Hemodialysis vascular access care during the COVID-19 pandemic

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Abstract: Dialysis patients are more vulnerable and susceptible to the severe coronavirus disease 2019 (COVID-19) infection due to multiple comorbidities. Since Taiwan has the highest incidence and prevalence of treated end-stage kidney disease worldwide, it is crucial to advance in prevention to avoid a potential disaster. In the face of the COVID-19 pandemic, we implement proactive infection control measures to prevent it from spreading without sacrificing the dialysis care quality. In this article, we focused on hemodialysis vascular access (HVA) care in particular. As a life-line of hemodialysis (HD) patients, HVA care has a profound impact on the patient’s quality of dialysis and life. Specifically, in our facility, the working and office areas of the HD units are separated to reduce cross-infection. All elective procedures for HVA are postponed, and operating rooms equipped with a negative-pressure anteroom are used for suspected or confirmed COVID-19 patients. Herein, we share how we modified our HVA care policy not only to prevent our patients from COVID-19 infection but also to maintain the quality of HVA care.

Keywords: COVID-19; Hemodialysis vascular access; Infection control; Severe acute respiratory syndrome coronavirus 2

1. INTRODUCTION

Coronavirus disease 2019 (COVID-19) struck China first in late 2019 and then spread worldwide in an enormous way in early 2020. Taiwan, being geographically 80 miles nearby China, was predicted to have the second-highest number of cases worldwide.1 On the contrary, this prediction did not become a reality, and Taiwan earned recognition as a successful example against this crisis.2 The low COVID-19 rate in Taiwan has partly attributed to the government's immigration and screening policies, spontaneous mask-wearing by the general public (either cloth or surgical masks), and the proactive infection control measures implemented at the hospital level.

Many COVID-19-infected patients were detected at the airport in Taiwan; however, there are still some civilians who got infected with an unidentified infection source.3 Taiwan has the highest incidence and prevalence of treated end-stage kidney disease worldwide.4 Since dialysis patients are more vulnerable and susceptible to severe COVID-19 infection due to old age and multiple comorbidities,5 we, therefore, have to implement proactive infection control measures to prevent a potential disaster.6 As a life-line of hemodialysis (HD) patients, hemodialysis vascular access (HVA) care has a profound impact on the patient's quality of dialysis and life. Our HVA Care Unit belongs to the HD center in Taipei Veterans General Hospital, which is a national tertiary-care referral hospital with 2,947 beds in total, including 187 intensive care unit beds, 90 HD beds, 82 regular isolation beds, and 16 negative-pressure isolation rooms.7 As a nation-run hospital, we are responsible for taking care of suspected and confirmed patients of COVID-19 in the special ward.

Our facility provides multidisciplinary and interdepartmental HVA care for HD patients, with 6,965 HD sessions per month. Our HVA care team comprises 10 nephrology physicians, three vascular interventionists, two vascular surgeons, three case managers, and one medical radiological technician. HVA services that we provide include routine HVA care, active and overall surveillance of intradialytic access flow quarterly for every patient using a Transonic HD03 monitor (Transonic, Ithaca, NY, USA); Doppler ultrasound of HVA for patients with abnormal access flow; angiographic examination and percutaneous intervention for HVA complications; and surgical intervention for HVA build-up and complication management. In this article, we share our experiences in the infection control measures implemented in our daily care for HVA.

2. GENERAL INFECTION CONTROL MEASURES

The entrance and exit numbers of our hospital are reduced for effective access control. For each building, only one entrance and one exit are open, and the rest are closed. Before entering
the building, wearing a mask is obligatory for every employee and visitor to reduce respiratory droplet transmission. Every open entrance was installed a thermal camera scanner with the automatic alarm function (Table 1). After temperature checks, the people flow separates into an express lane for hospital staffs with ID and an access control lane for visitors. For the access control lane, there is visitor number limit (i.e., one companion maximum for one outpatient; one visitor maximum for one inpatient), and documentation of the Travel/Occupation/Contact/Clustering (TOCC) history at the register counter is mandatory for every visitor. Besides, another measure to limit the people flow is to restrict the inpatient visiting hours, which is limited to 6:00 to 7:00 p.m. unless the inpatient encounters a medical emergency.

As shown in the Figure, the TOCC history declaration for COVID-19 is registered for every visitor at the hospital entrance, and the questionnaire is as follows: (1) Have you traveled abroad in the last 14 days? (2) Have you had a fever, respiratory symptoms such as cough, runny nose, sore throat, breathing asthma/dyspnea, and so on in the last 14 days? (3) What is your occupation? (4) Have you contacted and entered the following places in the past 14 days? (5) Your group history in the past month. When the visitor finishes the registry, a certificate sticker (valid for 1 day) is placed on the visitor’s ID card for recognition.

For patients/visitors who were screened positive, a special team wearing full personal protective equipment will transfer him/her to a specific zone where SARS-CoV2 will be tested. Confirmed and suspected cases will be quarantined in a COVID-19 special ward. Given the fact that an estimated 25% of patients infected with SARS-CoV2 are asymptomatic and can still transmit the virus, our facility requests patients/visitors to wear the mask at all times, a measure that may effectively reduce respiratory droplet transmission.12,13 However, most countries have a shortage of surgical masks. Although randomized controlled trial evidence is lacking, some data suggest that in terms of blocking droplet transmission, cloth masks may be only marginally less effective than surgical masks and fivefold more effective than not wearing masks.14 Therefore, face mask-wearing by the general public (either cloth or surgical masks) could have a substantial impact on transmission with a relatively small impact on social and economic life. Therefore, face mask-wearing by the general public (either cloth or surgical masks) could have a substantial impact on transmission with a relatively small impact on social and economic life.15–17 Herein, we would like to emphasize that the cloth mask is simple yet potentially effective in blocking the emission of particles.

