Stop and Smell the Steroids: Determining the Preventative Role of Intranasal Corticosteroids on Olfaction and Overall Symptom Severity in COVID-19 Patients

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Introduction

Olfaction, or the ability to smell, is one of the five human senses. Anosmia, or complete loss of smell, and hyposmia, a decrease in smell, are two types of olfactory dysfunction. Olfactory dysfunction is divided into three categories based on etiology: conductive, central and sensorineural. Sensorineural dysfunction, is due to inflammation of nerves and degeneration of the olfactory epithelium resulting from drug toxicities or infection. (1) Viruses are by far the more common etiology.

Post-viral olfaction dysfunction (PVOD) has become more prevalent with the emergence of the novel coronavirus severe acute respiratory syndrome (SARS-CoV-2), also known as COVID-19. There is now evidence that sudden onset anosmia or hyposmia is a symptom of SARS-CoV-2. In fact, a meta-analysis of 3,563 COVID-19 patients found that the overall prevalence of altered sense of smell or taste was 47% and that it preceded other symptoms of the virus by 20%. (2) There also seems to be an inversely proportional relationship between the anosmia or hyposmia and severity of COVID-19 symptoms. In a large multi-center study by Lechien et al., 55% of patients with mild viral symptoms self-reported having anosmia/hyposmia versus 37% of moderate to critically ill patients. (3)

There is currently no consensus on prevention or management of anosmia/hyposmia secondary to COVID-19. It has been theorized that steroids may be helpful, however the way they are administered remains controversial. Unlike oral steroids, intranasal corticosteroids sprays like; Fluticasone, Budesonide, Triamcinolone, and Mometasone, are not systemically absorbed and therefore avoid many adverse effects. Topical steroids are proven to be effective in the treatment of multiple ENT-related pathologies, including conductive olfaction dysfunction.

The purpose of our research is to determine if intranasal corticosteroids decrease the rate of anosmia or hyposmia in COVID-19 patients by way of prevention. If proven to be effective, risk of chronic or permanent loss of smell may be avoided and will ultimately improve overall patient outcome.

Methods

This was a retrospective cohort chart review utilizing the OhioHealth Hospital System Database. From our database, 500 random medical records of patients aged 18 years or older were selected who had a combination of either COVID-19 (SARS-CoV-2) and anosmia or COVID-19 (SARS-CoV-2) and hyposmia diagnostic codes between March 1, 2020 to February 28, 2021.

A focused review of each chart was then used to identify and exclude patients with missing documentation of a positive real-time reverse transcription-polymerase chain reaction (rRT-PCR) SARS-CoV-2 test and/or diagnosis of anosmia or hyposmia greater than one week prior to or any time after a positive COVID-19 test. Patients were also excluded if they had any history of previous olfaction dysfunction, neurologic or neurodegenerative disorder, history of head & neck radiation treatment, rhinologic or neurologic surgery, facial trauma or traumatic brain injury. Patients who were taking a systemic steroid for any reason were excluded as well. After removing charts based on the above exclusion criteria, the remaining records were then analyzed to determine if an active prescription for an internal steroid was present. These included Fluticasone (Flonase), Budesonide (Rhinocort), Triamcinolone (Nasocort) and Mometasone. Additionally, we also reviewed the clinical symptoms documented in the patients Review of Symptoms and assigned each patient a COVID-19 severity score (0= unable to determine, 1= mild, 2= moderate, 3= severe). This was based on the COVID-19 Disease Severity Scoring of World Health Organization Criteria. (Table 1)

Results

Of the 500 randomly selected medical records of patients aged 18 years or older who had a combination of either COVID-19 (SARS-CoV-2) and anosmia or COVID-19 (SARS-CoV-2) and hyposmia diagnostic codes between March 1, 2020 to February 28, 2021, 63 charts that were excluded from our study. Of those excluded, 19 had either a history or diagnosis of anosmia/hyposmia not correlating with their COVID-19 diagnosis, 16 had missing documentation confirming (PCR-positive) COVID-19 diagnosis, 13 had a history of rhinologic surgery (endoscopic sinus surgery, septoplasty, rhinoplasty), 7 were currently taking systemic steroids, 2 with a neurological degenerative disorder, 2 with history of radiation to the head and neck, 2 with facial trauma requiring surgica intervention, 1 with history or neurosurgery, and 1 with documented traumatic brain injury.

