МИНИСТЕРСТВО ЗА ЗДРАВСТВО
РЕПУБЛИКА МАКЕДОНИЈА

Невромускулни болести (ЕМГ и мускулна биопсија)

ЈЗУ Клиника за Неврологија

UCLA Ronald Regan Hospital –Los Angeles (1 Април- 1 Мај 2015)

Слободанка Саздова Бурнеска

Невромускулни болести (ЕМГ и мускулна биопсија)

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Ментор

Perry Shieh, M.D., Ph.D,
Associate Professor of Neurology
Dr. Shieh specializes in the diagnosis and the clinical care of rare muscle disease. His research interests are focused on
Clinical trials for muscle diseases
Pathogenesis of neuromuscular condiitons
Biomarkers of neuromuscular diseases.
Dr. Shieh earned his M.D. and Ph.D. degrees from the Johns Hopkins University of Medicine before completing his Neurology Residency Training at Stanford and his Clinical Neurophysiology Fellowship training at Partners in Boston. faculty in 2003.

UCLA is part of the NeuroNEXT network that is sponsored by the National Institutes of Health National Institute of Neurological Diseases and Stroke.. Dr. Perry Shieh and Michael Graves participate in a number of clinical trials that are sponsored by NIH, industry, and non-profit organizations. Currently active clinical trials include trials for:
Late Onset Pompe Disease (sponsored by BioMarin)
Hereditary Inclusion Body Myopathy (sponsored by Ultragenyx)
Periodic Paralysis (HYP-HOP, NIH Sponsored)
Steroid trial for Duchenne Muscular Dystrophy (FOR-DMD, NIH Sponsored)
Spinal Muscular Atrophy Biomarker (sponsored by NIH through NeuroNEXT)
NP001 for Amyotrophic Lateral Sclerosis (ALS) (sponsored by Neuraltus Pharmaceutical).
Ceftriaxone for Amyotrophic Lateral Sclerosis (ALS) (NEALS study, NIH Sponsored).

NEUROMUSCULAR CLINICS AT UCLA

UNDIAGNOSED CONDITIONS: Faculty in the UCLA Neuromuscular Medicine Program specialize in patients with undiagnosed condiitions. These conditions may be genetic or acquired. Different diagnostic tools may need to be employed, including specialized electrodiagnostic testing, genetic testing, muscle and/or nerve biopsy, and muscle imaging (MRI, ultrasound,etc). If you or someone you know has an undiagnosed neuromsuclar condition, you should ask your physician to refer to our clinic.

Services available through our clinic include:

- Electrodiagnostic testing (EMG and Nerve Conduciton Studies)
- Single Fiber EMG
- Muscle Biopsy
- Nerve Biopsy
- Multidisciplinary Nerve/Muscle Slide review

RARE CONDITIONS: Rare neuromuscular conditions will sometimes require specialized treatment, including medical therapeutics, rehabiliative care, preventive care, and interdisciplinary medicine. The UCLA Neuromuscular program maintains updated treatment protocols that focus on state-of-the art treatment for rare conditions.

