Electrophysiological studies

Dr Carmen Górriz Gil
Otorhinolaryngologist
Voice Unit

Hospital de Puerta de Hierro - Majadahonda
SaludMadrid
Comunidad de Madrid

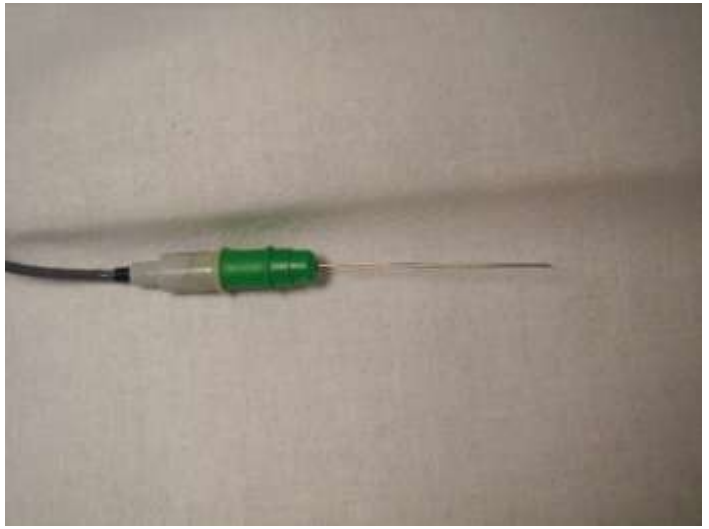
Who does LEMG?

- ENT + Neurophysiologist, neurologist

Dr Martínez
Dr Álvarez
Dr Gª Berrocal
Dr Vicente

EMG Technique

- Sitting up or supine position
- Anesthesia. No sedacion
- Muscles to test:
  - Cricothyroid
  - Tyroarythenoid
  - Posterior Cricoarythenoid
  - Lateral Cricoarythenoid
  - Interarythenoid

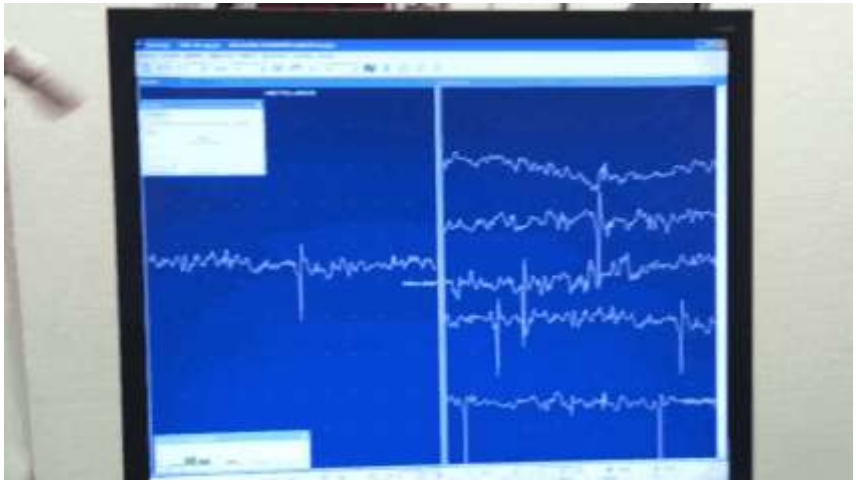


Transcutaneous

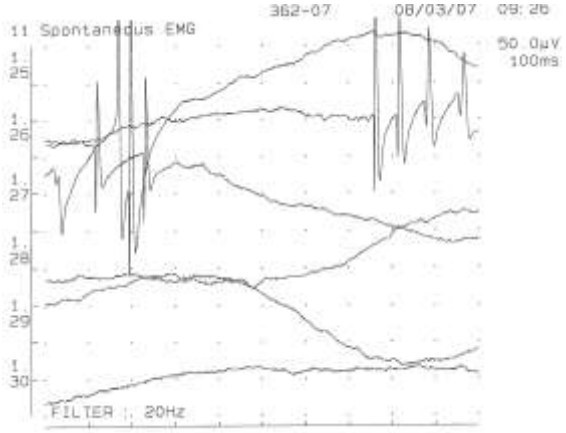
- Guided by:
  - Palpation (cricothyroid membrane)
  - Acoustic (air, muscle, fibrilations, positive sharp waves, MUAP, recruitment)
  - Visual EMG feedback

