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## Evaluation of Bronchoscopies Done in A Single Center in Pandemic Period

**Objectives:** Impact of COVID 19 pandemic changed approach to open airway procedures. In our study we want to retrospectively evaluate bronchoscopic interventions and COVID 19 infection risk after bronchoscopic evaluations under suggested precautions in a referrance hospital.

**Material and Methods:** 664 bronchoscopy procedure done in our hospitals bronchoscopy unit unıt between April 25th 2020- July 25th 2020 were retrospectively evaluated.

**Results:** 661 procedure were done to 604 patients (mean age 57.43±14.49; 70,4% male). 552 (91,4%) of the patients have undergone only one bronchoscopy but for others repeated bronchoscopies were done. Before the procedure, at least one COVID-19 PCR test via oropharyngeal/nasopharyngeal swab was performed (97,3%) of the 643 procedures. 447 (67,9%) fiberoptic bronchoscopy, 127 (18,8%) convex probe endobronchial ultrasound, and 87 (13,3%) rijid bronchoscopy were applied. During this 3 month time 36 pulmonologist, 10 nurse and 6 staf take part in these 661 prosedure. A total of 14.20±9.41 (1-36; IQR 12) prosedure per pulmonologist were done. No complaint was seen in any of the staf after 14 days of follow up. From 604 patients only for 54 of the patients PCR evaluation was done in the 14 days period (mean time 7.75±4.07(1-14). From 54 PCR only 3 (5,6%) resulted positive and have undergone treatment for COVID 19.

**Conclusion:** Pretesting before bronchoscopy and adhering protected measures as much as possible is ideal to protect health care workers and other sensitive patients.

**Key Words:** Broncoscopy, COVID 19, PCR

### Pandemi Döneminde Tek Merkezde Yapılan Bronkoskopilerin Değerlendirilmesi

**Amaç:** Covid 19 pandemisinin etkisi havayolu prosedürlerine yaklaşımı değiştirmiştir. Çalışmamızda referans bir hastanede belli önlemlere uyularak yapılan bronkoskopik işlemlerden sonra, bronkoskopik girişimleri ve Covid 19 enfeksiyon riskini retrospektif olarak değerlendirmek istedik.

**Gereç ve Yöntem:** 25 Nisan-25 Temmuz tarihleri arasında yapılan 664 bronkoskopi işlemi geriye dönük olarak değerlendirildi.

**Bulgular:** 604 hastaya 661 işlem yapıldı (ortalama yaş 57.43±14.49; %70.4 erkek). Hastaların 552'sine (%91.4) sadece bir bronkoskopi yapılırken, diğerlerine tekrarlayan bronkoskopiler yapıldı. 643 işlemden önce (%97.3) orofaringeal/nazofaringeal sürüntü ile en az bir Covid 19 PCR testi yapıldı. 447 (%67.9) fiberoptik bronkoskopi, 127 (%18.8) konveks prob endobronşial ultrason ve 87 (%13.3) rijid bronkoskopi uygulandı. Bu 661 işlemde üç aylık süre içerisinde 36 göğüs hastalıkları uzmanı, 10 hemşire ve 6 personel görev almıştır. Göğüs hastalıkları uzmanı başına 14.2±9.41 (1-36; IQR 12) işlem yapıldı. 14 günlük takip sonunda hiçbir personelde şikayet görülmedi. 604 hastadan sadece 54 hastanın on dört günlük periyotta PCR değerlendirimi yapıldı. 54 hastadan sadece 3 'ü (%5.6) pozitif sonuç verdi ve Covid 19 için tedavi gördü.

**Sonuç:** Bronkoskopiden önce Covid 19 için ön test yapmak ve mümkün olduğunca koruma önlemlerine bağlı kalmak sağlık çalışanlarını ve hassas hastaları korumak için idealdir.

