Considerations and prioritization on apheresis procedures during the SARS-CoV-2 coronavirus disease (COVID-19) pandemic

Chisa Yamada, Jan Hofmann, Volker Witt, Gaurav K. Gupta, Jeffrey L. Winters
ASFA COVID-19 Taskforce

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Since vaccination for SARS-CoV-2 coronavirus started, the trajectory of the patient number in the SARS-CoV-2 coronavirus disease (COVID-19) pandemic has been better, however, the variants of SARS-CoV-2 coronavirus have been emerged and pandemic status is still far from resolution at this point. National and social effort to prevent coronavirus infection continue in most states in the US and globally even after Centers for Disease Control and Prevention (CDC) declared some restriction relief for fully vaccinated people in March 2021. Each institution and some professional organizations have some guidelines or policies on preventing the spread of these viruses in the setting of apheresis by now.[1,2] In this section, the issues that apheresis services may encounter under the current COVID-19 pandemic will be discussed with potential strategies that can be adapted for efficient and optimum use of apheresis resources.

1. Patient clinical condition

Assessment of individual patient for apheresis indication is always essential; however, it is even more critical with ongoing pandemic, especially if the patient’s conditions require urgent apheresis or apheresis cannot be delayed, and if the apheresis procedure takes a critical role in managing of the patient or it is a second-line therapy. For example, when patients have an exacerbation of Myasthenia Gravis (MG) with severe respiratory demise, or sickle cell patients have acute chest syndrome or thrombotic stroke, therapeutic plasma exchange (TPE) or RBC exchange (RBCEx) respectively should not be postponed because these patients’ conditions are life-threatening. If the patient or donor are already conditioned for peripheral hematopoietic stem cell (HPC) collection for HPC transplant or mononuclear cell collection for chimeric antigen receptor T-cell therapy (CAR-T therapy), delaying the procedure will not only miss the good timing to collect those cells but also can have detrimental effect on patient/recipient outcome. On the other hand, if the stable patients who are receiving TPE as a maintenance treatment for MG or chronic inflammatory demyelinating polyneuropathy (CIDP), decreasing frequency of TPE treatments or postponing TPE may be appropriate especially when they are on immunosuppressive medications and may have a higher risk of infection by coming to the hospital. Nonetheless, there should be a hospital’s policy needed to be follow in each hospital.

2. Assessing post-COVID-19 patients and possible carriers

For non-urgent apheresis procedure, the patients who recovered from COVID-19 or asymptomatic SARS-CoV-2 carriers may also need to be assessed. In general, one antigen testing negativity or two antibody testing negativities are considered to be SARS-CoV-2 negative. However, many hospitals do not require post-COVID-19 patients to receive those tests and each hospital has a policy to evaluate post-COVID-19 status. For example, patients with history of positive SARS-CoV-2 who have been asymptomatic for more than 3 weeks can be
treated as SARS-CoV-2 negative patients. It is necessary to follow an institutional policy in this regard. Additionally, all patients who have not tested for SARS-CoV-2 should be treated with precautions with pre-procedure screening.

3. Indication of apheresis

The appropriate apheresis procedures and indications should be assessed as usual. Clinical applications of therapeutic apheresis: an evidence based approach, known as ASFA Guidelines is updated every 3 years with the most recent Guidelines published in 2019.[3] The evaluation of the conditions/diseases for which evidence demonstrates or suggests apheresis to be ineffective or harmful (Category IV) may be terminated in the following edition of Guidelines, the new indications are evaluated and may be added, and the new evidence may be added in the existing Guidelines, therefore, it is important to refer to the most recent edition of Guidelines. Under the COVID-19 pandemic, in general, the indications in Category I should be performed, indications in Category II may be considered in case by case manner, and indications in Category III are recommended to be postponed and indications for Category IV are recommended to be postponed or rejected. For the conditions/diseases that are not yet evaluated in Guidelines, it may be important to assess the patient’s condition and perform apheresis when there is any logical reason that the apheresis is beneficial for the patients and the benefits of apheresis overcome the risks.