Sounds

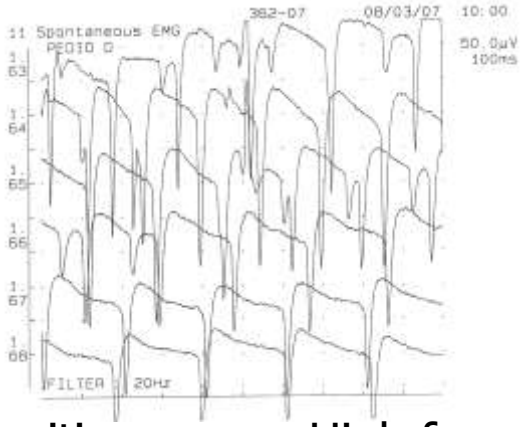
Air sound



Fibrillation sound

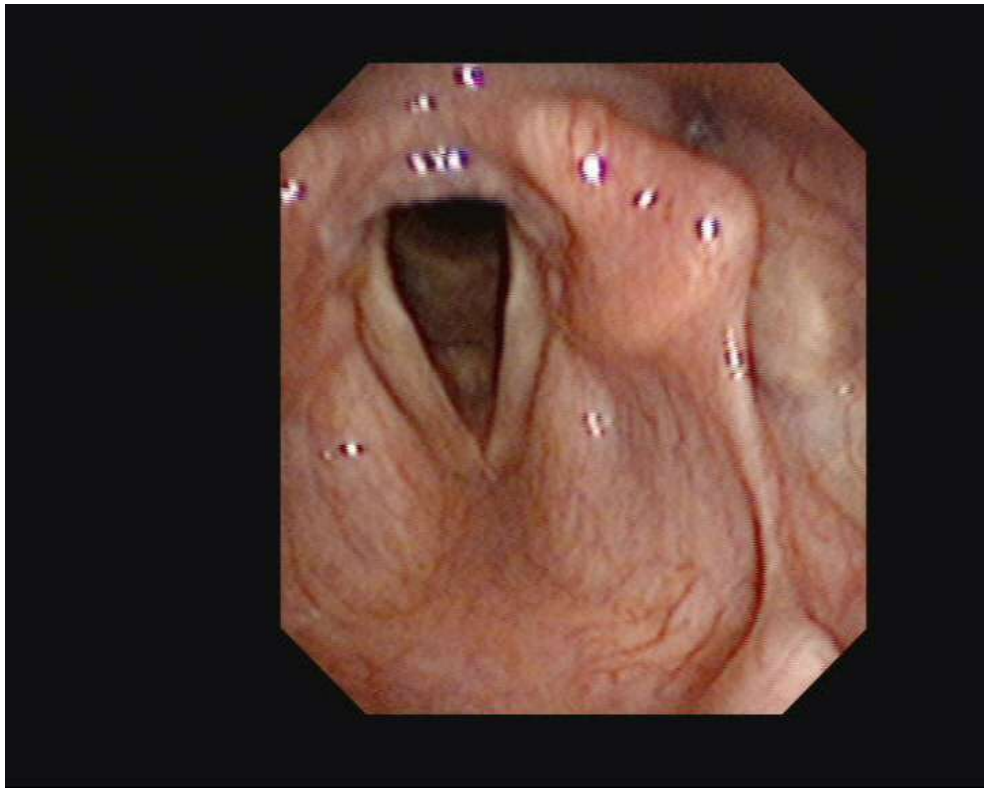


Fibrilations



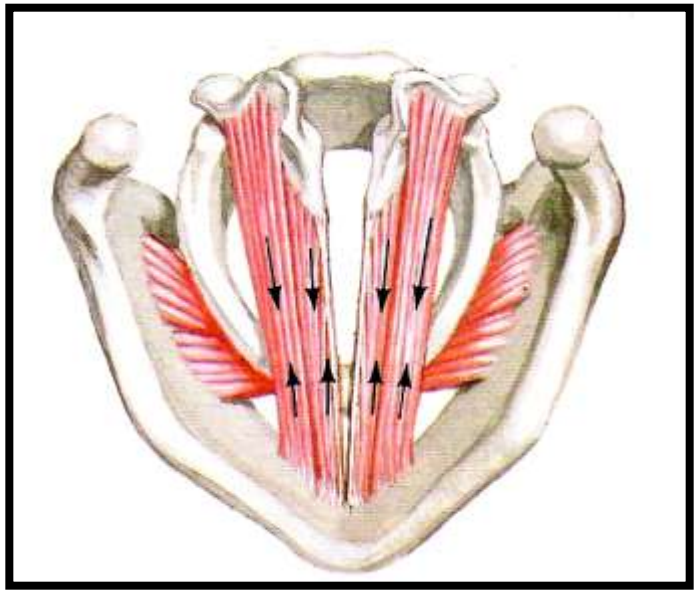
Positive waves. High frec descharges

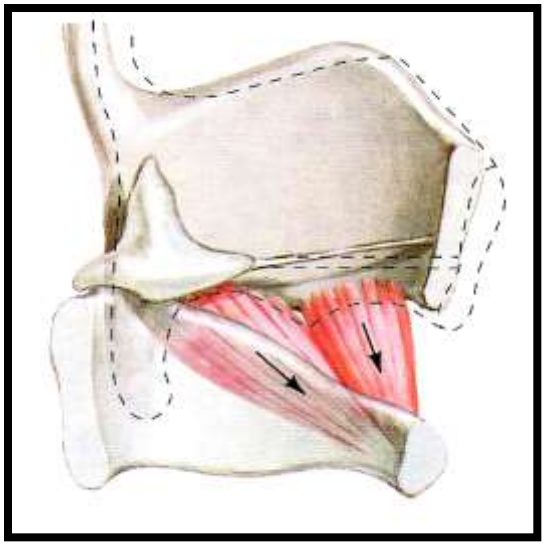
Emg with fibroscopic control

