

Enhancing Quality Of Life: The Impact Of Aging On Periodontal Health And Its Management

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Abstract:

Geriatric patients often face specific challenges related to oral health due to the natural aging process. As people age, they may experience changes in the oral cavity, such as decreased saliva production, alterations in the composition of saliva, and changes in the hard as well as soft tissues of the mouth, which can contribute to an increased risk of oral as well as periodontal diseases and that require periodontal management.

The periodontal management of geriatric patients is a specialized aspect of dental care that focuses on addressing the unique periodontal health needs of older individuals and involves comprehensive care, preventive strategies, and tailored treatment plans to maintain or improve oral health. This article discusses the various physiologic changes occurring during the process of aging, emphasizing the methods for providing periodontal care and highlighting the importance of periodontal health education in this population.

Key Word: Aging; Periodontal disease; Inflammaging; Geriatric patients; Oral health.

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I. INTRODUCTION

The word "geriatrics" originates from the Greek words "old man" (γέρων geron) and "healer" (ιατρός iatros). Nearly 177 million Indians will be elderly by 2025, accounting for approximately 14% of the nation's population over 60.¹ Age-related changes have been observed in the bone, temporomandibular joint, oral mucosa, and hard and soft tissues of the mouth. The clinical significance of these age changes affecting orofacial structures lies in the fact that some of them restrict the treatment prognosis.²

II. DEFINITIONS

Geriatrics¹: The branch of medical science that treats all problems, peculiar to the aging patient, including the clinical problem of senescence and severity (GPT—9).

Geriatric Dentistry (D.C.N.A. 1989, Jan)¹: The provision of dental care for adult persons with one or more chronic debilitating, physical, or mental illnesses with associated psychosocial problems.

Aging: Progressive decline or loss of intrinsic physiological functions, leading to a decrease in reproductive and survival rates.³

III. CLASSIFICATION

*According to Conduent Healthy Communities Institute, define the age groups.*¹

- Infants: <1 year
- Children: 1-11 years or <7th grade
- Teens: 12-17 years or 7th-12th grade
- Adults: 18-64 years
- Elderly: 65+ years

Classification of Geriatrics^{1,4}

According to the psychological reactions to the aging process

- **Realistic group-** They are exacting, philosophical types, healthy, proactive, and typically well-off, and both at home and in the community, people value their counsel. They take pride in their appearance, obey directions, maintain proper oral hygiene, seek dental care, and accept a healthy diet.
- **Resentment group-** They are chronically ill emotionally and physically, indifferent, hysterical, negligent in general as well as in oral health, and rarely seek dental care. They rarely seek dental treatment on their own, concerned family members frequently seek treatment on their behalf.

- Resigned group

According to functional criteria (Ettinger and Beck 1984)

- Functionally independent elderly- These individuals are community-unassisted constituting up to 70% of the population aged 65 or over. The same preventive measures, treatment principles, and procedures can be applied to these patients as in the younger population.
- Frail elderly- constitutes 20% of the population aged 65 or over. They have lost some of their independence, but still live in the community with the help of support services.
- Functionally dependent elderly- constitutes up to 10%, 5% are home-bound and 5% are in long-term care facilities. They are incapable of living independently in a community. Poor general health, a lack of support services, and low socioeconomic status are the factors that restrict access to dental health care.

IV. SENESCENCE AND RELATED CHANGES IN ORAL TISSUES

Effect of aging on salivary glands and salivary secretion

With advancing age, the salivary gland function is diminished due to an atrophy of acinar tissue with proliferation of ductal elements and degenerative changes occurring in the major as well as minor salivary glands. This results in a uniform decline in the acinar content of salivary gland tissue accompanying the aging process. Thus, with aging, the salivary gland tissue's acinar composition decreases naturally and consistently.⁵ Reduced salivary flow decreases the lubrication of oral tissues making them susceptible to mechanical insults, impairs the self-cleansing action, and lowers the local protective function along with increasing the susceptibility for periodontal infection.⁶

