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Oxygen-ozone therapy: our experience in the treatment of hard-root conflicts

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Abstract

Lower back pain and sciatica are clinical symptoms with debilitating effects on the quality of life; they are extremely common in the population. The treatment of patients affected by sciatica, and in particular of those incurred by herniated discs, may be medical, physiatric, percutaneous minimally invasive surgery. In recent years, for the treatment of disc-radicular conflicts the oxygen-ozone (O_2-O_3) therapy is spreading to a more and more significant extent. We report our experience with O_2-O_3 therapy in the treatment of herniated lumbar discs, evaluating the efficacy of the therapy in lower back pain and sciatica. We treated 32 patients with paravertebral intramuscular infiltrations of about 15 cc of the mixture of O_2-O_3 at a concentration of 30 µg/cc: 66.6% of the patients had a positive response to the treatment.

Introduction

Lower back pain and sciatica have clinical symptoms with debilitating effects on the quality of life. They are extremely common in the population, in both sexes, even in younger subjects. Such conditions can be determined by various kinds of spine disorders: in particular degenerative diseases, inflammatory, traumatic, neoplastic and malformation disorders.

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However, in most cases, lower back pain and/or more frequently sciatica are due to a herniated disc, or to a disc-radicular conflict.

The treatment of patients affected by sciatica, and in particular of those incurred by herniated discs, may be medical, physiatric, percutaneous minimally invasive, surgery.

In recent years, the oxygen-ozone (O_2-O_3) therapy is acquiring an increasing significance for the treatment of the disc-radicular conflicts. The oxygen-ozone therapy is in many cases a valid therapeutic alternative, characterized by a relative simplicity of execution (if performed by expert hands), good tolerability by the patient (few side effects) and a relatively low cost.

Ozone is an allotrope of oxygen (symbol O_3, molecular weight 48),[1] naturally present in the atmosphere, that has lots of biochemical properties. During the treatment of herniated discs O_3 has anti-inflammatory and analgesic properties, as well as the ability to reduce volumetrically the herniated disc tissue. The O_3 therapeutic effect is expressed, therefore, according to various mechanisms, which can be summarized as follows: i) improvement of the local circulation, with eutrophic effect on both the affected nerve root and the muscle cells that are often contracted; ii) normalization of the levels of cytokines and prostaglandins, with resulting pain-relieving and anti-inflammatory effects; iii) increased production of superoxide dismutase (an enzyme that reduces oxidizing agents); iv) degradation and reduction in volume of the disc tissue (degradation of mucopolysaccharides of the *nucleus pulposus*, dehydration, lymphocyte and macrophage infiltration, resulting essentially in an acceleration of the processes that occur spontaneously in case of hernia).[2-4]

Materials and Methods

In our clinic for the O_2-O_3 therapy we have treated 32 patients (18 M, 14 F; mean age 55±10.42) suffering from lower back pain and/or sciatica, herniated discs supported by both the subligamentosa type (contained) and the transligamentosa type (expelled).

The treatments were performed at regular time intervals, in a number of 2 per week for a total of 12 sessions and a total duration of the therapeutic cycle of 6 weeks.

The technique of administration of the O_2-O_3 mixture, after skin disinfection, consisted in the paravertebral intramuscular infiltrations of about 15 cc of the mixture of O_2-O_3 at a concentration of 20 µg/cc, performed with 23 G needle gauge and a length of 3 cm, in correspondence of the levels of disco-radicular conflict, about 2.5 cm lateral to the spinous processes.

After obtaining informed consent, patients were instructed on how to fill the brief pain inventory (BPI). This questionnaire was then filled by patients three times, at Time 0 (T0), before the start of treatment,

at Time 1 (T1), third week, after the sixth administration and at Time 2 (T2), six weeks after the last dose.

