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Safety and pulmonary function impact of surgical mask usage in stable COPD patients during the COVID-19 pandemic

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Abstract

There are hesitations about the use of surgical face masks, which are the main tools in protection from the COVID-19 pandemic, one of the biggest disasters of our age, in chronic airway diseases. The purpose of the study was to examine how stable patients with chronic obstructive pulmonary disease (COPD) responded to short-term surgical mask use in terms of in-mask air quality, oxygen saturation, and pulmonary function. Forty-one patients with stable COPD, by clinical presentation and pulmonary function tests (PFTs), were included in a quasi-experimental study. Stable COPD patients' PFTs, in-mask air quality, and pollution measures were collected before and after wearing surgical masks for two hours at rest. The findings of simultaneous tests of peripheral-blood-oxygen saturation were also recorded. The mean age of participants was 67.1 years and 87.8% were male. The pre- and post-mask PFTs parameters for GOLD (A+B) group were FEV_1 (ml), FEV_1 (%), FVC (ml), FVC (%), FEV_1/FVC (%) and DLCO (%) (p=0.067, p=0. 065, p=0.062, p=0.083, p=0.083, p=0.269, p=0.956, respectively), whereas in GOLD (C+D) group (p=0.340, p=0.538, p=0.728, p=0.044, p=0.105, p=0.054, respectively). In post-mask measurements, the respiratory function was not impaired in GOLD-2022 (A-B-C-D) COPD subgroups. Oxygen and carbon-monoxide concentrations in exhaled air and oxygen saturation decreased after surgical mask use. The difference was statistically significant, but the difference was unimportant in terms of clinical implications. Surgical masks don't appear to have a negative effect on pulmonary function and clinical parameters in stable COPD. This study may help provide evidence-based data to overcome hesitations in use of surgical masks in chronic airway diseases.

Key words: Air quality, chronic obstructive pulmonary disease, pulmonary function tests, saturation, masks

Introduction

One of the worst calamities of the century so far is the COVID-19 epidemic, which has killed and afflicted millions of people. The direct spread of virus particles by respiratory droplets in pandemics such as COVID-19 is known as the most important transmission route of respiratory infectious agents that endanger society and health systems worldwide [1]. In a pandemic, mitigation procedures such as social distancing, personal hygiene measures, effective use of protective face masks and minimizing migration of people to crowded environments stand out as basic measures to prevent transmission and spread of the disease [2].

The use of face masks is one of the most straightforward ways to stop the transmission of The Severe Acute Respiratory Syndrome Virus-2 (SARS-CoV-2), however it has generated considerable debate due to potential drawbacks. Face masks have been shown to protect against respiratory tract infections, but it is unclear whether short- and long-term use will have any negative effects on the air quality, oxygen saturation, or respiratory functions inside the mask, particularly in people who already have chronic airway diseases [3,4]. Several studies have also raised concerns regarding the possibility of hypoxemia and hypercapnia while wearing face masks [3-6]. According to this supposition, wearing a face mask while suffering from chronic obstructive pulmonary

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disease (COPD) with increased internal airway resistance brought on by chronic inflammation and a deficient respiratory reserve appears to be one of the riskiest scenarios in terms of hypoxemia and/or hypercapnia. In healthy adults, the use of surgical masks does not result in changes in tidal volume or respiratory rate that are clinically significant [3-5]. The use of surgical masks result in a small increase in respiratory resistance because the mask material is impacted by filtered particles, aerosols, and moisture that has been trapped in the material [3,5]. Although there is evidence to support the use of surgical masks in healthy people, there is less information on patients with chronic respiratory illnesses, particularly COPD [3,5]. Therefore, the purpose of this study is to investigate the effects of short-term usage of surgical face masks on stable COPD patients' respiratory functions, oxygen saturation levels, and inspired air quality.

Material and Methods

Study design and population

This study included consecutively 41 patients who were admitted to university hospital department of chest disease between July 1st, and October 1st, 2021, with the diagnosis of COPD based on clinical findings and respiratory function tests.

