

Examination of overactive PFM with EMG  
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High tone PFM - increased tension in tissue on palpation

- Contractile - Overactive PFM
  - Elevated EMG resting tension - fear, pain, neurogenic
  - Excessive contraction before or on initiation of penetration
- Non-contractile
  - Normal EMG
  - Contracture of connective tissue - radiation, surgical scarring, disease

Palpation versus EMG - contractile and non contractile tissues

EMG	Palpation	Possible cause
High uV level	Soft muscle	Artifact
High uV level	Hard muscle that relaxes easily with pressure and verbal cues	Overactive PFM - holding pattern
High uV level	Hard muscle that does not relaxes easily with pressure and verbal cues	Overactive PFM – spasm
Normal uV level	Soft muscle	Normal PFM
Normal uV level	Hard muscle	Short PFM Trigger points in muscle Connective tissue restriction

Other factors influencing resting baseline

- Medications which artificially decrease EMG signal:
  - Sedatives
  - Antihypertensive
  - Anticholinergic
  - Anti-angina drugs
  - Anti-spasmodic
  - Proton pump inhibitors
- Skill of the operator - unwanted signals

Unwanted signal

Environmental noise

- Usually elevated steady base line with little variability related to muscle activity
- Changes in tracing not related to patient activity
- Noise related to defective hardware - consult with equipment manufacture:
  - Computer
  - Cables - can fatigue and need to be replaced periodically
  - Electrodes - may need to remove and replace, especially the ground electrode

- Noise related to environmental activity
  - Can come from any electrical device including the computer, EMG device, lights, and electrical plinth
  - Check all connections
  - Unplug all electrical devices
  - Patient 3 ft from computer monitor
  - Computer monitor apart from EMG hard drive
  - Change power strip

<b>Artifact</b>	<b>What it Looks Like</b>	<b>What to Do</b>
Heart rate	Regular small spike occurring during rest phase	<ul style="list-style-type: none"> <li>• Move electrodes or ignore</li> </ul>
Cross talk: contraction of other muscles	Increased microvolt levels with contraction of other muscles	<ul style="list-style-type: none"> <li>• Watch / palpate patient</li> <li>• Keep patient relaxed and still</li> <li>• Support legs with pillows or wall</li> </ul>
Skin electrode shear: sliding of electrodes over skin surface	Spikes with skin movement	<ul style="list-style-type: none"> <li>• Ensure good contact</li> <li>• Reapply electrodes</li> </ul>
Electrical short circuit: Bridging of electrodes from gel or vaginal secretions, sweating getting down between two active electrodes	Flat line rest with little change on movement	<ul style="list-style-type: none"> <li>• Remove electrodes and re apply</li> </ul>

#### Evaluation measurements

- Many different protocols, no studies
- Very few hard and fast rules – the art of interpretation
- EMG assessment must be taken in context with other examination findings - patient has symptoms of overactive PFM – obstructed urination, defecation, pain
- 1 to 2 minute resting baseline
- Recheck resting baseline between tests
- Comparing session - it may not be reliable to compare day to day or patient to patient - look for trends and correlation with symptoms

#### Normal resting tone

- Baseline fairly constant
- Without large spikes
- Between contractions
- Between sessions
- There is no microvolt (uV) level below which normal resting tone occurs
- Past standard has been below 2 uV, this may be too strict and does not take other variables into account

## Standard deviation

- Variation size or "jumpiness" of a signal
- No norms established

## Overactive PFM

- Baseline between contractions – inconsistent and elevating
- Resting baseline - varies widely from session to session, especially in relation to pain
- Elevated standard deviation
- Return to baseline after startle or frightening – overactive PFM is slow

## Biofeedback Relaxation Training

- Contract relax to decrease PFM tension (Naess 2013)
- Small contraction with big relaxation - anti kegel
  - Study with normals and provoked vestibulodynia patients
  - Vaginal pressure measurement and EMG after 3 maximal PFM contractions
  - Results
    - Resting pressure in both patients and controls significantly decreased after contraction.
    - EMG significantly decreased only in patients.
- Gentle bearing down should result in lower EMG activity and descent of the PFM
- Diaphragm breathing (Talas 2011) - health women, real-time dynamic MRI
  - Diaphragm and PFM move caudally during inspiration and cranially during expiration.
- Levator ani syndrome - biofeedback is superior to Electrical Stimulation and massage (Chiarioni 2010)
- Pelvic muscle exercises with or without biofeedback may improve sexual function in women with pelvic floor disorders or pain. (Rogers 2018)
- Biofeedback combined with vaginal dilators (McGuire 2009)

## References

Chiarini G, et al. Biofeedback is superior to electrogalvanic stimulation and massage for the treatment of levator ani syndrome. *Gastroenterology* 2010;138:1321-1329

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