

Healing in the Hyperbaric Chamber

All divers are well aware of the importance of the hyperbaric chamber and how it is used in cases of diving emergencies. However, there are numerous other cases in which the hyperbaric chamber is revealed to be a powerful therapeutic instrument but unfortunately its healing usage remains unknown to most people. DAN knows about the health benefits of Hyperbaric Oxygen Therapy and that is why we decided to publish a series of articles that highlight its importance. In this article we will share the amazing results that were obtained on patients with Lupus.

Systemic Lupus Erythematosus (SLE) or Lupus, is a disease that rings a bell to most people. It is no surprise when you consider that amongst 100.000 inhabitants, 12 to 120 people suffer from this disease and every year, 2 to 10 new cases are discovered and more cases are diagnosed every year. Typical symptoms of Lupus, that are interesting from a hyperbaric medicine perspective, are ulcers on the skin level that could render daily activities more painful or grow into severe scars. Because of the health benefits known so far of the application of hyperbaric oxygen, HBO therapy was tested as a therapeutic option for lupus patients.

There are several factors that can make someone more susceptible for developing Lupus. There is the possibility to have a genetic predisposition and it was noted that the disease is prevalent in women, especially at a fertile age, which contributes to the belief that sexual hormones play an important role. Lupus can also be caused by an infection, although no specific infection has been linked to lupus so far. The exposure to physical factors, such as UV radiations and even some medication have been proven to develop forms of Lupus. As you see, the contributing factors are many, however, there isn't one specific cause that is identified to be the trigger of developing Lupus and for this reason, in most cases, the cause of Lupus is said to be unknown.

What exactly is Lupus and how can Hyperbaric Oxygen be used as a therapy? LSE is a systemic autoimmune disease, meaning that the immune system produces antibodies that work against the antigens of your body, attacking and killing your own cells. Cell structures, such as DNA, that are normally hidden from the mechanisms of the immune system, become exposed and the B cells, thinking that these unknown elements are external factors, produce white blood cells that end up settling themselves on the sides of the blood vessels. This can cause inflammation on the blood vessel wall, causing damage and altering the blood flow. The result is that there is a restriction in blood supply, causing a shortage of oxygen in the tissues. In fact, one of the many symptoms that characterises this disease is the continuous development of inflammation at different organs and at the skin level. Normally, because the autoimmune system is attacking your body, the medication prescribed for Lupus patients consist of immunosuppressants that will lower the activity of the immune system in combination with drugs that widen the blood vessels.

Hyperbaric Oxygen Therapy (HBOT) has only in recent years been considered as a therapeutic solution for refractory vasculitis ulcers that are resistant to immunosuppressive therapy. HBOT is known to have two main beneficial effects: firstly, the killing (bactericidal effect) and inhibiting reproduction (bacteriostatic effect) of bacteria and secondly, the active stimulation of tissue repair. The bactericidal and bacteriostatic effect of HBO considers that cells that are short of oxygen (hypoxic), are less resistant to infections and therefore hypoxic tissues are easier to be damaged. As the killing of bacteria is oxygen-dependent, breathing hyperbaric oxygen has both a direct and an indirect effect. First of all, it increases the amount of free oxygen in tissues, which eliminates the anaerobic and facultative aerobic bacteria. In addition, it determines the formation of oxygen free radicals that also kill bacteria. The indirect effect is that the partial oxygen pressure in the tissues increases, inactivating bacteria's growth. The wide diffusion of

oxygen allows a smooth passage of the oxygen from the capillaries to the hypoxic tissues and it makes it easier for certain antibiotics to travel across bacterial cell walls, improving the effectiveness of medication. The second main effect, the reparation of tissue, is based on the fact that collagen, which is the main structural protein of connective tissues and one of the essential elements in wound healing, is made out of the amino acid triplex Glycine, Proline and Lysine. For Proline and Lysine it is vital to react with oxygen to complete the hydroxylation process. If there is a shortage of oxygen in the tissue, only a preliminary form of collagen can be formed but it cannot be activated. When breathing 100% oxygen, the collagen can mature and it can perform its task in contributing to heal the ulcer. The therapy, furthermore, facilitates the production of new blood vessels and the spread of fibroblasts and endothelial cells, both essential in healing wounds. Breathing Hyperbaric oxygen reduces the adhesion of white blood cells to the sides of the blood vessels, which, as stated before, is often the cause of inflammation and so it can be said that the therapy also tackles one of the underlying causes of the inflammations as well as curing them.

HBO was already used as an additional treatment to heal ischemic ulcers and that is where the idea came from to use HBO on non-healing skin ulcers found in Lupus patients. In 2007 a study was performed on 35 patients of which 7 were diagnosed with Lupus, exposing them 5 times a week, for 4 weeks to 100% oxygen at 2 atmospheres absolute (ATA). The result was that 28 patients demonstrated a complete healing, 4 a partial healing and only 3 showed no sign of improvement, only one out of these three was a Lupus patient. None of the patients showed any signs of side-effects. The case studies on HBO therapy for Lupus patients are rather limited, but the reports so far seem to indicate the use of the hyperbaric chamber as a successful therapy.

In fact, the case report of the Department of Pediatrics of the Second University of Naples tells us the story of a 14 year old girl, that was presented to them in 2008. The girl, diagnosed with Lupus, was discharged with a traditional therapy, consisting of immunosuppressants and medication stimulating the blood flow. In fact she took 60 mg per day of Prednisone, an immunosuppressant drug. After two weeks there was an improvement in the inflammation, but the skin coloration, due to low oxygen access, had worsened. The girl had an ulcer underneath her toe that didn't respond well to medical cleansing. In 3 months, it reached a diameter of 1 cm and because of the continuous growing and deepening of the ulcer, it was decided to try Hyperbaric Oxygen Therapy. She was advised to have 5 weekly HBO sessions of 90 minutes at a pressure of 2.6 ATA, which corresponds more or less to descending 16 meters. After one week, the skin colouring disappeared and after two and a half weeks the ulcer had healed. The girl didn't have any side effects and even more important, after the interruption of the therapy there was no relapse. The dosage of Prednisone was slowly reduced and after several weeks, she only took 10 mg per day. In this case, Hyperbaric Oxygen Therapy was an absolute success!

It is only in the last couple of years that Hyperbaric Oxygen Therapy as a treatment of refractory vasculitis ulcers in Lupus patients is evaluated but because of the success stories, the road now lies clear ahead of us. Further studies will be performed to evaluate HBOT as a primary therapy for this type of ulcers. DAN Europe is thrilled with the successes produced by research in hyperbaric medicine and our experts will follow up closely all the possible treatments that take place in the hyperbaric chamber.