

**To Establish a Standardized Diagnosis and Treatment Process and  
Perioperative Protection Strategy for Osteoporotic Vertebral  
Compression Fracture during the Prevention and Control of  
COVID-19**

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**Abstract**

**Objective:** To establish a standardized diagnosis and treatment process and perioperative protection strategy for osteoporotic vertebral compression fracture during the prevention and control of COVID-19, to improve the diagnosis and treatment rate of OVCF patients with COVID-19, and to prevent infection transmission and nosocomial cross-infection.

**Methods:** (1) Establish the screening process for OVCF patients during emergency and outpatient visits during epidemic prevention and control; (2) The latest national standards and consensus on epidemic prevention and control; (3) Relevant literature at home and abroad.

**Results:** (1) Establish the screening process for OVCF patients during the epidemic prevention and control period; (2) Establish standardized diagnostic criteria for OVCF and COVID-19; (3) Establish the clinical classification criteria of OVCF patients diagnosed with COVID-19; (4) Formulate the treatment process for

OVCF patients with COVID-19 according to clinical classification; (5) Establish perioperative protection strategies for OVCF patients with confirmed COVID-19.

**Conclusions:** The implementation of standardized diagnosis and treatment process and perioperative protection strategy of OVCF during the prevention and control of COVID-19 has a guiding role in promoting scientific and effective treatment of patients and ensuring stable, orderly and safe medical treatment.

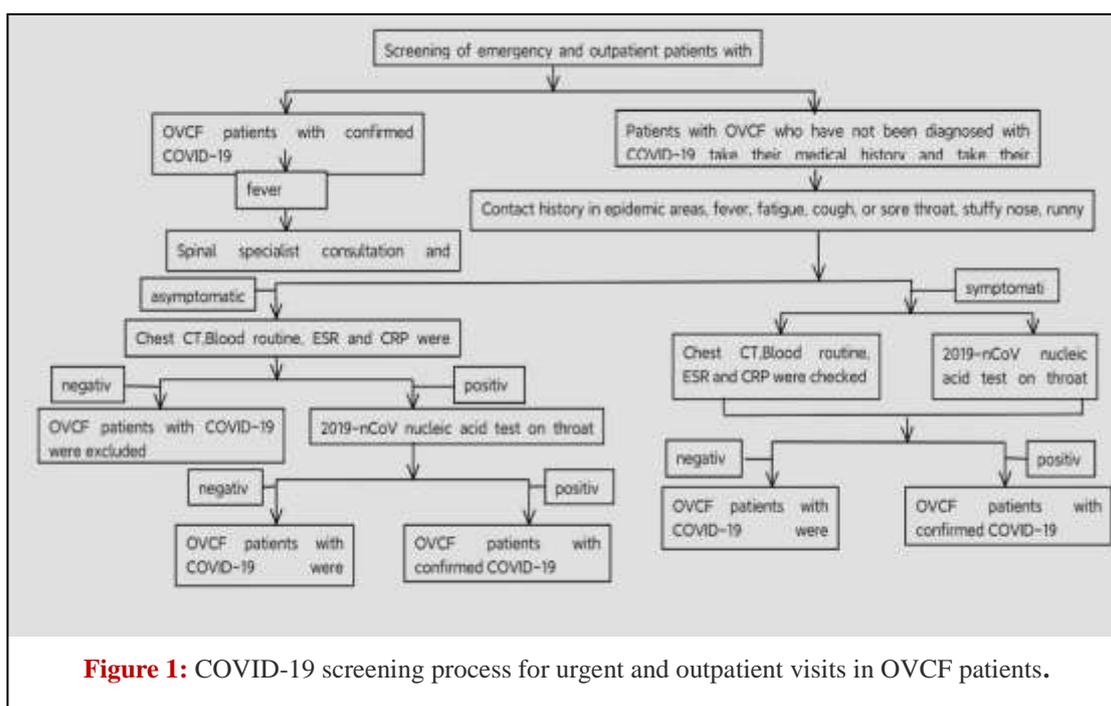
**Keywords:** COVID-19; Infection prevention and control; Osteoporotic vertebral compression fractures; Standardization; Clinical diagnosis and treatment; Process of disposal; Perioperative management; Protection strategy