4. Considerations for possible adverse effects of apheresis on COVID-19 and alternative treatment

Quite number of case reports have been showing TPE was effective to treat severely ill COVID-19 patients.[4-12] The main rationale for TPE in these patients is removal of cytokine caused by cytokine storm from SARS-CoV-2 coronavirus infection. However, no report was found to investigate the removal of antibodies that those patients produced against SARS-CoV-2 coronavirus, the effect of reduced immunoglobulins and decreased or sustained T-cell counts by TPE on SARS-CoV-2 infection. Additionally, the effects of TPE on vaccines or removal of medications for COVID-19 such as remdesivir (plasma protein binding of 88-93%, volume of distribution is not reported) are also not investigated. Considering these potential adverse effects, TPE may not be appropriate for the patients with mild symptoms. In addition, some cytokine removal devises are now available with or without using apheresis devices, although many of these devices are still under investigation and not freely available.

There are many treatment options for COVID-19 including trials, however, there is no “gold standard” treatment so far and the treatment options are still evolving with newly emerging variants of the virus, development of new medications or devices, and as we gain more experience to treat COVID-19 patients. One treatment method does not apply to all patients, therefore, treatment options have to be chosen carefully, and it is important that apheresis should be performed when apheresis is necessary. Alternative medications such as steroid or IVIG which can also be used to treat COVID-19 may be able to temporally replace apheresis procedures.

5. Staffing
The safety of the staff is also critical not only to continue patient’s care but also to protect them. The detail of how to protect staff is discussed in other section. Pre-procedure screening of the patients for COVID-19 using questionnaires who come to apheresis treatment facility is important for both the patients and the staffs and it may be necessary to postpone the procedure depending on the results on the questionnaires. Since the skills of apheresis nurses are very unique and training to master all apheresis procedures takes several months, there are no quick replacements of them. Therefore, protecting them by gown and gloves in addition to masks and face guard may be necessary when treating COVID-19 patients. In addition, minimizing staff in apheresis clinic, alternative working day/hour of the staff, and avoidance of deployment of apheresis nurses to COVID-19 floors should be addressed when applicable.

6. Locations for apheresis procedures

It is crucial to keep SARS-CoV-2 positive patients separated from the apheresis clinic to avoid exposure to other patients and apheresis staffs. Apheresis procedure should be performed in the patient’s room if the patient is an inpatient. In the outpatient setting, apheresis procedure should be warranted after careful considerations, and the patient should be admitted temporarily for the procedure, possibly triage unit or emergency department when available. Also, cleaning of the patient area, devices, beds, chairs, and any materials that the patients might touch with appropriate chemical solutions such as >70% alcohol, sodium hypochlorite or ammonium chloride after each procedure is critical in outpatient setting even if the patient is COVID-19 negative. For the smaller facilities that do not accept COVID-19 patients, the patients who are necessary to receive apheresis procedures may need to be transferred to the bigger facilities that are providing apheresis procedures.

7. Supplies and storage (Including RBC units)

One of the big issues in patient’s care in apheresis unit during the COVID-19 pandemic was shortage of supplies including RBC units and apheresis kit. The number of blood donations have once decreased due to the “stay home” order and fear of SARS-CoV-2 infection. RBCEx procedure usually requires multiple RBC units and patients with sickle cell disease (SCD) on maintenance RBCEx protocol usually receive some antigen matched RBC units for compatibility or prevention of alloimmunization. It was once extremely difficult to sustain RBC supplies for SCD patients on maintenance RBCEx even though a study showed that SCD patients have a high risk for a severe disease course, high rates of hospitalization, intensive care unit admission and death with COVID-19[13] and RBCEx might be a critical part of their treatments. Potential strategies for management of inventory to slightly increase of interval between procedures, change from monthly RBCEx to alternate RBCEx and simple RBC transfusions, temporal increase of fraction of cell remaining in the RBCEx setting, or temporal complete change to simple transfusions for stable patients. Depending on the patients’ conditions, the appropriate option should be chosen. Limitation of emergency RBCEx procedure may be necessary depending on the patient’s condition. It is also important for blood bank to make every effort to obtain those specific RBC units and keep them for the designated patients.
The shortage of apheresis kits or other materials is a challenge sometimes because of the low production by manufactures and delayed delivery. Communication with manufacturers are critical and constant storage of those supplies is always recommended when available.

8. Consideration for apheresis in telehealth technologies

Under the condition where it is difficult to see patients in person, telehealth technologies may be useful tool.[14] This topic will be covered in other section and the detail is not discussed here.

Conclusion

Under the COVID-19 pandemic, apheresis procedure should be performed with
1. Careful assessment of the patients
2. Assessment of indication of apheresis procedure on the patients’ conditions/diseases
3. Consideration of alternative treatments
4. Assuring the safety of the staff
5. Consideration of locations for apheresis procedures
6. Storing the enough supplies constantly

References


