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PREVENTIVE SOFT TISSUE PLASTIC SURGERY IN THE AREA OF THE UPCOMING RECONSTRUCTION OF THE ALVEOLAR BONE OF THE JAWS

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SUMMARY
The article presents a comparative analysis of the results of guided bone regeneration operations using individual titanium skeleton membranes, where in one group, soft tissue plastic surgery was not performed before alveolar bone reconstruction, and in the other group, it was performed accordingly. Soft tissue plastic surgery was performed using the technique of an apically displaced flap with the transfer of a free gingival graft to the wound surface. The individual titanium frame membrane was manufactured using the technology of direct laser sintering of metals on a 3D printer. In patients of the 1st group, 7 cases of complications were registered within a month after the direct bone regeneration (GBR) such as suture divergence and membrane densification. In group 2, after two months, all patients had a keratinized gum attachment with a width of 4–5 mm and a thickness of at least 1.5 mm; then, all patients underwent reconstruction of the alveolar ridge using individually manufactured titanium membranes. In the second group, 1 case of a complication in the form of membrane exposure was registered within a month after the GBR. According to a comparative analysis of the number of complications between the 1st and 2nd groups, statistically significant results were obtained in reducing the number of complications, in the form of suture divergence and membrane exposure, 28 and 4%, respectively, p = 0.049.

KEYWORDS: *targeted bone regeneration, soft tissue plastic surgery, individual titanium membranes, bone plastic surgery.*

CONFLICT OF INTEREST. The authors declare no conflict of interest.

ПРЕВЕНТИВНОЕ ПРОВЕДЕНИЕ МЯГКОТКАННОЙ ПЛАСТИКИ В ОБЛАСТИ ПРЕДСТОЯЩЕЙ РЕКОНСТРУКЦИИ АЛЬВЕОЛЯРНОЙ КОСТИ ЧЕЛЮСТЕЙ

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РЕЗЮМЕ
В статье представлен сравнительный анализ результатов проведенных операций по направленной костной регенерации с использованием индивидуальных титановых каркасных мембран, где в одной группе перед реконструкции альвеолярной кости операция мягко-тканной пластики не проводилась, а в другой группе соответственно проводилась. Операции мягко-тканной пластики проводились по методике апикально смещенного лоскута с переносом свободного десневого трансплантата на раневую поверхность. Индивидуальную титановую каркасную мембрану были изготовлены по технологии прямого лазерного спекания металлов на 3D принтере. У пациентов 1-й группы после проведения направленной костной регенерации (НКР) в течении месяца зарегистрировали 7 случаев осложнений, таких как: расхождения швов и оголения мембраны. Во 2-й группе через два месяца у всех пациентов была сформирована кератинизированная прикрепленная десна шириной 4–5 мм и толщиной не менее 1б5 мм; далее всем пациентам была проведена реконструкция альвеолярного гребня с использованием индивидуально изготовленных титановых мембран. Во второй группе после проведения НКР в течении месяца зарегистрировали 1 случай осложнения, в виде оголения мембраны. По проведенному сравнительному анализу по количеству полученных осложнений между 1-й и 2-й группой и получили статистически значимые результаты по снижению количества осложнений, в виде расхождения швов и оголении мембраны, 28 и 4% соответственно p = 0,049.

КЛЮЧЕВЫЕ СЛОВА: направленная костная регенерация, мягко-тканная пластика, индивидуальные титановые мембраны, костнопластические операции

КОНФЛИКТ ИНТЕРЕСОВ. *Авторы заявляют об отсутствии конфликта интересов.*

Relevance

Primary wound healing is one of the key success factors in all bone-grafting operations in the area of the alveolar bone of the jaws. When conducting guided bone regeneration (GBR) in the area of the alveolar bone, the main complication in the postoperative period is the divergence of the sutures and the exposure of the bone grafting area, which subsequently leads to infection of the bone regenerate [1, 2, 3].

In modern studies [5], the above complications are noted quite often — from 15 to 40% of cases.

The results of the study show that with early membrane exposure, the volume of newly formed bone tissue is 5–6 times less than with primary tension healing [4]. To obtain the most predictable result, it is necessary to hermetically suture the flap over the bone regeneration and ensure the stability of the sutures. In the area of bone defects of the alveolar bone, especially in the lower jaw, in addition to bone deficiency, there is also no keratinized gum attachment (KGA). Therefore, mobilized and thinned muco-periosteal flaps often do not provide adequate matching of wound edges and suture retention. As a result of postoperative edema, the sutures erupt and diverge, which leads to the consequences described above. The conducted studies on complications of directed bone regeneration demonstrate that the divergence of the wound edges occurs 2 times more often if the width of the efficiency zone is less than 3 mm [6].

The traditional approach involves soft tissue plastic surgery after bone reconstruction [7].

The purpose of the study was to substantiate the importance of the formation of keratinized attached gums before the upcoming reconstruction of the alveolar bone of the mandible in order to increase the effectiveness of the elimination of defects in the alveolar bone and dental implantation.

