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PREDICTIVE FACTORS FOR SACRAL NEUROMODULATION OUTCOME IN NON-OBSTRUCTIVE URINARY RETENTION.

Hypothesis / aims of study:
Non-obstructive urinary retention presents as urologically challenging condition, those patients usually depend on clean intermittent catheterization (CIC) or indwelling catheters to empty their bladders. This approach of treatment increases risk of recurrent urinary infections, trauma, and may affect the quality of life of those patients. Sacral Neuromodulation (SNM) has been shown to restore voiding functions in patients suffering from idiopathic urinary retention; InterStim® therapy was approved by FDA in 1999 as treatment modality for non-obstructive urinary retention. SNM is conducted in two steps; First step is called percutaneous nerve evaluation (PNE), then implantation of implantable pulse generator (IPG), second step, which is only reserved for patients who show 50% or more improvement in their voiding dysfunction parameters.

The success of SNM in treating non-obstructive urinary retention has been reported in the range of 30-60%; this range has improved significantly with the use of the staged approach to up to 79%. [1]. There still paucity of studies evaluating predictors that may affect the outcome of SNM in non-obstructive urine retention, Recently, Goh et al, reported that patients' ability to void predicts success of SNM in 29 patients diagnosed to have non-obstructive urine retention.[2]

The aim of this study is to evaluate several predicting factors that may contribute to the outcome of SNM in treatment of non-obstructive urinary retention in larger cohort of patients.

Study design, materials and methods:
A retrospective chart review was conducted in patients who were diagnosed to have incomplete or complete non obstructive urine retention and underwent PNE from 2002 to 2009. All patients with complete urine retention or high post void residual in the absence of infra-vesical obstruction were included in this review. Patients who had urine retention secondary to urethral surgery, post sling or any prostate surgery were excluded from the study. PNE was done bilaterally and success was defined as 50% or more reduction in their post-void residual (PVR) or number of CIC. Prior to PNE, patients had urodynamic study conducted and its traces were retrieved and included in our analysis. Pre and post PNE voiding diary was also used to evaluate the outcome. Logistic regression analysis was done using SPSS/PASW to evaluate the predictors that affect the outcome of SNM in those patients. Predictive factors that were included in the analysis were age, sex, duration of urine retention, severity of urine retention (complete or incomplete), causes (neurological diseases, post spinal cord surgery, post hysterectomy or pelvic surgery and idiopathic), presence or absence of urgency sensation (as per history and voiding diary), first urge sensation in urodynamic studies, presence or absence of detrusor muscle contractility, and association with constipation.

Results:
124 patients were diagnosed with non-obstructive urine retention and referred to us for SNM therapy. 97 patients were females (78%), 27 patients were males (22%). 46 patients (37%) had successful PNE and proceeded to permanent implantation, while 78 patients (63%) failed PNE and continued on CIC. In success group, 40 patients were females (87%) while 6 were males (13%). In the group of patients who failed the treatment, 57 patients were females (73%), and 21 patients were males (27%). 88 patients had complete urine retention and were fully dependant on CIC; of whom, 25 patients (28%) passed PNE testing, while 63 patients (72%) failed. On the other hand, 36 patients were diagnosed with incomplete urine retention had post void residual more than 1/3 of the bladder capacity and average PVR (272.5±62.3 ml); of whom, 15 patients (42%) failed PNE, while 21 patients (58%) had favorable improvement in their bladder emptying and considered candidates for permanent implantation.

The average follow-up was 5.04±1.7 yrs, 5 patients were explanted, 3 due to loss of efficacy, 1 patient due to pain and 1 patient as MRI precautions. 9 patients had revision for changing IPGs, 2 had re location for their IPG to upper gluteal regions. There is correlation between detrusor contractility and loss of efficacy (r=-0.21, p=0.02).

Table (1) Causes of non-obstructive urine retention.

Out-come of PNE	idiopathic	Neurological disease	Post spinal cord surgery	Post hysterectomy or pelvic surgery
success	23	6	7	10
failure	40	6	14	18
Total	63	12	21	28

Table (2) predicting factors differences between two out-comes:

Out-come PNE	*n*	Age (yr)	Duration of symptoms (yr)	Urgency (voiding Diary)		constipation		Detrusor contractility		1st urge sensation UDS (ml)
				yes	no	yes	no	yes	no	
Success	46	44.8±13.9	3.91±3.6	29	17	12	34	35	11	164.5±44
Failure	78	52.7±11.6	5.76±3.8	29	49	22	56	41	37	273±101.4
P value		0.001	0.009	0.005		0.8		0.009		0.0001

Correlation analysis revealed that patient's gender, cause of urine retention or association with constipation could not predict the out-come of PNE, however it showed a negative correlation between high volumes at first urge sensation during urodynamic study and PNE outcome (r = -.038, *p*=0.0001); also, a negative correlation between duration of urinary retention and the success of PNE (r = -0.23, *p*=0.009). In addition, advanced age of patients correlated with the failure of PNE (r=-0.3, *p*=0.001),

and there was favourable association between the presence of detrusor contractility during urodynamic and the sensation of urge to void with the success of PNE (r =0.23, p=0.009 and r =0.25, p=0.005) respectively.

Logistic regression results, table (3):

predictor	Log. Regression coefficient	S.E	Sig.	Odd Ratio (OR)	95% CI for OR	
					Lower	Upper
Detusor contractility	1.84	0.53	0.0001	6.3	2.24	17.7
Duration of complaint	-0.29	0.104	0.005	0.75	0.61	0.92
Incomplete urine retention	1.36	0.57	0.017	3.9	1.27	11.83
Age	-0.042	1.49	0.04	0.96	0.92	0.99

Interpretation of results:

Our data support previous studies that demonstrated that detrusor contractility is an important factor to overcome sphincter over activity in idiopathic urine retention [3].Presence of detrusor contractility is very important to maintain long term success of SNM. Patients who suffer from urine retention for long duration are susceptible to detrusor overstretch and this leads to muscle weakness and decreasing the chance to respond to SNM. In contrary patients who are able to void spontaneously with high post void residual are 4 times more likely to succeed PNE and SNM. This again can be explained by partially preserved detrusor muscle strength. Impaired detrusor contractility with advanced age is well known phenomenon and it was not surprising to see the adverse effect of age on the outcome of SNM.

Concluding message:

Weak detrusor muscles, long duration of urine retention accompanied by advanced age are risk factors for sacral neuromodulation failure in patients with non-obstructive urine retention.

References

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Specify source of funding or grant	**non**
Is this a clinical trial?	**No**
What were the subjects in the study?	**HUMAN**
Was this study approved by an ethics committee?	**Yes**
Specify Name of Ethics Committee	**University Health Network Ethica Board**
Was the Declaration of Helsinki followed?	**Yes**
Was informed consent obtained from the patients?	**No**