Neuromodulatie
Eenzelfde behandeling voor zowel darm- en blaasdisfunctie

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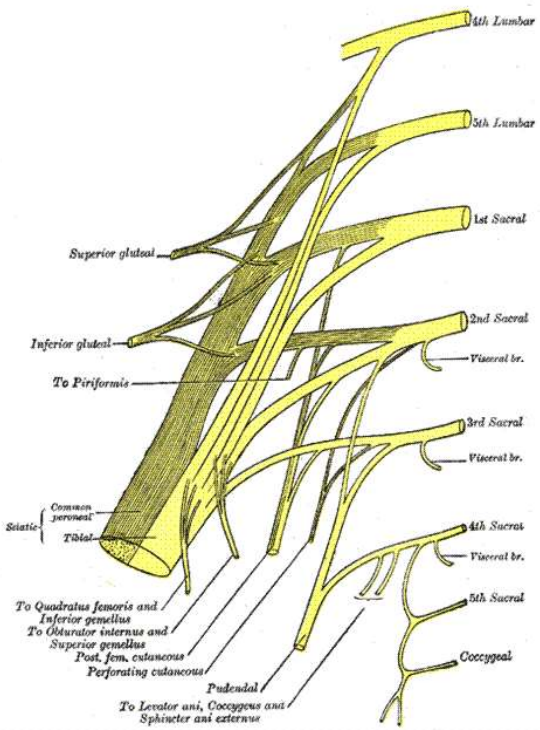
Neuromodulation



… is any "action" that changes/modulates pre-existing neural activity

to influence the physiological behavior of an organ

≠ nerve stimulation ∞ direct effect of stimulation

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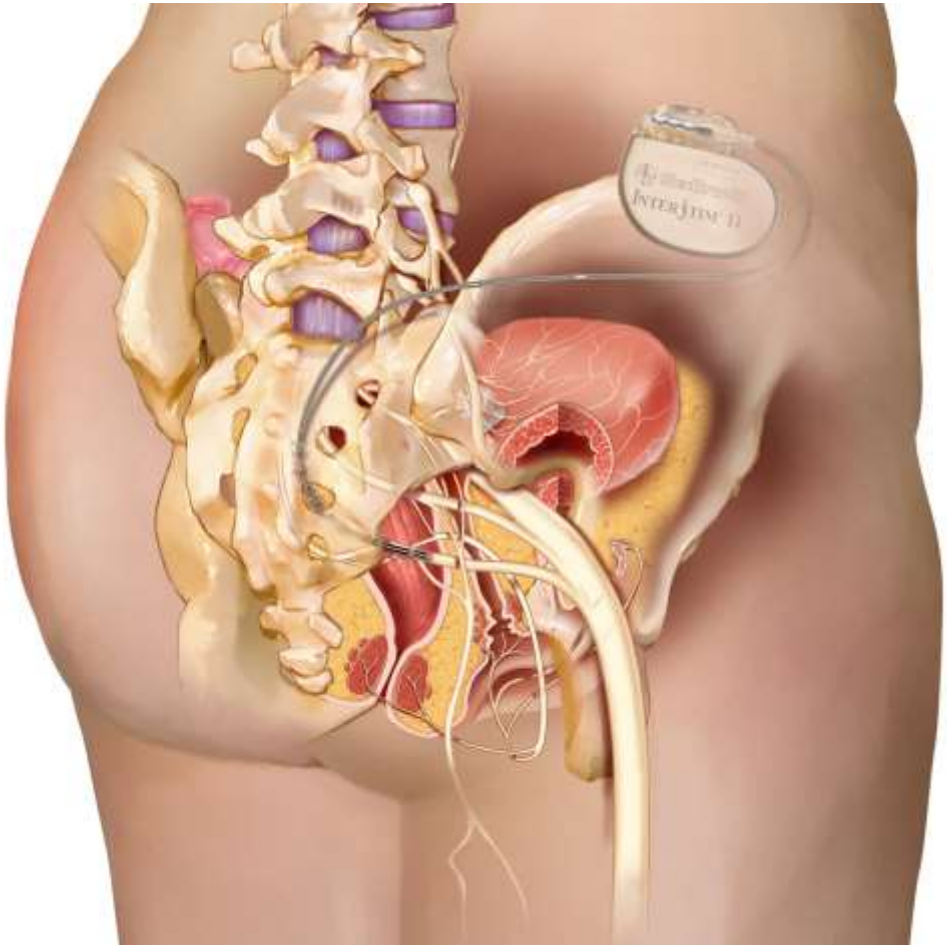
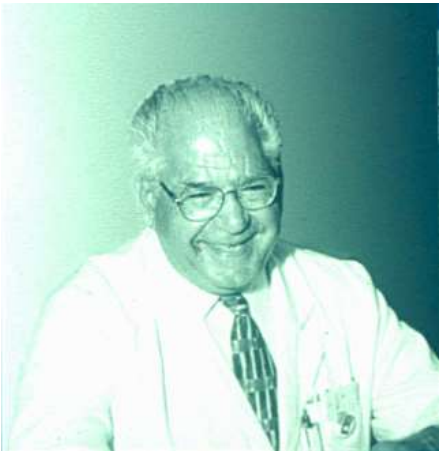
Sacral Neuromodulation



Electrical stimulation

- ***1864*** Budge showed detrusor contraction when stimulating sacral spinal cord
- ***1954*** Boyd first direct bladder stimulator in human
- **1972** Hopkinson sphincter stimulation with intra-anal electrodes
- ***1982*** Tanagho and Schmidt - California first SNS implant in urological patient
- ***2014*** > 150000 patients implanted



“holistische” aanpak?

