Author(s) D. De Ridder, F. Bruynickx, L. Baert

Institution, city, country Dept. of Urology and Dept. of Clinical neurophysiology, Katholieke Universiteit Leuven, Leuven, Belgium.

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SACRAL NEUROMODULATION INFLUENCES THE INTERDISCHARGE VARIABILITY OF THE MOTOR UNIT FIRING PATTERN IN THE STIMULATED PELVIC FLOOR MUSCLES.

Aims of the study: Sacral nerve stimulation is a succuessful treatment for chronic voiding dysfunction. To objectivate the stimulator effect on the urethral sphincter and other pelvic floor muscles, a concentric needle EMG study was performed.

Methods: In five patients, concentric needle EMG was performed before and after sacral nerve stimulation. In three patients this was done during the subchronic percuatanous testing phase In two other patients the study was done after definitive implant. In these patients the clinical effect was not satisfying and lead malpositioning was suspected, but could not be proven by X-ray or clinical testing.

Results: In all patients a stimulation artefact could be seen om the EMG.This artefact was not only present in the external urethral sphincter but also in other muscles which were not part of the same myotome (volume conduction). Besides this stimulation artefact, an influence on the discharge rate of the individual motor unit was seen. In rest, with no motor units firing, only the first stimulation artefact was seen. During slight voluntary contraction, motorunits were recruited, according to the size principle. Each motor unit starts by firing somewhat irregularly, but when its tonic level is reached the motor unit fires very regularly. Still, there is always a small interdischarge variability. It was noticed that in patients with a spinal stimulator this small but regular interdischarge variability of single motor units becomes very irregular. This, of course, only takes place in those muscles that depend on the spinal level(s) that are influenced by the stimulator. In muscles whose spinal level is not stimulated (and in muscles in which a stimulus artefact is present through volume conduction only, this phenomenon was not seen.In this way the correct stimulation of the external urethral sphincter, anal sphincter and some intrinsic foot muscles could be proven.

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Conclusion:1) This effect on interdischarge variability can be useful to determine wether the stimulator lead is placed in the best possible location. It can help to objectivate the stimulator effects in patients without clinical improvement of their voiding problems despite correct anatomical positioning of the lead.
2) The central control of the firing rate variability is poorly understood. Possibly the electric discharges produced by the stimulator interfere directly at the medullar level with the "pre-programmed" firing pattern, possibly by altering the times course of the repolarisation (after-hyperpolarization) phase of the spinal motor neurons, thus leading to irregular discharge rates. Additional influence upon the descending volleys from the pontine micturition/storage centers is also possible.

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