

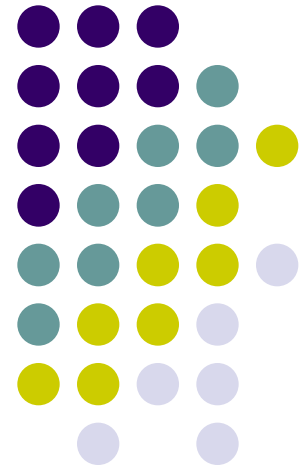
Therapeutic Apheresis

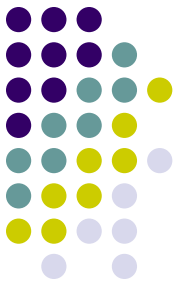
SEABB

Courtney Hopkins, D.O.

American Red Cross,

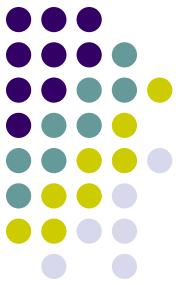
Southern Region





Outline

- Indication Categories
- Clinical Indications (I and II)
- Extracorporeal Photopheresis
- American Red Cross Therapeutic Apheresis Program



Indication Categories

- American Society for Apheresis (ASFA) provides guidelines for the use of Therapeutic Apheresis in clinical practice
- Based on best available evidence



Category I

- Diseases for which TA is standard and acceptable
- TA is primary therapy or valuable first-line adjunct
- Based on well-designed randomized, controlled trials or on broad, non-controversial base of published experience

Category II



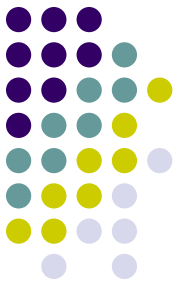
- Diseases for which TA is generally accepted
- TA supportive or an adjunct to other more definitive therapy (not first-line therapy)
- Are some randomized controlled trials, some small series or case studies

Category III



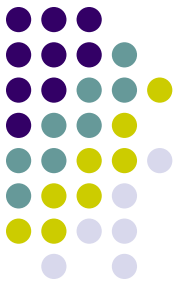
- Suggestion of benefit
- Existing evidence is insufficient, either to establish efficacy or clarify risk/benefit ratio associated with TA
- Controlled trials produced conflicting results or anecdotal reports without consensus
- TA may be used when conventional therapies do not produce an adequate response
- Heroic, last-ditch efforts to save patient

Category IV



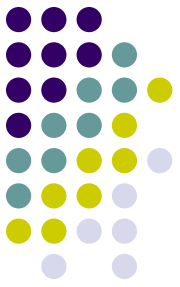
- TA is discouraged
- Controlled trials have not shown benefit or anecdotal reports have been discouraging

Category P

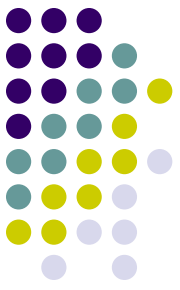


- Pending
- Includes disease which can be treated by TA using advices that are not available in the US and/or do not have FDA clearance (trial)
- Dilated cardiomyopathy
- Inflammatory bowel disease
- Macular degeneration, age related

Common Clinical Indications



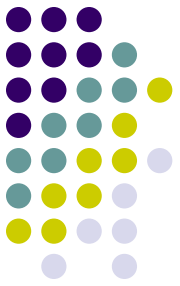
- Plasma exchange (TPE)
 - Therapeutic procedure in which blood of the patient is passed through a medical device which separates out plasma from other components of blood, the plasma is removed and replaced with a replacement solution (albumin, plasma)



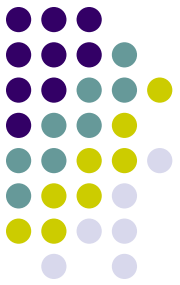
TPE Category I and II

- Hematologic
 - Hyperviscosity in monoclonal gammopathies (I)
 - Waldenstrom's macroglobulinemia: IgM
 - Multiple myeloma: IgA, IgG
 - Large amounts of paraprotein increase blood viscosity by causing sludging of RBCs and results in occlusion of microvasculature