Sacral neuromodulation
One therapy works for…

- Overactive bladder symptoms
- Urgency incontinence
- Urinary retention

Bladder

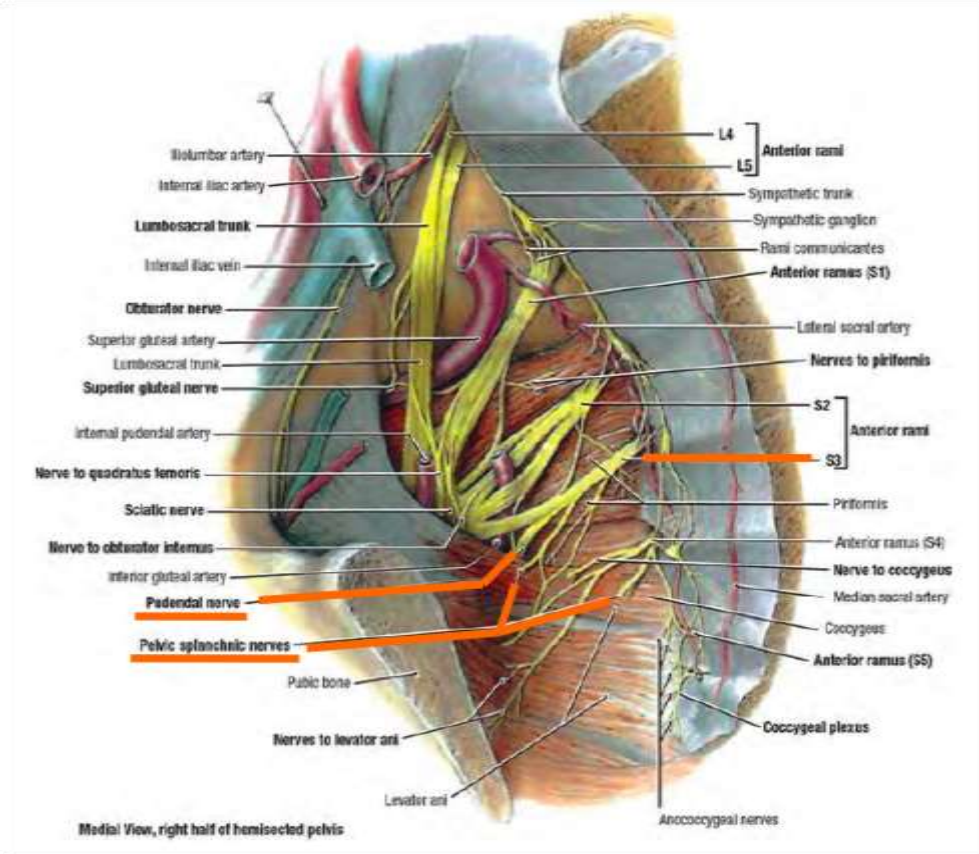
- Faecal incontinence
- Constipation

Bowel

- Pelvic pain
- Sexual dysfunction

Pelvic floor

S3 Stimulation



- Sensory nerves S2, S3
  - Cutaneous branches buttock, thigh
- Pudendal S2, S3, S4
  - Sensory to genitalia
    Muscular branches perineal muscles, external urethral and anal sphincter
- Pelvic splanchnic S2, S3, S4
  - Pelvic viscera via hypogastric and pelvic plexus
- Motor nerves S3, S4
  - Levator ani and coccygeus muscle