After anamnesis and physical examination, room-air quality measurements were performed and each COPD patient was included in the first series of pulmonary function tests (PFTs). Then the participants were asked to wear surgical masks properly in a closed room for two hours under observation. At the end of the second hour, the same measurements were repeated and recorded. The flow diagram of patient selection and measurements is shown in Figure 1.

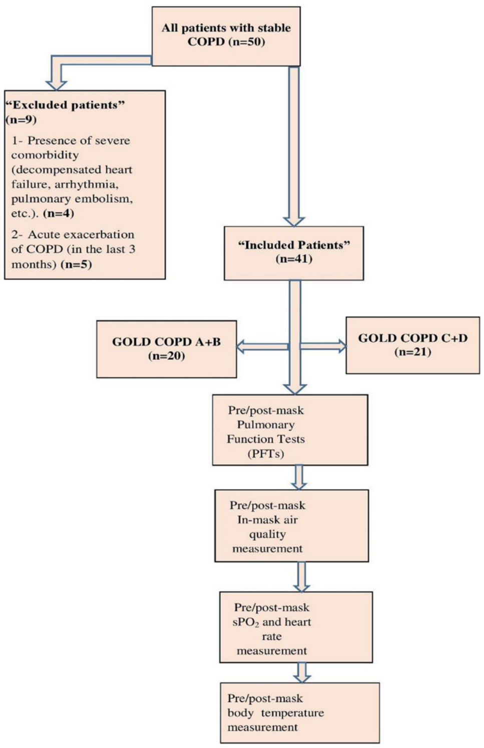

Figure 1. Measurements in participants before/after mask according to GOLD COPD group

Power analysis

We calculated the expected risk to enroll the bare minimum of patients because our study did not have any comparable studies in the literature. We calculated the minimum number of patients we need to reach as 31, as a result of the analysis performed with 95% confidence interval and 5% absolute (+/- % (d)), given that about 2% of COPD patients using short-term masks may suffer respiratory dysfunction [5,6]. We included 41 patients who met the criteria in the study.

Inclusion criteria

- Age≥18 years and giving consent to participate (signing an informed consent form).
- Cooperation of patients in PTFs maneuvers and adaptation to PFTS.
- Diagnosis of COPD by a pulmonologist, based on signs/symptoms and PFT findings.

Exclusion criteria

- Presence of severe comorbidity (decompensated heart failure, arrhythmia, pulmonary embolism, etc.).
- Acute exacerbation of COPD in the past 3 months.
- Five patients were excluded due to an acute exacerbation of COPD in the previous three months, and four patients were excluded due to significant comorbidities.

Data collection forms

The data collecting forms comprised sociodemographic data, measurements of the humidity and temperature in the mouth-nose area (MNA) before and after the facemasks were worn (no-mask and in-mask), as well as measures of the indoor room-air quality.

COPD diagnosis, classification and definition of smoking habits

In the absence of a primary diagnosis of bronchiectasis, asthma, or another serious respiratory disease, the diagnosis of COPD was based on a FEV_1/FVC ratio of less than 0.70 on PFTs with spirometry. FEV_1 is the forced expiratory volume in one second following bronchodilator, and FVC is the forced vital capacity. The diagnosis of COPD is supported by symptoms including shortness of breath, a persistent cough, or sputum production, as well as a history that is consistent with the condition (the disease starts after age 40, a history of smoking at least 10 packs annually, or occupational exposure to irritating or poisonous gases, or biomass). Following a thorough examination of the patients, the Global Initiative for Chronic Obstructive Lung Disease (GOLD) categories were established using exacerbation history and the modified Medical Research Council (mMRC) dyspnea scale [7]. The patients were investigated in four groups (A, B, C, and D) based on increasing severity. A frequent exacerbator was defined as someone who has experienced at least one COPD hospitalization and/or at least two courses of antibiotic and/or systemic steroid treatment as a result of worsening COPD symptoms in the previous 12 months. The GOLD categories for the patients were established using the GOLD 2022 combined evaluation approach [7].

