Mastoiditis Mimicry: Retro-auricular Cellulitis Related to Otitis Externa

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Abstract

Retro-auricular cellulitis associated with otitis externa is now the great mimicker of mastoiditis. It may be the most common cause of this specific cellulitis/auricular protrusion when it is associated with otitis externa. This column presents six cases of children who presented with peri-auricular redness, four of whom had protuberant ear and retro-auricular cellulitis. [Pediatr Ann. 2014;43(9):342-347.]

I have discussed the complexities of head and neck cellulitis in previous columns of Pediatric Annals. However, over the past decade, other pediatricians and I who practice in areas with warm climates have been witnessing multiple cases of the great mastoiditis mimicker—retro-auricular acute cellulitis. Just like mastoiditis, this specific infection is a surprisingly complex diagnostic and management issue that you will certainly encounter at some time. As in other recent summers, in 2014, I have already treated five cases of peri-auricular cellulitis within our large, rural pediatric practice.

By contrast, as most private practice pediatricians have also recently observed, mastoiditis has become almost as uncommon as bacterial meningitis in our practices. I have seen only one case of each infection in the past decade. Most likely, this is a wonderful consequence of our highly effective vaccine programs leading to high infant uptake of both Haemophilus influenzae type B (HIB) vaccine and pneumococcal conjugate vaccines (PCV7/PCV13).

RETRO-AURICULAR REDNESS AND THE PROTUBERANT EAR

How should a pediatrician approach the patient with skin redness behind the ear and a protuberant pinna, as in Figures 1 and 2? Does your approach change when you cannot see the tympanic membrane due to either marked canal swelling or obstruction due to purulent matter? Or when the tympanic membrane is normal? Or even if it looks infected? Does pain on palpation of the tragus or pinna change your approach?

Most important, the causative bacterial pathogens differ significantly between the mastoiditis/peri-orbital cellulitis/facial cellulitis group and the peri-auricular cellulitis associated with external otitis, which includes both pre-auricular and retro-auricular cellulitis. The infectious agents in the former infections are typically Pneumococcus, Group A Streptococcus, and sometimes nontypeable Haemophilus influenzae and Staphylococcus aureus. These are the usual middle ear and skin pathogens.

However, in many mastoiditis series, the third leading cause of mastoiditis is Pseudomonas aeruginosa. But, is this bacterium actually a primary pathogen recovered from the middle ear or mastoid aspiration? Or has the bacterium instead been recovered from purulent material in the ear canal from a swab of “apparent otorrhea,” which is usually highly contaminated or overgrown with Pseudomonas and skin commensals? Or has the bacteria been recovered from the posterior cellulitis of the skin when the mastoid is incised and drained in an apparent mastoiditis (as in some of the following cases)? Perhaps one could speculate that a number of these cases of Pseudomonas-related mastoiditis were actually retro-
auricular cellulitis, and the pathogen was actually recovered as in the latter two scenarios. Let me explain.

Please note that the pathogens of peri-auricular cellulitis appear to be typically the water-related pathogens of otitis externa, namely *Pseudomonas aeruginosa* (mostly) and *Staphylococcus epidermidis* (occasionally). Why? Because most all of these cases of peri-auricular cellulitis are triggered by acute otitis externa, not acute otitis media (AOM), unless it is a case of AOM with either spontaneous or pressure equalizer tube otorrhea. The cause of otitis externa is multifactorial and primarily related to moisture, trauma, heat, and removal of the protective film on the ear canal. “If the infectious process goes untreated, it leads to cellulitis of the auricle and surrounding area.” In cases of otitis externa, the pathogens are recovered only from the ear canal, whereas pseudomonal and staphylococcal species predominate in the purulent canal discharge, often as a super-infection.

**CASES**

**Case 1**

A previously healthy, afebrile 7-year-old male was seen in your office last week with moderate otalgia and an “apparent AOM” (the physician could not see the patient’s tympanic membrane [TM] due to the combination of swelling and whitish discharge). After all, ear pain and ear discharge equals AOM, or does it?