**Anahtar Kelimeler:** Broncoscopy, COVID 19, PCR

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### Introduction

World was in a struggle with severe acute respiratory syndrome coronavirus-2 since December 2019. It is first documented in pneumonia cases in Wuhan and since then coronavirus disease (COVID 19) has led to an increasing number of infections worldwide (1). It was declared a global pandemic by the WHO on 11 March 2020 (2). The first case was seen on 10 th of March in Turkey and the number increased by that time. Due to precautions taken by the government and by ministry of health, all the interventional procedures including bronchoscopic procedures, except emergency cases, were postponed in our hospital by 25 March 2020. All the health care staff and all our beds were reserved for treatment of COVID 19 patients.COVID 19 predominantly transmitted by air droplets and open airway procedures such as tracheal aspiration, sputum induction, intubation, taking respiratory sample, and bronchoscopy pose a significant risk to health care workers (3). Bronchoscopical procedures were done for various diagnostic and treatment indications. These procedures were applied as inpatient or outpatient. In the pandemic situation bronchoscopic procedures have

increased risk for health care workers as well as sensitive patient population that can get into contact with the COVID 19 infection (4). Different recommendations were suggested by the different societies (5-10). Precautions that must be taken before undergoing a bronchoscopy procedure differ depending on the population. There are different guidelines or consensus reports making recommendations about how and whom to apply bronchoscopy in the area of COVID 19 pandemia.

PCR testing is recommended to be done to asymptomatic patients before bronchoscopy in populations where community transmission of COVID 19 infection is present (7). But this strategy is contingent on the availability of testing in the local area. Also negativity of the test is not solely protective and personal protective equipment must be used in all of the patients. But the procedures of the positive resulted patients without emergency indications were suggested to be postponed in general (11).

In literature, a study about COVID 19 risk in patients after bronchoscopy whose evaluation was done by PCR testing before procedure was not found. But in literature there is one publication from our country where only %24.6 of the patients were tested before the procedure but none of the patients were detected COVID 19 after bronchoscopy (12).

In our study we want to retrospectively evaluate bronchoscopic interventions and COVID 19 infection risk after bronchoscopic evaluations under suggested precautions in a referral hospital.

## Materials and Methods

**Research and Publication Ethics:** This retrospective cohort study was done after being approved by the hospital scientific board and hospital ethical committee (06.08.2020/2020-11). Approval from Ministry Of Health was also obtained (2020-09-18T10-20-05).

A Total of 664 bronchoscopy procedures done in our third stage reference hospital in the standard bronchoscopy unit and interventional rigid bronchoscopy unit between April 25<sup>th</sup> - July 25<sup>th</sup> were retrospectively evaluated. Three Bronchoscopies done in the intensive care unit and bronchoscopies done to verified COVID 19 patients were excluded.

In our hospital, all scheduled patients were evaluated at least one time for PCR evaluation maximum 3 days pre procedure and if possible two PCR negativity in 48 hours interval is preferred if the procedure was not urgent. Also screening of symptoms, sick contacts and pre procedural vitals were done for each patient.

All procedures were done with minimum necessary personnel (one or two bronchoscopist, one nurse, one staff, and in case of a procedure under general anesthesia one anesthesiologist and one technician were present). In order to minimize the potential exposure to aerosolized particles, visitors and students

were not allowed to participate during these times. All the protective equipment given by the hospital to the personnel (N95 masks; eye glasses; gown, gloves, cap) were worn and taken out in accordance with the regulations. Alcohol-based hand sanitizers were located at every workstation. Hand hygiene (frequent hand washing with soap and water or alcohol-based solutions) was performed according to standard guidelines, specifically before donning and after removing gloves, after contact with contaminated areas, before touching any equipment needed for bronchoscopy or the patient.

When it comes to post procedural precautions, although there is not any consensus in our hospital. Scope disinfection was done with standard high level disinfection and surfaces in contact with patient or secretions are sterilized after each procedure and 20 minute interval was given in between two procedures.

All the data about the patients' demographical properties, indications, procedures done, duration of procedures, involved personnel, post bronchoscopic follow up data available and pcr results were evaluated.

## Results

After excluding three cases whose data were not available, 661 procedures which were applied to 604 patients in the bronchoscopy unit were evaluated. Mean age of the patients were 57,43±14,49 (18-93) and 425 (70,4%) of them were male.

In 552 (91,4%) of the patients only one bronchoscopy was done but 48 (7.9%) of them have undergone two, 3 (0.5%) of them three and 1 (0.2%) patient has undergone four times bronchoscopy during this three month time period. Before the procedure, at least one COVID-19 PCR test via oropharyngeal/nasopharyngeal swabs was performed (%97,3) in the 643 procedures. From the PCR results only 2 (0,3%) of the patients were resulted as positive and their bronchoscopies were postponed. In 18 (2.7%) of the procedures, bronchoscopy was done without a PCR result.

