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Is blood transfusion safety will be a challenge during COVID-19 infection?

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Abstract:

Recently the world faces a pandemic of infection with the new coronavirus which discovered first in Wuhan, China, in December 2019, which lead to a wide variety of symptoms ranging from mild symptoms to marked respiratory distress and pneumonia of unexplained etiology, it cause terrorism all over the world. According to the world health organization, it is considered an international public health emergency. Infection with the new coronavirus is considered one of the most common widespread infectious diseases in addition to viruses ike SASR and MERS. although coronaviruses mostly infect the respiratory system, Viral shedding may, unfortunately, occur in blood, so there is a risk of transmission of coronavirus by blood transfusion, this will be a major problem for patients depending on repeated blood transfusions such as cancer patients, blood disorders patients and pregnant women in need for blood transfusion so special considerations should be given to the safety of blood transfusion especially with the appearance of asymptomatic carriers.

Keywords: blood transfusion,COVID-19,cancer patients.

Introduction:

The new coronavirus outbreak (COVID-19), emerging first in China at the end of 2019 (SARS-CoV-2), now invades the world as a whole [1], its genome is 86.9 percent similar to the SARS genome of bat CoV but shows some differences from SARS-CoV or MERS-CoV. [1], the estimated incubation period of the virus 14 days, its mode of transmission by the air droplets from person to person[2].

COVID-19 typically causes fever, sore throat, dyspnea, and dry cough and fatal pneumonia particularly in immunocompromised high-risk patients the mortality in younger patients below the age of 20 years is very low but much higher in older patients particularly those with comorbidity, adequate ventilators must be provided to patients with severe symptoms [3].

Few studies suggesting that viral RNA shedding occurs in the plasma or serum of COVID-19 patients. In Wuhan City Viremia was founded in 6/41 (15%) of the first 41 patients with COVID- 19, this suggests low viral RNA concentration without any difference between intensive care patients and patients with mild symptoms [4,5,6]

Asymptomatic infected patients are infectious during the incubation period [7], in Germany, a report suggested transmission of infection from asymptomatic carrier [8]: an asymp-tomatic attendant from china to a business meeting in Germany was in the incubation period and infect 2 Partners in the Business meeting. But in this report, the authors did not interview directly the Traveler of China who was later found to be symptomatic when the contact took place. Many countries quickly started to do their best to discover much about the disease and mode of transmission and clinical picture and methods of diagnosis and treatment, as the virus is spreading rapidly, reports from Vietnam [9], Germany [8], and the United States [10] and other countries about the disease were done. In January 2020, the European Center for Disease Prevention and Control (ECDC) and American Association of Blood Banks (AABB) published rapid risk assessments of the outbreak of SARS-CoV-2 and blood safety. ECDC implied a precautionary deferral of donation of blood and cells for 21 days after possible exposure to a confirmed patient or anyone who returned from Wuhan, China—applying the approach used for SARS-CoV and MERS-CoV. Besides, recovering confirmed COVID-19 patients should be deferred for at least 28 days after symptom resolution and completion of therapy. [11]

The most recent update of AABB will continue to track the outbreak of respiretory disease effectively, despite the issues about blood safety during SARS-CoV-2. At this time, the Food and Drug, the AABB, and the Disease Control and Prevention Centers state that no decisions on blood monitoring or processing are mandatory since there is no sufficient evidence supporting the possibility of transmission of SARS-CoV-2 infection by blood transfusion. [12] A worldwide urgent emphasis and close monitoring are needed as an expansion of infection is rapid.

So the following points should be taken into consideration as regards blood transfusion: (1) it is noted that by about 2 to 3 days after the beginning of the symptoms in infected patients viral RNA could be detected in the blood of these patients ; (2) most patients, particularly young age persons who constitute most of the blood donors, had few symptoms than the old age; (3) In China, asymptomatic patients without fever and carriers were reported and this increases the likelihood that a COVID-19 patient or carrier can donate blood ; (4) The risk of infectiousness of patients during the incubation period remains unknown and blood viral load data for patients during incubation periods are not available. Therefore, it is critical to investigate as soon as possible if SARS-CoV-2 is more susceptible to transmission by transfusion than other types of corona-viruses, especially in endemic zones. All behaveor relating to postp-oning donation, SARS-CoV-2 RNA checkups, virus detection, or the use of inactivation of the virus in blood products must also be carefully evaluated. [11]

What about transfusion for cancer patients?

Cancer patients like blood disorders patients form a large percentage of either outpatient or inpatient's users of red cells, platelets, and blood transfusions [13]. Close supervision of patients during transfusion is needed and calls for in- and out-patient cancer programs to be under stress if COVID-19 spreads throughhout the population, because immune-compromised high-risk patients may be

subjected to infection if they visit transfusion acute care facilities or medical centers and come in contact with patients, or to health workers, who are shedding SARS-CoV-2.The dissemination of COVID-19 to the population is likely to decrease a blood donation and endanger blood supply by both postoppneement of donors and a lack of blood supply or reagents or due to decreased numbers of blood services staff. Finally, while no cases of transmission of infection via transfusion have been reported and no precedent exists for respiratory virus transmission by transfusion, detection of the SARS-COV-2 virus in the blood of infected persons, and delay donation is the only method currently in place to avoid blood component transmission of infection. [3]

These factors may support to diminish routine blood transfusion for cold cases once the COVID-19 infection spread has been developed and particularly when there are limited facilities available for cancer patients or blood services. Restrictive approaches have been evaluated in many settings for red cell transfusion [15], but optimum red cell transfusion rates have not been identified for patients with blood cancer [14] but practice differs greatly.

