



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

Journal Pre-proof

Patient outcomes after humeral fracture surgery during the COVID-19 outbreak in Spain

Montserrat Garcia-Portabella, MD, Jorge H. Nuñez, MD, Lledó Batalla, MD, Martin Plomer, MD, Kushal Lakhani, MD, PhD, Josep Massons, PhD

PII: S1058-2746(20)30472-9

DOI: <https://doi.org/10.1016/j.jse.2020.06.001>

Reference: YMSE 5219

To appear in: *Journal of Shoulder and Elbow Surgery*

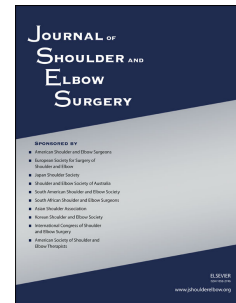
Received Date: 15 May 2020

Accepted Date: 8 June 2020

Please cite this article as: Garcia-Portabella M, Nuñez JH, Batalla L, Plomer M, Lakhani K, Massons J, Patient outcomes after humeral fracture surgery during the COVID-19 outbreak in Spain, *Journal of Shoulder and Elbow Surgery* (2020), doi: <https://doi.org/10.1016/j.jse.2020.06.001>.

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

© 2020 Journal of Shoulder and Elbow Surgery Board of Trustees. All rights reserved.



Patient outcomes after humeral fracture surgery during the COVID-19 outbreak in Spain**Running head:** Humeral Fractures in COVID-19**Authors:** M.D. Montserrat Garcia-Portabella, MD¹, Jorge H. Nuñez, MD¹, M.D. Lledó Batalla, MD¹, Martin Plomer, MD¹, Kushal Lakhani, MD¹, PhD; Josep Massons, PhD¹.**Institutional affiliation:**

1. Shoulder and Elbow Unit, Traumatology and Orthopaedic Surgery Department, Universitat Autònoma de Barcelona, Vall d'Hebron University Hospital, Passeig de la Vall d'Hebron, 119-129, 08035 Barcelona, Spain

Corresponding author:

Jorge Hassán Nuñez Camarena, MD

Shoulder and Elbow Unit. Traumatology and Orthopaedic Surgery Department, Vall d'Hebron University Hospital, Universitat Autònoma de Barcelona, Passeig de la Vall d'Hebron, 119-129, 08035 Barcelona, Spain

E-mail: j.nuñez@vhebron.net, hassan2803med@gmail.com

Telephone number: +34 727770739

Disclaimer: None.

Institutional review board approval was not required for this report.

Patient outcomes after humeral fracture surgery during the COVID-19 outbreak in Spain

Abstract

Background: The global spread of the 2019 novel coronavirus (COVID-19) has profoundly affected the way we conduct our healthcare practices. The goal of this paper is to report the outcomes of 11 patients who underwent humeral fracture surgery in the first few weeks of the COVID-19 outbreak in Spain.

Methods: This was a retrospective case series of 11 patients who underwent humeral fracture surgery during the first weeks of the COVID-19 outbreak in Spain, between 10 March and 25 April 2020. The clinical outcomes of these operative patients were monitored up to 12 May 2020, the final date of follow-up, a minimum of 15 days after all patients were discharged from the hospital. COVID-19 infection, mortality, demographic, clinical, and laboratory data were analyzed.

Results: Thirty-six humeral fractures were recorded between 10 March and 25 April 2020. During this period, humeral fracture fixation was the third most common surgery for fracture in our institution after hip fracture and ankle fracture surgery. Eleven patients underwent surgery (30.5%), of which seven were women (63.3%). The mean age was 64.8 years (SD 13.5). Nine operated cases had a proximal humerus fracture and 2 had a humeral shaft fracture. One of the 11 patients was positive for SARS-CoV-2 on the basis of quantitative reverse transcription polymerase chain reaction (RT-PCR) of throat swab

samples. The overall median surgical time was 101.2 minutes (SD 28.4). The overall median hospital length stays for the patient discharged was 2.2 days (range 1-4). No COVID-19 nosocomial intrahospital infection occurred, no patient reported COVID-19 infection during the 15 days after hospital discharge. No intrahospital mortality was recorded. Furthermore, no COVID-19 infection was reported in the shoulder surgeons that performed the surgeries.

