Article • Ocular Examination of the Deaf Patient: Strategies, Accommodations, and Special Considerations

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ABSTRACT

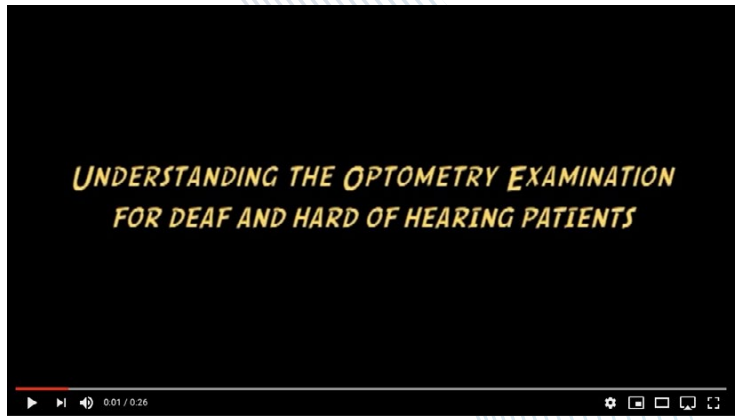
Deaf patients represent a subset of the population that may present to primary care optometrists. Deaf patients have a heightened need to maximize visual function due to their pre-existing sensory deficit. This clinical procedures manuscript aims to identify special considerations in the provision of eye care to deaf patients before, during, and after the exam encounter. Traditional methods of healthcare communication may need to be adjusted, and deaf cultural sensitivity is paramount. Specific examination strategies are discussed with the intent to equip the primary care optometrist with a particular skill set and additional resources in order to examine deaf patients efficiently and effectively.

Keywords: deaf, deafblind, eye care, multi-sensory impairment, optometry

Introduction

The Gallaudet Research Institute estimates that across all age groups in the United States (US), approximately 1 million individuals are functionally deaf, comprising 0.38% of the population.[1] According to the American Optometric Association's 2012 Executive Summary entitled *Practicing Optometrists and Their Patients*, the average optometrist treats approximately 3,000 patients per year.[2] These statistics predict that the average optometrist will encounter approximately 11 deaf patients per year. Additionally, there is a higher prevalence of ocular pathology in deaf patients than in their hearing counterparts.[3] Therefore, the ability to examine and to interact with deaf patients effectively and efficiently is an important skill for all optometrists to acquire.

Optometrists are very familiar with the legal definition of blindness. However, no universal, analogous legal definition exists to quantify deafness. In this text, the World Health Organization's (WHO) definition of deafness will be adopted, in which deafness refers to the complete loss of the ability to hear from one or both ears.[4] Using this definition of deafness, it is critical for optometrists to realize that this particular subset of patients



Video: *This video is for Deaf and Hard of Hearing patients to help explain the tests that your doctor may do for you at your eye exam.*

is already deficient in one mode of sensory input (i.e., auditory sensory input). Therefore, although the examination of deaf patients may involve different modifications on the part of the optometrist and office staff (including practice managers, receptionists, technicians, and opticians), a comprehensive eye exam is essential and arguably more important for these patients than for most. Although this paper mainly discusses patients with complete deafness, it is critical to acknowledge that different degrees of hearing loss exist (e.g., partial hearing loss), and therefore the techniques and considerations in this paper may be modified for the patient at hand and their unique mode of communication. Social

