

Experimental Usage of Plasmatic Irradiation for Osteogenesis Stimulation

Tamar Okropiridze

Tbilisi State Medical Academy of Post Graduated Education, Tbilisi, Georgia

Abstract

The work represents experimental and morphological studies of regeneration of damaged areas of maxillo-facial bones under the influence of the plasmatic stream. During the treatment we used micro plasmatic scalpel-irradiator "ARIELI XXI". The therapy showed positive results. Thus we recommend this method of treatment for introducing in practice.

Keywords: *plasmatic stream, osteogenesis stimulation, microplasmatic scalpel-irradiator, maxillo-facial bone, reparative regeneration, X-ray*

Introduction

For obtaining the plasmatic stream a microplasmatron was used. By passing Argon inert gas between two electrodes a plasmatic stream is obtained. We use low temperature plasma that is produced in semicircle unit during discharge in micro-plasmatrons where as a plasma creating gas inert gas is used. As a short wavelength part of solar radiation interaction with upper layer of atmospheric, ozone layer is being created around the stream too, that is coming out from plasmatron and is accompanying the stream during its existence. Plasmatic area is high energetic that is why it is mechanical transferor of the heat.[4,6].

In medicine, we hear about plasmatic streams since 1960. For the first time it was used for cutting, coagulation and evaporation. Until 1991 plasmatic units were named surgical tools scalpels characteristic the innovative name to the equipment plasmatic irradiator was given by us, that considered constitution of above

mentioned plasmatic characteristics and their unification into medical field- plasmatic therapeutic.

From 1997 the "plasmatic scalpel" was modified for therapeutical purposes and was called "plasmatic irradiator". Irradiation of injured tissue is performed from the distance of 7-12 cm for 3 mn. The treatment course consists of 3-10 seances, approximately. Plasmatic irradiation consists of the unity of whole spectre of the sun and ozone. It has strong antimicrobial [bacteriocidal] effect. Plasmatic therapy speeds up the process of metabolism in the organism, improves microcirculation, stimulates processes of immunity and reparation regeneration. [4,5]

Material and Methods

In the department of Maxillo-facial surgery of 4 Tbilisi hospital and clinical hospital of the Tbilisi medical academy we have been using the microplasmatrone unit "ARIELI", which provides us with the possibility to influence the tissue through the plasmatic stream itself, as well as through a certain distance by the further

neutral, excited stream, by the accompanying wide-spectrum electromagnetic irradiation and the biologically active ozone photolysis products with the helpful concentration of ozone in air, gotten through the ozone formed during the interaction of short wavelength part of this radiation with the air .

The experiment was carried out on the bodies of the lower jaw. Standard defects of 4-5 mm diameter and a depth of 5 mm were created. The rabbits n=16 of the experimental group were irradiated by plasmatic stream for 3 minutes at a distance of 7-12 cm. The rabbits of the control group n=16 were not irradiated. The rabbits of both groups n=32 were kept under similar conditions. On days 7-th, 14-th, 21-st and 28-th four rabbits from each group were killed and the defect investigated by X-ray and histological methods. We stained the micropreparations in hematoxiline-eosine. [2,3]

Discussion

The analysis clearly showed that irradiation of the damaged zone of the lower jaw bone by means of a microplasmatic stream accelerates the processes of reparative osteogenesis in the bone of the lower jaw of the rabbits. The process of bone formation is accelerated both in the early period and in later stages of regeneration. On the seventh day of the experiment there was acceleration of differentiation of osteogenic cellular elements and acceleration of proliferation under the influence of the plasmatic stream. Transformation of osteoidic to osteoid is accelerated as well as ossification processes. [1,3]

The plasmatic stream has been used at our clinic for the complex treatment of periodontitis and parodontitis, e.g. in case of acute apical periodontitis anti-inflammatory processes were noted also analgesic effect. Exudation processes became less. After 3 seances the patients health condition became satisfactory. In case of parodontitis, when the patient was bleeding-prone, the coagulation effect noted during the 3 minutes exposition on the whole treated area. The average number of seances was 5. After the treatment anti-inflammatory and antismelling processes were noted in patients, also there was the analgesic effect and hyperaemia lessend.