TPE Category I and II



- Hematologic
 - Thrombotic thrombocytopenic purpura (I)
 - Thrombocytopenia, MAHA, neurologic dysfunction, fever, renal dysfunction
 - Decreased ADAMTS-13 (may be autoantibody)
 - Need to replace with plasma



TPE Category I and II

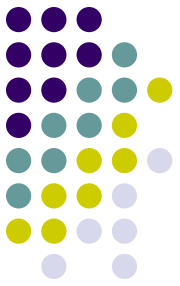
- Hematologic
 - Red cell alloimmunization in pregnancy (II)
 - Anti-D, anti-K, anti-C, anti-e, anti-PP1Pk
 - ABO incompatible hematopoietic progenitor cell transplantation (II)

TPE Category I and II



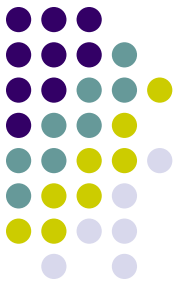
- Neurological
 - Acute inflammatory demyelinating polyneuropathy/Guillain Barre syndrome (I)
 - Ascending, progressive muscular weakness and areflexia
 - Autoimmune disorder with autoantibodies including complement fixing IgM antiperipheral nerve myelin antibodies

TPE Category I and II



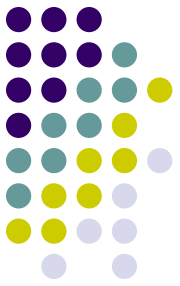
- Neurological
 - Chronic inflammatory demyelinating polyradiculoneuropathy-CIDP (I)
 - Chronic, autoimmune involves both motor and sensory nerves in a symmetrical distribution

TPE Category I and II



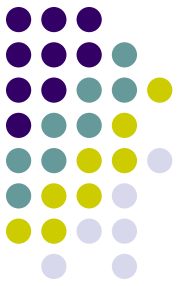
- Neurological
 - Multiple Sclerosis
 - Acute CNS inflammatory demyelinating disease (II)
 - Includes cases of Transverse Myelitis and Neuromyelitis Optica (Devic's Disease)
 - Acute, severe attacks refractory to medical therapy
 - Chronic progressive MS (III)
 - Autoimmune disease

TPE Category I and II

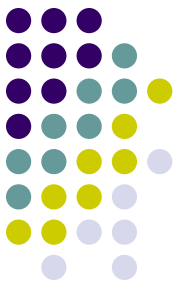


- Neurological
 - Lambert-Eaton myasthenic syndrome (II)
 - Autoimmune or paraneoplastic antibody disorder characterized by compromised transmission of Ach stimulation across the neuromuscular junction
 - 60% associated with small cell lung cancer

TPE Category I and II

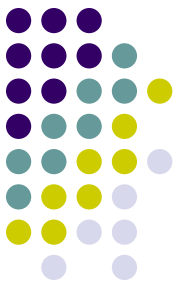


- Neurological
 - Myasthenia gravis exacerbation or surgical preparation (I)
 - Autoimmune disorder caused by autoantibodies to the acetylcholine receptor
 - Weakness of voluntary muscle groups worsened by activity and alleviated by rest



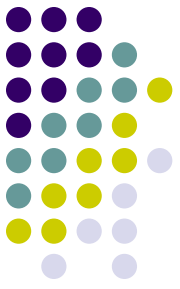
TPE Category I and II

- Neurological
 - Rasmussen's encephalitis (II)
 - Chronic focal encephalitis
 - Progressive hemiparesis, decline in cognitive function, epileptic seizures refractory to standard medical therapy
 - May necessitate hemispherectomy at expense of permanent hemiplegia