Table 1. Syndromal Causes of Deafness

Syndrome	Systemic Characteristics	Ocular Manifestations
Alport Syndrome[14,15]	Progressive decline in kidney function **Hearing loss** **Vision loss**	Anterior lenticonus Spherophakia Posterior polymorphous corneal dystrophy Megalocornea Cataracts Fundus albipunctatus/dot-fleck retinopathy Myopia Iris atrophy Nystagmus
CHARGE Syndrome[16,17]	**Coloboma (80-90%)** **H**eart disease **A**tresia of the choanae **R**etarded growth/development or central nervous system issues **G**enital underdevelopment **Ear abnormalities**	Coloboma (iris, lens, choroid, retina, optic nerve) Microphthalmia Congenital cataract Optic nerve hypoplasia Persistent hyperplastic primary vitreous Strabismus
Congenital CMV[18,19]	**Hearing loss** **Vison loss** Mental disabilities Microcephaly Intracranial calcifications Failure to thrive Cerebral palsy Seizures/Death	Chorioretinitis Pigmentary retinopathy Strabismus Optic atrophy
Congenital Rubella Syndrome[20,21]	**Hearing loss** **Vision loss** Congenital heart defects Growth problems	Cataract Nystagmus Microphthalmia Optic atrophy Corneal haze Glaucoma Pigmentary ("salt and pepper") retinopathy Chorioretinitis
Down Syndrome[22,23]	Mental retardation Congenital heart disease Respiratory problems Hearing impairment Five common physical characteristics (upward slanted palpebral fissures, flat profile, tongue protuberance, single palmar crease, hypotonia)	Refractive error Brushfield spots (on iris) Strabismus Nystagmus Cataracts Poor accommodation Keratoconus Lacrimal system obstruction Foveal hypoplasia Retinal pigment epithelial hyperplasia
Marshall Syndrome[24,25]	Flat/sunken midface "Saddle nose" Upward-flared nostrils Thickened skull/Calcium deposits in skull Short stature Early-onset arthritis **Hearing loss**	Myopia Cataract Strabismus Glaucoma Retinal detachment
Usher Syndrome[26,27]	**Hearing impairment** **Visual impairment** Issues with balance	Retinitis pigmentosa Bone spicules Disc changes (pallor, waxy appearance) Vessel attenuation Peripheral retinal mottling Vitreous cells Cystic macular lesions Posterior subcapsular cataract

haptic communication describes a holistic process in which a deaf individual uses their remaining senses to gather information from the surrounding environment mainly though tactile and visual input.[5] As optometrists, we facilitate the visual component of social haptic communication.

The ability to interact with deaf patients is not only important from a social standpoint, but from a legal standpoint as well. Internationally, significant variation exists with regard to

familiarity with deafness and deaf culture and with the progressiveness of disability legislation for this particular population. The first school for the deaf in England was established by Thomas Braidwood in 1760, thereby setting the precedent for the United Kingdom's (UK) exceptional progressiveness in providing services for deaf citizens.[6] It was not until the following century that the Gallaudet School for the Deaf was established in America in 1864.[6] The UK's reformism of deaf treatment carried over into the healthcare industry with the Royal National Institute for Deaf organization charging that 'urgent action' was necessary in the health service industry in order to improve communication and accessibility for deaf and hard-of-hearing patients in 2004. The UK Department of Health responded the following year with the recommendation that all front-line health service staff receive deaf awareness training (DAT).[7,8] A 2006 cross-sectional study of deaf patients performed in the UK found that communication preferences for deaf patients could be met and higher patient satisfaction achieved by increasing DAT for health care providers.[7] Given the lack of universal deaf rights in the healthcare sector, the United Nations' 2007 Convention on the Rights of Persons with Disabilities sought to remedy this and to formulate a broad framework of deaf rights, shifting the perspective of deafness from one that is medically based to one modeled on human rights.[9] Deaf awareness and sensitivity has also made its way to the US, being particularly geared toward professions that work directly with disabled populations.[10] Yet, driven by technological entrepreneurship, companies such as Sorenson Communications started to make video relay service possible for many deaf patients in the early 2000s, becoming strong proponents of public deaf awareness in the US.[11]

Slightly different from DAT (but equally important) is deaf equality training, with its emphasis on meeting requirements established in existing disability legislation, which may be more useful for practice managers and administrators. Health care providers in general should be acutely aware that in order to comply with disability legislation in the United States, according to Title III of the Americans with Disabilities Act signed into law in 1990 (and the revised version effective in 2011), discrimination against any individual with a disability in public locations, inclusive of healthcare settings, is strictly prohibited; therefore, all attempts must be made to meet the patient's unique communication needs, including (but not limited to) provision of various visual and hearing aids for patients, live and remote interpretation services, and alternative scheduling methods so that a deaf patient can communicate with healthcare providers as effectively as can hearing patients.[12]

