

Standardized out-patient diagnosis and treatment process for osteoporosis clinics during the COVID-19 pandemic

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Abstract. – Since the end of 2019, China and other regions around the world have been facing a pandemic of novel coronavirus pneumonia (COVID-19). The virus is highly transmissible, and the human population is generally susceptible. Most patients with osteoporosis are postmenopausal women or elderly people with hypoimmunity, so the osteoporosis clinic has become a new hotspot for corona virus infection. During the COVID-19 pandemic, it is necessary to establish standardized out-patient protocols to provide safe and effective treatment for osteoporosis patients and medical staff. In an osteoporosis clinic, we advocate the following suggestions to prevent and control osteoporosis during the pandemic period: (1) specialized diagnosis and treatment techniques for osteoporosis patients in the out-patient care, including enhancing the prevention for outpatient medical staff, strengthening awareness of COVID-19 prevention, strictly screening outpatients with COVID-19 infection, and insistent administration of anti-osteoporosis drugs during outbreaks; (2) home prevention for osteoporosis patients including keeping windows open, exposing them to sunlight, supplementing them with enough protein, exercising regularly, and administrating calcium supplements; and (3) simplifying the follow-up and evaluation of osteoporosis using online platforms.

Key Words:

Novel coronavirus pneumonia, COVID-19, Osteoporosis, Diagnosis and treatment process, Home prevention.

Introduction

Infectious diseases are like active volcanoes, which erupt at any time and devour human beings. During the First World War in 1918-1919,

about 500 million people were infected with Spanish influenza globally, 25 million to 40 million people died due to infection (at that time, the world population was about 1.7 billion people), the global average mortality rate was about 2.5%-5%, and the death toll even exceeded that of the First World War which lasted for 52 months^{1,2}. One hundred years later, the Pandora's box is opening again.

Novel coronavirus pneumonia (NCP) is a novel respiratory infection. The World Health Organization (WHO) has named novel coronavirus pneumonia "COVID-19" (Corona Virus Disease 2019), the pneumonia caused by 2019 novel coronavirus (2019-nCoV). In December 2019, COVID-19 was identified in Wuhan, Hubei Province, China. With the development of the epidemic, similar cases were reported in other parts of China and many countries and regions outside China. The source of infection is mainly patients already infected with novel coronavirus³⁻⁵, and asymptomatic infected people may also become a source of infection. The main routes of transmission are respiratory droplets and close contact. Exposure to high concentrations of aerosols for a long time in a relatively closed environment is likely to spread the infection, and crowds are generally susceptible. With the increase in the rate of globalization, population migration is much higher than it was 100 years ago, which makes the prevention and control of the pandemic more difficult.

Osteoporosis is a systemic and metabolic skeletal system disease characterized by low bone mass and destruction of bone microstructure, resulting in increased bone fragility, decreased bone strength, and increased fracture risk. Osteoporosis can be classified as primary osteoporosis and secondary osteoporosis⁶. According to the

statistics of the WHO, the global population over 60 years old reached 900 million by 2015 and is expected to reach 2 billion by 2050. The aging of the population is very prominent. Osteoporosis has become the seventh most common disease in the world, leading to a global public health concern. According to the International Osteoporosis Foundation (IOF), there are more than 200 million women with osteoporosis in the world. Osteoporosis has become a major chronic disease after cardiovascular disease and diabetes, which seriously affects the health of the elderly. Patients with osteoporosis need long-term medication, treatment and intermittent follow-up. During the COVID-19 pandemic, it is necessary to establish standardized out-patient protocols to provide safe and effective treatment for osteoporosis patients and medical staff.

Recommendations of Standardized Outpatient Prevention Protocol

Prevention and Control Measures of COVID-19 for Outpatient Medical Staff

During the COVID-19 pandemic, the outpatient medical staff in osteoporosis clinic should strictly follow the following requirements⁷:

1. The outpatient medical staff should wear overalls and surgical masks correctly and selectively wear eye patches or goggles, isolation clothing, and latex gloves. Hand disinfection should be carried out before and after wearing the mask and after removing the gloves;
2. The ventilation in outpatient rooms must be strengthened along with the cleaning and disinfection of the ground and surfaces of all objects. The time of indoor ventilation should be more than 30 min, and the ground and object surfaces should be disinfected with a disinfectant containing chlorine (500 mg/L) at least twice a day. If there is any contamination, it should be cleaned and disinfected immediately;
3. Hand disinfection facilities should be placed at the entrance and exit of each clinic and nurse station, and hand hygiene should be strictly implemented;
4. Doctors must conduct one-to-one diagnosis and treatment to manage the patients in the waiting area in order to avoid crowd gathering;

5. The doctor should keep a distance of 1 meter from the patient to avoid being affected by the cough breath of the patient;
6. Contaminated masks and gloves should be put in a garbage bag immediately after use.