The age at which smoking was first initiated, the number of cigarettes smoked each day, and the age at which smoking was stopped were all questions that were used to gather data on active smoking. At the time of the exam, ongoing cigarette smoking (duration >6 months) was considered to be current. A history of smoking for more than six months and the absence of present smoking were considered to be former smoking. Passive smoking was determined based on responses to questions about whether smokers lived in the participant's family throughout their childhood and whether smokers lived in the participant's family or were present at work during their adult years. If they said yes, more details were gathered about adult passive smoking exposure (weekly exposure totals, time spent exposed at home and at work). Adults who have been exposed to passive smoking for more than a year or more than once a week are considered to have engaged in the practice. Exposure while childhood was cut off at age 18 and exposure after this age was included in exposure throughout adulthood.

Measurement instruments

A multi-gas monitoring instrument called iBRID MX 6 (Industrial Scientific Corporation, Pittsburgh, USA) is used to measure pollution and air quality. About 120 different types of chemicals, including O_2 saturation (%) in the air and CO, sulphur dioxide (SO_2), nitrogen oxides (NOx), and volatile organic compounds (VOC) concentrations in parts per million (ppm), can be measured by this equipment. The apparatus contains a warning alarm for dangerously high concentrations. During in-mask measurements, the device's warning time-point was noted.

Measurements of peripheral blood O_2 saturation (SpO_2) are made simultaneously before and after wearing the mask for two hours using the VRN501 Veron fingertip pulse oximeter (Shanghai International Trading Company, Hamburg, Germany).

Simultaneous measurements of indoor ambient air quality, no-mask air quality, and in-mask air quality were taken using a humidimeter and thermometer. Before the experiments began, all of the equipment was calibrated.

Measurements

A total of 123 measurements were performed with and without facemasks (before, with and after mask). The participants were monitored in a closed room to make sure they wore surgical masks properly.

- In the first step, measurements were made of the temperature, humidity, O_2, CO, SO_2, NOx, and VOC concentrations in the air in the room.
- Prior to donning the mask, the second stage measures comprised measuring the MNA and the room's air quality and pollution (including O_2, CO, SO_2, NOx, VOC concentrations, humidity, and temperature). At the 15th minute, mean values were noted. For each participant, single-use, disposable soft medical cannulas were used to measure the air quality. For each participant, a different humidiometer and thermometer probe was used to measure the humidity and temperature. In order to release the ambient air that had been trapped inside the cannula, the measurements were taken after the 15th minute.
- Third step measurements included the same measurements as in the second stage, but this time after wearing and keeping the surgical mask on for at least two hours. Once more, mean values at the 15th minute were noted. To assess the air quality inside the mask, soft, single-use, disposable medical cannulas were inserted. No gas exchange with the outside was possible due to the tight fitting probes into MNA. After each participant in the humidity and temperature measurements, the probes connected to the humidiometers and thermometers were also changed.

Pulmonary function tests (PFTs)

A calibrated Sensor Medics V-Max 20 spirometer (Jaeger MS-PFT Analyser Unit, Wiasys Healthcare GmbH, Höchberg, Germany) was used to perform PFTs. The patients were advised to abstain from smoking before and after the test and not to take any oral or inhaled short-acting beta-2 agonists within 4 hours of the test. Patients who continued their usual inhaler bronchodilator therapy were noted along with their medications prior to the test. Three baseline FEV_1 and FVC measurements were taken, and the best reading was recorded. Helium dilution was used to determine total lung capacity. Using the single breath technique, the lung's transfer factor for carbon monoxide (DLCO) was calculated. The percentages of the projected values were used to represent the results.

