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Review Article

Clinical Diagnosis, Classification and Individualized Treatment Strategy of Osteoporotic Vertebral Compression Fractures During the Epidemic Prevention and Control of COVID-19

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Abstract

Objective: To establish the diagnosis and treatment strategy of osteoporotic vertebral compression fracture during the prevention and control of COVID-19, effectively ensure the safety of medical staff and patients, reduce the cross-infection caused by the spread of COVID-19, and improve the cure rate. **Methods:** (1) Clinical experience and prevention and control experience of osteoporotic vertebral compression fractures during epidemic prevention and control in the First Affiliated Hospital of Hebei North University; (2) The latest national standards and consensus on epidemic prevention and control; (3) Relevant literature at home and abroad. **Results:** (1) The clinical diagnosis and classification criteria of osteoporotic vertebral compression fractures during the prevention and control of COVID-19 were formulated, and the individualized treatment plan was implemented according to the clinical classification. (2) Develop COVID-19 screening procedures for urgent and outpatient visits of OVCF patients; (3) Develop clinical diagnosis and treatment procedures for OVCF patients with suspected and confirmed COVID-19. **Conclusions**: Further standardizing the scientific and effective treatment of osteoporotic vertebral compression fracture during the prevention and control of COVID-19 has a guiding role in promoting the rapid recovery of patients and ensuring the stable, orderly and safe medical treatment.

Keywords: COVID-19; Infection prevention and control; Osteoporotic vertebral compression fractures; Clinical diagnosis; Clinical classification; Individualized; Treatment strategies

Introduction

The main pathogens of patients diagnosed with novel coronavirus pneumonia (NCP) worldwide in the past three years are 2019 novel coronavirus (2019-NCoV). WHO named NCP as 2019 Corona Virus Disease (COVID-19) [1]? As of October 12, 2022, according to the latest real-time statistics of the WHO, there have been 6,19,770,633 confirmed COVID-19 cases and 6,539,058 deaths worldwide. China has 254,066 confirmed cases and 5,226 deaths, or 0.4 deaths per 100,000 people, 1/785 of the United States. The Health Commission of China (NHC) has included COVID-19 in the Class B infectious diseases stipulated

in the Law of the People's Republic of China on the Prevention and Treatment of Infectious Diseases, but the prevention and control measures for class A infectious diseases are adopted [2]. COVID-19 spreads rapidly, is virulent, and the population is highly susceptible, especially the elderly. Osteoporosis Vertebra Compressed Fracture (OVCF) is the most common fracture in the elderly. Epidemic prevention and control during although has taken the most strict isolation and closed management measures to restrict people to go out, but the elderly life that occupy the home chores or accident slight injury can cause OVCF, pain, can't stay in bed, lead to the original internal diseases aggravate and fracture complications occurred in bed, In particular, pendant pneumonia, pressure ulcers, lower extremity deep vein thrombosis and other high mortality. Therefore, it is necessary to treat patients with OVCF urgently while preventing and controlling the epidemic. It is of great significance to formulate standardized protocols to guide the individualized treatment of OVCF patients with suspected or confirmed COVID-19 during epidemic prevention and control. From January 2021 to October 2022, the authors standardized the examination procedures of OVCF patients with suspected or confirmed COVID-19 in emergency and outpatient clinics during the epidemic prevention and control period of COVID-19. OVCF patients with normal or confirmed COVID-19 were scientifically classified and classified according to the severity of the disease, and individualized diagnosis and treatment strategies were developed to achieve good clinical results. The experience is summarized as follows.

Epidemiology, Diagnosis and Typing

Epidemiology

COVID-19 is caused by 2019-nCoV virus, and the main source of infection is patients infected with 2019-nCoV virus. Asymptomatic patients are also confirmed to be infectious. The main transmission routes are respiratory droplets and contact transmission, followed by aerosol and digestive tract transmission [3].The population is generally susceptible. The incubation period of COVID-19 is generally no more than 14 days, up to 24 days, and mostly 3 to 7 days. The latest epidemiological studies also confirmed that 86.6% of COVID-19 patients were 30-80 years old, and 66.5% of them were over 50 years old. Among these patients, 6.0% were male and 32.1% were female with postmenopausal osteoporosis or senile osteoporosis. The prevalence of osteoporosis in people over 65 years old reached 32.0%, with 10.7% in males and 51.6% in females. The global incidence of OVCF in people over 50 years old ranges from 11% to 50%, and there are certain differences in the incidence of OVCF among different ages, genders, regions and races [4].

