**Injectable carboxytherapy as a treatment method of musculoskeletal pains**

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***Abstract:*** *The results of implementation of injectable carboxytherapy as a medical approach within the complex treatment of patients with musculoskeletal pains. It was shown that in the group of patients who received injections of purified carbon dioxide (CO2) within a course program Healthy Spine were defined health improvements represented on IRBIS 2000.*

**Introduction**

Musculoskeletal pain (MSP) is a staggeringly widespread diagnosis reaching roughly one third of the all acute chronic pain syndromes. In accordance with a modern concept it covers back pain and pains connected with osteoarthritis and pathology of periarticular soft tissues: bursitis, tendons, tenosynovitis, enthesopathy. While MSP origin and pain distribution is various among a significant portion of population, pain symptoms occur weather simultaneously or alternately within a various areas. MSP is considered an arising threat among productive people at any age from younger to elder generations. Patients suffering from joint pains are experiencing constant restrictions regarding their physical activity which dramatically reduces their quality of life, professional and welfare potential.

Myofascial pain syndrome is one of the most common examples of MSP as its roots evaluate from certain trigger points occurring in muscles, fascia, tendons. Any trigger represents itself as a highly sensitive localized area with a callous signs being observed after palpation. Pressuring a proactive trigger point is accompanied by urgent pain within a local area as well as reflected pain symptoms within a specific remote area. Each trigger has its own reflected pain areas. Therefore, myofascial pain syndrome is subject to occur within any muscle and cause pains within different body areas.

Neck muscles, head, upper arm and lower back are the favored points as that’s where trigger points are most likely to emerge leading to: headaches, cervicalgia, neck and shoulder myofascial syndrome, pains radiating to the buttock and hip, etc. Side effects may also cause dystonic conditions such as torticollis. Recurring injuries have been regarded as the main cause of the trigger points as they damage the myofibril structure and functionality. Especially true for untrained body, intensive and prolonged physical activity increases tension and creates tearings within places where muscles are attached, muscle fibers and their connective tissues.

Emerging pains and spasmodic muscle contractions are caused by reflected tension in spinal pathology, the large joints, internal diseases, psycho-emotional stress, hypothermia, and suboptimal dynamic stereotype: wrong posture, pose overtension. In their turn spasmodic muscles initiate a vicious circle consisting of pain and cramps, while only being an additional pain source. It may eventually result into a chronic pain syndrome which is often considered as a separate threat to patient’s wellbeing. Since chronic pain usually has a long track record with no other symptoms, it’s hard to find out what had been the initial cause. On average, 15-20% of all world population are suffering from chronic pains which are most commonly related to the musculoskeletal issues.

Besides being related to spinal pathology, joint and tissue pains, this type of pains are also interconnected with internal organs pathology. Almost any somatic pathology could be followed by myofascial pain syndrome as pain impact from the damaged organ leads to defensive tension within the surrounding muscles. Therefore, myofascial pain syndrome needs to be diagnosed with a great care and patience. It’s necessary to mention that spinal and joint motions do not affect the syndrome’s pain intensity caused by internal diseases.

Dysfunctional pains is a separate group of pain syndromes. Underlying these is a changing of functional condition within different parts of central nervous system involved in pain control. They are mostly influenced by emotional, psychological and social factors. It’s impossible to determine the cause or the internal disease which causes the pain which is dysfunctional pain group’s main difference. Fibromyalgia, tension headache, and psychogenic pain - these all the examples of dysfunctional pains.

Treatment of patients with MSP diagnosis at White Nights medical resort introduces a relatively new method in Russia - injectable carboxytherapy: controlled application of purified carbon dioxide (CO2) into specific sites beneath the skin through the needle. Manipulation requires a stationary unit for carboxytherapy INCO2 by Medexim (Slovak Republic) and short needles of 12-13 mm in length . While treatment dosage is increasing according to a certain schedule, portioned treatment is available due to the usage of INCO2 unit.

The physician injects the gas beneath the skin through the needle at a 45-degree angle. Injection sites are determined based on MSP’s origin and patterns choosing either one of the following options: paravertebral in cervical, thoracic, and lumbar regions of the spine ; directly targeting trigger points within the pathologically spasmodic muscles if it’s neck and shoulder myofascial pain syndrome and tension headache ; joint areas if it’s osteoarthrosis or periarthritis .

While being an individual variable, the quantity of injections is usually around 16-20 per one treatment. Flushing (hyperemia) is easily observed at the CO2 injection sites while their size and depth differ significantly .

Due to direct impact on arteriolar vascular smooth muscle cells by CO2 injections, vasodilation occurs and leads to increased oxygen (O2) consumption out of blood flow. Also known as the Bohr effect it leads to tissue oxygenation and neoangiogenesis. Additionally, chemical reactions occurring during the treatment process affect pH level of local tissues. As a result, the penetration of capillary walls enhances as well as collagen fiber flexibility. Also free nerve endings tend to change the pattern in tissues through which they permeate. All together these analgesic and spasmolytic effects are able to turn off active trigger points and locally decrease painful muscle spasm.

Carboxytherapy is considered to be forward-looking in the complex treatment of episodic and chronic tension headache in which involuntary tension within pericranial muscles, neck and shoulder girdle play a major role. Injections in the treatment of tension headache are applied in mastoids and trigger points within the back muscles.

An advantage of carboxytherapy is its minimal invasiveness. It’s also well-tolerated and has no complications. There were only a few cases when the the treatments have been postponed due to patients’ low pain tolerance.

The contradiction of performing this approach is limited to: acute infectious diseases, high arterial hypertension, unstable stenocardia or recent acute myocardial infarction, renal failure, epilepsy, pregnancy.

**Results**

Since the implementation of carboxytherapy at White Nights in 2015, the treatment was received by 437 patients including: 331 people suffering from back pains; 40 having tension headache; 30 people with periarthritis diagnosis; 36 people with osteoarthritis diagnosis. Medical infrared spine thermography based on IRBIS 2000 unit was used for monitoring and evaluation purposes. The examination is done before and after the course for all patients within the medical program Healthy Spine.

Since July 2018, there was a total of 72 patients have been examined while 63 (87,5%) of them are defined to have health improvements represented on IRBIS 2000 as a decrease in the temperature gradient along the spine as well as a reduction of hyperthermia centers and their severity **.**

**Conclusion**

It’s worth to mention that carboxytherapy was used as a part of the overall medical wellness treatment process. Therefore, it was not our purpose to identify carboxytherapy as a separate approach. However, clinical observations among a large number of patients leads to a conclusion that injectable carboxytherapy is effective treatment method of musculoskeletal pains. It provides a significant decrease in pain syndromes and pathological muscle tension.

Experience in the use of injectable carboxytherapy at White Nights enhances the feasibility of implementing this method into complex treatment of patients with MSP.