COVID-19 Epidemiological Data Management of Osteoporosis Outpatients

Separate points for pre-examination of fever should be set up in the outpatient department of osteoporosis. The separate points should be set up in the eye-catching position of the outpatient department with good ventilation. Doctors with professional experience in infectious diseases department or related specialties should be assigned to take charge of pre-examination tasks. Medical staff should conduct detailed inquiry regarding history of epidemiology [history of travel, residence and transportation in Wuhan, Hubei Province, China, and surrounding areas, or other communities with reported cases, and history of exposure to COVID-19 infection (nucleic acid test is positive)]. Patients are required to show roaming information or a passcode from mobile operator to determine the likelihood of COVID-19 infection. If the patient with fever has an epidemiological history, the patient should be brought to the fever clinic by a specially assigned staff. If the patient has fever and/or respiratory tract infection but has no epidemiological history, chest CT examination must be recommended in the outpatient department of respiratory medicine or emergency department of medicine. If the patient has no fever and/or respiratory symptoms and no suspected epidemiological clues, he should go to the normal outpatient department for treatment⁷.

The Distributory of Outpatients

If the possibility of COVID-19 infection is completely excluded, the patients should be treated under routine protection. If there is an epidemiological history, chest CT and serological examination are required. If the patient is a suspected case, the patient should be immediately isolated for single room treatment. The expert group of the hospital should conduct consultation. If the case is still considered as a suspected case, a direct network report should be conducted within 2 hours, and samples should be collected for novel coronavirus nucleic acid detection. Meanwhile, the suspected case should be safely transferred to the COVID-19-designated hospital. If the patient is a confirmed case, a specially as-

signed staff and special vehicle should be used to transfer the patient to the designated hospital for diagnosis and treatment⁸.

The Use of Osteoporosis Drugs During COVID-19 Outbreak

As the patient is at home, the amount of exercise is reduced, and sufficient drugs are required. Anti-osteoporosis drugs include bone resorption inhibitors, bone formation accelerators, and “double-acting” drugs. The bone resorption inhibitors include bisphosphonates, calcitonin, and selective estrogen receptor modulators. Bone formation accelerators mainly include parathyroid hormone analogues, such as tripathin. The main “double-acting” drug used is strontium ranelate^{9,10}.

Bisphosphonates: the representative drug is alendronate sodium, which can improve the bone density of lumbar and hip and reduce the risk of vertebral and non-vertebral fracture. Usage: take the whole cup of water more than 30 minutes before breakfast every week, and patients should avoid lying down for at least 30 minutes after taking the medicine. Dosage: 70 mg once a week.

Calcitonin: calcitonin inhibits osteoclasts and has analgesic effect. Salmon calcitonin is injected subcutaneously or intramuscularly 2-5 times a week, 50-100 units each time. The dosage of salmon calcitonin nasal spray is 200 units/day.

Selective estrogen receptor modulators: raloxifene is a third-generation selective estrogen receptor modulator. In bone tissue, raloxifene can inhibit bone absorption and reduce the risk of vertebral fracture. Usage: take one tablet (60 mg) orally every day; this medicine needs long-term use.

Trypatide: it is suitable for patients with severe osteoporosis and can reduce the risk of vertebral and nonvertebral fractures. Usage: it is subcutaneously injected at a dosage of 20 µg/time, once a day.

Strontium ranelate: it is an anti-osteoporosis drug that can promote bone formation and inhibit bone destruction. Clinical studies have confirmed that strontium ranelate can increase bone mass. Usage: take 2 g orally once a day. In addition, the drug should be taken before sleep and at least 2 hours after meal.

