

Ozone Therapy in Management of Toxoplasmosis

Azza B. Nashed, PT. D* and Mohamed N. Mawsouf**

* Department of Physical Therapy for Gynaecology & Obstetrics, Faculty of Physical Therapy, Cairo University.

** Head of Ozone Therapy Unit, National Cancer Institute, Cairo University.

ABSTRACT

This study was conducted to determine the effect of ozone therapy in management of toxoplasmosis. Thirty volunteer non pregnant patients were participated in this study, their age ranged from 20-35 yrs and were diagnosed as having toxoplasmosis. Patients were assigned into two groups (15 patients each). Group (A) study group received ozone treatment through rectal insufflation with volume ranged from 250-300 ml of medical ozone gas and in a concentration of 20-40 µg/ml (six sessions per week) for 3 weeks. Group (B) control group received treatment in the form of Spiramycin 3 MIU tablets twice per day for 3 weeks. Evaluation of all patients in both groups was done through measuring immunoglobulin M (IgM) through blood sample from the patients before and after the end of the treatment. The results of the present study showed a statistically highly significant ($P < 0.001$) decrease in IgM in the study group (A) while in control group (B) there was a significant ($P < 0.05$) decrease in IgM. Comparing between both groups (A&B) before treatment there was non significant difference while after treatment there was a statistically highly significant decrease in IgM in the study group (A) compared to control group (B). Accordingly, it can be concluded that ozone is an effective physical therapy modality in management of toxoplasmosis.

Key words: Ozone therapy, toxoplasmosis, immunoglobulin M.

INTRODUCTION

Toxoplasmosis is an infection caused by a single-celled parasite called toxoplasma gondii. Pregnant women and those with compromised immune systems should be cautions about being exposed because a toxoplasma infection can cause serious problems¹⁰.

Toxoplasmosis is acquired through accidental ingestion of contaminated cat feces, ingestion of raw or partly cooked meat, drinking water contaminated with toxoplasma, or by receiving an infected organ transplant or blood transfusion⁴.

Following toxoplasma infection IgM antibodies appear as a 1st line of defense within a week, and usually last for a few months, its presence denotes an acute infection and decrease of its titer caused by treatment is

used as a follow up for the efficacy of treatment⁸.

Ozone is an energized form of oxygen with extra electrons. It has a bactericidal, virucidal, antifungal and antiprotozoan therapeutic agent⁹.

Ozone produces its therapeutic effects through decrease allergic reactions and inactivation of viruses, bacteria, yeast, fungus and protozoa through disruption of the integrity of the bacterial cell envelope through oxidation of the phospholipids and lipoproteins in fungi. Ozone, inhibits cell growth at certain stages. With viruses, ozone damages the viral capsid and disrupts the reproductive cycle by disrupting the virus-to-cell contacts with peroxidation¹.

Ozone therapy for toxoplasmosis disrupts the integrity of the toxoplasma cell envelope through oxidation of the phospholipids and lipoproteins. The resultant

drop of IgM titer is an indirect effect as diminution of the immune response is due to cure of the disease and destruction of the parasite¹.

Ozone does not have any adverse effects at therapeutic doses, and microbes do not develop resistance to ozone. This made it possible to use ozone in the treatment of various gynaecological diseases⁵.

The purpose of the present study is to determine the effect of ozone therapy in management of toxoplasmosis.

SUBJECTS, MATERIAL AND METHODS

Subjects

Thirty volunteer patients complaining from previous recurrent abortion (i.e. at least 3 successive abortions) due to toxoplasmosis, were participated in this study. They were recruited from the outpatient clinic of the Obstetrics and Gynaecologic Department of Kasr El-Aini University Hospital. Their age

ranged from 20-35 years old. Patients were classified into two groups (study and control) equal in number. Patients who have any other causes of abortion as congenital anomalies, incompetent cervix, malnutrition, heart and chest diseased were excluded from this study.

Informed consent form had been signed from each patient before starting the study indicating her voluntary participation in this study.

1- Group (A) study group: Composed of 15 patients. They received ozone therapy with volume ranged from 250- 300 ml of ozone gas in a concentration of 20-40 µg/ml injected through a rectal catheter six sessions per week for 3 weeks.

2- Group (B) control group: Composed of 15 patients. They received medical treatment only in the form of (spiramycin) 3 MIU tablets twice daily for 3 weeks.

