Team Medicine

23#

Myopathies

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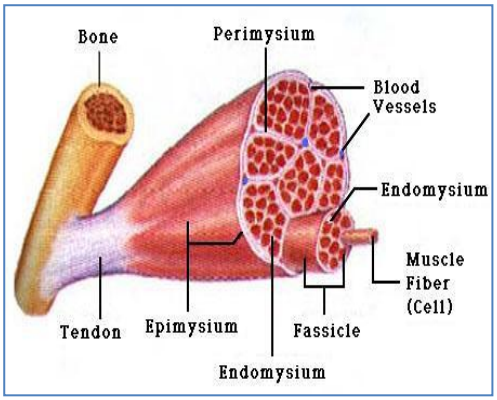
■ Slides ■ Doctors notes ■ Additional

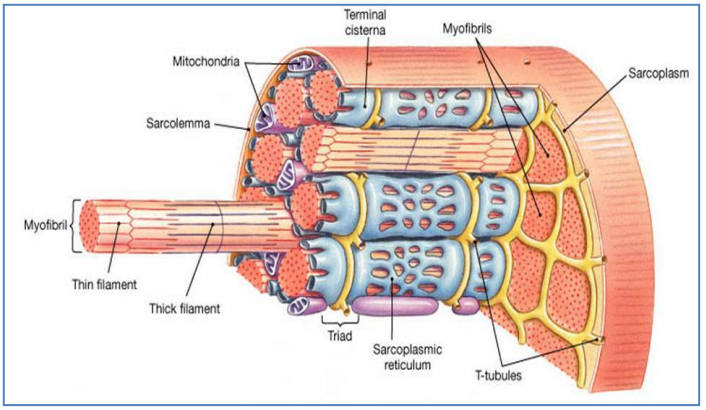
431 Teams

Introduction:

Brief review of anatomy:



single muscle fiber:



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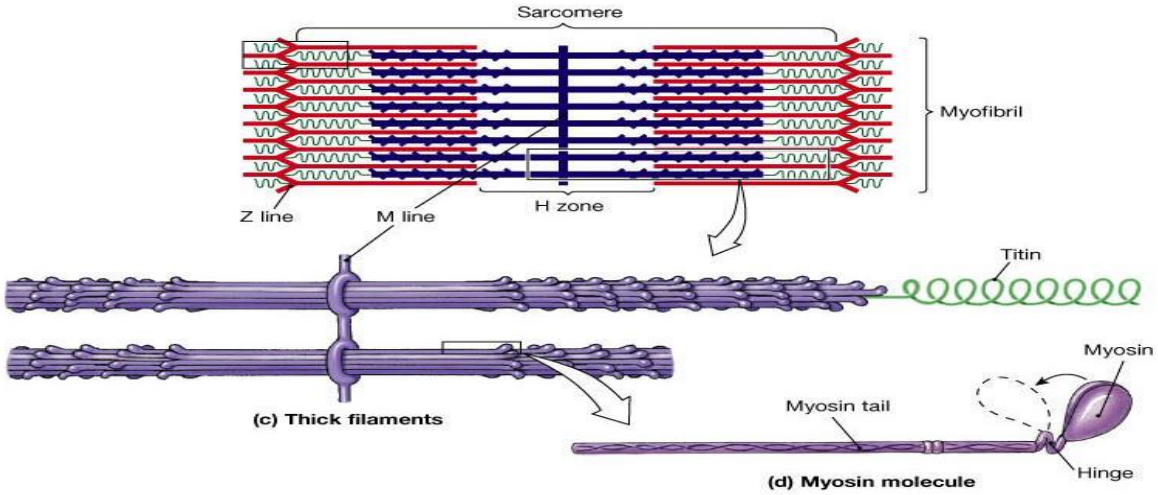
Thick filaments: myosin (helps in the contraction)

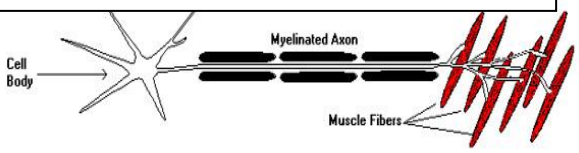


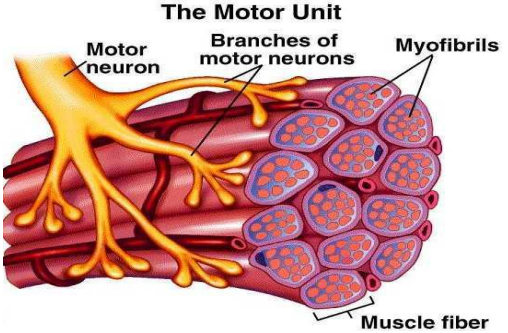
Motor unit:

One single lower motor **nerve** innervate **group of muscle fiber.**

Size of motor unit depends on the type of muscle. Big motor unit → for antigravity muscles (limited movement)... Small motors units → for muscles with delicate functions eg: hand muscles

Electromyography (EMG): is a technique for evaluating and recording the electrical activity produced by skeletal muscle. Inserting a needle inside the muscle and recording its electricity.
It's basic function is to differentiate if the disease is muscle disease or nerve disease





Neuropathic disease has the following defining EMG characteristics:

- An action potential amplitude that is twice normal due to the increased number of fibres per motor unit because of reinnervation of denervated fibres
- A decrease in the firing rate of the nerve.
- A decrease in the number of motor units in the muscle.

Myopathic disease has these defining EMG characteristics:

- An increase in the firing rate of the nerve because it's intact and try to push the muscle to work.
- A reduction in the area to amplitude ratio of the action potential
- A decrease in the number of motor units in the muscle (in extremely severe cases only).

Muscle Fibers	
Type I : SLOW	Type II: FAST (divided into types a & b)
Slow switch and long contraction time	Fast
High O2 ➔ aerobic	Anaerobic
More myoglobin and mitochondria	Less myoglobin & mitochondria
Less fatigable	Fatigable (but quick)
Eg; Antigravity muscle	Eg: Extraocular muscles

Most skeletal muscles have mixture of the two

Mnemonics:
· Type **1**:
"**1 slow fat red ox**":
-**slow** twitch
-**lipid** accumulation
-**red** fibers
-**ox**idative
·
Type **2**:
"**2 fast skinny white breasts**":
-**fast** twitch
-**low lipid**
-**white** fibers, like chicken **breasts**

---Ocean University of Texas Medical Branch
http://www.medicalmnemonics.com

Lower vs. Upper Motor Neuron		
	Upper Motor Neuron (Brain to corticospinal tract)	**Lower Motor Neuron (Anterior horn cells to peripheral nerves)**
Reflexes	Hyperactive +/- clonus	Diminished or absent
Atrophy	Absent* (Disuse atrophy can develop after initial presentation)	Present
Fasciculations	Absent	Present
Tone	Increased (spasticity)	Decreased or absent
Extensor planter	**Up-going (Babinski's sign)**	Down-going

* Pattern of reflexes could help to determine the cause of weakness if it's neuropathies or myopathies. E.g. if patellar reflex is absent and ankle reflex is normal that means proximal muscles (quadriceps) are affected. In contrast, if it's neuropathy ankle reflex should be diminished.

* There are few cases of myopathies could resemble neuropathies signs but UNCOMMON

Distinguishing Lower Motor Neuron Weakness from Muscle Weakness		
	Due to Neuropathy	**Due to Myopathy**
Distribution	**Distal** > proximal	**Proximal** > distal (more likely to be **symmetrical**)
Fasciculation	May be present	Absent
Reflexes	Diminished (absent)	Can be preserved (initial phase) (normal in the beginning but then becomes reduced and maybe absent)
Sensory signs/symptoms	May be present	**Absent**

Myopathies:

Common symptoms of Myopathies	
Positive +	**negative -**
• **Myalgia Cramps** • **Contractures *** • **Myoglobinuria** • **Myotonia (difficulty in relaxation)**	• **Weakness** • **Fatigue** • **Atrophy** (it's a sign) • **Periodic paralysis**** • **Cardiomyopathy**

Positive: When a patient presents with symptom without loss of function.

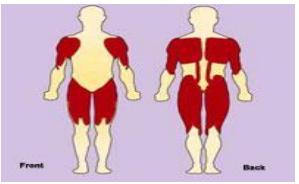
Negative: A function that the patient should have had is lost, which produces symptom.