A total of 447 (67,9%) fiberoptic bronchoscopy, 127 (18,8%) convex probe endobronchial ultrasound (EBUS), and 87 (13.3%) rigid bronchoscopy were applied. From these 661 procedures in 98 (14.8%) of the cases no specimen was taken, 195 (29,5%) bronchoscopic aspirate was taken, 164 (24.8%) biopsy, 167 (25,3%) transbronchial needle aspiration and from 37 (5,6%) of them both biopsy and transbronchial needle aspiration was taken. Procedure time was documented in 355 of the procedures and mean time was 31.59±13.97 minutes (10-100).

From the 447 patient undergoing fiberoptic bronchoscopy, indications were as follows; 278 (62,2%) tumor, 61 (13.6%) hemoptysis, 42 (9,4%) evaluation for endobronchial component for late resolving pneumonia or effusion, 35 (7,8%) follow up after an intervention, 15 (3,4%) suspicion of mycobacterium tuberculosis infection, 9 (2%) staging for lung cancer, 6 (1,3%)

interstitial lung disease and 1 (0,2%) suspicion of foreign body aspiration.

From the 127 patient undergoing endobronchial ultrasound, indications were as follows; 53 (41,7%) diagnosis, 42 (33,1%) diagnosis and staging at the same time, and 32 (25,2%) for staging.

From the 87 rigid bronchoscopy, indications were as follows; 39 (44,8%) malign airway obstruction, 23 (26,4%) postintubation tracheal stenosis, 11 (12,6%) stent revision, 11 (12,6%) hemoptysis, and 3 (3,6%) suspicion of foreign body aspiration

During this 3 month interval, 36 pulmonologist, 10 nurse and 6 staff take part in these 661 procedures.  $14.20 \pm 9.41$  (1-36; IQR 12) procedures per pulmonologist were done. PCR evaluation was done in health care staff on demand in case of occurring symptoms. No complaint was seen in any of the staff after 14 days of follow up.

The patients applied to the outpatient clinic with the pathological results of bronchoscopy in about 14 days. PCR was obtained from patients who were symptomatic (cough, fever, loss of taste or smell) at presentation or who were going to undergo another intervention. From 604 patients, PCR evaluation was done only in 54 of the patients in a 14 days period (mean time  $7.75 \pm 4.07$  (1-14)). From 54 PCR only 3 (5,6%) resulted positive and undergone treatment for COVID 19. While the other patients were asymptomatic and 3 out of 604 patient (0,49%) were PCR positive in the 14 days period.

## Discussion

COVID 19 manifests itself mainly as a lower respiratory tract illness and has a high morbidity and mortality. COVID 19 is predominantly transmitted by air droplets and open airway procedures such as bronchoscopy and poses a significant risk to health care workers (3,13).

Although there is an increased risk of infection for the health care workers during bronchoscopy, it is health care workers' primary responsibility to diagnose and treat the patients (14). Bronchoscopy is an aerosol-generating procedure and should only be performed when necessary and if the result is going to change the treatment decision. To provide a guidance for health care workers, several bronchology societies have issued statements or guidelines regarding bronchoscopy during the COVID 19 pandemic (5-11).

In a commentary reviewing the societal guidelines regarding bronchoscopy during COVID 19 pandemic, procedural steps and protections were summarized (11). All the elective procedures were recommended to be postponed. Specific indications considered elective are mild tracheal or bronchial airway stenosis; clearance of mucus; suspected sarcoidosis without indication for immediate treatment; chronic interstitial lung disease; suspected atypical mycobacteria infection; chronic cough; tracheobronchomalacia evaluation; bronchial thermoplasty; bronchoscopic lung volume reduction (7). Where as severe airway stenosis, symptomatic central

airway obstruction, massive hemoptysis, migrated stent were emergent indications for bronchoscopy. On the other hand concern for an alternate aetiology of respiratory disease which would change management; suspicion of superinfection; lobar or entire lung atelectasis concerning for mucus plugging were considered as bronchoscopy indications in the guidelines (5-11). In our bronchoscopy unit we performed bronchoscopy to a wide variety of indications including cases that could be postponed, because of our prediction that the pandemic will last long, following the recommended precautions.

Screening of symptoms, sick contacts and pre procedural vitals were recommended. Although not all the guidelines recommend it, American Association for Bronchology and Interventional Bronchoscopy (AABIP) also recommends that a nasopharyngeal specimen should be taken before the procedure (7). We screened all the patients for symptoms, sick contacts and preprocedure vitals as well as at least one COVID-19 PCR test via oropharyngeal/nasopharyngeal swab.

