ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 12, Issue, 06, pp.12116-12121, June, 2020

DOI: https://doi.org/10.24941/ijcr.38963.06.2020

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

REVIEW ARTICLE

GERIATRIC ENDODONTICS

[1,*]Sonali Talwar, [2]Pinki Narwal, [3]Smridhi Bhanot, [4]Amit Sood, [5]Simarjit Singh and [6]Pardeep Mahajan

[1]Post Graduate Student, Department of Conservative Dentistry and Endodontics, Genesis Institute of Dental Sciences and Research, Ferozepur, Punjab, India
[2]Post Graduate Student, Department of Conservative Dentistry and Endodontics, Genesis Institute of Dental Sciences and Research, Ferozepur, Punjab, India
[3]Post Graduate Student, Department of Conservative Dentistry and Endodontics, Genesis Institute of Dental Sciences and Research, Ferozepur, Punjab, India
[4]Professor, Department of Conservative Dentistry and Endodontics, Genesis Institute of Dental Sciences and Research, Ferozepur, Punjab, India
[5]Private Practice, Sandhar Dental Clinic, Punjab, India
[6]Professor and Head of Department, Department of Conservative Dentistry and Endodontics, Genesis Institute of Dental Sciences and Research, Ferozepur, Punjab, India

ARTICLE INFO

Article History:
Received 20th March, 2020
Received in revised form
29h April, 2020
Accepted 27th May, 2020
Published online 30th June, 2020

Key Words:

Geriatric , Endodontics ,Oral health, Elderly, Clinical changes, Root canal treatment.

ABSTRACT

Increase in the life expectancy and the health care has led to the rising of the elderly numbers in the populations. With the increase in the life span, chronic diseases play a significant role and the dental diseases are the most prevalent chronic condition . The dentist, therefore, has an essential role in maintaining and improving dental health as part of total healthcare services available to the elderly.Root canal therapy is an essential phase of such treatments. Elderly patients may exhibit one or more systemic conditions that require special care, in addition to other changes that occur within the dentition and oral mucosa as a result of aging. These make root canal treatment in elderly patients a great challenge.This article reviews the role of endodontics in helping older adults achieve the goal of retaining healthy teeth and satisfactory oral function into old age.

Citation: ***Sonali Talwar, Pinki Narwal, Smridhi Bhanot, Amit Sood, Simarjit Singh and Pardeep Mahajan.*** **2020.** "Geriatric endodontics", *International Journal of Current Research*, 12, (06), 12116-12121.

INTRODUCTION

Aging is a natural process. Old age should be regarded as normal, inevitable biological phenomenon (Manjusha 2016).The mouth is referred to, as a mirror of overall health reinforcing that oral health is an integral part of general health. In elderly population poor oral health has been considered a risk factor for general health problems; on the other hand, older adults are more susceptible to oral conditions or diseases due to increase in chronic conditions and physical and mental disabilities (Yeh 2008). The dentist, therefore, has an essential role in maintaining and improving dental health as part of total healthcare services available to the elderly.

Corresponding author: **Sonali Talwar,**
Post Graduate Student, Department of Conservative Dentistry and Endodontics, Genesis Institute of Dental Sciences and Research, Ferozepur, Punjab, India.

With advances in oral health promotion and oral disease prevention in industrialized countries, more people retain their natural teeth into their old age as compared to a half-century ago. Therefore, dental services for the elderly are shifting from removable prosthetic-centered care to comprehensive treatment including restorative dentistry, periodontal therapy, oral surgery, endodontics, and even cosmetic dentistry, orthodontics and implants (Yeh, 2008). Endodontic treatment is an essential part of maintaining the health and well-being of the elderly. Retention of natural teeth improves the quality of life and the overall health and longevity of ageing patients. Also, teeth that might be otherwise extracted may be strategically valuable to retain a prosthesis, and elderly patients are more likely to have medical complications that may prevent dental extractions from being safely performed (Johnstone, 2015). The technical goals of endodontic treatment in the elderly are the same as those for younger patients. Purpose of this paper is to outline the role of endodontics in

helping older adults achieve the goal of retaining healthy teeth and satisfactory oral function into old age.