Ethical approval

The ethics committee of Çukurova University approved this quasi-experimental study (113/2021). Informed consent was obtained from all participants. The national research committee, and the 1964 Helsinki declaration's ethical guidelines were followed in all procedures carried out during the study that involved human subjects.

Statistical analysis

The data were analyzed by using SPSS 22® software. The normal distribution was examined using the Shapiro-Wilk test. Arithmetic mean, standard deviation, median, minimum, maximum, and percentage were used to present the data. In order to analyze the data, the paired t-test, Wilcoxon test, and McNemar's test were utilized. The threshold for statistical significance was set at 0.05. The effect size was calculated using an effect size calculator. In the interpretation of the effect size (Cohen's d), $0.0 \leq d < 0.20$ was considered as ignored; $0.20 \leq d < 0.50$ as small; $0.50 \leq d < 0.80$ as moderate; 0.80≤d<1.30 as large and d≥1.30 as very large.

Results

The forty-one participants had a mean age of 67.1 years, and 87.8% of them were male. According to the GOLD categorization, the distribution of patients was as follows Group A (n=9) 22%, Group B (n=11) 26.8%, Group C (n=2) 4.9%, and Group D (n=19) 46.3%. The detailed characteristics of the participants were presented in Table 1.

When pre-mask (before wearing the mask) PFT results were compared with post-mask (after wearing and keeping the mask on for two hours) values, a statistically significant increase was observed only in the FVC (%) measurement with FVC (%) increased from a mean of 70.72±25.24 (95% CI=63.00-78.50) to 74.80±24.24 (95% CI=67.40-82.20) reflecting into a medians change of 70.0 (47.3-92.0) to 70.0 (51.5-93.4) (p=0.019). The effect size of the mask on all PFTs, including the FVC (%), was found to be very small. The detailed PFT analyses results were presented in Table 2.

Considering the combined assessment groups by using the exacerbation counts in the previous year of the patients and symptoms or the GOLD classification of the patients, the increase in FVC (%) was statistically significant in the group with frequent exacerbations (p=0.019). After two hours of wearing a surgical mask, the effect size of wearing a mask on PFTs was found to be small or ignorable as can be seen in Table 3.

The outdoor air quality indices were simultaneously compared with the in-mask air quality values measured after 2 hours of mask use. Statistically significant decreases were found in O_2 (%) with a drop of 8.6% (from 20.99±0.02% to 19.17±0.64%) (p<0.001) and CO (ppm) with a drop of 21.6 ppm (from 3.46±3.29 ppm to 2.71±2.73 ppm (p=0.003) concentrations in the in-mask air at the end of two hours of wearing the mask, while there were observed significant increases in VOC (ppm) (an increase of 455 ppm), humidity (%) (an increase of 73.5%) and temperature (%) (an increase of 73.5%) values (p>0.001). The effect size of the mask on the decrease of O_2 (d=4.01), and on the increase of VOC (d=1.96), humidity and temperature values was found to be very large. Following in-mask air measurements of SpO_2, simultaneous measurements from the finger revealed a decrease in SpO_2 (p=0.005), but the effect size was small (d=0.28) (Table 4).

Table 1. Sociodemographic and diagnostic characteristics of COPD patients

Characteristics	n (%) or x̄±SD (min–max)
Age (years)	67.1±7.2 (53–85)
Sex (male/female)	36 (87.8)/5 (12.2)
Active smoker (no/yes)	27 (65.9)/14 (34.1)
Passive smoker (no/yes)	37 (90.2)/4 (9.8)
Cigarettes (package/years)	47.00±26.01
Exacerbations (frequent/rare)	20 (48.8)/21 (51.2)
GOLD score A/B/C/D[1]	9 (22.0)/11 (26.8)/2 (4.9)/19 (46.3)
mMRC score 1/2/3/4[2]	11 (26.8)/6 (14.6)/17 (41.5)/7 (17.1)
Time since COPD diagnosis (years)	8.14±6.51 (0-30)
Visit frequency of emergency department in the last year	2.41±3.44 (0-15)
Home care support (no/yes)	6 (14.6)/35 (85.4)

