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AKUTNI MASTOIDITIS: ZAŠTO JE VAŽNA OBAVEZNA IMUNIZACIJA?

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SAŽETAK

Uvod/Cilj: Akutni mastoiditis (AM) je ozbiljna bakterijska infekcija mastoidne kosti koja nastaje kao posledica akutnog zapaljenja srednjeg uva (AOM). Iako se mastoiditis može javiti u bilo kom uzrastu, većina pacijenata je mlađa od dve godine. Infekciju najčešće izazava *Streptococcus pneumoniae*. Nakon uvođenja antibiotske terapije i imunizacije protiv pneumokoka, samo 0,002% dece sa AOM razviće akutni mastoiditis. Cilj ovog rada je da prikaže slučaj četvorogodišnje devojčice sa AM kod koje je utvrđeno da nije vakcinisana konjugovanom pneumokoknom vakcinom prema Kalendaru obavezne imunizacije Republike Srbije.
Prikaz bolesnika: Prikazali smo slučaj četvorogodišnje devojčice sa AM kod koje je utvrđeno da nije vakcinisana konjugovanom pneumokoknom vakcinom. Devojčica je na pregledu bila razdražljiva, nervozna, febrilna, žalila se na bol u uvu, sa prisutnim retroaurikularnim otokom i crvenilom kože. Parametri inflamacije bili su povišeni. Zbog postojanja sumnje na akutni mastoiditis urađen je CT endokranijuma koji je potvrdio dijagnozu. Pravovremenim započinjanjem parenteralne antimikrobne terapije uz hiruršku retroaurikularnu inciziju i drenažu periostalnog apscesa, učinjenu mastoidektomiju i miringotomiju, kod devojčice je dovelo do poboljšanja opšteg stanja, a u dreniranom sadržaju je izolovan *Streptococcus pneumoniae*.
Zaključak: Prikazom slučaja nevakcinisanog deteta koje je obolelo od akutnog mastoiditisa, uzrokovanog pneumokom, odnosno infekcijom koja je vakcinom preventabilna, još jednom želimo da skrenemo pažnju na značaj pravovremene imunizacije prema Kalendaru obavezne imunizacije Republike Srbije.

Ključne reči: akutni mastoiditis, *Streptococcus pneumoniae*, konjugovana pneumokokna vakcina, obavezna imunizacija

Uvod

Akutni mastoiditis (AM) je akutno gnojno zapaljenje sluznice i kosti mastoidnog nastavka. Javlja se kao komplikacija akutne upale srednjeg uva, a predispozicija za nastanak zavisi od uzrasta, anatomskih karakteristika temporalne kosti, uzročnika i imunološkog statusa obolelog. Danas je veoma retko oboljenje zahvaljujući redovnoj vakcinaciji i upotrebi antibiotika.

Iako se mastoiditis može javiti u bilo kom uzrastu, većina pacijenata je mlađa od dve godine, sa srednjom starošću od 12 meseci. U pre-antibiotskoj eri, 20% slučajeva akutnog zapaljenja srednjeg uva je bilo komplikovano akutnim mastoiditisom i često povezano sa teškim intrakranijalnim komplikacijama. Nakon uvođenja antibiotske terapije i pneumokokne vakcine, samo 0,002% dece sa akutnim otitisom razviće akutni mastoiditis sa stopom mortaliteta manjom od 0,01 na 100.000 stanovnika (1).

Kao ozbiljna komplikacija zapaljenja srednjeg uva (AOM), akutni mastoiditis se kod dece manifestuje otalgijom, groznicom, retroaurikulatnim otokom i bolnom osetljivošću. Infekcija je najčešće izazavana *Streptococcus*-om *pneumoniae*, a ređe su uključeni *Streptococcus pyogenes*, *Hemophilus influenzae*, *Staphylococcus aureus* i dr. (2).

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CASE REPORT

ACUTE MASTOIDITIS: WHY MANDATORY IMMUNIZATION IS IMPORTANT?

