Acute otitis media an overview and literature review

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Definition:

Acute otitis media is defined as middle ear infection of 3 weeks duration. In acute otitis media there is evidence of acute illness along with symptoms like pain, fullness of ear. On examination the ear drum appears to be bulging and under high tension. If there is associated accumulation of fluid in the middle ear cavity then it is termed as otitis media with effusion (OME). In otitis media with effusion there is absence of these dramatic signs and symptoms. Only positive history being ear block,

Introduction:

In order to decide on the optimal management modality\(^1\) it is vital to distinguish between Otitis media, acute suppurative otitis media and otitis media with effusion. Antibiotics have been traditionally advised in treating patients with otitis media and acute suppurative otitis media, where as it is not indicated in managing children with otitis media with effusion. There is always the associated never ending controversy of whether to use antibiotics in these patients or not, with scholarly opinion equally divided.

Signs and symptoms:

Common symptoms of acute otitis media are pertained to ear related\(^2\), which include:

- Ear ache
- Ear block
- Fever

Incessant crying was also present in 90% of these children

These children usually have antecedant history of upper respiratory tract infection.

Physical examination findings / otoscopy is not reliable. A crying child would always have a red colored ear drum due to vascular congestion caused due to excessive crying.

Otoscopic findings that serves as a pointer towards the diaganosis include \(^5\):

- Poorly mobile bulging yellowish / opacified ear drum
- In the presence of mildly retracted ear drum a fluid level should be present behind the ear drum
- Fluid aspirated by performing tympanocentesis is diagnostic. Tympanocentesis can be performed using modern day otoscopes which has a detachable lens system
- Among the above mentioned features the color of the ear drum is the least important.

Position of ear drum:
Bulging ear drum – is seen in acute otitis media

Retracted ear drum / drum in neutral position – seen in otitis media with effusion

Diagnostic value of tympanocentesis:

Tympanocentesis has been accepted as a gold standard in the diagnosis of acute otitis media. It not only ensures identification of fluid in the middle ear, the same can be sent for culture and sensitivity also. By removing fluid from the middle ear cavity the healing process is hastened. The patient should be properly restrained during the procedure and the drum should be visualized well. This way the complications of this procedure are rather rare.

Fig. 1: Otoscopy showing bulging lustreless ear drum

Pathophysiology:

Eustachian tube obstruction is the most common antecedent event. Majority of eustachian tube blocks are triggered by upper respiratory tract infections. Pathogen usually find their way into the middle ear cavity via the eustachian tube. Infections usually begin as viral ones, and later the middle ear becomes secondarily colonized by bacteria.

Predisposing factors include:

Poor sanitary conditions

Over crowding

Malnutrition

Allergy

Flask Model explaining the role played by eustachian tube in middle ear infections:

The eustachian tube, middle ear, and mastoid air cell system can be likened to a flask with a long narrow neck. The mouth of the flask represents the nasopharyngeal end, the narrow neck, the isthmus of the eustachian tube, and the bulbous portion, the middle ear and mastoid air chamber. The fluid flow through the neck of the flask would be dependent on the pressure at either end, the radius and length of the neck, and the viscosity of the liquid. When a small amount of liquid is instilled into the mouth of the flask, liquid flow stops somewhere in the narrow neck owing to capillarity within the neck and the relative positive air pressure that develops in the chamber of the flask.

Mouth of the flask – Is the nasopharyngeal end of eustachian tube

Narrow neck portion of flask – Isthmus portion of eustachian tube
Bulbous portion of flask – Middle ear and mastoid air cell system

Fluid flow through the neck of the flask is dependent on:

1. Pressure differential at either end
2. Radius of the neck
3. Length of the neck
4. Viscosity of the fluid

Hence when a small amount of fluid is instilled into the mouth of the flask, the flow of liquid stops somewhere in the narrow neck owing to the capillary action of the neck and the relative positive pressure present within the chamber of the flask. The basic geometry is considered to be critical for the protective function of the eustachean tube -middle ear system. Reflux of liquid into the body of the flask occurs if the neck of the flask is excessively wide, or the length of the neck of the flask is too short as seen in children. Because infants have a shorter eustachean tube than adults, reflux is more likely to occur in the baby. The position of the flask in relation to the liquid is another important factor. In humans, the supine position enhances flow of liquid into the middle ear; thus infants might be at risk for developing reflux otitis media because they are commonly supine. Reflux of liquid into the vessel can also occur if a hole is made in the bulbous portion of the flask, because this prevents the creation of positive pressure in the bulbous portion. This positive pressure is useful in the prevention of reflux of material from the neck of the flask.

In malnourished children the eustachean tube is rather patulous. This condition was first reported by Schwartz in 1864. This is due to loss of fat pad around the pharyngeal end of eustachean tube. This loss of fat tissue around tubal eminence causes the pharyngeal end of eustachean tube to be perpetually open. This open eustachean tube facilitates easy entry of organism from nasopharynx into the middle ear cavity. Children with neuromuscular disorders or with abnormalities involving 1st and 2nd branchial arches also have patulous eustachean tube and are more prone for middle ear infections due to organism from nasopharynx.
Commonly implicated bacteria:

1. Streptococcus pneumoniae
2. H. Influenza
3. M. Catarrhalis

During upper respiratory tract infection the causative organism (virus / Bacteria) that normally colonizes the nasopharynx refluxes / aspirates / insufflates into the middle ear cavity. This causes acute otitis media.

