CLINICAL CASE

Sacral neuromodulation (Medtronic InterStim® System) in the treatment of voiding dysfunction

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Abstract  Sacral neuromodulation (SNM) utilizes an implantable pulse generator and is a therapeutic option for patients with different types of voiding dysfunction that are refractory to conservative treatment.

A 47-year-old woman presented with urinary incontinence of 5-year progression that was refractory to conservative and pharmacologic treatment. Her diagnostic evaluation met the inclusion criteria for SNM treatment.

The surgery was performed with no complications. The device was placed definitively, resulting in a significant decrease in the Sandvik Severity Index and an improvement in the impact of urinary incontinence on quality of life measured by the Potenziani questionnaire.

SNM with the implantation of a pulse generator is a therapeutic option that can improve the clinical conditions of patients with refractory urinary incontinence.

PALABRAS CLAVE
Neuromodulation; Sacral nerve; Voiding dysfunction; Mexico

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Neuromodulación; Nervio sacro; Disfunción miccional; México.
Introduction

Sacral neuromodulation (SNM) utilizes an implantable pulse generator and is a therapeutic option for patients with different forms of voiding dysfunction that are refractory to conservative treatment.1,2 Neuromodulation is an alternative that is less invasive than the available surgical techniques, it does not alter the anatomic integrity of the lower urinary tract, and is easily reversible, given that its implantation does not cause neurologic injury. Chronic voiding dysfunction is defined as the alteration of the micturition reflex, whether in the detrusor and/or the sphincteral complex, that has no organic or neurologic cause and that also affects micturition habit. Qualitatively, and from a urodynamometric point of view, the concrete alteration of the micturition reflex groups such disparate syndromes together as urinary urgency-frequency, urge urinary incontinence, and chronic non-obstructive urinary retention. Quality of life in these patients can be so altered that it becomes incapacitating. The positive response rates described (defined as a more than 50% improvement of symptoms) range from 52%-83% in patients with urge urinary incontinence,3-4 and those presenting with the syndrome of urgency-frequency and urinary retention also benefit from the technique.5,6 As a result of prospective multicenter studies (Study MDT103), the U.S. Federal Drug Administration (FDA) has approved the use of posterior sacral root neuromodulation for the treatment of 3 clinical conditions: urgency-frequency syndrome, urgency-incontinence, and chronic non-obstructive retention that, in conjunction, are called chronic voiding dysfunction syndrome. SNM is a therapeutic alternative for urinary incontinence that has shown good clinical results.7,8

Case presentation

A 47-year old woman presented with urinary incontinence of 5-year progression that had an important impact on her quality of life. She had been treated with anticholinergics with partial results and significant secondary effects. Her diagnostic evaluation met the inclusion criteria for sacral neuromodulation treatment. Uroflowmetry: flow pressure with intermittence, Qmax 15mL/sec, emptying time 48 sec. Cystometry: Volume at the first micturition sensation 200 mL, detrusor pressure (Pdet) 1 cmH2O, abdominal pressure (Pabd) 21 cmH2O, and intravesical pressure (Pves) 22 cmH2O. Bladder ultrasound: bladder capacity 608 cc and residual urine 284 cc.

Sacral nerve stimulation consists of 3 stages described by Bosch and Groen.7 The first stage, or sacral nerve stimulation test, was carried out under general anesthesia and without the use of muscle relaxants. The patient was placed in the prone position with the perineal area and the distal part of both legs exposed.

Figure 1 Chronic phase: the impulse generator was implanted definitively.

