

The Impact of Aging on Oral Structures in Geriatric Patients through Prosthodontic Perspective

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Abstract

As it is anticipated that there is going to be surge in population of old age individuals in upcoming years and by 2050 it is going to be around 1.5 billion, which is a concern for scientists and for whole field of medicine, owing to which there is an urge to develop expertise in geriatric medicine in coming years. As oral health and general well-being of an individual are correlated there are few changes which come in oral cavity because of the diseases which occur as one ages such as diabetes while there are other changes which are bound to occurs with age in geriatric patients which are resorption of alveolar bone, non-carious cervical lesions, vascular changes in pulp, edentulous mouth and can further cause other problems in body such as malnutrition. Apart from thisg, salivary glands situated in oral cavity also show changes

with age and salivary flow decreases which further poses difficulty in chewing and swallowing. Also, these conditions also affect the fabrication of dental prosthesis. Therefore, to properly cure these diseases and fabricate appropriate dental prosthesis such as complete denture, removable partial denture, it is necessary to be familiar with the alterations and modifications which occurs in oral cavity of geriatric patients.

Keywords: Dental Prosthesis, Diabetic Patients, Oral Health, Swallowing

Introduction

Age is a natural process which everyone experiences. As an individual age, there are some physiologic as well as pathologic changes which are bound to occur in the body. The physiologic changes that a body experience through the aging process is such as impaired gas exchange in

lungs, increase in blood pressure, decrease in cardiac output, slower expiratory flow rates, arteriosclerosis¹. Organs in body undergoes different changes, for example, epidermis of skin atrophies with age¹. Also, skin loses its tone and elasticity¹. Apart from that, the muscular performance also reduces as the age advances¹. There are numerous factors responsible for these changes, few of them includes malnutrition, circulatory impairment.

Similarly, oral cavity also experiences some changes as the age advances. The changes which are commonly found in the oral cavity of geriatric patients include high frequency for dental caries, periodontal diseases, edentulism, dry mouth and many more. Geriatric people are more susceptible to oral diseases as they have more chronic conditions and physical disabilities. For example, reduced saliva secretion which is commonly seen in old age individuals occurs due to the side effects of the medicines or because of poor health². In general, oral health is crucial for maintaining an overall healthy body. As in case of impaired masticatory system which can result in disease like malnutrition and generally body becomes weak which is a frequent finding among old age individuals. In older population, poor oral health has been considered as a risk factor for general health as it can elevate the hospitalization risk due to both the infectious and noninfectious diseases³. Apart from this, older people are more receptive of oral conditions or diseases owing to their other systemic diseases. These disabilities affect their capacity to maintain good oral health.

Further, the oral diseases have their own repercussions and can impact the quality of their lives such as having low esteem, nutritional deficiencies⁴. However, the oral health in geriatric patients is not getting the attention and care which it needs as the focus has always been mainly

on their systemic diseases or conditions. Therefore, this narrative review paper will discuss the possible changes which are observed in oral cavity in geriatric or old age individuals either due to their systemic diseases or because of the natural aging process.

Material and Methodology

To review the literature, studies were selected from Google scholar and PubMed without restrictions on publication year, to provide a comprehensive overview of current knowledge on oral cavity changes in geriatric patients. The review focused on how differently oral tissues and structures changes as an individual ages. The search terms included: 'geriatric patients,' 'oral cavity changes,' 'old age individuals'.

Geriatric patients and their population

Geriatric patients are those above 65 years or older. Generally, young population is considered as the center of attraction for many things while older people are usually ignored. Similarly, in the field of medicine not much attention was paid to the elderly people but now anticipated surge in geriatric population in upcoming years has diverted the concern of scientists. It is estimated that by 2050 geriatric population will grow dramatically and will be around 1.5 billion people⁵. In United States, it is expected that population aged above 65 will grow and be around 83.7 million in 2050 which is almost double of 43.1 million in 2012⁶. This projection in old age individuals will pose challenges for finance department as it will include the cost of caring of old age people, policy makers and the healthcare department. The urge to develop expertise in geriatric medicine is mounting since the end of last century.

Correlation between general health and oral health in geriatric patients

Good Oral health has direct impact on social wellbeing of an individual. It effects the psychological, functional, and

social aspects of overall health. For example, a patient with completely edentulous mouth faces challenges in social interactions and it directly impact their social life along with their mental health. Apart from that, diabetes and periodontitis are interrelated as in diabetic patients the chances of occurring of severe periodontal disease is more common than the other counterpart as the level of plaque is more in diabetic patients⁷. Similarly, periodontitis is considered as a risk factor not only for diabetes mellitus but also for cardiovascular diseases, pulmonary infections, kidney diseases and some type of cancers. It has also been suggested that poor periodontal health also contributes to dementia although the exact reason behind this is still unclear⁵. Although the evidence suggesting the direct link between periodontal disease and dementia is not there yet older individuals should not compromise their oral health as it plays a major role in nutrition and general health of an individual⁵.

