



Dental Care and Oral Health Maintenance among Alzheimer's Disease Patients- A Narrative Review

Dr. Arnavi Gaur*, Dr. Vaishali Yadav and Dr. Avantika Katyal

Department of Dental Surgery, Formerly Artemis Hospitals, Gurgaon, India

***Corresponding Author:** Dr. Arnavi Gaur, Department of Dental Surgery, Formerly, Artemis Hospitals, India.

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Abstract

Effective interventions in dental clinical settings are adding years to the lives of a greater number of geriatric patients who have either primary or acquired neurological conditions or diseases. In the next 3 decades, a new case of Alzheimer's is expected to arise every 33 seconds i.e., a million cases a year with the total prevalence expected to reach 13.8 million. With this increased prevalence of Alzheimer's disease, it is more likely that a dental practitioner comes up with an active management of dental diseases, thus improving the quality of patient's life. A case-control study published as a systematic review using quantitative meta-analysis indicated that these patients are more prone to edentulism due to their poor ability to maintain oral hygiene compared to healthy subjects. This loss of tooth structure affects mastication and the pathogenesis of Alzheimer's disease, thereby affecting their quality of life. This can be explained by the negligence of oral health by both patients and caregivers, as these patients suffer from behavioral and psychiatric symptoms resulting in poor oral hygiene, causing periodontal diseases. Alzheimer's is a slow progressive degenerative brain disease that causes severe morbidity and can prove to be fatal [1].

Keywords: Dental Care; Oral Health; Alzheimer's Disease; Patients.

Introduction

According to Neuropathologists, Alzheimer's is characterized by accumulation of 2 protein hallmarks-extracellular abnormally folded insoluble beta-amyloid and intracellular neurofibrillary tangle - NFTs. Evidence suggests that parallel pathways provided by tau and amyloid beta cause Alzheimer's disease [2]. Using different molecular pathways, the protein abnormalities cause synaptic failure, neurotrophin depletion, mitochondrial dysfunction, disruption of insulin signalling pathways, inability of brain to metabolize glucose, parenchymal inflammation, vascular injury and cognitive neurotransmitter like Acetylcholine are affected². The cognitive deficits in Alzheimer's maybe caused by -dysfunction of cholinergic, muscarinic and dopaminergic receptors, as only in these affected brain areas, cerebral atrophy occurs [1]. More-

over, neuronal losses cause atrophy of cerebral cortex and enlargement of the ventricles. Also, deficits of norepinephrine, serotonin, GABA (gamma aminobutyric acid) and dopamine occurs [3]. Less than 1% or less of Alzheimer's cases occur due to mutation to any of these 3 specific single genes- APP or chromosome 14 presenilin1 gene inheritance can guarantee development of Alzheimer's. Chromosome 19 APOE 2,3 shows genes that are related to onset of Alzheimer's and dementia [3]. The incidence of Alzheimer's increases with age. The various modifiable lifestyle related factors related to Alzheimer's is - diabetes, hypertension, obesity, physical inactivity, limited social and cognitive engagements, depression, smoking and lower educational attainment. Gingipains- virulence factor of *Porphyromonas gingivalis*, released during dental infection is associated with Alzheimer's disease [4]. The progression of Alzheimer's disease has different disease stages with different

severity levels. Various clinical symptoms include memory disturbances and disorders, aphasia, apraxia and visual agnosia. Mean duration of each stage is 5.5 years. Each stage is accompanied by continuous physical decline.

Mild stage (Early phase)

The duration for the initial and moderate stages is 3.5 years. characteristic sign- memory loss; causing disruption of daily life, temporal disorientation, loss of spontaneity, and deterioration in physical appearance and hygiene [5]. Patients may have difficulty remembering recent conversations or events and experience feelings of not coping. The earliest symptoms are stress, bereavement, and normal ageing. Most patients function independently in many areas but need assistance with some activities. Therefore, they may still be able to perform daily activities, and less intensive domiciliary care is needed at this stage.

Moderate stage

Though its duration is 3.5 years, it is the longest stage for some. Loss of intellectual capacity is rapid. The patient's observational skills, ability to perceive humor, self-recognition, language comprehensibility, and motor skills are affected, accompanied by partial or total loss of speech. There may be difficulty performing routine tasks, confusion about whereabouts, distinguishing between day and night, or wandering at night. Thus, decreasing attention to personal and oral hygiene. Suspiciousness, sudden mood changes with loss of inhibitions, and becoming belligerent [5] are examples of behavioral and personality changes that can occur. Increase in the severity of disease, anxiety and depression become problematic, eventually requiring more intensive domiciliary care.

