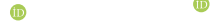


# Spine Surgery During the COVID 19 Pandemic: One Trauma Center Experience in Central Anatolia

COVID 19 Salgını Sırasında Omurga Cerrahisi Orta Anadolu da Bir Travma Merkezi Deneyimi

<sup>1</sup>Ismail Bozkurt, <sup>2</sup>Ebru Karakoc



<sup>1</sup>Cankiri State Hospital, Clinic of  
Neurosurgery, Cankiri, Turkey

<sup>2</sup>Cankiri State Hospital,  
Critical Care Unit, Cankiri, Turkey

## Abstract

The COVID-19 has affected all aspects of public health. In order to preserve valuable medical resources, most health care systems have halted elective and non-essential surgeries. Spine surgery is no exception in this period. However, defining essential and non-essential surgeries, the management of patients and due screening process has made a clear algorithm a must. The patients operated for various spinal surgeries during a 9-month period at an only reference trauma and spinal surgery performing secondary step state hospital in Central Anatolia were evaluated. During this time period, a guideline in discriminating essential surgeries, handling the pre and post-operative course based on previous publications and recommendations was formed. During this period 70 spinal surgeries were performed. The patients were categorized into 2 groups; 1- no to low risk and 2- high risk to definite group. Each group of patients underwent distinct process during their hospital stay in order to minimize the risk of contamination. No patient operated on was diagnosed with COVID-19 during their hospital stay or 10 days following their discharge. The COVID-19 pandemic is an ongoing process. Numerous centers have shared their experiences while still fighting the contagion. This paper aimed to share an experience of a single trauma hospital of a city serving a population more than 250,000. Numerous more studies based on evidence based medicine are needed to frame a golden standard approach for surgical candidates during the pandemic.

**Keywords:** COVID-19, pandemic, essential, elective, spine surgery

## Özet

COVID-19 pandemisi halk sağlığını tüm yönleriyle etkiledi. Kısıtlı sağlık kaynakları korumak amacıyla çoğu sağlık sistemi seçmeli ve zorunlu olmayan ameliyatları durdurdu. Omurga cerrahisi de bu süreçte etkilendi. Fakat acil ve elektif ameliyatların tanımlanması, yapılması planlanan ameliyatlar öncesi, sırası ve sonrasında alınması gereken önlemlerin geliştirilmesi ve net bir algoritma yaratılması zorunlu hale getirmiştir. Bu çalışmada 9 aylık süreçte İç Anadolu'da bir şehrin tek travma ve omurga cerrahisi yapan ikinci basamak bir devlet hastanesinde omurga ameliyatı yapılan hastalar değerlendirildi. Bu süreçte daha önceki yayınlara ve önerilere dayalı olarak, acil ve elektif ameliyatların ayırt edilmesi, ameliyat öncesi ve sonrası sürecin ele alınması konusunda bir kılavuz oluşturulmuştur. Bu dönemde 70 omurga cerrahisi yapıldı. Hastalar COVID-19 açısından 1- düşük riskli ve 2- yüksek riskli olarak iki gruba ayrıldı. Kontaminasyon riskini en aza indirmek için her hasta grubuna hastanede kaldıkları süre boyunca gerekli tedbirler uygulandı. Ameliyat öncesi hazırlık döneminde, acil veya elektif ve risk grubuna göre önlemler alınarak paylaşıldı. Ameliyat edilen hiçbir hastaya hastanede kaldıkları süre boyunca veya taburcu olduktan 10 gün sonra COVID-19 teşhisi konmadı. COVID-19 pandemisi devam eden bir süreçtir. Çok sayıda merkez salgınla mücadele ederken deneyimlerini paylaştı. Bu makale, 250.000'den fazla nüfusa hizmet veren bir şehrin tek bir travma hastanesi deneyimini paylaşmayı amaçlamıştır. Pandemi sırasında cerrahi adayları için altın standart bir yaklaşımı belirlemek için kanıt dayalı tıp üzerine temellendirilen çok sayıda çalışmaya ihtiyaç vardır. Bu vaka serisi ile gelecekte yapılacak olan algoritmalar için kanıt sunulmuştur.

