CODEN [USA]: IAJPBB ISSN: 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES

http://doi.org/10.5281/zenodo.1495140

Available online at: http://www.iajps.com ***Review Article***

THE SURGICAL DENTAL TREATMENT IN PATIENTS WITH BLOOD COAGULATION DISORDERS: LITERATURE REVIEW

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Abstract:

Providing surgical dental care to patients with diseases of the hematopoietic system is an important and not completely solved problem in practical dentistry. Implementation of surgical interventions in patients with impaired hemostasis is especially problematic.Vascular-platelet hemostasis plays a leading role in preventing and stopping bleeding from arterial vessels and from the most vulnerable small caliber vessels - up to 100 microns. Disorders of platelet hemostasis can be caused by both a quantitative change in platelets (thrombocytopenia, thrombocythemia), and impairments of their functional abilities (thrombocytopathy). When conducting surgical treatment in patients with impaired hemostasis, there is a risk of pronounced and prolonged intra- and postoperative bleeding. Bleeding in platelet hemostasis disorders is microcirculatory in nature. Saliva in the oral cavity has fibrinolytic activity, which increases the risk of bleeding. Platelets contain growth factors and vasoactive substances that affect tissue repair. The number and functional activity of platelets have a direct impact on the normal healing of wounds. In addition, drug treatment of hematological patients with impaired platelet hemostasis includes the prescription of glucocorticoids or cytotoxic drugs that often cause immunosuppression, have a negative effect on the processes of repair and regeneration, contribute to the emergence of postoperative inflammatory complications.Currently, dental care for patients with impaired hemostasis, is mainly rendered on the appealability due to acute pain. Surgical dental interventions in most cases are usually performed in the hospital after preliminary medical preparation, using local hemostatic agents. Often, dentists refuse such patients the necessary help because of the fear of bleeding.Therefore, the search for new approaches in providing surgical dental care to patients with impaired platelet hemostasis is relevant.To optimize the provision of care to patients with this pathology, it is advisable to evaluate the possibility of using laser technology. Interest in laser technology is due to a number of their advantages over alternative methods. First of all, dissecting the tissue, the laser beam simultaneously coagulates the vessels on the walls of the wound, promoting hemostasis. In addition, postoperative edema is minimal, the intensity of intraoperative and postoperative pain syndrome decreases. Laser radiation has a bactericidal effect on pathological microflora in the operating area, which helps to reduce the likelihood of postoperative complications and stimulates tissue repair and regeneration. It is of great interest to study the possibility of using a surgical laser in patients with impaired platelet hemostasis, as this may help to reduce the duration and volume of preoperative drug therapy and the risk of secondary bleeding and inflammatory complications. In addition, it will provide an opportunity to provide surgical dental care to patients with the pathology of the hematopoietic system at a qualitatively new level.

Key words : *hemostatic disorders, laser, surgical treatment, bleeding*

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Please cite this article in press Larionova E.V et al., ***The Surgical Dental Treatment in Patients with Blood Coagulation Disorders: Literature Review.,*** *Indo Am. J. P. Sci, 2018; 05(11).*

INTRODUCTION:

It is known that practical dentistry, being, basically, a mass outpatient-polyclinic type of medical service, takes the second place in terms of the number of visits after therapeutic assistance. In its volume, a significant proportion falls to dental surgery with an absolute predominance of tooth extraction operations. The blood supply of the alveolar processes, interdental and inter-root partitions, gums, teeth and pericemental area is characterized by the presence of an abundant network of vessels of various caliber. The operation of tooth extraction is accompanied by mechanical injury to the tissue of the socket and the violation of the integrity of the vessels (of periosteum, gums and periodontal ligament). The natural consequence of tooth extraction is bleeding from the socket and the nearest gum. Normally, this bleeding ends within 5-15 minutes, when a blood clot forms in the socket. And the nature of this bleeding is capillary. .[2]

Tooth extraction operations are sometimes complicated by severe long-term bleeding. Most of the bleeding that occurs after a tooth is removed is not life threatening, but it is often intense and prolonged. In cases where bleeding develops on the background of hypocoagulation, hemorrhagic diathesis and, especially, hemophilia, they can be a deadly danger for patients. Data from epidemiological studies of oral lesions in patients with coagulopathies show a high prevalence of various dental diseases, a low hygienic condition of the oral cavity, which entails a significant need for dental treatment and preventive measures. There is a correlation between the intensity of dental diseases and the intensity of the underlying disease. The unsatisfactory condition of oral hygiene in patients with coagulopathy is usually due to the lack of regular, thorough cleaning of the teeth for fear of provoking bleeding. [13,14]