Table 1: List of xerostomia-inducing medications¹

Sr. No.	Class	Name of the Drug
1	Antihistaminics	Diphenhydramine, chlorpheniramine
2	Decongestants	Pseudoephedrine
3	Antidepressants	Amitryptiline
4	Antipsychotics	Haloperidol, Phenothiazine derivatives
5	Antihypertensives	Reserpine, Methyldopa, Chlorthiazide, Furosemide, Metoprolol, Calcium channel blockers
6	Anticholinergics	Atropine, Scopolamine

Effect on the oral mucous membrane

With aging, oral mucosa becomes thinner and smoother and presents an edematous, satin-like look along with a loss of stippling and elasticity. Tongue exhibits noticeable clinical changes with atrophy of the papillae of the tongue, particularly the filiform papillae. Other changes include slower wound healing, a decrease in the number of taste buds in the circumvallate papillae, and the development of sublingual varices which are more vulnerable to Candidial infections.⁷

Effect on the teeth

Tooth form is affected due to wear and attrition. The enamel surface displays a flat appearance with fewer details due to the loss of perikymata and imbrication lines. These surface alterations in older individuals result in a different pattern of light reflection, causing a change in the observed color. Changes in dentinal quantity (thickness) and quality may also cause a gradual loss of transparency.⁷

With advancing age, enamel becomes less permeable and more brittle with an increase in the nitrogen content and increased organic material, probably due to the filling in of the cracks by organic material (acquired lamellae).⁸

Age-dependent changes in dentin include Continued growth (physiological secondary dentin formation) and gradual obturation of the dentinal tubules (dentin sclerosis). Other changes include dentinal hypersensitivity resulting from exposure of the dentinal tubules due to abrasion, erosion, acute or chronic trauma, recession, or various restorative procedures, Abrasion may be caused due to overzealous brushing, faulty use of dental floss and toothpicks and erosion resulting from long term intake of fruit juices and carbonated beverages and GERD.^{8,9}

Dental pulp displays reduced volume due to an increase in fibers, fewer cells, and reduced blood supply thus affecting the healing capacity of pulp. Electron microscopy reveals degeneration of both myelinated and unmyelinated nerves. Pulp calcifications are noted with increased frequency, number, and size.

Cementum deposition continues throughout life, but the rate of deposition diminishes with age. An increase in the fluoride and magnesium content is noted. Countable annular rings are seen at the microscopic

level which might aid in age estimation in forensic specimens. Hypercementosis is observed with increased frequency.⁸

V. SENESCENCE AND ITS EFFECT ON THE PERIODONTIUM

Gingival epithelium: Thinning and reduced keratinization of the gingival epithelium which results in an increased epithelial permeability to bacterial antigens, decreased resistance to functional trauma, or both. Other described changes with aging include the flattening of rete pegs and altered cellular density.

Gingival Connective Tissue: Appears coarser and denser. Collagen fibers display qualitative and quantitative changes, a decreased rate of collagen synthesis, and an increased rate of conversion of soluble to insoluble collagen. Other changes include fewer cellular elements, reduced mitotic activity of the cells, and an overall reduction in organic matrix production.¹⁰

Periodontal ligament: With aging, there is a reduction in cell density and formation of the organic matrix, principal fibers thicken, bundles become wavy and broad, and the periodontal ligament structure becomes more and more irregular. PDL displays degenerative hyaline alterations and occasionally exhibits visible cells within lacunae. Epithelial rests exhibit modified forms of aggregation, and calcified bodies become more prevalent.

Width of Periodontal ligament space: Regarding variations in the width of the periodontal ligament with age in both human and animal models, contradictory findings have been documented. While there may be actual variation, this result most likely represents the functional state of the teeth because the width of the space will either increase with excessive occlusal loading or reduce if the tooth is unopposed (hypofunction).¹¹

Alveolar Bone: There is a reduction in the rate of bone formation resulting in decreased bone mass, cellular density of bone, and remodeling. Reduced bone production may result from a decrease in the synthesis and release of vital bone matrix proteins or from a decrease in osteoblast proliferating precursors. The extracellular matrix that envelops osteoblasts is crucial to the metabolism of bone. Therefore, aging may be linked to potential extracellular matrix dysfunction, which is crucial for bone metabolism.