* **Contractures:** Fibrosed tendon which is a sign of Lower Motor Neuron lesion.
** **Periodic paralysis:** seen in channelopathies, calcium or potassium channel. Typically it's post-prandial: Patient has heavy dinner → can't walk for few days (but no pain)... blood test: low potassium... then patient goes back to normal

- Bulbar muscles can be affected by weakness → cause dysphagia
- Shortness of breath might occur because of muscle weakness: either by weakness of diaphragm, or weakness of the heart (cardiomyopathy)

No correlating sensory symptoms

*** When a patient comes with NEGATIVE symptoms, they may be mistaken for stroke symptoms.**



Patterns of weakness:

The pattern	Notes
Proximal **arm and** BILATERL **leg distribution**	**by far the most common**. Described by the patient: Cannot comb my hair, cannot climb stairs
Distal distribution	Mostly congenital
Proximal arm and distal leg	Affects face, deltoid, trapezius and distally tibialis anterior (scapulo-peroneal).
Distal arm and proximal leg.	
Prominent ptosis	Especially in MITOCHONDRIAL Myopathies
Prominent head drop	Neck extensors are affected. Seen in inflammatory myopathies

Pattern + temporal profile (clinical Course) = appropriate DDx list of myopathies

General approach:

*** Hx:** focus on:

1) Age of onset. (Onset in myopathy is GRADUAL)
2) Temporal profile (if the symptom episodic or gradually getting worse).
3) Triggers of onset (e.g. drugs, certain dose of **steroid or statins**).
4) Family Hx (tree) (for genetic disorder)

*** P/E:**

1) Determine pattern, severity and degree of disability.

2) Full neurological and general exam (cardiac, thyroid, LNs,…)

- If bilateral proximal muscles show weakness → must examine the neck muscles and cranial muscles(extraocular & facial muscles)... Also ask for breathing difficulties. Also consider the heart.

- Degree of weakness and presence of reflexes (absent=severe, reduced=early mopathy) → Determines the severity of the myopathy

*** Investigations [standard protocol]:**

1) **CK** (elevated in destructive myopathies in early phase, not in motor myopathies... In late phase → muscle is distructed so no CK)

EMG (needles insertion in muscle measures motor unit potential, in myopathies → huge amplitude of motor unit potential because of recruitment pattern [more motor units will try to activate the weak muscle]) ,

Biopsy (from moderately affected muscle)

2) Specific for the cause or complication like genetics, ESR…

Basically, **muscle biopsy** is needed for any patient with myopathy but there are some specific cases that don't need biopsy as long as the cause is known e.g. Drug-induced myopathy.

Sometimes the type of myopathy does not have a cure → don't try to search for the exact subtype of myopathy

Types of myopathies:

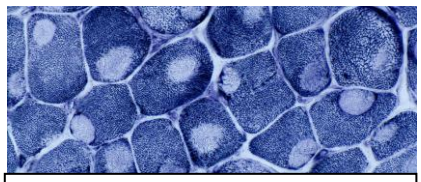
- Congenital
- Muscular dystrophies
- Channelopathies
- Metabolic (inherited)
- Mitochondrial
- Inflammatory
- Infection induced
- Drug(s) induced
- Acquired metabolic
- Others

Congenital disease: patient is born with it but doesn't always have abnormal genes

The doctor said: the most important things to know for our level:
1) To be able to **recognize** a patient with **myopathy** 2) the **protocol** for investigation: CK, EMG, Biopsy
3) know the main **types** of myopathies

Congenital Myopathies:

- Early **childhood presentation**
- AD [Autosomal Dominant] (majority), AR [Autosomal Recessive] , or sporadic
- Affect growth
- + deformities and contractures
- **Central core myopathy may be associated with malignant hyperthermia when going for anesthesia** → we must inform the anesthetist because these patients have to go for special preparations



In this slide: there is a cavity in the middle of each muscle fiber.
→ this is **central core myopathy**

Dx:
muscle biopsy +/- genetic testing

Rx
-Genetic counseling
-Medical and surgical Rx for complications
-Teach re prenatal Dx

Duchenne Muscular Dystrophy:

Dystrophinopathy:

- First described in 1881- **dystrophin** gene (protein that encodes the protein around the muscle wall, important in the contraction mechanism) discovered in the early 1980's .

- **Cause:** deficiency of **dystrophin**, resulting in progressive loss of muscle fibers

- **Becker's type: reduced** amount of **dystrophin** with more course.

- Affects ~ 1 in 3500 live **male** births **X-linked disease** - Xp21
- 50% of cases are **sporadic**

- Boys with age of onset at 3-5 years

- Initial symptoms: difficulty getting up from deep position and climbing steps, waddling gait

Gower's sign: Indicates weakness of the proximal muscles, patient that has to use his hands and arms to "walk" up his own body from a squatting position due to lack of hip and thigh muscle strength. (patient depends on distal muscles because proximal muscles are weak). This is not specific for Duchenne.

