

Management Of Deaf And Mute Completely Edentulous Patient Using Various Communication Aids During Complete Denture Rehabilitation- A Review And A Case Report

Case Report

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Abstract

Background: Hearing impairment is a condition in which patients are fully/ partially unable to detect some frequencies of sound that are perceived by normal individuals. It can be congenital/acquired, conductive/sensorineural (with associated speech impairment)/mixed; unilateral/bilateral, and mild/moderate/severe/profound.

Management of a deaf and mute completely edentulous individual is always challenging. Hence, a prosthodontist needs to be sensitive to the non-verbal mode of communication

Case Report: A 57-year-old female patient reported with a chief complaint of missing upper and lower teeth and inability to chew. She is suffering from hearing loss and difficulty in speaking due to childhood trauma. Medical records revealed sensorineural bilateral severe hearing loss (80 dB) and speech impairment.

Intraoral examination showed completely edentulous maxillary and mandibular arches.

The rehabilitation with conventional complete denture was successful by establishing an effective communication with patient and reciprocation of the functional movements by the patients, upon using combination of 4 different modes of communications like sign languages, visual aids –models, videos, lip-reading by the patient and by the guidance of interpreter/ bystander.

Conclusion: The challenge of communicating with deaf and mute during treatment phase of complete denture could be overcome by using combinations of communication modes rather than relying on a single mode. Visual aids and sign language gave better responses than other modes.

Introduction

Hearing impairment is “ a condition in which patients are fully or partially unable to detect some frequencies of sound that are perceived by normal individuals”. As per the WHO report 2021, 466 million individuals are suffering from hearing impairment problems (includes 34 million children and 432 million adults) and estimated that by 2050, over 700 million people, i.e. 1 in every 10 individuals will have disabling hearing loss.[1] Hearing loss is also accompanied by speech impairment. Such impairment caused by trauma/head injury/loud noises/inherited genetically/aging process results in sensorineural hearing loss (SNHL) resulting from damage to the structures in the inner ear/auditory nerve/auditory pathway. 90 % of the hearing loss in adults is SNHL and consid-

ered as the most common type of hearing loss.[1] Even though the hearing loss and speech disability is not fatal, it has a negative impact on patients' life, creating a social stigma which in turn affects mental health.

Prosthodontic management of a deaf and mute completely edentulous individual is always challenging especially to execute the various functional movements by patients with tongue, jaws, and oral musculature during impression making, jaw relation, trial insertion, and denture insertion. Hence, a prosthodontist should be sensitive to the nonverbal mode of communication such as facial expressions, sign languages, postural movements, visual aids, etc. as a mode of conveying the information during the treatment phase and for post-insertion care.

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This article gives information about the hearing loss and speech impairment along with its treatment recommendation and communication mode to be adopted during the treatment through a review and case report that describes the use of combination of non-verbal communication aids like sign language, expression, visual aids, models, and guidance by the bystander (lip reading) to rehabilitate the completely edentulous deaf and mute patient (sensorineural hearing loss and speech impairment) with a conventional complete denture successfully.

Hearing Loss And Deafness

- A person is said to have hearing loss when they are unable to hear particular frequencies of sound that are perceived by a normal individual
- Normal hearing indicates hearing thresholds of 20 dB or better in both ears.
- Disabling hearing loss is a condition in which hearing loss is above 35dB in the better ear.
- Hard of hearing refers to those with hearing loss ranging from mild to severe. They can use spoken language for communication. They also benefit from hearing aids, cochlear implants, and other assistive devices & captioning.
- 'Deaf' individual has profound hearing loss, indicates very little or no hearing. Use sign language for communication.[1]

Types Of Hearing Loss: [2]

They are of mainly 4 types:

- **Conductive Hearing Loss:** Resulting from something that prevents sounds from passing through the outer or middle ear. Often treated by medicine or surgery.
- **Sensorineural Hearing Loss:** Results due to damage in the inner ear or auditory nerve or auditory pathway.
- **Mixed Hearing Loss:** Combination of both the conductive and the sensorineural hearing loss.
- **Auditory Neuropathy Spectrum Disorder:** The condition in which the sound enters the ear normally, but, the sound is not organized in a way that the brain can understand due to damage to the inner ear or the hearing nerve.