Currently, outpatient dental surgery in patients with coagulopathy is dominated by a tooth extraction operation with 63-70% of patients needing it. Usually, tooth preserving operations are not performed in such patients. At the same time, surgical intervention in patients with impaired hemostasis presents significant difficulties associated with the risk of long-lasting and pronounced socket bleeding. Dentists often refuse such patients the necessary help for fear of bleeding. [15]

Hemorrhagic complications in patients with coagulopathy manifest as bleeding and hematoma in the oral cavity. The causes of their occurrence are diverse: deciduous teeth replacement, tooth extraction, operations on the oral mucosa, removal of subgingival dental plaque, injection, suturing, extirpation of dental pulp, spontaneous bleeding from the interdental gingival papillae, oral mucosa, and bleeding that occurs when eating solid food and brushing your teeth. Hemorrhages in the oral mucosa are frequently identified in these patients, and they more often have the appearance of petechiae.

Microcirculatory bleeding is characteristic of patients with impaired platelet hemostasis. Bleeding develops immediately or within 1-2 hours after the intervention and usually this is bleeding from capillaries and small caliber vessels. Bleeding during tooth extraction does not always occur, begins immediately after the intervention and lasts several hours or days and after stopping, they usually do not resume. [2] In primary immune thrombocytopenia, a well-known paradox is characteristic: major trauma, major surgery (appendectomy, splenectomy) do not produce large and prolonged bleeding, minor injuries and minor surgeries can result in pronounced bleeding. In this disease, thrombocytopenia, impaired retraction of the blood clot and increased permeability of the vascular wall are noted. Retraction of the blood clot is extremely slow or absent. The clot remains friable, the serum is not separated. This phenomenon lasts from 2 to 6 hours after the discharge of blood from the vessel walls.

Dental care for patients with coagulopathy, even with an established diagnosis and under the supervision of a hematologist, is rendered mainly due to acute pain. Insufficient knowledge of the specificity of coagulopathies, prevention and treatment of bleeding that occur in the oral cavity by the dentists, hamper the use of modern technologies of treatment, anesthesia and prosthetics .[13,14]

Along with this, there are very few developments in the management of patients with coagulopathy, the practical application of modern methods for the prevention and treatment of dental diseases, anesthesia, materials and structures of dental prostheses, and the existing ones have not found proper application in the practical work of dentists.

Melnichenko E.M. and Petrovich N.I. (2000) report on the use of the drug polycapran, which is cellulose modified with ε-aminocaproic acid and oxidized with nitric oxide, when providing surgical dental care to children with impaired hemostasis. The drug was used for local hemostasis after surgical debridement of the oral cavity in children with ITP and acute lymphoblastic leukemia. The intervention was carried out in stationary conditions on the background of general hemostatic therapy. A hemostatic sponge was used in

the comparison group. The authors reported on the effectiveness of the drug polycapran: on the background of general hemostatic therapy, the time of hemostasis after removal was approximately 5 minutes, no further bleeding was observed. When using a hemostatic sponge, the authors noted bleeding in children with ITP in 10 cases (12.83.8%), in 7 cases with a platelet count less than 50x109 / l and in 3 cases with a platelet count from 50 to 1009 / l.

Patients with von Willebrand disease, thrombocytopathy and systemic blood diseases that occur with increased bleeding, the extraction of the teeth is carried out without prior transfusion therapy. Local anesthetics are used for anesthesia: lidocaine with the addition of adrenaline, articain. After extraction, the socket is treated with caprofer solution and tightly tamponed with a hemostatic sponge. There is no need to put in any stitches. It should be noted that there is no bleeding in patients with thrombocytopathy, von Willebrand disease and systemic blood diseases; depending on the severity of the disease delayed bleeding may occur in patients with hemophilia . [13,14]

Popov S.A. and co-authors (1999) performed surgical debridement of the oral cavity in patients with myeloproliferative diseases (chronic myeloid leukemia and polycythemia vera) under anesthesia in a hospital setting. Hemostasis was performed by stitching the mucous membrane of the sockets of the extracted teeth and inserting a hemostatic sponge into the sockets. Patients were observed for up to 3 days in the hospital and up to 14 days on an outpatient basis. Similarly, surgical debridement of the oral cavity was performed in patients with primary immune thrombocytopenia. During the debridement of the oral cavity in patients with diseases of the blood system, complications occurred in 8.12% of cases and were manifested by bleeding (5.08%) and local inflammatory processes (3.05%) in the area of dental manipulations from 1 to 3 days after treatment. It was noted that the probability of complications is significantly less with a hemoglobin level of at least 100 g / l, the number of granulocytes is more than (1.5-2) x109 / l and the number of platelets is more than (50-60) x109 / l. With true polycythemia, the level of erythrocytes should not exceed (4.5-5) x109 / l. The authors recommended interventions in a short-stay hospital and in close cooperation with a hematologist.

