International Journal of Healthcare Sciences ISSN 2348-5728 (Online)
Vol. 4, Issue 2, pp: (1735-1741), Month: October 2016 - March 2017, Available at: www.researchpublish.com

Overview of Diagnosis and Treatment Approaches of Acute Otitis Media (AOM)

[1]Abdulrahman Saed Almalki, [2]Faisal Abdulghani Althobaiti,
[3]Ahmed Mohammed Al Thobaiti, [4]Ibrahim Saleh Almalki,
[5]Hamed Awadh Hamed Alharthi, [6]Mohammed Abdullah Algarni

Abstract: **This review study was aimed to overview the diagnostic procedures and treatment approaches of acute otitis media (AOM), through reviewing the evidence based on the proper treatment for this otolaryngology condition. We carried out an extensive literature review, through following databases; (Medline, and Embase) searching for articles presenting reporting diagnosis and treatment of AOM, published up to January,2017. Search restriction was applied to English language articles with human subject included. We further searched references lists of those selected articles. Acute otitis media and otitis media with effusion are common youth disorders, a source of considerable morbidity, and a leading reason for antibiotic prescription in primary health care. Effective treatments are offered, some imperfections stay, and thus better treatments would be welcome. Recent discoveries within the field of otitis media research relating to its etiology and pathogenesis have actually caused additional investigation focused on developing novel treatments. The focus of this practice guideline is the proper medical diagnosis and initial treatment of a patient providing with AOM., and these guidelines will assist in decisions making on treatment of AOM.**

Keywords: **Acute Otitis Media (AOM), Otitis media (OM).**

1. INTRODUCTION

Otitis media (OM) is a group of intricate infective and inflammatory conditions impacting the middle ear, with a range of subtypes varying in presentation, associated issues, and treatment. OM is a leading cause of health care visits worldwide, and its problems are important causes of preventable hearing loss, especially in the developing world [(1)]. Acute otitis media (AOM) is the most typical infection for which antibacterial representatives are prescribed for children in the United States. As such, the medical diagnosis and management of AOM has a considerable influence on the health of children, cost of providing care, and general use of antibacterial agents. The illness also produces a substantial social burden and indirect cost due to time lost from school and work. It is thought that between 50% and 85% of children experience a minimum of one episode of AOM by 3 years of age with the peak occurrence being in between 6 and 15 months [(2)]. OME is the commonest cause of hearing impairment in children in the industrialized world, and can affect as lots of as 80% of children at some phase, [(3,4)] with around 2.2 million brand-new cases of OME annually in the United States of America [(5)]. Children are more prone to AOM and OME due to an anatomical predisposition; the eustachian tube is shorter, more versatile, and horizontal which enables nasopharyngeal pathogens to get in the middle ear with relative ease. Nasopharyngeal measurements have actually been revealed to be smaller sized in children suffering from duplicated attacks of AOM [(6)]. Associated to AOM and acute mastoiditis, OM with effusion (OME) is a chronic inflammatory condition. It typically impacts children in between 3 and 7 years of ages. It is characterized by the presence of an effusion, glue-like fluid behind an intact tympanic membrane in the lack of symptoms and signs of acute inflammation [(3)]; for this reason, the commonest reported sign is hearing loss, which might lead to speech delay or educational issues. Histologically it is a chronic inflammatory condition, characterized by inflammation in the middle ear mucosa, overproduction of mucin and production of transformed, more thick mucin [(4)]. Mucin is the predominant element of the middle ear effusion responsible for the thick viscous properties of the "glue;" many other components including bacteria have actually been recognized in the middle ear effusion likewise [(4)]. The hearing loss in OME is typically short-term as the middle ear effusion regularly fixes spontaneously, [(3)] particularly if OME follows an episode of AOM; when OME is

found on screening of asymptomatic children, it solves in 63% by 3 months and in 88% by 1 year. For this reason a "watch and wait" period must be embraced and treatment just provided to those in whom an effusion is relentless. When OME is persistent, especially if early and bilateral in life, it may impact adversely on speech advancement, education, and behavior, although the extent to which OME affects these factors and lifestyle can be variable and is questionable [3].

This review study was aimed to overview the diagnostic procedures and treatment approaches of acute otitis media (AOM), through reviewing the evidence based on the proper treatment for this otolaryngology condition.

2. METHODOLOGY

We carried out an extensive literature review, through following databases; (Medline, and Embase) searching for articles presenting reporting diagnosis and treatment of AOM, published up to January,2017. Search restriction was applied to English language articles with human subject included. We further searched references lists of those selected articles.

