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Original Research Article

Effectiveness of Intranasal Corticosteroids in Allergic Rhinitis and Chronic Rhinosinusitis (AR-CRS) Overlap: A Prospective Observational Study

Dawood Agoo[1], Ravneet Sidhu[2], Gurchand Singh[3], Reetika[4]

[1,2,3,4]Department of Otorhinolaryngology (ENT), Adesh Medical College and Hospital, Shahbad, Kurukshetra, Haryana, India

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Corresponding author: Dr. Dawood Agoo

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Abstract

Background: Allergic rhinitis (AR) and chronic rhinosinusitis (CRS) frequently coexist, leading to a distinct overlap syndrome characterized by persistent nasal obstruction, rhinorrhea, and reduced quality of life. Although intranasal corticosteroids (INCS) are the mainstay treatment for AR or CRS individually, their efficacy in AR-CRS overlap remains underexplored.

Objective: To evaluate the effectiveness and safety of INCS in patients with AR-CRS overlap.

Methods: A prospective observational study was conducted at Adesh Medical College and Hospital, Ambala, from October 2023 to April 2025. A total of 200 patients with clinically and radiologically confirmed AR-CRS overlap received standard-dose INCS for 12 weeks. Symptom severity was assessed using Total Nasal Symptom Score (TNSS), Sino-Nasal Outcome Test (SNOT-22), and Visual Analogue Scale (VAS) at baseline, 6 weeks, and 12 weeks. Adverse effects were also recorded.

Results: Significant and progressive symptom improvement was observed. Mean TNSS decreased from 12.3 ± 3.0 at baseline to 5.5 ± 2.1 at 12 weeks (55% reduction), SNOT-22 from 47.8 ± 9.8 to 21.9 ± 7.5 (54% reduction), and VAS from 7.7 ± 1.2 to 3.0 ± 0.8 (61% reduction). Benefits were consistent across age, gender, and comorbid asthma subgroups. Adverse effects were minimal, with mild nasal irritation in 10% of patients and mild epistaxis in 5%.

Conclusion: INCS are highly effective and well-tolerated in AR-CRS overlap, providing rapid symptom relief and meaningful improvements in quality of life. Early initiation of therapy can break the cycle of chronic inflammation, prevent complications, and optimize patient outcomes.

Keywords: Allergic Rhinitis, Chronic Rhinosinusitis, Intranasal Corticosteroids, AR-CRS Overlap.

Introduction

Allergic rhinitis (AR) and chronic rhinosinusitis (CRS) are among the most common inflammatory disorders of the upper airway, affecting millions worldwide. While each condition alone can significantly impair daily functioning, their overlap represents a distinct and more challenging clinical entity. Patients with AR-CRS overlap often experience persistent nasal obstruction, rhinorrhea, sneezing, postnasal drip, and facial discomfort, which together severely reduce sleep quality, productivity, and overall quality of life.

Global and Regional Burden: AR affects 10–30% of the global population and 15–20% of adults in India, while CRS affects 5–12% globally and 8–10% in India. The prevalence of overlapping AR-CRS is not well-established, but emerging evidence suggests that a substantial subset of patients suffers from both conditions, often with more severe and refractory symptoms than either condition alone.

Pathophysiology: AR and CRS share common inflammatory pathways, including Th2-mediated immune responses, eosinophilic infiltration, IgE hypersensitivity, and cytokine-driven mucosal edema. In overlap patients, this synergy amplifies nasal congestion, sinus blockage, and chronic inflammation, often creating a vicious cycle of persistent symptoms and reduced responsiveness to standard therapy.

Current Therapeutic Approaches: Intranasal corticosteroids (INCS) are widely recognized as the first-line treatment for both AR and CRS due to their potent anti-inflammatory effects. They reduce mucosal edema, inhibit cytokine release, and improve sinus ventilation. Despite their established use in isolated AR or CRS, the efficacy of INCS specifically in patients with AR-CRS overlap remains underexplored, leaving clinicians with

limited guidance for managing this complex population.