Because of concerns that he might have a “secondary” otitis externa or “swimmer’s ear” from otorrhea, not only was he prescribed twice-daily amoxicillin for apparent AOM, but he was also prescribed topical combination steroid-antibiotic drops four times daily. But do these drops actually get past the canal or anywhere near the canal skin?

Today when you see him, his right ear is now protuberant with redness of the skin behind the ear and loss of the ear sulcus (Figure 1). You are completely surprised at the degree of pain with any motion of the pinna; the boy screams and cries real tears every time you attempt to insert your otoscope speculum into his ear canal, and he begs you to stop. You are perplexed; as a novel practitioner you have never seen this type of reaction before. Surely this is mastoiditis. So you blithely order a complete blood count (CBC), plain films of the mastoid (despite their low yield), and in the diagnostic “coup de gras” — a computed tomography (CT) scan of the mastoids. You are also aware of all the recent “brouhaha” about head CT scans’ association with slightly increased risk of cancers.

All of the tests are normal, including the blood leukocyte count. So what is going on here? You now assume that this must be a case of *S. aureus* cellulitis associated with otitis externa. You wish to provide antibiotic coverage for methicillin-resistant *S. aureus* (MRSA), which has been so prevalent this summer, so you prescribe thrice-daily oral clindamycin, along with some oral codeine for pain. He returns to your office in 48 hours, with no change in pain and redness. The ear is only slightly more protuberant.

You consider hospitalizing him for parenteral antibiotics and pain relief. You explain this to the mother and child, who both promptly ask you, “Is there not anything else we can try first, doctor?” You tell them that we can always try a large dose of parenteral ceftriaxone at 50 mg/kg for a few days. You assume that this will stop his AOM and otorrhea, but you doubt it would do much good to ameliorate MRSA cellulitis. Thus, you also add oral trimethoprim-sulfamethoxazole to cover for the possibility of clindamycin-resistant MRSA. You now assume that this will stop his AOM and otorrhea, but you doubt it would do much good to ameliorate MRSA cellulitis. Thus, you also add oral trimethoprim-sulfamethoxazole to cover for the possibility of clindamycin-resistant MRSA, as recently reported for some strains. But what about coverage for the most common pathogen of otitis externa?

The next day he has still made no progress and still complains of intense pain. You consult your pediatric infectious disease expert and decide whether to hospitalize him for parenteral antibiotics.

**Case 2**

The same week, a previously healthy 4-year-old female presented to your pediatrician partner 5 days earlier with a swollen ear canal and a very reddened TM, which he thought he could see despite the canal swelling. She was prescribed amoxicillin clavulanate for AOM.

When you see her today, she is afebrile and nontoxic, with an otherwise normal physical examination. However, as you attempt to examine her left TM, she cries vociferously when you put pressure on her pinna. You pull her hair back and see redness behind the earlobe and the loss of ear sulcus. From this perspective, you can now see that the earlobe is protuberant (Figure 2). Are you seeing a mini-epidemic of mastoiditis?

You grab your smallest ear speculum (original equipment’s tapered 2.5-mm size) and try to talk her through the painful TM examination. Yet, all that you can see now is a swollen canal with thick white debris. Her blood leukocyte count is 13,500 cells/cm³.
A plain radiograph of the mastoids shows some cloudiness in the mastoid air cells. But you also remember from your AOM lecture in residency that more than 50% of cases of routine AOM may have some mastoid cloudiness. And, you also recall your infectious disease text, which states that when it comes to plain radiograph films, only coalescent mastoiditis is considered diagnostic for acute mastoiditis. Should you perform a CT scan of her mastoid, which is a more definitive test? But even cloudiness on the CT scan may be considered normal.

Because she is afebrile and nontoxic, should you instead just proceed with additional oral antibiotic coverage for MRSA cellulitis localized to the skin? Or is there another choice? What about the primary pathogen of otitis externa?

Case 3
During the spring, a previously healthy 2-year-old white female developed an earache, which was treated 1 week ago with cefdinir for a diagnosed AOM infection. Today, you observe that the child is afebrile with extreme tenderness on palpation of the tragus, where the skin also appears mildly reddened and swollen (Figure 3). She has some mildly tender reactive lymphadenopathy in the anterior left anterior cervical and pre-auricular regions. The ear area was marked by your partner yesterday to monitor for any extension of the pre-auricular cellulitis over the next few days. It is impossible to examine the left TM due to the ear canal swelling, pain, and green debris.

