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Special article

Outbreak of novel coronavirus (2019-nCoV): The first three-month experience of anesthesiologists in Thai university hospital

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The pandemic of the new coronavirus disease, COVID-19, has involved in 750,890 cases worldwide with 36,405 (4.8%) deaths as of 31st March 2020. The virus is novel to human and there is no vaccine yet. Thailand was the first country after China that reported a confirmed COVID-19 patient on 13th January 2020. At the end of March, total confirmed COVID-19 cases in Thailand were 1,524 cases with 9 deaths (0.6%). Emerging Infectious Disease Health Science Centre, Faculty of Medicine, Chulalongkorn University was able to detect novel coronavirus on 8th January 2020 before it was confirmed by matching its genome with China's laboratory. King Chulalongkorn Memorial Hospital, the Thai Red Cross Society, was well prepared for COVID-19 patients. Laboratory capacity for detection was increased. An isolated building was specifically arranged for isolation and providing cares to COVID-19 patients. Anesthesiologists are at high risk of infection because of exposure to droplets and aerosols during airway procedures. Preparation of equipment such as video-laryngoscopes, medications and appropriate personal protective equipment were completed before the admission of the first COVID-19 patient. As being anesthesiologists in a Thai university hospital, on call staffs were consulted for endotracheal intubation in 8 critically ill patients during 18 - 31 March 2020 (14 days). In summary, anesthesiologists in Thai university hospital were consulted for endotracheal intubation in the early phase of the epidemic and would have a major role for perioperative care for patients in the progression of outbreak in Thailand.

Keywords: COVID-19, intubation, anesthesia, corona virus, anesthesiologists, airway.

Coronaviruses are a large family of viruses that may cause diseases in either animals or human. Several coronaviruses are known to cause respiratory symptoms ranging from common cold to more serious conditions such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). The new single strand, positive sense RNA virus has emerged as the cause of an unusual cluster of viral pneumonia cases in Wuhan, Hubei Province of China.^(1 - 3) The 2019-nCoV virus has been renamed as severe acute respiratory syndrome-

related coronavirus 2 (SARS-CoV-2) by the World Health Organization (WHO) and the disease is also termed as coronavirus disease 2019 (COVID-19).

The pandemic

In December 2019, there was an outbreak of pneumonia of unknown origin in Wuhan City, China. Chinese scientists revealed the cause of a novel coronavirus by 7th January 2020.⁽¹⁾ WHO declared the outbreak as a public health emergency of international concern (PHEIC) on 30th January 2020 in response to rapid growth of epidemic.⁽⁴⁾ As of 31st January 2020, there were 9,826 confirmed COVID-19 cases, of which 9,720 cases in China, 106 cases in other countries, including 2 cases reported in Italy who had travelled to Wuhan city.⁽⁴⁾ At the end of February 2020, WHO reported 85,473 confirmed cases globally, of which 79,360 were from China, and 6,113 cases were from 53 countries outside China.

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China, South Korea, Italy and Iran were countries with most common COVID-19 cases respectively. As of 31st March 2020, total number of 750,890 confirmed COVID-19 cases were reported with 36,405 deaths (4.8%). Details of the number of confirmed cases in countries with high frequency of cases including Thailand are shown in Table 1.⁽⁴⁾ WHO declared the outbreak as pandemic on 11th March 2020, according to the alarming levels of spread and severity.⁽⁴⁾

Development of COVID-19 epidemic in Thailand

Since the WHO office in China was informed of pneumonia cases with unknown cause on 31st December 2019. The Ministry of Public Health of Thailand reported the first imported cases of laboratory confirmed coronavirus (2019-nCoV) from Wuhan City, China on 13th January 2020. As of 20th January 2020, 282 confirmed cases have been reported from 4 countries including China (278 cases), Thailand (2 cases), Japan (1 case) and South Korea (1 case).

On 4th February, an evacuation flight with 138 Thai-citizen passengers returned from Wuhan. Upon landing at U-Tapao International Airport in Rayong Province, the passengers were immediately transferred to Navy guesthouses for 14-day

quarantine. Physical examinations and laboratory tests were provided for the group. A man among this group tested positive for COVID-19 on 7th February 2020.⁽⁴⁾

Thailand has recently updated its dedicated national pandemic influenza preparedness plan. Thailand has strong capacities for case detection, risk assessment, case investigation, laboratory diagnosis, clinical management, infection prevention and risk communication, as cited by the WHO Thailand.⁽⁴⁾ Accordingly, Thailand was ranked at 6 out of 195 countries with index scores of 73.2. The ranking and index was recently published in October 2019 by Johns Hopkins Center for Health Security, Nuclear Threat Initiative and the Economist Intelligence Unit.⁽⁵⁾ The results of Thailand's response to the COVID-19 pandemic could also prove the index even more correctly. As of the end of March 2020, the mortality rate of COVID-19 patients were less than 2.0% in America, Germany, Switzerland, South Korea and Thailand.

