# WHAT IS THE PLASMAPHERESIS?

# INDICATION AND CONTRAINDICATION

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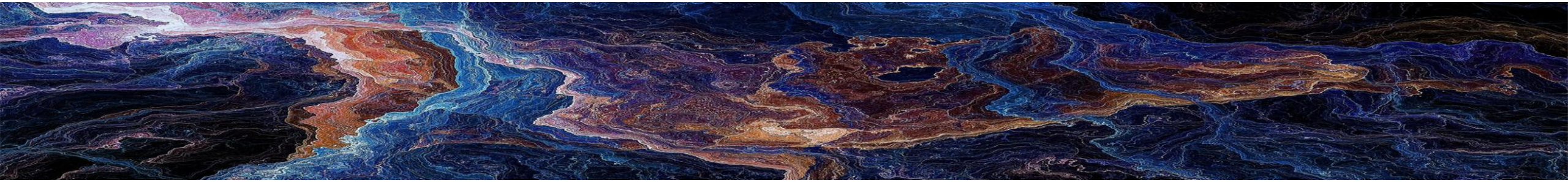
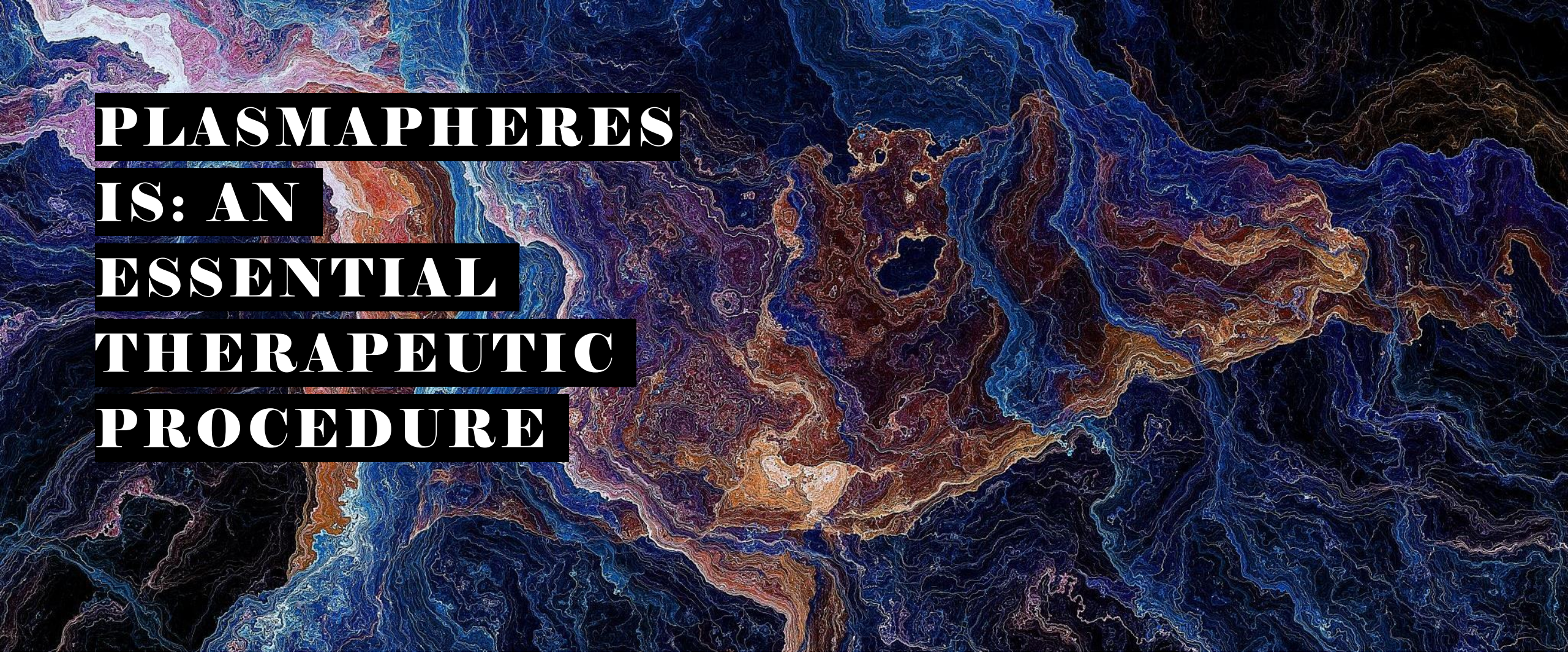



PLASMAPHERES
IS: AN
ESSENTIAL
THERAPEUTIC
PROCEDURE

# DEFINITION OF PLASMAPHERESIS

- Plasmapheresis: Removing, Treating, and Returning Blood Plasma
- Therapeutic plasma exchange (TPE) is now applied specifically to procedures that involve replacement solely with plasma.
- During plasmapheresis, a specialized machine called a centrifuge is used to separate the different components of blood
- The plasma, containing antibodies, immune complexes, and other substances, is removed for therapeutic purposes

# PROCEDURE OVERVIEW

- Plasmapheresis is a multi-step procedure that follows a standardized protocol
- The procedure begins with the collection of the patient's blood, which is then processed through a centrifuge
- The centrifuge separates the plasma from other blood elements, allowing for its removal and replacement with a suitable substitute

For most conditions, it has become standard practice to perform 1 to 1.5 plasma volume exchanges per procedure.

The following formula can be used to estimate the plasma volume in most adults :

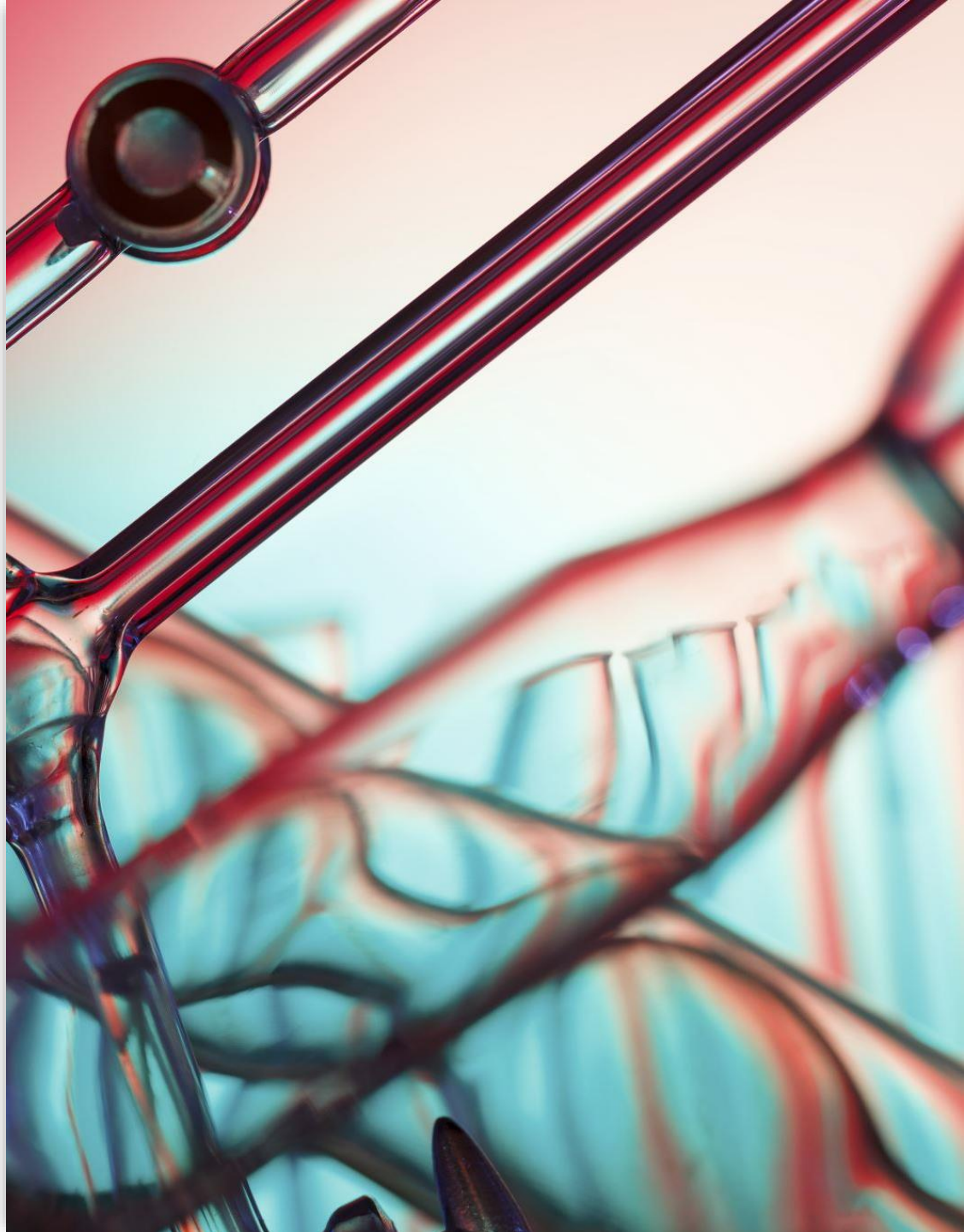
Estimated plasma volume (in liters) = 0.07 x weight (kg) x (1 - hematocrit)