Rationale and Study Objective: Given the clinical burden and pathophysiological overlap, it is critical to evaluate the real-world effectiveness and safety of INCS in AR-CRS overlap. This study aims to provide prospective evidence on symptom improvement, quality-of-life enhancement, and adverse effect profile in patients treated with standard-dose INCS over 12 weeks, helping to inform clinical decision-making and optimize patient outcomes.

Materials and Methods

Study Design and Setting: This was a prospective observational study conducted at the Department of Otorhinolaryngology, Adesh Medical College and Hospital, Ambala, spanning October 2023 to April 2025. The study aimed to evaluate the real-world effectiveness and safety of intranasal corticosteroids (INCS) in patients with allergic rhinitis (AR) and chronic rhinosinusitis (CRS) overlap.

Sample Size and Patient Recruitment: A total of 200 adult patients aged 18–65 years, diagnosed with moderate-to-severe AR-CRS overlap, and were enrolled consecutively. Eligibility was determined through clinical evaluation, nasal endoscopy, and radiological confirmation. Patients with a history of sinus surgery, systemic corticosteroid use in the previous three months, immunodeficiency, pregnancy, or other severe comorbidities were excluded to ensure safety and study consistency.

Intervention: All participants received fluticasone propionate nasal spray (200 mcg/day) for a period of 12 weeks. Patients were instructed on proper intranasal spray technique to maximize drug delivery and minimize adverse effects.

Outcome Measures: Symptom severity and treatment response were assessed using the following validated tools:

- Total Nasal Symptom Score (TNSS): Evaluates nasal obstruction, rhinorrhea, sneezing, and nasal itching.
- Sino-Nasal Outcome Test (SNOT-22): Measures quality-of-life impact of nasal and sinus symptoms.
- Visual Analogue Scale (VAS): Captures patients' subjective perception of symptom severity.
- Sleep quality assessment: Subjective improvement in sleep disruption related to nasal congestion.
- Endoscopic evaluation: Mucosal edema, polyp status, and nasal cavity patency were assessed at baseline and follow-up.

Assessments were conducted at baseline, 6 weeks, and 12 weeks to track both early and sustained response to therapy.

Safety Monitoring: All adverse events, including nasal irritation, epistaxis, or other local/systemic reactions, were carefully recorded at each visit. Patients were advised to report any new or concerning symptoms immediately.

Statistical Analysis:

Data were analyzed using descriptive and inferential statistics:

- Continuous variables were expressed as mean ± standard deviation (SD).
- Categorical variables were expressed as percentages.
- Comparisons between baseline and follow-up scores were performed using paired t-tests, with $p < 0.05$ considered statistically significant.
- Subgroup analyses were conducted based on age, gender, and comorbidities to explore differential treatment responses.

Results

1. Patient Demographics: A total of 200 patients were enrolled, with a mean age of 34.5 ± 10.2 years (range 18–65). There were 110 males (55%) and 90 females (45%). Comorbidities included mild asthma in 25% and atopic dermatitis in 15%, reflecting a typical atopic population. Most patients presented with persistent nasal obstruction, rhinorrhea, and postnasal drip, consistent with AR-CRS overlap.

2. Symptom Score Trends: All symptom scores showed significant and progressive improvement over 12 weeks.

Table 1: Symptom scores (TNSS, SNOT-22, VAS) improvement over a period of 12 weeks

Time Point	TNSS (Mean ± SD)	% Improvement	SNOT-22 (Mean ± SD)	% Improvement	VAS (Mean ± SD)	% Improvement
Baseline	12.3 ± 3.0	-	47.8 ± 9.8	-	7.7 ± 1.2	-
6 Weeks	8.1 ± 2.5	34%	33.9 ± 8.7	29%	5.1 ± 1.0	34%
12 Weeks	5.5 ± 2.1	55%	21.9 ± 7.5	54%	3.0 ± 0.8	61%

Interpretation:

- TNSS reduction indicates major relief in nasal obstruction, sneezing, and rhinorrhea.
- SNOT-22 improvement reflects enhanced overall quality of life and reduced sinus-related discomfort.
- VAS reduction confirms patients' subjective perception of symptom relief.
- Significant improvement was observed as early as 6 weeks, with continued gains by 12 weeks.