In Thailand, the confirmed COVID-19 cases increased from 19 to 42 and to 1,651. at the end of January, February and March, respectively, with average mortality rate of 0.6%. Details of numbers of cases in China, outside China and Thailand are shown in Table 2.

Table 1. Countries or territories with COVID-19 confirmed cases (31st March 2020).

Countries	Total confirmed cases	Total deaths (%)
China	82,545	3,314 (4.0)
USA	140,640	2,398 (1.7)
Italy	101,739	11,591 (11.4)
Spain	85,195	7,340 (8.6)
Germany	61,913	583 (0.9)
France	43,977	3,017 (6.8)
Iran	41,495	2,757 (6.6)
United Kingdom	22,145	1,408 (6.3)
Switzerland	15,412	295 (1.9)
South Korea	9,786	162 (1.6)
Thailand	1,524	9 (0.6)
Total	750,890	36,405 (4.8)

Source: World Health Organization

Table 2. Number of confirmed COVID-19 cases and fatal cases in China, Thailand and outside China at the end of each month of 2020.

	2020	COVID-19 Case	Death	Percentage
China	31 Jan	9,692	213	2.2
	29 Feb	79,360	2,835	3.5
	31 Mar	81,518	3,305	4.0
Outside China, including Thailand	31 Jan	115	0	0.0
	29 Feb	6,113	89	1.46
	31 Mar	689,586	33,639	4.8
All cases	31 Jan	9,807	213	2.1
	29 Feb	85,473	2,924	3.4
	31 Mar	771,104	36,944	4.8
Thailand	31 Jan	19	0	0.0
	29 Feb	42	1	2.3
	31 Mar	1,651	10	0.6

Source: World Health Organization

King Chulalongkorn Memorial Hospital and Chulalongkorn University

King Chulalongkorn Memorial Hospital, the Thai Red Cross Society and Faculty of Medicine, Chulalongkorn University is a 1,500-bed supertertiary hospital. The faculty has strengthened ability to manage epidemic situation. On 8th January, Thailand became the first country outside China to detect COVID-19 case. The Thai Red Cross Emerging Infectious Diseases Health Science Centre, Faculty of Medicine at Chulalongkorn University was able to detect an unknown coronavirus. As soon as China shared the genome of COVID-19 on 11th January, medical technologists could confirm a match and disclose the information on 12th January. The hospital has been well prepared with laboratory test, emerging infectious disease clinic, and an isolated building for hospitalization and isolation of COVID-19 patients since January 2020.

Experiences of anesthesiologists during the first 3 months of COVID-19 epidemic

King Chulalongkorn Memorial Hospital had the first COVID-19 patient on 10th March, 2020. The number of patients was increasing continuously. Most cases were mild. On 18th March, 2020, we had the first critically-ill patient who required ventilatory support. After that, the number of critically-ill patients has been increasing significantly.

As of 31st March, 2020, there were 136 confirmed COVID-19 cases diagnosed in King Chulalongkorn Memorial Hospital, of which 49 patients were still being

admitted in the hospital, 8 of them were intubated and being under invasive ventilation. There are 4 infectious units in the center, consisting of 4 airborne infectious negative pressure isolation rooms which can be converted into ICU unit, 13-bed cohort Intensive Care Unit (ICU) with a HEPA filtration system, and 2 cohort wards.

COVID-19 causes various degree of illness, ranging from mild symptom and severe ARDS to death. A recent report from mainland China showed that 2.3% of patients underwent invasive mechanical ventilation.⁽⁶⁾ At our center, there were 8 out of 76 patients (10.5%) that required invasive mechanical ventilation. There was no death reported.

The decision to intubate was made at the discretion of the attending pulmonologist, depending on clinical signs and symptoms of moderate to severe ARDS and the progression of the disease. All tracheal intubations were performed by anesthesiologists from the Department of Anesthesiology at King Chulalongkorn Memorial Hospital. All of them were performed either in negative pressure isolation rooms or in Intensive Care Unit (ICU) with a high efficiency particulate air (HEPA) filtration system. First assistant, in charge of drug administration and intubating assistance, was an anesthesiology fellow. Second assistant, in charge of suctioning and ventilator preparation, was an ICU nurse or ward nurse. Preparation of intravenous anesthetic drugs, vasoactive drugs and airway equipment were done before entering into patient rooms.

The healthcare workers involved in the intubation procedure were trained to follow the contact and airborne precautions guidelines. The personal protective equipment (PPE), including disposable impermeable coverall suit, 2 layers of disposable extended cuff gloves, disposable shoe covers, boots, Powered Air-Purifying Respirator (PAPR) or N95 respirator with goggles and faceshield, and water resistant apron, were provided. The donning (wearing PPE) and doffing (taking off PPE) procedures were continuously monitored and checked by an experienced infectious control nurse.

