

The Use of ACP/PRP in Meso-Aesthetics

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PRP (platelet-rich plasma, an autologous substance) is being used increasingly in aesthetic medicine. No down time, immediately visible results and next to no side effects are the reasons why this method is becoming ever more popular. By administering the PRP using the injection methods of mesotherapy, which employs micro-fine needles, PRP can be used in small quantities to successfully treat even large areas. Studies confirm its efficiency, and this opens up new opportunities in aesthetic medicine for the achievement of rapidly visible results using a less invasive technique.

As early as the 1960s Dr. Schulte was treating wound defects using autologous blood, but it was not until 1996 that autologous blood products were used as tissue glue (Yamamoto et al.). In dental surgery PRP has been used for wound healing and bone regeneration.¹ Bisphosphonate-associated osteonecrosis of the jaw has also been treated successfully using PRP.² PRP has been tested as a suitable method in the case of androgenetic hair loss.³ In the field of orthopedics and sports medicine platelet-rich plasma has been used successfully for many years. Its effect is proven in a number of studies.

The methodology and principle of PRP / ACP

PRP is the umbrella term for platelet-rich plasma. By definition this is a natural product which is extracted from whole blood using a separation process and contains an increased number of thrombocytes. Autologous conditioned plasma – ACP – is the body's own blood plasma conditioned as part of a special production process, i.e., largely separated from the other blood components, and concentrated. ACP is a platelet-rich plasma containing numerous growth factors.

One of the important points in the production of ACP for use in aesthetic medicine is a minimum of neutrophil granulocytes in low concentration in the plasma. Too much is counterproductive to the process. The number of erythrocytes also has to be kept as low as possible since the breakdown of erythrocytes creates free radicals which can lead to inflammation and cell death.

The growth factors are involved in a number of processes such as cell proliferation, chemotaxis,

cell differentiation and angiogenesis. Through an increased concentration of thrombocytes, significant stimulation of proliferation and synthesis of hyaluronic acid could be shown. By administering ACP, an increased thrombocyte concentration is applied which supports the formation of blood vessels, new cells and tissue.

ACP is safe, well tolerated and a natural alternative to conventional methods in aesthetic medicine. Administration is quick and easy, biologic, contains no foreign substances, stimulates the body's own hyaluronic acid synthesis, induces collagen synthesis and stimulates the breakdown of light-damaged components of the extracellular matrix. In addition, this biologic product stimulates the proliferation and differentiation of stem cells at the hair follicles.

Preparation Method

After blood is taken, it is centrifuged and the plasma separated from the other blood cells. One significant factor in the increased use of this method is that manufacturers have developed easy-to-use syringe systems. One very good example is the double syringe system from Arthrex®, in which the blood product remains in the system throughout the whole process. This ensures the best possible protection against contamination. With this system no anticoagulant is needed, which means that the PRP is entirely autologous.

The blood is prepared in just a few minutes and is available for application immediately. It has a high safety index and is quick and easy to handle. The technical equipment includes a centrifuge. Another major