[1]: The GOLD 2022 combined assessment method for COPD [7], [2]: The Modified Medical Research Council (mMRC) Dyspnea Scale [7]

Table 2. Comparison of pulmonary function test values before wearing and after 2 hours of wearing surgical masks by COPD patients

PFTs Parameters	Pre-mask (n=41)		Post-mask (n=41)		p	Cohen's d
	x̄±SD	Median (IQR)	x̄±SD	Median (IQR)		
FEV_1 (ml)	1283.90±553.93	835.0-1190.0-1570.0 (735.0)	1349.02±607.36	860.0-1220.0-1690.0 (830.0)	0.083	0.11
FEV_1 (%)	49.52±22.89	30.050-44.600-68.300 (38.3)	51.81±24.29	32.40-50.00-71.80 (39.4)	0.057	0.09
FVC (ml)	2356.34±765.05	1730.0-2400.0-2785.0 (1055.0)	2448.48±821.9	1895.0-2370.0-2850.0 (955.0)	0.225	0.11
FVC (%)	70.72±25.24	47.30-70.00-92.00 (44.7)	74.80±24.24	51.450-70.000-93.350 (41.9)	**0.019***	0.16
FEV_1/FVC (%)	53.15±9.35	46.400-54.400-61.155 (14.76)	52.12±10.78	44.590-52.570-59.970 (15.38)	0.830	0.10
DLCO (%)	55.93±20.54	40.00-53.00-74.50 (35.0)	54.49±22.77	39.0-50.0-76.0 (37.0)	0.130	0.06

*: statistically significant, Pre-mask: before wearing the mask, Post-mask: after wearing and keeping the mask on for two hours, x̄±SD: mean±standard deviation, IQR : inter-quartile range, FEV_1: post-bronchodilator forced expiratory volume in one second, FVC: forced vital capacity, DLCO: transfer factor of the lung for carbon monoxide

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Table 3. Comparison of premask and postmask pulmonary function test values of COPD patients according to the combined COPD assessment groups

PFTs parameters	Combined assessment groups GOLD A/B/C/D			
	GOLD COPD A+B (n=20)		GOLD COPD C+D (n=21)	
	x̄±SD	Median (IQR)	x̄±SD	Median (IQR)
Pre-FEV_1 (ml)	1580.00±533.56	1415.00 (862.5)	1001.91±414.80	1010.0 (750.0)
Post-FEV_1 (ml)	1696.00±617.61	1555.00(845.0)	1018.57±374.65	920.00 (675.0)
	p=0.067, d=0.20		p=0.340, d=0.04	
Pre-FEV_1 (%)	61.75±19.95	56.90 (31.4)	37.87±19.43	31.60 (25.9)
Post-FEV_1 (%)	66.11±21.77	60.00 (28.7)	38.21±18.20	32.40 (25.0)
	p=0.065, d=0.20		p=0.538, d=0.01	
Pre-FVC (ml)	2744.0±759.52	2640.0 (970.0)	1987.14±573.73	2030.0 (925.0)
Post-FVC (ml)	2884.5±823.37	2735.0 (1310.0)	2033.24±579.58	20400 (670.0)
	p=0.062, d=0.17		p=0.728, d=0.07	
Pre-FVC (%)	83.16±20.63	82.35(34.3)	58.89±23.85	54.60(31.4)
Post-FVC (%)	87.53±21.62	86.45(39.4)	62.68±20.38	55.70(24.4)
	p=0.083, d=0.20		p=0.044, d=0.17	
PreFEV_1 /FVC (%)	57.10±7.73	57.15 (16.57)	49.39±9.38	46.90 (14.70)
PostFEV_1/FVC (%)	57.76±8.08	57.63 (15.16)	46.75±10.42	46.05 (18.30)
	p=0.269, d=0.08		p=0.105, d=0.26	
Pre-DLCO (%)	65.35±19.64	67.50 (31.0)	46.95±17.45	42.00 (24.0)
Post-DLCO (%)	65.42±21.10	69.00 (36.8)	44.10±19.55	40.00 (18.0)
	p=0.956, d=0.003		p=0.054, d=0.15	

