Gomez GPR, et al., J Pulm Med Respir Res 2021 7: 055
DOI: 10.24966/PMRR-0177/100055

HSOA Journal of Pulmonary Medicine and Respiratory Research

Case Report

Utility and Safety of Fiberoptic Bronchoscopy in Patients Infected with COVID-19. A Case Series

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Abstract

Background: Bronchoscopy is a safe diagnostic and therapeutic tool. Performance of bronchoscopy in patients with highly communicable lung diseases like SARS-CoV-2 infection is controversial due to the risk for healthcare personnel. There is no data regarding bronchoscopy in patients admitted with COVID-19 pneumonia.

Case series: The goal of the study was to review those patients with COVID-19 pneumonia who underwent bronchoscopy. We discuss safety issues and utility of the procedure. This was a retrospective study of patients with pneumonia due to SARS-CoV-2 infection who underwent bronchoscopy. A safety check list was created to standardize the procedure process. Eight patients with confirmed COVID-19 infection who had bronchoscopy were identified.

Comorbid conditions were seen in 87.5% of patients and included hypertension, chronic obstructive airway disease and diabetes mellitus. Seven patients were on mechanical ventilation prior to procedure. Indications for bronchoscopy included lung collapse in two patients and persistent sepsis in the remaining six patients. Mean time from initial positive COVID test to bronchoscopy was 31.5 days (range 1-65 days). The utility for diagnostic FOB leading to change in management was 50% and 100% for therapeutic FOB.

Compliance with the safety checklist was 100%. All personnel involved were followed for an average of three weeks with daily temperature checks and symptoms monitoring. Nobody showed symptoms of COVID-19 infection.

Conclusion: Bronchoscopy in patients with COVID-19 if performed following strict safety measures is potentially safe and can assist with patient care. Emergency or urgent procedures should not be delayed as bronchoscopy could change management in half of cases.

Keywords: Bronchoscopy; COVID-19

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Citation: Gomez GPR, Venkatram S, Fuentes GD (2021) Utility and Safety of Fiberoptic Bronchoscopy in Patients Infected with COVID-19. A Case Series. J Pulm Med Respir Res 7: 055.

Received: January 21, 2021; **Accepted:** February 02, 2021; **Published:** February 09, 2021

Introduction

Fiberoptic bronchoscopy is considered a safe diagnostic and therapeutic tool throughout a wide range of pulmonary pathologies. Performance of bronchoscopy in patients with highly communicable lung diseases is controversial due to the risk involved for healthcare personnel involved in the procedure. Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) is the agent responsible for the recent Coronavirus Disease 2019 (COVID-19) pandemic and the virus is predominantly spread through large droplets [1].

Considering the current global spread of COVID-19 infection and the increased number of confirmed cases across the United States and the world, several associations had issued guidelines regarding the safe and effective use of bronchoscopy in patients with suspected or confirmed COVID-19 infection [2]. During the COVID pandemic and due to the extremely high risk of transmission of SARS-CoV-2, the performance of FOB was not advised.

Bronchoscopy is relatively contraindicated because of the high risk of spreading the infection to the staff involved; it could be considered in immunocompromised patients, if there is the strong suspicion of super-infection or mucus plugging, or in life saving conditions [3-8].

The diagnosis of COVID-19 pneumonia is mainly based on typical symptoms, history of exposure to an infected person and bilateral involvement on chest radiographs, and it is confirmed by a positive nucleic acid test for SARS-CoV-2 from numerous types of specimens.

To date, there is only limited data regarding bronchoscopy in patients admitted with COVID-19 pneumonia. The goal of our study was to present and review all patients infected with COVID-19 who required diagnostic or therapeutic bronchoscopy for management. We discuss safety issues and benefits of the procedure

Case Series

Study design and patients

This was a retrospective study conducted at BronxCare Hospital Center which is a 972 bedded inner-city community teaching hospital serving the South and Central Bronx. All adult patients who underwent bronchoscopy in the midst of the pandemic, April 1 to June 30, 2020 who were infected with COVID-19 and required a diagnostic or therapeutic bronchoscopy were included.

Ethical approval

This study protocol adhered to the amended Declaration of Helsinki and was approved by our Institutional Review Board (approval number 06 11 20 03). As a retrospective series study, the need for informed consent was waived.

Data abstraction and analysis

All data were drawn from electronic medical records to include baseline demographics, comorbid conditions, and chest imaging reports, therapeutic interventions, FOB data and patient outcomes. Information on cultures was also pursued. The primary outcome measure was utility and safety of the bronchoscopy in patients infected with COVID-19.