3. Subgroup Analysis

- Age: Patients under 40 demonstrated slightly faster TNSS improvement (mean reduction 6.9 vs 6.1 at 12 weeks), though both groups achieved significant symptom relief.
- Gender: Males and females showed comparable improvement, indicating efficacy is independent of sex.
- Comorbid asthma: Patients with asthma also benefited, showing parallel symptom improvement without increased adverse effects.

4. Adverse Effects

INCS were well-tolerated. Reported adverse effects were minor and transient:

- No adverse effects: 170 (85%)
- Mild nasal irritation: 20 (10%)
- Mild epistaxis: 10 (5%)

No patients discontinued therapy due to adverse effects, confirming a favorable safety profile.

Key Takeaways:

- INCS provided rapid symptom relief, with over 50% improvement by 12 weeks.
- Benefits were consistent across age, gender, and comorbidity subgroups.
- Minimal adverse effects reinforce INCS as a first-line therapy for AR-CRS overlap.

Discussion

The results of our study provide strong evidence that intranasal corticosteroids (INCS) are highly effective for patients with AR-CRS overlap, a condition that often significantly impairs quality of life and daily functioning.

Over the 12-week treatment period, patients experienced a dramatic reduction in nasal symptoms, as reflected by TNSS, SNOT-22, and VAS scores, highlighting the real-world effectiveness of INCS beyond controlled clinical trials.

Clinical Significance: AR-CRS overlap is more than just the sum of AR and CRS symptoms—it represents a synergistic exacerbation that often leads to sleep disturbances, cognitive fatigue, and decreased work productivity. By alleviating both upper airway inflammation and sinus pathology, INCS provide patients with meaningful functional improvement, not just numeric symptom relief.

Mechanistic Insights: The efficacy of INCS is rooted in their anti-inflammatory action, targeting Th2-mediated immune responses, eosinophilic infiltration, and cytokine release. This study supports the concept that addressing inflammation at both the nasal and sinus mucosa simultaneously can interrupt the vicious cycle of chronic nasal obstruction and sinus congestion, resulting in rapid symptom resolution and improved nasal airflow.

Comparison with Existing Literature: While previous studies have evaluated INCS in AR or CRS separately, few have addressed the overlap population. Our findings are consistent with Meltzer et al. (2021) and Hellings et al. (2022), confirming that INCS are not only safe but also remarkably effective in patients with overlapping pathology. Moreover, the speed of symptom improvement observed—significant by 6 weeks—suggests early initiation can prevent long-term complications.

Subgroup Observations:

- Age: Patients under 40 showed slightly faster improvement, though older adults also benefited significantly, emphasizing that INCS are broadly effective across age groups.
- Gender: Response was similar in males and females, indicating therapy efficacy is independent of sex.

Safety and Tolerability: Adverse effects were minimal, with only mild nasal irritation reported in 10% of patients and no serious complications, confirming the favorable risk-benefit profile of INCS.

Limitations: Despite the compelling results, this study is limited by its single-center design and observational nature, with a relatively short follow-up.

Future multicenter randomized trials with longer follow-up are warranted to validate these findings and explore long-term outcomes, including recurrence prevention and impact on asthma control in overlap patients.

Future Directions:

- Exploring combination therapy (INCS + antihistamines or leukotriene antagonists) in refractory cases
- Biomarker-guided therapy to identify patients most likely to benefit
- Assessing effects on sleep quality, productivity, and healthcare utilization

Conclusion

Intranasal corticosteroids provide a robust, safe, and well-tolerated treatment for patients with AR-CRS overlap.

They deliver rapid and meaningful improvement in symptoms, enhance quality of life, and address the underlying inflammation driving this challenging condition.

Clinicians should consider early initiation of INCS in patients presenting with overlapping nasal and sinus symptoms, as timely intervention can break the cycle of chronic inflammation, prevent complications, and improve overall patient well-being.

In essence, this study highlights that AR-CRS overlap is not just a combination of two conditions—it is a distinct clinical entity, and targeted anti-inflammatory therapy with INCS is a cornerstone for effective management.

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