Severe stage

The duration of severe stage is 3.2 years. Physical restrictions occur due to motor dysfunction as the areas of brain involved in movement are damaged. Patients may become bed-bound and require 24/7 care [5]. They become vulnerable to- blood clots (deep vein thrombosis), pressure sores, skin and chest infections, and sepsis due to being confined to bed. Help with basic activities like bathing, dressing, using bathroom is required [1]. Patient may become rigid, incontinent, disoriented and unable to communicate. Generalized seizures may occur. Behavioral problems may aggravate showing verbal or physical aggression. Damage to brain areas controlling swallowing makes eating and drinking hard. Due

to this, oral inhalation of food debris and particles can occur into trachea rather than esophagus leading to lung infection or aspiration pneumonia.

Commonly encountered Dental issues in Alzheimer's patients

Xerostomia

Xerostomia/dry mouth is not a direct feature of the disease but due to common risk factor- old age. Drug interactions cause reduced salivary flow in some patients, thereby altering the microflora of oral cavity leading to inflammation and burning sensation.

Candidiasis

Candidiasis is not exclusively caused by Alzheimer's disease but occurs as a consequence of decreased salivary flow and poor oral hygiene. Prosthesis acts as a reservoir of plaques and microbes. Growth of candida is more prevalent on acrylic prosthesis in comparison to metallic prosthesis as the surface of acrylic prosthesis gets rough with time, allowing accumulation of plaque and microbes. According to Gusmao., *et al.* patients who wear prosthesis at night have higher occurrence of candida yeast.

Broken/Fractured tooth

Falls in Alzheimer's patients may cause severe or minor fracture of tooth. But broken/fractured teeth should be addressed immediately to avoid subsequent oral infections.

Gingivitis and gingival hyperplasia

Poor oral hygiene results in more plaque and calculus increasing risks of developing gingivitis. Gingival overgrowth presents as an adverse drug reaction and seen in patients using anticonvulsant drugs.

Chronic periodontitis

Chronic periodontitis is inflammation of tooth supporting apparatus resulting in attachment loss, gingival recession and bone loss. It is the most common periodontal polymicrobial disease associated with the microbiological involvement of red complex. Red complex bacteria are *Porphyromonas gingivalis*, *Tannerella forsythia*, *Treponema denticola* [6]. *P. gingivalis* produces trypsin like cysteine proteases gingipains (lysine gingipain, arginine gingipain A, arginine gingipain B), which is associated with vascular injury and thrombi formation. Gingipains cannot cross blood brain

barrier in healthy functioning body system [6]. The bacterial toxin leads to increased production of Abeta and activate microglial cells resulting in innate inflammatory response in brain which results in neuron damage, thus exacerbate A.D. Also, chronic periodontitis results in teeth loss which results in nutritional deficiencies and cognitive decline.

Ulcers

Oral ulcers can occur due to ill-fitting prosthesis and masticatory trauma.

Dental diseases and infections

Increased levels of plaque in Alzheimer's patients cause demineralization of enamel buccally and caries in incisal surfaces of anterior teeth. Root surface caries and coronal caries due to difficulty in access is more common among older Alzheimer's patients. Localization of the source of dental and oral pain and addressing it may be poor in Alzheimer's patients which can cause deterioration of patient's behaviour [8]. Also, Dental infections are potential causes of orofacial pain as well as masticatory dysfunction such as Temporomandibular disorders, an important co-morbidity [8].

Prosthetic problems

Refusal to eat, strained facial expressions and discomfort while eating may indicate mouth pain due to ill-fitting dentures. Edentulous patients may misplace/accidentally throw their dentures and may even attempt to wear upper denture on lower arch and vice-versa [9].

Periodontal problems

Teeth loss results in masticatory dysfunction leading to poor nutrition with subsequent reduction in cerebral blood perfusion, decreased Ach levels and pyramidal cells involving the hippocampus which has been observed in different models showing link with masticatory problems [10].

Oral complications

In case of muscular dysfunction symptoms like dystonia, dyskinesia or tardive dyskinesia, in oral and facial regions developing in Alzheimer's patients due to antipsychotic drugs; she should be referred to a physician for evaluation and management [9]. Infliction of oral injuries via mutilation in Alzheimer's patients with psychiatric disorders like lip, cheek or tongue biting, mucosal injury or

burning of oral tissue with cigarette tip have been reported [11].

Oral healthcare and treatment planning

Alzheimer's patients should receive oral diagnosis and treatment as early as possible in the course of the disease. Treatment planning must be realistic, patient-centric and designed according to the disease stage. When planning treatment, the basic criteria dentist must know is whether patient can brush teeth/dentures, describe their complaints, follow instructions, tolerate dental instruments in mouth and if there is physical aggression. If patient is cooperative for criteria, they are in early stage of Alzheimer's; if they answer 'sometimes' to the questions, they are in moderate stage and if they are consistently uncooperative and aggressive, they are in the later stages. While performing clinical examination, evaluation of each tooth, their periodontal status, oral mucosal conditions, salivary flow rates, denture status, temporomandibular dysfunction signs and symptoms and daily oral hygiene practices, should be done. Radiographs to be taken if necessary to get a diagnosis. Risk of rapid oral health deteriorators (ROHD) can be reduced by an early and comprehensive dental examination defining stage of disease progression and implementing prevention strategies.