▫ Weakness most pronounced in limb-girdle muscles, trunk erectors; craniobulbar muscles are spared

▫ Skeletal deformities (scoliosis, winging of scapula)

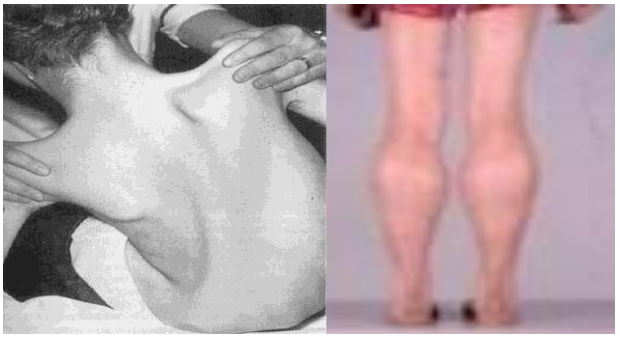
▫ Enlarged calves (pseudo-hypertrophy)

▫ Cardiomyopathy

▫ Inability to walk by 9-11 years

▫ Death occurs usually in the 3rd decade, from **respiratory insufficiency** (because it affects the diaphragm)

▫ Female carriers: usually asymptomatic.



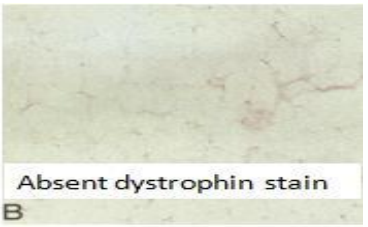
The pic on the left: **pseudohypertrophy**.
It means that the atrophy of the hamstrings make the calf muscles seems as if they are enlarged and hypertrophied.

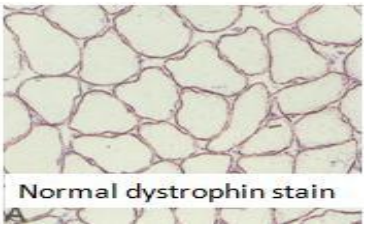
The pic on the right: **winging** of **scapula + scoliosis**.
Winging of scapula: If caused by muscle weakness, the scapula will deviate to the **opposite** side.
Muscles that are attached to the scapula are:
- Trapezius
- Rhomboids major & minor
- Serratus anterior
- Latissmus dorsi

Dx

▫ **Muscle biopsy**: Lack of immunostaining of dystrophin
(if dystrophin stain is absent→ Duchenne... if present but reduced → Becker's)

▫ Demonstration of deletion in the dystrophin gene (limitation: small gene deletion in 30%).



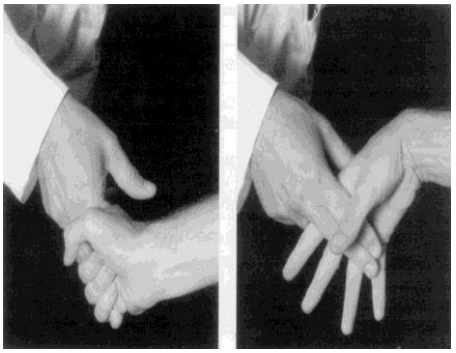


Rx:

▫ Supportive care, and Rx of complications
▫ Steroids: delay deterioration (minimal benefit)
▫ Genetic counseling
(if disease appears to be x-linked → mothers will inherit it to all sons, females will be carriers)

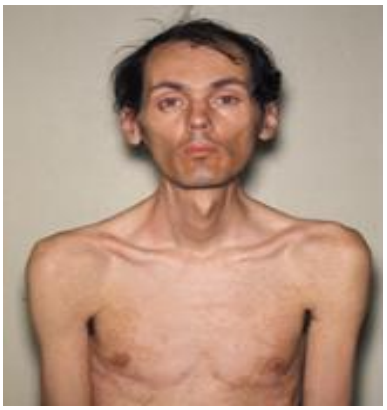
Myotonic Dystrophy:

- Prevalence: 1 in 8000
- Cause: CTG repeat expansion in a gene on chr. 19
- Autosomal dominant inheritance with anticipation*
- More CTG repeats ➔ younger age of onset
- Usual onset: 3rd decade



Myotonia:
(difficulty in relaxtion phase, although contraction is normal)

- **Multisystemic disease:**
  - Myotonia: hyperexcitability of muscle membrane → inability of quick muscle relaxation
  - Progressive muscular weakness and wasting, most prominent in cranial and distal muscles
  - Cataracts, frontal balding, testicular atrophy, diabetes
  - Cardiac abnormalities (Eg: conduction block... so they need ECG, Holter monitor, cardiologist consultation, sometimes pacemaker)
  - Mental retardation
  - Endocrine abnormalities.