Safety of the bronchoscopy procedure

The pulmonary and critical division taking in consideration available infection control information, developed local practice guidelines in how to perform bronchoscopy in patients infected with COVID-19. A safety recommendations guideline for bronchoscopy team was created and included all features recommended as per current guidelines. In addition, all procedures should be performed with patients sedated and ideally paralyzed on ventilator; Stryker's Hood Flyte Peel Away was used to complement standard Personal Protective Equipment (PPE); ventilator is placed on stand-by every time patient is disconnected ie to connect/remove bronchoscopy adaptor, to insert/remove bronchoscope. Once scope has been introduced into the airway, the procedure should be expedited as quickly as possible to minimize withdrawal and reintroduction of scope. Only essential personnel participate in the procedure and they are advised to monitor for COVID-symptoms for at least 14 days. Monitoring of daily temperature for all healthcare employees is recommended by institutional policies (Table 1).

1	Clear indications for procedure,bronchoscopy should be considered when all non-invasive interventions and work up were non contributory. Benefits outweigh risk of procedure
2	Bronchoscopy is considered urgent or emergency or will change management or outcome
3	All bronchoscopies should done with patient on mechanical ventilation if possible
4	Ideally patients should be in a negative pressure room
5	Sedation should be optimized to avoid coughing Use of neuromuscular blockers should be considered
6	Mandatory PPE for everyone participating in procedure: Gaggles for eye coverage, N95 mask, surgical gown, 2 pairs gloves, Stryker's Hood Flyte Peel Away (or equivalent)
7	Ventilator Setting Preoxygenation with FIO2 100% prior to procedure Volume control mode TV increased by 100-150 ml to avoid hypercapnia Alarm setting for peak pressure increased to at least 20 above preset
8	Ventilator placed on stand-by every time patient is disconnected from ventilator i.e. to connect or remove bronchoscopy adaptor, to insert / remove broncho-scope.
9	Maintain a close system at all time: Specimen trap should be already connected to bronchoscope prior to procedure
10	Once scope has been introduced into the airway, the procedure should be expe-dited as quickly as possible to minimize withdrawal and reintroduction of scope
12	At time of withdraw of scope- the assistant occludes the suction port to avoid secretions to aerosolize
13	Role of each person involved in procedure is clearly delineated to minimize exposure Only essential personnel in the room
14	Use of disposable scopes is recommended if available, otherwise high level disinfection should be done

Table 1: Safety recommendations for bronchoscopy in patients with suspected or confirmed COVID-19 infection.

Results

We identified eight patients with confirmed COVID-19 infection who had bronchoscopy during that period of time. All patients had nasopharyngeal swab samples on hospital admission. Reverse-Transcriptase-Polymerase-Chain-Reaction (RT-PCR) that targets the E genes was the method for SARS-CoV-2 detection.

All patients, except one had comorbid conditions; the most frequent were hypertension (88%), chronic obstructive airway disease (75%) and diabetes mellitus. Seven of the eight (88%) were on mechanical ventilation prior to the FOB, 2 patients had Acute Respiratory Distress Syndrome (ARDS) and three (36%) patients were in septic shock at the time of the bronchoscopy.

Regarding treatment, five (62.5%) patients received steroids, three tocilizumab, two anakinra, two received COVID convalescent plasma, one received remdesivir and one hydroxychloroquine. All patients received broad spectrum antibiotics for possible bacterial or atypical infections as well as oseltamivir for possible influenza. None of the patients had any blood, urine or respiratory culture or serology positive for infection. They all had suspected COVID-19 pneumonia.

All patients had abnormal chest-radiography on admission. Indications for the procedure included total lung collapse in two (25%) patients and persistent sepsis despite broad spectrum antibiotics with cultures in the remaining six patients. The mean time from initial COVID test positive to bronchoscopy was 31.5 days (range 1-65 days).

Only one patient required intubation for the bronchoscopy, this was a young woman post partum that developed acute hypoxic respiratory failure due to lung collapse that did not improve with conservative measures. The remaining seven patients were already on mechanical ventilator at time of procedure.

Seven (87.5%) bronchoscopies were performed using a standard flexible bronchoscopy (Olympus America Inc; Melville, NY), one with a disposable scope (*Ambu®aScope™*). Close monitoring of oxygenation during and post bronchoscopy was performed as per protocol, no complications were identified. As standard precautions, an Ambu bag was readily available in case of hypoxia.

