

Review Article

The Activities and Roles of Trauma Surgeons in the Treatment of COVID-19 Patients



Younghwan Kim ^{1b}, Seok Hwa Youn * ^{1b}

Department of Surgery, National Trauma Center, National Medical Center, Seoul, Korea

Article history:

Received: June 13, 2023

Revised: July 08, 2023

Accepted: July 09, 2023

*Corresponding Author:

Seok Hwa Youn
Department of Surgery, National Trauma
Center, National Medical Center, 245 Eulji-ro,
Jung-gu, Seoul, 04564 Korea
Email: iguassufalls@hanmail.net

ABSTRACT

Trauma surgeons' roles in a national hospital in Korea changed during the COVID-19 pandemic. In this study, we report on their roles over a 15-month period (March 2020 to May 2021) including the eight months where the hospital was a COVID-19-only hospital. Despite shortages in medical resources including medical personnel, and intensive care unit (ICU) beds, the trauma surgeons helped to control the public health problem by assuming various roles including working in another COVID-19 ICU in Dae-gu, treating trauma patients with COVID-19 or those who needed self-quarantine, being in charge of care for some COVID-19 patients in the ICU (for two months), and performing the role of a rapid response team member for COVID-19 ICU patients. In this report, we emphasize how trauma surgeons, along with intensivists, played an active role in treatment of COVID-19 patients, and helped prevent the collapse of the healthcare system within the hospital during the pandemic.

Keywords: COVID-19, pandemics, surgeons

Introduction

The Middle East respiratory syndrome coronavirus (MERS-CoV) epidemic emerged in 2012, and the National Medical Center in Korea was the hospital designated for all cases of MERS-CoV infections. The MERS-CoV epidemic had a high fatality rate, but the number of cases was small. At that time, infectious disease specialists and pulmonologists were at the forefront of inpatient care and the surgeons provided support for various procedures performed in the ICU. Coronavirus disease 2019 (COVID-19) is also a respiratory infectious disease but this virus (SARS-CoV-2) led to a pandemic (11th March 2020 to 5th May 2023).

It has been more than three years since COVID-19 was first reported, and we are no longer in a pandemic. During the pandemic, after vaccination had begun, the number of COVID-19 cases increased and then decreased repeatedly. These waves of infection were thought to be due to mutant strains of the SARS-CoV-2 virus [1]. When the COVID-19 epidemic became a pandemic, the number of cases were too large for

infectious disease specialists and pulmonologists to cope with, leading to shortages of medical personnel and hospital resources in almost all countries and regions [2,3].

In Korea, the shortage of medical resources including medical personnel and hospitals with intensive care units (ICUs) were a profound issue. In this report, we discuss the roles that trauma surgeons assumed over a 15-month period (March 2020 to May 2021) in a national hospital dedicated exclusively to COVID-19 over an eight-month period.

Results

COVID-19 was declared a pandemic in March 2020 and our hospital was designated as a COVID-19 national hospital during the period from March 2020 to October 2020. Trauma surgeons helped to overcome this national crisis and below are some of the roles they assumed while helping to control this public health emergency (Table 1).

The first COVID-19 case in Korea was identified in Dae-

Table 1. Activities and roles assumed by trauma surgeons and nurses treating COVID-19 patients.

	Period	Activity
Trauma surgeon	March, 2020	A trauma surgeon's participation in intensive care of COVID-19 in Keimyung University Daegu Dongsan Hospital
	March, 2020 – May, 2020	Night shift for COVID-19 in hospital patients
	May, 2020 – August, 2020	Inpatient treatment for trauma patients related to COVID-19
	September, 2020 – October, 2020	COVID-19 ICU patients
	March, 2020 – May, 2021	Rapid response team like activity
Trauma nurses	March, 2020 – May, 2020	COVID-19 ICU care
	May, 2020 – May, 2021	Rapid response team like activity

COVID-19 = coronavirus disease 2019; ICU = intensive care unit.

gu city in March 2020. The Society of Critical Care Medicine and related organizations decided to expand the ICU in the COVID-19 hospital in Dae-gu, and recruited physicians and nurses for the treatment of critically ill patients [4]. This ICU in Dae-gu operated from March 10 to April 15. Of the 28 medical doctors who volunteered, 11 were general surgeons. Most surgeons had specialized in intensive care medicine or as a trauma surgeon, and were working in trauma centers. A trauma surgeon from our hospital joined the COVID-19 hospital team in Dae-gu for 3 weeks. Since the management of respiratory failure in surgical patients and multiorgan dysfunction in COVID-19 patients is similar, general surgeons could play an important role in the COVID-19 ICU, along with infectious disease specialists and pulmonologists.