How important is the tooth?

Before considering the challenges and technalities in providing successful endodontic treatment to geriatric patients, importance of preserving the tooth should be considered. The decision-making process regarding endodontic treatment should be guided by the strategic importance of the tooth. Preservation of a tooth may be useful as (Allen, 2005):

- It preserves an intact dental arch, especially in an aesthetically important area.
- It enhance the retention of a removable prosthesis, particularly when loss of the tooth will result in a free-end saddle.
- Act as a retainer for a fixed prosthesis.
- A means of maintaining an important occlusal contact in a reduced dentition. Retention of a final standing molar may help to preserve occlusal stability, avoid the need for a removable partial denture altogether, or at least avoid the need for it to have a free-end saddle.
- It preserves bone while planning a partial or complete tooth supported overdenture. Teeth, which are periodontally compromised can serve as overdenture abutments after root canal treatment and decoronation.

In each of these cases, the clinician needs to deal with the immediate problem of management of a non-vital, possibly infected, tooth and also plan the long-term care for this patient. Retention of strategic teeth in such cases, is an essential factor for successful prosthodontic procedure. In other situations, preservation of a tooth may be unhelpful. This includes teeth, with no functional capacity, unfavorably fractured or grossly carious teeth, which have unmanageable periodontal disease. Occasionally, a tooth may be grossly over-erupted and may create difficulties for achieving an acceptable occlusal scheme for an opposing denture or bridge, and extraction is a preferable course of action.

CHANGES WITH AGE (Yeh, 2008**)**

Saliva: One profound side effect of multipharmacy is xerostomia (mouth dryness). Saliva is the primary oral defense mechanism in maintaining tooth structure against oral infections. Saliva contains multiple antimicrobial factors, buffering systems, supersaturated calcium phosphates, large lubricant molecules and digestive enzymes. Salivary hypofunction usually causes rampant and severe oral diseases such as caries and Candida infection. Without adequate salivary function, quality of life also is likely to be compromised since salivary moisture offers lubrication for taste, speech, chewing and swallowing.

Effect of Drugs

Certain medications commonly prescribed for the elderly can cause enlargement of gingival tissues (e.g. phenytoin sodium and calcium channel blockers) or induce lichenoid reaction (e.g. hydrochlorothiazides and ACE inhibitors or angiotensin II receptor antagonists). Clinical conditions, such as hypertension, anticoagulation therapy and hypoglycemia, can trigger emergency crises during dental treatment. Patients with diabetes often have cardiovascular diseases and are more susceptible to infection if the disease is not properly controlled. Although controversial, antibiotic prophylaxis may be necessary for dental procedures in frail elders to prevent infection of replaced joints and cardiac prosthetic valves. While dental health care workers provide their professional judgment regarding these special conditions, consultations with other health professions are often required to optimize patient care. Unlike the former guideline, the new AHA guideline has limited preventive antibiotic use prior to invasive dental procedures in patients with artificial heart valve, history of infective endocariditis, certain specific and severe congenital heart diseases, and a cardiac transplant with valve problem.

Aging of the Dental tissues: (Stanley, 1983; Pashley, 2002; Seltzer, 1990; Stanley, 1962; Walton, 1997; Bernick, 1967; Bernick, Nedelman, 1975)

Enamel: The enamel of our teeth endures both chemical and morphological changes through the years. These tissues become less hydrated and experiences superficial increases in fluoride content with age, especially with the uses of dentifrice and tap water. Thickness of the enamel does change overtime, especially on the facial, proximal contacts, and incisal and occlusal surfaces due to the many chewing cycles and cleaning with abrasive dentifrices. The disappearance of the outer layer of enamel overtime changes the way in which the tissue interacts with acidic solutions.

Dentin: The volume of dentin increases through the continuous apposition of secondary dentin on the walls of the pulpal chamber. Aged dentin is more brittle, less soluble, less permeable, and darker than it was earlier in life. There is formation of tertiary dentin in response to trauma, caries or any irritation. Thus the dentinal changes are:

- Increased peritubular dentin
- Increased dentinal sclerosis
- Increased number of dead tracts
- Decreased tubular permeability
- Increased reparative and secondary dentin formation
- Yellowish discoloration of dentin.

