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Indexed in: EMBASE, Elsevier
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Editorial

The Spine and Its Discontents

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You may think that it takes remarkable courage to stand up, but there is actually more pressure if you keep sitting.

Of course my statement could easily refer to the boldness of President A.P.J Kalam to honour the blast victims with two minutes of silence at the Mahim railway station or the determined demonstration by a group of concerned citizens in New York City against the devastating violence in South Lebanon. But to stay consistent with the writings in this space, my statement is directed not at international but at intervertebral pressure as it relates to back pain. In this context the statement reads: “It is not obvious, but when you sit you exert more pressure on your back than when you stand.”

History books may disagree, but the great works of the Italian master anatomist Vesalius assure us that all men have a spine. Pre-history books are more objective and agree that the existence of our spine is what in fact defines us. Over 500 million years ago we developed from tiny organisms that lived in water into vertebrates or ones with vertebrae. We began to walk as humans two million years ago as the first hominid, Homo ergaster. Our ability to balance upon only two limbs gave us the freedom to use our upper extremities as we wanted. Some use their hands to write for peace. Others shrug their shoulders and bear arms. The spine is certainly the birth of civilization (and its discontents).

A major discontent that falls squarely on the spine is back pain. If neither you nor any of your friends have had back pain, you need to make more friends. Nearly 80% of us will experience at least one episode in our lives. In 90% of us, the pain will improve without any treatment. Unfortunately it will recur in almost 85% of us. As you can imagine, we are talking big numbers. In the US, back pain puts the economy back approximately $90 billion in lost productivity and healthcare costs each year. That is nearly the entire GDP of Sri Lanka.

Most patients who experience lower back pain that is caused by a slipped or herniated disc heal naturally without surgery. A disc can be compared to a lychee fruit. It has a tough outside covering (the anulus) and a soft, watery centre (the nucleus). Does the spinal cord run through the centre of the disc where the seed would be? No, the spinal cord is behind the disc, surrounded by the same three tissues that cover the brain. The bony vertebrae are the ones that protect the spinal canal. The discs sit between the vertebrae and give the spine flexibility.

A disc does not truly ‘slip’ per se. With trauma or degeneration of the lychee (that begins as early as 13), the nucleus pushes on the anulus that can tear and release the contents of the nucleus to nearby nerves. Increasing studies now show that it is not simply the mechanical pressure that a herniated disc places on nerves that causes the sensation of pain. Compressing a normal nerve does not elicit pain. A nerve must be swollen or inflamed for pressure to cause pain. Molecules that escape from the nucleus trigger an inflammatory cascade and irritate the nerves. So a herniated disc is not a simple mechanical problem like misaligned teeth.
The field of pain management is rapidly growing with anaesthesiologists, neuroradiologists and neurologists joining the spinal surgeons to offer their favourite treatments. Steroids are routinely injected into the space around the spinal canal, and give temporary relief of pain on account of their anti-inflammatory effects. Pulsed or continuous current is applied to the disc using radiofrequency to numb the nerves. Precise amounts of oxygen-ozone gas that is injected into the disc both break bonds to resorb the bulging disc, and change the molecular milieu of inflammatory mediators.

While back surgery makes intuitive sense, injecting a gas requires an appreciation of the molecular mechanisms of pain. Clinical data support the science that these alternatives work. So much so that my neurosurgeon father has virtually traded in his scalpel for a needle and electrode!

What can you do to prevent spinal discontent? Swim, lose weight, be happy, stop smoking, and, of course, stand up!

The author is a clinical pathologist and engineer from Harvard Medical School and MIT. In 2004, he was named by MIT’s Technology Review magazine as one of the world's Top 100 innovators under 35, the youngest Indian to have received that honour.

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The Italian Oxygen-Ozone Therapy Federation (FIO) Study on Oxygen-Ozone Treatment of Herniated Disc

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Key words: oxygen-ozone therapy, herniated disc, complications

SUMMARY - Oxygen-ozone therapy exploits the chemical properties of ozone, an unstable allotropic form of oxygen with the symbol O₃ and a molecular weight of 48 kDa. Many biologic effects have been attributed to ozone: increased glycolysis, effects on red blood cells, effects on rheology, bactericidal, fungicide and virustatic, immunomodulating action and analgesic and anti-inflammatory effects. This broad spectrum of action explains the many indications for medical ozone administration. We assessed the results obtained in treating 15,000 patients with oxygen-ozone therapy and in particular to describe possible complications or collateral effects. The only thing we can understand is that the authors did not use correct asepsis and hygiene procedures. Hence, the low costs of oxygen-ozone therapy and the lack of any complications or collateral effects make this minimally invasive procedure safe and useful for the treatment of lumbar disc herniation.

Introduction

Oxygen-ozone intradiscal and periganglionic injection is a minimally invasive procedure first applied clinically in the peridural treatment of lumbar sciatic pain and lumbar disk herniation. A reduction in herniated disk volume is one of the therapeutic aims of the gas mixture, as disk shrinkage may reduce nerve root compression. Another reason for using medical ozone to treat disk herniation is its analgesic and anti-inflammatory effects. The transit of pure oxygen through high-voltage tubes forms ozone available for an injecting device. This type of treatment is developed to offer good clinical results combined with a well-tolerated, low-cost procedure. A vast bibliography can be found in a recent study on how oxygen-ozone works 1-3. Oxygen-ozone therapy exploits the chemical properties of ozone, an unstable allotropic form of oxygen with the symbol O₃, and a molecular weight of 48 kDa. Many biologic effects have been attributed to ozone: increased glycolysis, effects on red blood cells, effects on rheology, bactericidal, fungicide and virustatic, immunomodulating action and analgesic and anti-inflammatory effects. This broad spectrum of action explains the many indications for medical ozone administration. We assessed the results obtained in treating 15,000 patients with oxygen-ozone therapy and in particular to describe possible complications or collateral effects.

Methods

In 2004 the FIO (Italian Oxygen-Ozone Therapy Federation) instituted a control study group to monitor possible adverse events occurring during treatments with oxygen-ozone therapy for discal pathologies. The tool used was the FIO website (www.webfio.it) in a private area that allows access to an electronic clinical folder where all the data concerning the type of treatment are collected and any complications discovered can be reported (figures 1, 2 and 3). From January 2004 to December 2006, 12,000 patients were treated with a single session of oxygen-ozone therapy. All the treatments were executed following the guidelines of the Italian Oxygen-Ozone Therapy Federation (FIO).
These patients represent a consecutive series of patients who presented with lumbar disk herniation during the two years and who were judged not to be surgical candidates for clinical or anatomic reasons. Informed consent was obtained from all patients.

The injection site was disinfected in all patients and local anesthesia applied using an ethyl chloride spray. Infiltrations were done by specialist neuroradiologists. The puncture site was identified on CT scans and marked on the patient’s skin. The distance from this point to the foramen was subsequently measured (figure 4A). A 22-gauge needle was positioned inside the disc (figure 4B) and then 2-3 mm from the foraminal region (figure 5A), close to the ganglion of the affected nerve root. A 10 cm needle was typically used, but longer needles (15 cm) were occasionally needed depending on the size of the patient and the thickness of the skin layer. CT scanning was performed to check correct needle placement. O₂-O₃ was infiltrated by injecting 3 mL of the gas mixture at a rate of 25 µg/mL close to the neural foramen. The needle was then retracted a few millimeters and another 5 mL of
the mixture was injected to involve the facet joint region. CT scans were used to check the correct distribution of the gas mixture in the foramen (figures 5B and A).

The gas mixture was injected by using a polypropylene syringe with the interconnection of a millipore filter. Time for injection was 15 seconds in all. A longer time is not suitable because of the unstable condition of medical ozone whose decaying time (2 µg/mL) is after about 20 seconds. At the end of treatment patients were advised to rest in supine decubitus position for an hour.

No premedication or anesthesia was given to either group, and the procedure was performed at an outpatient facility. Selection criteria for oxygen-ozone therapy were clinical and included low back pain resistant to conservative management (drugs, physiotherapy and others) lasting at least three months, and low back pain with positive signs of nerve root involvement, with or without paraesthesia or hyposthesia, with appropriate dermatome distribution. Neuroradiologic criteria were CT and/or MR evidence of contained disk herniation, in line with the patient’s clinical symptoms, with or
Figure 3  FIO Website. This is the page where all the patients' information is collected from different centres.

Figure 4  Treatment technique. A) Calculation of the access point and the position of the needle.B) The needle is correctly positioned inside the disc.
without disk degeneration, and residues of surgical microdiscectomy with recurrent herniation.

Exclusion criteria for oxygen-ozone therapy were neuroradiologic evidence of disk prolapse or free fragments of herniated disk, and major neurologic deficit correlated to disk disease. In these cases, the patients underwent surgical treatment.

All patients underwent follow-up examinations two weeks, two months and six months after treatment to assess any complications or collateral effects. Clinical outcome was assessed six months after treatment by applying a modified MacNab method.

All operators could log in through our web site (www.webfio.it) and inspect patients’ data. These data are stored inside a password-protected area where operators can point out collateral effects and details of O₂-O₃ treatment.

Results

No early or late neurological or infectious complications have been reported following oxygen-ozone injection. In our experience we have observed only a few cases of vagal crisis resolved without resorting to medical management but maintaining the patient in the Trendelemburg position. The results are virtually the same as those of other percutaneous techniques (75-80% success rate).

Discussion

In oxygen-ozone therapy, ozone is administered in the form of an oxygen-ozone gas mixture, medical ozone, at nontoxic concentrations varying from 15 to 30 µg of ozone per milliliter of oxygen. For intradiscal administration the optimal concentration of ozone per milliliter of oxygen is 25 µg. At this concentration, ozone has a direct effect on the proteoglycans composing the disk’s nucleus pulposus, resulting in its release of water molecules and subsequent cell degeneration of the matrix, which is replaced by fibrous tissues in the space of five weeks and the formation of new blood cells. Together, these events result in a reduction of herniated disk volume which is one of the therapeutic reasons for intradiscal administration of medical ozone as disk shrinkage may reduce nerve root compression.

We emphasize a few simple precautions. It is very important to inform patients about the method adopted, reassure them and help them relax. The infiltrations should be administered very slowly, trying not to force the introduction of the gas to avoid causing pain to the patient. It is always better to inject a small amount of gas instead of causing pain and risking a vagal crisis triggered by the emotive state caused by the infiltrations, and possibly to pain which should normally be minimum or absent if the procedure is executed correctly.

We have searched the literature to find the main adverse events reported for the most common procedures for the treatment of herniated disk and any complications reported for oxygen-ozone therapy.

In the last two decades, a better understanding of the spinal anatomy, function and the pain generation mechanism along with technological achievements has accelerated the development of many modalities for the treatment of low back pain. Chemonucleolysis with chymopapain, nucleo-discectomy introduced by Onik, intradiscal laser discectomy, intradiscal electrothermal therapy, chemodiscolysis with an oxygen-ozone mixture and most recently percutaneous nucleoplasty are the minimally invasive techniques developed for this aim.

Chemonucleolysis with chymopapain is based on an enzymatic dissolution of the nucleus pulposus. The herniation should be rigorously contained to avoid contact with the proteolytic enzyme and the spine contents like spinal cord, dural sac and roots. Moreover, although purified prepared enzymes are used, anaphylactic reactions could occur, especially in patients undergoing a repeat chemonucleolysis procedure with a prevalence of 17%. Other adverse effects reported in the USA to the Food and Drug Administration (FDA) include infections, hemorrhage, namely subarachnoid hemorrhage, and neurologic events with a mortality rate of 0.019%.4-12.

The nucleo-discectomy introduced by Onik is called “automated” percutaneous lumbar discectomy (APLD) since it involves a mechanical probe. Working by a “suction and cutting” action for removal of the nucleus pulposus this is a minimally invasive technique. Candidates for this procedure should be carefully evaluated on the basis of precise clinical criteria and instrumental diagnosis. A study of 1146 patients treated by Onik reported two cases of discitis (0.17%), one acute hematoma of the iliopsoas muscle and in eight patients (0.7%) the disc protrusion appeared more bulky, extruded or sequestrated after the percutaneous procedure. Cases of infectious discitis after the procedure have also been referred in other studies13-18.

Intradiscal electrothermal treatment (IDET) was developed as a potential alternative therapy for patients with chronic lower back pain resulting from an internal disc disruption who failed to
improve with any of the wide variety of non-surgical treatments available. IDET involves coagulating the anulus fibrosus of the painful disc with a flexible electrode which is threaded into the disc percutaneously under fluoroscopic control. A study of 1675 patients treated reported a few cases (0.4%) of nerve root injury and another study had a case of cauda equina. A case report describes the migration of a broken intradiscal electrothermal therapy catheter tip from the disc space into the thecal sac, leading to a radiculopathy that improved after removing the catheter. A recent case study reported a complication of endplate osteonecrosis post-IDET procedure, while another study found one patient with endplate erosion post-IDET. A further IDET study treating 79 patients with discogenic back pain reported a complication rate of 10%, and the only risk factor associated with intradiscal electrothermal therapy failure was obesity (P = 0.01). These complications raise serious concerns over the long-term sequelae of thermal treatment on the intervertebral disc and stress the importance of further studies and continued follow-up.

