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Benefits of vitamin D supplementation after functional endoscopic sinus surgery for recurrent nasal polyposis

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ORIGINAL ARTICLE

Benefits of Vitamin D Supplementation After Functional Endoscopic Sinus Surgery for Recurrent Nasal Polyposis

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Abstract

Background: **Nasal polyps as a type of nasal masses usually present with nasal obstruction and smell disorders. There is high recurrence following sinus surgery, which motivated us to study the role of cholecalciferol in preventing recurrence of sinonasal polyposis after endoscopic excision of these polyps.**

Objective: **The aim of the work was to study the clinical and radiological outcomes of oral cholecalciferol supplementation after functional endoscopic sinus surgery for recurrent nasal polyposis.**

Patients and methods: **A total of 62 patients with recurrent sinonasal polyposis were included in our study during the period from January 2019 to May 2022. The patients underwent functional endoscopic sinus surgery. Overall, 33 patients used oral cholecalciferol postoperatively as group A and 29 patients used oral steroid postoperatively as group B. Patients were scheduled for a follow-up visit (up to 3 months) concerning computed tomographic scan of paranasal sinuses scoring and sinonasal outcome test-22 scoring.**

Results: **There were nonsignificant clinical and radiological outcomes of recurrent nasal polyposis in the cholecalciferol group versus the steroid group based on sinonasal outcome test-22 scoring. There was a significant difference in the incidence of adverse effects such as headache, gastric upset, and constipation between both groups.**

Conclusion: **Cholecalciferol was studied as a common drug that has fewer adverse effects and is found to be efficient in minimizing outcomes in the recurrence of nasal polyposis after their endoscopic excision.**

Keywords: Cholecalciferol, Endoscopic surgery, Nasal polyposis, Steroid

1. Introduction

Chronic rhinosinusitis is defined as an inflammation of the mucosa of the nose and paranasal sinuses in a prolonged period of at least 12 weeks with persistent nasal manifestations without relief on medical treatment. Functional endoscopic sinus surgery is the optimal surgical management of chronic rhinosinusitis with nasal polyposis after failure of medical therapy, but there is a high rate of recurrence following such surgical interference. Multiple medications are used postoperatively to reduce the recurrence of nasal polyposis [1].

Although beneficial, long-term topical steroid administration carries the risk of potential adverse effects. Topical and oral steroids were used usually for management of nasal polyposis or the recurrent attacks of such disease. Steroid therapy reduces the inflammation and edema of nasal mucosa, thus minimizing the clinical effects of this disease. Many studies proved that nasal steroid spray after initial oral steroid dose showed more effective results than nasal steroid spray alone over 6 months in minimizing the polyp size [2].

Sinus surgery is the optimal surgical interference for nasal polyps, but there is high recurrence rate following such surgeries. Sinus surgery has many complications either early or delayed. Complications after sinus surgery are affected by the degree of the disease extent inside the paranasal sinuses.

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Therefore, rhinologists are seeking for better management techniques to reduce the recurrent episodes of nasal [3].

Steroid treatment in nasal polyposis had many mechanisms such as reducing eosinophil infiltration to counteract the inflammation process and activation plus significant down-regulation of interleukin-5. After short period of oral steroid therapy, there is significant reduction of polyposis on computed tomography scan of nose and paranasal sinuses. However, it is not recommended to have systemic steroid regimen in patients presented with diabetes mellitus, or gastric ulcer [4].

Cholecalciferol is a secosteroid hormone that regulates calcium and bone homeostasis and has immunomodulatory effects on monocyte-macrophages and T cells. Cholecalciferol has also antiproliferative and anti-inflammatory effects and plays a crucial role in respiratory health. In addition, cholecalciferol derivatives inhibit the proliferation of nasal polyp-derived fibroblasts [5].

On the contrary, cholecalciferol deficiency is inversely correlated with the infections of the upper respiratory tract, and the higher degrees of cholecalciferol are associated with decreased possibility of asthma-related complications, as well as reduced use of anti-inflammatory medication. The present study aimed to assess the possible efficacy of cholecalciferol supplementation (4000 IU/day) on the recurrence rate of nasal polyposis following functional endoscopic sinus surgery in patients with CRSwNP [6].

