Comparison of intraperitoneal and intrateesticular ozone therapy for the treatment of testicular ischemia-reperfusion injury in rats.

Mete F, Tarhan H, Celik O¹, Akarken I, Vural K, Ekin RG, Aydemir I, Ilbey YO.

Author information

Abstract
We compare the efficacy of intrateesticular ozone therapy with intraperitoneal ozone therapy in an experimental rat model. For this purpose, 24 rats were divided into four groups including sham-operated, torsion/detorsion, torsion/detorsion plus intraperitoneal ozone (O-IP), and torsion/detorsion plus intrateesticular ozone (O-IT). The O-IP ozone group received a 4 mg kg⁻¹ intraperitoneal injection of ozone, and the O-IT group received the same injection epididymally. At 4 h after detorsion, the rats were sacrificed and orchiectomy materials were assessed histopathologically. Spermatogenesis in the seminiferous tubules and damage to the Sertoli cells were histopathologically evaluated in the testes using the Johnsen scoring system. i-NOS and e-NOS activities in the testis tissue were also evaluated. Torsion-detorsion caused a decreased Johnsen score and increased apoptosis of spermatogonal and Sertoli cells. Ozone injection prevented increases in Johnsen score and i-NOS level. e-NOS level of the O-IP group was significantly lower than that of the O-IP group, and i-NOS level of the O-IT group was significantly lower than that of the O-IP group. Local ozone therapy is more effective than systemic ozone therapy at improving IRI-related testicular torsion. Our study is the first to show that the efficacy of intrateesticular implementation of ozone therapy is higher than that of intraperitoneal ozone therapy.
The Role of Ozone Therapy in Hepatic Fibrosis due to Biliary Tract Obstruction.

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Author information

Abstract

Purposes  In this experimental study, we investigated the role of ozone therapy in hepatic fibrosis caused by biliary obstruction. Materials and Methods  In this study, 21 male Sprague-Dawley rats were divided equally into three groups. In the control group, only laparotomy was performed and intraperitoneal cavity is washed with 1 mL of saline. In the sham group (SG), common bile duct is binded with laparotomy and no treatment is given afterward. In the experimental group (EG) after the binding of common bile duct with laparotomy, 1 mg/kg dose and 50 mg/mL concentration of ozone were applied rectally for 21 days. Hepatic tissue sample and intracardiac blood samples were collected from all animals at postoperative 21st day with relaparotomy. Results  When we compared the experiment to SG, we detected a decrease in aspartate aminotransferase, alkaline phosphate (ALP), total bilirubin, and direct bilirubin levels in the EG, however, only the decrease in total bilirubin levels were statistically significant (p = 0.025). Histopathological examination of livers of rats in the EG showed lower level of hepatic fibrosis and inflammation. In the SG, incomplete cirrhosis was detected in 57.1% of the rats, whereas in the EG, no cirrhosis was detected. Immunohistochemically, periportal inflammation was 100% in the SG, whereas it was seen (3/7) 42.9% in the EG. A significant decrease in positive α-smooth muscle actin reaction was observed in ozone-treated group compared with SG. Conclusion We suggest that ozone can decrease the hepatic destruction levels in experimental model of biliary obstruction.

Georg Thieme Verlag KG Stuttgart · New York.
Fluoroscopic-guided intradiscal oxygen-ozone injection therapy for thoracolumbar intervertebral disc herniations in dogs.
Han HJ¹, Kim JY, Jang HY, Lee B, Yoon JH, Jang SK, Choi SH, Jeong SW.

Author information

Abstract

BACKGROUND:
To investigate the effect of oxygen-ozone (O2-O3) injection on thoracolumbar intervertebral disc herniation (IVDH) in dogs.

MATERIALS AND METHODS:
Ten herniated discs of five dogs were treated with percutaneous injection of an O2-O3 gas mixture with O3 concentration of 32 microg/microl intradiscally (1.5-2 microl) under fluoroscopy guidance.

RESULTS:
Five weeks after treatment, the mean size of herniated discs was measured by computed tomography and showed significant reduction of disc volumes in all animals (8.8%+-3.82%). The degree of shrinkage was negatively linearly correlated with disc mineralization (correlation coefficient=-0.636) and statistically significant at p<0.05. All five dogs regained their gait function and none recurred.