Junctional epithelium: With increasing age, a gradual progressive physiological recession of the gingiva occurs along with apical migration of the epithelium, which in turn results from occlusal migration of the teeth in an attempt to maintain occlusal contact with its opposing tooth (i.e., passive eruption) as a result of tooth surface loss from attrition.¹²

The above-mentioned age-related changes in the hard as well as soft tissues of the oral cavity in turn increases the vulnerability of the oral and periodontal tissues to the development of periodontal disease.¹³

VI. EFFECT OF AGING ON INFLAMMATORY RESPONSE

Franceschi et al. (2000) introduced the term "inflammaging," which adds a contemporary perspective to aging research and asserts that aging is characterized by a gradual, chronic proinflammatory phenotype.¹⁴ Inflammaging is defined as a chronic, controllable, and systematic increase of a pro-inflammatory state with advancing age.¹⁵

VII. AGING PERIODONTIUM AND CHANGES IN BACTERIAL PLAQUE MICROBIOLOGY

Bacterial plaque accumulation has been found to increase with age as a result of increased hard tissue surface area resulting from gingival recession, altered surface characteristics of the exposed root surface compared to enamel, and physiologic age change in salivary composition and flow rate.¹¹ Kleinberg et al¹⁶ (1971) demonstrated that plaque contains higher amounts of calcium and phosphorus which may be due to an increase in the calcium and phosphorus levels in saliva. Socransky et al¹⁷ (1963) demonstrated that the prevalence of spirochetes increases and the number of streptococci decreases with age. Plaque from young patients has more viable microorganisms per mg than plaque from the elderly.¹⁷

VIII. PERIODONTAL TREATMENT RESPONSE TO AGE-RELATED CHANGES

Studies clearly show that despite the histologic changes in the periodontium with aging, there are no differences in response to nonsurgical or surgical therapy for periodontitis. However, if plaque control is inadequate, continued attachment loss is inevitable.

IX. AGING AND PROGNOSIS

In patients with the same amount of periodontal destruction, the rule holds the older the patient, the better the prognosis in terms of no recurrence of the disease. This belief is primarily predicated on the logic that, given

that the process of periodontal destruction occurs much faster in younger people, older people must have a higher resistance to periodontal breakdown.¹¹

X. PERIODONTAL MANAGEMENT OF GERIATRIC PATIENTS

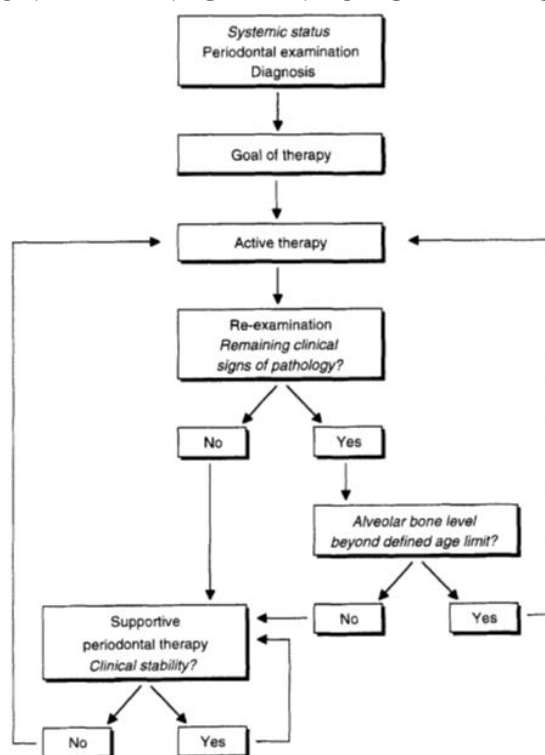


Fig 1. Decision Tree for periodontal treatment of Older adults¹⁸

Non-surgical periodontal therapy:

In geriatric patients with existing comorbidities, preventive and non-invasive therapy to control periodontal disease should be given priority. Regular supportive periodontal therapy with careful monitoring of home care, toothbrushing, flossing, and use of other interdental aids along with gingival massaging helps to maintain good dental health in older adults.¹⁹ Those with diminished manual dexterity may benefit from the use of powered toothbrushes as demonstrated by Verma et al²⁰ (2004). Patients wearing dentures should be instructed to regularly clean their dentures and massage the tissues under the denture at least once daily to increase blood circulation, epithelization, and keratinization, enhancing the health of these tissues.⁸

Surgical periodontal therapy:

Age is not a contraindication to surgical periodontal therapy, and the healing observed following therapy is similar in older adults as compared with younger individuals.²¹ The level of post-operative plaque management and frequency of professional care received by the patient are critical factors that determine the success of surgical periodontal therapy. Surgical periodontal treatment will not help patients who struggle to maintain proper oral hygiene standards. To reduce the amount of additional root exposure, a flap method that preserves the periodontal tissues should be performed. To preserve the outer, more fluoride-rich surface of the root, instrumentation of supragingival root surfaces should be restricted to calculus removal.¹⁸ Mikami R. et al²² (2022) demonstrated that periodontal regenerative therapy with enamel matrix derivatives significantly improved clinical periodontal outcomes on long-term observation, irrespective of the patient's age.

Supportive periodontal therapy:

Kerry et al (1995)²³ gave 3 therapeutic goals of supportive periodontal treatment:

- (i) To prevent the progression and recurrence of periodontal disease among patients who have previously been treated for periodontal disease;
- (ii) To lower the incidence of tooth loss;
- (iii) To raise the likelihood of identifying and treating additional diseases or conditions that affect the oral cavity.

Long-term study results have unequivocally shown that adult participants who receive regular preventive therapy have a generally low incidence of tooth loss and the progression or recurrence of periodontal disease, regardless of age.¹⁸

Dental Implants in the Geriatrics Population

When planning dental implants in geriatric patients, aggregate risk should be considered to reduce complications and encourage patient participation. For older patients, a customized maintenance plan with a suitable in-office and at-home regimen is highly suggested for a positive long-term outcome of implant treatment. Furthermore, research has demonstrated that the use of an electric toothbrush, water flosser, or airflow recalls system can preserve the health of the tissue surrounding implants in older patients who lack the dexterity, vision, or cognitive capacity to maintain proper oral hygiene.¹⁹ Compton SM. et al²⁴ (2017), Grant BT. et al²⁵ (2007) demonstrated that treatment with dental implants in geriatric patients is predictable and safe. Due to improved access to oral healthcare and longer life expectancies, there has been a rise in patient expectations for comfort, function, and aesthetics, that may not always be met by conventional removable partial dentures (RPDs). In such cases, implant-supported prostheses have been demonstrated to be a viable substitute for conventional partial dentures as they preserve alveolar bone, and improve retention, stability, and comfort.²⁶ Age alone should not be considered as an exclusion criterion for older adults who need dental implants to replace their lost teeth. Therefore, if dental implants are a viable and better alternative, all geriatric patients should be given the option.²⁷

XI. CONCLUSION

There is no evidence that older folks respond differently to periodontal therapy than younger people. However, it is more typical in older persons to encounter deteriorated systemic status that may impair the patient's capacity to maintain a sufficient quality of self-performed plaque control. Although this can be mitigated in part by a well-planned supportive therapy program, the prevention and/or elimination of clinical signs of periodontal inflammation may not always be an attainable goal of periodontal therapy in older adults, particularly those who are frail and functionally dependent. Controlling disease progression to maintain a healthy lifestyle may be a more realistic objective for many individuals. The decision-making process about treatment levels for the individual patient must involve factors such as the amount of intact periodontal support, the risk of disease development, demands for oral health, and life expectancy.

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