Hearing loss can also be:

1. Unilateral/Bilateral: Hearing loss occurs in one / both the ear respectively.
2. Pre-lingual/ Post-lingual: Hearing loss that occurs before/ after a person learn to talk respectively.
3. Symmetrical/Asymmetrical: Hearing loss is similar in both ears/varies in each ear respectively.
4. Progressive/Sudden: Hearing loss that worsens over a period time/happens quickly respectively.
5. Fluctuating/Stable: Hearing loss that gets either better or worse over time/stays the same over time respectively.
6. Congenital/Acquired or delayed onset: Hearing loss is present at birth/appears sometime later in life respectively.

Etiology Of Hearing Impairment: [1, 2]

Conductive hearing loss: The following can cause conductive

hearing loss.

- earwax
- hole/defect in the tympanic membrane
- benign tumors
- obstruction by foreign objects
- deformations in the outer or middle ear
- blockade of Eustachian tube due to common cold

Sensorineural hearing loss: Damage to the hair cells/neural pathway results from:

- hereditary
- injury to 8th cranial nerve
- infections
- head injury/trauma
- autoimmune disease
- Meniere's disease
- certain drugs or medications- streptomycin
- vascular/circulation problem
- loud noise (>80 dB)

Classification For Hearing Impairment

Goodman classification (1965). (Table 1). [3].

WHO's first classification of hearing impairment was put forth in 1986, modified to current version (published in 1991) (Table 2).[4]

GBD Expert Group revisited the WHO classification and proposed new classification systems in 2010 with inclusion of certain changes (Table 3). [4]

Role Of Audition In Voice/ Speech Production [5, 6]

- Voice/ speech is produced by the integration of the respiratory, phonatory, articulatory, resonatory, nervous system,, and by the 6th component audition according to Lawson et al.
- Audition – The mechanism involves reception and interpretation of speech. Audition not only permits oral communication but also enables the individual to check, guide and control own speech output.

- ✓ Provides information about voice targets, for correction of pitch, volume, and other attributes to create an intelligible speech.
- ✓ Provides feedback about environmental conditions, which is vital in noisy situations, so that the speaker knows to enunciate more clearly, to increase amplitude, and to slow down the speaking rate to improve intelligibility.

The auditory system two types of control over speech production.

1. Feedback control – Monitor the performance of task during execution and deviation from desired performance, which are corrected in accordance with sensory information
2. Feedforward control – In this task is executed using previously learned commands, without relying on incoming task-related sensory information.

Auditory feedback influences both feedforward and feedback

Table 1. Goodman’s Classification of Severity of Hearing impairment (1965) [4].

Classification	PTA range in dB HL
Normal Hearing	10 to 15
Slight Hearing Loss	16 to 25
Mild Hearing Loss	26 to 45
Moderate Hearing Loss	46 to 55
Moderately-severe Hearing Loss	56 to 70
Severe Hearing Loss	71 to 90
Profound Hearing Loss	91 and more

Table 2. WHO’s Grades of Hearing Impairment (1991) [2].

Category	Pure tone audiometry	Hearing experience in a quiet environment	Hearing experience in a noisy environment
Normal hearing	-10 to 4.9 dB hearing level. 5 to 19.9 dB hearing level.	Excellent hearing	Good hearing
		Good hearing	Rarely have difficulty in following/ taking part in a conversation
Mild hearing loss	20 to 34.9 dB hearing level.	Does not have problem in hearing what is said	May have real difficulty following / taking part in conversation
Moderate hearing loss	35 to 49.9 dB hearing level	May have difficulty hearing a normal voice	Has difficulty in hearing and taking part in conversation
Moderately severe hearing loss	50 to 64.9 dB hearing level	Can hear loud speech	Has great difficulty in hearing and taking part in conversation
Severe hearing loss	65 to 79.9 dB hearing level	Can hear loud speech directly in one’s ear	Has very great difficulty in hearing and taking part in conversation
Profound hearing loss	80 to 94.9 dB hearing level	Has great difficult hearing	Cannot hear any speech
Complete or total hearing loss	95 hearing level or greater	Profoundly deaf, hears no speech/ loud sounds	Cannot hear any speech or sound
Unilateral hearing loss	< 20 dB hearing level in the better ear, 35dB or greater in the worse ear	Does not have problems unless sound is near poorer hearing ear	May have real difficulty in following / taking part in a conversation

Table 3. Grades of hearing impairment as recommended by the Global Burden of Disease Expert Group on Hearing Loss- 2010 [2].