*: statistically significant, Pre-mask: before wearing the mask, Post-mask: after wearing and keeping the mask on for two hours, FEV_1: post-bronchodilator forced expiratory volume in one second, FVC: forced vital capacity, DLCO: transfer factor of the lung for carbon monoxide

Table 4. Comparison of ambient and in-mask air quality and physiological parameters after 2-hours of mask-wearing in COPD patients

Characteristics	Ambient air		In mask air (after 2-hours)				
Air quality	**x̄±SD**	**Median N (IQR)**	**x̄±SD**	**Median (IQR)**	**Change %**	**p**	**Cohen's d**
O_2 (%)	20.99±0.02	21.0 (0.0)	19.17±0.64	19.2 (0.9)	-8.6	<0.001*	4.01
CO (ppm)	3.46±3.29	5.0 (6)	2.71±2.73	4.0 (5)	-21.6	0.003*	0.24
SO_2 (ppm)	0.00±0.00	0.0 (0.0)	0.0±0.00	0.0 (0.0)	0	1.000	0
NO_X (ppm)	0.00±0.00	0.0 (0)	0.00±0.00	0.0 (0.0)	0	1.000	0
VOC (ppm)	54.44±28.77	48.3 (45.1)	297.20±171.98	216.0 (190.5)	+455	<0.001*	1.96
Humidity (%)	53.34±11.81	52.0 (15.5)	92.57±7.80	99.0 (14.0)	+73.5	<0.001*	3.91
Temperature (°C)	24.61±1.77	25.0 (2.6)	30.13±1.59	30.0 (3.0)	+22.4	<0.001*	3.28
Physiological parameters							
SpO_2 (%)	94.73±2.51	95.0 (4)	94.00±2.54	94.0 (4)	-0.77	0.005*	0.28
Heart rate (min^{-1})	86.12±10.53	86.0 (14.0)	87.68±10.05	88.0 (14.0)	+1.81	0.160	0.15

*: statistically significant, x̄±SD: mean±standard deviation, IQR: inter-quartile range, O_2: oxygen saturation (%), CO: carbon monoxide concentration (ppm), SO_2: sulphur dioxide (ppm), NO_x: nitrogen oxides (ppm), VOC: volatile organic compounds (ppm), SpO_2: oxygen saturation in peripheral blood

A level of 90% is a critical value for SpO_2 regarding the severity of oxygenation, the measurements were compared for this critical value. Putting on and keeping for 2 hours the masks did not alter significantly the SpO_2 values in COPD patients. It was observed that SpO_2 values of below 90% were observed in 7.3% and 9.8% of patients before and after the mask use, respectively.

Discussion

The study's key finding was that "among patients with stable COPD, use of a surgical face mask in a relaxed setting, at rest, and for a brief period of time prevents COVID-19-like respiratory viral diseases and does not have a significant adverse effect on respiratory function and clinical markers."

When the pre- and post-mask measures (taken after 2 hours of wearing) were compared in stable COPD patients, PFTs did not reveal any clinically significant difference. FVC (%) in post-mask PFTs was higher than pre-mask ones with a small effect size, but this was not a clinically significant response. The fact that the FVC (%) value was high after the mask was interpreted as it may be due to the minimal resistance that the in-mask particles may cause in the airway and that this situation would not lead to a clinical or physiologic adverse situation. When pre-mask and post-mask PFT values were compared according to GOLD COPD combined assessment (i.e. A+B and C+D), using mask was found clinically and functionally safe in both groups. Of course, because they were made in a particular patient population, these findings provide evaluation with a specified impact size. A study examining the effects of surgical masks and FFP2/N95 masks on cardiopulmonary exercise capacity in a small group of healthy volunteers found that surgical masks reduced FVC, FEV_1 and peak expiratory flow (PEF), and FFP2/N95 masks caused even greater impairments. However, they found that arterial blood gas analyses were similar in the unmasked, surgical masked and FFP2/N95 masked groups [8]. To the best of our knowledge, this is the first article to examine the impact of mask use on COPD patients using PFTs in the literature that is currently available.

