

ORIGINAL ARTICLE

Strategies for prevention and control of the 2019 novel coronavirus disease in the department of kidney transplantation

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SUMMARY

To summarize measures for the prevention and control of the 2019 novel coronavirus disease (COVID-19) in the department of kidney transplantation. We retrospectively analyzed the clinical data of outpatients and inpatients in the department of kidney transplantation from January 20 to March 1, 2020, and followed up the in-home kidney transplant recipients and those waiting for kidney transplantation through the Internet platform. Our department had formulated detailed prevention and control measures, mainly including kidney transplant outpatient management, kidney transplantation ward management, management of kidney transplant surgery, dialysis management of patients waiting for kidney transplantation, personal protection of medical staff, and follow-up management of discharged patients after kidney transplantation. During the epidemic period, there were no COVID-19 cases among 68 outpatient examined kidney transplant recipients, 32 hospitalized kidney transplant recipients, 19 patients waiting for kidney transplantation in hospital, and 30 medical staff. There were no COVID-19 cases among 160 follow-up recipients after kidney transplantation and 60 patients waiting for kidney transplantation. During the epidemic period, we implemented strict prevention and control measures and adjusted working methods and procedures to ensure safe and orderly work of the department.

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Key words

2019 novel coronavirus disease, kidney transplant, pneumonia, prevention and control

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Introduction

On December 31, 2019, a series of unexplained cases of pneumonia has been firstly announced by the Wuhan Municipal Health Commission [1], and this epidemic spreads rapidly throughout the country. On January 12, 2020, the World Health Organization (WHO) provisionally named the new virus as “2019 novel coronavirus” (2019-nCoV) [2]. Subsequently, on

February 11, 2020, the WHO officially named the disease induced by 2019-nCoV as coronavirus disease 2019 (COVID-19) [3]. Up to March 1, 2020, Zhengzhou City has diagnosed a total of 157 cases of COVID-19, with a total population of 10 352 million, a prevalence rate of 1.52/100 000, a cumulative death rate of five cases, and a cumulative cure rate of 152 cases. COVID-19 was mainly transmitted through respiratory droplets and close contact. The elderly and

people with low immunity were more susceptible infected and developed into serious illness. Kidney transplant patients suffered from poor physical fitness and low immunity because of long-term preoperative dialysis, malnutrition, anemia, and long-term use of immunosuppressants after surgery. Thus, the kidney transplant patients were at high risk for COVID-19 [4]. According to related reports, seven kidney transplant recipients and one liver transplant recipient were confirmed cases of COVID-19 in Wuhan and its surrounding areas, while two kidney transplants and one liver recipient were highly suspected cases [5]. Therefore, this phenomenon should pay enough attention and strengthen prevention. In this study, we systematically reported the prevention and control measures taken by our kidney transplant department during the epidemic of COVID-19, providing reference for medical staff to respond to this disease.

Materials and methods

Materials

We retrospectively analyzed the clinical data in the department of kidney transplantation of Henan Provincial People's Hospital from January 20 to March 1, 2020. Among them, a total of 51 patients were hospitalized in our ward, aged 42.08 ± 9.09 years, 35 male and 16 female. There were 32 hospitalized kidney transplant recipients, including three cases of diarrhea, eight cases of urinary tract infection, one case of acute rejection, six cases of lung infection, 12 cases of elevated serum creatinine, and two cases of renal artery stenosis. Nineteen patients were hospitalized for kidney transplantation. During this period, 16 cases of kidney transplantation were performed, all of which were donated kidneys with heart-death organs—14 cases that recovered smoothly after operation, one case of delayed recovery of transplanted kidney function, and one case of acute rejection. We used telephone or WeChat to follow up the home-based patients after kidney transplantation and those waiting for kidney transplantation, among which 160 recipients were recipients after kidney transplantation and 60 patients were waiting for kidney transplantation. A total of 68 recipients after kidney transplantation in the outpatient clinic, among them, 3 of whom underwent transplanted kidney ureteral stent removal and one underwent renal biopsy guided by color Doppler ultrasound.

