



OZONIZED SALINE SOLUTION LAVAGES IN A DOG WITH MULTI-RESISTANT BACTERIAL PERITONITIS DUE TO A GUN SHOT

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Background: Septic peritonitis is a life-threatening condition. Outcome is variable with a mortality > 68% with surgical intervention. Management includes surgical debridement and correction of the septic source, prompt and appropriate antibiotic therapy and cardiovascular support. Broad- spectrum antibiotic therapy is generally chosen while awaiting results of peritoneal bacterial culture and susceptibility. The time between the diagnosis of septic shock and the administration of appropriate antibiotic therapy has also been shown to influence survival.

Many authors consider that post-surgical continued drainage of the abdominal cavity is important as it facilitates the primary action of peritoneal defense, that is physically removing bacteria and inflammatory mediators from the abdominal cavity. Copious saline lavage of the abdomen through the drainage may help to remove bacteria and inflammation.

Ozone is an allotropic modification of the oxygen molecule into a chain of three atoms of oxygen. It is found in natural form in the atmosphere or it can be produced by generators. Ozone is a gas with a high oxidative potential, it has affinity for carbon double bonds and oxidates bacterial cell walls and cytoplasmic membranes and acts on fungi, protozoa, and viruses. When interacts with bacterial cytoplasmic membranes affects osmotic stability, promoting oxidation of aminoacids and nucleic acids, and causing bacterial cellular lysis. Medical ozone can be administered as a gas (mixture of ozone and oxygen), as an ozonized oil or as an ozonized solution. Ozonated saline solution (O₃SS) has been shown to possess antibacterial and anti-inflammatory effects and has been used successfully in human wound healing, chronic pelvic pain and in experimental peritonitis in rats.

Case presentation: A female mongrel dog, seven months old, 30 kg, was received in the ER/ICU service due to septic peritonitis induced by a gun shot. Five intestinal perforations and an abscess with the bullet inside were observed in laparotomy (Fig. 1). The affected area was resected and an anastomosis was performed and a closed active drain was placed. Blood and peritoneal fluid cultures were performed. Post-surgical treatment included intravenous broad- spectrum antibiotics (amoxicillin/clavulanate 20 mg/kg BID, metronidazole 10 mg/kg BID and marbofloxacin 2 mg/kg SID).

While waiting for culture results, daily O₃SS lavages were made. A medical ozone generator (Ozonobaric P- Sedecal®) was used (Fig. 2). Ozonation of 250 ml 0,9% saline solution was performed by using the Dual-Kit System (Bexen medical®) bubbling ozone through the solution (ozone concentration: 50 µg/NmL; 20 minutes) (Fig. 3). One lavage per day during 5 days with 250 ml of O₃SS were done and peritoneal fluid production decreased from 1000 ml to 58 ml/day with an improvement of clinical signs and no side effects. A multi-resistant *Enterococcus faecium* was isolated in blood and peritoneal fluid only sensitive to sulfamethoxazole/trimethoprim and rifampin. Oral therapy with sulfamethoxazole/trimethoprim was started after the 5 lavages and the patient was discharged after 2 days with the appropriate antimicrobial therapy.