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SUMMARY

Introduction: Acute mastoiditis (AM) is a serious bacterial infection of the mastoid bone that occurs as a consequence of acute otitis media (AOM). Although mastoiditis can occur at any age, the majority of patients are less than two years of age, with a median age of 12 months. The infection is most often caused by Streptococcus pneumoniae. After antibiotics and pneumococcal vaccination, 0,002% of children with AOM progress too acute coalescent mastoiditis. The aim of this study is to present the case of a four-year-old girl with AM who was found not vaccinated by pneumococcal conjugated vaccine according to the mandatory immunization schedule of the Republic of Serbia.
Case report: We describe the case of a four-year-old girl with AM, where we found that she was not regularly vaccinated by pneumococcal conjugated vaccine. The girl was presenting with irritability, fussiness, fever, ear pain, red and swollen retroauricular skin. The inflammatory markers were elevated. Due to the suspicion of acute mastoiditis, a CT scan of the endocranium was performed, which confirmed the diagnosis. Timely initiation of parenteral antimicrobial therapy with surgical retroauricular incision and drainage of the periosteal abscess, mastoidectomy and myringotomy perfomed on the girl led to an improvement in the general condition, and *Streptococcus pneumoniae* was isolated in the drained contents.
Conclusion: By presenting the case of an unvaccinated child who suffered from acute mastoiditis caused by a vaccine preventable disease we once again wanted to draw attention to the importance of timely immunization.

Key words: acute mastoiditis, *Streptococcus pneumoniae*, pneumococcal conjugate vaccine, mandatory immunization

Introduction

Acute mastoiditis (AM) is an acute purulent inflammation of the mucosal lining and bone in the mastoid process. It occurs as the complication of acute otitis media, while the predisposition for its occurrence depends on age, on the anatomical characteristics of the temporal bone, causative agents and the immune status of the patient. Today, the disease is very rare thanks to regular vaccination and the use of antibiotics.

Although acute mastoiditis can occur at any age, the majority of patients are younger than 2 years, with the median age of 12 months. In the pre-antibiotic era, 20% of cases of acute otitis media were complicated by acute mastoiditis and often associated with severe intracranial complications. After the introduction of antibiotic therapy and pneumococcal vaccine, only 0.002% of children with acute otitis develop acute mastoiditis with a mortality rate of less than 0.01% per 100,000 population (1).

As a severe complication of acute otitis media (AOM), acute mastoiditis in children is manifested as otalgia, fever, retroauricular swelling and tenderness on palpation. The infection is most often caused by *Streptococcus pneumoniae*, while *Streptococcus pyogenes*, *Hemophilus influenzae*,

Diferencijalno dijagnostički retroaurikularni otok i bolna osetljivost mogu nastati kao komplikacija upale spoljašnjeg uva (AOE), koju najčešće izaziva *Pseudomonas aeruginosa*. Ova razlika u mikrobnoj etiologiji čini razliku između akutnog mastoiditisa i periaurikularnog celulitisa koji je sekundarno važan za AOE (3).

Komplikacije AM mogu biti ekstrakranijalne i intrakranijalne, nekad veoma ozbiljne i opasne po život. Od ekstrakranijalnih komplikacija najčešća je subperiostalni apsces sa posledičnom dekalcifikacijom i resorpcijom kosti (koalescentni mastoiditis), zatim labirintitis, lezije facijalnog nerva, tromboza jugularne vene. Intrakranijalne komplikacije nisu česte, ali nesumnjivo mogu biti ozbiljne i završiti se smrtnim ishodom. Simtomatologija je uglavnom neurološka i/ili septička u slučaju meningitisa, epiduralnih apscesa, encefalitisa ili tromboze kavernoznog sinusa (4). Upotreba antibiotika značajno je smanjila učestalost pomenutih komplikacija, ali takođe danas predstavlja klinički problem jer antibiotici mogu prikriti važne kliničke simptome. Zbog toga je kod dece kod koje postoji sumnja na akutni mastoiditis potrebno što ranije uraditi kompjuterizovanu tomografiju (CT) endokranijuma, praćenu magnetnom rezonancom (MR) lobanje ako postoji sumnja na intrakranijalne komplikacije (5).

Lečenje nekomplikovanih oblika AM podrazumeva upotrebu antimikrobnih lekova. S obzirom na to da je *Streptococcus pneumoniae* najčešći uzročnik i da je njegova specifična osetljivost na cefalosporine velika, savetuje se započinjanje intravenozne primene ceftriaksona kod hospitalizovanih pacijenata. Upotreba drugih antibiotika može biti opravdana samo na osnovu antibiograma (2). U slučaju komplikacije AM pristupa se hirurškom lečenju (mastoidektomija, timpanoplastika, drenaža apscesa i dr.) (6).