Oral cavity changes in geriatric patients

Oral cavity commonly known as mouth plays a vital role in overall development of an individual. It comprises of various components such as teeth, tongue, lips, hard and soft palate. All these anatomically different structures perform different functions such as teeth along with tongue performs chewing of food which helps it cutting food in small pieces and when combined with saliva it forms bolus which is digested in intestine of a human. Apart from this, speech which is an integral component of human life is also performed by structures in oral cavity. Oral microbiome is a significant contributor of an individual general health and it consists of approximately 700 species of bacteria along with viruses, fungi, and protozoa. Moreover, oral cavity is composed of several muscles such as mylohyoid muscle composes floor of the cavity and soft palate which is made up of five different

muscles forms superior border of the oral cavity. All these structures in oral cavity experiences some changes as an individual ages. Although most of the oral functions remains undamaged in old age individuals yet few factors such as systemic diseases may affect these functions and in general every organ undergoes metabolic and physical changes. It is believed that the following process represents the inability of cells to replicate after reaching a certain point in old age⁸. There are some changes which are due to physiological aging and few because of pathological diseases although there is no clear demarcation between both⁹. Changes such as attrition, abrasion, erosion are commonly seen as individual ages however changes like burgeoning epithelium and bone loss are maybe caused by plaque accumulation⁹. Apart from teeth and periodontium, other structures such as temporomandibular joint, salivary gland also undergoes changes. The changes which are seen in these structures of oral cavity are listed below.

Changes in teeth

Teeth in human body experience changes throughout the life of an individual from circa 10 weeks in utero till old age. The physiological age of an individual can be determined by the condition of teeth and it can further be influenced by the other factors such as chewing, brushing, genetic factors. Teeth alter their form along with some macroscopic changes which are observed as individual ages⁵. Various non-carious cervical lesions are observed in geriatric patients which are nothing but loss of tooth structure in cervical regions. These lesions do not occur because of the caries but involves multiple factors in its occurrence such as bruxism, erosive food, poor salivary flow which is common in old age people. With increasing age, the prevalence of non-carious cervical lesions also increases¹⁰. The changes can be present in the form of abrasion, erosion, abfraction. Not

only the changes are physical but also affects the pulp vitality of tooth which further influences the treatment plan and the success of that treatment¹⁰. Also, it is believed that in response to the abrasive changes or even in absence of this, tooth develops a secondary dentin between the abrasive part and pulp as an individual ages due to which the pulp chamber reduces and becomes smaller in size¹¹. Other changes which pulp experiences as an individual ages are reduction in vascular supply, formation of fibrous bundles and sometimes calcification of pulp¹¹. Calcifications which occur in the coronal region of tooth are called as pulp stones while other one is called as pulp obliteration which involves radicular pulp. Along with this, the regenerative capacity of pulp also decreases as an individual ages¹¹ and this increases occurrence of different diseases. As the tooth undergoes abrasive changes, the deeper layer of enamel becomes exposed which possesses different properties than the outer layer of enamel⁵. Apart from this, enamel surface becomes ill-defined and flat owing to the deprivation of perikymata and imbrication lines as an individual ages⁵.

Bone

Bones which comprise the oral cavity are maxilla, mandible, and palatine bone. The mandible and maxilla surround the oral cavity anteriorly and laterally. Hard palate forms the anterior two-thirds of the roof of the oral cavity. Hard palate is composed of two facial bones and that are palatine process of the maxilla and the paired palatine bones¹². The alveolar bone which is also known as alveolar process is the one which carries and support the teeth roots and it is a part of the jaw bone¹³. In geriatric patients, a lot of changes has been observed in the structure and density of bone as the equilibrium between the osteoblastic cells (which are responsible for bone formation) and osteoclastic cells (responsible for bone resorption) is lost¹⁴. In old age, the activity of

osteoblastic cells becomes static while the efficiency of osteoclastic cells burgeons¹⁴. Therefore, the resorption of alveolar bone increases as an individual ages and the height of alveolar ridge decreases¹³. The resorption is high in mandible when compared with maxilla¹³. The direction of the reduction of residual ridge can be anticipated by looking at the inclination of the natural teeth¹⁴. The mandibular residual ridge tends to resorb and then move more lingually and inferiorly in the anterior region while posteriorly it migrates towards buccal direction¹⁴. This loss of tooth along with reduction in bone height results in decreased facial height which can directly affects the patient's self-image and confidence¹³. Another factor responsible for the bone loss as an individual ages can be periodontitis which can be caused by plaque accumulation and deposition of calculus⁸. If not removed at proper time can lead to gingivitis and then the apical movement of epithelial attachment and ultimately leads to periodontitis which causes bone loss⁸.

