HYPERTONIC SALINE NASAL IRRIGATION

Literature review

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INTRODUCTION:

• The use of nasal irrigation dates back centuries.
• For more than a century physicians have recommended nasal irrigation for treatment of sinonasal disease and after sinonasal surgery.
• The goals of this treatment are to clear secretions, debris, and crusts, reduce risk of postoperative mucosal adhesions, and accelerate mucosal healing.
Introduction

• Saline solutions can be classified into isotonic or hypertonic, buffered or non-buffered.

• Preparations include powder, spray or mist forms; with and without preservative; and with and without dispenser.

• The number of available products in the market can make it difficult for the doctor to decide on what product to recommend for his patient, ranging from inexpensive home-made preparations to very expensive imported solutions.
Currently the medical literature includes recommendations for saline in a variety of sino-nasal complaints:

- Allergic rhinitis
- Pregnancy rhinitis
- Paediatric chronic sinusitis
- Sinonasal sarcoid
- Wegener’s granulomatosis
- Chronic rhinosinusitis
- Post-operative care
MECHANISM OF ACTION

- Different studies have shown that both isotonic and hypertonic nasal saline irrigations have beneficial effects in many sinonasal conditions.
- The exact mechanism by which improvement is effected is unclear.
- Hypotheses for why nasal saline irrigation promotes improvement of nasal symptoms include the following:
  1. improving mucociliary clearance
  2. decreasing mucosal edema
  3. decreasing inflammatory mediators
  4. mechanically clearing nasal crusts and thick mucous
Effect of HTS on mucociliary clearance

Effect of HTS on ciliary beat frequency

Effect of HTS on nasal patency
MUCOCILIARY CLEARANCE:

- Nasal mucociliary clearance may be impaired by several factors: decreased ciliary beat frequency, increased viscosity of the mucus layer, outflow obstruction, crusting, mucosal contact, and altered ventilation.

- Impaired mucociliary function is associated with upper respiratory tract infections, allergic rhinitis, and rhinosinusitis.
• study was undertaken using volunteers without any significant sinonasal disease.
• Patients served as their own control using a saccharin clearance test before any nasal irrigation was used.
• Patients then used one of two solutions to irrigate their nose-buffered normal saline or buffered hypertonic saline-and were then retested. On a separate day, the control test was repeated, followed by irrigation with the alternate solution and a second saccharin clearance test.

Conclusion:

- Buffered hypertonic saline nasal irrigation improved mucociliary clearance, whereas buffered physiological saline had no effect on mucociliary clearance.
- Hypertonic saline might have the added beneficial effect of decongesting the nose through an osmotic mechanism.

Aim of study: to compare the effect of buffered hypertonic and buffered normal saline sprays on mucociliary clearance (as assessed by the saccharine clearance method)

Study design: Double-blind trial with subjects acting as their own controls.

Participants no: 22

RESULTS: Buffered hypertonic saline and buffered normal saline both improved saccharine clearance times ($P < 0.0001$ for buffered hypertonic and $P 0.002$ for buffered normal saline). Buffered hypertonic saline improved saccharine clearance times more than buffered normal saline (39.6% vs 24.1%)

EBM: B2
Fig 2. Percentage difference in saccharine clearance times between buffered hypertonic and buffered normal saline.
Effect of HTS on the ciliary beat frequency (CBF)
• **Boek et al,** studied the effect of different saline solutions on the ciliary beat frequency (CBF) of cryopreserved mucosa of the sphenoidal sinus measured by a photoelectric method.

• Results revealed that Locke-Ringer’s solution (LR) had no effect on the CBF, NaCl 0.9% had a moderately negative effect, NaCl 7% solution led to complete ciliostasis within five minutes (reversible after rinsing with LR), and 14.4% hypertonic solution had an irreversible ciliostatic effect.

• He concluded that LR is an isotonic solution with no effect on ciliary beat frequency.

**Study**: David, 2009  
**Study design**: RCT  
**Participants**: Eight healthy volunteers  
**Study groups**: 0.9% saline spray to one nostril and 3.0% saline spray to the other. Ciliated cells were collected.  
**Primary endpoint**: CBF was calculated using computerized microphotometry.

**Conclusion**: The administration of hypertonic saline results in a significantly faster CBF 5 minutes after administration. This effect is not seen 60 minutes after administration.
The effect of hypertonic saline solution on nasal patency
• **OBJECTIVE:** To compare the effect of two saline nasal sprays on nasal patency and mucociliary clearance in patients with rhinosinusitis.

• **STUDY DESIGN:** Randomized double-blind trial.

