Ear care – an update for nurses (part 1)

Abstract: our ears are essential for both hearing and balance. Up to 4% of the population will have difficulties with their ears relating to impacted cerumen and many of them will present in primary care with ear discomfort or hearing difficulties. In the first of two articles, we review the anatomy and physiology of the ear and cerumen production, followed by a discussion of the key aspects of making an assessment using the SOAP (Subjective, Objective, Assessment, Plan) mnemonic.

Key words: cerumen, Primary Care Nursing, nursing assessment, evidence-based nursing, continuing nursing education

Key points:

- The ear is comprised of three sections: external, medial and internal
- Cerumen is produced in the external auditory meatus for protection and cleaning but can become impacted
- A thorough assessment is crucial to planning appropriate treatment in primary care for patients complaining of ear pain or hearing loss

Introduction

The Nursing and Midwifery Council (NMC) Code (2015) states that we are responsible for ensuring we maintain our skills and knowledge for effective practice. As part of this, we should practise according to best available information. This is the first of two articles that attempt to summarise the most recent evidence around ear care for General Practice Nurses (GPNs) and District Nurses (DNs) to support your practice. In this article, the anatomy and physiology of the ear will be covered, including the purpose and production of cerumen, along with key factors to consider when assessing for the presence of impacted cerumen. A future article will cover a clinical update of interventions including cerumenolytics for softening or removal, self-care or -management advice, ear irrigation and aural toilet.

Anatomy and Physiology of the Ear

Knowledge of the basic anatomy and physiology of the ear is crucial to ensuring adequate assessment, diagnosis and treatment of common ear problems in primary care (Harkin, 2015). Our ears are crucial for hearing and balance. The ear is divided into three main areas: the external ear, the middle ear and the internal ear (Tortora and Derrickson, 2009)(fig 1). The external ear includes the auricle (also known as the pinna), external auditory meatus (EAM) and tympanic membrane and is primarily responsible for collecting and focusing sound waves. The EAM is approximately 2.5cm long and is slightly s-shaped. It has hairs growing in the outer third of its length and has a temporary slight narrowing as it passes through the temporal bone. The tympanic membrane is a semi-transparent membrane that separates the EAM from the middle ear. It has various landmarks that can be visualised with an otoscope (fig 2). These are the pars flaccida, an area of thicker 'looser' tissue located in the upper aspect of the tympanic membrane; the pars tensa, the section of the tympanic membrane that is translucent and has the appearance of a drum surface; the annulus, which is a pale ring around the edge of the tympanic membrane where it attaches to the EAM; the

handle of the malleus, which is visible where it adheres to the medial surface of the tympanic membrane and forms the umbo, near the centre of the tympanic membrane; and the cone of light, which is located in the anterior and inferior surface of the tympanic membrane and is formed by the reflection of the otoscope light off a portion of the pars tensa. The anterior recess is a small outpouching of the EAM just before the tympanic membrane (after the narrowing identified earlier) which is at risk of trapping debris.

