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METHODS OF USING PLATELET-RICH PLASMA THERAPY AFTER SURGICAL TREATMENT OF PURULENT-NECROTIC COMPLICATIONS OF THE MAXILLOFACIAL REGION

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Abstract

Objective: to substantiate and systematize methods for the use of autologous platelet-rich plasma therapy after surgical treatment of purulent-necrotic complications of the maxillofacial region. Materials and methods: a clinical-methodological analysis was performed on the basis of contemporary principles of maxillofacial surgical infection management, staged wound sanitation, regenerative medicine and published evidence on platelet-rich plasma in oral surgery and wound healing. Results: the method includes four consecutive stages: pre-PRP evaluation, surgical sanitation and infection control, selection of the appropriate platelet-rich plasma form, and repeated local application with clinical and laboratory monitoring. The preferred options are platelet-rich plasma gel for soft-tissue wounds, fibrin-like autologous clot or membrane for granulating defects, and combined placement with osteoplastic material in selected bone cavities after complete debridement. Conclusion: platelet-rich plasma therapy should be considered as an adjunctive regenerative method, not as an alternative to surgery, drainage, antibacterial therapy or systemic correction. Correct timing and strict selection of indications increase the practical value of the method in postoperative rehabilitation of patients with purulent-necrotic maxillofacial complications.

Keywords: platelet-rich plasma, maxillofacial surgery, purulent-necrotic complication, necrectomy, wound healing, regenerative therapy, PRP gel, postoperative rehabilitation.

YUZ-JAG‘ SOHASI YIRINGLI-NEKROTIK ASORATLARINI JARROHLIK USULIDA DAVOLASHDAN SO‘NG TROMBOTSITLARGA BOY PLAZMA TERAPIYASINI QO‘LLASH USULLARI

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Annotatsiya

Maqsad: yuz-jag‘ sohasi yiringli-nekrotik asoratlarini jarrohlik usulida davolashdan so‘ng autolog trombotsitlarga boy plazma terapiyasini qo‘llash usullarini ilmiy asoslash va tizimlashtirish. Material va metodlar: yuz-jag‘ sohasi jarrohlik infeksiyalarini davolashning zamonaviy tamoyillari, bosqichma-bosqich yara sanatsiyasi, regenerativ tibbiyot yondashuvlari hamda og‘iz bo‘shlig‘i jarrohligi va yara bitish jarayonlarida trombotsitlarga boy plazmadan foydalanishga oid ilmiy manbalar asosida klinik-metodologik tahlil o‘tkazildi. Natijalar: mazkur usul to‘rt ketma-ket bosqichni o‘z ichiga oladi: PRP terapiyadan oldingi klinik baholash, jarrohlik sanatsiyasi va infeksion jarayonni nazorat qilish, trombotsitlarga boy plazmaning maqbul shaklini tanlash hamda klinik-laborator monitoring asosida mahalliy takroriy qo‘llash. Yumshoq to‘qima jarohatlarida PRP-gel, granulyatsiyalanayotgan nuqsonlarda fibrinsimon autolog ivindi yoki membrana, to‘liq debridmentdan so‘ng ayrim suyak bo‘shliqlarida esa osteoplastik material bilan kombinatsiyalangan qo‘llash maqsadga muvofiq hisoblanadi. Xulosa: trombotsitlarga boy plazma terapiyasi jarrohlik amaliyoti, drenajlash, antibakterial davolash va tizimli korreksiya o‘rnini bosuvchi usul emas, balki qo‘shimcha regenerativ davolash usuli sifatida baholanishi lozim. PRP terapiyani to‘g‘ri muddatda qo‘llash va ko‘rsatmalarni qat’iy tanlash yuz-jag‘ sohasi yiringli-nekrotik asoratlari bo‘lgan bemorlarning operatsiyadan keyingi reabilitatsiyasida ushbu usulning amaliy ahamiyatini oshiradi.

Kalit so‘zlar: trombotsitlarga boy plazma, yuz-jag‘ jarrohligi, yiringli-nekrotik asorat, nekrektomiya, yara bitishi, regenerativ terapiya, PRP-gel, operatsiyadan keyingi reabilitatsiya.

