

HEARING LOSS(HL) PATIENTS` TREATMENT APPROACHES, MENTAL HEALTH ISSUES, AND SOCIAL ORAL PATHOLOGIES- part 2-treatment plan

Lucian Stefan Burlea¹⁺, Liana Aminov²⁺, Veronica Serban Pintiliciuc^{3*}, Ovidiu
Stamatin^{4*}, Tudor Hamburda²⁺, Laura Elisabeta Checheriță²

¹"Gr. T. Popa" U.M.Ph.- Iași, Romania, Faculty of Dentistry, Public Health and Management Department

²"Gr. T. Popa" U.M.Ph.- Iași, Romania, Faculty of Dentistry, Odontology, Periodontology and Fixed Prosthesis Department

³"Gr. T. Popa" U.M.Ph.- Iași, Romania, Faculty of Dentistry, Pedodontics Department

⁴"Gr. T. Popa" U.M.Ph.- Iași, Romania, Faculty of Dentistry, Oral-Implantology, Dental Prostheses Technology and Removable Dentures Department

*Corresponding authors; e-mail: ovidiustamatin@yahoo.com and veronica.serbanpintiliciuc@umfiasi.ro

+ These authors contributed equally, and they have the same scientific rights as the first authors.

ABSTRACT

Hearing loss (HL) is the third most prevalent chronic health problem among older adults and is quite common in our study group research. Our study wants to illustrate the research on the connection between HL and depression as well as the therapeutic ramifications for diagnosing and treating comorbid like intraoral rehabilitation, HL, and mental disorders also.

Key words: hearing depreciation, depression, treatment, temporomandibular joint (TMJ), Temporomandibular disorders (TMDs), aging, intraoral rehabilitation.

Introduction Following a thorough clinical analysis of these patient typologies and a thorough paraclinical examination[1-10], the stages of the therapeutic plan are outlined, and subsequently, notable improvements are observed in both the function of the sense of hearing impaired and the stomatognathic system, taking into account the theories of the Costen stomatognathic dysfunctions and the auditory sensitivity level system, which can be improved through complex oral rehabilitation in a specific percentage of cases[11-14].

This study aims to highlight the literature on the relationship between HL
TREATMENT PLAN

We strongly recommend this template to be used for writing the article.

The first paragraph begins here. The number of paragraphs depends on the inner

and depression as well as the therapeutic implications for identifying and treating comorbid conditions such as HL, mental illnesses, and intraoral rehabilitation. Materials and procedures: 28 HL patients, ages 50 to 65, who came to the Prosthodontic Clinic at "Mihail Kogalniceanu," Iasi, for treatment of TMDs in conjunction with prosthetic treatment, comprised the analyzed study sample. After clinical and paraclinical supports and diagnosed management it will be indicated the treatment supportive directions.

structure of the paper.

Primary prophylaxis- Health education

Patient awareness of his bad oral hygiene (Figure 22):

- Advice on general oral hygiene:

Demonstration of modified bass technique: brushing teeth, suggestion for a toothbrush with medium/soft tufts, use of mouthwash and dental floss.

- Introduction of concept of regular flossing and non-cariogenic diet.
- Patient awareness of the risks of smoking/ alcohol.

Extraction of teeth 4.6, remaining roots of 3.6 and 4.7 (Figure 23).

Explanation of treatment plan and possible future complications: cause, duration, etc. (Figure 24).

Endodontic treatment of 3.2 3.1 4.2 4.3 and removal of old restoration extending from 4.3 to 4.6.

Establishing steps of treatment: schedule treatment plan.

Secondary prophylaxis/treatment outline (inc. pre-prosthetic)- treatment of diseases and prevent local complications: professional brushing and scaling; treating decays; solving periodontal disease; endodontic treatment unrelated to the abutment; extractions.

Tertiary prophylaxis (inc. pre-prosthetic)-prevent complications (loco-regional and general).

Prevention of further complications due to edentulous status by treatment with prosthetic solution: specificity: *mandibular fixed dentures and mandibular removable partial dentures*.

General health treatment:

- Knowing the general diseases of the patient and the treatment they might be doing meanwhile.
- Explanation of seriousness of health issue and emphasizing on taking his/her necessary medication.
- Explaining a balanced diet (less sugars, more proteins, no smoking, no alcohol, etc.)
- Writing down all the medications that the

patient takes on his/her chart.