The literature describes the results of surgical debridement of the oral cavity in patients with congenital coagulopathy (hemophilia and von Willebrand disease) on an outpatient basis on the background of replacement therapy. Antiseptic sponges with kanamycin and capropher were used as local hemostatic agents. Authors did not observe bleeding in the postoperative period [15].

The transfusion of blood products (cryoprecipitate, platelet mass, fresh frozen blood plasma, etc.) carried out in a hospital setting has long been the treatment that aimed at preventing bleeding. However, repeated administration of scarce and expensive drugs containing coagulation factors, contributes to the emergence of severe post-transfusion complications and inhibitory forms of the disease caused by the introduction of foreign proteins, transmission of hepatitis viruses, HIV. [9,15]

The most common current methods of hemostasis - a tight socket tamponade and the use of a hemostatic sponge - have certain disadvantages. Thus, a tight socket tamponade is not always effective, has a negative effect on the healing process of the socket and can lead to the development of repeated bleeding when the tampon is removed from the socket.

Despite the large number of fairly effective hemostasis methods used in dental practice, the search for new, fast and reliable ways to stop bleeding from the socket of the extracted tooth has not yet lost its relevance. Until now, this contingent of patients has been deprived of the possibility of obtaining timely and high-quality dental treatment and preventive care in outpatient settings, which largely determines the high prevalence of inflammatory diseases of the maxillofacial area.

MATERIALS AND METHODS:

The analysis of modern literature on the provision of oral surgery to patients with impaired hemostasis was carried out.

RESULT AND DISCUSSION:

Nowadays, the use of laser technology is becoming widespread in medicine and in dentistry in particular. Today, lasers are widely used in all areas of dentistry: in surgical dentistry (excision of soft tissue formations of the oral cavity, vascular formations, opening abscesses, periodontal surgery), implantology, periodontology, endodontics, cariesology, teeth whitening and in the prevention of dental diseases. Such widespread use of lasers is due to the unique physical and biological properties of the laser radiation.

It is safe to say that the use of lasers in dentistry is justified, cost effective and is a better alternative to existing methods of treating dental diseases. The use of laser technology opens up completely new possibilities, allowing the dentist to offer the patient a

large list of minimally invasive, virtually painless procedures in a safe, healthy environment that meets the highest clinical standards of dental care. [6]

The word "laser" is an abbreviation of «Light amplification by stimulated emission of radiation». The laser is a generator of electromagnetic radiation in the optical range which is based on the use of stimulated radiation or light scattering. In surgery, the laser is used primarily for destructive effects on biological tissue, and heat energy is most often used as a destructive factor (a surgical instrument). [4,12].

Lasers emit either a continuous or pulsating beam of light. The gas CO2 laser is used, as well as Nd: YAG, Ho: YAG, Er: YAG, Er, Cr: YSGG solid-state lasers and semiconductor diode lasers [4.9]. The biophysical characteristics of laser irradiation are determined by the wavelength, power, pulse duration, and also by the properties of tissues (the content of water and ions, pigmentation, which generally determines the thermal conductivity and density of the treated tissue of a biological object). Absorption of laser energy by a certain structural element (chromophore) occurs in the tissues. Natural chromophores of biological tissues include water, hydroxyapatite, hemoglobin, oxyhemoglobin, protein, melanin. When laser energy is absorbed, it is converted into heat, and, as a result, heating and irreversible denaturation (coagulation of proteins) occur, which causes destruction and evaporation of tissue structures. [7].

A CO2 laser with a wavelength of 10,600 nm is well absorbed in an aqueous environment. The diode laser has wavelengths from 792 to 1300 nm, the chromophore for this type of laser is melanin and hemoglobin. The Nd: YAG laser with a wavelength of 1064 nm is well absorbed by protein structures and pigments. These lasers are often used for surgery on soft tissues. Erbium-chromium (Er, Cr: YSGG) and erbium (Er: YAG) lasers with a wavelength of 2780 nm and 2940 nm, respectively, have a high absorption coefficient not only in water, but also in the mineral phase - hydroxyapatite crystals. These lasers can be used to affect both soft and hard tissues [4]..