Methods

Management of kidney transplantation outpatient department

For recipients with stable renal function after kidney transplantation, we recommended that they extended the interval between outpatient visits in the hospital to reduce the number of hospital visits and the chance of infection. All patients who intended to come to the hospital for treatment are subject to online real-name appointments and requiring patients to see the doctor by time. A temperature monitoring point was set up at the entrance of the outpatient clinic, and full-time staff was arranged to screen the patients and the companions for epidemiological conditions and ask whether there were symptoms of fever, dry cough, asthma, diarrhea, fatigue, and body ache and other symptoms, signed the "COVID-19 pneumonia Epidemic Prevention Control Commitment," and told that if they deliberately concealed, they would bear corresponding legal liabilities. For patients with suspicious symptoms such as fever, we instructed them to go to the fever clinic of the hospital to investigate COVID-19. We had continuously strengthened the cleaning and disinfection of the consultation room, turned off the central air conditioning, maintained good ventilation, appropriately increased the number of outpatient doctors and reduced the total number of patients in each consultation room, and ensured that there were one doctor and one patient in each room, while keeping the distance of more than 1.5 m between the doctor and the patient. For patients who needed to undergo outpatient operations such as removal of ureteral stent or renal biopsy, they were required to complete chest computed tomography (CT), blood routine examination, and nucleic acid detection before operation to rule out the infection of COVID-19 and then arranged for surgery in an operating room of independent unit. During the operation, the medical staff implemented secondary protective measures and performed terminal disinfection after the operation. We also had added online outpatient service, in which recipients could contact the doctors via telephone, WeChat, etc. After comprehensive evaluation by the doctor, they could make a judgment on whether the patient needs to come to the hospital for treatment.

Management of kidney transplantation ward

Environmental disinfection. In the department units, ultraviolet air disinfection was performed twice a day

for 1 h each time. The disinfection of environmental object surface and ground and the reused medical, therapeutic appliances was carried out strictly in accordance with the “Technical Specifications for Disinfection of Medical Institutions” [6]. The medical waste management was strictly implemented in accordance with the “Regulation on medical waste management” and “Measures for the management of medical wastes in medical and health institutions” [7]. The medical waste bucket had foot-operated and with a cover. There was a warning sign on the outer surface of the special packaging bags and sharps containers. Before holding the medical waste, carefully inspected should be carried out to ensure that there was no damaged or leaked. When medical waste reached 3/4 of the packaging bag or sharps containers, it should be effectively sealed. The medical waste should be packaged in special yellow packaging bag with double layer and sealed with a gooseneck knot to ensure tight sealing.

Management of admission and hospitalization of recipients after kidney transplantation. For kidney transplant recipients who need to be hospitalized, regardless of whether they had fever or not, the epidemiological history of the patients should be investigated in detail, and chest CT imaging, blood routine examination, and nucleic acid examination should be carried out when necessary to exclude the infection of COVID-19. And signed the “COVID-19 pneumonia epidemic prevention and control of hospitalized patients’ commitment letter.” It was strictly forbidden for others to visit the hospital. In general, no escort was allowed. When the patient was critically ill and had special needs, each patient was limited to one person to accompany. Accompanying personnel of inpatients must sign the “Questionnaire and Commitment Letter of Accompaniment of Inpatients for the Prevention and Control of COVID-19 pneumonia Outbreak,” and the department issued an escort certificate, which would be valid for seven days. The escort staff entered and left the ward with the escort certificate, and other visitors were strictly prohibited. The temperature of patients and their families was measured and recorded three times a day. In order to avoid cross-infection when patients ate in the hospital restaurant, the medical team of our department timely combined with the nutrition department and logistics support department to formulate a reasonable nutritious diet according to the dietary principles and precautions of patients after kidney transplantation. In addition, we also provided meal delivery service to patients. Patients could order meals via the WeChat app. The food delivery followed the “three fixed”

principle, including fixed person (deliver staff) responsible for food delivery service, fixed food delivery car, and fixed dedicated line (delivery route and designated junction). After the meal was delivered, the dining car should be thermally or chemically disinfected. Furthermore, we were committed to health education of patients and accompanying personnel. A previous study indicated that the COVID-19 had the ability of interpersonal transmission in hospital and family settings [8]. Crowd gathering was an important factor leading to the spread of the epidemic, and health education of patients and caregivers was a crucial measure to reduce person-to-person transmission. On the basis of routine education, our department adopted oral education, text-picture, video education, and other forms to conduct health education on the prevention and control of COVID-19 for patients and accompanying staff to guide patients to wear the mask correctly, master the six-step handwashing method, and learn the knowledge of cough etiquette and dietary guidance.

