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Chest Radiograph within a Week Prior Anesthesia during COVID-19 Pandemic in King Chulalongkorn Memorial Hospital

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Background: In COVID-19 pandemic, King Chulalongkorn Memorial Hospital has developed a COVID-19 screening protocol for every patient undergoing time sensitive procedures, urgency and emergency surgeries. The preventive measures are obligation since April 13, 2020 including the screening questionnaire and the detection of SARS-CoV-2 RNA within 2 days prior to schedule for anesthesia. The chest radiograph within a week is requested even the patient had previous study.

Objective: To observe the prevalence of detected SARS-CoV-2 and the abnormal lung opacities on chest radiograph within a week prior to anesthesia

Methods: This was descriptive, prospective data collection of retrospective analysis of 296 patients from King Chulalongkorn Memorial Hospital. Data were collected from the medical record during April 13-30, 2020. All patients undergoing anesthesia with universal screening RT-PCR for COVID-19 and preoperative chest radiograph were included. The prevalence of detected SARS-CoV-2 and detected abnormal lung parenchymal opacity on chest radiograph were collected as the primary outcome.

Results: None of patients had been detected SARS-CoV-2 by RT-PCR. The chest radiography was done in 237 patients undergoing anesthesia. There were 204 patients (86%) strictly to the hospital screening protocol of chest radiograph. Among these patients, 51 patients (25%) had abnormal lung parenchymal opacities. The chest radiographic findings were related to their prior medical conditions.

Conclusion: None of patients underwent anesthesia are detected for SARS-CoV-2 by RT-PCR confirmation test. There is no new lesion of lung parenchyma on chest radiography within a week prior to schedule for anesthesia in the patients of negative screening for COVID-19.

Keywords: Chest radiograph (CXR), COVID-19, SARS-CoV-2, Preoperative Chest Radiograph

วิสัญญีสาร 2563; 46(3) ฉบับพิเศษ: 16-20. • Thai J Anesthesiol 2020; 46(3) supplement: 16-20.

Introduction

The Coronavirus disease 2019 (COVID-19) originated in Wuhan has been reported since December 2019 and now outbreak throughout the rest of the world. It is contagious infectious disease with respiratory involvement. The main route of transmission is respiratory droplet and close contact transmission but in hospital it can be aerosol transmission with aerosol generating procedure such as intubation, extubating, bronchoscopy or face mask positive ventilation.[1,2]

Nasopharyngeal swab or bronchoalveolar lavage for reverse transcription polymerase chain reaction (RT-PCR) for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is used as a diagnostic confirmation for COVID-19. But the sensitivity of RT-PCR is 83.3% compared to chest computed tomography (CT scan) which has higher sensitivity 97.2% and lower false negative rates.[3,4] However CT chest is not practical to use as a screening tool for low risk patients because of its low specificity (25%)[3] and its cost. While chest

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Received 30 May 2020, Revised -, Accepted 2 June 2020

radiograph has lower cost but even lower sensitivity (69%).[5,6]

Currently there is no specific treatment for COVID-19. To prevent the transmission from the patient to the healthcare workers in hospital is a major concern. The screening questionnaire for patient under investigation (PUI) is inadequate to detect asymptomatic COVID-19 patient[7,8]. The cross transmission during airway maneuvers which exposed to many medical staffs may be occurred.[2,6]

In COVID-19 pandemic, King Chulalongkorn Memorial Hospital has developed the COVID-19 screening protocol for every patient undergoing surgery. Among the screening tools, there are nasopharyngeal swab for RT-PCR within 2 days and chest radiograph within a week prior to schedule for anesthesia. Without other indications, to routinely perform a new chest radiograph within a week prior to schedule for anesthesia in every patient, with exception for pregnancy and some pediatric patients, is still a question when the RT-PCR for SARS-CoV-2 is also screening.

Material and methods

King Chulalongkorn Memorial Hospital is an urban academic hospital. Even through the human-to-human transmission of SARS-CoV-2 is a major concerned in our hospital, Anesthesiology department has continued providing anesthesia for the time-sensitive procedures, urgency and emergency surgeries during the COVID-19 pandemic in Thailand. Time-sensitive procedure is defined as any procedure, postponed within 6 weeks, the patient will be in higher risk, changing the outcome. Our hospital has developed the screening protocol for every patient undergoing anesthesia which can be a risk of aerosol generating procedure. The screening questionnaire and nasopharyngeal swab for detection of SARS-CoV-2 by RT-PCR within 2 days prior to schedule for anesthesia are obligation since April 13, 2020. The preoperative chest radiograph within a week should be performed.