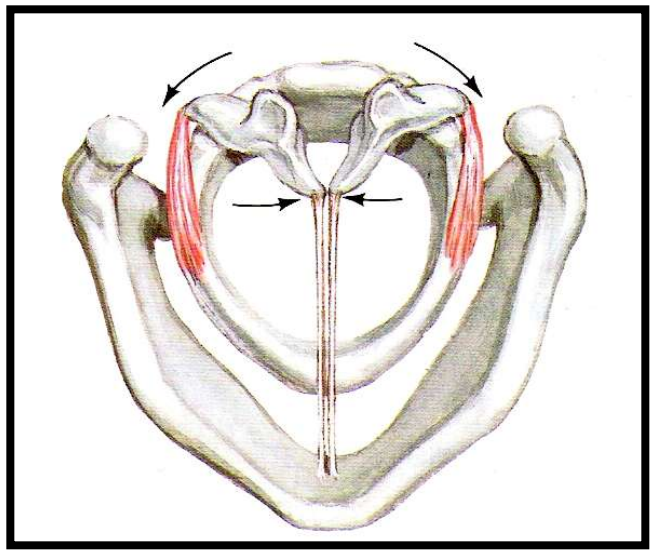


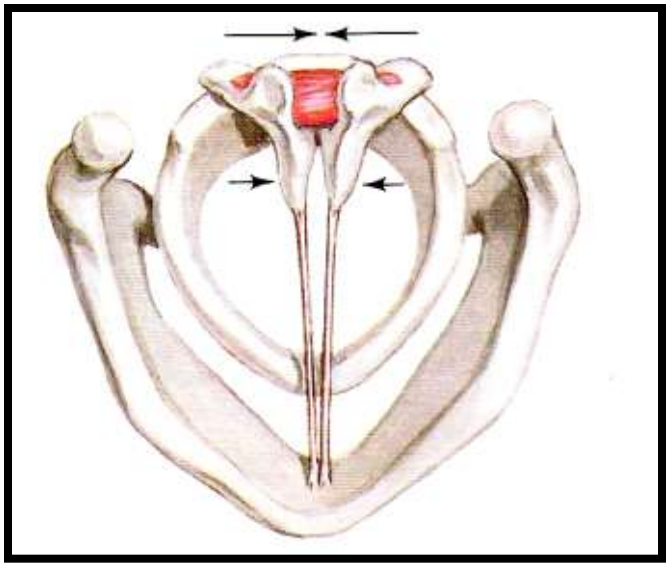
Muscles

- TA
- CT
- LCA
- PCA
- IA

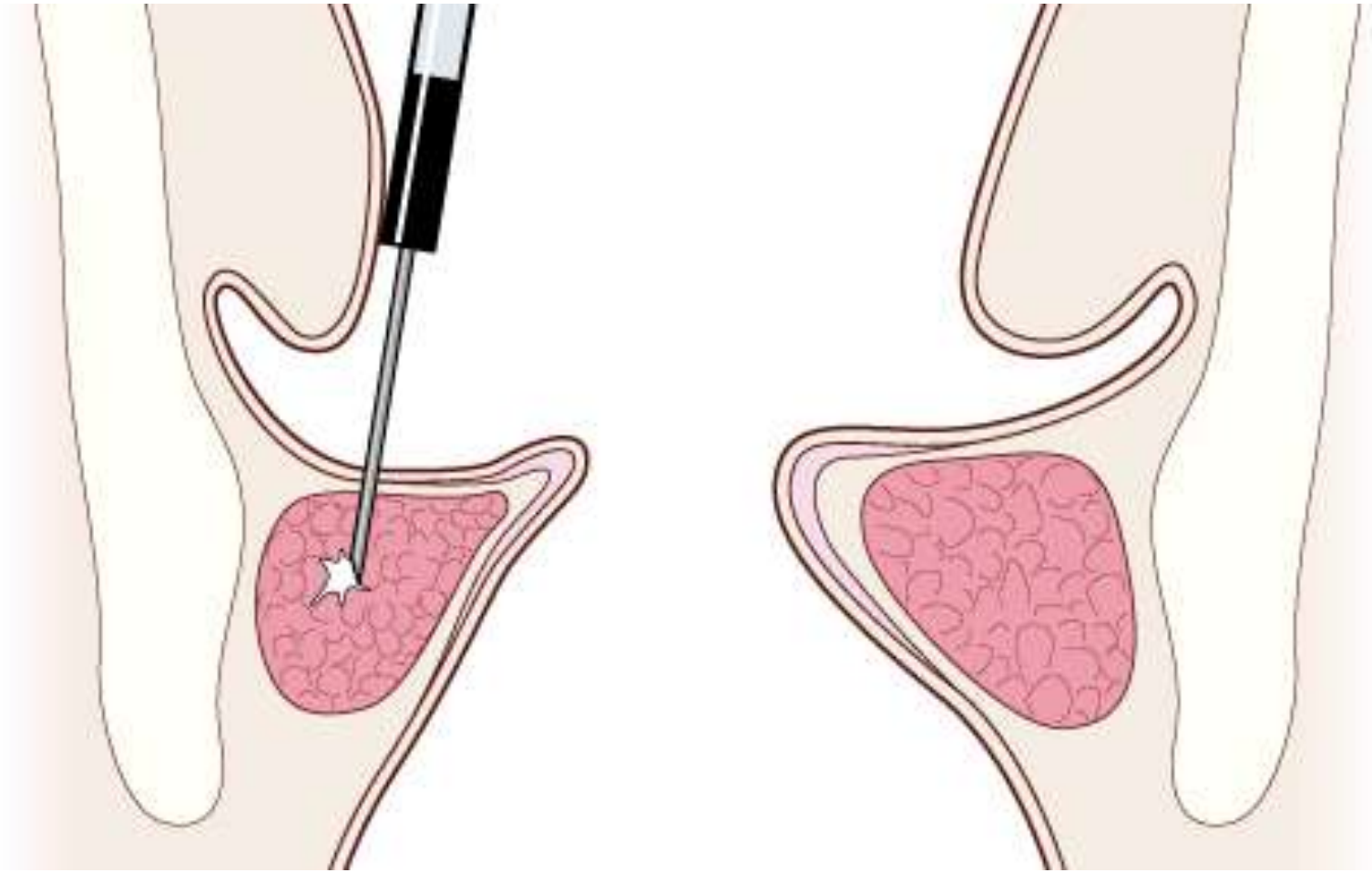




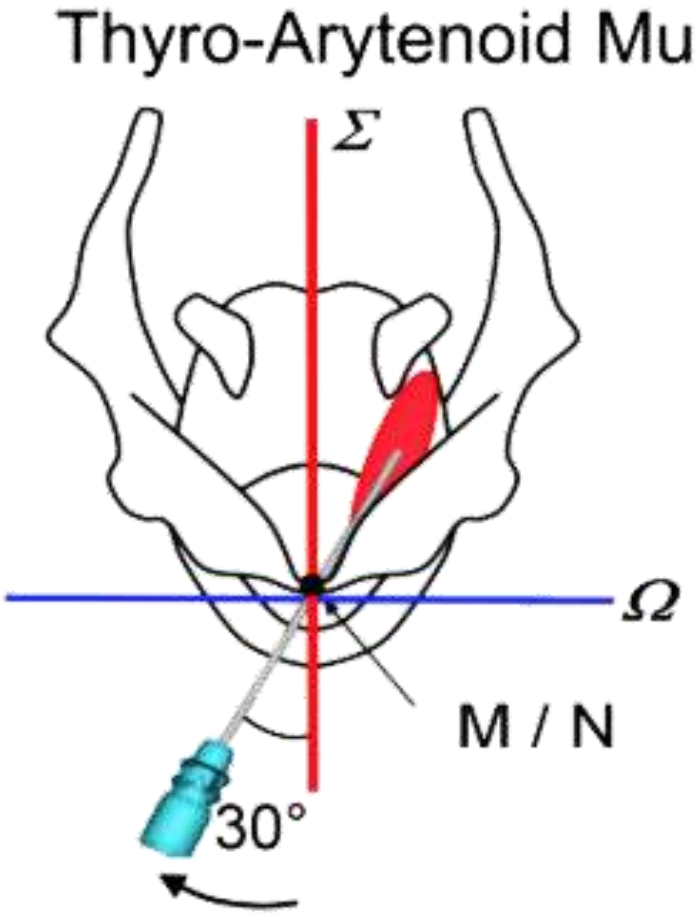


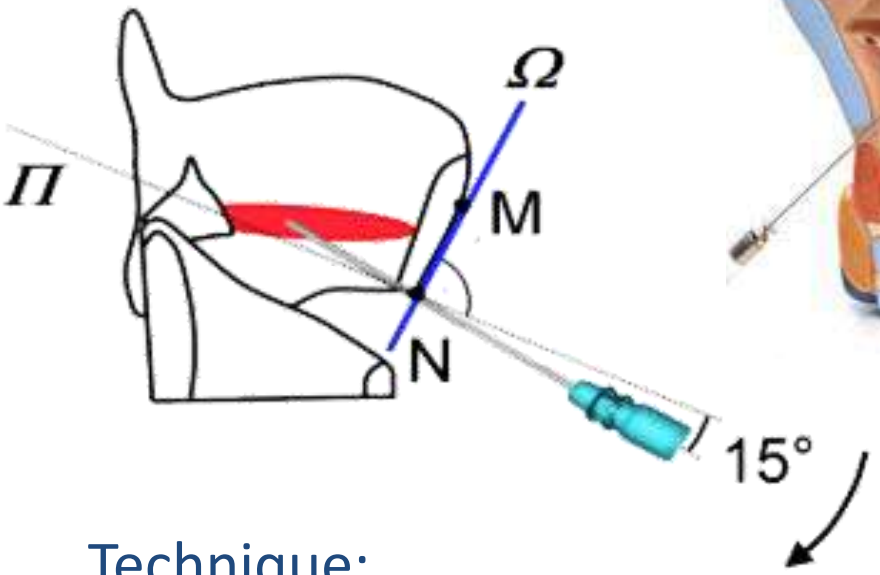


TA muscle



TA muscle

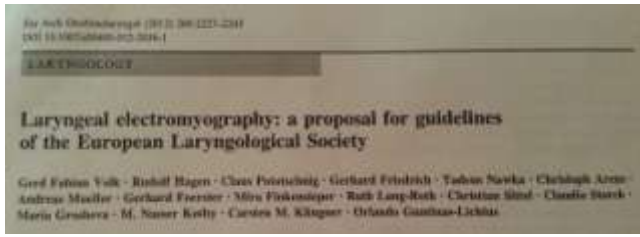




Technique:

