

CONTRIBUTION OF IMAGING EXAMINATIONS IN DIAGNOSIS OF INTRACRANIAL COMPLICATIONS IN CHILDREN OTOMASTOIDITIS

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ABSTRACT

Introduction. Otitis media (OM) is one of the most common infections in child pathology, most often with self-limited evolution (1,2). In 2-6% of cases (2) developed, intracranial complications with unfavorable, fatal outcome in 8-26.3% of them (2,3). Presence of neurological signs in the evolution of suppurative otitis require early imaging examinations (2-8).

Material and methods. We presents the case of a 10 year old girl with suppurative otitis complicated, transferred to the Clinical Emergency Hospital for Children „M.S. Curie“, Bucharest to ENT department after 2 weeks of disease progression. The child presents at hospital: fever, purulent otorrhea, neurological signs represented by headache, seizures, stiff neck. Contrast-enhanced computed tomographic (CT) were performed in emergency.

Result. CT scanning, extended to the neck show the presence of a lytic process in the temporal bone, solution of continuity between mastoid antrum and meninges with epidural abscess form over sigmoid sinus, trombophlebitis and thrombus of sigmoid sinus, which is propagate to the lateral sinus and the jugular vein ;signs of meningitis, cerebellar cerebritis, brain temporal abscess and subdural empyema.

Conclusions. Complications in middle ear infections are rare, but the appearance of neurological signs in clinical examination must be completed by CT of head with contrast, which can specify local architecture, presence of local or distant complications, help in the application to a fast and appropriate therapy.

Keywords: child, otitis media, complications, computer tomography (CT)

INTRODUCTION

Otitis media is inflammation of the mucous membrane of the middle ear cleft (tympanic cavity, mastoid antrum, mastoid air cells and the Eustachian tube) (6). The disease is caused more frequent by microbial agents (*streptococcus pneumonia*, *haemophilus influenza*) (2,7) or rarely by viral agents (7). Favoring factors to young children are: immature immune system, the short and horizontal path of Eustachian tube, the presence of a rich lymphoid tissue in the nasopharynx (5-11). To the older children are represented by, congenital or secondary immunosuppression (ex: measles, tuberculosis,

pertussis) (12) allergic rhinitis, asthma, upper respiratory tract infections (11,12). Most cases heal spontaneously or with symptomatic treatment, other give eardrum perforation and progression to chronic suppurative otitis and some of them can reach the intracranial complications (1,13,14).

Widespread use of antibiotics in the treatment of otitis media has reduced cases that progress to complications, (8,9,14,15) but led to the selection of resistant strains, and in some cases masking symptoms and meningo-encephalitis dissemination (4,8,15). The most severe complications are: meningitis, intra-parenchymal, abscess, trombophlebitis, subdural and epidural empyema (4-14).

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Spread of infection from the mastoids and middle ear cleft may occur via four routes: via the anatomical pathways: internal auditory canal, aqueduct of the cochlea, temporal bone sutures (for meningitis and epidural collections); bone erosion (subdural empyema and meningitis). Thrombophlebitis, periphlebitis, are the other ways of infection spreading by venous pathway that allows the transportation of germs through mastoid venules and impaired venous network of high caliber, lateral sinus, mastoid emissary vein, cortical and diploic veins. (1-14). These may cause lateral sinus thrombophlebitis, encephalitis, meningitis, peri or subdural abscess, intraparenchymal abscess (2-11).

The diagnosis is suspected in case of association neurological signs and general infections in a patient known with otitis (5,11), but confirmation is given by computer tomography examination (CT) with intravenous contrast which allows positive diagnosis, assessment of topographic lesions and severity of complications (2-15).

CASE PRESENTATION

We present the case of a 10 years girl with suppurative otomastoiditis and multiple intracranial complications.

In a history, girl presented more episodes of acute otitis, treated ambulatory, and after an episode of intercurrent respiratory infection for which she received oral antibiotic and symptomatics, the child presented: fever, ear pain, and is admitted to a local hospital where receives antibiotic treatment for 3 days. Under therapy appears: headache, otorrhea, malaise, reasons for that is transferred to the regional hospital where are changed antibiotic treatment and is practiced tympanocentesis. After another four days symptoms are worse, with neck stiffness, convulsions, drowsiness. The girl is transferred to a neurosurgical service, then in the service of ENT, Emergency Hospital for Children „M.S. Curie“. Clinical examination reveals mediocre general condition, pale skin, drowsiness, meningeal syndrome present. On palpation left latero-cervical reveals a painful swelling.

Otoscopic examination view, left external auditory canal with purulent secretions, eardrum perforation which discharge abundant muco-purulent secretions.

Head CT examination was performed extended to the neck, with iv contrast administration; sections of 5 mm (reconstruction in parenchyma window with 2.5 mm; and with high resolution centered to the temporal bone, thin cups), then, after

contrast, sequence with thin reconstruction, axial coronal and sagittal, parenchymal window.

CT scan reveals: presence of a tympanic cavity and mastoid antrum enlarged with irregular walls, hypodense content (Fig. A1); lysis of the posterior petrous pyramid in contact with sigmoid sinus (Fig. A2); air present in the subdural space (Fig. A3); the presence of a small adjacent epidural abscess that has marginal contrast outlet (fig. A4).

Trombosis of sigmoid sinus (Fig. A5) with involvement of transverse sinus (Fig. A6), jugular vein (Fig. A7) of the left side with a hypodense content and small bubbles air leakage. Contrast-enhanced scans reveal outlet contrast at wall level, without intraluminal opacification (Fig. A7).

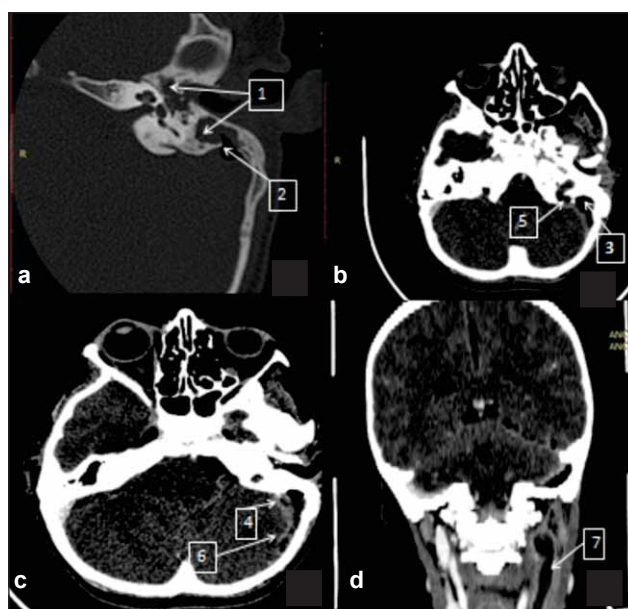


FIGURE A. Head and cervical CT

a. axial fine reconstruction 1.25 mm with high resolution, to the temporal bone; b, c. contrast enhanced axial CT, to the posterior fossa in parenchymal window; d. cervical, coronal reconstruction in vessels plan, with contrast iv administration

In the left cerebellar parenchyma had evidence a hypodense area native and post contrast range, shaped diffuse, with aspect of cerebritis (Fig. B8).

It is also noted the dissemination in the left temporal lobe with hypodense area with peripheral linear enhancement suggestive for temporal abscess (Fig. B9)

Asymmetric enhancement of contrast to the tabernacle, thicker on the left. (Fig. B10). Collection in temporal subdural and along the cerebral convexity with multiple temporal air bubbles (Fig. B11).

Diffuse cerebral edema in the posterior fossa with erasing grooves without signs of engagement in the occipital hole, allowing a lumbar puncture.



FIGURE B. Head CT examination
 e. contrast-enhanced axial reconstructions 2.5 mm, to the posterior fossa in parenchymal window; f. axial CT reconstructions to the temporal lobe without and IV contrast enhanced; g. axial CT without contrast; h. coronal reconstruction with contrast-enhanced

At lumbar puncture is obtained xantocrom CSF with proteinorahie 3,135 mg/l and at citobacteriologic exam 65% neutrophils, 35% lymphocytes, gram-positive cocci.

Laboratory examinations reveals leukocytosis 32,500/mm³ with 97% neutrophils.

Intervention is emergency surgery practicing antrotomie with the evacuation of mastoid pus collections, of which are made directly bacteriological examination with highlighting of gram-negative and gram-positive cocci in chains and on the culture media were developed *Proteus mirabilis* bacilli.

DIAGNOSIS AND EVOLUTION

Corroborating all data final diagnosis was: left chronic otomastoiditis complicated with thrombophlebitis and thrombosis of the transverse sinus, sigmoid sinus spread to the jugular vein. Meningo-encephalitis with abscess in left temporal lobe and cerebellum. Subdural empyema left cerebral hemisphere.

The therapeutic scheme was complexe with multiple antibiotic treatment, hydration and electrolyte rebalancing infusion, associated with anti-inflammatory, non-steroid and steroid, antithrombotic, but despite efforts, evolution is unsatisfactory with significant deterioration of general condition,

septicemia, coma grade III and finally with exitus by cardiac arrest, 72 hours from hospitalization.

DISCUSSIONS

Otitis media is one of the most common infections in the world at childhood and it can give in 2-6% of cases intracranial suppurative complications with adverse outcome, fatal in 8 to 26.3% of them (2,3). Complications arise due to immaturity of the immune system in children, often after upper respiratory infections that cause immune-suppression, may evolve insidiously with symptoms masked by antibiotics treatment and only suspected to the appearance of neurological signs.

Imaging investigations provide important information about the type of intracranial complications, the propagation of the infection, in our case emphasizing the destructive damage to the middle ear with the erosion of the bone and spread infection to the space Trautman in close contact with the sigmoid sinus to form an abscess perisinusal, sinus wall erosion process that determines the appearance of local thrombophlebitis and thrombosis intralumenale that has spread to the transverse sinus and internal jugular vein. By close contact with the meninges give epidural abscess, and venous circulation meningeal cause meningeal dissemination but also a epidural collection.

Cerebellar abscess appeared by insemmination of contiguity in the cerebellum through a meningeal breach and he was discovered in phase of diffuse cerebritis and in temporal lobe in phase of abscess formation with highlighting membrane and the air presence.

CONCLUSIONS

In ear infections, complications are rare most often multiple, but when they are accompanied by neurological signs put indication on performing an imagistic examination most commonly CT scan in emergency with iv injection of contrast and reconstruction thin-section centered to petrous pyramid. In some cases, CT examination should be extended to the neck to assess extensions. It can determine whether there is a possibility of complications by viewing destructive lesions in the middle ear, make positive diagnosis, establish mechanisms for dissemination, severity of complications and their topography for the best therapeutic approach. Contrast-enhanced CT scans were performed routinely to plan a more definitive course of management

A good collaboration between clinician and radiologist, accessibility to imaging investigations

involve an early diagnosis which can save the patient's life.

REFERENCES

1. **Scrafton D.K., Qureishi A., Nogueira-Luc's C.** Abscess as an unlucky complications of mastoiditis. *AnnR, Col, Surg Engl.* 2014; 96:28-30.
2. **Oestreicher-Kedem Y., Ben Sira L., Grissaru G.** Arterial brain infarction in complicated acute otitis media. *Int J of Pediatric Otorhinolaryngology.* 2002.7; 71:659-663.
3. **Novoa E., Podvinec M., Angst R.** Paediatric otogenic lateral sinus thrombosis: Therapeutic management, outcome and thrombophilic evaluation. *Int J of Ped Otorhinolaryngology.* 2013; 77:996-1001.
4. **Miura M.S., Krumennauer R.C., Lubianca J.** Neto-Intracranial complications of chronic suppurative otitis media in children. *Rev Bras. Otorrinolaringol.* 2005; 71:639-643.
5. **Mattos H.L., Colman K.L., Casselbrant M.L.** Intratemporal and intracranial complications of acute otitis media in a pediatric population. *Int J of Pediatric Otorhinolaryngology.* 2014; 78: 2161–2164.
6. **Dubey S.P., Larawin V.** Complications of chronic suppurative otitis media and their management. *Laryngoscope.* 2007; 117:264-267.
7. **Ilechukwu G.C., Ubesie A.C.** Otitis Media in Children. *J of Pediatrics.* 2014; 4:47-53.
8. **Minks D.P., Porte M., Jenkins N.** Acute mastoiditis – The role of radiology. *Clinical Radiology* 2013; 68:397-305.
9. **Berman S., Johnson C., Chan K. et al.** Ear, Nose and Throat. In: Hay W.W., Hayward, A.R., Levin M.J., Sondheimer J.M., Eds., *Current Pediatric Diagnosis and Treatment*, 2001: 400-410.
10. **Go C., Bernstein J.M., de Jong A.L., et al.** Intracranial complications mastoiditis. *Int J Ped Otorhinolaryngology.* 2000; 52:143-148.
11. **Vazquez E., Castellote A., Piqueras J., et al.** Imaging of complications acute mastoiditis in children. *RadioGraphics.* 2003; 23:359e72.
12. **Munoz A., Ruiz-Contreras, Jimenez A.** Bilateral tuberculous otomastoiditis in an immunocompetent 5-year-old child: CT and MRI findings. *Eur Radiol.* 2009; 19: 1560–1563.
13. **Novoa E., Podvinec M., Angst R.** Paediatric otogenic lateral sinus thrombosis: Therapeutic management, outcome and thrombophilic evaluation. *Int J of Pediatric Otorhinolaryngology.* 2013; 77:996-1001.
14. **Nussinovitch M., Yoeli R., Elishkevitz K., et al.** Acute mastoiditis in children: epidemiologic, clinical, microbiologic, and therapeutic aspects over past years. *Clin Pediatr.* 2004; 43:261e7.
15. **Thorne C., Chewaproug L., Elden L.M.** Suppurative complications of acute otitis media. *Arch Otolaryngol Head Neck Surg.* 2009; 135: 638–641.
16. **Ozer E., Sivasli E., Bayazit Y., et al.** Otogenic cerebral venous infarction: a rare complication of acute otitis media, *Int. J. Pediatr. Otorhinolaryngol.* 2003. 67: 1019–1021.