INTRODUCTION: The indications for sacral nerve stimulation (SNS) for fecal incontinence expanded during the last decade. This report aims to analyse the clinical outcome of the current pragmatic use of sacral nerve stimulation in the treatment of fecal incontinence caused by various pathophysiological conditions. Secondly it intends to explore the most recent use of SNS in patients presenting with sphincteric lesions.

METHOD: The literature was searched using Medline and Cochrane databases. The search was limited to publications in English. For the analysis, studies with less than 25 patients were excluded. For the presentation of SNS in patients with sphincter defects, all papers were included.

RESULTS: Thirteen publications were included in the analysis of clinical outcome of SNS. Ten papers were identified reporting about the application of SNS in patients presenting with a morphological sphincter lesion. The most common outcome measures of clinical efficacy were frequency of incontinence and Cleveland Clinic Incontinence Score. All studies demonstrated a highly improved function, in all outcome measures used. The improvement was significant. The results are reproducible. Also in patients with sphincteric gaps ranging from 17 to 180 degree SNS was clinical efficient. The size of the lesion had not impact on the outcome.

CONCLUSION: Sacral spinal nerve stimulation has evolved to become a clinical efficient therapy applicable in a wide spectrum of causes leading to fecal incontinence. It is now considered to be an essential part of the current surgical treatment algorithm for fecal incontinence.

Key words: sacral nerve stimulation, fecal incontinence

INTRODUCTION

The initial use of sacral nerve stimulation (SNS) for the treatment of fecal incontinence was confined to patients suffering from incontinence due to a functional deficient anal sphincter complex, despite its morphological integrity. The idea was to recruit residual function of the anorectal continence organ by electrical stimulation of its peripheral nerve supply with a technique adapted from the field of Urology. A phase of temporary test stimulation was used to identify patients who may benefit from permanent stimulation with an implantable device. As the test stimulation phase revealed to be highly predictive of the outcome of the permanent therapeutic stimulation, it became used liberally in various pathophysiological conditions resulting in fecal incontinence.

This pragmatic trial and error approach led to a broad spectrum of indications of SNS for patients suffering from fecal incontinence owing to a wide variety of causes. Recently the use of SNS has even been described in patients with sphincteric lesions, which would have been amenable to sphincter repair.

This paper aims to report the clinical outcome of the current pragmatic use of SNS in the treatment of fecal incontinence. Secondly it intends to highlight the most current use of SNS in patients with fecal incontinence presenting with sphincteric lesions.

METHOD

The literature was searched using the keywords "fecal incontinence", "sacral nerve stimulation" "sacral neuro-modulation", "sphincter repair", "sphincter lesion". Medline and Cochrane databases were consulted. The search was limited to publications in English language. For the analysis, studies with less than 25 patients were excluded. For the presentation of SNS in patients with sphincter defects, all papers were included.
Thirteen publications were included in the analysis of clinical outcome of SNS for fecal incontinence. Ten papers were identified related to the use of SNS in patients presenting with a morphological sphincter lesion. In all papers, patients for permanent implantation of a neurostimulation device are selected in a uniform way by a therapeutic trial with a timely limited percutaneous test stimulation, usually for at least 2 weeks, during which bowel habits are monitored. The implantation of the permanent neurostimulation device was commonly advised if the frequency of episodes of faecal incontinence is reduced by at least 50% during the test stimulation.

The surgical technique is standardized: Percutaneous nerve evaluation (PNE), is used to confirm a satisfactory response to stimulation and then to evaluate the clinical effect of temporary stimulation prior to the permanent implant. Two technical options are used for PNE: the more common one in Coloproctology is the use of a temporary, percutaneously placed lead, which is used during the test stimulation and removed at the end of this phase; the second one is a quadripolar lead, the so-called "tined lead" electrode, which is operatively placed through a trochar with the help of fluoroscopy in a minimally invasive intervention. If the test stimulation is effective, this electrode stays in place and is used for permanent stimulation. For screening, both types of leads are connected to an external pulse, the latter with a percutaneous extension cable. If screening is successful a permanent electrode and pulse generator are implanted. In those with a tined lead electrode already in place for screening, the percutaneous extension is removed and only the pulse generator is added (the so-called "two-stage implant"). The pulse generator is placed subcutaneously, most commonly in the gluteal area. Early after surgery the pulse generator is activated and stimulation parameters set to low frequency stimulation by telemetry. Morbidity of the procedures is low and complications are rare.

With the help of test stimulation, the spectrum of indications of SNS for incontinence has been continuously expanded to patients suffering from fecal incontinence owing to a wide variety of causes resulting in a lack of function: e.g. success during a 3 week period of test stimulation: 77% in patients with idiopathic fecal incontinence, 76% in patients with sphincter rupture-/episiotomy, 78% in patients with/after anal repair, 73% in patients with neurologic injury. The therapeutic effects of chronic SNS have been demonstrated in multiple trials (Table 1)\(^4\)\(^-\)\(^15\). The results are reproducible. The outcome varies, however the improvement of function is significant in all studies. With chronic SNS the frequency of involuntary loss of bowel content is

