that because this is going to spread further down. You ligate if you want to isolate infection from the system and prevent embolus. Against ligation you worry around the presence of a collateral system and the risk of retrograde thrombosis.

Otitic hydrocephalus is usually associated with sigmoid sinus thrombosis. The children will have headaches, visual changes and of course, radiologically this is a child with bilateral delta on MRI - that is unilateral complete blockage and partial blockage of the second sigmoid – you can see that complete blockage, partial blockage, partial and complete. Child presented with bilateral mastoiditis and cranial nerves - specifically, lazy eye, ended up with bilateral mastoidectomy and did well. Treatment is to control the ear disease, lower the CSF pressure with steroids, Mannitol, and serial CSF drainage.

Brain abscess depends on what stage you find them. Early stage would be encephalitis, latent stages you have few specific symptoms and eventually you have a full abscess. Mortality is still high, around 20% to 40%. Most common sites are temporal bone and cerebellum. Most of the cases that we have seen are in the cerebellum, and usually this is associated with cranial nerve palsies – you go in, in conjunction with the neuro-surgeon you do your mastoidectomy, they drain the abscess, and you usually get complete recovery. In the brain abscesses, you have to treat the neuro-surgical issues first, otologic surgery when the child is stable. There are some options for neurosurgical treatment. Some neurosurgeons prefer to give antibiotics alone, some surgeons will aspirate and some will go for open drainage. **Epidural and subdural abscesses** are direct extensions. Treatment is usually medical.

To summarize, antimicrobial therapy has decreased but not eliminated the development of otitis media related complications and sometimes the mortality rates remain unchanged. Vigilance is needed from everybody involved, from the pediatrician diagnosis to the tertiary care center.