Although it may require more planning and innovation on the part of the eye care provider, the ocular examination of deaf patients is a worthwhile endeavor due to the higher occurrence of ocular pathology in deaf patients than in their hearing counterparts.[3] Due to the common developmental origin of the eyes and the ears, with both sensory organs developing concurrently from similar embryonic tissue types between weeks three and eight of gestation,[13] determining the etiology of a patient's deafness may provide insight into the specific types of ocular pathology that they may develop later in life.[14-27] Table 1 includes both the systemic and ocular characteristics of several syndromes that may present with visual and auditory deficiencies.[14-27] It is estimated that one-third of all cases of deafness are syndromal.[28] Thus, it is critical that ocular examination is as comprehensive and seamless as possible.

Additionally, while optometrists may think that what occurs in the exam room itself is the most critical part of the exam, a significant amount of interaction also occurs between

the patient and the eye care team prior to being seated in the exam chair and after the patient leaves the exam room. Thus, special considerations for deaf patients before, during, and after their eye exams will be discussed, with the intent of equipping the primary care optometrist with a skill set needed to see a deaf patient of any age, pediatric through geriatric.

Considerations Before the Exam

Scheduling an Appointment

A prerequisite to a positive ocular examination experience is the ability to schedule an appointment. Optometric practices should offer at least one method of scheduling an appointment that is user-friendly to deaf patients. Appointment scheduling via website, email, or text message are all acceptable alternatives to a single option of scheduling appointments via telephone. Additionally, when scheduling an appointment (regardless of the scheduling modality used), the staff should inquire as to whether any special accommodations are necessary. This simple question provides the patient with an opportunity to inform the staff of their state of deafness/hearing impairment and to request the examination modifications required.

It is also helpful to ask whether the patient has a specific interpreter (local or available via remote access) that they prefer to use. Not all sign language interpreters have equal educational or stylistic backgrounds, and some are trained specifically for medical interpretation. Interpreters for the deafblind may employ tactile or "hand-over-hand" signing.[8] Therefore, arranging the most qualified interpreter ahead of time will likely make the day of the exam more efficient for both the patient and the provider. As a general guideline, the British Deaf Association recommends that health professions allow at least eight weeks to book an interpreter in order to ensure that a properly trained interpreter is available on the day of the patient's choosing.[8] If appointment reminders are provided for hearing patients, they should also be provided for deaf patients. Ideally, reminders should be provided in the same modality as was used when the patient's appointment was originally scheduled.

Deaf patients may be more anxious prior to ocular examination than the average patient due to a lack of understanding of what is to occur during the exam. Therefore, any information that can be provided ahead of time explaining common examination techniques (via text, pictorial representation, or ideally, both) is beneficial to ease the mind of the patient and to let them know what to expect. This information may be provided in the form of informational brochures/pamphlets or closed-captioned videos.

Office Environment

With regard to the office environment (inclusive of waiting room, exam rooms, and restroom facilities), simple modifications can make a deaf patient feel much more welcome while enabling the patient to retain their independence. Practitioners should consider installing a visual appointment board or monitor in-office to indicate when the technician, doctor, or optician is ready to take the next patient. Special care should be taken to ensure that said monitor or appointment board is consistent with the Health Insurance Portability and Accountability Act (HIPAA) guidelines. Additionally, it is beneficial to position the seats in the waiting room facing towards the reception desk or visual monitor/board so that deaf patients can be more aware of their surroundings and so that doctors and office staff are not needlessly searching for a patient who is not aware that they are being addressed.

As a general consideration, office staff and providers should be aware that written notes may be an acceptable supplemental form of communication to patients who are hard-of-hearing (i.e., those with mild to

moderate hearing loss, such as aging patients exhibiting presbycusis) but who are still able to use speech as their main communication modality; however, written notes may serve as a hindrance to those whose first language is sign language. This is because the patient may struggle to read and process the note due to grammatical differences between conventional English and American Sign Language (ASL), proving detrimental to overall examination and encounter comprehension. However, it is nearly impossible to avoid all forms of written communication. Thus, when written notes are necessary and reduced vision is present, one should remember that text is easier read when fonts such as Arial or Verdana (as opposed to Times New Roman or italicized text) are used. One should automatically start with 14-point text size and increase the text size until the patient confirms that they can read the presented written material.[8] If a white background with black lettering is illegible to the patient, white text on a black background or yellow text on a blue background may be more easily seen.[8] Given that deaf individuals tend to be very visually perceptive, pictures are an excellent supplementary educational resource and should be used to complement text or interpretation whenever possible.[8]