Initial evidence in favor of outpatients' transfusion for myelodysplastic syndromes indicates that marked restriction in red blood cell transfusion requires fewer red cells, although they may have a low quality of life [16].

Alternatives to transfusion of red blood cells can be used in many patients such as iron, folic acid, vitamin B12, or erythropoietin, or it can reduce the need for transfusion. [17] Extreme restriction may be unsuitable for patients with cardiovascular disease [18]

Platelets would most probably be affectted by a lack of transfusion due to their short life span. Although prophylactic transfusion of platelet decreases the risk of hemorrhage in patients who undergo chemotherapy with hematological malignancies, an effect on their survival has not shown. [19]

International guidelines recommend a 'no prophylactic platelet transfusion' strategy for asymptomatic patients with chronic bone marrow failure (including patients taking low dose oral chemotherapy or azacitidine) and to consider not giving prophylactic platelet transfusions to good patients without evidence of bleeding after an autologous stem cell transplant [20].

The assessment of the effectiveness and safety of prophylactic use of tranexamic acid for a marked thrombocytopenia that results from intensive treatment in blood cancer patients is under investigation [21].

Alternatives such as frozen platelets are currently being investigated, but these are not currently available for daily use. [22, 23]

When there is healthcare restrain or there is a risk of supply of platelets, physicians should suggest only transfusing certain patients at greatest risk for bleeding and consider alternatives to platelets transfusion (e.g. tranexamic acid), adoption of strict platelet transfusion criteria and postponing non-urgent intervention that might need platelet transfusion supplementation. [24]

Inactivation of Coronavirus in Blood Products:

Coronaviruses are single-stranded RNA viruses with positive-sense envelopes. Coronaviruses typically are easily affected by acid-pH, basic-pH, and heat [25], but at a temperature of 4°C [26] seem

more stable. Refrigerating and heating the virus didn't markedly decrease the infectious titer [26]. Several studies have examined pathogen inactivation/reduction(PRT) technologies to decrease or fully eliminate possible risk of coronavirus transmission through blood products following the SARS and MERS outbreaks. [27-32].

In general, some blood constitutes destroyed by PRT therapy [37, 38]. Some methods for inactivating plasma and platelet coronaviruses depend primarily on heating and radiation. In general, the reduction of SARS-CoV from non-cell plasma by heating 60 ° C from 15 to 30 minutes is sufficient [30], and plasma products could be inactivated by 60 ° C for 10 hours [33].

Heating could alter the protein in the blood, SARS-CoV is sensitive to solvent and detergent, such as TNBP/Triton X-100(tri-n-butylphosphate), TNBP/Tween 80, and sodium cholate [30].

Specific wavelength lighting has also affected SARS and MERS virus behaviors in the blood as Ultraviolet (UV) [28, 29, and 32]. These systems could decrease the activities of SARS and MERS virus in the blood. Methylene blue plus visible light also can inactivate coronaviruses in plasma [27, 38]. PRT cost still a significant barrier to its use [36]. The degree and prevalence of COVID-19 in different countries and the real risk of transmission of SARS-Cov-2 by transfusion are the major determinants of usage PRT in response to SARS-CoV-2[3].

Collection of COVID-19 convalescent plasma:

An experimental therapy by COVID-19 convalescent plasma is recognized by WHO as that is appropriate for evaluation in clinical studies. Reports of several uncontrolled case series and a randomized controlled trial (RCT) of use of COVID-19 convalescent plasma showed favorable patient outcome. [39][40]

Although,WHO encourages international partners to obtain and share information on protocols and policies for establish universal protocol for collection of COVID19 convalescent plasma. The common criteria for acceptance of donors of COVID-19 convalescent plasma could include:

A. Using the standard criteria for blood or plasma donation
B. Evidence of sure prior infection with COVID-19 by PCR
C. Cessation of treatments for COVID-19 for and complete resolution of symptoms at least 14 days prior to the donation
D. Establishment of the minimum neutralizing antibody titre wanted to use plasma as convalescent plasma
E. Determination of the neutralizing antibody titre in the unit of convalescent plasma.
F. Plasma collection should be obtained by plasmapheresis to avoid unnecessary red blood cell loss in the donor.

Mitigating the risk of staff and donor exposure to COVID-19:

Many appropriate protective measures should be used to make sure no infection is transmitted between staff and donor during flow of work. Potential donors or staff should be informed of the importance of self-deferral if they are feeling unwell or have COVID-19 related symptoms. Before entry into the donation area, identification of potentially infected donors' blood should be excluded at the earliest opportunity through relevant information on websites or pre-selection procedures as temperature

measure-ment and pretransfusion investigations before the entrance.Early detection and managem-ent of the suspected or confirmed donor, staff and contacts by national public health guidelines could help in avoiding virus transmission. Schedule blood donations by appointment to avoid crowding. Minimizing contacts time between donors and staff. Regular environmental decontamination and Infection prevention measures should be reinforced. In all circumstances, Standard laboratory biosafety practices should be followed. If Staff feel ill or may have been exposed should be advised not to come to work.

Conclusion:

Whilst COVID-19 infection contributes mainly to causing mild to serious respiratory infections, the transfusion potential should be taken into account. Centers for blood transfusion and health care providers should put into consideration the following; (1) taking a good history from the donors and measure body temperature before donations to exclude susceptible persons, (2) exclude persons with a history of traveling to infected area or area where the disease is endemic or come in contact with infected patients, (3)return all non-transfused blood from infected patients. More rigorous steps, such as the screening of blood donors for virus RNA or the use of PRT in certain areas, may be introduced where appropriate.

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