3. RESULTS

➢ Pathophysiology and causes of AOM:

The etiology of OM is multifactorial and associates with physiological variations, pathophysiology including the interaction between microbial agents and host immune reaction, and cell biology of the middle ear cleft (mastoid, middle ear cavity, eustachian tube) and nasopharynx [7,8]. Viral upper respiratory tract infections typically coincide or precede with episodes of AOM; examples include breathing syncytial infection, cytomegalovirus, and adenovirus [9]. Viral infections are now believed to have a pivotal role in AOM progression, and current randomized controlled trials have actually shown the function of antiviral treatment for AOM [10]. It is thought that viral infection of the nasopharynx produces an environment that promotes bacterial colonization, adhesion to cells, and intrusion of the middle ear [9]. The bacteria typically implicated in upper breathing system infections are likewise those most regularly separated from middle ear effusions in AOM. These are Streptococcus pneumoniae, Haemophilus influenzae, Moraxella catarrhalis, and to a lower extent Staphylococcus aureus, and Streptococcus pyogenes; they are believed to go into the middle ear cleft through the eustachian tube. There is a variable occurrence in the detection of these bacteria from effusions in AOM, but S. pneumoniae and H. influenzae have actually been discovered most often in recent research studies [11,12]. Comparable germs have likewise been cultured from fluid in OME, although various studies in various scenarios in different nations may produce various findings. In general, the germs in OME resemble those seen in frequent AOM (RAOM) [13]. Upper respiratory system infections can result in mucosal congestion in the eustachian tube and nasopharynx. The resultant blockage prevents regular eustachian tube function and pressure regulation is altered within the middle ear. If sustained, aspiration of nasopharyngeal pathogens can take place into the middle ear. The presence of these pathogens then promotes inflammation and pus collection within the middle ear, resulting in medical signs of AOM. During this inflammatory period, the middle ear ossicles are less mobile and may undergo resorption [14], which might even cause irreversible conductive hearing loss. Studies have actually explained patients with smaller sized mastoid cavities as having greater risk of establishing chronic middle ear disease [9]; however, whether this effect is causative is controversial. Patients with chronic infection might also establish sensorineural hearing loss secondary to ototoxicity. Pathogenesis of AOM is complex and multifactorial. (**Figure 1**) shows a few of the complicated interactions that might cause AOM development [9,14].

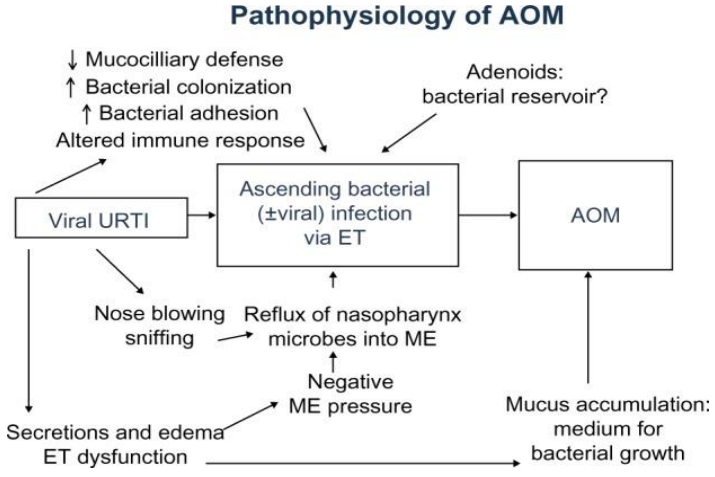

Figure 1: Pathophysiology of AOM. ET, eustachian tube; ME, middle ear; URTI, upper respiratory tract infection.

➢ **Diagnosis of AOM:**

Numerous guidelines exist to help clinicians in diagnosing OM and its subtypes. AOM is differentiated from OME and CSOM based on the history and examination findings. Myringotomy (surgical incision of the ear drum) is considered the gold requirement for the diagnosis of middle ear fluid; [8] however, it is not practical to subject every child to this surgical procedure when the medical diagnosis can be made on the basis of assessment in the center.