Five percent albumin, saline, or a combination of albumin and saline are the replacement fluids of choice for most conditions.

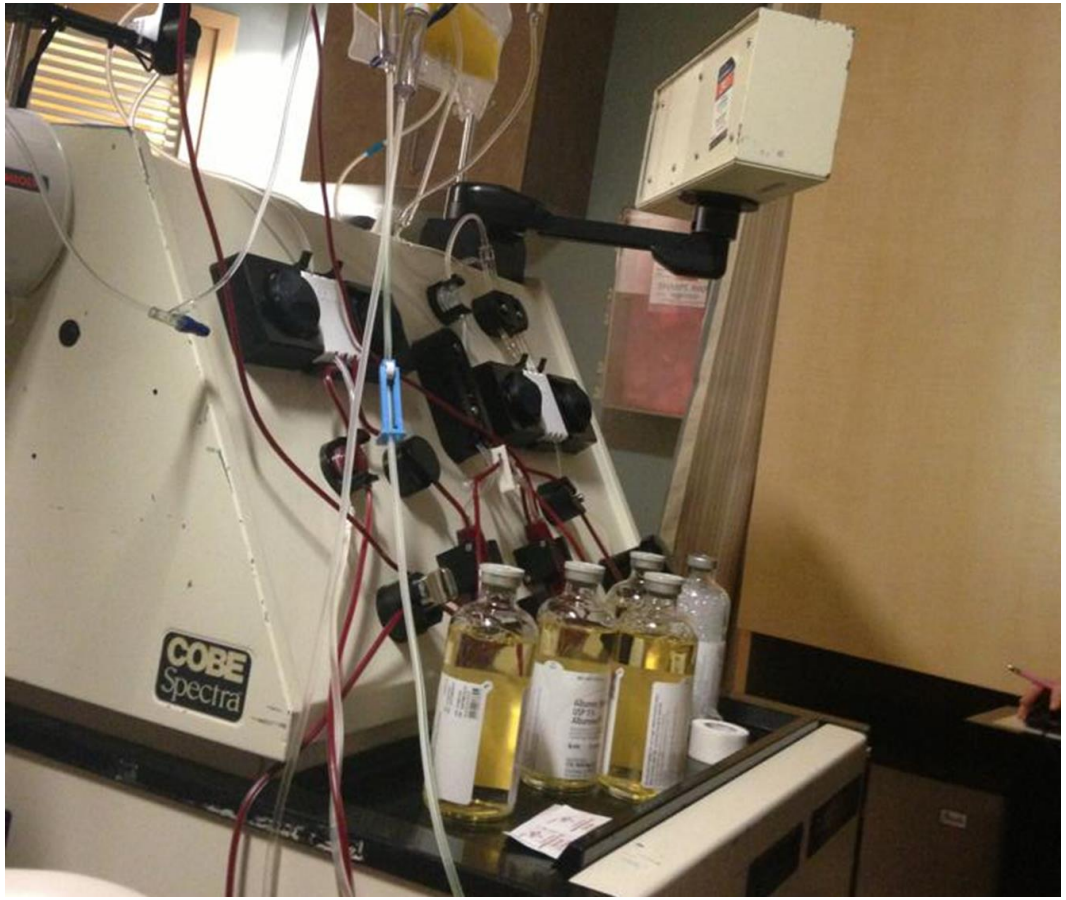
Five percent albumin is used for most conditions; saline for hyperviscosity; and some combination of albumin and saline if cost is a consideration.

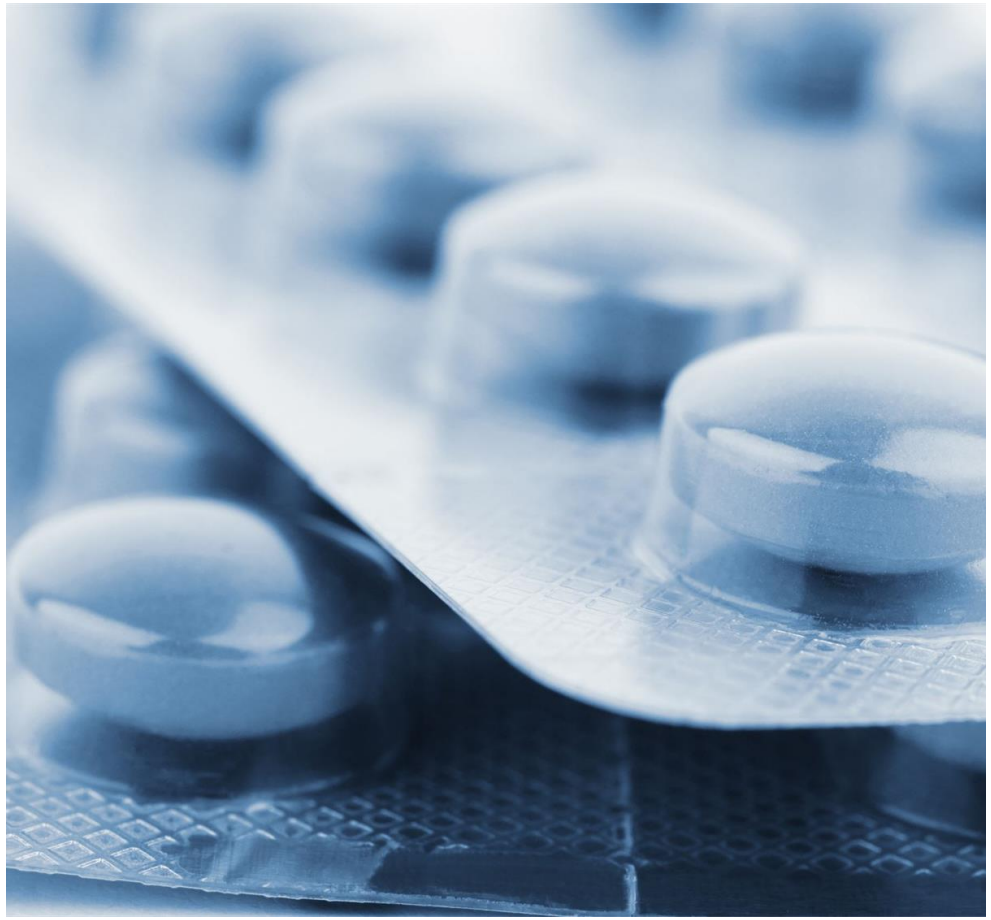
5 percent albumin or a crystalloid-colloid (ie, albumin-saline) combination prefer as the replacement fluid, rather than saline alone.

It is generally recommended that plasma only be used as the replacement fluid for conditions in which constituents of plasma are necessary to achieve a specific therapeutic goal (eg, thrombotic thrombocytopenic purpura [TTP]).



- Therapeutic apheresis is highly effective for the removal of pathologic autoantibodies. Immunoglobulin (Ig) G has an average molecular weight over 150,000 daltons and a half-life of approximately 21 days.
- Thus, even if immunosuppressive therapy could immediately halt new antibody production, the plasma concentration would decrease only about 50 percent within 21 days.
- Such a delay may not be acceptable with an aggressive autoantibody such as that seen in anti-glomerular basement membrane (anti-GBM) antibody disease.