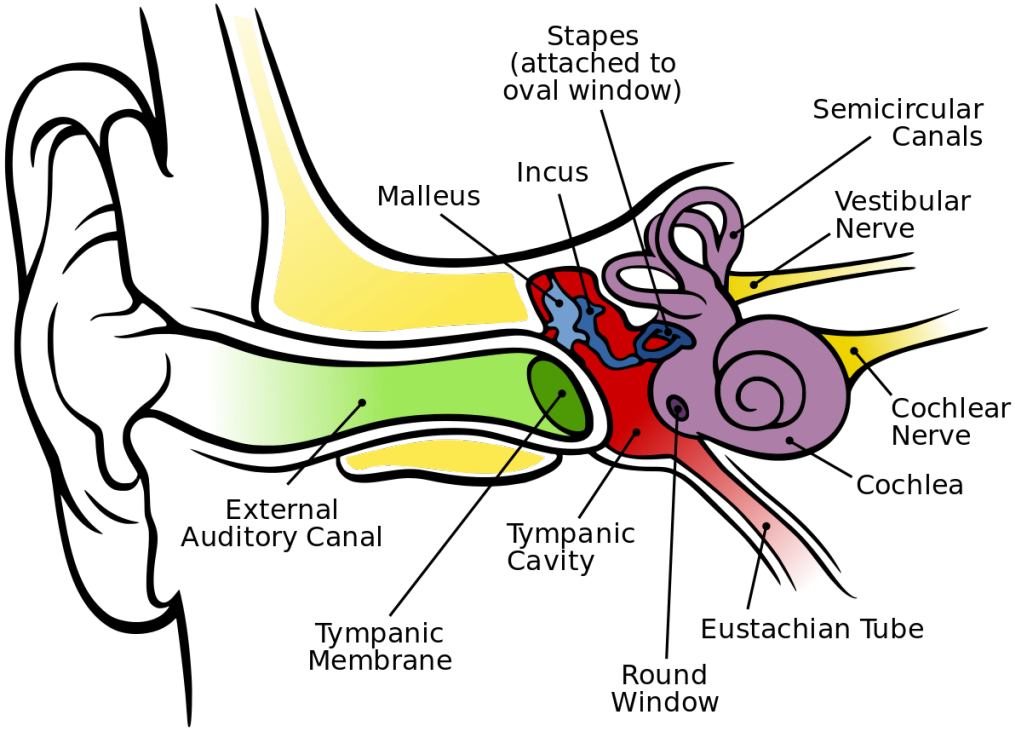

Fig 1. Cross-sectional diagram of external, middle, and inner ear. Reproduced with permission from Chittka L, Brockmann A (2005)

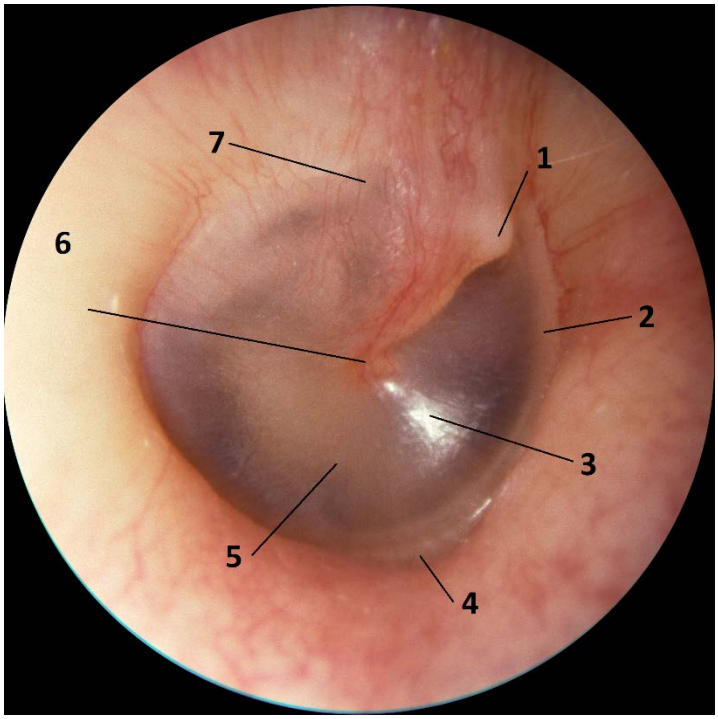

Fig 2. Tympanic membrane. Reproduced with permission from M Hawke MD. 1=short process of malleus; 2=annulus; 3=cone of light; 4=anterior recess; 5=pars tensa; 6=umbo; 7=pars flaccida

The middle ear contains the three ossicles – malleus, incus and stapes – and the round and oval windows which in combination transmit vibrations from the tympanic membrane to the inner ear (Bickley and Szilagyi, 2007). The inner ear contains the semi-circular canals, vestibule and cochlea which are all part of the labyrinth. The semi-circular canals and vestibule are involved in the maintenance of equilibrium and balance and the cochlea, which is filled with fluid, is involved in sound transmission (Tortora and Derrickson, 2009).

Cerumen production and function

Cerumen is a naturally occurring waxy substance produced by sebaceous and ceruminous glands in the EAM (Tortora and Derrickson, 2009). It provides lubrication and waterproofing, and its acidic properties act as a bactericidal to protect the cells of the EAM from bacteria or fungi (Primary Ear Care Centre (PECC), 2014a). This, along with the hairs lining the outer third of the EAM, provides a barrier to prevent the entry of, and reduce damage from, foreign bodies and other debris including insects (Tortora and Derrickson, 2009). Cerumen can range in colour from pale yellow to dark reddish brown and in consistency from dry and flaky to moist and sticky. South Asian groups are more likely to have dry cerumen and Caucasians and Africans or Afro-Caribbeans wet and sticky (PECC, 2014a). As we age, our cerumen becomes dryer and flakier. Some groups or individuals, as listed in Table 1, are more likely to produce higher volumes of cerumen.