In light of the most likely otitis externa infection, how should you proceed? Is this a case of MRSA cellulitis, or is this cellulitis more likely related to the pathogen of her otitis externa?

Although she is very young to be considered for a diagnosis of otitis externa, her clinical examination is classic.

Case 4
A 16-year-old Guatemalan male was diagnosed with AOM 2 days earlier when his swollen ear canal was full of purulent debris, for presumptive AOM otorrhea. He was started on oral cefixime therapy but now has acutely worsened with severe pre-auricular redness, and ear canal and tragus pain. You are uncertain how to proceed, so you ask your senior partner for advice.

You are uncertain how to proceed, so you ask for a consultation from your senior partner.

Case 5
During July, a previously healthy, afebrile, nontoxic 7-year-old white male presented with a very painful and protruberant right ear lobe. You peer into his ear canal and observe a swollen canal, and you are unable to see his tympanic membrane. You order a complete blood count, which shows a leukocyte count of 16,500 mm$^3$. You are the first physician to see him for this illness—how should you proceed?

Would an empiric trial of an oral antibiotic and aural toileting be a suitable option before you obtain the ancillary radiographic testing?
Case 6
A previously healthy, afebrile 7-year-old white male has just returned from spring break in Florida. He now presents to your office with an earache for the past 48 hours. He was examined earlier in the local emergency department, where he was prescribed twice-daily, high-dose amoxicillin and topical otic antibiotics. When you examine him today, you can see that he has a moderately swollen ear canal with some mild white debris, and you think that you can almost see a normal-appearing TM—almost! The tragus and pinna are both quite painful when touched. You note that his ear is protruding, and thus ask to take a look behind his ear, where you see the reddened skin and loss of the ear sulcus (Figure 6).

Why has his condition worsened in the past 24 hours? Should you consider treating his cellulitis for MRSA, which is rampant in your community this month? Or, should you consider that the typical pathogen causing his external otitis may be the main culprit here?

DISCUSSION
In each of the six cases presented here, the child had developed peri-auricular cellulitis. But cases 1, 2, 5, and 6 had retro-auricular cellulitis with loss of ear sulcus, a markedly protruding ear lobe, and potential for a hidden AOM infection, as visualization of the TM was unobtainable or questionable. In the past, many practitioners and emergency departments seeing these children have diagnosed them with mastoiditis, triggering its full evaluation. Mastoid radiographs, CT scans, hospitalization, and otolaryngology consultation would have been ordered. Parenteral treatment for oto-pathogens and possibly MRSA would have been ordered too. Rarely, the unconventional selection of antipseudomonal antibiotics would have been ordered. But each of these six patients was managed as an outpatient, and no radiographic imaging was obtained. How did that happen?

Each of these six cases demonstrates the practical difficulties in determining the origin of retro-auricular cellulitis or pre-auricular cellulitis:

A) potential mastoiditis (very rare today) secondary to AOM, which is most commonly related to gram-positive organisms such as Streptococcus pneumoniae or Streptococcus pyogenes, or

B) skin structure infection like cellulitis (uncommon in this anatomic area) due most commonly to methicillin-susceptible S. aureus or MRSA, or

C) cellulitis infection strictly secondary to otitis externa, which is mostly related to Pseudomonas?

Thus, how does one differentiate the three potential causes of peri-auricular cellulitis?

THE DIAGNOSIS OF OTITIS EXTERNA
In general, fever and any appearance of toxicity are most likely related to mastoiditis. Elevation of the leukocyte count or other inflammatory markers is too nonspecific but may direct you more toward mastoiditis. But to simplify, the key is in a meticulous and detailed clinical examination, looking for each of the physical findings shown in Table 1.