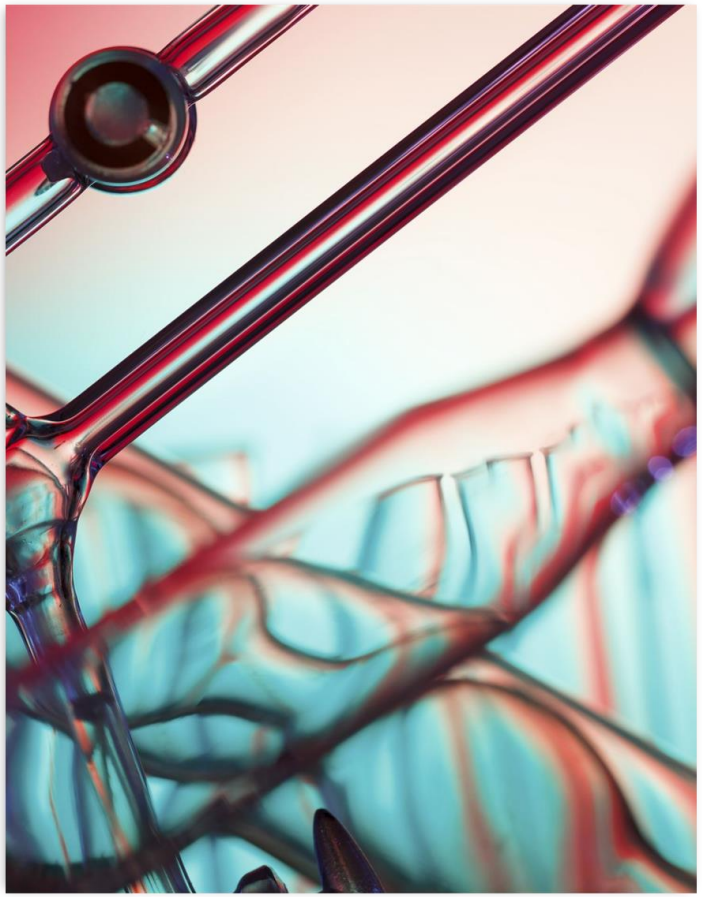


- TECHNICAL CONSIDERATIONS
- When using the Plasmaflo filter with a standard dialysis machine, transmembrane pressure (TMP) should be modest (recommended TMP <75 mmHg, although the maximum TMP for the OP-05W is listed as 100 mmHg), and blood flow is often 50 to 150 mL/min in order to minimize the tendency for hemolysis and filter clotting.
- Give a bolus of low-dose heparin (2000 units) at the start of the treatment, unless anticoagulation is contraindicated. This dose is based upon clinical experience and is not supported by clinical evidence. The heparin dose should be increased when the hematocrit is reduced. In this setting, there is a relative increase in plasma volume removal (since more of the blood is composed of plasma), leading to enhanced removal of heparin.
- Initial recommendations had been to start with a heparin dose of 5000 units [8] or 40 to 60 units/kg [13] followed by a maintenance dose of approximately 1000 units per hour.However, a report from Columbia, using no anticoagulation, documented only one case of filter clotting occurring out of 500 MPS treatments

**Pathologic substances removed by therapeutic apheresis**

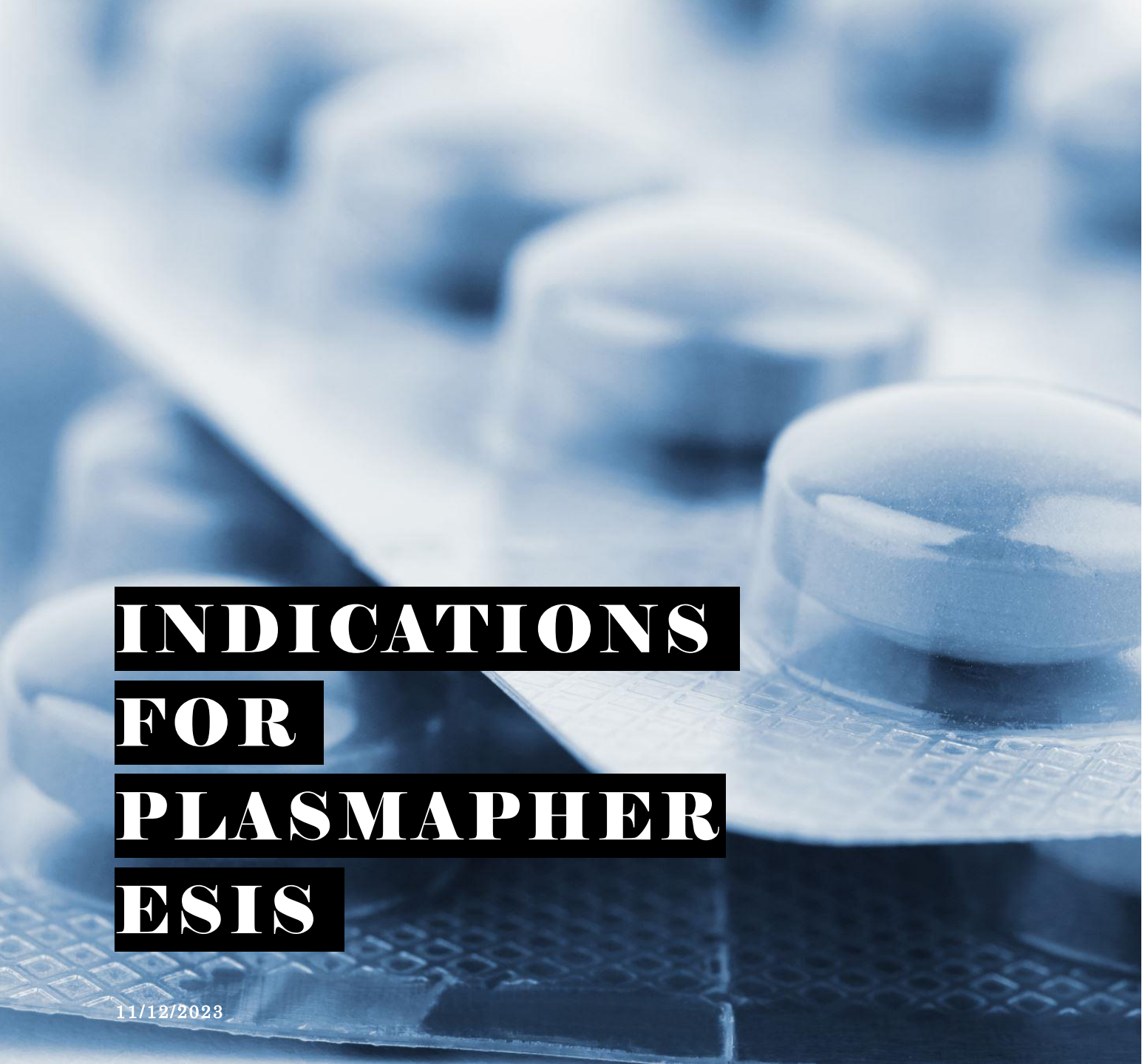
| Pathologic substance | Diseases |
|---|---|
| Immunoglobulins | Hyperviscosity syndrome |
| | Waldenström macroglobulinemia |
| | Multiple myeloma |
| Autoantibodies | Myasthenia gravis |
| | Anti-GBM antibody disease |
| | Systemic lupus erythematosus |
| | Systemic vasculitis |
| | Factor VIII inhibitors |
| | Thrombotic thrombocytopenic purpura |
| Lipoproteins | Hypercholesterolemia |
| Leukocytes | Hyperleukemic leukostasis |
| Platelets | Severe thrombocytosis |
| Abnormal red cells | Sickle cell disease (pain crisis, acute chest syndrome, stroke) |
| Circulating immune complexes | Immune complex glomerulonephritis |
| | Systemic lupus erythematosus |
| | Systemic vasculitis |
| Protein-bound substances and toxins | Thyroid storm |
| | Amanita phalloides toxins |
| Hyperparasitemia | Malaria, babesiosis |

- Disorders for which apheresis is accepted "as first-line therapy, either as primary stand-alone treatment or in conjunction with other modes of treatment.“ Examples include therapeutic apheresis in Guillain-Barré syndrome or acquired autoimmune TTP, and erythrocytapheresis in sickle cell disease with certain complications such as stroke.
- Category II – Disorders for which apheresis is accepted "as second-line therapy," either as a stand-alone treatment or in conjunction with other treatments. Examples include TA for life-threatening hemolytic anemia for cold agglutinin disease or Lambert-Eaton myasthenic syndrome.