Insert needle midline, 30º lat and 15º superiorly

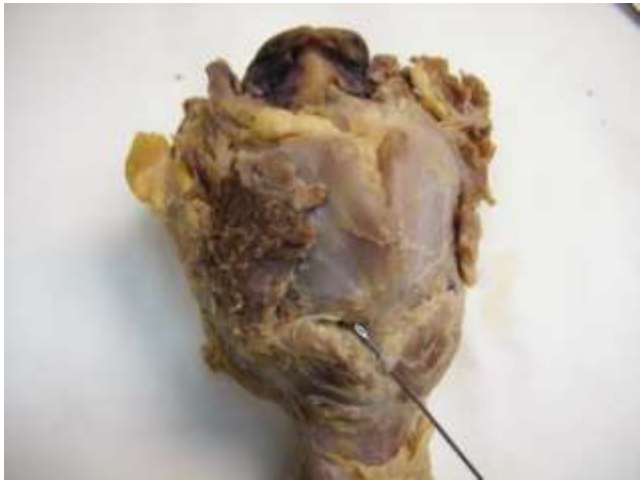
Pierce on cricoid, 45º under thyroid



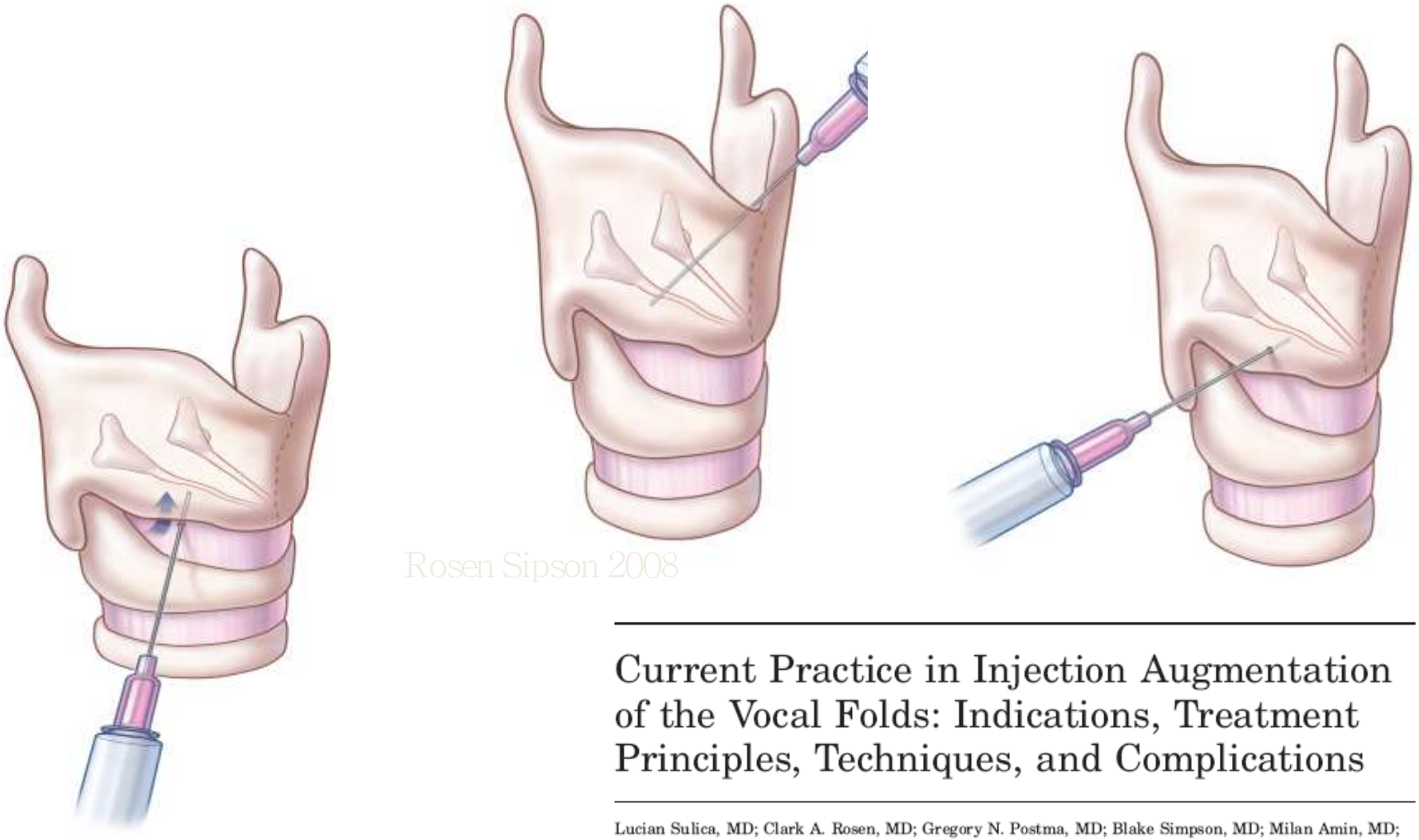
Storck C et al. (2012) Laryngeal electromyography: electrode guidance based on 3-dimensional magnetic resonance tomography images of the larynx. J Voice. 2012 Jan;26(1):110-6

TA muscle

- Technique:
  - Insert needle midline, 30º lat and 15º superiorly
  - Pierce on cricoid, 45º under thyroid.
- Agonist actions:
  - /i/ sustained
  - Holding breath by glottic stop
  - Swallowing (brief activation)
  - Expiration
- Antagonist actions
  - Forcefull sniffing
  - Inspiration



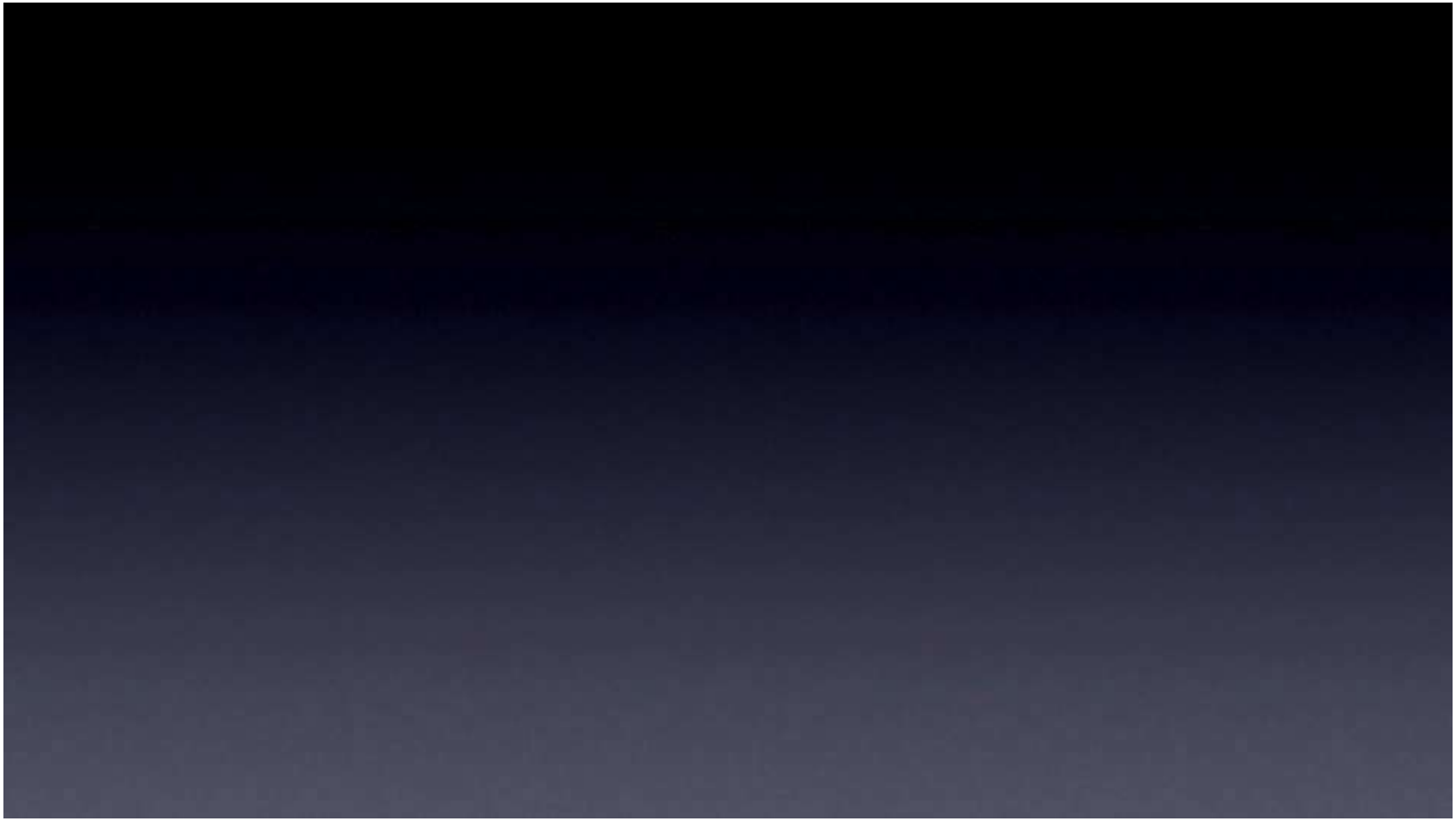
Different approaches to the TA



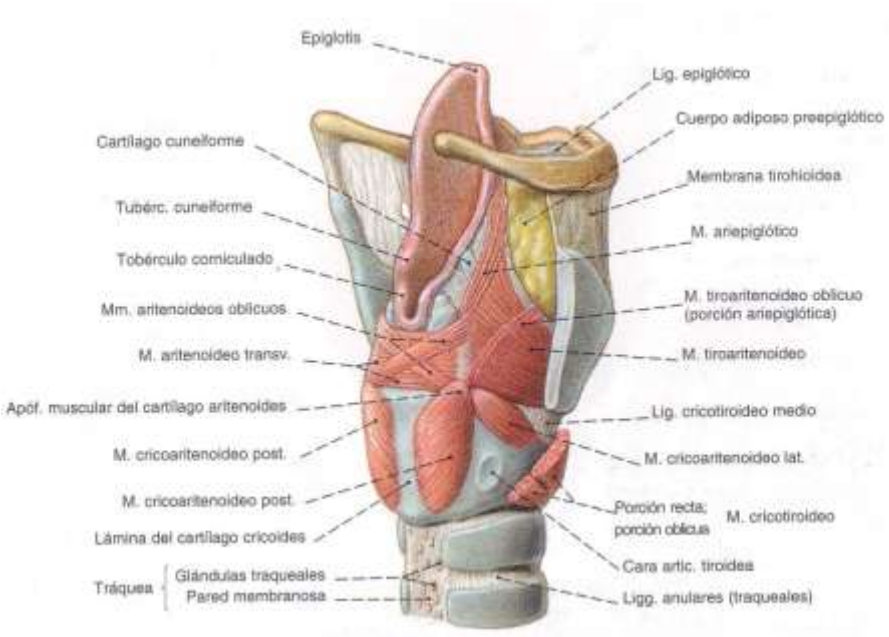
Current Practice in Injection Augmentation of the Vocal Folds: Indications, Treatment Principles, Techniques, and Complications