Mucous membrane

The mucosa of oral cavity differs from the other soft lining of the body and have more features like skin with which it forms a junction at lips. The soft tissue of the oral cavity is formed by stratified straight epithelium¹⁵. Some areas which have masticatory forces are formed by keratinized epithelium and is tightly attached to underlying tissues while other region where there is requirement of flexibility are formed by non-keratinized epithelium¹⁵. Oral mucosa act as a protective layer for host as it protects the underlying tissues from toxic microorganisms and materials¹⁵. Most of the changes in oral mucosa are seen after the age of 70 while few can be observed before that. Histologically, oral mucosa is composed by two layers which are the epithelium and the connective tissue¹⁵. There are not much changes

observed in these layers with age although the epithelial cells tend to become bigger and flatter as an individual ages. With age, the oral mucosa becomes shiny and smoother with edematous appearance along with loss of elasticity and stippling⁵. Edema is usually observed in those areas where there is lack of tight contact with underlying tissues⁸. As the epithelium becomes thin with age, it becomes more prone to injury such as eating hard substances eventually leading to protein deficiency in geriatric patients⁸. Moreover, the capacity of membrane to regenerate also gets lost due to the reduction in number of capillaries⁸. The atherosclerotic changes have been observed in blood vessels as an individual ages⁸. Owing to the changes in oral mucosa with age, patients also encounter difficulties to adapt prosthesis such as complete denture. Further, diseases like Denture sore mouth are observed in geriatric patients where palate becomes edematous and spongy and symptoms gets resolved if denture is removed for one or two days. It can occur due to both factors which includes changes in mucosa and an ill-fitting denture⁸. Several other mucosal lesions which can be observed in geriatric patients such as oral lichen planus, benign mucosal membrane pemphigoid along with increased prevalence of oral carcinomas⁸. Almost 75 percent of oral cancers have been mainly observed in the individuals aged above 50, indicating that this is the disease that occurs due to changes in oral mucosa with age¹⁴.

Salivary glands

Oral cavity contains three major salivary glands and more than 1000 minor salivary glands. They all secrete saliva in oral cavity which further has many useful functions. It helps in the digestion of the food and maintain oral hygiene. Salivary secretion can be increased or decreased with aromas of food. Several studies have been conducted to demonstrate the changes

in salivary glands in old individuals. The number of acinar cells decreases with age while the amount of saliva flow remains independent of age factor shown by the histomorphometry examination of the salivary gland tissue¹⁶. The flow rate of saliva can be reduced in several physiological stressful circumstances such as medications, radiotherapy, surgery, due to which functions of saliva gets compromised¹⁶. Apart from this, salivary flow can also get reduced in other conditions like menopause, diabetes, fear, anxiety, and vitamin B complex deficiency¹⁴. There are also physiochemical changes in saliva such as decrease in ptyalin content, elevated mucous content and saliva becomes more viscous and ropier¹⁴. Reduced salivary flow can also pose difficulty in adjustment of prosthesis like complete denture as the mouth becomes dry and retention of denture decreases¹⁴. In individuals above 65, the 'dry mouth syndrome' is more prevalent which further causes burning sensation in mouth along with increased occurrence of dental caries⁸. A study conducted on aging and secretory reserve capacity of major salivary glands showed that lack of secretory reserve capacity of salivary glands would not impair functions in geriatric patients however few conditions such as usage of medications like anticholinergic drugs would damage more old age group than the younger ones¹⁶.

Conclusion

Although geriatric people form a major part of society yet they receive less attention for their medical conditions especially for their oral health. As discussed in this article, there are few inevitable changes which occur in human body as an individual ages and the changes which occur in oral cavity can affect the overall health of old individuals and the diseases which an aged person gets may also cause some changes and diseases in oral cavity. The changes which occur in oral cavity includes

changes in hard and soft tissues which comprises of teeth, bone and mucous membrane, tongue respectively. Complete edentulous geriatric patients experience malnutrition and other health problems due to lack of proper nutrients and food they intake. Other changes which are observed in geriatric patients are increased prevalence of dental caries, resorption of alveolar bone which can further pose challenges for dentist to fabricate correct dental prosthesis such as complete denture for geriatric patients. Apart from this, the amount of saliva secretion also decreases with age which further causes diseases like dry mouth syndrome and difficulty in adjustment of complete denture. Therefore, a good understanding of the oral changes in geriatric patients is necessary to provide the correct treatment and prosthesis.

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