TPE Category I and II

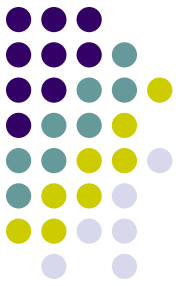
- Neurological
 - Pediatric autoimmune neuropsychiatric disorders associated with streptococcal infections (PANDAS); Sydenham's chorea (I)
 - Antineuronal autoantibodies stimulated by group A B-hemolytic streptococcal infection
 - OCD, Tourette's syndrome, other tic disorders of childhood



TPE Category I and II

- Neurological
 - Paraproteinemic polyneuropathies
 - 10% of patients with idiopathic polyneuropathy have a monoclonal immunoglobulin in their serum- MGUS
 - IgG/IgA (I)
 - IgM (II)

TPE Category I and II



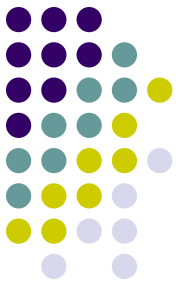
- Renal
 - Rapidly progressive glomerulonephritis
 - Rapid deterioration in renal function over a period of a few days to weeks
 - Number of different diseases cause RPGN classified by histological and serological findings
 - Goodpasture's syndrome
 - Wegener's granulomatosis
 - Systemic vasculitis and primary GN immune-complex deposits

TPE Category I and II

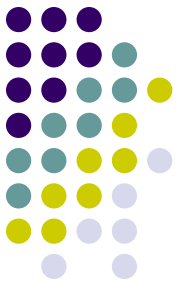


- Renal
 - Anti-glomerular basement membrane disease (Goodpasture's syndrome) (I)
 - IgG antibody
 - Renal failure, pulmonary hemorrhage, anti-GBM
 - Measure anti-GBM serially to follow course of disease and efficacy of treatment
 - Demonstrate anti-GBM on lung/renal tissue

TPE Category I and II



- Renal
 - ANCA-associated rapidly progressive glomerulonephritis (Wegener's granulomatosis) (II)
 - c-ANCA, autoantibody to proteinase-3



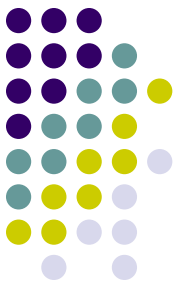
TPE Category I and II

- Renal Transplant
 - ABO incompatible solid organ transplantation (II)
 - Antibody mediated rejection (II)
 - HLA desensitization
 - May need to replace with plasma if perioperative period

TPE Category I and II



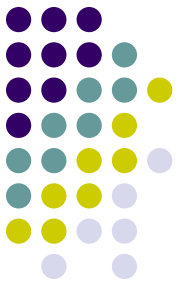
- Autoimmune
 - Cryoglobulinemia (I)
 - Immunoglobulins that reversibly precipitate at cold temperatures (extremities, skin, vascular occlusion)



TPE Category I and II

- Metabolic
 - Heterozygous Familial Hypercholesterolemia (II)
 - Mushroom poisoning (II)
 - Effective at removing highly protein-bound toxins from blood
 - Phytic acid storage disease/Refsum's disease (II)
 - Autosomal recessive disorder
 - Can't metabolize PA secondary to deficiency in alpha-oxidase
 - Reduces plasma PA levels

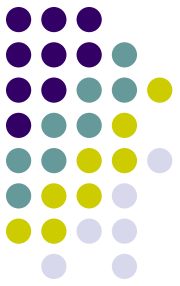
Common Clinical Indications



- Erythrocytapheresis
 - RBC exchange: blood of the patient is passed through a medical device which separates red blood cells from other components of blood, the red blood cells are removed and replaced with donor red blood cells
 - RBC Reduction

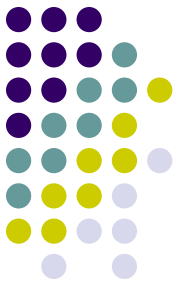
Erythrocytapheresis

Category I and II



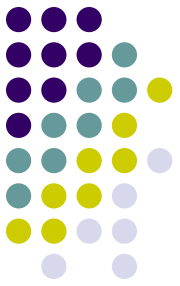
- Reduction
 - Polycythemia vera (II)
- Severe Babesiosis (II)
- Severe Malaria (II)
- Sickle cell disease
 - Life and organ threatening (stroke, acute chest, priapism) (I)
 - Stroke prophylaxis and prevention of iron overload (II)