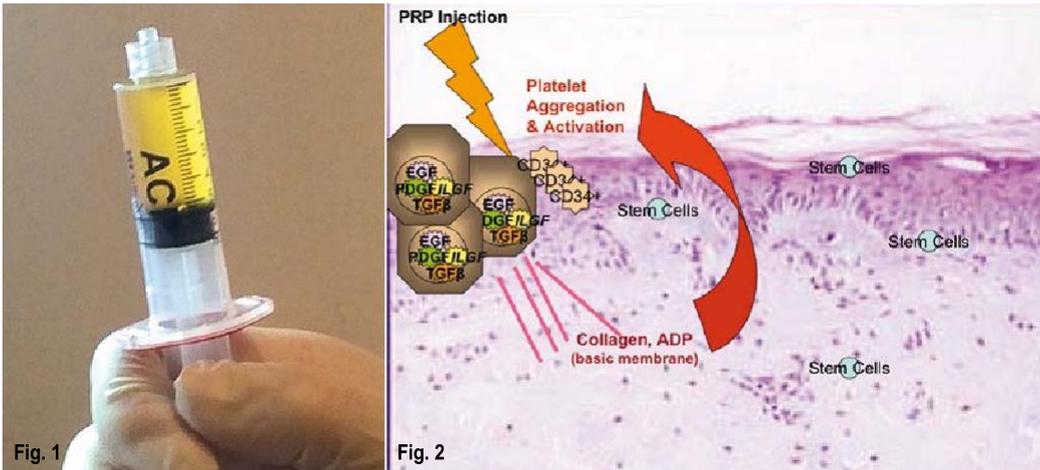


Fig. 1: Arthrex® Double Syringe System.
Fig. 2: PRP injection: Lock-and-key principle, protein synthesis.

advantage is the scatter effect. The growth factors which are released from the alpha granules of the thrombocytes are ligands which bind to specific receptors in the cell wall (lock-and-key principle). The ligands locking onto the receptors causes a conformational change in the receptor which in turn produces downstream activities (further signal cascades in the cell). Through transcription and translation particular proteins with specific tasks are synthesized, such as proteases which are involved in conversion processes. Cells have a limited number of receptors. Most of the receptors bind to only one ligand (growth factor). In the case of an excess of ligands, receptor saturation and thus maximum cell response is reached. When saturation level is reached, the addition of further ligands makes no difference. There are no free receptors for them and they are broken down by the enzymes present.

With ACP the growth factors are protected from being broken down in the thrombocytes and have a lifespan of approx. 1 week. So, there is a release of growth factors and thus a cell response for up to one week, instead of a maximum of 24 hours if all growth factors were released exogenously.

The Application of ACP

Treatment with ACP is a regeneration therapy. The use of ACP is so popular in aesthetic medicine because it represents a logical extension of the substances used up until now. ACP can be very easily combined with, for instance, laser therapy, botox, hyaluronic acid or peeling. Its effect consists of biostimulation of the body's own cells. The growth factors in the body's own blood concentrate stimulate microcirculation. The skin appears brighter, skin structure improves and wrinkles are reduced.

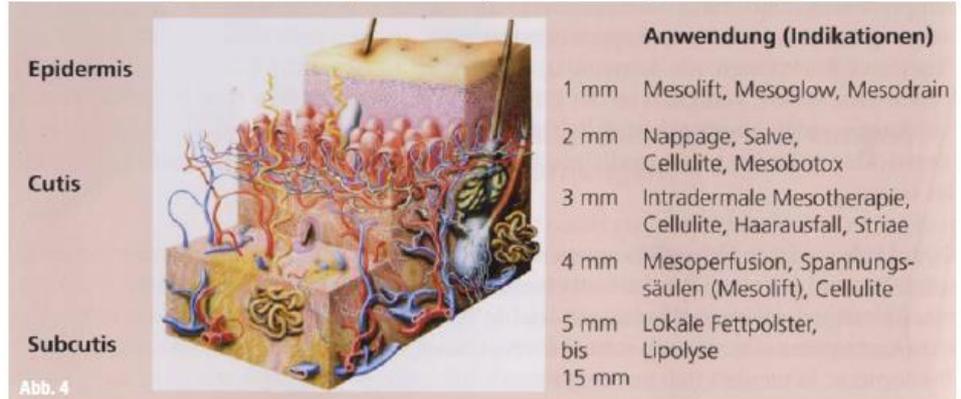
Growth Factors in Thrombocytes

Factor	Name	Place of formation	Effects
PDGF: aa, bb, ab	Platelet derived growth factors	Activated thrombocytes	Mitogens for mesench. stem cells; support formation of the extracellular matrix
TGF: alpha, beta	Transforming growth factors	Activated thrombocytes	Proliferation and differentiation of various cell types. Support of collagen synthesis
IGF: I and II	Insulin-like growth factors	Activated thrombocytes	Stimulate the proliferation and differentiation of osteoblasts
EGF	Epidermal growth factor	Activated thrombocytes	Co-stimulation of angiogenesis
VEGF	Vascular endothelial growth factor	Leukocytes	Stimulation of angiogenesis

Tab.1

Fig. 3a–b: ACP treatment on day 1 (a) and 3 months later after 3 treatments (b).