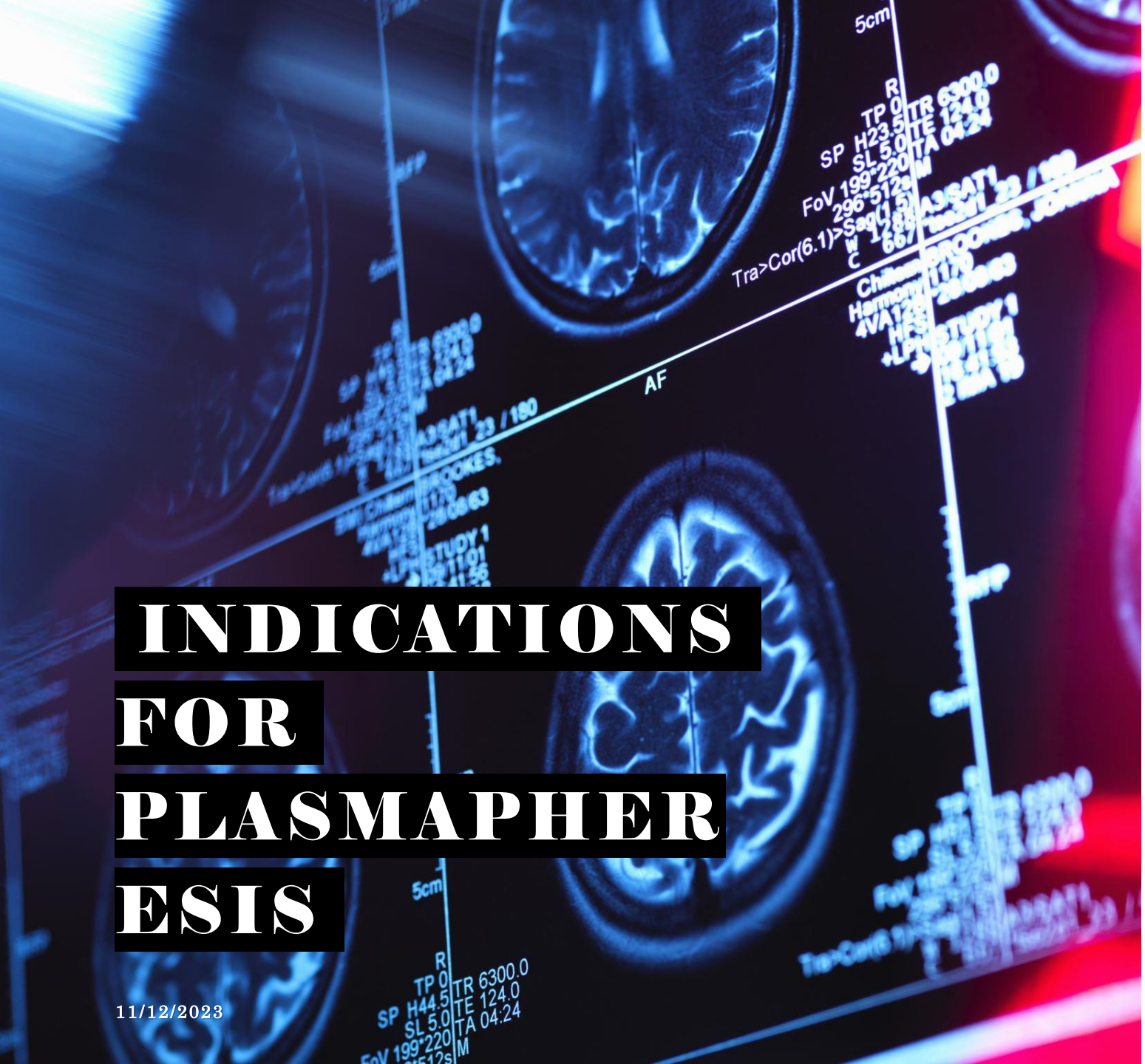
- Category III – Disorders for which the "optimum role of apheresis therapy is not established." Decision-making should be individualized. Examples include TPE for hypertriglyceridemic pancreatitis or extracorporeal photopheresis for nephrogenic systemic fibrosis.
- Category IV – Disorders for which "published evidence demonstrates or suggests apheresis may be ineffective or harmful." Examples include TPE for active rheumatoid arthritis.

- For some indications, therapeutic apheresis is considered first-line therapy (eg, TTP, acute Guillain-Barré syndrome),
- whereas for others such as light chain cast nephropathy in multiple myeloma, apheresis may need to be combined with other established treatments such as chemotherapy to stop antibody production



# INDICATIONS FOR PLASMAPHERESIS

- **Treating Autoimmune Disorders with Plasmapheresis**
- Plasmapheresis is indicated in various autoimmune disorders to remove harmful autoantibodies and immune complexes
- Conditions such as Guillain-Barré syndrome, myasthenia gravis, and lupus can benefit from plasmapheresis
- The procedure is often used as an adjuvant therapy in conjunction with other treatment modalities



# INDICATIONS FOR PLASMAPHERESIS

- **Plasmapheresis for Neurological Disorders and Hematological Conditions**
- In addition to autoimmune disorders, plasmapheresis is employed in the treatment of various neurological and hematological conditions
- Patients with chronic inflammatory demyelinating polyneuropathy and multiple sclerosis may benefit from plasmapheresis
- Hematological disorders such as thrombotic thrombocytopenic purpura and hemolytic uremic syndrome also warrant plasmapheresis

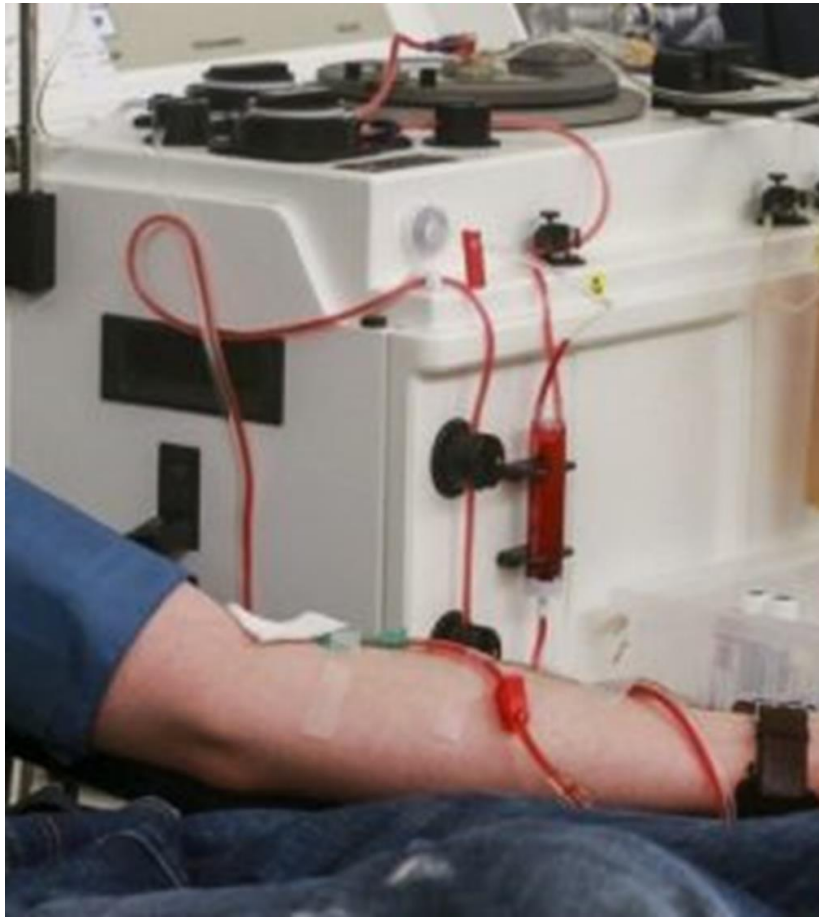
- A review of reported complications from over 15,000 therapeutic plasma exchange (TPE) treatments found that adverse reactions were substantially more common with plasma than with albumin replacement (20 versus 1.4 percent).