Prevencija svih oboljenja izazvanih *Streptococcus*-om *pneumoniae* podrazumeva imunizaciju, a uvođenjem konjugovanih pneumokoknih vakcina zabeležen je značajan pad incidencije pneumokokne invazivne bolesti i akutnog mastoiditisa (7). Konjugovana desetovalentna pneumokokna vakcina uključena je u Kalendaru obavezne imunizacije Republike Srbije od 2018. godine.

Cilj ovog rada je da prikaže slučaj četvorogodišnje devojčice sa AM kod koje je utvrđeno da nije vakcinisana konjugovanom pneumokoknom vakcinom prema Kalendaru obavezne imunizacije Republike Srbije.

Prikaz bolesnika

Na pedijatrijski pregled dovedena je devojčica zbog povišene temperature i otoka iza desnog uva. Bolest je počela nekoliko dana pre pregleda u vidu febrilnosti do 39,3°C, potom razdražljivosti i bola u desnom uvu, a od prethodnog dana su primetili i otok iza desne ušne školjke. Anamnestički od terapije je dobijala analgoantipiretike, a nisu se javljali lekaru.

Iz lične anamneze dobijeni su podaci da je devojčica četvrto dete iz uredne trudnoće završene u terminu prirodnim putem, da je uglavnom bila zdrava i da ne postoje podaci o redovnoj imunizaciji deteta zbog čestih selidbi i menjanja mesta prebivališta. Živi u skromnim uslovima, bez tekuće vode i kanalizacije.

Slika 1. Desna ušna školjka pomerena unapred usled retroaurikularnog otoka

Slika 2. Retroaurikularni otok i crvenilo kože

Staphylococcus aureus are less frequently involved etc. (2). In the differential diagnostic evaluation, retroauricular swelling and tenderness on palpation may occur as a complication of acute otitis externa (AOE) that is most often caused by *Pseudomonas aeruginosa*. This difference in microbial etiology differentiates between acute mastoiditis and periauricular cellulitis that is secondary to AOE (3).

The complications of AM can be extracranial and intracranial, sometimes very severe and life-threatening. Of extracranial complications, the most common is subperiosteal abscess with consequent decalcification and bone resorption (coalescent mastoiditis), then labyrinthitis, lesions of facial nerve, and thrombosis of the jugular vein. Intracranial complications are not common, but they can undoubtedly be serious and fatal. The symptomatology is mainly neurological and/or septic in case of meningitis, epidural abscesses, encephalitis or cavernous sinus thrombosis (4). The use of antibiotics has significantly reduced the frequency of mentioned complications, but it is also a clinical problem today because antibiotics can mask important clinical symptoms. Therefore, in children suspected of having acute mastoiditis, it is necessary to perform computerized tomography (CT) of the endocranium as soon as possible, followed by magnetic resonance (MR) of the scull if intracranial complications are suspected (5).

The treatment of uncomplicated forms of AM involves the use of antimicrobial drugs. Given that *Streptococcus pneumoniae* is the most common causative agent and that its specific sensitivity to cephalosporins is high, it is recommended to start the intravenous administration of ceftriaxone in hospitalized patients. The use of other antibiotics can be justified only on the basis of the antibiogram (2). In case of complications of AM, surgical treatment is performed (mastoidectomy, tympanoplasty, abscess drainage, etc.) (6).

The prevention of all diseases caused by Streptococcus pneumonia involves immunization, and with the introduction of pneumococcal conjugate vaccines, a significant decrease in the incidence of pneumococcal invasive disease and acute mastoiditis was recorded (7). The ten-valent pneumococcal conjugate vaccine was included in the Mandatory Immunization Schedule in the Republic of Serbia in 2018.

The aim of this study was to present the case of a four-year-old girl with AM, who had not been vaccinated with the pneumococcal conjugate vaccine according to the Mandatory Immunization Schedule in the Republic of Serbia.

Case report

A girl was brought to a pediatric examination due to fever and swelling behind the right ear. The illness started a few days prior to the examination in the form of fever up to 39.3°C, then irritability and pain in the right ear, and since the previous day they noticed swelling behind the right auricle. Anamnestically, she received analgoantipyretics, but they did not report to the doctor.