During the procedure ideal setting was a negative pressure room which is not possible in most of the centers but it is recommended by AABIP and Spanish Society of Pneumology and Thoracic Surgery (SEPAR) (7, 9). Limited and minimum necessary personnel contacting the patient and use of a slotted mask for the patient during procedure is recommended. For the protection of the personnel, N95 or FFP3 masks; eye protection with glasses or full face shield; gloves, and caps were all recommended. For the anesthesia avoiding atomized or nebulized lidocaine and enough sedation to minimize cough are recommended. Flexible bronchoscopy is preferred over rigid bronchoscopy and in cases where rigid bronchoscopy is obligatory, then it is advised to be done by closed-circuit ventilation, avoiding jet ventilation (11).

In our hospital all procedures were done with minimum necessary personnel and all personnel preventive measures were applied as stated in the guidelines. Flexible bronchoscopy was preferred to rigid bronchoscopy unless an indication for rigid bronchoscopy existed. To shorten the contact time as much as possible no fellow was accepted during this period in to the bronchoscopy unit and mean procedure time in our series was 30 minutes which was enough for the evaluation of the patient and sampling of the lesion if needed.

When it comes to post procedural precautions, although there is not any consensus, in our hospital scope disinfection was done with standard high level disinfection and surfaces in contact with patient or secretions are sterilized after each procedure. Each patient is recovered in the same room where the bronchoscopical procedure was done. After the patient discharged, room was cleaned with standard high level disinfection and then ventilated for 20 minutes after each procedure. Next patient was taken after drying of the contact areas. In our hospital all scheduled patients were evaluated at least one time for PCR evaluation and

twice if the procedure in nonurgent and screening of symptoms, sick contacts and evaluating pre procedural vitals were done.

Our mean bronchoscopy number in our bronchoscopy unit was around 35 per day during last summer. After the new guidelines were published our bronchoscopy unit started to apply bronchoscopies to elective cases not to delay the diagnosis and treatment. But after precautions that were taken during COVID 19 pandemic 12 patients per day were taken into our bronchoscopy unit. So these precautions cut down the number of bronchoscopy cases.

Diagnosis of COVID 19 depends on detection of viral RNA by rRT-PCR. Although it is known that there is a continued debate about the effectivity, sensitivity and specificity of these tests (15). Result of the tests can be affected by lots of parameter like as sampling method, contamination, transfer to the laboratory, use of unvalidated method in the evaluation, timing of the infection, interpretation mistakes (16). Different RT-PCR sensitivity was reported and interpretation of these tests in asymptomatic patients without suspicion of the disease becomes harder because of the false negativity problem. False-negative test results may occur in up to 20% to 67% of patients (17). On the other hand, it was known that some of the asymptomatic patients can be diagnosed with PCR tests. But in some other patients false negativity will give you a false trust. So although the test result was negative all the precautions and protection had to be applied for each patient in pandemic situation. So In our hospital we evaluate at least one PCR result prior to bronchoscopy, and if the procedure is nonurgent a second PCR was also seen to decrease false negativity. We use personnel protective equipment as defined as in the CDC regardless of the result.

Prevalence of asymptomatic COVID 19 in the population is important (18). If the asymptomatic disease is rare then the detailed test wont be cost effective. If the asymptomatic patient with nonurgent bronchoscopy was

detected to be positive then the procedure can be postponed to protect the health care workers. By this way sensitive patient population that can get into contact in the bronchoscopy unit will also be protected.

The biggest limitation of the study is its retrospective design. Bronchoscopy patients were evaluated by their doctors when they come to the outpatient clinic with their pathological results and PCR test was done in patients who need to undergo another intervention or who have symptoms like cough, fever, loss of taste or smell. So asymptomatic patients and patients without need for further evaluation were not evaluated by PCR. Also bronchoscopy unit staff underwent PCR evaluation in complaint of any symptom. In other words, routine PCR evaluation will give more definite results in a prospective designed study.

In conclusion, guidelines recommend that infection risk can be minimized with postponing elective or semi elective bronchoscopies. They generally highlight that bronchoscopy is strongly discouraged if alternative method for the diagnosis or treatment due exist. Bronchoscopy is suggested when it is absolutely necessary. It is predicted that this pandemic will last long so postponing procedures was not considered as a solution. Providing appropriate medical care to patients and protecting healthcare workers is mandatory in the pandemic setting. Our patient infection ratio is low (%0.49) and none of our health care workers were infected. This shows that under careful circumstances bronchoscopy can be done in COVID 19 pandemic.

