

## **Evaluation of thermovision and planimetry in the assessment of the effects of hyperbaric oxygen therapy and Oxybaria S in the treatment of hard-to-heal wounds.**

Hyperbaric oxygen therapy (HBOT) uses higher than atmospheric pressure air or pure oxygen on the human body to facilitate wound healing.

Usually planimetry and oximetry are used in the quantitative evaluation of hyperbaric oxygen therapy effects. However, a non-invasive, quick and easy to perform method of evaluation is still required. Thus, the main aim of our study was to assess the usefulness of thermal imaging in evaluating the effects of hyperbaric oxygen therapy on hard-to-heal wounds and to compare these results with planimetric parameters.

The studies were performed at the Burn Treatment Center in Siemianowice Slaskie and at the Specialist Hospital No. 2 in Bytom is applicable to the use of a non-invasive technique, which is a thermal imaging, in the assessment of changes in the thermal map of hard-to-heal wounds as a result of hyperbaric oxygen therapy and topical hyperbaric oxygen therapy by Oxybaria S. In addition, the study attempts to correlate the surface obtained from planimetric studies and isothermal areas resulting from metabolic changes in soft tissues.

The study group consisted of one treated in Burn Treatment Center consisted of 60 patients (28 women and 32 men) aged between 48 and 82 who was suffering from hard-to-heal wounds. The patients were treated with hyperbaric oxygen therapy. Each patient underwent 30 treatments in a hyperbaric chamber, where a single treatment lasted 86 minutes. Thermal imaging was performed each time before and after a single oxygen therapy session. The obtained results were analyzed both taking into account individual sessions in a hyperbaric chamber and considering the full treatment cycle by grouping the results of patients in individual periods of the entire cycle: the first part of the treatment (1-10 treatments) - period I, the second part (11-20) - II and the third part of treatment (21-30) - period III.

Planimetric imaging was performed analogously to the thermograms performed. The images were analyzed for the wound surface area at different stages of treatment, comparing the structural changes with changes at the metabolic level from thermographic imaging.

The second study group of patients was subjected to topical hyperbaric oxygen therapy – called Oxybaria S at the Specialist Hospital No. 2 in Bytom. The group consisted of 12 patients (8 women and 4 men) aged 52 to 85 years, suffered from hard-to-heal wounds. Patients were subjected to 10 therapeutic sessions with Oxybaria S. Each session lasted 30 minutes.

Thermal imaging was performed each time before and after a single oxygen therapy session. The obtained results were analyzed both taking into account individual treatment sessions and considering the full treatment cycle, grouping the results of patients in individual periods of the entire cycle: treatment period I (after 1 session), period II (after 5 session) and period III (after 10 session).

The conducted research showed differences in parameters obtained from planimetric and thermal measurements.

On the basis of the obtained results, it seems that the application of thermovision diagnostics in the case of hard-to-heal wounds, may provide important information, not only in the assessment of treatment effects, but also in the qualification of patients for hyperbaric oxygen therapy.

There is also a conclusion that both imaging techniques (thermographic and planimetric) should be combined, so that the physician is able to assess the wound both at the structural level and the extent of the intensity of metabolic processes, because both techniques seem to be complementary, which may be beneficial in the process of assessing the degree of the development of the disease.

**Keywords:** Thermal imaging, planimetry, hyperbaric oxygen therapy, hard-to-heal wounds,