Common Clinical Indications



- Leukocytapheresis
 - Blood of the patient or donor is passed through a medical device which separates out the WBCs, collects the selected cells and returns the remainder to the patient/donor
 - Used therapeutically or in preparation of blood components (granulocytes)

Leukocytapheresis Category I



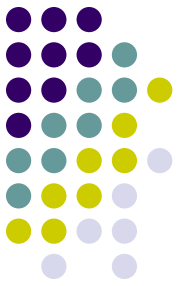
- Hyperleukocytosis with leukostasis (I)
 - Interaction with adhesion molecules on leukemic blast cells and endothelial cells which is thought to contribute to the leukostasis
 - AML blasts are thought to be “sticky”
 - Leukostasis symptoms: CNS, pulmonary
 - Also used to prevent tumor lysis syndrome

Common Clinical Indications



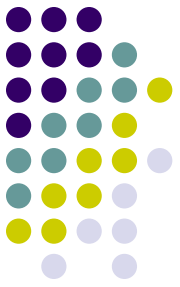
- Plateletpheresis
 - Blood of the patient/donor passes through a medical device which separates out platelets, collects them and returns remainder of the patient/donor blood

Plateletpheresis Category II



- Symptomatic Thrombocytosis
 - Complications of thrombocytosis include both hemorrhagic and thrombotic
 - Platelet count does not correlate with the risk of thrombosis
 - Need to treat when patient is symptomatic
 - May also be indicated in pregnancy and in the preoperative setting

Extracorporeal Photopheresis (ECP)



- A therapeutic procedure in which buffy coat, separated from the patient's blood is treated extracorporeally with a photoactive compounds (psoralens) and exposed to ultraviolet A light and subsequently reinfused to the patient during the same procedure

ECP

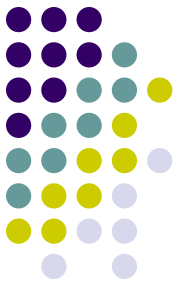


- Immunomodulatory effect
- Total time per treatment: 3 hours
- Two treatments on consecutive days every four weeks
- Patients are sensitive to sunlight following procedure

ECP Category I and II

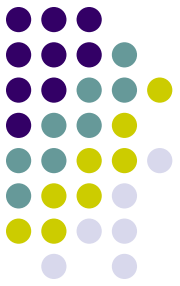


- CTCL/Mycosis fungoides (I)
 - Skin-based T cell lymphoma
 - Long premalignant phase of eczematous skin lesions
 - May progress to leukemic phase: Sezary syndrome
 - ECP induces a CD8+ T cell response to the pathologic T cell clones
 - Psoralen, upon exposure to UVA, irreversibly binds to DNA, proteins and lipids and causes apoptosis of malignant T cells
 - Increase in HLA Class I molecules
 - Monocytes differentiate in the tubing into dendritic cells which then phagocytose the malignant T cells
 - DC activate cytotoxic T cells upon reinfusion



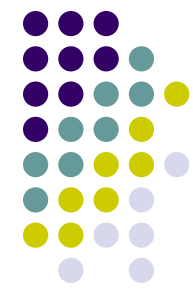
ECP Category I and II

- Graft-versus-host disease (II)
 - Unclear mechanism of action
 - Decrease in antigen recognition, decreased numbers of DC, decreased reactivity by T cells
- Heart transplant rejection
 - Prophylaxis (I)
 - Treatment (II)



ARC TA Services

- 24/7/365
- Therapeutic plasma exchange
 - Plasma, albumin
- Erythrocytapheresis
- Leukocytapheresis
- Thrombocytapheresis
- Photopheresis