Reference

1. Bessho k. et al. "Analysis of bone morfogenetic protein [BMP] derived from human and bovine bone matrix." Clin. Orthop.1991 Jul.286:226-234.
2. Kapanadze R."Pathologic anatomy".1997, 138 p.
3. Mohan S.,Baylink D.J."Bone growth factors". Clin. Orth.Rel.Res..1991, 263:30-48

The advantage of the plasmic therapy is that it regulates microcirculation, stimulates reparation regeneration, and increases the cell resistance to pathogenic agents, by means of which it shortens the time of treatment. The perception of intensity of pain is decreased by the action of plasmic irradiator. Besides if it participates in the treatment process, accordingly we can reduce the use of antibacterial and only inflammation medicines, the days of illness reduced too.

It has to be taken into account, that the essence of plasmic therapy envirazes the influence of plasmic stream's accompanying wide spectrum electromagnetic irradiation not only on the upper layers of the skin, but also on the sub-skin and more deeper lying tissues and organs. Achievement of positive effect and the interest to the given method are conditioned by the following characteristics of plasmatic stream: spatially localized and regulated temperature, formed by speeded up stream of ionised and neutral gas. The result: sterilization, possibility of objects heating up to necessary temperature; formation of the ozone layer and biologically active ozone photolysis products with the helpful concentration of ozone in air. The result: quick and effective healing, oxygen enrichment, the speeding up of oxidizing-recovering processes and antiseptic action. The presence of the continuous spectrum of intensive electromagnetic radiation from 0.3 to 22um and far in artificially directed space sector. The result: possibility of electoral choice or simultaneous usage of "helpful" radiation by the object and regulations of irradiation dosage with simple transference by the doctor's hand bacteria destruction (antiseptic action) by the absorption of the light radiation.

Results and Conclusion

We have obtained good results by using plasma therapy in experiment and during complex treatment. Plasma irradiation quickly removes oedemas and pain, speeds up healing of infected or aseptice wounds. Plasmatic treatment causes the stimulation of reparative osteogenesis and can be recommended for wide application in the clinical practice. It has great future.

4. Nemsadze O., Okropiridze T. "Therapeutic Stomatology" 2001,426 p.
5. Nemsadze O. , Okropiridze T. etc."Stimulation of reparative regeneration of mandibular bone under the influence of plasmatic stream".2000.J.of cranio-maxillo-facial surg. v. 28,N3,p.55-57.
6. Nemsadze, G. Asatiani, S. Jaiani. Maxillo-Facial Surgery and Stomatology Conference of Black sea Countries "Plasmatic Therapy in Maxillo-Facial Surgery", Tbilisi 26-28 September 1997; p. 27-28.

Применение плазменного потока в эксперименте для стимуляции остеогенеза

Тамар Окропиридзе

Кафедра хирургической и ортопедической стоматологии Тбилисской медицинской академии постдипломного обучения, Грузия

Р Е З Ю М Е

В эксперименте установлено, что наиболее позитивное действие на процессы костной репарации оказывает плазменный поток, по сравнению с другими физиотерапевтическими процедурами. Эксперименты проводили на кроликах породы шиншилла массой до 2 кг (n=32). У животных под общим калипсоловым наркозом на кости нижней челюсти создавали стандартный дефект диаметром 4-5 мм. По окончании операции раны ушивали шелковой нитью. У контрольных животных (n=16) костные дефекты заживлялись под кровяным сгустком, а у животных основной группы (n=16) костный дефект облучали плазменным потоком. Животных декапитуировали под наркозом на 7-ые, 14-ые, 21-ые и 28-ые сутки после нанесения костной раны. На точку наблюдения в каждой из групп приходилось по 4 кролика. Костные фрагменты фиксировали в формалине, декальцинировали в трилоне-Б и заливали в парафин. Срезы окрашивали гематоксилином и эозином. Установлено, что плазменная терапия усиливает процессы обмена веществ в организме, улучшает микроциркуляцию, стимулирует процессы иммунитета и репаративной регенерации.

Ключевые слова: *плазменная терапия, стимуляция остеогенеза, костная ткань нижней челюсти, репаративная регенерация, морфологическое исследование, рентгенологическое исследование*