CONCLUSION:
We conclude that intradiscal O2-O3 injection can decompress affected discs by disc shrinkage.
Ozone is a molecule consisting of three oxygen atoms, formed as a result of oxygen being exposed to high-energy electric current and ultraviolet rays in nature. It is a powerful oxidising agent. Therefore, it has bactericidal, virucidal and fungicidal properties. Ozone treatment is a therapy method consisting of mixing pure oxygen and ozone at certain ratios (0.05-5% O3; 95-99.95% O2) and administering this combination to the patient via different routes. Ozone has an oxidising effect on the organism and activates the antioxidant enzyme systems. It implements the release of cytokines such as interferons and interleukins by leucocytes and stimulates the immune system. Ozone has 30 different methods of administration which can be classified under main headings such as; intravenous, intramuscular, transdermal, rectal insufflation and inhalation. Ozone treatment is used in wound healing, tumours, peritonitis cases, orthopaedic disorders, eye disorders and dentistry. This review aims to share the therapeutic effects and easy administration of ozone with colleagues and present as a new treatment procedure to veterinary practice in our country.

Key Words: Ozone therapy, autohemotherapy, veterinary surgery

Comparison of the Effects of Low-Level Laser Therapy and Ozone Therapy on Bone Healing.

Alan H¹, Vardi N, Özgür C, Acar AH, Yolcu Ü, Doğan DO.

Author information

Erratum in


Abstract

This study aims to compare the effect of low-level laser therapy (LLLT) and ozone therapy on the bone healing. Thirty-six adult male Wistar albino rats were used for this study. Monocortical defects were shaped in right femur of all rats. Defects were filled with nano-hydroxyapatite graft. The animals were divided into 3 groups and each group was than divided into 2 subgroups. Then, LLLT with a diode laser was applied to the first group (G1), ozone therapy was applied to the second group (G2), and no treatment was applied to the third group as a control group (G3). Animals were sacrificed after 4th and 8th weeks and the sections were examined to evaluate the density of the inflammation, the formation of connective tissue, the osteogenic potential, and osteocalcin activity. As a result, there were no significant differences among the groups of 4 weeks in terms of new bone formation. In the immunohistochemical assessment, the number of osteocalcin-positive cells was higher in the laser group compared to the other group of 4 weeks; this difference was statistically significant in the LLLT and ozone groups (P<0.05). Histomorphometric assessment showed that the new bone areas were higher in the LLLT and ozone groups; furthermore, there was a statistically significant difference in the LLLT in comparison with the control group at 8th week (P<0.05). At the same time immunohistochemical assessment showed that osteocalcin-positive cells were considerably higher in G2 than G1 at 8th week (P<0.05). The findings of this study may be the result of differences in the number of treatment sessions. Further studies are therefore needed to determine the optimal treatment modality.
Comparison of intrarectal ozone, ozone administered in acupoints and meloxicam for postoperative analgesia in bitches undergoing ovariohysterectomy.

Teixeira LR*, Luna SP, Taffarel MO, Lima AF, Sousa NR, Joaquim JG, Freitas PM.

Author information

Abstract

Since all analgesics currently available for use in dogs have been associated with some adverse effects, the search for an effective analgesic that does not cause harm is important. This study investigated the postoperative analgesic effects of ozone administered either intrarectally or into acupoints in bitches undergoing ovariohysterectomy (OH). Twenty-four healthy adult bitches were randomly assigned to one of the three treatments 10 min after sedation, as follows: 0.2mg/kg of intramuscular (IM) meloxicam (M); rectal insufflation of 10 mL of 30 μg/mL ozone (OI), or acupoint injection of 0.5 mL ozone (30 μg/mL; OA). Following sedation with acetylpromazine, anaesthesia was induced with propofol and fentanyl and maintained with isoflurane/O2. Pain was assessed using the modified Glasgow pain scale (MGPS) and the visual analogue scale (VAS) on the day before surgery, before anaesthesia, and at 1, 2, 4, 6, 8, 12 and 24h after surgery. Rescue analgesia was performed using 0.5mg/kg of morphine IM if MGPS was >3.33 points. No statistically significant differences in pain scales were found among the three analgesic protocols or the time points in each group (P>0.05). Two dogs treated with OA required rescue analgesia. Meloxicam, rectal insufflation of ozone and ozone injected into acupoints provided satisfactory analgesia for 24h in bitches undergoing elective OH. Ozone had no measurable adverse effects and is an alternative option to promote pain relief.

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KEYWORDS:

Dogs; Hysterectomy; Ozone; Pain; Postoperative
The intrauterine treatment of the retained foetal membrane in dairy goats by ozone: novel alternative to antibiotic therapy.