Therapeutic Hemapheresis Procedure

Date/Time: _____

Patient Name: _____ DOB: _____

Hospital: _____ Allergies: _____ NKA

Diagnosis: _____ Clinical Indications: _____

Treatment Protocol and Replacement Fluid (check one procedure type and product, indicating volume):

- Plasma Exchange:** (1.25volume exchange ~ 45 ml/kg)
 - _____ mL 5% Albumin
 - _____ mL Frozen Plasma
 - _____ mL Cryoprecipitate Reduced Plasma

NOTE: Discontinue ACE Inhibitors 48 hours prior to treatment with Albumin. If treatment required within 48 hours use Plasma as an alternate replacement fluid.

- RBC Exchange:** (Adults ~ 8-10 units, Pediatrics ~ 4 units)
 - _____ units PRBC Desired Ending Hct% _____, Desired Ending HbS% _____
- Special product requirements (i.e., sickle cell negative, CMV safe) _____

- Reduction:**
 - RBC Reduction:** Desired Ending Hct% _____
 - WBC Reduction:** Desired Ending WBC _____ Process 2X patient's total blood volume.
 - Platelet Reduction:** Desired Ending Plt count _____ Process 2X patient's total blood volume.
- Replacement fluids to be administered** None Required _____ mL _____ (type)

- Blood Prime:** (Pt. Hct <15 and/or weight <50 lbs.) Type and crossmatch one unit PRBC for Blood Prime
- Frequency:** _____ **Duration:** _____ (inpatient orders must be renewed every 7 days)
- Labs:** None required _____ (specify)

- Medications** (to be administered by Hospital Staff): None required
- Benadryl _____ mg Route of Administration _____
 - Tylenol _____ mg Route of Administration _____
 - Other: _____ (specify)

- Calcium Gluconate** (prevents citrate reaction – administered by Hospital Staff): None required

*Infuse IV over entire apheresis procedure. Consult with ARC nurse to determine length of procedure.

- 1 gram in 100 mL Normal Saline*
- 2 grams in 200 mL / 250 mL Normal Saline*
- Other pediatric dose _____

- Flush for Central Line/Port Device:**
- 10,000 units Heparin (5000 units/ml each lumen standard minimum concentration for Adults)
 - 2,000 units Heparin (1000 units/ml each lumen standard pediatric concentration)
 - Other _____

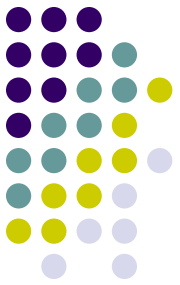
Special conditions (e.g., coordinate treatment with dialysis, delay/hold medications)

Contact American Red Cross Therapeutic Apheresis Department to schedule treatment.
 For Atlanta, please call 770-852-4430 or 1-800-884-2710 ext. 4430. For Savannah, please call 1-800-507-2184.

Physician Name:(print) _____ Office Phone: _____

Physician Signature: _____ Cell Phone or Pager: _____

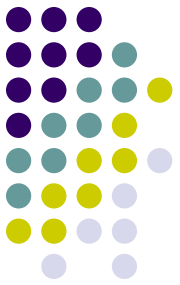
Verbal Order Documented by _____ Hospital Staff Signature/Title _____



Pre-procedure

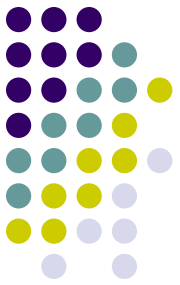
- Physician Orders- check off boxes
 - Replacement fluid (volume)
 - Premedications if necessary
 - Calcium gluconate
 - Flush for vascular catheter (heparin)
- Have physician document in the chart that the vascular catheter is “okay to use”

Pre-procedure



- Consents
 - Need signed consent form in the chart for transfusions if may be needed
 - Plasma, RBCs
 - If patient is unable to provide consent for procedure, need to have signed consent form in the chart from patient's designee

ARC TA



- Physician consultation is available 24/7/365
- Thank you!