

**Growth factors is a name for some specific blood elements. They take part in the processes of tissue repair and regeneration. The longer they've been used in medicine, the more it's visible that they have a positive effect on the beginning of healing process and then on accelerating the regeneration.**

Growth factors have become popular at the beginning of the 1980s. Medicine since always has looked for methods that would enhance quicker and more effective healing of soft tissues and organs and bone setting.

## QUICK HEALING

It was in the 1980s when medicine became interested in blood plates, the smallest elements present in our blood. The most important feature of blood plates (from the perspective of enhancing healing) is their ability to attach to injured spots in the organism. They stop bleeding and give impulses to boost reparative processes. The name „growth factors" evolved from the so-called alpha granulation, from which factors are freed in a response to tissue damage in the process of blood coagulation. They're inside the plates and serve as „warehouses" for protein substances, which are called growth factors. In other words, these factors are nothing but proteins that take part in complicated mechanisms of tissue repair and regeneration. They're a means of communication between cells. The factors send signals to adequate cells activating receptors in the cell membranes. This is how important mechanisms are activated: first directed cell migration (hemotaxis), then cell multiplication and, finally, their differentiation. These processes play the most important role in tissue healing. If we want to understand the phenomenon, we need to learn a few basic details.

So, elevated concentration of growth factors (higher than normally present in organisms) activates the following biological processes:

- hemotaxis – inviting cells,
- angiogenesis – creating new blood vessels,
- proliferation – multiplication of cells,
- differentiation.

The above mechanisms are used in therapy. The main substances involved in this process are:

- PDGF – Platelet-derived growth factor,
- TGF- $\beta$  – Transforming growth factor beta,
- EGF – Epidermal growth factor,
- VEGF – Vascular endothelial growth factor,
- IGF – Insulin-like growth factor,
- bFGF – Basic fibroblast growth factor.

The substances share one quality: once they're activated, they lead to new bone tissue formation or soft tissue repair in the area of injection.

## **SIMPLE BLOOD COLLECTION AND INJECTION**

One of methods to obtain growth factors is preparing PRP (Platelet Rich Plasma) of patient's own blood.

Collecting growth factors is as simple as collecting blood. We collect 30-50ml of venous blood, put it in sterile test tubes and centrifuge it for a few minutes. Then we collect the biological plasma fraction of high blood plate concentration containing growth factors. This is how we obtain a few milliliters of concentrate. The concentration of blood plates here is 8-9 times higher than in the normal concentration of whole blood. This part is re-injected in sterile conditions under ultrasound control into the injured area or during a surgery in the operating theatre. That's a high concentration of biological stimulant to repair tissues.

Growth factors can be used in hospitals as well as outpatient clinics. In the latter case, the growth factors are injected into injured sites under ultrasound supervision in order to produce an effect exactly in the site that requires treatment. The administration of growth factors is a simple injection. The same goes for stem cells – similar to embryonic cells, that can develop into any tissue. We obtain it either by puncturing areas with the greatest quantity of stem cells, that is by collecting bone marrow from the wing of ilium or by stimulating their passing from bone marrow into the peripheral blood and then collecting them from the circulating blood. This kind of healing stimulation and tissue development can be used to replete cavities of the articular cartilage.

## **WHEN TO USE IT?**

The indications for treatment with growth factors are as follow:

- enthesopathies – diseases of muscle attachments: tennis elbow, golfer's elbow, jumper's knee,
- diseases of the Achilles tendon,
- diseases of the plantar aponeurosis,
- injuries of ligaments, muscles and tendons,
- overload and degenerative changes of the soft tissues of the locomotor system,
- disorders of bone union,
- to support healing of skin wounds during tooth implants.

In orthopaedics we use them to enhance bone union and tissue (muscle and tendons) healing. During surgical procedures we use growth factors as a support in treating the false joints, in ligament reconstructions or suturing of the Achilles tendon. Growth factors produce a positive effect in all diseases when there's a possibility of weaker/slower healing (eg.massive, multifocal injuries). Research prove

that healing is quicker, stronger and the new tissue matures earlier, which allows the patient's quick recuperation. The growth factors are often used in outpatient clinics to treat overload and degenerative changes of mainly soft tissues, but there're papers proving the beneficial effects of administering them into the joint...

## **SAFETY AND EFFECTIVENESS**

The procedure must be carried out by the rules in required conditions by qualified specialists – only then injecting growth factors is safe. The factors are a natural substance, we don't mix them with any chemical substances. They're obtained from patient's blood and re-injected to the patient right after they've been prepared. There's no risk of transmitting viral diseases or of an allergic reaction. The growth factors are prepared in hermetic and sterile containers. Medicine has been looking for a panaceum, a golden cure for all diseases, yet it hasn't been found so far. Growth factors are not an ideal cure for any disease. This is not their role. They're an inductor of natural reparative processes. In order for them to work, a reparative reaction/capability must be present. When the growth factors have been administered, the reparative reaction is multiplied. The criterium patient needs to meet before injection is an imaging examination of the healing process. This is why before the growth factors are injected, thorough examination must be carried out.

## **REHABILITATION**

Depending on the kind of disease, the degree of tissue damage and the injection site, temporary stabilization (in a stabilizer, orthosis) or walking with crutches may turn out to be necessary to create most suitable conditions for healing. During the first hours or even days after the injection the patient may feel pain in the site. The doctor decides if analgesic drugs can be administered, as some analgesic drugs may stop the growth factors' activity.

Rehabilitation is a very important element of the therapy – it burdens the healing tissues carefully. Growth factors start or strengthen reparative processes, but the most important is proper burdening of the healing tissues. Doctors decide when to start rehabilitation (right after the injection or maybe some time later). (See: Management after treatment with growth factors).

[Management after treatment with growth factors](#)

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