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Nasal saline irrigation in children: A study of compliance and tolerance

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ABSTRACT

Objective: To determine the compliance with and tolerance of nasal saline irrigation in children.
Study design: Phone survey.
Setting: Tertiary pediatric hospital.
Methods: Children diagnosed with nasal congestion and rhinorrhea from sinusitis, chronic rhinitis or allergic rhinitis were identified. Children who were prescribed a therapeutic course of nasal saline, who were instructed how to administer the treatment and who were available for follow up were included. Parents were contacted by phone and asked to complete a questionnaire regarding their child's experience with nasal saline irrigation.
Results: 61 Children met inclusion criteria. 73% of parents initially thought that nasal saline irrigation would be helpful, but only 28% thought that their children would tolerate the treatment. 93% of children made an attempt to use nasal saline irrigation and 86% were able to tolerate the treatment. 84% of parents whose children attempted nasal saline irrigation noted an improvement in their child's nasal symptoms. 77% of children that attempted nasal saline irrigation continue to use this treatment for symptom relief. 93% reported an improvement in their child's overall health that they attributed to this treatment.
Conclusions: Perhaps the biggest barrier to routine recommendation of nasal saline irrigation in children is the assumption by both parents and physicians that children will not tolerate it. However, this study demonstrates that the majority of children, regardless of age, were judged by their parents to tolerate nasal saline irrigation.

1. Introduction

Rhinosinusitis is a common clinical problem with significant morbidity and often refractory symptoms that accounts for approximately 26.7 million office and emergency room visits and results in 5.8 billion dollars spent in direct costs in the United States each year [1]. The impact of sinonasal disease on a patient's quality of life is significant in both the adult and pediatric population. Parents of children with chronic rhinosinusitis perceive their children to have more bodily pain and be more physically limited than do parents of children with other chronic diseases, including attention deficit/hyperactivity disorder, juvenile rheumatoid arthritis, epilepsy and asthma [2]. As part of the "unified airway" theory, studies have shown that treatment and resolution of rhinosinusitis results in an improvement in several pulmonary conditions such as asthma and cystic fibrosis [3].

Nasal saline irrigation are a personal hygiene practice in which mucus and debris is flushed from the nasal cavity. This is typically performed using a commercially available neti pot or flexible plastic bottle and warm saline solution. Nasal saline irrigation has long been a mainstay of treatment for sinonasal disease in the adult population because of its economy, safety and apparent efficacy. While the literature suggests a benefit to nasal irrigation in the treatment of children with seasonal allergies [4], acute sinusitis [5] and chronic sinusitis [6], these studies are limited by small sample sizes, inconsistent methodologies and undefined compliance rates. To our knowledge, the compliance with and tolerance of nasal saline irrigation has not before been studied in the pediatric population. In our experience, there is often an assumption by parents and physicians that children will be unwilling to attempt nasal saline irrigation and unable to tolerate this treatment.

Our objective was to determine the compliance with and tolerance of nasal saline irrigation in children.

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2. Methods

2.1. Study design

The charts of children (aged <18 years) that presented to one of the authors (JWS) at a single outpatient satellite office of Children's Memorial Hospital (Chicago, IL) from October 1, 2009, through November 1, 2010, with persistent nasal congestion and rhinorrhea secondary to sinusitis, chronic rhinitis or allergic rhinitis were reviewed. Children who were prescribed a therapeutic course of isotonic nasal saline rinses, who were taught how to perform the rinses via live demonstration from a trained nurse and who were available for follow up were included in the study population. All children used Neil Med brand sinus rinses twice a day. Each rinse consisted of 100 cm^3 of room temperature isotonic saline irrigated through each nostril. All children received standard of care medical therapy. Parents of these children were contacted by phone within 2–4 months of being prescribed the treatment and asked to complete a verbal questionnaire regarding their child's experience with nasal saline irrigation. The Children's Memorial Hospital Internal Review Board approved the study protocol.