Percutaneous laser disc decompression (PLDD) is a minimally invasive technique pioneered by Choy and colleagues in 1984 for the treatment of patients with herniated disc problems. The advantage of PLDD is that it reduces the volume and pressure of the affected disc. The aim of PLDD is to vaporize a small portion of the nucleus pulposus of an intervertebral disk, thereby reducing the volume and pressure of a diseased disk. One study treated 3377 patients using the Nd-YAG laser and the complication rate evaluated was 0.5% (1% in the cervical spine area). Another study of 1275 patients treated reported 0.4% of infectious discitis. A further study with 178 herniated cervical discs in 93 patients treated with PLDD using the Nd-YAG laser reported only one complication (0.6%): a retro-esophageal abscess that responded to incision and drainage. A complication rate of less than 1% was referred in a study after 752 intervertebral discs procedure in 518 patients.

Nucleoplasty was recently approved by the FDA (1999). The technique uses non-thermal ablation (coblation=controlled ablation) with a 10-20% reduction in disc volume. This action occurs through an electrode positioned in the nucleus pulposus using low temperatures (50-70°C) and achieves the same results as thermal ablations at high temperatures (150-200°C). The current data on this new technique are insufficient. Preliminary reports indicate that the technique is relatively safe, but early and long-term effects and/or complications observed with this procedure have not yet been reported.

We emphasize that oxygen-ozone therapy is a minimally invasive procedure with positive results in more than 75% of the cases and no complications in our case histories of more than 15,000 patients. Our literature search disclosed some reports of adverse events. The first case report described a case of bilateral intraocular hemorrhages occurring...
after transcutaneous intradiscal and periganglionic infiltration of O$_2$O$_3$ for lumbar disk herniation. A 45-year-old woman was referred to the orthopedics department for an intradiscal (10 ml) and periganglionic (20 ml) injection of O$_2$O$_3$ mixture at an ozone concentration of 27 µg/ml for the treatment of lumbar disk herniation. The injections were administered by an extraspinal lateral approach at the L1-L2 level using a 22-gauge 17.78 cm spinal needle. The time for each injection was 15 seconds in all. No premedication or anesthesia was given, and the procedure was performed at an outpatient facility. At the end of the treatment the patient was advised to rest in a supine decubitus position for two hours. Immediately after the procedure she noticed “patches” obscuring her vision in both eyes. An ophthalmic examination seven days after infiltration disclosed a reduction of visual acuity. Magnetic resonance imaging of brain and spinal cord for intracranial hemorrhage was unremarkable. Blood pressure, blood sugar, full blood count, and clotting screen were normal.

The authors described literature reports of possible retinal hemorrhages during/after myelography or epidural corticosteroid injections. The invoked mechanism is that an increase in CSF pressure, transmitted through the sheaths of the optic nerve to the retinal venous circulatory system caused rupture of the retinal and peripapillary capillaries, causing bleeding from retinal capillaries. Another possibility is that leakage of ozone from the disc due to a microfracture of the anulus fibrosus with transient spike in cerebrospinal fluid pressure after disk infiltration could be responsible for the retinal hemorrhages.

Our considerations concerning this first case report are that the amount of 10 cc O$_2$O$_3$ injected at intradiscal level is excessive: in our experience oxygen-ozone leakage in the epidural space is common, but only a fews cc and no problem has ever arisen. The possibility of ozone leaking from the disc due to lesions of the anulus fibrosus with passage in the epidural space has also been described, but no evidence was give. This problem is not so important if the procedure is carried out under CT guidance and the cause-effect correlation cannot be proved with certainty, as the same authors declare.

In the second case report a 66-year-old woman with hypertension who had smoked 20 cigarettes/day since the age of 22 years was admitted to hospital for an abrupt onset of bilateral blindness. The patient had been admitted from a local pain clinic and had developed a tension-type frontal headache without nausea and vomiting and then almost suddenly bilateral blindness during a lumbar (L5-S1) intradiscal ozone injection for sciatica. A computed tomography scan four hours after the onset of symptoms showed multiple hemispheric subcortical lacunar lesions but no sign of recent ischemic or hemorrhagic stroke. Magnetic resonance images showed hyperintensities in the occipital cortex and frontal white matter bilaterally and in the left thalamus in the T2-weighted sequences, with diffu-
sion-weighted highlighted changes in the occipital cortex bilaterally and in the left thalamus. Magnetic resonance angiography performed within 12 hours after onset appeared normal.

The authors presented this case as similar to vertebrobasilar stroke during an oxygen-ozone therapy medical application. The invoked mechanism is that an intense painful stimulus during the procedure could have provoked paroxysmal cardiac arrhythmias leading to embolic migration of thrombotic debris from cardiac chambers. The authors specified that no radiological guidance was used during the treatment. They assume that very strong pain could be cause of arrythmias, but if the procedure is correct patients should not suffer undue pain. Moreover it is not clear if the pain mechanism was assumed by the authors or actually referred by the patient.

Another case report described a 59-year-old woman with an unremarkable history. On hospital admission neurological examination was normal, namely muscle force, reflex responses, and the superficial sensory perception showed no changes in either leg. NCS and EMG were normal in the lower limbs. Magnetic resonance showed a posterior protrusion of the L4-L5 disk that was in contact with the proximal portion of the L5 radicular pouch and a median posterior protrusion of the L5-S1 disk with moderate bilateral foraminal stenosis. The patient was judged not to be a candidate for a conventional surgical approach. One month later she received a percutaneous intradiscal (L5) injection of an O₃O₃ mixture with an ozone concentration of 10 µg/ml. The patient did not complain of any sensation immediately after introduction of needle and drug, but a few minutes (figure 6B) after the procedure, she experienced paresthesia along the anterolateral compartment of her left leg and hypesthesia over the dorsum of the left foot. The day after, lumbosciatalgia occurred in the left limb. Subsequently a ventral and dorsal root injury was diagnosed according to clinical, physical and electrophysiologic findings.

The principal invoked mechanism is: “assuming the presence of microfractures of the annulus fibrosus, one possibility is that an abrupt, transient spike in CFP after disk infiltration was responsible for the lesions. In fact, dorsal and ventral roots, crossing through a subarachnoid space and lacking in perineurium and epineurium, are susceptible to be damaged by a sudden rise in CFP”. According to the authors, this mechanism could explain the double injury found in this patient, whereas they excluded a direct lesion by the needle because the patient did not refer any pain during the injection.

In this case we have several doubts about the procedure adopted. In our opinion the concentration used (10 µg/ml) is low and we have no information about the injection pressure. Nor do we have any elements to evaluate the technique used or whether any radiological guidance was adopted for the procedure (CT? Fluoroscopy?). In addition, we do not consider it correct to treat a bulging without radiculopathy.

The lack of information makes it impossible to understand what occurred in these adverse events published, therefore we think that they cannot be taken into consideration.

The last most recent case report of fulminating septicemia secondary to oxygen-ozone therapy failed to explain the procedure adopted correctly, and for this reason it is impossible to associate the adverse event with the therapy itself. The only thing we can understand is that the authors did not use correct asepsis and hygiene procedures. Since ozone is a very powerful disinfectant is highly improbable that this gas can create this adverse event.

**Conclusion**

When the guidelines of the Italian Oxygen-Ozone Therapy Federation are followed, intradiscal and periganglionic injection of oxygen-ozone mixture is considered safe, without any complications or collateral effects making intradiscal-intraforaminal oxygen-ozone injection under CT guidance the method of choice in the percutaneous treatment of herniated disc.

Our study covered about 12,000 patients, and all the procedures were performed following the guidelines of the Italian Oxygen-Ozone Therapy Federation (FIO) with no complications.

Hence, the low costs of oxygen-ozone therapy and the lack of any complications or collateral effects make this minimally invasive procedure safe and useful for the treatment of lumbar disc herniation, in particular in patients who have failed to respond to conservative management, before recourse to surgery or when surgery is not possible.
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Bonetti, Muto, Andreula, Pellicanò

Reportage
Vertebroplasty, Kyphoplasty and Ozonucleolysis

October 29th, 2006 - Tata Institute - Mumbai (India)

Poster of the Congress
Gateway (Mumbai, India)

Tata Institute is the most important cancer hospital in the whole of India.

Bonetti

Andreula and Bonetti are awarded prizes at the Congress of Vertebroplasty and Ozonucleolysis held in Mumbai (India) on 29th October 2006

Bonetti, Muto, Andreula, Pellicanò
Spinal Ozone Therapy in Lumbar Spinal Stenosis

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Key words: ozone therapy, lumbar spinal stenosis, neurogenic claudication, low back pain

SUMMARY - Lumbar spinal stenosis (LSS) is the first indication of lumbar surgery in the population over 65 years in the USA, according to the North American Spine Society. Degenerative aetiology is the most common, and as the elderly population grows, this pathology will increase in prevalence. The natural history of LSS shows that there is no need for surgery unless symptoms clearly progress or the clinical situation is unbearable. A high rate of complications with traditional surgery has encouraged the development of minimal invasive surgery and percutaneous techniques like ozone-therapy, for improving quality of life in these patients. In vitro studies have demonstrated the phospholypase A2 blocking action of ozone, which is the same enzyme steroids block to produce their antinflammatory effect. The success of epidural and intraforaminal steroids injections in decreasing surgery rates and the published reports comparing these techniques versus ozone injections encouraged me to use periforaminal ozone injections to treat these patients. Based on the SICOT 953902 protocol widely used in Italy to treat lumbar spondylosis and the works on steroids injections in LSS, an experimental protocol was devised and used in a previous study to determine the indications and the optimal number of sessions in a group of 20 patients. Seventy-two patients have completed the protocol since September 2002 with no drop outs; 59 patients have a one year follow-up. One patient died five months after ending the protocol. No major side effects were observed; four patients returned to their baseline during the first year of follow-up. Evaluation was done using the Zurich Claudication Questionaire (ZCQ) and Visual Analogue Scale (VAS) for low back pain and leg pain. These scales were fulfilled by the patients before the treatment and in the follow-up controls at one, three, six and 12 months. Forty-three patients were considered excellent and good results, reaching a ZCQ improvement over 60% or 40%. This is a 74% success rate out in the 58 patients evaluated at one year. Natural history positive evolution rate of LSS has been settled at around 15%, so the protocol seems to be useful for treating LSS patients. A randomized controlled study directly comparing treated and non-treated patients would be necessary to confirm these results.

Introduction

Lumbar spinal stenosis (LSS) refers to the narrowing of the neural canal containing the lumbar roots intradurally (central canal) and extradurally (lateral canal) (figures 1-2).

Although there have been references to this pathology since 18031, the modern concept was settled by Henk Verbiest in 19492.

Epidemiology

According to the North American Spinal Society (NASS)3, around 20% of the adult population suffers from this pathology (5% central stenosis and 15% lateral stenosis). In patients over 60 years old, it is well tolerated, being asymptomatic in more than 20% of patients with radiological LSS. On the other hand, 98% of patients under 60 years are symptomatic. Nowadays, LSS has become the first indication for lumbar surgery in patients over 65 years in the USA.

Anatomy

The central canal has a variable anterior-posterior diameter4 that ranges from 15 mm in L1-2 to 12 mm in L5-S1. This gives us an area ranging from 85 to 100 mm². The lateral canal is present “as it is”5 in 72% of the L3-4 level and in 100% of L4-5 and L5-S1 levels6. Its dimensions range from 50 to 150 mm² and depend on the lumbar flexion to extension position.

Classification

According to the items affected, lumbar stenosis can be classified as: 1) Central:
Spinal Ozone Therapy in Lumbar Spinal Stenosis

J. Baeza-Noci

a) Absolute: when the central canal diameter is below 10 mm or the area is below 65 mm$^2$.
b) Relative: when the central canal AP diameter is between 10 and 12 mm (area between 65 to 85 mm$^2$) and one of the following factors is present:
   - Disc protrusion.
   - Body posterior osteophytes.
   - Flavum ligament hypertrophy.
c) Combined: relative stenosis with the presence of more than one concomitant factor.

2) Lateral: narrowing greater than 50% of the area.
3) Mixed: central + lateral.

Depending on the aetiology, LSS can be classified as 8:
1) Primary:
   a) Idiopathic: short pedicles, spondilolysthesis with spondilolysis.
   b) Achondroplasy.
2) Secondary:
   a) Degenerative.
   b) Iatrogenic: post-surgery.
   c) Post-traumatic: body fracture, pedicle/isthmus fracture.
   d) Others: Paget disease, skeletal fluorosis, etc.

Clinical symptoms

LSS give rise to three main symptoms:
- Neurological intermittent claudication.
- Radicular pain and/or discomfort.
- Low back pain.

The three symptoms are related to the patient’s position. Seated position and slight lumbar flexion produces relief of pain due to an enlargement of the size of both canals. On the other hand, the upright position and lumbar extension reduce the size of the canals, worsening the symptoms. The lumbar pain is related to the anatomical damage of what Kirkaldy-Willis named the “three joint complex”.

Two different factors have been proposed to explain the neurological alterations: a) a mechanical factor and a vascular factor. The mechanical factor is obviously deduced from the observation of the symptoms that clearly change in relation to the patient’s position. The chronic compression of root and ganglion produces oedema and fibrosis in these structures, with hyperexcitability and ectopic firing. The anatomopathological findings also show vascular stasis and hypoxic changes, related indirectly to the mechanical factors, increasing the malfunctioning of the neural structures.

Diagnosis

Medical history and physical examination disclose the three typical symptoms, which are not present in all cases. We confirm the diagnosis with imaging (X-ray, CT, MRI) and neurophysiologic assessment.

Natural history

Before treatment, we must know the natural evolution of LSS to properly decide the best management for our patients. I emphasize two papers: the first one by Johnson who followed 32 patients with LSS during 49 months; 70% remained without clinical changes, 15% worsened needing surgery and 15% improved the baseline; the second paper by Atlas et al., known as the Maine Lumbar Spine Study, followed 42 patients with conservative treatment for ten years; 36% of patients needed surgery, 40% of them being satisfied after the surgery; the remaining patients (64%) did not need surgery and 54% of them were satisfied.