EMG

Nerve conduction study

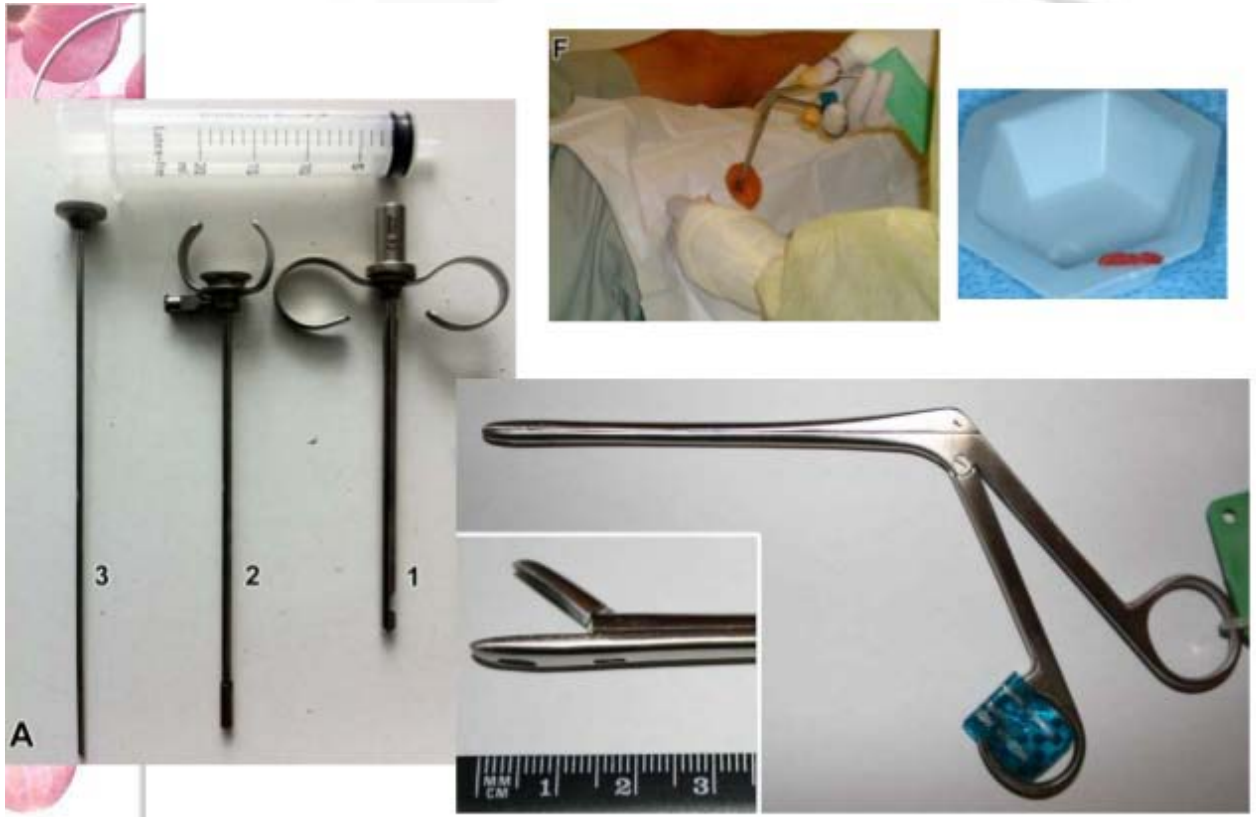
Needle EMG

Single needle EMG

Мускулна биопсија

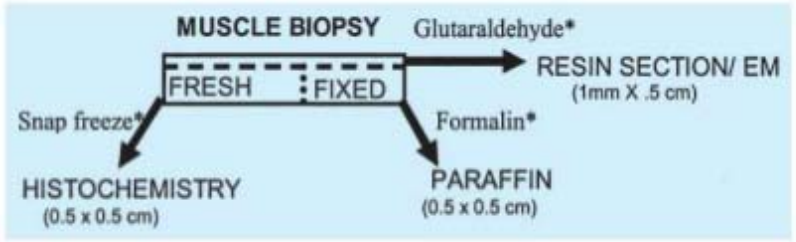
Перкутана иглена биопсија

Отворена мускулна биопсија



The Weil-Blakelsley Cochotome with a 6mm bitting tip

Перкутана иглена биопсија



STAINS FOR MUSCLE BIOPSY

- Haematoxylin & eosin
- Verhoeff Van-Gieson
- Gomori trichrome
- Oil red O
- Congo red
- PAS modified (glycogen)

- Phosphorylase
- ATPase ph9.4, 4.3, 4.6
- NADH-TR
- SDH
- Cytochrome oxidase

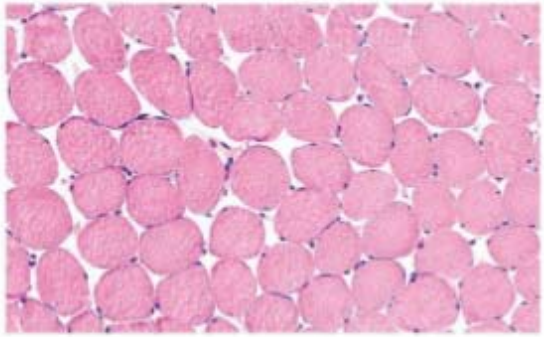
- Acid/alkaline phosphatase
- Non-specific esterase
- LDH etc.

- Immunohistochemistry to detect protein abnormalities
  e.g. dystrophin & other membrane related proteins, accumulation of a protein.

Normal Muscle

Skeletal mucle is composed of elongated, multinucleate ,unbranched contractile cell described as mucle fibre

Characteristic cross-striations seen on LM d/t arrangement of contractile protein



Normal muscle (transverse section). The fibers are typically polygonal, and the sarcolemmal nuclei are located peripherally.

