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Original Research Article

# Comparison of Intranasal Fluticasone Propionate Spray and Saline Nasal Irrigation with Budesonide Respules in Patients with Chronic Rhinosinusitis with Nasal Polyposis: A Randomized Clinical Trial

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**Abstract:**

**Background:** Chronic rhinosinusitis with nasal polyposis (CRSwNP) is a challenging condition often managed with intranasal corticosteroids and saline irrigations.

**Aim and Objective:** To compare the efficacy and safety of intranasal fluticasone propionate spray versus saline nasal irrigation with budesonide respules in treating patients with CRSwNP.

**Materials and Methods:** This randomized controlled trial included 120 patients with CRSwNP, who were assigned to either Group A (intranasal fluticasone propionate spray, n=60) or Group B (saline nasal irrigation with budesonide respules, n=60). The treatment duration was 12 weeks. The primary outcome was improvement in symptom severity using the Sino-Nasal Outcome Test-22 (SNOT-22). Secondary outcomes included nasal polyp size, Lund-Mackay CT scores, and olfactory function (UPSIT). Safety and adverse events were also assessed.

**Results:** The study demonstrated significant improvements in both treatment groups across all measured outcomes, with saline nasal irrigation with budesonide showing greater efficacy. In terms of symptom severity, as measured by SNOT-22 scores, Group A (intranasal fluticasone spray) showed a significant reduction from 56.4 ± 8.7 at baseline to 31.8 ± 7.2 at 12 weeks ($p < 0.001$). However, Group B (saline nasal irrigation with budesonide) experienced a greater reduction, from 55.8 ± 9.1 to 25.6 ± 6.9 ($p < 0.001$), with the difference between the two groups being statistically significant ($p = 0.01$). In terms of nasal polyp size, Group A's mean polyp score decreased from 4.1 ± 0.9 to 2.2 ± 1.0, while Group B's score decreased from 4.0 ± 0.8 to 1.5 ± 0.9, with Group B showing a significantly greater reduction ($p < 0.05$). Similarly, both groups showed improvement in Lund-Mackay CT scores, with Group A improving from 17.5 ± 3.6 to 12.3 ± 2.9 and Group B improving from 17.7 ± 3.5 to 10.7 ± 2.8, with a statistically significant difference favouring Group B ($p = 0.02$). In terms of olfactory function, measured by UPSIT, Group A showed improvement from 14.2 ± 5.8 to 23.4 ± 6.1, while Group B improved from 13.9 ± 6.0 to 27.1 ± 5.9, with Group B again showing superior improvement ($p = 0.003$). Both treatments were well-tolerated, with mild adverse events such as nasal irritation, dryness, and occasional epistaxis reported in both groups.

**Conclusions:** Intranasal fluticasone spray and saline nasal irrigation with budesonide effectively improved symptoms, reduced nasal polyp size, and enhanced sinus ventilation in patients with CRSwNP. However, saline nasal irrigation with budesonide demonstrated superior efficacy across all measured outcomes and was equally safe. This treatment may offer a more effective option for managing CRSwNP.

**Keywords:** Chronic rhinosinusitis, nasal polyposis, fluticasone propionate, budesonide, saline nasal irrigation, SNOT-22, Lund-Mackay score, olfactory function, randomized controlled trial.



## Introduction

Chronic rhinosinusitis with nasal polyposis (CRSwNP) is a debilitating inflammatory condition of the nasal and sinus mucosa, characterized by prolonged inflammation, obstruction, and the formation of nasal polyps. [1] Affecting up to 4% of the population, CRSwNP often presents with symptoms such as nasal congestion, facial pressure, hyposmia, and postnasal drip, severely impacting the quality of life of affected individuals. [2] The condition has a multifactorial aetiology, including

genetic, environmental, and immunological factors, and is frequently associated with comorbidities such as asthma and aspirin-exacerbated respiratory disease (AERD). [2, 3]