Considerations During the Exam

General Communication Guidelines

Several general guidelines intended for healthcare interactions with deaf sign language users include:[8]

- After greeting the patient, the doctor should directly ask the patient what exactly is their preferred method of communication and whether any remaining hearing ability exists. A 2006 cross-sectional study found that in a clinical setting, 50% of sign language users preferred to have a consultation via a sign language interpreter, 43% preferred to have a consultation directly with a signing health provider, and 7% would accept a consultation in speech provided that there was adequate DAT on the part of the health professional.[7]

Video: *This video is designed to teach optometrists how to utilize tools that are available to optimize interactions with deaf patients.*

- Pending patient permission, a patient's relative and/or caregiver may be an invaluable resource and is often happy to provide communication assistance. However, it should not be assumed that those accompanying the patient are able and/or willing to provide interpretation services. Such expectations can place an undue burden on relatives and caregivers while also invading the patient's privacy and independence.
- Ask at what distance the patient prefers the doctor and interpreter to stand while communicating, as this may vary depending on the patient's degree of visual function or the presence of ocular pathology. It will likely be impractical (or impossible) for the doctor and the interpreter to maintain this positioning for the entire course of the examination; however, such positioning is critical when instruction is to be given. For instance, patients with Usher syndrome may have bilaterally constricted visual fields (see visual field in diagnostic testing section), necessitating a larger distance between the patient and the interpreter, whereas deafblind patients may require a much closer distance.

- Ensure that the exam room environment facilitates sign language usage. This is especially pertinent in the context of an eye exam, as there are many visually occlusive devices that are employed during the exam:
  - The room should be well lit for the initial introductions and instructions. The interpreter should not be standing in front of a window, nor should light be shining in the patient's eyes. Additionally, the faces of the doctor and interpreter should be well-illuminated.
  - The patient should have an unobstructed view of both the doctor and the interpreter. Given that some patients lip-read, care should be taken to ensure that the view of the doctor's mouth is not obstructed. Common obstructing agents include examination equipment, charts/papers, pens, medical masks, facial hair, or one's hand.
  - If the patient retains any hearing ability, background noise should be minimized.
  - Eliminate unnecessary movements in the exam room that may distract the patient from watching the interpreter.

- When communicating via an interpreter, the following expressive communication protocol should be followed:
  - The doctor should speak directly to the patient (not to the interpreter) clearly and at a normal pace. It is important to ensure that the interpreter has caught up before transitioning to a new topic.
  - The conversation should be spoken in the first person using "I".
  - Eye contact should be maintained with the patient.
  - When a topic change occurs in the dialogue, it should be explicitly stated in order to allow the patient to follow the course of the conversation more easily.
  - If more than one health care provider is present, the speakers should take turns, and the speaker should raise their hand before speaking so that the patient is aware of the change.
  - Confirm patient understanding at regular intervals, and ask for a short summary of important take-away points (such as treatment recommendations, prognosis, or recommended follow-up schedule) in order to ensure patient comprehension.

- When communicating with a patient using an interpreter, the following receptive communication protocol should be followed:
  - Always look at the patient while listening to the interpreter.
  - If clarification is desired, direct questions to the patient rather than to the interpreter.
  - Re-state what the patient has communicated in order to ensure mutual understanding.

- If a poor prognosis or test result is to be delivered to the patient, the interpreter should be forewarned so that they will be prepared to maintain professional composure and most appropriately communicate the news.

Eye Care Specific Guidelines

One of the most important considerations while working with deaf patients is understanding how reliant they may be on their eyesight to function. Naturally, a deaf patient may be extraordinarily defensive regarding any object coming near their eye. Therefore, it is critical that doctors and technicians explain what will be done prior to specific tests, confirm patient understanding, and obtain consent before proceeding.