• **SUBJECTS AND METHODS:** 80 patients with rhinosinusitis had nasal patency and mucociliary clearance measured.

  Each patient was then treated with either physiological or hypertonic saline. Nasal patency and mucociliary clearance measurements were repeated after treatment.

  Subjective evaluation was also performed.
Conclusion:

- Buffered physiological and buffered hypertonic saline nasal sprays both improve mucociliary clearance, which is beneficial for treatment of rhinosinusitis.

- Buffered physiological saline improves nasal airway patency, whereas buffered hypertonic saline has no effect.

- **Both solutions provide symptomatic relief, but buffered hypertonic saline is more irritating and cause more burning sensation.**
Use of Topical Nasal Therapies in the Management of Chronic Rhinosinusitis
**Baraniuk et al.** documented that hypertonic saline may induce sensations of pain, blockage and rhinorrhea in a dose-dependent manner. These adverse effects become evident when concentration as high as 5.4% was used.


**Krayenbuhl et al.** documented that concentrations as high as 5.4% have no effect on nasal reactivity and suggest that solutions to use as provocative should be at least above this cut-off.

Hypertonic saline in AR

- **Study**: Garavello et al 2003
- **Study design**: Randomized controlled trial
- **Number of patients**: 20 (children 6–12 years old with allergic rhinitis)
- **Study groups**: Hypertonic 3.0% saline 5 mL tid, no irrigation for 6 weeks
- **Primary endpoint**: Rhinitis symptom score
- **Level of evidence**: 1b
- **Conclusion**: HS irrigation produced statistically significant improvement in rhinitis symptom scores in weeks 3–5 of treatment compared to no irrigation group.

Hypertonic saline in AR

Study: Garavello 2005
Study design: Randomized controlled trial
Number of patients: 44 (children under age 16 with allergic rhinitis)
Study groups: Hypertonic 3.0% tid, no irrigation for 7 weeks
Primary endpoint: Rhino-conjunctivitis score
Level of evidence: 1b
Conclusion: HS irrigation produced statistically significant improvement in rhinoconjunctivitis symptom scores in weeks 6–7 of treatment compared to no irrigation group.

Hypertonic saline in AR

Study: Cordray 2005
Study design: Randomized, single-blind, Placebo controlled
Number of patients: 15 (adults with allergic rhinitis)
Study groups: Hypertonic Dead Sea saline spray tid, aqueous triamcinolone (220 lg tid), NS spray tid for 7 days
Primary endpoint: RQLQ score
Level of evidence: 1b
Conclusion: HS and intranasal steroid groups produced statistically significant reductions in RQLQ scores (P <0.0001); no significant improvement occurred in control group.

HYPERTONIC SALINE IN CRS

Study: Pinto 2006
Study design: RCT
Number of patients: 60
Study groups: NS spray; HS spray; no spray
Primary endpoints: Symptom scores
Level of evidence: 1b

Conclusion: Symptom scores showed higher nasal discharge scores in HS group; there was not significant improvement in symptom scores from no treatment.

Study: Shoseyov 1998
Study design: Randomized, double-blind
Patients no: 30 (children 3–16 years old)
Study groups: HS 1 mL tid, NS 1 mL tid for 4 weeks
Primary endpoint: Symptom (cough and postnasal drip) scores

Level of evidence: 1b
Conclusion: The HS treatment produced significant improvement in symptom scores; the NS treatment produced significant improvement in postnasal drip score.

study: Rabago 2002
Study design: Randomized controlled trial
Patients no: 76
study groups: SinuCleanse 2.0% saline 300 mL qD for 6 months, no irrigation
Primary endpoint: SF-12 and RSDI scores
Level of evidence: 1b
Conclusion: Saline irrigation produced statistically significant improvement in RSDI scores compared to no irrigation group; there was no statistically significant improvement in SF-12 scores.

STUDY: Pynnonen 2007
DESIGN: Randomized controlled trial
PATIENTS NO: 127
STUDY GROUPS: Large volume NS irrigation (NeilMed), HTS (Deep Sea nasal saline spray) FOR 8 weeks
Primary endpoint: Symptom scores (SNOT- 20)
Level of evidence: 1b
Conclusion: Large volume isotonic saline irrigation produced statistically significant improvement in SNOT-20 scores at all time points (2, 4, and 8 weeks) compared to the spray group.

Clinicians should not confuse saline spray with saline irrigation ... because irrigation is more effective in expelling secretions and improving quality of life.

Irrigation can be performed with isotonic or hypertonic nasal solution, but evidence is insufficient to support superiority of either approach.
Thanks …