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Geriatric Endodontics- An Overview: Introduction, Patient Classification, Education Scope in India and Age Changes in Dental Tissues (Part – I)

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Abstract

General well-being is related to health and disease states of the oral cavity as well as the rest of the body. An awareness of this inter-relationship is essential when the clinician is working with the older patient because the incidence of major dental problems and the frequency of chronic illness increase dramatically in older people. This review article was searched for electronic databases (PubMed/Medline, Cochrane, Science Direct Online, Embase, and Web of Science). About 150 articles with clinical studies and reviews were screened. Relevant electronically searched journals were retrieved and then appropriate information was compiled.

Keywords: Age changes; Geriatric Dentistry; Geriatric Education, Geriartic Patients; Oral Health

Introduction

The term geriatrics stems from a Greek word "GERON" meaning, 'old man' and "IATROS" means 'healer'. It is cognate with "JARA" in Sanskrit which also means 'old' [1]. Geriatric dentistry or Gerodontics is the delivery of dental care to older adults involving diagnosis, prevention and management of problems associated with normal aging and age related diseases as part of an inter-disciplinary team with other health care professionals [2].

Endodontic procedures in the elderly have been considered challenging from a technical perspective in view of the likelihood of the root canal system being 'sclerosed' [3].

Success in endodontics can be achieved in the elderly with special attention to diagnosis, good quality radiographs and technique oriented to overcome the challenges posed by calcification of the root canal system. As long as a tooth has a strategically important role to play, the endodontic procedures are indicated and justified in healthy elderly patients.

Classification of geriatric patients:

According to Ettinger and Beck [4]

1. Functionally independent elderly – forms the vast majority of older adults that are able to visit the dentist.

2. Frail elderly – older adults with chronic conditions that create major limitations in ability.

3. Functionally dependent elderly – older adults which are homebound or institutionalized in nursing homes.

According to Dr. Suzanne Riechard [5]

1. Mature group – Well integrated persons with self awareness, satisfied, realistic, flexible and adaptive. Neither hostile nor do they repress hostility, open minded, self aware of growing old and accept the physiological changes.

2. Rocking chair group – Passive dependers that lean on others for materials and emotional support. These are unambitious who find little satisfaction in work, impulsive and extravagant, have a tendency for excessive eating and drinking. They accept ageing and look back on their lives with contentment.

3. Armored group – Characterized by rigidity in character, work and principles of life. They are independent, participate actively in organizations and work hard as it keeps them well occupied. They have stereotyped thinking and counteract with their fear of growing old by remaining active, self aware of their health but will not accept new treatment modalities, unless proven.

4. Angry group – Generally hostile, frustrated and blame others for failure. Pessimists and picture old age as a time of economic deprivation and virtual starvation.

5. Self haters – These are people who are dejected of life and blame themselves for failures and frustrations. They characteristically turn aggression inward as self accusation and self blame.

According to MM House [6]

1. Philosophical patient – Presents the best mental attitude for treatment acceptance. This patient is rational, sensible, calm and composed in difficult situations.

2. Exacting patient – May have all the good attributes of the philosophical patient; however may require extreme care, effort and patience on the part of the dentist. This patient is methodical, precise and accurate and at times makes several demands.

3. Indifferent patient – Presents a questionable or unfavorable prognosis. Evidences little if any concern, apathetic, uninterested, lacks motivation, pays no attention to instructions, will not cooperate and is prone to blame the dentist for poor oral health. A dental education programme before the treatment is recommended.

4. Hysterical patient – Emotionally unstable, excitable, excessively apprehensive and hypertensive. The prognosis is unfavourable and additional professional (psychiatric) help is required prior to and during the treatment.

According to Razak et al [7]

1. New or young elderly (65-74 years) who tend to be relatively healthy and active.

2. Mid-old (75-84 years) who vary from those being healthy and active to those managing an array of chronic diseases.

3. Oldest-old (85 years) who tend to be physically frailer and

this last group is the fastest-growing segment of the older adult population.

Scope of geriatric education in India

Geriatric medicine is in its infancy and geriatric dentistry is almost non-existent in India. Very few initiatives that have been taken in geriatric education are:

• Only one Government Medical College in Chennai (in South India) offers full-fledged Doctor of Medicine (MD) and Master of Surgery (MS) degree courses in Geriatric Medicine and Geriatric Surgery respectively.

• The Indira Gandhi National Open University at Delhi (IGNOU) has started a 1-year postgraduate (PG) Diploma Course in Geriatric Medicine from the academic year 2003-04. In this PG Diploma course, the curriculum includes a chapter on Geriatric Oral Health.

