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REVIEW OF METHODOLOGY AND MATERIALS USING INCREASING OF SOFT TISSUES OF GUM

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Abstract:

In the review it is analyzed the basic surgical techniques and materials used for the increasing of keratinizated gum, such as dermal and collagen matrix. The analysis of the literature highlights the main advantages and disadvantages of these methods and materials, the most significant and promising areas for further clinical research.

Key words: ***autograft, xenogeneic material, dental implant, gum, collagenous matrix***

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INTRODUCTION:

Gum plastic surgery is an integral part of surgical dentistry and modern dental implantology. The increasing of the gum soft tissue volume allows to eliminate the manifestations of some pathologies of the dental system (gum recession, exposure of the roots of teeth, etc.) and is carried out both in preparation for implantation and after the installation of dental implants, which is confirmed by a number of scientific studies.

The most used previously proposed technique of gum plasty is a flap surgery, however, the displacement of the flap is a technically complex stage of the procedure, especially with a significant exposure of the roots of the teeth, and therefore free gingival grafts were began to use: these "transplants" allow to increase the area of the attached gum. The most modern methods include those based on the use of free gingival transplants and collagen matrices, as well as their combination. These techniques are simple in execution, reducing the overall trauma, but have a number of advantages and disadvantages, which led to the need to write an analytical review on this issue, as well as to determine the most promising areas of experimental and clinical research.

1.The main techniques used for the increasing of the volume of soft tissues of the gum: advantages and disadvantages

To obtain the required volume of gum in surgical dentistry and dental implantation the following techniques are most often used [1]

In the preimplantation period:

- full-layer mucous periosteal flap on the feeding pedicle;
- bifid apical-shifted flap;
- technique of cushion with non-epithelial flap;
- autograft from the palatine;
- tunnel plasty using connective tissue graft;
- bifid apical-biased flap with the use of special membranes;
- tunnel plastic using special membranes [2].

In order to increase the depth of the vestibule part almost the same techniques are used but adapted for this type of operation.

The using types of surgery are listed below.

1.1. Full-thickness mucous periosteal flap on a feeding pedicle

The aim of the operation is to obtain a flap consisting of connective tissue from the palatine side, having a vascular pedicle to improve blood supply. The connective tissue part moves vestibulary under the the mucous membrane and is placed on the periosteum.

The advantage of this method is that the volume of soft tissues from the vestibular side of the upper jaw increases as a result of surgical intervention, though the possible failure is the displacement of the keratinized gum, tension of the sutures in the area of the surgical wound [3].

1.2.Bifid apical displaced flap

The technique was first proposed in 1953 by H. B. Clark [4]. The increasing of the area of the attached gum is achieved by moving the existing "mature" gum apically along the tooth surface and the alveolar crest. The advantage of the method is to achieve an increasing in the width and volume of keratinized gums compared to the methods of subepithelial connective tissue and free gingival graft [5]. The main disadvantage of this technique is associated with low predictability of treatment results due to the small potential for the formation of new bone tissue [6].

1.3.Methods of forming a cushion of non-epithelial palatal flap

It involves the use of local tissues for the augmentation of the gum of the vestibular surface of the alveolar crest and is used in the presence of small defects that require a limited increasing in the thickness of soft tissues (not more than 2 mm) or for elimination of the aesthetic imperfections due to the vision of the dental implant. The augmentation technique is also used in the modeling of the gum around the dental implant at the II stage of treatment. The advantage of technology is the ability to obtain a stable good result. The lack of the technique is limited volume of the recipient area, long-time pain syndrome in the postoperative period [7].

1.4. Free gingival graft

Free gingival graft is modelized in the area of palatine surface of the maxilla, which is associated with the presence in this area of a sufficient amount of dense mucosa. There are three types of transplants depending on tissue: epithelial, full-layer (combined) and connective tissue. The two-layer technique is used in the absence of keratinized gum in the presence of multiple or wide deep recessions [8]. The main advantage is the simplicity of execution, which is why it is widespread among practicing dentists. The main disadvantage is additional postoperative wound in the area of graft collection in the palatine, its possibility for necrosis due to insufficient blood supply, the difference in color and

structure of the area of the graft accustomed to the surrounding tissues, the complexity of the intervention in some cases due to insufficient thickness of soft tissues in the hard palate due to individual anatomical features.

1.5.Tunnel vestibuloplasty with fixation of connective tissue graft

This technique is based on the creation of a submucosal tunnel through which a connective tissue graft is moved, which is then fixated with submerged sutures [2]. The main advantage of the technique is the preservation of the interdental papillae and the contour of the gingival margin, though the disadvantage is the technical difficulties in performing the operation.