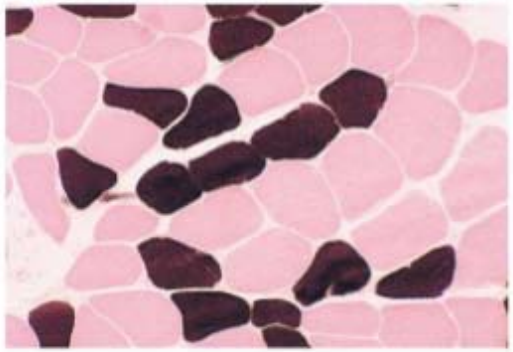
Muscle fibre types

Type 1
- High oxidative enzyme activity
- Utilise Krebs' cycle
- Adapted for sustained activity
- Correspond to red fibres in animals

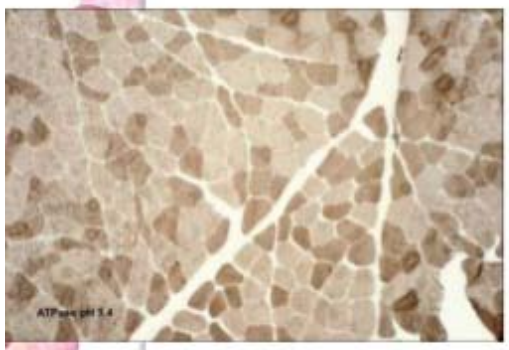
Type 2
- High phosphorylase
- Depend on intrinsic glycogen
- Utilise glycolytic pathway
- Designed for rapid unsustained activity
- Correspond to white fibres in animals

Fiber Typing in Skeletal Muscle

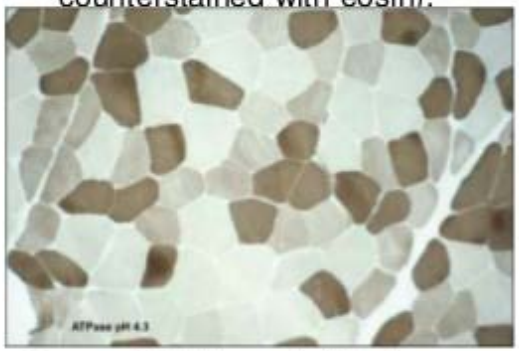
	Type 1	*Type 2*
Color	Red	White
Adenosine triphosphatase activity (pH 9.4)	Low	High
Oxidative enzyme content	High	Low
Glycogen	Low	High
Phosphorylase	Low	High
Lipid content	High	Low



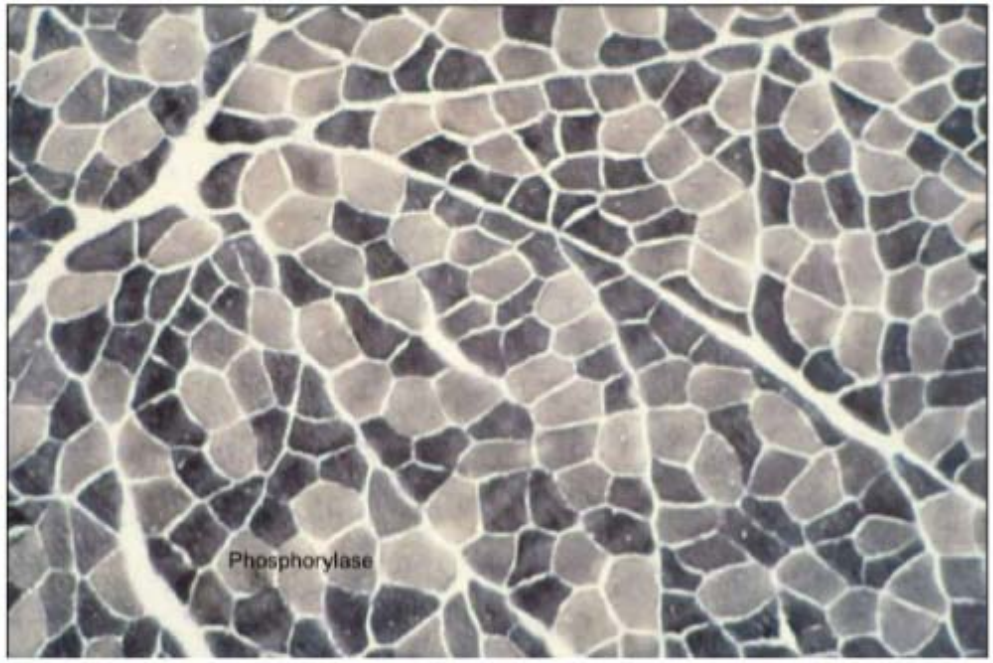
Normal muscle. In the alkaline adenosine triphosphatase (ATPase) reaction, type 1 fibers are light, and type 2 fibers are dark because of their high content of ATPase for use
in the glycolytic pathway. (ATPase, pH 9.4, counterstained with eosin).



ATPase at ph 9.4 shows a normal 'checkerboard' or 'mosaic' distribution of fibre types 1 and 2. Type 2 fibres stain darkly.

