Electroneuromyographic studies
in the diagnosis of Pudendal Entrapment Syndrome

BY

NAGLAA ALI GADALLAH
PROFESSOR OF PHYSICAL MEDICINE,
RHEUMATOLOGY & REHABILITATION
AIN SHAMS UNIVERSITY
Pudendal neuralgia

- It is a chronic perineal pain syndrome that is frequently (but not always) caused by the entrapment of the pudendal nerve.
- In most cases, the pudendal nerve trunk is entrapped in its proximal segment.
Pudendal Entrapment Syndrome

- This syndrome must be diagnosed because this can result in the indication of surgical decompression of the entrapped nerve for pain relief.
- Electroneuromyographic (ENMG) investigation is often performed in this context, based on needle electromyography and the study of sacral reflex and pudendal nerve motor latencies.
**Neurophysiological techniques**

- Pudendal nerve motor conduction studies
- Sacral reflex latencies.
- Concentric needle electromyography (EMG), performed bilaterally in both bulbocavernosus and external anal sphincter muscles for comparative analysis.
- Pudendal SSEP.
Pudendal nerve motor conduction studies
PNTML is commonly considered as the gold standard.
The accepted “normal” values for PNTML in the literature is still under debate.

Some centers refer to the term pudendal neuropathy as > 2ms, others as 2.1 ms, and still others as >2.2 or 2.3 ms.

These discrepancies in measurement lead to very different results and make comparison among different centers impossible.

In our lab the cut off value is 3 ms.
PNTML

Unilateral delay

Bilateral delay
Using recording surface electrodes
The perineal branch of the pudendal nerve may be also studied in females mainly, by using the Foley catheter mounted double ring electrode for recording.
**PNTMLs:**

- the pudendal nerve is frequently entrapped *proximally* to the site of transrectal stimulation.
- Therefore, PNTML may be measured using *magnetic* stimulation of the sacral roots, allowing the whole length of the nerve to be tested.
Sacral reflexes

In general, pelvic viscera are innervated by both divisions of the autonomic nervous system, the **sympathetic** and **parasympathetic** divisions, as well as by the **somatic** and **sensory** nervous systems.

In a broad anatomical view, dual projections from the thoracolumbar and sacral segments of the spinal cord carry out this innervation.
The sacral reflexes can be defined as reflex contractions of skeletal muscle structures in the pelvic floor, occurring in response to a stimulus of a pelvic structure involves neurotransmission through sacral neural routes.
Types of Sacral reflexes

- Cutaneoanal reflex
- Urethral Anal Reflex
- Bladder Anal Reflex
- Somatosomatomic reflex (Pudeno anal reflex)
- Bulbo Cavernosus Reflex (BCR)
Pudeno anal reflex  Bulbocavernosus reflex

Sacral Reflexes

DNP (pudendal n.)

perineal n. (pudendal n.)

Sacral cord

Bulbocavernosus reflex

Pudendoanal reflex

EAS
Bladder anal reflex  Urethral anal reflex
## Sacral reflexes

<table>
<thead>
<tr>
<th>Stimulation</th>
<th>Right EAS</th>
<th>Left EAS</th>
<th>Stimulation</th>
<th>Right EAS</th>
<th>Left EAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>right Pudendal n.</td>
<td>72.8 ms</td>
<td>60.0 ms</td>
<td>left Pudendal n.</td>
<td>57.4 ms</td>
<td>37.2 ms</td>
</tr>
</tbody>
</table>
Electromyography

- The EAS is regarded as the indicator muscle for detection of neuropathic lesions in the lower sacral myotoms.
- For EAS EMG, the procedure is usually performed with a concentric needle electrode.
- Insertion & spontaneous activities, Motor unit potential (MUP) morphology and motor unit potential recruitment during voluntary or reflex contraction are recorded.
Needle EMG evidence of neurogenic sphincter lesion include signs of muscle denervation or reinnervation.
Correlations between pathophysiological mechanisms and ENMG results

- Pain induced by nerve entrapment is first related to a local increase in axonal excitability, leading to excessive and ectopic spike discharges. Conventional ENMG techniques cannot provide direct evidences of these processes and therefore, ENMG results do not correlate to pain intensity in case of nerve entrapment syndrome.

- If nerve compression is more severe or long-standing, segmental demyelination occurs focal nerve conduction slowing with abnormal motor unit potential recruitment in case of conduction block.
Correlations between pathophysiological mechanisms and ENMG results

- At an advanced stage of compression, there is **axon al** loss due to Wallerian degeneration and thereby, the EMG interference pattern is reduced with a high firing rate and altered motor unit potentials.
- In addition, spontaneous EMG activity can be present in case of active denervation and motor nerve conduction velocity can be reduced because of the loss of large, fast-conducting fibers.
Correlations between pathophysiological mechanisms and ENMG results

In addition to the previously mentioned general considerations about entrapment-induced neuropathic pain, some points are particular to pudendal nerve entrapment:

- The site of pudendal nerve compression *cannot* be ascertained by ENMG examination, even by comparing the latencies of the sacral reflexes recorded in various perineal muscles.
Neurapraxia

Evoked Potential

Proximal Stimulation  Distal Stimulation

A
B
C

Axonotmesis

Immediately After

A

10 Days After

B

Evoked Response

Proximal Stimulation  Distal Stimulation

A'
B'
Correlations between pathophysiological mechanisms and ENMG results

- The usual neurophysiological techniques do not directly test *sensory* parameters of pudendal innervation.

- *In conclusion*, ENMG results correlate more with structural abnormalities (demyelination and axonal loss) than with functional abnormalities, such as those involved in the mechanisms of neuropathic pain.

- In any case, the objective assessment of pudendal motor innervation appears to be of good clinical practice before performing neurolysis.
Intraoperative PNTML monitoring

- On the contrary, ENMG examination is not considered useful for intraoperative monitoring.
- In case of entrapment syndrome, nerve conduction slowing is due to demyelinating process or axonal loss that will take at least several weeks to recover after decompression.
- Therefore, it is nearly impossible to observe any change in pudendal nerve conduction during the time of surgery in the operating room.
Thank You