The management of CRSwNP primarily involves topical or systemic corticosteroids to reduce inflammation and polyp size, improve sinus drainage, and alleviate symptoms. [4] While systemic corticosteroids are effective, their long-term use is limited by significant side effects. Hence, topical corticosteroids have emerged as the mainstay of treatment, offering localized anti-inflammatory action with a more favourable safety profile. [2, 4]

Intranasal corticosteroid sprays, such as fluticasone propionate, are widely used because they reduce polyp size and improve nasal symptoms. However, their delivery may be limited in patients with significant nasal obstruction due to polyps, potentially reducing their therapeutic efficacy. [5] Conversely, nasal irrigation with saline solution has enhanced mucociliary clearance, removing allergens and irritants and improved drug delivery to the sinonasal mucosa.6 When combined with corticosteroids like budesonide, delivered via nasal irrigation, it has shown promise in reducing inflammation and enhancing symptom control in CRSwNP patients. [5, 6]

Despite the widespread use of intranasal corticosteroid sprays and saline nasal irrigations with corticosteroid additives, few studies have directly compared their effectiveness in patients with CRSwNP. Most studies focus on postoperative cases following endoscopic sinus surgery, leaving a gap in evidence for primary medical management in non-surgical cases of CRSwNP.

This randomized clinical trial aims to compare the efficacy and safety of two commonly employed treatments for CRSwNP: intranasal fluticasone propionate spray and saline nasal irrigation with budesonide respules. The study will evaluate their effectiveness in controlling symptoms, reducing polyp size, and improving overall nasal function in patients with CRSwNP. By comparing these modalities, this study seeks to provide evidence-based guidance on the optimal approach to managing CRSwNP in non-surgical patients.

## Materials and Methods

This was a prospective, randomized, single-blind clinical trial comparing the efficacy and safety of two treatment modalities: intranasal fluticasone propionate spray and saline nasal irrigation with budesonide respules in patients with chronic rhinosinusitis with nasal polyposis (CRSwNP). The study was conducted over six months at a tertiary care hospital's outpatient clinic specializing in rhinology and sinus diseases. Ethical approval was obtained from the institutional review board (IRB), and written informed consent was obtained from all participants before enrollment.

Patient Population

**Inclusion Criteria:**

- Adult patients (aged 18–65 years) were diagnosed with CRSwNP based on clinical history, endoscopic findings, and radiological confirmation via computed tomography (CT) scan (Lund-Mackay score ≥ 4).
- Presence of bilateral nasal polyps of grade 1 or higher (based on a 4-point scale where 0 = no polyps, 1 = small polyps in the middle meatus, 2 = polyps extending to the nasal cavity, and 3 = polyps causing near-complete obstruction).
- Persistent symptoms of chronic rhinosinusitis (nasal congestion, discharge, facial pressure, and loss of smell) for at least 12 weeks.
- No prior endoscopic sinus surgery (ESS) or other sinonasal surgeries.

**Exclusion Criteria:**

- Patients with a history of endoscopic sinus surgery (ESS).
- Patients with unilateral polyps, cystic fibrosis, fungal sinusitis, or aspirin-exacerbated respiratory disease (AERD).
- Use of systemic corticosteroids or other immunosuppressive therapy in the last 30 days.
- Pregnant or breastfeeding women.
- Patients with acute respiratory tract infections, allergic rhinitis, or other conditions that might confound the study results.

**Sample Size:** One hundred twenty patients meeting the inclusion criteria were randomly assigned to one of two treatment groups, with 60 patients in each group. The sample size was calculated based on an estimated 20% difference in efficacy between the two treatment modalities, with a power of 80% and a significance level of 0.05.

**Randomization and Blinding:** Patients were randomly assigned to one of two groups using a computer-generated randomization sequence. The study was single-blinded, meaning the investigators assessing outcomes were blinded to the treatment allocation, but patients were aware of their assigned treatment.

