Hypertonic Saline Therapy in Cystic Fibrosis

Idil Mohamed

University of North Dakota

Follow this and additional works at: https://commons.und.edu/pas-grad-posters

Part of the Respiratory Tract Diseases Commons

Recommended Citation

This Poster is brought to you for free and open access by the Department of Physician Studies at UND Scholarly Commons. It has been accepted for inclusion in Physician Assistant Scholarly Project Posters by an authorized administrator of UND Scholarly Commons. For more information, please contact zeinehyousif@library.und.edu.
Abstract
Cystic fibrosis is an autosomal recessive genetic disorder that severely affects the lungs as well as other organs in the body. The pathophysiology of cystic fibrosis lung disease involves the production of thick and sticky mucus that accumulates leading to obstruction and inflammation of the airways. This disease is characterized by abnormal transport of sodium and chloride across an epithelium by defective genes, resulting in thick mucus secretions. Nebulized hypertonic saline (3% NaCl) improves mucociliary clearance through rehydration of the airway surface liquid of the lungs. The purpose of this study is to evaluate the effects of nebulized hypertonic saline in improving lung function and decreasing exacerbation rates in older children (10-18 years of age) and adults with stable cystic fibrosis compared to normal saline (0.9%).

The review of literature will focus on comparing the use of nebulized hypertonic saline in enhancing mucociliary clearance in CF patients compared to other methods. The expected outcome is that nebulized hypertonic saline treatment will improve lung function and decrease exacerbation of CF in these groups.

Introduction

Cystic fibrosis characterized by abnormal transport of sodium and chloride across an epithelium by defective genes, resulting in thick mucus secretions.

Enhancement of therapy practices to advance outcomes is an area of cystic fibrosis care, which has progressed significantly over the last few decades. As the choices of treatment for CF increases, the clinicians are confronted with the predicament of developing a treatment plan that provides optimal benefit, addresses the complex therapeutic routine on patient compliance and is cost-effective.

Today, CF patients are living longer and clinicians need to recognize and implement early treatment to maintain optimal outcome. An early efficient management of children with CF is a road map to increasing the quality of life and health status of these patients as they transition to adulthood.

Statement of the Problem

With the practices of newborn screening and an increase in life expectancy, the management of individuals with CF must adapt to a more vigorous and individualized methodology and CF physiotherapy management needs to reflect the shifting landscape, with increasing life expectancy and decreasing disease burden in CF patients.

Research Question

In older children and adults with stable cystic fibrosis who have failed to show improvement with recombinant human deoxyribonuclease (rhDNase) does treatment with nebulized hypertonic saline improve lung function, forced expiratory volume in one second (FEV1) and pulmonary exacerbation compared to SS?

Discussion

In a controlled long-term trial, treatment with hypertonic saline for one year had an adequate yet continued improvement in the level of lung function.

More interesting, however, were the apparent reduction rates of exacerbations, antibiotic use, and overall improvement of quality of life that were associated with use of hypertonic saline.

Eng et al. (1996) observed improvement of 15% in FEV1 from baseline to 62% in the control group; P=0.03).

Nebulized hypertonic saline treatment is inexpensive and safe as an additional therapy in patients with cystic fibrosis and can play an essential role in the clinical setting.

Research

Gupta et al. (2012) conducted a randomized control trial in which 31 children diagnosed with cystic fibrosis were administered either 3% saline or 7% saline for 28 days.

Peak expiratory flow rate improved from 172.7 l/min at a baseline to 195.3 l/min on day 28 of the trial in the group that received the 3% hypertonic saline and from 194/min to 212 l/min in the group that received the 7% saline.

Eng et al. (1996) conducted a 48 week double-blind study in which patients were randomly assigned to inhale 4ml of either 7 percent hypertonic saline or 0.9 percent saline twice daily for 48 weeks.

The group that received the hypertonic saline treatment had significantly higher FVC (at 82ml; 95% confidence interval, 12, to 153) and FEV1 (at 68ml; 95% confidence interval, 3 to 132) values, but parallel FEV25-75 values.

Hypertonic saline had significantly greater numbers of patients without pulmonary exacerbation (76% compared with 62% in the control group, P=0.03).

Application to Clinical Practice

Nebulized hypertonic saline illustrates tangible improvement in mucus clearance without major adverse effects by reducing the number of exacerbation, use of antibiotics, and improving lung function.

Hypertonic saline achieves this function by its direct effect on mucus, breaking the innate bonds leading to lower viscosity and elasticity.

Hypertonic saline has been shown to improve mucociliary clearance in patients with cystic fibrosis and recent studies provide indication for clinical efficacy for hypertonic saline in cystic fibrosis.

Figure 1

The CFTR protein is a channel protein that controls the flow of H2O and Cl- ions. When the CFTR protein is working correctly (Panel 1) ions freely flow in and out of the cells. However, when the CFTR protein is malfunctioning (Panel 2) ions cannot flow out of the cell due to a blocked channel (Karl Kunzelman, 2000).

Figure 2

Absolute Change from Baseline in Forced Vital Capacity (FVC) (Panel A) and the Forced Expiratory Volume in One Second (FEV1) (Panel B) (Elkins, 2006).

Figure 2

Absolute Change from Baseline in Forced Vital Capacity (FVC) (Panel A) and the Forced Expiratory Volume in One Second (FEV1) (Panel B) (Elkins, 2006).

References


Acknowledgments

✓ Dr. Vikki McCleary, Associate Professor of the PA program at UND for her constant support and guidance.

✓ Dr. Susan Kuntz, Assistant Professor of the PA program at UND for being patient and providing valuable resource for this project.

✓ Dr. Awo Abdi, Assistant Professor of Sociology at University of Minnesota for her critical advice, guidance, and timeless efforts.

✓ Family and friends who have been constant source of support and inspiration throughout this project.