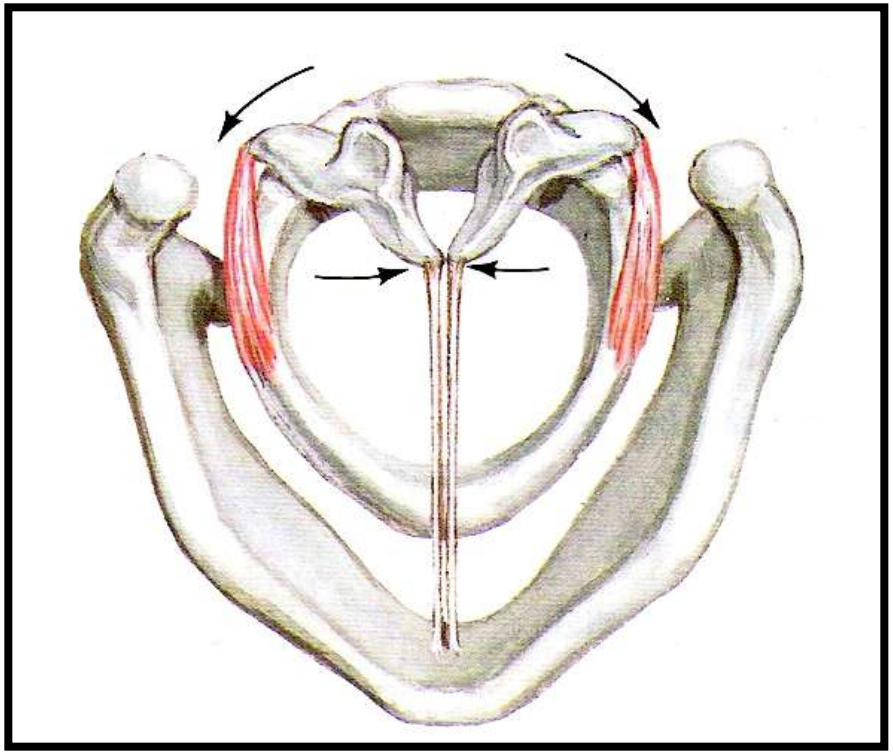
Lucian Sulica, MD; Clark A. Rosen, MD; Gregory N. Postma, MD; Blake Simpson, MD; Milan Amin, MD; Mark Courey, MD; Albert Merati, MD

TA ins/expiration, swallow, valsalva



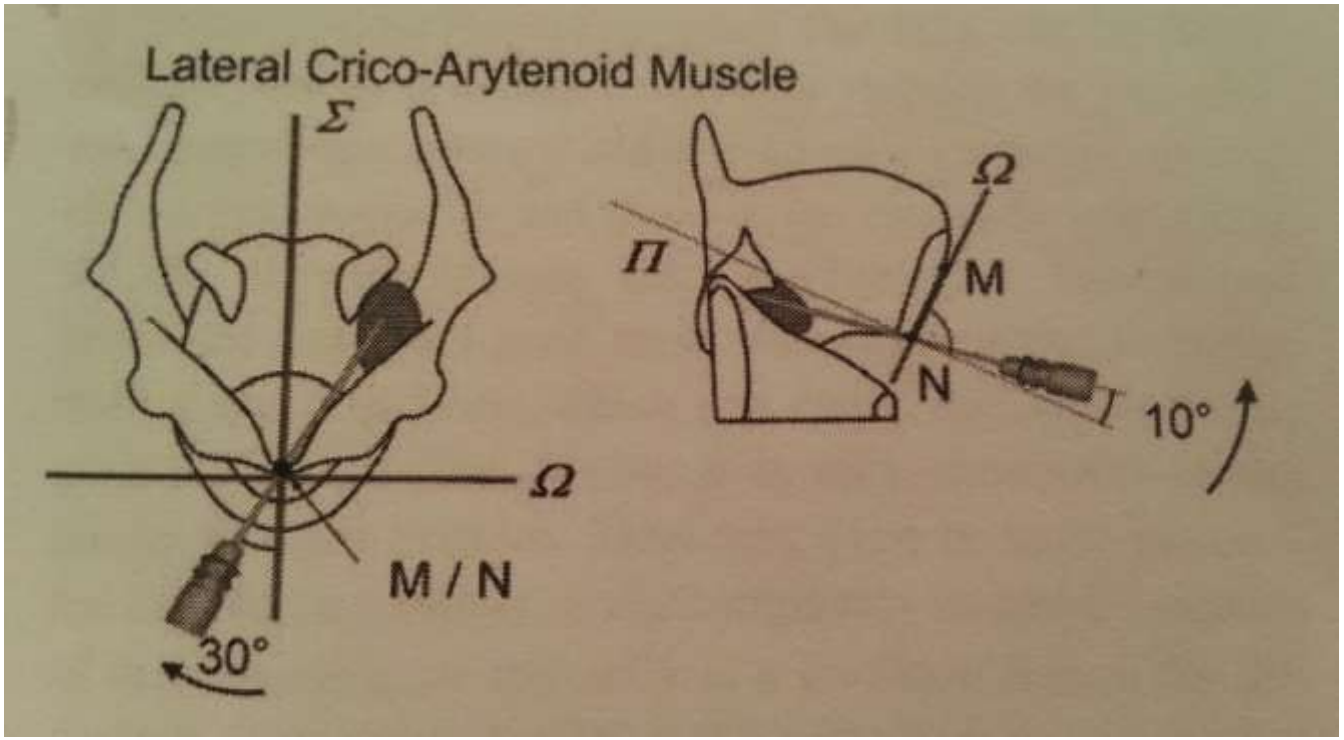
LCA


Epiglotis
Lig. epiglótico
Cuerpo adiposo preepiglótico
Cartílago cuneiforme
Membrana tirohioidea
Tubérc. cuneiforme
M. ariepiglótico
Tobérculo corniculado
M. tiroaritenoideo oblicuo
(porción ariepiglótica)
Mm. aritenoideos oblicuos
M. aritenoideo transv.
M. tiroaritenoideo
Apóf. muscular del cartílago aritenoides
Lig. cricotiroideo medio
M. cricoaritenoideo post.
M. cricoaritenoideo lat.
M. cricoaritenoideo post.
Porción recta;
porción oblicua
M. cricotiroideo
Lámina del cartílago cricoides
Cara artic. tiroidea
Tráquea
Glándulas traqueales
Pared membranosa
Ligg. anulares (traqueales)