Dx:
- Genetic testing
- Screen for associated medical conditions like DM, cardiac.

Rx:
- Counseling
- Supportive
- Prenatal Dx

* In genetics, anticipation is a phenomenon whereby the symptoms of a genetic disorder become apparent at an earlier age as it is passed on to the next generation. In most cases, an increase of severity of symptoms is also noted from generation to generation.

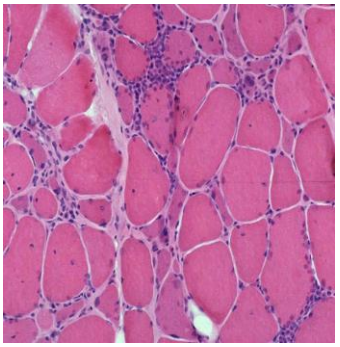
Idiopathic Inflammatory Myopathies [Most Important Group]:

Significant symptom in idiopathic inflammatory myopathy is **MYALEGIA**. In other myopathies, myalegia isn't significant.

▫ Heterogeneous group of disorders characterized by:
- Proximal muscle weakness
- Non-suppurative inflammation of skeletal muscle with predominantly lymphocytic infiltrates.

Types:

- **Polymyositis (PM)** (seen more in adult patients)
- **Dermatomyositis (DM)** (seen more in younger patients)
- **Inclusion Body Myositis (IBM)**(seen more in patients above 60 years of age)
- Juvenile Dermatomyositis.
- Myositis associated with malignancy.
- Myositis associated with collagen vascular disease.



▫ 2-8 cases per million per year.
▫ **Female:male = 2:1**
▫ May associate with **malignancy** are common after the age of 50 years
  ▫ 35% with dermatomyositis (ovarian or lung, **hematological, GI**).
  ▫ 15% with polymyositis (lymphoma or lung)
▫ Mechanism:
  - Cell mediated in polymyositis and IBM
  - Humoral response with vasculitis in dermatomyositis

▫ **Diagnosis**

- Clinical presentation
- Elevation of CK (may >10 times normal)… more at initial phase
- AST, ALT, and LDH are elevated in most cases
- Classic EMG findings for myositis
- **Muscle biopsy**

Treatment:

- Corticosteroids (prednisone)… less beneficial for IBM
- IVIG, and Plasma exchange
- Immuno-suppresive agents like azathioprine, methotrexate, mycophenylate mofetil
- **Screening** for malignancy: early detection! (colonoscopy once in every 2 years)

First we start with the easier: steroids, if no benefit we try IVIG. If no benefit: long lasting immunosuppressive agents

Polymyositis (Type of Idiopathic Inflammatory Myopathies):

- Usually affect **adults**
- Usually insidious onset over 3-6 months
- No identifiable precipitant
- Shoulder and pelvic girdle muscles affected most severely
- Neck muscles (esp. flexors) involved in 50% of patients
- Dysphagia & dysphonia may occur
- Ocular and facial muscles almost never affected
- Distal muscles are spared in majority of pts.

- No vasculitis seen in biopsy
- No skin manifestations

Systemic features

- **Cardiac disturbances:**
  - Asymptomatic ECG changes
  - Conduction disturbances
  - Supraventricular arrhythmias
  - Cardiomyopathy
  - Congestive heart failure

- **Respiratory involvement:**
  - Interstitial fibrosis
  - Interstitial pneumonitis

- **Systemic symptoms:**
  - Arthralgias
  - Fever, malaise
  - Raynaud's phenomenon

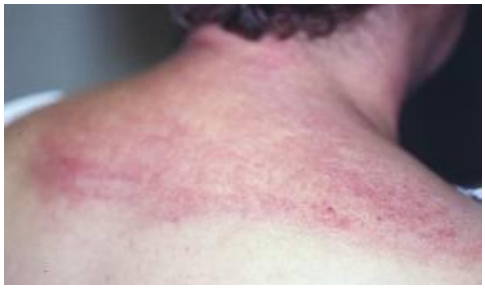
Dermatomyositis (Type of Idiopathic Inflammatory Myopathies):