- Any change in the patient's status (eg, dyspnea, seizures, chest pain, and hypotension not responsive to one or two fluid boluses) should prompt discontinuation of the TPE procedure and evaluation for the cause of the symptoms.
- The reported overall incidence of death from TPE is 0.03 to 0.05 percent

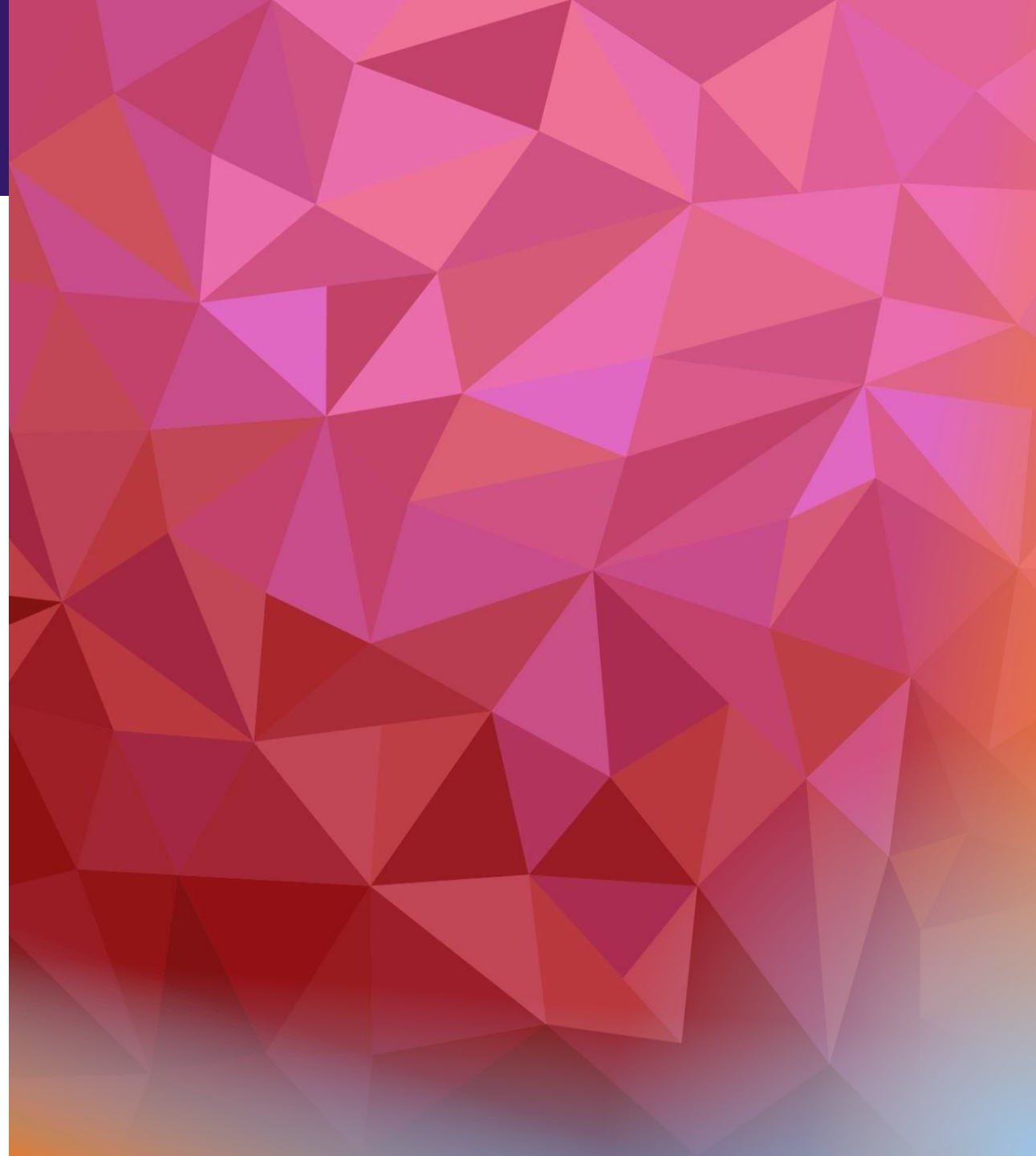
# POTENTIAL RISKS AND COMPLICATIONS

- While plasmapheresis is generally safe, it carries some potential risks and complications
- These may include allergic reactions to plasma substitutes, bleeding or hematoma at the access site, infection, hypotension, electrolyte imbalances, and citrate toxicity
- Prompt recognition and management of complications are essential to ensure patient safety

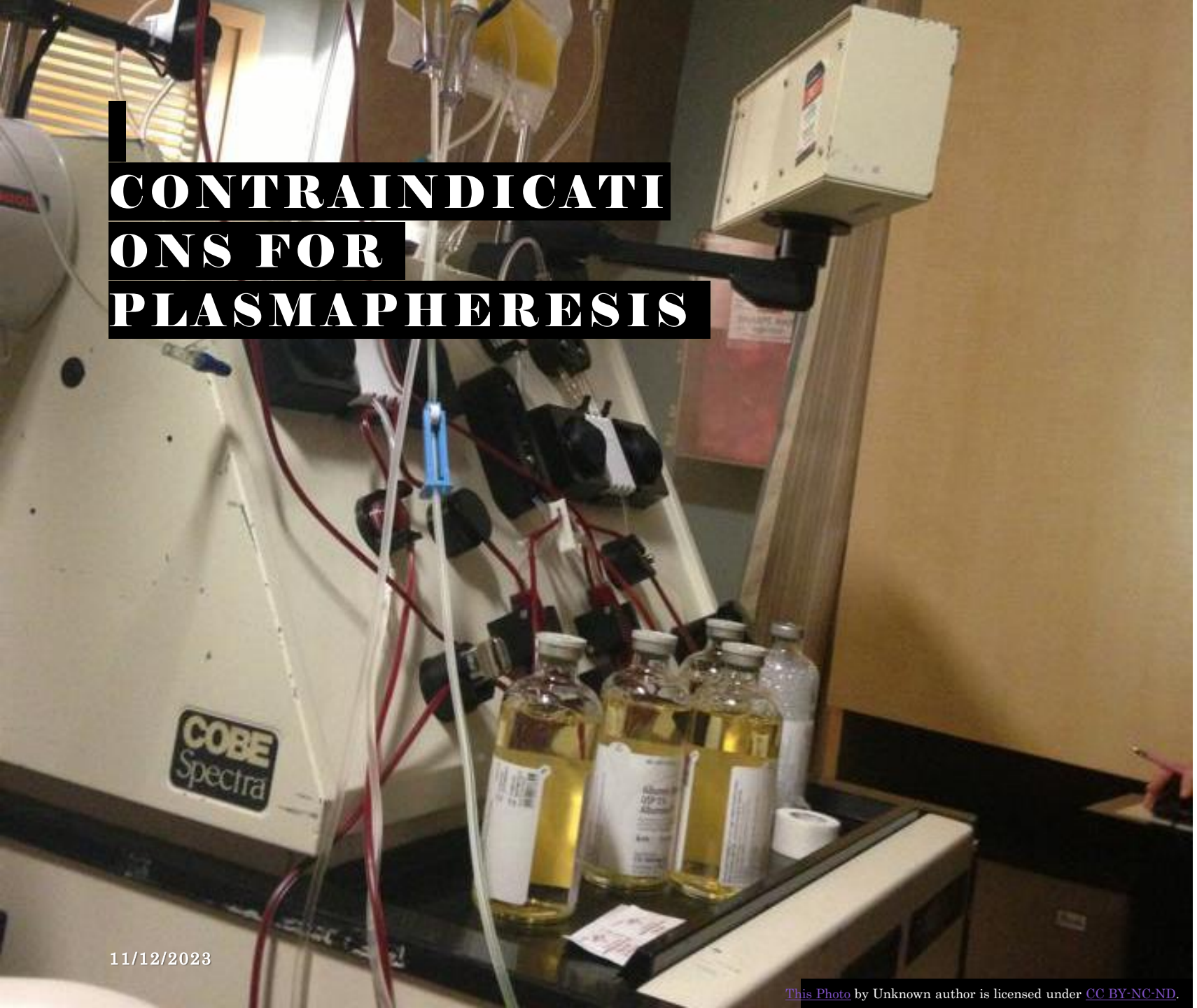
- Any replacement fluid – A common issue is citrate-induced symptoms of hypocalcemia, due to binding of ionized (free) calcium by citrate, which is used as an anticoagulant during the procedure. Symptoms include paresthesias, nausea and vomiting, muscle cramps, chest pain, hypotension, and, in the extreme, tetany or arrhythmias such as QT prolongation.
- Non-plasma replacement fluids for plasma exchange – Non-plasma replacement fluids may cause hypokalemia, reduction in coagulation factor and/or immunoglobulins levels, or hypotension if the patient is taking an angiotensin converting enzyme (ACE) inhibitor.
- Donor plasma or RBC exposure – Exposure to allogeneic (donor) plasma or RBCs may cause more serious complications, such as hemolytic transfusion reactions (if out-ofgroup products are given), severe anaphylactic reactions, or transfusion-related acute lung injury (TRALI), and may increase the risk of transfusion-transmitted disease. Use of blood products should conform to accreditation standards and regulations