**Anahtar Kelimeler:** COVID-19, pandemi, esansiyel, elektif, omurga cerrahisi

## Correspondence:

Ebru KARAKOÇ  
Cankiri State Hospital, Critical Care  
Unit, Cankiri, Turkey  
e-mail: ebrukarakoc1983@gmail.com

Received 25.06.2021 Accepted 05.07.2021 Online published 06.07.2021

## 1. Introduction

On March 11th, 2020 the General Director of the World Health Organization (WHO), Dr. Tedros Adhanom Ghebreyesus announced the pandemic breakout of Coronavirus Disease 2019 (COVID-19) (4). COVID-19 caused by the virus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is primarily transmitted through aerosols and causes pulmonary infection in humans. In his briefing, he summarized that this virus broke out from Wuhan, China and has logarithmically increased in the last two weeks and the worst is yet to come. There are many take home messages from the briefing. The world, in all considerations has changed ever since from economics to politics, from sports to the health system. But his summary in four key areas can be applied to all fields and spine surgery is not exempt from it;

“First, prepare and be ready.  
Second, detect, protect and treat.  
Third, reduce transmission.  
Fourth, innovate and learn.”

The first case of COVID-19 in Turkey was recorded on 11 March and as of December 18, 2020 there are almost two million people diagnosed with COVID-19 in Turkey alone, making it the 6th country with most cases. Since March, strategies to contain the pandemic have involved the health system, politics and public coordination. In terms of the health system, it has shifted towards more urgent related treatments and COVID-19 diagnosis, treatment and follow-up. With the advice of the Coronavirus Scientific Advisory Board of the Ministry of Health in Turkey, on March 17th, 2020, just 6 days after the WHO briefing, all non essential and non urgent surgical interventions were halted (no. 14500235-403.99) (10). Thus similar questions boggled the minds of all spine

surgeons; patient selection criteria, when and how to operate and the postoperative period. In this paper, a 9-month experience from the only spine surgery performing state hospital in a city is shared considering the diagnosis, inclusion criteria, anesthesiology and surgical management, and follow-up at the hospital until discharge with possible recommendations.

## 2. Methods

The study was performed in agreement with the ethical standards specified in the Declaration of Helsinki and was accepted by the Research Ethics Committee of Çankırı Karatekin University (No. 463/010321). Approval from the Ministry of Health in regards to studies involving COVID-19 cases was obtained (2020-12-24T18\_44\_57). All patients read and signed the consent form before being included in the study.

### *Patient Considerations*

The surgical unit at Çankırı Karatekin Hospital; a secondary step state hospital, is the only center in the region performing complex spinal surgeries serving a population over 250,000. It is also based near a major route connecting the black sea region to the capital city Ankara and the most populous city of Turkey, Istanbul, hence becoming a referral trauma center. The present investigation consists in a retrospective one center analysis of a 9-month period from March 17 till December 17. All patients referred from the emergency room (ER), COVID wards and the outpatient clinic for possible spine surgery indications were evaluated. Inclusion criteria for surgery are listed in table 1. The surgical procedures were categorized into two major groups; 1. No-low risk group, 2. High risk-definite group (Table 2).

**Table 1.** Patient Selection Criteria

<b>Inclusion</b>
Vertebra fracture with a score of 4 or higher in the SLIC or TLICS classification regardless of American Spinal injury Association (ASIA) impairment scale (AIS)
Vertebra fracture causing root or cord injury evidenced by neurological examination
Spinal stenosis or herniation of nucleus pulposus causing; <ul style="list-style-type: none"> <li>- unbearable radicular pain resistant to all sorts of analgesic treatment</li> <li>- motor strength at the affected level of muscles is less than 4/5</li> <li>- myelopathy / myelomalacia</li> </ul>
Progressive weakness, foot drop and cauda equine syndrome
Malignancy or infectious diseases of the spine needing urgent intervention
Failed previous spinal instrumentation; <ul style="list-style-type: none"> <li>- Screw loosening, pull out, rod fracture, cage migration</li> </ul>
<b>Exclusion</b>
Herniation of nucleus pulposus; <ul style="list-style-type: none"> <li>- at any level responsive to analgesic treatment</li> <li>- with affected level of muscles having a motor strength of 4/5 or more</li> <li>- with possible COVID-19 infection</li> </ul>
Chronic lumbar degenerative disorders with aggravated pain
Patient with a grade of 3 or higher in the American Society of Anaesthesiologists' (ASA) classification of Physical Health that may require post operative ICU stay