МЕТОДЫ ПРИМЕНЕНИЯ ТЕРАПИИ БОГАТОЙ ТРОМБОЦИТАМИ ПЛАЗМОЙ ПОСЛЕ ХИРУРГИЧЕСКОГО ЛЕЧЕНИЯ ГНОЙНО-НЕКРОТИЧЕСКИХ ОСЛОЖНЕНИЙ ЧЕЛЮСТНО-ЛИЦЕВОЙ ОБЛАСТИ

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Аннотация

Цель: научно обосновать и систематизировать методы применения аутологичной терапии богатой тромбоцитами плазмой после хирургического лечения гнойно-некротических осложнений челюстно-лицевой области. Материалы и методы: проведен клинико-методологический анализ на основе современных принципов лечения хирургической инфекции челюстно-лицевой области, этапной санации раны, подходов регенеративной медицины, а также опубликованных научных данных о применении богатой тромбоцитами плазмы в хирургии полости рта и процессах заживления ран. Результаты: предложенный метод включает четыре последовательных этапа: предварительную клиническую оценку перед проведением PRP-терапии, хирургическую санацию и контроль инфекционного процесса, выбор оптимальной формы богатой тромбоцитами плазмы, а также повторное местное применение под клинико-лабораторным мониторингом. При ранах мягких тканей целесообразно применение PRP-геля, при гранулирующих дефектах — фибриноподобного аутологичного сгустка или мембраны, а при отдельных костных полостях после полного дебридмента — комбинированное использование PRP с остеопластическим материалом. Заключение: терапия богатой тромбоцитами плазмой должна рассматриваться как дополнительный регенеративный метод, а не как альтернатива хирургическому вмешательству, дренированию, антибактериальной терапии или системной коррекции. Правильный выбор сроков применения и строгое определение показаний повышают практическую значимость данного метода в послеоперационной реабилитации пациентов с гнойно-некротическими осложнениями челюстно-лицевой области.

Ключевые слова: богатая тромбоцитами плазма, челюстно-лицевая хирургия, гнойно-некротическое осложнение, некрэктомия, заживление ран, регенеративная терапия, PRP-гель, послеоперационная реабилитация.

Introduction. Purulent-necrotic complications of the maxillofacial region remain among the most difficult problems of contemporary oral and maxillofacial surgery. Their clinical significance is determined by the complex topographic anatomy of the face, the connection of fascial spaces with the floor of the mouth and neck, the proximity of the upper airway, the frequent odontogenic origin of infection, and the risk of rapid transition from a localized abscess to diffuse phlegmon, osteomyelitis or systemic inflammatory response. The surgical principle in such conditions is well established: the purulent-necrotic focus must be opened, decompressed, drained and sanitized, while non-viable soft tissues and sequestrated bone must be removed. However, even after technically adequate surgical treatment, wound repair may remain slow and unpredictable, especially in patients with systemic background conditions, immune dysregulation, anemia, diabetes mellitus, vascular pathology, renal dysfunction, post-viral endothelial injury or prolonged antibacterial exposure.

Platelet-rich plasma is an autologous blood-derived concentrate containing platelets above the baseline level and a biologically active mixture of growth factors, cytokines, chemokines, adhesive proteins and fibrin components. After activation, platelet alpha granules release platelet-derived growth factor, transforming growth factor beta, vascular endothelial growth factor, epidermal growth factor, insulin-like growth factor and other mediators that participate in hemostasis, angiogenesis, fibroblast migration, extracellular matrix remodeling, collagen synthesis and epithelial repair. For this reason, platelet-rich plasma has been studied in dentistry, oral surgery,

implantology, periodontal surgery, bone regeneration and chronic wound management as a method capable of supporting tissue repair in selected clinical situations [1-4].

The scientific and practical relevance of the present article is connected with the need to translate the general regenerative potential of platelet-rich plasma into a clear postoperative algorithm for maxillofacial purulent-necrotic wounds. The method should answer several practical questions: when platelet-rich plasma may be started, which form is preferable for soft-tissue and bone defects, how many sessions are reasonable, what clinical indicators must be monitored, and in which situations the method should be postponed or contraindicated. A differentiated protocol is required because the same patient may have an extraoral phlegmon wound, an intraoral mucosal defect, a bone cavity after sequestrectomy and a sinus-related inflammatory component. Each of these anatomical situations requires a different way of delivering the autologous concentrate.

Aim of the study. To develop and present an OAK-oriented clinical-methodological article describing indications, timing, forms and practical methods of using autologous platelet-rich plasma therapy after surgical treatment of purulent-necrotic complications of the maxillofacial region, with emphasis on safety, staged wound sanitation and postoperative rehabilitation.