Summary of patient's physical characteristics is shown in table (1).

Table (1): Statistical summary of the physical characteristics of all patients for both study and control groups (A and B).

Variables	Group	Mean	SD	P-value	Sig
Age (yrs)	Study (A)	25.30	±2.24	> 0.05	NS
	Control (B)	24.90	±3.15		
Weight (Kgs)	Study (A)	67.53	±9.36	> 0.05	NS
	Control (B)	69.80	±3.87		
Height (cms)	Study (A)	163.80	±7.32	> 0.05	NS
	Control (B)	164.70	±7.90		
BMI (Kg/m ²)	Study (A)	25.04	±1.68	> 0.05	NS
	Control (B)	25.74	±1.12		

The results showed that there was non-significant difference between study and control groups.

Instrumentations

1- Ozone generator: The Ozone LABTM OL 80 desktop line (45° panel series) of ozone generator was used to deliver ozone gas,

which was used in the treatment of all patients in group (A).

2- Doppler Ultrasound Machine: Sony, Au 530. ESAOTE EIOMECIA Geno. It was done for exclusion of any congenital and other uterine anomalies that may cause recurrent abortion in both groups (A and B) before treatment.

- 3- Catheter: Disposable Nyleton's catheter gage 16 was introduced into the patient's rectum through her anus for administration of ozone therapy for all patients in group (A).
- 4- Ky gel: Was used to lubricate the catheter.
- 5- Syringes
 - 50 ml disposable syringes was used to collect the ozone dose from the generator and introduced it into the catheter.
 - 5 ml disposable syringes was used to collect blood samples before and after treatment in both groups (A and B) for measuring IgM.
- 6- Clamp: To close the catheter before changing the syringe
- 7- Weight height scale: Was used to measure weight and height for each patient to calculate the BMI for each patient in both groups (A and B) before starting the study.

Proceedures

A) Evaluative procedures

- 1- Personal data: Data and information of each participant in this study were recorded in a recording sheet.
- 2- History taking: A detailed medical, obstetrical as well as gynaecological history were taken from each participant.

B) Measurement procedures

- 1- Ultrasonographic examination: Full transvaginal ultrasonographic assessment of each patient in both groups (A and B) to detect anomalies such as bicornoate uterus, hypoplasia, endometriosis and incompetent cervix.
- 2- Blood samples: Two blood samples were taken from each patient in both groups (A&B) before starting the treatment and after 3 weeks of treatment to determine IgM (indication of recent infection) as normal reference is from (0-0.5) according to ELISA kits.

C) Treatment Procedures

Group (A): Study group

Each patient was informed about the benefits and mechanism of ozone in the treatment of toxoplasmosis to gain her confidence and co-operation. Each patient was advised to evacuate her bladder and rectum before starting each ozone therapy session to be relaxed all through the time of treatment. Ozone was given by rectal insufflation 250-300 ml in a concentration of 20-40 µg/ml injected through a rectal catheter while the patient was in side lying position (six sessions per week) for 3 weeks and the duration of each treatment session was about 30 minutes. Anus was cleaned with an enema. Three disposable syringes of 50 ml were filled with ozone from the generator (total ozone of 150 ml) with the appropriate concentration which was used to deliver the ozone into the rectum via the catheter in the first session then the dose and concentration of ozone were increased gradually in the subsequent sessions to reach the maximum range (ozone dose of 300 ml and concentration of 40 µg/ml by using 6 disposable syringes.

Group (B): Control group

Each patient in this group received medical treatment only in the form of spiramycin 3MIU tablets twice daily for 3 weeks.

Statistical Analysis

Descriptive statistics was used for the collected data, to calculate the mean and standard deviation. Inferential statistical analysis was used in the form of independent t-test for comparing between before and after the end of the treatment. Also between both groups (A and B) after the end of the study. The level of significance of 0.05 was used throughout all the statistical tests within this study, P-value < 0.05 indicate a significant

result, P -value < 0.005 indicate a highly significant result, the smaller the P -value obtained, the more significant was the results⁶.

RESULTS

As shown in table (2) and figure (1), the mean values of IgM before starting the treatment was (58.01 ± 20.44) for the study group (A), and after the end of three weeks of ozone treatment, it was (3.20 ± 0.98) with a

percentage of change of 92%. These changes were found to be highly significantly decreased ($P < 0.001$).