Diagnosis

The diagnosis of OVCF is mainly based on the patient's age, gender, menopause history, fragility fracture history, clinical manifestations, imaging and/or bone mineral density examination results. A confirmed COVID-19 diagnosis must meet one of the following criteria [3] : (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. Early chest CT showed multiple small patch shadows and interstitial changes, especially in the outer lung zone, and then developed into multiple ground-glass shadows and infiltrating shadows in both lungs.

Clinical classification:

OVCF classification is mainly based on the degree of height reduction of anterior, middle or posterior vertebral body in thoracolumbar lateral radiographic images. Mild OVCF compression is 20%-25% in the height of the original vertebral body, moderate OVCF compression is 25%-40%, and severe OVCF compression is more than 40% [5]. There are four clinical types of COVID-19: mild, common, severe and critical [3]. Mild: 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: (1) Respiratory rate ≥30 times /min; (2) Oxygen saturation ≤93% in resting state; (3) arterial partial pressure of oxygen (PaO2)/ oxygen uptake concentration (FiO2)≤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.

Screening of OVCF patients during emergency and outpatient visits during epidemic prevention and control

During the epidemic prevention and control period, emergency and outpatient medical staff should be protected according to the three-level COVID-19 protection measures, and ordinary patients with OVCF as the first symptom should be regarded as suspected patients during the epidemic prevention and control period. First, screening for COVID-19 was carried out according to the COVID-19 Prevention and Control Protocol (ninth edition), and relevant tests and examinations were carried out according to the flow chart for emergency and outpatient screening of OVCF patients suspected of COVID-19 (Figure 1). For OVCF patients diagnosed with COVID-19, they should visit the fever clinic, which should apply for spinal surgery specialist consultation, and take personal three-level protection for medical staff in advance [6]. All COVID-19 patients (including suspected and confirmed patients) are strictly isolated in designated medical institutions.

