ORIGINAL ARTICLE

Effects of nasal aspiration by the Proetz® method in pediatric patients with sinusitis

Yaskara Amorim Filgueira[1]
Vanderlan Nogueira Holanda[2]
Fernando Luiz Affonso Fonseca[3]
David Feder[3]

1. Departamento de Fisioterapia, Centro Universitário Doutor Leão Sampaio – Unileão, Juazeiro do Norte, CE, Brasil.
2. Departamento de Bioquímica, Centro de Biociências, Universidade Federal de Pernambuco, Recife, Brasil.
3. Centro Universitário Saúde ABC, Santo André, SP, Brasil.

http://dx.doi.org/10.1590/1806-9282.66.11.1503

SUMMARY

OBJECTIVE: *To characterize the effects of nasal aspiration with Proetz® in peak nasal inspiratory flow (PNIF) in pediatric sinusitis (PS) patients with nasal obstruction.*

METHODS: *This is a non-randomized descriptive-analytical clinical trial with a quantitative approach. The sample comprised 30 children. Initially, the PNIF was measured and the Visual Analogical Scale (VAS) was used for nasal obstruction, followed by the nasal aspiration procedure. The SNOT-22 questionnaire was applied to the legal guardian of each child, and one week later, it was reapplied for the sake of follow-up.*

RESULTS: *16 (53.3%) patients were females and 14 (46.7%) were males, with an average age of 6.4±1.8 years (between 4 and 10 years of age). Analyses of the VAS for obstruction before the intervention revealed that 10 of the participants (33.3%) presented moderate levels, and 20 of them (66.7%) severe levels. However, after the Proetz® method was applied, all the samples (n=30) had mild levels. The PNIF significantly increased after the technique was used, with an improvement of 23.4% in mean values. There was no significant correlation between the VAS and the PNIF.*

CONCLUSION: *Nasal aspiration with the Proetz® method significantly improved the clinical condition of sinusitis patients with nasal obstruction according to the visual analogical scale, the PNIF, and the SNOT-22 questionnaire. No correlation between the VAS and the PNIF could be found. The study confirms the importance of non-pharmacological interventions in the treatment of sinusitis in children, thus resulting in an improvement in their quality of life.*

KEYWORDS: *Sinusitis. Respiratory Tract Infections. Child. Nasal Obstruction.*

INTRODUCTION

Nasal obstruction is a common symptom of upper-airway disorders in children, and conservative therapy for nasal passage obstruction, whenever indicated, is essential[1]. However, to reestablish the drainage pathway by clearing the paranasal sinuses is as important as eliminating the etiologic agent[2]. Some interference of nasal cleansing and massage over nasal aeration can be observed in children with physiological mouth breathing. Nasal aeration measures showed sensitivity to the cleansing and massage techniques, and measures of nasal geometry confirmed its effect on respiratory physiology[3].

DATE OF SUBMISSION: 13-May-2020
DATE OF ACCEPTANCE: 02-Jul-2020
CORRESPONDING AUTHOR: Yaskara Filgueira
Av. Maria Letícia Leite Pereira, s/n, Juazeiro do Norte, CE, Brasil – 63022-145
Tel: +55 88 98812-5774
E-mail: yascarafilgueira@leaosampaio.edu.br

In order to relieve the nasal obstruction in the upper airways, some techniques lead to good results, like the nasal instillation of saline solution[4], therapeutic ultrasound[5], and nasal aspiration with Proetz®[6]. The method of nasal aspiration with Proetz® was described by and named after Arthur W. Proetz in 1926[7]. It consists of the clearing of the nasal cavity to decongest the upper airways. This technique is performed through the nostrils by means of suction that exerts negative pressure in the nasal cavities. It is based on the air elasticity principle in the paranasal cavities and the gas-compressibility law for the displacement of secretions[8].

It is known that PA usually causes from 6 to 8 upper airway infectious attacks a year, with high symptomatology of nasal duct obstruction[9]. Therefore, studies on nasal aspiration with the Proetz® method are justified, and if proven effective, it may open doors to the pediatric society to a new therapeutic method based on scientific evidence regarding the efficacy of the technique in the treatment of nasal obstruction.