Materials and methods. The article was prepared as a clinical-methodological analysis focused on postoperative management of patients with purulent-necrotic complications of the maxillofacial region after surgical treatment [8-12]. The methodological basis included the principles of emergency maxillofacial infection surgery, wound bed preparation, antibacterial therapy, prevention of surgical site infection and contemporary approaches to autologous platelet concentrate use. The proposed protocol is intended for clinical situations in which a patient has already undergone opening and drainage of purulent spaces, necrectomy of non-viable soft tissues, sequestrectomy or bone debridement when indicated, and repeated wound sanitation until clear local criteria for transition from the destructive inflammatory phase to the reparative phase have appeared.

Before platelet-rich plasma therapy, every patient should undergo repeated clinical assessment. The surgeon evaluates pain intensity, edema, skin or mucosal hyperemia, wound discharge, odor, necrotic tissue, granulation quality, drainage function, trismus, swallowing disorders and regional lymphadenitis. Laboratory monitoring includes complete blood count, leukocyte formula, C-reactive protein when available, blood glucose, coagulation parameters, platelet count, hemoglobin level, creatinine and other indicators depending on the systemic background. Imaging with radiography, computed tomography or cone-beam computed tomography is used when bone necrosis, sequestration, sinus communication or deep extension is suspected. Microbiological sampling is advisable before correction of antibacterial therapy, especially in recurrent, hospital-associated or immunocompromised cases.

Autologous platelet-rich plasma should be prepared under aseptic conditions from the patient's venous blood by a validated centrifugation system. The protocol used in a clinical institution must be recorded in the medical documentation, including volume of collected blood, anticoagulant, centrifugation mode or manufacturer's kit, platelet concentration if available, leukocyte content when measured, activation method, final volume and route of application. Such documentation is essential because platelet-rich plasma is not a single standardized product; its biological properties depend on preparation technology [5-7]. In purulent-necrotic maxillofacial wounds, the practical preference is given to a product that can form a gel or clot and remain in contact with the wound surface without blocking drainage.

Outcome assessment after platelet-rich plasma therapy should include local and general indicators. Local indicators are reduction of wound exudation, absence of new necrosis, transition from pale or edematous granulation to bright viable granulation, decrease in wound area, epithelialization of mucosal margins, closure of dead spaces, absence of recurrent suppuration and improvement of mouth opening when trismus was related to inflammation. General indicators include regression of fever, decrease in intoxication, normalization or reduction of inflammatory markers, ability to reduce drainage, shorter requirement for daily intensive dressings and satisfactory functional recovery. Safety indicators include absence of hematoma, allergic reaction, secondary infection, uncontrolled bleeding, excessive pain after application and deterioration of systemic status.

Results. The analysis made it possible to systematize a four-stage method of using platelet-rich plasma after surgical treatment of purulent-necrotic complications of the maxillofacial region. The first stage is pre-PRP assessment. At this stage, the surgeon confirms that surgical decompression has been performed, drainage is adequate and the wound does not contain retained necrotic tissue. The second stage is biological readiness of the wound bed. It is determined by local signs of cleansing, decreased exudation, absence of progressive edema and appearance of viable granulation. The third stage is selection of the application form according to the anatomical defect. The fourth stage is repeated clinical monitoring with the possibility of additional platelet-rich plasma application, continuation of local wound care, correction of systemic factors and timely refusal of PRP if inflammatory deterioration occurs.

Table 1

Staged algorithm for PRP therapy after maxillofacial purulent-necrotic surgery.

Stage	Main action	PRP-related decision	Expected clinical control
I	Opening, drainage, necrectomy, sequestrectomy when indicated	PRP is not applied before adequate sanitation	Reduction of tissue tension and elimination of pus
II	Repeated wound inspection and laboratory monitoring	Decision on readiness for PRP	No progressive necrosis, decreasing exudation, stable systemic status
III	Selection of gel, clot, membrane or combined bone-cavity placement	Local application according to anatomical defect	Viable wound bed remains open for monitoring and drainage
IV	Repeated dressings, reassessment and rehabilitation	Additional PRP sessions only if healing is positive	Granulation, epithelialization, absence of recurrent suppuration

For intraoral mucosal defects, alveolar wounds and palatal or gingival defects after removal of necrotic tissues, platelet-rich plasma may be used as a clot-like membrane or gel that is adapted to the mucosal surface. The purpose is to protect exposed connective tissue, support epithelial migration and reduce mechanical irritation from saliva, food and speech. Because the oral cavity has a high microbial load, this method requires careful local hygiene, elimination of sharp bone edges, control of odontogenic foci and avoidance of tight closure over an infected cavity. The platelet-rich plasma membrane should support secondary healing, not create a closed anaerobic space.

