Review
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Acute mastoiditis in children

Akutni mastoiditis u djece

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Summary

Acute mastoiditis and antritis in children is a severe complication of acute otitis media, very common pathology in the young population. Children younger than 3 years had higher incidence of antritis than older ones. Despite adequate antibiotic therapy, or in some countries widespread pneumococcal vaccination, the incidence of acute mastoiditis is not decreasing. Streptococcus pneumoniae is an isolated pathogen from majority samples, a big number of microbiological samples stay sterile and anaerobes have higher incidence of intracranial complications.

The suggested antibiotic therapy is third generation of cephalosporine, adapted after microbiological results. Surgery treatment is indicated by patient deterioration regardless of antibiotic therapy and the occurring complications which are rare but life threatening. If there is no improvement in conservative therapy, the general condition is very bad, or in presence of complications surgical treatment is necessary.

This review is based on recent studies on incidence, causes and acute mastoiditis treatment. The pathophysiology and symptoms of the disease are described and in showing the case our way of solving complications is described.

Key words: acute mastoiditis, children, microbiology, therapy

Sažetak

Akutni dječji mastoiditis i antritis ozbiljna je komplikacija upale srednjega uha, česte bolesti u dječjoj dobi. Antritis je najučestaliji u djece mlađe od tri godine i unatoč dostupnosti antibiotika i pneumokoknog cjepiva, incidencija mastoiditisa i antritisa u dječjoj dobi se ne smanjuje. Streptoccocus pneumoniae je najčešći uzročnik, no velika je učestalost i sterilnih uzoraka, a intrakranijske komplikacije najčešće su kod infekcije anaerobnim bakterijama.

Inicijalna terapija izbora su cefalosporini treće generacije, a modificira se po pristiglom antibiogramu. Indikacije za kirurško liječenje su pogoršanje stanja unatoč antibiotskoj terapiji i pojava komplikacija, koje su rijetke ali životno ugrožavajuće. Rad se temelji na recentnim spoznajama o incidenciji, uzročnicima i liječenju akutnog mastoiditisa

Prikazane su patofiziološke osnove i simptomi bolesti, a prikazom slučaja prikazan je i naš način rješavanja komplikacija.

Ključne riječi: akutni mastoiditis, dječja dob, mikrobiologija, terapija

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Introduction

Acute mastoiditis is a potentially very dangerous inflammatory process in the mastoid part of the temporal bone. It is a complication of acute otitis media and it can be the first sign of ear inflammation, especially in young children. It spreads from the middle ear through the aditus ad antrum into the antrum – the biggest mastoid cell, and from there to other cells. Aditus ad antrum is the only place where cavum tympani and mastoid space communicate and it is very narrow. During inflammation, the mucosa thickens 50-100x because of hyperemia and edema which is enough to stop communication between the cavum tympani and mastoid cells. Pus produced in the mastoid cannot be drained in the cavum tympani and through eardrum perforation to the ear canal. Empyema under pressure causes osteolysis of the mastoid cells trabecula and the surrounding bone, spreading into the adjacent areas. Zona cribrosa suprameatica on planum mastoideum (mastoid cortex) is the place where small vessels pass through the bone and it is possible for the purulent mass to pass directly into the subperiostal space.

Smaller aditus make younger children more sensitive. A study made in Norway found the incidence of acute mastoiditis in children below the age of 2 ranged from 13.5-16.8 per 100,000 children. Older children, 2-16 years, had incidence 4.3-7.1 per 100,000 children during this study. The specific age incidence achieved its peak during the second and third year of life,[4,14,16] A study in Spain found 67.4% younger than 3 years of age.[3] Restrictive use of antibiotics and watchful waiting guideline for acute otitis media in the Nordic countries did not increase the incidence of acute mastoiditis[4,10,13] and the occurrence of mastoidectomy.[10,13]