Grades of impairment	Corresponding audiometric ISO value	Performance	Recommendations
0: No impairment	25 dB or better	No / very slight hearing problems. Able to hear whispers.	None
1: Slight impairment	26 – 40 dB	Able to hear and repeat words spoken in normal voice at 1m	Counselling.
			Hearing aids may be needed
2: Moderate impairment	41 – 60 dB	Able to hear and repeat words using raised voice at 1m	Hearing aids.
3: Severe impairment	61 – 80 dB	Able to hear some words when shouted into better ear	Hearing aids.
			If hearing aids are not available then lip reading should be taught.
4: Profound impairment including deafness	81 dB or greater	Unable to hear and understand even a shouted voice	Hearing aids may help in understanding words.
			Additional rehabilitation required.
			Lip- reading and sometimes signing needed.

Figure 1. Visual aid for patient education.



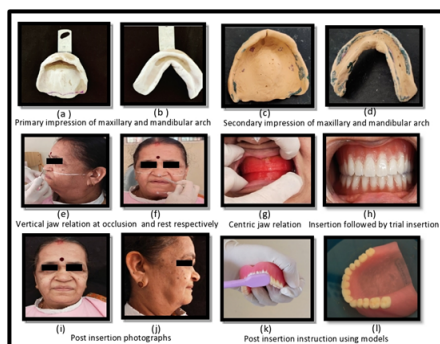
Figure 2. Instructions to deaf and mute patient using sign languages during complete denture fabrication.



Figure 3. Interpreter (bystander) aiding in lip-reading of words like ‘emma’, ‘om’, ‘m’ for recording vertical dimension at rest.



Figure 4. Steps in complete denture fabrication and complete denture models used to give post-insertion instructions.



control mechanisms in speech and voice production.[6]

Speech hence produced are of two types

Spoken speech: [5-9]

Spoken speech means understanding spoken word and expressing the ideas in speech

Mechanism:

Sound is heard(require an intact auditory pathway from ear to

primary auditory centre (area 41)



Sound must be able to understand (require an active auditory psychic area- area 20, 21)



Interpretation and understanding of auditory and visual informations by Wernicke's area-(area 22)



Broca's speech area (area 44) process the information received into a detailed and coordinated pattern of vocalization.



Pattern is projected into motor cortex, which initiates appropriate movement of lip, tongue, and larynx to produce speech.

Written speech: [5-9]

Written speech means understanding written words and expressing the ideas in writing.

Mechanism:

1. Viewing the word (requires intact visual pathway, area- 17)



2. written symbols are interpreted (visuopsychic area- area18, 19)



3. express ideas in writing (Dejerine's area – area 39)



4. converted to auditory form (Wernickes area- area 22)

Speech Disorder

A speech disorder is a condition in which a person has problems creating or forming the speech sounds or quality of voice needed to communicate with others.

Classified mainly as 3 types:

SOUND DISORDER: Due to motor/neurological disorder (traumatic brain injury, stroke), structural abnormalities (cleft lip and palate/after surgery of neoplasm), sensory/perceptual disorder(hearing impairment leading to speech sound difficulties, unable to hear the sound the way they produce them).

FLUENCY DISORDER: Associated with difficulties in rhythm and timing of speech characterized by hesitations, repetitions, or prolongations of sounds, syllables, words, or phrases. Eg: stuttering , cluttering.

VOICE DISORDER: It can be structural (vocal fold edema, nodules)/neurogenic (vocal tremor, paralysis of vocal fold caused by problems nervous system innervation to larynx).[10]

The presented case in this article is categorized based on above classification system of hearing impairment and speech disorder as severe sensorineural hearing loss (according to WHO 1991 and Goodman 1965) which is bilateral, pre-lingual, symmetrical, sudden and stable type with sensory speech sound disorder and spoken speech impairment. (The patient here is capable for written speech, the patient writes her name and signature but not other words as she is illiterate).

General Management Of A Deaf And Mute Individuals

Patients with hearing loss and speech impairment should be investigated and should undergo a full audiometric evaluation by a multidisciplinary team, including an otolaryngologist, audiologist, radiologist and speech/language therapist as early as possible.