Data were obtained from the personal anamnesis that the girls was the fourth child born as a full-term baby in a natural way, that she

Figure 1. Right auricle displaced forward due to retroauricular swelling

Figure 2. Retroauricular swelling and redness of the skin

Na pregledu, žensko dete uzrasta tri godine i 11 meseci, telesne mase (TM) 14 kg, telesne visine (TV) 97cm, visoko febrilno (38,9°C), eupnoično i urednih vitalnih parametara. Koža topla, bleda, sniženog turgora i elasticiteta bez patoloških eflorescencija. Glava normokranična, uobičajeno osetljiva na palpaciju. Bulbusi medioponirani, pokretni u svim pravcima, zenice kružne i izdašno reaguju na svetlost i akomodaciju. U nosu sasušen purulentan sekret. Ždrelo hiperemično. Desna ušna školjka pomerena unapred (Slika 1), a retroaurikularno desno prisutni su crvenilo kože i otok, osetljivi na pritisak. (Slika 2). Vrat valjkast, aktivno i pasivno pokretan, obostrano se palpiraju lako uvećani limfni nodusi. Grudni koš cilindričan i simetrično respiratorno pokretan. Auskultatorni nalaz nad srcem i plućima je uredan. Abdomen mek, jetra i slezina se ne palpiraju. Genitalije ženskog tipa odgovaraju uzrastu. Grub neurološki nalaz je uredan za uzrast, a meningealni znaci su negativni.

Parametri inflamacije ukazivali su na akutnu infekciju: SE 45 mm/1h, fibrinogen 5,03 g/L, CRP 149,32 mg/L, prokalcitonin 0,34 ng/L, a u krvnoj slici bilo je 20,0 × 10^9/L leukocita (granulocita 71,4%, monocita 10,1%, limfocita 18,5%), 4,07 × 10^{12}/L eritrocita, hemoglobin je bio 110 g/L, hematokrit 0,33, a trombocita je bilo 381 × e10^9/L. Biohemijske analize krvi i rutinski nalaz urina bili su uredni. Hemokulture su ostale sterilne. Učinjena je i radiografija pluća, te ultrazvučni pregled abdomena koji su, takođe, bili bez patološkog nalaza. Otoskopija: desna bubna opna matirana, izmenjena i netransparentna.

Zbog retroaurikularnog otoka desno sa posledično odstojećom ušnom školjkom i sumnjom na AM učinjen je CT endokranijuma: semisolidni sadržaj gustih atenuacija u celosti ispunjava desni timpanični kavum, sa smanjenim denzitetom i suspektnim osteolitičkim procesom u nivou stapesa, očuvanog tegmenta timpani, zadebljale membrane, sa proširenim antrumom mastoida i sadržajem koji ispunjava ceo desni mastoid, sa osteolizom koštanih struktura, bez znakova intrakranijalne propagacije (Slika 3)

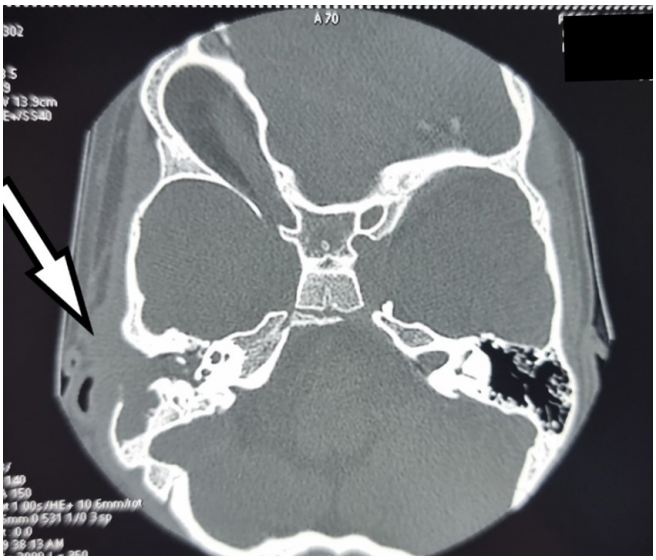
Retroaurikularnim pristupom u opštoj endotrahealnoj anesteziji učinjena je incizija i drenaža subperiostalnog apscesa, potom mastoidektomija i miringotomija sa ugradnjom aeracionih cevčica, te uzet bris sadržaja nakon incizije. Započeta je parenteralna antibiotska terapija ceftriaksonom koju je dete dobijalo tokom 14 dana. Dolazi do postepene i potpune regresije kliničkog i lokalnog nalaza (Slika 4).