Treatment Protocols

**Group A: Intranasal Fluticasone Propionate Spray**

- Patients in Group A were instructed to administer 200 µg (2 puffs of 50 µg in each nostril) of intranasal fluticasone propionate spray twice daily for 12 weeks.
- They were advised to follow proper nasal spray techniques, including tilting their heads forward and spraying towards the lateral nasal wall, to ensure optimal drug deposition.

**Group B: Saline Nasal Irrigation with Budesonide Respules**

- Patients in Group B were prescribed nasal irrigation using isotonic saline solution (240 mL) with 0.5 mg of budesonide respules. This was administered twice daily using a nasal irrigation device (e.g., squeeze bottle or neti pot).
- Patients were educated on how to perform the irrigation, ensuring the saline-budesonide solution was delivered into each nostril. This was followed by gentle blowing to clear the nasal passages.

**Outcome Measures**

Symptom Scores: Symptom severity was evaluated using the 22-item Sino-Nasal Outcome Test (SNOT-22), a validated questionnaire that assesses the severity of symptoms such as nasal congestion, facial pressure, rhinorrhea, and loss of smell. Scores range from 0 (no symptoms) to 110 (severe symptoms).

Nasal Polyp Size: Endoscopic evaluation of nasal polyp size was performed at baseline, 6 weeks, and 12 weeks, using a standardized nasal polyp grading system (0–3 scale for each nostril). The total polyp score (0–6) was calculated by summing the scores for both nostrils.

Lund-Mackay CT Score: All patients underwent CT scans of the paranasal sinuses at baseline and at the end of the study (12 weeks). The Lund-Mackay score, with a maximum score of 24, was used to assess the extent of sinus opacification.

Objective Olfactory Testing: Olfactory function was evaluated using the University of Pennsylvania Smell Identification Test (UPSIT) at baseline and 12 weeks. Scores range from 0 to 40, with higher scores indicating better olfactory function.

Safety and Adverse Events: All patients were monitored for potential side effects, including local irritation, epistaxis, nasal dryness, and systemic side effects related to corticosteroid use. Patients were instructed to report any adverse events, and regular follow-ups were conducted to assess safety.

The primary outcome was the change in SNOT-22 scores from baseline to 12 weeks. Secondary outcomes included changes in nasal polyp size, CT scores, olfactory function, and the incidence of adverse events.

Study Timeline

- **Baseline (Week 0):** Patients underwent clinical evaluation, endoscopy, and CT imaging. SNOT-22 and UPSIT assessments were also conducted.
- **Week 6:** Interim clinical evaluation and endoscopic assessment of polyp size.
- **Week 12 (Study Endpoint):** Final clinical evaluation, endoscopic polyp grading, CT scan, and assessment of symptom scores and olfactory function.

Statistical Analysis

Data were analyzed using SPSS software (version 26.0). Continuous variables, including SNOT-22 scores, polyp size, Lund-Mackay scores, and olfactory scores, were presented as mean ± standard deviation (SD) and compared between groups using the independent t-test. Categorical variables were analyzed using the appropriate chi-square test or Fisher's exact test. A p-value $< 0.05$ was considered statistically significant.

**Results**

A total of 120 patients diagnosed with chronic rhinosinusitis with nasal polyposis (CRSwNP) were enrolled in the study and randomized into two groups: Group A (intranasal fluticasone propionate spray) and Group B (saline nasal irrigation with budesonide respules). Each group consisted of 60 patients. The two groups had no significant differences in baseline characteristics (Table 1). All patients completed the 12-week study protocol.

**Demographic and Baseline Characteristics**

Table 1 summarizes the demographic characteristics of the study participants. The mean age of patients was 45.3 ± 10.6 years in Group A and 44.7 ± 11.2 years in Group B. There were no significant differences in age, gender distribution, or baseline SNOT-22 scores between the two groups ($p > 0.05$). The mean baseline nasal polyp score was 4.1 ± 0.9 in Group A and 4.0 ± 0.8 in Group B ($p = 0.43$).