As previously stated, many deaf patients communicate via various forms of sign language, which requires the full use of one's hands (preferably both hands). Thus, throughout the examination process, it is critical to ensure that the patient is able to

provide feedback freely when needed. For instance, when taking visual acuity, it may be necessary to hold the near acuity card or the occluder for the patient so that they can communicate what optotypes they see. A clip-on spectacle occluder may also be used if available. Similarly, when performing stereopsis or color testing, assistance may be needed to hold the test books. By simply being cognizant of the patient's need for use of their hands throughout the exam, the doctor can make the patient feel more involved in the examination process whether explicit feedback is required at that moment in the exam or not.

Depending on patient preference and comfort with use of technology, computers may be used for translation via written text throughout the exam. However, optometrists should not rely on written text alone, as deaf patients may have varying levels of literacy with conventional English (or other regional languages). For instance, in ASL specifically, different grammar, syntax, morphology, phonology, and pragmatics are employed. Therefore, while communicating via written text certainly may confer some benefit, providers should be aware that it does not function as a perfect word-to-word ASL-to-English translation, and further methods of communication reinforcement should be sought.

Computers may also be used to display pictorial reinforcement of what was discussed in the exam. A light-writer may be of particular benefit to those exhibiting multi-sensory impairment (which is defined as a reduction of two or more senses) or deaf-blindness. Light-writers present text one line at a time and in a large font size. These machines are relatively inexpensive and are available for loan or purchase. With regard to portability, many light-writers are more portable than the average computer.[8]

Short breaks should be taken during the examination process, especially with patients who exhibit some degree of deafblindness. It requires a considerable amount of energy for a person who is visually and auditorily deficient to make sense of what is going on around themself. Do not be resistant to having the patient back for multiple visits if they seem fatigued or overwhelmed.

Optometry Technique Modifications During the Exam

Case History

Although communication may require more effort in patients who are deaf, a comprehensive ocular and systemic case history is crucial and may ultimately save time for all parties involved. Be familiar with the types of ocular pathology that may be present depending on the cause of the patient's deafness (Table 1), as some exam findings may be subtle and remain undetected if the provider does not explicitly know what to look for, such as early corneal changes in those with Alport syndrome or nasolacrimal system obstruction in those with Down syndrome.[14-27]

Instructing the patient to fill out an intake form in the waiting room immediately prior to the visit, or at home where the patient may have better access to assistance in filling out the paperwork and/or to their health records, may greatly streamline the case history process and identify areas where further inquiry is necessary.

It also may be beneficial to inquire respectfully as to whether the patient is using any assistive hearing devices such as hearing aids or cochlear implants (many of which may not be evident to the unseasoned observer). These devices may greatly improve the communication skills of the patient; however, one should not assume that because such a device is used, the patient can hear and effectively communicate without further accommodations. Conversely, by improving language functionality, providers

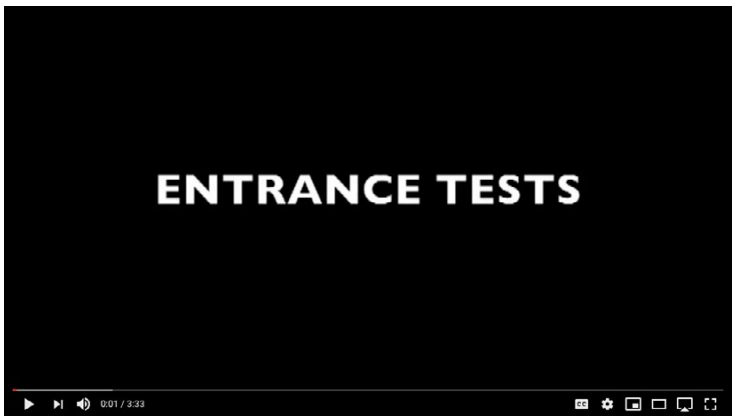
should also realize that these devices have the potential to disguise a more severe underlying hearing impairment, and thus optometrists should still carefully screen for ocular diseases associated with deafness.

Visual Acuity

As noted above, deaf patients may be particularly sensitive to any objects approaching their eyes. Since monocular measurement of acuity is the standard, the patient should be informed that one eye is to be covered before their personal space is entered.