2.2. Data extraction

Data were abstracted from the hospital's electronic medical record system and entered into a standardized collection form. All otolaryngology office visit notes were reviewed. Data abstracted included name, phone number, date of birth, gender, age at the time of office visit and whether nasal saline irrigation was recommended as a part of treatment.

2.3. Parental questionnaires

We created a parental questionnaire to assess the compliance with and tolerance of nasal saline irrigation, and to assess whether parents noted a positive impact of this treatment on the health of their child. All parents were asked the same 5 questions regarding their initial perceptions of nasal saline irrigation and whether their child used the treatment. Parents of children that did use nasal saline irrigation were asked an additional 8 follow up questions regarding the frequency of use and whether they felt the irrigation subjectively reduced their child's sinonasal symptoms. Parents of children that did not attempt nasal saline irrigation were asked 2 additional questions regarding factors that may have contributed to noncompliance. Parents of children that did attempt nasal saline irrigation but do not currently use the treatment were asked 5 additional questions regarding the frequency of use and reasons for discontinuing the treatment.

There was no reimbursement or incentive for participation in this study. If parents agreed to participate, they were read an informed consent statement and gave their verbal consent for inclusion into the study.

2.4. Statistical analysis

Children were divided into 3 different age groups according to school level: pre-kindergarten (≤5 years), elementary school (6–12 years) and high school (≥13 years). For each item on the questionnaire, the 3 groups were compared using a Chi-squared test. A p-value of <0.05 was considered significant.

3. Results

Charts from 114 children were reviewed. Children were excluded ($n = 19$) because recommendation of nasal saline irrigation was not documented in the medical record ($n = 18$), and because the child was >18 years of age at the time of the study ($n = 1$). Parents of the remaining 95 children were contacted by phone and asked to participate in the study. Additional children were excluded ($n = 34$) because they were lost to follow-up ($n = 4$), their parents declined participation in the study ($n = 7$), or their parents were unable to be reached despite 3 separate attempts ($n = 23$). Parents of 61 children were successfully contacted and completed phone questionnaires.

Table 1
Patient demographics.

Parameter	Value
n	61
Median age, years (range)	8 (2–16)
Age, n (%)	
≤5 years	14 (23)
6–12 years	38 (62)
≥13 years	9 (15)
Male, n (%)	41 (67)

A summary of patient demographics is shown in Table 1. The median age at the time nasal saline irrigation was recommended was 8 years (range: 2–16 years), and 67% of children were male.

57 children (93%) made an attempt to use nasal saline irrigation (see Fig. 1). 4 children (7%) did not attempt nasal saline irrigation; in all 4 instances the parents did not think their child would tolerate the treatment and said that their child refused to attempt it. All 4 parents said they would have been more likely to attempt nasal saline irrigation if their child was older. There was a trend toward older children being less likely to attempt nasal saline irrigation, but this was not statistically significant ($p = 0.10$).

When nasal saline irrigation was first described to parents, 44 (72%) thought it would be helpful in alleviating symptoms. However, only 17 parents (28%) thought that their child would tolerate this treatment (Fig. 2). While there was a trend toward parents of older children being more likely to think their child would tolerate nasal saline irrigation, this was not statistically significant ($p = 0.17$). Of the 57 children that attempted nasal saline irrigation, 49 (86%) were able to tolerate the treatment. There was no statistically significant difference in tolerance between the three age groups ($p = 0.51$). There was, however, a significant difference between actual tolerance of nasal saline irrigation and initial parental assumption of tolerance ($p < 0.001$). Of the 8 children that did not tolerate nasal saline irrigation, 3 (37.5%)

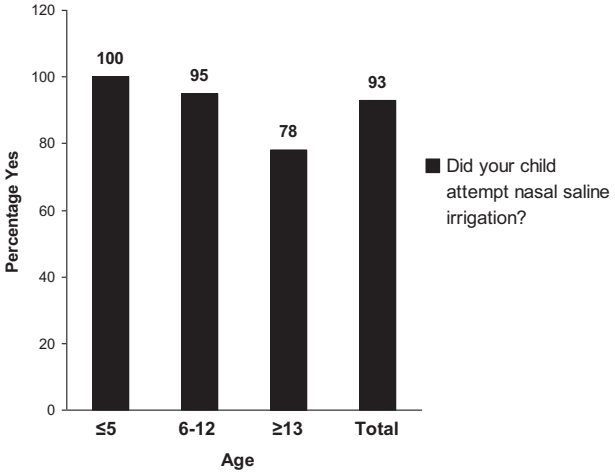

Fig. 1. 93% of children attempted nasal saline irrigation. While there was a trend toward older children being less likely to attempt nasal saline irrigation, this was not statistically significant ($p = 0.10$).