• The All India Institute of Medical Sciences, in collaboration with WHO conducts short-term training programmes in Geriatric Medicine for sensitization and reorientation of teachers in medical schools so that they can incorporate geriatric aspect in the teaching of various clinical subjects [8].

Present barriers of geriatric dentistry [9]:

• Lack of experience and fear among dental surgeons when treating geriatric problems.

•Absence of extra financial incentives to the dental surgeons.

•Practical problems that exist in providing dentistry to homebound and institutionalized patients.

•Difficulties dealing with debilitating and life threatening illnesses.

•The problem of informed consent and of family members or residential facility staff members with negative attitudes.

However, studies also indicate that the attitude towards dentistry is changing. Several authors have stated that as people age, a brighter picture may emerge as they

• will be better educated than previous generations of older adults.

• will have higher expectations about maintaining and preserving their natural dentition.

•may have the financial resources to fulfill their expectations.

Strategies to improve barriers of geriatric dentistry:

• Health care delivery should be as pain-free and comfortable for the elderly as possible.

• Treatment plan should be aimed at retaining the maximum number of natural teeth through preventive and curative procedures rather than extraction and dentures [10].

• The graduate students should be encouraged to treat elderly patients under supervision using multi-disciplinary approach.

• Training in geriatric dentistry should enable the dental surgeon to understand and empathise with the psychosocial behaviour of elderly, especially those suffering from depression and isolation or those with severe debilitating disorders such as stroke, Alzheimer's and Parkinson's diseases [8].

• Cost effective modern educational strategies and educational tools such as problem-based learning will help to overcome the dearth of trained faculty in geriatric dentistry [11].

Therefore, geriatric dentistry needs to be developed as soon as possible to provide quality oral health care for the vast human resource of the elderly population in India [8].

Age changes in dental hard and soft tissues:
Hard tissue changes with age:

Alveolar Bone - After the age of 35 to 40 years, approximately 1% of bone mass is lost per year in both men and women.[11] By the time old age is reached, atrophy of bone results from slow resorption with very little remodeling along with generalized decline in bone volume. This results in reduced resilience and increased brittleness and fragility.[12] The periosteal and periodontal surfaces of alveolar bone become less resistant to harmful local oral trauma, inflammation or disease which is a major factor contributing to periodontal disease, loss of teeth and inability to obtain adequate support and stability for dentures in edentulous patients.[13] In both the maxilla and the mandible, the amount, extent and uniformity of the bone loss differ by varying factors as age, sex, race and health status of the patient when the

teeth are extracted; the tooth extraction technique; the diet of the patient; and the frequency of denture use [12].

Maxillary teeth generally flare downward and outwards, so that bone reduction is generally upwards and inwards. Since the outer cortical plate is thinner than the inner cortical plate, resorption from the outer cortex would be greater and faster. The mandibular anterior teeth generally incline upward and forward to the occlusal plane, whereas the posterior teeth are either vertical or lingually inclined [14]. The outer cortex is generally thicker than the inner, except in the molar region. Also the width of the mandible increases towards its inferior border. As a result, the mandibular residual ridge appears to migrate lingually and inferiorly in the anterior region and to migrate buccally in the posterior region [15].

Enamel - Wearing of the enamel (loss of vertical dimension and flattening of proximal contours) is known as attrition. The patterns of tooth wear vary with each patient and are cumulative because the enamel is incapable of repair or regeneration [16]. However, there is no agreement on the point at which physiologic attrition becomes pathologic or contributes to pathologic conditions [17]. Spijker et al. (2009) [18] concluded that the percentage of adult patients presenting with severe tooth wear increased from 3% at the age of 20 years to 17% at the age of 70 years, with a tendency to develop more wear with age.

With aging, enamel becomes less permeable due to increase in size of the crystal. Crystal size increases due to ions acquired by it from the oral fluids which decreases the pores between them causing a reduction in permeability.[19]

Dentin - age changes in dentin include:-

1. Dentinal sclerosis – associated with

• Increase in peritubular dentin with increase in deposition of apatite crystals result in occluding of dentinal tubules. This is known as 'sclerosis of dentin.'

• Sclerosis occur in apical third of root with ageing [19].

2. Dead tracts –

• Empty tubules filled with air, where odontoblasts have degenerated.

• In ground sections, they entrap air, so appear black in transmitted light and white in reflected light.

• They often observed in the area of narrow pulpal horns because of crowding of odontoblasts.

•Decreased sensitivity is seen in these areas [19].

