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RT-PCR testing should be performed prior to elective orthopaedic surgery during the COVID-19 pandemic

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An outbreak of novel coronavirus SARS-CoV-2-infected pneumonia in Wuhan City, China has caused a global health emergency, and the number of patients is continuing to increase. The spread of 2019 SARS-CoV-2 disease (COVID-19) has created a pandemic. SARS-CoV-2 belongs to the \( \beta \) genus of the new coronavirus. The pneumonia caused by this coronavirus resembles that in severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome [1]. In the absence of specific therapeutic drugs or vaccines for COVID-19, it is essential to detect the disease at an early stage and immediately isolate infected patients. Critical now as we contemplate re-establishing normalcy, is the prevention of further spread of COVID-19 and limiting of the possibility and extent of a “second wave”.

Lei et al. reported the clinical characteristics and outcomes of patients who were unintentionally scheduled for elective surgeries during the SARS-CoV-2 incubation period following exposure. This retrospective cohort study showed that 44.1% of patients needed ICU care, and the mortality was 20.5% [2].

On May 8th 2020, the International Consensus Group provided guidelines to resume elective orthopaedic surgery during the COVID-19 pandemic. Of critical importance when considering these guidelines is understanding which practices and protocols should be altered or implemented in order to minimize the risk of pathogen transfer. It has been recommended that each hospital and health system should consider their unique situation in terms of COVID-19 prevalence, staffing capabilities, and personal protection equipment supply, when determining how and when to implement these guidelines [3].

The Japanese Orthopaedic Association has requested that the Ministry of Health, Labor and Welfare adopt reverse transcription-polymerase chain reaction (RT-PCR) testing for SARS-CoV-2 prior to elective orthopaedic surgery across the National Health System.

The purpose of the present retrospective study was to evaluate the preoperative testings for elective orthopaedic surgery during the COVID-19 pandemic.

1. Methods

This was a retrospective observational study conducted at a secondary emergency hospital. Our hospital is located near the nursing home that produced the first cluster of COVID-19 cases in Hyogo prefecture. Fifty consecutive patients who underwent elective orthopaedic surgery from May 15th to June 12th, 2020 were included. The institutional review board of our hospital approved this retrospective study, and the need for written informed consent was waived. Information on TOCC (travel, occupation, contact, cluster) risk factors were documented for each patient. Screening for COVID-19 symptoms (fever, cough, dyspnea, myalgia or fatigue, headache, sneeze, sputum production, pharyngalgia, gastrointestinal discomfort, diarrhea, no appetite) was carried out and results documented. If patients presented with TOCC risk factors and/or exhibited symptoms, they were referred to a COVID-19 outpatient clinic. Thus, none of the included patients exhibited TOCC risk factors or COVID-19 symptoms. Chest computed tomography (CT), RT-PCR, and tests for SARS-CoV-2 IgG and IgM antibodies were performed prior to elective orthopaedic surgery. All images were obtained on a VCT system (GE, America) with patients in a supine position. The main scanning parameters were as follows: tube voltage = 120 kVp, automatic tube current modulation = 30–70 mAs, pitch = 1.375 mm, matrix = 512 × 512, slice thickness = 2.5 mm, field of view = 350 mm × 350 mm. All images were then reconstructed with a slice thickness of...
0.675 mm with the same increment. Radiologists reviewed the CT images and decided whether patients were positive or negative for COVID-19 pneumonia. The CT images were assessed following a standardized protocol. Clinicians looked for the presence and distribution of the following abnormalities: ground-glass opacities, nodules, linear densities, crazy paving, consolidations, architectural distortion, or traction bronchiectasis, pleural effusion, lymphadenopathy, air bronchogram, tree-in-bud signs, and white lung. The epidemiological history and clinical symptoms were accessible to the radiologists. RT-PCR testing on samples taken from the nasal pharynx was performed three to five days prior to admission. The RT-PCR assays were performed using LightMix Modular SARS and Wuhan CoV E-gene- N-gene (Roche Co., Ltd., Switzerland). An antibody testing for IgG and IgM was performed on the day of admission using the ALLTEST 2019-nCoV IgG/IgM Rapid Test Cassette (Hangzhou ALLTEST Biotech Co., Ltd., Hangzhou, China).