Individuals likely to produce larger volumes of cerumen (Roesser and Ballanchanda, 1997; Rodgers, 2002; Guest et al, 2004)
Excessive perspiration
Diets high in saturated fats
Hereditary factors
Learning Disabilities

Anatomical differences
Anxiety or stress

Table 1: Individuals likely to produce larger volumes of cerumen

Cerumen impaction

Cerumen is expelled from the external auditory meatus through epithelial migration as well as through jaw movements such as chewing and speaking (PECC, 2014a). It normally only causes a problem when it becomes impacted (Wright, 2015). Impaction usually occurs when the natural extrusion is impeded, predominantly due to hearing aids, ear plugs, in-ear headphones, or the use of cotton buds (Wright, 2015)(table 2). Other high risk groups include those with narrow EAMs, men, and older adults (Burton et al, 2016). Occupational exposure to high dust or debris environments can increase the amount of debris trapped in the hairs and cerumen, increasing the risk of impaction. People with a learning disability are also more likely to get cerumen impaction although the cause of this is not clear. One hypothesis is that there are anatomical changes associated with certain genetic disorders (e.g. trisomy 21) as well as increased cerumen production (Guest et al, 2004).

Groups at risk of cerumen impaction	**Rationale**
Hearing aids, ear plugs, in-ear headphones	Natural extrusion is impeded by physical barrier of hearing aids etc.
Use of cotton buds in the ears	Use of cotton buds creates irritation which can stimulate increased cerumen production, as well as compacted cerumen already present
Narrow EAM	Lesser volumes of cerumen are required to create impaction compared to normal EAM
Men	Increased growth of hairs within the outer third of the EAM impede the natural expulsion
Older adults	Epithelial migration slows with age and cerumen produced becomes dryer
Builders, construction workers, outdoor work	Increased exposure to dust and debris adds volume to cerumen and slows movement
People with learning disabilities	Some anatomical changes to the EAM are associated with certain genetic disorders (e.g. trisomy 21) as well as increased cerumen production

Table 2: High risk groups for cerumen impaction

Cerumen impaction can result in hearing loss, dizziness, tinnitus, itching or pain (Wright, 2015). It can also lead to social withdrawal and decreased function (Guest et al, 2004). It is estimated that up to four percent of the population have cerumen impaction (Guest et al 2004). Ear irrigation is a common procedure in primary care with approximately two million people in England and Wales having their ears irrigated with water every year (Loveman et al 2011). Despite the scale of cerumen-related ear conditions in primary care there is still poor evidence to support current best practice recommendations (Burton and Doree, 2009; Loveman et al, 2011; Wright, 2015).

The assessment process - SOAP

With so many people presenting to primary care with ear and hearing-related issues, it is important to ensure a thorough assessment is undertaken to determine the cause. A common structure for this is SOAP: Subjective, Objective, Assessment, and Plan.

Subjective

The subjective assessment is the history that we take from our patients – what they tell us about what is wrong and their previous medical, social and occupational history. Done well, this can give us up to 80% of the information we need to make a clinical diagnosis (Douglas et al, 2009). When eliciting a history from a patient presenting with ear problems it is important to gain the following information: when the difficulty started; where it is (e.g. whether it is pain in the auricle, or a feeling of blockage just inside the EAM); whether it fluctuates or has changed over time; a description from the patient about the characteristics (e.g. if there is pain whether it is throbbing, sharp, a feeling of pressure etc.); whether there are any other symptoms that may be associated such as fever or discharge; what seems to relieve the problem or make it worse; whether they have had a similar issue before; what treatments they have already tried; and what they feel the problem might be as well as what outcome or treatment they are seeking (Bickley and Szilagyi, 2007; Douglas et al, 2009). If there is discharge, find out more detail including colour, odour, consistency, and volume. Check for a previous history of ear problems, particularly in childhood, as well as family history (Douglas et al, 2009). Check for current and recent medications as some drugs may be ototoxic, and social and occupational history for excessive noise or particulate exposure (Bickley and Szilagyi, 2007).

