Original Article

Banji's test: A new diagnostic test of ear wax impaction

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Abstract

Background: Impaction is a major clinical criterion for the treatment of ear wax. In this paper, a new diagnostic test of ear wax impaction is described with a view to improve the diagnostic accuracy of ear wax impaction. **Methods:** Patients with or without impaction of their ear wax were examined with the Banji's test. The test consists of a pull on the pinna and a response to sound perception. A sudden, momentary increase in sound perception following the pull is considered positive and indicates impaction. A negative response is when there is no increase in sound perception and is non-specific. **Results:** In all, 165 patients aged 10 to 43 years were studied. Of this, 60 (36.4%) had bilateral while 105 (63.6%) had unilateral ear wax, giving a total of 225 ears with the condition. Of the 225 ears, 132 had impaction while 93 had no impaction. Banji's test was positive in 121 and negative in 11 ears with impaction, while it was positive in 12 and negative in 81 ears without impaction. This gives a sensitivity of 91.7% and specificity of 87.1%. There was a strong correlation between the Banji's test and clinical criteria for impaction. **Conclusion:** With a sensitivity of 91.7%, Banji's test can accurately diagnose ear wax impaction. A positive test is predictive that removal of the ear wax will significantly relieve the patient of auditory symptoms. The test is simple, harmless, and can discriminate between wax and other causes of otological symptoms.

Keywords: Banji's test, earwax, impaction

Introduction

Ear wax (Cerumen) impaction is an important otological condition. It is a worldwide disorder, found in all races, across age groups, and both sexes. In the UK, some 2.3 million people suffer cerumen problems serious enough to warrant management, with approximately 4 million ears syringed annually.[1] A total of 437 were diagnosed with the condition in one year at the Ear, Nose, and Throat clinic of Ekiti State University Teaching Hospital, Ado-Ekiti, South-Western Nigeria[2], and 181,000 Omani people were estimated to have impacted wax in the ear canal with economic burden estimated to be 3.6 million US dollars to the ear care services.[3] Ear wax is secreted in and excreted from the outer third of the cartilaginous portion of the human external auditory canal. It is a fluid consisting of desquamated cells with 60% keratin, 12–20% saturated and unsaturated long-chain fatty acids, alcohols, squalene, and 6–9% cholesterol.[4,5] The constituents has cleansing, antibacterial, and antifungi properties.[6] The excreting mechanism consists of outward flowing of the fluid along with epithelial migration until it arrives at the outer part of the external auditory meatus from where it is extruded. However, due to breakdown in the epithelial migration of the external auditory canal,[7] overproduction or both, ear wax sometimes builds up in the external auditory canal with pathological consequences. Clinically, ear wax may be impacted or non-impacted. Impaction is defined as an accumulation of wax that causes symptoms, prevents assessment of the ear or both.[8] The symptoms include: hearing loss, otalgia, tinitus, fullness in the ear, itching, cough, and vertigo.[8,9] According to the panel on the guidelines for the management of cerumen impaction, clinicians should treat or refer to a clinician who can treat cerumen impaction defined as accumulation of cerumen that is associated with symptoms, prevents needed assessment of the ear or both.[8] While this recommedation stands, it is advantageous to always know, as it is being investigated by workers,[10,11] if the treatment of the ear wax will improve the hearing ability of the patients. Thus,

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not only must it be ascertained that impaction exists but also that removal of the wax will effectively relieve patients of their auditory symptoms. It is the purpose of this study to describe an evidence-based test that can accurately diagnose ear wax impaction yet predict the patients who would benefit from removal of the ear wax.

Subjects and Methods

Study setting

This study was conducted at the Ear, Nose, and Throat (Otorhinolaryngology) clinic of the Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria. The institution is a tertiary hospital serving the local communities in the state and also receives referrals from the neighboring states.

Study design and data collection

Patients with ear wax were booked and randomly selected for the study. Their ears were encoded with "R" and a number for the right and "L" with a number for the left ears (e.g., R1 and L1 indicate right and left ears of same patient). In addition, using the clinical criteria for impaction, the impaction status of each ear was determined and recorded against its code (e.g., R1 Impacted and R15 Not impacted). The ears, without knowledge of their impaction status (i.e., without taking history or looking directly into the external auditory canal) were double-blindly examined with the Banji's test. The test consists of a slight, outward pull on the pinna or forward retraction of the tragus such that the skin of the external auditory canal is retracted away from the wax, while the patient is asked of any change in sound perception. A sudden, momentary improvement in sound perception that disappears when the pinna or tragus is released is reported as positive and indicates impaction. A negative response is non-specific. The responses were recorded against the code of each ear (e.g., positive for R12 and negative for R10). The results were compared with the impaction status of the ears. All the ears were examined before and after removal of the wax with pure tone audiometric, while the ears were examined with tympanometric studies after removal of the wax. Patients with additional pathology in their ears were excluded from the study. A search for similar study in the literatures was conducted.

Ethical consideration

Written informed consents were obtained from the participants, and Institutional approval with protocol number EKSUTH/A67/2018/03/001 was obtained from the institution's Ethics and Research Committee.

