

## **Biochemical and Histological Researches Regarding the Use of New Therapeutic Methods in Some Oral and Facial Pathologies**

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### **Abstract**

At the basis of the use of the own platelet plasma is the discovery that platelets contain protein factors (PRP FACTORS) that initiate the processes of cellular regeneration.

Tissue regeneration with the help of growth factors is a revolutionary method in all medical fields.

**Keywords:** PRP ,growth factors,platelet plasma, tissue regeneration, autologous plasma.

### **Introduction**

The first notifications about the injection of own blood in the treatment of wounds were made in 1876 (Schede, Germany).

The founders of the method of injecting own blood into the body are considered Graffstrom and Elfstrom.

In 1898, in the United States, they used autologous blood injections in saline solutions for the first time in the world to treat pneumonia and tuberculosis.

In 1905 August Bier, a German surgeon, used infiltration injections with autologous blood to stimulate the healing of fractured bones. The most important observation of the German surgeon was that the cure rate of the different pathologies increased by 30% compared to the treatments performed conventionally. The same doctor made injections into the thighs with autologous blood to stimulate immunity.

In 1934 Russian surgeon V.F VOINO YASENETSKY publishes the paper: "ESSAY ON SEPTIC SURGERY" in which he describes the methods of autohemotherapy in the form of blood infiltration in the foci of inflammatory processes of soft tissues.

The Russian surgeon evaluated as positive the therapeutic effect of autologous blood injections (eg treatment of boils). Due to the positive side effects and minimal side effects, autohemotherapy and autoserotherapy have been used as adjunctive methods of treatment until the beginning of the antibiotic era.

The next stage in the development of injection methods based on the patient's own blood became the administration of platelet-rich blood, but not red blood cells. At the basis of the use of the own platelet plasma is the discovery that platelets contain protein factors (PRP FACTORS) that initiate the processes of cellular regeneration.

At the end of the year a group of researchers led by R.E.Marx 1980 were among the first who began to use gel-shaped plasma.

Autologous plasma gel technology has been proposed for use in dental medicine (Harvest Company). Thrombocyte plasma as a gel was used to correct defects of the lower jaw after tumor resection (5cm), but also after extractions in the alveoli.

The group led by Marx conducted a study. The study was divided into two groups of patients, the first group was given the autologous plasma gel that was mixed with autologous bone, and the control group was given only autologous bone. The study demonstrated a faster and harder bone formation in patients with autologous bone. Also in this study it was shown that in the autologous bone there are receptors that bind the growth factors contained in platelets.

Other research has shown that in the alveoli of the extracted teeth in which thrombocyte plasma gel was introduced, bone and epithelial regeneration occurred faster.

A new stage in the development of regenerative medicine was the creation of the injectable autologous platelet plasma developed in 2003 by Russian scientists Renat Rashitovich Akhmerov, doctor in medical sciences and Roman F Zarudi. This method has been called PLASMOLIFTING '(2003).

The main advantage of the platelet-rich autologous plasma injection form is the convenience of use, not only in the surgical practice but also in the therapeutic one.

It is important to mention that this technology represented by "PLASMOLIFTING" does not require the use of calcium chloride and a double centrifugation, maintaining its efficiency.

**1. Tissue regeneration** is one of the most current methods of contemporary medicine. In the 1980s of the twentieth century, for the stimulation of regeneration processes, the main attention was paid to tissue oxygenation. This is a fundamental factor in improving the phagocytic and bactericidal capacity of immune cells, contributing to the synthesis of proteins and collagen.

**2. The main purpose** of the research of regeneration processes is:

- Identification of growth factors
- Understanding mechanism of action

- Possibilities of using these to improve wound healing.

The transition from one stage to another was marked by the discovery that the influence of oxygen on macrophages and tissue oxygenation in general is achieved directly through agioneogenesis factors and other growth factors. The use of platelet plasma is one of the few, valid methods of improvement due to tissue regeneration, growth factors (GF).

**3. Obtaining auto-plasma involves** the separation of the plasma with platelets from red blood cells. Thrombocyte plasma is neither toxic nor immunoreactive, accelerating the natural regeneration processes due to the presence of growth factors. Thrombocyte autologous plasma modulates and regulates the functioning of primary, secondary and tertiary growth factors, influencing all regeneration stages simultaneously.

Platelets contain the following growth factors (GF):

- I.G.F (insulin growth factor)
- P. D. G. F. (Platelet-derived growth factor)
- E.G.F (Epidermal growth factor)
- F.G.F (fibroblastic growth factor)
- T.G.F (transforming growth factor)
- P.D.E.G.F (platelet-derived epidermal growth factor)
- P.L.G.F (platelet growth factor)

P.D.G.F- activates the proliferation and migration of osteogenic mesenchymal cells and induces angiogenesis.

