

Age Changes In Oral Tissues

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Abstract

Ageing is a part of the continuous process from conception to death. It is a multidimensional process of physical, psychological, and social change. Generally normal aging is associated with a reduction in functional reserve capacity in tissues and organs. WHO refers to old age as a period when impairment of physical conditions becomes frequently apparent. Ageing is the consequence of various autonomous events involving random genetic change, genetically programmed senescence, and environmental injury. Roughly 100,000 people worldwide die each day due to age-related causes.

Introduction

Ageing and senescence are related words and are often used interchangeably as both processes are characterized by progressive changes in the tissue of the body, eventually leading to a decline in function and death of the organism. Senescence refers to a post maturational process that leads to diminished homeostasis and increased vulnerability of the organism to death. Ageing in contrast refers to any time related process and is continuous process that starts at conception and continues until death.³

Age Changes In Enamel⁴

Physical Changes: Most apparent change is wearing of the Occlusal Surface and proximal contacts due to Mastication.

Clinical manifestation: Appearance of small polished facet on the cusp tip or ridge or slight flattening of the incisal edges, progressing gradually with age.

- * Reduction in the cuspal height and inclination and flattening of proximal contour.
- * Loss of vertical dimensions.
- * Reduced maxillary/mandibular overjet and so an edge to edge anterior relation exists.
- * Shortening of the length of dental arch due to reduction in the mesiodistal diameters of the teeth through proximal attrition.
- * Enamel becomes harder and brittle with age.
- * Color changes: teeth darken with age due to
 - i) addition of organic material to the enamel from environment
 - ii) deepening of progressively thickened dentin seen through progressively thinned translucent enamel.

Chemical Change:

- * Some researchers claim an increase in the organic content however some report a decline.
- * Increase in Nitrogen and Fluoride content (increasing caries resistance)
- * Increase in the size of the enamel crystal (due to ions acquired by it from the oral fluids)

Age Changes In Dentin

- * Continuous narrowing of the lumen of the dentinal tubule, increasing calcification, reduction in the amount of peritubular fluid and reduced sensitivity due to formation of physiologic secondary dentin.
- * The thickness of mantle dentine and globular dentine decreases with age.
- * Pathologic effects of dental caries, abrasion, attrition, or erosion causes development of dead tracts, sclerosis, and reparative dentin.
- * Formation of reactionary/regenerative and reparative/ tertiary dentin (lacks dentin phosphophoryn).
- * Nestin and Notch proteins which are expressed in young odontoblasts during odontogenesis are absent in adult tissue but are re-expressed in reparative dentin.
- * Reparative dentin formation is maximum (3.5µ /day) between 1 – 1.5 months post operatively, after which it rapidly declines.
- * Dead tracts have decreased sensitivity and occurs to a greater extent in older teeth.
- * Manifests as a black zone by transmitted light but as a white zone by reflected light.
- * Due to the differences in the refractive indices of affected and normal tubules.
- * Tubules are not calcified, and hence are permeable.
- * Sclerosis of the primary dentin / transparent dentin
- * Characterized by calcification of the dentinal tubules (source of Ca salts is the fluid within the tubules).
- * Apatite crystals appear in dentinal tubules
- * The increased mineralization of the tooth decreases the conductivity of the odontoblastic processes
- * Harder than adjacent normal dentin.

Age Changes In Pulp

Cellular Changes:

- * Number of cells, cell size, number of cytoplasmic organelles decreases with age.
- * Intracellular organelles eg. Mitochondria and endoplasmic reticulum; are reduced in

number and size

- * Fibroblasts in aging pulp has less perinuclear cytoplasm with long, thin cytoplasmic processes.
- * Decreased pulp cell density may reduce pulp repair activity.

Fibrosis

- * Degeneration and disappearance of the odontoblasts.
- * In aging pulp, accumulations of both diffuse fibrillar components and bundles of collagen fibres appear.
- * Fibre bundles : longitudinal in radicular pulp and diffuse in coronal pulp
- * With age there is reticular atrophy of the pulp (discrete vacuolization of the pulpal tissue and reduction in the number of cellular elements)
- * The volume of the pulp declines owing to the deposition of secondary dentin.

Vascular changes⁵

- * Atherosclerotic plaques appear in pulpal vessels.
- * Capillary endothelium shows numerous pinocytal vesicles micro vesicles and microfilaments along with lipid like vacuoles, glycogen granules and many Golgi complexes.
- * Blood flow also decreases with age.
- * Calcification seen in the vessel wall, more near the apical foramen.
- * Outer diameter of blood vessel becomes greater due to increase in collagen in the adventitial and medial layers of blood vessels.

Age Changes In Cementum

- * Width of cementum at 76 years of age is 3 times that of at 11 years of age.
- * Cemental irregularities increase with age
- * Occurrence of small spikes or outgrowths of cementum on the root surface is observed due to deposition of irregular cementum in focal groups of fibres of the PDL.
- * Cementicles (small foci of calcified tissue)

are also an example of degenerative change in the cementum

- * may be free / attached/embedded and not larger than 0.2-0.3 mm in diameter.
- * Clusters of cementicles known as cementoma is more commonly seen in apical region of the tooth.