Recommendations of Prevention and Control Methods of Osteoporosis at Home

During the COVID-19 pandemic, people stay at home every day, and prevention and manage-

ment of osteoporosis should be done at home. Management and prevention can be carried out using the following aspects⁸:

1. Calcium and vitamin D are the basic supplements to maintain normal physiological structure and function of bone. Calcium is one of the important components of bone. Vitamin D can promote the absorption of calcium. According to the recommendation of the Chinese Nutrition Society, people over 50 years old need to take about 400-600 mg/d calcium in addition to the normal diet. In addition to daily dietary calcium, supplementation with 500-600 mg calcium agent and 800-1200 units/d of vitamin D can be used to assist calcium absorption;
2. Indoor window ventilation and sun exposure not only prevents novel coronavirus, but also the exposure the face and neck skin to light. The best time is between 10 AM and 4 PM. 15-30 minutes a day, 2-3 times a week;
3. While staying at home, osteoporosis patients should not sit for long time, but walk or jog, walk quickly, and do Tai Chi or the bone exercise recommended by the Chinese Medical Association of osteoporosis. It is recommended to exercise for 30-40 minutes every day;
4. In terms of diet and lifestyle, osteoporosis patients should ensure adequate daily intake of protein, low salt diet, no smoking, no drinking, avoiding too much coffee, daily intake of 800-1000 mg protein/kg body weight;
5. During the period of pandemic prevention and control, osteoporosis patients should avoid visiting the hospital and undergo re-examination as much as possible, to reduce the risk of cross infection in the hospital. However, patients need to follow the doctor's orders to take medicine on time. If you have any questions, you can consult the hospital or contact the attending doctor;
5. Traditional Chinese Medicine Culture has a long history. During the pandemic, there are many Chinese medicine drugs or prescriptions that can effectively prevent and treat COVID-19¹¹⁻¹³. The most prominent Chinese medicine is Lianhua Qingwen, which can significantly inhibit the replication of novel coronavirus at the cellular level, affects the morphology of the virus and inhibit inflammation, and inhibits the attack of novel coronavirus on the body. We recommend that

osteoporosis patients take Chinese medicine at home, which can be more effective in pandemic prevention.

Follow-Up and Evaluation of Osteoporosis Patients During COVID-19 Pandemic

During the COVID-19 pandemic, in order to reduce the risk of infection, follow-up and evaluation of osteoporosis patients during the pandemic should be appropriately simplified. The specific measures are as follows:

1. With the development of internet in recent years, during the COVID-19 pandemic, more than 10 online medical platforms launched online consultation, which enabled the patients to seek medical advice online and the doctors to follow-up the patients through the internet;
2. The following evaluation methods can be used: the visual analog score (VAS) is used to evaluate pain before and after the administration of anti-osteoporosis drugs; the SF-36 is used to evaluate the difference in quality of life before and after treatment; the Berg Balance Scale (BBS) is used to evaluate the balance function of patients before and 1 year after intervention; and the motricity index (MI-L) is used to evaluate the muscle strength of the lower limbs before and 1 year after intervention^{9,10};
3. Detailed questions were asked about the occurrence of fractures, whether the number of falls was reduced, and whether the activity function improved.

Conclusions

The COVID-19 pandemic among the global world is still serious. We recommended the standardized procedures for the diagnosis and treatment of osteoporosis. It is strictly requested that patients at home take their medicine regularly and that they are under supervision to manage and protect themselves at home. Our procedures simplified the follow-up and assessment of the patients with osteoporosis. These measures ensure the safety and effectiveness of the osteoporosis clinic as well as the safety of patients at home, and they reduce the risk of COVID-19 in osteoporosis patients.

Conflict of Interest

The Authors declare that they have no conflict of interests.

Acknowledgements

We thank WHO for providing important data.

