THE MORPHOLOGY OF THE GUM AND OF THE DESMODONTIUM

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ABSTRACT (online version)

The gum and the desmodontium are constituent parts of the morpho-functional complex of the parodontium. Depending on its topographic situation, we can describe three portions of the gum: alveolar, marginal and interdental, each one having its features. Within the gum, the collagen fibres from the subepithelial net are grouped in alveologingival, dentogingival, circular and interdental, the last ones being seen by us as a single group, called peridental fibres. The desmodontium or the alveolodental ligament or the parodontal ligament makes the relation between the alveolar bone and the radicular cement within the dentoalveolar articulation, articulation known under the name of gomphosis, a syndesmose that does not allow any movement to the tooth. Depending on their topographic situation, the collagen fibres in the constitution of the alveolodental ligament, also called cemento-alveolar fibres, can be divided in marginal, intermediary and apical. The alveolodental ligament has the important role in the transmission of the chewing forces to the resistance structures within the functional architectonics of the cranium.

KEY WORDS: parodontium, gum, desmodontium or alveolodental ligament or parodontal ligament.

The parodontium is the morpho-functional complex that ensures the fastening of the teeth in the sockets. This complex is constituted by the alveolar bone, by the gum, by the alveolodental ligament and by the radicular cement, which all intervene in the transmission of the chewing forces to the resistance structures within the functional architectonics of cranium.

In what follows, our study approaches the morphology of the gum and of the desmodontium, the last one being represented by the alveolodental ligament, also called parodontal ligament, a constituent of the parodontium that plays a major part in the transmission of the chewing forces. Although the collagen fibres of the gum, included in an supraalveolar fibrous apparatus, have a minor role, their role cannot be contested or omitted.
THE MORPHOLOGY OF THE GUM

The gum or the gingival mucous is the part of the oral mucous that adheres to the alveolar bone and surrounds the cervical region or the dental neck. The gingival mucous strengthens the parodontium, ensures the continuity of surfaces, fills the interdental spaces, plays a protective role and helps the fastening of the teeth in the sockets. The thickness of the gingival mucous can vary, and also variable is its colour, from light (pale) pink to deep (coral) pink, the colour depending on the quantity of pigments, on the vascularisation and, of course, on the thickness and on the structure of the gingival mucous.

Between the oral mucous and the gum, as if separating them, the mucogingival line comes into view, indicating the border between the adherent, alveolodental part and the mobile part of the mucous. At the level of the lingual face of the alveolar process of the maxilla, the gum is continued by the mucous that covers the palate without any limit, in which case there is no mucogingival line at this level.

Depending on its topographic situation, we can describe three portions of the gum: alveolar, marginal and interdental. The alveolar gum adheres to the periosteum of the alveolar bone and has an average extension of 6-7 mm, from the marginal gum to the mucogingival line. The marginal gum, of approximately 1-2 mm high, surrounds the tooth. Normally, there is a tight contact between the enamel of the cervical region of the tooth and the marginal gum, a contact that does not allow for the forming of a gingival ditch between the tooth and the marginal gum. Causally, the gingival ditch indicates a pathological condition. The interdental gum is represented by the gingival papillae, which are situated between the place of contact of the teeth with the interalveolar bony septum. In each interdental space there is a vestibular gingival papilla and a lingual one, bound together by means of a formation having a saddle appearance. The interdental gum, fastened in the interalveolar bony septum has the role of filling the interdental spaces.

Taking into account the fact that the interdental gum is a constituent of the marginal gum, we think that the classical division of the gum into alveolar, marginal and interdental could be replaced by a new division, in an alveolar gum and a dental gum, the latter containing both the marginal gum and the interdental one.

The gum has a multi-stratified keratinated epithelium, under which there is a lax interstitial tissue that constitutes a genuine lax subepithelial net.
mostly formed of collagen fibres and very few elastic fibres. The collagen fibres form the fibrous apparatus that binds the gum both to the tooth and to the alveolar bone. This connection apparatus, studied very thoroughly by H. Feneis (1952), presents 14 types of trajectories of the collagen fibres. The variety of the dento-maxilar apparatus, of the bone structures and of the morphology of the teeth, the individuality of the bite, the types of chewing as well as the age and the numerous differences between the normal condition and the multiple pathological conditions, lead to a large morphological variability of the trajectories of the collagen fibres.

For these reasons, the realization of a typology of the trajectories for the collagen fibres of the gum, is very difficult, if not impossible.

The collagen fibres from the subepithelial net of the gum can be grouped in alveolo-gingival, dento-gingival circular and interdental (Fig. 1).