Bronchoscopic Broncho-Alveolar Lavage (BAL) was performed in all patients. BAL fluid PCR tested positive for Covid-19 in three (38%) patients. There was a change in antibiotics management based in BAL finding in two patients and the lung expanded in both patients with lung collapse. There was no bronchoscopy related complications. Three (37.5%) patients died during the hospital admission, the others were discharged. Details of patients can be seen in table 2.

The safety checklist for bronchoscopy was followed for all the procedures. A total of nine healthcare workers participated in the bronchoscopies.

Characteristics	Patient #1	Patient #2	Patient #3	Patient #4	Patient #5	Patient #6	Patient #7	Patient #8
Demographics								
Age (yrs)	38	42	29	74	34	80	70	80
Gender	M	M	F	F	M	M	M	M
Symptoms on Admission								
Fever	+	-	-	-	-	-	-	-
Cough/ SOB	+	+	-	-	+	-	+	+
Constitutional symptoms	-	+	-	-	+	-	-	-
Chest pain	+	-	-	-	-	-	-	-
GI symptoms	-	-	-	-	-	-	-	-
Others	-	-	-	Confusion	-	Cardiac arrest	-	-
Comorbid conditions								
Hypertension	+	+	-	+	+	+	+	+
Diabetes Mellitus	+	+	-	+	-	+	-	-
COPD/Asthma	-	+	-	-	+	+	+	+
Cardiovascular diseases/ heart failure	-	-	-	-	-	-	-	+
Malignancy	-	-	-	-	-	-	+	-
Other			Pregnancy	HIV/AIDS				
Chest roentgenographic findings prior to bronchoscopy								
Bilateral interstitial / patchy infiltrates	+	+	-	-	+	+	+	+
Bilateral consolidation	-	-	-	-	-	-	+	-
Others	-	-	Complete left lung collapse	Complete left lung collapse	-	-	-	-
Bronchoscopy data								
Time from Covid test +to FOB (days)	14	9	1	9	50	48	65	56
ABG pre FOB	7.38/52/60/91%	7.39/54/65/93%	7.47/33/67/94%	7.4/27/199/100%	7.32/58/73/92%	7.39/57/70/93%	7.31/32/92/95%	7.31/71/119/99%
ABG post FOB or Sat O2	Sat O2 90%	7.43/43/113/98%	7.46/34/194/99%	7.48/32/103/98%	7.33/61/72/93%	Sat O2 92%	Sat O2 96%	7.39/59/142/99%
Indication for FOB	Bilateral infiltrates with shock	Bilateral infiltrates with clinical shock/						
ARDS	Left lung collapse	Left lung						
Collapse								
R/o PJP	Persistent bilateral infiltrates with ARDS not improving	Persistent bilateral infiltrates	Persistent right upper lobe infiltrate Malignancy versus infection	Persistent bilateral infiltrates				
FOB findings	Mucoid secretions	Copious sanguineous thick secretions	Left mucous plugs	Left purulent secretions	Purulent secretions	Mucoid secretions	Mucoid secretions	Mucoid secretions
BAL Covidtest	Negative	Positive	Positive	Positive	Negative	Negative	Negative	Negative
BAL yield forinfections	ESBL Proteus	Burkholderiacepacia	Negative	Negative	Negative	Negative	Negative	Negative
Change in management								
Due to FOB	Yes	Yes	Therapeutic FOB	Therapeutic FOB	Yes	No	No	No

Table 2: Demographics, clinical- radiological and bronchoscopy characteristics of patients with COVID-19 who underwent bronchoscopy.

Everyone was followed for an average of three weeks (range 2-10 weeks) with daily temperature checks and symptoms monitoring. Nobody has shown any symptoms of COVID-19 infection; neither anyone had prior infection.

Discussion

In this manuscript we describe, to our knowledge, the first single-center experience in USA of urgent or emergency bronchoscopy in patients with COVID-19 pneumonia. Review of literature revealed only one recent study from Spain describing 93 patients who underwent emergent or urgent bronchoscopy [6]. Contrary to their study, not all our patients had the mucus changes described in that study.

Our institution is located in the Bronx, New York, one of the five boroughs of New York City and home to the poorest congressional district in the nation, it has been recognized as one of the epicenters of the of the COVID-19 pandemic in New York state [9,10].

The common indications for bronchoscopy in critically ill hospitalized patient are either therapeutic, for lung collapse or hemoptysis. Diagnostic FOB is usually done to evaluate for infections or non infectious process like diffuse alveolar hemorrhage, acute

eosinophilic pneumonia or malignancy. Bronchoscopy in critically ill patients or patients in the intensive care unit have shown a diagnostic yield of 50-65% in immunocompromised patients with pulmonary infiltrates when the cause of the pulmonary infiltrate is infectious in nature [11,12]. The therapeutic utility of FOB for lung collapse or atelectasis ranges from 40-70% [13,14].