From Grants Atlas of Anatomy

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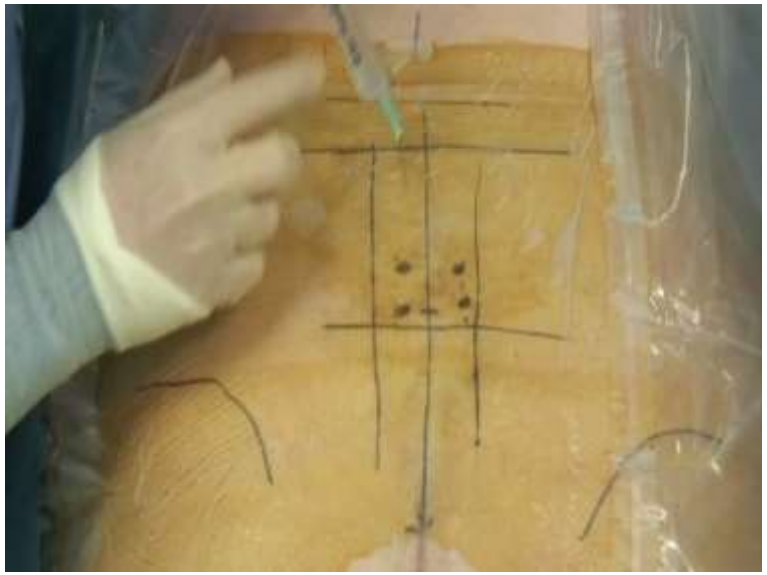
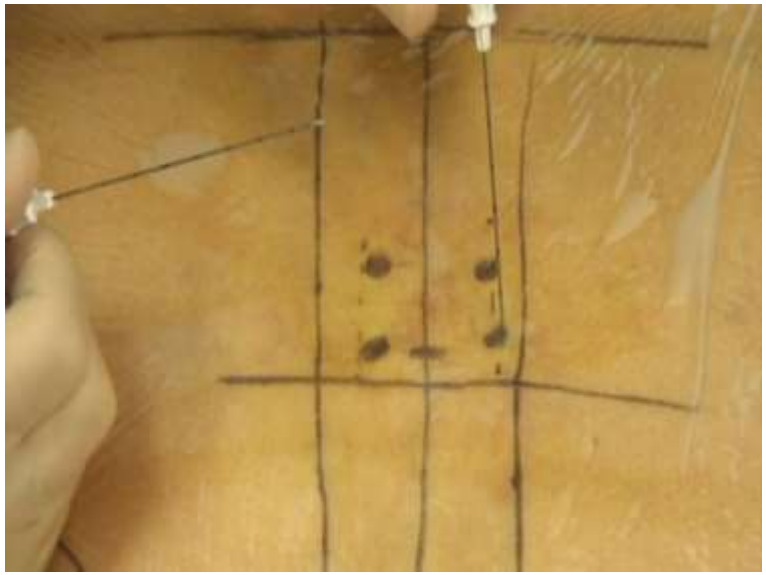
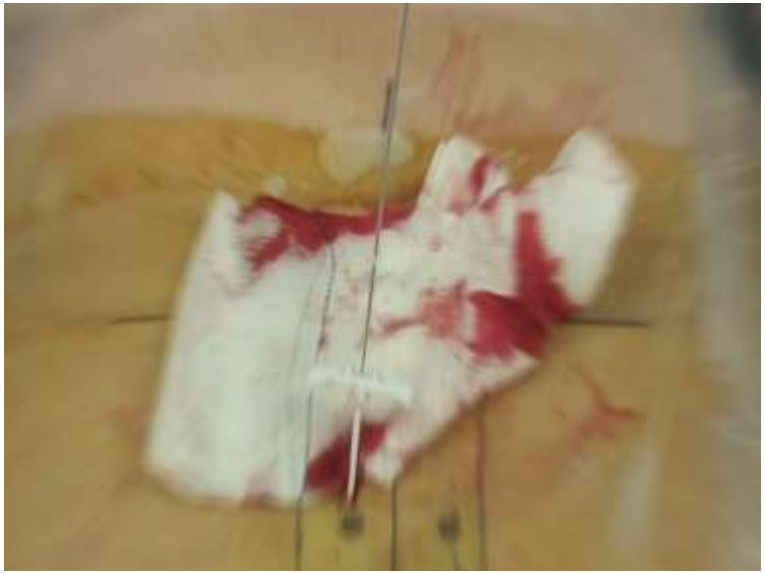
Procedure







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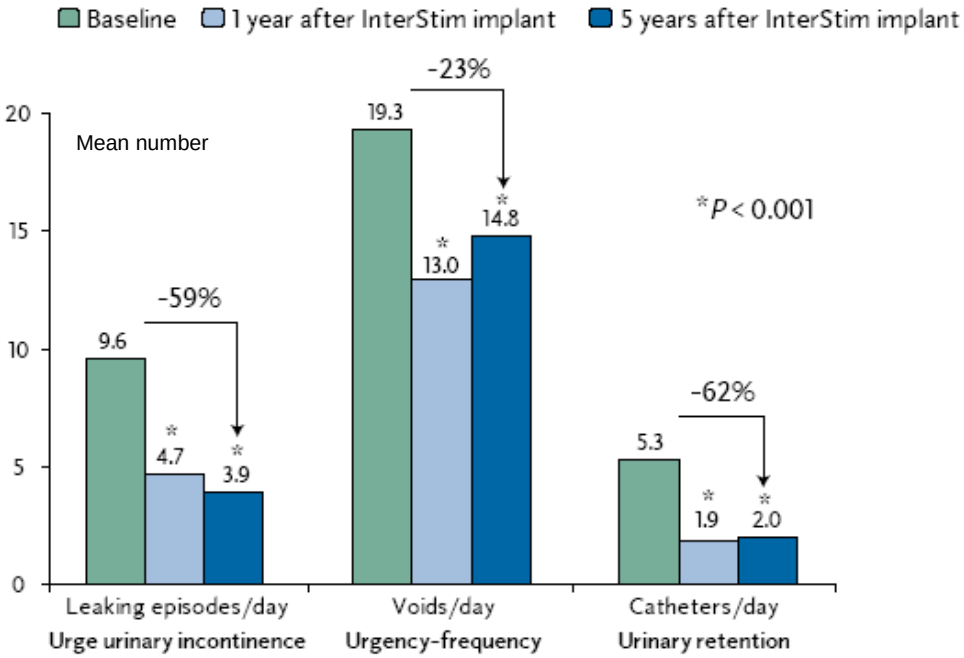
Long term results “Bladder”

- Prospective ww, multicenter - 5 year FU
- 152 pt’s:
  - 96 UUI (63.2%)
  - 25 (16.4%) urgency-frequency and
  - 31 (20.4%) urinary retention
- 105 pt’s had 5 year data

- There was a high correlation between 1- and 5-year success rates:
  - 84% of patients with UUI,
  - 71% with UF and
  - 78% with UR