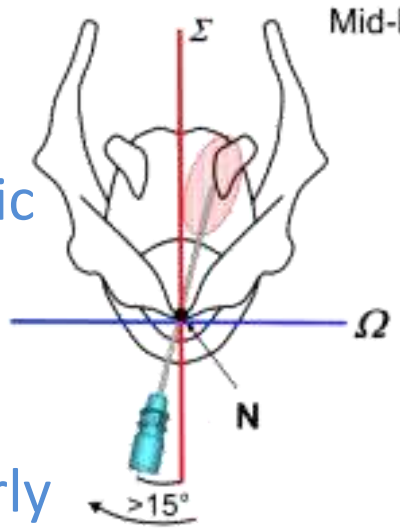
LCA mucle

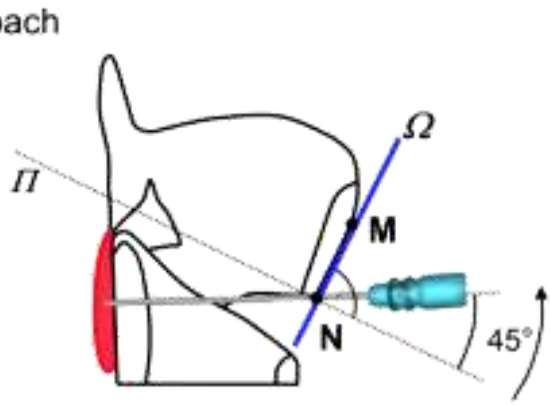
- Technique: enter CT membrane, 10º superiorly, angulate 30º laterally. Deeper and lower than TA
- Action: /i/ short inicial burst and decreases after



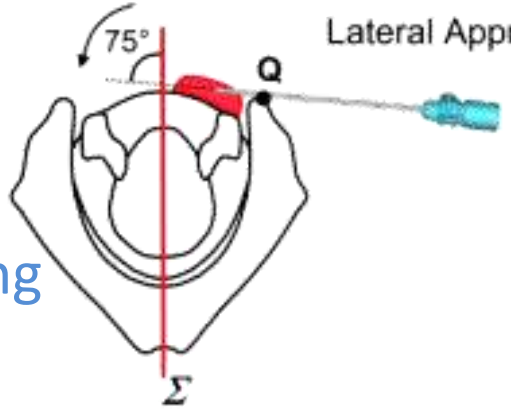
PCA muscle

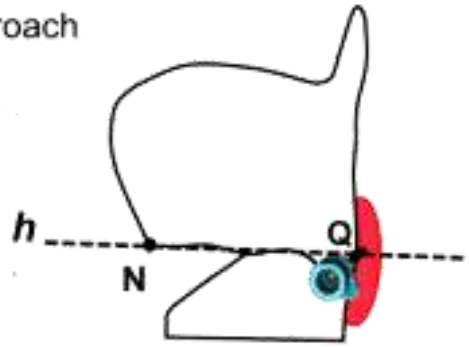
- Technique:
  - Through cricothyroid membrane, sagital, 5-10mm off midline, glottic lumen, and 15º lateral. Young women
  - Rotate larynx, inside thyroid lamina posteriorly





