CASE REPORT

Amyloidosis in bilateral external auditory canals

Takahiro Hosoi,¹ Gurpreet Dhaliwal,² Yasuharu Tokuda³

¹University of Tsukuba Hospital, Tsukuba, Japan
²VA Medical Center, San Francisco, California, USA
³General Internal Medicine, Tsukuba University, Mito, Ibaraki, Japan

Correspondence to
 Professor Yasuharu Tokuda,
 yasuharu.tokuda@gmail.com

Accepted 23 April 2014

SUMMARY

We report a 76-year-old man, a retired farmer, presenting with bilateral external auditory canal obstruction. Skin examination revealed multiple pruritic nodules and periorbital purpura. Ear canal opening surgery was performed. Skin and ear canal biopsy revealed extensive amyloid depositions. Immunoelectrophoresis for urinary Bence-Jones protein was positive, and bone marrow examination showed plasma cell dyscrasia. He received chemotherapy for amyloid light-chain amyloidosis secondary to light-chain multiple myeloma but died from myeloma progression. This case demonstrated how infiltrative conditions such as amyloidosis can lead to bilateral auditory canal obstruction and that the diagnosis of amyloidosis can be missed if a clinician focuses solely on a single organ.

BACKGROUND

Although involvement of the external auditory canals in a rare manifestation of systemic amyloidosis, it can seriously lower patients' quality of life on account of hearing loss. Early diagnosis and treatment may reduce the risk of permanent hearing loss.

CASE PRESENTATION

A 76-year-old man presented with a 6-month history of bilateral ear pain and progressive hearing loss. He reported bilateral hearing loss about 5 years prior to the onset of ear pain. He did not describe any other neurological symptoms. He denied fever, chills, weight loss, night sweats, headache, vertigo, tinnitus, olfactory or taste

disturbance, vision loss, double vision, dysarthria, dysphagia or hoarseness. He also denied dyspnoea, palpitations, chest pain, dizziness or gastrointestinal symptoms.

He had hypertension for the past 4 years which was treated with amlodipine 5 mg daily. He had no history of diabetes, dyslipidemia, otitis media or head injury. He smoked one pack of cigarettes per day for the past 40 years and did not consume alcohol. He was born in Japan and had never travelled outside the country. He was a retired farmer.

On examination, he appeared ill but not in acute distress. His blood pressure was 120/60 mm Hg, heart rate 60 bpm, respiratory rate 14/min and temperature 36°C. Both external auditory canals appeared to be occluded by thickened skin ([figure 1](#)) and thus his ear drums could not be examined. The jugular venous pressure was not elevated. Examination of lungs, heart and abdomen was normal. Skin examination identified multiple brownish papules between 0.5 and 1 cm on the scalp and lower abdomen ([figure 2](#)) as well as on the periorbital purpura ([figure 3](#)). Neurological examination was normal except for bilateral hearing loss.

INVESTIGATIONS

The complete blood count showed a white cell count of 4800/mm³ with a normal differential, haemoglobin 13.6 g/dL and platelets 270 000/mm³. Blood chemistry revealed total protein 6.3 g/dL, albumin 3.6 g/dL, calcium 8.7 mg/dL, glucose, 84 mg/dL and normal liver and renal functions.

Figure 1 Both external auditory canals appeared to be occluded by thickened skin.

CrossMark

To cite: Hosoi T, Dhaliwal G, Tokuda Y. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2013-200753

Serum IgG was 652 mg/dL, IgM 35 mg/dL and IgA 75 mg/dL. Urinalysis was weakly positive for protein but negative for occult blood. Urine sediment revealed only hyaline cast. Urine collection revealed 0.9 g/day of urine protein. Stool was negative for occult blood.

Chest radiograph was normal except for mild cardiomegaly. ECG showed normal sinus rhythm with left axis deviation, negative P wave in V1–2 and poor R wave progression in V1–V3 (figure 4). Audiometry suggested bilateral mixed (sensory and conductive) hearing loss. CT demonstrated soft-tissue thickening in the left external ear canal. Echocardiography demonstrated left ventricular hypertrophy (LVH), while abdominal

ultrasonography showed no hepatosplenomegaly, intra-abdominal masses or enlarged lymph nodes.