The guiding question of this study was designed based on the PICO acronym, in which P stands for the Population (pediatric patients - PA), I for Intervention (effects of nasal aspiration with Proetz® method), and CO for Context (nasal obstruction due to sinusitis diagnosis). Therefore, the following question arose: Is the Proetz® method effective for the removal of secretions from the nasal duct in pediatric patients?

The aim of this study was to characterize the effects of nasal aspiration with Proetz® in PNIF in PS patients with nasal obstruction.

METHODS

This is a non-randomized descriptive-analytical clinical trial with a quantitative approach. It was conducted at the Respiratory Physiotherapy Department, pediatric wing, from the Centro Universitário Doutor Leão Sampaio (Unileão), in Juazeiro do Norte, Brasil, in May 2017. The study was approved by the Research Ethics Committee of Unileão under nº 2256330. All the parents or guardians signed a term of consent and patients signed an assent term.

The sample comprised 30 male and female children aged between 4 and 10 years. They were selected by intentional sampling, including sinusitis patients with nasal obstruction whose guardians signed all the terms presented to them. The exclusion criteria were: children with neurologic diseases, with cognitive, renal, metabolic and/or cardiovascular alterations; those with facial trauma, headache, facial burns, recurrent epistaxis, diagnosis of neoplasia; patients in a mediate or immediate postoperative period; children who could not complete the tests presented by the researchers.

The treatment was carried out in the afternoon, in a climate-controlled environment, at the same temperature proposed in the study by Teixeira et al.[10], namely, between 22 and 24°C. At first, the children were submitted to a clinical examination that included an ectoscopy followed by the measurement of the PNIF and evaluation using the VAS.

The PNIF was measured to analyze how much the nasal obstruction interfered with the intake of air, or if there was no direct influence. The measurement was performed by using an in-check inspiratory flow meter (Clement Clark International) with a padded oronasal mask over the face of the patient. The values of the analysis ranged from 30 to 370 L/min registered on the surface of the cylinder after each inhalation. The result was immediately obtained.

The VAS was carried out to evaluate the level of nasal obstruction according to the child's subjective perception. The scale ranges from 0 to 10, and it is organized by colors that describe the intensity of nasal congestion, which goes from mild to moderate, to severe. This scale has already been used in other studies with good acceptance and promising results for the subjective analysis of pain in children and adolescents, like in the study conducted by Tostes et al.[11].

It is important to point out that before the measurement of PNIF was performed, it was clearly and concisely explained to the patient, taking each age into account. The patient was placed in a sitting position, and the mask was properly adjusted to the face so that no air could escape from it. To start the procedure, the command "close your mouth and smell the flower very quickly" was given, which, in a playful way, corresponds to quickly breathing in through the nose. Three measurements were taken from each patient at intervals of 1 minute, and at the end, the highest was selected. If a variation higher than 40 L/min was detected between measurements, a new evaluation was done.

Once the measurements were taken and after a resting period, the SNOT-22 questionnaire was applied. Translated into Portuguese by Kosugi et al.[12], this questionnaire analyzes symptoms during two weeks prior to its application. The questions were adapted so that the legal guardians could answer

them. Although it is self-applicable, the researchers were available to help the respondents, without interfering in their answers, when questions came up.

The SNOT-22 is specific for sino-nasal disorders. It is composed of 22 questions that encompass nasal, paranasal, and psychological symptoms as well as aspects related to the quality of sleep. Each question receives a score from 0 to 5, where 0 is the absence of a condition and 5 is the most severe case of the condition. The questionnaire also evaluates the quality of life of sinusitis patients; therefore, it is also applied whenever interventional processes or therapeutic procedures are to be conducted so that their efficacy and the significant effects on the life of the patient can be analyzed. SNOT-22 is considered the best questionnaire for the evaluation of sinusitis[13].