- who were successfully treated at 1 year continued to have a successful outcome after 5 years

- AE resulting in surgical intervention occurred respectively in 19.9% and 39.5% of patients at 1-year and 5-year follow-up



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van Kerrebroeck et al. J Urol 2007;178:2029-34

Long term results “Bladder”

- **64 patients; FU 53 months**
- **5 patients not-related death ➔ 59 patients**

- **Objective success (>50% improvement voiding diary): 64% (38/59)**
- **Subjective success: 83% (49/59)**

- 23 reinterventions: 7 explants; 7 reposition IPG pain; 5 lead revision; 4 battery replacement (53 months) ➔ **0.075 / patient / year**
  1 re-intervention / 13 patients / year

- Reprogramming 2.8x/patient (0.7/year): painful stimulation – efficacy

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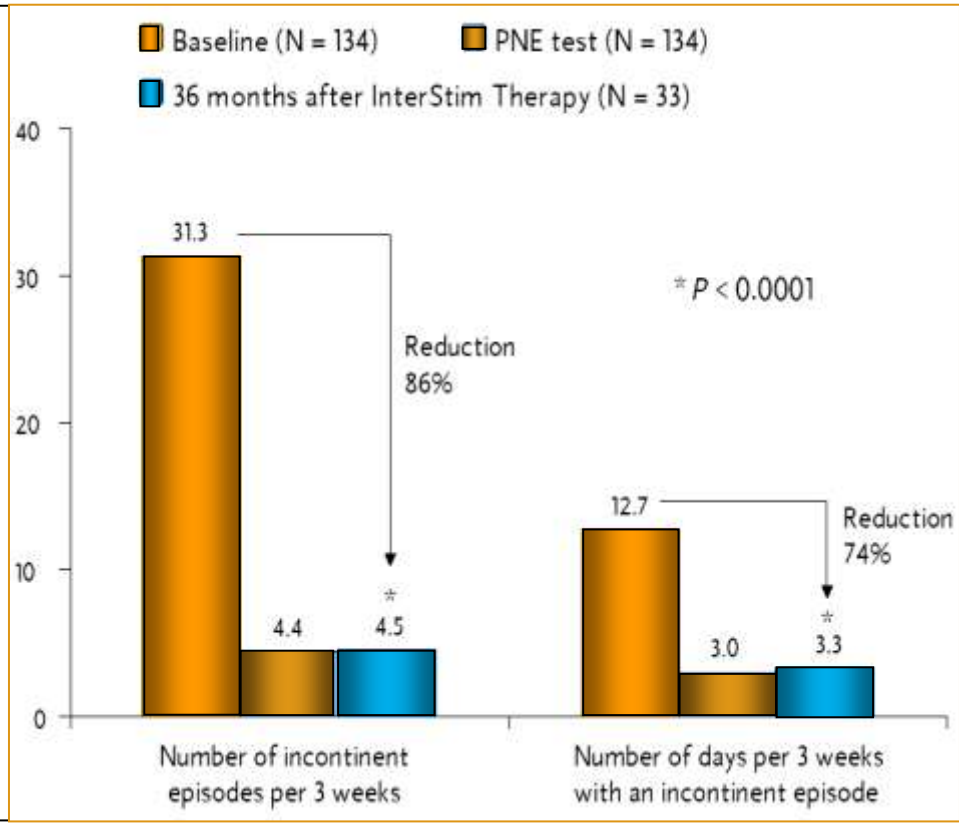
Marcelissen, Leong, De Bie, Van Kerrebroeck, De Wachter, J Urol 2010

Mid / Long term results “Bowel”

	N	F/U (years)	Success Rate
Matzel 2008	12	9.8	75%
Altomare 2009	60	6.2	66%
Maeda 2010	163	≈ 3	63%
Mellgren 2011	83	3	79%
Hollingshead 2011	18	5	83%
Uludag 2011	50	7.1	80%
			74%

Long term results “Bowel”

- ***134 pts (117 F, 17 M) with FI***
- ***3-week PNE test***
  - *–75% (100/134) success*
    - » *77% of patients with idiopathic FI*
    - » *76% of patients with rupture or episiotomy*
    - » *78% of patients with anal repair*
    - » *73% of patients with neurologic injury*
- ***100 Implants (89 F, 11 M), mean 55 yr***
  - *–79% success*
- ***25.5 ([2.5 – 63.2]) months mean FU***