The aim of this work was to study the clinical and radiological outcomes of oral cholecalciferol supplementation after functional endoscopic sinus surgery for recurrent nasal polyposis.

2. Patients and methods

This prospective study was conducted on 62 patients diagnosed with bilateral nasal polyposis in the period from January 2019 to May 2022. Patients above 18 years old with recurrent rhinosinusitis with bilateral nasal polyps were included in this study. They were fit for anesthesia and surgical intervention. Many patients were excluded from the study like those who had hypersensitivity to cholecalciferol or who had known systemic diseases such as renal failure, cardiovascular diseases, or hypertension. All patients were subjected to full personal, medical, and surgical history taking, general examination, otorhinolaryngological examination, including endoscopic sinus examination using 0° and 30° lenses, and computed tomography of the nose and paranasal sinuses (coronal and axial views) preoperatively and 3 months postoperatively. Under general anesthesia, the standard approach used in this study was functional endoscopic sinus surgery by 0° and 30° 4-mm rod endoscopes (Karl Stores, Germany) attached to a camera connected to a video screen. A total of 33 patients used cholecalciferol postoperatively as group A and 29 patients used oral steroid postoperatively as group B. Figure 1 shows the endoscopic view of nasal polyps before the surgical intervention.

Polyp tissue was excised using polyp forceps, through cutting instruments or microdebrider. Uncinate process was incised to do infundibulectomy, and then using the polyp forceps, the surgeon opened the ethmoidal bulla, and ethmoidectomy was done. Finally, antibiotic-soaked merocele was placed in the whole nasal cavity. Packs were removed after 48 h. After the surgery, both groups of patients received routine postoperative management (i.e. debridement in the first week, alkaline nasal irrigation, cefixime 400 mg daily for 10 days, and montelukast 10-mg tablets for 2 weeks). The intervention group received oral cholecalciferol tablets 4000 IU (single dose daily) for a month, and the control group was given oral steroid for 1 month (1 mg/kg/day). Patients were reassessed after 1 month and 3 months clinically by sinonasal outcome test scoring-22 and radiologically by computed topography scoring system over the nose and paranasal sinuses using the Lund–Mackay scoring system (Figs. 2 and 3) [7,8].

Consent was taken from patients before performing operation and they had the right to refuse at any time. The study was approved by the Research Ethics Committee of the Hospital. Its ethical number was 2019/ENT/142.

2.1. Statistical analysis

Sample size was calculated to be 84, with margin of error 5% and level of confidence 95%. Recorded data were analyzed using the Statistical Package for the Social Sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean ± SD. Qualitative data were expressed as frequency and percentage. The following tests were done when needed: t test or χ^2 test. So, the P value was considered significant as follows: P value 0.05 was considered insignificant.

3. Results

Patients' age ranged from 18 to 44 years old (with mean age 39.4 years). There was a female

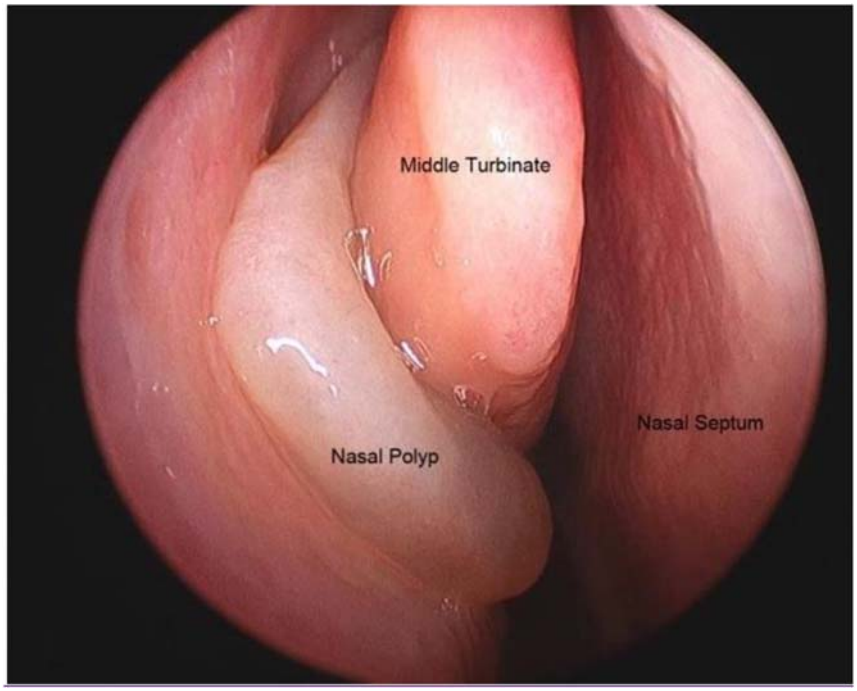

Fig. 1. Nasal polyp occupying the nasal cavity.