- Affects younger people

Features of Polymyositis as well as **cutaneous (skin)** manifestations:

- **The skin lesions** may precede or follow the muscle syndrome
- **Gottron's sign** (erythematous eruption over the extensor surfaces of the metacarpophalangeal and interphalangeal joints of the fingers.)
- **Heliotrope rash** (The classic rash seen on the face of patients with dermatomyositis)
- **Shawl sign** (diffuse, flat, erythematous lesion over the back and shoulders or in a "V" over the posterior neck and back or neck and upper chest)

- A patient has proximal muscle weakness, myalegia and cutaneous manifestation? Think of dermatomyositis.
- Caused by autoimmune reaction → **inflammatory** cells go to blood vessels and cause **vasculitis** (seen in muscle biopsy)
- Dermatomyositis is associated with malignancy such as (**colorectal** cancer and **hematological** malignancies).

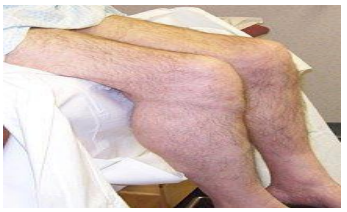


Shawl sign

Heliotrope Rash

Gottron's Sign

Inclusion Body Myositis (Type of Idiopathic Inflammatory Myopathies):



- Usually affects adults >50 yrs (elderly age groups) , More male
- Gradual painless weakness of **quadriceps** and **fingers flexors** (difficulty to close the hand and extend the knee)
- Affects other muscles
- Muscle biopsy shows **amyloid inclusions** in muscle fibers → that's why we call it "inclusion body myositis" so diagnosis is by MUSCLE BIOPSY... You cannot confirm it clinically

Endocrine- myopathies:

- Thyrotoxic myopathy
- Hypothyroidism
- Hyperparathyroidism
- Adrenal insufficiency
- Hypokalemia
- Others

- If myopathy is caused by thyroid myopathy → you will see other systemic symptoms of thyroid disease

Drug-induced Myopathies:

- **Corticosteroids**
- **Statins**
- ETOH (ethanol)
- Heroin
- Many others

Statins-induced myopathy presents with muscle pain. Seen more in young adults or middle aged(30's or 40's) with early vascular disease (stroke or heart attack). They are at risk of statins-induced myopathy because they take high dose + they are physically active. Also can come in elderly because they take statins

Steroid-induced Myopathies [it's under drug-induced myopathies]:

- Exact incidence and prevalence ?
- More in women
- Reported with inhaled steroids too

- A patient under oncology, rheumatology or pulmonology (with bronchial asthma) receiving of regular doses steroids and complaining of muscle weakness and pain → think of steroid-induced myopathy

Mechanism:

- decreased protein synthesis
- increased protein degradation
- alterations in carbohydrate metabolism
- mitochondrial alterations
- electrolyte disturbances
- decreased sarcolemmal excitability

Tests:

CK, EMG, and muscle biopsy are typically **normal** *

[**CK levels** in steroid myopathy are usually normal or mildly elevated... In statin-induced myopathy CK levels could be doubled (except in rhabdomyolysis, like if patient is on high doses for a long time and came late to the hospital because he/she's trying to tolerate the pain it will be very high, but this is rare)... However, in inflammatory myopathies the levels are very very high.]

Treatment:

- **R** e -assess indication of steroid and consider dose reduction.
- **A** v o i d excessive exercises.
- **P** a i n control and other supportive measures

Summary

- The **motor unit** consists of one nerve supplying a group of muscle fibers

- **Muscle fibers** types:
  - Type I: slow, less fatigable, eg: anti-gravity muscles
  - Type II: fast, fatigable, eg: extra-ocular muscles

- Most skeletal muscles contain the two types of fibers, but usually one type predominates, like in the examples mentioned above.

- We use **EMG** to measure the electricity of the muscles. It helps us to differentiate between muscle diseases and nerve diseases.