U kulturi sadržaja dobijenog nakon incizije izolovan je *Streptococcus pneumoniae*.

Tokom lečenja utvrđeno je da dete nije dobilo konjugovanu pneumokoknu vakcinu.

Diskusija

Uvođenjem konjugovanih pneumokoknih vakcina u programe obavezne imunizacije primećena



Slika 3. CT endokranijuma: semisolidni sadržaj gustih atenuacija u celosti ispunjava desni timpanični kavum sa proširenim antrumom mastoida i sadržajem koji ispunjava ceo desni mastoid

Slika 4. Nakon incizije i drenaže subperiostalnog apscesa i inicijalne antibiotske terapije dolazi do regresije retroaurikularnog otoka

was mostly healthy and that there were no data about regular immunization of the child because they moved frequently and changed the place of residence. She lived in modest conditions, with no running water and sewage.

On the examination, a female child aged three years and 11 months, whose body weight was 14 kg, height 97 cm, was highly febrile (38.9°C), eupnoic and with normal vital parameters. The skin was warm, pale, with a decreased turgor and elasticity, without pathological efflorescence. The head was normocephalic, with normal findings on palpation. The eye globes were medially positioned, mobile in all directions, the pupils circular and reacted generously to light and accommodation. Dried purulent secretion was in the nose. The pharynx was hyperemic. The right auricle was displaced forward (Picture 1), while on the right retroauricular side, the skin was red and swollen, sensitive to palpation (Picture 2). The neck was cylindrical, actively and passively movable, slightly enlarged lymph nodes were palpated on both sides. The thorax was cylindrical and symmetrically movable. The auscultation findings of the heart and lungs were normal. The abdomen was soft, the liver and spleen were not palpable. The female genitals were normal for age. The gross neurological findings were normal for her age, while meningeal signs were negative.

The parameters of inflammation indicate an acute infection: SE 45 mm/1h, fibrinogen 5.03 g/L, CRP 149.32 mg/L, procalcitonin 0.34 ng/L, and in the blood count, there were 20.0 x 10^9/L leukocytes (granulocytes 71.4%, monocytes 10.1%, lymphocytes 18.5%), 4.07 x 10^{12}/L erythrocytes, hemoglobin was 110 g/L, hematocrit 0.33, and platelets 381 x 10^9/L. Biochemical blood analyses and routine urine tests were normal. Blood culture was sterile. The chest radiography and the abdominal ultrasound were also without pathological findings. Otoscopy: the right tympanic membrane was matted, changed and non-transparent.

Due to the retroauricular swelling on the right with the resulting displaced auricle and the suspicion of AM, CT of the endocranium was performed: semisolid content of dense attenuation completely filled the right tympanic cavity, with reduced density and a suspicious osteolytic process at the level of the stapes, preserved tegmen tympany, thickened membrane, with an enlarged mastoid antrum and contents that filled the entire right mastoid, with osteolysis of bony structures, with no signs of intracranial propagation (Picture 3).

The incision and drainage of subperiostal abscess was performed using a retroauricular approach under general endotracheal anesthesia, then mastoidectomy and myringotomy with the insertion of aeration tubes, and a swab of the contents was taken after the incision. Parenteral antibiotic therapy with ceftriaxone was started, which the child received for 14 days. There is a

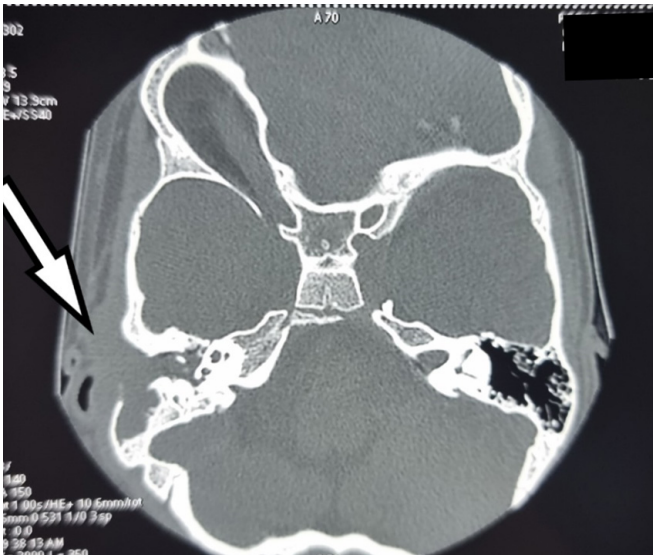


Figure 3. CT of the endocranium: semisolid content of dense attenuation completely fills the right tympanic cavity with an enlarged mastoid antrum and content that fills the entire right mastoid