Treatment

From these papers and other similar reports, there is strong evidence that treatment should be conservative unless there is severe pain, an unbear-
able clinical situation or progression of the neurological deficit.

Although it is the first option for the majority of patients, conservative treatment has not been standardized\(^\text{14,15}\). It is based on:
- Analgesic drugs.
- NSAID.
- Gabapentin and pregabalin (under testing).
- Steroids: oral, epidural, intraforaminal.
- Physical therapy.
- Lumbar support.

Surgical treatment comprises two groups of techniques:
- Neural decompression:
  - Bone removal:
  - Laminectomy (total, partial).
  - Facetectomy.
  - Recalibrating.
  - Spur removal.
  - Interespinous devices.
- Spine fixation:
  - Non-instrumented.
  - Instrumented:
    - Posterior.
    - Anterior: PLIF, TLIF, ALIF.

The first group of techniques is devoted to improving the neurological symptoms. The second group is for low back pain and instability if present. Surgical treatment is not standardized either\(^\text{16}\) and has to be indicated individually\(^\text{17}\) as each case is different. On the other hand, patients are usually elderly, with concomitant pathology, high surgical risk and multilevel disease. Moreover, there is a high rate of iatrogenics\(^\text{18,19}\) (instability, fibrosis, dural tears, root damage, fusion failure, implant malposition, infection, …) and NASS\(^\text{20}\) refers up to 23% of re-operations during the first year.

*Rational use of ozone therapy*

There are several reasons to justify the use of ozone in LSS:
- According the natural history of LSS, the majority of patients do not substantially worsen over time, so surgical treatment can wait in most cases.
- Epidural steroid injections reduce pain and surgical rates in LSS\(^\text{21,22,23,24,25,26,27,28}\), as ozone blocks phospholipase A2 like steroids do\(^\text{29}\), it makes sense to substitute steroid with a much safer drug with the same mechanism of action.
- Ozone also improves the microcirculation\(^\text{30}\) which is a factor of neurological pain in LSS.
- Intrarticular ozone injections ameliorate pain and inflammation in knee osteoarthritis\(^\text{31,32,33}\), so it should also work in facet joint osteoarthritis.
- Intraforaminal ozone injections ameliorate radicular pain in lumbar disc herniation better than steroids (and the effect is long-lasting!)\(^\text{34}\).

*Patients*

From this empirical approach, in September 2002 we started to treat patients with mild and moderate LSS, first to establish the optimal dosage, and then to settle the clinical outcomes in an open prospective non-controlled study.

*Clinical criteria*

Inclusion criteria in our series have always been:
- Age>50 years.
- Neurological intermitent claudication +/- low back pain.
- Conservative treatment for >3 months.

Exclusion criteria are:
- Previous surgery.
- Vascular claudication.
- Peripheral neuropathy (diabetes, f.i.).
- Urgent surgical indications:
  - Fixed/progressive motor deficit.
  - Cauda equina syndrome.
  - Ozone-therapy contraindication.
Imaging criteria

Indications are:
- Relative central stenosis (no pedicle shortening):
  - Degenerative disc protrusion/spondylosis.
  - Flavum ligament hypertrophy.
  - Small osteophytes.
- Lateral stenosis:
  - Any aetiology but synovial cyst.
- Mixed stenosis (central+lateral):
  - “Three joint” degeneration.
Contraindications are:
- Absolute central stenosis.
- No recent fracture related to stenosis.
- No spondylolisthesis greater than grade I.
- No scoliosis greater than 15°.

Basic statistics

From September 2002 to June 2006 I have treated 72 patients with mild and moderate LSS according to the Zurich Claudication Questionnaire. From them all, one died of natural causes five months after ending the treatment; 13 have a follow-up of less than one year. I have included in this paper the remainder of the group (58 patients).

Gender, age and level distribution are shown in figures 3, 4 and 5.

Method

Ozone treatment

I used the SIOOT (Italian Society of Oxygen-Ozone Therapy) protocol 953902 with small modifications; this protocol is widely used in Italy and Spain to treat low back pain and mild lumbar disc herniation:
- ten twice weekly sessions + five weekly sessions.
- two periforaminal injections (right and left) per level.
- 2 cc from spinous process – No fluoroscopy.
- Local anesthesia.
- 10 cc-20 microgr/ml each injection.

In a preliminary study we tested the best dosage between ten and 20 sessions, finding 15 to be the most successful in a homogeneous group of LSS patients.

Only ten patients had 12 sessions because of an asymptomatic clinical situation. I decided not to exclude them from the study, but to see if this group had a different outcome, which it did not.

The original protocol uses intramuscular injections with a 40 mm length needle. I use a spinal 85 mm long needle to reach the foramen by putting the tip of the needle on the most lateral side of the vertebral lamina. You should be careful in this manoeuvre, because you can touch the root with the tip of the needle if you go too laterally; although there is no risk in this, your patient will feel an electric shock.

Figures 6 and 7 show the different distribution of gas depending on the position of the needle.

The ozone generators used were Multiossigen 99 IR and Iral with CE compliance number. All the disposable material was ozone resistant. The syringes used were BD 60 cc and the needles were Spinocan 25G×3½”.

Follow-up controls

Patients were followed after the treatment for one, three and six months; then one year (58
patients), two years (28 patients) and three years (6 patients). This paper makes a short reference to the two-year group, without statistical significance, and no reference to the three-year group.

**Evaluation scales**

The evaluation of the patients was done previously and in each follow-up control, with three scales:
- Zurich Claudication Questionaire.
- Leg pain VAS.
- Low back pain VAS.

These scales were used since in the time I started the study, the USA FDA department advised them for medical surgical devices in LSS patients as it was the only validated method. Thus, I should be able to compare clinical outcomes with other papers.

Zurich Claudication Questionaire (ZCQ) is a scale divided into four domains:
- Symptom severity:
  - seven questions (1 to 5 points).
- Physical function:
  - five questions (1 to 4 points).
- Satisfaction:
  - six questions (1 to 4 points).

A score of one point means the situation is Excellent (18 points) and four to five points means Very Poor (79 points).

Data between domains should not be added. To show data properly, the punctuation in each domain was divided between the number of questions to be able to compare between them and test the correlation. Due to the fact that the “Symptom severity” domain ranges up to five points, and the other domains range up to four points, the first original data were corrected to a four point scale, only for graphic representation. VAS ranges from 0 (no pain) to 10 (most un-bearable pain). All data were collected on a form with the patient’s ID, date of control and control number. The score was written down by the patient in the waiting room just before the control. Afterwards these data were inserted into a Microsoft Excel-2003 sheet for simple calculations. Statistical analysis was performed over the data with Statgraphics Plus Version 4 standard edition. All software runs on a laptop with Microsoft Windows XP professional SP2.

**Results**

According to ZCQ, 43 patients were considered excellent and good results, reaching a ZCQ improvement over 60% or 40% respectively. This rate is 74% of success out of the 58 patients evaluated at one year. Baseline ZCQ was 8.78 out of 13, with “Symptoms severity” score of 3.38 (corrected to 2.71 in graphics), “Physical function” score of 2.82 and “Satisfaction” score of 2.58. One month after treatment, the improvement was around 33%. Three months later, the improvement was around 56%, reaching up to 60% at one year follow-up control (figures 8 and 9). If we see the ZQC results at one year, 34 patients (59%) improved over the baseline more than 60%; nine patients (15%) improved between 40% and 60%; three (5%) improved between 21% and 40 % and 12 (21%) improved 20% or less. We considered recurrence those patients (46) with improvement over 20% who worsened significantly and permanently during the follow-up. Four patients (8.7%) fulfilled...
these criteria. One went for surgery; three repeated the treatment. These three patients were not re-included in this study. We considered failure the fair and poor results, with improvement equal to or less than 40%. Twelve patients fulfilled these criteria; three (25%) returned to the baseline situation and went for surgery. VAS improvement reflects the results shown in ZCQ graphics. Low back pain dropped from 6.93 to 0.18 and leg pain from 7.97 to 0.17 (figures 10 and 11). No major complications were observed. No patient abandoned the treatment. There is only one missing case due to death for natural reasons. The 12-session patients group (10 patients) showed no statistically significant difference from the 15-session group (48 patients) regarding ZCQ or VAS results.

**Discussion**

It is very difficult to compare this cohort with other published series. Most of the surgical papers are retrospective and heterogeneous in techniques and the good results range from 45% to 86%.

The scales used also differ so direct matching is not possible. Katz et Al refer to clinical outcome of hemilaminectomy in LSS using ZCQ and VAS as evaluation scales. Zucherman et Al compared X-Stop interespisous device vs epidural blocks in a group of 200 patients randomized between the two techniques. Seventy-three percent had significant improvement at six months; results tended to worsen over time, and two-year follow-up showed 63% of significant improvement. Evaluation scales were ZCQ and VAS. Inclusion and exclusion criteria are nearly the same as those in this study, so the results can be compared. The complications rate is the most important goal of ozone therapy compared with any paper on non-conservative treatment. Surgical reoperations range from 10-23%. The length of the treatment is around two months. No patient abandoned the treatment in our series, but it would be useful to shorten the treatment without worsening the results. A higher ozone concentration may help, but the higher the ozone concentration used,
the greater the pain during the injection. A recent paper by Bonetti et al. showed an improvement in LSS with intraforaminal injection. Direct comparison between these two techniques may help to establish an optimal treatment.

Conclusion

Seventy-four per cent of patients improved significantly (excellent and good results) from the baseline after one year. Peak improvement was achieved in the first six months after treatment. The rate of recurrence was 8.7 at one year, over 79% of patients with excellent, good and fair results. My major concern is long-term recurrence to be able to establish a long-term prognosis in case of initial success. We know from the literature that there is a positive evolution of LSS in around 15% of patients, so this technique may be useful for treating patients with mild and moderate LSS according to ZCQ. A randomized controlled study directly comparing treated and non-treated patients, or ozone therapy versus other strong validated treatments, would be necessary to confirm these results.

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Experimental Ultrasound Study Monitoring Diffusion of an Oxygen-Ozone Gas Mixture in Adipose Tissue

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Key words: ultrasound, diffusion dynamics, oxygen-ozone

SUMMARY - This paper reports the first ultrasound demonstration of the diffusion of an oxygen-ozone gas mixture in human adipose tissue. The study aimed to assess possible changes in injection technique in the treatment of oedematous fibrosclerotic panniculopathy and localised adipose deposits.

Introduction

The advent of ultrasound devices fitted with high resolution probes has led to the study of superficial tissues in high anatomic detail in different body districts.

From an ultrasound point of view adipose tissue is made up of a complex internal architecture characterized by hypoechogenic areas (adipose tissue) within which narrow hyperechogenic septa are displayed (connective tissue). Ultrasound devices can also give accurate measurements of the thickness of the subcutaneous adipose panniculum (ultrasound foldmetry).

This study aimed to ascertain the potential applications of ultrasound in oxygen-ozone infiltrations into subcutaneous adipose tissue and for ultrasound demonstration of the diffusion of the gas mixture in the tissue after injection.

Materials and Methods

We used the following equipment:

a) A portable echograph fitted with a high resolution probe with frequencies of 10 MHz.
b) A 50 cc syringe with an eccentric cone.
c) A 20 mm long 27 G needle.
d) An ALNITEC-OZO FUTURA 2 medical ozone device for the production of oxygen-ozone.

The tests were carried out on five patients. The trochanteric and abdominal regions were treated in all cases injecting 10 cc of the gas mixture into each target area with the needle perpendicular to the skin. The O2-O3 gas mixture was administered at a concentration of 5 µg/ml which is the average concentration commonly used in clinical practice (2-10 µg /ml). The amount of 10 cc gas mixture was chosen because larger volumes give rise to pain in the injection site and are therefore poorly tolerated. As usual, each injection was preceded by an aspiration manoeuvre withdrawing the syringe plunger to avoid accidental injection of gas into a blood vessel.

Longitudinal and transverse ultrasound scans were done over the region of interest in all patients to visualize the normal echographic tissue anatomy. By appropriate positioning and orientation of the ultrasound probe the O2-O3 gas mixture was injected monitoring diffusion of the gas within the adipose tissue. The procedure was recorded on paper and video for subsequent evaluation.

Results

Ultrasound scans displayed the O2-O3 gas mixture in all patients documenting its diffusion within the adipose tissue. The O2-O3 gas mixture is highly echogenic and well differentiated from adipose tissue. Ultrasound also demonstrated the characteristic distribution of the gas in the adipose tissue extending in circular movements with a radius of 5 cm on a plane perpendicular to the needle direction, whereas its diffusion in depth from the surface was around 3 cm.
Figure 1 Ultrasound scan showing the subcutaneous adipose tissue characterized by a mainly hypoechogenic echo pattern (adipose lobules) with hyperechogenic septa (connective tissue).

Figure 2 This ultrasound scan over the anterior abdominal wall served to measure the thickness of the subcutaneous adipose tissue.

Figure 3 A,B) Peritrochanteric region. Top: ultrasound evaluation of the subcutaneous adipose tissue before injecting the O₂-O₃ gas mixture. After O₂-O₃ infiltration the ultrasound scan displayed the gas as a highly echogenic structure diffused in the tissue. C,D) Anterior abdominal wall. Top: note the characteristic ultrasound appearance of the subcutaneous adipose tissue. After O₂-O₃ infiltration the hyperechogenic gas diffuses within the tissue mainly along the horizontal planes.
Conclusions

Our findings add further information in determining the distance between injection points for infiltration of an O$_2$-O$_3$ gas mixture to treat qualitative and quantitative changes in the adipose tissue (oedematous fibrosclerotic panniculopathy and localised adiposity).