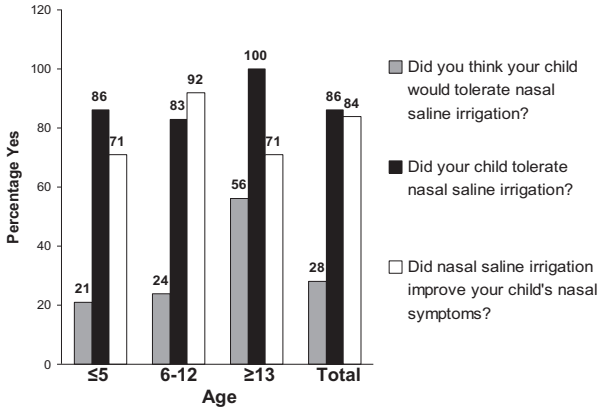

Fig. 2. Only 28% of parents thought their children would tolerate nasal saline irrigation ($p = 0.17$), while 86% of children actually tolerated this treatment ($p = 0.51$). 84% of parents believed that nasal saline irrigation improved their child's nasal symptoms ($p = 0.13$).

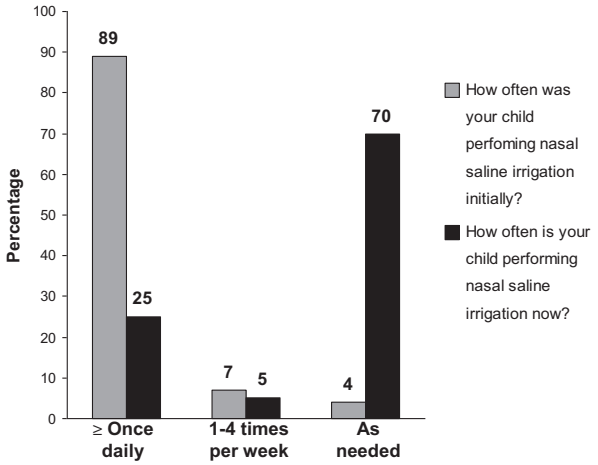

Fig. 3. 89% of children that use nasal saline irrigation initially performed irrigation at least once per day. 70% of children now use the treatment on an as-needed basis.

attempted it only once, 3 (37.5%) attempted it fewer than 7 times, and 2 (25%) attempted it more than 7 times. Of the 44 children that tolerated nasal saline irrigation, 6 (14%) accepted the treatment after the first use, 32 (73%) accepted the treatment in fewer than 7 days, and 5 (11%) took between 7 and 14 days to accept the treatment.

Parents of 7 children that attempted nasal saline irrigation (12%) reported side effects (Table 2). These included ear pain/popping ($n = 3$), cough/gagging ($n = 2$), nausea ($n = 1$) and pain ($n = 1$). In the majority of cases (71%), side effects were not severe enough to preclude continuation of treatment. Only 2 children were unable to tolerate nasal saline irrigation secondary to side effects. Parents of the remaining 6 children that did not tolerate nasal saline irrigation noted that their child did not like the treatment, but denied specific side effects.

Of the 57 children that attempted nasal saline irrigation, 48 (84%) had an improvement in sinonasal symptoms (defined as less nasal congestion, rhinorrhea and/or post-nasal drip) that their parents attributed to nasal saline irrigation (Fig. 2). There was no statistically significant difference in perceived improvement between the three groups ($p = 0.13$). There were 5 children (8.8%) that discontinued nasal saline irrigation because they did not feel it was having a significant impact on symptoms. Of all children that attempted nasal saline irrigation, 44 (77%) continue to use nasal saline irrigation for treatment of their symptoms. There was no statistical difference in compliance with treatment between the 3 age groups ($p = 0.40$).