At the outpatient department, if surgery was indicated, the patient was questioned for fever, cough, fatigue, anorexia, shortness of breath, sputum production, loss of taste and smell, sore throat, diarrhea and nasal congestion. If no symptoms were present, nasopharyngeal swab polymerase chain reaction (PCR) test was performed at least 48 hours before the surgery day. If the patient presented with mild symptoms or had a history of contact with a COVID-19 patient, at least 2 negative PCR tests were obtained with at least 48 hours separated between the tests. If the patient presented with major symptoms such as fever, cough, shortness of breath, loss

of taste and smell, or close contact with a COVID-19 patient, a non contrast enhanced thorax computerized tomography (CT) along with 2 negative PCR tests separated by 48 hours were obtained prior to surgery. The patient was advised to quarantine themselves at the interval between the test and surgery. Any patient with a positive PCR test or a positive CT scan at the outpatient department were first referred to the infectious diseases department for treatment, after the COVID treatment was finalized at least two negative PCR results timed 48 hours apart was obtained before surgery.

**Table 2.** Patient Risk Categories

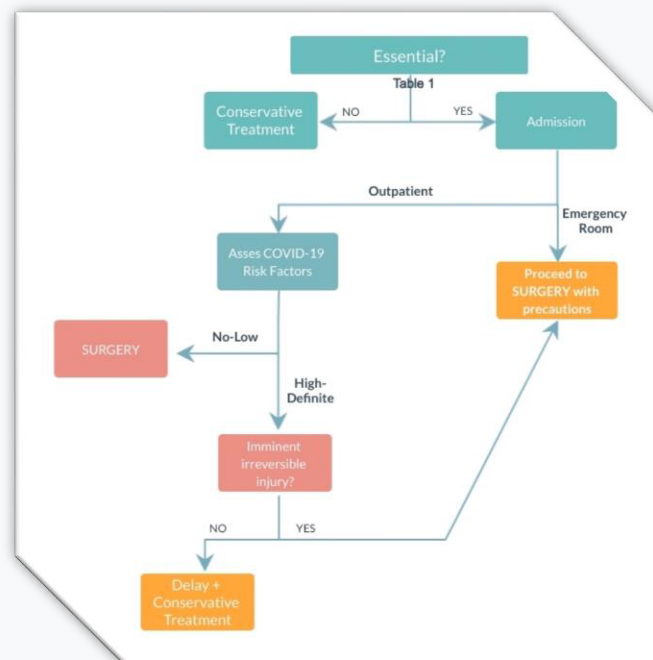
Group	Category	COVID-19 Symptoms	Investigation
1	None	No symptoms	Negative PCR test
	Low	Mild* symptoms	2 negative PCR tests 48h apart
2	High	Major** symptoms or undetermined ER patient	2 negative PCR tests 48h apart and a negative Thorax CT scan
	Definite	Major symptoms	Positive PCR test and/or positive Thorax CT findings

\*Mild: fatigue, sore throat, nasal congestion, myalgia

\*\*Major: fever, cough, shortness of breath, loss of taste and smell or close contact with a diagnosed patient

For urgent cases evaluated at the ER, a nasopharyngeal swab PCR test was ordered and a thorax CT was obtained. For vertebral fractures, patients with a score of 4 or higher in the thoracolumbar injury classification and severity score (TLICS) and subaxial cervical spine injury classification (SLIC) were operated. All these cases were operated as a high risk group. The patients were followed up on at the ward as a COVID positive patient until the first swab test at the ER and postoperative 24th hour swab test revealed to be negative with a normal thorax CT. If the

patient presented with a typical thorax CT scan of COVID pneumonia, COVID treatment was started right after the operation. After the surgical follow up period was finalized, the patient was transferred to the COVID ward. The process of preparing the patient surgery is summarized in figure 1. All patients indicated for surgery were informed of the ongoing pandemic, the possible risk of nosocomial infection and the necessary precautions that have to be made by the patient and their relatives.