Limitations in communication may compound difficulties in the measurement of visual acuity. Many deaf patients will be able to perform traditional Snellen acuity testing by using an interpreter to relay the optotype that is seen. If no interpreter is available, and the doctor or technician is unable definitively to understand the patient or to read the patient's lips, the HOTV acuity chart may be used, with the patient matching the optotype that they see to the one present on their lap card. If the HOTV chart or lap card are not readily available, the Tumbling E chart may be used, with the patient using their hand to indicate the direction in which the E's three prongs are facing.

If the patient is unable to perform any of the aforementioned visual acuity tests requiring subjective feedback, other objective techniques may be used, such as preferential looking with Teller acuity, Cardiff cards, or graded paddles; or an optokinetic nystagmus drum may be used to assess the level of visual processing.[29] In the event that the aforementioned tests of visual acuity yield insufficient visual acuity measurement or a level of acuity that does not correlate with clinical findings, electrophysiological tests of visual function such as electroretinography, electro-oculography, or visual evoked potential may be employed.



Entrance Testing

Several entrance tests require minimal feedback on the part of the patient but can provide useful information regarding visual function.

A significant amount of information can be gathered from a rudimentary binocular screening. A cover test or Hirschberg test may be performed in order to assess ocular alignment. A Brückner test may be useful to aid in the detection of the presence of a large-magnitude strabismus or the presence of anisometropic refractive error, leukocoria, or lens opacity. Particularly in those with Down syndrome,[22,23] it is important to distinguish pseudostrabismus from true strabismus by tightening the patient's epicanthal folds; this may be done by pinching the bridge of the patient's nose, thereby appearing to "straighten" a pseudostrabismus.[29] In order to assess for a significant difference in vision between both eyes and/or significant visual suppression secondary to an eye turn, the vertical prism dissociation test can be used.[29] Bifoveal fixation may be assessed with the Randot stereopsis test.[28] However, the latter test can be difficult to perform on patients who are unable to provide subjective feedback. For younger children who are unable to perform Randot stereopsis testing, the Stereo Smile test may instead be attempted. Of note, the aforementioned testing should ideally be performed with best optical correction. Therefore, if entering visual acuity is reduced and improves with pinhole testing, entrance testing may be postponed in the exam sequence until after appropriate optical correction has been provided in the form of trial-frame lenses. If esotropia is noted,

cyclopleigic refraction may be indicated to rule out excessive hyperopia that may be inducing the eye turn.

Given that many sign language users are accustomed to observing hand signals, deaf patients are generally very receptive to, and cooperative with, confrontation visual field testing for the assessment of their peripheral visual function. In patients with known or suspected severe visual field constriction (secondary to Usher syndrome or other etiology), Amsler grid testing or facial confrontation field testing may prove beneficial. Extraocular motility testing and pupil function testing can generally be completed without much difficulty when instructions are effectively communicated.

Refraction

Refraction is a critical component of the optometric exam, especially if a lens prescription is to be released. Given that the traditional method of refracting requires feedback on the part of the patient (logically termed subjective refraction), some eye care providers may be daunted by the task of refracting a deaf patient due to the presumed communication barrier. However, when properly addressed, communication barriers should not preclude one from performing an accurate refraction.

Retinoscopy is an invaluable objective skill when working with deaf patient populations. Retinoscopy confers additional benefits, such as the visualization of the quality of the reflex to evaluate the clarity of the ocular media (i.e., to assess for the presence of cataracts) and the assessment of accommodation. Dynamic retinoscopy may be particularly beneficial to assess accommodative ability in patients with Down syndrome.[22,23] Ideally, retinoscopy should be performed with free lenses or a lens rack in order to avoid unnecessarily obstructing the patient's view of the doctor and/or interpreter. However, if retinoscopy is performed behind the phoropter, ensure that the procedure is discussed with the patient before the phoropter is placed in front of their face. If subjective refraction is difficult, proficiency in retinoscopy may provide the ability to prescribe using only objective findings, and subjective refraction may be circumvented.

