

# Influence of Edentulousness on Masticatory Efficacy of the Elderly: A Review of the Literature

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## ABSTRACT

The prevalence of edentulousness increases sharply with age and leads to feeding difficulties related to a deficiency in chewing. The course of chewing of these subjects is totally disturbed and the number of masticatory cycles performed, the duration of the sequence or muscle contraction are much higher than in elderly dentated subjects. Seniors often have to change their food choices to foods that are easy to chew but are less nutritionally desirable

**Key words:** Old subject, masticatory disorder, undernutrition, extensive alveolar resorption

## INTRODUCTION

Long live !!, it is the conclusion of numerous statistical studies and epidemiological data on life expectancy on a global scale, in particular that produced and published by a team of researchers from the Imperial College of London, underlining that life expectancy will rise to 90 years in 2030.<sup>[1]</sup> Algeria and according to the World Health Organization, OMS is the first African country to achieve a life expectancy of 76.5 years (73.8 for men and 77.5 for women) followed by Tunisia with 75.3 years and Morocco with 74.3 years.<sup>[1,2]</sup>

In France, people aged 65 and over makeup nearly 16% of the population. Life expectancy is 80.2 years (76.7 for men and 83.8 for women).<sup>[3]</sup>

Polypathology and polymedication associated with undernutrition constitute the daily trio of the elderly subject; the latter factor is undoubtedly a direct consequence of edentulism.

Total edentation is an oral health problem that affects most seniors. It generates a strong esthetic deficit due to the lack

of support of the tissues and the musculature of the face. It is accompanied by inevitable bone resorption, especially in the absence of treatment affecting and greatly reducing the masticatory efficacy of food.

## CHEWING AND MASTICATORY EFFECTIVENESS

Mastication is the act of mouth that allows the food to be grinded after being grinded and triturated by the teeth. It is a voluntary act where habits take precedence over directive consciousness.

Thus, the brain, through sight and manipulation, will bring information. In the same way, the contact with the tongue, the palate, and the lips addresses additional information to the cortex which will answer by an exact application of the force to exercise. The dental proprioceptors will refine this information to activate the masticatory scheme suitable for the grinding and trituration of the recognized food.

In 1965, Yurkstas declared: "The maintenance or restoration of masticatory efficacy is one of the primary objectives of

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many dental restorative procedures. However, the available data on the factors influencing this important oral function are surprisingly few.”

Merickse-Stern discusses the different definitions of masticatory function in the literature such as the ability to fragment foods (Slatger *et al.*, 1992), masticatory efficacy defined as the ability to crush or reduce foods (Carlsson, 1984 and Gunne, 1985), masticatory performance (Wayler and Chauncey, 1983), and masticatory power (Yurkstas, 1965). Although often used as synonyms, all these terms have been defined precisely in some studies.

In 1984, Carlsson defined masticatory efficiency of the masticatory system as being “the ability to reduce food to smaller sized particles suitable for swallowing.”

The loss of age-related striated muscle mass as well as compensatory factors such as unilateral chewing contributes to decrease masticatory efficacy.

## THE EFFECTS OF AGING ON MASTICATORY EFFICIENCY

Aging is a complex phenomenon whose current theoretical model involves “the central action of the imbalance between the phenomena of “repair” and “degradation” of the body. There is a sensory aging (sight, hearing, taste, smell, and touch), organic (cardiovascular, respiratory, and digestive), functional (muscle, bone, and joint), cognitive, cutaneous, and immune [Figure 1].<sup>[6]</sup>

Many studies have shown that the ability to chew a particular food is a decisive factor in the choice of diet. Mastication is an oral function that plays a decisive role in maintaining a rich, balanced, and, above all, unrestricted diet, involving several participants in the masticatory system.

Bernier (2008) reports that 2/3 of edentulous whole patients’ complaint of a problem to chew and that 73% are unable to chew certain foods.