predominance, as 61.3% of patients were of female sex and 38.7% were of male sex, as shown in Table 1, which shows the patients' baseline characteristics. Bronchial asthma was presented by 22.6% of our included patients.

According to the Sino-Nasal Outcome Test-22 scoring, nonstatistically significant results were detected preoperatively in the clinical findings among both groups. The oral vitamin D3 differed from steroid in their effects on nasal polyposis based on SinoNasal Outcome Test-22 scoring, which is summarized in Table 2. Preoperative mean SNOT-22 scoring for group A was 59.8 and for group B was 57.6, but the mean postoperative SNOT-22 after one and three months showed significant reduction in group A (34.7 and 18.5, respectively) and group B (38.3 and 19.3, respectively). There was a nonsignificant difference among both groups in the

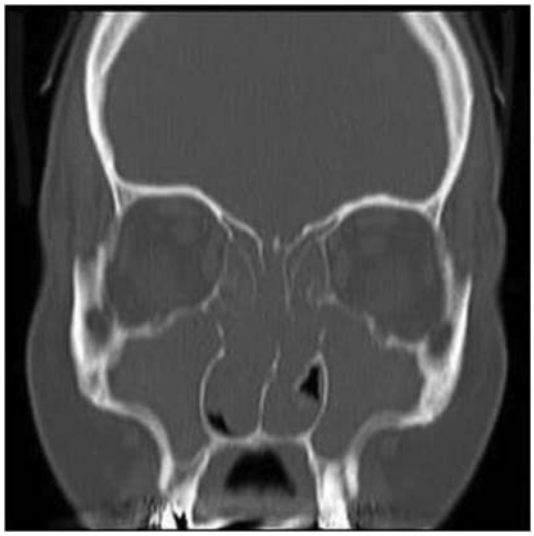

Fig. 2. Preoperative computed tomography nose and paranasal sinuses for the study group.

Fig. 3. Postoperative computed tomography nose and paranasal sinuses for the study group.

Table 1. Patient characteristic.

Variables	
Age	18–44 years old, mean ± SD = 39.4 ± 10.5
Sex	
Male	24 (38.7)
Female	38 (61.3)
Results	
Yes	14 (22.6)
No	48 (77.4)

Table 2. SNOT-22 scoring using test.

SNOT-22 test	Mean ± SD		*P* value
	Group A	Group B	
Preoperative	59.8 ± 9.9	57.6 ± 6.7	0.735 NS
Postoperative (1 month)	34.7 ± 4.2	38.3 ± 5.5	0.824 NS
Postoperative (3 months)	18.5 ± 4.4	19.3 ± 6.5	0.891 NS
P value			
1 month postoperatively	0.0001 HS	0.0001 HS	
3 months postoperatively	0.0001 HS	0.0001 HS	

postoperative reduction of SNOT-22 scoring, as shown in Table 2.

According to computed tomography of paranasal sinuses, as shown in Table 3, there were significant differences between preoperative and postoperative scoring system for computed tomography paranasal sinuses. No statistically significant differences were detected preoperatively or postoperatively in the extent of polyposis between both groups.

The oral cholecalciferol differed from steroid in their effects on nasal polyposis-based Lund–Mackay scoring system results, which are summarized in Tables 3 and 4.

Table 3. Computed tomography paranasal sinuses scoring (using t test).

CT severity score	Preoperative (mean ± SD)		*P* value
	Group A	Group B	
Preoperative	19.5 ± 2.9	18.9 ± 1.7	0.378 NS
Postoperative (1 month)	7.6 ± 2.4	8.3 ± 5.5	0.471 NS
Postoperative (3 month)	4.5 ± 2.6	6.1 ± 1.5	0.677 NS
P value			
1 month postoperatively	0.0001 HS	0.0001 HS	
3 months postoperatively	0.0001 HS	0.0001 HS	

Table 4. Significant differences between both groups regarding adverse effects.