After all the analyses were carried out, nasal aspiration with the Proetz® method was performed. The patient was in a quiet environment, lying on a stretcher with no head elevation, and the therapist was alongside the head of the stretcher for the procedure. A 10 ml syringe was used for the gradual introduction of 0.9 saline solution to thin the secretions, and then the vacuum aspiration (-150/-180mmHg) technique was applied. The same process was repeated for the second nostril. The whole procedure lasted from 2 to 4 minutes aiming to remove all the secretions from the paranasal sinuses, and the PNIF could then be reassessed.

The statistical analysis was performed using the Shapiro-Wilk test for the analysis of data normality. It was observed that the variable post-inspiratory pressure did not show normal distribution (p=0.011), and the variable post-VAS had a probability value close to non-normal distribution (0.071). Hence, the descriptive values mean, standard deviation, median, and 25-75 percentiles were shown. For inferential comparison, the Wilcoxon and Spearman's rank tests were used for the variables from the SNOT-22 questionnaire. The Stata 11 software was used for data analysis.

RESULTS

The sample was composed of 30 children clinically diagnosed with sinusitis. There were 16 females (53.3%) and 14 males (46.7%) at an average age of 6.4±1.8 years, ranging between 4 and 10 years (S^2 3.206 and *SE* 0.327). The means and medians obtained from the VAS and PNIF before and after the Proetz® method are shown in Table 1.

Initially, it could be observed that the VAS scores significantly improved with the Proetz® method. Before the procedure, 10 (33.30%) of the participants had a moderate score, and 20 (60.70%) had a severe score. However, after the method was used, the entire sample (n=30) presented a mild score, indicating that there was a reduction in nasal obstruction according to the patients' perception.

The analysis of the PNIF measurement showed significant improvement after the procedure. Before the application of the technique, the values ranged from 40 to 100 L/min. On the other hand, after the intervention, these values ranged from 50 to 120 L/min in all patients, with an increase of 80% in one of them.

TABLE 1. DESCRIPTIVE VALUES AND TESTING OF HYPOTHESIS FOR THE DIFFERENCES IN THE VISUAL ANALOGICAL SCALE (VAS) AND INSPIRATORY PRESSURE BEFORE AND AFTER THE PROCEDURE.

Indicators	VAS			Inspiratory pressure		
	Before	After	p*	Before	After	p*
Mean (sd)	7.5 (1.4)	2.6 (1.0)	<0.001	64.0 (20,1)	79.8 (20,4)	<0.001
Median (p25 – p75)	7.0 (7–8)	2 (2–3)		60 (50 -80)	80 (60 -100)	

sd = standard deviation; p25 = 25 percentile; p75 = 75 percentile; * Wilcoxon test.

Table 2 shows the Spearman correlation for VAS and PNIF before and after the Proetz® method. No statistical significance could be found in this correlation.

TABLE 2. SPEARMAN CORRELATION BETWEEN VAS BEFORE - INSPIRATORY PRESSURE BEFORE AND VAS AFTER - INSPIRATORY PRESSURE AFTER.

Correlation	Spearman rank correlation	p
VAS before – inspiratory pressure before	0.26	0.168
VAS after – inspiratory pressure after	0.14	0.465

*VAS: Visual Analogical Scale

The analyses of the SNOT-22 questionnaire can be found in Table 3.

According to the data supplied by the patients, after the procedure, there was a statistical significance for the variables "need to blow nose", "sneezing", "runny nose", "cough", "post-nasal discharge", "thick nasal discharge", "ear fullness", "ear pain", "facial pain/pressure", "difficulty to fall asleep", "wake up at night", "reduced concentration"; "frustrated/restless/irritable", "sad", "decreased sense of smell/taste" and "nasal blockage". The results reveal that there is a direct impact on the patients' quality of life.

TABLE 3. ANALYSIS OF THE VARIABLES FROM THE SNOT-22 QUESTIONNAIRE (N=30).