Before starting the treatment, all cases in study group (A) had infected by toxoplasmosis as revealed by the values of IgM (above $0.5 \mu\text{g/ml}$), while after 3 weeks of ozone treatment 10 cases (75%) improved and only 5 cases (25%) were still not improved.

Table (2): Mean values of IgM before and after the end of treatment for both groups (A and B).

	IgM ($\mu\text{g/ml}$) study group		IgM ($\mu\text{g/ml}$) control group	
	Before treatment	After treatment	Before treatment	After treatment
Mean	58.01	3.20	56.75	32.43
SD	± 20.44	± 0.98	± 19.55	± 15.06
Percentage of changes	92%		44%	
Level of significance	$P < 0.001$		$P < 0.05$	

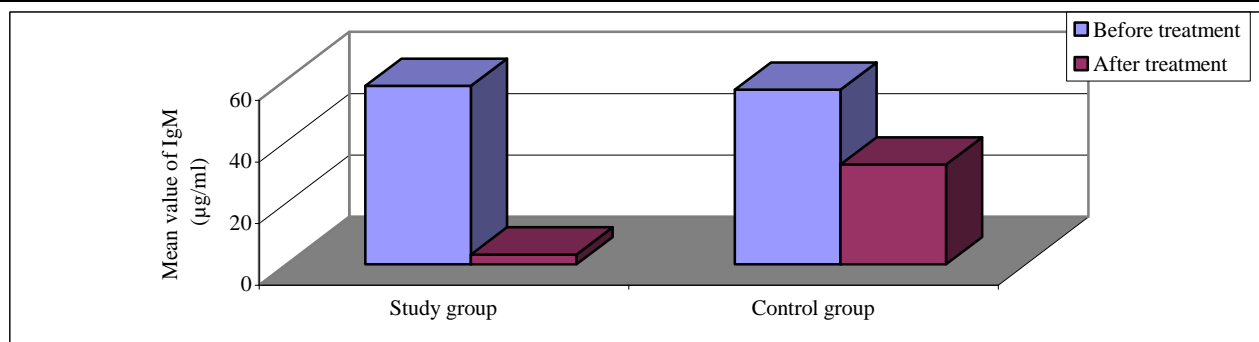


Fig. (1): The mean values of IgM ($\mu\text{g/ml}$) before and after the end of treatment for both groups (A and B).

As shown in table (2) and figure (1), the mean values of IgM before starting the treatment was (56.75 ± 19.55) for control group (B) and after the end of 3 weeks of spiramycin treatment was (32.43 ± 15.06) with percentage of changes of 44%. These changes were found to be statistically significantly decreased ($P < 0.05$).

Before starting the treatment, all cases in the control group (B) have infected by toxoplasmosis as revealed by the values of IgM (above 0.5), while after 3 weeks of spiramycin treatment, 5 cases (25%) improved while 10 cases didn't improved. (75%).

Table (3): Mean values of IgM after the end of treatment between both groups (A and B).

	IgM ($\mu\text{g/ml}$) after the end of treatment	
	Study group (A)	Control group (B)
Mean	3.20	32.43
SD	± 0.98	± 15.06
Mean differences	29.23	
Level of significance	$P < 0.002$ HS	

As shown in table (3) and figure (2), the mean values of IgM after the end of ozone treatment was (3.20 ± 0.98) for study group (A), while it was (32.43 ± 15.06) for control

group (B) with a mean difference of 29.23 $\mu\text{g/ml}$. These changes were found to be highly statistically significant decrease ($P < 0.002$) in study group (A) than in control group (B).