Ultrasound is an effective means of guiding O$_2$-O$_3$ injection and monitoring the long-term efficacy of treatment by means of accurate measurements.
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Oxygen-Ozone Therapy Associated with Magnetic Bioresonance in Degenerative Arthrosis of the Spine: Preliminary Findings

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Key words: oxygen-ozone therapy, medical ozone, spondyloarthrosis, magnetic bioresonance

SUMMARY - We describe our preliminary experience in treating degenerative arthrosis of the spine in elderly patients administering oxygen-ozone therapy associated with magnetic bioresonance. From April 2005 to November 2006 we selected 490 patients with CT and/or MR evidence of spondyloarthrotic disc degeneration of the lumbar spine. All patients had been treated by CT-guided intraforaminal oxygen-ozone injection as the first therapy followed by another four weekly outpatient paravertebral infiltrations. All patients were then offered the association of magnetic bioresonance sessions in the month after the last outpatient infiltration. The patients who agreed to supplementary bioresonance (196 - group A) were clinically reassessed three months after the last treatment session. The patients who opted for oxygen-ozone therapy alone (294 – group B) had a clinical follow-up visit six months after the end of treatment. The good results obtained by the association of oxygen-ozone therapy with magnetic bioresonance show that these two methods constitute an ideal treatment free from side-effects for patients with degenerative disease of the spine.

Introduction

The longer average lifespan has led to an exponential increase in degenerative disease of the lumbar spine in elderly patients. In particular, non-discal spine disease (osteoarthrosis, pseudo-spondylolisthesis, vertebral canal stenosis, facet joint syndrome) is increasingly the cause of disability in people who already have other age-related diseases (e.g. obliterating arteriopathy of the lower limbs, diabetes, cerebrovascular insufficiency, etc.)

Comorbidities may also limit the use of analgesic and anti-inflammatory drugs which could relieve pain and improve patients’ quality of life even though they do not resolve the natural evolution of the degenerative process.

We present the preliminary findings of a study on 196 patients aged between 55 and 87 years with contraindications to the use of regular analgesic and anti-inflammatory medication to assess the therapeutic efficacy of infiltrations of an O$_2$-O$_3$ gas mixture in association with magnetic bioresonance sessions. Clinical outcome was reassessed three months after treatment in comparison with a group of patients who received O$_2$-O$_3$ therapy alone.

The aim of the study was to ascertain any improvement in the therapeutic success rate in elderly patients with degenerative spine disease combining well established O$_2$-O$_3$ therapy with a novel treatment like magnetic bioresonance.

We used a Vital Body System (VBS) which has a pulsed magnetic field, i.e. intermittent emission of electromagnetic waves. Magnetic bioresonance is a cybernetic treatment system indicated for all chronic degenerative diseases of bones and joints.

Material and Methods

From April 2005 to November 2006, 490 patients aged between 55 and 87 years (average age 68 years) with chronic low back pain underwent CT-guided infiltration of a O$_2$-O$_3$ gas mixture completed with four weekly paravertebral outpatient injections. After the treatment patients were offered magnetic bioresonance sessions in the month after the last outpatient O$_2$-O$_3$ injection.

On enrolment a clinical record was prepared for all patients including the following information: name, date of birth, date of enrolment, date of treatment, clinical examination details defin-
ing pain characteristics, irradiation, paraesthesias, Lasègue’s sign, degree of sensitivity, lower limb reflexes, plantar and dorsal foot extension, dorsal extension of the big toe. Before enrolment all patients had had a CT or MR scan documenting advanced signs of arthrotic zygo-apophyseal degeneration, multiple lumbar discopathies, segmental canal stenosis, pseudo-spondylolisthesis and severe features of scoliosis. The patients enrolled in the study had chronic unilateral or bilateral low back pain irradiating along the innervation territories of the lumbosacral plexus.

Patients with electromyographic evidence of neurogenic injury (diabetic neuropathy) and those with concomitant obliterating arteriopathy of the lower limbs with grade III and IV intermittent claudication were excluded.

After disinfecting the target area all patients received local skin anaesthesia by ethyl chloride spray. Infiltrations were carried out by specialist neuroradiologists at the Neuroradiology Service of Città di Brescia Hospital. The injection site was identified under CT guidance and marked with a dermographic pen on the skin. The distance from

Figure 1  Total body diffusor (VBS).

Figure 2 A 78-year-old man with chronic low back pain. The MR scan shows multiple degenerative discopathies, namely L4-L5 with vertebral collapse of D12 (arrows). The D12 vertebral body is shortened with large intraspongiotic herniations in the middle third of the end plates. The MR features of vertebral collapse rule out the possibility of vertebroplasty as the fracture appears well stabilized. The patient received multilevel O₂-O₃ injections and subsequently underwent a cycle of three 15 minute daily sessions of magnetic bioresonance treatment for 30 days with an excellent clinical outcome.
this point to the root canal was then measured. A 22 G Terumo needle (usually 9 cm long and sometimes longer depending on patient size) was positioned 2-3 mm from the root canal close to the ganglion of the nerve involved. CT scan was repeated to check the correct placement of the needle.

In patients with facet joint syndrome the O$_2$-O$_3$ gas mixture was injected into the intervertebral joint or just around the joint capsule when the intervertebral space could not be reached (osteo-phytosis, asymmetry of the facet joints and unusual conformation of the joint rim).

Up to three perianglionic injections were made in patients with disease at more than one level. The treatment was administered injecting 3 cc of the gas mixture at 25 µg/ml then withdrawing the needle several millimetres and injecting another 5 cc of the mixture to involve the whole joint region. Correct distribution of the gas mixture was checked by CT scans of the root canal and intervertebral joint. All injections were made using a device fitted with photometric detection of the ozone concentration in the gas mixture. The cycle of treatments was completed with four weekly par-

Figure 3 A,B  A 73-year-old woman with severe right low back pain. CT scan shows a right preforaminal partially calcified disc herniation (arrows) with nerve root compression in both right L5 and S1. The patient was treated by O$_2$-O$_3$ therapy with CT-guided right L5-S1 intraforaminal infiltration which gave immediate clinical relief. After O$_2$-O$_3$ administration was completed the patient also underwent a cycle of magnetic bioresonance treatment with a further clinical improvement.

Figure 4  A 68-year-old man. MR scan shows spondylodiscarthrosis, particularly marked in L2-L3 (arrows). He received CT-guided bilateral intraforaminal injection of O$_2$-O$_3$ followed by a cycle of home treatment with VBS At three month follow-up the patient reported a 50% reduction of pain.
Oxygen-Ozone Therapy Associated with Magnetic Bioresonance in Degenerative Arthrosis of the Spine: ... M. Bonetti

avertebral injections in an outpatient setting. These injections consisted of 10 cc of O₂-O₃ gas mixture at 25 µg/ml into each infiltration point using 23 G Terumo needles. A medical ozone device was used (ALNITEC FUTURA 2) fitted with photometric detection of the ozone concentration. The injection site was kept constant at 2 cm from the spinous apophysis of the space involved. Treatments were usually multilevel.

Magnetic bioresonance sessions were carried out with a Vital Body System using a pulsed magnetic field emitting intermittent electromagnetic waves to ensure that:
1) the thermal effect heating body tissue was almost non-existent as heat can be dispersed during the breaks in treatment; this is important because it means VBS can be used in patients with varices and reflex algodystrophy who cannot tolerate the increase in temperature;
2) dependence is almost eliminated so the treatment can be administered on a continuous basis and patients with chronic degenerative disease can continue the therapy at home. VBS has no side effects. We used a total body diffusor making three applications a day lasting 15 min each. As our patients were elderly and often weak we started the treatment at low intensity, one or two, working up after three or four applications.

The patients who received O₂-O₃ injections alone (294 – group B) had a clinical follow-up visit six months after the end of treatment whereas the patients who agreed to supplementary magnetic bioresonance session (196 – group A) were clinically reassessed three months after the last treatment, using a modified MacNab method considering:
a. excellent: resolution of pain and return to regular daily activity before pain onset;
b. good or satisfactory: more than 50% reduction of pain;
c. mediocre or poor: partial reduction of pain below 70%.

Results

At three month follow-up 118 (60%) patients in group A reported a clear-cut improvement in clinical symptoms with almost a disappearance of low back pain.

Although satisfied with the treatment, 41 (21%) patients reported a partial reduction of pain and
A 68-year-old man. A) Coronal MR scan shows severe convex left scoliosis of the lumbar spine. B) Sagittal MR scan documents the inversion of the physiological lordosis with multiple lumbar discopathies, L4-L5 herniated disc, Modic type II osteochondrosis of the L5-S1 end plates. C) Axial MR scan of L4-L5 confirms the right paramedian-preforaminal disc herniation responsible for severe low back and sciatic nerve pain. D) Sagittal MR scan after contrast administration shows peripheral enhancement around the L4-L5 herniated disc as if from granulation tissue. At three month follow-up the patient reported unchanged symptoms except for a mild attenuation of sciatic nerve pain.
37 (19%) patients had little or no benefit from the treatment.

At six month clinical follow-up 153 (52%) group B patients had maintained an excellent quality of life with an almost total resolution of low back pain. Outcome was considered poor in 82 (27%) patients.

**Discussion and Conclusions**

Three months after treatment 60% of our group A patients treated with both ozone therapy and magnetic bioresonance reported a clear-cut improvement in quality of life due to disappearance of pain and a resumption of previously abandoned activities. After a period of improvement 41 out of 196 treated patients (21%) experienced a partial return of pain. Eighty-one percent of patients treated with the new techniques had a clinical benefit judged excellent or good compared with 73% of patients who had ozone injections alone.

The treatment success rates therefore appear to be enhanced associating O$_2$-O$_3$ therapy with magnetic bioresonance sessions.

The rationale underlying the good results obtained six months after treatment is the ability of the O$_2$-O$_3$ mixture injected into the ganglionic region to normalize cytokine and prostaglandin levels, increase superoxidedismutase (SOD) and minimize oxidizing reactive species (ROS) with an improvement in local periganglionic circula-

tion and a eutrophic effect on the nerve root. These effects seem to be attenuated in the long-term especially in patients with a continuous algogenic stimulus resulting from morphostructural changes to the spine.

Oxygen-ozone administration has proved a valid treatment for spondylogenic nerve root pain due to its well-known antalgic properties. It is an alternative to medical management with drugs like corticosteroids which have a series of side-effects (e.g. sensory disorders, intestinal/bladder dysfunction) which cannot be ignored, especially in fragile patients like the elderly.

The association of magnetic bioresonance treatment in our cohort further increased the success rate of O$_2$-O$_3$ therapy. The VBS treatment was generally well tolerated by our patients although a worsening of symptoms was noted in nine cases. We reduced the intensity of the treatment to a minimum in these patients for the remainder of the sessions. We concluded that the principle greater intensity = greater efficacy is not appropriate and that the best results are often obtained at lower intensities prolonging the treatment schedule.

Our preliminary findings show that in association with magnetic bioresonance, O$_2$-O$_3$ therapy can guarantee long periods of improved quality of life in patients with contraindications to drug treatments in addition to the medical management required for age-related comorbidities. As no side-effects are entailed, the treatment can be repeated six months to a year later to ensure antalgic cover and avoid the need for surgery.
References

"Máster de Ozonoterapia" en la Universidad de Valladolid

Tras gestiones realizadas por la Dra. Alfonsa Martín, vocal de la Junta Directiva, con la Fundación para la Formación del Colegio de Médicos de Valladolid y la Universidad de Valladolid, estamos preparando un proyecto para realizar un "Máster en Ozonoterapia"

Ambas instituciones han mostrado gran interés en incorporar a su programa formativo este Tema, que ya forma parte de la asignatura de Farmacología en varias Universidades italianas, dentro de la Licenciatura de Medicina.

En breve ofreceremos información ampliada en la Sección "Cursos y Congresos Otros Eventos" - www.aceoot.org
Paravertebral Oxygen-Ozone Infiltrations:
High versus Low Doses: towards the Minimum Effective Dose
A Retrospective Study

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Key words: Ozone, Oxigen-ozone, paravertebral infiltration, side effects, dose, low dose, discal herniation, side-effects

SUMMARY - Paravertebral oxygen-ozone injection is a consolidated technique in the treatment of disc herniation and protrusion given its high success rate and limited side-effects. This study compares different doses and concentrations of O₂-O₃ in relation to therapeutic efficacy and side-effects.

Introduction

Paravertebral infiltration of an oxygen-ozone gas mixture has proved a successful treatment for nerve root compression in the lumbar spine. There have been some reports of adverse effects initially attributed to pain-related vagal reactions and changes in posture ¹, but later ascribed to episodes of syncope and above all a possible gas embolism aetiology ². The gradual increase in the number of O₂-O₃ injections has led to the assessment of possible side-effects. Whereas the infiltration technique is relatively standardized, there are still some discrepancies in the dose and concentration of the gas mixture administered. The reasons for this lie in the relative scarcity of side-effects which in any case vary widely and tend to be mild, and the general belief that ozone is virtually lacking in side-effects.

The aim of this study is to determine the efficacy and side-effects of O₂-O₃ treatment comparing different doses and concentrations of O₂-O₃ at the same concentrations, then the same doses at different concentrations in the treatment of lumbar herniated disc by paravertebral lumbar infiltration in the lumbar spine.

