

Otitis Media in Children can Develop Potentially Dangerous Complications

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Abstract

Otitis media is rarely an isolated disease, it mainly occurs as part of respiratory infections of the nose and throat, because inflammation from the nose penetrates through the Eustachian tube into the middle ear. Acute otitis media is defined as an inflammatory process involving the middle ear, Eustachian tube, and mastoid cells with the presence of secretions in the middle ear. In children, inflammation is common due to specific anatomical structures, immaturity of the immune system, and hypertrophy of lymphatic tissue. In case the eardrum is very hyperemic, bulging, or purulent secretion is already present in the ear canal as well as in the nose, it is necessary to introduce an antibiotic in the treatment. It is important to take a bacteriological nasal swab before antibiotic therapy and for a runny ear and ear swab. When and which antibiotic to prescribe depends on the clinical picture and age of the child and on the cause and its resistance to the antibiotic.

Keywords: Child, Ear, Otitis Media, Complications, Health**Introduction**

Otitis media (OM) is the second most common cause after well-child take care of a go to to the pediatrician and the most common cause for which antibiotics are prescribed for children [1]. An anticipated 30 million workplace visits consistent with year are for the assessment and remedy of OM within the United States. More than 25% of all prescriptions written every year for oral antibiotics have been for the remedy of center ear infections. Many surgical procedures, together with myringotomy with tympanostomy tube placement or adenoidectomy, have been done on children for remedy of recurrent sickness. However, a dramatic decline has passed off in the superiority of OM from the prepneumococcal conjugated vaccine (PCV) 7 generation to the post-PCV13 generation, from 9.5% of workplace visits to 5.5%, respectively, and from 826 consistent with 1,000 children to 387 consistent with 1,000 children, respectively. Despite this decline, the number one care medical doctor have to have a very good know-how of those pediatric situations, which remain quite common.

Otitis media may be labeled into the subsequent five categories: acute OM (AOM), OM with effusion (OME), recurrent AOM, chronic OME, and chronic suppurative OM. It is critical to differentiate among every of those entities due to the fact their presentation and control differ.

Acute OM (ie, acute suppurative or purulent OM) is the surprising onset of infection of the center ear, that's regularly observed via

way of means of fever and ear ache (ie, otalgia). The scientific findings of infection mentioned on otoscopic exam are bulging of the tympanic membrane (TM), restricted or absent mobility of the TM, air-fluid degree in the back of the TM, and otorrhea now no longer attributable to acute otitis externa. Otitis media with effusion or serous OM is the patience of nonpurulent center ear fluid after antimicrobial remedy following decision of acute inflammatory signs. Fluid can also additionally persist for two to a few months however normally resolves inside three to four weeks in 60% of cases. Recurrent OM is described as common episodes of AOM with entire clearing among every episode, despite the fact that a extra particular definition of recurrent OM is three new episodes of AOM requiring antibiotic remedy inside a 6-month duration or four documented infections in 1 year. This circumstance impacts about 20% of children with a propensity to otitis; such children normally have their first contamination at more youthful than 1 year. Chronic OME, which is likewise called serous OM, secretory OM, nonsuppurative OM, mucoid OM, and glue ear OM, is characterised via way of means of persistence of fluid within the center ear for three months or longer. The TM is retracted or concave with impaired mobility however with out signs of acute infection. The affected child can be asymptomatic. The child with persistent OME is at extended chance for growing listening to deficits, speech postpone, and studying problems. Chronic suppurative OM implies a non-intact TM (ie, perforation or tympanostomy tube gift) with as a minimum 6 weeks of center ear drainage.

Due to issues approximately antibiotic overuse, along with: improvement of resistant organisms, loss of efficacy in addressing ache or stopping tympanic rupture, and excessive rate of spontaneous remission, many pediatric organizations, along with the American Academy of Pediatrics, have followed watchful ready durations of 2–3 days, accompanied via way of means of re-exam previous to recommending or beginning antibiotic remedy [2]. Adverse consequences from antibiotic remedy in children with otitis are not unusual; of each 14 children handled, it's been proven that one will go through an unfavourable occasion together with gastrointestinal upset, rash, or allergic reaction. It is presently encouraged that antibiotics be reserved for children below age 2 years with bilateral contamination, or with unilateral contamination and tympanic membrane perforation. Management in different companies need to awareness on ache control, with ear recheck in 2–3 days.