I.G.F - the insulin factor stimulates the differentiation of young cells, increases bone tissue formation and collagen synthesis.

Growth factors are introduced into the tissues using plasma as an injectable form and the increased concentration is obtained by injecting a large volume of plasma. This stimulates the formation of fibroblasts (cells of the connective tissue) and, fibroblasts also produce collagen, hyaluronic acid and elastin, producing young connective tissue and capillary blood vessels.

-The growth factors block the activity of the osteoclasts, stimulate the activity of the osteoblasts, stopping the processes of degeneration of the bone tissue and contributing to its regeneration.

**4. The advantage of** the method is to increase the volume of platelet counts in the tissue by injecting a large amount of plasma. (In practice it means injecting 1-2 ml). This factor accelerates the regeneration process. This method is widespread in different medical areas nowadays, it is mainly used for the treatment of chronic inflammatory pathologies: chronic acne, localized and generalized periodontitis, gingivitis, peri-implantitis, endocervicitis.

Accelerates the regeneration process of connective, epithelial and cartilaginous tissues.

Stimulates the processes of collagenogenesis, angiogenesis and osteogenesis.

Activation of metabolism in tissues.

Normalization of tissue respiration.

Stimulation of immunity.

### 5. Equipment

- **Centrifuge** (centrifugal force 3200 rpm)



**Fig.1.** Centrifuge for plasma preparation

- Apyrogenic, sterile, 9 ml vacuum **tubes**, made of medical glass and covered on the inside, at the top and middle, with a microdispersion of sodium heparin, and at the bottom - a separating gel (thixotropic)..



**Fig.2** Plasmolifting tubes

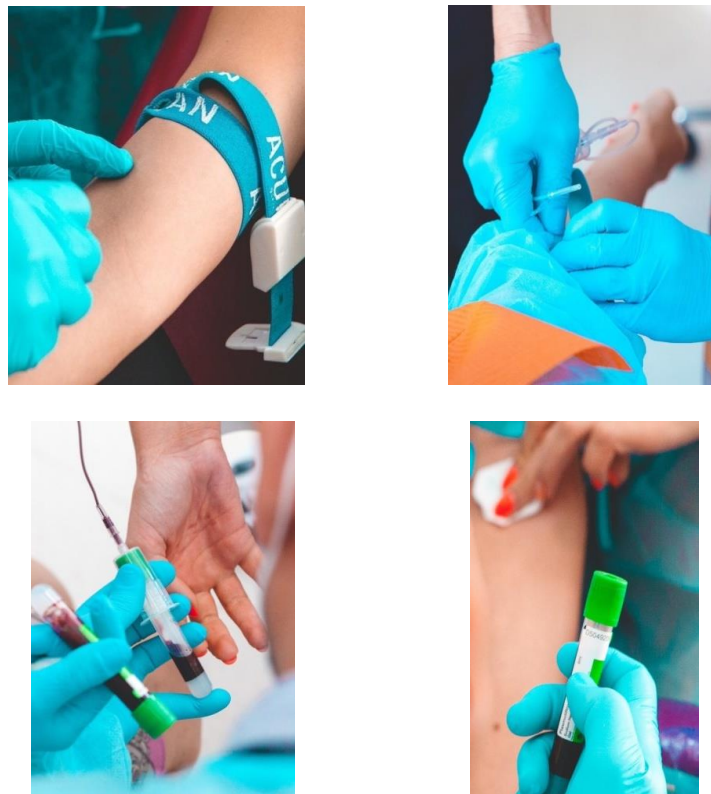
- Peripheral venous catheters of at least 1.1 mm
- Sterile syringes of 2-3 ml luer lock
- Needles for injections



**Fig 3.** Venous blood collection instruments

#### **6. Blood collection:**

A volume of 18-36 ml is collected in 2-4 special plasmolifting tubes



**Fig 4.** Venous blood collection technique

**7. Method of obtaining platelet rich plasma:**

The tubes are arranged in the centrifuge, the centrifuge is set according to the manufacturer's instructions. 3500 rpm - 5min



**Fig.5** How to arrange a test tube in the centrifuge



**Fig 6.** Number of rotations and spin time

During the spin in the centrifuge the blood is separated into two main fractions:

1. Leucocyte concentrate, erythrocytes
2. Platelet rich plasma



**Fig 7.** Finish the spin cycle

Using a 2-3 ml syringe, collect platelet-rich plasma that is at the top of the tube above the separating gel.