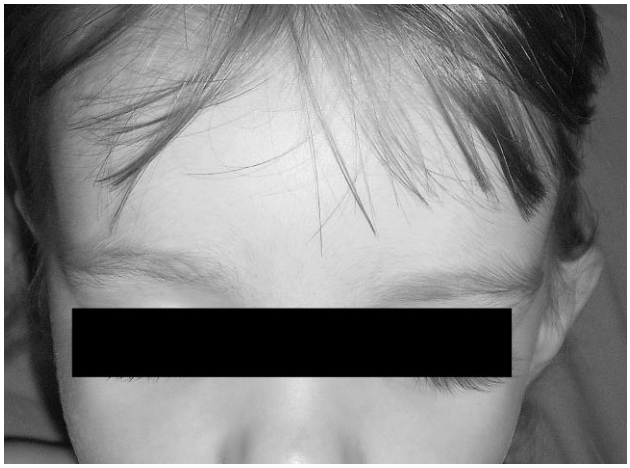
Subperiostal abscess occurs in the big majority of mastoiditis and causes auricle protrusion, retro-auricular redness and edema. Otoscopically, the external ear canal is lowered in the superior-posterior part. Retroauricular pain is constant and it rises on percussion or palpation when it is possible to feel fluctuation. Fever with general bad condition is present, followed by leucocitosis and high CRP values. Hearing loss and pus in the external auditory canal are symptoms of purulent otitis media, the origin of mastoiditis. Other symptoms of otitis media, like vomitus or vertigo, are also common. Radiological findings show blur and destruction of air cells, and abscess formation.

The middle ear is connected with the nasopharynx by the tuba auditiva and it is the usual pathway for microorganisms. Pathogens isolated after surgery are different in different studies, but the most common is *Streptococcus pneumoniae*.[1,3,7,8,12,14,15,16] Even wide-spread *pneumococcal* conjugate vaccine use did not decrease the number of acute mastoiditis caused with these pathogens.[8,16] A study made in France on 188 children isolated *Streptococcus pneumoniae* in 51%, *Streptococcus pyogenes* in 11.5%, Anaerobes 6.5%, coagulasa-negative *Staphylococcus* 6.5%. 33% of cultures remained negative.[1] A study made in Israel found *Staphilococcus aureus* and *Streptococcus pyogenes* more often than *Streptococcus pneumoniae*. Other isolated pathogens in that study were *Hemophilus influenzae*, *Pseudomonas aeruginosa, Escherichia coli* and *Klebsiella pneumoniae*.[2] Negative cultures were found in 25-53.68%.[1,2,3,9]

Case report

A girl aged 26 months was brought to the ENT emergency. Her general condition was weak and dehydrated. In heteroanamnesis, otherwise a happy child, she was restless and hipped for more than one month. During that period she lost 3 kilograms. All that time she often touched her left ear but did not allow others to touch it. Amoxicillin-clavulonate and azitromicin were prescribed. The parents then noticed redness and tenderness behind the left ear and auricle protrusion.

Her status was left ear protrusion, a swelling behind the auricle and redness very painful on palpation (Picture 1).

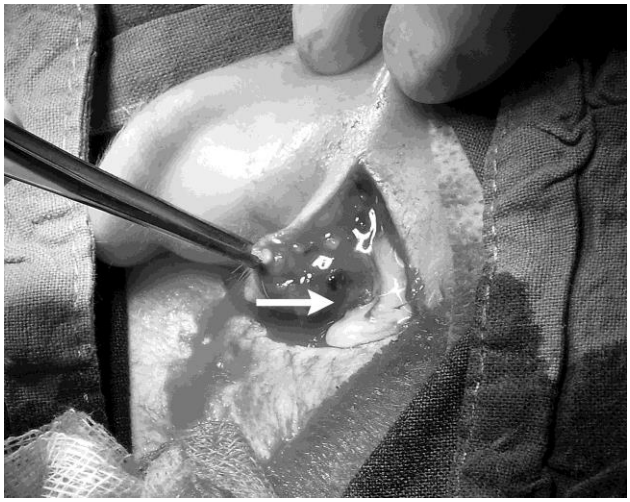


Picture 1 Acute mastoiditis. Protruded left ear.
Slika 2. Akutni mastoiditis. Odstojeća lijeva uška.