Pulp Space: The size of the pulp chamber and volume of the pulpal tissue decreases with reparative and secondary dentin formation. The odontoblastic layer surrounding the pulp changes progressively from a multilayer organization of active columnar cells to a single layer of relatively inactive cuboidal cells. Calcification of the root canals increases with age, and the cementum volume within the alveolus increases gradually overtime, notably in the apical and periapical areas.

Age changes in the Pulp

- Decreased cells
- Increased collagen fibers (fibrosis)
- Receding pulp horns
- Small volume of pulp space
- Calcifications
- Decrease in pulpal nerves and blood vessels
- Decreased pulpal healing capacity
- Decrease in odontoblastic size
- Disappearance of odontoblasts in pulpal floor areas especially in bifurcation and trifurcation.

In Root (Stein, 1990)

- Increased cementum deposition at root apex
- Calcification of root canals

Pathologic And Physiologic Changes In Geriatric Patients (Kaweckyl 2011)

Cardiovascular System

- High blood pressure—cardiac disease, cerebrovascular disease, renovascular disease.
- Coronary artery disease—angina pectoris, arrhythmias, myocardial infarction, decreased contractility

Central Nervous System

- Alzheimerism
- Responses to stimuli—all autonomic reflexes are slower
- Sleep patterns—less restful sleep, possible insomnia
- Voice: decreased range may become higher pitched.
- Cerebral arteriosclerosis—CVA, decreased memory, emotional changes
- Parkinsonism

Endocrine System

- Decreased response to stress
- Maturity—type two adult-onset diabetes mellitus.

Gastrointestinal System

- Mastication—impaired, due to loss of teeth or ill-fitting appliances
- Swallowing—more difficult as salivary secretions decrease
- Digestion—decreased due to reduction in production of digestive enzymes.
- Tongue—increase in the number of lingual varicosities
- Salivary glands—decreased production, especially by some medications.

Respiratory System

- Arthritic changes in thorax
- Interstitial fibrosis
- Pulmonary problems related to pollutants

Genitourinary System

- Decreased renal blood flow
- Decreased number of functioning glomeruli
- Decreased tubular reabsorption
- Benign prostatic hypertrophy
- Increased urination frequency
- Incontinence.

Hearing

- Decrease in hearing capacity, may wear hearing aids
- Integumentary system
- Texture—skin loses elasticity, wrinkling, dryness
- Color—face paler, spotty pigmentation
- Temperature—extremities cooler, decreased perspiration
- Hair—decreased growth, thinning, graying
- Nails—decreased growth, increased ridges.

Olfactory System

Decrease in sense of smell (will affect the sense of taste).

Oral Cavity

- Bone—darker in color, stained, attrition, weakened under load
- Circumoral tissues—stiffen
- TMJ—muscle tone decreases
- Mucous membranes—dry, shiny, more fragile
- Periodontium—recession, redness, swelling, deterioration of bone
- Senile emphysema
- Anatomic structure-increased anterior-posterior diameter.

Vision

- Decrease in peripheral vision
- Sensitivities to bright lights
- Glaucoma
- Cataracts

Diagnosis & Treatment Plan

Medical History (Newton, 1998)

A thorough medical history is more important in older patients because they are likely to suffer from chronic diseases and take more medications. Sensitivity to medications, drug intolerance and potential interactions with drugs prescribed for dental treatment are to be anticipated.

Chief Complaint

• Geriatric patients usually have fewer complaints and dental pain usually is indicative of either pulpal or periodontal pain
• Patients must be allowed to explain in their own words at which time one must note for visual /auditory handicaps, patient's dental knowledge and his/her ability tocommunicate.

Dental History: Usually will have a history of repeated episodes of dental treatment and decay, multiple restorations and frequent dental visits.

Subjective Symptoms: The examiner can pursue responses to questions about the patient's complaint, the stimulus or irritant that causes pain, the nature of the pain, and its relationship to the stimulus or irritant. This information is most useful in determining whether the source of the pain is pulpal in origin, if the problem is reversible, and whether inflammation or infection has extended to the apical tissues. Thus the clinician can determine what types of tests are necessary to confirm findings or suspicions.

