



Are Motor Responses during Tined Lead Procedures Predictive of Success for Sacral Neuromodulation?

Kleiterp V.J.¹, Engberts M.K.², Witte L.P.W. ¹, Nijholt I.M.

1. Department of Urology, Isala Zwolle, The Netherlands
2. Department of Gynaecology and Obstetrics, Isala Zwolle, The Netherlands

Hypothesis / aims of study

Little is known about predictive factors for sensory succes in tined lead procedure (TLP). During TLP, the lead is evaluated with foot and bellows responses on each electrode to confirm that they are close to the sacral nerve. Clinicians should strive to achieve motor responses on all four electrodes at stimulus amplitudes of <2 V.[1] Results of previous studies have been contradictory. Some shown that responses to all four electrodes are associated with lower amplitudes for eliciting motor responses.[2] This led to lower revisions but did correlate with more clinical success.[2] Other studies showed no associations between the number of electrodes eliciting motor responses during TLP and short-term outcomes.[2,3]

Hyothesis: A high number of electrodes eliciting motor responses during TLP correlates with optimal anatomical position and clinical success and a lower likelihood of revision during follow-up.

Aim: Correlate peri-operative motor responses during TLP with clinical succes of SNM.

Study design, materials and methods

This was a single-site retrospective cohort study, encompassing all patients who underwent unilateral staged TLP performed in Isala Clinics, Zwolle between September 4, 2017, and July 10, 2023. Indications for TLP were wet or dry OAB, NOUR, interstitial cystitis (IC) or FI. The inclusion criteria was documentation of motor responses for all four electrodes. Patients were excluded in case of neurological disorders, when no primary TLP was performed, or in case of missing data. TLPs were carried out in accordance with the International Continence Society's (ICS) best practice statement for the use of SNM.[1] TLPs were performed of either a urologist or urogynecologist. Motor responses were evaluated by individually stimulating each electrode with three different current intensities: 0.5 mA, 1.0mA, and 2.0 mA. Categorization of foot and bellows responses was as follows: no response (-), good response (+), or very good response. Successful TLP was defined as >50% reduction in symptoms.

Results and interpretation

Baseline characteristics
149 patients were eligible for the study. The records of 87 patients fulfilled the inclusion criteria. The cohort comprised 73 (84%) female patients with a mean age of 52.4 (± 1.7) years (Table 1). Overall, 40 (46%) patients had SNM indications for OAB.

Number of electrodes active during tined lead procedure
Scores of foot and bellows responses were analyzed for each electrode and cumulatively (Table 2).These variables were analyzed and compared between responders and non-responders for each outcome: clinical success or requirement of revision. There were no significant differences between the groups for each outcome. This applied for foot and bellows response separately as well as cumulatively.

Correlation between motor response and TLP success and revision rate
Logistic regression analyses were conducted to examine the association between the number of electrodes and TLP for each outcome. The results showed no significant association with odds ratio. This applied to foot and bellows responses and both outcomes; TLP succes and the chance of revision, for each electrode separately or cumulatively.

Table 1. Baseline characteristics of the total study population

	n (%)
Total patients	87
Age (mean ± SD)	52.4 ± 1.7
Gender	
Female	73 (84)
Male	14 (16)
Comorbidities	
Total n (%)	
Male n (%)	
Female n (%)	
PTSD	11 (13)
Psychiatric disorder	16 (18)
Diabetes Mellitus	8 (9)
Diabetes Mellitus	1 (13)
7 (88)	
TLP Characteristics	n (%)
Target nerve (S3/S4)	79 (91) / 8 (9)
Successful TLP	63 (72)
OAB (n = 40)	30 (75)
NOUR (n = 34)	21 (62)
FI (n = 4)	4 (100)
IC (n = 3)	2 (66)
Other (n = 6)	6 (100)
Days test phase (mean ± SD)	23.1 ± 1.2
No. months follow-up median (IQR)	49 (27-58)
No. revision	27 (31)
Decreased effect (non-technical)	12 (14)
Lead failure (technical)	6 (7)
Pain	
Lead pain (during stimulation)	7 (8)
IPG pain (during stimulation)	3 (3)
Bleeding	1 (1)
Infection	1 (1)
No. months till revision median (IQR: Q1-Q3)	16 (5-27)