The study was approved by the Institutional Review Board of the Faculty of medicine, Chulalongkorn University, Thailand. This descriptive study was a prospective data collection with retrospective analysis of patients who following the screening protocol in King Chulalongkorn Memorial Hospital. Every patient underwent anesthesia during April 13-30, 2020 with RT-PCR screening for SARS-CoV-2 within 2 days and preoperative chest radiograph at any time were included. The exclusion criteria are patient's refusal and patient without either for the result of RT-PCR for COVID-19 or preoperative chest radiograph.

Data collected included demographic data, clinical symptoms of respiratory tract infection, the result of RT-PCR for COVID-19 and the result of chest imaging; chest radiograph and chest CT scan. The time of investigations was recorded. The abnormal chest radiograph is focused only lung parenchyma opacity. The primary outcome is the prevalence of detected abnormal lung parenchymal opacity on chest radiograph and detected RT-PCR for SARS-CoV-2 among the patients undergoing anesthesia. The secondary outcome are the patient's clinical symptoms of respiratory tract infection and the impact of abnormal lung parenchyma opacities in chest radiograph on perioperative management. Normally distributed variables are presented as mean (SD), whereas nonnormally distributed data are presented as median (interquartile ranges [IQRs]). The categorical data are reported in frequency and percentage.

Results

A total of 296 patients underwent anesthesia during April 13-30, 2020 at King Chulalongkorn Memorial Hospital, we excluded 59 patients who preoperative chest radiograph was not performed. Since it is not routinely performed chest radiograph in pregnancy and some pediatric patients.

The demographic characteristics, underlying disease, and type of procedures are summarized in Table 1. The universal screening for COVID-19 within 2 days prior to schedule for anesthesia and preoperative chest radiography were screening in 237 patients. None of patients had been detected for SARS-CoV-2 as shown in Table 2. There were 204 patients (86%) strictly

to the hospital screening protocol of chest radiograph. Among these patients, 153 (75%) had normal finding on their chest radiograph and 51 (25%) had abnormal lung parenchymal opacities. The abnormal chest radiographic findings were related to their prior medical conditions. None of them were found as a new lesion.

Table 1 Demographics, underlying disease and type of procedure.

Parameter		Patient with chest radiograph within a week 204 patients (86%)	Patient with chest radiograph for more than a week 33 patients (14%)
Age (Mean ± SD)		55 ± 21	52 ± 22
Sex (n)	Male	100 (49%)	18 (54.5%)
	Female	104 (51%)	15 (45.45%)
ASA (n)	ASA class I	71 (34.8%)	8 (24.24%)
	ASA class II	71 (34.8%)	14 (42.43%)
	ASA class III	52 (25.5%)	10 (30.3%)
	ASA class IV	10 (4.9%)	1 (3.0%)
	ASA class V	0	0
Underlying disease (n)	Cardiovascular disease	16 (7.8%)	3 (9.1%)
	Pulmonary disease	12 (5.9%)	2 (6.1%)
	Diabetes	37 (75.5%)	6 (18.2%)
	Hypertension	64 (31.4%)	13 (39.4%)
	Dyslipidemia	38 (18.6%)	4 (12.1%)
	Renal insufficiency	12 (5.9%)	0
	Liver disease	8 (3.9%)	1 (3.0%)
	Others	34 (16.7%)	3 (9.1%)
	Healthy	100 (49%)	4 (12.1%)
Type of case (n)	Time-sensitive procedure	165(80.9%)	32(97%)
	urgency and emergency	39 (19.1%)	1(3%)
	Cancer	89 (43.6%)	23 (69.7%)
	Non cancer	115 (56.4%)	10 (30.3%)
Type of procedure (n)	Surgery	201 (98.5%)	29 (87.9%)
	Non-surgery	3 (1.5%)	4 (12.1%)

Table 2 The prevalence of detected abnormal lung parenchymal opacity on chest radiograph and detected SARS-CoV-2 among the patients undergoing anesthesia

Patient with chest radiograph within a week prior to schedule for anesthesia 204 patients (86%)			Patient with chest radiograph for more than a week prior to schedule for anesthesia 33 patients (14%)		
Normal imaging finding	Abnormal lung parenchymal opacity		Normal imaging finding	Abnormal lung parenchymal opacity	
153 patients (75%)	51 patients (25%)		30 patients (90.9%)	3 patients (9.1%)	
	Asymptomatic	Mild clinical symptoms		Asymptomatic	Clinical symptoms
	42 patients (82.4%)	9 patients (17.6%)		3 patients (100%)	None (0%)
RT-PCR for COVID-19 not detected (100%)	RT-PCR for COVID-19 not detected (100%)		RT-PCR for COVID-19 not detected (100%)	RT-PCR for COVID-19 not detected (100%)	
Further chest CT scan none	Further chest CT scan none		Further chest CT scan none	Further chest CT scan none	

Focusing on the ones who had abnormal finding on repeated imaging, 9 (17.6%) had abnormal mild clinical symptoms which can be related to respiratory tract infection. (4 patients had cough, 3 patients had fever, 1 patient had mild dyspnea and 1 patient had rhinorrhea.)