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Author information

Abstract

One of the major post-parturient complications in dairy goats is the retention of foetal membrane (RFM), which negatively influences their health, reproductive efficacy and welfare. The aim of this study was to compare the efficiency of intrauterine either ozone (OZ) or antibiotic (AB) treatments to establish the use of OZ as a novel and potential alternative to AB therapy in does with the RFM. The study was performed on 7 herds of dairy goats (n = 563) kept in the farms in Croatia. The conception rate was 563 of 641 total matings or 87.83%. The does from selected farms were observed during early puerperium and were divided into animals without the RFM (n = 522) and with the RFM (n = 41), treated either with foam spray OZ (n = 21) or with foaming AB oxytetracycline tablets (n = 20). The does with the RFM were mated successfully and became pregnant next kidding season, regardless of the treatment applied. Treatment with OZ attained similar results to the standard AB therapy, indicating that it could be novel potential alternative therapy of the RFM in dairy goats.

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Effect of Extracorporeal Blood Treatment with an Ozone-Oxygen Mixture on Pulmonary Functions in Healthy Dogs and Dogs with Shock Lungs

E. I. Yakovleva, S. P. Peretyagin, K. N. Kontorshchikova, G. S. Seroglazova, N. N. Andreeva, and T. V. Dergunova

Translated from Byulleten' Experimental'noi Biologii i Meditsiny, Vol. 119, № 3, pp. 266-269, March, 1995
Original article submitted March 3, 1994

Extracorporeal blood treatment with an ozone-oxygen mixture increased the efficacy of pulmonary ventilation and improved gas exchange, blood oxygenation in the pulmonary circulation, and the microcirculation in peripheral tissues in intact dogs and dogs with experimentally produced shock lung. This procedure activated glycogenolysis, glycolysis, and metabolic processes in the lung tissue (in particular, the uptake of palmitate from the blood by the lungs was increased in intact dogs, as was the uptake of lactate and pyruvate in dogs with shock lung), and it also raised blood levels of molecular lipid peroxidation products in dogs of both groups.

Key Words: ozone; pulmonary functions; shock lung

Extracorporeal blood treatment (ECBT) with an ozone-oxygen mixture containing ozone in a concentration of 48 μg/liter has been shown to promote a better supply of the body with oxygen and to raise the metabolic activity of biological systems [7]. However, parenteral administration of ozone is severely limited because of its extremely strong oxidizing action on biomembrane phospholipids. The purpose of this work was to study the gas-exchanging and metabolic functions of the lungs after ECBT in intact dogs and dogs with experimentally produced shock lung.

MATERIALS AND METHODS

A total of 36 adult mongrel dogs of both sexes weighing 12.3 ± 4.7 kg were used. They were divided into four groups. Group 1 (n=10) consisted of intact control dogs. Group 2 (n=10) comprised intact dogs whose blood had been treated for 30 min in an arteriovenous shunt (femoral artery -

Fig. 1. Pressure of blood gases after extracorporeal blood treatment (ECBT) in intact dogs (A) and dogs with shock lung (B). Solid line: pO₂; dashed line: pCO₂. Here and in Figs. 2 and 3: w = arterial blood; v = venous blood; *p<0.05 in comparison with baseline.

Central Research Laboratory, Medical Academy, Nizhny Novgorod. (Presented by B. A. Korsunov, Member of the Russian Academy of Sciences)
Protective effects of medical ozone combined with traditional Chinese medicine against chemically-induced hepatic injury in dogs.

Li LJ’, Yang YG, Zhang ZL, Nie SF, Li Z, Li F, Hua HY, Hu YJ, Zhang HS, Guo YB.

Author information

Abstract

AIM:
To investigate the protective effect of medical ozone (O(3)) combined with Traditional Chinese Medicine (TCM) Yigan Fuzheng Paidu Capsules (YC) against carbon tetrachloride (CCl(4))-induced hepatic injury in dogs.

METHODS:
Thirty healthy dogs were divided randomly into five groups (n = 6 in each group), namely control, oleanolic acid tablet (OAT), O(3), YC and O(3) + YC, given either no particular pre-treatment, oral OAT, medical ozone rectal insufflation every other day, oral YC, or oral YC plus medical ozone rectal insufflation every other day, respectively, for 30 consecutive days. After pre-treatment, acute hepatic injury was induced in all dogs with a single-dose intraperitoneal injection of CCl(4). General condition and survival time were recorded. The biochemical and hematological indexes of alanine aminotransferase (ALT), aspartate aminotransferase/alanine aminotransferase (AST/ALT), serum total bilirubin (TBIL), prothrombin time (PT), blood ammonia (AMMO), and blood urea nitrogen (BUN) were measured after CCl(4) injection. Hepatic pathological changes were also observed.