3. Formation of secondary dentin –

• Secondary dentin is a narrow band of dentin bordering the pulp and representing that dentin formed after root completion [20].

•Two types of secondary dentin is laid down. The regular secondary dentin is considered physiological whereas irregular secondary dentin is considered as pathological. This process of secondary dentin formation results in gradual reduction in size of the pulp chamber and root canals [21].

Cementum -

• Cementum lines the root surface connecting the tooth to the periodontium. As cementum ages, its thickness increases 3-fold between the ages of 10 and 75 years, with the thickest layer at the apex and varying degrees of thickness along the root depending on recession and wear of the root surface [22].

• In general, cementum is cellular except at the root apices and in the furcation areas of multirooted teeth. With age, cementum becomes acellular**.** Although remodeling of cementum occurs infrequently, resorption at the cementum surface followed by cementum apposition is often observed and, with age, this might result in irregular cementum surfaces [19].

Pulp - this includes:-

1. Compromised circulation and innervation - With age the pulp spaces of teeth decrease in size through the deposition of secondary and tertiary dentine. Blood vessels undergo arteriosclerotic changes with diminished blood supply to pulpal cells. There is progressive mineralization of nerve sheath [23].

2. Fibrosis of pulp - With ageing process, there is a considerable decrease in the number of pulpal cells (fibroblasts, odontoblasts and mesenchymal cells), with the cell density decreasing by half from 20 to 70 years.[24] At the same time, fibrous tissue accumulation occurs termed as fibrous degeneration/ pulposis/ senile fibrosis or pulp atrophy [25].

Fat droplet deposition -

1. Histologically, seen as fine droplets of fatty deposits in odontoblasts, nuclei of pulp cells and walls of pulp tissue capillaries [26].

2. Odontoblastic vacuolization - The odontoblastic cells are pushed apart and separated from the dentinal wall by the apparent pressure of an intercellular accumulation of fissure fluid.

Reticular atrophy - Pulp tissue has a netlike appearance that is apparently related to an abundance of intercellular fluid and a reduction in the number of pulpal cells.

1. Hyaline degeneration - is usually an intermediate stage in the formation of pulpal calcification which is seen as a sequelae to long-standing fibrous degeneration.

2. Mucoid degeneration - Mucoid lies in the interstitial spaces between cells and reticulum. With aging, mucoid increases and acid polysaccharides decrease [26].

Pulp calcifications - they have been classified in various types:- [23]

(i) Based on structure-
a) True -
- Made of dentin
- Lined by odontoblasts

b) False -
- Made from degenerated hyalinized pulpal tissue
- Not lined by odontoblasts

(ii) Based on size-
a) Fine -
- Exhibits fibrillar and irregular mineralization

b) Diffused -
- Exhibits relatively well defined hard structure in pulp

(iii) Based on location-
a) Free -
- Surrounded by pulp tissue

b) Attached -
- Partly fused with dentin

c) Embedded -
- Entirely surrounded by dentin

(iv) Based on recent classification by Schaffner et al. (2014) [27]
a) Layered -
- Arranged in layers
- Formed centrifugally
- Present in coronal pulp

b) Filament -
- Arranged in oval or elongated shape
- Formed irregularly
- Present in apical pulp

Temporomandibular Joint -

• Signs of TMJ change include joint clicking, limitation of jaw opening and deviation of the mandible during function, with the major symptom being pain [22]. Researchers with the Baltimore Longitudinal Study of Aging assessed all of these for arteriosclerosis or obliteration of the capillaries [28].

•More research into the aging TMJ is needed because these age-related changes might explain some of the masticatory problems in this age group [29].

Soft tissue changes with age:

Oral mucosa - Tissue friability arises from three sources:

i) a shift in water balance from the intracellular to the extracellular compartment and diminished kidney function results in dehydration of the oral mucosa,

ii) progressive thinning of the epithelial layers which increase the tissue vulnerability to mild stresses and

iii) nutritionally deficient cells.

The clinical result is the mucosa susceptible to even minor irritating stress and connective tissue that heals slowly [30].

Clinically, these changes involve the surface epithelium becoming thinner, drier, less elastic, less vascular, less firmly attached to the underlying connective tissue and bone and more susceptible to injury from mild stresses [30,16]. This often results in traumatic ulcers and angular cheilosis [15]. Some symptoms associated with these alterations, include xerostomia (mouth dryness) and sensations of pain or burning on the tongue, palate or oral mucosa [13]. These changes, however, must be interpreted with caution.