Early Intervention (0-3 years)

Babies diagnosed with hearing loss should get intervention as soon as possible not later than 6 months of age because hearing loss can affect a child's ability to develop speech, language, and social skills.[11, 12] This include:

7:1:1 Hearing aids:

Hearing aids make sounds louder. They can be worn by people of any age, including infants (0-6 months).[11]

Cochlear and Auditory Brainstem Implants

A cochlear implant may help many children (even infants less than 12 months) and adult with severe to profound hearing loss. Unlike conventional hearing aid, cochlear implants do not amplify sound , instead they bypass the damaged part of auditory system and directly stimulate auditory nerve. They sends sound signals directly to the hearing nerve. Hearing aid and cochlear implant won't benefit individuals with severe to profound hearing loss due to an absent or very small hearing nerve or severely abnormal inner ear (cochlea), instead an auditory brainstem serves the role. This directly stimulates the hearing pathways in the brainstem, bypassing the inner ear and auditory nerve.

Both these implants have two main component- The inner component placed inside the inner ear, the cochlea, or base of the brain, the brainstem during surgery, and the outer component worn outside the ear after surgery. The outer component sends sounds to the inner component. These aids are used in sensorineural hearing loss. [11]

Bone anchored hearing aids

Used in children (even in 2- 4yrs)/adult with conductive or mixed or unilateral hearing loss (malformed outer/middle ear) and requires a functional inner ear. Specifically for children who cannot wear hearing aids 'in the ear' or 'behind the ear'. Here implants placed surgically in bone behind the ear and conduct the sound wave through the bone to inner ear. [11]

Special Education (3-22 years)

Instructions are specifically designed to address the educational and related developmental needs of older children with disabilities, or those who are experiencing developmental delays. Should begin as soon as hearing loss is diagnosed or 2- 5 years of age which ever is the first. At these age most of the speech development occurs.

Consult a speech therapist who build the communication by vari-

ous activities:

1. Help in developing proper grammar and sentences.
2. Exercises that helps strengthen and learn how to move your lips, mouth, and tongue to make certain sounds and also to allow swallowing if any difficulty exists in doing so.
3. Helps in learning various communication methods, such as:

- o sign language
- o finger spelling
- o writing
- o gestures
- o facial expressions
- o assistive technology

These skills along with hearing aids, cochlear or auditory brainstem implants, and other devices help a deaf and mute individual to hear and reciprocate to the commands and communicate.[11]

Other Assistive Devices

FM System

Helps the individual with hearing loss to hear in background noise. The frequency modulation signal system is the same as that of a radio system. Used along with hearing aids. An extra component is attached to the hearing aid that works with the FM system.[11]

Captioning

The conversation spoken is shown as sound track of a program on the bottom of the television screen as in television programs, videos, and DVDs. [11]

Text messaging

Telephone amplifiers

Flashing and vibrating alarms

Audio loop systems

Infrared listening devices

Portable sound amplifiers

TTY (Text Telephone or teletypewriter).[14]

Medical and Surgical intervention

Benefits individuals with conductive hearing loss, or one that involves a part of the outer or middle ear.

Conductive hearing loss due to chronic ear infection is treated with medication (antibiotics, anti-inflammatory drugs) and careful monitoring. Infections that persist even after using medication can be treated with a simple surgery by inserting a tiny tube into the eardrum to drain the fluid out.

Conductive hearing loss due to malformation of the outer and/or middle ear and can be treated by surgical placement of cochlear implant, auditory brainstem implant, or bone-anchored hearing aid, and sensorineural hearing loss by cochlear and auditory brainstem implants. [11]

Communication Modes Used For Treating A Deaf And Mute Patient

This includes:

Speech reading/ lip reading

Hearing impaired individuals are good speech readers. The practitioner or interpreter should speak facing the patient in normal pace with clear and good articulation, thence, allowing the reading of the lips. The medical terms should be conveyed in their language or English whichever is best known to them. It may vary with individual of same hearing loss based on their knowledge in Standard English or their own language. Hence, this alone cannot be considered as a means of communication instead a combination of speechreading and amplification enables to combine the auditory and visual cues successfully to carry out a conversation. [13]

Writing

The first opted communication alternative by a physician when the normal conversation is impaired. It can be used to communicate with hearing-impaired patients, along with speech reading with understandable or partly understandable patient speech. Writing alone can't be used a conversational mode as it is slow, frustrating and ponderous to use.

The response varies with patient's knowledge as well as with understanding of standard English / own language. An individual with pre-lingual hearing loss and who is illiterate, it is quite difficult to follow the instructions written and may require an interpreter to convey them.[13]

Visual Aids

A picture is always worth than a thousand words. Visual aids can be a chart, diagram or picture, videos, models that can be used to illustrate medical terminology or processes. This is advantageous to physician, deaf and mute patients and interpreter.