All patients, who required intubation had acute hypoxemic respiratory failure with tachypnea and poor oxygenation, were provided with an oxygen supplement. However, none had severe desaturation or hemodynamic instability. A brief airway evaluation was done. Preoxygenation with 100.0% oxygen for 3 - 5 minutes was done, using two hand grip technique to tighten facemask and minimize leakage. An electrostatic filter-heat and moisture exchanger (HME) was connected between facemask and self-inflating bag. A rapid sequence induction technique with propofol 2 - 2.9 mg/kg and succinylcholine 1.73 - 2.59 mg/kg was used for anesthesia induction in all cases. Many types of video-laryngoscope, such as McGRATH™ MAC, C-MAC® video laryngoscope, were used to facilitate intubation. 7 out of 8 intubation procedures were successful in one attempt. One was successful in two attempts due to inappropriate angle of the stylet used in the first attempt, and was successful after re-angulation of the stylet. All cases were successfully intubated without facemask ventilation. The confirmation of endotracheal intubation was performed by at least one of the following methods; visualization of endotracheal tube passing through vocal cords, capnography waveform, visible chest movement, and ventilator waveform. After confirmation of endotracheal intubation, the ventilator circuit with In-line suction catheter was immediately connected to the patients, and unnecessary disconnection was avoided. If the disconnection was necessary, the endotracheal clamping was used before disconnection the breathing circuits. Table 3 shows cases of critically-ill COVID-19 patients, and the intubation technique used.

When using the reusable laryngoscope blade, it was cleaned by wiping with 70.0% alcohol and washing with water, then disinfected by immersing in 2.0% Glutaraldehyde for 30 minutes. As of 31st March, 2020, all critically-ill COVID-19 patients had not been extubated.

In a recent article about practices and experiences from Wuhan, Anesthesiologists, wearing disposable hair cover, N95 respirator or equivalent, fluid-resistant gown, two layers of gloves, goggles and faceshield, and fluid-resistant shoe covers, performed endotracheal intubation. Modified rapid sequence induction technique with video-laryngoscope is recommended. Either propofol or etomidate had been used regarding to the patient's hemodynamic status and severity of illness.⁽⁷⁾ However, The Difficult Airway Society recommends using ketamine for induction if there is higher risk of cardiovascular instability.⁽⁸⁾ Rocuronium or succinylcholine was administered after loss of consciousness. Opioids, such as fentanyl, sufentanil, remifentanil, or intravenous lidocaine may be used.⁽⁷⁾ Vasoactive agents for managing extreme cardiovascular reactions should be prepared. Due to concerns of contamination, chest auscultation after intubation is not recommended. Capnography, ventilator graphics, fogging in the endotracheal tube, chest movement, pulse oximetry and the color of skin and mucous membrane were used to confirm endotracheal intubation.⁽⁷⁻⁸⁾

As unexpected difficult intubation and ventilation can be occurred in COVID-19 patients, we suggest using short-duration muscle relaxant, such as succinylcholine in this situation.⁽⁸⁾ The advantage of rocuronium is its longer duration of action which providing enough time for other procedures following intubation, such as central venous access, and can be used when succinylcholine is contraindicated, however, we recommend preparing sugammadex for immediately neuromuscular reversal. There have been recently published articles related to precautions of endotracheal intubation in the perioperative setting as a guidance for anesthesiologists.⁽⁹⁻¹¹⁾ Anesthesiologists play important roles in perioperative care, intensive care unit and airway management outside the operating room.

Table 3. Details of critically-ill COVID-19 patients at King Chulalongkorn Memorial Hospital and the intubation technique used.

Patient No.	Age (years)	Sex	Weight (kg)	Height (cm)	Underlying disease	Intubation day (after admission)	laryngoscope	Donning duration (min)	Doffing duration (min)	Expected Difficult airway	Laryngoscopic view	Number of Attempt
1	59	Male	75	170	Diabetes Mellitus	2	McGRATH™ MAC	15	10	No	1	1
2	67	Male	72	170	Chronic lung disease, BPH	0	C-MAC®, disposable blade	8	5	No	2	2
3	41	Female	68	160	None	1	C-MAC®, disposable blade	15	20	No	2	1
4	50	Male	77	175	Diabetes Mellitus	3	C-MAC®	10	5	No	1	1
5	38	Male	80	170	None	0	C-MAC®, disposable blade	15	10	No	1	1
6	50	Male	72	165	None	1	C-MAC®	5	10	No	1	1
7	31	Male	78	183	None	2	C-MAC®	10	10	No	1	1
8	76	Male	56	167	Hypertension, Diabetes Mellitus	8	CMAC®, disposable blade	10	7	No	1	1

Conclusion

The situation of novel coronavirus (SARS CoV-2) outbreak during the first three months of 2020 in Thailand was considered as early phase of local epidemic. King Chulalongkorn Memorial Hospital, a university hospital, was well prepared for progression of the outbreak. Anesthesiologists are among the healthcare workers, who pose high risk of infection because of their close contact with patients and exposure to droplets and aerosols from the patients' airway. Besides providing perioperative care (in operating theatre, post-anesthetic care unit or surgical intensive care unit), anesthesiologists in Thai university hospital also play important roles in airway management outside operating room under limited and sometimes difficult conditions.

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