RESULTS:
Compared to the other four groups, the changes of group O(3) + YC dogs' general conditions (motoricity, mental state, eating, urination and defecation) could be better controlled. In group O(3) + YC the survival rates were higher (P < 0.05 vs group control). AST/ALT values were kept within a normal level in group O(3) + YC. Hepatic histopathology showed that hepatic injury in group O(3) + YC was less serious than those in the other four groups.

CONCLUSION:
Medical ozone combined with TCM YC could exert a protective effect on acute liver injury induced by CCl(4).
[Protective effect of Yigan Fuzheng Paidu capsules combined with ozone on CCl4-induced acute hepatic injury in dogs].

[Article in Chinese]

Li LJ, Yang YG, Wang C, Zhang ZL, Huo D, Hua HY, Chen PC, Zhang HS, Guo YB.

Abstract

OBJECTIVE:
To investigate the protective effect of Yigan Fuzheng Paidu Capsules (YC) combined with medical ozone against hepatic injury in dogs induced by hepatotoxic drug.

METHODS:
Twenty-four dogs were randomized equally into 4 groups (n=6), namely the model group, oleanolic acid tablet (OAT) group, YC group and YC+O(3) group, given either no particular treatment, oral OAT at 10 mg/day, oral YC at 0.2 g/day, or YC at 0.2 g/day plus 150 ml medical ozone transrectal insufflation every other day, respectively, for totally 30 consecutive days. Acute hepatic injury was induced after the treatment in the dogs with a single-dose intraperitoneal injection of 0.9 ml/kg CCl(4) and peanut oil mixture (1:1, W/W). The general condition, survival time, alanine aminotransferase (ALT), aspartate aminotransferase/alanine aminotransferase (AST/ALT), serum total bilirubin (TBIL), prothrombin time (PT), blood ammonia (AMMO), and blood urea nitrogen (BUN) were recorded or measured. The hepatic pathological changes were observed upon death or on day 15 following CCl(4) injection.

RESULTS:
Compared with the other 3 treatment protocols, YC plus O(3) showed favorable effects on the activity, mental state, diet, urination and defecation of the dogs, which had significantly higher survival rate and higher levels of ALT, TBIL, PT, and AMMO than the model and OAT groups (P<0.05). AST/ALT remained normal in YC+O(3) group, which had also milder hepatic injury than the other 3 groups.

CONCLUSIONS:
YC combined with medical ozone may decrease transaminase and blood ammonia levels, relieve jaundice, prolong the survival time of dogs with CCl(4)-induced hepatic injury.
Ozone-Oxidative Preconditioning Prevents Doxorubicin-induced Cardiotoxicity in Sprague-Dawley Rats.

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Author information

Abstract

OBJECTIVES: Induced dilated cardiomyopathy is the main limitation of the anti-cancer drug doxorubicin, which causes oxidative stress and cardiomyocyte death. As ozone therapy can activate the antioxidant systems, this study aimed to investigate the therapeutic efficacy of ozone-oxidative preconditioning against doxorubicin-induced cardiotoxicity.

METHODS: The study was carried out from September 2013 to January 2014. Sprague-Dawley rats were randomly distributed in the following treatment groups: Group 1 were treated with 2 mg/kg intraperitoneal (i.p.) of doxorubicin twice a week for 50 days; Group 2 were treated with 0.3 mg of ozone/oxygen mixture at 50 μg/mL of ozone per 6 mL of oxygen by rectal insufflation and then treated with doxorubicin; Group 3 were treated as Group 2 but only with the oxygen, and Group 4 were treated with oxygen first, and then with sodium chloride i.p. as the control group.

RESULTS: The results showed that ozone therapy preserved left ventricle morphology which was accompanied by a reduction of serum pro-brain natriuretic peptide levels. The cardioprotective effects of ozone-oxidative preconditioning were associated with a significant increase (P <0.05) of antioxidant enzymes activities and a reduction of lipid and protein oxidation (P <0.05).

CONCLUSION: Ozone-oxidative preconditioning prevents doxorubicin-induced dilated cardiomyopathy through an increase of antioxidant enzymes and a reduction of oxidised macromolecules. This establishes the background for future studies to determine if ozone therapy can be used as a complementary treatment for attenuating doxorubicin-induced cardiotoxicity in cancer patients.
Prophylaxis and therapeutic potential of ozone in buiatrics: Current knowledge.