Fig. 4: Anatomy of the skin and depth of injection in meso-aesthetics



Areas of Application

- Hair loss
- Skin tightening
- Smoothing of wrinkles
- Facial volume replenishment
- Scars, acne scars
- Dark rings under the eyes
- Improvement of skin appearance

ACP is being used more and more for cell regeneration, e.g. in the case of alopecia where the growth factors activate hair growth and proliferation of DP (double positive) cells. DP cells are important for the development and differentiation of T-cells, which cover several stages. Fibroblast growth factor 7 and β -catenin, which are potent stimuli for hair growth, were upregulated in DP cells.⁵ The application of ACP induces a faster transition from the telegenic to the anagenic phase of hair growth. The thrombocytes in ACP support development of the hair follicles by way of the growth factors released. Inactive hair follicles are activated and converted to an active growth phase.⁴ Patients can expect increased hair growth

within three to six months. ACP has become a very successful method to combat hair loss.

Skin aging

Skin aging is a biological process which describes age-related changes in the skin. Besides the intrinsic aging process – genetically determined – there are also extrinsic factors, such as UV light, chemical reagents, environmental and mechanical strain. UV light in particular penetrates deep into the skin and causes the development of singlet oxygen, inducing enzyme production which damages collagen fibers and reduces the tautness of the skin. The more advanced the aging of the skin, the less collagen and elastin is in the tissue, since cell division is drastically reduced. The subcutaneous tissue becomes thinner, the fat and water content of the skin is reduced. This leads to successive formation of wrinkles.

Skin aging starts even at the age of 25 to 30. The signs are divided into four types in the Glogau scale (see Table 2). Wrinkles are the first thing one thinks of in terms of skin aging.

These, however, can be divided into the following types depending on how they are caused:

- Mimic lines, e.g. frown lines: Contraction of the facial muscles leads to the formation of visible lines, similar to the bunching of fabric;
- Lines caused by the sagging of the face as a result of collagen loss and the shifting of fat depots in the face: e.g. nasolabial lines;
- Fine lines caused by exposure to the sun;
- Smokers' lines around the mouth.

With ACP it is possible to achieve good to very good results up to the age of 70 for types I to III.

PRP is already assuming a significant role alongside lasers, hyaluronic acid and peeling. Particularly on the skin of the face, décolleté and hands the result is an augmentation of collagen to achieve smoother and tighter skin. The application is quick and uncomplicated and there is an immediate effect in terms of evenness and improved skin tone.

ACP and Mesotherapy

Just as important as the systems which offer hygienic and uncomplicated preparation of ACP, is the method of application. Here, mesotherapy represents a very well suited form. Meso-aesthetics has been an established injection technique for decades and was developed in France. Its advantages lie in the micro-fine needles used for administration and the principle of application at a shallow skin depth. Thus skin rejuvenation is stimulated twice: firstly through the needling effect upon application, and secondly through the administration of very small amounts of ACP directly into the target areas in particular skin layers, depending on the method and the area.