- Making sure the patient is not taking anti-coagulant medications such as Aspirin, Warfarin, Heparin or having serious hepatic diseases.

Preliminary impression (Figure 25)

Before doing the abutments preparations. Is a negative image of patient's hard and soft tissue of the oral cavity using alginate.

Before doing the abutments preparations. Is a negative image of patient's hard and soft tissue of the oral cavity using alginate.

Abutments preparations

Local anaesthesia was used in preparing crown for insertion of future fixed dentures.

The procedure was sensitive and was done with a lot of care and patience.

Preparation is done in an angulation with the insertion axis of the tooth to facilitate insertion of the future prosthesis (Figure 27).

Dental Impression. WASH TECHNIQUE. Adequate amount of Putty was mixed with the activator. It was inserted homogeneously in a previously verified impression tray. The tray was inserted centrally on the patient's mouth. Digital pressure was done until the *high viscosity silicon* was set (Figure 28).

After removing the impression from the oral cavity, we must check the impression to be sure it is done perfectly.

Now we prepare the "Low Viscosity Silicon" and place it on the previously done impression and re-insert it in the oral cavity of the patient (Figure 29).

This WASH technique records the finest details. The bite registration was done with high viscosity silicone. An impression of the patient's occlusion in *centric relation* was made for the technician to have the correct relationship between maxilla and mandible.

Obtained results

An important step for final adaptation of future prosthesis in conjunct prosthesis is metallic structure verification.

Metallic substructure: one “Nickel-Chromium” framework was made in the laboratory; bridge (conjunct prosthesis) from 3.2-4.3.

Extra-oral check on the cast: Verification of metallic substructure (Figure 30), (The metallic framework was cleaned with alcohol before insertion in the oral cavity). The insertion path and height of the metallic framework was checked.

Intra-oral check: adaptation of metallic substructure.

Metal framework had adequate adaptation and no further modification was necessary. Choosing the colour for ceramic. Using a “Colour key” (Figure 31) we chose the colour of the future ceramic layer. All the necessary data, including the colour, area that need more retention on metallic substructure etc., was written on a paper to be delivered to the technician.

Final restoration

Extra-oral checking of the final metal-ceramic restoration, fitting the final bridge and checking the occlusion. Making sure that we will have no premature contacts and “free space” for the cement (Figure 32).

Checking premature contact points is done using rotary instrument to remove them and articulation paper (Figure 33).

Cementation of the final restorations registered by doing luting of the prosthetic restoration with temporary cement– Repin and definitive with Fuji-glass ionomer (Figure 34).

Patients’ follow-up, the verification and definitive cementation, and patient also received his acrylic mandibular partial removable denture for accomplish the

complete mandibular treatment and define a stable occlusion and prevent the dys-homeostatic incidents.

RESULTS AND DISCUSSIONS

Following the complex oral rehabilitation, the treatment being carried out both from the point of view of restoring oral hygiene, the treatment of dental caries, simple or complicated, root caries, endodontic periodontal treatments and the treatment of cl I-IV Kennedy edentulous teeth with strict modifications, to- also considered the treatment of occlusal rebalancing and cranio-mandibular repositioning with the wearing of re-relaxation braces and the related balneal-physiotherapy treatment (Figure 35).

The results at the level of the study group obtained from the evaluation after the application of oral rehabilitation procedures are presented in Table 2. The application of the questionnaire after the treatments performed, proved to be structured in the following way: 4(14.29%)=9; 5(16.85%)=8; 5(16.85%)=7; 6(21.43%)=6; 8(28.57%)=5. There are still average results in terms of restoring the desired parameters like: mental and hearing status and we try testing for a longer period to observe at the 2nd time, results that can change to be able to give plausible references.

The mandible, the ear, and the TMJ share important embryologic and anatomic connections [15]. Despite that, the role of mandibular malposition and TMJ dysfunction is frequently overlooked in the management of otitis media. Relation between various ear conditions and TMJ has been known for a century, with a possible role for orthognathic therapy in ameliorating ear function and dental malocclusion also [16, 17].

Old studies and theories said that recognizes that the loss of molars and premolars produces a distalizing movement of the condyle which causes direct pressure on the Eustachian tube (ET), ear structures and the auriculo-temporal nerve. It shows that a vertical collapse of the occlusion is responsible for triggering TMDs, a statement representing the birth of the Mechanical Displacement Theory. The pathogenetic role of the TMJ function, mandible position, and malocclusion has been hypothesized in this complex scenario [18].