When marked pain both over the tragus and in the ear canal is associated with ear canal swelling and some non-cerumen debris, it is nearly pathognomonic for otitis externa. Furthermore, the skin over the retro-auricular cellulitis associated with otitis externa is uncommonly very tender, in total contradistinction to either mastoiditis or staphylococcal cellulitis. But, one needs to be aware that the skin involvement with otitis externa-related pre-auricular cellulitis is usually quite tender, as was seen in Cases 3 and 4.

TREATMENT OF PERI-AURICULAR CELLULITIS RELATED TO OTITIS EXTERNA
Thus, when a definitive diagnosis of otitis externa (including a very painful tragus) is combined with either a pre-auricular cellulitis or a retro-auricular (minimally painful) cellulitis, then the antibiotic should target Pseudomonas.

In previous decades, this generally meant resorting to parenteral ceftazidime or other parenteral anti-pseudomonal antibiotics. Currently though, we can readily treat this infection as an outpatient with oral ciprofloxacin in any child older than age 12 months. The earlier concerns about the general safety and joint issues of ciprofloxacin in children younger than age 18 years have been dispelled. Ciprofloxacin has been approved by the US Food and Drug Administration to treat any complicated or refractory urinary tract infection in any child older than age 12 months.

Yet, a few caveats to the use of ciprofloxacin are in order here:

- Rarely, otitis externa can hide an underlying AOM infection, and ciprofloxacin will have poor coverage for most otopathogens.
- If the cellulitis is due to S. aureus, ciprofloxacin will have no coverage.
- Increased rates of Pseudomonas resistance to ciprofloxacin are being reported in the United States. This could create some
real confusion as to why an infection is nonresponsive to outpatient management.

Thus, when you encounter a child with peri-auricular cellulitis associated with definitive otitis externa, you should consider proceeding as shown in Table 2.

**CASE 1**

After your phone consultation with your pediatric infectious disease physician, you decide to try one more oral outpatient antibiotic—twice-daily oral ciprofloxacin. You combine this with good aural toileting during the visit. You insert an otowick, then you prescribe oral ciprofloxacin topical drops every 2 hours the first 2 days, along with some oral narcotics for the first 24 hours. On follow-up 24 hours later, he has almost regained his full daily functioning.

**CASES 2, 5, AND 6**

Similar to Case 1, you begin twice-daily oral ciprofloxacin in each of these patients with a remarkable turnaround in symptoms within 24 hours. As recommended by the textbook of Feigin et al., 1 I think that the initial gentle debridement of the canal and the insertion of an otowick are also keys to the rapid positive response in each of these patients. 6

**CASES 3 AND 4**

Each of these patients was diagnosed with AOM prior to developing the obvious otitis externa on your later clinical examination. Was this AOM diagnosis a best guess? Both children were treated with oral antibiotics that are considered fairly active against the typical otopathogens, but with no activity at all against *Pseudomonas* or MRSA. Mastoiditis was not a consideration here because of the anterior location of the cellulitis.

But, an infection with MRSA, methicillin-sensitive *Staphylococcus aureus*, *Streptococcus*, or particularly *Bartonella* (Parinaud’s syndrome in light of the underlying pre-auricular lymphadenitis) were considered. Neither patient had a history of cat or dog scratches in the past few months. But, the association of the cellulitis with a full-blown, very painful otitis externa on clinical examination prompted you to treat with oral ciprofloxacin and topical (Table 2) ciprofloxacin for the high likelihood of a pseudomonal cellulitis infection secondary to the otitis externa. It is the same principle