Classifying patient using assessment of risk categories of ROHD which are

- no risk factors present.
- Patient at risk of ROHD but not experiencing ROHD.
- Patient currently experiencing ROHD.
- Patient is experiencing ROHD.

Lastly, a self-assessment to be done for evaluating if any data has been missed, effectiveness of communication process or plan which aids in improving quality and practice for future treatments.

Dental management

Early stage

Early intervention is important as patients are able to perform most of the daily life activities including oral hygiene routines. They should be encouraged and reminded to carry out oral hygiene procedures [12]. Patient to be kept in-charge of their oral hygiene routine with some supervision and measures to make sure they have

access to a mirror on which instructions are written. Supervision like reminding, giving cues to remember performing oral hygiene measures, removal of dentures at night and their cleaning is needed. In case of impaired manual dexterity, electric toothbrush/modified handle should be provided [13]. To prevent caries, high concentrated fluoridated toothpastes (5000ppm) twice a day will be ideal [14]. Prescribe chlorhexidine/fluoride as mouthwash, spray or professionally applied varnish. Liase with the patient's doctor to ensure whenever possible sugar-free medication is prescribed.

In earlier stages, treatment is tolerable, thus major treatments should be carried out. GIC can be used as preferred restorative material when partial caries removal technique is used. Removable prosthesis is easier to clean while fixed ones require more motor skills/caregiver's manual ability [13]. Magnets have proven as a good solution for patients with lower implants and for those with residual roots. However, in patients with pacemakers, magnet use is contraindicated. Adding R.P. Ds without a corresponding improvement in ROHD may lead to its increased risk. In some cases, lower removable prosthesis, though aiding in mastication, may interfere in swallowing process, after which re-motion and re-adaptation after myofunctional work is indicated [14]. It is important to highlight that adhesive can help in stabilization of well-adapted prosthesis.

Moderate stage

Treatment goals should aim at maintaining existing dentition, dental status, minimizing deterioration without any new disease occurring. Patients may be less amenable to dental treatment compared to earlier stages.

Autonomy should be encouraged for as long as possible using techniques like

- Task breakdown (breaking activity into small steps).
- Hand over hand (patient holds toothbrush and caregiver places their hand on patient's hand for guidance).
- Chaining (caregiver starts brushing and lets patient finish it).
- Bridging (caregiver holds toothbrush and brushes with another toothbrush).

Appointments should be stress-free and preferably in the morning, before patient gets tired. Treatment to be carried out in small steps and postponed if patient gets tired, upset or sick. Shorter recalls for patients (6 months/less) depending on patient need with use of least traumatic interventions [12]. Prefer chemical caries removal techniques and hand scaling. Patient to be warned about noisy equipment prior to procedures. Lower teeth are preferred in cases of unrealistic approach to treat every tooth, as lower denture is less likely to be tolerated. Imperative sedation/general anesthesia (GA) can be used during inadequate cooperation, only after physician's consultation. Oral sedation maybe effective but is unpredictable [14]. Complex fixed prosthesis is much harder to maintain in moderate and severe stages. The dentist must be aware of all the medications patient is on, know whether any side effect might harm the making/retention of prosthesis like involuntary muscle movement/hyper salivation etc. It is also important to guarantee, during treatment, that patient is comfortable and proper handling of impression material with skillful staff ensuring no leakage of material down the throat occurs [13]. After complete denture installation, a liquid-pasty diet is indicated. Thereafter alteration of food consistency with the comfort of patient with new prosthesis is done.

Advanced stage

Physical and mental limitations make dental care most difficult, but even so they may respond to a calm voice and physical reassurance. Alzheimer's Patients are poor reporters and cannot communicate if they are in pain. Pain can be indicated by sudden behavioral change, refusal to eat, increased restlessness, increased aggression and disturbed sleep. Caregivers have complete responsibility of taking care of patient's oral hygiene [14]. A danger of self-injury to patients from removable prosthesis is there and may need to be taken away. Patients with advanced dementia may require short appointments and sedation¹⁵. Chloral hydrate and benzodiazepines have been used with some success. If the patient is resistant, techniques like 1) rescuing (second caregiver enters as first one leaves). 2) Distraction (patient distracted by music or holding preferred items) can be used. If signs of dysphagia are seen, process of planning of prosthetic treatment can be compromised [13]. In this case, a speech therapist and nutritionist must establish a single therapeutic project to define any changes in alimentation, set

mealtime and alteration in food consistency. Excessively soft diet may not contain adequate nutrients for patient's biological needs, generating anemic and apathetic states which can lead to death. Also, it is important to remember that patients might benefit from an alternative way of eating, e.g., nasogastric tube or gastrostomy, no longer needing their teeth.