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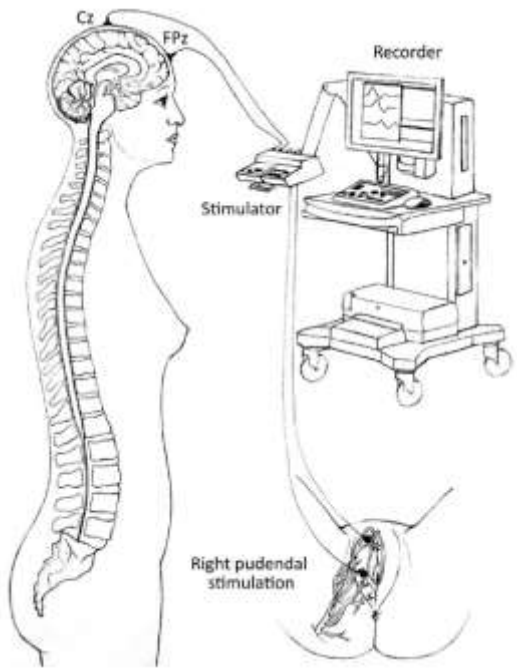
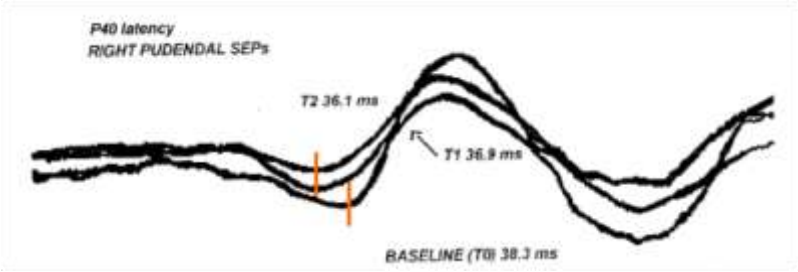
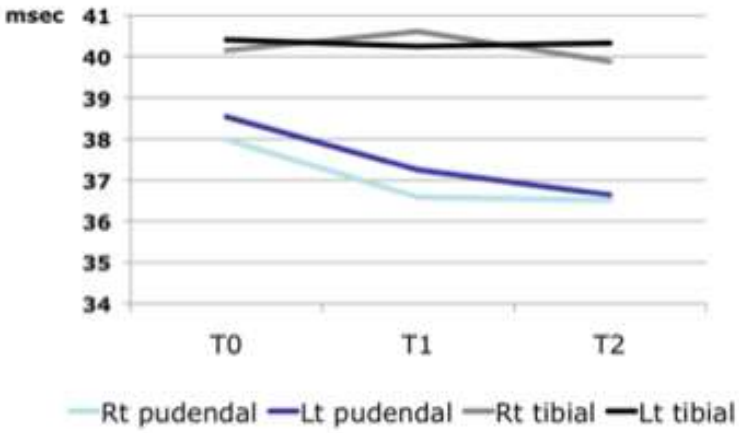
Chronic S3 stimulation…







Modulates Central afferent transmission

Malaguti et al. J Urol 170:2323-2326,2003

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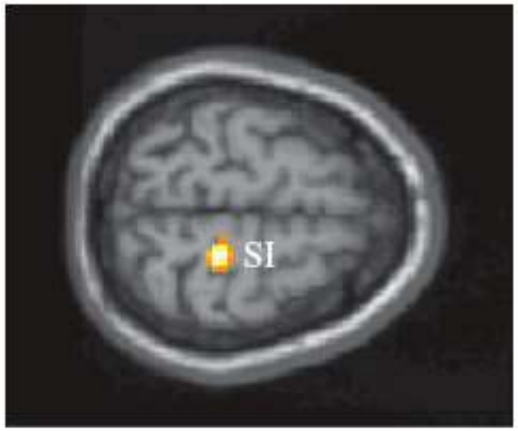
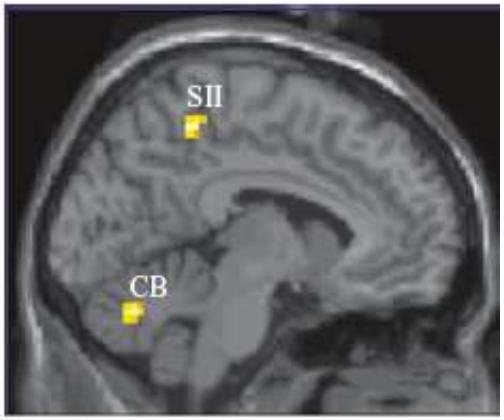
Brain imaging: Acute vs Chronic SNM

Acute



Chronic



Sensorimotor learning

↓

Alertness – attention
Initiation voiding
Sense of filling

N = 12
Urgency incontinence
Detrusor overactivity

Blok et al. BJU Int 98:1238-1243,2006

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“Holistic view”

Bladder / Urethra		***Colo-rectum / Anus***
	Autonomic	
Stimulation IUS Relaxation detrusor	OrthoSympathetic Hypogastric nerve D11 – L2	Stimulation IAS Inhibits colonic motility
Detrusor activation	Parasympathetic Pelvic nerve S2 – S4	Increase colonic motility
Increase EUS	Somatic Pudendal nerve S2 – S4	Increase EAS