Materials and Methods

This retrospective study analysed patients with low back pain treated by O₂-O₃ injection in the period 2000-2006. All patients had CT or MR evidence of herniated disc in L3-L4, L4-L5 or L5-S1. Median and paramedian, intra and extraforaminal, ascending and descending herniations were treated. Herniations were calcified in 12 cases. All patients underwent O₂-O₃ treatment after the failure of medical management. Exclusion criteria included cauda equina syndrome, pregnancy and uncontrolled hypertension.

All patients received O₂-O₃ injections at concentrations of 20 µg/ml. Patients in the first group (A) had six paramedian infiltrations of 10 ml for a total volume of 60 ml at an O₂-O₃ concentration of 20 µg/ml. Patients in the second group (B) had six paramedian infiltrations of 5 ml for a total volume of 30 ml at an O₂-O₃ concentration of 20 µg/ml. Patients in the third group (C) had six paramedian infiltrations of 5 ml for a total volume of 30 ml at an O₂-O₃ concentration of 10 µg/ml. After placing the patient in a prone position, the gas mixture was injected into the intervertebral spaces affected by the herniation and the immediately adjacent spaces using 20 ml syringes and 50 mm long 23 G needles. Infiltration was carried out after exclusion of intravascular location by a negative aspiration test. If the aspiration test was positive no injection was made and another puncture was done medial or lateral to the entry site. Infiltration was done at flow speeds below 10 ml/min in all patients. Five minutes after O₂-O₃ administration patients were asked to sit up for a few seconds and then to return to the orthostatic position.
The treatment comprised ten to twelve sessions twice weekly. Therapeutic efficacy was assessed in terms of pain reduction using the Verbal Analogic Score (VAS) before each treatment session and the modified MacNab score at the end of the treatment cycle. Any side-effects noted or referred by patients either immediately or in the long-term were recorded. Side-effects were determined in percentage terms in relation to the total number of O₂-O₃ administrations. Statistical analysis was done using SPSS 10 (SPSS INC Illinois) for Windows. Average values were compared using Student’s t test, whereas the percentages were analysed by the χ² test or Fisher’s Exact Test depending on the size of the sample.

**Results**

A total of 508 patients were treated: 123 in group A, 226 in group B, 159 in group C. There were no significant differences among patients in terms of age, sex, associated disease, herniation features and total O₂-O₃ administrations per patient.

Table 1 summarises the results of the study in terms of therapeutic efficacy.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Therapeutic efficacy: The reduction of VAS should be related to the initial value (before treatment)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group A</strong></td>
<td><strong>Group B</strong></td>
</tr>
<tr>
<td>(10 ml × 6)</td>
<td>(5 ml × 6)</td>
</tr>
<tr>
<td>20 µg</td>
<td>20 µg</td>
</tr>
<tr>
<td>Number of patients treated</td>
<td>123</td>
</tr>
<tr>
<td>Number of O₂-O₃ administrations</td>
<td>1405</td>
</tr>
<tr>
<td>VAS &lt; 50%</td>
<td>97%</td>
</tr>
<tr>
<td>VAS &lt; 80%</td>
<td>76%</td>
</tr>
<tr>
<td>MacNab (mod)</td>
<td></td>
</tr>
<tr>
<td>Excellent</td>
<td>54.2</td>
</tr>
<tr>
<td>Good / Satisfactory</td>
<td>21.2</td>
</tr>
<tr>
<td>Mediocre / Poor</td>
<td>24.6</td>
</tr>
<tr>
<td>Surgical referral n° (percentage)</td>
<td>1(0.8%)</td>
</tr>
</tbody>
</table>

The comparison between groups is summarised in table 2.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Side-effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Doses</strong></td>
<td><strong>Group A</strong></td>
</tr>
<tr>
<td>(6-10 ml × 6)</td>
<td>(3-5 ml × 6)</td>
</tr>
<tr>
<td>20 µg</td>
<td>20 µg</td>
</tr>
<tr>
<td>(N=1405)</td>
<td>(N=2609)</td>
</tr>
<tr>
<td>Perspiration</td>
<td>10</td>
</tr>
<tr>
<td>Weakness</td>
<td>13</td>
</tr>
<tr>
<td>Paraesthesias</td>
<td>11</td>
</tr>
<tr>
<td>Chest constriction</td>
<td>4</td>
</tr>
<tr>
<td>Empty head sensation</td>
<td>6</td>
</tr>
<tr>
<td>Headache</td>
<td>3</td>
</tr>
<tr>
<td>Vertigo</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>12</td>
</tr>
<tr>
<td>Lower limb weakness</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
</tr>
<tr>
<td>Percentage total</td>
<td>5.6%*</td>
</tr>
</tbody>
</table>

* p < 0.005 between group A and groups B and C;  
◊ p < 0.005 between groups B and C
Discussion

Paravertebral, intraforaminal and intradiscal O₂-O₃ infiltration has proved a successful treatment for nerve-root compression as demonstrated by numerous scientific reports. The major literature reports published in the last twenty years are listed in table 3.

Table 3

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Dose per single injection ml</th>
<th>Number of injections</th>
<th>O₂-O₃ concentration µg /ml</th>
<th>Needle gauge</th>
<th>Syringe ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verga</td>
<td>1989</td>
<td>30</td>
<td>4</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bonetti</td>
<td>1994</td>
<td>15</td>
<td>2</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Richelmi et Al</td>
<td>1995</td>
<td>10-20</td>
<td>2-4</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protoccoli SIOOT</td>
<td>2000</td>
<td>10-20</td>
<td>2-4</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tabaracci</td>
<td>2000</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bonetti et Al</td>
<td>2000</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tomasso</td>
<td>2000</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gjonovich</td>
<td>2000</td>
<td>15-20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arena</td>
<td>2003</td>
<td>10-15</td>
<td></td>
<td>25-30</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Fabris</td>
<td>2003</td>
<td>10</td>
<td></td>
<td>20-30</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Piana</td>
<td>2004</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ceccherelli</td>
<td>2004</td>
<td>10-20</td>
<td></td>
<td>14-25</td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

The first report by Verga in 1989 suggested using 30 ml in four paravertebral injection points at a concentration of 30 µg. Five years later Bonetti described a similarly effective treatment using 15 ml of O₂-O₃ injected into only two points at a concentration of 25 µg.

In 1995 Richelmi used doses between 10 and 20 ml in two to four infiltration points at concentra-
both the disc space affected by the herniation or protrusion and the spaces immediately above or below is based different reasons:
– to ensure that structures within the intervertebral discs had optimum oxygenation conditions, especially at a time when the mechanical and anatomical function of the disc-vertebra system is inevitably subjected to greater stress due to the impaired function of the adjacent disc-vertebra due to disc disease;
– to split the O₂-O₃ administrations to attenuate pain and side-effects;
– to treat different points to enhance the algogenic stimulus and thereby raise the pain threshold.

It was subsequently decided to reduce the concentration of ozone administered keeping the partial and total volumes unchanged. The concentration adopted was 10 µg/ml based on personal experience and that of other colleagues (Fabris G., personal communication). The results show that there is no statistically significant difference between groups A, B and C with respect to outcome assessed by VAS or MacNab three months after treatment, whereas side-effects were dramatically reduced in groups B and C in terms of pain and other signs and symptoms. Subsequent comparison between groups B and C demonstrated a further significant reduction of side-effects while therapeutic outcome remained unchanged. It is interesting that the reduction of side-effects in groups B and C with respect to group A mainly concerned symptoms due to gas micro-emboli, whereas the mild reduction of side-effects between groups B and C seems to depend on reduced pain on administration of the gas mixture.

Conclusions

Before a new technique can be promoted it must first be validated critically by the group responsible for the original idea of exploring new scientific horizons. This entails an ongoing review of methods both from the strictly speculative standpoint and in terms of procedure with the aim of enhancing the therapeutic success rate and reducing side-effects. The pioneering phase of oxygen-ozone therapy focused on the method as a whole. This was followed by analysis and criticism of the different elements involved in the oxygen-ozone technique. A new phase has seen the focus shift to each detail of the method. The ensuing suggestions can be used extensively when they are favourable to patients. Oxygen-ozone administration is currently an effective, safe and reliable treatment. Its side-effects are now negligible with little clinical impact and not likely to give rise to emboli. This complication also arises during spinal surgery, but is no longer considered a risk using ozone volumes of 5 ml, slow infiltration speed and aspiration test. Reducing the concentration of ozone to 10 µg/ml makes administration of the gas mixture less painful and hence less unpleasant for the patient, without altering its therapeutic effects. This concentration is currently deemed the minimum effective dose. After twenty years, are we close to the gold standard?
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VI Jornadas Nacionales de Oxígeno-Ozonoterapia Médica

Medina del Campo (Valladolid)
16, 17 y 18 de noviembre de 2007

Organizado por:

Dra. Aflonsa Martín Francisco

e-mail: fonsimed@hotmail.com

Aquellos compañeros interesados en presentar su experiencia dispondrán de 10 minutos en el turno de comunicaciones libres.

Se aceptarán 12 comunicaciones por riguroso orden de inscripción y previa aceptación por el Comité Científico.

Existe la posibilidad de presentar el trabajo en forma de Póster.

En breve podrá consultar el Programa Provisional de las Jornadas.
Oxygen-Ozone Therapy: a Hope Turns into Reality
II part

A. IZZO, A. BERTOLOTTI
InterMed Onlus, Africa Sahariana

Key words: Buruli’s ulcer, ozone therapy

For the past two years Intermed Onlus, a humanitarian organization with health cooperation expertise in developing countries, has been tackling a severe disease caused by Mycobacterium Ulcerans. Known as Buruli’s ulcer, this disease takes its name from a region in Uganda where an outbreak occurred in 1958. The germ responsible for the disease was isolated by MacCallum et al. in Australia in 1948. During a primary health care project implemented at the Zinviè dispensary in Benin, Intermed Onlus noted numerous cases of Buruli’s ulcer, especially in children. Frequent bathing in Benin’s many rivers or lagoons, the children would be bitten by an aquatic insect responsible for inoculation of the mycobacterium causing the disease. Initially a nodular formation appears on the skin ulcerating after about a week to give rise to lesions which may be extensive. Current treatment is surgery which is seldom confined to excision of the nodule because patients present when they already have huge ulcers making resection highly invasive with large excisions requiring skin grafts. When possible patients are also given medical treatment with rifampicin and streptomycin.

Intermed Onlus works in cooperation with the treatment centre for Buruli ulcer at the “La Croix” hospital run by monks in Benin and in agreement with the hospital management it has installed an oxygen-ozone device to treat patients with the disease. After staff were trained by Intermed to administer ozone therapy, a treatment protocol was established: 1) prepare the ozonized water at a concentration of 30 µg/ml; 2) wash the lesions; 3) position the bag with insufflation of the mixture at a concentration of 25-30 µg/ml, close the bag with an elastic band, treatment time 20 min; 4) medicate with sterile gauze.

We carried out two to three weekly treatment sessions obtaining excellent results. The surgeon responsible referred difficult cases to us, i.e. patients already treated with skin grafts still presenting large non granulating areas. As seen

Figure 1  Zinviè Centre for screening and treatment of Buruli’s ulcer.

Figure 2  Houses on the lagoon in Benin.
from the figures, other patients with different lesions have been added: a man with severe burns, a child with an arm amputated due to infiltrating carcinoma and a young women with the residue of mastectomy. Hope has turned into reality and Intermed’s commitment is to carry on.
Figure 8  Area of skin removal for grafting.

Figure 9  Child receiving ozone treatment. The area of skin removal for grafting is clearly visible.

Figure 10  Same patient receiving treatment.

Figure 11  Buruli’s ulcer after excision and skin graft.
Figure 12  Washing with ozonized water.

Figure 13  Large Buruli's ulcer treated with ozone.

Figure 14  Child receiving ozone treatment.

Figure 15  Medication after ozone therapy.
Figure 16  Man with burns.

Figure 17  Same patient receiving ozone treatment.

Figure 18  Child amputated for infiltrating carcinoma.
Figure 19 A woman admitted to the Centre.

Figure 20 Residue of mastectomy.

Figure 21 Same patient receiving treatment.
MR Follow-up Three Weeks after Cervical Disc Herniation: A Case Report

M. BONETTI, A. FONTANA
Neuroradiology Service, Clinical Institute; Brescia, Italy

Key words: ozone therapy, oxygen-ozone therapy, cervical herniation

SUMMARY - We describe a 28-year-old woman who suffered a whiplash injury in a road traffic accident. The patient complained of sudden pain in the neck radiating to the right arm caused by herniation of discal material in C5-C6. Prompt oxygen-ozone treatment by CT-guided periganglionic injection followed by four paravertebral intramuscular infiltrations led to the patient's full recovery in the space of three weeks with disappearance of the herniated disc at follow-up MR scan.

Introduction

Cervical disc herniation is five times less common than herniated disc in the lumbar spine, and is mostly encountered when the disc has already degenerated. The single soft disc protrusions of lumbar disc herniation are seldom seen in the cervical spine where hard disc disease tends to be the rule, often with multiple herniations and prominent spondylosis. Although cervical disc herniations are rarer that those in the lumbar spine, they can give rise to acute symptoms requiring prompt recognition and immediate treatment.

Acute cervical herniated disc may occur at any age and hence is independent of the spondylosis more commonly encountered in middle aged and elderly patients. Acute disc herniation often results from sudden neck movements not calibrated by the patient, but the commonest cause is the typical whiplash injury due to a car accident.

Acute cervical herniation is usually median and hence causes anterior cord compression resulting in spastic paraparesis associated with imprecise signs of spinal level (neck rigidity, upper limb paraesthesias). When the herniation is lateral the main symptom is violent arm pain whereas cord compression is milder or absent. Sometimes the symptoms of herniated disc may be subacute and progressive mimicking a spinal cord tumour.

