

WINGED SACRAL LAMINECTOMY FOR THE IMPLANT OF ELECTRODES CLOSE TO THE SHEATH OF THE NERVE ROOTS: TECHNICAL NOTE AND PRELIMINARY RESULTS.

Hypothesis / aims of study

In standard surgical or percutaneous electrode implant for Sacral Neuromodulation (SNM) quadripolar lead is separated from the sheath of the sacral nerve by piriformis muscle attachment, fat tissue and vessels. Site of stimulation (peripheral nerve) and lack of direct contact with nervous structure might be the reason for periodical parameters changes and changes in efficacy of chronic SNM. Electrode implant in tight contact with the sheath of the sacral root in the spinal canal at a pre-gangliar level is suggested to decrease the impedance of the stimulation in order to allow low voltage usage, decrease parameters changing and increase life-time of the battery. Furthermore, implant in tight contact with the sheath of the root might allow better clinical results.

Study design, materials and methods

After sacral exposure the S3 foramen is identified. Following a line from the S2 spinous process to the S3 foramen, a "winged sacral laminectomy" (WSL) is performed to uncover S3 root bilaterally (Images 1,2). A quadripolar linear electrode (3886 model) is introduced in the "bone tunnel" in tight contact with S3 sheath; stimulation is performed at each pole to ensure electrode positioning. The electrode is finally fastened through the interspinous ligament. From September 2005 to October 2006 we performed 8 implants in patients with poor result of chronic SNM (4 urinary retention, 2 overactive bladder, 1 pelvic and 1 chronic colorectal hyperalgesia in spinal cord injury). Poor results were either from first stage procedure at both sides and from permanent implant.

Results

No complications were observed and the procedure can be considered safe. Two electrode displacements have been experienced. Since stimulus activation, amplitude never exceeded 0.5 Volts out the spinal cord injured patients (1.5 Volts) that also required an higher number of parameters settings changes (4 and 5 respectively in a 8 months follow-up). In the remaining patients mean number of parameters changes was 2.1 in one year follow-up. In two out of the four retention cases complete voiding occurred; in one case patient passed from four to two catheterization a day. Functional and clinical results in overactive bladder patients were encouraging (first detrusor contraction voiding from less than 100 ml to 200 ml and bladder pressure from 50.2 to 15 cm H₂O). Pelvic pain patient significantly decreased the use of medical therapy and abdominal pain patient shifted from 7 to 2 in visual analogue scale for the evaluation of pain. The first implant was performed in a complete urinary retention in Fowler Syndrome who experienced 6 surgeries for SNM in the previous 8 years due to lack of maintenance of electrode contact with the nerve, with following recurrence of urinary retention. Soon after implant by SWL (one side S3), complete voiding occurred with no parameters changing in 13 months follow-up. Furthermore she referred a "normal" voiding, without hesitancy and with complete relaxation of pelvic floor. Urodynamic evaluation demonstrated voiding without any functional activity of striated sphincter.

Interpretation of results

Since patients implanted by WSL experienced poor results from previous treatment with SNM, direct contact of the electrode with the root might be the reason for better results.

Concluding message

SNM by WSL can be considered a safe procedure. Due to the invasiveness and the short term follow-up, at present it has to be proposed in selected patients with poor results of conventional SNM. The aim of reducing the parameters setting changes has been achieved, as well as reduction of stimulation amplitude. In the next future, neurophysiologic assessment at the level of the root nerve could explain the better clinical results.

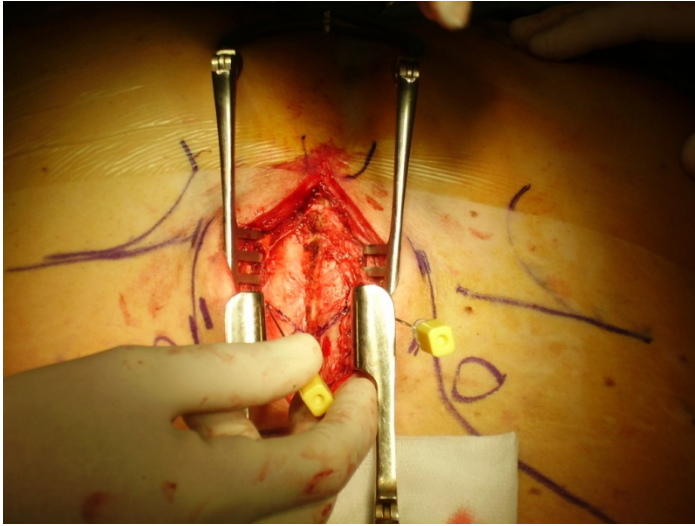


Image 1: A line is drawn from the S2 spinous process to the S3 foramen (needle inside the S3 foramen).

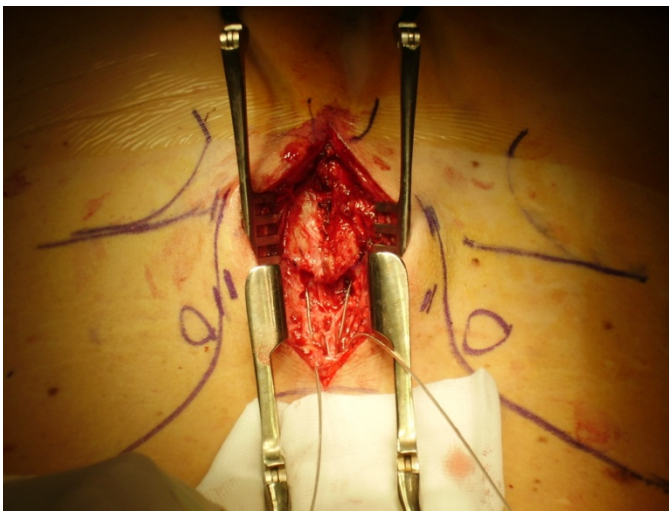


Image 2: A "winged sacral laminectomy" (WSL) is performed to uncover S3 root bilaterally. Electrode are inserted inside the bone tunnel, in contact with the roots.

FUNDING: No grants.

HUMAN SUBJECTS: This study did not need ethical approval because It is a commonly used surgical procedure. but followed the Declaration of Helsinki Informed consent was obtained from the patients.