DIFFERENTIAL DIAGNOSIS

Among elderly patients, hearing loss is common. There are two types of hearing loss: conductive hearing loss arising from abnormalities of the outer and middle ear and sensory hearing loss secondary to inner ear pathology. Bedside examination tests for differentiating these two causes include Rinne and Weber tests. However, their discriminatory value is limited and formal audiometry testing is often needed to accurately characterise the deficit.

This patient had striking bilateral external ear canal stenosis which accounted for his conductive hearing loss. The most common explanation for this finding—cerumen impaction—was not present. The external ear canal is an unusual location for primary or secondary malignancy, so cancer was thought to be less likely than other local or systemic conditions, including:

1. Chronic otitis externa
2. Cholesteatoma
3. Vasculitis, such as granulomatosis with polyangiitis (formerly Wegener's granulomatosis (WG))
4. Infiltrative disease, such as sarcoidosis or amyloidosis

Chronic otitis externa and cholesteatoma (abnormal skin growth inside the middle ear) are typically unilateral, and more importantly, are not associated with other skin lesions. Although multisystem disease was present, none of the findings (skin abnormalities, LVH and mild proteinuria) was highly suggestive of vasculitis, particularly WG, either together or in isolation. Bilateral involvement of ear canals and multiple small nodular skin lesions suggested an infiltrative disease such as sarcoidosis, amyloidosis or mastocytosis. Additional data which pointed to an infiltrative process included elevated serum alkaline phosphatase, which may have arisen from the liver or bone.

The 24 h urine collection study showed overt proteinuria, but he did not have a history of diabetes or chronic kidney disease. The presence of overt proteinuria with only a trace of urine protein detected on dipstick testing is characteristic of immunoglobulin light chains. In addition, when echocardiography shows LVH but ECG does not show LVH (and instead reveals normal or even low voltages), infiltrative processes of the heart should be considered, including amyloidosis, sarcoidosis, haemochromatosis or endomyocardial fibrosis. The periorbital purpura which he exhibited is highly characteristic of amyloid light-chain (AL) amyloidosis.

Confirmation of amyloidosis, which is most likely in this patient, requires the identification of amyloid depositions with apple-green-coloured birefringence in the Congo red-stained

Figure 2 Multiple brownish papules on the scalp and lower abdomen.

Figure 3 Periorbital purpura was noted on examination.

Figure 4 ECG showed normal sinus rhythm with left axis deviation, negative P wave in V1–V2 and poor R wave progression in V1–V3.

Figure 5 Biopsy of the skin (Congo red stain) showed amyloid depositions.

tissue specimens. Biopsy is typically performed in the involved organs. Since renal or endomyocardial biopsy would be more invasive, biopsy of the skin and ear canals was performed. For cases without appropriate sites for biopsy, random fat pad or rectal biopsy can be pursued, although their yield is limited.

OUTCOME AND FOLLOW-UP

Biopsy of the skin (Congo red stain) and external auditory canal (H&E staining) showed amyloid depositions (figures 5 and 6). The obstructing tissue in the external auditory canals was excised surgically. Urine and serum immunoelectrophoresis demonstrated monoclonal light chains. Bone marrow examination showed an increased number of abnormal plasma cells. A final diagnosis of amyloidosis (primary AL type) associated with κ -type light-chain multiple myeloma was made and he underwent several courses of chemotherapy. Although the external auditory canals remained open and his hearing returned to normal, he died from progressive myeloma 2 years after diagnosis.

DISCUSSION

Amyloidosis is an infiltrative disease characterised by extracellular deposition of amyloid proteins in various tissues and organs. AL-type amyloidosis can be associated with multiple myeloma, while other types of amyloidosis can be caused by chronic inflammations (bronchiectasis, rheumatoid arthritis, etc), haemodialysis or genetic predispositions (hereditary amyloidosis). The most serious organ complications are caused by amyloid infiltration into the heart (heart failure or arrhythmia), kidney (proteinuria, renal failure) or nerves (orthostatic hypotension or carpal tunnel syndrome).