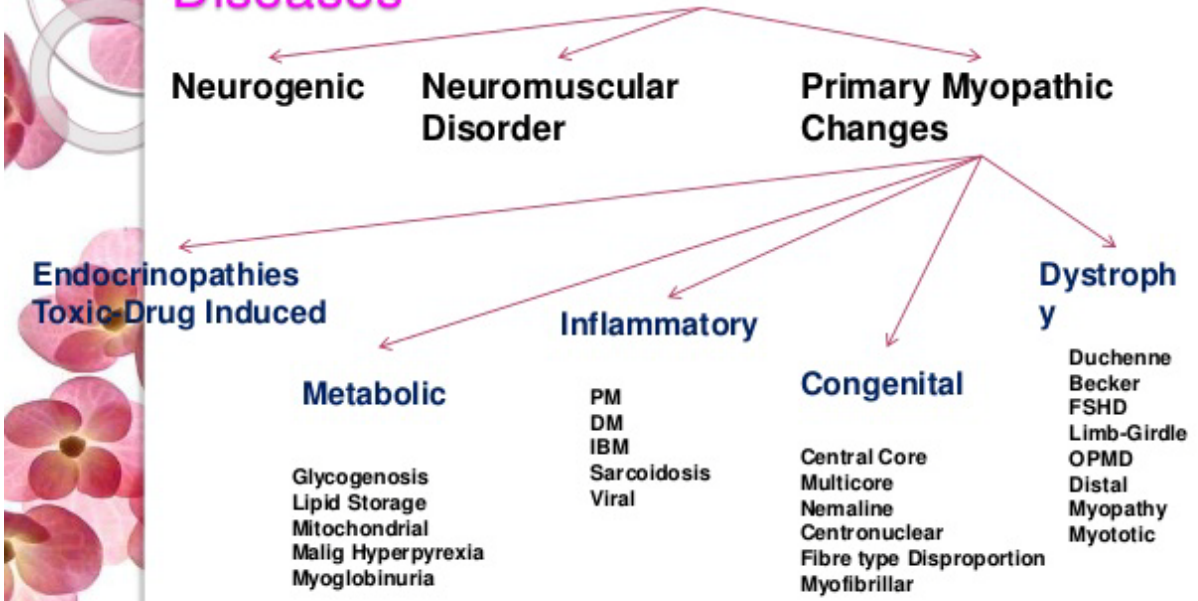


'Reverse' ATPase ph 4.3 shows the normal distribution of dark type 1 fibres, pale type 2A fibres and also
intermediate type 2B fibres.



Frozen section stained for phosphorylase. Type 2 fibres are stained darkly but this reaction is not used routinely to demonstrate fibre type differentiation. Complete absence of staining is typical of McArdle's disease (Type V Glycogenosis).

Working Classification of Muscular Diseases



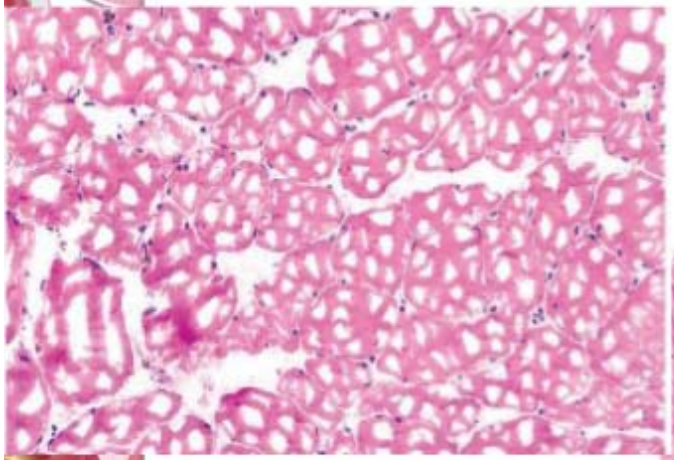
Abnormalities of fibre type distribution

- Small group atrophy
- Large group atrophy

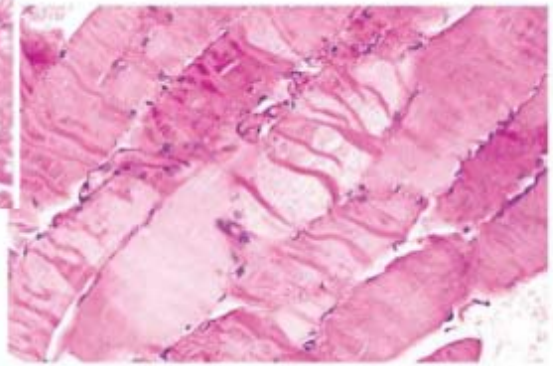
→ denervation

- Perifascicular atrophy → dermatomyositis
- Fibre type grouping → chronic denervation with reinnervation
- Fibre type predominance
- Fibre type deficiency

Artifact & Pitfall



Freezing artifact. Extensive vacuolar change is caused by improper freezing. Many of the vacuoles have linear, noncircular geometric shapes.



Contraction artifact. Darker contraction bands and disrupted lucent zones are seen in several longitudinally oriented fibers (periodic acid-Schiff stain).