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Poonam Malik

Demonstrator Department of
Prosthodontics Post Graduate
Institute of Dental Sciences Pt.
B. D. Sharma University of
Health Sciences Rohtak,
Haryana, India.

Manu Rathee

Senior Professor and Head of
Department Department of
Prosthodontics Post Graduate
Institute of Dental Sciences Pt.
B. D. Sharma University of
Health Sciences Rohtak,
Haryana, India.

Mohaneesh Bhorla

Demonstrator Department of
Prosthodontics Post Graduate
Institute of Dental Sciences Pt.
B.D.Sharma University of
Health Sciences Rohtak,
Haryana, India.

Correspondence

Poonam Malik

Demonstrator Department of
Prosthodontics Post Graduate
Institute of Dental Sciences Pt.
B. D. Sharma University of
Health Sciences Rohtak,
Haryana, India.

Oral tissues - Considerations in geriatric patients

Poonam Malik, Manu Rathee, Mohaneesh Bhorla

Abstract

We as care-takers of the human masticatory apparatus and associated structures, need to be familiar with the physiologic changes, that take place due to aging in the structure and functions of the stomatognathic system. This does not imply that, one should concentrate only on the oral and dental aspects of aging. On the contrary we should examine and treat the patient as a whole and not his isolated oral and dental problems. As Of the primary importance to the prosthodontists are the effects of systemic aging changes on the oro-dental and associated structures. The paper summarizes in brief the degenerative changes contributing to the senescence.

Keywords: Denture bearing area, muscle hypotonicity, Xerostomia.

1. Introduction

The prosthodontist can play a key role in reducing the number of prosthetic failures by a careful understanding of the physical, mental and metabolic changes that occur during senescence. The oral changes that occur during aging should be recognized, understood and treated before prosthetic restorations are prescribed for these individuals. The paper summarizes in brief the degenerative changes contributing to the senescence.

a) Bone

This is the most important tissue to the prosthodontist. If we can somehow maintain the equilibrium between osteoblastic and osteoclastic activities in old age, the problem of maintaining dentures in function would be greatly diminished. But unfortunately osteoblastic activity comes almost to a standstill in elders, which results in apparent acceleration of osteoclastic activities. Moreover, in old age, anabolism decreases and there is a slight increase in catabolic processes. Production of matrix is further impaired by lack of proteins which are not either present in the diet in sufficient amount or are not completely utilized. Calcium deficiencies and negative calcium balance are common in the older person. Even if sufficient calcium intake is observed, the bones may lack the ability to retain the absorbed calcium. Amount of phosphorous intake also plays an important role, as calcium can be retained in the body only if there is enough phosphorous.

Study reported that that poor calcium absorption is caused by achlorhydria excess calcium loss via kidneys due to diuresis and deficiency of Vitamin D intake. Also have said that, the health of oral tissues depends upon proper endocrine balance, and proper calcium phosphorous blood vessels. Moreover, uncontrolled diabetes hastens alveolar bone loss. In case, the patient has received radiation therapy than in that case bone regeneration power is reduced remarkably because of osteoradionecrosis. Blood dyscrasias, if present, prevent proper nutrition from reaching the tissues thus reducing bone formation and increasing tissue fragility^[1].

Microradiographic studies shown that young persons have a high degree of both bone formation and resorption. In young adults, both occurs with equal amount, but in persons over 70 years, about 25 percent of bone may be engaged in resorptive processes. Osteoporosis in some degree may be normal after menopause. Believes that, it is not improbable that the ridge, which appears so liable, may show resorption in connection with a generalized osteoporosis.

By observing the axial inclination of the natural teeth, one can predict the direction of residual ridge reduction subsequent to the loss of teeth. 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 ^[2]. 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. Consequential to the resorptive patterns of maxilla and mandible, the residual maxillary ridge becomes smaller in all dimensions and the denture bearing surface decreases. Whereas the residual mandibular ridge either appears to remain static or to become wider posteriorly. This discrepancy in relative jaw sizes, can pose several technical problems.

b) Oral mucous membrane

Oral tissues like others change as an individual grows older. The oral mucosa of the aged is friable and easily injured. According to Massler, 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.

Even under the best circumstances, the cells of the aged do not enjoy the optimal nourishment and vitality of youthful cells. The results are: 1) reduced cohesiveness and integrity of the epithelial layer due to vitamin A deficiency 2) reduced metabolism of the cells due to a vitamin B deficiency and 3) poorly differentiated connective tissue cells and fibres due to vitamin C deficiency. The clinical result is the mucosa susceptible to even minor irritating stress and connective tissue that heals slowly. Traumatic ulcers and angular cheilosis may be produced.