Đuričić D¹, Valpotić H², Samardžija M³.

Author information

Abstract

Ozone therapy has been in use since 1896 in the USA. As a highly reactive molecule, ozone may inactivate bacteria, viruses, fungi, yeasts and protozoans, stimulate the oxygen metabolism of tissue, treat diseases, activate the immune system, and exhibit strong analgesic activity. More recently, ozone has been used in veterinary medicine, particularly in buiatrics, but still insufficiently. Medical ozone therapy has shown effectiveness as an alternative to the use of antibiotics, which are restricted to clinical use and have been withdrawn from non-clinical use as in-feed growth promoters in animal production. This review is an overview of current knowledge regarding the preventive and therapeutic effects of ozone in ruminants for the treatment of puerperal diseases and improvement in their fertility. In particular, ozone preparations have been tested in the treatment of reproductive tract lesions, urovagina and pneumomovagina, metritis, endometritis, fetal membrane retention and mastitis, as well as in the functional restoration of endometrium in dairy cows and goats. In addition, the preventive use of the intrauterine application of ozone has been assessed in order to evaluate its effectiveness in improving reproductive efficiency in dairy cows. No adverse effects were observed in cows and goats treated with ozone preparations. Moreover, there is a lot of evidence indicating the advantages of ozone preparation therapy in comparison to the application of antibiotics. However, there are certain limitations on ozone use in veterinary medicine and buiatrics, such as inactivity against intracellular microbes and selective activity against the same bacterial species, as well as the induction of tissue inflammation through inappropriate application of the preparation.

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Ozone oxidative postconditioning ameliorates joint damage and decreases pro-inflammatory cytokine levels and oxidative stress in PG/PS-induced arthritis in rats.


Author information

Abstract

Rheumatoid Arthritis (RA) is the most prevalent chronic condition present in ~1% of the adult population. Many pro-inflammatory mediators are increased in RA, including Reactive Oxygen Species such as nitric oxide NO, pro-inflammatory cytokines as tumor necrosis factor alpha (TNF-α), interleukin-1beta (IL-1β) and other molecules. Ozone oxidative postconditioning has regulatory effects on some pathological targets associated with RA. Thus, the aim of this study was to investigate the efficacy of ozone therapy in PG/PS-induced arthritis in rats in point of joints inflammation and morphology. Moreover, cytokines, nitric oxide and oxidative stress levels in spleen homogenates were evaluated. Ozone treatment ameliorated joint damage, reduced TNF-α concentrations as well as TNF-α and IL-1β mRNA levels. Besides, cellular redox balance, nitric oxide and fructolysine levels were reestablished after ozone oxidative postconditioning. It was concluded that pleiotropic ozone's effects clarify its therapeutic efficacy in RA. Decreasing inflammation and joint injury, reduction of pro-inflammatory cytokines, TNF-α and IL-1β transcripts and re-establishment of cellular redox balance after ozone treatment were demonstrated.

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Bactericidal effects of ozone at nonspermicidal concentrations.

C Gradil, M D Eaglesome, B Stewart, M M Garcia, and F Quimby

Abstract

A study was conducted to assess the use of ozone (O3) to control pathogens or contaminants of concern to animal breeders and regulatory officials. In separate experiments, samples of fresh bovine semen and Pseudomonas aeruginosa, Escherichia coli, or Campylobacter fetus subsp. venerealis were diluted with antibiotic-free milk (10(6) sperm and 10(6) organisms/mL of diluted semen), exposed in the previous day to a constantly monitored level of 5, 10, 15, or 20 micrograms/mL of O3 for 3-5 min. After 10 min at 30 degrees C, sperm motility was assessed and the samples cooled to 5 degrees C. Two and 18 h after the beginning of cooling, aliquots of each semen sample were evaluated for motility and cultured for organisms. Reductions were observed in P. aeruginosa and E. coli colony counts of 2 logs, and in C. fetus of 5 logs, after exposure for 2 h to O3 at a concentration of 5 micrograms/mL that had a moderate effect on sperm motility (reduction of 20%). Fewer than 100 colonies, i.e., a 4 logs reduction of all bacteria, were counted after dilution with ozonized-treated milk at 20 micrograms/mL of O3. However, this concentration of O3 reduced sperm motility by 50% 10 min after dilution. The results of these experiments indicate that a concentration and exposure time to O3 can be selected to reduce P. aeruginosa, E. coli, and C. fetus in contaminated bull semen diluted with milk while having only minimal effects on sperm motility.