

Table 11.4 Medications Used to Treat Myasthenia Gravis

Medication	Indications	Dosing	Side effects affecting rehab	Other side effects or considerations
<b>Acetylcholine esterase inhibitors</b>				
Neostigmine bromide (Prostigmin)	Used to increase acetylcholine levels in MG and improve motor function.	Adults: 15-375 mg by mouth/day. Onset is 30-60 min; effects last 3-6 h.	Cog: + S: + A: 0 Motor: ++ D: ++ Com: ++ F: ++	Excessive salivation, muscle fasciculation, intestinal cramps, and diarrhea.
Pyridostigmine (Mestinon) 60 mg scored tab, 180 mg time-span tab, 60 mg/5 ml syrup	Used to increase acetylcholine levels in MG and improve motor function.	Adults, oral dosage range: 60-960 mg by mouth/day in divided doses. Adults, IV: Use 1/30th of total oral daily dose over 24 h. Onset is 30-60 min; effects last 3-6 h. Time-span tablet effects last 2.5 times longer. Adults, syrup and conventional tablets: 10 of the 60 mg tablets or 10 teaspoons/day, spaced to provide maximum relief. Severe cases need up to 25 tablets or teaspoons/day; mild cases need 1-6 tablets or teaspoons/day. Adults, time-span tablets: 1-3 180 mg tablets 1-2 times/day, spaced at least 6 h apart. Children: 7 mg/kg/day in divided doses.	Cog: + S: + A: 0 Motor: ++ D: ++ Com: ++ F: ++	Excessive salivation, muscle fasciculation, intestinal cramps, diarrhea.
Amibenonium chloride (Mytelase)	Used to increase acetylcholine levels in MG and improve motor function.	Adults: 5-25 mg 3-4 times/day. Start at 5 mg and increase gradually every 1-2 days. Range is 5-50 or 75 mg/dose. Onset is 30-60 min; lasts 3-4 h.	Cog: + S: + A: 0 Motor: ++ D: ++ Com: ++ F: ++	Excessive salivation, abdominal cramps, miosis, diarrhea, urinary urgency, sweating, nausea, vomiting, increased lachrymal and bronchial secretions, nicotinic effects of muscle cramps and fasciculation, malaise, vertigo.
<b>Immunosuppressants</b>				
Prednisone	Used to treat symptoms not controlled with acetylcholine esterase inhibitors.	Adults: Start at 15 mg by mouth/day and increase by 5 mg every 2-3 days as needed. Maximum dose of 50-60 mg/day. Begin taper after 3-6 mo of treatment and response. High-dose regimen: Start at 20-30 mg by mouth/day and increase by 5-10 mg every 2-3 days. Maximum dose of 60 mg/day. Children: 4-5 mg/m <sup>2</sup> by mouth/day. Alternative: 1-2 mg/kg by mouth/day; taper over several	Cog: ++ S: 0 A: ++ Motor: ++ D: 0 Com: + F: ++	Increased appetite, psychosis, bloating, acne, insomnia, headache, muscle weakness, hyperglycemia, confusion. Initial deterioration occurs with high-dose therapy; initiate under medical supervision.

From L. Carl, J. Gallo, and P. Johnson, 2014, *Practical Pharmacology in Rehabilitation: Effect of Medication on Therapy* (Champaign, IL: Human Kinetics).