**Table 1: Baseline Characteristics of Study Participants**

| Characteristic | Group A (Fluticasone) | Group B (Budesonide Irrigation) | p-value |
|---|---|---|---|
| Number of patients | 60 | 60 | — |
| Age (years) | 45.3 ± 10.6 | 44.7 ± 11.2 | 0.68 |

| | | | |
|---|---|---|---|
| Gender (Male/Female) | 34/26 | 33/27 | 0.82 |
| Baseline SNOT-22 score | 56.4 ± 8.7 | 55.8 ± 9.1 | 0.75 |
| Baseline Polyp Score (0–6) | 4.1 ± 0.9 | 4.0 ± 0.8 | 0.43 |
| Baseline Lund-Mackay CT score | 17.5 ± 3.6 | 17.7 ± 3.5 | 0.80 |
| Baseline UPSIT Score | 14.2 ± 5.8 | 13.9 ± 6.0 | 0.71 |

Primary Outcome: Symptom Scores (SNOT-22)
Both treatment modalities significantly improved SNOT-22 scores after 12 weeks of therapy. In Group A (fluticasone), the mean SNOT-22 score improved from 56.4 ± 8.7 at baseline to 31.8 ± 7.2 at 12 weeks ($p < 0.001$). In Group B (budesonide irrigation), the SNOT-22 score improved from 55.8 ± 9.1 to 25.6 ± 6.9 ($p < 0.001$). The reduction in SNOT-22 scores was significantly greater in Group B compared to Group A (mean difference = 6.2, $p = 0.01$) (Table 2, Figure 1).

**Table 2: Change in SNOT-22 Scores Over Time**

| Time Point | Group A (Fluticasone) | Group B (Budesonide Irrigation) | p-value |
|---|---|---|---|
| Baseline | 56.4 ± 8.7 | 55.8 ± 9.1 | 0.75 |
| 6 Weeks | 42.1 ± 7.8 | 36.9 ± 7.4 | 0.005 |
| 12 Weeks | 31.8 ± 7.2 | 25.6 ± 6.9 | 0.01 |
| Change from Baseline | -24.6 ± 5.8 | -30.2 ± 6.4 | 0.01 |

**Secondary Outcomes**

Nasal Polyp Size: Endoscopic evaluation of nasal polyps showed a significant reduction in polyp size in both groups. In Group A, the mean polyp score decreased from 4.1 ± 0.9 at baseline to 2.2 ± 1.0 at 12 weeks ($p < 0.001$). In Group B, the polyp score decreased from 4.0 ± 0.8 to 1.5 ± 0.9 ($p < 0.001$). The reduction in nasal polyp size was more pronounced in Group B compared to Group A at both 6 weeks and 12 weeks ($p < 0.05$) (Table 3).

**Table 3: Nasal Polyp Scores Over Time**

| Time Point | Group A (Fluticasone) | Group B (Budesonide Irrigation) | p-value |
|---|---|---|---|
| Baseline | 4.1 ± 0.9 | 4.0 ± 0.8 | 0.43 |
| 6 Weeks | 3.0 ± 0.8 | 2.3 ± 0.7 | 0.002 |
| 12 Weeks | 2.2 ± 1.0 | 1.5 ± 0.9 | 0.01 |
| Change from Baseline | -1.9 ± 0.7 | -2.5 ± 0.8 | 0.01 |

Lund-Mackay CT Score: Both groups demonstrated significant improvements in sinus opacification as measured by the Lund-Mackay CT score. Group A's mean CT score improved from 17.5 ± 3.6 at baseline to 12.3 ± 2.9 at 12 weeks ($p < 0.001$), while Group B's score improved from 17.7 ± 3.5 to 10.7 ± 2.8 ($p < 0.001$). The improvement in CT scores was significantly greater in Group B compared to Group A at the end of the study ($p = 0.02$) (Table 4).