AOM is a purulent middle ear process, for that reason the signs and signs constant with acute inflammation exist. AOM generally has a short history, and is frequently related to fever, otalgia, irritability, otorrhea, sleepiness, anorexia, and throwing up; the signs alone lack level of sensitivity and uniqueness for medical diagnosis [15]. The American Academy of Pediatrics guidelines [16] state that AOM need to be detected in children with moderate to extreme bulging of the tympanic membrane or brand-new start otorrhea not secondary to otitis externa. The diagnosis may likewise be made with mild bulging of the tympanic membrane with otalgia or intense tympanic membrane erythema; in the absence of a middle ear effusion (examined with pneumatic otoscopy or tympanometry) the medical diagnosis is not likely. Pneumatic otoscopy and tympanometry evaluate mobility of the ear drum, and if a non-perforated ear drum is stable this indicates the existence of a middle ear effusion; both methods rely on differing the ear canal pressure, with pneumatic otoscopy envisioning the ear drum directly and tympanometry assessing movement by means of sound reflection. If a child has three episodes of AOM within a 6-month duration, or four in 1 year, the condition is referred to as RAOM [17].

Precise diagnosis of AOM is important to sound scientific decision-making and high-quality research study. The 2004 "Clinical Practice Guideline: Diagnosis and Management of AOM"1 utilized a 3-part definition for AOM: (A) acute start of symptoms, (B) presence of MEE, and (C) indications of acute middle ear in- flammation. This definition generated comprehensive discussion and reanalysis of the AOM diagnostic proof. The 2004 definition did not have precision to leave out cases of OME, and medical diagnoses of AOM could be made in children with acute start of signs, consisting of extreme otalgia and MEE, without other otoscopic findings of inflammation [18]. The use of "uncertain diagnosis" in the 2004 AOM guideline may have allowed diagnoses of AOM without clear visualization of the TM. Earlier research studies may have registered children who had OME rather than AOM, leading to the possible classi- fication of such children as improved since their nonspecific signs would have eased off despite therapy [19,20,21]. 2 studies, published in 2011, utilized stringent diagnostic requirements for identifying AOM with much less risk of conclusions based upon information from mixed patients [22,23]. Considering that publication of the 2004 AOM guideline, a number of research studies have been carried out evaluating scales for the presence of signs. These research studies did not show a consistent connection of signs with the initial medical diagnosis of AOM, especially in preverbal children. To appropriately identify AOM, there should be fluid behind the tympanic membrane (a middle ear effusion) and specific symptoms and signs of middle ear inflammation (**Table 1**) [22,23] suggesting that this fluid is pus.

Table 1: The signs or symptoms that must be present to make a diagnosis of acute otitis media

Signs of a middle ear effusion: list-behavior=unordered prefix-word= mark-type=disc • An immobile tympanic membrane (as demonstrated by pneumatic insufflation, tympanogram or acoustic reflectometry) or presence of liquid in the external ear canal as a result of tympanic membrane rupture (acute otorrhea) • +/− Opacification of the tympanic membrane (not secondary to scarring) • +/− Loss of the bony landmarks behind the tympanic membrane (specifically loss of the short or lateral process of the malleus) • +/− A visible air fluid level behind the tympanic membrane
Signs of middle ear inflammation: list-behavior=unordered prefix-word= mark-type=disc • Bulging tympanic membrane with marked discolouration (hemorrhagic, red, gray or yellow)
Acute onset of symptoms: list-behavior=unordered prefix-word= mark-type=disc • Rapid onset of ear pain (otalgia), or unexplained irritability in a preverbal child

Examination of tympanic membrane (TM):

The pneumatic otoscope is the standard tool utilized in identifying OM. Valuable likewise is a surgical head, which considerably helps with cleansing cerumen from an infant's external auditory canal. Cerumen might be removed by using a curette, mild suction, or watering [24]. The pneumatic otoscope should have a light of adequate brightness and an air-tight

seal that allows application of negative and favorable pressure. In general, non-disposable specula attain a much better seal with less pain because of a thicker, smoother edge and better light transmission residential or commercial properties. Pneumatic otoscopy allows assessment of the shape of the TM (normal, pulled back, full, bulging), its color (gray, yellow, pink, amber, white, red, blue), its clarity (translucent, semiopaque, opaque), and its movement (regular, increased, decreased, missing). The regular TM is translucent, pearly gray, and has a ground-glass look (**Figure 2A**) [24]. Specific landmarks can be pictured. They consist of the brief process and the manubrium of the malleus and the pars flaccida, situated par excellence. These are easily observed and help to recognize the position of the TM. Inward movement of the TM on favorable pressure in the external canal and outside movement on negative pressure should happen, especially in the superior posterior quadrant.

