OPINION ARTICLE

Ozone therapy: a complex term

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ABSTRACT

INTRODUCTION

The term 'ozone therapy' is increasingly used and apparently known in the medical-scientific field. However, it is not infrequent to come across a superficial knowledge of this method with its numerous therapeutic applications characterised by multiple modes of administration. Therefore, irrespective of the clinical aspects, I consider a contribution of clarity to highlight the peculiarities of the different modes of administration to be appropriate.

ARGUMENTATION

With regard to ozone therapy at systemic level, the standardisation of the methods adopted and the safety of the treatments, also in relation to the absence of potential toxic chemical species, are indispensable features. Adequate knowledge of them must be the starting point for any health professional who considers it in his or her interest to also employ this practice as an armoury for the health of his or her patients. In fact, unlike normal drug prescriptions, systemic ozone therapy usually also engages the physician in terms of preparation and administration of the therapeutic treatment.

CONCLUSION

The purpose of this note lies in stimulating in the reader an attitude of knowledge for a careful evaluation of all the parameters that come into play even before adopting the enormous clinical potential of the correct use of oxygen-ozone gaseous mixtures.

KEYWORDS

Ozone therapy; Safety; Therapy management; Quality of treatment.

The term 'ozone therapy' encompasses a multiplicity of treatment and administration methods. Apart from ozonated derivatives obtained from vegetable matrices such as olive oil, sunflower oil and analogues for which it is legitimate to speak of the 'shelf-life' of the active portion identifiable as 'ozonide' and chemically corresponding to the 1,2,4-trioxolane ring, all other treatment modalities involve the extemporaneous preparation of the gaseous oxygen-ozone mixture for subsequent administration.

In this regard, it is necessary from the outset to distinguish the topical and/or loco-regional route from the systemic route. With the exception

of external 'bagging' primarily used in dermatology, the loco-regional route is mainly used in orthopaedics, physiatrist and similar disciplines. In a nutshell, the gaseous mixture is directly inoculated into the affected districts in well-defined positions, in known volumes and concentrations, using syringes of suitable capacity equipped with appropriate needles, in accordance with the good clinical practices issued by the various scientific societies operating in the field.

As for systemic administration, on the other hand, the description becomes even more articulated and, as such, difficult to summarise in a few words. The modality that historically gave rise to this treatment was inspired by the extracorporeal treatment of whole blood in the presence of a suitable anticoagulant and mixed with oxygen under UV irradiation before reinfusion in the same patient. The therapeutic approach in which ozone replaced UV radiation remained largely empirical until the 1990s, when following Prof. Bocci's studies the systemic treatment known in Italy as "Grande AutoEmoTerapia" (GAET) and internationally under the corresponding term Major AutoHemoTherapy (M-AHT) underwent considerable development. In order to avoid regulatory misunderstandings resulting from the inevitable manipulation of blood, it has been recently suggested to use the more accurate and specific term 'systemic indirect intravenous ozone therapy' following ozonation of whole blood from the same patient, or similar terms. In view of the reinfusion of the treated blood once the reaction has taken place completely in the appropriate device used (ozone-resistant polymer bag, or rigid plastic or glass vessels) it is of interest to highlight, in this regard, the generation of any overpressure, with the consequent impact on the amount of soluble ozone. Other practical aspects, such as the amount of blood to be treated, the choice of anticoagulant and its mode of use, the mode and time of contact between the blood and the gas mixture, and the reinfusion rate, are very important aspects for the standardisation of the ozone administration method.

Moreover, M-AHT can be defined as an ex vivo extravascular treatment of autologous blood in static mode, with the reaction of the appropriate amount of ozone involving a defined pool of whole blood outside the body to be re-infused to the same patient in an appropriate time interval. For the sake of completeness, at least for the time being there is both insufficient experimental evidence and rational aspects to justify methods aimed at increasing both the number of consecutive treatments and ozone dosage of the same whole blood pool before reinfusion.

In order to overcome certain criticalities, among which the drawing of blood in large quantities for the number of sessions deemed necessary is paramount, some clinicians adopt systemic intravenous administration of ozonated infusion aqueous solutions. However, in these cases, it is an intravascular in vivo blood treatment in dynamic mode, where molecular

correlations with blood components are the result of instantaneous and consecutive reactions. Ultimately, the reaction between ozone and whole blood takes place directly in the vein, with foaming in the circulatory stream to be expected with each drop of infusion aqueous solutions carrying dissolved ozone in a chemically reactive form.