**Fig 8.** The step in which the vial is removed from the centrifuge



**Fig 9.** Plasma harvesting from the tube 1





**Fig 10.** Plasma harvesting from the tube 2



**Fig 11.** Plasma harvesting from the tube 3

## **8. Indications**

1. Diseases of skin and cellulose tissue
2. Senile atrophy, weakening of the skin
3. Dermatology
4. Diseases of the skin attachments: juvenile / vulgar acne, alopecia, androgenic alopecia
5. Dentistry
6. Traumatology, recovery medicine
7. Gynecology



## 9. Contraindication

1. Malignant neoformation
2. Systemic blood diseases
3. Mental illness
4. Allergic reactions to anticoagulant (heparin)

## Method of use

### 1. In Atrofia Senila (withered skin )

Skin cleansing with water-based antiseptics

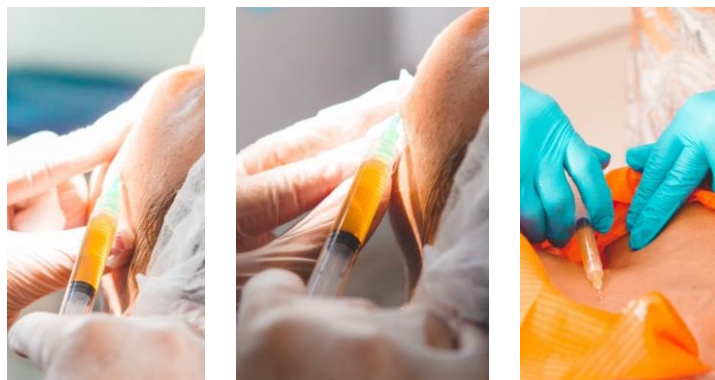
Injection site: subcutaneously

Quantity: 0-4 ml

Surface: 2 cm

Duration: 30-40 min

The treatment consists of 8 sessions, 1 to 7 days



**Fig 12.** Platelet-rich platelet injections in the face and neck

### 2. Juvenile acne

Skin cleansing with water-based antiseptics

Place: Intradermic

Quantity: 0.1ml

Surface: 1 cm

Treatment consists of 4-7 sessions at 7-14 days

### 3. Alopecia

Skin cleansing with water-based antiseptics

Place: In the scalp

Quantity: 1 ml

Surface: 1 cm

Treatment consists of 2-10 sessions at 7 days



**Fig.13** Platelet-rich platelet injections in the scalp

#### **4. In stomatology**

The method of using platelet plasma in the form of injections allows the stimulation of the self-regeneration processes. The method can be combined with any other treatment techniques. Simple technique that excludes allergic reactions, not producing addiction, carried out in the necessary areas.

##### **Indications:**

Gingivitis  
Prophylaxis of periodontal disease  
Localized marginal periodontitis  
Localized marginal periodontitis  
Apical periodontitis  
Peri-implantitis  
Extractions  
Insertion of endoscopic implants

##### **Procedure for use:**

###### **In periodontal disease**

In the gingival sulcus a volume of 0,2 ml is inserted at 2-3 mm.

In the mobile mucosa a volume of 0.3-0.5 ml is introduced at 1-2 teeth

Period: 4 sessions with a pause between 7-8 days in the same place (gingival sulcus, mobile mucosa, interpapillary, in the periodontal pouch, after performing all the necessary dental procedures: hygiene, occlusal rebalancing, restoration of the overflowing seals, closed field closure / open, guided tissue regeneration techniques.

Autologous plasma injections constitute the final regenerative stage of periodontal treatment;



**Fig 14.** Platelet injections rich in platelets in periodontal disease



**Fig 15.** Platelet-rich platelet injections in periodontal disease,  
the injections in the periodontal pouch

### **In alveolitis**

Performing alveolar curettage followed by washes with antiseptic solution and plasma injection into the sulcus and edges.

In peri-implantitis injections are performed in the marginal area of the gum within the limit of 2 teeth.

When the implants are inserted, they are injected the same day or the next day 0.1-0.2.

### **The efficiency of the method**

Stopping inflammatory processes

Reduction of painful syndrome

Acceleration of the implant integration process

Stopping gingival bleeding

Accelerating tissue healing in diabetes patients

## Conclusions

Tissue regeneration with the help of growth factors is a revolutionary method in all medical fields but it is still young, in this method there are many more things to be discovered. The exact mechanism of action of the various factors is not yet fully understood.



**Fig 16.** Platelet-rich platelet injections

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