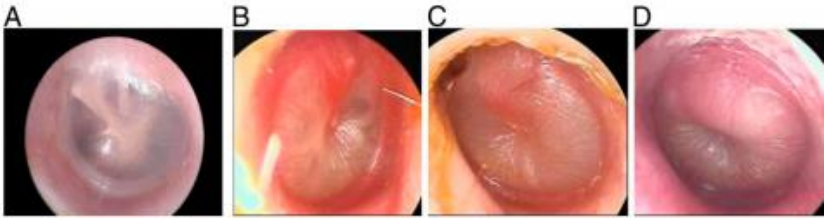

Figure 2: A, Normal TM. B, TM with mild bulging. C, TM with moderate bulging. D, TM with severe bulging.

- **Treatment approaches of AOM:**

In general, AOM follows a beneficial course without antibiotic treatment, with analgesia and antipyretics being necessary. Meta-analyses have actually demonstrated that around 80% of children have spontaneous relief of AOM within 2-14 days [25,26,27]. In children aged <2 years the results are less clear and resolution might be as low as 30% in a couple of days [28]. The overall high rates of resolution mean that it might be appropriate to simply observe children diagnosed with AOM in the lack of believed problems.

Present USA guidelines for the treatment of AOM advise that antibiotics should be used in children aged over 6 months when unilateral or bilateral AOM is serious (moderate to severe otalgia, otalgia lasting at least 48 hours, temperature level 39 ° C) [29]. If AOM is not extreme but is bilateral in a child aged 6 - 23 months, antibiotics should also be recommended. In the case of non-severe unilateral AOM in a child aged 6-23 months, or non-severe unilateral/bilateral AOM in a child aged 24 months or older, prescription antibiotics might be prescribed or observation offered; if observation is selected, a mechanism must remain in place to provide antibiotics if symptoms do not enhance in 48-72 hours. In addition to evaluation of the child's condition, the ideas of parents or caretakers should be thought about and decisions made jointly. Pain assessment and management is a necessary aspect of treating AOM. Notably, an initial period of observation is not connected with a higher risk of issues when compared with those receiving instant treatment [25].

For RAOM, surgically placed ventilation tubes should be considered if RAOM is associated with a consistent middle ear effusion in between AOM attacks [30]. Prophylactic prescription antibiotics are generally not suggested for RAOM, although a methodical evaluation has actually noted that they are effective [31]; due to concerns about long duration of antibiotic direct exposure and prospective adverse effects, ventilation tubes usually wind up being the favored choice.

As with AOM, numerous children with OME do not require treatment due to high rates of spontaneous resolution. Nevertheless, when OME is bilateral and persistent for more than 3 months, the chances of natural resolution are much lower and treatment might be advantageous. Current UK and USA guidelines [30,32] advise a 3-month period of observation with serial audiometry and evaluation of the degree of hearing loss and the impact on a child's development prior to figuring out the requirement for treatment, although guidelines are not constantly followed [33]. Standards advise either surgical treatment in the form of ventilation tubes or hearing helps. Ventilation tube insertion is related to a variety of threats, that include purulent otorrhea (10%-- 26%), myringosclerosis (39%-65%), retraction pockets (21%), and relentless tympanic membrane perforations (3%, although with longer-stay T-tubes, as much as 24%) [34]. In addition, when tubes extrude OME may return, with one trial of short-term tubes noting that 20%-- 25% of children required a 2nd set of ventilation tubes within 2 years [35]. Adenoidectomy is likewise thought to have a role in avoiding reoccurring OME [36], however due to involved risks it is generally not suggested as a primary treatment of OME, unless there are consistent or regular upper respiratory system infections [32].

Unlike AOM and OME, the conclusive management for CSOM is normally surgical, with a range of techniques described to fix the ear drum and remove infection. Conservative management is appropriate in choose patient groups, with the goal of minimizing bouts of frequent discharge and infection and for that reason associated hearing loss [37]. Topical quinolones (eg, ciprofloxacin) have been discovered to be the most reliable treatment in a recent Cochrane review (38), however although these are licensed in the USA, they are currently not licensed as ear drops in the UK. A number of the frequently used ear drops are based upon aminoglycosides, and although issues exist about their possible ototoxicity when used in the existence of tympanic membrane perforation, the current agreement is that their use is safe simply put, supervised courses, and less ototoxic than the infection itself [39].