Objective Signs

- Increased incidence of root sensitivity that is hard to control.
- Increased incidence of caries specially subgingival root caries which is difficult to restore in the interproximal regions resulting in restoration failure and continued decay.
- Tooth wear in the form of attrition, abrasion and erosion.

- Increased susceptibility to cracks, cuspal fracture, craze lines due to loss of resiliency and decreased organic component of teeth.
- Temporomandibular joint dysfunction and decreased vertical dimension owing to compensating bite because of loss of teeth.
- Less tilting and supraeruption because of decreased eruptive forces of teeth.
- Increased incidence of periodontal problems and a need for combined endodontic-periodontic treatment.

Diagnostic Aids (Stanley, 1962; Walton, 1997; Bernick, 1967; Bernick, 1975 and Keir et al., 1991**)**

Pulp Testing

- Slow and gentle testing should be done
- Response to pulpal stimuli is weaker in such cases
- There is no correlation between the degree of response to electric pulp test and degree of inflammation because of decreased neural and vascular components, increased fibrosis, reduced pulp volume, change in character of ground substance, excessive calcification, pulp recession and extensive restorations.
- Must be avoided in patients with pacemakers
- Test cavity is less useful.

Radiographs

Film placement:

- Adversely affected by tori, exostoses
- Assisted by apical position of muscle attachments that increase depth of vestibule
- Use of film holders
- Increased exposure time due to tori, exostoses and denser bone.

For patients that cannot firmly stabilize mid-treatment radiographs, alternative techniques should be considered, such as using the rubber dam to support the film holders. The use of a Snap-A-Ray as opposed to artery forceps gives a broader surface area for the patient to grip, which may be easier to support during mid-treatment films, especially in the anterior region (Johnstone 2015).

Radiographic images generally show:

- Pulp calcifications
- Pulp recession
- Increased cementum formation at apex (hypercementosis)
- Small canals
- Even canal calcification throughout
- Decreased osteosclerosis and condensing osteitis
- Increased incidence of some odontogenic cysts and tumors

General considerations for dentist (AlRahabi 2019)

- Informed consent and communication with patients before any procedure.
- Strict evaluation of medical history and medication should be done in consultation with their physicians.
- Older adults are more susceptible to orthostatic hypotension. Dentists must be attentive when older adults are transferred from a reclining posture in the dental chair to a standing position.
- The dentist should be aware of the psychosocial and economic considerations for the patient, problems such as the expense of the medications , the possibility of forgetfulness and poor compliance. Special packaging, clear labeling, and simplified dose regimens may improve compliance.
- Dental office should be designed to accommodate people with special needs (e.g. wheelchairs). Patients who remain in the wheelchair during treatment will need additional head support in the form of a portable headrest
- Timing of appointment should be either early morning or late morning/afternoon so that the patient would have had his/her breakfast and routine medications
- Chair adjustments (preferably upright position) and pillows are required for neck support. Always ask the patient before moving the chair or adjusting supports, and frequently ask if the patient is still comfortable
- Shield patients eye from dental light
- Prevent jaw fatigue by short treatment procedures and the use of bite blocks
- Restroom facility is necessary for breaks at regular intervals

Endodontic Considerations

(Kaweckyl, 2011; Newton, 1998; Koch, 2011; Gutmann, 2006)

Preparing For Treatment

Need for anesthesia depends on:

- Pulp vitality status
- Cervical positioning of rubber dam clamp

During anesthesia: Anatomic landmarks that are used as guides to needle placement during block and infiltration injections are usually more distinguishable in older patients. The effects of epinephrine should be considered when selecting anesthetics for routine endodontic procedures. Anesthetics should be deposited very slowly (and skeletal muscle avoided) if epinephrine is the vasoconstrictor. The reduced width of the periodontal ligament makes needle placement for supplementary intraligamentary injections more difficult.The majority of patients receiving an intraosseous injection of 2% lidocaine with 1:100,000 epinephrine (correct ratio) solution experience a transient increase in heart rate. This would not be clinically significant in most healthy patients, but in the older patient whose medical condition, drug therapies, or epinephrine sensitivity suggests caution, 3% mepivacaine is a good alternative for intraosseous injections.The reduced volume of the pulp chamber makes intrapulpal anesthesia difficult.