Management of patients awaiting kidney transplantation. First, we strengthened the epidemic prevention education for patients waiting for kidney transplantation and their families. Patients awaiting surgery with a clear epidemiological history should be isolated for 14 days before kidney transplantation. During the waiting period for transplantation, the patients underwent regular dialysis in the blood purification center. If the patients had symptoms of respiratory tract infection and COVID-19 was excluded, would arrange in the corner of the dialysis room, which was covered by a screen. Patients with highly suspected or confirmed COVID-19 were strictly isolated, followed by continuous renal replacement therapy (CRRT) beside the bed. The dialyzer used by the patient was strictly prohibited to be pushed out of the ward and was placed at a designated place and operated by a special person.

Management of kidney transplantation

During the epidemic, according to the epidemic prevention and control requirements, the working methods and procedures of kidney transplantation had been adjusted by our department timely (Table 1).

Personal protection of medical staff

Learn guidelines and workflow for COVID-19. Work systems and procedures were key factors in ensuring proper care during the outbreak of COVID-19. The

Table 1. Workflow adjustment program for kidney transplantation under the COVID-19 epidemic.

Transplant processes	Adjustment methods
Donor and recipient screening	<ol style="list-style-type: none"> 1. Within 14 days, the donor or the recipient had no history of staying in the epidemic area and no history of contact with COVID-19 patients. None of the people in close contact with them had a history of sojourn in the epidemic area 2. There are no fever, progressive dyspnea, dry cough, diarrhea, and other related symptoms within 14 days before the onset of the primary disease 3. Chest CT and laboratory examination showed no pneumonia 4. Nasopharyngeal swabs, sputum, lower respiratory tract secretions, blood, feces, and other specimens tested negative for new coronavirus nucleic acid 5. All were limited to one escort, who had no epidemiological history and normal body temperature 6. The hospital ethics committee examines the authenticity of the worker's willingness to donate and the legality of the source of the donor
Donor maintenance	<ol style="list-style-type: none"> 1. Single-room medical unit, fixed personnel to participate in the maintenance 2. Screening the coordinator and donor and transplant staff 3. The apparatus and equipment needed for organ acquisition shall be packed with protection; after the operation is completed, store the protective layer of the outer packaging of the instruments should in a centralized manner and dispose of it medical waste as medical waste contaminated by viruses; after the acquisition personnel return, sterilize the exterior of the organ preservation device, refrigerator, and other instruments
Operation and postoperative management	<ol style="list-style-type: none"> 1. Strengthen the health investigation and management of medical staff 2. Independent operating room and postoperative laminar flow ward 3. In case of suspected infection of COVID-19 during the perioperative period, the transplant recipient shall be isolated in a single room immediately and report to the relevant department of the hospital for consultation. When the patient is confirmed to be infected with COVID-19, the patient is transferred to the special ward of the hospital immediately and the medical staff who contacted the patient are isolated for 14 days 4. Strict implementation of disinfection and isolation system 5. Implement the system of professional responsible persons to improve the quality of care

medical staff actively learned the relevant guidelines and workflows for the treatment of COVID-19 and learned to use protective equipment correctly. The combination of on-site demonstration teaching, online video teaching, and self-study of online courses was applied to comprehensive training for all medical staff, nurses, and cleaners in the department.