The atrophic mucosa of elders is frequently thin and tightly stretched and it blanches easily. It is seen that a mucosa of reduced thickness is associated with reduced residual ridge height. ^[3] He postulated that epithelial atrophy, which results in a reduction in the number of epithelial cells layers, and the thickness of the underlying connective tissue, also manifests itself in a reduction of surface area of the oral mucosa. This in turn applies pressure to the underlying ridge. The externally applied molding force meets more or less resistance from the bone itself and this is the action involved in the resorption process.

Newton in studied age changes in the collagen fibres of the oral mucosa. He has shown that these shorten to a degree compatible with the concept of a contracting mucosa acting as a moulding force on alveolar bone ^[4].

An atrophying denture-bearing mucosa is frequently encountered during menopause. The reduction in the estrogen output is known to have an atrophic effect on epithelial surface. Hormonal replacement therapy can be beneficial in such patients to create a more favourable oral environment for the dentures.

Aging produces changes in the blood vessels, particularly atherosclerotic changes ^[5]. Oral varicosities are often noted on the under surface of the tongue, and in the floor of the mouth and are related to varicosities found elsewhere. The accumulation of lipids in walls of these medium sized sublingual arteries are result of the dietary risk factors such as high intake of saturated fats, cholesterol and sucrose ^[6].

The degree of keratinization of the mucosa is of marked significance and must always be carefully examined and

critically evaluated. When the mucosa lacks adequate keratinization, the protecting capacity provided by the keratinized layer is reduced and the patient is prone to suffer from chemical, bacterial and mechanical irritations ^[7]. The capacity of the prosthesis to initiate mechanical irritations in these patients is therefore a significant problem in patient management.

Frequently, the mucosa presents with heavy layers of thick keratin. It may be distributed throughout the oral cavity or it may be localized. Such excessive keratinization is not necessarily a problem in patient management ^[8]. Yet, it is extremely important that it be closely and continuously examined. Its potential for leukoplakia and for neoplastic activity is well known. Because of these changes the denture adjustment period can be prolonged, and a continuous problem in management. These patients should be educated to accept long-term adjustments as routine and inevitable ^[9].

The most dangerous problem associated with epithelial changes in the aging patients arises with the increasing incidence of oral cancer which accounts for approximately four percent of all cancers ^[10]. Over 75 percent of these cancers lie in the age group of persons 50 years and over, indicating that this is a disease of the aging population and geriatric problem. The high coincidence of these lesions around denture borders always bring forward the speculation of irritation as an etiologic factor.

The level of the pain threshold of soft tissue changes markedly after the menopausal period and the male climacteric. Commonly, there is an increase in sensitivity ^[11]. Denture tolerance, as a consequence is markedly reduced. The capacity of the tissues for repair through cell division is impaired. As a consequence these patients present a foundation for the prosthesis which has reduced capacity to adapt to the demands of appliance.

As a result of reduced pain threshold and the reduction in muscular adaptability ^[12]. There is a considerable reduction in the masticatory force value from an average of over 150 psi in the young adult to an average of 25 psi or less in the elderly ^[13].

Patient management requires that we educate our patients to understand and accept this reduced masticatory capacity ^[14].

c) Changes in inter alveolar space and relation

With the loss of teeth, the patient may develop a protruding chin, wrinkling, which extends downward from the oral commissures and an obtuse angle of the mandible. There is also loss of inter-arch space especially in the posterior segment. Patient develops a habitual mandibular prognathism, failure to restore and maintain the proper inter-arch space places undue stress on the temporomandibular joints. Fore-shortening of the inter-arch distance results in the establishment of a state of hypotonicity of all the muscles of mastication except the external pterygoid, which becomes hypertonic, as it is one of the mandibular depressants. The resultant tension produced upon the capsular ligament of temporomandibular joint produce pain in this region ^[14]. These changes in the muscles, coupled with the residual ridge reduction, bring about a change in the relation of mandible to the maxillae. This may also result in catarrhal deafness and neuralgias of the tongue and of the pharyngeal and cephalic regions. Management of the geriatric patients experiencing temporomandibular joint pain requires further evaluation of the validity of vertical dimension of occlusion of the prosthesis.

d) Tongue and taste sensation

Probably the most common manifestation of aging of the tongue is depapillization, which usually begins at the apex and lateral borders. Tongue frequently becomes smooth and glossy or red and inflamed in appearance. The tongue is capable of many varied shapes and positions during speech, mastication, and swallowing and in all of these functions is in constant contact with the lingual surface of the teeth, the lingual flange of the lower denture and the palatal surface of the upper denture. Because of this contact, the tongue is a dominant factor in establishing the neutral zone and therefore in the stability or lack of stability of the lower denture. As the age advances, the tongue seems to increase in size in the edentulous mouth and thus the greatest influencing factors in lower denture instability, because it violates the neutral zone and encroaches on the tongue space.