**Figure 1.** Pre Operative Patient Planning

### ***Institutional Considerations***

Although the Ministry of Health continuously published guidelines to all hospitals, each hospital improvised these guidelines according to the hospital size, number of other pandemic hospitals in the city, number of patients, staff number and intensive care unit (ICU) capacity. At our hospital, elective cases have been halted since March 17 and surgeons have been advised to evaluate patients and postpone elective surgeries where possible.

All admittance to the hospital required temperature measurement along with risk factor screening and a strict mask requirement and social distancing were implemented. A stern no visitor rule was applied at the wards. All patients were monitored, attended to and ambulated by nurses. The patients were educated about the precautions required in regards to the ongoing pandemic such as hand hygiene, mask, social distancing and visitor restriction.

All staff was routinely screened for fever, symptoms, and contact with a COVID-19 patient without personal protective equipment (PPE). They were also trained for PPE usage and careful attention to other staff in order to warn them of any improper use of PPE.

After discharge, the patients were scheduled for a one-time follow up examinations 10 days after the surgery. Thereafter, they were given contact details of the hospital and all questions were handled via phone conversation and only when the surgeon deemed it fit, the patient was called back to the hospital in order to minimize face to face clinic visits. All patients were questioned for COVID symptoms up until 10 days after discharge.

### ***Surgical Considerations***

The patients were operated on 2 categories. The first group of patients were either no to low risk group, who had no symptoms of COVID-19 and had a negative PCR result or mild flu like symptoms with 2 normal PCR

tests and a negative thorax CT. This group of patients were operated via standard operating room (OR) techniques. The second group of patients was the high risk to definite positive group. These patients were unavoidable patients from the ER with undetermined status or a pre operative CT scan typical of COVID-19 pneumonia. During the high risk group operations, all OR personnel used FFP3 type masks with an addition of face shields along with standard surgical PPE. All the surgical equipment went through standard sterilization techniques.

If the patients were transferred to the ward postoperatively and had no previous history of ICU stay, 1-4 days of observance were allowed before discharge. The patients were educated on red flag signs that may appear at home, mobilization techniques and wound care.

### ***OR Considerations***

The individual rooms of the OR had separate air-handling units with high efficiency particulate air (HEPA) filters. All non-essential personnel were restricted in entering the OR. All patients had a surgical mask until the intubation period. The approach for the high risk to definite patients differed from this point on.

The surgical team attended the surgery with N95 masks, hooded AAMI level III gown and gloves but did not receive any prophylactic treatment (Figure 2). During intubation and extubation, the operating team exited the room and only the anesthesia team consisting of two was allowed to remain in the OR to decrease contamination risk. The patient was allowed to recover in the OR when possible to avoid being transferred to the recovery room before the ward. Postoperatively, the surfaces of all equipment in the operating room were thoroughly wiped and when possible allowed for a 6 hour off period. The surgeon and the surgical team changed the scrubs and masks after each operation.



**Figure 2.** Scrub nurse with PPE during a lumbar fracture operation

The OR was stocked with all possible medications, fluids and other equipment that may be necessary intraoperatively to minimize room traffic. Prone position was the most commonly employed approach but when anterior approach was necessary, the patient's nostrils and mouth was covered by a cotton sponge after intubation.

If the patient needed time in the recovery room, only 2 patients were allowed at one time at a three bed recovery room. All the staff in the recovery room used N-95 masks. The patients had a surgical mask over the oxygen mask. The stay in the recovery room was minimized as much as possible.