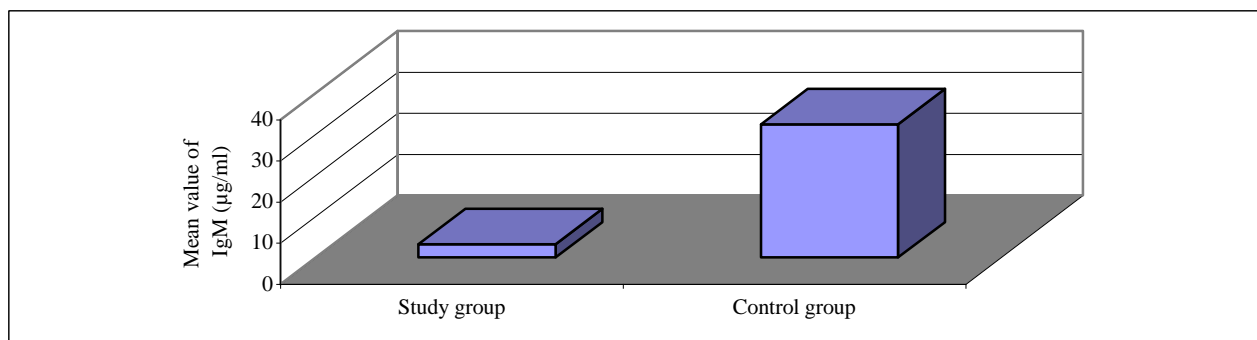


Fig. (2): Mean values of IgM ($\mu\text{g/ml}$) after the end of treatment between both groups (A and B).

DISCUSSION

Toxoplasmosis is a widely distributed illness, caused by *Toxoplasma gondii*, an intracellular parasite⁷.

Ozone have been successfully used in inflammatory diseases of female genital tract, also destruction of intracellular micro organism such as *Plasmodium*⁹. Such evidence makes ozone a promising solution that was not investigated before by other studies in the treatment of recurrent abortion cases especially those caused by an intracellular parasite as *Toxoplasma*.

This study, was conducted to determine the effect of ozone in management of toxoplasmosis in cases with recurrent abortion. The results of the present study revealed a highly significant decrease in the mean values of immunoglobulin (IgM) after the end of treatment sessions by ozone therapy via rectal insufflation (6 sessions per weeks for 3 weeks) in study group, (A) in comparison to control group (B).

The results of the present study was in agreement with that of Viebahn, (2001)¹², who

found that ozone therapy was effective in case of *Plasmodium* –infected red blood cells. The active mechanism involved by ozone can be explained via the reaction of ozone with the unsaturated fatty acids of the erythrocyte membrane and a consequent penetration of hydroxyhydroperoxides, into cells. A direct reaction of short chain peroxides with the parasites². Second reaction path takes place via the glutathione system which act as an effective antioxidant system to reduce the peroxides formed from ozone and is itself converted into an oxidized form. Consequently, the parasites involved are subjected to an increased oxidative stress, and their reproductive cycle disrupted.

In addition to this, an ozone induced increase in 2,3- DPG counteracts the influence of the plasmodia on the erythrocytes metabolism².

Velasques et al. (2001)¹¹ reported that ozone therapy is able to cause destruction of potentially viable fertilized helminth eggs, and concluded that ozone therapy is highly reactive to the chemical compounds found in external and internal layers of fertile helminth eggs.

Also the results of the present study were supported by that of D'mello, (2001)³ who concluded that ozone therapy has a good curative effect on infection caused by bacteria, Chlamydia, urea plasma, viruses and toxoplasmosis. Also, it was concluded that ozone therapy stimulates production of immunoglobulin in the blood (IgG, IgA, IgM), increase resistance of micro-organism to microbes, improves the rheological properties and oxygen transportation mechanism of the blood and also destroys all contacts of the virus with the cells.

Guennadi, (2001)⁵ investigated the effect of ozone, on the concentration of serum immunoglobulins (IgA, IgM, IgG), and the level of circulating immune complexes found that, ozone therapy had a favorable effects on the immunity of patients by inducing a decrease in the circulating immune complexes in patients with threatened abortion, and stimulate the hormogenic function of fetoplacental complex. Ozone produced a positive effect on the lipid peroxidation processes and the antioxidative defence system. Also, it was concluded that ozone therapy produced not only direct positive effect on the clinical aspects of threatened abortion, prolongation of pregnancy to the physiological terms of delivery, also it decreases the risk of gestational complications as repeated threatened abortion and late gestosis.

So, from results of this study , it could be concluded that ozone is a very effective physical therapy modality in treating cases suffers from toxoplasmosis.