4. CONCLUSION

Acute otitis media and otitis media with effusion are common youth disorders, a source of considerable morbidity, and a leading reason for antibiotic prescription in primary health care. Effective treatments are offered, some imperfections stay, and thus better treatments would be welcome. Recent discoveries within the field of otitis media research relating to its etiology and pathogenesis have actually caused additional investigation focused on developing novel treatments. The focus of this practice guideline is the proper medical diagnosis and initial treatment of a patient providing with AOM., and these guidelines will assist in decisions making on treatment of AOM.

REFERENCES

[1] Monasta L, Ronfani L, Marchetti F, et al. Burden of disease caused by otitis media: systematic review and global estimates. PLoS One. 2012;7(4):e36226.

[2] Klein JO. Epidemiology of otitis media. Pediatr Infect Dis J. 1989;8(Suppl 1):S9.

[3] van Zon A, van der Heijden GJ, van Dongen TM, Burton MJ, Schilder AG. Antibiotics for otitis media with effusion in children [review] Cochrane Database Syst Rev. 2012;9:CD009163.

[4] Kubba H, Pearson JP, Birchall JP. The aetiology of otitis media with effusion: a review. Clin Otolaryngol Allied Sci. 2000;25(3):181–194.

[5] American Academy of Family Physicians. American Academy of Otolaryngology-Head and Neck Surgery. American Academy of Pediatrics Subcommittee on Otitis Media With Effusion Otitis media with effusion. Pediatrics. 2004;113(5):1412–1429.

[6] Renko M, Kristo A, Tapiainen T, et al. Nasopharyngeal dimensions in magnetic resonance imaging and the risk of acute otitis media. J Laryngol Otol. 2007;121(9):853–856.

[7] Cayé-Thomasen P, Hermansson A, Bakaletz L, et al. Panel 3: Recent advances in anatomy, pathology, and cell biology in relation to otitis media pathogenesis. Otolaryngol Head Neck Surg. 2013;148(Suppl 4):E37–E51.

[8] Rovers MM, Schilder AG, Zielhuis GA, Rosenfeld RM. Otitis media. Lancet. 2004;363(9407):465–473.

[9] Murphy TF, Chonmaitree T, Barenkamp S, et al. Panel 5: Microbiology and immunology panel. Otolaryngol Head Neck Surg. 2013;148(Suppl 4):E64–E89.

[10] Heinonen S, Silvennoinen H, Lehtinen P, et al. Early oseltamivir treatment of influenza in children 1–3 years of age: a randomized controlled trial. Clin Infect Dis. 2010;51(8):887–894.

[11] Pumarola F, Marès J, Losada I, et al. Microbiology of bacteria causing recurrent acute otitis media (AOM) and AOM treatment failure in young children in Spain: shifting pathogens in the post-pneumococcal conjugate vaccination era. Int J Pediatr Otorhinolaryngol. 2013;77(8):1231–1236.

[12] Chen YJ, Hsieh YC, Huang YC, Chiu CH. Clinical manifestations and microbiology of acute otitis media with spontaneous otorrhoea in children. J Microbiol Immunol Infect. 2013;46(5):382–388.

[13] Stol K, Verhaegh SJ, Graamans K, et al. Microbial profiling does not differentiate between childhood recurrent acute otitis media and chronic otitis media with effusion. Int J Pediatr Otorhinolaryngol. 2013;77(4):488–493.

[14] Salomonsen RL, Hermansson A, Cayé-Thomasen P. Ossicular bone modeling in acute otitis media. Otol Neurotol. 2010;31(7):1109–1114.

[15] Scottish Intercollegiate Guidelines Network. Guidelines No 66. Diagnosis and Management of Childhood Otitis Media in Primary Care. Edinburgh; Royal College of Physicians; 2003. Available from: http://www.sign.ac.uk/pdf/qrg66.pdf.

[16] Lieberthal AS, Carroll AE, Chonmaitree T, et al. The diagnosis and management of acute otitis media. Pediatrics. 2013;131(3):e964–e999.

[17] Whittemore KR., Jr What is the role of tympanostomy tubes in the treatment of recurrent acute otitis media? Laryngoscope. 2013;123(1):9–10.

[18] Block SL, Harrison CJ. Diagnosis and Management of Acute Otitis Media. 3rd ed. Caddo, OK: Professional Communications; 2005:48–50

[19] Wald ER. Acute otitis media: more trouble with the evidence. Pediatr Infect Dis J. 2003;22(2):103–104.