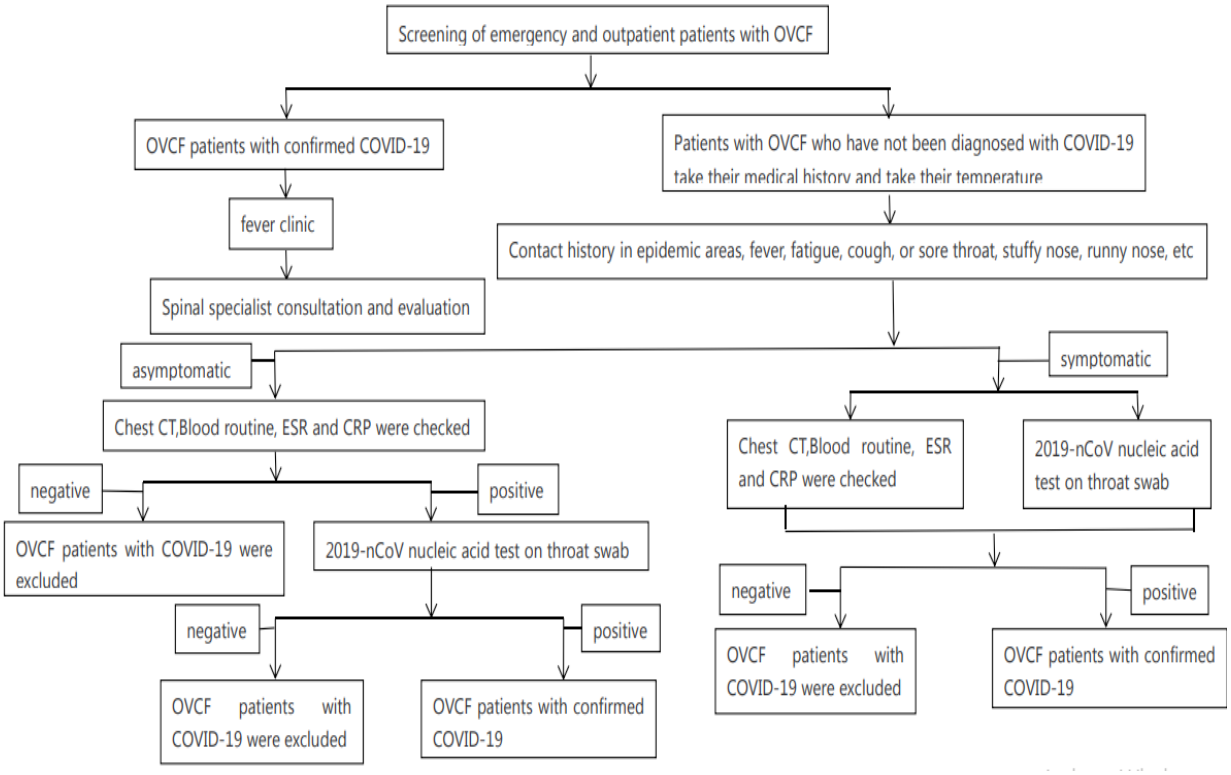

Figure 1: The flow chart for emergency and outpatient screening of OVCF.

Clinical classification of OVCF patients with confirmed COVID-19

To comprehensively classify OVCF patients with confirmed COVID-19 according to the degree of osteoporotic spinal compression fracture combined with the severity of COVID-19, so as to guide clinical development of individualized treatment strategies.

The classification criteria are as follows:

(1) Mild and moderate were defined as type Ⅰ (mild and moderate fracture + mild or common COVID-19) : According to the X-ray classification criteria, mild and moderate were defined as mild (20%-25%), moderate (25%-40%) or the total score of osteoporotic thoracolumbar Injury Classification and Scoring System (OTLICS) ≤4; At the same time, the clinical degree of COVID-19 is mild and common, that is, the clinical symptoms are mild or have fever, respiratory symptoms and other symptoms, and the imaging shows pneumonia, and the nucleic acid test is positive.

(2) Severe or type Ⅱ: It is divided into three subtypes. Type Ⅱa (severe fracture + mild or common COVID-19): patients with severe osteoporotic spinal compression (>40%) or total OTLICS score >4, accompanied by neurological dysfunction, COVID-19 is mild or common; Type Ⅱb (mild or moderate fracture + severe COVID-19): According to the X-ray classification criteria of mild (20%-25%), moderate (25%-40%) or OTLICS total score ≤4, COVID-19 is severe; Type Ⅱc (severe fracture + severe COVID-19) : Severe according to X-ray classification criteria: that is, the degree of osteoporotic spinal compression (>40%) or the total OTLICS score >4, accompanied by neurological dysfunction, COVID-19 is severe.

(3) Type III is critical (fracture of any degree + critical COVID-19): regardless of OVCF type, as long as COVID-19 is clinically critical.

Treatment strategies for OVCF patients with COVID-19

Principles of Treatment

For OVCF patients who have been excluded from COVID-19, the specific treatment plan should be implemented according to the non-epidemic or daily OVCF treatment guidelines [7]. Under the current epidemic prevention and control, the treatment methods for

OVCF patients diagnosed with COVID-19 include non-surgical treatment and surgical treatment. The overall treatment principles are as follows: (1) under the condition of following the priority of COVID-19 prevention and control, non-surgical or surgical treatment strategy should be formulated according to the clinical classification of patients. Type Ⅰ, Ⅱa, and Ⅱb should be treated with non-surgical treatment, the first choice for type Ⅱc is non-surgical treatment or surgical treatment when COVID-19 is stable, and type III should be treated according to the COVID-19 critical protocol. This is an absolute contraindication of surgery; (2) Surgical treatment still needs to be cautious, the basic principles are: strictly grasp the indications of surgery, do not operate if possible; Can do minor surgery as far as possible not to do major surgery, that is, can minimally invasive surgery as far as possible not open surgery; (3) To implement network multidisciplinary collaboration (MDT) diagnosis and treatment to achieve the goal of individualized treatment of OVCF patients in line with the context of epidemic prevention and control.

