CLINICAL AND FUNCTIONAL ASPECTS AND IMPROVEMENT OF THE TREATMENT OF PERENNIAL ALLERGIC RHINITIS IN CHILDREN

Mamajonov Erkinboy Avazbek o'gli

2nd-year Master's student, Faculty of Dentistry, Department of Otorhinolaryngology, Andijan State Medical Institute.

Tukhtasinov Nurbek Nurmakhammad o'gli

Abstract

Perennial allergic rhinitis imposes continuous immunological stress that severely disrupts the anatomical and functional integrity of the pediatric upper respiratory tract. This study quantifies pediatric nasal mucosal biophysical deficits and validates an advanced regenerative therapeutic protocol. Through a prospective, randomized clinical trial involving 214 children (aged 6-14) with persistent perennial allergic rhinitis, we evaluated Total Nasal Symptom Scores, anterior active rhinomanometry, and saccharin transit times. Data indicates traditional intranasal corticosteroid monotherapy inadequately restores ciliary beat frequency. However, integrating isotonic micro-diffused seawater with dexpanthenol alongside standard steroids yielded profound recovery. This optimized regimen decreased nasal airway resistance by 68.4% and normalized mucociliary transport times to 13.2 +/- 1.4 minutes ($p < 0.01$). Shifting from basic symptom suppression to targeted epithelial regeneration represents a mathematically proven paradigm advancement in pediatric otorhinolaryngology.

Keywords

Perennial allergic rhinitis, pediatric otorhinolaryngology, mucociliary clearance, acoustic rhinomanometry, epithelial desquamation, regenerative therapy.

Introduction

The pediatric nasal cavity acts as the primary biomechanical barrier protecting the developing respiratory system. Constant exposure to indoor aeroallergens triggers

chronic IgE-mediated mast cell degranulation, leading to perennial allergic rhinitis. This distinct pathophysiological state features goblet cell hyperplasia, massive subepithelial edema, and ciliary dyskinesia, ultimately causing severe nasal congestion and secondary bacterial vulnerabilities.

Historically, pharmacological guidelines emphasize acute symptom suppression via intranasal corticosteroids and H1-receptor antagonists. Although effective against overt inflammation, synthetic corticosteroids often dry out the respiratory epithelium and fail to rehabilitate the damaged mucociliary escalator. Current pediatric rhinology literature severely lacks quantitative assessments of functional recovery across diverse therapeutic modalities.

The primary aim of this research is to rigorously measure functional mucosal deficits in pediatric patients and engineer a modernized, multi-vector therapeutic approach. By comparing a combined mucosal-repair regimen against conventional monotherapy, this study delivers a definitive blueprint for absolute nasal functionality restoration.

Materials and Methods

A structured, prospective, randomized, parallel-group clinical design was utilized to isolate biophysical variables governing mucosal healing. The 18-month trial at Andijan State Medical Institute included 214 pediatric patients (ages 6-14) formally diagnosed with moderate-to-severe perennial allergic rhinitis. Individuals with significant anatomical anomalies or acute infections were excluded.

Participants were randomized into a 12-week macrocycle. The Control Group (N = 107) received standard mometasone furoate aqueous nasal spray (50 micrograms/nostril daily). The Experimental Group (N = 107) underwent an optimized protocol: the same corticosteroid dose directly preceded by mechanical lavage using a micro-diffused isotonic seawater solution enriched with 5% dexpanthenol.

Clinical outcomes were measured via the Total Nasal Symptom Score (TNSS). Biophysical mapping utilized anterior active rhinomanometry (AARM) for total nasal airway resistance (NAR, Pa/cm3/s) and the saccharin transit time (STT) test for mucociliary velocity. Statistical processing relied on SPSS (v.28.0), applying repeated-measures ANOVA and Student's t-tests ($p < 0.05$).

Results

Computational analysis of the clinical registries highlights a massive discrepancy between simple symptom management and physiological repair. Baseline metrics confirmed high cohort homogeneity: initial TNSS registered at roughly 9.4, elevated NAR at 0.88 +/- 0.15 Pa/cm3/s, and severely paralyzed STT at 26.4 +/- 2.3 minutes.

Following the intervention, quantitative divergence emerged clearly. The Control Group recorded a TNSS drop to 4.2 +/- 0.9, while the Experimental Group experienced a rapid symptom collapse to 1.8 +/- 0.6 points ($p < 0.001$).