We describe a young woman with post-traumatic right C5-C6 disc herniation treated by oxygen-ozone injection. The treatment led to a resolution of symptoms and disappearance of the herniated disc at MR follow-up after only three weeks of therapy.

Case Report

On 8th November 2006, a 28-year-old woman driver was involved in a high speed accident with another vehicle. The patient was taken to the nearest emergency room where she was found to have a whiplash injury with onset of right cervicobrachial neuralgia, nausea, vomiting and nuchal headache. Standard x-rays of the cervical spine fail to disclose pathological findings. The patient was prescribed a Camp-type orthopaedic collar for thirty days and analgesic therapy.

Five days later persistence of severe symptoms in the patient led to a cervical MR scan. MR imaging on 15th November 2006 demonstrated a right paramedian subligamentous C5-C6 herniated disc (figure 1 A-E). With this diagnosis the patient contacted us for a possible cycle of oxygen-ozone treatment. After requesting informed consent in view of the patient’s clinical and neuroradiological findings, we started a cycle of O₃-O₂ therapy.

A first session of treatment with CT-guided periganglionic infiltration of the gas mixture was performed at the Neuroradiological Service of the Brescia Clinical Institute on 18th November.
Figure 1 A-E  MR scan (15.11.2006): Right C5-C6 paramedian subligamentous disc herniation (arrows).
After disinfection, the skin was anaesthetized using ethyl chloride spray. CT guidance was used to identify the puncture site which was marked on the patient’s skin. The distance from this point to the ganglion was then measured. A 22 G Terumo needle was positioned 2-3 mm from the foraminal region adjacent to the ganglion of the nerve route involved. Another CT scan was done to check the correct positioning of the needle then 3 cc of the oxygen-ozone mixture was injected at a concentration of 25 µg/ml. Further CT scans monitored the correct distribution of the gas mixture in the root canal of the intervertebral joint. The treatment was administered using a device fitted with a pho-
In the following two weeks the patient received four oxygen-ozone treatment sessions each involving injection of 3 cc of the gas mixture at a concentration of 25 µg/ml puncturing the spinous apophysis two centimetres from the herniated disc space. Remission of symptoms was more or less immediate after the first CT-guided treatment and three weeks later the neck and right arm pain had completely disappeared. With the patient’s consent an MR scan was performed on 5th December, three weeks after the first treatment and demonstrated a complete disappearance of the herniation (figure 2 A-E).

Discussion

It is now widely documented that soft disc herniation has a spontaneous favourable outcome as also supported by CT and MR evidence. Equally widely known is the therapeutic effect of oxygen-ozone therapy. Based on these two considerations, we presented this case report which is vitally important to understand the mechanism of action and consequent clinical advantages of oxygen-ozone therapy, especially when administered to a herniated disc of recent onset and hence with a high water content. To date there have been no neuroradiological reports of patients with such a rapid disappearance of a disc herniation, such as the three weeks in our case. The prompt resolution of pain was due to the indirect mechanisms of ozone administration and hence its anti-inflammatory, analgaesic and eutrophic effects, and reduction of disc degeneration and decongestion of the nerve roots, and its direct effects on the mucopolysaccharide chains of the nucleus pulposus with their oxidation and the release of water molecules and the resulting resolution of disc-nerve root compression. This occurred in our patient after just three weeks of treatment with remarkable findings on clinical neurological follow-up and magnetic resonance imaging. In addition to the importance of the therapeutic outcome in our patient, we also emphasise a new finding for us linked to patient management. Although the patient had severe cervicobrachial neuralgia with evidence of severe disc herniation no surgical indications were posed … “Is this a sign of changing times?”

Conclusion

In view of the rapid resolution of pain without complications and technical ease of execution, we propose oxygen-ozone therapy as a first choice conservative treatment for cervical herniated disc.
References


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L5-S1 Herniated Disc Cured by CT Guided Intraforaminal Infiltration of Oxygen-Ozone Confirmed by MR Follow-up One Month after Treatment.

A Case Report

A. FONTANA
Neuroradiology Service, Città di Brescia Clinical Institute; Brescia, Italy

Key words: oxygen-ozone, herniated disc, medical ozone

SUMMARY - This report describes a male patient with L5-S1 herniated disc completely cured by oxygen-ozone infiltration using the CT guided intraforaminal technique with MR follow-up one month after treatment.

Introduction

Administration of oxygen-ozone to treat disc herniation was introduced for the first time in 1985. Since then positive results varying from 75% to 90% have been reported in numerous literature series.

Low back and sciatic nerve pain is highly disabling and increasingly widespread in all social groups and at an earlier age.

Symptoms arise acutely following unusual movements or strain or slowly, worsening progressively. The underlying causes range from diseases of the intervertebral discs, facet joints, spondilolysis or listhesis, vertebral canal stenosis to primary or metastatic tumours. Accurate diagnosis is essential and is established by thorough clinical examination and appropriate instrumental tests, namely standard spine x-ray in addition to CT and/or MR scans.

Since 1993 our centre has administered oxygen-ozone therapy for low back and sciatic nerve pain resulting from nerve root compression. This paper describes a male patient with disc herniation completely cured by CT-guided intraforaminal oxygen-ozone injection as demonstrated by MR follow-up one month after treatment.

Case Report

A 65-year-old man was referred to us for left low back pain and loss of strength in his leg. Clinical examination disclosed left S1 innervation deficit with weakness in the left sural triceps muscle. The patient presented with an MR scan done on 10.01.2007 showing a large left paramedian L5-S1 herniation (figure 1 A-C).

A neurosurgeon colleague assessed the severity of the patient’s symptoms with clinical examina-
tion and inspection of the MR scan. Following the logical criteria of classical neurosurgical assessment, the patient was advised to undergo surgery as soon as possible.

However, the patient declined the operation and opted for oxygen-ozone treatment having given his signed consent.

The patient was administered CT-guided intraforaminal injection of oxygen-ozone using a 22 G needle and infiltrating 8 cc of the gas mixture at a concentration of 20 µg/ml.

The patient was clinically reassessed two hours after the treatment and referred a clear-cut improvement of low back pain and increased muscle strength. Clinical follow-up ten days later showed a complete resolution of pain and paraesthesia.

The patient is no longer taking analgesic and anti-inflammatory drugs. On 11.02.2007 a follow-up MR scan disclosed a complete disappearance of the L5-S1 disc herniation (figure 2 A-D). Clinically the patient had no symptoms.

Discussion and Conclusions

In daily practice, neurosurgical assessment of our patient’s severe clinical symptoms would usually entail surgical intervention.

However, our patient insisted on attempting oxygen-ozone therapy. The outcome was an immediate clinical response to treatment thereby avoiding surgery. This was confirmed one month later by MR follow-up scan demonstrating a complete disappearance of the treated herniated disc.

We emphasize the absolute safety of oxygen-ozone administration unlike herniectomy.

This operation is still too readily offered in daily practice without considering all the risks involved in surgery including those related to anaesthe-
sia, recurrent herniations, perimedullary and periradicular adherences, a hospital admission and convalescence before returning to work. We think oxygen-ozone administration should be deemed the first choice treatment for patients with herniated disc as it acts on both the symptom of low back pain without and without sciatica and on the underlying causes of disc herniation \(19-23\).
References


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The case for oxygen-ozonetherapy

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Accepted: 29 December 2005

Introduction

The title of this brief review intends to be constructively provocative because oxygen-ozonetherapy is often thought of as toxic, with scant evidence to justify its use in medicine. However, the author will demonstrate that these suppositions are incorrect.

There is no doubt that ozone, the third strongest oxidant in chemistry, is intrinsically toxic. The respiratory system and, to a lesser extent, mucosal membranes and skin should never be exposed to ozone and other pollutants because they enjoy little protection from the antioxidants present in the aqueous-lipid film layer.

During summer months, the bronchial-alveolar lining, which is exposed daily to air polluted with 90–100 ppb ozone, produces toxic compounds (e.g., reactive oxygen species [ROS], lipid oxidation products [LOPs], proinflammatory cytokines and proteases) that damage the lungs and, after being absorbed by lymphatics and capillaries into the circulation, vital organs.

Moreover, saline-washed erythrocytes suspended in saline or cells in culture undergo haemolysis or apoptosis, respectively, even if exposed to very low ozone concentrations, as they fail to be protected by natural antioxidants such as ascorbate, uric acid, albumin and α-tocopherol. However, these experimental data are misleading because, while human blood is endowed with a potent antioxidant system, washed erythrocytes or cells cultured in antioxidant-poor media are very sensitive to ozonation. This has persuaded chemists and cell biologists to establish the dogma that ozone is cytotoxic and should not be used in medicine.

In the 1990s, the direct intravenous (iv) administration of ozone-ozone in human immunodeficiency virus (HIV)-infected patients, in the belief that ozone would destroy the virus, often resulted in pulmonary embolism. This resulted in the prohibition of ozonetherapy in several states in the USA. In addition, incorrect use of ozonetherapy has further contributed to the defamnation of ozonetherapy.

In a recent review, ozone is compared to the Roman god Janus because it has opposing effects: it is toxic in the troposphere or if generated during inflammation, but it is very useful in the stratosphere, where it blocks ultraviolet (UV) rays and is now used widely for water sterilisation, food processing and in veterinary medicine. Moreover, when ozone is used as a drug in a well-defined therapeutic window, its oxidant activity is quenched by the antioxidant system (enzymes and hydrophilic and lyophilic compounds) present in blood and tissue.

It is widely appreciated that any chemical compound, depending on its dosage, can be beneficial or toxic. The most striking example is glucose, which, while essential for life at physiological concentration, can be lethal if it falls below 0.4 mg/mL or is constantly higher than 1.3 mg/mL. Thus, although intrinsic toxicity of ozone must be borne in mind, only a few deaths and side effects have been recorded. In contrast, Vioxx may have caused the death of as many as 55,000 people during the past four years in the USA.

Update of clinical results

Since 1988 the author and colleagues have investigated the therapeutic potential of ozone scientifically using precise ozone generators, which allows continual checking of the ozone concentration in real time by a photometer calibrated using the classical iodometric method. Some reviews and two critical books have reported the first comprehensive...
framework for understanding and recommending ozonotherapy in some diseases.

Today, ozone is considered to be a drug and thus it must be used with caution after carefully defining its therapeutic window\(^\text{16}\) (from 10 µg/mL [0.21 µmol/mL] up to 80 µg/mL [1.68 µmol/mL] blood). Thus, it is important to calibrate precisely the ozone dose used against the antioxidant capacity of the patient’s blood, thereby limiting potential ozone toxicity.

Clinical applications demonstrate that the classical treatment, denominated ozonated autohaumotherapy (O\(_2\)-AHT), which consists of exposing a precise volume of blood to a precisely calibrated ozone dose for a few minutes, followed by re-infusion of activated blood to the donor, stimulates several biochemical pathways\(^{16}\) without producing acute or chronic toxicity\(^\text{16}\). The potent antioxidant capacity of blood tames the reactivity of a calculated ozone dose and readily reconstitutes the antioxidant titre.

In addition, the concept that ozone is always toxic is inconsistent with the knowledge that another two potentially toxic gaseous molecules (nitric oxide [NO] and carbon monoxide [CO]) can operate as crucial cell activators after short exposure to low concentrations in particular cells and tissues.\(^\text{1}^\) On the other hand, during chronic inflammation typical of viral and autoimmune disease, diabetes, atherosclerosis and cancer, excessive and constant release of ROS, NO and peroxynitrite are detrimental and perpetuate the pathological state. Thus, it is possible that precise and brief (2–3 min) oxidative stress induced by physiological ozone concentrations cannot be equated to the pathological chronic oxidative stress caused by excessive and unchecked ROS caused by antioxidants.

Contrary to expectations, the judicious application of ozone in infectious disease,\(^{16,17,23}\) the atrophic form of age-related macular degeneration (ARMD),\(^7\) vasculopathies,\(^{25-31}\) diabetes,\(^8\) wound healing disorders,\(^{15,16,23}\) orthopedics\(^9\) and dentistry\(^{24-26}\) has yielded striking results. Therefore, it would seem appropriate to reconsider the potential of ozone in other diseases.

As soon as it is dissolved in the aqueous part of plasma, ozone reacts immediately with antioxidants and polyunsaturated fatty acids, generating a cascade of well-defined compounds such as hydrogen peroxide and lipid peroxidation products, in particular 4-hydroxynonenal,\(^\text{10}\) that are able to activate blood, endothelial and parenchymal cells responsible for biological and therapeutic responses in various diseases.

The versatility of ozone is due to the generation of chemical compounds, some of which have disinfectant activity, while others, acting on cells with different functions, exert a number of biological responses. This explains why ozonotherapy, in combination with conventional medicine, can be applied only in specific diseases and should not be seen as a panacea for all ills. In reality, it may be specifically useful in only a few pathologies where orthodox medicine has proved inadequate. The following examples aim to clarify this concept.

**Age-related macular degeneration**

In the UK alone, some 200,000 patients affected by the dry form of ARMD are suitable for treatment with O\(_2\)-AHT\(^\text{17}\). Nonetheless, ophthalmologists can only prescribe antioxidants and zinc, which are only modestly effective.\(^\text{16}\) Since 1995, almost 700 patients with the dry form of ARMD have been treated with O\(_2\)-AHT and three-quarters have shown an improvement of one to two lines on the visual acuity chart.\(^\text{16}\)

Usually 15-18 treatments, at an initial ozone concentration of 25 µg of gas per mL blood, slowly upgraded to 40 µg/mL (twice weekly), followed by a monthly session as a maintenance therapy, permit continued visual acuity.\(^\text{17}\) Although uncontrolled, this study emphasises that ozone therapy can improve the patient’s quality of life dramatically.