Erbium laser with a wavelength of 2940 nm has a penetration depth of 0.003 mm and can be used to work with both soft and hard tissues. According to the literature, a diode, neodymium and carbon dioxide lasers have a more pronounced hemostatic effect, but with the use of an erbium laser, reliable hemostasis can also be ensured for capillary bleeding due to the sealing of small-caliber vessels [9].

A number of studies have noted the high efficiency of using an erbium laser during operations on soft and hard tissues of the oral cavity. There is an almost complete absence of pain and collateral edema in the postoperative region, a positive effect of the erbium laser radiation on bone tissue regeneration in comparison with rotating instruments. This reduces the time of regeneration and trauma of the walls of the bone defect (according to the results of microfocus X-ray after laser exposure, the bone regenerate density is comparable to that of the intact bone after 6 months, while with the traditional method of treatment it is 12 months). An acceleration of the healing process of the oral mucosa is noted. [3,5,10,16].

It is reported that erbium laser is successfully used in the treatment of periimplantitis, during the extraction of the impacted misplaced third molar, at the second stage of dental implantation . [1,7].

The laser beam (even with the highest degree of focus), when cutting through the tissue, leaves a strip of coagulated edges of the wound. This occurs, firstly, due to thermal damage by dissipating heat from the central zone of the laser beam, energy of which is used to evaporate the tissue and, secondly, due to the impact of the peripheral part of the beam, which is not enough to evaporate the tissue due to its reduction from the center and reflections from the sloping walls of the crater of the forming wound.

The undoubted advantages of the laser beam include: aseptic, antiseptic (due to the high temperature of the laser beam), hemostasis, antiblastics, ablastics - these are the effects at the time of exposure to biological tissue. Anti-inflammatory effects of laser radiation are well known: activation of superoxide dismutase and catalase — activation of microcirculation, changes in the level of prostaglandins, reduction of lipid peroxidation — equalization of osmotic pressure, reduction of tissue swelling, ATP accumulation, stimulation of cell metabolism, increased proliferation of fibroblasts, protein and collagen synthesis. A depression of the exudative phase of inflammation occurs, with acceleration of tissue regeneration (reduction of the healing time of postoperative wounds) and the formation of highly effective, inconspicuous scars. [1,5,7,10,11].

A high-energy laser also has a biostimulating effect similar to that of a low-energy one; the laser has a powerful desensibilizing and immunomodulatory effect, normalizes microcirculation, increases the

oxygen content in the tissues, reduces the permeability of the walls of blood vessels. Improving tissue aeration leads to improved trophism, reduced inflammatory reactions and increased proliferative, regenerative potential of tissues in inflammatory conditions. The analgesic effect of the laser is well known due to the stimulating effect on neurons, improving the conduction of impulses along the nerve fibers, reducing the bioelectric activity of the receptors and stimulating the regeneration of the nerve trunks after they are damaged. It is noticed that during the surgery, the laser reduces pain to a minimum. This is probably due to the fact that the laser energy is absorbed by the cell fluid, and not by the nerve endings, so there is no stress on the nerve cells [10,16].

A number of studies have demonstrated the stimulating effect of laser radiation on bone tissue, the improvement of metabolic processes in bone tissue, the restoration of osteification processes, and the regeneration of bone tissue. According to the results of histological studies, when exposed to a surgical laser, coagulation blood clots form in the vessels. In the zone of necrosis, the blood vessels are filled with brownish masses, and their walls transform into homogeneous cell-free plates. The boundaries of necrosis are clearly expressed, and an abrupt transition to healthy tissues is easily detected. In the preserved tissues on the border with necrosis, the edematous cells of the endothelium violate the passability of the capillaries, causing a narrowing of their clearance, which leads to the appearance of stasis in the microcirculation system, intravascular aggregation of blood cells and microthrombus formation. (Risovanniy S.I., et al., 2005). When using a laser scalpel, the trauma of the surrounding tissues is minimal, there is no friction, pressure or vibration. Laser wound healing occurs without inflammatory reaction and neutrophil infiltration. [8,12,16].