## **Introduction**

Novel Coronavirus Pneumonia (NCP) is mainly caused by 2019 novel coronavirus (2019-ncov). The World Health Organization (WHO) named NCP as 2019 Corona Virus Disease (COVID-19) [1]. COVID-19 spreads rapidly, is highly virulent, and the population is highly susceptible. Especially the elderly has many complications and high mortality. Osteoporosis Vertebra Compressed Fracture (OVCF) is the most common fracture in the elderly. Due to severe pain and long-term bed rest, complications such as hypostasis pneumonia, pressure ulcers and deep vein thrombosis of lower limbs occur. In addition, it leads to the aggravation of various diseases in the internal medicine of the elderly and has a high fatality rate. Urgent treatment is required for OVCF in patients with or without COVID-19 during epidemic prevention and control. It is of great significance to formulate a scientific diagnosis and treatment plan during epidemic prevention and control to guide the standardized treatment of OVCF patients with suspected or confirmed COVID-19. From January 2020 to October 2022, the authors admitted 580 OVCF patients during the COVID-19 epidemic prevention and control period. By standardizing the examination process of OVCF patients suspected or confirmed with COVID-19 in emergency and outpatient clinics, the OVCF patients excluded or confirmed with COVID-19 were scientifically classified according to the degree of disease. In addition, the standardized diagnosis and treatment process and perioperative protection strategy have achieved good clinical results, with good prognosis of patients, no cross-infection in the hospital, and zero infection rate of medical staff. The experience is summarized as follows.

## Establish the Screening Process for OVCF Patients during Emergency and Outpatient Visits during Epidemic Prevention and Control

During the epidemic prevention and control period, emergency and outpatient medical staff shall be protected according to the three-level COVID-19 protection measures. Ordinary patients with OVCF as the first symptom should be regarded as suspected patients when they visit emergency and outpatient clinics during the epidemic prevention and control period. Firstly, COVID-19 screening was carried out according to the Prevention and Control Plan of the Novel Coronavirus Pneumonia (ninth edition) [1], and relevant tests and examinations were carried out for urgent and outpatient screening of OVCF patients suspected of COVID-19 according to the flow chart (Figure 1). OVCF patients who have been diagnosed with COVID-19 should be treated in the fever clinic, which should apply for spinal surgery specialist consultation, and the personal three-level protection of medical staff should be done in advance [2]. All COVID-19 patients, including suspected and confirmed patients, are strictly isolated in designated medical institutions.



## Establish Standardized Diagnostic Criteria for OVCF and COVID-19

### Diagnostic criteria for OVCF

The diagnosis of OVCF is mainly based on the patient's age, gender, menopause history, brittle fracture history, clinical manifestations, imaging and/or bone mineral density examination results. The typical symptoms of OVCF are low back pain, physical examination shows limited spinal movement, fractured vertebral tenderness

and percussion pain, kyphosis and loss of height. The diagnosis of OVCF is mainly based on imaging findings that the height of the anterior, middle or posterior vertebral body decreases by more than 20%, or the height of the vertebral body decreases by 4 mm compared with the baseline vertebral body [3]. Clinically, it is divided into mild, moderate and severe OVCF. Mild OVCF compression is 20-25% at the height of the original vertebral body, moderate OVCF compression is 25-40%, and severe OVCF compression is more than 40% [3].

### **Diagnostic criteria for COVID-19**

A diagnosis of COVID-19 must meet any of the following criteria [4]: (1) 2019-nCoV nucleic acid was positive by RT-PCR; (2) Viral gene sequencing, highly homologous to the known 2019-nCoV. In the early stage of COVID-19, the peripheral blood lymphocyte count of most patients decreased, and C-Reactive Protein (CRP) and Erythrocyte Sedimentation Rate (ESR) increased. 2019-nCoV nucleic acid can be detected in nasopharyngeal swabs, sputum, lower respiratory tract secretions, blood, stool and other specimens. Chest CT showed signs of pneumonia. COVID-19 is clinically divided into mild, common, severe and critical types [4].

**Mild type:** the clinical symptoms are mild, and there is no evidence of pneumonia on imaging. **Common type:** with fever, respiratory symptoms, imaging can be seen pneumonia. **Severe type:** (1) Respiratory rate  $\geq 30$  times /min; (2) Oxygen saturation  $\leq 93\%$  in resting state; (3) arterial partial pressure of oxygen (PaO<sub>2</sub>)/ oxygen uptake concentration (FiO<sub>2</sub>)  $\leq 300$  mmHg (1 mmHg = 0.133kPa); (4) Lung imaging showed significant lesion progression  $>50\%$  within 24 to 48 hours. **Critical type:** (1) Respiratory failure and need mechanical ventilation; (2) The appearance of shock; (3) Patients with other organ failure need ICU care and treatment.