- Main **differences** between **muscle diseases and nerve diseases** (lower motor neuron):
  - Neuropathies are more distal; myopathies are more proximal usually & symmetrical
  - Neuropathies have sensory symptoms; myopathies are not related to sensory symptoms.
  - In neuropathies, reflexes are absent from the beginning; in myopathies the reflexes are found in the beginning of the disease (then they become reduced or absent)

- **Signs and symptoms of myopathies:**
  - Positive signs (signs present without loss of function): myalgia, contractures, myoglobinuria, myotonia
  - Negative signs (normal function is lost): Weakness, fatigue, atrophy, periodic paralysis, cardiomyopathy, breathing problems (diaphragm affected), dysphagia (bullbar muscles affected)

- **Patterns of weakness:**
  - Proximal + bilateral: most common
  - Distal: more in congenital myopathies
  - Proximal arms, distal legs: scapulo-peroneal
  - Distal arms, proximal legs
  - Prominant ptosis: mitochondrial myopathies
  - Prominant head drop: Neck extensores are affected, more in inflammatory myopathies

- **Approach:**
  - History: age of onset, progression of symptoms, triggers, family history

  - Physical examination: Full neurological + general examination. And identify pattern of weakness, severity, degree of disability

  - Investigations: CK, EMG, **muscle biopsy** [Most IMP], tests for specific causes of complications (eg: genetic testing, ESR)

- **Types of myopathies:**
  - Congenital
  - Metabolic (inherited)
  - Acquired metabolic
  - Mitochondrial
  - Muscular dystrophies (Duchenne, Becker's)
  - Inflammatory (inclusion body myositis, dermatomyositis and polymyositis)
  - Drug-induced (most commonly: steroids or statins)
  - Infection-induced
  - Channelopathies
  - Others

- **Congenital myopathies:**
  - Presentation: Early childhood presentation, affects growth.
  - Diagnosed by: muscle biopsy + genetic testing
  - If central core myopathy → malignant **hyperthermia** might occur in **anesthesia**
  - Treatment: Genetic counseling, treat complications(surgical/medical), prenatal diagnosis

- **Duchenne Muscular Dystrophy:**
  - Presentation: More in males, 3-5 years-old.
  - Caused by: dystrophin deficiency → progressive muscle loss
  - Becker's type: amount of dystrophin is REDUCED, has more benign course
  - Initial symptom: difficulty getting up
  - Other symptoms: weakness in limb-girdle muscles, skeletal deformities (scoliosis, winging of scapula), pseudohypertrophy, cardiomyopathy, respiratory insufficiency (this is deadly).
  - Diagnosed by: Muscle biopsy (if dystrophin staining is absent → Duchenne... if reduced → Becker's)
  - Treated by: Supportive care, treat complications, steroids (might delay deterioration but minimal effect), genetic counseling

- **Myotonic Dystrophy:**
  - Usual onset: 3rd decade of life
  - Caused by: CTG repeat expansion (chromosome 19)
  - Inherited, with anticipation (worsens with every generation; starts earlier + more severe)
  - Myotonia generally means: difficulty in muscle relaxation after muscle contracted
  - Symptoms: myotonia, progressive muscle weakness, cataracts, frontal balding, cardiac abnormalities, mental retardation, endocrine problems, diabetes, testicular atrophy.
  - Diagnosed by: Genetic testing, screening for associated medical conditions/symptoms (diabetes, cardiac abnormalities).
  - Treated by: Counseling, support, prenatal diagnosis

- **Idiopathic Inflammatory Myopathies:**

  - Presentation: More in females than males = 2:1

  - Types: polymyositis, dermatomyositis, inclusion body myositis... and others
    * polymyositis → usually in adults
    * dermatomyositis → usually in younger people
    * inclusion body myositis → usually in elderly (above 50's)

  - Characterized by: proximal muscle weakness, non-suppurative inflammation of muscles
  - **Myalgia** is the most significant symptom in this myopathy.

  - Polymyositis symptoms: cardiac disturbances (cardiomyopathies, CHF,...etc), respiratory involvemet (interstitial fibrosis, pneumonitis), systemic symptoms (arthralgia, fever, malaise, raynaud's phenomenon)
  - Dermatomyositis symptoms: Same as polymyositis symptoms + skin manifestation (Gottron's sign on fingers, Heliotrope rash on eyelid, Shawl sign on the back and shoulders)

  - Polymyositis has no vasculitis and no skin manifestation.
  - Dermatomyositis has vasculitis and has skin manifestation.

  - Idiopathic inflammatory myopathies may be associated with **malignancies**:
    * Polymyositis --> lymphoma or lung cancers
    * Dermatomyositis --> ovarian, lung, hematological, GI cancers

  - Inclusion body myositis: **muscle biopsy** shows **amyloid inclusions** in muscles fibers. This myopathy affects quadriceps and fingers flexors (difficulty to close the hand and extend the knee). Also other muscles are affected.