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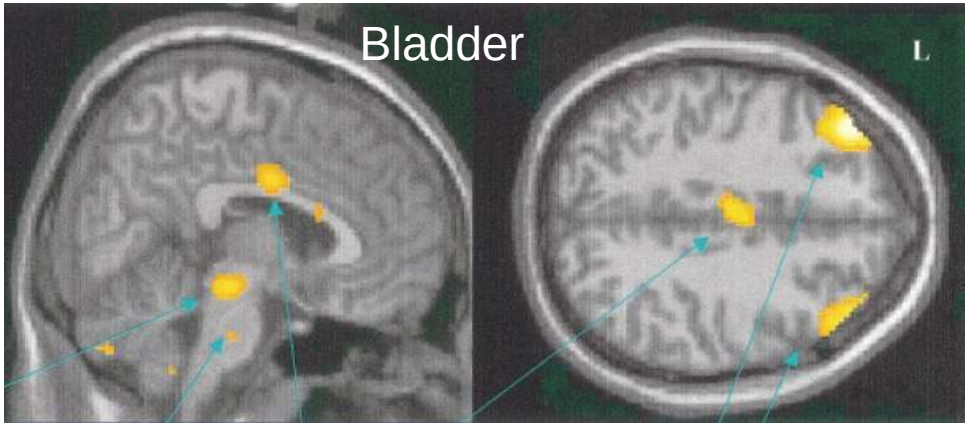
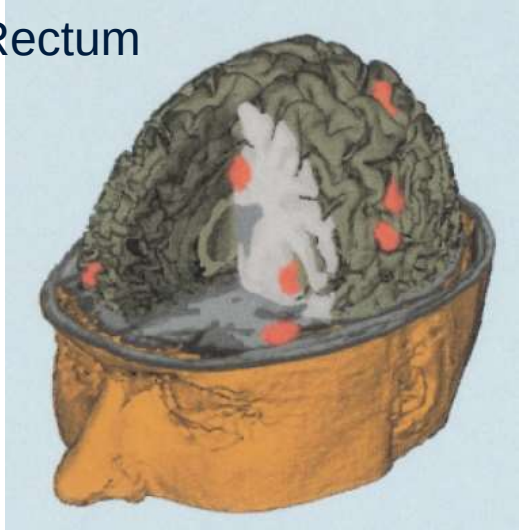
Combined bladder/bowel mechanisms



Rectum



- Human studies
  - Imaging techniques
  - Same cortical areas activated
    - Bladder distension
    - Rectal distension
  - Areas pons – Barrington
  - Locus coeruleus
  - Frontal lobe
  - Anterior Cingulate Gyrus

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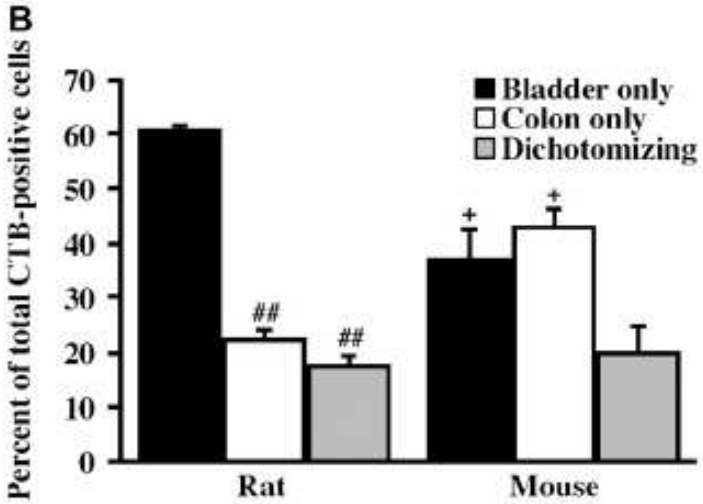
Athwal et al. Brain 124:369-377,2001
Blok et al. Brain 120:111-121,1997; Hobday et al. Brain 124:361-368, 2001; Nour et al. Brain 123:781-789,2000

Combined bladder/bowel mechanisms

- Animal studies
  - Convergence of Primary afferents
  - Lumbosacral/Thoracolumbar



Christianson et al. Pain 128:235-243,2007

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“Works for the bladder”

“Works for the bowel”

“Holistic approach?”

“Bladder and Bowel together”
“Pelvic Floor Disorders”

UK 2001

Costs treatment urinary and faecal incontinence

500 000 000 £

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Caremel et al. Urology 79: 80-85, 2012
Netten et al Personal Social Services Research Unit 2001

Sacral neuromodulation
"Pelvic Floor Disorders"

- Urinary incontinence adults
  - prevalence 14 – 41%
  - Anal incontinence prevalence 20 – 30% (flatus) / 8% (solid)