- Action: deep inspiration
- Confirmation: not swallowing or /i/

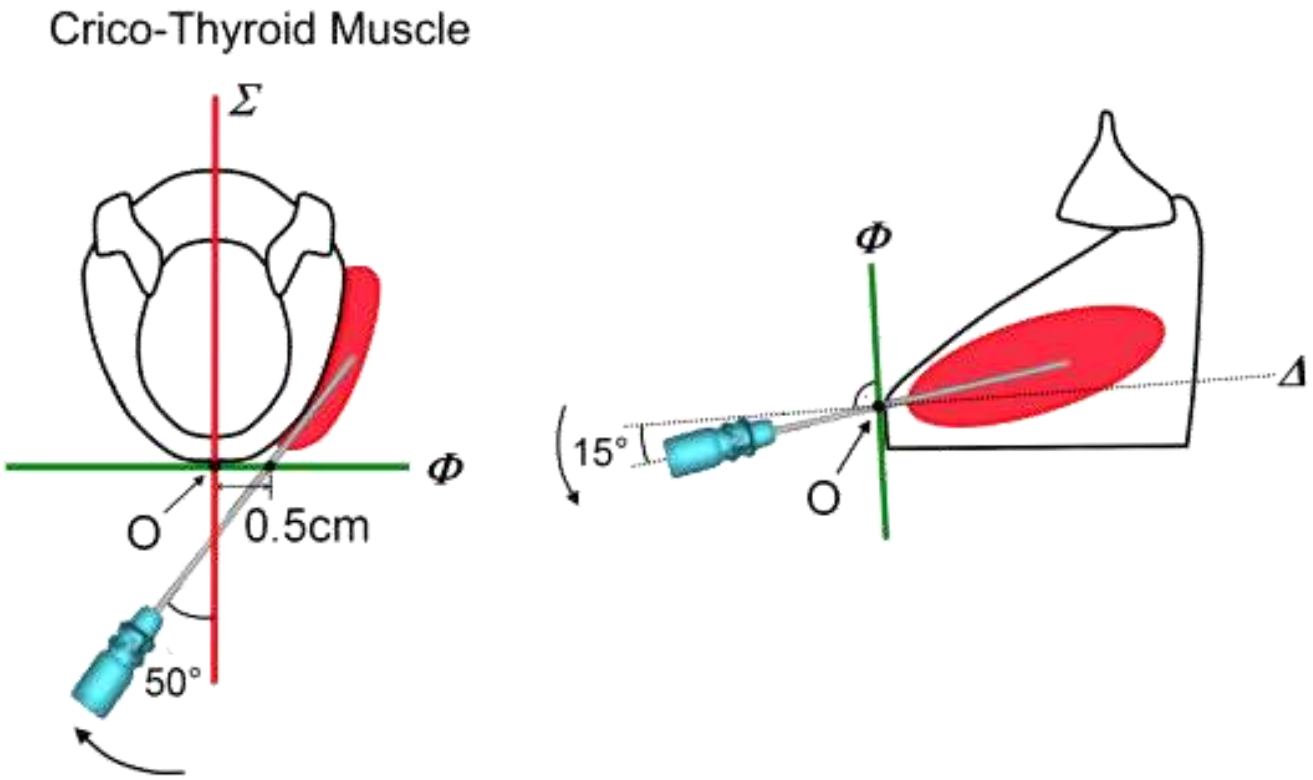




PCA muscle

PCA muscle

CT muscle

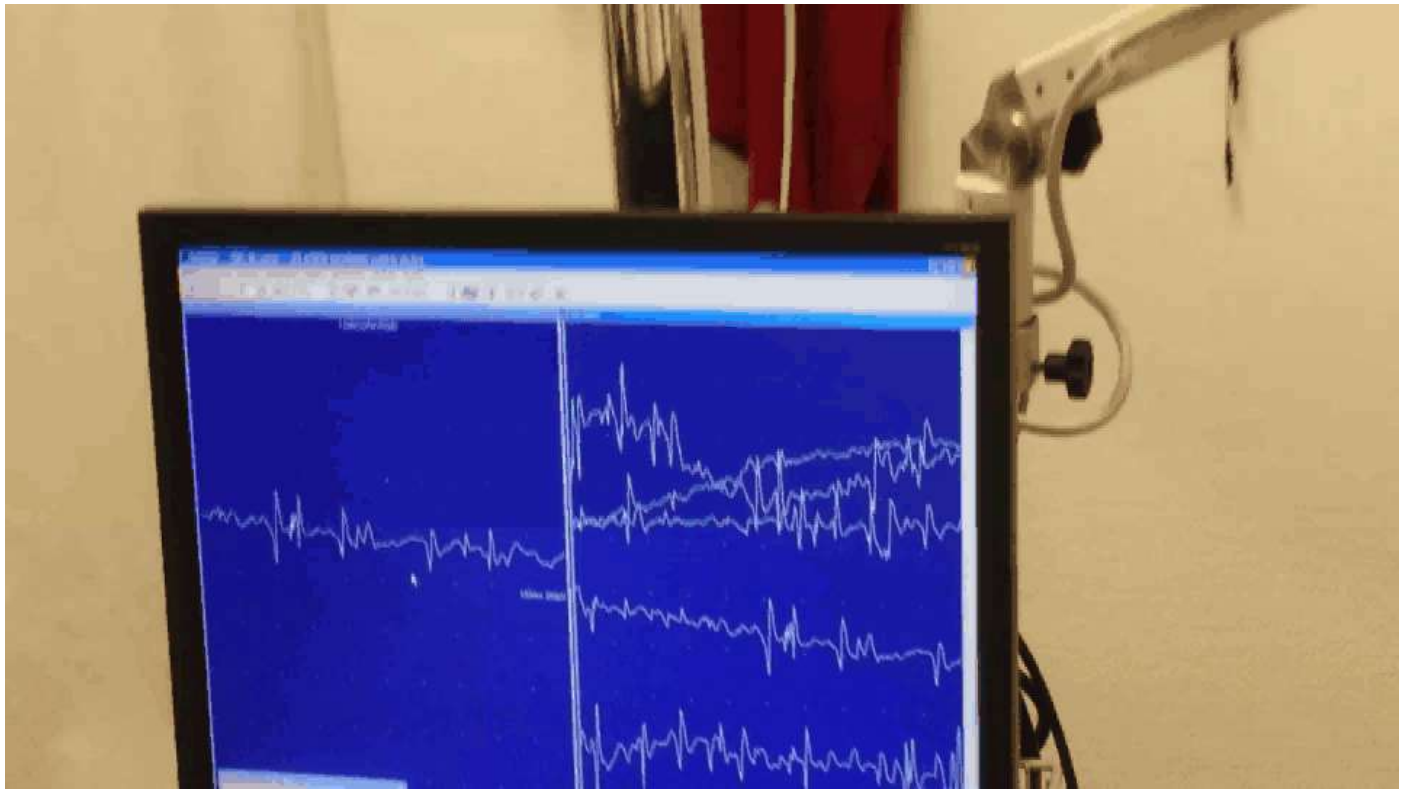


- Technique: pierce on cricothyroid notch, 5mm off midline,angle 50º laterally and 15º superiorly. Enter 15-20mm
- Confirmation: elevate or lateralize head
- Action: glissando

CT muscle

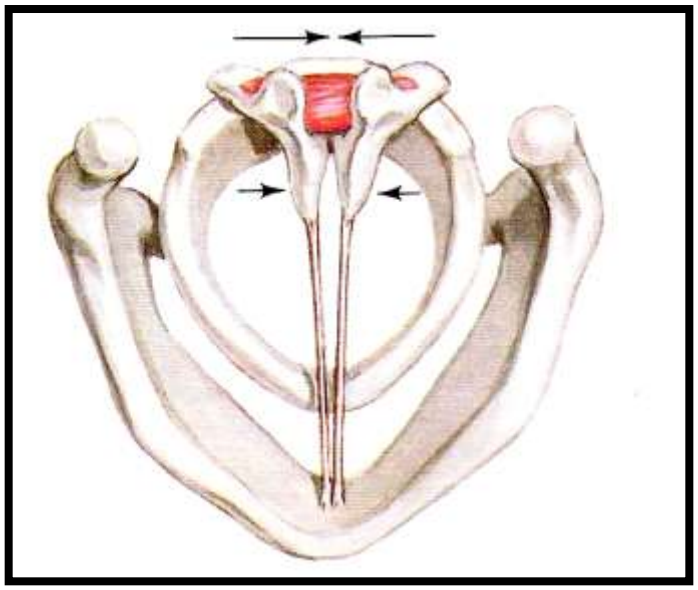
CT actions

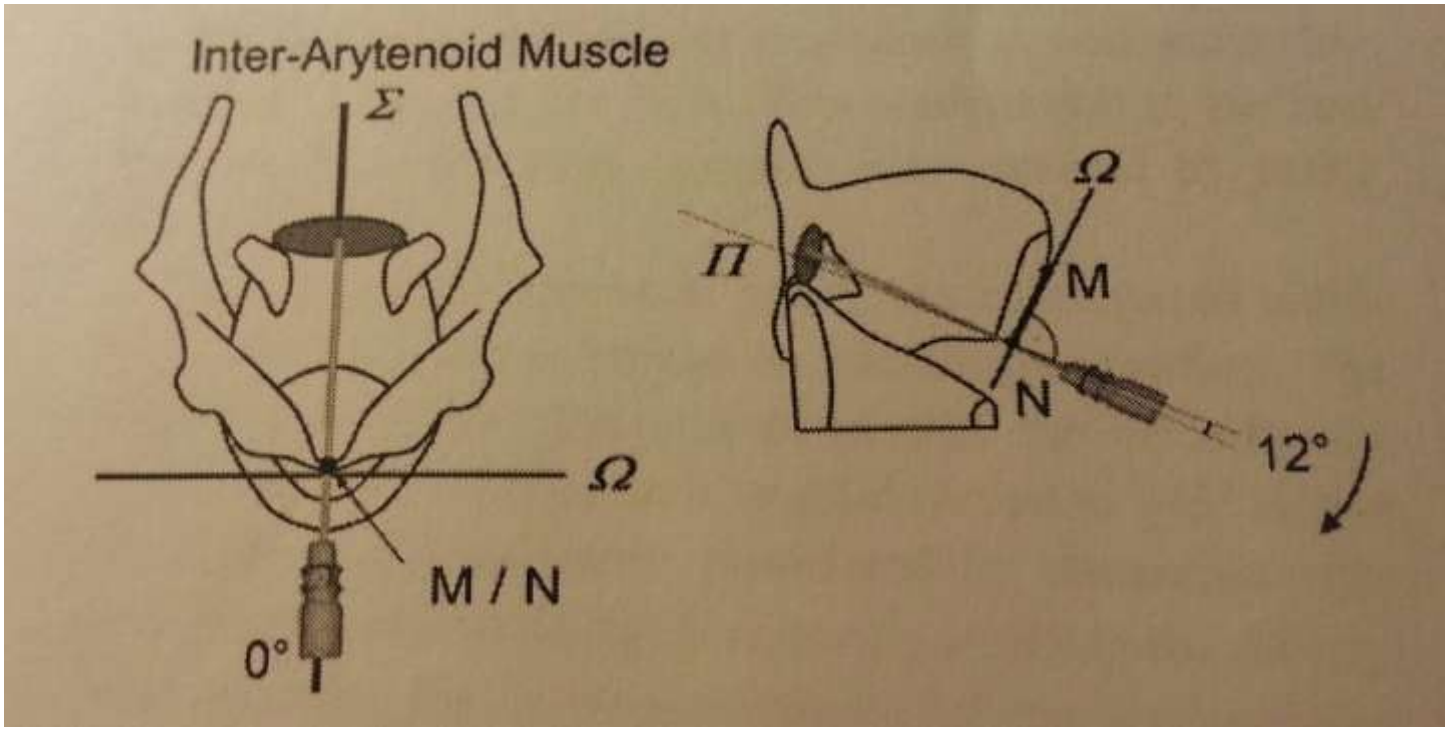
Neck MUAP



IA muscle

- Technique: Through membrane, glottic lumen, 12º down and central
- Acción: /i/
- Confirmation: not sniffing, not swallowing





IA muscle

Neurophysiological studies

- Tests muscle and nerve function
- When?
  - Movement problems
- What for? Differential diagnosis:
  - Nerve: central or peripheral
  - Muscle
  - Neuromuscular synapses
  - Cricoarytenoid joint problem
- Consider with caution

LEMG

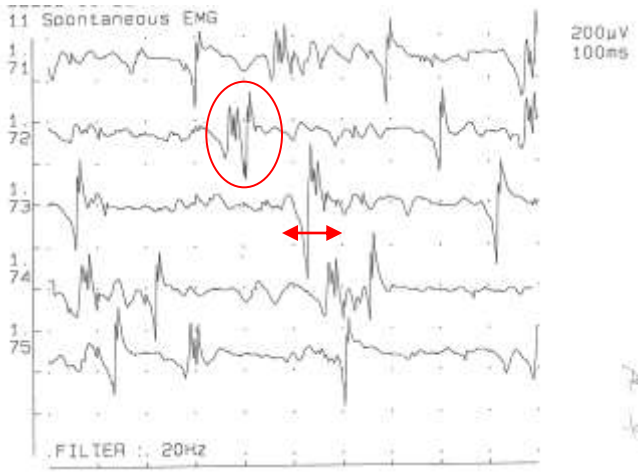
1. Electroneurogram. Nerve conduction. Damage to myelin or axon.
2. EMG. Registers electric activity in the muscle
    1. Neurogen or myogen damage
    2. If neurogen: active or chronic damage
3. Neuromuscular transmission