Results

We observed that the values measured at T2, in response to the four questions relating to the pain intensity of the BPI [maximum (max) pain intensity in the last 24 h, minimum (min) pain intensity perceived in the last 24 h, average (avg) intensity of pain perceived in the last 24 h, intensity of pain perceived at the time of the questionnaire], were reduced compared to the ones measured at Time 0: min. pain 4.83±0.75 (T0) *vs.* 3.33±1.50 (T2), max. pain: 7.66±0.51 (T0) *vs.* 5.66±1.21 (T2), avg. pain 6.25±0.52 (T0) *vs.* 4.5±1.30 (T2).

In particular, there has been a greater reduction of the value correlated to the intensity of pain perceived in the 24 h: it has been observed, in fact, that 50% of the patients, at the end of the study, reported, in relation to such a parameter, a reduction of at least two points on the relative numerical scale of eleven values.

The effect of treatment on quality of life was assessed by analyzing the responses to question 9 of the BPI, where patients described on a numerical scale of eleven values the interference of pain in the last 24 h regarding seven aspects of daily activities; analyzing the average score obtained from the sum of all of the subgroups of question 9, we observed at T2 a reduction of about 7 points *vs.* T1 (47.83±2.48 *vs.* 40.83±5.84 average of the question 9 at T0 compared to T2), with a total score reduction of at least 7 units for 66.6% of the treated patients.

At the end of the study, 66.6% of the patients expressed through the use of a verbal scale of six units the highest satisfaction with the benefits derived from the therapy.

Discussion

The aim of our study was to describe the efficacy of ozone therapy in the treatment of herniated lumbar discs.

The beneficial effects of ozone derived from the molecule's anti-inflammatory and analgesic properties, as well as the ability to reduce volumetrically the herniated disc tissue.

Radicular pain, in fact, depends only in part by the direct compression of the herniated disc on the nerve root, but is also determined by tissue inflammation.[5]

A study carried out on pigs, assessed the impact on swine intervertebral discs of intradiscal, intraforaminal, cutaneous and intramuscular injection of an O_2-O_3 mixture.

The sections revealed micro- and macro-vacuolar herniated disc degeneration with small halos of necrosis and edema. The micro- and macro-vacuolar degeneration may account for the reduced disc volume with decreased intradiscal pressure and impairment of nerve structures.[6] The high therapeutic success rate, the relative simplicity of the method, good tolerability by the patient (few side effects) and a relatively low cost have favored the adoption of O_3 therapy for hard-root conflicts and other diseases. However, the rarity of adverse events linked to the treatment must not lead to the erroneous conviction that ozone therapy is always free of side effects. Vasovagal attack is not the only form of presentation of adverse reactions linked to O_2-O_3 administration.

In 1982 Jacobs (Germany) examined any possible adverse effects of ozone therapy in a large sample of treatments, reporting an incidence of side effects of approximately 0.0007%.[7] Jacobs also described four cases of death from air embolism resulting from intravenous gas direct injection. This technique is absolutely prohibited.

In 2000 Bocci dedicated himself to the study of side effects of the ozone therapy. He describes the risk of vagal crisis, with the possibility of cardiac arrest and death, following the pain associated with the administration of O_2-O_3 mixture.[8]

For therapeutic success and to reduce the incidence of side effects, it is important to implement correct therapeutic procedures: to administer the O_2-O_3 mixture in a concentration of about 10-20 mg/cc and since ozone is an unstable molecule, it is necessary to inject the mixture immediately after by picking.[9]

Great attention must be paid to the volumes of ozone administered. It would seem prudent, as regards the paravertebral infiltrations, not exceed volumes of 10 mL.[10]

During the treatment of herniated discs, the O_2-O_3 therapy provides positive results in 75-90% of cases,[2,11] our experience therefore confirms the high rates of successful treatment.

Conclusions

O_2-O_3 therapy has proven effective in improving the quality of life in a significant percentage of the sample studied.

The simplicity of execution and the minimally invasive therapeutic technique, the low risk of complications, the optimal cost/benefit ratio, make the O_2-O_3 therapy an effective therapeutic alternative for hard-articular conflicts. An increasingly greater use of this technique in the future is advisable.

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