- Anal incontinence adults
  - prevalence 8%
  - Urinary incontinence 40%

UK 2001
Costs treatment urinary and faecal incontinence
500 000 000 £

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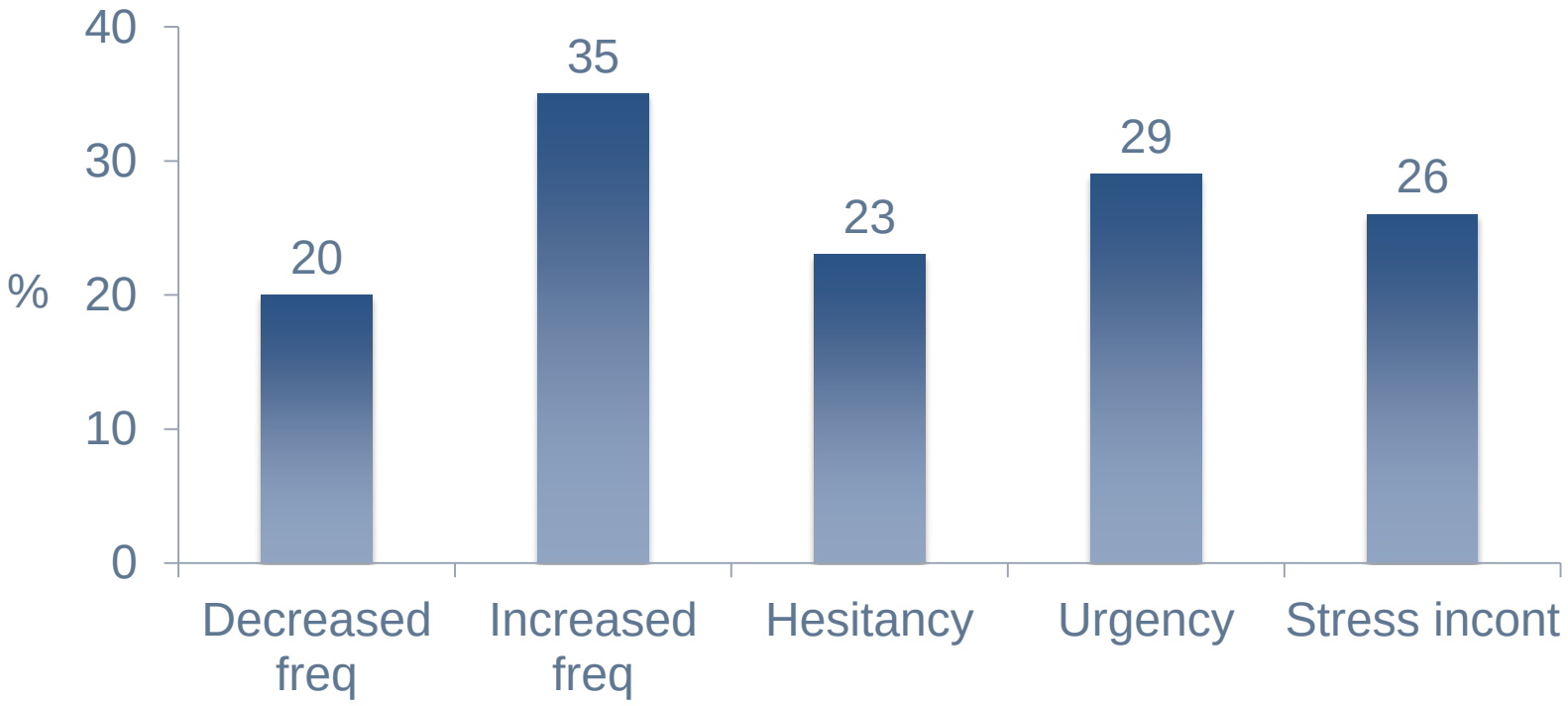
Caremel et al. Urology 79: 80-85, 2012
Netten et al Personal Social Services Research Unit 2001

Sacral neuromodulation
"Pelvic Floor Disorders"

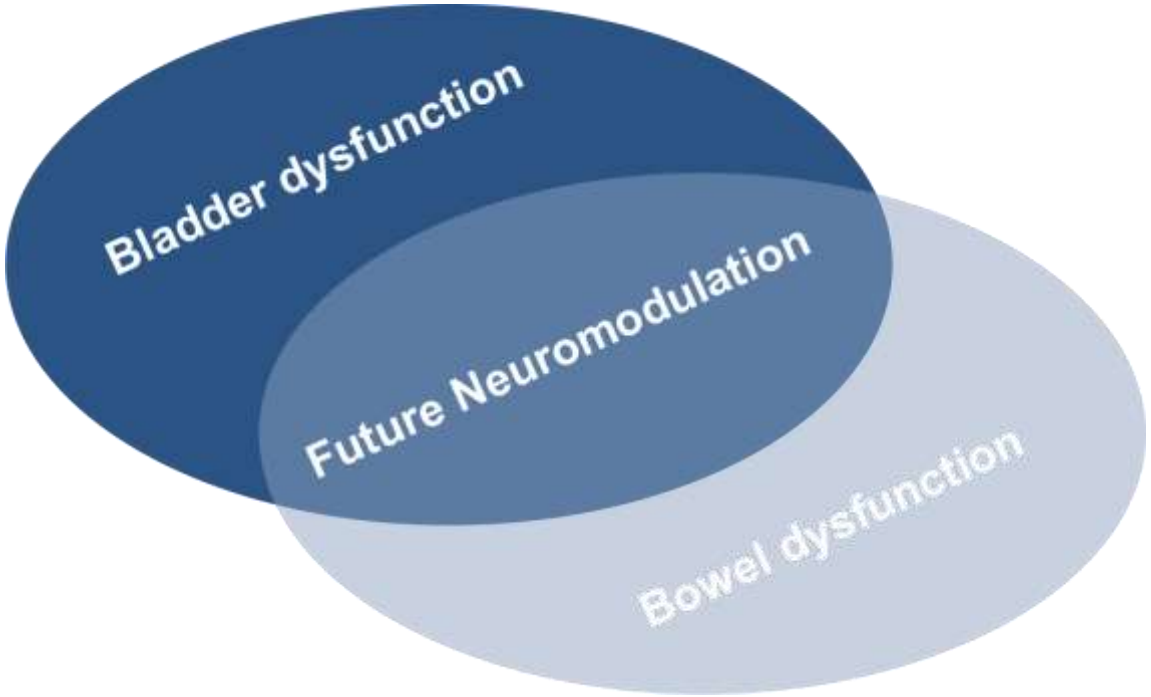
- Constipation



Bannister Int J Colorect Dis, 1986

Sacral neuromodulation
"Pelvic Floor Disorders"

- ***Caremel et al 2012***
  - Retrospective study – looked at double incontinence
  - Inclusion organ specific



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Caremel et al. Urology 79: 80-85, 2012

Double incontinence (DI)

- Questionnaire to 51 patients with DI
- 37 reponsders – 57 years – 30 months postimplant

- Main indication
  - Overactive bladder ∞ 80% reponse
  - Faecal incontinence ∞ 86% reponse

- 49% improvement in both urinary and faecal incontinence

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Caremel et al. Urology 79: 80-85, 2012

“The role of SNM in double incontinence”

Table 1 Results of studies regarding the efficacy of sacral nerve modulation (SNM) in patients suffering from double incontinence.

