



## Efficacy of low-concentration hypochlorous acid spray in acute sore throat relief

Hypochlorous acid spray in acute sore throat relief

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### Abstract

**Aim:** Sore throat is one of the most predominant symptoms of the human population. The aim of the study was to define the efficacy of low-concentration hypochlorous acid (HOCl) in patients with sore throat. Low-concentration hypochlorous acid (HOCl) is an antiviral and antibacterial agent which is produced endogenously. **Material and Method:** 50 patients over the age of 18 were included in this study. The patients were randomly chosen to receive oropharyngeal mouthwash with either low-concentration HOCl (n= 24) or placebo saline solution (n= 26) for 4 days. We evaluated the sore throat relief using the 7-point Sore Throat Relief Scale (STRS). **Results:** The STRS scores were significantly lower in the HOCl group than in the placebo group after 4 days of treatment (p<0.05). **Discussion:** This study showed that low-concentration HOCl spray provided better improvement in sore throat symptoms when compared to placebo saline spray.

### Keywords

Sore Throat; Hypochlorous Acid; Pain

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## Introduction

Sore throat is a very common inflammatory symptom. Most of the population experiences 2-3 episodes of infection every year with significant morbidity. Unnecessary use of antibiotics increases the risk of bacterial resistance, which is a threat to modern healthcare [1]. There are several reasons for sore throat, but worldwide, pharyngotonsillitis is the most common upper respiratory tract infection for which antibiotics are prescribed. Use of different adjunct therapies including oropharyngeal anti-inflammatory and antimicrobial sprays has been attempted to control sore throats.

Hypochlorous acid (HOCl) is a weak acid that forms when chlorine dissolves in water. HOCl is traditionally used as a medical disinfectant for wound care [2]. Antibacterial, antifungal, and antiviral effects of low concentrations of HOCl have been shown without toxicity to the nasal mucosa, indicating that it can also be used effectively for the oropharynx and oral cavity. Low-concentration HOCl oropharyngeal spray would be beneficial to patients with sore throat because of its antibacterial and antiviral effects, and it may be used as a primary therapy in patients with the symptoms of sore throat. The aim of this study was to evaluate the efficacy of low-concentration HOCl oropharyngeal spray for the reduction of sore throat symptoms such as dry throat, burning/painful sensation, hoarseness/husky voice, painful talking, painful swallowing, irritation, prickly sensation/tingle, and a scratchy/itchy throat.

## Material and Method

50 adults (male and female) over 18 years of age with complaint of a sore throat less than 3 days were enrolled in the study. All patients signed written informed consent before the study. Patients were selected who had a sore throat due to an upper respiratory tract infection (tonsillitis, pharyngitis, or rhinopharyngitis). Clinical confirmation was made by a physician for the presence of typical signs (spontaneous pain, local inflammation) of acute pharyngitis or tonsillitis. Sore throat relief scores on the Sore Throat Relief Scale (STRS), a 7-point descriptive rating scale, were completed by the patients. Patients with a history of allergy, active smokers, those with fever over 38°C, with asthma, chronic rhinosinusitis, chronic obstructive pulmonary disease, gastroesophageal reflux disease (GERD), known immunodeficiency, controlled or uncontrolled diabetes, evidence of mouth breathing or severe coughing, or current antibiotherapy or antibiotherapy that had been stopped within 2 weeks before inclusion were excluded from the study. Patients who used analgesics or common cold drugs within 24 hours were also excluded from the study. The study protocol was approved by the local ethics committee and was conducted in accordance with the ethical principles of the Declaration of Helsinki.

All participants were randomly assigned to either the HOCl or placebo group. 24 patients in the HOCl group received three puffs of oropharyngeal HOCl spray two times daily. 26 patients in the placebo group received three puffs of saline two times daily. No other treatment was given to the patients. All of the patients completed the STRS on the first day, before the intervention, and then daily for the next three days. These tests are self-administered and specific to patients with sore throat.

Primary outcome measures and incidence of adverse events occurring during the study were evaluated in this study.

The baseline characteristics were compared between the two study groups using a Chi-square test for the categorical variables and a 2-sample t test for the continuous variables. The statistical analyses were performed using SPSS for Windows, Version 20.0 (IBM, North Castle, NY, USA). The level of significance was set at  $p < 0.05$ .

## Results

This study included 24 male and 26 female patients, with a mean age of 37.3 years (range 18–64 years). There were no significant differences in the STRS scores between the groups before the start of the treatment. There was a significant improvement in the mean STRS scores in the HOCl group following the 3rd day of treatment ( $p < 0.05$ ). There was no improvement in the mean STRS scores in the placebo group following the third day of treatment ( $p = 0.33$ ). The mean STRS scores after treatment were significantly lower in the HOCl group compared with the placebo group ( $p < 0.05$ ). We examined the oral cavities of all patients at each follow-up visit, and no adverse events were observed in either group. No patients in either the HOCl or the placebo group reported any significant uncomfortable adverse effects.

## Discussion

Sore throat is a common cause of patient discomfort and visits to the doctor's office. The sensation, which may be described by sufferers as scratchy, raw, tight, burning, or achy, may last from minutes to months, depending on the underlying cause, and may be accompanied by related complaints such as fever, runny nose, hoarseness, or difficulty swallowing. Infection is the most common cause of sore throats in the upper respiratory tract, including in the ears, nose, and sinuses as well as the throat and tonsils. Studies have shown that more than half of these infections are caused by common viruses. Infectious mononucleosis agent Epstein-Barr virus accounts for less than 10 percent. Most of the remainder is caused by various bacteria. Group A beta-hemolytic Streptococcus is the most common of the bacterial causes. Other bacterial causes include species of Staphylococcus, Hemophilus, Mycoplasma, and non-group A Streptococcus. Fungus is a rare cause of sore throat and most commonly encountered in patients with immunosuppression.

Use of unnecessary antibiotic treatment for sore throat is one of the major health risks for future generations. Antibiotic use is complicated by many factors, including drug interactions, cost, and the potential for allergic reactions. Unnecessary use has led to the development of antibiotic-resistant forms of bacteria which are very difficult if not impossible to treat. We believe that it is important to define effective adjunct therapies for sore throat to avoid the unnecessary use of antibiotics.

HOCl is acidic matter that has been used as a bleach, an oxidizer, and a disinfectant. Low concentrations of HOCl have been shown to have antibacterial and antiviral effects [4]. Research has shown that it is an effective nasal irrigant. The disinfectant mechanism of HOCl is still unclear [5]. However, it is thought that chlorine acts as a disinfectant by inhibiting key enzymatic reactions within cells and by denaturing proteins.

HOCl has been shown to be effective on bacteria and fungi such as *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Rhizopus oryzae*, *Candida albicans*, and *Aspergillus fumigatus* [4]. Yu et al. reported that low-concentration HOCl inhibited the human rhinovirus-induced secretion of interleukin-8 and interleukin-6 and viral replication in human nasal epithelial cells. They suggested the use of HOCl as an effective adjuvant therapy for chronic rhinosinusitis [6]. Based on the fact that low concentrations of HOCl have excellent antibacterial and antiviral effects, we decided to use the solution for sore throat. Our study showed that low concentrations of HOCl sprays are a very effective and tolerable treatment for sore throat if started within 72 hours of the symptoms' onset.

There are several limitations of this study. Future studies with a larger number of patients would further support the use of HOCl for sore throat.

#### **Scientific Responsibility Statement**

*The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.*

#### **Animal and human rights statement**

*All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.*

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#### **Conflict of interest**

*None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.*

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