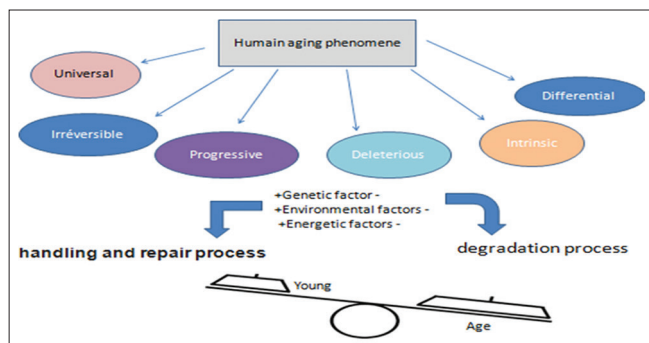


Figure 1: Concept of aging by Pouyssegur and Malher, 2010<sup>[6]</sup>

The toothless patient will use his edentulous ridges to grind food and his tongue that crushes the food bowl against the palate. The contribution of the tongue to chewing leads to its muscular development: Its volume sometimes increases to such an extent that it interposes between the arches at rest. Mastication between edentulous crests is by lateral action in mandibular diduction because bone reduction (centripetal maxillary and centrifugal mandibular) has caused a shift of the bases in the frontal plane. All of these phenomena lead to a coarse grinding of food.<sup>[4]</sup>

According to Dupuis (2005), the alveolar ridges hardly crush the bolus, and despite an increased chewing time, the size of the particles ingested is important, which increases the length of stay of the food in the stomach and requires from this one an extra effort to the assimilation of nutrients.

Indeed, chewing is the first step in digestion (Leonard *et al.*, 2008). The action of salivary enzymes on the food particles resulting from grinding by the teeth makes it possible to release the nutritive substances contained in the foods and to facilitate their assimilation at the digestive level. The author states in fact that “the absence of dental reconstruction resulting in a masticatory deficit leads to a decrease in saliva flow.”<sup>[5]</sup>

The course of chewing these subjects is totally disturbed. The number of masticatory cycles performed, the duration of the sequence, or the muscular contraction is much higher than what is observed in the elderly and well dentured.<sup>[6,7]</sup>

In addition, according to Dupuis (2005), the masticatory difficulties of total toothlessness not paired up lead him to favor foods with soft textures that do not require intense masticatory efforts. The poorly stimulated salivary glands produce little saliva and tend to atrophy gradually.

There are a large number of factors that can aggravate hyposaliva in the toothless such as certain therapeutics (anxiolytics, diuretics, and cervicofacial radiotherapy) or certain pathologies such as Sjögren’s syndrome and diabetes.

The incidence of age on this secretion is controversial according to the authors. For Huë and Berteretche (2003), “there is no obvious change in salivary flow in healthy elderly people, but other factors such as dietary balance and general health affect flow.” For Pouyssegur and Malher, one of the consequences of aging on the oral sphere is the decrease in salivary flow.<sup>[6]</sup>

The masticatory deficit frequently leads to the appearance of nutritional deficiencies and especially hypovitaminoses. The oral cavity, by virtue of its very rapid cellular renewal, is the first anatomical entity where these general disorders will manifest themselves, mainly at the level of the tongue and the mucous membranes.

For Leonard *et al.*, in 2008, hypovitaminoses lead to weakening of the oral mucosa and increase the risk of candidiasis.

It seems difficult for older people to consume the recommended intake of vitamins, minerals, and proteins. Vinas *et al.* (2011), through their review of literature (studies with  $n \geq 100$ ), reported inadequate intakes of several vitamins and minerals in older people living in different European countries (Vinas *et al.*, 2011). In Brazil (Pineiro *et al.*, 2011), low intakes of Vitamin A (92.4%), Vitamin C (85.1%), and Vitamin E (99.7%) were observed in a high proportion of participants ( $n = 2344$ ).<sup>[5]</sup>

Many studies have shown that deteriorated oral status and poor chewing evolve in combination with malnutrition or undernutrition, or systemic, metabolic, or digestive diseases (N'Gom and Woda, 2002). More recently, studies have clearly shown that the use of traditional oral health indicators (number of functional units and GOHAI oral quality of life questionnaire) associated with the Mini Nutritional Assessment score was assessed the risk of malnutrition in the elderly (Cousson *et al.*, 2011 and El Osta *et al.*, 2013).<sup>[7]</sup>

## CONCLUSION

At the end of the 21<sup>st</sup> century, total edentulous is still a hot topic and is not about to disappear! especially that we will not get older by the same way.

Eating must be a pleasure and seniors need a diversified and adapted diet not only nutritionally but also sensory (texture as well as taste).

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