	BEFORE			AFTER			Wilcoxon**	
	ẋ	sd	S^2	ẋ	sd	S^2	Z	p
Need to blow nose	3.470	0.681	0.464	0.700	0.651	0.424	-4.843	0.001
Sneezing	1.400	1.303	1.697	0.400	0.498	0.248	-3.159	0.002
Runny nose	3.800	0.714	0.510	0.700	0.651	0.424	-4.836	0.001
Cough	0.730	0.785	0.616	0.430	0.504	0.254	-2.065	0.039
Post-nasal discharge	0.930	0.907	0.823	0.500	0.509	0.259	-2.230	0.026
Thick nasal discharge	3.130	1.252	1.568	0.630	0.556	0.309	-4.737	0.001
Ear fullness	0.270	0.450	0.202	0.000	0.000	0.000	-2.828	0.005
Dizziness or vertigo	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000*
Ear pain	0.270	0.450	0.202	0.000	0.000	0.000	-2.828	0.005
Facial pain/pressure	2.570	0.504	0.254	0.630	0.490	0.240	-4.847	0.001
Difficulty to fall asleep	2.270	0.691	0.478	0.670	0.479	0.230	-4.800	0.001
Wake up at night	2.330	0.661	0.437	0.430	0.504	0.254	-4.700	0.001
Lack of a good night's sleep	0.530	0.730	0.533	0.230	0.430	0.185	-1.726	0.084*
Wake up tired	0.430	0.504	0.254	0.230	0.430	0.185	-1.420	0.180*
Fatigue	0.430	0.504	0.254	0.230	0.430	0.185	-1.342	0.180*
Reduced productivity	0.530	0.507	0.257	0.370	0.490	0.240	-1.508	0.132*
Reduced concentration	1.300	0.794	0.631	0.470	0.507	0.257	-3.000	0.001
Frustrated/restless/irritable	2.030	0.669	0.447	0.570	0.504	0.254	-4.932	0.001
Sad	2.000	0.830	0.690	0.130	0.346	0.120	-4.686	0.001
Embarrassed	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000*
Decreased sense of smell/taste	2.030	0.809	0.654	0.470	0.507	0.257	-4.421	0.001
Nasal blockage	3.230	0.898	0.806	0.700	0.651	0.424	-4.90	0.001

ẋ (mean); sd (standard deviation); S^2 (variance); Z (Wilcoxon value); p (significance <0.05);*Statistically non-significant;** Non-parametric Wilcoxon signed-rank test.

Source: Own authorship

DISCUSSION

Besides drug therapies and surgical approaches that target the improvement in airway clearance, there are other resources that can bring the breathing function closer to normal. Such resources consist of a clinical procedure called nasal irrigation, which allows for an improvement in bilateral air intake and output through the cleansing of the airways with 0.9 saline and non-invasive aspiration. However, the results obtained from this procedure regarding nasal permeability are usually subjectively evaluated. The quantitative measurements of peak nasal inspiratory and expiratory flow are of utmost importance[14].

A study conducted by Fritz[15] showed the great efficacy of the Proetz® method in children in the treatment of paranasal sinus obstruction, especially the ethmoid sinus. Such results minimize or eliminate the complications brought by sinusitis in this population. Stancić[16] had a sample of 166 children aged between 6 months and 14 years with upper airway obstructions who did not respond to conventional pharmacological treatment. When the Proetz® method was used, it helped in the patients' full recovery from nasal obstruction conditions.

The result obtained from the use of the Proetz® method regarding the improvement in nasal clearance and permeability increases aeration efficiency due to the clearance of the paranasal sinuses. Therefore, the effect of the method on nasal permeability, in structural terms related to the nasal mucosa, is significant, the functional effect on aeration was a fact that can be considered satisfactory for the recovery from nasal obstructive conditions. Tugrul et al.[17] worked with a sample of 90 children suffering from acute rhinosinusitis on whom the nasal obstruction treatment was performed. There was a significance in the values of PNIF after the procedure. Soler et al.[18] conducted a study with individuals between 2 and 21 years old diagnosed with chronic rhinosinusitis. They underwent conservative treatment for 6 months before and after the intervention. According to the results obtained from the SNOT-22 questionnaire, the patients seemed to be confident regarding their overall quality of life with mean values 42,2 ± 19,2 vs. 10,4 ± 9,7 p <0,0001.