The tongue loses its usual muscle tone and offers less resistance when palpated bidigitally. Glossodynia and glossopyrosis are common complaints in senescence. These symptoms are usually attributed to the nutritional deficiencies of folic acid, vitamin B₁₂ and / or iron.

Vitamin B₁₂ deficiency, particularly in menopausal women is characterized by a triad of symptoms, generalized weakness, sore, painful tongue and numbness or tingling of the extremities. Achlorhydria, sensory disturbances, difficulty in walking are some of the characteristic features of pernicious anaemia. The major treatment consists of intramuscular administration of vitamin B₁₂.

The elderly patient who lives on a "tea and toast" diet is a prime candidate for iron deficiency anemia. On the other hand, and adequately nourished older man or post menopausal woman would probably not have this problem unless there is hemorrhage^[15]. The oral manifestations of iron deficiency anemia are glossitis and fissures at the corners of the mouth.

Tongue thrusting associated with nervous tension or with attempts to control a lower denture can lead to a sore tongue.

Lingual tissue changes are commonly associated with alterations in the taste sensation. This diminished acuity of taste can be because of some gradual nerve degeneration and / or hyper keratinization of the epithelium which may occlude the taste bud ducts and pores. Vitamin A deficiency may be associated with such epithelial hyper keratinization. If there are not systemic contraindications, increased use of condiments might provide more flavour to the food.

e) Xerostomia

Salivary secretion is usually a reflex response to movements of the jaw during chewing or speaking. Salivary flow can be increased by aromas of food and by stimulation of other special senses. On the other hand, a variety of conditions can tend to reduce the salivary flow, such as menopause, fear, anxiety, diabetes, and vitamin B complex deficiency particularly in alcoholics.

As a result of regressive changes in the salivary glands, particularly atrophy of the cells lining the inter-mediate ducts, there is a decrease in salivary flow in the aged. This diminished function of the glands also results in physiochemical changes in the saliva, which shows a decrease in ptyalin content and an increase in mucus content. Saliva becomes more viscous and ropy. Further when salivary flow is reduced, the oral mucosa becomes dry and inelastic. There may be cracking of the lips and fissuring of the tongue. Oral mucosal sore spots are seen under a denture because of the lack of lubrication by the saliva. Denture retention is adversely affected. Chewing and swallowing become difficult. As a

result food selection becomes limited to soft or liquid type^[16]. Because of lowered ptyalin contents of saliva, digestion of cooked starch is remarkably reduced. Xerostomia also affects oral hygiene as in absence of lubricant action of saliva, food particles adhere to the tissues. This makes the oral cavity prone to infection. Xerostomia is frequently accompanied by achlorhydria, which causes gastritis. Statistics indicate that primary gastritis is most prevalent in the edentulous aged.

f) Motor-nervous control

Prosthodontists face severe problems because of altered capacity of motor learning in elderly patients. As a result of aging there is diminution in the brain substance. The ventricular spaces also increase in size, causing further reduction in the brain substance. In the age period from 60-85 years this capacity declines from an approximate 50 percent reduction at 60 years of age to over 85 percent reduction in motor learning in the age group above 65 years. This fact gives an indication of the motor learning capacity one should expect the patient to possess.

Prosthodontic management of the geriatric patients having an earlier prosthetic restoration in use, presents different problems than the patient, who is going to receive his first ever prosthesis. These problems are in terms of differences in the concepts of earlier days and those followed by prosthodontist. In this connection, Paul W. Vinton has a suggestion to make. He advises construction of an appliance, which would resemble the old appliance in terms of its extensions, tissue coverage and interarch relationships. He further says that the patient has already made the necessary adaptive motor learning responses to these appliances. Deviations at this time may in his opinion, pose handicaps in its utilization.

However, this suggestion of Vinton does not seem to be recommendable in the opinion of the author, because the clinical and technical procedures at present are modified according to the patient's requirements, which are beneficial to the patient's oral health in long-run. This can probably be attributed to the better understanding on the part of the operator, or oral anatomy, histology and physiology and response of oral tissues to different materials, used in the fabrication of the prosthesis as well as availability of a wide range of new dental materials^[18-20].

2. Conclusion

Systemic changes that take place due to aging have been discussed in brief, followed by a detailed review of the senile changes in the tissues of oral cavity. Knowledge of the senile changes that take place in different tissues is important for the prosthodontists, to be able to appreciate and treat these conditions.

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