

The Report from ASFA COVID-19 Taskforce: Considerations and Prioritization on Apheresis Procedures during the SARS-CoV-2 Coronavirus Disease (COVID-19) Pandemic

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Abstract

Since vaccination for SARS-CoV-2 coronavirus started, the trajectory of patient numbers infected with the virus has improved once, however, variants of SARS-CoV-2 have emerged and more people have been infected, therefore, pandemic status is still far from resolution.

Government and social efforts to prevent coronavirus infection continue in most states in the US and globally even after the Centers for Disease Control and Prevention (CDC) declared some restriction relief for fully vaccinated people in March 2021. Healthcare institutions and various professional organizations have developed guidelines or policies to prevent the spread of these coronaviruses in the setting of apheresis.[1,2] In this report, the issues that apheresis services may encounter under the current COVID-19 (SARS-CoV-2 coronavirus disease) pandemic will be discussed with potential strategies that can be adapted for efficient and optimum use of apheresis resources.

1. Patient clinical condition

A careful evaluation of individual patient for an apheresis indication is always essential; however, it is even more critical with the ongoing pandemic, particularly if the patient's condition requires urgent apheresis or apheresis cannot be delayed, and if the apheresis procedure takes a critical role in management of the patient or it is a second-line therapy. For example, when patients have an exacerbation of myasthenia gravis (MG) with severe respiratory dysfunction, 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. In the setting of peripheral hematopoietic

stem cell (HPC) transplantation, if the recipient has already undergone conditioning or the donor has been mobilized, delaying the HPC collection can lead to adverse outcomes. Delaying mononuclear cell collection for chimeric antigen receptor T-cell therapy (CAR-T therapy) also can cause detrimental effects on patient outcome. Conversely, in stable patients receive 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 patients are on immunosuppressive medications and may have a higher risk of infection by coming to the hospital. These situations underline the need for institutional policies including pre-procedure screening to determine appropriate and careful use of hospital resources during the pandemic.

2. Assessing post-COVID-19 patients and possible carriers for infectious conditions

For non-urgent apheresis procedures, the patients who have recovered from COVID-19 or asymptomatic SARS-CoV-2 carriers may also need to be assessed for SARS-CoV-2 infectious status. PCR or antigen testing for SARS-CoV-2 is widely available now and the institutional policies for application of those tests have likely been developed already. 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 without PCR/antigen testing. It is necessary to follow an institutional policy and apheresis providers should remain updated in this regard. Additionally, all patients who have not tested for SARS-CoV-2 should be treated with precautions with pre-procedure screening for the symptoms such as fever or respiratory

symptoms regardless of the infectious status of the patients and vaccination status of patients and apheresis providers.

3. Indication of apheresis

The appropriate apheresis procedures and indications should be assessed as usual. Clinical applications of therapeutic apheresis: an evidence based approach, also known as the 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 prioritized to receive therapeutic apheresis procedures over the indications in other categories, indications in Category II should be considered and carefully evaluated in case by case manner, indications in Category III are recommended to be postponed and indications for Category IV are recommended to be postponed or rejected. Whenever the conditions of the patients and/or COVID-19 pandemic are changed, the patients whose procedures were postponed or rejected should be re-evaluated for the procedures. 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 for COVID-19 and alternative treatment

Quite a number of case reports have shown that TPE could effectively treat severely ill COVID-19 patients.[4-12] The main rationale for TPE in these patients is removal of cytokines caused by cytokine storm from SARS-CoV-2 infection. However, no report was found to investigate the removal of antibodies that those patients produced against the virus, the effect of reduced immunoglobulins, and decreased T-cell counts after TPE on patients with SARS-CoV-2 infection was also reported [7]. 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 devices are now available with or without using apheresis devices, although many of these devices are still under investigation and are not readily 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 must be chosen carefully. And it is important that apheresis should be performed when benefits of apheresis overcome possible risks mentioned above. 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. 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. If a patient with COVID-19 with a life-threatening disease that requires emergent apheresis procedures, apheresis procedures should be performed and the nurses should be provided with personal protective equipment (PPE) [13] per institutional infection control policy. An innovative apheresis method that allows apheresis nurses to work outside of the patient's room was reported and can be considered.[14] 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 as same as other specialized health care providers. Therefore, protecting them by gown and gloves in addition to masks and face guards 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. If an apheresis nurse had COVID-19, all personnel working in apheresis unit should receive SARS-CoV-2 test and should not work if the test resulted in positive. In extreme circumstances, shutting down of apheresis unit may be necessary.

6. Locations for apheresis procedures

It is crucial to keep SARS-CoV-2 positive patients separated from the apheresis outpatient clinic to avoid exposure to other patients and apheresis staff. Optimally, all inpatients should receive apheresis procedures in the patient's room. In the outpatient setting, apheresis procedure should be performed only after careful consideration. If the patient cannot be admitted temporally for the procedure, possibly triage unit or isolated room in emergency department or within the apheresis clinic should be used. 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 the 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 larger facilities that are providing apheresis procedures.

7. Supplies and storage (Including RBC units)

One of the major issues in patient care in the apheresis unit during the COVID-19 pandemic was shortage of supplies including RBC units and apheresis kits. The number of blood donations decreased dramatically due to "stay home" orders and fear of SARS-CoV-2 infection. RBCEx procedure usually requires multiple RBC units and patients with sickle cell disease (SCD) on maintenance RBCEx protocols usually receive some degree of antigen matched RBC units for compatibility or prevention of alloimmunization. During the height of the pandemic, it was extremely difficult to sustain RBC inventory for SCD patients on maintenance RBCEx in certain area of the US despite a study showing that SCD patients have a high risk for a severe disease course, high rates of hospitalization and intensive care unit admission, and death with COVID-19

[15], therefore, 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, temporary increase of fraction of cell remaining in the RBCEx setting, or temporary switch to simple transfusions for stable patients. Depending on the patient's condition, the appropriate option should be chosen. It is important for blood banks to make every effort to obtain those specific RBC units and keep them for the designated patients on planned procedures, however, limitation of emergency RBCEx procedure may be necessary because the appropriate RBC units may not be available.

The temporary shortages of apheresis kits or other materials can occur because of low production by manufacturers and delayed delivery. Communication with manufacturers is critical and constant storage of those supplies is always recommended when available.

Conclusion

Under the COVID-19 pandemic, apheresis procedure should be performed with considerations including a careful evaluation of the patients for their conditions from their diseases and COVID-19 status, an assessment of indication of apheresis procedure on the patients' conditions/diseases, a consideration of alternative treatments, and a safe environment not only for the patients who receive apheresis procedures but also for other patients and staffs. It is also important to assure safety of the apheresis providers or staffs by providing PPE or a consideration of scheduling of the providers, and maintaining adequate supply inventory on regular basis should be considered.

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Table 1: Checklist to consider when apheresis procedures are requested in the COVID-19 pandemic

1. Careful evaluation 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. Maintaining adequate supply inventory on regular basis