Ciprandi et al.[19] studied the correlation of VAS for nasal obstruction and the PNIF. The researchers

confirmed the relevance of the clinical use of the scale, with Spearman's coefficient rho=0.879 (p<0.001).

Hence, the application of the method in PA with nasal obstruction is strongly recommended. After the Proetz® method, according to the VAS for nasal obstruction, patients described their pain as mild, and an improvement in nasal obstruction and in nasal aeration could be observed. The insufficient sample size, as well as the lack of comparative literature on the subject (very few similar studies using the same technique in different populations), were factors that posed as limitations to the current study.

CONCLUSION

It could be observed that nasal aspiration with the Proetz® method significantly improved the clinical condition of sinusitis patients with nasal obstruction according to the visual analogical scale, the PNIF, and the SNOT-22 questionnaire. No correlation between the VAS and the PNIF could be found. The study confirms the importance of the application of non-pharmacological interventions in the treatment of sinusitis in children, thus resulting in an improvement in their quality of life. Additionally, this group of researchers hopes to enrich the national literature with further knowledge on the real effects of Proetz®, a valuable tool for pediatric physiotherapy.

Author's Contribution

Yaskara Amorim Filgueira: Conceptualization, Validation, Investigation, and Writing; Vanderlan Nogueira Holanda: Writing - Review & Editing; Fernando Luiz Affonso Fonseca: Investigation, Supervision, Project Management; David Feder: Investigation, Supervision, Writing - Editing, Project Management.

RESUMO

OBJETIVO: *Caracterizar os efeitos da aspiração nasal com Proetz® no pico do fluxo inspiratório nasal (Pnif) em pacientes com sinusite pediátrica (SP) com obstrução nasal.*

MÉTODOS: *Trata-se de um ensaio clínico analítico descritivo, não randomizado, com abordagem quantitativa. A amostra foi composta por 30 crianças. Inicialmente, o Pnif foi medido e a escala visual analógica (EVA) foi utilizada para obstrução nasal, seguida do procedimento de aspiração nasal. O questionário Snot-22 foi aplicado ao responsável legal de cada criança e, uma semana depois, foi reaplicado para fins de acompanhamento.*

RESULTADOS: *Dezesseis (53,3%) pacientes eram do sexo feminino e 14 (46,7%) do sexo masculino, com idade média de 6,4±1,8 anos (entre 4 e 10 anos). A análise da EVA para obstrução antes da intervenção revelou que dez dos participantes (33,3%) apresentaram níveis moderados e 20 deles (66,7%), níveis graves. No entanto, após a aplicação do método Proetz®, todas as amostras (n=30) apresentaram níveis leves. O Pnif aumentou significativamente após a utilização da técnica, com uma melhoria de 23,4% nos valores médios. Não houve correlação significativa entre EVA e Pnif.*

CONCLUSÃO: *A aspiração nasal com o método Proetz® melhorou significativamente o quadro clínico de pacientes com sinusite com obstrução nasal, de acordo com a escala visual analógica, o Pnif e o questionário Snot-22. Não foi encontrada correlação entre EVA e Pnif. O estudo confirma a importância de intervenções não farmacológicas no tratamento da sinusite em crianças, resultando em melhoria na sua qualidade de vida.*