Isolation

- Isolation should be carried out for single tooth preferably
- Multiple tooth isolation should be carried out only if adjacent teeth can be clamped and saliva ejector

placement tolerated (Saliva ejector is usually not preferred because of decreased salivary outflow and gag reflex)

Access

- Identification of canal orifices and access to root canals can be challenging therefore, use of magnification (microscopes) is an advantage.
- Use of DG 16, micro-openers and microdebriders to locate canal orifices. Piezo electric ultrasonic endodontic tips are excellent for removing the secondary dentin that often covers the canal orifices
- Another aid in the treatment of geriatric patients is the use of transillumination. The technique is quite simple. Turn off all the lights in the treatment room and turn off the light on the dental unit. Proceed to shine the fiber optic light through the tooth at the CEJ level. The tooth will appear like a 'Jack O' Lantern'. Calcified canals will appear as dark dots, not as wide canals. Transillumination is also a good way to diagnose cracked and fractured teeth
- Negotiation with No. 8/No.10 K-file with chelating agents
- Use of dye to differentiate orifice surrounding dentin
- Avoid use of broaches
- Modification to enhance access-Coronal tooth structure might have to be sacrificed for access (at times even complete removal of crown) and widening of axial walls for visibility
- Perforations are more likely to occur as the pulp chamber is calcified and disk- like. Immediate sealing with an appropriate root repair material improves the prognosis significantly.

Preparation

- Calcification of older canals is much more concentric and linear and this allows easier penetration once canals are found
- Flaring of canal is advised early in the procedure to provide reservoir for irrigation solution and to reduce binding of instruments
- NiTi rotary instrumentation provides a more efficient and reliable shaping of the calcified and curved root canals and the clinician can bypass the tedious work of hand instrumentation benefit from the super elasticity of the NiTi metal
- Longer canals seen because of increased cementum deposition
- Use of instruments with no rake angle and crown down technique preferred
- The root canals associated with the elderly can be sufficiently cleaned and shaped if one can take the preparation to a fully tapered 0.04 taper
- Difficulty of locating apical constriction:
  - 0.5 to 2.5 mm from radiographic apex
  - Clinicians tactile sense reduced
  - Reduced periapical sensitivity in older patients
  - Use of electronic apex locator limited in heavily restored teeth
  - Penetration into calcified canal is difficult.

Obturation

- Gutta-percha techniques that do not require large midroot taper are preferred. A hydraulic/lateral condensation technique with a bioceramic sealer and coated cones is ideal and less time-consuming. Root fractures may occur when much taper is given to the canals and post failures are likely to occur with parallel posts
- Adequate coronal seal is mandatory and amalgam or bonded restorative materials may be used.

Success and Failure of Endodontic Treatment: Persistence or the development of the symptoms should not be ignored, and the extent of failure should be closely examined before re-treatment attempt; surgery or extraction is suggested. With vital pulps, repair of periapical tissues is determined by the presence of local and systemic factors. With non-vital pulps and periapical pathology, repair is slow because of arteriosclerotic changes of blood vessels and altered viscosity of connective tissues. Periapical repair is more difficult as the rate of bone formation decreases with age. Intentional replantation is not a good alternative treatment in geriatric patients in case of failure of any case. If necessary, the simplest surgical alternatives (i.e., incision and drainage) are possible. But if the patient is healthy, endodontic surgery can be planned (if the surgery is only alternative), i.e., very valuable abutment to save if there is no any other alternative or treating and correcting some procedural errors.

Endodontic Surgery: Generally, considerations and indications for endodontic surgery are not affected by age. Medical considerations may require consultation but do not contraindicate surgical treatment when extraction is the alternative. Many older patients receive low-dose aspirin therapy to prevent blood clot formation and may be subject to embolic formation if the treatment is interrupted. Aspirin therapy should be continued throughout dental procedures, even during extraction or surgery.