Materials and methods

The study was conducted on the basis of the clinical diagnostic center of the Peoples' Friendship University of Russia. The study involved 50 patients (age 36–56) with partial loss of teeth in the lower jaw and atrophy of the alveolar part of the lower jaw in the area of the chewing teeth. Patients of group 1 (25 people) underwent reconstruction of the alveolar part of the lower jaw according to the following protocol: bone grafting using individual titanium skeleton membranes, dental implantation, soft tissue grafting around implants with the formation of keratinized attached gums. In group 2, surgical treatment was performed according to the proposed surgical protocol, namely: before bone grafting, all patients in group 2 underwent soft tissue grafting with the transfer of a free gingival graft to the wound surface to create a keratinized gum. After 2 months, targeted bone regeneration using individual titanium scaffold membranes was performed, and after 6 months, dental implantation was performed. This approach was chosen to reduce the risks of postoperative complications such as suture divergence and infection of the regenerate.

During an intraoral examination of the patients' oral cavity, attention was paid to the color, moisture content of the mucous membrane, and the width of the attached keratinized gum in the area of the intended surgical intervention. The degree of atrophy of the alveolar ridge was assessed, as well as the extent of the defect in the area of missing teeth. At the site of the proposed surgical intervention, the severity of the submucosal layer and the relief of the atrophied alveolar ridge were palpated. Based on the conducted objective studies, the state of oral hygiene and the need for its rehabilitation were assessed.

All patients underwent tests such as a general blood test (RW, HIV, Hbs, blood glucose, clotting). According to the results of the tests, HIV infection, syphilis, markers of hepatitis B, C, acute inflammatory processes in the body were excluded, and special attention was also paid to blood glucose levels. The blood test was also a "marker" for determining the patient's level of health. Based on the data obtained on the patients' health status and the results of blood tests, the relative and absolute contraindications to soft tissue plastic surgery and targeted bone regeneration were determined.

Thus, the studies included patients of health groups I and II, in whom the width of the keratinized attached gum was less than 3 mm in the area of the intended surgical intervention.

In patients of group 1, the reconstruction of the alveolar part of the lower jaw was performed according to a generally accepted protocol, which involves soft tissue plastic surgery after targeted bone regeneration.

At the first stage, patients of group 2 underwent soft tissue plastic surgery in the form of an apically displaced flap and suturing of a free gingival graft (at least 5–6 mm wide) to the wound surface. and the length in accordance with the length of the defect); after 2 months, GBR was performed using an individually manufactured titanium membrane; after 6 months, removal of the individual titanium membrane and dental implantation; After 6 months, gingival cuff shapers were installed and temporary and permanent rational prosthetics on dental implants were performed for 2–3 months.

To demonstrate the need for preliminary soft tissue plastic surgery (STPS) in the field of upcoming bone reconstruction, we provide clinical examples. In the first case, where the STPS was performed before the GBR, the wound was healed by primary tension (Figure 1), and in the second case, where the STPS was not performed after two weeks before the GBR, the necks were exposed (Figure 2).

Fig. 1. Appearance in the oral cavity 2 months after the GBR

Fig. 2. Appearance in the oral cavity 2 weeks after the GBR

Results and discussion

In patients of the 1st group, 7 cases of complications were registered within a month after the NCR, such as suture divergence and membrane densification. After removal of the individual titanium membranes, the wounds were healed by secondary tension. According to the results of soft tissue plastic surgery in group 2, after two months, keratinized gums with a width of 4–5 mm and a thickness of at least 1.5 mm were formed in all patients; then, all patients underwent reconstruction of the alveolar ridge using an individually manufactured titanium membrane. In the second group, 1 case of a complication in the form of membrane stripping was registered within a month after the NCR. The wound was treated with antiseptic bandages for a month. After monitoring the stability of bone regeneration, the membrane was removed and the wound healed by secondary tension. In other patients from groups 1 and 2, the postoperative (post-NCR) period was the same. Edema in the area of the performed intervention persisted for 3–4 days in the area of the performed intervention. The stitches were removed after two weeks. No complications were detected in the early postoperative and long-term periods (follow-up period up to 4 years). 6 months after the NCR operations, the height and width of the formed bone regenerate were evaluated in all patients according to the results of the CBCT study. In group 1, membrane exposure was n=7 cases, which is 28%. In group 2, membrane exposure was n=1 case, which is 4%. A comparative analysis of the number of complications was performed between the 1st and 2nd groups and statistically significant results were obtained in reducing the number of complications, in the form of suture divergence and membrane exposure, 28% and 4%, respectively, $p = 0.049$. As a result of the comparison of wound healing by primary tension depending on the MTP operation, significant differences were revealed ($p = 0.049$; the method used is the exact Fischer criterion).

Conclusion

Conducting guided bone regeneration operations with a titanium membrane has certain risks of complications of membrane stripping. Thus, our proposed method with the preventive creation of a keratinized gum zone reduces the risks of complications associated with suture failure, exposure and infection of the regenerate.

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