Figure 4. After the incision and drainage of the subperiosteal abscess and initial antibiotic therapy, regression of retroauricular swelling occurs

je inverzna veza između broja vakcinisane dece i dece sa epizodama akutnog mastoiditisa (8). Iako su opisani etiopatogeneza, klinički, dijagnostički i terapeutski aspekti, akutni mastoiditis i dalje predstavlja problem (9). Dijagnoza AM je uglavnom klinička, a najčešći klinički znaci su retroaurikularni otok ili fluktuacija, eritem, bolna osetljivost, hiperemija bubne opne. Pored toga, prisustvo predisponirajućih faktora kao što su uzrast mlađi od 2 godine, visoki parametri inflamacije ili prethodni AOM takođe mogu ukazati na AM (2). Kliničke studije preporučuju kompjuterizovanu tomografiju (CT) kao senzitivnu ali nespecifičnu dijagnostičku proceduru koju je potrebno uraditi kod sve dece sa sumnjom na akutni mastoiditis i obično pokazuje zamućenje mastoidnih ćelija, zamagljivanje mastoidnih obrisa i elevaciju periosta mastoidnog nastavka (10). Kombinacija parenteralne antibiotske terapije i hirurške incizije sa drenažom sadržaja smanjuje stopu komplikacija AM. Ukoliko u vremenskom intervalu 24-48 sati nakon započinjanja lečenja ne dođe do postepene regresije simptoma i znakova bolesti, potrebno je razmotriti i mogućnost mastoidektomije, kada se kroz retroaurikularni pristup prvo evakuiše subperiostalni apsces, a zatim buši mastoid dok se ne pronađe antrum. Nakon evakuacije empijema radi se neka vrsta drenaže, najčešće miringotomija uz implantaciju aeracionih cevčica. Druge procedure kao što su retro-aurikularna punkcija mastoidnog empijema ili samo miringotomija bez mastoidektomije nisu uvek dovoljno efikasne (11). Trajanje parenteralne antibiotske terapije trebalo bi da bude 10-14 dana (3).

Prikazali smo slučaj devojčice sa akutnim mastoiditisom izazvanim *Streptococcus*-om *pneumoniae* koja nije bila vakcinisana protiv pneumokoka, a ta informacija može biti jedan od značajnih predisponirajućih faktora za razvoj bolesti.

Na osnovu kliničke slike odmah smo posumnjali da se kod deteta radi o AM, ali uzrast stariji od dve godine i nekompletni anamestički podaci o prethodnim bolestima i imunizaciji diferencijalno dijagnostički mogli su ukazivati i na lokalni cellulitis ili adenitis. Febrilnost i visoki parametri inflamacije (CRP 149,32 mg/L, prokalcitonin 0,34 ng/L, leukociti 20,0 × 10^9/L) ukazivali su na akutnu infekciju, a radiografijom pluća i ultrazvučnim pregledom abdomena isključene su inflamacije respiratornog i urinarnog trakta. Naš prikaz slučaja potvrdio je da CT dijagnostika predstavlja senzitivnu dijagnostičku proceduru kojom smo potvrdili dijagnozu. Pravovremenim započinjanjem parenteralne antimikrobne terapije uz hiruršku retroaurikularnu inciziju i drenažu subperiostalnog apscesa, mastoidektomiju i miringotomiju desne bubne opne sa ugradnjom aeracionih cevčica drugog dana hospitalizacije, kod devojčice je dovelo do poboljšanja opšteg stanja, a u dreniranom sadržaju je izolovan uzročnik infekcije.

Po našem mišljenju prikazani slučaj može biti zanimljiv u svakodnevnoj praksi jer se radilo o detetu koje anamnestički prethodno nije imalo upale srednjeg uva, koje nije vakcinisano konjugovanom pneumokoknom vakcinom i kod koga je u dreniranom sadržaju izolovan uzročnik infekcije – pneumokok, a ova bolest je vakcinom preventabilna.