Trauma patients with confirmed COVID-19 or those who needed to self-quarantine were treated at a COVID-19 dedicated hospital (Table 2). Most trauma patients with COVID-19 required an ICU which had negative pressure and an operating room for their treatment. Although these trauma patients with COVID-19 were rare, it was difficult to find a hospital that could accommodate them [5-7]. In the early period of the pandemic, a self-quarantined foreign patient with a tibia fracture due to a fall, came to the hospital in a deteriorated condition after several

hours of looking for a hospital which could provide treatment. The trauma team treated him in the negative pressure ICU and sent him home to his country. Another patient with third-degree (50%) burns was treated in the negative pressure ICU for a two-week self-quarantine period, and after that period, she was transferred to a burns dedicated hospital (Figure 1).

For two months the trauma surgeons oversaw the care of some COVID-19 patients in the ICU (Table 2). During late August 2020, the metropolitan areas including Seoul, Gyeonggi-do, and Incheon suffered a severe shortage of medical resources including medical staff, and ICU facilities. As severe cases of COVID-19 continued to rise, trauma surgeons assumed the role of primary physicians for ICU patients (September 2020 to October 2020). Although the course of COVID-19 is different from typical ICU trauma patients, the basic treatment principles for complications such as pneumonia, acute respiratory distress syndrome, heart failure, sepsis, and acute kidney injury are similar [8-10]. From the ICU to the general isolation room

Table 2. ICU patients with COVID-19 hospitalized under the trauma division.

Patients	Trauma	Injury	No.
COVID-19	Trauma	Traumatic brain injury	2
		Tibiofibular fracture	1
		Humerus fracture	1
	No trauma	Respiratory failure	6
Self-quarantine		Burn	2
		Fall	1
Total			13

COVID-19 = coronavirus disease 2019; ICU = intensive care unit.



Figure 1. Dressing of injuries in a burn patient requiring COVID-19 self-quarantine.



Figure 2. (A) Prone positioning of a patient with acute respiratory distress syndrome; (B) Aiding rehabilitation in a general isolation room using a trauma team protocol.



Figure 3. The role of the rapid response team, and emergency airway management.

Table 3. Activities of trauma surgeons which were similar to COVID-19 rapid response team activities.

Activity (≤ 12 mo)	No.
Intubation	6
Chest tube	14
Tracheostomy	20
Central line	4
Ventilator adjustment	2
CPR support	1
Others	6
Total	53

COVID-19 = coronavirus disease 2019; CPR = cardiopulmonary resuscitation.

with rehabilitation, the patient was managed by the trauma team using the protocol for treatment of severe trauma patients (Figure 2).

The trauma surgeons also performed the role of a rapid response team member for COVID-19 ICU patients. The medical staff in the ICU always wore personal protective equipment, which made various treatment procedures and certain aspects of management more difficult, especially for trainees. Trauma surgeons, because of the nature of the cases are generally proficient in various ICU procedures. Since our hospital did not have a rapid response team, the trauma surgeons

acted like a member of a rapid response team, and performed many critical procedures for COVID-19 ICU patients, especially during the night shift (Table 3, Figure 3).

Discussion

Trauma surgeons assumed various roles throughout the duration of the COVID-19 pandemic, and actively participated in COVID-19 treatment, along with intensivists. As a national hospital, our hospital was inevitably closed for normal business during a national crisis. The pandemic status of COVID-19 had an effect similar to a disaster such as the collapse of a large building. When such a disaster occurs and multiple casualties arise, all the medical staff in the hospital who can treat critically ill patients, regardless of their specialization, are expected to assist. In the case of a pandemic, the situation requires a similar approach. Such a disaster should not become the burden for just one department.

During the pandemic there was panic among medical staff worldwide. There was ever-changing information, along with ignorance, and fear of the disease. The emergence of a new coronavirus, SARS-CoV-2, had paralyzed many Emergency Departments. Patients who were not treated in time died outside the hospital, and the death rate increased in the intensive care unit due to a lack of treatments, and the high severity of the disease [11]. While SARS-CoV-2 was undergoing genetic changes, from the highly severe virus genotype to the highly contagious, and the low-severity omicron variant, we have experienced the near collapse of the healthcare system, including the emergency departments and the intensive care units [12]. The overwhelming critically ill COVID-19 patients and the lack of intensivists dedicated to them accelerated the collapse of health care step by step. The resulting collateral damage affected diseases unrelated to COVID-19, causing more victims, and many problems in society as a whole [7,13].

Trauma surgeons treat severe trauma patients with hemodynamic instability. They are specialists at responding to respiratory collapse and sepsis in the ICU after primary resuscitation [14,15]. As the specialists of surgical critical care, they treat acute respiratory distress syndrome and pneumonia, and perform airway management including performing tracheostomies. They are well trained at inserting chest tubes as well as inserting various lines and tubes [14]. It is believed that they have sufficient ability to help infection-experts to treat the critically ill patients during a pandemic. Therefore, trauma surgeons must step up and offer their help (when they can help to prevent the collapse of the healthcare system) [16].