Key points for dentists in the event of providing oral health-care to the Alzheimer's patients

- Send the patient/caretaker a reminder at least one day in advance.
- Ask your dental assistant to schedule appointments according to patient's convenience and their best time of day and date of visit after inquiring from the caregiver about the same [16].
- Ensure the patient has emptied the bladder before the appointment.
- Maintain a quiet and private environment.
- Avoid lengthy appointments and keep their duration to less than 45 minutes.
- Provide clear follow-up instructions to the caregiver and the patient in simple terms.
- Be willing to pay domiciliary visits in late stages of the disease for best response and coping is better as unfamiliar places upset and make Alzheimer's patients uneasy [16].
- Regarding taking of straightforward decisions related to their oral healthcare, patients in early stage can do so if explained simply.
- In moderate and advanced stages, an informed consent might have to be taken from the legal guardian/caretakers as patients are not capable of providing any form of consent/ following up with a maintenance plan [15].

General Instructions for Dental Clinicians while communicating with Alzheimer's patients

- Communicate using short words/sentences, repeat instructions and rephrase if they do not comprehend. Written instructions are recommended along with a good communication with family member/caregiver depending on stage of

the disease [17].

- Never speak down/speak across them as if they're not present, include them in your conversations.
- Engage their attention by elimination of distractions and performing positive non-verbal communication to comfort them [17].
- Be sure to make a conscious effort with your facial movements and body posture, giving verbal cues like 'I am your dentist' rather than 'do you remember who I am?'
- Ask "yes"/"no" questions and one at a time. Listen carefully and calmly to what they have to say [16].
- Constantly reassure them. Use gentle humor to form a bond and once established, it may be appropriate to call them by their first name.

Medications for the treatment of most commonly encountered or expected dental issues in Alzheimer's patients

Consequence of xerostomia can be prevented using local salivary stimulants (gum with xylitol, parasympathomimetic drugs/salivary substitutes) and artificial saliva can be used. Denture fixatives may be useful in case of xerostomia in patients using dental prosthesis. Treatment of chronic atrophic candidiasis includes Nystatin [18]. It is to be applied to affected area/to right surface of prosthesis. The process of application may be compromised due to difficulty and loss of motor skills. To prevent lips from drying/cracking, ointment can be prescribed.

Oral hygiene maintenance

Mechanical treatment of plaque can be done using electric toothbrushes with fluoridated toothpaste and electric surgical aspirator depending on caregiver's ability. Mint tea with thickener can be given to the patient to maintain taste, if toothpaste is refused. Proxabrush can be used instead of floss to clean between teeth [19]. Mouthwashes should be used as they reduce plaque ten-fold. Chlorhexidine in the form of sprays, gels/varnishes can be used with a maximum time of 15 days to avoid dental staining, in patients unable to rinse [20]. Mouthwashes containing alcohol is contraindicated in cases with mucositis, immunocompromised patients and patients with composite resin restorations. A healthy and balanced diet with minimal sugar content should be provided.

Patients should be placed on an aggressive prevention dentistry program including 3-month recall, prophylaxis and oral hygiene education and adjustment prosthesis can be done. In elderly patients with mobility problems and those wearing prosthesis, chemical to clean prosthesis maybe helpful [21]. Immersion cleaning also decontaminates the prosthesis through destruction of microorganisms by cleaning chemicals. Instructions, types of toothbrushes and material depend on the type of prosthesis. Educate the caregiver on how to clean dentures. Rinse the denture with plain water after meals and brush with wet toothbrush to remove food debris. Caution them against using toothpaste on denture as it can damage it. Also, dentures need to be removed each night and soaked in a cleanser or mouthwash. A soft bristled toothbrush or a moistened gauze pad can be used to clean gums, tongue, roof of their mouth and the other soft oral tissues [22]. Proper routine cleaning of the dental prosthesis is necessary for preventing stomatitis and in order to keep healthy supporting tissues.

Conclusion

Dentists should consider that less than ideal oral hygiene will be done in patients with Alzheimer's disease. And with the progression of disease, treatment tolerance will be compromised and thus the dental practitioner should aim at eliminating potential sources of future problems and plan for self-care. Treatment planning goals must include oral health maintenance, comfort, function, prevention of oral diseases and treating cause of dental pain and providing relief. With regard to general health conditions of the patient, revise and review of systemic diseases, medications and the capacity to tolerate treatment and maintenance plan should be done by the dentist. To avoid general medical risks General Anesthesia may be required sometimes.

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