Of the 437 records that were included and analyzed, it was determined that 18 patients (4.1%) had an active prescription for a nasal corticosteroid on file when diagnosed with olfaction symptoms in the setting of COVID-19 occurred. Of note, 100% of the 18 patients developed only mild COVID-19 symptoms overall. (Table 2)

Table 1: Word Health Organization Criteria for COVID-19 Disease Severity Scoring

Severity	Description
Mild	No evidence of viral pneumonia or hypoxia
Moderate	Clinical signs of pneumonia (fever, cough, dyspnea, fast breathing) but no sign of severe pneumonia (including SpO2 ≥ 90% on room air)
Severe	Clinical signs of pneumonia plus one of the following: respiratory rate > 30 breaths/min; severe respiratory distress; or SpO2 < 90% on room air

Table 2: Clinical Characteristics and Patient Demographics

	Active Intranasal Steroid Prescription (n = 18)	No Intranasal Steroid Prescription (n = 419)	p-value
Characteristic			
Age, mean ± sd	43.9 ± 16.4	36.9 ± 14.2	0.041
Sex, % (n)			0.298
Female	55.6 (10)	69.2 (290)	
Male	44.4 (8)	30.8 (129)	
Race, % (n)			0.537
Caucasian	94.4 (17)	74.2 (311)	
African American	0 (0)	12.6 (53)	
Asian	0 (0)	1.7 (7)	
Other	0 (0)	0.7 (3)	
Declined/Missing	5.6 (1)	10.7 (45)	
Current Smoker, % (n)	16.7 (3)	13.5 (54)	0.723
Olfaction Dysfunction, n (%)			0.854
No diagnosis of OD	0 (0)	0.7 (3)	
Hyposmia	5.6 (1)	3.6 (15)	
Anosmia	94.4 (17)	95.7 (401)	
WHO severity score, n (%)			0.870
0 = Unknown	0.2 (1)	0 (0)	
1 = Mild	100 (18)	96.2 (403)	
2 = Moderate	0 (0)	3.1 (13)	
3 = Severe	0 (0)	0.5 (2)	
Comorbidities, n (%)			
Chronic Rhinitis	0 (0)	0 (0)	-
Allergic Rhinitis	33.3% (6)	6.7% (28)	0.001

Discussion

- Our study did not show a statistically significant decrease in anomia/hyposmia in the group of patients who were on a topical steroid at the time of testing positive for COVID-19.
- However, data did show was that 100% of patients in the topical steroid group only suffered from mild COVID-19 symptoms. (Table 1)
- The nasal cavity is the initial site of inoculation and replication for SARS-CoV-2 and it mediates seeding of the lung through aspiration. (8)
- Directly treating the nasal cavity with a topical steroid early on or even prior to infection may reduce symptom severity overall, duration of symptoms, and possibly viral transmission.
- When collecting data, we used the patient's active prescription list in their medical record to determine if they were on a nasal steroid. This process does not take into account those patients who have an active prescription but are not taking the medication or those patients using a steroid spray purchased over the counter and without a prescription. There is also no way to determine if the medication was administered correctly.
- Based on evidence from the previously mentioned Lechien study, anosmia and hyposmia appears to have an inversely proportional relationship with overall symptom severity of COVID-19.
- Since this study population was composed of only patients who had both loss of smell and COVID-19, the likelihood that those patients would have milder symptoms overall would be much higher.
- In order to address research limitations, a prospective study with controls for symptoms is warranted.

Conclusion

The use of intranasal corticosteroids prior to and at time of COVID-19 diagnosis did not decrease the rate of hyposmia or anosmia as a presenting symptom. Patients who were on a topical steroid at the time of COVID-19 diagnosis, however, only suffered from mild symptoms overall. Therefore, using a nasal corticosteroid spray prior to becoming infected with COVID-19 may reduce the severity of viral symptoms overall.

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