Procedures must be done by adhering protected measures as much as possible. Although it was known that resources are not unlimited, pretesting before bronchoscopy is ideal to protect health care workers and other patients. We also believe that protection of healthcare staff is very important and we want to emphasize the benefits of pre-procedure PCR evaluation at least once but preferably twice and proper PPE use for bronchoscopic procedure.

## References

1. Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med* 2020; 382: 727-733.
2. Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV). "World Health Organization; 30 January 2020. Archived from the original on 31 January 2020. World Health Organization (2020) Novel coronavirus (2019-nCoV)". Situation Report. 11 March 2020. <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-COVID-19-11-March-2020/> 10.04.2020.
3. Wilson NM, Norton A, Young FP, et al. Airborne transmission of severe acute respiratory syndrome coronavirus-2 to healthcare workers: a narrative review. *Anaesthesia* 2020; 75: 1086-1095.
4. Ost DE. Bronchoscopy in the Age of COVID-19. *J Bronchology Interv Pulmonol* 2020; 27: 160-161.
5. Luo F, Darwiche K, Singh S, et al. Performing bronchoscopy in times of the COVID-19 Pandemic: Practice Statement from an International Expert Panel Respiration 2020; 28: 1-6.
6. Group of Interventional Respiratory Medicine, Chinese Thoracic Society. Expert consensus for bronchoscopy during the epidemic of 2019 novel coronavirus infection (Trial version). *Zhonghua Jie He He Hu Xi Za Zhi* 2020; 43: 199-202.
7. Wahidi MM, Shojaee S, Lamb CR, et al. The Use of Bronchoscopy during the COVID-19 Pandemic: CHEST/AABIP Guideline and Expert Panel Report. *Chest* 2020; 158: 1268-1281.
8. Darwiche K, Ross B, Gesierich W, et al. Recommendations for performing bronchoscopy in times of the COVID 19 pandemic. *Pneumologie* 2020; 74: 260-262.

9. Cordovilla R, Alvarez S, Llanos L, et al. SEPAR and AEER consensus recommendations on the Use of bronchoscopy and airway sampling in patients with suspected or confirmed COVID-19 Infection. *Arch Bronconeumol* 2020; 56 Suppl 2: 19-26.
10. Anonim. "Asociación Argentina de Broncoesofagología. RECOMENDACIONES Asociación Argentina de Broncoesofagología (AABE) basados en la Wold Association for Bronchology and Interventional Pulmonary WABIP para el manejo de pacientes con COVID 19 en situación de pandemia, 2020". <http://www.broncoscopia.org.ar/recomendaciones-asociacion-argentina-de-broncoesofagologia-aabe-basados-en-la-wold-association-for-bronchology-and-interventional-pulmonary-wabip-para-el-manejo-de-pacientes-con-COVID-19-en-situacio/26.03.2020>.
11. Lentz RJ, Colt H. Summarizing societal guidelines regarding bronchoscopy during the COVID-19 pandemic. *Respirology*. 2020; 25: 574-577.
12. Ozturk A, Sener MU, Yilmaz A. Bronchoscopic procedures during COVID-19 pandemic: Experiences in Turkey. *J Surg Oncol* 2020; 122: 1020-1026.
13. Tran K, Cimon K, Severn M, Pessoa-Silva CL, Conly J. Aerosol generating procedures and risk of transmission of acute respiratory infections to healthcare workers: A systematic review. *PLoS One*. 2012; 7: e35797.
14. Anonim. "Centers for Disease Control and Prevention. Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 (COVID-19) in Healthcare Settings". <https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html/30.10.2020>.
15. Woloshin S, Patel N, Kesselheim AS. False negative tests for SARS-CoV-2 infection – challenges and implications. *N Engl J Med* 2020; 383: e38.
16. Tahamtan A, Ardebili A. Real-time RT-PCR in COVID-19 detection: Issues affecting the results. *Expert Rev Mol Diagn* 2020: 1-2.
17. Wiersinga WJ, Rhodes A, Cheng AC, et al. Pathophysiology, transmission, diagnosis, and treatment of coronavirus disease 2019 (COVID-19): A review. *JAMA*. 2020; 324: 782-793.
18. Bai Y, Yao L, Wei T, et al. Presumed asymptomatic carrier transmission of COVID-19. *JAMA* 2020; 323: 1406.