

MYOPATHY, NEUROMUSCULAR JUNCTION & NERVE DISORDERS: Points in differential diagnosis

Distinctive Features: Most myopathies have weakness that is maximal proximally.

<p>Extraocular muscles weak Myasthenia Gravis (MG) Thyroid; Botulism Mitochondrial: KS; PEO; MNGIE Centronuclear; Multicore Oculopharyngeal MD; IBM + Contracture Oculopharyngodistal myopathy Congenital ophthalmoplegias</p>	<p>Periocular without EOM Weakness Dystrophies: Myotonic; FSH; Oculopharyngeal Myasthenia Gravis (MG) Congenital Myopathies Rule out: VII nerve lesion</p>	<p>Bulbar dysfunction MG; Thyroid; Cranial nerve Δ Oculopharyngeal MD Distal myopathy (MPD2) IBM (IM-VAMP); Scleroderma Motor neuron Δ: ALS; BSMA Pseudobulbar; Fazio-Londe Brown-Vialetto-van Laere</p>	<p>Posterior neck weak Common: MG; PM; ALS Focal myopathy: Neck; Paraspinal Rare: FSH dyst; LMN synd; IBM; Rod; PROMM; Acid maltase; ↓ K⁺ Carnitine; Endocrine; Desmin</p>
<p>Distal & Proximal weakness Dystrophy: Myotonic; FSH Scapuloperoneal Myopathy: Congenital; Distal Glycogenoses: Debrancher Phosphorylase b kinase Neuropathy + Myopathy: Paraneoplastic; Sarcoid; Mitochondria; HIV; Drugs (Amiodarone; Doxorubicin Colchicine; Chloroquine)</p>	<p>Acute weakness Brody's syndrome; Myoglobinuria Myosin loss myopathy; Carnitine ↓ Periodic paralysis: X-Episodic Xp22 Hypo K: CACNA1S; SCN4A; KCNE3 Hyper K: SCN4A; KCNE3 Andersen: KCNJ2 Electrolyte disorders: K ↑ or ↓; Mg ↑; PO₄ ↓; Barium Rule out: Neuropathy; Spinal cord</p>	<p>Wasting > Weakness Pathology: Type II atrophy Cachexia; Wt loss > 15% Disuse; Steroid myopathy; Paraneoplastic; Aging</p> <p>Weakness > Wasting Immune myopathy; Myoglobinuria; Periodic Paralysis; Myasthenia gravis; Neuropathy + conduction block</p>	<p>Proximal arms weak Dystrophy: Scapuloperoneal; FSH BCIM; Absent muscles; Shoulder joint Δ MG; Neuropathic: ALS; P-LMN; Brachial plexopathy</p> <p>Quadriceps weak LGD: Becker; 1B; 2B; 2H; Ring fib Myositis: IBM; Mitochon; Focal Nerve: Femoral; LS plexopathy; Diabetic amyotrophy; L3-L4 root</p>
<p>Myoglobinuria Hereditary: Glycogenolysis; CPT II; LPIN1 Malignant Hyperthermia; Central core King-Denborough; DMD (Some) ↓ K⁺: Licorice; Li; Thiazide; Amphotericin; Laxative Infections; Mitochondrial; Trauma Muscle: Ischemia; Overactivity; PM Neuroleptic malignant syndrome Drugs: Heroin; Phencyclidine; ε-ACA Clofibrate + Renal failure; Cyclosporine A + Lovastatin Toxins: Venoms; IV drugs Oral: Haff; Mushrooms; EtOH</p>	<p>Muscle activity Brody's syndrome: ATP2A1 Cramps: Benign Myoedema Myotonia Congenita Dominant (Thomsen): CLCN1 (Cl) Recessive (Becker): CLCN1 Acetazolamide responsive: SCN4A Myotonic Dystrophy 1: DMPK, CTG rpt Myotonic Dystrophy 2: ZNF9, CCTG rpt Paramyotonia: Na channel (SCN4A) Periodic paralysis. Hyperkalemic Schwartz-Jampel: Perlecan Neural & Spinal activity</p>	<p>Cardiac disorders Dystrophy: DMD/Becker; Myotonic; McLeod; Emery-Dreifuss; Barth; Scapuloperoneal; Desmin Polymyositis; NemaLine rod Acid Maltase; Debrancher Carnitine ↓; Desmin ↑ Mitochondrial; Amyloid Drugs: Metronidazole; Emetine; Chloroquine; Clofibrate; Colchicine Cardiomyopathy + cores Periodic paralyses</p>	<p>Respiratory Failure Myasthenia gravis Myosin-loss myopathy Acid Maltase Amyloid; Desmin Polymyositis (Jo-1) Congenital Myopathy: Rod; Centronuclear Hydroxychloroquine Neural: Phrenic lesions Arnold-Chiari; Churg-Strauss Brachial plexopathy; ALS</p> <p>GI disorders: See Neuropathy</p>
<p>Muscle pain Myositis: + Conn tissue dis; Aldolase ↑ Polymyalgia; Rhabdomyolysis Infections: Trichinosis; Brucellosis Myoadenylate deaminase ↓ (< 2%) Myopathy +: Tubular aggregates; Focal ↓ mitochondria Drugs: Azathioprine; Steroid ↓... Rule out: Small fiber neuropathy; Phlebitis Bone & joint pain; Muscle Ischemia</p>	<p>Large muscles Overusage: Myotonia; Exercise Neural Overactivity Partial denervation Endocrine: ↓ Thyroid; Acromegaly Hered: DMD; LGMD; Lipodyst; Myostatin Infection: Cysticercosis; Trichinosis; Schistosomiasis Drugs: β₂ adrenergic; Androgen Storage: Glycogen; Amyloid Fat; Gangliosides Short stature: Schwartz-Jampel; Myhre</p>	<p>Cramps Normal: Single Muscles Post-contraction; Sleep Electrolyte: Dehydration ↓ Na, Mg, Ca, Glucose Endocrine: Thyroid; ↓ Adrenal Drugs; Pregnant; Spine stenosis Cramp-fasciculation; Familial Myopathy: Becker Motor neuron: ALS Electrically silent: phosphorylase Rippling muscle; Brody's</p>	<p>Contractures Arthrogyrosis Bethlem Myopathy Congenital MD Dermatomyositis Dystrophinopathies Emery-Dreifuss IM drug injections Rigid spine syndrome SMA: SMN; X-linked Tel Hashomer Williams-Beuren</p>
<p>CNS + Myopathy Congenital MD: Santavuori POMGnT1; Merosin; Fukuyama Fukutin; Integrin-α7 Dystrophy: DMD; McLeod DM1; DM2; HIBM Other hereditary: Mitochondrial Acid Maltase: Aneurysms Phosphoglycerate Kinase Acquired: Myosin-loss; Thyroid Necrotizing Encephalopathy; Pipestem capillaries Hearing loss: FSH; Scapuloperoneal; Mito</p>	<p>Antibodies + Myopathy MG: Anti-AChR Binding + Thymoma: Striation TTN, ACTN, RYR1 LEMS: P-type Calcium channel Immune myopathies t-RNA synthetase (Jo-1 + other): Lung; Raynaud's; Arthritis Signal recognition Particle: Severe HMGCR: IMPP + Necrosis TIF 1y: DM-VP; Neoplasm-associated DM: Mi-2 Nail Δ; MDA5 Ulcers NT5C1A: IM-VAMP (sIBM) PM-Scl: PM + Scleroderma Decorin: M-protein; Myopathy</p>	<p>CK: High > 1,000 Dystrophy X-linked: DMD/Becker Recessive: 2A-2I Dominant: 1C; Ankle contract Distal myopathy: Miyoshi Immune myopathy SRP, HMGCoAR & Jo-1 Ab; Paraneoplastic (RIMM) Acid maltase Acute damage: Injection Rhabdomyolysis; Trauma Thyroid: Hypo-</p>	<p>Immune & Inflammatory Myopathy Antibodies: Decorin; SRP; Mi-2; t-RNA synthetase (Jo-1 75%); HMGCR Perimysial pathology (IMPP) Vasculopathy; Dermatomyositis; RIMM Brachio-cervical inflammatory (BCIM) Granulomatous ± Sarcoid Polymyopathy (CK high; No inflammation): SRP; Paraneoplastic IM-VAMP: Inclusion body; PM-Mitochondria Systemic disease: Drugs; GVHD Collagen vascular; Infection; Malignancy; Toxic Hereditary: FSH</p>