Conclusions: Although humeral fractures were not the most frequent fracture during this outbreak, some required surgery. With good preoperative management that included RT-PCR for COVID-19 and chest radiographs, protective measurements for the surgical team, and rapid discharge of the patients, we were able to operate on 11 humeral fractures with no COVID-19 nosocomial intrahospital infection in the patients or in the shoulder surgeons that performed the surgeries.

Level of Evidence: Level IV, Retrospective Case Series

Keywords: shoulder; humerus; fracture; coronavirus; pandemic

The global spread of the 2019 novel coronavirus (COVID-19) has profoundly affected the way we conduct our healthcare practices ¹. On 11 March 2020, the World Health Organization (WHO) declared COVID-19 a pandemic. As of early June 2020, more than 7,000,000 people across all countries, territories, and regions have been infected by this virus, and over 400,000 people have died ¹⁷.

Hospitals' work regimes have been re-prioritized. However, even though coronavirus infection must be a priority, this pandemic does not cause other health injuries, including shoulder fractures, to disappear¹³. Although most surgeons are not fighting on the front line, we must continue treatment for surgical patients and in the meantime, protect healthcare workers and patients from COVID-19 infection¹⁴. Current guidelines, based on expert opinion, suggest operating may be done on select closed shoulder fractures, that if left untreated for more than 30 days, may lead to loss of function, permanent disability, and/or irreducible dislocation of major joints ¹⁶. However, outcomes reported during the pandemic have been less than optimal. Lei et al, retrospective analyzed 34 operative patients who underwent elective surgeries during the incubation of COVID-19 in Wuhan, they reported that all patients developed COVID-19, 44% required intensive care unit (ICU) admission, and 7 died after admission to the ICU. Aminian et al, reported 4 surgical patients (cholecystectomy, hernia repair, gastric bypass, and hysterectomy) who developed perioperative complications in the first few weeks of COVID-19 outbreak in Tehran, Iran, with a mortality of 75%². Mi et al, reported 7 cases of osteoporotic hip fractures with an intrahospital mortality of 42.9%, (3 of 7) and the other 4 remained in the hospital, with no one discharged home⁸. Although many questions remain unanswered about COVID-19 and

surgical practice, surgical teams should appropriately respond to this worldwide public health crisis to improve patient outcomes and minimize the burden on the health care systems and global society.

Despite shoulder fractures not being the most common fracture during this outbreak, most shoulder fractures occurred in the home, so the implementation of stringent lockdown measures for the population may not affect their incidence. Zhu et al, in a retrospective multi-centre study of the epidemiologic characteristics of traumatic fractures in elderly patients during the outbreak of coronavirus disease 2019 in China found that shoulder fractures were the third most common fracture after hip fractures and spine fractures¹⁹. The goal of this paper is to report the outcomes of 11 patients who underwent humeral fracture surgery in the first weeks of the COVID-19 outbreak in Spain. Furthermore, we discuss our personal protective equipment (PPE) and recommendations in these cases.

Material and methods

Our experience comes from our work at a hospital within the Spanish National Health System, which is one of the orthopedic and trauma referral centers in Spain. This was a retrospective review of all humeral fractures between 10 March and 25 April 2020. We also analyzed a retrospective case series of all patients who underwent humeral fracture surgery. We monitored the clinical outcomes of these operative patients up to 12 May 2020, the final date of follow-up, a minimum of 15 days after all patients were discharged from hospital.

Surgery Protection Measures

A description of our personal protective equipment (PPE) is in table 1, and is also shown in Figure 1. In our institution, two different surgical areas were created, each on a different floor: one a COVID-positive surgical area and the other a COVID-negative surgical area. Reverse transcription polymerase chain reaction (RT-PCR) tests for COVID-19 and chest radiographs were performed before the patients underwent surgery.