### **Establish the Clinical Classification Criteria for OVCF Patients Diagnosed with COVID-19**

OVCF patients diagnosed with COVID-19 were comprehensively classified according to the degree of osteoporotic spinal compression fracture combined with the degree of COVID-19. The classification criteria were as follows: (1) Mild and moderate were defined as type I: Mild to moderate OVCF is associated with mild to common COVID-19. (2) Severe is type II : divided into three subtypes, ①Type IIa: severe OVCF with neurological dysfunction, while COVID-19 is mild and common; ②Type IIb: mild or moderate OVCF with severe COVID-19; ③Type IIc: severe OVCF with neurological dysfunction, while COVID-19 is severe; (3) Critical type is type III: no matter what degree of OVCF, as long as COVID-19 is clinically critical.

## **Formulate the Treatment Process for OVCF Patients with COVID-19 According to Clinical Classification**

### **Treatment principles**

For OVCF patients who have been excluded from COVID-19, the specific treatment plan shall be implemented according to the OVCF treatment guidelines during non-epidemic period [5]. Under the current epidemic prevention and control, the treatment methods for OVCF patients confirmed with COVID-19 include non-surgical treatment and surgical treatment. The general treatment principles are as follows: (1) Under the condition of giving priority to COVID-19 prevention and control, non-surgical or surgical treatment strategies should be formulated according to the clinical classification of patients. Non-surgical treatment should be adopted for types I, IIa and IIb, non-surgical treatment should be preferred for type IIc, or surgical treatment should be performed when the condition of COVID-19 is stable, and absolute surgical contraindication should be made for type III. At this time, treatment was carried out according to the COVID-19 critical protocol. (2) Surgical treatment still needs to be cautious. The basic principles are as follows: strictly grasp the surgical indications, and try not to perform surgery if possible; Can do small surgery as far as possible not to do major surgery, can do minimally invasive surgery as far as possible not to do open surgery; (3) Implement network Multidisciplinary collaboration Diagnosis and Treatment (MDT) to achieve the purpose of individualized treatment for OVCF patients in line with the background of epidemic prevention and control.

### **Implement individualized treatment plan according to clinical classification**

Individualized treatment regimens were implemented according to the clinical classification of OVCF patients confirmed with COVID-19 (Figure 2): (1) **Type I:** It is recommended to give priority to the isolation ward for preventive isolation and COVID-19 treatment, and non-surgical treatment for OVCF, including psychological care, dietary care, health education, reasonable analgesia, bed rest, appropriate activities under brace protection and drug therapy (calcium tablets + vitamin D+ anti-osteoporosis drugs). The reasons for not giving priority to minimally invasive surgery, namely Percutaneous Vertebroplasty (PVP) and Percutaneous Kyphoplasty (PKP), for such patients are: firstly, it does not interfere with the priority treatment of COVID-19; secondly, it prevents contamination of non-infected areas such as non-infected wards and operating rooms and reduces the risk of cross-infection in the hospital. (2) **Type II:** ① **Type IIa** If no surgical treatment will cause serious consequences to the patient after full evaluation before surgery and multidisciplinary consultation, minimally invasive surgery (PVP or PKP) under local anesthesia should be preferred under strict whole-process protection conditions, and immediately transferred to the infectious ward for COVID-19 treatment after surgery. ② **Type**

**IIb** Severe COVID-19 is a contraindication for surgery, and it is recommended to give priority to the isolation ward for COVID-19 treatment, while non-surgical treatment for OVCF. **③ Type IIc** The treatment is the same as type IIb, and active treatment of COVID-19 is given priority. Non-surgical treatment is given to OVCF, and spinal fracture surgery is performed after COVID-19 is stable or cured. **(3) Type III** The critical type of COVID-19 is an absolute contraindication for surgery. Under the three-level protection conditions of ICU, priority should be given to saving patients' lives, actively treating COVID-19, and preventing infection or cross-infection in the hospital [6].