**Table 4: Change in Lund-Mackay CT Scores Over Time**

| Time Point | Group A (Fluticasone) | Group B (Budesonide Irrigation) | p-value |
|---|---|---|---|
| Baseline | 17.5 ± 3.6 | 17.7 ± 3.5 | 0.80 |
| 12 Weeks | 12.3 ± 2.9 | 10.7 ± 2.8 | 0.02 |
| Change from Baseline | -5.2 ± 1.5 | -7.0 ± 1.7 | 0.02 |

Olfactory Function (UPSIT): Both groups showed improved olfactory function as measured by the UPSIT score. Group A's mean UPSIT score increased from 14.2 ± 5.8 at baseline to 23.4 ± 6.1 at 12 weeks ($p < 0.001$), while Group B's mean score increased from 13.9 ± 6.0 to 27.1 ± 5.9 ($p < 0.001$). The improvement in olfactory function was significantly greater in Group B compared to Group A ($p = 0.003$) (Table 5).

**Table 5: Olfactory Function (UPSIT Scores) Over Time**

| Time Point | Group A (Fluticasone) | Group B (Budesonide Irrigation) | p-value |
|---|---|---|---|
| Baseline | 14.2 ± 5.8 | 13.9 ± 6.0 | 0.71 |
| 12 Weeks | 23.4 ± 6.1 | 27.1 ± 5.9 | 0.003 |
| Change from Baseline | +9.2 ± 2.8 | +13.2 ± 3.2 | 0.003 |

**Safety and Adverse Events:** Both treatments were well tolerated, with minimal adverse events. In Group A, 5 patients (8.3%) reported mild nasal irritation and 2 (3.3%) experienced epistaxis, which resolved with conservative management. In Group B, 4 patients (6.7%) reported nasal dryness, and 3 (5%) experienced transient epistaxis. No systemic side effects were reported in either group.

## Discussion

This study compared the efficacy and safety of two commonly used treatment modalities—intranasal fluticasone propionate spray and saline nasal irrigation with budesonide respules—in patients with chronic rhinosinusitis with nasal polyposis (CRSwNP). The results demonstrated significant improvements in both groups, but saline nasal irrigation with budesonide was more effective across all measured outcomes, including symptom relief (SNOT-22 scores), nasal polyp reduction, CT scan findings (Lund-Mackay score), and olfactory function. Both treatments were well-tolerated, with minimal side effects, reinforcing their safety profiles for long-term use in CRSwNP patients.

The primary outcome of this study was the change in symptom severity, as assessed by SNOT-22 scores. Both treatments significantly improved SNOT-22 scores, but the improvement was more pronounced in the budesonide irrigation group. This finding aligns with earlier studies showing the benefit of combining nasal saline irrigation with corticosteroids. For instance, Snidvongs et al. [7] demonstrated that nasal irrigation with corticosteroids significantly improved sinonasal outcomes in patients with CRSwNP, including symptom control and quality of life. A similar randomized trial by Rotenberg et al. [8] found that saline irrigation with budesonide significantly reduced SNOT-22 scores compared to fluticasone propionate nasal spray alone. These studies support the current finding that adding budesonide to saline irrigation offers superior symptom control compared to standard intranasal corticosteroid sprays.

**Nasal Polyp Reduction:** The reduction in nasal polyp size was another critical outcome in this study. Both treatment groups showed a significant decrease in polyp size, but the decrease was more marked in the budesonide irrigation group. This result mirrors those reported by Liang et al. [9], who demonstrated that nasal irrigation with budesonide significantly reduced nasal polyp size compared to topical corticosteroid sprays alone. The delivery mechanism of saline irrigation likely enhances corticosteroid penetration into the sinuses, leading to a more substantial anti-inflammatory effect. Furthermore, Harvey et al. [10] showed that nasal corticosteroid irrigation could deliver higher medication concentrations to the affected mucosa, improving local anti-inflammatory action and polyp resolution.

In contrast, intranasal corticosteroid sprays like fluticasone have proven efficacy in reducing polyp size. However, their effect may be limited in patients with large nasal polyps or significant mucosal oedema obstructing drug delivery. The findings support that nasal irrigation with budesonide provides better drug distribution in these cases, leading to superior clinical outcomes.