**FIG.1.** The disposition of the collagen fibres at the level of the gum.
1 – dentine; 2 – enamel; 3 – cement; 4 - alveolar bone; 5 – epithelium; 6 -dento-gingival fibres; 7 - crossing interdental fibres; 8 - circular fibres; 9 - meziodistal interdental fibres; 10 - alveolo-gingival fibres; 11- dento-gingival fibres.
The alveolo-gingival fibres radiate from the periosteum of the alveolar bone to the gum, which they fasten to the bone. The dento-gingival fibres extend radially from the extraalveolar cement to the gum compressing the connection epithelium from the level of the dental crown and thus having a protective role. The circular fibres surround the tooth, flexing in the apical and occlusal direction, having a role in the taking of the pressure forces. The interdental fibres connect the vestibular interdental papilla to the lingual ones, ensuring their continuity at the level of the interdental space. Most of these fibres are crossing. There also are mesiodistal interdental fibres, like, for example, the fibres that extend between the mezial face of the first molar and the distal face of the last premolar.

We think that, by their disposition surrounding the tooth, the circular and the interdental fibres could be reunited in a single group of fibres, that could be called peridental fibres. If this opinion were adopted, the collagen fibres would not be grouped in four categories, but only in three: alveolo-gingival, dento-gingival and peridental.

THE MORPHOLOGY OF THE DESMODONTIUM

Due to its interposing between the alveolar wall and the root of the tooth, the desmodontium or the alveolo-dental ligament or the parodontal ligament plays the most important part in the transmission of the chewing forces to the resistance functional structures of the architectonics of the cranium.

From an anatomical point of view, the connection between the tooth and the alveolar cavity constitutes the dento-alveolar or the alveolo-dental articulation, known by the name of gomophosis. Within this articulation, the articular surfaces are represented by the cement that covers the root of the tooth and the alveolar bone, and the connecting means are the alveolo-dental ligaments. This type of articulation, which belongs to the category of syndesmose does not allow any movement to the tooth.

All the constituents of the parodontium, the gum, the alveolar bone, the cement and, respectively, the alveolo-dental ligament (Fig. 2) are, from a genetic, structural, biologic and functional perspective, structures that belong to a common origin and represent a morpho-functional unit. The morpho-genesis of the dental cement, of the parodontal ligament and of the alveolar bone is produced at the level of the dental sack, in which three strata can be distinguished: the internal, cementoblastic lamina, with
numerous cells and intensely vascularized, from which the radicular cement derives, the medium, paradontoblastic lamina, which gives birth to the parodontal or alveolo-dental ligament and the external, osteoblastic lamina, in which the alveolar bone originates.

The alveolo-dental ligament originates in the parodontoblastic lamina, which represents the medium stratum of the dental sack. The
collagen fibres of the alveolo-dental ligament, made out of fibroblasts are grouped in small bundles, which, through their tips, adhere on the one hand to the radicular cement and on the other hand to the bony alveolar bone. The collagen fibres within the alveolo-dental ligament are called Charpey fibres. We should also mention the free fibres, which do not fasten at the level of the alveolar bone, which are situated so that one continues the other and are agglomerated towards the centre. We should also add the fact that during the dental eruption a permanent phenomenon of dissemination and re-grouping occurs, the functional loading that follows the dental eruption determining the final orientation in the strengthening of the collagen fibres.

The morphogenesis of the alveolo-dental ligament starts at the level of the cervical region of the dental root. With the lengthening of the root, the process extends, the fibres lengthen and they extend obliquely to the apical, between the radicular cement and the alveolar bone. The marginal fibres are oriented obliquely from the dental neck to the alveolar edge and the marginal gum. After the tooth erupted the fibres situated deeply get a horizontal direction and then orient along the alveolar wall to the inferior. We must mention the fact that the restant fibroblasts at the level of the alveolo-dental ligament permanently form the collagen fibres or are transformed into cementoblasts, osteoblasts and odontoblasts, the parodontium having the propriety of regenerating itself permanently.

The alveolo-dental ligament is constituted from cemento-alveolar fibres that form the alveolo-dental fibrilar apparatus which fastens at the level of the alveolar bone and of the radicular cement. Along the force trajectories, as well as in the region of the radicular tip, to the alveolo-dental fibrilar apparatus a laxer connection tissue is added. The constitutive fibres of the alveolo-dental ligament present different orientations, trajectories or directions. Thus, in the region of the dental neck, of the radicular tip and of the ramification of the multiradicular teeth, the fibres are oriented radially, while in the medium region they are disposed obliquely, from the alveolar bone to the root of the tooth.

Depending on their topographic situation, the fibres of the alveolo-dental ligament can be divided into: marginal cemento-alveolar fibres, which extend from the dental neck to the edge of the socket and pierce the gum, too; intermediary cemento-alveolar fibres, obliquely oriented between the alveolar bone and the dental root; apical cemento-alveolar fibres, which
are ordered radially from the basis of the socket to the radicular tip; ramification cemento-alveolar fibres, which branch out, starting with the interradicular septum of the alveolar bone. If we look at the fibres of the alveolo-dental ligament on a transversal section at the level of the uniradicular teeth, we will notice that the fibres that surround the root present different orientations, clockwise, counterclockwise, radially or tangentially, orientations that counteract the rotation and the tangential movements.

To conclude, within the morpho-functional complex of the parodontium – the alveolar bone, the gum, the alveolo-dental ligament and the alveolar cement – giving each constituent the deserved place, we have to specify that the alveolo-dental ligament plays the most important role in the transmission of the chewing forces.

REFERENCES

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