References

- 1) TAUBENBERGER JK, MORENS DM. The 1918 influenza pandemic and its legacy. *Cold Spring Harb Perspect Med* 2019 Dec 30. pii: a038695. doi: 10.1101/cshperspect.a038695. [Epub ahead of print].
- 2) TAUBENBERGER JK, KASH JC, MORENS DM. The 1918 influenza pandemic: 100 years of questions answered and unanswered. *Sci Transl Med* 2019 Jul 24. pii: eaau5485. doi: 10.1126/scitranslmed.aau5485. [Epub ahead of print].
- 3) ZHOU F, YU T, DU R, FAN G, LIU Y, LIU Z, XIANG J, WANG Y, SONG B, GU X, GUAN L, WEI Y, LI H, WU X, XU J, TU S, ZHANG Y, CHEN H, CAO B. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet* 2020; 395: 1054-1062.
- 4) ROSENBAUM L. Facing Covid-19 in Italy - ethics, logistics, and therapeutics on the epidemic's front line. *N Engl J Med* 2020. doi: 10.1056/NEJMp2005492. [Epub ahead of print].
- 5) LI Q, GUAN X, WU P, WANG X, ZHOU L, TONG Y, REN R, LEUNG KSM, LAU EHY, WONG JY, XING X, XIANG N, WU Y, LI C, CHEN Q, LI D, LIU T, ZHAO J, LI M, TU W, CHEN C, JIN L, YANG R, WANG Q, ZHOU S, WANG R, LIU H, LUO Y, LIU Y, SHAO G, LI H, TAO Z, YANG Y, DENG Z, LIU B, MA Z, ZHANG Y, SHI G, LAM TTY, WU JTK, GAO GF, COWLING BJ, YANG B, LEUNG GM, FENG Z. Early transmission dynamics in Wuhan, China, of Novel Coronavirus-infected pneumonia. *N Engl J Med* 2020; 382: 1199-1207.
- 6) MA YZ, WANG YP, LIU Q, LI CL, MA X, WANG YJ, DENG LF, HE L, YANG NL, CHEN BH, QIU GX, ZHU HM, TAO TZ, QIN L, WANG L, CHENG XG. 2018 China guideline for the diagnosis and treatment of senile osteoporosis. *Chinese Journal of Gerontology* 2019; 39: 2561-2579.
- 7) DEAN'S OFFICE OF THE FIRST AFFILIATED HOSPITAL OF SOOCHOW UNIVERSITY. Novel coronavirus pneumonia prevention and control manual of First Hospital Affiliated to Soochow University. [online]. Available at: <http://new.sdfyy.cn/Article/detail/id/54609/category/>.
- 8) GENERAL OFFICE OF NATIONAL HEALTH COMMISSION OF THE PEOPLE'S REPUBLIC OF CHINA, OFFICE OF STATE ADMINISTRATION OF TRADITIONAL CHINESE MEDICINE. Covid-19 treatment plan (trial version 7). [online]. Available at <http://www.nhc.gov.cn/yzygj/s7653p/202003/202046c209294a202007dfe202004cef202080dc202007f205912eb201989.shtml>.
- 9) QASEEM A, FORCIEA MA, McLEAN RM, DENBERG TD. Treatment of Low bone density or osteoporosis to prevent fractures in men and women: a clinical practice guideline update from the american college of physicians. *Ann Intern Med* 2017; 166: 818-839.

- 10) MILLER PD. Management of severe osteoporosis. *Expert Opin Pharmacother* 2016; 17: 473-488.
- 11) ZHANG DH, WU KL, ZHANG X, DENG SQ, PENG B. In silico screening of Chinese herbal medicines with the potential to directly inhibit 2019 novel coronavirus. *J Integr Med* 2020; 18: 152-158.
- 12) WAN S, XIANG Y, FANG W, ZHENG Y, LI B, HU Y, LANG C, HUANG D, SUN Q, XIONG Y, HUANG X, LV J, LUO Y, SHEN L, YANG H, HUANG G, YANG R. Clinical features and treatment of COVID-19 patients in North-east Chongqing. *J Med Virol* 2020. doi: 10.1002/jmv.25783. [Epub ahead of print].
- 13) RUNFENG L, YUNLONG H, JICHENG H, WEIQI P, QINHAI M, YONGXIA S, CHUFANG L, JIN Z, ZHENHUA J, HAIMING J, KUI Z, SHUXIANG H, JUN D, XIAOBO L, XIAOTAO H, LIN W, NANSHAN Z, ZIFENG Y. Lianhuaqingwen exerts anti-viral and anti-inflammatory activity against novel coronavirus (SARS-CoV-2). *Pharmacol Res* 2020; 156:104761. doi: 10.1016/j.phrs.2020.104761. [Epub ahead of print].