In this disease there is progressive degeneration and death of the fovea centralis photoreceptors and of the pigmented retinal epithelium (PRE) as a consequence of several factors, one of which is chronic hypoxia. Although ozonotherapy induces a pleiotropic response, the main advantage is increased delivery of oxygen to the retina.

It is worth noting that ozonotherapy is useless, even harmful, in the exudative form of ARMD and in multifaceted and progressive disorders (e.g., retinitis pigmentosa and retinopathy Stargardt’s disease).\(^\text{17}\) The exudative form, characterised by an abundant choroidal vascular growth and a vascular hyperpermeability beneath the retina and the PRE, is treated with several experimental therapies, such as photodynamic therapy with verteporfin or with the periocular or intravitreal administration of angiostatic inhibitors.\(^{25,29}\)

It should be emphasised that orthodox therapies (in the exudative form) and ozonotherapy (in the dry form) not only improve visual acuity but also quality of life.

**Vascular disease**

Ozonotherapy, in comparison to pentoxifylline and prostanooids (the gold standard of orthodox treatment), has proved more effective and less toxic in ischaemic vascular disease. In a small trial,\(^\text{28}\) 28 patients were randomised to either receipt of their own ozonated blood or to iv infusion of prostacyclin. All patients continued conventional treatment with statins and antihypertensive and antiplatelet aggregation drugs. Ozonotherapy proved more effective than prostacyclin in terms of pain reduction and improvement in the quality of life, but no significant difference was seen in vascularisation of the lower limbs in either group, possibly due to the short duration of treatment (14 treatments in seven weeks).

Since 1982, several studies\(^{25-27}\) have confirmed the validity of ozonotherapy in this complex pathology, but it is a mistake to stop therapy too early in these patients because ozonotherapy, as with other conventional drugs, must be continued for life. An improved schedule, as yet to be fully evaluated, consists of two-ozonated HAT (225 mL blood plus 25 mL 3.8% sodium citrate solution), given weekly for at least four months, with topical therapy with ozonated olive oil, is useful when initial dry gangrene or ulcers are present.

Millions of people suffer from chronic limb, brain and heart ischaemia, which represent the major cause of death worldwide. This has a huge socio-economic impact, particularly in the developing world. Despite the present lack of a proof of concept study in this patient group, it is
possible that ozonetherapy as an adjunct to conventional treatment may prove effective.

Metastatic cancer

Although cancer cells up-regulate glycolysis, even in aerobic conditions, they thrive in hypoxia. The greater the hypoxia in the neoplastic environment, the more clinically aggressive is the cancer. It is now well known that hypoxia favours metastasis, and thus administration of anti-angiogenic proteins or anti-vascular endothelial growth factor (VEGF) antibodies should halt tumour growth. However, after massive investments in time and of money and energy, this approach has been disappointing. For example, survival of colon cancer patients treated with chemotherapy and bevacizumab was prolonged for just five months. From a physiological perspective, it would seem logical to restore normoxia in the neoplastic environment.

Preliminary study on a small number of preterminal patients has been performed, consisting of two ozonated-HATs and two minor AHTs (via intramuscular administration) weekly for at least six months. At the very least, improvement in oxygen transport and delivery should enhance the effect of radiotherapy and chemotherapy. Furthermore, ozonetherapy exerts an anti-immunosuppressive effect and reduces the symptoms of fatigue, which plague almost 90% of patients.

As soon as chemo-resistance becomes evident, chemotherapy should be stopped and replaced by ozonetherapy, which, in the author's experience, improves the quality of life due to a feeling of wellness and euphoria. If chemotherapy is continued, the patient becomes totally disabled, with a Karnofsky status below 40%. At this point even ozonetherapy is essentially useless.

Diabetes mellitus

A controlled and randomised clinical trial was performed recently at the Institute of Angiology and Vascular Surgery, University of Havana, Cuba, in which 101 patients with diabetic foot were recruited. Fifty-two patients were treated 15 times in 20 days with ozone (local and rectal insufflation of the gas mixture, including about 96% oxygen and about 4% ozone, with a fixed ozone dose of 10 mg). Forty-nine patients were treated with systemic antibiotics and conventional topical treatment. The efficacy of these interventions was evaluated in both groups after 20 days of treatment.

Ozonetherapy improved glycaemic control, prevented oxidative stress, normalised levels of organic peroxides, increased intra-erythrocyte superoxide dismutase, enhanced ulcer healing and significantly reduced amputation rate. The authors concluded that medical ozone treatment could be an alternative therapy in the treatment of diabetes and its complications. The Cuban study reports exceptional data that should be replicated in a much larger controlled study as soon as possible. If rectal administration of ozone, which is an imprecise and biochemically less-effective procedure than O2-AHT, produces such exceptional improvements in advanced diabetes, then health authorities worldwide should evaluate the enormous potential of this therapy.

Lung disease

Lung diseases, such as chronic obstructive pulmonary disease (COPD), will soon become the fourth most common cause of death, which, with emphysema and asthma, cause significant incapacity. Using corticosteroids, long-acting β2-agonists and antibiotics, orthodox medicine has certainly proved helpful, but it cannot change the course of COPD. However, in a series of elderly patients affected by macular degeneration and either emphysema or COPD, a remarkable improvement has been observed by combining ozonetherapy (using the schedule adopted for vasculopathies) with the best conventional treatments.

Ozonetherapy also appears to be effective in asthma. Hernandez et al. have treated 113 patients with three cycles during one year of either 15 ozonated AHT (applied at doses of 4 mg and 8 mg) or rectal insufflation of gas. In Cuba ozonetherapy is used in all hospitals and rectal administration has proved to be both practical and quick, although some patients have refused rectal administration of gas.

Using a fixed ozone concentration of 40 μg/mL per mL blood (8 mg dose) and after completion of the last cycle of 15 treatments, a significant reduction in IgE and HLA-DR levels was observed, together with increased blood antioxidant capacity, as determined by increased GSH and GSH peroxidase levels. They also noted a significant improvement in lung function and symptoms. On the other hand, rectal insufflation of gas (10 mg for each treatment per 20 sessions) in one group of patients was found less effective, indicating that ozonated AHT was the most effective treatment. The comparison of ozonetherapy with conventional therapies with respect to improvements in lung function are awaited.

Chronic infectious disease

Clearly, ozone is regarded as the best topical disinfectant because bacteria, viruses, fungi and protozoa, when free in water, are readily oxidised. However, destruction of free pathogens in plasma by ozone, ex vivo, is hampered by soluble antioxidants such as albumin, ascorbic acid and uric acid, and they are virtually unassailable when intracellular.

However, ozonetherapy still deserves attention because, by improving metabolism and operating as a mild cytokine inducer, it can have a beneficial influence on infectious diseases. Thus, there remains a place for the application of ozonetherapy as an adjuvant in chronic viral infections (e.g., HIV), in combination with highly active anti-retroviral therapy (HAART), pegylated interferon-α plus either lamivudine or ribavirin and the acyclovir.

Bacterial septicaemia must be treated with the most suitable antibiotics to prevent toxemia and multisystem organ dysfunction. However, it should be kept in mind that ozone generates in blood the same ROS produced by granulocytes and macrophages during infection, and this is one of the reasons for the efficacy of ozonetherapy. Particularly important is the topical application of ozone as a gas mixture (about 4% ozone and 96% oxygen), as ozonated water or ozonated olive oil (where ozone is stabilised as a trioxonide) for the treatment of, for example, bacterial, viral
and fungal infections, burns, abscesses and osteomyelitis.

Topical therapy is most effective when combined with O-AHT owing to oxygenation of hypoxic tissues. Radiodermatitis and wound healing have been enhanced because ozonated solutions display a cleansing effect, act as a disinfectant and stimulate tissue reconstruction.

In 1996, 6.5 million people in the USA suffered from diabetic ulcers, at an annual cost of about $21 billion. As previously discussed, it is now possible to improve the prognosis of diabetes by combining ozonated topical therapy with the simple, inexpensive and risk-free rectal insufflation of oxygen-ozone, which could be carried out by the patient at home under the supervision of a physician.

Chronic ulcers and/or putrid wounds are one of the most distressing and difficult medical problems with which to deal, and are caused by ischaemia, diabetes, immunosuppression and malnutrition. During the past decade the use of ozone in such cases has proved very beneficial. With the current increase in medical costs, ozonetherapy deserves attention because it reduces hospital assistance and is cheap.

Another exciting finding is that ozone, when properly used with O-AHT, can up-regulate the intracellular synthesis of antioxidant enzymes and the most protective stress protein, haem oxygenase-1. Thus, ozone can induce an adaptive response and is the only drug able to correct the chronic oxidative stress observed in cancer, diabetes, uraemia, atherosclerosis, chronic infection and neurodegenerative diseases. Small oxygen doses induce stimulation, while high ones cause inhibition.

In comparison with the inconclusive usefulness of oral antioxidants, experimental and clinical data show that the cautious and prolonged use of ozonetherapy can arrest or delay the progression of these diseases and improve the quality of life. However, some patients respond less well to repeated and minimal oxidative stress, which may be due to an advanced stage of disease or to polymorphism of the Ncf1 protein, which is an essential component of the NADPH oxidase complex. Interestingly, Hultqvist et al. suggest the use of photol to overcome the effect of possible genetic mutations in patients with rheumatoid arthritis.

Dentistry and orthopaedics

Recently, ozone has proved very useful in dentistry for eliminating infection and blocking primary root carious lesions.

The application of ozone in low back pain has proved very effective. It can be administered directly (intradiscal) or indirectly via intramuscular administration into the paravertebral muscles. Ozone exerts a multiplicity of effects, such as the activation of the anti-angiogenic system, and has anti-inflammatory action due to lipid peroxidation products, with the consequent inhibition of cyclooxygenase.

Conclusions

Ozonetherapy is well known among complementary medical approaches, but is yet to be practised correctly in many situations. However, on the basis of basic and small clinical studies performed over the past decade, it has become clear that ozone, in judicious dosages, behaves as a drug and that its biochemical and pharmacological mechanisms of action are in the realm of orthodox medicine.

Ozone is an extremely versatile drug and the therapeutic range has been defined precisely to exclude acute and chronic toxicity. The majority of patients report a feeling of wellbeing during prolonged ozone therapy.

In chronic cutaneous infection, which affects millions of patients, the use of parenteral and topical application of ozone is far more effective than conventional medication in enhancing healing, simply because ozone disinfests, oxygenates and stimulates cell proliferation.

Clearly, there is evidence for the usefulness of ozonetherapy in the diseases outlined above and now is the time for conventional multicentre clinical trials to be undertaken. Owing to the potential cost savings, it is hoped that national and international health authorities will undertake such studies in conjunction with national associations devoted to ozonetherapy.

A recent editorial addressed the problem of the "catastrophic failures of public health". The author of this review believes that the implementation of ozonetherapy in all hospitals could be a first important step in the right direction.

Thanks are due to Professor G. P. Pessina for hospitality in the Department of Physiology of the University of Siena, to Mrs. Helen Carter for linguistic revision, and to the Editor and reviewers for critical comments that improved the conciseness of this review.

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Oxygen-ozone therapy comes of age


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Informazioni Generali

Sede del Congresso: Centro Congressi Giovanni XXIII - Viale Papa Giovanni XXIII, 106 - Bergamo - Tel. +39 035 236435
Segreteria Scientifica: Cristina Agostinis, Maria Luisa Colleoni, Ornella Manara - Neuroradiologia, Ospedali Riuniti - Largo Barozzi 1 - Bergamo - Tel. +39 035 269320/373 - Fax +39 035266671.
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Hi doctor about six years ago you saved me from the torture of an operation which I don’t know how much good or bad would have done.

Now my life continues more or less well except for when the weather changes or when I ask too much of my surviving disc.

I think that over these years I have talked about you and your treatment to at least a hundred people and many of them have got in touch with you at the Golgi Clinic.

I decided to write to thank you for everything and to wish you will carry on the good work to put back in shape all those who can and who ... can’t.

I hope you and your co-workers have a good life and never forget to watch the sky and the sun rise and set.

Greetings from Mauro (long hair and a beard in case you don’t remember).

Bye.
Dr Matteo Bonetti
Scientific Director
International Journal of Ozone Therapy

Dear Matteo,

In the hope of putting an end to an erroneous and dangerous practice, I would be grateful if you would publish the following letter:

Why Do Patients Continue to Be Intoxicated by the Use of Plastic Bags?

V. BOCCI
Department of Physiology, University of Siena; Siena, Italy

SUMMARY - Since 1999, the Italian Ministry of Health has prohibited the use of plastic bags for autotransfusion of blood after the insufflation of oxygen-ozone. Plastic bags are commonly used in all Italian blood centres and the spontaneous release of phthalates is deemed to be small and tolerable during sporadic utilization. Oxygen is so reactive that, even in the presence of blood, it attacks the plastic and causes not only a massive release of phthalates, but of plastic microparticles, which upon infusion of the contaminated blood, reach the circulation and are mostly taken up by the reticuloendothelial system. The plastic material cannot be detoxicated and, with time, may develop mitogenic and carcinogenic effects with dangerous consequences. As the use of any plastic bag is officially prohibited, the ozone therapist becomes liable to prosecution and in any case damages the patient and discredits the ozone therapy approach. As I have been informed that plastic bags are still used in several Italian private clinics, it is absolutely necessary to stop this erroneous practice immediately.