Many authors noted the hemostatic effect of the laser. Unlike a conventional scalpel, a high-intensity laser light beam performs photo-hydraulic preparation of soft tissues with photocoagulation and ablation. At the same time, capillary bleeding is absent due to the fact that when crossing small vessels, their clearance is “brewed” when exposed to high temperature . This allows to bloodlessly conduct such interventions as treatment of the inner surface of periodontal pockets, flap surgery, gingivectomy and other operations on the soft tissues of the oral cavity. [3,5,11]

Reducing bleeding during surgery allows you to expand the range of outpatient interventions with a lower degree of risk and reduces the time of surgery, which sometimes helps to avoid the need for manipulations in the hospital.

In many studies, the authors draw attention to the good economic effect of using laser technology as it helps to reduce the number of visits and the total duration of treatment, the number of drugs and materials used. [1,6,10]

CONCLUSION:

Thus, the analysis of the literature shows that despite the presence of a large number of local hemostatic agents and methods of their use, there are many difficulties in conducting surgical dental treatment of patients with impaired hemostasis at the moment, especially in outpatient conditions, there is a risk of intra- and postoperative bleeding, complications of an inflammatory nature. The use of laser technology in patients with blood coagulation disorders can effectively solve the problem of hemostasis during surgical dental treatment of this group of patients.

ACKNOWLEDGEMENTS:

Sopported by the «Russian Academic Excellence Project 5-100».

REFERENCES:

1. Arnabat-Dominguez. Erbium:YAG Laser Application in the Second Phase of Implant Surgery: A Pilot Study in 20 Patients/ Curtis B.R., McFarland J. G., Bougie D.W et. al. // Int. J. *Oral Maxillofacial Implants*, Jan-Feb, 2003 №18(1) – 104-112.
2. Baklaja R., Pešic´ M. C., Czarnecki J. Hemostasis and Hemorrhagic Disorders // Germany, *Fermentation* -Biotec GmbH, 2008. – 332.
3. Clayman L., Kuo P., Lasers in maxillofacial surgery and dentistry // New York: *Thieme*, 1997. – 187.
4. Cobb C. M. Lasers in Periodontics: a review of the literature // *Periodontal*. - 2006. – Vol.77, Num. 4 - 545-564.
5. Glenn van As. Erbium lasers in dentistry / / *The Dental clinics of North America*; 2004, № 48 . – 1017–1059.
6. Grigoryants L.A., Simonyan D.V., Khachaturov A.E. Use of a fiber laser scalpel with radiation of a wavelength of 1.9 microns in outpatient surgical dentistry // *Dentistry*. - 2010, vol. 89, No. 6.- 43-46 [In Rus.].
7. Knappe V., Frank F., Rodhe E. // Principles of lasers and biophotonic effects // *Photomed/ Laser Surg*. - 2004. - Vol.22. – 411-417.
8. Reykhanyan A. Dental operations performed using erbium (Er: YAG), carbon dioxide and di-

ode lasers // Moscow: *Dental Market*. - 2005. - №4. - 0-14 [In Rus.].
9. Tarasenko I.V., Vavilova T.P., Tarasenko S.V. Changes in the number of growth factors in the dynamics of reparative processes with various methods of forming defects of the bone tissue of rats // *Russian dentistry*, 2011. - (5) 40-43 [In Rus.].
10. Tarasenko S.V., Lazarikhina N.M., Tarasenko I.V. Clinical efficacy of surgical laser technology in periodontics. // *Department*; Vol. 6 (3), 2007. - 60-63 [In Rus.].
11. Wang X., Zhang C., Matsuomoto K. In vivo study of the healing processes that occur in the jaws of rabbits following perforation by an Er, Cr:YSGG laser// *Lasers Med Sci*.- 2005, №20. – 21-27.
12. Risovanniy S.I., Risovanniy N.O., Masychev V.I. Laser dentistry. // Krasnodar: Kuban-Book. 2005. - 276 [In Rus.].
13. Davidenko N.L. Organization of the provision of dental care to patients with hereditary coagulopathy // Ph.D. Diss. // Moscow State Medical and Dental University. - 2005. - 98 [In Rus.].
14. Denisenko A.G. Local hemostatic therapy in the surgical rehabilitation of dental patients with an increased risk of bleeding. (Laboratory and clinical study) // Ph.D. Diss. // Kiev Medical Institute. - 1987. - 18 [In Rus.].
15. Soboleva O.I. Prevention of some dental diseases and hemorrhagic complications in patients with hereditary coagulopathy // Ph.D. Dissertation // - L., 1990. - 23 [In Rus.].
16. Tolstykh A.V. The use of an erbium laser for the surgical treatment of radicular cysts of the jaws: Ph.D. Diss. // Moscow State University of Medicine and Dentistry - M., 2009. - 110 [In Rus.].