In the operating room, general anesthesia with endotracheal intubation was performed, with only the anesthesiologist and one surgical nurse in the room at that time. Only one surgeon performed patient positioning in the beach-chair. In draping the surgical field, we started by draping and covering the head, instead of starting at the axilla, for further protection of the healthcare providers. A maximum of three surgeons was allowed during surgery, although most of the surgeries were performed by only two surgeons.

Follow-up and outcome measures

Primary data included demographics, clinical characteristics, laboratory findings, evidence of COVID-19 infection or lack thereof, surgical treatment, and clinical outcome. Data collected included: patient's age, gender, injury mechanism, ASA (American Society of Anesthesiologists) score, fracture type (Shoulder fracture using the AO classification), and complications. We also recorded the surgical duration and time from hospital admission to discharge. We monitored the status of any COVID-19 positive patients, to know if it was reasonable to operate on patients with fractures during this pandemic. A COVID-19 nosocomial infection was defined as one that was acquired in the hospital. We reviewed the electronic medical record to note if any symptoms of fever, dyspnea or COVID-19 infection (RT-PCR for COVID-19 and chest radiographs) occurred up until 12 May 2020, a minimum of 15 days after surgery. We also directly communicated with the patients and their families for any missing information.

Statistical Analysis

The results are presented as descriptive statistics, describing the categorical variables by absolute values and percentages. Quantitative variables were presented by their measures of central tendency (mean and standard deviation [SD]). We used SPSS software (version 23.0; IBM, Armonk, NY, USA) for statistical analysis of the data.

Results

Thirty-six humeral fractures presented between 10 March and 25 April 2020, of which 26 (72.2%) were female. The mean patient age was 71.4 years (standard deviation (SD) 15.2). Of these patients, 11 underwent surgery (30.5%) (Table 2), of which 7 (63.6%) were women. The age range on surgical patients was 43-86, with a mean age of 64.8 years old (SD 13.5). A fall from standing height caused 10 (90.9%) of the fractures. One younger patient was involved in a high-velocity (traffic) accident, which caused his humeral fracture and also a thoracic vertebral fracture that required surgery and débridement.

Nine operated cases had a proximal humerus fracture and two had a humeral shaft fracture. The patients included in this study underwent 3 different surgical procedures. Eight underwent open reduction and internal fixation (ORIF) of a proximal humeral fracture with a proximal humeral plate, two underwent ORIF of a humeral shaft fracture with a humeral nail, and one underwent a reverse total shoulder arthroplasty.

At the time of surgery, one of the 11 patients was positive for SARS-CoV-2 on the basis of quantitative RT-PCR of throat swab samples. The overall median time between fracture and surgery was 9 days (SD 8.7). All patients had an ASA score of II. The overall median surgical time was 101.2 minutes (SD 28.4), and the overall median hospital stay until discharge was 2.2 days (range 1- 4). No COVID-19 nosocomial intrahospital infections occurred, and no patient reported COVID-19 infection during the 15 days after hospital discharge. No intrahospital mortality was recorded. The 10 COVID-19 free patients, were discharged, nine to home and one to a nursing home. The COVID-19 patient remained in

the hospital for complications related to his spine surgery, but as of 19 April 2020 was asymptomatic with a negative RT-PCR for COVID-19. Furthermore, no COVID-19 infection occurred in the shoulder surgeons that performed the surgeries.

Discussion

This report, to the best of our knowledge, is the first retrospective cohort study to describe the clinical characteristics and outcomes of shoulder surgery patients during the COVID-19 pandemic. Shoulder fractures are not the most frequent fracture during this outbreak, but their incidence is relatively constant despite the implementation of stringent lockdown measures for the population because, as with hip fractures, most shoulder fractures occur at home¹¹. Proximal humeral fractures account for 4% to 5% of all fractures, with only hip and distal radial fractures being more common in the elderly³. In our study, humeral fracture fixation was the third most common fracture surgery at our institution after hip and ankle fractures (Figure 2). Using all the protective measurements described, we had no COVID-19 nosocomial intrahospital infection in the patients nor shoulder surgeons that performed the surgeries.