Medication	Indications	Dosing	Side effects affecting rehab	Other side effects or considerations
		months once symptoms resolve.		
Azathioprine (Imuran)	Used to modulate antibody action on acetylcholine receptors and treat symptoms not controlled with acetylcholine esterase inhibitors.	Adults: Start at 1 mg/kg by mouth/day (may increase to 2-3 mg/kg/day) in divided doses with meals to minimize gastrointestinal upset. Children: 1-2 mg/kg by mouth/day. Reserved for steroid failure or for steroid-sparing effects to lower steroid dose. Onset of action is 6-12 mo.	Cog: 0 S: 0 A: 0 Motor: 0 D: ++ Com: 0 F: 0	Mild nausea or vomiting, diarrhea, fever, malaise, myalgias, increased risk of infection, leukopenia, thrombocytopenia.
Immune globulin intravenous (Gamimune, Gammagard, Sandoglobulin)	Infusion of antibodies used for acute treatment of myasthenic crisis.	Adults and children: 2 g/kg slow IV infusion over 2-5 days.	Cog: ++ S: ++ A: 0 Motor: ++ D: ++ Com: + F: ++	Back pain, chills, cough, diarrhea, ear pain, fatigue, flushing, headache, muscle cramps, nausea, reactions at injection site (pain, swelling, muscle stiffness, or redness), sore throat, stuffy nose, weakness, allergic reactions. Best used in crisis management or before surgery.
Cyclosporine A (Neoral, Sandimmune)	Used to modulate the antibody action on the acetylcholine receptors and treat symptoms not controlled with acetylcholine esterase inhibitors; second-line therapy in patients who cannot tolerate steroids.	Adults and children: Dose to trough serum level of 100-200 ng/ml. Normal dose is 4-10 mg/kg by mouth/day in 2-3 divided doses.	Cog: 0 S: 0 A: ++ Motor: +++ D: +++ Com: + F: +++	Acne, dizziness, flushing, headache, increased hair growth, nausea, runny nose, sleeplessness, stomach discomfort, vomiting, renal dysfunction tremor, hirsutism, hypertension, gum hyperplasia.
Cyclophosphamide (Cytoxan, Neosar)	Used to modulate antibody action on acetylcholine receptors and treat symptoms not controlled with acetylcholine esterase inhibitors; chemotherapy agent used as second line therapy.	Adults: 200-250 mg IV for 5 days. IV dose range of 350-1000 g/m <sup>2</sup> . Children: Not established.	Cog: 0 S: 0 A: 0 Motor: 0 D: ++ Com: 0 F: 0	Nausea, vomiting, alopecia, leukopenia, thrombocytopenia, interstitial nephritis.
Mycophenolate mofetil (CellCept,	Used to modulate antibody action on acetylcholine receptors and treat	Adults: 1-3 g by mouth in 1-2 divided doses. Children: Not established.	Cog: + S: + A: + Motor: +++	Anxiety, back pain, constipation, cough, diarrhea, dizziness, headache, loss of

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Medication	Indications	Dosing	Side effects affecting rehab	Other side effects or considerations
Myfortic)	symptoms not controlled with acetylcholine esterase inhibitors.		D: +++ Com: + F: +++	appetite, mild stomach pain, mild tiredness or weakness, nausea, tremor, trouble sleeping, upset stomach, vomiting, diarrhea, leukopenia, sepsis, increased risk of infection.
Rituximab (Rituxan)*	Used to modulate antibody action on acetylcholine receptors and treat symptoms not controlled with acetylcholine esterase inhibitors.	Adults and children: Not established.	Cog: ++ S: ++ A: 0 Motor: 0 D: ++ Com: ++ F: ++	Infusion reactions (chills, headache, nausea, pruritus, pyrexia, and fatigue) occur in 75%; pretreat with diphenhydramine and acetaminophen 30-60 min before infusion. Other side effects include increased urinary tract infections, sinusitis, throat irritation, and nasopharyngitis.

\*Immunize prior to starting therapy. Avoid in patients with congestive heart failure or demyelinating disease. Monitor for reactivation of infections such as tuberculosis, hepatitis, and histoplasmosis fungal infections.

Cog = cognition; S = sedation; A = agitation; Motor = discoordination; D = dysphagia; Com = communication; F = falls; MG = myasthenia gravis; IV = intravenous.

The likelihood rating scale for encountering the side effects is as follows: 0 = Almost no probability of encountering side effects. + = Little likelihood of encountering side effects. +/+ = Low probability of encountering side effects; however, probability increases with increased dosage. ++ = Medium likelihood of encountering side effects. +++ = High likelihood of encountering side effects, particularly with high doses. ++++ = Highest likelihood of encountering side effects; best to avoid in at-risk patients.