Oral appliance and the orthodontic treatment could be seen as a myo-functional treatment since they permanently change the vectorial forces of the medial pterygoid muscles and TMJ ligaments, with possibly more durable effects compared to *Eustachian tube (ET) rehabilitation therapy*, whose ending could be followed by a relapse once the muscular dysfunction re-establishes due to malocclusion [19-21].

TMDs is a physical manifestation of a more extensive systemic problem and are termed as a common condition involved in orofacial pain [22, 23]. It is common in orofacial pain and can be linked to comorbid conditions like headaches, tinnitus, and HL. Neurological disorders like Parkinson's and

Cervical Dystonia may cause TMDs. Undiagnosed disc dislocations, bone loss, trauma, and bruxism can cause neurologic, dystonic, and neuromuscular disorders.

Peng, showed that, patients that were subsequently treated for TMDs, 90.2% of it showed disappearance of or significant improvement in aural fullness, suggesting TMDs as a cause of the aural fullness and physiotherapy which includes heat therapy, acupuncture and massage is effective. To the author's knowledge, there has been a case report showing that ear fullness was successfully managed as a TMD. In general, changes in the state of hearing, the slight increase in its quality and implicitly in the quality of life, include the improvement of the state of anxiety [24] or depression that complicates situations by removing it from the socially engaged system [25].

CONCLUSION

The treatment of patients taken in study, who are frequently encountered in our clinic has demonstrated a recovery through complex oral rehabilitation that certainly requires time, dedication, and interest, in favour of the patient to obtain a homeostasis at the level of the stomatogenous system and adjacent to it.



a) BEFORE



b) AFTER

Figure 22. Oral Hygiene (Pre-Prosthetic plan treatment).

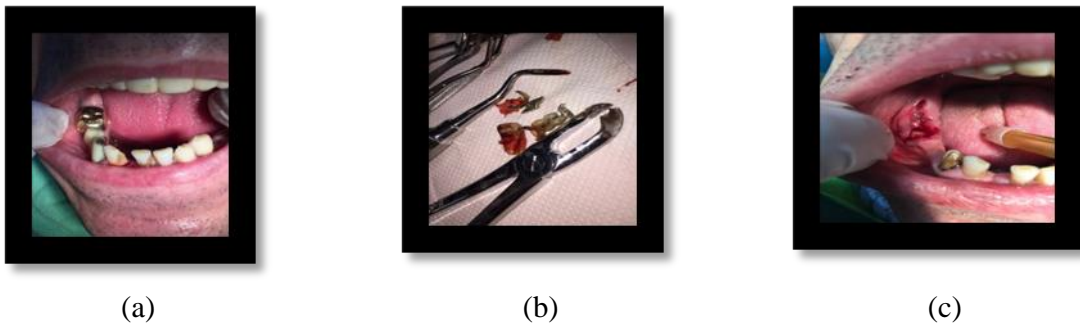


Figure 23. Extractions (Pre-Prosthetic reparation plan treatment).

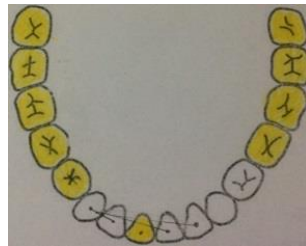


Figure 24. Therapeutic solution indicators at mandibular level sector, Dynamic diagram (social case, regular we must have the informed consent of patient to action at previous treatment); Polynomial law is satisfied for fixed areal future conjunct prosthesis $P = 1$; $R = 3+1+1+1 = 6$. $R > P$.



Figure 25. Preliminary impression.



Figure 26. Endodontic treatment of 3.1 / 3.2 / 4.2 / 4.3.