Neurophysiologic study

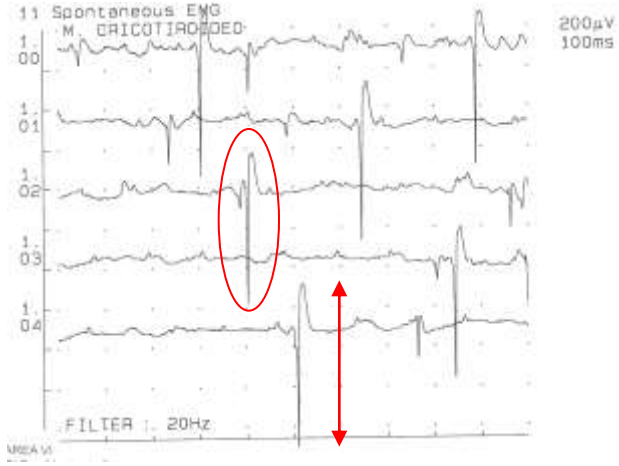
1. Electroneurogram. Measures the speed of the nerve. Myeline or axón damage
2. EMG. Registers activity in the muscle
    1. Insertional
    2. Spontaneous: active nerve damage: Fibrilation, positive waves
    3. Volitional
        1. MUP: normal, big, polyphasic
        2. Maximum effort
3. Repetitive stimulation: Neuromuscular transmission

EMG. Volitional activity. MUAP

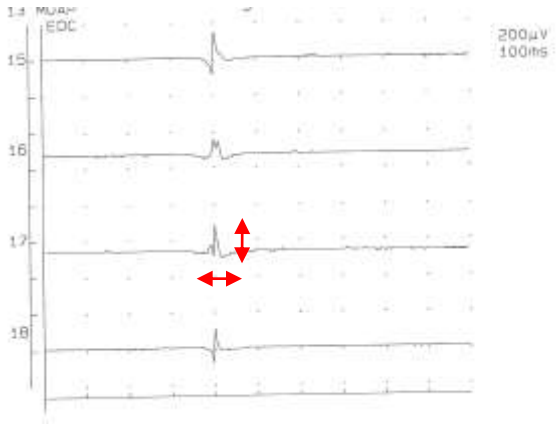
- Check: MUAP duration.
- Normal: mean duration for the specific muscle in an specific age group
- Big: Chronic axonal process. The non impaired axon recruits other muscle fibers (synkenesis). Chronic reinervation: good prognosis
    - Polyphasic potential: beginning of reinnervation
- Small: myopathic
    - Polyphasic potential



Big polyphasic MUAP



Big MUAP



Myopathic MUAP

Conclusion and key points

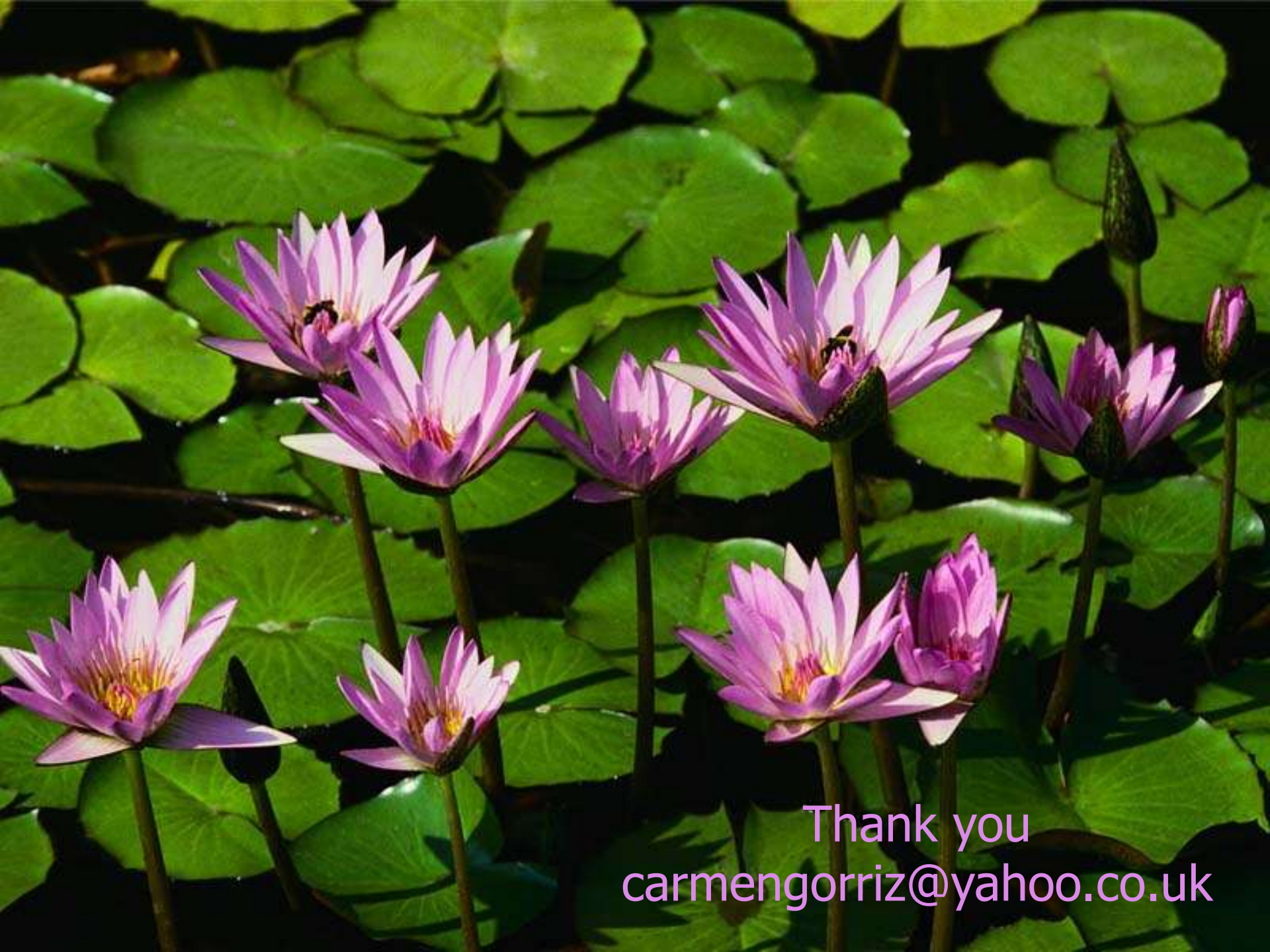
- Neurolaryngologic examination is vital to discover subtle movement dissorders
- LEMG is important in the DDiag of movement dissorders
  - Nerve (central or peripheral)
  - Muscle
  - Neuromuscular union
  - Cricoarythenoid fixation

Conclusions II

- Helps in prognosis
  - Better if myelin problem than axonal
  - Reinervation signs (MUP polyphasic and big)
- EMG: after the 3th week
- ENG: after the 5-7 day
- Useful for botulin toxin
- Be cautious interpreting
  - Difficult to find the exact muscle

Conclusions III

- If no organic lesion is found in dysphonia, perform LEMG
- Dysphonia can be the 1st sign in neuronal and muscular disorders
- Need of a multidisciplinary team


Thank you
carmengorriz@yahoo.co.uk