Unfortunately, this pandemic does not mean other medical emergencies disappear, including shoulder fractures requiring surgery. We recommend only operating when it is essential, and realize that we put both ourselves and our team, which includes anesthesiologists and nurses, at risk. We must remember that intubation is considered one of the highest-risk procedures when dealing with COVID-19 patients¹². The majority of proximal humerus fractures and humerus shaft fractures can be treated non-operatively. In a

study evaluating the surgical management of proximal humerus fractures it was found that the percentage of patients with proximal humerus fractures who underwent surgery ranged from 0% to 68%³. A randomized clinical trial also found that in 2 years of follow-up, no significant differences were seen in patient-reported outcomes between surgical and non-surgical management of displaced proximal humeral fractures of the surgical neck. Although in that study, the patients who underwent non-operative management underwent guided physiotherapy¹⁵. In our study only 30.5% of humerus fracture required surgery and was indicated only in complex and displaced fractures. Three cases were fracture-dislocations of the proximal humerus, 6 cases were three and four-part proximal humeral fractures, and the 2 humeral shaft fractures were severely displaced.

We note that in comparison with other studies, our patients had good outcomes with respect to COVID-19 infection or respiratory complications. Fifteen days after discharge no patient was noted to have COVID-19 infection. We assessed the patients after 15 days because it has been estimated that 97.5% of COVID-19 infected cases will show symptoms within 11.5 days (95% CI, 8.2 to 15.6 days)⁶.

One of the most important problems during the pandemic outbreak has been nosocomial COVID-19 infections. In our hospital, as of 2 April 2020, 707 COVID-19 patients had been admitted, of whom 165 were considered critical, requiring intensive care unit (ICU) (Figure 3)⁵.

One point that differs from other studies is that we did surgery on the day of the admission in 81.1% of our cases. Only 2 cases had a hospital admission prior to our surgery, one because of polytrauma in the COVID-19 positive patient, and the other one due to a concomitant proximal femur fracture. The overall mean hospital length stay was 2.2 days (range 1-4), although we excluded the polytrauma patient, because he was COVID-19 positive before surgery and stayed to the date of this paper due to his spinal surgery.

In the Spanish HIP-COVID Investigation Group study, the mean delay from presentation to the surgical procedure was 2.4 days. They did not report the overall median hospital length. In that study of 62 patients who were tested for COVID-19, 23 patients were positive¹⁰. In a study of 305 patients admitted to gastrointestinal surgery services, Luong-Nguyen et al⁷ had 15 patients (4.9%) develop a nosocomial infection with SARS-Cov-2. In 12 patients (80%), the diagnosis was made after a hospital stay of more than 14 days (15-63 days)⁷. A report of 138 hospitalized patients from a single institution in Wuhan indicated that hospital-acquired transmission accounted for 41.3% of these admitted patients, thus implicating the hospital environment as a source of spread of the virus. Among those discharged alive, the median hospital stay was 10 days (IQR, 7.0-14.0)¹⁸.

From an epidemiological perspective, nosocomial infection is a time-dependent event, although other factors can contribute to nosocomial infection⁴. However, in our study with a mean hospital stay of 2.2 days, we had excellent outcomes with respect to COVID-19 nosocomial infection. No COVID-19 infection was reported in the shoulder surgeons that performed the surgeries.

214

215 It is known that COVID-19 has forced 1000s of healthcare workers out of action in
216 Europe⁹. As of 25 April 2020, more than 35,000 healthcare workers were infected in Spain
217 ¹⁶. Every possible effort is important to create a feeling of healthcare provider protection. In
218 our study, 3 patients had abnormal laboratory data with an increase in white blood-cell
219 count and D-dimer, despite having a negative RT-PCR for COVID-19 and normal chest
220 radiographs.

221

222 We recommend that surgical draping start by covering the head, instead of starting at the
223 axilla. With our protocol, no surgical wound infection developed in our patients at an early
224 follow-up. Also, depending on the severity of the epidemic and available resources, the risk
225 and benefits of performing shoulder surgical procedures should be carefully assessed. In
226 locations with widespread infections and limited resources, the risk of shoulder surgical
227 procedures for the patient and the community may outweigh the benefit. Hospital beds,
228 surgical masks, and other PPE are in enormous demand around the world.