PALAVRAS-CHAVE: *Sinusite. Infecções respiratórias. Criança. Obstrução nasal.*

REFERENCES

1. Leboulanger N. L'obstruction nasale de l'enfant. Ann Fr Oto-Rhino-Laryngol Pathol Cervico-Faciale. 2016;133(3):164-8.
2. Nienkoetter JM, Fernandes M, Schivinski CIS. Fisioterapia e pneumonia em crianças: uma revisão sistemática. Pediatr Mod. 2012;48(5).
3. Melo ACC, Gomes AOC, Cunha DA, Lima SJH, Lima WRP, Cunha RA, et al. Mudança nas áreas nasais em crianças com respiração oral após a limpeza e massagem nasal. CoDAS. 2016;28(6):770-7.
4. Brant TCS. Efeitos da desobstrução rinofaríngea retrógrada isolada e associada à instilação de soro fisiológico (0,9% NACL), sobre as propriedades do muco nasal, a celularidade e as citocinas em lavado nasal e sintomas nasais de motociclistas profissionais expostos à poluição da cidade de Belo Horizonte [Tese de doutorado]. São Paulo: Faculdade de Medicina, Universidade de São Paulo; 2014.
5. Ansari NN, Naghdi S, Fathali M, Bartley J, Rastak MS. A randomized clinical trial comparing pulsed ultrasound and erythromycin phonophoresis in the treatment of patients with chronic rhinosinusitis. Physiother Theory Pract. 2015;31(3):166-72.
6. Sonehara E, Galvão ACM, Caldas LS, Gurgel MP. Atuação fisioterapêutica na sinusite crônica. Rev Bras Fisioter. 2010;14(supl. 1):438.

7. Gouzy R, Gouzy J. La méthode de déplacement de Proetz. La Lettre d'Oto-rhino-laryngologie et de Chirurgie Cervico-faciale. 1999;247:7-8.

8. Pinto RMNF, Pinto RMN, Farias UP. Iatrogenic acure sinus barotrauma. Braz J Otorhinolaryngol. 1975;42(2):162-7.

9. Becke K. Anesthesia in children with a cold. Curr Opin Anaesthesiol. 2012;25(3):333-9.

10. Teixeira RU, Zappelini CE, Alves FS, Costa EA. Peak nasal inspiratory flow evaluation as an objective method of measuring nasal airflow. Braz J Otorhinolaryngol. 2011;77(4):473-80.

11. Tostes MA, Braga JAP, Len CA, Hilário MOE. Avaliação de dor em crianças e adolescentes portadores de doença falciforme. Rev Ciênc Méd. 2008;17(3-6):141-7.

12. Kosugi EM, Chen VG, Fonseca VM, Cursino MM, Mendes Neto JA, Gregório LC. Translation, cross-cultural adaptation and validation of SinoNasal Outcome Test (SNOT) - 22 to Brazilian Portuguese. Braz J Otorhinolaryngol. 2011;77(5):663-9.

13. Caminha GP, Melo Junior JT, Hopkins C, Pizzichini E, Pizzichini MM. SNOT-22: psychometric properties and cross-cultural adaptation into the Portuguese Language spoken in Brasil. Braz J Otorhinolaryngol. 2012;78(6):34-9.

14. Silva AML. Rinometria acústica: valores de referência numa população de estudantes universitários [Dissertação de Mestrado]. Lisboa: Faculdade de Ciências Médicas. Universidade Nova de Lisboa; 2012.

15. Fritz K. The ethmoiditis of the child and the irrigation treatments by Proetz in short general anaesthesia (author's transl). Laryngol Rhinol Otol (Stuttg). 1980;59(1):30-3.

16. Stancić M. Sinobronchial syndrome and obstructive nonspecific pulmonary diseases in children. Srp Arh Celok Lek. 1991;119(11-12):346-8.

17. Tugrul S, Dogan R, Eren SB, Meric A, Ozturan O. The use of large volume low pressure nasal saline with fluticasone propionate for the treatment of pediatric acute rhinosinusitis. Int J Pediatr Otorhinolaryngol. 2014;78(8):1393-9.

18. Soler ZM, Rosenbloom JS, Skarada D, Gutman M, Hoy MJ, Nguyen SA. Prospective, multicenter evaluation of balloon sinus dilation for treatment of pediatric chronic rhinosinusitis. Int Forum Allergy Rhinol. 2017;7(3):221-9.

19. Ciprandi G, Mora F, Cassano M, Gallina AM, Mora R. Visual Analog Scale (VAS) and nasal obstruction in persistent allergic rhinitis. Otolaryngology Head Neck Surg. 2009;141(4):527-9.