Age Changes In Periodontium⁶

- * Increased number of elastic fibres with decreased number of collagen fibres and mucopolysaccharides. decreased vascularity, mitotic activity and fibroplasia.
- * - Width of ligament can increase or decrease.
- * -The cell number and activity decrease with age
- * Activity of PDL decreases with age because of restricted diet thus diminishing the normal functional stimulation of the PD tissue
- * With age degree of periodontal breakdown increases
- * - inflammation of the periodontium develops more rapidly
- * - slower rate of wound healing.
- * These effects are based on molecular changes in the periodontal cells, which intensify bone loss in elderly patients with periodontitis.
- * The bacterial composition of the periodontal pocket is altered with increasing age as gram positive cocci increase and gram negative anaerobic rods decrease.

Age Changes In Mandible

In Children:

- * The two halves of the mandible fuse during the first year of life.
- * At birth the mental foramen opens below the lower border of deciduous molar teeth.
- * The mandibular canal runs near the lower border.
- * The foramen and canal gradually shifts upwards.

In adults

In old age

- * Teeth fall out and alveolar border is absorbed,so that the height of the body is markedly reduced.
- * The mental foramen and mandibular canal are close to the alveolar bone.
- * The angle becomes obtuse about 140 degrees because the ramus is oblique.

Changes In Maxilla

- * At birth-the transverse and anteroposterior diameters are more then the vertical diameter.
- * Frontal process is well marked.
- * Body consist of a little more then the alveolar process, the tooth reaching to the floor of orbit
- * Maxillary sinus is a mere furrow on the lateral wall of the nose.

In Adults:

- * Vertical diameter is greatest due to the

development of alveolar process and increase in the size of the sinus.

In Old Age:

- * The bone reverts to the infantile condition.
- * Its height is a result of absorption of the alveolar process.

Age Changes In Oral Mucosa

- * With age oral mucosa becomes smooth and dry. Due to thinning of epithelium due to reduction in the thickness of epithelial ridges and decrease in salivary secretions.
- * Atrophy of the connective tissue, loss of elasticity.
- * Ectopic sebaceous glands (Fordyce's spots) commonly seen in elderly.

Age Changes In Tongue

- * The filiform papilla becomes reduced and the tongue appears smooth owing to reduction in the thickness of epithelium also due to nutritional deficiencies
- * Varicose veins seen on the ventral aspect of tongue known as lingual varices or cavier tongue
- * Glossitis, geographic tongue, fissured tongue, black hairy tongue, atrophy of fungiform and filiform papillae, angular stomatitis and oral hyperpigmentation also occur with increasing frequency in the geriatric population.
- * Scott et al. (1983) and Masaru Sasaki(1994) studied lingual dorsal and lateral epithelial thicknesses in humans and reported that the mean epithelial thickness decreased 30% in this age range.

Age Changes In Salivary Glands

- * Generalized loss of gland parenchymal tissues, with gradual loss of acinar volume.
- * Lost salivary cells are replaced by adipose tissues.
- * Increased fibrous connective tissue and vascular elements.
- * Increase in the nonstriated intralobular ducts, dilatation of extralobular ducts with degenerative and metaplastic changes.
- * Reduction of salivary flow, causing dry mouth makes it difficult to eat, swallow, taste, and even speak, also increases the risk for oral disease.
- * The saliva has an important immunological role. It contain immunoglobulin A, inhibit bacterial adherence, to neutralize toxins, and to protect the oral mucosa from penetrating antigens and allergens .
- * A decrease in the saliva, has been reported which thus compromises the immunity of the mucosa. (Riedler et al 1993).
- * Oral clearance, speaking, oral comfort, denture retention, and caries resistance are all impaired to some degree by xerostomia, because the saliva that is present is often more viscous rather than watery.
- * Dry mouth can also contribute to halitosis, periodontal disease, increased caries, and sinus problems.
- * Slight decrease of the secretion from the

serous/mucous glands under conditions of minimal or extended stimulation.

Cellular Changes

- * Cells become larger.
- * Their capacity to divide and reproduce tends to decrease.
- * Normal cells have ability to repair minor damage, but the ability to repair declines in aging cells.
- * Collagen and elastin decrease in connective tissue formation, resulting in joint tissues becoming stiffer, less elastic, and less efficient in their function.
- * Lipid and fat content of tissues change. In men, there is a gradual increase in tissue lipids and fat until age 60; then there is a gradual decrease. In women, lipids and fats accumulate in the tissues continuously, but there is no decline as happens in men.
- * Organelles such as the mitochondria and lysosomes numbers are reduced, causing cells to function less efficiently which causes.

Age Changes In Tmj

- * Clicking and snapping of the joint, but not necessarily painful.
 - due to atypical disk motion, due to discordant mandibular condyle-disk function due to changes in the articular disk.
- * Discal changes - loss of elasticity, surface erosions of varying degrees, hyalinization, presence of vertical cracks from surface through the cartilaginous plate into the subchondral bone.
- * With advancing age, there is slower and less complete replacement of chondroblasts and chondrocytes in the joint cartilage
- * Cartilage matrix/ fibrocartilage turns over slowly, forcing the available fibres to work longer and become susceptible to fatigue.
- * Matrix also holds less water, becoming desiccated and brittle
- * The blood flow diminishes and thus the nutritional supply is also compromised

References

References are available on request at editor@healtalkht.com