- Diagnosed by: clinical presentation, elevated CK, elevated AST, ALT and LDH, EMG finding of myositis, muscle biopsy [most IMP]

- Treated by: Corticosteroids, if no response → IVIG, if no response → immunosuppresive agents (azathioprine, methotrexate, mycophenylate mofetil)... Screen for malignancies.

- **Endocrine myopathies:** other systemic signs of endocrine disease will also be found along with myopathy

- **Drug-induced myopathies:**
  - Statins and steroids are most common drugs. Usually, CK levels, EMG and biopsy will be normal.
  - Statin-induced myopathy: muscle pain, young patients with vascular disease (stroke, MI) are more prone to it. Also found a lot in elderly.
  - Steroid-induced myopathy: more in women. happens to patients taking regular doses of steroids... Treated by: modify steroid doses and check the indication for it, avoid excessive exercise, pain control, supportive measures.

Questions:

A 58-year-old woman presents with a several-month history of progressively worsening muscle weakness. She has difficulty getting into and out of chairs, climbing stairs and lifting things over her head. She recently developed a violet-colored rash around her eyes. The systemic review is positive for fatigue, joint stiffness and unintentional weight loss over the past 6 months. She takes no medication.
Investigations:
CK: elevated Aldolase: elevated AST: elevated
EMG: suggestive of myopathy
Muscle biopsy: shows an infiltration of lymphocytes and muscle atrophy

1- The diagnosis of the patient is:
   A) Polymyositis
   B) Dermatomyositis
   C) Myasthenia Gravis
   D) Muscular dystrophy

2- What malignancies do you suspect to find in this patient?
   A) Hematological malignancies
   B) GI malignancies
   C) Both A + B
   D) None

3- If we want to treat this patient, what drug will we use first?
   A) Corticosteroids (prednisone)
   B) IVIG
   C) Immunosuppresive agents (Methotrexate)
   D) Antibiotics (ciprofloxacin)

The parents of a 3-year-old boy are concerned that he is not walking as well as other boys his age. Both parents are healthy, and there is no family history of neuromuscular disease. He has three older brothers who are healthy. Physical examination shows that he has large calf muscles and lower extremity proximal muscle weakness, as demonstrated by the need to use his arms and hands to assist in standing from a seated position. CK levels are elevated.

4- If you are suspecting Duchenne dystrophy, what will the results of dystrophin staining show?
   A) Reduced dystrophin staining
   B) Normal dystrophin staining
   C) Increased dystrophin staining
   D) Absent dystrophin staining

5- How did the patient get the disease?
   A) Inherited from his mother (x-linked disease inheritance)
   B) Inherited from his mother and father (autosomal recessive)
   C) Sporadic (spontaneous)

A patient complains of a history of generalized muscle weakness. On examination, his facial muscles show marked atrophy, and when you ask him to shake your hand, he appears to be unable to relax his grip for an extended period.

6- What is the likely diagnosis?
   A) Myasthenia Gravis
   B) Inclusion body myositis
   C) Becker's dystrophy
   D) Myotonic Dystrophy

7- What other symptoms might the patient have?
   A) Sleep problems
   B) Flank pain
   C) Frontal balding
   D) Skin rash

Answers:

1- B
2- C
3- A
4- D
5- C
6- D
7- C

Explanations:

1- Note that the patient had proximal muscle weakness + skin manifestation. CK is elevated. So dermatomyositis is the diagnosis.
2- As the doctor said, dermatomyositis patients might be prone to GI and hematological malignancies.
3- Remember that we start first with corticosteroids (prednisone), then IVIG if no response, then immunosuppresive agents (eg: methotrexate).
4- Absent dystrophin staining is remarkable for Duchenne. If it is reduced, we might think of Becker's.
5- Remember that the disease can be inherited as an x-linked disease, and that it can also occur spontaneously. In this patient, the parents are healthy as well as the brothers, and there is no family history, so inheritance is less likely, and sporadic (spontaneous) disease is more likely.
6- Myotonic dystrophy is more likely because of the patient's inability to fully relax the hand after contracting it. There is also facial muscle atrophy.
7- Other symptoms that patients with myotonic dystrophy might have: Frontal baldness, endocrine disease (eg: DM), cardiac abnormalities, mental retardation, cataracts, testicular atrophy.

The **scenarios** of the questions were all taken from:

USMLE Step 1 Secrets, 3rd Edition, by Thomas A. Brown & Sonali Shah

Good luck!