Objective

An objective assessment is the clinical examination following the subjective information gained as part of the history. In this situation, it is the inspection of the outer ear, EAM and tympanic membrane using direct visualisation and an otoscope. The examination starts with direct visualisation of the auricle using a torch or otoscope, identifying key anatomical landmarks such as the helix, tragus, concha and entrance to the EAM, inspecting for any abnormalities, skin changes or discharge. Check the scalp around and behind the outer ear for scars, lesions and swelling and then palpate the tragus (PECC 2014b). If this elicits pain this may indicate infection within the EAM (Douglas et al, 2009) so use caution when commencing otoscopic examination (PECC, 2014b). The examination may need to be stopped at this point if the patient complains of significant discomfort. At this point either commence treatment on an empirical basis for otitis externa, refer to the GP for review, or refer to specialist ENT services according to local guidelines.

Once the outer part of the ear has been examined, using one hand to grasp the superior aspect of the pinna, gently pull the pinna up and out to straighten the EAM and insert the speculum of the otoscope into the entrance, passing through the hairs near the outer aspect (Harkin, 2003). Look through the otoscope to visualise the EAM and tympanic membrane. You may need to shift your position and that of the otoscope to ensure adequate visualisation. When undertaking an examination of the tympanic membrane all areas – cone of light, handle of malleus, pars flaccida, pars tensa and anterior recess – should be visualised (Harkin, 2015) before the GPN can confidently say that the tympanic membrane is normal. If cerumen is present, it should be assessed for colour, consistency and location. Generally, if the cerumen is dull and does not reflect light it is more likely to be harder (Harkin, 2003). On completion of tympanic membrane inspection, slowly withdraw the

otoscope, inspecting the walls of the EAM for condition of the skin and any irritation. Document any abnormal findings clearly and concisely.

Otoscope technique

When using an otoscope, positioning is important. Ensure you are at the same height as your patient when seated (Harkin, 2003) and make sure you position yourself close to them so you are not leaning forward and placing greater strain on your back. Reposition yourself or your patient if you need to, so that you can visualise the entirety of the tympanic membrane. The recommended technique for holding the otoscope is to hold it like a pen and use the little finger to rest on the patient's cheek for safety in case of sudden movements (PECC, 2014b). As much as possible, use the left hand for inspecting the left ear and the right hand for the right ear as this gives improved visualisation of the tympanic membrane (Bickley and Szilagyi, 2007). This may require considerable practice to feel comfortable and confident.

Assessment (diagnosis)

The third stage of structuring a thorough assessment is called assessment. This is the process of synthesising the information gained through subjective history and objective examination to reach a diagnosis. Common diagnoses related to ears that are seen in primary care include otitis externa, otitis media, traumatic tympanic membrane perforation, foreign bodies, and cerumen impaction.

As Registered Nurses, we cannot rely entirely on another professional's assessment as we are responsible for our own practise and accountable for ensuring this is evidence-based (NMC, 2014). Even if a patient comes for ear irrigation after being assessed as having impacted cerumen by the GP, the GPN must always satisfy him/herself that this is the current and correct diagnosis through reviewing the history and undertaking an examination. Although it is likely that the GPN review will confirm the original diagnosis, there is a possibility of reaching a different conclusion, particularly if considerable time has passed since the initial assessment. For example, the presence of excess cerumen has been linked to an increased risk of infection (Guest et al, 2004) so it is possible for a patient to develop otitis media or externa in the meantime.

Plan

Once a diagnosis has been made, a plan needs to be formulated. This may range from self-care advice, through provision of a prescription, to interventions such as ear irrigation. Further details of these will be provided in the second article in this series.

Conclusion

In this article, we have revised the anatomy and physiology of the ear, and the function of cerumen, identifying those groups more likely to develop cerumen impaction. The SOAP model was used to structure the process of undertaking a thorough assessment, with an emphasis on the responsibility of the GPN to practise autonomously yet be aware of the limitations of their skills and knowledge. In a future article, current best practice recommendations for cerumen removal will be discussed in detail.

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Useful websites:

www.earcarecentre.com

www.rnid.org.uk