Among 33 patients (14%) who performed preoperative chest radiograph more than a week prior to anesthesia, 3 (9.1%) of them had abnormal lung parenchymal opacity. They had neither abnormal respiratory symptom nor new lesion from chest radiograph compared to previous imaging.

Because of no new detected lesion on chest radiograph, all of patients who had abnormal lung parenchyma can be going on schedule without further investigations.

Discussion

King Chulalongkorn Memorial Hospital is a tertiary care hospital. The first COVID-19 confirmation case is admitted in our hospital on March 9, 2020. The cross transmission of SARS-CoV-2 is a major concern especially airborne can be the route of transmission in the hospital. The aerosol generating procedures are common in the operating theater. With the global shortage of protective precaution equipment for the healthcare workers, the limitation of elective surgery applies in March 2020. Anesthesiology department will provide anesthesia only for the time-sensitive procedure, urgency and emergency surgery in April 2020.

As the COVID-19 pandemic worsens in Bangkok, the medical staffs increasingly have a high index of suspicion and a low threshold for diagnostic testing for SARS-CoV-2. We concerned the patient who is scheduled for the time-sensitive procedure might be asymptomatic COVID-19, which previous study,[7] reported the incubation period of COVID-19 patient can present strong infectivity. Then our hospital has developed the policy of screening protocol for every patient undergoing aerosol generating procedures. The screening questionnaire seeking for the PUI is mandatory. The nasopharyngeal swab within 2 days for universal screening by RT-PCR in every patient must be performed since April 13, 2020. The chest radiograph within a week prior to schedule for anesthesia is requested due to the false negative RT-PCR from nasopharyngeal swab was detected in some COVID-19 patients who had new abnormal lung opacity in our hospital.

The patients undergoing urgency and emergency surgeries will be followed by the same policy. The result of RT-PCR for SARS-CoV-2 will be reported standardly within 4-6 hours, but within 2 hours for the rapid RT-PCR test in a case of true emergency. Preoperative chest radiograph will be regularly performed.

Our study, surprisingly, none of patient is asymptomatic COVID-19. Compared with other universal screening study, 13.5% of 215 pregnant woman who admitted for delivery are asymptomatic, SARS-CoV-2 positive.[8] Among our negative for SARS-CoV-2 patients, the mild clinical respiratory symptom is not significantly influenced medical staffs' on delay the procedure. All patients can be followed on the schedule even if there is the repeated chest radiography within a week. The requested chest imaging, caused more expense and radiation exposure, is found no new abnormal opacity. None of our hospital's healthcare workers are reported COVID-19.

Our opinions, the detection of asymptomatic COVID-19 is the cornerstone of a prevention measure for the spreader in hospital. The screening RT-PCR of SARS-CoV-2 is still most reliable diagnostic test. The chest radiography should be requested in case of high risk for PUI or as the standard indication.

Looking back during April 13-30 in Thailand, we are in downward trend of the first wave of COVID-19 outbreak. The new detected positive case in our hospital and in Thailand is also decreasing since a state of emergency declaration. The number of patients underwent anesthesia is quite low due to the limitation of elective surgery according to our hospital policies. The ones underwent time-sensitive procedures were advised to prevent themselves especially to keep social distancing. These can be the study limitation.

The universal screening in our hospital is being continued. The further studies for the cost-effectiveness, sensitivity, specificity, and the proper timing of chest radiography prior to anesthesia should be confirmed in COVID-19 pandemic.

Conclusion

None of patients in King Chulalongkorn Memorial Hospital underwent anesthesia are detected for SARS-CoV-2 by RT-PCR confirmation test during April 13-30, 2020. There is no new lung parenchyma lesion on repeated chest radiography within a week prior schedule for anesthesia in the study population. The mild abnormal respiratory symptom is not significantly influenced medical staffs' on delay the procedure. The cost-effectiveness of routinely repeated chest radiograph in COVID-19 pandemic should be the further study.

Acknowledgements

The authors would like to thank all my teachers especially Professor Somrat Charuluxananan and Assistant Professor Thammasak Thawitsri for their support in completing this study.

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