Non-surgical treatment strategy

It takes into account the balanced treatment of COVID-19 and OVCF to obtain the best curative effect. The main measures are as follows: (1) Rational analgesia: multimodal and combined analgesia were used to control visual analogue scale (VAS) score <3 to reduce systemic oxygen consumption caused by fracture pain, so as to reduce the burden of respiratory function. However, opioid analgesia was carefully used to avoid respiratory depression and aggravate respiratory dysfunction caused by COVID-19. (2) Adequate rest combined with appropriate activities under external fixation: in the early stage, try to rest on a hard bed to recover from COVID-19, and immobilization is conducive to OVCF treatment; Light and strong thoracolumbar braces should be used when getting out of bed properly, but excessive restriction of thoracic movement should not be used to avoid affecting or aggravating the disease of COVID-19. (3) Standardized antiosteoporosis drug treatment: use calcium tablets + vitamin D+ antiosteoporosis drugs. For specific drug selection, usage and dosage, see reference [8-10]. (4) Standardized treatment of COVID-19 according to the severity of the disease: the traditional Chinese medicine decoction "*Qingfei Dedu decoction*" is also strongly recommended for patients with confirmed COVID-19. At the same time, we should strengthen the promotion of the immunity of the elderly, which is, reasonable diet, adequate sleep, moderate activities, maintain a good mood and mentality.

Surgical Treatment Strategy

Timing of operation

When spinal fractures with neurological dysfunction or progressive neurological deterioration require nerve decompression, the earlier the operation time, the better; however, for patients with severe or critical COVID-19, spinal surgery should be considered after recovery from COVID-19.

Surgical indications: (1) minimally invasive vertebrae enhancement surgery under local anesthesia, including percutaneous vertebroplasty (PVP) and percutaneous kyphoplasty (PKP). When the condition of COVID-19 allows, its indications include ineffective non-surgical treatment and severe pain; Unstable vertebral compression fracture; Vertebral fracture nonunion or internal cystic changes, vertebral body necrosis; should not be bedridden for a long time, reduce the incidence of complications of heart, lung and fracture. (2) Open decompression spinal stable fusion surgery. It is suitable for patients with symptoms and signs of nerve compression or progressive deterioration of neurological function after cure of COVID-19; Severe kyphosis requiring osteotomy; Patients with unstable vertebral fractures who are not suitable for minimally invasive surgery.

Individualized treatment plan should be implemented according to clinical classification

Individualized treatment regimens were implemented according to the clinical classification of OVCF patients with confirmed COVID-19: (1) type Ⅰ: it is recommended to be admitted to the isolation ward for preventive isolation and corresponding treatment for COVID-19, and non-surgical treatment for OVCF. The reasons for not giving priority to minimally invasive surgery for such patients are not to interfere with the priority treatment of COVID-19, and to prevent the contamination of non-infected zones such as non-infected wards and operating rooms and reduce the risk of nosocomial cross-infection. (2) Type Ⅱ, according to each subtype of the corresponding treatment : Type Ⅱa: Minimally invasive surgery (PVP or PKP) with local anesthesia should be preferred under strict protective conditions if the patient is fully evaluated before surgery and no surgery after multidisciplinary consultation will cause serious consequences to the patient.

Immediately after surgery, he was transferred to the infectious ward for treatment of COVID-19. Type Ⅱb: Severe COVID-19 is contraindicated for surgery. It is recommended that patients with this type be admitted to isolation ward for COVID-19 treatment first, and non-surgical treatment for OVCF should be performed at the same time. Type Ⅱc: The treatment is the same as type Ⅱb, with priority given to active treatment of COVID-19, non-surgical treatment for OVCF, and spinal fracture surgery after cure of COVID-19. (3) Type III: The critical type of COVID-19 is an absolute contraindication for surgery. Patients' lives should be saved first under the tertiary protection condition of ICU to prevent infection or nosocomial cross infection [11].

To sum up, most OVCF patients coexist with multiple underlying diseases and are prone to multiple complications. In addition, OVCF patients diagnosed with COVID-19 are

characterized by high morbidity, poor prognosis and high mortality. Therefore, dealing with this special group during COVID-19 is a new challenge for orthopedic surgeons. The key links for orthopedic surgeons to quickly master the ninth edition of COVID-19 prevention and treatment knowledge, reception principles, correct clinical classification, and implementation of standardized and effective treatment strategies are to ensure the efficacy and rapid recovery of OVCF patients with COVID-19.

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