Factors

Otitis media (OM) is the most common cause for visits to the pediatrician within the first three 12 months of life, the main motive of antibiotic use, and the most common motive of listening to loss in kids [3]. However, the proportion of children in visits for OM getting antibiotics remained enormously stable (from 80% to 76%). Factors that can have contributed to the lower in visits for OM encompass monetary issues, use of pneumococcal vaccine, extended use of influenza vaccine, and public training campaigns stressing the overuse of antibiotics. Many elements make contributions to OM improvement, along with host (i.e., immune machine or anatomic abnormality), infectious (i.e., bacterial or viral pathogen), allergic (i.e., second-hand smoke), and environmental (i.e., feeding techniques and organization daycare) elements. Socioeconomic elements additionally have an effect on the chance of growing OM, its diagnosis, and remedy. Since the creation of the pneumococcal conjugate vaccine, the most common bacterial pathogen for acute otitis media (AOM) is β -lactamase–generating *Haemophilus influenzae*, accompanied via way of means of penicillin-resistant *Streptococcus pneumoniae*. The AAP (American Academy of Pediatrics) up to date the Clinical Practice Guidelines for AOM and once more encouraged statement with out antibiotic remedy for select, in any other case healthful kids 6 mo to 12 year of age with AOM for 48–72 hr and pressured the significance of follow-up with the ones kids in that point frame. It turned into additionally pressured that if kids handled with antibiotics did now no longer enhance or have become extra sick in the forty eight–seventy two hr, they had to be reevaluated. Pain evaluation and control have been addressed within the new recommendations additionally. It mentioned that whether or not on antibiotics or now no longer, ache could now no longer clear up in 24 hr and, in approximately 30% of kids more youthful than 2 12 months, it is able to closing 3–7 days without or with a fever. Oral ache medicinal drugs together with acetaminophen and ibuprofen are very powerful; topical medicinal drugs have questionable gain.

Eustachian Tube

In reality, the eustachian tube isn't always only a tube however an organ along with a lumen with its mucosa, cartilage, surrounding

smooth tissue, paratubal muscles (i.e., tensor veli palatini, tensor tympani, levator veli palatini, and salpingopharyngeus), and bony support (sphenoid sulcus and medial pterygoid plate) [4]. The time period center-ear cleft is regularly used to explain the eustachian tube, center ear, and mastoid gas cells. The larynx, any other organ within the airway, has many similarities to the eustachian tube in that each have comparable (1) anatomy, along with a lumen this is blanketed via way of means of mucosa, cartilage support, and a muscular starting mechanism; (2) physiologic capabilities (e.g., air flow, safety, and clearance); and (three) pathophysiologic processes (i.e., the lumen may be too open or too closed or the hole or final mechanism can also additionally fail). The eustachian tube is a part of a machine of contiguous organs. The nasal hollow space, palate, and pharynx are at its proximal cease, and the center ear and mastoid gas cells are at its distal cease. Modern otologic surgeons have to stay in detail acquainted with the anatomy of the middle-ear cleft, particularly now that endoscopy has joined the otomicroscope for operative procedures.

The eustachian tube isn't always only a tube however an organ this is a part of a machine of organs. The nasal cavities, palate, and pharynx are on the proximal cease of the eustachian tube, and the center ear and mastoid gas cell system are at its distal cease. Thus, the capabilities of the eustachian tube have to be assessed inside this machine due to the fact the regular eustachian tube will characteristic maximum correctly whilst the structures at both cease also are regular.

There are 3 physiologic capabilities attributed to the eustachian tube: (1) pressure regulation (air flow) of the center ear that equilibrates gas pressure within the center ear with atmospheric pressure; (2) protection of the center ear from nasopharyngeal sound pressure and secretions; and (three) clearance (drainage) of secretions produced in the center ear into the nasopharynx.