Abbreviations: FI, fecal incontinence; IC, interstitial cystitis; IPG, implanted pulse generator; NOUR, nonobstructive urinary retention; OAB, overactive bladder; PTSD, post-traumatic stress disorder; S3, sacral nerve three; S4, sacral never four; TLP, tined lead procedure

Table 2. Number of electrodes score differences between responders and non-responders

TLP success and response score: Chi-square test. total n = 87 successful TLP n = 63 failed TLP n = 24										
Cumulative presence response and TLP success ^a	0/4 n(%)	1/4 n(%)	2/4 n(%)	3/4 n(%)	4/4 n(%)	P-value ^b				
Foot +	26 (29)	4 (5)	4 (5)	6 (7)	23 (26)	0.80				
Foot -	13 (15)	2 (2)	1 (1)	2 (2)	6 (7)					
Bellows +	0 (0)	3 (3)	2 (2)	10 (12)	48 (55)	0.21				
Bellows -	1 (1)	0 (0)	1 (1)	7 (8)	15 (17)					
	0/8 n(%)	1/8 n(%)	2/8 n(%)	3/8 n(%)	4/8 n(%)	5/8 n(%)	6/8 n(%)	7/8 n (%)	8/8n(%)	P-value ^b
Foot and Bellows +	1 (1)	0 (0)	1 (1)	3 (3)	9 (10)	1 (1)	3 (3)	1(1)	5 (7)	0.77
Foot and Bellows -	0 (0)	1 (1)	2 (2)	6 (7)	20 (23)	4 (5)	8 (9)	1(1)	21 (24)	
Revision and response score: Chi-square test. Total n = 87 No revision needed n = 60 Revision n = 27										
Cumulative presence response and Revision ^a	0/4 n(%)	1/4 n(%)	2/4 n(%)	3/4 n(%)	4/4 n(%)	P-value ^b				
Foot +	13 (15)	2 (2)	2 (2)	2 (2)	8 (9)	0.99				
Foot -	26 (30)	4 (5)	3 (3)	6 (7)	21 (24)					
Bellows +	0 (0)	1 (1)	2 (2)	4 (5)	20 (23)	0.93				
Bellows -	1 (1)	2 (2)	1 (1)	13(15)	43 (49)					
	0/8 n(%)	1/8 n(%)	2/8 n(%)	3/8 n(%)	4/8 n(%)	5/8 n(%)	6/8 n(%)	7/8 n (%)	8/8n(%)	P-value ^b
Foot and Bellows +	0 (0)	1 (1)	2 (2)	3 (3)	8 (9)	2 (2)	3 (3)	1 (1)	7 (8)	0.71
Foot and Bellows -	1 (1)	0 (0)	1 (1)	6 (7)	21 (24)	3 (3)	8 (9)	1 (1)	19 (22)	

Abbreviations: Foot +; foot response and TLP success *or* revision, Foot -; foot response and failed TLP *or* no revision, Bellows +; bellows response and TLP success *or* revision, Bellows -, Bellows response failed TLP *or* no revision
^a; cumulative response score is the presence or absence on any electrode cumulative, independent on which electrode the motor response was elicited.
^b; based on Chi-square test for categorical binary outcomes.

Conclusions

Our study revealed that the number of electrodes eliciting motor responses during TLP did not influence clinical success or revision rates. During test stimulation, only a single well-positioned electrode is necessary to achieve clinical success. However, it is important to consider all electrodes to optimize the program options and strive for durable SNM therapy.

References

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