REFERENCES

- 1- Bocci, V., Luzzi, E., Corradeschi, F. and Paulesu, L.: "Studies on the biological effects of ozone: An attempt to define conditions for optimal induction of cytokines", journal General Physiology, 12(2): 121-126, 1993.
- 2- Bocci, V.: "Infectious diseases bacterial, viral, fungal and parasitic", Ozone New Medical Drug., (9): 100-101, 2005.
- 3- D'mello, R.: "Ozone therapy in female infertility", 15th Ozone World Congress-London., 2-5, 2001.
- 4- Gruenberg, J. and Van Der Goot, F.: "Toxoplasma: guess who's coming to dinner", Cell., 125(2): 226-228, 2006.
- 5- Guennadi, O.: "Ozone Therapy as the main component of the complex treatment of threatened abortion", Med. Academy of Nizhny, Novogord and Russia., 229-235, 2001.
- 6- Ingelfinger, J., Moskeller, F., Thibodeau L. and Ware, J.: Biostatistics in clinical medicine, 3rd ed. Mc, Graw - Hiel Inc., New York: 120-140, 1994.
- 7- Jones, J., Kruszon, D. and Wilson, M.: "Toxoplasma gondii infection in the united states", Centers for Disease Control and Prevention., 19(11): 1-6, 2003.
- 8- Lopez, A., Dietz, V. and Wilson, M.: "Preventing congenital toxoplasmosis," Morbidity and Mortality Weekly Report, 49: 59-75, 2000 (Abst).
- 9- Pressman, S.: "The Story of Ozone", German Medical Society for Ozone Therapy., 1-24, 2005.
- 10- Sensini, A.: "Toxoplasma gondii infection in pregnancy: Opportunities and pitfalls of serological diagnosis", Clin Microbial Infect., 12(6): 504-512, 2006.
- 11- Velasquez, M. Neftali, M. and Ignacia, M.: "Destruction of helminth eggs (Ascaris suum) by Ozone", Instituto de Ingeniera, Corrdination de Ingenieria Ambiental, Universidad Nacional., 1, 2001.
- 12- Viebahn, R.: "The Effect of Ozone on plasmodium falciparum-infected red blood cells", Departemnt of parasitology, institute for tropical medicine, University of Tuebingen, Germany, 26-39, 2001.
- 1- Bocci, V., Luzzi, E., Corradeschi, F. and Paulesu, L.: "Studies on the biological effects of ozone: An attempt to define conditions for

الملخص العربي

تأثير العلاج بالأوزون في علاج داء المقوسات

الهدف من هذه الدراسة هو معرفة تأثير الأوزون في علاج داء المقوسات . وقد شاركت في هذه الدراسة ثلاثون مريضة متطوعة ممن تراوحت أعمارهن ما بين 20-35 عاما ، ثم تشخيصهن علي أنهن تعانين من مرض داء المقوسات ، وقد تم تقسيمهن إلى مجموعتين متساويتين في العدد . المجموعة (أ) - مجموعة الدراسة وتضمنت 15 مريضة تم علاجهن بالأوزون (250 إلى 300 مل من غاز الأوزون بتركيز 20 إلى 40 ميج لكل ملي بواقع ستة جلسات أسبوعيا لمدة ثلاثة أسابيع ، ومجموعة (ب) - مجموعة ضابطة - تلقين العلاج الدوائي (سبيراميسين 31 مللي وحدة دولية) مرتين يوميا لمدة ثلاثة أسابيع . وقد تم التقييم لجميع الحالات عن طريق تحليل الدم لقياس الأجسام المضادة إم (أي-جي-أم) وذلك قبل بداية الدراسة وبعد ثلاثة أسابيع من العلاج لكلا من المجموعتين (أ،ب) . وقد أوضحت النتائج أن هناك انخفاضاً ذو دلالة معنوية عالية في الأجسام المضادة (أي-جي-أم) في مجموعة الدراسة (أ) بينما كان هناك انخفاض ذو دلالة معنوية في الأجسام المضادة (أي . جي . أم) للمجموعة (ب) بعد ثلاثة أسابيع من العلاج ، وبالمقارنة يلاحظ وجود فرق ذو دلالة غير معنوية في الأجسام المضادة إم (أي-جي-أم) قبل بداية الدراسة بالنسبة للمجموعتين (أ،ب) بينما كان هناك فرق ذو دلالة معنوية عالية في المجموعة (أ) عنه في المجموعة (ب) بعد انتهاء العلاج (3 أسابيع) وهكذا يمكن أن نستخلص من هذه الدراسة أن الأوزون يمكن اعتباره احد وسائل العلاج الطبيعي الفعالة في علاج داء المقوسات .

الكلمات الدالة : العلاج بالأوزون - داء المقوسات - الأجسام المضادة إم .