### **3. Results**

The patients referred from the COVID wards were evaluated for the surgical inclusion criteria as well. But no patient met the inclusion criteria so only conservative treatment and a follow up examination after

COVID treatment were advised. During this 9 month period, a total of 70 patients were operated on and are summarized in table 2. 11 of the patients were operated from the ER and included in group 2 whereas the rest were from the outpatient clinic and other wards and included in group 1. None of the patients were diagnosed with COVID-19 during their hospital stay and 10 days following discharge. Patients operated for Cervical and Lumbar HNP (herniated nucleus pulposus) were discharged on the first day after surgery. The patient with C5-6 dislocation was transferred to a physical therapy and rehabilitation hospital 6 days after the surgery and the patient with T11 CSF fistulae received IV anti biotic for 14 days after surgery, the rest of patients were discharged on average 3.1 days after surgery. No patient experienced any complications or problems during their stay at the hospital. All patients but the C5-6 dislocation was ambulatory at the time of discharge.

**Table 3.** List of Operated Patients

Diagnosis	Number	Referral	Group
<i>Thoracolumbar Fracture</i>	9	ER	2
T9 Burst	2		
T12 Burst	2		
L1 Burst	4		
L4 Burst	1		
<i>Cervical Fracture</i>	2	ER	2
C5-6 Dislocation Fracture	1		
C5 Flexion tear drop fracture + unilateral facet dislocation	1		
<i>Vertebral Malignancy + Infections</i>	6		1
T11 CSF fistulae / paravertebral muscles abscess	1	Outpatient Clinic	
Wound infection after C1 anterior arch fracture	1	Infectious Diseases Ward	
T1-2 intradural meningioma	1	Outpatient Clinic	
Giant cell tumor of sacrum	1	Outpatient Clinic	
L4 metastasis of prostate cancer (Tomita 4)	1	Internal Medicine Ward	
T8 metastasis of prostate cancer (Tomita 6)	1	Outpatient Clinic	
<i>Spinal Stenosis</i>	10	Outpatient Clinic	1
Cervical	1		
Thoracic	1		
Lumbar	8		
<i>Herniation of Nucleus Pulposus (HNP)</i>	37	Outpatient Clinic	1
Cervical	9		
Lumbar	28		
<i>Instrumentation Failure/Revision</i>	6	Outpatient Clinic	1
Lumbar Stenosis	3		
Lumbar Fracture	2		
Thoracic Fracture	1		
<b>TOTAL</b>	<b>70</b>		

#### 4. Discussion

Although besides a few case reports, the COVID-19 virus does not seem to have a major impact on the spinal cord and peripheral nerves. But the high contagiousness of the virus along with worldwide depleting resources such as doctors, operating rooms, ICU beds, etc., has brought the necessity of adequate adjustments to everyday clinical entities including spine surgery. All medical specialties at this time of pandemic, has halted all possible elective treatment modalities in order to preserve resources. Thus a clear algorithm encapsulating all aspects of the disease must be developed. This paper aimed to evaluate the selection criteria and all considerations pertaining to spinal surgery

during the COVID-19 pandemic at a single institution performing the only spinal surgeries of a city in Anatolia.

Before the COVID-19 pandemic broke out all spine surgeons had their own surgical considerations based on literature and experience. However as elective operations are halted, non essential surgical considerations have been postponed. There are no clear guidelines on which operations should be postponed or operated on during the pandemic. The dilemma arises from operating patients that may increase contamination when they could be postponed. Although the normal incubation period of COVID-19 is 5-14 days there have been cases of up to 24

days. The alarming level of mortality of 3.6% just adds to the complexity of the issue. Last but not least, the increasing rate of infection among health care workers should limit surgeons on operating non essential patients (11).

The inclusion criteria used at this institution was constructed in order to delay possible surgeries to minimize risk of contamination and conserve valuable resources. Previous similar studies where experiences have been shared, a wide variety of inclusion criteria have been implemented (9,11). But there are also proposes where nothing but traumatic fractures and malignancies should be operated. In this experience, four major considerations have guided the inclusion criteria; pain, instability, neurological deficit and irreversible injury.

As the Hippocratic dictum states “Divinum est opus sedare dolorem” - Divine is the work to subdue pain. The patients operated on disc hernias at the institution who did not present with major neurological deficits, foot drops or cauda equine syndrome where surgery was considered essential, all possible analgesic treatments were given including NSAIDs, opioid analgesics, short course of rest and epidural steroid injections. However, when these modalities failed and the patient was unable to continue standard daily activities the operation was considered essential.

