

Images of otoscopy: rate and extent of non-compliance with good practice standards

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Abstract

Background: The British Society of Audiology has produced clear guidelines as to how otoscopy should be undertaken; however, no nationally recognised guidelines exist for the wider clinical community. Images of otoscopy appear in many books, journals, magazines and websites.

Objective: This study aimed to determine the rate of non-compliance with good practice in images of otoscopy, the seriousness of the breach, and whether this is more common in sites for professionals or the general public.

Method: Google Images was searched using the terms ‘otoscopy’ and ‘ear examination’. A total of 200 images were identified and collated. The images were reviewed for compliance with good practice standards.

Results: Only 12.75 per cent of the images were graded as having no breach of good practice standards.

Conclusion: Professional websites have a responsibility to show best practice. When choosing an image, the source of the image needs to be carefully considered.

Key words: Otoscopy; Oscopes

Introduction

Otoscopy (which refers to ear examination) is an important procedure used by many clinical specialties, including general practitioners, paediatricians, otologists and audiologists. Using an otoscope (or auri-scope), the pinna, external auditory meatus and tympanic membrane are examined for abnormalities to inform clinical diagnosis.¹

Otoscopy is a skill that can be difficult to master.^{2,3} The British Society of Audiology has produced clear guidelines as to how otoscopy should be safely and effectively undertaken.⁴ However, the authors could not find any nationally recognised guidelines on otoscopy specifically for medical staff. Several medical textbooks briefly discuss correct otoscopy techniques when describing otoscopic findings. For example, Wormald and Browning describe a structured approach to examination of the external auditory canal and tympanic membrane, but do not clearly describe how the otoscope should be braced to prevent injury should the subject move suddenly.³

There will always be variations in individual techniques and associated deviations from good otoscopy practice guidelines, and some clinicians may disagree

on the importance of deviation from the guidelines. For the purpose of the present study, the British Society of Audiology guidelines⁴ were considered as the ‘gold standard’.

Images of otoscopy appear in many books, journals, magazines and websites. With the proliferation of the internet, many authors will use image libraries such as Google Images or iStockphoto rather than taking a photograph. An initial inspection by the authors indicated that a significant proportion of otoscopy images do not conform to good practice. This study aimed to determine the rate of non-compliance with good practice in images of otoscopy, the seriousness of the breach and whether this is more common in sites for professionals or the general public.

Materials and methods

Google Images⁵ was searched on 12th February 2013 using the search terms ‘otoscopy’ and ‘ear examination’. Google Images was used because of the intelligent search algorithm used and the popularity of Google (Google is the most widely used search engine, with 114.7 billion searches annually; 76.6 per cent of the market share).⁶

A total of 200 unique images were identified and collated. The images were graded independently by six clinicians: two assistant technical officers (from the department of audiology), a clinical scientist (audiology), an ENT specialist registrar, a senior audiologist and a senior lecturer in audiology. The images were reviewed for compliance with good practice standards as described in the British Society of Audiology guidelines. Compliance was categorised as follows: grade 0 = no breach, grade 1 = minor breach, grade 2 = several minor breaches, grade 3 = major breach and grade 4 = several major (and minor) breaches.

The images were then independently classified by the lead author for adherence to correct technique, in relation to the following factors: bracing against the cheek; clinician in a seated position; patient looking comfortable; speculum attached; patient restrained; and otoscope held as recommended in the British Society of Audiology guidelines (like a pen), using the right hand to hold the otoscope for right ear examination and the left hand for left ear examination.

The results were collated and analysed by the lead author using Microsoft[®] Excel and the Statistical Package for the Social Sciences[®] software.

Results

The mean grade for all images by all clinicians was 2.91 (mode = 4 and median = 3), with a standard deviation of 1.41. The grade most commonly given by all clinicians was grade 4 (several major and minor breaches) (48 per cent; see Figure 1). Only seven images were allocated grade 0 (no breaches) by all clinicians.