229

230 Our study has several notable limitations. The sample size of the present study was small
231 with a short follow-up. However, this is understandable because all surgeries around the
232 world have decreased because the COVID-19 pandemic. Additionally, only 7 patients had
233 RT-PCR for COVID-19 before surgery, however, none developed SARS-CoV-2 infection
234 after surgery, and no respiratory symptoms were recorded during follow-up.

235

236 **Conclusion**

237 With good preoperative management that included RT-PCR for COVID-19 and chest
238 radiographs, protective measures for the surgical team, and rapid patient discharge, we
239 were able to operate on 11 humeral fractures with no COVID-19 nosocomial intrahospital
240 infection in the patients or the shoulder surgeons who performed the surgeries.

References

1. Acter T, Uddin N, Das J, Akhter A, Choudhury TR, Kim S. Evolution of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) as coronavirus disease 2019 (COVID-19) pandemic: A global health emergency. *Sci Total Env.* 2020 Apr 30 [Epub ahead of print]. doi: 10.1016/j.scitotenv.2020.138996.
2. Aminian A, Safari S, Razeghian-Jahromi A, Ghorbani M, Delaney CP. COVID-19 Outbreak and Surgical Practice. *Ann. Surg.* 2020 Mar 26 [Epub ahead of print]. doi:10.1097/sla.0000000000003925
3. Bell JE, Leung BC, Spratt KF, Koval KJ, Weinstein JD, Goodman DC, Tosteson AN. Trends and variation in incidence, surgical treatment, and repeat surgery of proximal humeral fractures in the elderly. *J Bone Joint Surg Am.* 2011;93(2):121–131. doi:10.2106/JBJS.I.01505
4. Beyersmann J, Kneib T, Schumacher M, Gastmeier P. Nosocomial Infection, Length of Stay, and Time-Dependent Bias. *Infect Control Hosp Epidemiol.* 2009;30(3):273–276. doi:10.1086/596020
5. Hospital Universitario Vall d' Hebron. Dades actualització situació COVID-19 - Evolució Ingressos i Altes Hospitalització. 2020 <https://hospital.vallhebron.com/es/enfermedades/coronavirus-sars-cov-2> (12 May 2020, date last accessed)
6. Lauer SA, Grantz KH, Bi Q, Jones FK, Zheng Q, Meredith HR, et al. The Incubation Period of Coronavirus Disease 2019 (COVID-19) From Publicly Reported

Confirmed Cases: Estimation and Application. *Ann Intern Med.* 2020 Mar 20 [Epub ahead of print]. doi:10.7326/M20-0504

7. Luong-Nguyen M, Hermand H, Abdalla S, Cabrit N, Hobeika C, Brouquet A, et al. Nosocomial infection with SARS-Cov-2 within Departments of Digestive Surgery. *J Visc Surg.* 2020 April 24 [Epub ahead of print]. doi:10.1016/j.jviscsurg.2020.04.016

8. Mi B, Chen L, Xiong Y, Xue H, Zhou W, Liu G. Characteristics and Early Prognosis of COVID-19 Infection in Fracture Patients. *J Bone Joint Surg Am.* 2020 Apr 1 [Epub ahead of print]. doi:10.2106/jbjs.20.00390

9. Minder R. Virus Knocks Thousands of Health Workers Out of Action in Europe. *The New York Times.* <https://www.nytimes.com/2020/03/24/world/europe/coronavirus-europe-covid-19.html> (Accessed 17 March 2020)

10. Muñoz Vives JM, Jornet-Gibert M, Cámara-Cabrera J, Esteban PL, Brunet L, Delgado-Flores L, et al. Mortality Rates of Patients with Proximal Femoral Fracture in a Worldwide Pandemic Preliminary Results of the Spanish HIP-COVID Observational Study. *J Bone Joint Surg Am.* 2020 May 6 [Epub ahead of print]. doi:10.2106/JBJS.20.00686

