CLINICAL CASE

Traumatic periorbital soft tissue injury.

Dr. Serguei Kisselev

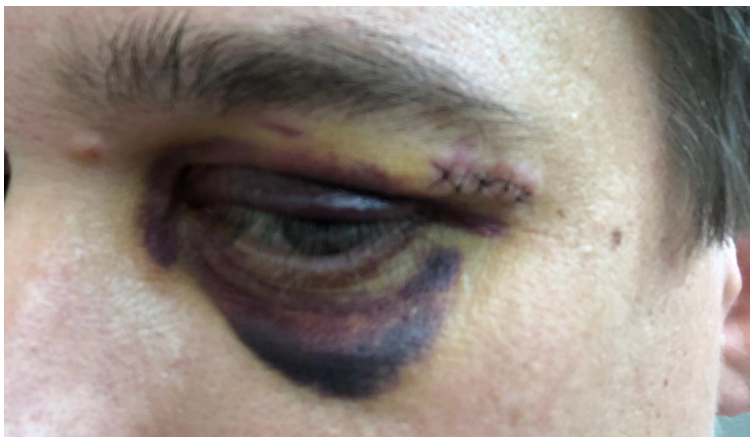
Assaulted 37 years old, healthy man.
No significant past medical history, no current medications
Assessed in the Department of Emergency Medicine – no facial bone fractures

Second day after assault, Before treatment.

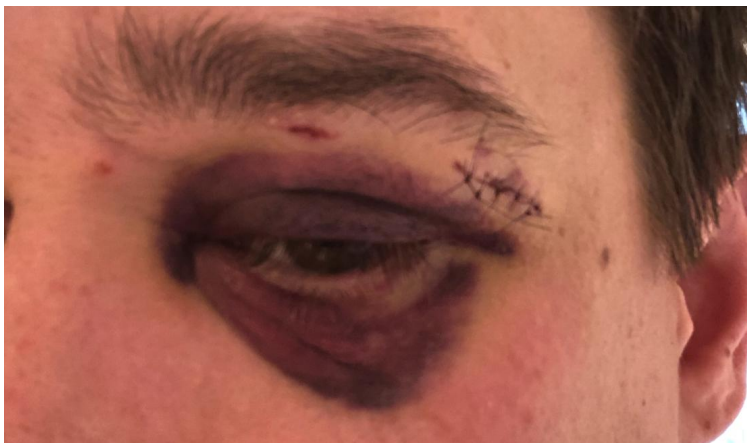
Started "CURE" as a consecutive and combine therapy, using:

1. Microcurrent stimulation – 20 min – Single application,
2. Daily application for 5 days
   - PBM/LLLT 635 nm, continuous,15 mWt – power, 2 min per zone, 3 zones following
   - 904nm, pulsed, 20Wt, 2 min per zone, 3 zones around the area of the injury

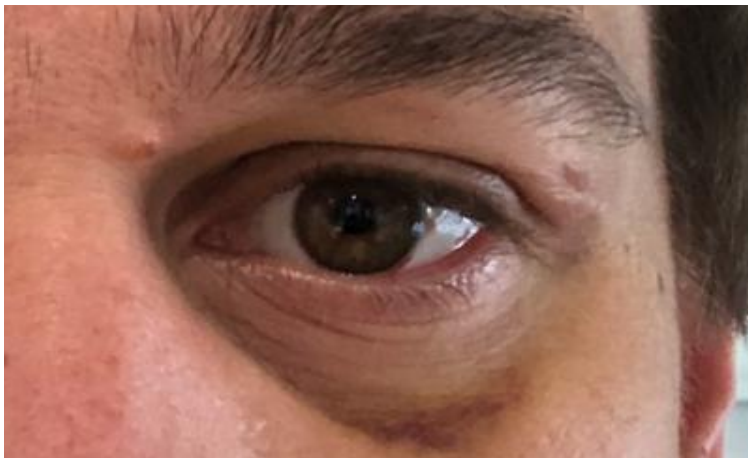
Third day after assault, Day two of treatment.



Fourth day after assault, Day three of treatment.