Kappa statistics for multiple ratings showed a fair level of agreement between clinicians (multiple ratings kappa value = 0.318). For example, all clinicians rated image 1 (Figure 2) as grade 0 (no breaches) and image 2 (Figure 3) as grade 4 (several major and minor breaches).^{7,8}

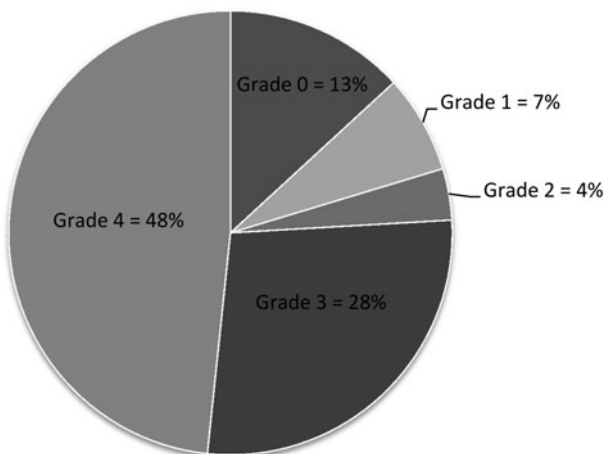


FIG. 1

Distribution of grades allocated for all images, calculated using the average grade allocated by all clinicians per image.



FIG. 2

Image 1, graded as 0 (no breaches) by all clinicians. (Image sourced from ENT-UK.⁷)

The clinician with the harshest grading was the clinical scientist (from the audiology department) (mean = 3.07, median = 4 and mode = 4) and the most lenient grader was the senior audiologist (mean = 2.61, median = 3 and mode = 4) (Table I).

Linear regression analysis indicated that correct bracing was the most influential factor, with a coefficient value of 0.941 (Table II). The second most influential factor in the grading of the images was correct holding of the otoscope, with a coefficient value of 0.611. Holding the subject's head was the least influential factor in grading the image.



FIG. 3

Image 2, graded as 4 (several major and minor breaches) by all clinicians. (Image sourced from iStockphoto.⁸)

TABLE I
MEAN, MEDIAN AND MODE GRADES ALLOCATED BY EACH CLINICIAN

Average	Clinician					
	Senior audiologist	Assistant technical officer 1	Clinical scientist (audiology)	Senior lecturer in audiology	ENT specialist registrar	Assistant technical officer 2
Mean	2.61	3.04	3.07	2.98	2.98	2.78
Median	3	4	4	4	4	3
Mode	4	4	4	4	4	3

Bracing

The correct otoscopy technique, as described in the British Society of Audiology guidelines, requires the hand holding the otoscope to be steadied by securely bracing it against the subject’s head or cheek to prevent injury to the ear if the subject moves suddenly.^{4,9–12}

In 34 of the 200 images (17 per cent), there is clear bracing against the cheek. In 134 images (67 per cent), there is no bracing against the cheek. In 17 images (8.5 per cent), there is bracing but it is with the tip of the clinician’s finger or against the mastoid (with the left hand holding the otoscope to the right ear and vice versa); these images were classified as not meeting best practice standards. In the remaining 7.5 per cent of the images, it is unclear if the clinician is bracing because of the angle that the photo was taken from or the cropping of the image. The mean grade of images with no bracing was 3.55 (mode = 4); in contrast, the mean grade of images with clear bracing was 0.74 (mode = 0).

Holding of otoscope

The ability to securely brace the otoscope depends on how the otoscope is held. The British Society of Audiology guidelines recommend that the otoscope is held like a pen, using the right hand to hold the otoscope for right ear examination and the left hand for the left ear examination.^{2,9,11} The free hand is used to manipulate the pinna to align the cartilaginous portion of the ear canal with the bony portion, thus affording a clear view of the tympanic membrane.

Bickley suggests holding the otoscope handle so that it is pointing upwards or forwards, whilst holding the ulnar side of the hand that has the otoscope against the head, to provide a buffer against sudden

movement.¹³ However, as an alternative, particularly with children, Bickley suggests holding the otoscope with the handle pointing downwards towards the child’s feet. Holding the otoscope like a pen gives the clinician a greater level of control than holding the otoscope like a hammer; furthermore, it reduces the risk of trauma or pain caused by pressing the speculum tip against the skin of the ear canal, which can occur if the subject moves suddenly.