Tips to use visual aids:

1. Should be positioned vertical and close to patient without blocking by practitioner's face. Hence patient can view both the aid and practitioner at a time, thereby avoiding constant shift of visual focus.
2. Practice working with a visual aid from behind so that practitioner can point things out without changing the practitioner's posture and position of aids constantly.
3. Do not talk/ point intricacies in between while using visual aid as the patient can look only one thing at a time.[13]

Visual Language

There are various forms of visual language used by hearing impaired individuals. The use of same type of visual language that have been using outside would be preferred by most of the patient for better understanding and reciprocation of the commands given by practitioner procedure. This includes some combination of the following:

Finger Spelling

Each letter of the alphabet expressed by hand configuration, but this is difficult to understand for an untrained individual and slower than the spoken communication. However, any physician who can finger spell and read finger spelling-even badly-tremendously facilitates his relationship with deaf patients. As with any linguistic group, someone who is trying to communicate in their language means a great deal to the hearing-impaired person. By doing so patients feels that such a physician is more likely to accept and cares them and in turn, they will accept and trust the physician.[13]

Signs

Vocabulary and concepts in general situations and in medical or dental practices ,are expressed by a system of sign language alleviating the need to use finger spelling for and making rapid conversation .These basic sign along with facial expression, or with variation in the way the sign is produced made the conversation fruitful with better understanding.[13]

Manual or signed English

This mode of language is taught in schools for deaf and mute individuals where standard English is taught. Here sign is drawn from Ameslan (American Sign language) and finger spelling are integrated with the grammatical structure of standard English. This creates a bridge between visual language and standard English and lead to development of bilingual persons who can potentially operate well in both a standard English dominated society and in the hearing-impaired community. These "anglicized" forms of sign language are slower and more tedious to use.[13]

The Interpreter-Role and Function

An interpreter's role is to act as a mediator in between the two primary participants, thereby transmitting the information precisely and rapidly from the hearing-impaired to the hearing and back again in two basic situations:

- * When communication between one person to other is impossible.
- * When the an important information like explain procedure and consent for a major surgical operation or due to time constraints slow or occasionally inaccurate communication cannot be preferred.[13]

Tips On The Use Of An Interpreter:

1. Try to choose an interpreter certified by the National Registry of Interpreters for the Deaf.
2. Seat the interpreter as close as possible to you so that the patient avoids the "ping-pong" effect (excessive movement of the eyes between you and the interpreter).
3. Practitioner can monitor interpreter through side vision rather than interfering in between communication. This allows you to develop the ability to tell how well the interpreter is keeping up with you and thereby to pause when he or she falls behind. In regard to your role, always talk directly to the patient and avoid talking about a patient in the third person.[13]

Prosthetic Considerations

Case presentation

A 57 year old philosophical female patient reported to the Department of Prosthodontics and Crown & Bridge, JSSDC & H, Mysuru, with the chief complaint of missing upper and lower teeth and inability to chew. Patient had undergone extraction of teeth due to looseness in a sequence of mandibular anterior teeth first followed by maxillary anterior teeth, mandibular posterior teeth and mandibular posterior teeth. Past medical history revealed patient has rheumatoid arthritis since past 6 years and was under medication for the same. Also patient is suffering from hearing loss and difficulty in speaking since past 53 years. Medical reports revealed bilateral severe sensorineural hearing loss and speech impairment (hearing loss of 80 dB HL in both the ears) (according to classification by Goodman in 1965, WHO 1991) (Table 1 , Table 2). Considered as profound hearing loss category according to GBD Expert Group 2010 (Table 3). Patient had a history of fall and head injury during childhood at the age of 4 following which she lost the hearing and speech ability. She consulted an ENT specialist and started using hearing aid at the age of 25. Even though it was helpful in hearing , she discontinued the use of same after 11/2 year as it is a body wrap type and larger in size which led to discomfort in wearing the same. Further she adapted to the situation and started lip reading and communication via sign languages and facial expression. She also experienced difficulty in reciprocating the words spoken by a stranger even in loud tone, at the same time she found it easy to understand and reciprocate back among her daughter and family members.