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>No of pts</th>
<th>Follow-up (months)</th>
<th>Incontinence episodes per week</th>
<th>Incontinence - Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matzel et al</td>
<td>2004</td>
<td>34</td>
<td>24*</td>
<td>16.4</td>
<td>2.0</td>
</tr>
<tr>
<td>Jarret et al</td>
<td>2004</td>
<td>46</td>
<td>12*</td>
<td>7</td>
<td>1</td>
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<tr>
<td>Rasmussen et al</td>
<td>2004</td>
<td>34</td>
<td>6</td>
<td>nr</td>
<td>nr</td>
</tr>
<tr>
<td>Leroi et al</td>
<td>2005</td>
<td>34</td>
<td>7*</td>
<td>3.5*</td>
<td>0.5*</td>
</tr>
<tr>
<td>Hotzer et al</td>
<td>2007</td>
<td>29</td>
<td>35*</td>
<td>2.3</td>
<td>0.67</td>
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<tr>
<td>Hotzer et al</td>
<td>2007</td>
<td>37</td>
<td>13</td>
<td>nr</td>
<td>nr</td>
</tr>
<tr>
<td>Tan et al</td>
<td>2007</td>
<td>53</td>
<td>12</td>
<td>9.5</td>
<td>3.1</td>
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<tr>
<td>Melenhotrstr et al</td>
<td>2007</td>
<td>100</td>
<td>25.5</td>
<td>10.4</td>
<td>1.5</td>
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<tr>
<td>Vallet et al</td>
<td>2008</td>
<td>32</td>
<td>37</td>
<td>nr</td>
<td>nr</td>
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<tr>
<td>Altomare et al</td>
<td>2009</td>
<td>60</td>
<td>74</td>
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<tr>
<td>Wexner et al</td>
<td>2010</td>
<td>120</td>
<td>28</td>
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<td>1.4</td>
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<tr>
<td>Gallas et al</td>
<td>2010</td>
<td>200</td>
<td>12*</td>
<td>4*</td>
<td>nr</td>
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<tr>
<td>Michelsen et al</td>
<td>2010</td>
<td>126</td>
<td>24</td>
<td>8.3</td>
<td>0.6</td>
</tr>
</tbody>
</table>

CCIS: Cleveland Clinic Fecal Incontinence Score: 0=fully continence; 20=worst incontinence; *median, otherwise all data presented as mean, NR: not reported
reduced, and the Cleveland Clinic Score is improved (if used to monitor the outcome).

Reports on long term follow-up are still scattered. They all demonstrate a sustained clinical improvement. Since the first report on the efficacy of SNS in patients with an existing anal sphincter gap, there is an increasing body of evidence that SNS may also be an option for patients with an unrepaired sphincter lesion.

The papers differ with regards to the extent of the sphincteric gap of the patients included in the studies, however they all show a significant improvement of clinical function, measures either as frequency of incontinence episodes per observed time period or with the Cleveland Clinic Incontinence Score (Table 2). In all papers the improvement of outcome did not depend on the size of the sphincter gap.

### DISCUSSION

The indication for SNS in treating fecal incontinence evolved. Based on the high predictive value of a minimal invasive test stimulation it changed from a very selective application in a confined groups of patients with distinct physiological and morphological conditions to a concept of a liberal application of the test stimulation in various pathophysiological conditions leading to fecal incontinence. This resulted in a broader use and acceptance of SNS. The technique revealed to be clinical efficient and beneficial. The results are reproducible. Due to its efficacy and the reproducibility of the outcome, the technique became an essential part of the current surgical treatment algorithm for fecal incontinence.

### SUMMARY

**SAKRALNA NERVNA STIMULACIJA ZA FEKALNU INKONTINENCIJU. ŠTA JE POSTIGNUTO?**

Uvod: Indikacije za sakralnu nervnu stimulacijo (SNS) za fekalna inkontinencijo so se proširile v toku poslednje dekade. Ovaj prikaz ima za cilj da analizira kliničke rezultate pragmatično koriščene sakralne nervne stimulacije u tretmanu fekalne inkontinencije uzrokovanih različitim patofiziološkim stanjima. Drugi cilj je da se istraga najnovejši pristop koriščanja SNS kod pacijenata s lezijami sfinktera.
Surgical Management of Faecal Incontinence

Candidate for surgery for FI

EVALUATION
EAUS± Manometry, EMG, MRI, Defecography

Persistent
Surgical treatment for anatomical abnormality

COMPLETE SPINAL CORD IMPAIRMENT

RECTAL PROLAPSE, CLOACA, RECTOVAGINAL FISTULA

ACE
Colostomy

SPHINCTER DEFECT

None

< 180°
Sphincteroplasty

>180° or perineal tissue loss

SNS

* Individualized treatment:
  - Sphincteroplasty
  - Muscle transposition
  - Artificial sphincter
  - Sacral nerve stimulation
  - Biomaterial injection
  - ACE
  - Colostomy
  - Conservative therapy

* = inadequate symptom relief
FI: fecal incontinence;
ACE: antegrade continence enema;
EAUS: endoanal ultrasonography;
EMG: electromyography;
MRI: magnetic resonance imaging
SNS: sacral nerve stimulation

FIGURE 1
ICI RECOMMENDATION


Zaključak: Sakralna spinalna nervna stimulacija postala je klinički efikasan terapija koja se može koristiti kod širokog spektruma uzroka koji vode do fekalne inkontinencije. Sada se smatra za esencijalni deo trenutnog algoritma hirurškog tretmana inkontinencije.

Ključne reči: spinalna nervna stimulacija, fekalna inkontinencija

REFERENCES