Reasonably deployed human resources and paid attention to the physical health of department staff. We deployed paramedics quickly in emergency situations to ensure efficient, safe, and orderly care delivery, which was one of the important contents of nursing work [9]. On January 23, 2020, to implement the “Urgent notice on the suspension of vacations by provincial health administrative departments and medical institutions at all levels” issued by Health Commission of Henan Province, all nursing staff in the department stopped vacation and returned to the unit. According to the condition and

number of patients and the age and professional level of the nursing staff, our department rationally allocated human resource, scientifically and flexibly configured shifts, and dynamically adjusted the number of staff on duty. The occurrence of the COVID-19 was highly contagious with numerous confirmed and suspected patients, and multiple clinical medical staffs were infected. Medical staffs as clinical frontline treatment personnel were under tremendous occupational pressure, and long-term pressure could easily cause burnout syndrome in nurses [10]. Our department improved the communication mechanism to timely understand the changes of staff's psychological activities, meanwhile, daily released of advanced anti-epidemic stories in the work group and hospital anti-epidemic dynamics to motivate medical staff. The temperature of all the staff was measured and recorded three times a day. In addition, the personnel put on standby in home reported their body temperature and physical condition daily in

the work group. We provided nutritious diet, urged medical staff to strengthen nutrition, maintained a good attitude, alternated work with rest, improved physical fitness, and lastly, properly increased the rest time for nurses during pregnancy.

Follow-up management after kidney transplantation

There might be organ rejection, toxic side effects of immunosuppressive agents, and various complications after kidney transplantation. Thus, regular review after surgery was essential to successfully ensure the long-term survival of kidney transplant patients and transplanted kidneys, while minimizing the risk of related complications [11]. During the outbreak of COVID-19 pneumonia, our department recommended the recipients and their leading doctors to use the application with the function of history record and disease change comparison (transplantation of Shenzhou APP) for follow-up, health consultation, and drug guidance. For patients with insufficient drug reserves, they could purchase medicines online through the hospital's connected smart pharmacy, and the drugs were then mailed home. The prevention and control knowledge of COVID-19 was released daily in the WeChat group of kidney transplant patients and patients waiting for transplantation. As kidney transplant recipients are more sensitive and concern about fever and lung infection, they are prone to anxiety and fear. For these patients, they should be strengthened timely and professional counseling should be provided with the help of a psychologist when necessary.

Ethics

The study was reviewed by the ethics committee. All participants signed the informed consent form.

Results

All 51 patients who were hospitalized from January 20 to March 1, 2020, underwent chest CT and blood routine examination before admission, and there were no confirmed cases of COVID-19 pneumonia. Among them, 14 patients with fever symptoms were admitted to the ward after exclusion of COVID-19 in the fever outpatient department of the hospital. The patients were placed in a single room, and chest CT examination and novel coronavirus nucleic acid test were performed

again (the interval between two times was no less than 1 day) to further rule out COVID-19. During this period, our department completed a total of 18 cases of surgery, including two cases of arterial balloon dilatation of transplanted kidney and 16 cases of kidney transplantation (14 cases of successful discharge, one case of delayed recovery of transplanted kidney function, and one case of acute rejection). In addition, there were 160 follow-up recipients after kidney transplantation, 60 patients waiting for kidney transplantation, and 68 patients re-examined for kidney transplantation. None of them were infected with COVID-19.

Discussion

In recent years, organ donation and transplantation have developed rapidly in China, and the number of organ donations and solid organ transplantations in China ranks second in the world. Under the situation of the COVID-19 pneumonia epidemic, how to safely carry out organ transplantation work is not only related to the development of the transplantation business, but also related to the treatment of many uremic patients, and it also affects the overall situation of epidemic prevention and control. Our department adjusted the working methods and procedures timely and then implemented the emergency prevention and control measures with whole process and full coverage, which reduced the risk of COVID-19 transmission and ensured the safety of patients and medical staff effectively.

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Conflicts of interest

The authors have declared no conflicts of interest.

Authors' statement

Yurong Li and Ning Yang had the idea and designed the study. Junpeng Wang and Tianzhong Yan identified studies and extracted data. Xiaoxiao Li performed all statistical analyses. Yurong Li and Ning Yang drafted the article. Yurong Li critically revised the article. All authors reviewed and approved the final manuscript.

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