[20] Paradise JL, Rockette HE, Colborn DK, et al. Otitis media in 2253 Pittsburgh-area infants: prevalence and risk factors during the first two years of life. Pediatrics. 1997;99(3):318–333.

[21] McCormick DP, Chonmaitree T, Pittman C, et al. Nonsevere acute otitis media: a clinical trial comparing outcomes of watchful waiting versus immediate antibiotic treatment. Pediatrics. 2005;115(6): 1455–1465.

[22] Hoberman A, Paradise JL, Rockette HE, et al. Treatment of acute otitis media in children under 2 years of age. N Engl J Med. 2011;364(2):105–115.

[23] Tähtinen PA, Laine MK, Huovinen P, Jalava J, Ruuskanen O, Ruohola A. A placebocontrolled trial of antimicrobial treatment for acute otitis media. N Engl J Med. 2011;364(2):116–126

[24] Roland PS, Smith TL, Schwartz SR, et al. Clinical practice guideline: cerumen impaction. Otolaryngol Head Neck Surg. 2008;139(3 suppl 2):S1–S21

[25] Marcy M, Takata G, Shekelle P, et al. Management of Acute Otitis Media. Evidence Report/Technology Assessment No 15. Rockville, MD: Agency for Healthcare Research and Quality; 2001.

[26] Glasziou PP, Del Mar CB, Sanders SL, Hayem M. Antibiotics for acute otitis media in children [review] Cochrane Database Syst Rev. 2004;(1):CD000219.

[27] Rosenfeld RM, Vertrees JE, Carr J, et al. Clinical efficacy of antimicrobial drugs for acute otitis media: metaanalysis of 5400 children from thirty-three randomized trials. J Pediatr. 1994;124(3):355–367.

[28] Damoiseaux RA, van Balen FA, Hoes AW, Verheij TJ, de Melker RA. Primary care based randomised double blind trial of amoxicillin versus placebo for acute otitis media in children aged under 2 years. BMJ. 2000;320(7231):350–354.

[29] American Academy of Pediatrics Subcommittee on Management of Acute Otitis Media Diagnosis and management of acute otitis media. Pediatrics. 2004;113(5):1451–1465.

[30] Rosenfeld RM, Schwartz SR, Pynnonen MA, et al. Clinical practice guideline: Tympanostomy tubes in children. *Otolaryngol Head Neck Surg*. Jul. 2013;149(Suppl 1):S1–S35.

[31] Leach AJ, Morris PJ. Antibiotics for the prevention of acute and chronic suppurative otitis media in children [review] Cochrane Database Syst Rev. 2006;(4):CD004401.

[32] Surgical management of children with otitis media with effusion (OME) [webpage on the Internet] London: National Institute for Health and Clinical Excellence; 2008.. [updated May 30, 2012]. Available from: http://guidance.nice.org.uk/CG60.

[33] Daniel M, Kamani T, El-Shunnar S, et al. National Institute for Clinical Excellence guidelines on the surgical management of otitis media with effusion: are they being followed and have they changed practice? Int J Pediatr Otorhinolaryngol. 2013;77(1):54–58.

[34] Vlastarakos PV, Nikolopoulos TP, Korres S, Tavoulari E, Tzagaroulakis A, Ferekidis E. Grommets in otitis media with effusion: the most frequent operation in children. But is it associated with significant complications? Eur J Pediatr. 2007;166(5):385–391.

[35] Daniel M, Chessman R, Al-Zahid S, et al. Biofilm eradication with biodegradable modified-release antibiotic pellets: a potential treatment for glue ear. Arch Otolaryngol Head Neck Surg. 2012;138(10):942–949.

[36] van den Aardweg MT, Schilder AG, Herkert E, Boonacker CW, Rovers MM. Adenoidectomy for otitis media in children [review] Cochrane Database Syst Rev. 2010;(1):CD007810.

[37] Woodfield G, Dugdale A. Evidence behind the WHO guidelines: hospital care for children: what is the most effective antibiotic regime for chronic suppurative otitis media in children? J Trop Pediatr. 2008;54(3):151–156.

[38] Macfadyen CA, Acuin JM, Gamble C. Systemic antibiotics versus topical treatments for chronically discharging ears with underlying eardrum perforations [review] Cochrane Database Syst Rev. 2006;(1):CD005608.

[39] Phillips JS, Yung MW, Burton MJ, Swain IR. Evidence review and ENT-UK consensus report for the use of aminoglycoside-containing ear drops in the presence of an open middle ear. Clin Otolaryngol. 2007;32(5):330–336.