11. Nuñez JH, Sallent A, Lakhani K, Guerra-Farfan E, Vidal N, Ekhtiari S, Minguell J. Impact of the COVID-19 Pandemic on an Emergency Traumatology Service: Experience at a Tertiary Trauma Centre in Spain. *Injury.* 2020 May 12 [Epub ahead of print]. doi:10.1016/j.injury.2020.05.016

- 283 12. Orser BA. Recommendations for Endotracheal Intubation of COVID-19 Patients.
 284 Anesth Analg. 2020;130(5):1109–1110. doi:10.1213/ANE.0000000000004803
- 285 13. Prada C, Chang Y, Poolman R, Johal H, Bhandari M. Best Practice for Surgeons.
 286 COVID-19 Evidence-Based Scoping Review A Unifying Report of Global
 287 Recommendations. <https://myorthoevidence.com/covid19> (12 April 2020, date last
 288 accessed)
- 289 14. Ramanathan K, Antognini D, Combes A, Paden M, Zakhary B, Ogino M, et al.
 290 Health-care Development Planning and provision of ECMO services for severe
 291 ARDS during the COVID-19 pandemic and other outbreaks of emerging infectious
 292 diseases. Lancet Respir. 2020;8(5):518-526. doi:10.1016/S2213-2600(20)30121-1
- 293 15. Rangan A, Handoll H, Brealey S, Jefferson L, Keding A, Martin BC, et al. Surgical
 294 vs nonsurgical treatment of adults with displaced fractures of the proximal humerus
 295 the PROFHER randomized clinical trial. JAMA. 2015;313(10):1037–1047.
 296 doi:10.1001/jama.2015.1629
- 297 16. Urrea S. Spain ranks first for Covid-19 infections among healthcare workers. El País.
 298 [https://english.elpais.com/spanish_news/2020-04-25/spain-ranks-first-for-covid-19-](https://english.elpais.com/spanish_news/2020-04-25/spain-ranks-first-for-covid-19-infections-among-healthcare-workers.html)
 299 [infections-among-healthcare-workers.html](https://english.elpais.com/spanish_news/2020-04-25/spain-ranks-first-for-covid-19-infections-among-healthcare-workers.html) (25 April 2020, date last accessed)
- 300 17. World Health Organization (WHO). <https://ourworldindata.org/coronavirus>. (8 June
 301 2020, date last accessed)
- 302 18. Yu J, Ouyang W, Chua MLK, Xie C. SARS-CoV-2 Transmission in Patients with
 303 Cancer at a Tertiary Care Hospital in Wuhan, China. JAMA Oncol. 2020 Mar 25

- 304 [Epub ahead of print]. doi:10.1001/jamaoncol.2020.0980
- 305 19. Zhu Y, Chen W, Xin X, Yin Y, Hu J, Lv H, et al. Epidemiologic characteristics of
306 traumatic fractures in elderly patients during the outbreak of coronavirus disease
307 2019 in China. *Int. Orthop.* 2020 Apr 29 [Epub ahead of print]. doi:10.1007/s00264-
308 020-04575-0

Tables

Table 1. Description of personal protective equipment (PPE).

Table 2. Demographic, Clinical and Laboratory Data for Patients who underwent surgery in our study.

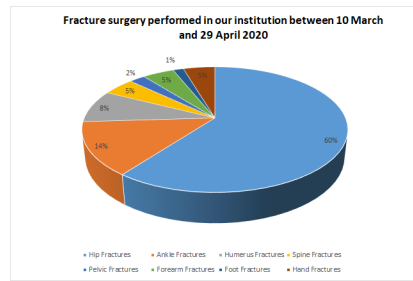
Figure Legends

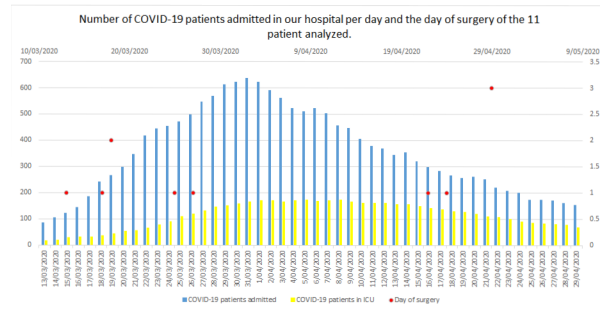
Figure 1: Photographs of our personal protective equipment (PPE)