39 of the 44 children (89%) that use nasal saline irrigation initially performed irrigation at least once per day (Fig. 3). While 11 children (25%) continue to use nasal saline irrigation on a daily basis, the majority (70%) now use it only on an as-needed basis for symptom relief.

82% of parents whose children use nasal saline irrigation believe that their child has fewer sinus infections as a result of the treatments. 93% of parents whose children use nasal saline irrigation believe the treatment has improved their child's overall health.

Table 2
Side effects of nasal saline irrigation.

Side effect	Number of children, *n* (%)
Ear pain/popping	3 (5)
Cough/gagging	2 (4)
Nausea	1 (2)
Pain	1 (2)

4. Discussion

Nasal saline irrigation is a commonly prescribed therapy for the treatment of sinonasal disease in adults, and its efficacy in this population has been well established [7–9]. While the exact mechanism of action is unknown, both isotonic and hypertonic rinses have been demonstrated to improve mucociliary clearance, and isotonic saline rinses have further been shown to increase nasal patency [10]. A recent Cochrane review provides evidence that nasal saline irrigation is beneficial not only when used as a treatment adjunct, but also when used as the sole modality of treatment [11]. This review also provides evidence that routine use of nasal saline irrigation is associated with decreased use of antibiotics. Nasal saline irrigation is well tolerated in the adult population. While minor side effects such as nasal burning, irritation and nausea are reported, there have been no documented severe adverse effects [11].

The evidence supporting the use of nasal saline irrigation in children is less clear. In 1998, Shoseyov et al. performed a randomized double blind study comparing the efficacy of hypertonic saline irrigation to normal saline irrigation in 34 children [6]. In this study, irrigation consisted of 10 drops of solution instilled into the nasal cavity 3 times daily. Outcomes were measured using 2 clinical scores determined by the parents and investigators (cough and nasal secretions/postnasal drip), and a radiology score determined by the investigators. Both hypertonic and normal saline irrigation resulted in improvements in nasal secretions/post-nasal drip, and hypertonic irrigation was further shown to improve radiographic evidence of disease on Waters' projection. 4 children (12%) were unable to tolerate the treatment and withdrew from the study.

In 2003, Garavello et al. performed a non-blinded randomized trial comparing hypertonic saline irrigation to no irrigation in 20 children with seasonal allergic rhinitis [4]. In this study, irrigation consisted of 2.5 mL of solution delivered to each nostril via a disposable syringe 3 times daily. Outcomes were measured using daily parental recordings of nasal symptoms and use of antihistamines throughout the study period. Children in the study group demonstrated a significant improvement in mean daily rhinitis scores and reported decreased use of antihistamines throughout the study period compared with the control group. The authors reported a 100% compliance rate with treatment, although

there were 6 children that refused participation in the study for unclear reasons.

More recently, in 2009, Wang et al. performed a randomized, placebo-controlled study comparing normal saline irrigation to no irrigation in 69 children with acute sinusitis [5]. In this study, irrigation consisted of 15–20 mL of solution delivered to each nostril via a disposable syringe 1–3 times daily. Outcomes were measured by pre- and post-treatment nasal peak expiratory flow, nasal smear examination, radiography, Pediatric Rhinoconjunctivitis Quality of Life Questionnaires and daily symptom diaries. Children in the study group had significantly improved nasal peak expiratory flow, improved mean quality of life scores and decreased nasal symptoms compared with the control groups. There was no significant difference in nasal smears or in post-treatment radiography between the 2 groups. The compliance rate of this study was undefined.

