# REGULATION OF THE MASTICATORY FUNCTION: FORMATION OF THE ALIMENTARY BOLUS

The influences of size on the alimentary morsel, the hardness of the food and its rheological properties have been the subject of different experiments. Augmenting size leads to an increase of several parameters, but especially that of the vertical amplitude of mandibular movements. The influences of the hardness of the food and of its rheological properties have been tested in other experiments, using model foods made in the laboratory rather than natural ones. The special quality of these products lies in the fact that they always present the same mechanical property: they are consistently elastic or plastic, but can be produced in a range of varying hardnesses. With these products, it is therefore possible to dissociate the masticatory adaptations due to hardness from those caused by an adaptation to the texture of the food. It appears that an increase in hardness results in an increase both in EMG activity during each cycle and in the number of cycles in the sequence. The transition from an elastic food to a plastic food results in a change in the shape of the cycle, characterized, among other things, by an increase in the range of mandibular movements in both vertical and lateral components.

Another tool for studying mastication aims to describe the food bolus that constitutes the primary objective of this function. In fact, chewing helps, through insalivation and reduction of the food into particles, to form an alimentary bolus which, to make it easy to swallow, must be plastic, slippery and especially, cohesive. We must emphasize the word “cohesive,” which implies that the bolus must behave as a unit that must not divide spontaneously. From the moment when the alimentary bolus passes through the esophagus, it is indeed essential that the particles do not disperse in different directions. To understand this well, it is enough to think of the high rates of morbidity observed among the dependent elderly because of silent aspiration,, one of the notable causes of chronic pneumonia. It is therefore very important that mastication leads to the formation of a bolus that is well formed and, above all, cohesive.

The analysis of the food bolus is carried out by measuring its particle size. This is accomplished by retrieving the bolus by making the subject spit it out just when the latter feels that he/she is about to swallow. The bolus is then dried and subsequently passed through sieves of different sizes. It can also be analyzed by using optical microscopy and image analysis software to observe the size of the particles. The bolus can then be placed in suspension, and the food particles bombarded by a laser; the diffraction angle of the beam changes in accordance with the size of the particle, which gives a measure of its diameter. These different methods contribute to an important finding. Despite notable differences in the distribution of particle size from one food to another, it is remarkable that study subjects produce approximately the same type of grain size in the food bolus. This can be interpreted as reflecting the vital necessity represented by the proper accomplishment of the objective of chewing, to ensure risk-free swallowing. This observation strongly contrasts with the very large variability of most of the parameters of chewing, such as the number of cycles in the sequence, the duration of the sequence, the range of mandibular movements, the shape of the cycles or the extent of EMG activity during each cycle. Finally, it is clear that all individuals manage with the morphological characteristics that are specific to their masticatory apparatus, with their habits and their learning processes. So the bolus which each person makes during swallowing is similar for all because it meets the vital need of avoiding silent aspiration.

The effects of aging and of edentulism on chewing were observed in three samples representing three distinct populations, compared two by two. Young dentates were compared to elderly dentates, who were themselves compared to elderly persons with hearing aids. In other words, the effect of aging was considered first, while, secondly, the effect of endentulism compensated by complete prosthesis was analyzed. (...)