Complications

Even alevn though the intracranial suppurative complications of otitis media, together with meningitis and mind abscess, are enormously unusual nowadays in developed countries of the world, clinicians anywhere nonetheless regularly stumble upon the extracranial (intratemporal) complications and sequelae of otitis media—those who arise in the aural hollow space and adjoining systems of the temporal bone [5]. The extracranial complications of otitis media are listening to loss; vestibular, stability, and motor dysfunctions; acute perforation of the tympanic membrane; mastoiditis; petrositis; labyrinthitis; facial paralysis; and outside otitis. The intratemporal sequelae of otitis media are persistent suppurative otitis media, atelectasis of the center ear, adhesive otitis media, cholesteatoma, ldl cholesterol granuloma, tympanosclerosis, and ossicular discontinuity and fixation. Hearing loss may be both a hardship or a sequela of otitis media. Almost all kids who've a center-ear effusion have a few degree of listening to loss, however listening to loss also can arise whilst any other suppurative hardship (e.g., perforation of the tympanic membrane or labyrinthitis) or sequela of otitis media develops, together with perforation of the tympanic membrane, adhesive otitis media, cholesteatoma,

tympanosclerosis, or ossicular discontinuity or fixation. Even though there had been a few latest scientific trials to the contrary, different research have cautioned that kids who've had recurrent episodes of otitis media or continual middle ear effusion in early youth carry out much less nicely on assessments of speech and language than do their sickness-free peers. These statistics endorse that postpone in or impairment of improvement can be an critical sequela of otitis media. Also, there are a few reviews that otitis media in toddlers can also additionally predispose kids to later disturbances of stability and ultrahigh-frequency listening to.

The sorts of listening to impairment had been labeled in keeping with the area of the problem [6]. Impairment can be one in all 3 types: conductive, sensorineural, or a combination of those. Conductive losses rise up from situations that have an effect on the outer and center ear; sensorineural loss effects from internal ear issues; and combination losses end result from disruptions in each regions of the ear.

Conductive listening to loss exists whilst disorder withinside the outer or center ear disrupts the regular series of sound localization and vibration. Frequently, the outside auditory meatus will become occluded via way of means of cerumen (wax), which impedes the transmission of sound. Otitis media, an contamination of the center ear, is the maximum not unusualplace motive of conductive listening to loss. In this instance, fluid accumulates withinside the center ear, stopping the tympanic membrane and ossicular chain from vibrating normally. Congenital deformities of the outer ear can also inhibit the neonate's cappotential to hear. Because the characteristic of the outside ear is to funnel sound, versions withinside the shape and protrusion of the pinna can also additionally make contributions to conductive listening to loss. A lacking or deformed pinna can end result from a malformation of the auricular folds. Atresia of the auditory meatus or unusual improvement of the ossicular chain can also additionally rise up from faulty improvement of the brachial chain. Infants with conductive listening to loss have problem listening to low-frequency sounds (i.e., the ones withinside the 125 to 500 Hz range). Management of the neonate with conductive listening to loss is directed closer to early statement, detection, and intervention to dispose of the supply of contamination, to eliminate the blockage, and to offer amplification, ensuing withinside the recovery of regular listening to.

Sensorineural listening to impairment effects from harm to the sensory nerve endings of the cochlea or disorder of the auditory nerve (8th cranial nerve). A traditional function of internal ear disorder is the incapability of the internal ear to interpret fluid modifications withinside the cochlea. Sensorineural listening to loss can also additionally happen as a congenital internal ear abnormality, ensuing in congenital deafness. Other situations that can motive sensorineural listening to loss are trauma to the internal ear, the consequences of positive drugs, extended publicity to loud noise, infections, infectious situations together with measles, and the consequences of aging.

Epidemiology

The incidence of OM peaks in kids 6 to 24 months of age [1]. An extra smaller height happens at about four to six years of age. Otitis media is enormously unusual in older kids and adolescents. The circumstance is extra not unusualplace in boys than girls.