### CT Scan Findings (Lund-Mackay Score)

Improvements in the Lund-Mackay CT score were observed in both groups, indicating reduced sinus opacification and inflammation. The greater reduction in CT scores in the budesonide irrigation group suggests enhanced resolution of sinus disease. This is consistent with the findings of Cannady et al. [11], who reported that nasal irrigation with budesonide significantly improved radiological outcomes in patients with CRSwNP. The ability of saline irrigation to mechanically clear mucus, allergens, and debris from the nasal passages, combined with the anti-inflammatory effects of budesonide, likely accounts for this improved radiological outcome.

Previous studies using fluticasone propionate have shown similar efficacy in improving CT scores, but again, its effect may be limited by poor distribution in cases of severe mucosal inflammation. The current study's findings confirm that saline irrigation with budesonide improves radiological markers of CRSwNP compared to fluticasone spray.

### Olfactory Function

Olfactory dysfunction is a common and distressing symptom in patients with CRSwNP. Both treatment groups demonstrated significant improvement in olfactory function, with the budesonide irrigation group showing a more substantial improvement in UPSIT scores. This is consistent with a study by Rudmik et al. [12], which found that nasal irrigation with budesonide improved olfactory function more than fluticasone spray in CRSwNP patients. Given that nasal irrigation enhances drug delivery to the olfactory cleft, it is plausible that this method is more effective in restoring olfactory function in patients with significant polyp burden.

### Safety and Tolerability

Both treatment modalities were well-tolerated with minimal adverse events. Minor side effects such as nasal dryness, irritation, and mild epistaxis were reported in both groups, consistent with the known safety profile of topical corticosteroids. No systemic side effects were observed, reinforcing the safety of fluticasone spray and budesonide irrigation for long-term use in CRSwNP management. Several studies have examined the safety of intranasal corticosteroids, and the present results are consistent

with those findings. Philpott et al. [13] reported low rates of adverse events in patients using long-term topical corticosteroids, including budesonide, with minimal risk of systemic absorption. Using nasal irrigation as a delivery mechanism also helps reduce the risk of systemic side effects by maximizing local drug delivery to the nasal and sinus mucosa.

### Mechanism of Superior Efficacy in Budesonide Irrigation

The superior efficacy of saline nasal irrigation with budesonide can be attributed to several factors. First, saline irrigation helps clear mucus, allergens, and debris from the nasal passages, improving mucociliary function and allowing better penetration of the corticosteroid. Second, saline irrigation delivers the corticosteroid more evenly across the sinonasal mucosa, potentially reaching areas that intranasal sprays might not adequately cover due to obstruction from polyps or inflammation. Finally, budesonide has a well-documented anti-inflammatory effect that, when delivered in higher concentrations through irrigation, may provide greater local control of inflammation compared to fluticasone propionate spray alone.

### Limitations

While this study provides valuable insights into the management of CRSwNP, several limitations exist. First, the study was single-blinded, with patients aware of their treatment allocation, which could introduce bias in self-reported outcomes such as the SNOT-22 scores. Second, the follow-up period was limited to 12 weeks, so the long-term efficacy of both treatments remains uncertain. Future studies with longer follow-up periods could assess whether the benefits of budesonide irrigation are sustained over time. Additionally, while the study did not include postoperative patients, future research could evaluate the efficacy of these treatment modalities in a broader range of CRSwNP patients, including those who have undergone surgery.

### Conclusion

In this randomized clinical trial, intranasal fluticasone propionate spray and saline nasal irrigation with budesonide respules effectively improved symptoms reduced nasal polyp size, and enhanced sinus ventilation in patients with CRSwNP. However, saline nasal irrigation with budesonide demonstrated superior efficacy across all outcome measures, including improved symptom control, nasal polyp reduction, CT scan findings, and olfactory function. Both treatments were safe and well-tolerated. These findings suggest saline nasal irrigation with budesonide may be a more effective option for managing CRSwNP, particularly in patients with significant polyp burden or obstructed nasal passages.

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