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**TABLE 1.**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Peri-Auricular Cellulitis</th>
<th>Acute Mastoiditis</th>
<th>Superficial Skin Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redness of skin behind the pinna</td>
<td>Always, unless it is pre-auricular cellulitis</td>
<td>Almost always</td>
<td>Usually, unless it is pre-auricular</td>
</tr>
<tr>
<td>Protuberant ear</td>
<td>Typically if retro-auricular</td>
<td>Almost always</td>
<td>Rarely, unless related to insect bite or sting</td>
</tr>
<tr>
<td>Loss of posterior ear sulcus landmark</td>
<td>Always, unless it is pre-auricular</td>
<td>Always</td>
<td>Possibly</td>
</tr>
<tr>
<td>TM with AOM</td>
<td>Occasionally</td>
<td>Always</td>
<td>No</td>
</tr>
<tr>
<td>Otitis externa: swollen canal with canal discharge</td>
<td>Always</td>
<td>Occasionally from spontaneously ruptured TM or draining tubes</td>
<td>No</td>
</tr>
<tr>
<td>Severe pain of ear canal</td>
<td>Always</td>
<td>Very rarely</td>
<td>No</td>
</tr>
<tr>
<td>Severe pain over tragus and pinna</td>
<td>Always</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Pain on skin behind pinna</td>
<td>No</td>
<td>Always</td>
<td>Yes</td>
</tr>
<tr>
<td>Plain radiograph of mastoid</td>
<td>Normal typically</td>
<td>Usually cloudy or rarely coalesced air cells</td>
<td>Normal</td>
</tr>
<tr>
<td>Positive CT scan with cloudy mastoid air cells, etc.</td>
<td>Normal typically</td>
<td>Almost always</td>
<td>Normal</td>
</tr>
<tr>
<td>Fever</td>
<td>Very rarely</td>
<td>Usually</td>
<td>Very rarely</td>
</tr>
</tbody>
</table>

*OAM = acute otitis media; CT = computed tomography; TM = tympanic membrane.*

**TABLE 2.**

<table>
<thead>
<tr>
<th>Optimizing Outpatient Management of Peri-auricular Cellulitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Consider plain radiographs and/or computed tomography scan of mastoids when uncertain or inexperienced practitioner, or if febrile child.</td>
</tr>
<tr>
<td>• Assess carefully for severity of pain in external canal, pinna, and tragus to confirm the diagnosis.</td>
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<tr>
<td>• “Aural toileting:” Gently clean out debris in the ear canal with a small, dry, Calgiswab-like device. This can be quite painful but important debridement.</td>
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<tr>
<td>• Insert cotton otowick; instill the first dose of topical antibiotic drops to moisten it. A few drops of lidocaine may be helpful.</td>
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<tr>
<td>• Prescribe ciprofloxacin otic (or ophthalmic, which is cheaper) drops every 2 hours for the first day, then four times daily.</td>
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<tr>
<td>• Prescribe oral ciprofloxacin twice daily for 7 to 10 days.</td>
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<tr>
<td>• Consider oral narcotics for a few doses.</td>
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<tr>
<td>• Follow up daily for 1 to 2 days; remove wick; replace if not much better.</td>
</tr>
<tr>
<td>• (very rare) Consider hospitalization for parental ceftazidime or meropenem if not much better; or may need addition of staphylococal coverage for possible methicillin-resistant <em>Staphylococcus aureus</em> cellulitis.</td>
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</tbody>
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as *Pseudomonas* otitis externa causing retro-auricular cellulitis (just that the skin infection proceeded anteriorly instead of posteriorly for some reason).

The clinical response was again amazingly rapid, with full resolution of the canal pain and swelling along with the cellulitis within 48 hours.

**CONCLUSION**

As reported in 1994 by Hopkin, retro-auricular cellulitis associated with otitis externa is now the great mimicker of mastoiditis. It may be the most common cause of this specific cellulitis/auricular protrusion—when it is associated with otitis externa. In the era of the highly efficacious HIB and PCV vaccination programs, mastoiditis has almost seemingly disappeared from the office in most general pediatric practices. The diagnosis of otitis externa is relatively straightforward (severe pain over the tragus and in the ear canal, an ear canal with swelling and discharge). When otitis externa is associated with a peri-auricular cellulitis, you will need to probably target your antibiotic toward *Pseudomonas* (ie, use oral ciprofloxacin). This should be combined with good aural toileting and insertion of an otowick.

Once you become comfortable with this diagnostic constellation, you will likely be able to avoid the significant time, sedation procedures, expense, days of ineffective antibiotics, and radiation created by the radiographic exposures to evaluate possible mastoiditis in your young patients. Patient response at careful, early, daily follow-up visits is critical to ensure that you are not dealing with untreated MRSA, underlying AOM, or very early mastoiditis.

**REFERENCES**