Myasthenic Syndromes	Hereditary Myopathy Syndromes	
<p>Acquired MG: Immune ± Thyroid or Thymoma; Childhood; Drug-induced; Neonatal Transient Lambert-Eaton myasthenic syndrome (LEMS) Congenital & Familial: Presynaptic: Familial infantile (ChAT) ↓ Synaptic vesicles & Quantal release Congenital Lambert-Eaton-like; SLC18A3 Episodic ataxia 2: CACNA1A; SLC5A7 Synaptic: AChE deficiency (ColQ) Postsynaptic: AChR α β δ ε; Rapsyn; Plectin AChRs: Kinetic Δ & ↓ # @ NMJs Slow AChR channel; ↓ Channel open time AChRs: Kinetic Δ & Normal # @ NMJs ↑ Conductance & Fast closure of AChRs ↓ ACh-affinity & Fast-channel AChRs: ↓ #s @ NMJs & Kinetic WNL Rapsyn: ↓ AChRs @ NMJs Plectin; MuSK; Dok-7; LRP4; SNAP25 SCN4A (Apnea & Bulbar); Limb-girdle MG: GFPT1; DPAGT1; ALG2; RYR1 Other: Agrin; ALG14; SCN4A; ZC4H2; CNTN1 TPM3; Congenital LEMS-like; COL13A1 Familial immune; PREPL</p>	<p>Dystrophies: Limb-Girdle & Other Dominant: 1A MYOT; 1B LMNA; 1C Cav3 (AD & AR); 1D DNAJB6; 1E DES; 1F TNPO3; 1G 4p21; 1H 3p23 Cytoplasmic body MYH7, Titin; Bethlem COL6A1,2,3 Emery-Dreifuss LMNA, SYNE 1&2; Hyaline body MYH7 Myotonic dyst: 1 DMPK CTG rpt; 2 ZNF9 CCTG rpt IBM: 1 Desmin; 3 Myosin HC2; Paget VCP FSH DUX4 del; Oculopharyngeal PABP2 GCG rpt; Myofibrillar: Desmin; αB-crystallin; BAG3; ACTA1 ZASP; Myotilin; FLNC; SEPN1; RBCK1; TPM2; TPM3 Dysplasia Diaphys TGFB1; Epiphys COL9A 2& 3, COMP Recessive: 2A Calpain-3; 2B DYSF; 2G TCAP; 2H TRIM32; Sarcoglycan 2C γ; 2D α; 2E β; 2F δ; 2I FKRP; 2J Titin; 2K POMT1; 2L; 2M FKTN; 2N POMT2; 2O POMGnT1; 2P DAG1; 2Q Plectin; 2R Desmin; 2S TRAPPC11; 2T GMPPB 2U ISPD; 2V GAA; 2W LIM2; 2X POPDC1; 2Y TOR1AIP1 2Z POGlut1; COL6A2; MYH2 DPM2 (Epilepsy); DPM3 (Cardiomyopathy); PTRF; POMGNT2 CMD: FKRP; SEPN1; POMT1; POMT2; FKTN; LARGE; GTDC2; TMEM5; B3GALNT2; SGK196; B3GNT1; GMPPB ISPD; Resp fail 1q42; Ullrich COL6A; Laminin α-2 X-linked: Barth Tafazzin; Autophagy VMA21; XMEA VMA21 Emery-Dreifuss Emerin; Danon LAMP-2; McLeod XK; Becker & Duchenne Dystrophin; Scapuloperoneal FHL1</p>	<p>Distal Myopathies Dominant: Welander TIA1: Late; Hands & Ant. Legs Finnish Titin: Late; Ant Tib Gowers-Laing (MPD1) MYH7: Adult; Ant leg Dystrophy + Rimmed vacuoles IBM1 (Quad) Desmin; MPD2 (Vocal cord) MATR3 MPD3: Adult, Asymmetric; LGD 1A & 1C IBM +: Paget VCP; HNRNPA2B1; HNRNPA1 Oculopharyngodistal; Scapuloperoneal Myofibrillar Recessive: Nonaka & IBM2 GNE: Quad sparing Miyoshi & LGD 2B DYSF: Early adult; Post leg MMD3 ANO5: Post leg LGD 2G Telethonin: Teens; Ant leg & Prox</p> <p>Congenital myopathy Core RYR1; Rod; Centronuclear; Spindle excess HRAS Other myopathies Barnes; Congenital; Lipid; Glycogen; Familial MG; Tubular Aggregates</p>