Several epidemiologic chance elements for OM had been identified, along with age more youthful than 2 years; first episode earlier than 6 months; familial predisposition; siblings withinside the household; low socioeconomic status; toddler now no longer breastfed; altered host defenses (ie, obtained or congenital immunodeficiencies); environmental elements (eg, cigarette smoke); child care attendance; and the presence of an underlying circumstance, together with allergic sickness of the top airway, persistent sinusitis, a cleft palate, or different craniofacial anomalies. Children with Down, Goldenhar, or Treacher Collins syndrome and ciliary disorder are also at extended chance for OM. American Indian/Alaska Native people have a better prevalence of AOM than whites. Otitis media normally happens in the course of the winter and early spring, coinciding with peaks withinside the prevalence of viral upper respiration infections (URIs).

Worldwide, OM effects in an anticipated 50,000 deaths consistent with year in kids more youthful than five years due to the complications of chronic suppurative OM. Otitis media is anticipated to have an effect on 65 million to 133 million people worldwide, 60% of whom revel in great listening to loss. Chronic suppurative OM is a unprecedented entity in evolved nations, wherein maximum times of OM are of the extreme presentation or with effusion.

Children with AOM regularly have a records of fever and ear ache. Associated signs encompass URI, cough, vomiting, diarrhea, and nonspecific signs, together with reduced appetite, waking at night, generalized malaise, lethargy, and irritability. Purulent otorrhea with minimum ear ache and listening to loss may arise and indicates rupture of the TM. Fever happens in about 30% to 50% of sufferers. Temperatures exceeding 40°C (104°F) are unusual and are suggestive of bacteremia or any other hardship. Verbal kids can also additionally document tinnitus, vertigo, and listening to loss; Bell palsy is a unprecedented finding. Nonverbal kids can also additionally seem ataxic on bodily exam.

Acute otitis media is normally preceded via way of means of a URI with cough and rhinorrhea [7]. Additional signs start 2–3 days later and might encompass fever, ache, dizziness, humming withinside the ear, or reduced listening to. In toddlers, there are nonspecific signs, together with irritability, extended crying, reduced feeding, sleep disturbance, vomiting, or diarrhea. In more youthful sufferers there can also additionally most effective be fever, a continual URI, or behavioral modifications (cranky, now no longer feeding or napping nicely). Ear tugging is an unreliable signal of AOM. Occasionally, there may be a records of extreme ear ache that stepped forward all of sudden whilst a bloody or yellowish discharge commenced to empty from the outside canal (tympanic membrane perforation). In summary, scientific records alone is an inaccurate predictor of AOM; therefore, look at the ears of a affect-

ed person with any of the signs noted above, despite the fact that otoscopy withinside the preceding 24–36 hours did now no longer screen an otitis media.

For anatomic motives, kids much less than 2 years of age are much more likely to increase OM [8]. The eustachian tube in those kids is shorter and is extra horizontal than it's miles in adults, permitting simpler passage of micro organism from the nasopharynx into the center ear. Furthermore, the canal of the eustachian tube may be very slim and challenge to occlusion via way of means of the encompassing adenoids and lymphoid follicles. Even slight URIs can motive those lymphoid tissues to make bigger and impede the drainage of fluid from the center ear. URIs additionally harm the ciliated epithelium of the eustachian tube, which will increase the probability of micro organism adhering to the wall and predisposes the person to a superimposed bacterial contamination. Ear ache effects from growing strain because of fluid accumulation and infection.

The version of the mechanism for the infection of AOM is primarily based totally at the statement that AOM generally follows an top respiration infection in kids [9]. Excessive secretions of mucus from the nasopharyngeal mucosa, collectively with edema, can also additionally motive brief obstruction of the eustachian tube. The obstruction reasons a build-up of strain withinside the center ear cleft due to the fact there may be most effective one go out thru the eustachian tube. Air is changed with fluid (mucus or inflammatory fluid) and the accompanying stasis will increase the opportunity of bacterial contamination withinside the center ear area.