Adverse effects	Group A	Group B	*P* value
Headache	12	4	0.44 S
Gastric upset	9	3	
Constipation	6	3	
Blurring of vision	7	0	

There were less adverse effects recorded in the cholecalciferol group compared with the steroid group such as gastric upset, headache, and constipation.

4. Discussion

Nasal polyps are the most presenting nasal masses that lead to various clinical presentation like sleep problems, and nasal obstruction, which could be either bilateral or unilateral, all of which could affect their lifestyle. Endoscopic sinus surgery is reported to be the most effective treatment of rhinosinusal polyposis. There are high rates of recurrence of nasal polyposis owing to genetic and environmental causes. Therefore, there are many literature studies seeking to use medications either topical or systemic to minimize the recurrence of the disease [9].

New research studies described that patients with chronic rhinosinusitis (CRS) usually had deficiency of cholecalciferol. There are effects of anti-inflammation and diminishing rate of tissues proliferation that suggest this medication as an alternative treatment to minimize the recurrence rate of CRS. There is scant literature studying the efficacy of cholecalciferol in the reduction of the recurrence rate of nasal polyposis following endoscopic sinus surgery. Results of the present study showed the efficacy and safety of cholecalciferol supplementation in reducing the recurrence of polyposis after endoscopic sinus surgery in patients with CRSwNP. Findings of the present study are in line with the results of several studies exploring possible effects of oral cholecalciferol supplementation on CRSwNP. It was concluded that the use of cholecalciferol supplementation may be an inexpensive and cost-effective prophylactic measure in the therapeutic control of AFRS and CRSwNP either by itself alone or as a synergistic therapeutic option with traditional therapies [10].

A study conducted by Carrol and Schlosser studied 15 cases with nasal polyposis diagnosed as cholecalciferol deficiency by serum levels and examined the histopathology and blood test of these included patients. They found that patients with chronic rhinosinusitis with polyposis with cholecalciferol deficiency were accompanied by rising levels of human sinus fibroblasts in nasal tissues. To confirm, they were treated with calcitriol tablets and showed a significant reduction in the index of fibroblast proliferation compared with the control group [11].

Another study by Sansoni showed a negative correlation between cholecalciferol and basic fibroblast growth factor significantly in cases with chronic rhinosinusitis with polyposis. In another retrospective research, Schlosser studied the clinical findings in patients with nasal polyposis and showed the role of cholecalciferol deficiency. They reported that 55% of these cases had insufficient

levels of cholecalciferol. There was also a positive correlation between the serum vitamin level and the mucosal thickness in the computed tomography scans, which is in line with the findings of the present study [12–14].

Faruk studied patients with high-dose supplementations of cholecalciferol and showed significant reduction in either endoscopic findings or the visual analog scale for clinical presentation. They compared in their research the effectiveness of the use of either low-dose or high-dose cholecalciferol supply in managing the postoperative period. Therefore, the main conclusion was that high-dose cholecalciferol postoperatively helps in restoration of normal nasal mucosa [15].

Moreover, in our study, Heshiman and colleagues studied 40 patients with CRSwP and found out that the severity of polyposis was reported to be significantly lower in the oral cholecalciferol group compared with the steroid group based on SNOT-22 (16.25 ± 10.16 in the oral cholecalciferol group vs. 47.45 ± 13.55 in the steroid group; $P < 0.001$) and Meltzer scores (0.50 ± 0.60 in the oral cholecalciferol group vs. 2.65 ± 0.93 in the placebo group; $P < 0.001$). No adverse effects were observed in the case group [16].

5. Conclusion

There is significant reduction in the recurrence rate of nasal polyposis by oral cholecalciferol, which is confirmed in this study with no additional adverse effects after sinus surgery.

Conflicts of interest

There are no conflicts of interest.

Acknowledgements

Authorship: The conception and design of the study, or acquisition of data, or analysis and interpretation of data were done in agreement with all authors. Drafting the article or revising it critically for important intellectual content was done by the corresponding author. Final approval of the version to be submitted was taken from all authors.

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