While these studies do suggest a benefit to nasal saline irrigation in the pediatric population, the generalizability of these results is limited by the different populations targeted, inconsistent methodologies and varying outcome measures. However, in all three studies there was a perceived improvement in nasal symptoms secondary to nasal saline irrigation. Our primary objective was to determine the compliance with and tolerance of nasal saline irrigation. We did not objectively study the efficacy of sinus rinses is treating any medical disease. Therefore, we did not restrict inclusion to one specific diagnosis. Our goal was to include all children with persistent nasal congestion and/or rhinorrhea.

Perhaps the biggest barrier to routine recommendation of nasal saline irrigation in children is the assumption by both parents and physicians that children will not tolerate it. In our experience, parents are often skeptical that their children will tolerate nasal saline irrigation, especially when their children are young. We have shown these observations to be true. Only 28% of parents in this study believed their child would tolerate nasal saline irrigation when it was first described to them, and there was a trend toward parents of older children being more likely to think their child would tolerate the treatment. Parents of the 4 children that did not attempt nasal saline irrigation also said they would be more likely to try if their children were older.

Interestingly, our findings demonstrate that the majority of children will attempt and tolerate nasal saline irrigation, regardless of age. There was no statistically significant difference in tolerance of nasal saline irrigation across the age groups, even among the youngest children studied. This has important implications when counseling parents on the use of this treatment in their children. Children, especially young children, are much more likely to tolerate this treatment than their parents anticipate.

There were no significant side effects reported in our study. Side effects were generally mild and, in the majority of cases, were not severe enough to preclude continued use of nasal saline irrigation.

In 2000, Cunningham et al. demonstrated that parental perception of disease in chronic rhinosinusitis in children is significant [2]. This perception is often the driving factor behind visits to a physician's office and influences perception of a child's overall quality of life. We believe, then, that parental perception of treatment efficacy is an important issue to consider in the pediatric population. In our study, the majority of parents surveyed reported a subjective improvement in their child's nasal symptoms that they attributed to nasal saline irrigation. However, this improved perception of disease burden makes nasal saline irrigation an important treatment adjunct when treating the symptoms of sinonasal disease in children.

The overall compliance with nasal saline irrigation in children is very similar to that seen in adults. In 2001, Heatley et al. studied 150 adult patients that were randomized to nasal saline irrigation or control treatment with reflexology massage [7]. 70% of patients in the irrigation group said they would continue to use nasal saline irrigation once the study was complete. In 2002, Rabago et al. performed a randomized controlled trial comparing nasal saline irrigation to no irrigation in 76 adult patients [9]. 93% of patients in the experimental group said they would continue to use nasal saline irrigation after completion of the study. A follow-up study in 2005 revealed that 87% of patients did continue to use nasal saline irrigation, with 55% using this treatment only on an as-needed basis for symptom relief [12]. Our results were similar, with 77% of parents reporting ongoing use of nasal saline irrigation by their children. The majority of these children use the treatment on an as-needed basis.

This study was not designed to determine if nasal saline irrigations effectively treat or cure any medical condition. Previous research has already demonstrated the utility of sinus rinses in treating allergic rhinitis [4] and acute sinusitis [5]. Instead, this study determines the compliance with and tolerance of nasal saline irrigation in children across all age groups. To this end, there were limitations in this study that merit further discussion. The completion of surveys by parents may have lead to recall bias. However, the children who did tolerate nasal saline irrigation were still using it at the time of the phone call, and parents whose children who did not use the treatment had a clear description of why it was not tolerated in their children. Despite this limitation, the results demonstrate that nasal saline irrigation is well tolerated in children of all ages and that their parents believe the treatment is beneficial in improving nasal symptoms. Given that this is an inexpensive therapy with minimal side effects, it may be a useful treatment adjunct in the management of pediatric sinonasal disease.

5. Conclusion

The majority of children in this study, regardless of age, were judged by their parents to tolerate nasal saline irrigation. Parents of children that use nasal saline irrigation reported subjective improvement in nasal symptoms and improved overall health in their children. Nasal saline irrigation may be considered as a safe, effective and well-tolerated treatment adjunct in the management of pediatric sinonasal disease.

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Conflicts of interest

The authors have no conflicts of interest to disclose.

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