For bone lesions, including jaw osteomyelitis with sequestration, platelet-rich plasma is considered only after removal of sequestra, curettage of non-viable bone, smoothing of sharp margins and confirmation that the remaining bone surface is viable. In small or moderate defects,

platelet-rich plasma gel may be placed into the cavity to support clot stability and early granulation. In larger defects, the concentrate may be combined with osteoconductive material, but only when the surgeon is confident that active infection has been controlled. In post-necrotic bone cavities, excessive packing should be avoided because it may impair drainage or hide recurrent suppuration. Radiological follow-up is required when there was extensive bone destruction, maxillary sinus involvement or risk of pathologic fracture.

The practical result of the proposed algorithm is the transformation of platelet-rich plasma therapy from an empirical adjunct into a controlled postoperative stage. The method defines not only how PRP is applied, but also when it is prohibited, when it should be postponed and how clinical effect should be evaluated. This is essential for OAK-oriented scientific presentation because a regenerative technology in infected maxillofacial wounds must be reproducible, safe, clinically justified and connected with objective criteria rather than subjective preference.

Table 2

Differentiated forms of PRP application according to wound type.

Wound or defect type	Recommended PRP form	Main purpose	Important limitation
Extraoral granulating wound after phlegmon drainage	PRP gel on wound surface	Support granulation and soft-tissue repair	Do not close spaces requiring drainage
Intraoral mucosal or alveolar defect	PRP clot or membrane	Protect surface and support epithelial migration	Avoid covering an infected undrained cavity
Bone cavity after sequestrectomy	PRP gel, sometimes with osteoconductive material	Stabilize clot and support early bone repair	Only after complete debridement and infection control
Delayed wound edge epithelialization	Periwound PRP infiltration plus surface gel	Activate viable margins and microcirculation	Contraindicated in cellulitis or recurrent abscess
Combined soft-tissue and bone lesion	Sequential surface and cavity application	Coordinate soft-tissue and bone regeneration	Requires repeated inspection and imaging when needed

Discussion. The proposed method is based on the concept that platelet-rich plasma should be integrated into the reparative phase of treatment, whereas the acute destructive phase remains the domain of surgical decompression, drainage, necrectomy, antimicrobial therapy and systemic stabilization. This distinction is fundamental. In purulent-necrotic maxillofacial complications, the main cause of tissue destruction is not a deficit of growth factors alone, but the combined influence of infection, ischemia, edema, toxins, necrotic detritus and impaired host response. Therefore, regenerative stimulation is rational only after the wound has been prepared biologically and mechanically.

The biological rationale of platelet-rich plasma is attractive for maxillofacial surgery. Platelets participate in early hemostasis and then release mediators that stimulate fibroblast activity, endothelial cell migration, angiogenesis, matrix formation and epithelialization. In oral surgery, platelet concentrates have been used to support soft-tissue healing, extraction socket repair, periodontal regeneration, implant-related bone repair and management of difficult wounds [1,2]. Systematic reviews of chronic wound treatment have reported better healing indicators in several wound categories when platelet-rich plasma is added to conventional therapy [3,17,18]. Nevertheless, infected necrotic maxillofacial wounds represent a more complex group than clean oral surgical wounds; therefore, direct extrapolation must be cautious.

The limitations of the proposed method should be acknowledged. The method is not a

universal replacement for reconstructive surgery, flap coverage, bone grafting, vascularized tissue transfer or systemic treatment of the underlying disease. In large composite defects, PRP may be only one element of staged reconstruction. In malignant tumors, unexplained proliferative lesions or uncontrolled systemic diseases, the decision must be made individually. Future studies should compare standardized PRP protocols with conventional postoperative management in homogeneous patient groups, using objective endpoints such as wound area reduction, time to granulation, epithelialization rate, pain dynamics, inflammatory markers, frequency of repeated sanitation, length of hospital stay and long-term scar quality.

Table 3

Contraindications and reasons to postpone PRP therapy.