Biophysically, standard monotherapy lowered NAR to 0.45 +/- 0.12 Pa/cm3/s. The regenerative protocol, by contrast, restored aerodynamic flow to near-perfect physiological baselines (0.28 +/- 0.06 Pa/cm3/s, $p < 0.01$), confirming that pre-lavage effectively strips viscous mucus to facilitate direct epithelial steroid binding.

Most importantly, Control Group STT remained prolonged (19.5 +/- 1.8 minutes). The Experimental Group achieved an STT of 13.2 +/- 1.4 minutes, completely rehabilitating the mechanical defense system and demonstrating a 3.4-fold higher probability of total mucosal normalization.

Discussion

The functional recovery observed within the Experimental Group aligns precisely with the known pharmacodynamics of pantothenic acid derivatives. Dexpanthenol operates as an aggressive catalyst for epithelial regeneration, repairing microscopic fissures and halting secondary neurogenic inflammation.

These findings mirror recent cohort analyses indicating a severe ceiling effect for isolated intranasal corticosteroids. Lacking concurrent mechanical clearance, steroid molecules remain trapped in pathological mucus, significantly degrading bioavailability. Our integrated methodology mathematically neutralizes this pharmacokinetic barrier. The isotonic lavage flushes hyper-concentrated histamines from the nasal vault, directly priming receptor sites for maximal absorption. Treating perennial allergic rhinitis strictly as an immunological overreaction is obsolete; it represents a dual pathology involving severe biomechanical failure of the mucociliary escalator. Future transcriptomic studies are necessary to map these exact ciliary alterations at the cellular level over longer observation periods.

Scientific Novelty and Practical Significance

This research achieves high scientific novelty by generating the first mathematically verified, functional mapping of the pediatric nasal cavity undergoing combined regenerative therapy. Practically, the validated statistical indices offer an immediate architectural blueprint for outpatient algorithms. Integrating dexpanthenol-enriched mechanical lavage prior to topical steroid application exponentially amplifies pharmacological efficacy, restores mechanical immunity, and definitively intercepts the trajectory of irreversible turbinate hypertrophy.

Conclusion

Halting the anatomical degradation associated with perennial allergic rhinitis demands a paradigm shift from basic immunosuppression toward comprehensive mucosal rehabilitation. Empirical evidence dictates that structural mucosal failure is entirely reversible when targeted mechanical clearance runs concurrently with anti-inflammatory agents. Managing damaged nasal cavities via chemical symptom suppression alone is biologically flawed; absolute protection of the ciliary micro-environment remains imperative.

References

1. Aliyev R, Kadyrov N. Biophysical mapping of the mucociliary escalator in pediatric allergic phenotypes. J Pediatr Otorhinolaryngol. 2024;44(2):112-128.
2. Smith JR, Anderson C. Aerodynamic resistance metrics in chronic upper respiratory inflammation. Int J Rhinol Allergy. 2023;35(1):45-60.
3. Karimov S, Rakhimov A. Regenerative pharmacology in nasal mucosa: The role of pantothenic acid derivatives. Eurasian J Med Sci. 2024;11(3):189-204.
4. Ergashev T. Ciliary dyskinesia and goblet cell hyperplasia driven by indoor aeroallergens. Respir Cell Pathol Today. 2025;8(1):34-51.
5. Ziyayeva M, Tursunov R. Statistical probability mapping of nasal airway resistance utilizing anterior active rhinomanometry. J Quant Med. 2023;22(3):144-160.
6. Akhmedov B. Algorithmic identification of sub-clinical mucosal damage via saccharin transit timing. Digit Med Res. 2023;9(2):55-71.
7. Usmanova L. Reactive vs proactive rhinology: The economic burden of uncontrolled pediatric allergies. J Health Econ Policy. 2024;18(3):211-228.
8. Pulatov A. Isotonic seawater lavage as a pharmacokinetic primer for topical steroid administration. Pharmacol Ther Adv. 2021;34(1):92-108.
9. Ismoilov K. Structural interference in the epithelial basement membrane due to chronic IgE cross-linking. J Cell Immunol. 2022;29(2):130-147.
10. Rustamov D. Redefining perennial allergic rhinitis as a biomechanical failure of the upper respiratory tract. Intern Med Rev. 2024;15(1):77-94.