Intraoral examination revealed completely edentulous high well rounded maxillary and mandibular arch, with squarish and U shaped arch form respectively. Unilateral maxillary anterior undercut (right labial aspect) present.

In this case, the management of patient mainly focused on utilization of 4 different modes of communication for hearing and speech impaired individual during fabrication of conventional complete denture like:

1. Visual aids- Include videos and models (Figure 1 & 4 respectively)
2. Sign language- Different signs were used individually for conveying different functional movements prior to procedure in-office. (Figure 2)
3. Bystander as an interpreter as the patient is illiterate to convey the information to and from the practitioner and patient.(Figure 3)
4. Lip reading technique – For carrying out the procedure requiring phonetics like jaw relation etc.(Figure 3)

Prosthetic management of the presented edentulous deaf and mute patient

The treatment plan was fabrication of conventional complete denture as patient was not ready for any invasive procedure like implant supported denture.

All through the appointments patient was accompanied by her daughter (acted as an interpreter/ translator) due to the difficulty in hearing and speech. Patient education about the treatment was well explained with the help visual aid- video (Figure 1), case history and other relevant information regarding the patient were

collected from patient with the help of by stander during the first appointment. The consent for treatment and taking photographs was obtained from the patient and her daughter as well.

The medical reports from All India Institute of Speech and Hearing, Mysuru described that the patient has bilateral severe sensorineural hearing loss and speech impairment (hearing loss of 80 dB HL in both the ears) since 4 years of age due to alleged history of fall.

Two days before each appointment videos related to the treatment (impression making, maxillomandibular relations, try in and post insertion procedures) were send to the patients' daughter via smartphone for better understanding of the procedure by the patient, to practice the required tongue/oral musculature and jaw movements and there by reducing the anxiety and fear to the procedure.

In the second appointment primary impressions (DPI Pinnacle Impression compound) (Figure 4a, 4b) were made followed by fabrication of a primary cast on to which a special tray was fabricated with self-cure acrylic resin (DPI RR Cold cure acrylic), border molding (DPI Pinnacle tracing stick) was done and final impressions (DPI Impression Paste- ZOE) (Figure 4c, 4d) were made and a master cast (Type III-Kalstone) was fabricated. These procedures were made successful by using visual aids like videos played in laptop and asking the patient to reciprocate the same. Also a synergistic effect in patients' response was seen when sign languages and the guidance by the bystander/ interpreter to evoke same movements (as in cases of Valsalva maneuver etc.) was used along with the visual aid (Figure 2a to 2m).

During the second appointment itself patient was educated about the next procedure along with videos; and the patient was guided accordingly. Related videos were sent to patients daughter for practicing the movements. Hence, the third appointment for recording jaw relation was made easier. Record bases (Shellac base plate- MAARC) and rims (Hindustan Modelling Wax- No. 2) were constructed conventionally for jaw relations. Patient was positioned upright and occlusal rims were inserted and checked for lip support, visibility – at rest, high lip line low lip line by using sign language- smile (Figure 2n) along with guidance by the bystander through facial expression. Followed by recording orientation jaw relation, vertical jaw relation at rest by seating patient in relaxed position and phonetic method, here interpreter reciprocate the word spelled by practitioner which is then read (lip reading) by the patient- "m, Emma, Om" (Figure 3, 4f); and vertical dimension at occlusion by sign language asking patient to swallow and occlude and facial measurements recorded and obtained the freeway space (Figure 2o, 2p, 4e). Phonetic methods (f, v, s-) were used to evaluate closest speaking space with the help of interpreter as previously mentioned. The horizontal jaw relation/ centric relation was recorded by guiding mandible to most anterosuperior position in glenoid fossa bimanually / guiding by touching the tongue in the soft palate and swallowing and occluding, all these movement was made easier by demonstrating using s videos and sign language (Figure 2o to 2s).

Followed by teeth arrangement (Ruthinium Dental, Acryrock) in Class I occlusion relation and the try-in. During try-in interpreter played a major role by reciprocating phonetics used to evaluate closest speaking space, freeway space and to evaluate anteropos-

terior and vertical overlap relation of anterior etc. by lip reading (Figure 3). Then evaluated for any discomfort or pain via sign language and patient satisfaction with the appearance was also assessed through facial expression and thumbs up/down signs (Figure 2t, 2u, 2v).

After try-in maxillary and mandibular dentures were acrylized using heat cure PMMA resin (Dentsply-Lucitone) and denture insertion was done.