2. Results

Patient’ characteristics are presented in the Table. We enrolled 50 consecutive patients (15 men and 35 women), with a median age of 74 years (range, 30–97 years) who were admitted to our hospital. As shown in the Table, there were 42 general anesthesia and 8 conduction anesthesia. Chest CT showed 17 abnormalities, but no typical signs of COVID-19 pneumonia. All patients had negative results from RT-PCR and IgM testing. One female patient showed positive IgG (2%), and one male patient showed borderline IgG (2%). The female patient was 67 years old and had been very cautious. Her medical history included right total knee arthroplasty, and the laboratory findings were positive for human T-cell lymphotropic virus type 1. When the COVID-19 pandemic began, she was vigilant to hand hygiene, wore a mask, and had maintained social distancing since March 2020. She had no TOCC risk factors and showed no COVID-19 symptoms but was evidently a healed

### Table

| Sex | Age | Orthopaedic Diagnosis | Ope | anesthesia | PCR | IgG | IgM | CT findings |
|-----|-----|-----------------------|-----|------------|-----|-----|-----|-------------|
| F   | 80  | hip osteoarthritis    | THA | general    |     |     |     | negative    |
| F   | 64  | hip osteoarthritis    | THA | general    |     |     |     | negative    |
| M   | 52  | knee osteoarthritis   | TKA | general    |     |     |     | negative    |
| F   | 72  | olecranon fracture    | ORIF| general    |     |     |     | negative    |
| M   | 48  | luber disc hernia     | Love| general    |     |     |     | negative    |
| M   | 70  | knee osteoarthritis   | TKA | general    |     |     |     | negative    |
| F   | 79  | hip fracture          | BHA | general    |     |     |     | negative    |
| F   | 83  | humerus fracture      | ORIF| general    |     |     |     | negative    |
| F   | 66  | cervical spondylosis  | laminoplasty| general|     |     |     | negative    |
| F   | 71  | hip and knee osteoarthritis | TKA | general    |     |     |     | negative    |
| F   | 77  | hip osteoarthritis    | THA | general    |     |     |     | interstitial pneumonia negative |
| F   | 88  | clavicle fracture     | ORIF| general    |     |     |     | negative    |
| M   | 79  | lumbar canal stenosis | L2/3FN L3/4/5PLIF | general |     |     |     | negative    |
| M   | 76  | rheumatoid arthritis  | TKA | general    |     |     |     | negative    |
| M   | 30  | ankle fracture        | ORIF| general    |     |     |     | negative    |
| M   | 73  | knee osteoarthritis   | TKA | general    |     |     |     | negative    |
| F   | 83  | hip fracture          | BHA | general    |     |     |     | negative    |
| F   | 90  | hip fracture          | BHA | general    |     |     |     | negative    |
| M   | 48  | radius fracture       | ORIF| general    |     |     |     | negative    |
| F   | 87  | radius fracture       | ORIF| general    |     |     |     | old inflammation negative |
| F   | 50  | humerus fracture      | ORIF| general    |     |     |     | negative    |
| F   | 90  | hip fracture          | BHA | general    |     |     |     | negative    |
| M   | 82  | lumbar canal stenosis | L3/4/5 TLIF 2/3 fenestration| general |     |     |     | negative    |
| F   | 72  | hip osteoarthritis    | THA | general    |     |     |     | negative    |
| F   | 75  | tibia fracture        | ORIF| general    |     |     |     | negative    |
| F   | 87  | suppurative arthritis | lesion curettage | general |     |     |     | negative    |
| F   | 65  | radius fracture       | ORIF| general    |     |     |     | negative    |
| F   | 72  | radius fracture       | ORIF| general    |     |     |     | negative    |
| F   | 97  | hip fracture          | ORIF| general    |     |     |     | negative    |
| F   | 66  | lumbar fracture       | extraction| general |     |     |     | negative    |
| M   | 69  | lumbar disc hernia    | Love| general    |     |     |     | negative    |
| F   | 67  | knee osteoarthritis   | TKA | general    |     |     |     | bilateral nodules negative |
| F   | 82  | knee osteonecrosis    | THA | general    |     |     |     | interstitial pneumonia negative |
| F   | 49  | radius fracture       | ORIF| general    |     |     |     | left old inflammation negative |
| F   | 57  | humerus fracture      | ORIF| general    |     |     |     | negative    |
| F   | 95  | hip fracture          | ORIF| general    |     |     |     | negative    |
| F   | 68  | hip osteoarthritis    | THA | general    |     |     |     | bilateral nodules negative |
| F   | 79  | knee osteoarthritis   | TKA | general    |     |     |     | negative    |
| M   | 74  | radius fracture       | extraction| general |     |     |     | negative    |
| M   | 51  | ulnar tunnel syndrome | neurolysis| general |     |     |     | negative    |
| F   | 43  | luber disc hernia     | PLIF| general    |     |     |     | negative    |
| F   | 67  | lumbar canal stenosis | TLIF| general    |     |     |     | right ground-glass negative |
| F   | 81  | knee osteoarthritis   | TKA | general    |     |     |     | negative    |
| M   | 51  | hip osteoarthritis    | THA | general    |     |     |     | negative    |
| M   | 58  | hip osteoarthritis    | THA | general    |     |     |     | negative    |
| F   | 79  | knee osteoarthritis   | TKA | general    |     |     |     | negative    |
| F   | 81  | knee osteoarthritis   | TKA | general    |     |     |     | negative    |
| F   | 84  | hip fracture          | ORIF| general    |     |     |     | negative    |
| M   | 94  | hip fracture          | ORIF| general    |     |     |     | negative    |
| F   | 81  | hip fracture          | ORIF| general    |     |     |     | interstitial pneumonia negative |
asymptomatic patient. Post admission, she received left total knee arthroplasty and showed excellent knee function with no complications. The male patient was 51 years old and had a diagnosis of ulnar tunnel syndrome. He had no medical history, and there were no abnormal laboratory findings. He had also been vigilant with hand hygiene, worn a mask, and maintained social distancing since April 2020. Post admission, neurolysis was performed, and he showed good recovery of ulnar nerve function without complications.