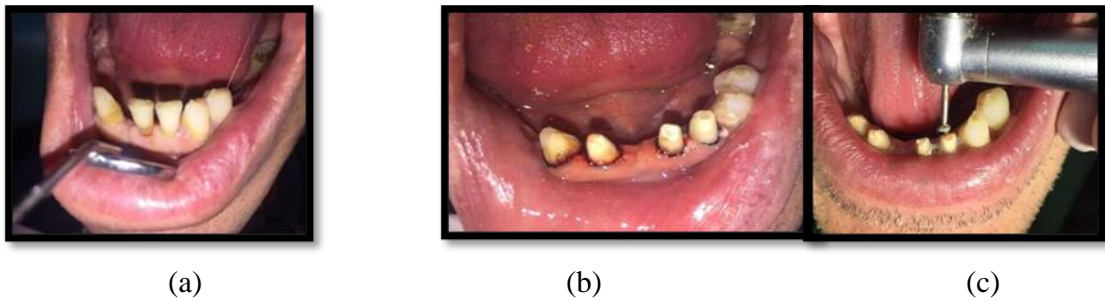


Figure 27. Protetic (*Pro-Prosthetic*) aspects from mandibular incisors-abutments preparations.



Figure 28. Dental impression partial result preliminary impression and clinical aspects through registration of impression at mandibular arch.



Figure 29. The mandible-functional impression (WASH technique) and the bite registration results.



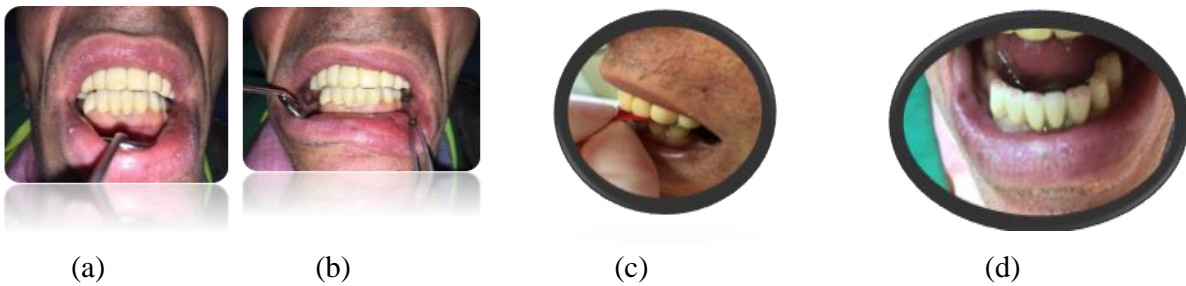
Figure 30. Adaptation of metallic substructure. Intra-oral and extra-oral check.



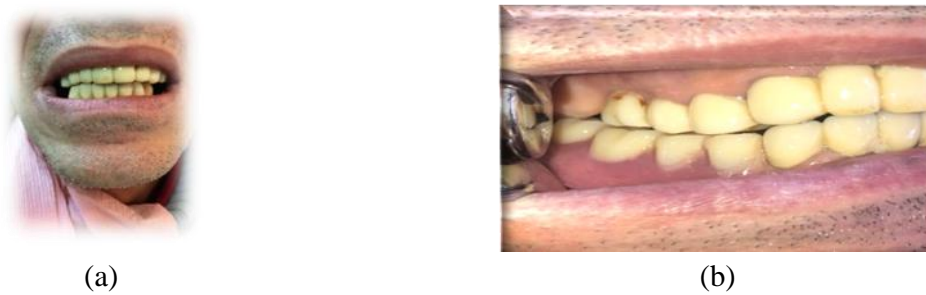
Figure 31. Colour key-device.



(a) (b) (c) (d)
Figure 32. Extra-oral checking of the final metal-ceramic restoration- multiple view.



(a) (b) (c) (d)
Figure 33. Intraoral adaptation of final metal-ceramic prosthesis.



(a) (b)
Figure 34. Cementation of the final prosthetic restoration

Table 2. Scoring results of Souleroy scale representation.

Patients number, and (%)	Scoring (Scale 0-10)
4 (14.29%)	9
5 (16.85%)	
5 (16.85%)	8
5 (16.85%)	7
6 (21.43%)	6
8 (28.57%)	5