Thus, all the above described techniques of surgery have limitations, despite the long period of their application in clinical practice. Complications can occur both in the donor and recipient areas, and the frequency of complications and risk factors have not been adequately investigated.

2.Advantages and problems of using connective tissue grafts

The use of connective tissue grafts is characterized by faster engraftment in the donor area, compared with full-layer flaps, but a number of authors has the opposite point of view [7].

S. V. Tarasenko and I. P. Ashurko in 2015, having conducted a comprehensive analysis of the literature on this issue and clinical studies, came to the conclusion about the lack of information about the results of histological studies obtained using transplants, especially when using collagen matrices [9].

Collagen-based materials have long been studied and have been widely used on the last 30 years in the implementation of osteoplasty and mucogyngival surgery due to such advantages as high rate of biodegradation. In modern dentistry collagen membranes with improved characteristics are continued to develop.

3. Other materials used to increase the volume of the gum.

Currently, there are a lot of allogeneic and xenogenic materials used to increase the volume of the gum.

3.1. Acellular dermal matrix Alloderm. It's a cryopreserved, cell-free dermal matrix derived from human skin samples from the resources of U.S. tissue banks. The material is used both in surgical dentistry and in other areas of medicine.

Alloderm is characterized by low immunogenic activity due to its composition (type I collagen and proteoglycans). When using the material for increasing of the volume of the gum, surgical intervention can be carried out with the both types of graft - free full-layer palatine flap or the "envelope technique" [10]. In the framework of the comparative research there was evaluated the volume keratinizated gum after the using of the matrix Alloderm and connective tissue graft, and after 6 months different results were obtained and divided into three types: 1) the keratinization of the gum in greater degree was expressed by using a connective tissue graft [4]; 2) significant differences in the growth of the gum between the connective tissue graft and allogenic dermal matrix have not been identified; 3) the use of Alloderm has resulted in a larger volume of tissue in less time than in the case of a connective tissue flap [11].

3.2.Xenogenic dermal matrix. Xenogenic dermal matrix based on bovine collagen type I was introduced into surgical practice. Its use in studies has proven the presence of attachment and proliferation of fibroblasts. Good clinical results with this matrix were obtained by Batista et all in operations for increasing of the volume of soft tissues in the area of removed teeth [12]. The gingivoplasty was performed using a two-layer collagen matrix and compared with the free connective tissue flap transplantation [13], obtaining a stable decreasing in the recession size both in the vertical and horizontal direction, however, the difference between the indices between the groups at the terms of 3 and 6 months after the operation was statistically unreliable.

The use of the matrix, which consists of bovine collagen type I, keratinocytes and cadaveric fibroblasts, is promising, since there is evidence of an increasing in the rate of production of growth factors in their joint application [14].

Japanese researchers suggested to use growth factors for increasing of the volume of gum. In the experiment, which performed the injection into the soft tissue of immunodeficient rats of solutions containing human mesenchymal stromal cells, culture of fibroblasts, a suspension of hyaluronic acid and growth factors platelet rich plasma it was revealed a significant change in the growth of tissues with different combinations of cells. The most significant result was obtained while the content of the cell suspension had plasma rich in platelets [15].

3.3. Mucograft collagen matrix. It is a collagen matrix derived from pig tissue that has undergone multi-stage purification to avoid the development of immune reactions. The composition of the material includes collagen type I and III without cross-linking or chemical treatment. The peculiarity of the matrix is the presence of two layers (compact and porous). The compact layer is made of pork peritoneum and it plays a protective role in open wound healing. The elasticity of this layer makes it easy to fix the membrane seams to the surrounding soft tissues. The inner spongy loose layer of the matrix is made of pig skin. Both layers are joined through biophysical processes without the use of chemical reagents. The material is fixed to the periosteum with the help of medical suture material. When using the matrix, the technique of a split flap is carried out. The matrix eliminates violations of soft tissue architectonics, reducing the depth of the vestibule, allowing to avoid additional surgical intervention.

CONCLUSION:

Disadvantages of methods of use of different types of connective tissue grafts cause the need to find alternative materials to replace them in surgical dentistry. However, in our opinion, connective tissue grafts require further study in order to reduce the volume and trauma of surgical intervention.

In general, the analysis of the literature on the methods and materials used for increasing of the volume of gum showed that the use of collagen matrices is promising due to the imperfection of the classical technique using the "gold standard" - free connective tissue flaps - and good results of the studies obtained for the matrices in terms of the effectiveness and safety of the material.

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