The criteria for instability were considered for ER patients presenting with a vertebral fracture. While other studies evaluated American Spinal Injury Association (ASIA) impairment scale for surgical indication (11), this institution only used the TLICS and SLIC scale. These scales both include neurological status; however the presence or absence of neurological deficit does not allow the determination of instability. The TLICS and SLIC scale allows for instability evaluation and we did not discharge or transfer a patient with an unstable vertebra just because there were no neurological deficits. This is part due to allowing for more contamination risk whilst and after the patient is transferred to another institution.

Major neurological deficits defined as the affected muscle group having a motor strength

less than 4/5 and the possibility of irreversible injury was considered to be an inclusion criteria. As the North American Spine Society suggests (3) “progressive or severe neurologic deficits due to neurologic compression from any cause (infection, tumor, fracture, disc herniation)” requires urgent surgical intervention without any delay. Thus all acute spinal cord injuries, vertebral fractures that had a 4 or higher score in the TLICS and SLIC scale, spinal stenosis and HNP patients and any malignancies with neurological deficits, infectious causes and failed previous instrumentation that were unstable have been included for urgent and essential surgery criteria.

After the selection process, the obstacle of categorizing the patient in to group 1 – no or low risk and group 2 – high risk to definite arises. Although the sensitivity the PCR test varies from 71-98% (12), all surgical candidates were ordered for PCR screening. In addition, if the patient applied with mild symptoms of COVID-19, a second PCR test was ordered for confirmation as studies out of China show that 96% of patients presented fever, 76% with cough and 44% with myalgia (5). Although specificity of the test has been reported to be 95%, another study where 4653 close contact patients underwent throat swabs every 48 h, the initial sensitivity of the test was 71% (6), thus a second PCR test was ordered at this institution to minimize false negative results. In order to further minimize false negative PCR results, patients presenting with major symptoms such as fever, cough, shortness of breath, loss of taste and smell or close contact with a diagnosed patient were ordered for a thorax CT scan. The sensitivity of thorax CT scan for COVID-19 was found to be 97% in the largest available study from Wuhan (2). Although there are no conclusive studies evaluating the sensitivity of a CT scan in asymptomatic patients, since an unprotected distance of 1m is considered to be a mode of transmission by the WHO, we decided it would be best to be over cautious than sorry. Fever was considered to be major symptoms since in adults it almost always is caused by an infection or inflammation. Cough is very specific for upper and lower respiratory tract infections and shortness of breath is a major symptom defined by the



WHO. A systematic review of 24 studies revealed an olfactory dysfunction in 41% and gustatory dysfunction in 38.2% of patients (1). At a time of pandemic, such a specific symptom must be handled cautiously before a surgical planning.

A framework from an Orthopedic Hospital in New York City outlined a policy in order to minimize the spread of the virus to patients and the staff within the hospital whilst continuing urgent operations. In short the authors advised for patient and visitor screening, use of patient-PPE, self surveillance of symptoms by the staff and staff testing when returning to work after quarantine (8). Our institution held weekly meetings with the administrative staff along with representatives from doctors including surgeons and other healthcare workers to continuously update the algorithms and precautions taken at every department of the hospital. The administration applied a strict no visitor policy with all applying patients going through temperature check and risk factor screening before entering the hospital. All staff according to their positions were educated on the usage of PPE along with frequent announcements from the hospital loudspeakers urging all those that are in the hospital to keep their masks on and check for social distancing. All secretaries were advised for a swift record taking and caretakers to transport patients with pre organized time frames to decrease the amount of delay. All staff at the hospital was also educated for signs and symptoms of COVID-19 and when they developed were advised to stay at a student dormitory reserved for healthcare workers that are suspected or diagnosed. The families of the healthcare workers were also at an increased risk so this was done to minimize contamination. In addition, all staff responsible for handling phone calls were educated on handling all possible matters via phone, as an increasing number of patients also favored phone calls when feasible.