Support for this version comes from the statement that kids with anatomical issues of the nasopharynx (for example, people with cleft palate or trisomy 21) are much more likely to go through repeated assaults of AOM. The pathophysiologic version has been used to advise that antibiotics is probably beneficial withinside the control of the contamination. In America, the UK, and Australia, popular exercise is to apply antibiotics right away on diagnosis. This isn't always the norm in components of continental Europe, specifically the Low Countries and Scandinavia. Some have argued that infective or inflammatory fluid in a limited area constitutes an abscess, so tympanocentesis is appeared because the right technique of coping with the circumstance. Perforation of the tympanic membrane (synthetic or spontaneous) with accompanying drainage of pus, despite the fact that scary for plenty parents, normally heralds instantaneously alleviation of ache and determination of the episode of infection for the child. Another view altogether shows that AOM is a "self-limiting" (spontaneously remitting) infection, the regular decision of that's rapid sufficient to obviate the want for any remedy.

Examination

Following a complete records and exam, suitable investigations encompass an ear swab for submission to microbiology, particularly if there may be ear discharge [10]. Blood assessments need to encompass a complete blood count, renal characteristic, CRP

(C-reactive protein) and blood cultures earlier than beginning antibiotics.

In the ill affected person, imaging withinside the shape of a evaluation improved CT (computed tomography) of mind and temporal bone need to be done to search for subperiosteal or intracranial abscess preferably after evaluation via way of means of an ENT specialist. Radiological proof of mastoiditis consists of mastoid air cell opacification and breakdown of bony trabeculae. Localised bone necrosis and resorption will bring about a subperiosteal abscess.

Conservative control of AOM entails preserving the ear dry and microsuction of particles or pus withinside the outside auditory canal (to assist save you secondary otitis externa). Medical control consists of analgesia and pressing IV antibiotics as consistent with local microbiology protocol. The most common microorganisms are *Streptococcus pneumoniae* (60%), *Streptococcus pyogenes*, *Haemophilus influenzae* and *Staphylococcus aureus*, so a third-generation cephalosporin (e.g. ceftriaxone) with precise blood–brain barrier penetration is suitable in case of intracranial headaches. The affected person need to additionally take delivery of antibiotic eardrops together with Sofradex, which includes dexamethasone, framycetin and gramicidin till lifestyle and sensitivity end result are available.

If the affected person has signs of sepsis, neurological signs or signs, a subperiosteal abscess or intracranial collection, then the affected person will possibly gain from surgical intervention withinside the shape of a cortical mastoidectomy +/- air flow tube insertion into the tympanic membrane. Neurosurgical enter is needed if the affected person has an intracranial abscess and/or relevant venous sinus thrombosis.

Daignosis

Although apparently obvious, to properly diagnose otitis media, one have to get an good enough view of the center ear [11]. This isn't always continually easy. In general, the most important speculum viable need to be used to look at the ear. This allows the widest viable discipline of view. The speculum need to in shape with no trouble in and be nicely seated withinside the outer, cartilaginous part of the outside auditory canal (EAC). Using a smaller speculum limits the sphere of view and it's miles some distance simpler to over-insert the speculum which can also additionally bring about touch with the bony EAC, that's exquisitely painful. The EAC is regularly tortuous and mild posterior traction at the pinna may be used to straighten the EAC and permit for higher insertion of the speculum. Additionally, the speculum and/or otoscope need to be held in one of these manner that allows you to brace it towards the affected person's head. Thus, with any surprising movements, the speculum and otoscope will circulate with the affected person's head. All of those positioning strategies are aimed toward lowering any pain related to the examination. This is particularly critical in kids. It may be tough to look at toddlers and younger kids, right positioning and approach can assist in reaching a hit examination.