Gingiva -

• Thinning and decreased keratinization of gingival epithelium have been reported with age, resulting in subsequent exposure of more of the tooth surface and root [31,32]

• The degree of progression of gingival recession is related to age, tooth movement, inflammatory changes resulting from disease, oral care habits and heredity [32].

Tongue -

• It shows reduction in muscle tone without reduction in its size. The papillae are decreased both in number and size. At 20 years of age, there are around 252 taste corpuscles in a papilla and at 75 years of age, it drops to 88 corpuscles which leads to partial loss of taste sensation.

• There is hypertrophy of the foliate papilla and atrophy of filiform and fungiform papilla [33].

• Varicosities on the tongue can be commonly seen in elderly, characterized by small pin point and/or purple-red areas seen mainly on the ventral surface of tongue and can also extend to sides of the tongue and floor of mouth. These are the dilations of the diameter and increase in the number of vessels of the venous system. Their appearance is due to loss of support by the tissues, secondary to degeneration of elastic fibres [19].

Periodontal ligament -

• With advancing age, there is reduction in fiber and cellular contents, organic matrix production and the structure of ligament becomes more and more irregular [34]. Prominent age changes is seen in calcified tissues of periodontium, alveolar bone and cementum, is scalloping and the PDL fibers are attached to the peaks of these scallops than over the entire surface as seen in younger periodontium.

• Ive et al. (1980) [35] noted that both the width of socket and cementum increased with age. They suggested that as the socket remodels and increase in size with age, cementum is deposited at a relatively greater rate than the bone, causing a decrease in PDL space [36].

• The result is a progressive loss of soft tissue attachment, leading to exposure of the root and loosening of the teeth within their bony sockets [37].

Circumoral tissue changes with age:

Lips -

• They become very dry, wrinkled and sometimes present fissures in the external mouth corners. These symptoms can be more or less pronounced, depending on the individual's exposure to environmental agents such as solar radiation, temperature extremes, etc [19].

• Lévêque (2004) [38] showed that the wrinkle number and visibility are linearly related to age and becoming more visible at the fifth decade.

• Furthermore, the lip height decreases and inter commissural distance increases with ageing.

Oral musculature -

• Changes in aging oral musculature are consistent with those in aging muscle tissue in the body as a whole. In general, there are reductions in muscle tone, muscle performance, number and activity of muscle cells, and number and size of the muscle fibers [39,40].

• Replacement of the muscle mass by fat or fibrous connective tissue results in generalized atrophy of the musculature attached to the bones in the oral cavity [41].

Conclusion

This article summarizes the importance of geriatric education along with oral health care needs and oral tissue changes in the elderly. Geriatric dentistry is a specialized multidisciplinary branch of general dentistry designed to provide dental services to elderly patients. In addition, educating dental surgeons to play the role of oral physicians can determine the extent to which oral health care can be made accessible to the elderly population as oral health and maintaining healthy teeth should be a priority throughout life.

References:

1. Nadig RR, Usha G, Kumar V, Rao R, Bugalia A. Geriatric restorative care-the need, the demand and the challenges. J Conserv Dent 2011;14(3):208.

2. Mulligan R. Geriatrics: Contemporary and future concerns. Dent Clin North Am 2005;49:xi–xiii.

3. Allen PF, Whitworth JM. Endodontic considerations in the elderly. Gerodontology 2004 Dec;21(4):185-94.

4. Ettinger RL, Beck JD. Geriatric dental curriculum and the needs of the elderly. Spec Care Dentist 1984 Sep;4(5):207-13.

5. Reichard SK. Aging and personality: A study of eighty-seven older men. Ergonomics 1962;6(2):233-34.

6. House MM. Art—a fundamental in denture prosthesis. J Am Dent Assoc 1937 Mar 1;24(3):406-22.

7. Razak PA, Richard KJ, Thankachan RP, Hafiz KA, Kumar KN, Sameer KM. Geriatric oral health: a review article. J Int Oral Health 2014 Nov;6(6):110.

8. Shah N. Need for gerodontology education in India. Gerodontology. 2005 Jun;22(2):104-5.

9. Glassman P, Miller C, Wozniak T, Jones C. A preventive dentistry training program for caretakers of persons with disabilities residing in community residential facilities. Spec Care Dentist 1994 Jul;14(4):137-43.

10. Shetty S. The Need for Geriatric Dental Education. J Indian Prosthodont Soc 2014 March;14(1):1-2.

11. Ramazzotto LJ, Curro FA, Gates PE, Paterson JA. Calcium nutrition and the aging process: A review. Gerodontology 1986 Dec;5(3):159-68.