Local anatomic considerations in the elderly

- The thickness of overlying soft and bony tissue is usually reduced, and apically positioned muscle attachments extend the depth of the vestibule.
- Tissue is less resilient, and resistance to reflection appears to be diminished
- The position of anatomic features—the sinus, floor of the nose, and neurovascular bundles—remains the same, but their relationship to surrounding structures may change when teeth have been lost.
- Increased incidence of fenestrated/ dehisced root/exostoses
- Surgically more access to apex in older patients
- Ecchymosis is a more common postoperative finding in older patients and may appear to be extreme. The patient should be reassured that this condition is normal and that normal color may take as long as 2 weeks to return.

Conclusion

Elderly have low expectation of oral health, which needs to be changed by trained dental professionals. Treatment plan should be aimed at retaining the maximum number of natural teeth through preventive and curative procedures rather than extraction and dentures. Health care delivery should be as pain-free and comfortable for the elderly as possible. In conclusion, geriatric dentistry needs to be developed as soon as possible to provide quality oral health care to the elderly population.

REFERENCES

Allen, Patrick & Whitworth, John. 2005. Endodontic considerations in the elderly. Gerodontology. 21. 185-94.

AlRahabi, Mothanna K. 2019. "Root canal treatment in elderly patients: A review and clinical considerations", Saudi medical journal, 403 : 217-223.

Bernick S. 1967. Effect of aging on the nerve supply to human teeth. *J Dent Res.,* 46:694.

Bernick, Nedelman C. 1975. Effect of aging on the human pulp. *J Endod.,* 3:88.

Gutmann JL, Lovdahl PE. 2006. Problem solving in endodontic, gutman. 5th ed. chapter 8, Elsevier, Mosby, Problem Solving in Tooth Isolation, Access Openings, and Identification of Orifice Locations; p. 162-168.

Johnstone M et al, 2015.'Endodontics and the ageing patient', Australian Dental Journal, 60: 20-27.

Kaweckyl N. Geriatric dentistry: reviewing for the present, preparing for the Future Crest® Oral-B® at dentalcare.com Continuing Education Course, Revised August 16, 2011.

Keir DM, Walker WA 3rd, Schindler WG, Dazey SE. 1991. Thermally induced pulpagia in endodontically treated teeth. *J Endod.,* 17:38.

Koch K, Brave D. Gerontology and its clinical challenges, Endodontics feature, dentaltown.com, Nov 2011.

Manjusha S Pardhan et al., 2016. 'Geriatric Dentistry- an Overview', *International Journal of Oral Health Dentistry,* 2(1): 26-28.

Newton CW, Brown CE Jr, 1998. Geriatric endodontics. Chapter number 23, Pathways of the Pulp. 7th ed, Mosby Publishers, p 759-790.

Newton CW, Patterson SS. 1981. Geriatric endodontics. J Mass Dent Soc., 30:93-95.

Pashley DH, Walton RE, Slavkin HC. 2002. Histology and physiology of the dental pulp. Endodontics. 5th ed. BC Decker, Elsevier. Ont: BC Decker Inc; p. 25-61.

Seltzer S, Bender IB, editors. 1990. The dental pulp: biologic considerations in dental procedures, 3rd ed. St Louis: *Ishiyaku Euro America* p324-348.

Stanley HR, Pereira JC, Spiegel E, Broom C, Schultz M. 1983. The detection and prevalence of reactive and physiologic sclerotic dentin, reparative dentin and dead tracts beneath various types of dental lesions according to tooth surface and age. J Oral Pathol12:257.

Stanley HR, Ranney RR. 1962. Age changes in the human dental pulp. I. The quantity of collagen. *Oral Surg., 15*:1396.

Stein TJ, Corcoran JF. 1990. Anatomy of the root apex and its histologic changes with age. *Oral Surg Oral Pathol Oral Med.,* 69:238.

Walton RE. 1997. Endodontic considerations in the geriatric patient. *The Dental Clinic of North America* 41(4):795-816.

Yeh C-K et al. 2008. 'Geriatric dentistry: integral component to geriatric patient care', Taiwan Geriatrics Gerontology, 3(3): 182– 192.

****