Condition	Clinical decision	Reason
Unopened abscess or undrained phlegmon	Do not use PRP	Requires urgent surgical decompression first
Persistent necrotic tissue or sequestrum	Postpone PRP	Non-viable tissue blocks regeneration and maintains infection
Active sepsis or unstable systemic condition	Postpone PRP	Systemic stabilization has priority
Severe anemia, thrombocytopenia or coagulopathy	Correct condition before PRP	Autologous concentrate and blood collection may be unsafe or ineffective
Suspicion of fungal necrosis or progressive osteomyelitis	Postpone until diagnosis and treatment are clarified	Regenerative therapy must not mask progression
Recurrent pus discharge after PRP	Stop PRP and reassess surgically	Suggests residual infection or insufficient drainage

Conclusions. Platelet-rich plasma therapy after surgical treatment of purulent-necrotic complications of the maxillofacial region is justified as an adjunctive regenerative method aimed at supporting granulation, epithelialization, angiogenesis and soft-tissue or bone repair. The decisive condition for safe use is correct timing: PRP should be applied only after opening and drainage, necrectomy, sequestrectomy or bone debridement when indicated, and after control of active suppuration. The most practical forms are PRP gel for extraoral soft-tissue wounds, clot or membrane for intraoral mucosal defects, and carefully selected bone-cavity application after complete debridement of osteomyelitic lesions. Periwound infiltration is an auxiliary method for viable wound margins and should not be performed in the presence of spreading infection, recurrent abscess or progressive necrosis. The proposed staged algorithm allows PRP therapy to be integrated into postoperative rehabilitation while preserving the priority of surgery, drainage, antibacterial therapy and multidisciplinary systemic correction. For publication and clinical reproducibility, future studies should report PRP preparation parameters and evaluate objective endpoints including time to wound cleansing, granulation, epithelialization, repeated sanitation, complications and hospital stay.

Used literature:

1. Albanese A., Licata M.E., Polizzi B., Campisi G. Platelet-rich plasma (PRP) in dental and oral surgery: From the wound healing to bone regeneration // Immunity and Ageing. - 2013. - Vol. 10. - Article 23.

2. Boymuradov S.A., Rustamova D.A., Bobamuratova D.T., Kurbanov Y.X., et al. Complications of COVID-19 in the maxillo-facial region: clinical case and review of the literature // Advances in Oral and Maxillofacial Surgery. - 2021. - Vol. 3. - Article 100091.
3. Bratzler D.W., Dellinger E.P., Olsen K.M., et al. Clinical practice guidelines for antimicrobial prophylaxis in surgery // American Journal of Health-System Pharmacy. - 2013. - Vol. 70, No. 3. - P. 195-283.
4. Giannelli A., Di Carlo P., et al. Utilization of platelet-rich plasma in oral surgery: a systematic review // Journal of Clinical Medicine. - 2025. - Vol. 14, No. 8. - Article 2844.
5. Hupp J.R., Tucker M.R., Ellis E. Contemporary Oral and Maxillofacial Surgery. - 7th ed. - St. Louis: Elsevier, 2019.
6. Kitamura S. Anatomy of the fasciae and fascial spaces of the maxillofacial and anterior neck regions // Anatomical Science International. - 2018. - Vol. 93, No. 1. - P. 1-13.
7. Lana J.F.S.D., Purita J., Paulus C., et al. Contributions for classification of platelet rich plasma: proposal of a new classification, MARSPILL // Regenerative Medicine. - 2017. - Vol. 12, No. 5. - P. 565-574.
8. Magalon J., Chateau A.L., Bertrand B., et al. DEPA classification: a proposal for standardising PRP use and a retrospective application of available devices // BMJ Open Sport & Exercise Medicine. - 2016. - Vol. 2. - e000060.
9. Meznerics F.A., Fehervari P., Dembrovszky F., et al. Platelet-rich plasma in chronic wound management: a systematic review and meta-analysis of randomized clinical trials // Journal of Clinical Medicine. - 2022. - Vol. 11, No. 24. - Article 7532.
10. Milić T., Raidoo P., Gebauer D. Antibiotic prophylaxis in oral and maxillofacial surgery: a systematic review // British Journal of Oral and Maxillofacial Surgery. - 2021. - Vol. 59, No. 6. - P. 633-642.
11. Patel H., Sharma P., et al. A comprehensive review on platelet-rich plasma activation // Biomedicines. - 2023. - Vol. 11. - Article 3206.
12. Rossi L.A., Murray I.R., Chu C.R., Muschler G.F., Rodeo S.A., Piuzzi N.S. Classification systems for platelet-rich plasma // Bone & Joint Journal. - 2019. - Vol. 101-B, No. 8. - P. 891-896.
13. Tomar K., Roy I.D., Rangan M., Satyanarayan P., Jakka S. Post-COVID orofacial mucormycosis: a clinico-radiological classification system and management protocol // Journal of Maxillofacial and Oral Surgery. - 2023.
14. World Health Organization. Global Guidelines for the Prevention of Surgical Site Infection. - 2nd ed. - Geneva: World Health Organization, 2018.