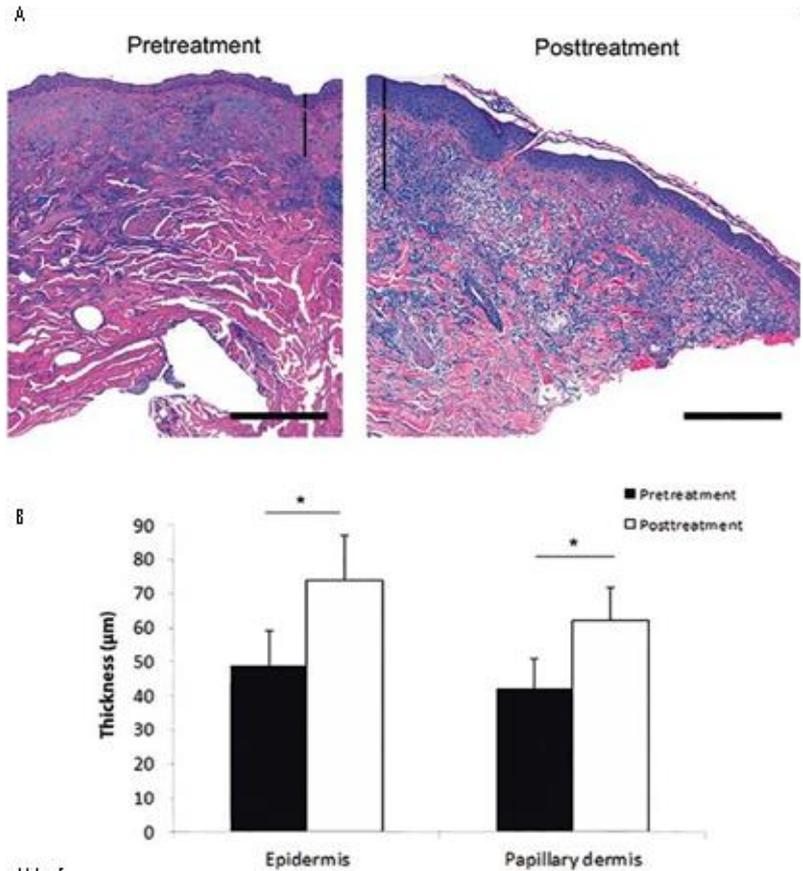


Abb. 5

The ACP serum can be applied directly under the surface of the skin. The meso-lift technique increases the skin's permeability through the micro needling effect, and thereby enables the drops left on the skin's surface to penetrate. Particularly in the case of crow's feet this achieves very good results. The quality of the skin is greatly improved after two or three treatments. Density, elasticity and homogeneity of the skin structure can be seen, as well as an increased glow. The effect of platelet-rich plasma on human dermal fibroblasts was proven in a study by Dr. Kim et al.⁶

Fig. 5: (A) Histological staining of skin biopsies (hematoxylin & eosin) was analyzed to measure the width of the epidermis and papillary dermis before and after the PRGF treatment. (B) A statistically significant increase in the dermis and papillary dermis thickness was observed after PRGF treatment ($p < 0.001$) for all the patients. Original magnification of both images: 5x Scale bar: 400 µm.

Glogau Scale of Skin Aging

Type I	No wrinkles, 20 to 30 years old, only slight signs of sun damage, such as certain irregular pigmentation
Type II	30 to 40 years old, wrinkles upon movement (e.g. frown lines and lines on forehead), slight sun damage
Type III	Visible wrinkles even without movement, visible sun damage such as irregular pigmentation and enlarged blood vessels
Type IV	Pronounced wrinkles ("nothing but wrinkles"), skin shows significant folds and leathery thickening, significant signs of sun damage (age spots, dry skin, perhaps also early stages of skin cancer), gray-yellow hue

Tab. 2

Fig. 6a–b: Patient before treatment (a) and half an hour later after ACP meso-lift (b)



Fig. 6a



Fig. 6b

The Advantages of ACP in Aesthetics

The benefit of using PRP in the case of skin aging was shown in a study by Diaz-Ley et al. Ten participants were given three PRP treatments by way of intradermal application. There was clear evidence of a significant increase in the thickness of the epidermis and papillary layer (see Fig. 5). Following the application of platelet-rich plasma, it was possible to see a reduction of solar damage in patients with clinical and histological signs of skin aging. No changes were seen in the number of CD 31, XIIIa factors, cKit, CD10, nor p53-positive cells.

The ACP serum can also be administered deeper as a filler. Besides the very good tolerability, the growth factors and minimal side effects, advantages were and are also the saving of down time, long-lasting, natural and immediately visible results and the possibility of treating relatively large areas with minimal required quantities.

Side Effects and Contraindications

- Changes in thrombocyte function (blood disease)
- Cancer
- Chronic or acute infections
- Fever
- Severe metabolic and/or systemic disorders
- Anticoagulation therapies
- Chronic liver disease
- Current or previous use of corticosteroids or NSARs (non-steroidal anti rheumatics)

Conclusion

In clinical application for skin rejuvenation, and in the case

of hair loss, excellent results have already been achieved using ACP. This biologic product is prepared from the patient's own whole blood without additives and has shown no side effects to date. This satisfies the increasing demand for biologic products. Supplementation with existing products is a welcome additional effect.

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