SpO_2 values were statistically significantly different in pre-mask and post-mask measurements; the effect size was small and the mean of SpO_2 in both groups were over 90%, which is the critical cut-off in clinical practice, so the difference is not clinically significative. If considered theoretically, a small increase in the exertion of breathing, increased inspiratory and expiratory flow resistance and dead space, re-inspiration of CO_2, anxiety, reduced fine-motor performance, cognitive impairments due to elevated CO_2 retention and slightly increased body temperature with surgical masks may pose problematic issues for people with advanced pulmonary disorders [9-11]. N95 respirators did not affect breathing while walking slowly (during low-intensity physical activity) on a treadmill (1.7 mph and 2.5 mph) for an hour with no effect on respiratory rate, tidal volume, or total ventilation, according to Roberge et al.'s study of the effects of N95 masks on respiratory functions in healthy adult healthcare workers [12]. Limited information about surgical mask use in COPD was found in a study of the literature. According to a letter on COPD, even in participants with severe lung impairment and a little drop in SpO_2 with exercise, the use of a surgical mask has no appreciable impact on gas exchange [6]. Using a surgical mask for an hour at modest work rates, a comparable investigation on healthy volunteers found slight physiological response increases without any clinical relevance [11]. According to a study, those with COPD who have a mMRC Score of 3 or a FEV_1 below 30% of expected should be cautious when using N95 masks because there is a higher risk of causing hypoxic or hypercapnic respiratory failure [13]. In a study conducted with a small number of participants with end-stage lung disease (the majority of them were COPD), it was shown that using a surgical mask did not affect them over a 6-minute walk test distance [11]. A study in Turkey revealed that the use of surgical facemasks did not cause abnormal physiological responses in healthy healthcare workers, but the quality of the inhaled air decreased in terms of increased humidity and temperature, and diminished comfort [14]. Another single-centre experimental study reported that the effect of a surgical mask on oxygen saturation and heart rate was very small in healthy participants at rest [15]. In the light of conflicting literature, our study contributed additional data that surgical masks was safe in COPD regardless of GOLD-COPD groups.

The main limitations of our study can be defined as being single-centered, lack of a control group other than COPD patients, exclusion of patients with exacerbation, and wearing the mask for a short time. Participants were evaluated after resting for a short time in a comfortable environment using masks for 2 hours continuously. PFT measurements made after the use of a single type of surgical mask were made only in closed environments and with the mask removed. Due to the use of one type of mask in our study, no inference can be made regarding the use of other mask types. Since lung volumes, ventilation/pCO_2 were not evaluated, other physiological respiratory parameters of the patients could not be evaluated and no comment could be made regarding this situation. In addition, this pilot study did not include patients with exacerbations, and therefore no clear conclusions can be drawn about such patients. Therefore, our results are not representative of all patients with chronic airway disease and COPD patients.

Conclusion

In conclusion, people with COPD can safely use surgical masks, which are increasingly used in pandemic situations and are known to reduce viral transmission. The use of surgical masks by people with chronic respiratory disorders, particularly COPD, for a brief period of time, in a comfortable setting, and while they are resting has been confirmed in light of these facts. By eliminating concerns about using surgical masks and encouraging patients with stable COPD to use them more frequently, this study may boost protection.

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Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
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Ethical Approval
Ethical approval was obtained from the Ethics Committee of Non-Interventional Clinical Trials of the Faculty of Medicine of the University of Cukurova dated July 9, 2021 and numbered 113 meeting.

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