The regular tympanic membrane is a 3 layered membrane with an outer layer of stratified squamous epithelium, a center fibrous layer and an internal mucosal layer of cuboidal epithelium contiguous with the center ear mucosa. It is grown up length at beginning even though its orientation modifications dramatically over the primary few years of life. At beginning it's miles a almost horizontal orientation (34° from the horizontal plane) however modifications because the cranium base grows to a extra vertical orientation (63° from the horizontal plane) in adults. The regular tympanic membrane is translucent and pearly gray. The malleus (quick manner and manubrium) can without difficulty be visible. Other landmarks withinside the center ear are normally seen via the tympanic membrane. The maximum not unusualplace motives for the tympanic membrane now no longer to seem regular are OME and AOM. There are many viable findings whilst inspecting the tympanic membrane and precise description of the examination findings allows with conversation among clinicians.

In evaluation to a regular tympanic membrane, the examination findings in otitis media are pretty different. Otitis media with effusion will regularly gift with lawsuits of fullness and probably reduced listening to. It will also be asymptomatic. Exam findings in serous OME are normally a yellow or amber tympanic membrane with regular or retracted position. Mobility is normally impaired and air bubbles can be visible withinside the fluid withinside the center ear area. Mucoïd OME has a yellow to white or creamy shadeation with a bulging, regular or retracted position. Mobility is normally reduced. The findings in OME evaluation with the findings in AOM. Here the affected person can also additionally or won't whinge or ear ache. The tympanic membrane will display outstanding vessels on examination. There can be purulent effusion withinside the center ear area and the tympanic membrane will seem in a regular or bulging position. Mobility can be reduced.

Treatment

Antibiotics are generally used to deal with AOM [12]. Since the appearance of antibiotic remedy for AOM, the rate of complications and deaths from AOM has dropped dramatically. The first-line antimicrobial agent for AOM is normally amoxicillin, given it has few aspect consequences and affordable efficacy. The use of better dose amoxicillin (90 mg/kg/day) is extra powerful towards drug-resistant pneumococcus; this remedy need to be taken into consideration in kids who've obtained antibiotics withinside the beyond three months, are much less than 2 years of age, or are in day care. In penicillin-allergic sufferers, bear in mind using sulfa-containing agents (trimethoprim– sulfamethoxazole, erythromycin–sulfisoxazole) or the macrolides (azithromycin or clarithromycin). Failure to enhance after seventy two hours of antibiotic remedy is taken into consideration a remedy failure. For sufferers who fail to reply to preliminary amoxicillin remedy, the Centers for Disease Control and Prevention advise amoxicillin/clavulanate, cefuroxime axetil or intramuscular ceftriaxone.

The want for antibiotic remedy in simple AOM is controversial. The over-prescription of antibiotics for AOM and emergence of bacterial resistance to commonly-used antibiotics has heightened

the urgency to lessen pointless antibiotic use. Recent data endorse a loss of gain to antibiotic remedy in kids with simple OM (the absence of fever and vomiting). The exercise of keeping antibiotic remedy and watchful ready is not unusualplace in Europe and gaining popularity withinside the US. Reliable sufferers with good enough get admission to to follow-up care are given a safety-net antibiotic prescription (SNAP) to be crammed most effective if their signs do now no longer clear up in the course of the first 48 hours. During this era of statement, sufferers are controlled with oral analgesics and topical otic anesthetic drops.

Conclusion

The significance of otitis media lies in its high incidence in the general population and potentially dangerous complications. Inflammation of the middle ear can affect certain parts of it, but there is usually moderate inflammation of all parts of the middle ear. The type and intensity of inflammation in the middle ear (non-purulent and purulent) depends on the virulence of microorganisms, the resistance and age of the patient, the manner and effect of treatment. Clinical examination and anamnesis from the parents are important for the accurate diagnosis of otitis media. The most common anamnestic data from the parents is that the child had a cold for a few days, his nose was leaking, and he woke up with pain in his ear. The cooperation of the parent and the child during the examination is important. During the examination, the child must be calm so that the ear canal can be cleaned of earwax, the eardrum can be visualized and an accurate diagnosis can be made. If the child has only mild hyperemia of the eardrum, and clear serum mucosal secretion from the nose, it is probably only viral inflammation. Clinical examination in addition to examination of the ear involves a detailed examination of the nose, nasal part of the pharynx which sometimes includes fiberoendoscopy.

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