

## Neuro-Pharmacology

## Immuno-modulatory Therapy

### IMMUNOMODULATING THERAPIES

Drug	Dose	Effect	Side effects	Monitoring
<b>Injections</b>				
<b>Rituximab</b> Rituxan	<b>IV infusion:</b> 2 doses of 1gm 2weeks apart, Repeated every 6 months	Ab against CD20	<b>Infusion reaction:</b> fatal arrhythmia, angina, hypotension, nausea, flushing <b>PML, HBV reactivation</b>  >Avoid live vaccines during therapy >Non-live vaccines will have reduced efficacy >Avoid in HBV infection, active infection	<b>Screening:</b> Hepatitis panel, CBC, HCG, creatinine <b>Premedication:</b> Tylenol 650, Benadryl 50, solumedrol 100mg IV <b>Monitoring:</b> Monthly CD19 level by flowcytometry (target <5%) & IgG level (target to keep 30% above LLN)
<b>Cyclophosphamide</b> Cytosan	<b>PO (daily):</b> 1-2mg/kg/day <b>IV (pulse):</b> 1gm/m <sup>2</sup> then 600 mg/m <sup>2</sup> every 2 months	Alkylating agent (interferes with DNA duplication)	Hemorrhagic cystitis, alopecia, infertility Infusion reaction: headache, nausea	Monthly CBC, UA Daily CBC, UA
<b>Methyl-prednisone</b> Solumedrol	<b>IV:</b> 1gm/day for 3-5 days		Anxiety, insomnia, psychosis Hyperglycemia, hypokalemia, gastritis	BP, FSBS, K
<b>IVIG</b> Gammagard Carimune	<b>IV:</b> 2gm/kg over 3-5 days then 1gm/kg every 1-2 months		Infusion reaction: hypotension, arrhythmia, flushing Nephrotoxicity, aseptic meningitis, blood clots Avoid Carimune in low GFR patients	Creatinine – BUN
<b>Tocilizumab</b> Actemra	<b>SC:</b> 162mg weekly with steroid taper	IL-6 Rc blocker	Avoid with active infections, live vaccines.	CBC, LFT after 4Wks then Q3 months ANC: hold if < 1000 – Dc if < 500 Plat: hold if < 100k – Dc if < 50K
<b>Eculizumab</b> Soliris	Infusion weekly then biweekly	C5 (complement) Ab	High risk for meningococcal infections Vaccinate for meningococcus before starting Soliris. Risk for encapsulated bacterial infection	
<b>Oral</b>				
<b>Azathioprine</b> Immunar	<b>PO:</b> 2-3mg/kg/day (QD)	Inhibits purine synthesis	Hepato-toxicity, Pancreatitis, leukopenia, anemia, <b>risk of malignancy</b> >Takes up to 6 months before it shows an effect >Never give with allopurinol (myelotoxic)	<b>Pre:</b> test for TPMT activity assay first <b>Monthly</b> CBC, LFT

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<p><b>Cyclosporin</b> Sandimmune</p>	<p><b>PO:</b> 4-6mg/kg/day (BID)</p>	<p>Calcineurin inhibitor, ↓ cytokines</p>	<p>Nephrotoxicity, hepatotoxicity, hypertension, hirsutism, tremors, gum hyperplasia, <b>malignancy</b> &gt;Shorter onset of action (1 month) &gt;Avoid nephrotoxic drugs (NSAIDs)</p>	<p>Monthly LFT, BUN/Cr, cyclosporine trough level (70–120 µg/l) BP monitoring</p>
<p><b>Mycophenolate</b> Cellcept</p>	<p><b>PO:</b> 1-1.5gm BID</p>	<p>Inosine-1P-dehyd inhibitor. Inhibits lymphocyte proliferation &amp; migration</p>	<p>Nausea, vomiting, abdominal pain, diarrhea Fever, peripheral edema, <b>malignancy (lower risk)</b> &gt;Takes up to 6 months before it shows an effect</p>	<p>Monthly CBC</p>
<p><b>Tacrolimus</b> Prograf, Protopic</p>	<p><b>PO:</b> 0.1-0.2mg/kg/day (BID)</p>	<p>Calcineurin inhibitor, ↓ cytokines</p>	<p>Nausea, vomiting, abdominal pain, diarrhea Nephrotoxicity, hepatotoxicity, hypertension Electrolyte imbalance (↓Mg), tremors &gt;Shorter onset of action (1 month) &gt;Take on empty stomach</p>	<p>Monthly BUN/Cr, electrolytes, trough level (weekly x4 then q3months) BP monitoring</p>
<p><b>Prednisolone</b></p>	<p><b>PO:</b> 100mg daily for 2 weeks then EOD for 4 weeks then gradual taper every 4 weeks</p>		<p>Anxiety, insomnia, psychosis Hyperglycemia, hypokalemia, gastritis</p>	<p>BP, FSBS, K, body weight, Dexa scan, monitor for cataract formation</p>
<p><b>Methotrexate</b></p>	<p><b>PO/IM:</b> 7.5mg weekly x 4Wks then 10mg weekly x 4Wks then 15-20mg weekly, taper steroids after 4 months of MTX.</p>	<p>Dihydrofolate inhibitor</p>	<p>Hepato-toxicity, Pulmonary fibrosis, gastritis, stomatitis, alopecia, infertility Give daily folate (4mg) to reduce side effects</p>	<p>Monthly LFT, CBC Liver biopsy at 2gm accumulative dose</p>