Our preliminary experience highlights several issues. First: Our data shows that FOB in patients infected with SARS-CoV-2 could be safe if strict safety measures are followed. Second: Indications for FOB in patients with COVID pneumonia are not different that for any other critically ill patient. Third: Utility of FOB in those patients is consistent with reported data- in our cohort, the utility for diagnostic FOB was 50% and for therapeutic FOB 100%. FOB led to change in management in half of patients.

Limitations of this study includes: The small size of the cohort and the retrospective nature of the study performed in a single center. This study was performed at the beginning of the pandemic and at this time, performance of FOB was limited to mainly emergencies or when benefits outweighed risk of the procedure.

Conclusion

Bronchoscopy in patients infected with COVID-19, performed following strict safety measures is potentially safe and can help with patient care. We must ensure appropriate differential diagnosis and initial antimicrobial treatment and non invasive diagnostic test to address opportunistic pulmonary infections or other conditions that could mimic infection with SARS-CoV-2.

Bronchoscopy, especially emergency or urgent procedures should not be delayed as bronchoscopy could change management. Implications of finding a positive BAL for SARS-CoV-2 are unclear but patients could potentially still be infective.

This pandemic is a challenge affecting everyone involved in patient care. By generating information such as the one presented here, everyone involved in bronchoscopic procedures can learn and plan so patients care might be improved while protecting the healthcare workers.

Conflict of Interest/Author disclosure

None of authors have a financial relationship with a commercial entity that has an interest in the subject of manuscript. No financial support was used for this case report.

References

1. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, et al. (2020) Clinical characteristics of Coronavirus disease 2019 in China. N Engl J Med 382: 1708-1720.
2. He M, Xiong J, Huang S, Bian Y, Yan P, et al. (2020) Airborne precautions recommended in Wuhan, China for bedside fiberoptic bronchoscopy examination of patients with COVID-19. J Infect 81: 75-77.
3. Ost DE (2020) Bronchoscopy in the age of COVID-19. J Bronchology Interv Pulmonol.
4. Darwiche K, Ross B, Gesierich W, Petermann C, Huebner RH, et al. (2020) Empfehlungen zur Durchführung einer Bronchoskopie in Zeiten der COVID-19-Pandemie. Pneumologie 74: 260-262.
5. Wahidi MM, Lamb C, Murgu S, Musani A, Shojaee S, et al. (2020) American Association for Bronchology and Interventional Pulmonology (AABIP) statement on the use of bronchoscopy and respiratory specimen collection in patients with suspected or confirmed COVID-19 infection. J Bronchology Interv Pulmonol 27: 52-54.
6. Torrego A, Pajares V, Fernández-Arias C, Vera P, Mancebo J (2020) Bronchoscopy in COVID-19 patients with invasive mechanical ventilation: A center experience. Am J Respir Crit Care Med.
7. Wahidi MM, Shojaee S, Lamb CR, Ost D, Maldonado F, et al. (2020) The use of bronchoscopy during the Coronavirus Disease 2019 Pandemic: CHEST/AABIP guideline and expert panel report. Chest 153: 1268-1281.
8. LentzRJ, Colt H (2020) Summarizing societal guidelines regarding bronchoscopy during the COVID-19 pandemic. Respirology 25: 574-577.
9. https://frac.org/maps/acs-poverty/tables/tab1-acs-poverty-cd-2017.html
10. https://covid19tracker.health.ny.gov/views/NYS-COVID19-Tracker/NYSDOHCOVID-19Tracker-Map?%3Aembed=yes&%3Atoolbar=no&%3Atabs=n
11. Jain P, Sandur S, Meli Y, Arroliga AC, Stoller JK, et al. (2004) Role of flexible bronchoscopy in immunocompromised patients with lung infiltrates. Chest 125: 712-722.
12. Brownback KR, Simpson SQ (2013) Association of bronchoalveolar lavage yield with chest computed tomography findings and symptoms in immunocompromised patients. Ann Thorac Med 8: 153-159.
13. Maldonado PÁ, Redondo CNP, Enríquez JDC, Reynoso FN, Sabid RC (2013) Indications and efficacy of fiberoptic bronchoscopy in the ICU: Have they changed since its introduction in clinical practice? ISRN Endoscopy.
14. Toolsie OG, Adrish M, Zaidi SAA, Diaz-Fuentes G (2019) Comparative outcomes of inpatients with lung collapse managed by bronchoscopic or conservative means. BMJ Open Respir Res 6.

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