12. Somerman MJ. Mineralized Tissue in Aging 1. Gerodontology 1984 Jul;3(2):93-9.

13. Baum BJ. Research on aging and oral health: an assessment of current status and future needs. Spec Care Dentist 1981 Jul;1(4):156-65.

14. Yellowitz J, Saunders MJ. The need for geriatric dental education. Dent Clin North Am 1989 Jan;33(1):11-8.

15. Poonam Malik, Manu Rathee, Mohaneesh Bhoria. Int J App Dent Sci 2015; 1(3): 04-07.

16. Hargreaves KM, Berman LH. Cohen's Pathways of the Pulp, 11th ed. Elsevier Health Sciences; 2015.

17. Crabb HSM, Bristol RCS. The Pattern of Mineralization of Human Dental Enamel. Proc R Soc Med 1937;52(2):118-22.

18. Spijker AV, Rodriguez JM, Kreulen CM, Bronkhorst EM, Bartlett DW, Creugers NH. Prevalence of tooth wear in adults. Int J Prosthodont. 2009 Jan 1;22(1).

19. Kumar GS. Orban's Oral Histology & Embryology. Elsevier Health Sciences; 2014.

20. Murray PE, Stanley HR, Matthews JB, Sloan AJ, Smith AJ. Age-related odontometric changes of human teeth. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2002 Apr 1;93(4):474-82.

21. Shroff FR, Williamson KI, Bertaud WS. Electron microscope studies of dentine: The true nature of the dentinal canals. Oral Surg Oral Med Oral Pathol Oral Radiol 1954 Jun 1;7(6):662-70.

22. An G. Normal aging of teeth. Geriatr Aging. 2009;12(10):513-7.

23. Goga, R, Chandler, NP, Oginni, AO. Pulp stones: a review. Int Endod J 2008;41(6):457-68.

24. Ketterl W. Age-induced changes in the teeth and their attachment apparatus. Int Dent J 1983 Sep;33(3):262-71.

25. Morse DE, Holm-Pedersen P, Holm-Pedersen J, Katz RV, Viitanen M, von Strauss E, Winblad B. Prosthetic crowns and other clinical risk indicators of caries among old-old Swedish adults: Findings from the KEOHS Project. Gerodontology 2002 Dec;19(2):73-9.

26. Seltzer S. Classification of pulpal pathosis. Oral Surg Oral Med Oral Pathol 1972 Aug 1;34(2):269-87.

27. Schaffner M, Stich H, Lussi A. [Denticles: dental pulp calculi]. Swiss Dent J. 2014; 124: 416-417.

28. Heft MW. Prevalence of TMJ signs and symptoms in the elderly. Gerodontology 1984 Jul;3(2):125-30.

29. Greene CS. Temporomandibular disorders in the geriatric population. J Prosthet Dent 1994 Nov 1;72(5):507-9.

30. Klein DR. Oral soft tissue changes in geriatric patients. Bull N Y Acad Med 1980;56(8):721.

31. Newman MG, Takei H, Klokkevold PR, Carranza FA. Carranza's Clinical Periodontology. Elsevier Health Sciences; 2011.

32. Saunders MJ, Yeh, CK . Oral health in elderly people. Geriatr Nutrition. 2013;163-208.

33. Berg R, Morgenstern NE. Physiologic changes in the elderly. Dent Clin North Am 1997;41(4):651-668.

34. Abiko Y, Shimizu N, Yamaguchi M, Suzuki H, Takiguchi H. Effect of aging on functional changes of periodontal tissue cells. Ann Periodontol 1998 Jul;3(1):350-69.

35. Ive JC, Shapiro PA, Ivey JL. Age-related changes in the periodontium of pigtail monkeys. J Periodontal Res 1980 Aug;15(4):420-8.

36. Van der Velden U. Effect of age on the periodontium. J Clin Periodontol 1984 May;11(5):281-94.

37. Mackenzie IC, Holm-Pedersen P, Karring T. Age changes in the oral mucous membranes and periodontium. Geriatr Dentistry 1986;25:103-16.

38. Lévêque JL, Goubanova E. Influence of age on the lips and perioral skin. Dermatol 2004;208(4):307-13.

39. Sonies BC, Stone M, Shawker T. Speech and swallowing in the elderly. Gerodontol 1984 Jul;3(2):115-23.

40. Newton JP, Yemm R, Abel RW, Menhinick S. Changes in human jaw muscles with age and dental state. Gerodontol 1993 Jul;10(1):16-22.

41. Vergo Jr TJ, Papas AS. Physiological aspects of geriatric dentistry. J Mass Dent Soc 1988;37(4):165.