### **Establish the Perioperative Protection Strategy for OVCF Patients with Confirmed COVID-19**

When the MDT medical team discusses and decides to take surgical treatment for OVCF patients with confirmed COVID-19, corresponding protective preparations and measures should be made in the anesthesiologist department, operating room and during transportation. It is particularly important to reduce nosocomial infection, prevent the local spread of the epidemic, and do a good job in the whole perioperative protection of COVID-19 patients [7].

#### **Preoperative protection strategy**

Surgical patients diagnosed with COVID-19 shall be escorted by special transport vehicles after wearing protective equipment by the operating room shuttle staff and sent to the special isolation area set up in the operating room through special channels and elevators to avoid contamination of the operating room. Surgical procedures should be carried out in a special infection-free operating room with negative pressure or radiation protection (intraoperative X-ray fluoroscopy is required). The operation can be carried out only when the negative pressure difference between the operating rooms is kept below -5 Pa [8]. All personnel participating in the operation were dressed according to three levels of protective standards: double disposable hats, N95 masks, disposable isolation surgical gowns and medical protective clothing, goggles and/or face mask, and double sterile gloves [9]. All medical supplies follow the principle of special personnel.

#### **Intraoperative protection strategy**

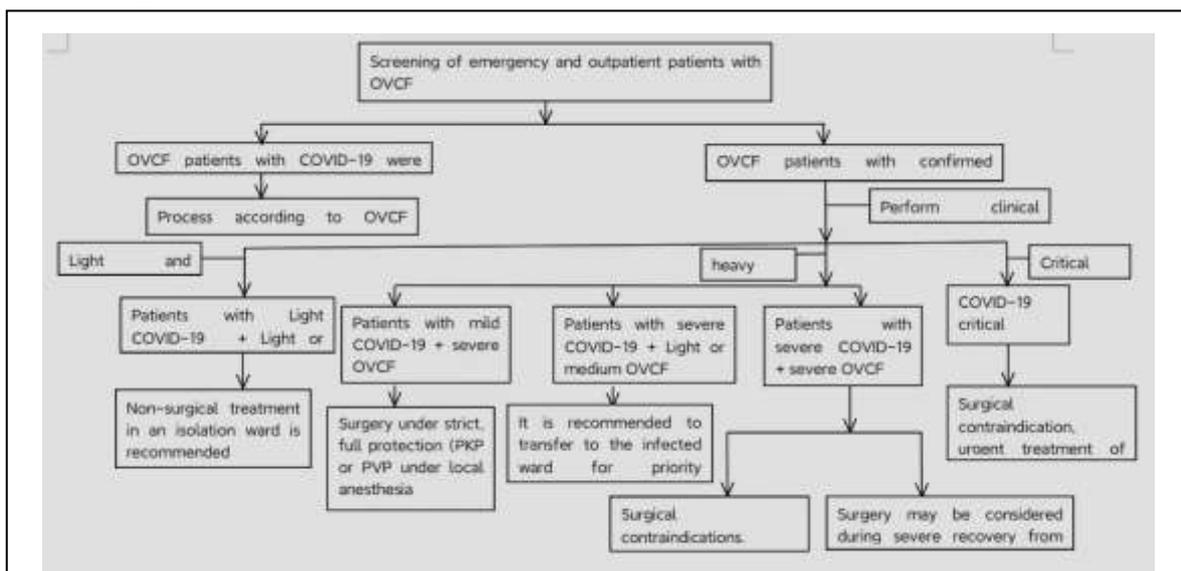
Intraoperative anesthesia to maintain sedation, muscle relaxation, reduce bucking. Isolation and protection should be strengthened during the operation, and patients' blood, secretions, excreta and possible aerosols should be protected during the operation [10]. Medical workers are not allowed to leave the isolation area wearing protective equipment, and should leave through a special channel after taking off protective equipment.

### Postoperative protection strategy

After the operation, the medical staff must first change the gloves, and then remove the operating gown and shoe cover and discard them in the medical waste bucket. After taking off the gloves, the standard hand disinfection should be carried out immediately, and the goggles, protective clothing, masks and hats should be removed in the buffer room of the operating room before leaving the operating room. Staff leaving the operating room must again wash their hands, disinfect their hands and wash their faces, as well as disinfect their noses. Patients were transported to designated wards for isolation and treatment according to specific routes. Items, walls, floors, transport vehicles and medical waste in the operating room must be strictly and thoroughly disinfected after operation; After disinfection treatment, sampling and testing are carried out, and the results can be used again only after passing [11,12]. It is recommended that the operating room be closed for more than 24 hours before the next operation can be carried out.