- **Day ten after assault, after five days of treatment and following two days of no treatment.**



Comments:
Managing this patient, we successfully used the "CURE" (Complex Unified Rehabilitation and Exercises) method. This method is flexible in its approach to manage different acute (as in our case) and chronic medical conditions. Depending on the problem we need to solve, a combination of different modalities, such as Electrostimulation, Photo Bio-Modulation (previously known as Low Level Laser Therapy), Prolotherapy, Ultrasound, electro-, phono- and laserophorhesis, peloid therapy, physiotherapy and exercise therapy can be used.
In this case we choose combination of two modalities:
A. Microcurrent therapy as an initial part.
Microcurrents are low level endogenous electrical currents. They are the triggers that stimulate healing, growth and regeneration in all living organisms (Robert O. Becker, MD, of the Department of Orthopedic Surgery, State University of New York Upstate Medical Centre)
Trauma will affect the electrical potential of cells in the damaged tissues. Initially the injured site has a much higher resistance than that of the surrounding tissue.
Basic physics dictates that electricity tends to flow towards the path of least resistance. Therefore, endogenous bioelectricity avoids areas of high resistance and take the easiest path, generally around the injury.
The decreased electrical flow through the injured area decreases the cellular capacitance.
Healing is actually impaired. This may be one of the reasons for inflammatory reactions such as pain, heat, swelling and redness.

Microcurrent mode of action
Augments of the endogenous current flow and allows the traumatized area to regain its capacitance. The resistance of the injured tissue is then reduced, allowing bioelectricity to enter the area to re-establish homeostasis. Therefore, microcurrent electrical therapy can be viewed as a catalyst helpful in initiating and sustaining the numerous chemical and electrical reactions that occur in the healing process.

- ATP is an essential factor in the healing process. Injured tissues are deficient in ATP. Microcurrent stimulation increases adenosine triphosphate (ATP) generation by almost 500 percent. Large amounts of ATP - the cell's main energy source - are required to control primary functions such as the movement of vital minerals, like sodium, potassium, magnesium and calcium, in and out of the cell. As the microcurrent restores the circulation and replenishes ATP, nutrients can again flow into injured cells and waste products can flow out. This is necessary for the development of healthy tissues.
- Increases protein synthesis. As ATP provides the energy that tissues require for building new proteins, it also increases protein synthesis and membrane transport of ions.

The microcurrent was shown to enhance amino acid transport and protein synthesis in the treated area 30 to 40 percent above controls. (Ngok Chang, MD, of the Department of Biochemistry and Orthopedic Surgery at the University of Louvain, Belgium)

- It also sustains the movement of waste products out of the cell.

Clinical applications of Microcurrent Therapy

Arthritis, Back pain, Diabetic ulcers, Fibromyalgia, Headaches, Herpes, Neck pain, Neuropathy, Sciatica, Shingles, Slow-healing wounds, Sports injuries, Tendon and ligament pain

B. PhotoBioModulation (previously known as Low Level Laser Therapy)

Laser illumination triggers the development of a cascade of responses at all levels, from the cells to the organism as a whole: activation of the mitochondria, metabolic processes and proliferation, the normalization of the immune and vascular systems, the inclusion of an analgesic effect in the Autonomic Nervous System (ANS) and the Central Nervous System (CNS) processes etc.

Mechanism of action: after the absorption of photons by the cell's acceptors, biochemical or physiological reactions characteristic (specific) for these absorbing elements are triggered.

A consequence of the photoinduced "behaviour" of macromolecules is the release of calcium ions from the calcium depot into the cytosol, and the propagation of waves of increased concentration of Ca2+ along and between cells. This is the main, key moment of the primary stage of development of the laser-induced process.

· Increase synthesis of DNA and RNA
· Increase redox potential of mitochondria, increase synthesis and accumulation of ATP
· Release of NO
· Release of the active form of oxygen
· Change of intracellular response to the action of hormones
· Activation of endo- and exocytosis
· Maintain the level of Ca2+ in Golgi body due to work of Ca2+-ATPhase is crucial in regulation of secretion and cellular interactions

LILI (Low Intensity Laser Illumination) initiates a wide variety of biochemical and physiological responses that represent a complex of adaptive and compensatory responses that result from the realization of primary effects in the tissues, organs and the complete living organism, as well as aiming at its recovery:

1) activation of the cell metabolism and an increase in their functional activity;
2) stimulation of reparative processes;
3) activation of the microcirculation of blood and an increase in the level of the trophic maintenance of tissues;
4) anaesthesia;
5) immunomodulatory action;
6) the reflexogenic effect on the functional activity of various organs and systems.

Clinical applications of PBM/LLLT

Musculoskeletal: Neuropathy, Neuralgia, Myofascial Pain Syndrome, Wounds management, Burns, Sprains, Ligament tears, After dislocations and reductions, Osteomyelitis, Bone fractures, Post-operative complications and rehabilitation, Osteoarthritis, Rheumatoid arthritis, Fibromyalgia, Tendoviginitis, Enthesopathy.