Though retinoscopy is preferred, autorefraction can serve as a useful starting point for refraction if retinoscopy cannot be performed in the event of small pupils, cloudy ocular media, etc. Autorefraction may help reduce overall chair time while also providing insight as to whether a visually significant media opacity may be present.

Despite this, subjective refraction is standard and should not be avoided if there is any indication that it would provide an improved prescription. As with retinoscopy, subjective refraction may be performed with or without the use of a phoropter. The primary advantage of performing a trial-frame refraction is that there is minimal visual obstruction, and thus, the interpreter may still be used if present. Additional time should be allowed for the patient to view through each lens in order to compensate for the delay due to the relay of communication. However, it should be noted that too much time should not be given between choices, as the intent of performing refraction is to display two different test conditions in rapid succession to allow the patient most effectively to appreciate which test condition is superior.[31] Performing a trial-frame refraction also allows the patient to get a more accurate idea of what their potential spectacle prescription would be like in free space and allows the doctor to check for eccentric viewing or nystagmus, with the latter commonly associated with syndromal causes of deafness such as Down syndrome or congenital rubella syndrome.[20-23]

If a trial-frame reaction cannot be performed, a subjective refraction can effectively be done with the phoropter by gently applying a tactile stimulus to the patient's skin as a substitute for

oral communication. Again, before placing the patient behind the phoropter, the refraction process should be carefully explained to the patient and confirmation of understanding received. Explanation to the patient (likely relayed by an interpreter) might be: "I will be showing you two different lens options, one at a time, and each for a couple of seconds. I will tap your hand one time when I show you the first lens option, and then I will tap your hand two times when I show you the second lens option. I want you to let me know which lens option is clearer by holding up one finger for the first option, or two fingers for the second option. We will repeat this process several times so that I can make sure that you receive the correct glasses prescription. Is this alright? Do you have any questions?" Given that optometrists do not generally touch the patient outside of the immediate vicinity of the eyes and adnexa, it is critical that the doctor respects the patient's personal space and obtains permission from the patient before beginning the tactile method of refraction.

Slit Lamp Biomicroscopy

Anterior segment examination should present few difficulties if proper instruction is given to the patient prior to placing the patient behind the slit lamp biomicroscope. The patient should be told that they will be instructed to look in various directions with their eyes only. The patient should be informed that instructions as to which direction to look will be indicated by gestures or by gently tapping that region of the patient's orbit. Following anterior segment examination, if intense light has been used, the patient should be given a moment to recover before further instruction is provided so that they can sufficiently see the interpreter once again.

Measurement of Intraocular Pressure

Measurement of intraocular pressure should be carried out just as it is with a hearing patient. Especially with applanation tonometry, informing the patient of what is to be done prior to beginning the test is imperative in order to ensure understanding and to minimize patient apprehension.

It should be noted that glaucoma is an ocular manifestation of some syndromal causes of deafness such as congenital rubella syndrome or Marshall syndrome.[20,21,24,25] Special care should be taken to obtain accurate intraocular pressure measurements in these patients at regular intervals.

Dilated Fundus Examination

There are no contraindications to the instillation of topical pharmacologic agents for dilation and cycloplegia unless there is an underlying syndromal cause for the patient's deafness that would contraindicate such use. The dilation protocol should be discussed with the patient, and the patient should be reminded that they will be asked to look in various directions to allow for examination of the entire retina. Again, individual instructions as to which direction to look may be indicated by gesturing in the direction desired with one's hands or by gently tapping that region of the patient's orbit. This second technique confers the advantage of employing tactile sensation, which may be easier if the patient has difficulty seeing the doctor due to bleaching of the retinal photoreceptors, especially in the dilated state.

Diagnostic Testing and Further Work-up

The condition of deafness itself should not preclude performance of diagnostic testing such as automated perimetry, optical coherence tomography, fundus photography, flourescein angiography, etc. It is, however, especially critical that these tests (and the rationale behind ordering them) are properly explained to the patient so that meaningful test results may be obtained, especially if the interpreter is not to be present on the day of the testing.