### Postoperative management of wards

Ordinary patients can be transferred to the general ward for continued treatment after surgery, but the precautions related to ward protection mentioned above should be strictly followed. Those with respiratory symptoms or fever after surgery should be isolated according to the criteria of suspected COVID-19, and nucleic acid test, chest CT, blood routine test, ESR, CRP, procalcitonin, D-dimer and blood biochemical test should be performed. Suspected or confirmed patients should be transferred to the designated isolation and care unit after surgery. When medical staff enter the isolation ward for diagnosis and treatment, they must strictly observe the third level of protection.



**Figure 2:** Clinical management process for OVCF patients with suspected and confirmed COVID-19.

## Conclusion

OVCF and COVID-19 are both prone to diseases in the elderly during the epidemic prevention and control period. Most elderly patients coexist with multiple underlying diseases, which are more likely to lead to complications. OVCF patients diagnosed with COVID-19 have a high mortality rate if they are not treated in time. If treatment is not standardized, the prognosis is poor, infection transmission and nosocomial cross-infection. Therefore, treating this special group during COVID-19 is a new challenge for orthopedic surgeons. The establishment of standardized diagnosis and treatment process and perioperative protection strategy for OVCF during COVID-19 prevention and control can enable orthopedic surgeons to master and strengthen the screening process, diagnostic criteria and correct clinical classification. The implementation of standardized and effective treatment and perioperative protection strategies is the key link to ensure the efficacy of OVCF patients with COVID-19 and prevent the spread of infection.

## Foundation Items

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## References

1. [National Health Commission of the People's Republic of China. Diagnosis and treatment Plan for COVID-19\(trial version 9\). Chin J Clin Infect Dis. 2022;15\(2\):81-89.](#)
2. [Gao XD, Qiao F, Che WS, et al. Expert consensus on prevention and control of infection in COVID-19 designated hospitals. Chin J Nosocomiol. 2022;32\(21\):1-8.](#)
3. [McCarthy J, Davis A. Diagnosis and management of vertebral compression fractures. Am Fam Physician. 2016;94\(1\):44-50.](#)
4. [National Health Commission of the People's Republic of China. Diagnosis and treatment plan for COVID-19 \(trial version 9\). Chin J Clin Infect Dis. 2022;15\(2\):81-89.](#)
5. [Yi P, Ma YZ, Ma X, et al. The clinical guideline for osteoporotic compression fractures. Chin J Osteoporos. 2015;21\(6\):643-8.](#)

6. [She J, Liu J, Li JW, et al. Treatment of severe and critical COVID-19 and protection of medical staff. Shanghai Med J. 2020;43\(4\):203-6.](#)
7. [Li XY, Wang Q, He YM, et al. Understanding and reflection on perioperative management and strategy for prevention and protection in patients with novel coronavirus pneumonia. Chin J Gen Surg. 2020;29\(2\):142-6.](#)
8. [Wei YQ, Zhang LJ, Mei N, et al. Management procedures and strategies for patients with COVID-19 undergoing emergency operation in clean operating room. China Med Equip. 2020;17\(8\):177-80.](#)
9. [Ma ML. Perioperative management and protective measures for patients suspected and infected with novel coronavirus pneumonia undergoing emergency surgery. Today Nurse. 2020;27\(36\):99-100.](#)
10. [Xie XM, Hong CH, Yu MH. Perioperative management and protective measures for patients suspected and infected with novel coronavirus pneumonia undergoing emergency surgery. Today Nurse. 2021;28\(16\):161-3.](#)
11. [Central Sterile Supply Department, Nursing Professional Committee, Chinese Nursing Association. Expert consensus on reprocessing procedures of reusable medical instruments for suspected or confirmed patients with coronavirus disease 2019. Chin J Nurs. 2020;55\(5\):683-91.](#)
12. [Chen YL, Zhang SL, Zhang ZM, et al. Management strategies and suggestions for operating room for emergency Operations on coronavirus disease 2019. J Xi'an Jiaotong University \(Medical Sciences\). 2020;41\(3\):447-50.](#)

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