3. INFECTION CONTROL MEASURES FOR HEMODIALYSIS UNIT AREAS

Our dialysis facility comprises of an office area, an outpatient hemodialysis unit (HDU) area, and an inpatient HDU area. Each area of the dialysis facility is connected through doors, which are temporarily closed to avoid cross-infection. These three major zones are separated, and checkpoints are set at each entrance. At each HDU checkpoint, we installed a thermal camera scanner, which alarms if the body temperature is higher than normal. Besides, our staffs take shifts to stay at each HDU checkpoint to record the body temperature for each visitor using a forehead thermometer. Because the ear thermometer is time-consuming for the probe cover replacement, we use an infrared forehead thermometer instead, but the fever threshold is 0.5°C lower (fever criteria: ≥37.5°C for a forehead thermometer; ≥38.0°C for an ear thermometer). Meanwhile, the ID registry for patients and their companions (one companion maximum for one patient) is mandatory at every checkpoint. On the other hand, in the office area checkpoint, the body temperature is measured and recorded by the staff themselves on a daily basis.

As the COVID-19 pandemic is a devastating threat to dialysis patients, we made every effort to prevent our patients from getting infected. Food and drink are prohibited in all HDU areas to reduce droplet transmission. We would like to emphasize that the purpose of obligatory mask-wearing at all times is to reduce respiratory droplet transmission.12,13 Taiwan government boosts the production of surgical masks since January 2020 and dispenses two surgical masks per HD session to every HD patient. Meanwhile, because contact transmission can be effectively prevented by hand washing,18 chlorhexidine (0.5%) dispensers are available at all checkpoints, all doors (both sides), all rooms, and all beds throughout the hospital for consistent hand hygiene. All hospital staff, patients, and visitors are encouraged to use chlorhexidine dispensers. In addition, chairs in the public area are marked to be seated separately for social distancing. With the measures conducted above, we continue the quarterly intradialytic access flow monitoring and the Doppler ultrasound of HVA to ensure that every HD patient is under the proper surveillance of HVA health.

4. INFECTION CONTROL MEASURES FOR ANGIOGRAPHIC AND OPERATING ROOMS

As listed in Table 2, we postpone all elective angiography and surgery for HVA, as guidelines suggested.20–22 For urgent angiography or surgery for HVA, the aforementioned general infection control measures have complied. However, when there is a suspected or confirmed COVID-19 patient who requires an immediate angiography or surgery for his/her HVA complication, an operating room with a negative-pressure anteroom is used. When the postoperative care and observation are needed, the patient is transferred to a negative-pressure recovery room after the surgery. Because the angiographic rooms in our hospital are not equipped with a negative-pressure anteroom, any suspected or confirmed COVID-19 patient who needs an urgent angiography is managed in the operating room instead.

5. HD FOR SUSPECTED OR CONFIRMED COVID-19 PATIENTS

Once there is a suspected or confirmed COVID-19-infected patient who requires renal replacement therapy. Intermittent HD is performed as appropriate in the isolation room of the COVID-19 special ward, which is equipped with reverse osmosis

Table 1

Patient and companion flow before HDU arrival

| Site                     | Infection control measure                                      |
|--------------------------|----------------------------------------------------------------|
| Hospital entrance        | Obligatory mask-wearing at all times in all in-hospital areas (no mask no entry) |
|                         | Thermal camera scanner with the automated alarm function       |
|                         | Express lane for hospital staffs with ID                        |
|                         | Visitor number limit (one companion maximum for one outpatient; one visitor maximum for one inpatient) |
|                         | Inpatient visiting hours restriction (6:00-7:00 p.m. unless the inpatient encounters a medical emergency) |
|                         | TOCC history declaration for every visitor at the register counter |
|                         | Place a certificate sticker (valid for 1 day) on the visitor’ ID card |
| HDU entrance             | Thermal camera scanner with the automated alarm function       |
|                         | ID registry for every visitor                                   |
|                         | Body temperature measurement and record for every visitor      |
|                         | People flow restriction (only open at the beginning/end of HD)  |
|                         | Prohibition of food and drink in all HDU areas                  |
|                         | Every HD patient is provided with two surgical masks per HD session by the government |

HD = hemodialysis; HDU = hemodialysis unit; TOCC= Travel/Occupation/Contact/Clustering.
In conclusion, HD patients are more comorbid and at risk of severe COVID-19 pneumonia once they get infected. In this article, we present the primary infection prevention measures for COVID-19 in an HVA care unit of the tertiary-care referral hospital, including obligatory mask-wearing at all times, body temperature measurement, visitor number limit, inpatient visiting hours restriction, and visitor’s TOCC history registry. We would like to highlight two easy yet effective measures, obligatory mask-wearing and consistent hand hygiene, to reduce respiratory droplet and contact transmission risks. Although in most parts of the world where stocks of surgical masks are quite limited for now, evidence suggests that cloth masks may be only...
marginal less effective than surgical masks and fivefold more effective than not wearing masks in blocking droplet transmission. Therefore, the cloth mask for hospital visitors is likely to be a good alternative in areas having a shortage of surgical masks and is better than wearing no mask at all.

In our facility, the working and office areas of the HD units are separated to reduce cross-infection. With the implementation of proactive infection control measures, we continue the quarterly intradialytic access flow monitoring and the Doppler ultrasound of HVA to ensure that every HD patient is under the proper surveillance of HVA health. All elective procedures for HVA are postponed, and operating rooms equipped with a negative-pressure anteroom are used for the suspected or confirmed COVID-19 patient who requires an urgent angiography or surgery for his/her HVA complication. By modifying our HVA care policy, we not only prevent our patients from getting infected with COVID-19 but also maintain HVA care quality.

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