3. Discussion

The most important finding of the present study was that 1 in 50 (2%) patients was positive for IgG antibody and 1 in 50 (2%) patients was borderline positive for IgG antibody. Borderline positive IgG antibody patient was considered for those already infected based on general information such as TOCC risk factors, COVID-19 symptoms, Chest CT findings, RT-PCR, and negative IgM anybody. These results reveal the existence of healed asymptomatic COVID-19 patients. San Miguel County, Colorado reported that SARS CoV-2 IgG antibody tests were performed county-wide in March and April 2020. Some 29 of 5455 tested individuals (0.53%) were IgG positive, and 79 (1.45%) were borderline. Our results had a high IgG positive rate; however, this could be due to our relatively small patients numbers when compared with the San Miguel population.

Lei et al. revealed the clinical characteristics and outcomes of the patients who were unintentionally scheduled for elective surgery during the SARS-CoV-2 incubation period following exposure. This retrospective cohort study found that 44.1% of patients needed ICU care, and the mortality was 20.5% [2]. Mi et al. reported four out of 10 SARS-CoV-2 infected fracture patients died after admission [4]. Therefore, we decided to undergo operation for only negative RT-PCR patient. In the present study, all elective orthopaedic surgery patients who underwent operation showed good clinical progress without complications. Our results support those of these reports, since none of our patients had COVID-19. These results suggest that patients with COVID-19 should not undergo elective surgery.

Ai et al. suggested that with RT-PCR results as a reference, the sensitivity, specificity, and accuracy of chest CT in cases of COVID-19 were 97% (95% CI 95–98%, 580/601 patients), 25% (95% CI 22–30%, 105/413 patients), and 68% (95% CI 65–70%, 685–1014 patients), respectively [5]. Our findings, that all negative RT-PCR patients gave COVID-19 negative CT images, are compatible with their results.

Many orthopaedic surgical procedures are life or limb-saving and cannot be postponed during the COVID-19 pandemic because of potential patient harm. Our goal is to analyze how orthopaedic surgeons can perform medically necessary procedures during the pandemic and to find guide decision-making perioperatively. We advocate that elective orthopaedic surgery should be performed using information on TOCC risk factors and preoperative RT-PCR testing during the COVID-19 pandemic. Our study has notable one limitation. The sample size was small, therefore increasing the probability of selection bias. However, we can confidently assert that RT-PCR is essential for detecting patients with COVID-19.

In conclusion, we evaluated the preoperative tests for elective orthopaedic surgery during the COVID-19 pandemic. RT-PCR testing should be performed prior to undergoing elective orthopaedic surgery during the COVID-19 pandemic.

Declaration of competing interest

None.

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