Figure 2: Fracture surgery performed in our institution between 10 March and 25 April 2020. Humeral fracture fixation was the third most common surgery for fracture in our institution after hip fracture and ankle fractures during this period.

Figure 3: Number of COVID-19 patients admitted in our hospital per day and the day of surgery of the 11th patient.







1 **Tables**2 **Table 1.** Description of personal protective equipment (PPE).

3

Description of personal protective equipment (PPE)
<p>1. Waterproof gown</p> <p>2. Mask. The conventional surgical mask does not offer protection if aerosols exist. The type of mask that is required includes the N95 and FFP2/FFP3 masks (which filter 96 and 99% of organisms, respectively). It is preferable to use masks without valves, since masks with valves do not protect patients from our microorganisms. We recommend wearing a surgical mask over a N95 or FFP2/FFP3 mask.</p> <p>3. Glasses. Because of the power tools, aerosols are produced during procedures, so that complete ocular screen coverage is essential.</p> <p>4. Full face coverage screen. This does not protect from aerosols, but is necessary when there is a risk of splashing (blood, vomiting or other biological fluids).</p> <p>5. Sterile gloves (2 pairs)</p> <p>6. Cap. It is a good idea for all staff with long hair to have it fully tied up in a low bun and properly restrained.</p> <p>7. Exclusive footwear for the area of activity, without perforations. We recommend long boots for arthroscopy.</p> <p>Once the PPE is in place, surgical scrubbing with an alcohol gel will be performed on the surgical gloves, and sterile equipment necessary for the surgical intervention (gown and sterile gloves) will be placed on the PPE.</p>

4 %: Percentage, PPE: Personal protective equipment

1 **Tables**2 **Table 2.** Demographic, Clinical and Laboratory Data for Patients who underwent surgery in our study.

3

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9	Case 10	Case 11
Sex	Female	Female	Female	Female	Male	Male	Female	Female	Male	Female	Male
Age (years)	86	74	64	58	55	43	84	73	50	60	66
ASA score	II	II	II	II	II	II	II	II	II	II	II
Comorbidity	HBP, DLP, A-fib	HBP	DLP	Fibromyalgia	Diabetes, DLP, BPH	Polytrauma with Thoracic vertebral fracture, pelvis fracture, PFF	Diabetes, Hypothyroidism, DLP	Asthma, DLP, PFF	HBP	HBP	HBP
Orthopaedic Diagnosis	Proximal Humerus Fracture	Humerus Shaft Fracture	Proximal Humerus Fracture	Proximal Humerus Fracture	Proximal Humerus Fracture	Proximal Humerus Fracture	Humerus Shaft Fracture	Proximal Humerus Fracture	Proximal Humerus Fracture	Proximal Humerus Fracture	Proximal Humerus Fracture
Orthopaedic Procedure	rTSA	ORIF with humeral nail and cerclages	ORIF with proximal humeral plate	ORIF with proximal humeral plate	ORIF with proximal humeral plate	ORIF with proximal humeral plate	ORIF with humeral nail and cerclages	ORIF with proximal humeral plate	ORIF with proximal humeral plate	ORIF with proximal humeral plate	ORIF with proximal humeral plate
Date of Fracture	March 04, 2020	March 13, 2020	March 14, 2020	March 15, 2020	March 21,2020	February 28, 2020	April 02, 2020	April 21, 2020	April 22, 2020	April 25, 2020	April 22, 2020
Date of Admission	March 13, 2020	March 17, 2020	March 18,2020	March 18,2020	March 25,2020	February 28, 2020	April 22, 2020	April 21, 2020	April 29, 2020	April 29, 2020	April 29, 2020
Orthopaedic Operation	March 13, 2020	March 17, 2020	March 18, 2020	March 18, 2020	March 25, 2020	March 27, 2020	April 22, 2020	April 24, 2020	April 29, 2020	April 29, 2020	April 29, 2020
Date of Discharge	March 16, 2020	March 20, 2020	March 19, 2020	March 20,2020	March 27, 2020	Remained in hospital	April0 25, 2020	April 26, 2020	April0 30, 2020	May 1, 2020	May 7, 2020
Surgical duration (minutes)	80	110	84	80	75	150	100	90	95	160	90
Hospital Length	3	3	1	2	2	Remained in	3	5	1	3	1

