

NEUROPHYSIOLOGICAL ASSESSMENT OF AFFERENT PUDENDAL NERVE ACTIVITY DURING PUDENDAL NERVE NEUROMODULATION FOR LOWER URINARY TRACT DYSFUNCTION.

Hypothesis / aims of study

Pudendal nerve is a one of the major nerves, which innervates the pelvic floor muscles, the external urethral and anal sphincters and the pelvic organs. The therapeutic effects of inhibition of overactive detrusor contractions applying electrical stimulation in perineal area are already known.

To attempt to stimulate pudendal nerve in a chronic setting we developed a minimally invasive approach to place a lead to stimulate pudendal nerve (Pudendal Percutaneous Implant: PPI) in order to treat neurogenic patients.

In order to correlate bladder behaviour with neural activity we therefore recorded neural traffic (afferent and efferent activity) from the Pudendal nerve lead nerve during cystomanometry.

Study design, materials and methods

Four female patients (age range 21-53) all non responder to antimuscarinic drugs 3 pts underwent sacral neuromodulation test stimulation (PNE) but had unsatisfactory results. All patients complaint of a neurogenic overactive bladder due to incomplete upper motor neuron lesion: (2 vascular myelopathy, 2 traumatic spinal cord lesion).

They were submitted by consent to percutaneous pudendal nerve implant for chronic pudendal nerve. All patients were submitted to a complete neurophysiological and urodynamics assessment (under International Continence Society recommendations) at the baseline.

Pudendal nerve stimulation and the electrode placement were performed during the neurophysiological monitoring using the lead and the introducer kit available for minimally invasive implant of sacral neuromodulation.

Our technique consists of measuring several Pudendal Nerve Terminal Motor Latency (PNTML) responses and Compound Muscle Action potentials from external anal sphincter. The best-evoked response (constituted by maximal amplitude, regular shape, shorter latency) is identified, recorded and memorized: this will be the reference potential response (RPR). The surgical procedure is done under local anaesthesia. An insulated needle is inserted perpendicular to the skin for about 4 cm to reach the ischial tuberosity. The needle is tilt laterally and dorsally to reach the recto-ischial fossa until it is located below and behind the ischial spine in Alcock's channel.

Once the needle is in this correct position, it is possible to place either a temporary stimulation lead (PNE) or a definitive quadripolar tined lead along the pudendal nerve in the Alcock's channel.

In each of the steps of the implant the neurophysiological monitoring is repeated in order to confirm the consistency between the recorded trace and the RPR.

The lead is then connected to an external stimulator and to a neurodiagnostic machine in order to record the ongoing activity arising from the pudendal nerve during the filling and the voiding phase of the cystometry.

An acute test of pudendal stimulation is performed during cystomanometry in response to the emergence of uninhibited bladder contractions in order to verify the effect of Pudendal nerve stimulation on the detrusor.

Results

All pts with urge incontinence became continent during the screening phase then received the permanent implant with persistent results after 9 months mean follow up.

Interpretation of results

Acute stimulation of pudendal nerve (5 Hz, 0.2 ms, intensity corresponding to the threshold capable to evoke bulbocavernosus reflex), during the filling phase of cystomanometry (20 ml/min) was effective in determine detrusor inhibition of contraction therefore allowing the increase in bladder capacity.

Pudendal nerve activity recorded during the filling phase showed an increasing afferent activity until the emergence of first uninhibited bladder contraction when the stimulation of the pudendal nerve caused an increase in efferent activity and the disappearance of bladder contraction.

Concluding message

Chronic pudendal nerve stimulation is feasible; the implant of the lead is easy to perform using percutaneous technique originally developed for sacral neurostimulation. Neurophysiological guidance allows reproducible and reliable guide to place the lead and to record on-going neural activity during cystometry. This technique could wide the field of application of electrical stimulation for treating functional disorders in neurogenic patients. Further study must carry out to optimise the method in order to allow pudendal nerve stimulation on physiologic demand.

FUNDING: NONE

DISCLOSURES: NONE

HUMAN SUBJECTS: This study was approved by the niguarda hospital and followed the Declaration of Helsinki Informed consent was obtained from the patients.