- Other serious complications such as those related to the vascular access such as pneumothorax, thrombosis, and infection, bleeding due to anticoagulant use, and increased risk of infection are rare.
- Use of peripheral veins may avoid complications associated with central venous catheters but is associated with slower blood flow and longer procedures that may eventually render peripheral veins ineffective or create patient discomfort. It may be more practical to insert a central catheter to manage conditions that warrant several procedures over a longer period of time.



- The reported incidence of paresthesia and cramps ranges from 1.5% to 9%. Reported incidence of hypotension ranges from 2.6% to 8.1%.
- For therapeutic apheresis in which a citrate-containing solution is used as an anticoagulant, patients may be at risk for citrate-induced hypocalcemia; metabolic alkalosis or complications related to the vascular catheter also may occur.

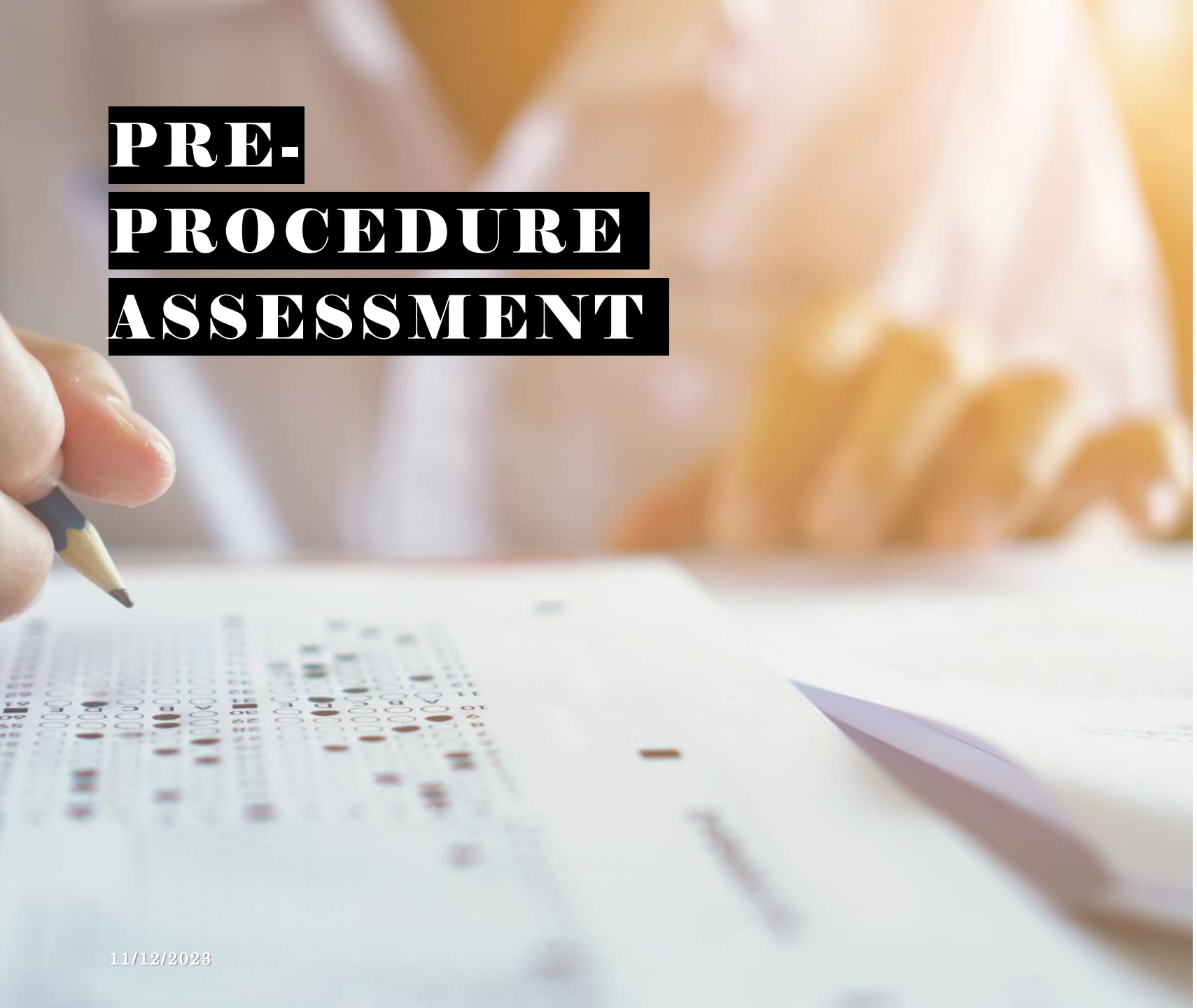



# CONTRAINDICATIONS FOR PLASMAPHERESIS

- Despite its therapeutic potential, plasmapheresis may not be suitable for all patients
- Unstable cardiovascular status is considered a contraindication, particularly in patients with severe cardiac conditions or unstable blood pressure
- Active infections are generally avoided as a contraindication to prevent complications and the spread of infectious agents