In a comprehensive paper from a large tertiary hospital in Singapore, operating room measures for the outbreak has been reviewed. An OR with a negative pressure environment was advised since intubation, extubation, manual ventilation and open suctioning of the

respiratory tract are all aerosol generating procedures (AGPs), thus becoming a potential transmission threat. Although it is a comprehensive paper, it did not mention the number of patients operated on and if any were diagnosed before or after surgery with COVID-19 (13). At our institution, there 6 operating rooms with only 1 having a negative pressure environment where all group 2 patients were operated. As advised by Wong et al. (13), all staff before the procedure held a meeting before wearing PPE which would make it difficult to communicate. Again all necessary equipment, drugs and fluids were made available in the room to decrease traffic. The anesthesiologists also took precautions to minimize postoperative coughing or emesis, whilst reducing AGPs by careful intubation, face mask ventilation and airway suctioning.

In a similar study from where similar precautions besides PCR testing has been taken in India (11), a 4-month period at a tertiary teaching hospital was evaluated with 13 patients that were operated for spine disorders and only 4 had available data for COVID-19 testing. Since the beginning of the pandemic our institution had enough PCR kits so that any suspicion of infection would be readily evaluated by a swab. A parallel study from Italy analyzed spine surgeries in a 4-month period as well and all patients underwent PCR testing preoperatively however patients with mild and major symptoms underwent thorax CT as well. Out of the 54 patients operated for spinal disorders only 2 patients were diagnosed with COVID-19 (9). The paper also failed to mention the precautions and recommendations for spine surgeons and focused more on the reduction of surgeries compared to the same time frame from a year ago. In a study where a review of literature was performed to categorize the patients into elective, urgent and emergent categories, similar indications for surgery was formed. A comprehensive guide on the preparation of the patient has been shared but only 2 cases have been discussed and results of this cautionary approach has not been evaluated (7).

Herein, the experiences of a single trauma center in classifying essential spine surgeries, handling the process of preparation,

institutional and operational considerations are shared. During this 9-month period 70 spine surgeries were performed with none of them being diagnosed with COVID-19 pre or postoperatively. A 10-day follow up was made to diagnose latent infections and revealed negative results as well. Experiences and recommendations of large centers dealing with similar problems should be evaluated by spine surgeons globally to allow for proper treatment without overdoing it. Non essential patients, especially those who would not present with irreversible injury and conservatively manageable conditions should for now wait until the alarming level of pandemic patients begin to decline. The virus continues to spread and all updates should be made readily available for healthcare workers to clarify a proper framework.

### 5. Conclusion

The battle against COVID-19 is still ongoing. It has become an evolutionary process where

guidelines are constantly being formed and changed. Scientists around the world are trying their best to share their experiences in this process to allow for better management of patients and keep the health care system functional. Herein, the experiences of a single referral trauma center in a city managing spinal disorders during the COVID-19 pandemic are shared. Although it is not meant to be an all inclusive algorithm in the management of spine disorders during the pandemic, it has aimed to raise awareness of the importance of acting precautions, eliminating unnecessary contamination and preserving the trauma resources of the hospital. It also sheds hope for safe surgery during the pandemic. Finally, this study has its limitations as it is a single center experience thus the results may not be generalized to a larger population or an advanced institution.

#### Abbreviation List

<b>WHO</b>	<i>World Health Organization</i>
<b>COVID-19</b>	<i>Coronavirus Disease 2019</i>
<b>ER</b>	<i>Emergency Room</i>
<b>PCR</b>	<i>Polymerase chain reaction</i>
<b>CT</b>	<i>Computerized tomography</i>
<b>ICU</b>	<i>Intensive care unit</i>
<b>PPE</b>	<i>Personal protective equipment</i>
<b>HNP</b>	<i>Herniated nucleus pulposus</i>
<b>NSAID</b>	<i>Nonsteroidal anti-inflammatory drugs</i>
<b>ASIA</b>	<i>American Spinal Injury Association</i>
<b>TLICS</b>	<i>Thoraco-Lumbar Injury Classification and Severity score</i>
<b>SLIC</b>	<i>Subaxial Cervical Spine Injury Classification</i>
<b>OR</b>	<i>Operating room</i>
<b>CSF</b>	<i>Cerebrospinal fluid</i>
<b>AGPs</b>	<i>Aerosol generating procedures</i>
<b>SARS-CoV-2</b>	<i>Severe acute respiratory syndrome coronavirus 2</i>

