W1: ICS Institute of Modern Technology - Advances in Neurostimulation: Technology-Based Approach

Workshop Chair: Emre Huri, Turkey

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20	The best technological advances for clinical side of sacral neurostimulation: techniques and clinical outcomes	David Castro-Diaz
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Aims of Workshop

The School of Modern Technology will work to deliver gold standard educational resources and project proposals in Modern Technology to ICS members through eLearning and work placements at international centres of excellence. The aims of workshop are: - talking on novel technological improvements related to neurostimulation procedures - increasing awareness of 3D medical printing and simulation modalities within the scope of neurostimulation - approach to refractory OAB and pelvic pain syndrome patient with using new technological instruments - discuss new technology on neurostimulation modalities

Learning Objectives

learning novel technologies and application to functional urology

Target Audience

Urology, Bowel Dysfunction

Advanced/Basic

Intermediate

Suggested Learning before Workshop Attendance

www.medtrain3dmodsim.eu https://www.ics.org/institute/technology

Standardisation of sacral neuromodulation and pudendal nerve stimulation

Stefan De Wachter, MD, PhD, FEBU, Professor of Urology , University of Antwerpen, Belgium

Sacral neuromodulation (SNM) is a well-established treatment for refractory overactive bladder, non-obstructed urinary retention and faecal incontinence. First reports on SNM were published in the early 1980's. Since then implant procedures have evolved from an open to a percutaneous technique, and implant 'tools' have been modified accordingly. However there is a large variability in lead placement and clinical results, with intention to treat ratios around 50-60%, leaving a large group of failed patients. Although patient selection certainly can be accounted for some of the variability, differences in implant procedure are equally importance. During this part of the workshop, standardization of the technique will be shown both theoretically and with short videos, along with new technologies to help standardize the procedure. A similar setup will also be used to explain standardisation in pudendal nerve stimulation.

The best technological advances for clinical side of sacral neurostimulation: techniques and clinical outcomes

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Sacral Neuromodulation (SNM), introduced in clinical practice more than two decades ago, has passed the test of time with more than 300 patients implanted for the indications of refractory overactive bladder, non-obstructive urinary retention and faecal incontinence. This therapy has evolved from open implantation of the electrode and bigger devices to percutaneous implantation of the quadripolar tined lead electrode and smaller device, becoming an established minimally invasive therapy. Response rate for the different indications ranges from 77% to 88% while reoperation rate due to several reasons ranges in between 3% and 33%.

Limitations of SNM include among others, the need of surgical revision for either technical issues or battery replacement and the incompatibility with Magnetic Resonance Image (MRI).
Recent advances in technology have allowed the introduction of smaller and rechargeable devices and MRI compatible electrode which with no doubt will impact the future of clinical practice.

The need of full-body MRI compatibility is clear because at least half of patients with neurostimulators will have a clinical indication for MRI sometime over their life. In addition, 1 in 4 of SNM explants are usually due to the need of MRI. Furthermore, the absence of MRI compatibility has traditionally been a contraindication for the subgroup of neurological patients with multiple sclerosis are they would need MRI in the follow up. An MRI compatible device will allow to apply this therapy to this subgroup of patients.
The battery life of the current Interstim II is estimated in between 5 and 7 years. The introduction of a rechargeable device is expected to reduce the number of reoperations which at the same time might be more comfortable for the patient due to the smaller size and lower pain at the neurostimulator. However, there are several pitfalls associated with rechargeable devices. Patients need to be skill with the periodical recharging procedure and have appropriate cognitive function and manual dexterity. In addition obesity might be an issue as well because the risk of twiddle of the device occasioning dislodging of the leads from their intended location and programming difficulties.

Criteria for patient selection: recharge-free versus rechargeable devices

Recharge-free SNM preferred	Patient´s choice and the impact of external factors	Rechargeable SNM preferred
History of therapeutic non-compliance	Patient choice versus physician recommendation	Technology-savvy, compliant, and highly motivated patient
Reduced compliance expected in the next 10–15 years	Reimbursement and socioeconomic factors	Need for a high energy stimulation with expected battery life of 3 years or less
Patients with forgetfulness; lack of motivation	Helpline in case of technical questions?	Thin patient
Patients with physical difficulties (finding the right spot to recharge)	Easy access in case of lost recharger?	Patient with a history of pain
Lack of technical knowledge	Cost issues (insurance in case of lost recharger?)	Patient with significant infection risk for device replacements
Incompatibility with lifestyle		

Adapted from De Wachter S, Adv Ther (2020) 37:637–643 641

<u>Patient-specific CT reconstructed 3D printed guide application, surgical planning and novel technology in neurostimulation</u>

Emre HURİ, MD-PhD, Professor of Urology
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Sacral neuromodulation (SNM) is a therapy system used to improve bladder function, including in people with overactive bladder (OAB). It is safe and can improve quality of life. It helps improve symptoms through direct modulation of nerve activity; mostly effects afferent nerves, it involves electrically stimulating the sacral nerves that carry signals between the pelvic floor, spinal cord and the brain and is thought to normalise neural communication between the bladder and brain. Technical properties and fine surgical technique may cause long-term learning time, and also finding the good position of needle for S3 can be problematic during surgery. Therefore, preoperative surgical planning is crucial in complex cases, such as anatomical abnormalities, secondary cases or obese patients. An important issue in which three-dimensional medical technologies can be beneficial is the pre-surgical planning stage. The data obtained by the patient's imaging methods can be made three-dimensional in the virtual environment, and the neighborhoods of the tissues and organs and the anatomical location of the

structure to be intervened can be evaluated in detail before surgery, and a more realistic assessment opportunity can be obtained while planning in the preoperative period. Models obtained with 3D printer technology can be used by offering in vitro work environment for different studies besides preoperative planning, medical education and patient information. 3D printed guide can be produced with using 3D medical printer, it can help to find S3 without X-ray.

NOVEL TECHNICAL ASPECTS OF PERIPHERAL NERVE STIMULATION FOR OAB .

John Heesakkers, RadboudUMC, Nijmegen the Netherlands, Maastricht UMC, Maastricht, the Netherlands

OVERACTIVE BLADDER SYNDROME (OAB) IS A CHRONIC CONDITION WHICH HAS FOR PATIENTS A LARGE SOCIAL BURDEN. IT IS A PROBLEM WHICH AFFECTS THE QUALITY OF LIFE OF PATIENTS SIGNIFICANTLY AND COMES WITH LARGE FINANCIAL COSTS FOR PATIENTS AND OUR HEALTHCARE SYSTEM. This review will focus on the technical aspects, advantages, drawbacks and limitations of the latest available applications of posterior tibial nerve stimulation.
In this presentation a series of new devices are dealt with like StimGuard, ECoin, Bluewind Renova, Bioness Stimrouter, of tibial nerve stimulation by transcutaneous, percutaneous and minimal invasive of stimulation. All different treatment options have advantages and disadvantages based on type of surgery, energy transfer, impedance, treatment setting options, risk of migration and patient usability.