Data analysis

The sensitivity and specificity of the test were determined using the formulae [TP ÷ (TP + FN)] and [TN ÷ (TN + FP)], respectively. [TP = True Positive for the ear with clinical impaction and positive BANJI's test, FN = False Negative for the ear with clinical impaction and negative BANJI's test. TN = True Negative for the ear without clinical impaction and negative BANJI's test, and FP = False positive for the ear without clinical impaction and positive BANJI's test]. The results were statistically correlated with the clinical criteria for impaction using SPSS, IBM version 20.

Results

In all, 165 patients aged 10 to 43 years were studied. There were 98 males and 67 females, giving a male to female ratio of 1.5:1. Of this, 60 (36.4%) had bilateral while 105 (63.6%) had unilateral ear wax, giving a total of 225 ears with the condition. Of the 225 ears, 132 had clinical wax impaction while 93 had no features of impaction. Banji's test was positive in 121 ears and negative in 11 ears with impaction, while it was positive in 12 and negative in 81 ears without impaction [Table 1]. This gives a sensitivity of 91.7% and specificity of 87.1% for the test. There was a strong correlation between the test and clinical diagnosis of impaction (Kappa coefficient = 0.789, $P < 0.05$). In some of the patients with bilateral ear wax, the result was positive in one ear and negative in the other ears. The positive responses were described by patients as "Pop," "Open," "Clear," or "Give way" sensation. The Pure Tone Audiometric and Tympanometric evaluation confirmed wax as the sole underlying pathology in the ears studied. There were improved hearing in all the ears with impaction. None of the patients in this study was too young or cognitively impaired to respond appropriately. There were no reports of such study in the literatures.

Discussion

The huge burden of ear wax (cerumen impaction) in the community is illustrated by the volume of publications on this clinical disorder. In their paper, Roland *et al.* cited 97 references on wax and related subjects,[12] thus indicating the huge number of research works induced among workers by this otologic condition. As noted by Carrie Armstrong, cerumen impaction is one of the most common reasons patients seek medical care for ear-related problems[13], and a total of 437 were diagnosed with the condition in one year at the Ear, Nose, and Throat clinic of Ekiti State University Teaching Hospital, Ado-Ekiti, South-Western Nigeria.[2] Realizing the challenges inherent in the diagnosis and treatment of ear wax, researchers have developed guidelines for all clinicians who are likely to diagnose and manage this clinical condition. The purpose of such guidelines is to improve the diagnostic accuracy for ear wax impaction, promote appropriate intervention

Table 1: Correlation between Banji's Test and Clinical diagnosis of Impaction

Banji's test	Clinical diagnosis		Total	$\varkappa$	*P*
	Impaction	No impaction			
Positive	121(a)	12(b)	133(q_1)	0.789	< 0.001
Negative	11(c)	81(d)	92(q_2)		
Total	132(p_1)	93(p_2)	225		

in patients with ear wax impaction, highlight the need for evaluation and intervention in special populations, promote appropriate therapeutic options with outcomes assessment, and improve counseling education for the prevention of ear wax impaction.[12] The purpose of the present study is to describe an evidence-based test that can accurately diagnose ear wax impaction and predict those who would benefit from therapeutic intervention. As the study shows, the test consists of an outward pull on the pinna or retraction of the tragus such that the skin of the external auditory canal is pulled away from the wax. Such maneuver if effectively performed, allows sound to pass in-between the wax and the wall of the external auditory canal causing a momentary improvement in sound perception in the affected ear. A positive response is indicative of impaction. This was proved authentic by correlating the findings with the existing clinical criteria for impaction. As found, there was a strong correlation between the test and the clinical criteria for impaction (Kappa coefficient = 0.789, $P < 0.05$). Although the existing criteria are able to identify impaction, the value of the new test lies in its ability to provide additional evidence of impaction through active demonstration of a physical sign. In addition, the mere outward pull on the pinna could evoke a noticeable increase in sound perception in the ear under test shows that hearing in the ear will significantly improve if the wax is removed. This was confirmed by the significant improvement in hearing of the ears that were tested positive to the Banji's test following removal of the wax. This serves to guide the clinicians on possible outcome of appropriate intervention in patients with symptoms of ear wax impaction. Furthermore, in no other lesion of the auditory pathways will a pull on the pinna produces sudden, momentary improvement in sound perception as found in this study. Thus, the new test has the added advantage of being able to discriminate between wax and other otologic conditions. However, this requires further empirical validation. That the test was positive in one and negative in the other ears of same patient with bilateral ear wax shows that the patient's responses were not only reliable but also objective. In addition, given a sensitivity of 91.7%, the test can accurately detect about ninety-two (92) in every hundred cases of ear wax impaction. Although a negative response is suggestive of non-impacted ear wax, the result is non-specific because it may be owing to poor technique, poor response, or both. Nevertheless, the test is simple, harmless, and reproducible and can be demonstrated by any health care giver, even by the patient. However, the limitation of the test is that it may not be feasible in patients who are too young or cognitively impaired to give appropriate response. So far, this is the first empirical study of such test described in the literature.

Conclusion

With a sensitivity of 91.7%, Banji's test can accurately diagnose ear wax impaction. A positive test is predictive that removal of the ear wax will significantly relieve the patient of auditory symptoms. The test is simple, harmless, and can discriminate between wax and other causes of otological symptoms

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Conflicts of interest

There are no conflicts of interest.

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