### REFERENCES

1. Agyeman AA, Chin KL, Landersdorfer CB, Liew D, Ofori-Asenso R: Smell and Taste Dysfunction in Patients With COVID-19: A Systematic Review and Meta-analysis. *Mayo Clin Proc* 2020; 95:1621-1631,
2. Ai T, Yang Z, Hou H, Zhan C, Chen C, Lv W, Tao Q, Sun Z, Xia L: Correlation of Chest CT and RT-PCR Testing for Coronavirus Disease 2019 (COVID-19) in China: A Report of 1014 Cases. *Radiology* 2020;296: E32-E40,
3. Bono CM, Dohring EJ, Finkenberg JG, Ghogawala Z, Kauffman CP, Kreiner S, O'Brien DR, Reiter MF, Reitman CA, Schneider PL, Sullivan WJ, Truumees E, Wang JC. NASS guidance document on elective, emergent and urgent procedures [NASS Website]. April 22, 2020. Available at: <https://www.spine.org/Portals/0/assets/downloads/Publications/NASSInsider/NASSGuidanceDocument040320.pdf> Accessed December 2, 2020

4. Ghebreyesus TA. WHO Director-General's opening remarks at the media briefing on COVID-19 [World Health Organization Website]. March 11, 2020. Available at: <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020> Accessed December 1, 2020
5. Jain NS, Alluri RK, Schopler SS, Hah R, Wang JC: COVID-19 and Spine Surgery: A Review and Evolving Recommendations. *Global Spine J* 2020;10:528-533,
6. Luo L, Liu D, Liao X, Wu X, Jing Q, Zheng J, Liu F, Yang S, Bi H, Li Z, Liu J, Song W, Zhu W, Wang Z, Zhang X, Huang Q, Chen P, Liu H, Cheng X, Cai M, Yang P, Yang X, Han Z, Tang J, Ma Y, Mao C. Contact Settings and Risk for Transmission in 3410 Close Contacts of Patients With COVID-19 in Guangzhou, China : A Prospective Cohort Study. *Ann Intern Med.* 2020;173:879-87.
7. Rizkalla JM, Hotchkiss W, Clavenna A, Dossett A, Syed IY: Triaging Spine Surgery and Treatment during the COVID-19 Pandemic. *J Orthop*: 2020;20:380-385,
8. Soffin EM, Reisener MJ, Sama AA, Beckman JD, Liguori GA, Lebl DR, Girardi FP, Cammisa FP, Hughes AP: Essential Spine Surgery During the COVID-19 Pandemic: A Comprehensive Framework for Clinical Practice from a Specialty Orthopedic Hospital in New York City. *HSS J* 2020; 16(Suppl 1):1-7,
9. Tamburrelli FC, Meluzio MC, Perna A, Santagada DA, Genitiempo M, Zirio G, Proietti L: Spinal surgery in COVID-19 pandemic era: One trauma hub center experience in central-southern Italy. *J Orthop* 2020;15;22:291-93,
10. Tekin A. Postponement of Elective Transactions and Other Measures to be Taken [Republic of Turkey, Ministry of Health]. March 17, 2020. Available at: <https://hasta.saglik.gov.tr/Eklenti/36865/0/elektif-islemlerin-ertelenmesi-ve-diger-tedbirlerpdf.pdf> Accessed December 1, 2020
11. Verma V, Nagar M, Jain V, Santoshi JA, Dwivedi M, Behera P, Selvanayagam R, Pal D, Singh K: Adapting Policy Guidelines for Spine Surgeries During COVID-19 Pandemic in View of Evolving Evidences: An Early Experience From a Tertiary Care Teaching Hospital. *Cureus*: 2020;12:e9147,
12. Watson J, Whiting PF, Brush JE. Interpreting a covid-19 test result. *BMJ.* 2020;:369:m1808.
13. Wong J, Goh QY, Tan Z, Lie SA, Tay YC, Ng SY, Soh CR: Preparing for a COVID-19 pandemic: a review of operating room outbreak response measures in a large tertiary hospital in Singapore. *Can J Anesth/J Can Anesth*: 2020; 67, 732–45