Stay (days)	hospital										
Laboratory test results											
Hemoglobin (g/dL)	12.9	11.9	13	14.6	14	12	13.2	15.2	13.1	13.7	14.1
White blood-cell count ($\times 10^9/L$)	17.2	12.2	10.62	6.97	15.63	10.78	5.79	13.2	10.9	17.66	7.4
Neutrophil count ($\times 10^9/L$)	14.4	7.9	6.9	4.1	12.3	8.2	3.4	9.4	8	15.6	5.6
Lymphocyte count ($\times 10^9/L$)	1.8	2.9	2.2	2	1.3	1.6	1.8	2.8	1.8	0.8	1.2
Monocyte count ($\times 10^9/L$)	0.9	1.1	1.5	0.7	1.5	0.6	0.5	0.7	1	1.3	0.5
Platelet count ($\times 10^9/L$)	264	256	288	253	189	647	249	269	298	258	250
aPTT (s)	26	26.4	31.1	27.8	26.6	28.3	28.8	22.9	34.3	29.7	30.1
PT (s)	16.1	11.9	11.3	10.9	12.8	14.6	13.1	11.5	12.2	13.1	13.1
Albumin (g/L)	3.3	3.7	3.2	3.7	3.7	2.7	4.1	NA	3.8	NA	4.7
ALT (U/L)	10	17	22	24	62	95	10	15	11	13	35
AST (U/L)	22	18	31	24	73	27	15	24	18	19	26
Total bilirubin (mg/dL)	NA	0.75	0.77	0.67	0.78	0.42	NA	0.68	NA	0.48	NA
Blood urea nitrogen (mg/dL)	56	47	44	51	32	28	33	54	15	35	46
Creatinine (mg/dL)	1.44	0.88	0.54	0.59	1.08	0.37	0.7	0.72	0.49	0.64	0.84
C-reactive protein (mg/dL)	0.70	1.45	0.75	0.39	1.41	2.76	0.24	0.27	0.75	0.24	0.39
IL-6	NA	NA	NA	NA	NA	17.1	NA	72.7	NA	25.23	NA

(pg/mL)											
D-dimer (ng/mL)	NA	NA	NA	NA	NA	710	NA	7780	NA	4743	NA
SARS-CoV-2 quantitative RT- PCR	NA	NA	NA	NA	NEGATIVE	POSITIVE	NEGATIVE	NEGATIVE	NEGATIVE	NEGATIVE	NEGATIVE
Chest X-ray	Lungs and pleural spaces were clear	Lungs and pleural spaces were clear	Lungs and pleural spaces were clear	Lungs and pleural spaces were clear	Lungs and pleural spaces were clear	Unilateral patchy consolidation	Lungs and pleural spaces were clear	Lungs and pleural spaces were clear	Lungs and pleural spaces were clear	Lungs and pleural spaces were clear	Lungs and pleural spaces were clear

HBP: high blood pressure; DLP: Dyslipidemia; A-fib: Atrial fibrillation; BHP: Benign prostatic hyperplasia; PFF: Proximal Femoral Fracture; rTSA: Reverser Total Shoulder Arthroplasty; aPTT: activated partial thromboplastin time; PT: prothrombin time; ALT: alanine aminotransferase; AST: aspartate aminotransferase; IL: interleukin; RT-PCR: Reverse transcription polymerase chain reaction.