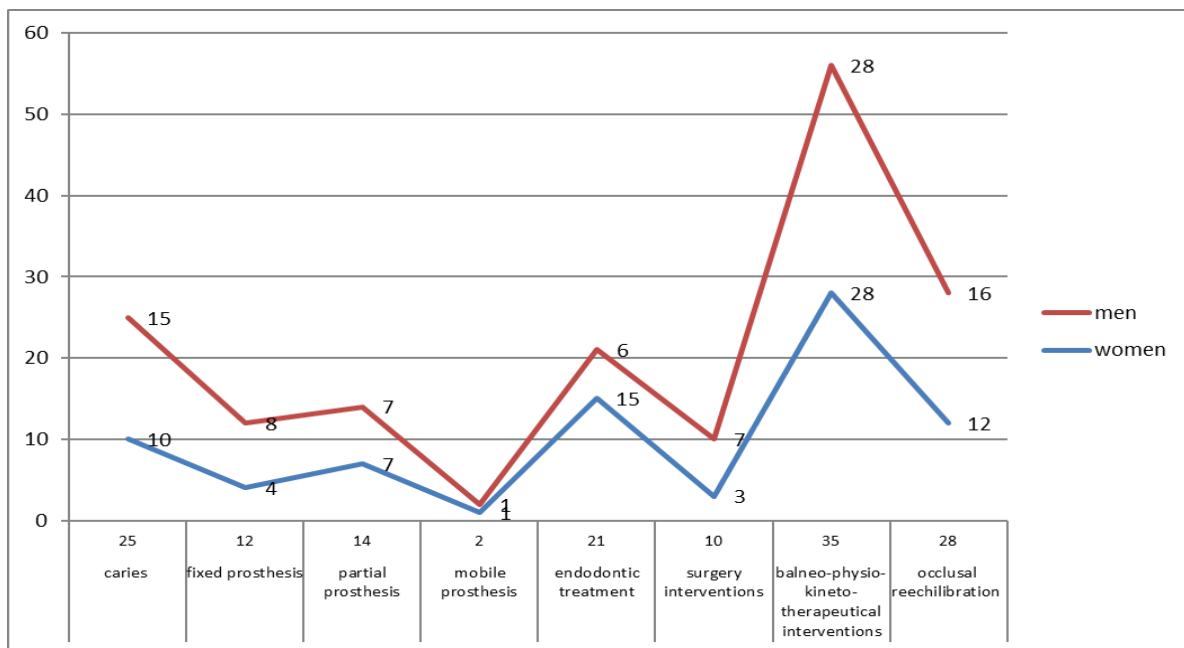


Figure 35. Repartition of intra-oral procedure complex rehabilitation.

REFERENCES

1. Armstrong N, Deal J, Betz J, Kritchevsky S, Pratt S, Harris T, et al. Associations of hearing loss and depressive symptoms with incident disability in older adults: health, aging, and body composition study. *J Gerontol a Biol Sci Med Sci.* 2020, 75:531–6. doi: 10.1093/gerona/gly251
2. Cărăușu EM, Dascălu CG, Zegan G, Burlea LȘ, Lupu IC, Antohe I. The General and Oral Health Status in Older Adults from Rural Environment of Iasi County, Romania. *RCIS/ Review of Research and Social Intervention/Revista de Cercetare si Interventie Sociala*, 2017, 59, 187-208.
3. Contrera K, Betz J, Deal J, Choi J, Ayonayon HN, Harris T, et al. Association of Hearing loss and emotional vitality in older adults. *J Gerontol Psychol Sci.* 2016, 71:400–4. doi: 10.1093/geronb/gbw0051.
4. Brewster KK, Ciarleglio A, Brown PJ, Chen C, Kim H, Roose SP, et al. Age-related hearing loss and its association with depression in later life. *Am J Geriatr Psychiatry.* 2018, 27:788–96. doi: 10.1016/j.jagp.2018.04.00
5. Zegan G, Anistoroiaie D, Cernei ED, Toma V, Sodor A, Cărăușu EM. Assessment of patient anxiety before dental treatment. *RJOR/Romanian Journal of Oral Rehabilitation*, 2019, 11 (1): 76-82.
6. Alexopoulos G, Meyers B, Young R, Kalayam B, Kakuma T, Gabrielle M, et al. executive dysfunction, and long-term outcomes of geriatric depression. *Arch Gen Psychiatry.* 2000, 57:285–90, doi: 10.1001/archpsyc.57.3.285
7. Scholes S, Biddulph JP, Davis AC, Mindell JS. Socioeconomic differences in hearing among middle-aged and older adults: cross-sectional analyses using the Health Survey for England. *BMJ Open*, 2018, 8.
8. Wu C. Bidirectional Association Between Depression and Hearing Loss: Evidence from the China Health and Retirement Longitudinal Study. *Journal of Applied Gerontology*, 2021, 41, 971-81.
9. Tsimpida D, Kontopantelis E, Ashcroft DM, Panagioti M. The dynamic relationship between hearing loss, quality of life, socioeconomic position and depression and the impact of hearing aids: answers from the English Longitudinal Study of Ageing (ELSA). *Social Psychiatry and Psychiatric Epidemiology*, 2021, 57, 353 - 362.
10. Hilgenberg PB, Saldanha AD, Cunha CO, Rubo JH, Conti PC. Temporomandibular