As general surgeons and trauma surgeons, we were able to perform various roles in treating critically ill patients. Although the acute care surgery division has not yet been established in

Korea, more surgeons are specializing in the management of critically ill patients [17]. It is therefore necessary to discuss the various aspects of the role of surgeons in the event of a disaster.

Author Contributions

Conceptualization: SHY and YK. Writing original draft: YK. Data Collection and/or Processing: YK. Writing review and editing: SHY. Supervision: SHY.

Conflicts of Interest

The authors have no conflicts of interest to disclose.

Funding

None.

Ethical Statement

This research did not involve any human or animal experiments.

Data Availability

All relevant data are included in this manuscript.

References

- [1] Laha S, Chakraborty J, Das S, Manna SK, Biswas S, Chatterjee R. Characterizations of SARS-CoV-2 mutational profile, spike protein stability and viral transmission. *Infect Genet Evol* 2020;85:104445.
- [2] Rasmussen S, Sperling P, Poulsen MS, Emmersen J, Andersen S. Medical students for health-care staff shortages during the COVID-19 pandemic. *Lancet* 2020;395(10234):e79-80.
- [3] Ranney ML, Griffeth V, Jha AK. Critical supply shortages—the need for ventilators and personal protective equipment during the Covid-19 pandemic. *N Engl J Med* 2020;382(18):e41.
- [4] Kim JH, Hong S-K, Kim Y, Ryu HG, Park C-M, Lee YS, et al. Experience of augmenting critical care capacity in Daegu during COVID-19 incident in South Korea. *Acute Crit Care* 2020;35(2):110-4.
- [5] Kwon DH, Do Y, Eun M-Y, Lee J, Park H, Sohn S-I, et al. Characteristics of Acute Stroke in Patients with Coronavirus Disease 2019 and Challenges in Stroke Management during an Epidemic. *J Korean Med Sci* 2020;35(35):e324.
- [6] Haut ER, Leeds IL, Livingston DH. The effect on trauma care secondary to the COVID-19 pandemic: collateral damage from diversion of resources. *Ann Surg* 2020;272(3):e204-7.
- [7] Sung HK, Paik JH, Lee YJ, Kang S. Impact of the COVID-19 Outbreak on Emergency Care Utilization in Patients with Acute Myocardial Infarction: a Nationwide Population-based Study. *J Korean Med Sci* 2021;36(16):e111.
- [8] Na KR, Kim HR, Ham Y, Choi DE, Lee KW, Moon JY, et al. Acute Kidney Injury and Kidney Damage in COVID-19 Patients. *J Korean Med Sci* 2020;35(28):e257.
- [9] Wang T, Du Z, Zhu F, Cao Z, An Y, Gao Y, et al. Comorbidities and multi-organ injuries in the treatment of COVID-19. *Lancet* 2020;395(10228):e52.
- [10] Zaim S, Chong JH, Sankaranarayanan V, Harky A. COVID-19 and Multiorgan Response. *Curr Probl Cardiol* 2020;45(8):100618.
- [11] Bhatraju PK, Ghassemieh BJ, Nichols M, Kim R, Jerome KR, Nalla AK, et al. Covid-19 in Critically Ill Patients in the Seattle Region - Case Series. *N Engl J Med* 2020;382(21):2012-22.
- [12] Esper FP, Adhikari TM, Tu ZJ, Cheng YW, El-Haddad K, Farkas DH, et al. Alpha to Omicron: Disease Severity and Clinical Outcomes of Major SARS-CoV-2 Variants. *J Infect Dis* 2023;227(3):344-52.
- [13] Neal K. The Collateral Damage of COVID-19. *J Public Health (Oxf)* 2020;42(4):659.
- [14] Michetti CP, Nahmias J, Rangel EL, Rappold JF, Gonzalez RP, Pathak AS, et al. The specialty of surgical critical care: A white paper from the American Association for the Surgery of Trauma Critical Care Committee. *J Trauma Acute Care Surg* 2022;93(2):e80-8.
- [15] Spain DA, Miller FB. Education and training of the future trauma surgeon in acute care surgery: trauma, critical care, and emergency surgery. *Am J Surg* 2005;190(2):212-7.
- [16] Lennquist S. Management of major accidents and disasters: an important responsibility for the trauma surgeons. *J Trauma* 2007;62(6):1321-9.
- [17] Tisherman SA, Ivy ME, Frangos SG, Kirton OC. Acute care surgery survey: opinions of surgeons about a new training paradigm. *Arch of Surg* 2011;146(1):101-6.