In 130 of the images (65 per cent), the otoscope was held like a hammer (mean grade = 3.60 and mode = 4), and in 67 images (34 per cent), the otoscope was held like a pen (mean grade = 1.56 and mode = 0).

Holding subject’s head

The purpose of holding the otoscope like a pen and bracing it is to prevent injury to the ear if the subject moves suddenly. The subject should be seated comfortably and remain motionless during the examination. The clinician should have a stable position when examining the ear to minimise loss of balance; the clinician should not stand bent over. In some circumstances, the subject may need to be restrained to prevent injury. For example, the British Society of Audiology guidelines suggest: ‘Young children may need to be held by an appropriate adult, which should be the person responsible for the child. For example, the child could be seated sideways on the adult’s lap, with the child’s hands secured by one hand and the child’s head held against the chest with the other hand’.¹⁴

In 18 of the images (9 per cent), the subject’s head is clearly being held, or the subject is being restrained (mean grade = 3.08). In 171 images (86 per cent), the subject is not being restrained (mean grade = 2.86). Holding the subject’s head prevents the clinician from being able to manipulate the pinna with the other hand and may result in the tympanic membrane not being fully visualised.

Subject’s expression

The subject’s expression may indicate if there is discomfort during the procedure. In seven images, the subject has a negative expression, suggesting some discomfort; the average grade of these images was 3.21. Where the subject has a positive expression, the average grade given was 3.05. Linear regression showed that the subject’s expression was not a

TABLE II
LINEAR REGRESSION COEFFICIENT VALUES

Factor	Coefficient value
Bracing	0.941
Holding of otoscope	0.611
Clinician seated	0.311
Subject’s expression	0.149
Speculum	0.146
Head holding	0.072

significant factor in the image grading; however, it will influence the decision to use an image in a publication.

Otoscope

To perform otoscopy correctly, the clinician needs to use a working otoscope with a bright light source and an appropriately sized speculum in order to be able to view the tympanic membrane clearly.^{4,9,15} Children typically have narrower ear canals than adults and therefore a narrower speculum is required.² In seven images (4 per cent), there is clearly no speculum on the otoscope (mean grade = 3.76). In 120 images (60 per cent), there is clearly a speculum attached (mean grade = 3.09).

- **The British Society of Audiology has produced guidelines for safe and effective otoscopy; however, there are no nationally recognised guidelines for medical staff**
- **This study aimed to determine the rate and extent of non-compliance with good practice in images of otoscopy**
- **Two hundred internet-sourced otoscopy images were graded independently by six clinicians for compliance with good practice standards**
- **Major breaches were identified in 48 per cent of images**
- **Linear regression analysis indicated that correct bracing was the most influential factor in grading of images**
- **There are a large number of otoscopy images in circulation that deviate markedly from good practice; these represented the majority of the images analysed**

Source of image

The data revealed that professional websites typically have images with better guideline compliance, as reflected by a mean grade of 2.80; however, this

TABLE III
SOURCE OF IMAGES

Source of image	Number of images	Mean grade	Standard deviation
Blog	33	3.05	1.24
Healthcare provider (including NHS, hearing aid dispenser & private medical practices)	57	2.93	1.39
Image library	37	2.94	1.42
Professional	45	2.80	1.55
Public website	28	2.84	1.40

NHS = National Health Service

value is not significantly different from that of 'blogs' ($p = 0.466$), which have the least compliant images (mean = 3.05) (Table III).

Discussion

The results of this survey indicate that there are a large number of images of otoscopy in circulation which deviate markedly from good practice, and in fact these represented the majority of the images analysed in the present study. The consequences of poor otoscopy techniques in clinical practice potentially include patient discomfort or injury, and misdiagnosis as a result of poor visualisation of the pinna, external auditory meatus and/or tympanic membrane. Whilst it is unlikely that clinicians would learn technique from images found on a Google search, the existence of so many images depicting poor practice may well contribute to a lack of rigour in clinician practice.

Professional websites have a responsibility to show best practice. Commercial image library websites are primarily concerned with selling images rather than technical accuracy. When choosing an image for a professional website or publication, the source of the image needs to be carefully considered, particularly where models are used rather than clinicians. Unlike clinicians, models are unlikely to be aware of correct otoscopy technique.

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