Involvement of amyloid in the external ear canal is rare. To the best of our knowledge, only 13 cases of amyloidosis in the external auditory canal, including our patient, have been reported.^{1–10} Based on these reports, amyloidosis in both ear canals is more common than unilateral canal involvement.

Figure 6 Biopsy of the external auditory canal (H&E staining) also showed amyloid depositions.

Amyloidosis-related lesions completely or partially occluded the external auditory canals in all cases. Six of the reported cases were classified as localised amyloidosis and six as systemic amyloidosis. Two dialysis-associated cases were reported. In our patient, chemotherapy was instituted for amyloidosis associated with multiple myeloma which controlled the underlying disease and prevented further stenosis of the external auditory canals, although he eventually died from progressive myeloma.

A diagnostic error is defined as a delayed or missed diagnosis. A first-order classification of diagnostic errors asks whether this was a 'no fault' error, cognitive error or systems error. As is often the case, this diagnostic error was multifactorial. Diagnosis was delayed in part because it was an atypical initial presentation of an uncommon disease (no fault error) and partially because clues to an underlying systemic condition were overlooked (cognitive error).

Early diagnosis of AL amyloidosis can lead to early appropriate therapy before critical organ damage develops. The failure to recognise periorbital purpura as a characteristic feature of AL amyloidosis or non-scaly plaques on the skin as being suggestive of an infiltrative process characterise faulty synthesis, the most common form of cognitive error.

Learning points

- ▶ Amyloidosis is a rare cause of external auditory canal occlusion.
- ▶ The finding of amyloidosis of amyloid light-chain type should prompt evaluation for multiple myeloma.
- ▶ The diagnosis of amyloidosis can be missed if a clinician focuses solely on a symptomatic local lesion. Detection of skin nodules can raise suspicion for an infiltrative process and provide a safe site for biopsy.

Contributors TH saw the patient and identified the correct diagnosis and wrote the manuscript. GD wrote the manuscript. YT consulted the patient and wrote the manuscript.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Noojin RO, Arrington TS. Unusual cutaneous findings in primary systemic amyloidosis. Report of a case. *Arch Dermatol* 1965;92:157–9.
- 2 El-Sayed I, Busaba NY, Faquin WC. Otologic manifestations of amyloidosis. *Otol Neurotol* 2002;23:158–9.
- 3 Alvarez-Ruiz SB, Perez-Gala S, Aragues M, et al. Unusual clinical presentation of amyloidosis: bilateral stenosis of the external auditory canal, hoarseness and a rapid course of cutaneous lesions. *Int J Dermatol* 2007;46:503–4.
- 4 Ashimori N, Hayashi Y, Mineta H, et al. Dialysis-related amyloidosis of the external auditory canals. *Am J Otolaryngol* 2002;23:374–7.
- 5 Gheriani H, Tewary R, O'Sullivan TJ. Amyloidosis of the external auditory canal and middle ear: unusual ear tumor. *Ear Nose Throat J* 2007;86:92–3, 106.
- 6 Klemens JJ, Recant W, Baron JM, et al. Amyloidosis of the external auditory canal. *Ear Nose Throat J* 2010;89:219–20.
- 7 Mozos A, Caballero M, Sole M, et al. [Amyloidosis of the external auditory canal]. *Acta Otorrinolaringol Esp* 2010;62:392–4.
- 8 Yamazaki K, Sato H, Ishijima K, et al. A case of hemodialysis-associated amyloidosis localized to the external auditory canal. *Auris Nasus Larynx* 2010;38:295–9.
- 9 Panarese A, Roland NJ, Green B. Primary amyloidosis of the external auditory canal: case report. *J Laryngol Otol* 1994;108:49–50.
- 10 Zundel RS, Pyle GM, Voytovich M. Head and neck manifestations of amyloidosis. *Otolaryngol Head Neck Surg* 1999;120:553–7.

Copyright 2014 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- Submit as many cases as you like
- Enjoy fast sympathetic peer review and rapid publication of accepted articles
- Access all the published articles
- Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow