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CASE REPORT

Granulocytic Sarcoma Manifesting as Otomastoiditis, Facial Nerve Paralysis and Unilateral Hearing Loss

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We report an 8-year-old boy with acute myeloid leukemia (AML) manifesting as granulocytic sarcoma (GS) in the parapharynx, right inner and middle ear, right external acoustic canal, right mastoid cells, parietal bone resulting conductive hearing loss, otomastoiditis and facial nerve palsy. After chemotherapy; facial nerve functions improved, conductive hearing loss disappeared and parietal bone involment resolved. At the sixth month of admission, facial nerve function was fully intact, the right tympanic membrane appeared essentially normal. Because extramedullary leukemic tumors are uncommon, we would like to emphasize that leukemia might be an etiological factor in patients who present with otomastoiditis, facial nerve paralysis and unilateral hearing loss. It is appropriate for an otorhinolaryngologist to consider complete blood count, peripheral blood smear and temporal bone imaging to exclude any other systemic disease like leukemia, especially before steroid administration.

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Introduction

Granulocytic sarcoma (GS) has been used to be described extramedullary tumorous collection of myeloid leukemic cells, and is found in 10.9 % of childhood [1] and 10% of adult cases of acute myeloid leukemia (AML). [2] In childhood AML, the most common site of GS is the skin, second common site is orbit, followed by other head and neck sites and central nervous system. [1] 16-40% of leukemic patients have otologic symptoms such as sensorineural and/or conductive hearing loss, vertigo, tinnitus, otalgia, otorrhea occuring after bleeding, infection, infiltration of the middle ear and mastoid. [3, 4] Sudden onset hearing loss as a presenting symptom of leukemia with GS is extremely rare. Therefore we report here a case of AML patient with granulocytic sarcoma in the mastoid cells, external acoustic canal, right inner and middle ear presenting as hearing loss and facial nerve palsy.

Case Report

An 8-year-old previously healthy boy was referred with history of sudden-onset right sided earache, hearing loss and facial paralysis with no history of trauma. It was learned that he was given antibiotics for prediagnosis of choelasans mastoiditis and methylprednisolone (1 mg/kg) for facial nerve paralysis previously, yet neither the facial nerve function nor the ear symptoms improved and he was admitted to Pediatrics Department. The past medical history and review of systems were unremarkable. The patient was born as the fifth child of a 36-year-old mother and there was no history of a similar disease in her family, nor consanguinity between her parents.

Examination revealed paleness, bulging at the right mastoid region, tenderness on the right ear on touching, right peripheral facial nerve paralysis. The right external ear canal was so edematous that

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inspection of the tympanic membrane could not be substantiated. The left tympanic membrane was normal. No skin lesion, discharge or fluctuance was apparent in the right ear. There was no hepatosplenomegaly and lymphadenopathy and no other neurologic abnormality.

The hemoglobin (Hb) was 97 g/L, hematocrit (Hct) 25.3 %, white blood cell count (WBC) 23.6 x 109/L, platelet count 73x109/L and mean corpuscular volume (MCV) 86.9 fL. The peripheric blood smear revealed 72% myeloblasts, 18% lymphocytes, 2% segmented polymorphonuclear cells and 4% monocytes. Bone marrow aspiration yielded a hypercellular specimen with a predominance of myeloid cells, including 82 % FAB-M2 type myeloblasts confirmed by flowcytometric analysis. Cytogenetic analysis showed t(8;21) (q22;q22), der(9) and –Y in all examined nuclei. Cerebrospinal fluid (CSF) revealed normal biochemistry and no blasts. Serum electrolytes, LDH, urine analysis, vitamin B12, folic acid and immunoglobulin levels were normal and viral serologies, antinuclear antibody, anti DNA were negative. The pure tone audiometry showed 65 dB-conductive hearing loss with an air-bone gap of 60 dB in the right ear and 10 dB threshold in the left ear. Acoustic impedence measurement yielded a " type As" tympanogram in the right ear. Magnetic resonance imaging (MRI) of the temporal bone showed diffuse inflammatory content throughout the right mastoid cells, encompassing middle and inner ear and eustachian tube, in the neighbourhood adjacent to the right VIIth and VIIIth cranial nerves (Figure 1). Gadolinium-enhanced MRI revealed enhancement in this areas, in the adjacent right temporal bone (Figure 2) and in a focal area at right parietal bone. There was not any destruction of the ossicles and the labyrinth. Both cerebellopontine angles were normal.

AML with t(8;21) (FAB M2) was diagnosed and surgery was undertaken to establish an absolute diagnosis to differentiate cholesteatoma from granulocytic sarcoma. Under general anesthesia through retro-auricular approach, subtotal mastoid - cell resection was performed. Multiple histopathologic examinations showed a predominance of myeloblastic leukemic cells consistent with granulocytic sarcoma. Thereafter, AML-BFM 2004 protocol was started. After chemotherapy facial nerve function improved promptly, earache disappeared and parietal bone involment resolved substantially. At the sixth month of admission, facial nerve function was fully intact, the right tympanic membrane appeared essentially normal. The control audiologic evaluation revealed that the patient's hearing threshold improved to 50 dB with an air-bone gap of 10 dB in the right ear, suggesting almost complete improvement of conductive hearing loss.

Follow up MRI demonstrated incomplete resolution of enhancement in the right parietal bone, middle and inner ear, eustachian tube and the area in the neighbourhood adjacent to the right VIIth and VIIIth cranial nerves (Figure 3). Whole cranium including primary involved areas were irradiated by using parellel opposed fields in ten fractions, yielding total 18 Gy. After completion of radiotherapy the patient was discharged with maintanence treatment and has been in remission.

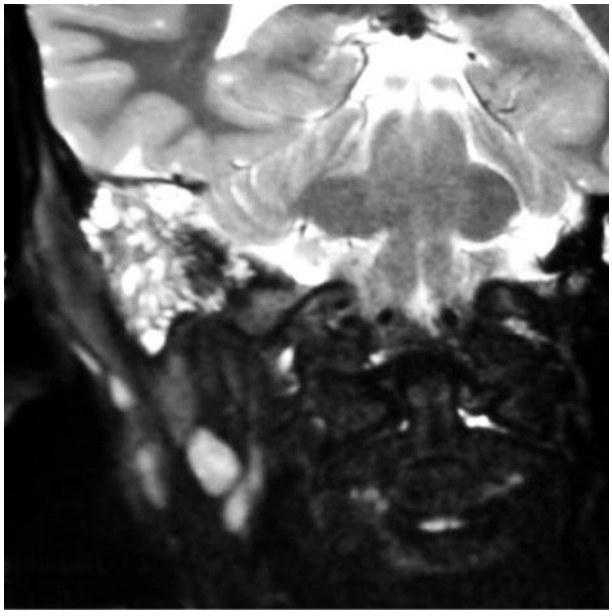

Figure 1. Coronal T2-weighted image shows hyperintense material in the right mastoid cells)

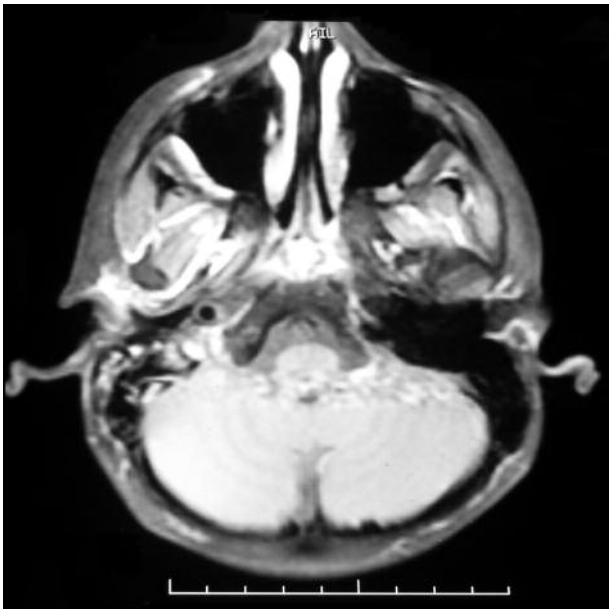

Figure 2. Contrast-enhanced fat-suppressed axial T1-weighted image shows focal area of enhancement along the right mastiod cells and right temporal bone

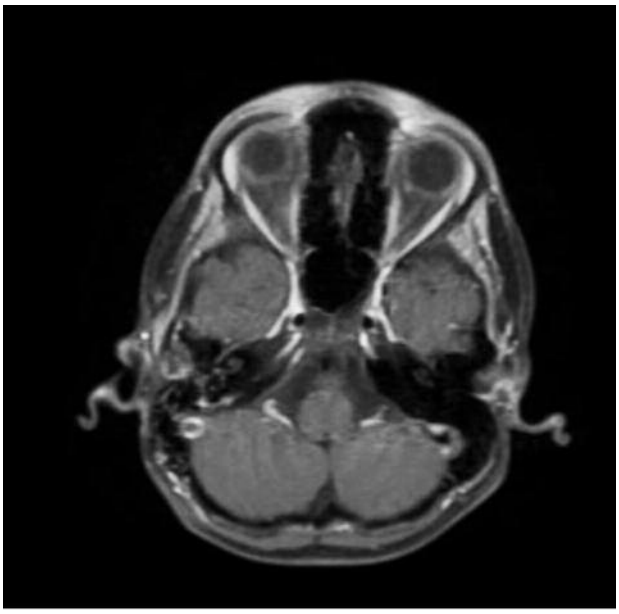

Figure 3. Follow-up axial contrast-enhanced fat-suppressed axial T1-weighted image shows marked regression of enhancement of mastiod cells

Discussion

Extramedullary leukemic tumors or GS in AML are uncommon, and may become clinically apparent before or concurrent with clinical evidence of marrow involment of AML[5-9]. The most common otolaryngologic manifestations of GS are oral and pharyngeal lesions.[3] Leukemic infiltration of the ear is uncommon, occuring as acute mastoiditis, conductive or sensorineural hearing loss, vertigo, acute hemorrhagic otitis media, retro-auricular mass or facial nerve paralysis.[10, 2, 11, 12, 13] Paparella et al. [14] reviewed the temporal bones of 25 patients with leukemia and found that 20% of these patients, all being children aged between 11 month-old and 16 years of age, (10% of AML, 50% of ALL) experienced otologic complications directly attributable to their leukemia at admission. When these patients were examined histologically, the middle ear showed leukemic infiltration and/or hemorrhage much more frequently than did the inner ear or external auditory canal. Histopathological examination of the temporal bones of 10 patients with AML showed leukemic infiltration in eustachian tube, external ear and the VIIth and VIIIth cranial nerves, in addition to prominent inflammatory changes in external ear, middle ear (mastoid and cleft) and hemorrhage only in eustachian tube. No inner ear involvement and no leukemic infiltration of the mastoid were noted in AML patients.[14] The presenting symptoms of AML in our patient were peripheral facial nerve paralysis, otomastoiditis and conductive hearing loss. Therefore, the extension of the leukemic infiltration which mimicked inflammation throughout external, middle and internal ear in MRI is striking. Absence of sensorioneural hearing loss despite inner ear involvement of our patient is explained by absence of labyrinth and the VIIIth cranial nerve involvement. There were no VIIIth cranial nevre thickening, contrast enhancement and labyrinth destruction. In addition, absence of any clinical evidence of inner ear may be due to that leukemic infiltration was mild to moderate, like in cases with mild-moderate middle ear leukemic infiltrations in which no clinical evidence like drainage and suppuration are evident. [14]

Sugimoto Y et al [2] reported otomastoiditis in four patients (three children, one adult) and external acoustic canal involvement in three adults out of 79

AML cases with t(8;21) and GS. Eustachian tube obstruction or infiltration of the nasopharynx secondary to GS and effusion of the middle ear mucosa can lead to acute otomastoiditis. If untreated massive bony erosion, deafness and vertigo might develop at a later stage due to progression of the lesion. [11] Acute otomastoiditis due to GS of the temporal bone may cause acoustic or facial nerve paralysis consistent with our patient, possibly via perineural and/or meningeal leukemic infiltration associated with hemorrhage and edema. [11] CT-scan of the head shows opacification without trabeculation of the mastoid air cells, and middle ear cleft with considerable swelling of the mucosa in leukemic focus of GS. [11]

GS arising from bony structures take the appearance of focally destructive lytic lesions with indistinct borders or an adjacent soft tissue mass, or reactive sclerosis. In this sense temporal bone involment of GS due to invasion of external and middle ear, may mimic cholesteatoma. Cholesteatomas have migratory and lytic characteristics, and may damage the chain of ossicles and the mastoid cell bone tissue, leading to intra and extracranial complications.[15]

External ear GS may mimic zona with hemorrhage or inflammatory changes [16], so examination of biopsy specimens is important for the diagnosis. But it may be difficult to obtain biopsy samples, especially in the middle-ear, because of thrombocytopenia or an acquired coagulopathy in GS. However, it was reported that there was no requirement to biopsy the GS unless there was no bone marrow involvement [1]. Additionally, imaging techniques such as CT-scan and MRI are likely to identify the lesion and discriminate between infection and tumoral involment of the ear. T2-weighted high resolution MRI sequences with a hypointense solid signal or reduction of the normal hypersignal is related to a specific infiltration.[16]

The surgical management of GS is restricted to obtaining a tissue sample to identify the lesion; draining infection if present and reducing neoplastic infiltration before chemotherapy.

In our case, chemotherapy quickly led to resolution of otological manifestations and complete hematologic remission. Involved area radiation therapy is not a general accepted first line treatment modality in children [1]. However, for patients with life-threatening or organ-threatening GSs, low dose emergency RT may be extremely effective. Likewise, for patients who have residual evidence of GS after intensive chemotherapy localized RT may play a role. [1] In patients having ear involment of GS, dissappearance of inflammatory changes might take longer time than clinical and biological data, so for differentiation between such inflammatory changes and relapse of GS, periodic temporal bone MRI should be performed. [16]

It has been shown that the presence of non-skin site GS; low initial WBC (<20 000/mm3), age 3-10, FAB M2 subtype, and female gender are significant favorable prognostic factors, while high initial WBC (>100 000/mm3), FAB-M4 or M5 subtype, CNS blasts at diagnosis and presence of skin GS [1] and for Turkey, orbito ocular GS [8] are unfavorable prognostic factors. However, secondary chromosome abnormalities in a t(8;21) AML such as loss of a sex chromosome like in our patient does not mean adverse prognosis.[6]

Patients presenting as GS should be closely followed for extramedullary leukemic recurrence with or without concurrent bone marrow relapse. It has been shown that almost 40% GS patients have extramedullary leukemic recurrence. [1] Byrd et al [17] described an AML case with t(8;21) who had a series of 11 episodes of GS over 29 months, in a variety of anatomic sites including scalp and ear, without evidence of bone marrow recurrence.

We would like to emphasize that leukemia might be an etiological factor in patients who present with otomastoiditis, facial nerve paralysis and unilateral hearing loss. It is appropriate for an otorhinolaryngologist to consider complete blood count, peripheral blood smear, and temporal bone imaging and exclude any other systemic disease like leukemia, especially before steroid administration that is used for treatment of facial nerve paralysis and sensory neural hearing loss, since steroids also have substantial role to reduce the size of granulocytic sarcoma.

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