Therefore, in my opinion, the common points between the conventional ex vivo methods and the in vivo methods just described can only be seen at a qualitative level, in relation to the chemical reactions between ozone and blood components. In all other respects, the organism's response modes are quantitatively and anatomically different, also in terms of the spatial-temporal distribution mode of the effector molecules that are generated.

Last but not least, the concerns arising from the potential formation of toxic compounds due to the oxidation reaction of ozone with the chemical species present in treated infusion solutions must be taken into account. In particular, physiological saline contains 0.9% NaCl. This issue has been addressed for several decades and the results are contradictory. Some studies have shown no formation of toxic hypochlorites or chlorates [1]. Others, however, recently report the formation of the chlorate ion as the main product [2,3]. Furthermore, in an indirect manner, the reactivity of ozone in saline solution is also evidenced by its rapid degradation [4], to the extent that constant bubbling is required when the solution is reinfused into the patient to ensure that the nominal concentration of dissolved ozone is maintained [5]. In view of the primum non nocere rule, reasonable doubt of the formation of chemical species with potential health risks should warn against treatments with ozonated salt solutions. The same approach should also be applied to other infusion solutions that may have been treated with ozone prior to infusion (Ringer lactate, Dextrose 5 % in water, and the like).

Ultimately, this note has achieved its purpose if, after reading it, the breadth and articulation of the term 'ozone therapy' becomes clearer. For the sake of completeness, apart from administration routes that are not widely practised and for which systemic absorption could represent an undesirable side effect (eg nasal, auricular, subcutaneous), still within the systemic mode of administration one can frame: i) the small autohaemotherapy (5-10 mL of whole blood, taken and treated directly in a syringe with an equivalent volume of gaseous oxygen-ozone mixture before administration in the same patient by intramuscular route), whose rationale for use can be identified as a kind of 'autovaccination'; ii) the transdermal route (use of special cabins with a controlled humidity level and capable of preventing the oxygen-ozone gas mixture from escaping in order to avoid unintentional inhalation), capable of exploiting the large

surface area represented by the skin; iii) rectal insufflation (as a rule, up to 200 ml of oxygen-ozone gas mixture at a maximum concentration of 40 μg/mL, by means of a special catheter, preferably after rectal evacuation of faecal residues). As far as rectal insufflation is concerned, a sort of dynamic intravascular absorption of ozone at the level of the haemorrhoidal plexus as it is or, more likely, of the effector molecules resulting from its reactivity at the level of the mucosa concerned is plausible. The disadvantages of this method are the unpredictability of absorption and the irritating effect.

In conclusion, for reasons of conventional procedures and the possibility of standardisation, in my opinion M-AHT remains the safest and most accepted way of ozone therapy by systemic administration.

REFERENCES

1. Razumovskii SD, Korovina GV, and T. V. Grinevich. Mechanism of the First Step of Ozone Decomposition in Aqueous Solutions of Sodium Chloride in View of New Data on the Composition of Reaction Products. Dokl Phys Chem 2010; 434: 163–165. DOI: 10.1134/S0012501610100027

2. Levanov AV, and Isaikina OY. Mechanism and Kinetic Model of Chlorate and Perchlorate Formation during Ozonation of Aqueous Chloride Solutions Ind Engin Chem Res 2020; 59 (32): 14278-14287. DOI: 10.1021/acs.iecr.0c02770

3. Yin X, Cui H, Li S, and Niu S. Simultaneous determination of chlorite, chlorate, perchlorate and bromate in ozonated saline by using IC-MS. Anal. Methods 2020; 12: 5916–5921. DOI: 10.1039/d0ay01903h.

4. Bocci V, Zanardi I, Borrelli E, and Travagli V. Reliable and effective oxygen-ozone therapy at a crossroads with ozonated saline infusion and ozone rectal insufflation. J Pharm Pharmacol 2012, 64, 482–489. DOI: 10.1111/j.2042-7158.2011.01427.x.

5. Martínez-Sánchez G. Practical aspects in ozone therapy: Study of the ozone concentration in the ozonized saline solution. Ozone Therapy Global J 2020; 10(1): 55-68