Study [reference no.]	No. patients	Main indication	Improvement > 50%	Follow up (months)
Leroi *et al.* [18]	6 (5 with DI)	FI	100% for FI 50% for urge UI 0% for stress UI	3
Ganio *et al.* [19]	16 (8 with DI)	FI	100% for FI 100% for urge UI 100% for stress UI	15
Uludag *et al.* [20]	50 (18 with DI)	FI	96% for FI 50% for UI	12
Altomare *et al.* [21]	16 (4 with DI)	FI	1/2 for urge UI 2/2 for stress UI	14
El-Gazzaz *et al.* [22]	24 DI	FI and UI	31.8% for DI 13.6% for FI only 18.2% for UI only	29.5
Haddad *et al.* [23]	33 children (19 with DI)	Neurogenic UI and/or FI with congenital malformation	81% for UI and 78% for FI	15

FI, faecal incontinence; UI, urinary incontinence.

- **Few studies with limited number of patients**
- **30-100% improve in urinary and faecal symptoms**
- **Need for prospective trials**

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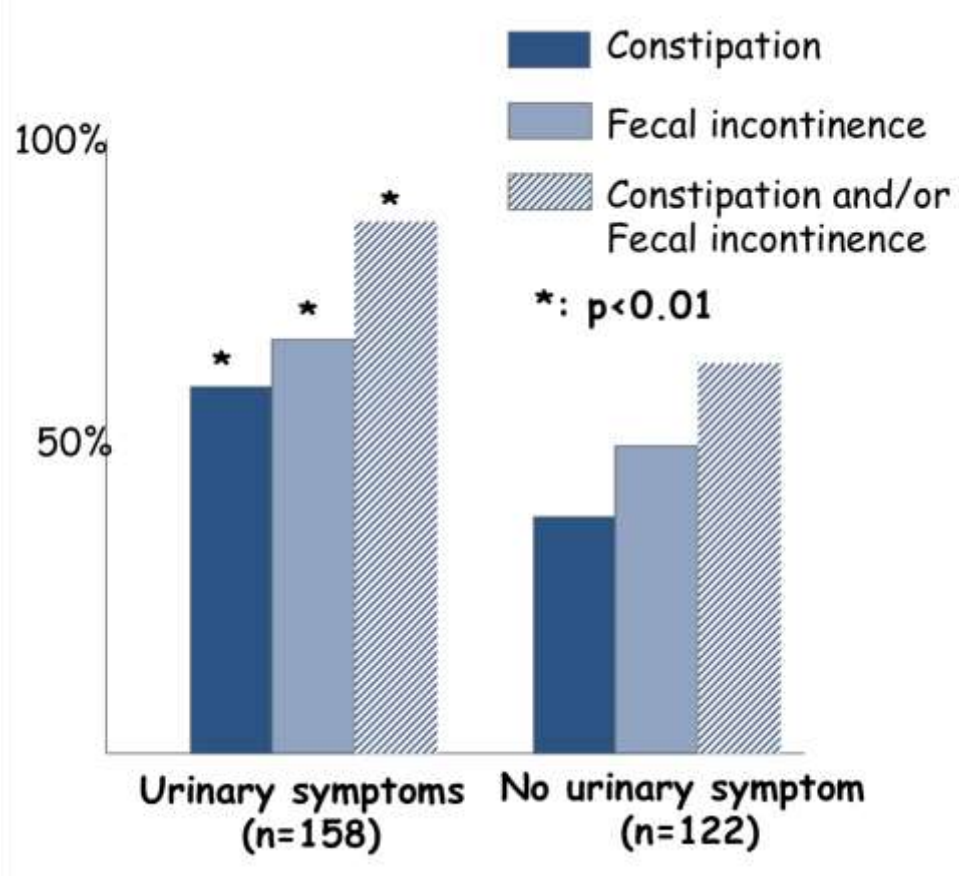
Leroi A, Colorectal Disease 13(2): 15-18, 2011

Sacral neuromodulation
Neurogenic pelvic foor dysfunctions - MS

- **90% will experience urinary dysfunction**

- Minardi & Muzzonigro, 2011
  - 25 patients
  - Retrospective
  - FU 49 +/- 26 months
  - 60% success

- Marinkovic & Gillen, 2010
  - 14 patients
  - Retrospective
  - FU 4.3 +/- 1.3 years
  - 12/14 regained voiding



Minardi & Muzzonigro, World J Urol 2011, march 15
Marinkovic & Gillen, Int Urogynecol J, 21:223-228, 2010
Hinds et al, Gastroenterology 98(6):587-595, 1990

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Summary

- Sacral neuromodulation is minimally invasive, second line treatment for
  - OAB – urinary retention
  - Faecal incontinence
  - **Concomitant diseases**
- Good long term succes rates +/- 70%
- Holistic approach for complex dysfunction