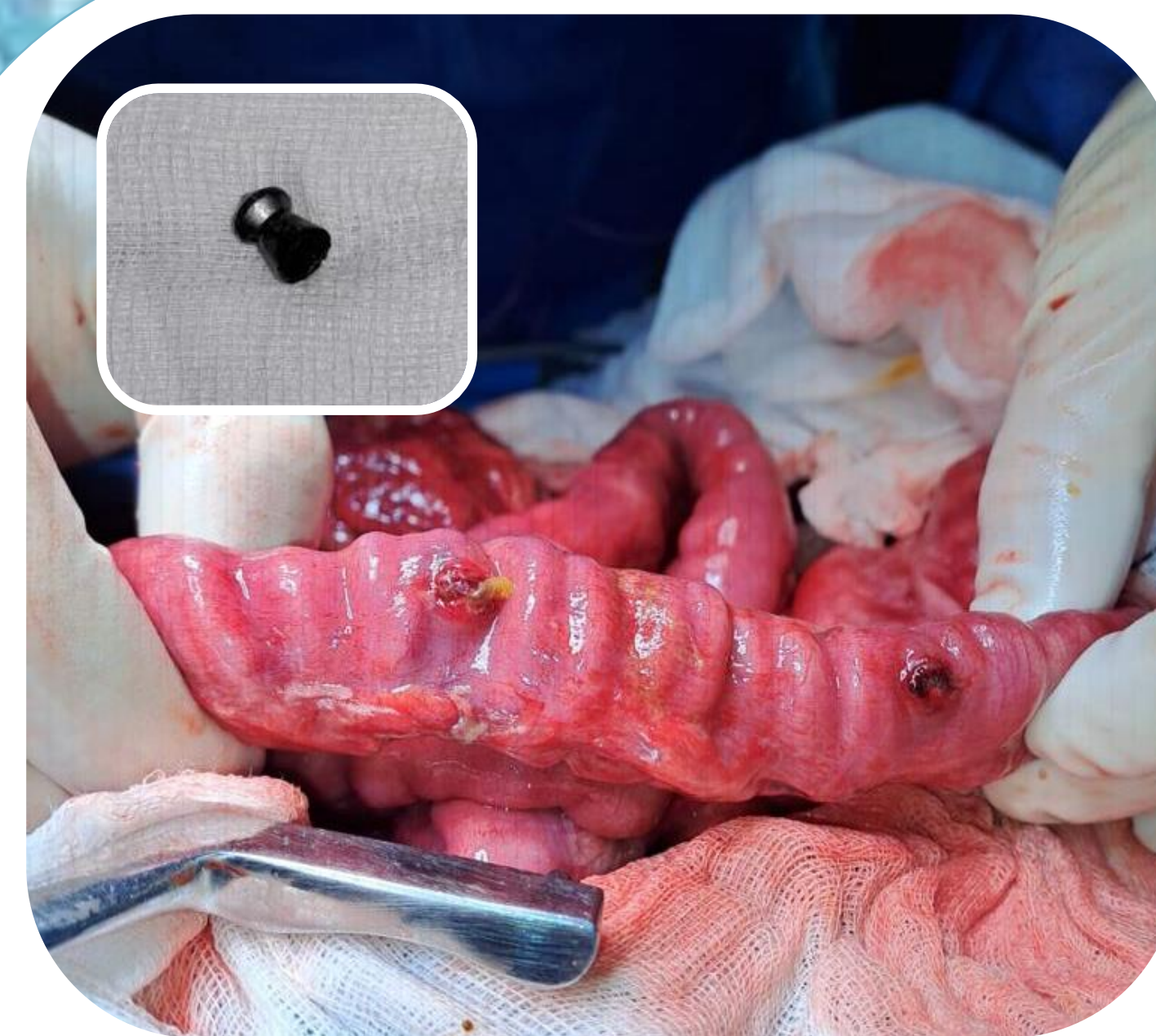


Fig. 1. Intestinal perforations due to gun shot



Fig. 2. Ozonobaric P- Sedecal® generator



Fig. 3. Dual-Kit System (Bexen medical®)- bubbling ozone in 0,9% NaCl

New/ Unique Information: Septic peritonitis is a common, life-threatening condition encountered in dogs and cats. Early control of infection is crucial and in septic shock any delay in administering appropriate antibiotics can have an impact on patient survival. Culture results are usually delayed for at least 48 hours. Data reported in the literature have shown that bacteria, spores, and viruses are inactivated by ozone after only few minutes of exposure. Ozone is capable of killing all the known types of gram- positive and gram- negative bacteria, including *Pseudomona aeruginosa* and *Escherichia coli*, both of which are extremely resistant to antibiotics. The anti-microbial effect of ozone is by the result of its action on cells by damaging its cytoplasmic membrane due to ozonolysis of dual bonds and also ozone induced modification of intracellular contents because of secondary oxidants effects. This action is non-specific and selective to microbial cells. The use of ozone in accordance with good practice does not damage human body cells; the reason attributed to this, is the presence of antioxidant mechanisms in mammalian cells and the lack of such mechanisms in microbial cells.

In our case, O₃SS presumably contributed to control multi-resistant septic peritonitis due to its bactericidal effect since bacteria were resistant to intravenous broad- spectrum antibiotics administered to this patient previous to the cultures results. Medical ozone has been in continuous medical use for over 100 years, having been used by German soldiers in the trenches to disinfect wounds in World War I. The use of ozone in humans and animals is still considered controversial because of its side effects that are specifically related to free radical formation and irritation of the respiratory system due to malpractice (non-aseptic techniques, inadequate dosage, non-approved generators...). For these reasons, ozone therapy has had limited acceptance in clinical practice, and most of the studies on ozone therapy have been experimental and preclinical. This is the first report of O₃SS peritoneal lavages used successfully as a coadjuvant antimicrobial treatment in a dog with multi-resistant bacterial peritonitis.

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