Otoscopically, the external meatus was red and the superior posternal part protruded. The ear drum was yellow and convexed. There was no pus in the external meatus. Rhinoscopicaly serous effusion was found and there was catharrus in the oropharynx. Emergency laboratory findings: L20.1 (neu 57.1%, ly

28.5%, mo 9.2%, eo 0.7%, ba 0.6%, anseg 4.0%), E4.78 Hgb 106 CRP 37.1. Electrolite values were normal.

That same day surgical evacuation in general endotracheal anesthesia of subperiosteal abscess and aticomastoidectomy were performed through retroauricular access. External meatus myringotomy of the left eardrum was performed and grommet implanted. In both spaces there was yellow pus (Picture 2).



Picture 2 Mastoiditis, retroauricular incision, purulent secretion (arrow)
Slika 2. Mastoiditis, retroaurikularna incizija, gnojna sekrecija (strelica)

The paediatrician was consulted and parenteral 3rd generation cephalosporine indicated (700 mg cephtriaxone in 100 ml Glucosae 5%; child weight 11 kilograms). Two microbiological samples were taken, one after myringotomy from the tympanic cavity, another from the mastoid space. Both had negative cultures – stayed sterile. The day after surgery her general condition was much better. Each postoperative day pus was aspirated from the external auditory canal, and it was evacuated from the retroauricular area through the drain put. The effusion stopped after 5-6 days. Control laboratory analysis 5 days later gave normal values, L14.9 (ref. interval 6-16) and CRP 0.8. Suttures were removed on the seventh day. She left hospital as a happy child who again likes to play.

Discussion

The goals in therapy are antimicrobal – antibiotic therapy, pus evacuation, analgesia and supportive therapy. Empiric therapy must start before the microbiological samples give results. Intravenous broad spectrum antibiotic treatment covering the most common involved germs (3rd generation cephalosporine) and secondary adopted to the microbiological results.[1] If there is no evidential improvement, the child's condition is poor or some complication arises, it is then necessary to evacuate the empyema surgically.[1,9,14,17,18] Few surgical procedures are suggested. The most common is mastoidectomy. Through retroauricular access subperiostal abscess is first evacuated, after that planum mastoideum and mastoid are drilled until the antrum is found. After empyema evacuation some kind of drainge is performed. Usually myringotomy is performed and a grommet implanted. It is a microsurgical procedure that demands a lot of patience, precision and skill. Other procedures such as retroauricular punction of mastoid empyema or just myringotomy without mastoidectomy are not always efficient enough.[1] Rare is the opinion that retroauricular puncture and grommet insertion are an effective alternative to mastoidectomy.[7]

Chewing and swallowing during ear inflammation can be very painful. That is why children often lose weight but also can be dehydrated. Infusion and good analgesia with non-steroid anti-inflammatory drugs improve the general condition.

The spreading of the inflammatory process in mastoid on adjacent structures results in intracranial and extracranial complications. Intracranial complications are epidural, subdural or cerebral abscess, meningitis, thrombosis of the sigmoid or lateral sinus and otitic hydrocephalus.[5,6] There is increased incidence of intracranial complications if infection is caused by anaerobic microorganisms.[5] Extracranial complications as paresis/paralysis of facial nerve are less common. Gradenigo's syndrome and Bezold's abscess are rare but life threatening complications. Complication treatment is the primary process, broad spectrum antibiotics, surgical pus evacuation, general condition support and treatment directed to complication.

Complications are rare but potentially life threatening and it is necessary to put in all efforts to avoid them and, if they do happen, to diagnose them early and start therapy as soon as possible.

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