The term middle ear effusion denotes accumulation of fluid in the middle ear cavity. It does not denote in anyway its etiology, pathogenesis or duration. The accumulated fluid could be:

- Serous – Thin and watery
- Mucoid – Thick and viscid
- Purulent – Pus
- A combination of any of the above types.

Persistent middle ear effusion:

This condition is characterised by the presence of middle ear effusion after cessation of an episode of acute otitis media.
Stages of acute suppurative otitis media:

Stage of hyperemia

Stage of exudation

Stage of suppuration

Stage of resolution

Progression through these stages are dependent on:

1. Host factors
2. Virulence of the infecting organism
3. Insufficient / inappropriate antibiotic treatment

Stage of hyperemia:

This stage is the initial stage in the progression of acute otitis media. This stage is characterised by hyperemia of middle ear mucosa. Since this phase is acute in nature it is accompanied by constitutional symptoms like fever. The affected ear feels rather full also. There is significant vascular engorgement of mucoperiosteal vessels in the middle ear cavity. Otoscopy in this phase is rather characteristic. It reveals congestion and dilatation of blood vessels along the handle of malleus and also along the margins of ear drum. Antibiotic therapy during this phase could lead to resolution of the disease. Amoxycillin is the preferred drug of choice.

Stage of exudation:

In the absence of treatment / treatment with inappropriate antibiotics the stage of exudation results. This stage is characterized by outpouring of fluid from dilated vessels of mucoperiosteum. This fluid is usually serous in nature containing lots of fibrin, red cells and polymorphs. Otoscopy in these patients reveals a bulging ear drum devoid of all its usual landmarks. These patients also have associated mastoid tenderness due to coexistent mastoiditis.
Stage of suppuration:

If these patients are not treated properly suppuration begins. Accumulated fluid in the middle ear cavity is an excellent culture medium for secondary bacterial infections.

Stage of resolution:

In this stage the patient recovers. It is usually preceded by ear drum rupture and ear discharge. During this stage patient has a relatively pain free interval.

Stage of complication:

If infection prevails for more than 2 weeks, it is always associated with mucoperiosteal thickening around periantral cells causing block in the mastoid antrum drainage. The pent up secretions within the mastoid cavity causes intense pressure, local acidosis and venous stasis. This local acidosis causes calcium dissolution from the masoid bone architecture. This leads to a condition known as “Coalescent mastoiditis”. These patients have nocturnal otalgia, mastoid tenderness and low grade fever. Erosion of the outer wall of bony mastoid cortex leads to the formation of subperiosteal abscess.

Management:

Role of antibiotics in patients with acute otitis media is highly controversial. Studies infact does not substantiate the usefulness of antibiotics in the management of early stages of acute otitis media 12. The consensus of opinion is veering towards more conservative approach like prescribing just antipyretics and anti-inflammatory drugs alone. Antibiotics is reserved only for recalcitrant cases. If otalgia and constitutional symptoms persist for more than a couple of days a course of antibiotics is warranted.

How long should antibiotics be prescribed if started?

This again is an unsettled issue. As far as uncomplicated acute otitis media goes studies reveal that 5 days regimen of antibiotics is aseffectiveas 10 days one 9. Hence 5 days regimen is recommended for children of 2 years of age and above. 10 days antibiotic regimen is recommended for children under the age of 2 and with a perforated ear drum.

Amoxycillin is the drug of choice. It is usually prescribed in doses of 40-45mg/kg/day in three divided doses orally. Clavulanate can be combined with amoxycillin. Combination of amoxycillin:clavulanate is about 7:1 in order to minimize gastrointestinal tract irritability. If this combination is not working then 4:1 combination can be resorted to. It is hence useful to give separate prescriptions for amoxycillin and clavulanic acid.

The following antibiotics should not be used in the management of acute otitis media:

1. Cephalexin – It has no activity agains H influenza / Morexella catarrhalis. Its activity against S. Pneumoniae is rather intermediate
2. Cefaclor – very poor activity against H influenza/ Morexella
3. Cefixime – drug resistance is common
4. Ceftriaxone – due to potential third generation antibiotic drug resistance
5. Clindamycin – It has absolutely zero activity against
6. Erythromycin – It has very poor activity against H influenza

Role of myringotomy:
If otalgia persists for more than 4 days despite adequate antibiotic therapy then myringotomy should be resorted to. Myringotomy should be done if the ear drum is bulging with a middle ear cavity filled with secretions. Some authors advocate early myringotomy. The advantages of early myringotomy according to these authors are:

1. Patients have immediate pain relief
2. Incidence of complications are reduced
3. Secretions from the middle ear cavity can be sent for microbiological analysis and antibiotic sensitivity tests.

References

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