During insertion appointment, the denture is inserted and checked for the comfort and fit of the complete dentures by various movements of oral musculature that were displayed on the laptop screen and by the sign languages (Figure 4h). Then checked for pressure points and intaglio surface irregularities, this was also evaluated with the help her facial expression and sign language indicative of discomfort/ pain. Patient satisfaction on adaptation and function of denture was evaluated by using signs of thumbs up / thumbs down and by facial expression and gestures. (Figure 2u, 2v). post insertion instructions given using complete denture models (Figure 4k, 4l).

Patient was then recalled after 24 hours, 1 week, 1 month intervals and 3 months. Patient was highly satisfied with the denture.

Discussion

According to the data provided by World Health Organization (WHO), the prevalence of hearing loss amongst individuals in India is around 6.3 % (63 million individuals suffering from significant hearing loss). [1] The prevalence of adult-onset deafness in India is 7.6 % and childhood onset is about 2 %. more than 90 % of hearing loss is Sensorineural hearing loss (SNHL) caused by damage to the structures of inner ear or auditory nerve. [14] Whatever be the type or cause of hearing loss and associated speech impairment, the diagnosis and intervention at right time can resolve the problem to a great extent, if not it can impair the social, and mental well-being of the individual creating a stigma from society. Hence when such individuals approach the dental or medical practitioners seeking treatment, communicating in their preferred mode is always beneficial to both the patient as well as to the practitioner. Hence it is the responsibility of a practitioner to learn those skills of communication.

Communication modes like:

- Writing should be the first alternative opted when normal conversation is impaired. For illiterate it is difficult to understand Standard English or even their language in written form. In this case, patient has pre-lingual hearing loss and patient was also illiterate, hence excluded. At same time this mode is slow, ponderous, and frustrating. Hence require an interpreter or use of other method to convey it. [13]
- Speech reading/ lip reading varies in individual based on their knowledge in standard English or in their language. Hence a combination of speech reading, visual cues as depicted in this case report can be opted along with amplification if required. [13]
- Visual language like finger spelling and manual English (grammar to form sentence), same problem arises where the individual should be trained properly for expressing each letter and grammatical structures using hand. These are usually taught in special

schools.[13]

- Visual sign language is the most comfortable and easily conveyed form of expressing vocabularies/ concepts in medical or dental practice. Doesn't require any special training, even a stranger can communicate easily with a deaf and mute individual. A good rapport with patient can be achieved with this alone, without any interpreter assistance or other aids. [13, 15, 16]
- Visual aids like videos as in this case report, models, diagrams, charts, etc. adds to the easy understanding and reciprocating the required functional movements easily during the procedure, also it can reduce the anxiety if patient is educated with these aids priorly. [13, 15, 17]

A study conducted by Gupta L et al in 2018 on evaluation of various visual methods like video and photographs to enhance the skills between dental care providers and speech and hearing impaired have revealed that retentiveness of the instruction given through these mediums lasted upto 1 month and gave around 80% correct response when compared to those groups where no medium like these were used.[15]

- Above all an interpreter, the bystander in the discussed case also plays an essential role when illustrating medical procedure or terminology or while taking consent or when time constraints exists where slow or inaccurate communication cannot be preferred. [13]

Among these different methods used visual aids and sign language efficiently conveyed all necessary commands required during the procedure and reciprocation of the same by patient. Along with these interpreter and lip reading technique enhanced the outcome especially during procedure where phonetics is opted. During the combination of visual aids like videos and sign language the patient responses were better throughout the procedure compared to other techniques.

Conclusion

A prosthodontist should be prudent enough to select right communication method to develop a rapport and to give necessary information to deaf and mute patients while treating them. This will make them feel more comfortable and confident while communicating and in-turn they will reciprocate all the necessary movements required for fabrication of the prosthesis. Especially in this COVID pandemic time it's difficult to work without PPE, hence

communication with deaf and mute patients via facial expression by practitioner doesn't play much role. At the same time movements of jaws or oral structures cannot be demonstrated by the practitioners by using all these equipments. Even though visual aids (video) and sign language are superior, it is always beneficial to use combination of various methods like visual languages (sign language), visual aids like video, photographs, charts, models etc., postural movements, lip reading, writing techniques and an interpreter (if condition demands) to communicate with patient for making the treatment successful. This not only save the time but also even prevent cross infections & exposure to infection in this present scenario.

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