Anatomic bony landmarks were used to locate the S2, S3, and S4 foramen. Once marked, the needle was placed at these sites through continuous fluoroscopic anteroposterior and lateral projections of the sacrum. Both sides were intermittently stimulated to prevent using up the muscle contraction capacity, looking for the best perianal and perineal contraction response in the S3 sacral foramen on the right side. The permanent electrode (Medtronic® Model 3080) was placed in the right S3, together with a percutaneous extension to the external impulse generator (Medtronic Interstim®). The impulse generator was activated 12 hours after the procedure with the following stimulation parameters: frequency, 10 pulses per minute; amplitude, 8 V (range: 1 to 10 V); and pulse width, 210 microseconds. During the test phase the patient kept a continence diary. The second treatment stage or subchronic phase lasted for 2 weeks, during which time the patient presented with a greater than 50% reduction in urgency and frequency episodes, as well as a reduced number of urinary accidents; thus the test was considered a success and the third stage or chronic phase was begun. This phase consisted of the definitive implantation of the pulse generator (fig. 1). The percutaneous extension was removed from the permanent electrode and connected to the impulse generator (Medtronic Interstim®), which was placed at the subcutaneous plane of the external upper quadrant in the right gluteus (fig. 2). The surgery was successful, there were no complications, and the stimulation parameters were not modified. The patient was released with prophylactic antibiotics. A plain abdominal film was taken to corroborate the adequate placement of the implant (fig. 3).

The continence diaries were completed for 2 more weeks after the definitive implant. During follow-up, we observed that the urinary habit diaries (table 1) improved even more,
following the definitive implant. The episodes of incontinence practically disappeared. No more symptoms of urinary urgency were registered and diurnal and nocturnal frequency diminished considerably. The patient was asked to complete the symptom severity and quality of life indices again in relation to urinary and fecal incontinence 60 days after definitive implant placement. The urinary diary evaluation was satisfactory. She presented with a significant reduction in the Sandvik’s Severity Index in relation to urinary incontinence, as well as in the Potenziani questionnaire score in relation to the impact of urinary incontinence on quality of life. The patient manifested notable improvement in her quality of life and presented with better scores in regard to lifestyle, behavior, and depression (Tables 2 and 3).

Discussion

SNM is beneficial in the treatment of patients with idiopathic chronic voiding dysfunction that does not respond to conservative treatment. Management of these patients is complex. The therapeutic alternatives for the patients with urinary retention are clean intermittent catheterization or permanent indwelling catheter, and in cases of urgency and frequency with or without incontinence, bladder amplification. SNM is an easy and well-tolerated technique with few complications.9 The sacral stimulation test is the only prognostic factor regarding treatment response. Patient selection depends on the clinical improvement demonstrated during this phase. The physiologic effect and the action mechanism of sacral neuromodulation in the treatment of incontinence have not yet been completely described, nor has only one clinical or physiologic factor been found for predicting therapeutic success.10-12 The best results at mid-term follow-up have been seen in both fecal and urinary urge incontinence, as well as in episodes of urinary urgency and frequency. Favorable results of sacral neuromodulation have been maintained for a mean period of up to 32.5 months (range: 3-99 months).13-14 There is increasingly more scientific evidence that the direct stimulation of the sacral nerve roots is not only capable of reducing the symptoms of urgency and frequency and urinary and fecal incontinence, but also of facilitating the recovery of patient quality of life.15

Table 1 Urinary habits before and after treatment

<table>
<thead>
<tr>
<th>Urinary diary</th>
<th>Before the implant</th>
<th>Stimulation test</th>
<th>Definitive implant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diurnal frequency</td>
<td>10</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Nocturnal frequency</td>
<td>3</td>
<td>1</td>
<td>0 a 1</td>
</tr>
<tr>
<td>Events with urgency</td>
<td>9 out of 10</td>
<td>1 out of 7</td>
<td>0</td>
</tr>
<tr>
<td>Micturition volume (mL)</td>
<td>250</td>
<td>310</td>
<td>390</td>
</tr>
<tr>
<td>Accidents per day</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Conclusions

SNM is useful in cases of idiopathic chronic voiding dysfunction that do not respond to pharmacologic treatment and/or re-education. SNM produces prolonged improvement in selected patients and the technique has a low morbidity rate. Chronic voiding dysfunction is a common complaint in urologic medical consultation that has a great impact on the quality of life of the patients. Therefore, the urologist should consider treatment with SNM as an efficacious alternative in voiding dysfunction.

Conflict of interest

The authors declare that there is no conflict of interest.

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References