# CONTRAINDICATIONS FOR PLASMAPHERESIS

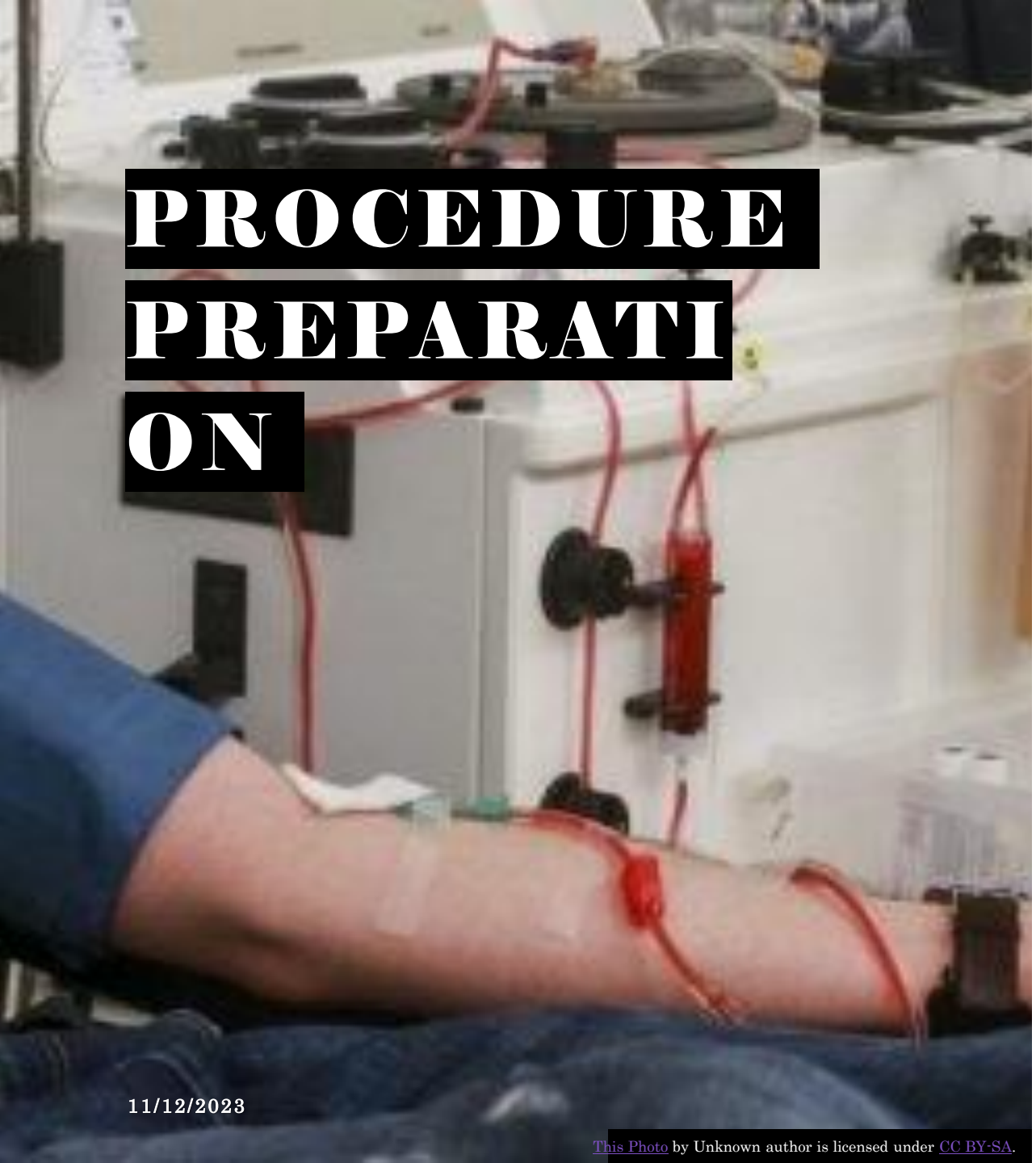
- Patients with severe clotting disorders, such as hemophilia, may have an increased risk of bleeding during or after plasmapheresis
- Allergies to plasma substitutes used during the procedure can be a contraindication, as they may trigger severe allergic reactions
- Plasmapheresis may lead to a temporary drop in red blood cell count, making it a contraindication for patients with severe anemia



# PRE-PROCEDURE ASSESSMENT

- **Comprehensive Evaluation Before Plasmapheresis**
- Before performing plasmapheresis, a thorough pre-procedure assessment is necessary to ensure patient safety and optimize treatment outcomes.
- The assessment involves obtaining a detailed medical history, including information on the patient's current condition, previous treatments, and any underlying medical issues.
- A comprehensive physical examination is conducted to evaluate the patient's overall health, vascular access points, and potential contraindications.
- Laboratory tests, such as blood tests and coagulation studies, are performed to assess the patient's general health, coagulation status, and renal function.