With minor differences depending on the manufacturer, plastic bags are made of a variable amount (50-55%) of polystyrene chloride (PVC) with the remaining 45-50% made of roughly 40% di (2-ethylhexyl)phthalate (DEHP), 1% zinc 2-ethylhexanoate, 1% stearate (Ca or Mg), 1% N,N’-diacylethylendiamine and around 5-8% epoxide oils (soya or linseed). As PVC is intrinsically rigid, the additives serve to make it elastic and easy to handle. Sterile plastic bags are universally used and authorized for the storage of human blood and other solutions.

For some time it has been known that these bags release phthalates in quantities deemed "acceptable" for sporadic use. However, it has been established that patients on dialysis who unfortunately have to use these bags continuously present blood levels of phthalates 500-600 fold higher than normal. We know that at high doses phthalates are toxic and mutagenic and the immunodepression of patients on dialysis may be due, at least in part, to these compounds.

During ozonized autohaemotherapy the plastic bag containing 100-250 ml of blood is insufflated with a gas mixture containing oxygen (~95%) and ozone (~5%). The oxygen is almost inert but the ozone inevitably enters into contact with the hydrophobic walls of the bag: the extreme reactivity of ozone causes a considerable release of DEHP and worse, microparticles of plastic (also containing PVC) measuring from 2 to 25 microns. All this has been extensively documented and published 2 and in November 1999, The Italian Ministry of Health sent all national health authorities a specific circular prohibiting the use of any plastic container for ozone therapy.

Recently, many colleagues have informed...
me that in different Italian regions there are still some ozone therapists who continue to use plastic bags because disposal costs are cheaper. By polluting patients’ blood, these colleagues may cause the onset of immunosuppressive diseases and/or cancer in transfused patients. At least two international seminars have emphasized the fact that phthalates have entered the food chain as they are ingested along with certain foods and drinks. Even though these xenogenous materials must first pass through the gastrointestinal tract, this finding is worrying because chronic ingestion, even of small quantities, may prove toxic in the long-term with unforeseen consequences. This worldwide problem is plainly not limited to phthalates, but we must avoid patients being subjected to the greater risk of plastic from infusion of contaminated blood.

As the ministerial circular is still in force, in addition to damaging patients and discrediting ozone therapy, ozone therapists still using plastic bags can be prosecuted by civil and criminal actions. It is even more serious that the plastic bags are only used in Italy, whereas other countries use ozone-resistant glass bottles, also because they often infuse ozonized saline solution, another procedure which should be banned.

Lastly, despite insinuations to the contrary, I would like to clarify that I have NO commercial interest in the sale of glass bottles and ozone-resistant ancillary equipment. Ozone therapists can purchase suitable glass bottles in Italy or Germany. I further specify that the agreement signed between the University of Siena and a glass bottle manufacturer (whose name I will not even mention) generated an income of 840 Euro to be spent on general expenses. This is a public deed and can be checked by anyone interested.

References


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Dr Matteo Bonetti  
Scientific Director  
International Journal of Ozone Therapy

Dear Dr. Bonetti,

You are not a doctor but a magician. Thanks to the miraculous treatment you gave me I have gone back to work 100% and for a craftsman that is no small thing. In addition I have gone back to my favourite hobby: fishing. Look at the photo and you will understand: I struggled for more than two hours with a catfish weighing 54 kg and my back gave me no problem. When I think that everyone wanted to operate on me...?

Give me a ring whenever you like and I’ll take you fishing on the river Po with your children. As soon as I go to Cremona I’ll bring you a special freshwater fish dish I make with carp. You won’t believe me but I assure you it is delicious.

Tell all your patients not to have surgery but to come to you. Everyone should be told that ozone therapy is a fantastic treatment.

Aldo Trentarossi  
Catfish
Reportage
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Greece
Argostoli Kefalonia
2006.12.2
The Medical Association of Kefalonia and Ithaca
Reportage

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Least Invasive Spine Intervention & Ozononucleolysis

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Kos

Baeza-Noci

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Congresso Nazionale FIO
Bologna, 12-13 ottobre 2007

Presidente: Dr Roberto Cardelli - Segretario: Dr Fabio de Santis

Proposta di programma

Venerdì 12 Ottobre
Servizio di Neuroradiologia, Ospedale Bellaria
Verranno realizzati Workshops pratici dedicati alle diverse tecniche di somministrazione della miscela di ossigeno-ozono:
Numero massimo di partecipanti per Workshop è di dieci persone circa. È quindi necessario prenotarsi per tempo presso la Segreteria Organizzativa. Nei limiti del possibile, si organizzerà un numero di Workshop proporzionale alle richieste.

Iniezione intradisciale (lombare, cervicale) con centratura in fluoroscopia (eventualmente centurata TAC se richiesto)

Iniezione paravertebrale e facettaria

Patologia articolare, terapia infiltrativa intrarticolare e periarticolare

Autoemotrasfusione (15-20 partecipanti)

Sabato 13 Ottobre
Aula Magna, Ospedale Bellaria Bologna

09,00 Apertura dei lavori

I Seduta: L’Ernia discale
Moderatori: Dr C. F. Andreula, Dr G. Pellicanò

09,15 Relazione introduttiva

Stato dell’Arte nel trattamento delle ernie discali
Dr Baeza Noci

09,30-10,30 Comunicazioni sul tema

10,30 Intervalle Caffè

II Seduta: Significato attuale delle infiltrazioni facettarie e paravertebrali
Moderatori: Dr A. Alexandre, Dr M. Muto

10,45 Relazione introduttiva

Significato attuale delle infiltrazioni facettarie e paravertebrali
Dr Matteo Bonetti

11,00-12,00 Comunicazioni sul tema

III Seduta
Moderatore: Dr R. Cardelli

12,00-12,30 Conferenza
“Prospettive future dell’Ossigeno-Ozonoterapia”
Prof. Bocci

12,30-13,00 Conferenza
Presentazione AMAMI - M. Maggiorotti, Presidente

13,00-14,00 Lunch Session: Assemblea FIO
Elezioni di rinnovo delle cariche sociali

IV Seduta: La Grande Autoemo Terapia

14,00 Relazione introduttiva

Moderatori: Dr R. Dall’Aglio, Dr A. Zambello

14,15 Comunicazioni sul tema

14,30-15,30 Conferenza
“Prospettive future dell’Ossigeno-Ozonoterapia”
Prof. Bocci

15,30-16,00 Conferenza
Presentazione AMAMI - M. Maggiorotti, Presidente

16,00-18,00 Conferenza
“Ossigeno-Ozonoterapia in patologia ortopedica e riabilitativa fisioterapica”

18,00-20,00 Conferenza
Medicina estetica, Odontostomatologia, Oculistica, Dermatologia, Veterinaria

20,00 Conclusione dei lavori

Data limite per l’invio delle proposte di comunicazioni sia sui temi che libere: 15 giugno 2007
Inviare una pagina word.doc a: fabio.desantis@ausl.bologna.it

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Bologna, 12-13 ottobre 2007
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AGENDA

Sunday, 9th Sep. 2007
REGISTRATION AND CHECK-IN
Venue: Jiuhua Resort & Convention Center

Monday, 10th Sep. 2007
DAY 1 OF SCIENTIFIC PROGRAMME & EXHIBITION
OPENING CEREMONY AND WELCOME COCKTAIL
Time: 16:00-21:00
Venue: the Great Wall

Tuesday, 11th Sep. 2007
DAY 2 OF SCIENTIFIC PROGRAMME & EXHIBITION
PRESIDENTIAL DINNER: Night of the Imperial Summer Palace in Golden Autumn
Time: 17:00-21:00
Venue: the Summer Palace

Wednesday, 12th Sep. 2007
DAY 3 OF SCIENTIFIC PROGRAMME & EXHIBITION
WFOT Session
GALA DINNER: Night of WFITN
Time: 19:00-21:30
Venue: Jiuhua Resort & Convention Center

Thursday, 13th Sep. 2007
DAY 4 OF SCIENTIFIC PROGRAMME & EXHIBITION
CLOSING REMARK
Time: 16:30-17:00
Venue: Jiuhua Resort & Convention Center

Friday, 14th Sep. 2007
SPECIAL TOUR TO THE FORBIDDEN CITY (Presented by the official organizer)
Time: 10:00-16:00
Venue: The Forbidden City (Imperial Palace)

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Paper Submission
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Prof. Ling Feng
President of the 9th WFITN Congress

9th to 13th, September 2007, Beijing, China

Please visit: www.wfitn2007.org for registration and paper submission
Il Corso Itinerante in Ossigeno-Ozonoterapia, viene effettuato allo scopo di diffondere la metodica, i suoi vantaggi, le indicazioni; evitarne l’uso da parte di chi non è medico, il tutto secondo le linee guida ministeriali e le linee guida prefisse dalla Federazione Italiana di Ossigeno-Ozonoterapia.

Il corso viene diviso in due sezioni:
La prima teorica allo scopo di definire in maniera univoca e ineccepibile le indicazioni della metodica, i protocolli e le tecniche di base del trattamento. La seconda parte pratica e di讨论 dei vari casi.

Il Corso si terrà presso la sala conferenze del Vittoria Parc Hotel - Via Nazionale 10/F - Bari Palese.

Corso riservato a 100 partecipanti.

Il corso di aggiornamento si svolge in una giornata della durata di 9 ore, al termine della quale verrà effettuato test di valutazione ECM.

Al termine verrà consegnato un attestato di partecipazione.

L’iscrizione è aperta fino ad una settimana prima del corso e prevede una quota di 100,00 Euro per i soci FIO, 125,00 Euro per i non soci, comprensiva di materiale didattico e colazione di lavoro.

PROGRAMMA

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Relatori:

Alberto Alexandre  Treviso
Cosma Andreula  Bari
Matteo Bonetti  Brescia
Luigi Brina  Bari
Paola D’Aprile  Bari
Eugenio Genovese  Varese
Marco Leonardi  Bologna
Claudio Mastronardi  Bari
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Ozone Therapy for Herniated Disc

Damascus, 5 May 2007

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Minutes of The Executive Board Meeting

WFOT - World Federation of Ozone Therapy

New Delhi (India) November 5th, 2006

Board members present: Vijay Sheel Kumar (President) India, Matteo Bonetti (Secretary) Italy, Cosma Andreula (Vice-President) Italy, José Baeza-Noce Spain, Juraj Viletelka Slovakia, Marco Leonardi (Honorary Member) Italy, Walet Kos (delegate) Australia, Mario Muto (delegate) Italy.

The meeting started at 8.00 a.m.

The President greeted those present and gave a short overview of the first year of work by the WFOT, focusing on three key issues for next year’s activity:

1) Organization of the WFOT World Congress in Beijing (China).
2) Enrolment of different national societies in the WFOT.
3) The need to turn the Rivista Italiana di Ossigeno-Ozonoterapia into the official journal of the WFOT changing its title to The International Journal of Ozone Therapy.

Prof. Leonardi expressed his agreement with the items on the agenda and after a long discussion the board members approved the change in title of the journal which shall become “The International Journal Ozone Therapy” from 2007 as the official journal of the WFOT, FIO (Italian Federation of Ozone Therapy) and ACEOO (Spanish Association of Ozone Therapy) together with the Indian, Slovak and Chinese national societies.

Dr. José Baeza-Noci offered to supervise relations with the Spanish society whereby all members directly enrolled in ACEOO will be able to become members of the WFOT and hence receive the new journal together with information on the WFOT sent by e-mail. This criterion shall also apply to members of the Indian and Chinese societies.

As WFOT Secretary, Dr. Matteo Bonetti was appointed to design the WFOT website. Dr. Bonetti agreed and ensured members that the site will be up and running before Christmas.

Drs Andreula and Muto commented on the importance of devising specific guidelines for all scientific societies with clear protocols. It was therefore decided to draw up a targeted scientific programme for Beijing 2007 presenting guideline reports to be published in the journal as a working model for all. Dr Baeza-Noci briefly outlined the work done by the Spanish society and Drs Muto and Andreula offered to work directly with Dr Baeza Noci to devise such protocols.

Dr Kumar suggested publishing the journal directly on the Internet. This idea was much appreciated and it was decided to discuss it at the next board meeting in the light of the problems entailed by suppressing a hard copy edition. Dr Kumar also outlined what he had done as WFOT President to boost ozone therapy in Asia, namely in Pakistan, Bangladesh, Taiwan and Thailand. The board expressed its satisfaction with everything the President and WFOT had managed to propose and obtain in the first year of work in Asia and Europe and in America and Oceania.

Prof. Leonardi and Dr Bonetti were appointed to prepare the programme and brochure for the forthcoming World Congress in Beijing to be divided into a first session devoted to reports on the guidelines and a second session devoted to national delegations. The following names were specified to start with: Kos (Australia), Pepa (Argentina), Bergeron (Canada), Vilitelka (Slovakia), Iliakis (Greece), Siddartha (India), Baeza-Noci (Spain). Free communications and posters will be accepted. The programme will be circulated via the WFOT website and through the journal (first issue scheduled for April 2007).

The President closed the meeting at 9.15 a.m.

V.S. Kumar
WFOT President

M. Bonetti
WFOT Secretary
World Federation of Oxygen - Ozone Therapy

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Al Presidente della FIO

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Allega un breve curriculum vitae (una pagina)

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Dr Matteo Bonetti
Segretario FIO

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Yours sincerely,

Dr Matteo Bonetti
FIO Secretary

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Cordialmente

Dr Matteo Bonetti
Segreteria FIO

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Oggetto: quota associativa

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Ti ringrazio fin da ora per il pagamento.

Cordialmente

Dr Matteo Bonetti
Segreteria FIO
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2) Names of authors, capitals of given names (in the case of more than three authors use “et Al”): Title of book, Printer, City year.


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