Following a similar rationale, further accommodative and binocular vision work-up may be performed (either at the initial examination or at a later date) if proper instruction is provided to the patient. Optometrists should not shy away from suggesting further binocular or accommodative testing due to communication difficulties alone, as these patients may greatly benefit from the findings of these tests and the treatment modalities (such as vision therapy) that they may necessitate. Remember, it is especially critical to have a properly functioning binocular system in patients already deficient in the sense of hearing. The importance of binocularity testing cannot be stressed enough, as strabismus may occur along with many syndromal causes of deafness, including CHARGE syndrome, congenital CMV, Down syndrome, and Marshall syndrome.[16-19,22-25]

Considerations After the Exam

At the conclusion of the exam, it is important to reinforce what was discussed during patient education. Optometrists should be aware that there are companies that will translate written material (including healthcare jargon) into easy-to-understand written English or DVD format with intended use for sign language users. In fact, some of these companies offer a turnaround time of as little as 24 hours (see Resources section).

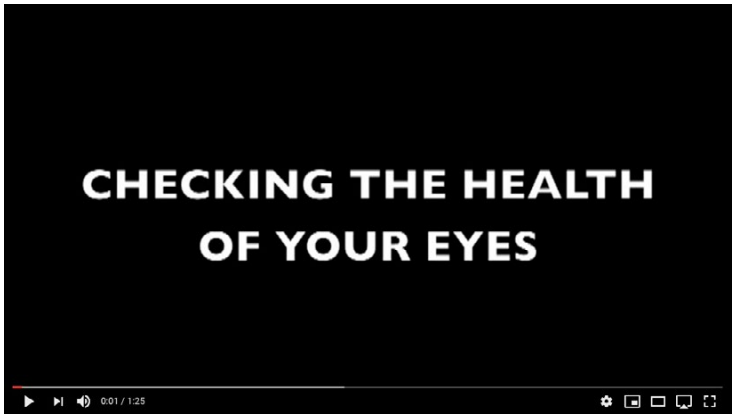
The best patient care is also provided by properly educating the patient in the event that optical correction or therapeutic treatment is necessary. Providing explicit directions on where to go and how to obtain the prescribed mode of correction or medication is most helpful. With regard to the spectacle correction of patients who are deaf, strong consideration for polycarbonate or other impact-resistant lenses should be given in order to afford additional ocular protection given the patient's pre-existing auditory deficit.

For future exams, it is helpful to have the patient's medical records clearly marked with their communication requirements. For instance, in an easily visible chart location, special chart notes might be written, such as, "ASL user with limited lip-reading ability. Slower pace necessary. Written materials found helpful, Arial font size 14 used." Therefore, at follow-up exams the office staff and doctor will be able to pick up seamlessly where the previous examination left off.

As previously mentioned, it is estimated that one-third of all cases of deafness are syndromal, and referrals may be necessary.[28] Although an optometrist's specialty may be the eyes, optometrists should be comfortable with referring the patient back to their primary care provider or to a genetic specialist if a syndromal cause of deafness is suspected, or to the appropriate specialist for consultation if the optometrist believes that the patient has not received a complete workup. Examples of referrals that may be indicated include coordination of care with a nephrologist for those suspected of having Alport syndrome or with a cardiologist for those with Down syndrome.[14,15,22,23]

Conclusion

As primary eye care providers, optometrists have the ability to improve a deaf patient's ability to maximize their visual function significantly. Simple modifications, both inside and outside of the exam room, and creative strategies, along with the use



Video: *Checking the Health of Your Eyes*

Video: *Pretesting*

of various optometric tools, can make a substantial difference in a deaf patient's examination experience. Most importantly, the optometrist plays a critical role in helping the deaf patient compensate for their auditory deficit and optimize their interactions with their surroundings.

Resources

Companies that will translate written material into plain English or ASL:

Integrated Translation Services, LLC
SignAll

Companies that will translate written material into plain English or BSL:

TeamHado
AC2.com
Remark!

Companies that provide deaf awareness training:

Deaf Student Solutions
Deaf Resource Centre
Deaf Aware
Deafworks
Vicdeaf

Companies that provide deaf equality training:

Deafworks
RNID
Centre for Deaf and Hard of Hearing People

Companies that provide live, online ASL interpretation:

Alta Video Remote Interpreting
LanguageLine Solutions
Karasch American Sign Language Service

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