Zaključak

Broj obolelih od akutnog mastoiditisa i njegovih komplikacija u pedijatrijskoj populaciji značajno se smanjio uvođenjem konjugovane pneumokokne vakcine. Prikazom slučaja nevakcinisanog deteta koje je obolelo od akutnog mastoiditisa izazavanog pneumokom, odnosno infekcijom koja je vakcinom preventabilna, još jednom želimo da skrenemo pažnju na značaj pravovremene imunizacije prema Kalendaru obavezne imunizacije Republike Srbije.

Konflikt interesa

Autori su izjavili da nema konflikta interesa.

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gradual and complete regression of clinical and local findings (Picture 4).

Streptococcus pneumoniae was isolated in the culture of the contents obtained after the incision. It was found during the treatment that the child had not received the pneumococcal conjugate vaccine.

Discussion

With the introduction of pneumococcal conjugate vaccine in the programs of mandatory immunization, an inverse relationship was observed between the number of vaccinated children and children with episodes of acute mastoiditis (8). Although the etiopathogenesis, clinical, diagnostic and therapeutic aspects were described, mastoiditis is still a problem (9). The diagnosis of AM is mostly clinical, and the most common clinical signs are retroauricular swelling or fluctuation, erythema, tenderness on palpation, hyperemia of the tympanic membrane. In addition, the presence of predisposing factors such as age younger than 2 years, high parameters of inflammation, or previous AOM may also indicate AM (2). Clinical studies recommend computed tomography (CT) as a sensitive but non-specific diagnostic procedure which should be performed in all children suspected of acute mastoiditis and it usually shows the opacification of mastoid cells, haziness of the mastoid outline and the elevation of the periosteum of the mastoid pocess (10). The combination of parenteral antibiotic therapy and surgical incision with drainage of the contents reduces the complication rate of AM. If there is no gradual regression of symptoms and signs of the disease in the time interval 24-48 hours after the beginning of treatment, the possibility of mastoidectomy should be considered, when the subperiosteal abscess is first evacuated through the retroauricular approach and then the mastoid is drilled until the antrum is found. After the empyema is evacuated, some kind of drainage is performed, most often myringotomy with the implantation of aeration tubes. Other procedures such as the retroauricular puncture of mastoid empyema or just myringotomy without mastoidectomy are not always effective enough (11). Duration of the parenteral antibiotic therapy should be 10-14 days (3).

We presented the case of the girl with acute mastoiditis caused by *Streptococcus pneumoniae*, who was not vaccinated against pneumococci, and this information may be one of significant predisposing factors for the development of this disease.

Based on the clinical picture, we immediately suspected that the child had AM, but the age older than 2 years and incomplete anamnestic data on previous diseases and immunizations could also indicate local cellulitis or adenitis. Febrility and high inflammation parameters (CRP 149.32 mg/L, procalcitonin 0.34 ng/L, leukocytes 20.0 x 10^9/L) indicated an acute infection, and chest radiography and abdominal ultrasound ruled out the inflammation of respiratory and urinary tract. Our case report confirmed that CT diagnostics is a sensitive diagnostic procedure with the help of which we confirmed the diagnosis. The timely administration of parenteral antimicrobial therapy with surgical retroauricular incision and drainage of the subperiosteal abscess, mastoidectomy and myringotomy of the right tympanic membrane with the insertion of aeration tubes on the second day of hospitalization led to the improvement in the girl's general condition, and the causative agent of the infection was isolated in the drained contents.

In our opinion, the case report can be interesting in everyday practice because it included the child who did not previously have otitis media in her anamnesis, who was not vaccinated by pneumococcal conjugate vaccine, and in whom the causative agent of infection – pneumococcus – was isolated in the drained contents, and this disease is vaccine preventable.

Conclusion

The number of patients with acute mastoiditis and its complications in the pediatric population has significantly decreased with the introduction of pneumococcal conjugate vaccine. By presenting the case of an unvaccinated child who suffered from acute mastoiditis caused by pneumococcus, that is, an infection that is vaccine preventable, we once again want to draw attention to the importance of timely immunization according to the Mandatory Immunization Schedule of the Republic of Serbia.

Competing interests

The authors declared no competing interests.

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