- disorders, otologic symptoms and depression levels in tinnitus patients. *J Oral Rehabil.* 2012, 39(4):239-44. doi: 10.1111/j.1365-2842.2011.02266.x. PMID: 22035253.
11. Checherita LE, Rezus E, Leon MM, Stamatin O, Cărașu EM. Impact of medication with Diclofenac sodium vs. Etoricoxibum in patients with inflammatory reumatic pathology, prosthetic complications, and Algo-dysfunctional Syndrome. *Revista de Chimie (Rev. Chim.)*, 2017, 68 (5): 977-81, <https://doi.org/10.37358/RC.17.5.5594>.
 12. Costen JB. Some features of the mandibular articulation as it pertains to medical diagnosis, especially otolaryngology. *Journal of the American Dental Association and Dental Cosmos* 1937, 24, 1507–1511.
 13. Burlui V, Morarasu C. *Gnatologie*. Editura Apollonia Iasi, 2000, ISBN 973-93333-55-9.
 14. Forna Norina Consuela. *Protetica Dentara Vol. I și II (Manual unic de protetica dentara inclus în bibliografia de rezidentiat)*, Editura Enciclopedica, 2011.
 15. Takano K, Takahashi N, Ogasawara N, Himi T. The Association of External and Middle Ear Anomaly and Mandibular Morphology in Congenital Microtia. *Otol. Neurotol.* 2016; 37:889–894.
 16. Ramirez L.M., Ballesteros L.E., Sandoval G.P. Topical review: Temporomandibular disorders in an integral otic symptom model. *Int. J. Audiol.* 2008; 47:215–227
 17. Shu MT, Lin HC, Chen YC, Huang JK. Mandibular condyle and tympanic plate fracture causing external auditory canal stenosis. *Otol Neurotol.* 2010, 31(1):173-4. doi: 10.1097/MAO.0b013e3181977e1f. PMID: 19300302.
 18. Bernkopf E, Capriotti V, Bernkopf G, Cancellieri E, D'Alessandro A, Marcuzzo AV, Gentili C, De Vincentis GC, Tirelli G. Oral splint therapy in patients with Menière's disease and temporomandibular disorder: A long-term, controlled study. *Eur. Arch. Oto-Rhino-Laryngol.* 2022:1–14.
 19. Villaça Avoglio J.L. Dental occlusion as one cause of tinnitus. *Med. Hypotheses.* 2019; 130:109280.
 20. Bernkopf E, Lovato A, Bernkopf G, Giacomelli L, De Vincentis GC, Macrì F, de Filippis C. Outcomes of Recurrent Acute Otitis Media in Children Treated for Dental Malocclusion: A Preliminary Report. *BioMed. Res. Int.* 2016:2473059.
 21. Barkhordarian A, Demerjian G, Chiappelli F. Translational research of temporomandibular joint pathology: a preliminary biomarker and fMRI study. *J Transl Med.* 2020; 18(1):22.
 22. Lundstrom IM. Orofacial and general disorders in oral medicine patients: oral and medical history. *Swed Dent J.* 2009; 33(1):27–39.
 23. Yin CS, Lee YJ, Lee YJ. Neurological influences of the temporomandibular joint. *J Bodywork Movement Ther.* 2007; 11(4):285–294.
 24. Peng Y. Temporomandibular Joint Disorders as a Cause of Aural Fullness. *Clin Exp Otorhinolaryngol.* 2017, 10(3):236-40. doi:10.21053/ceo.2016.01039. PMID: 28103655; PMCID: PMC554 5700.
 25. Dalla-Bona D, Shackleton T, Clark G, Ram S. Unilateral ear fullness and temporary hearing loss diagnosed and successfully managed as a temporomandibular disorder: a case report. *J Am Dent Assoc.* 2015, 146(3):192-4.