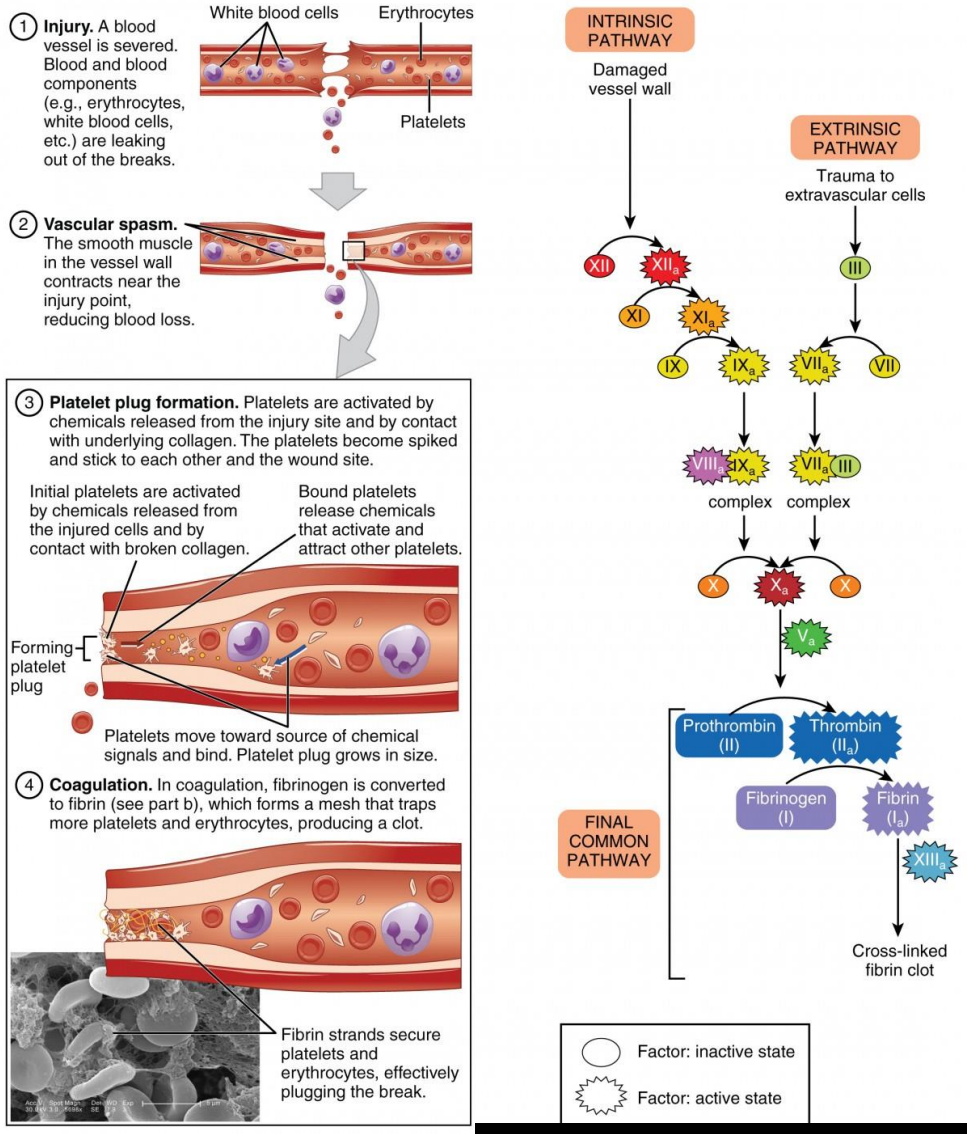
# PROCEDURE PREPARATION



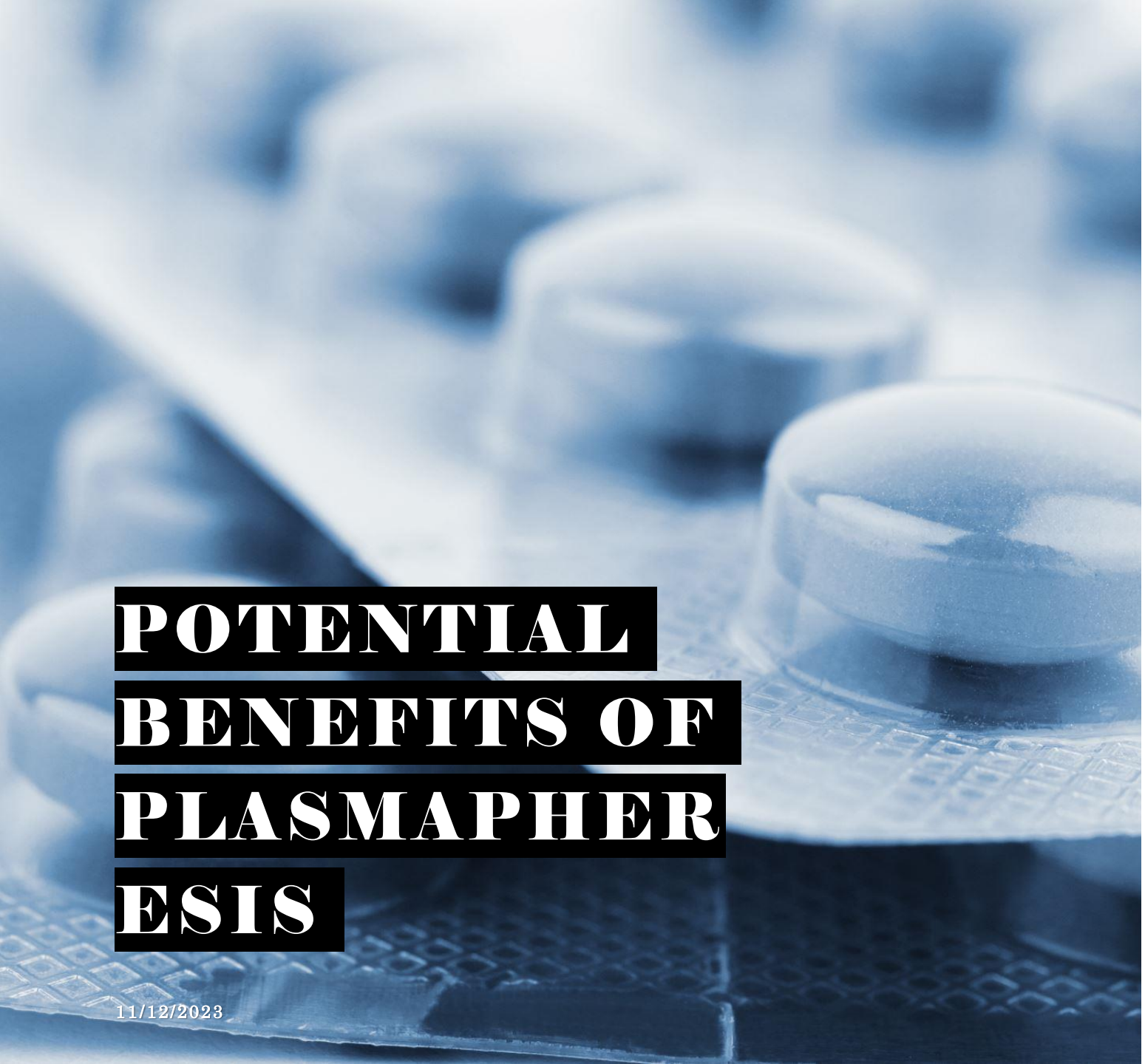
- Proper preparation is crucial for a successful plasmapheresis procedure
- The patient's consent should be obtained after explaining the procedure, potential risks, and benefits
- Necessary preparations include ensuring adequate vascular access, preparing the plasmapheresis machine, and assembling the required equipment and supplies

# PLASMAPHERESIS PROCEDURE STEPS

- **Step-by-Step Guide to Plasmapheresis**
- Plasmapheresis follows a standardized set of steps to ensure consistency and safety
- The procedure typically involves the placement of venous access, connection to the plasmapheresis machine, collection of blood, separation of plasma, and reinfusion of treated blood
- Trained healthcare professionals closely monitor the patient's vital signs and overall well-being throughout the procedure



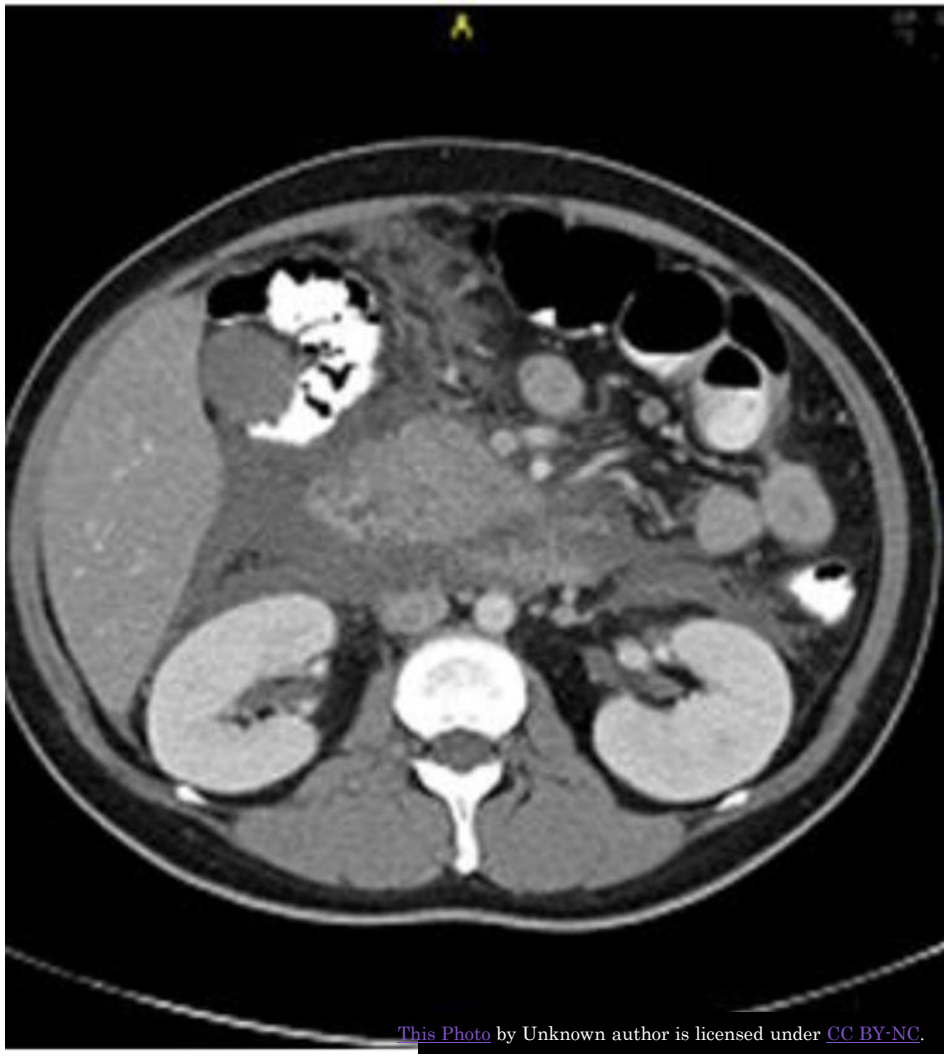

(a) The general steps of clotting



# POTENTIAL BENEFITS OF PLASMAPHERESIS

- **Positive Outcomes with**
- **Plasmapheresis**
- Plasmapheresis offers several potential benefits for patients with appropriate indications
- By removing harmful substances from the bloodstream, plasmapheresis helps modulate the immune response and reduce disease activity
- The procedure has been associated with improved outcomes and reduced mortality in certain conditions

- A total of 192 procedures performed on 40 patients (22 males and 18 females).
- Vascular access was femoral catheter in 27 (67.5%) and internal jugular catheter in 13 (32.5%).
- A total of 36 patients (90%) showed significant improvement in condition, 2 did not show any change, while one worsened and one died due to respiratory complications.
- GBS accounted for 67.5% (>two-third of causes) for PE with neuromyelitis optica being the second common cause in 10% of patients.
- Previous co-morbid medical conditions included diabetes mellitus in 8 (20%), hypertension in 7 (17.5%), chronic obstructive pulmonary disease in 2 (5%) patients, and ischemic heart disease in 2 (5%) patients.
- All patients were medically stable at the time of PE.
- Vascular access was femoral catheter in 27 (67.5%) of patients while internal jugular catheter was used in 13 (32.5%) of patients.
- None of our patients was pregnant at the time of PE




# CONCLUSION

Plasmapheresis is a valuable therapeutic procedure with widespread applications

It plays a significant role in the treatment of autoimmune, neurological, and hematological disorders

By understanding the indications, contraindications, and potential benefits and risks of plasmapheresis, healthcare professionals can make informed decisions and provide effective patient care

# QUESTIONS AND DISCUSSION

- This concludes the formal presentation on plasmapheresis
- We now invite questions and discussion to further explore the topic and address any concerns or queries you may have
- Thank you for your attention and participation

# THANKS FOR YOUR ATTENTION