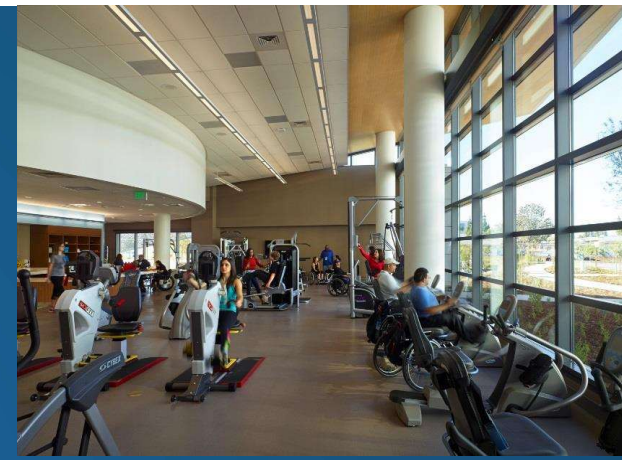
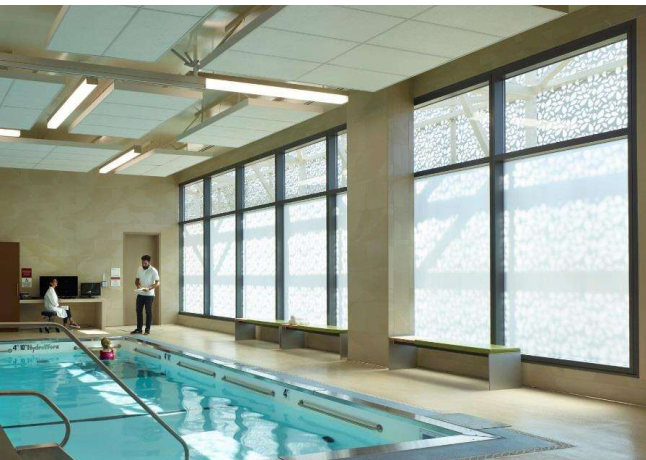


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Pelvic Health after Spinal Cord Injury: Where We Are and Where We Are Going

March 23, 2023

Evgeniy I. Kreydin, MD

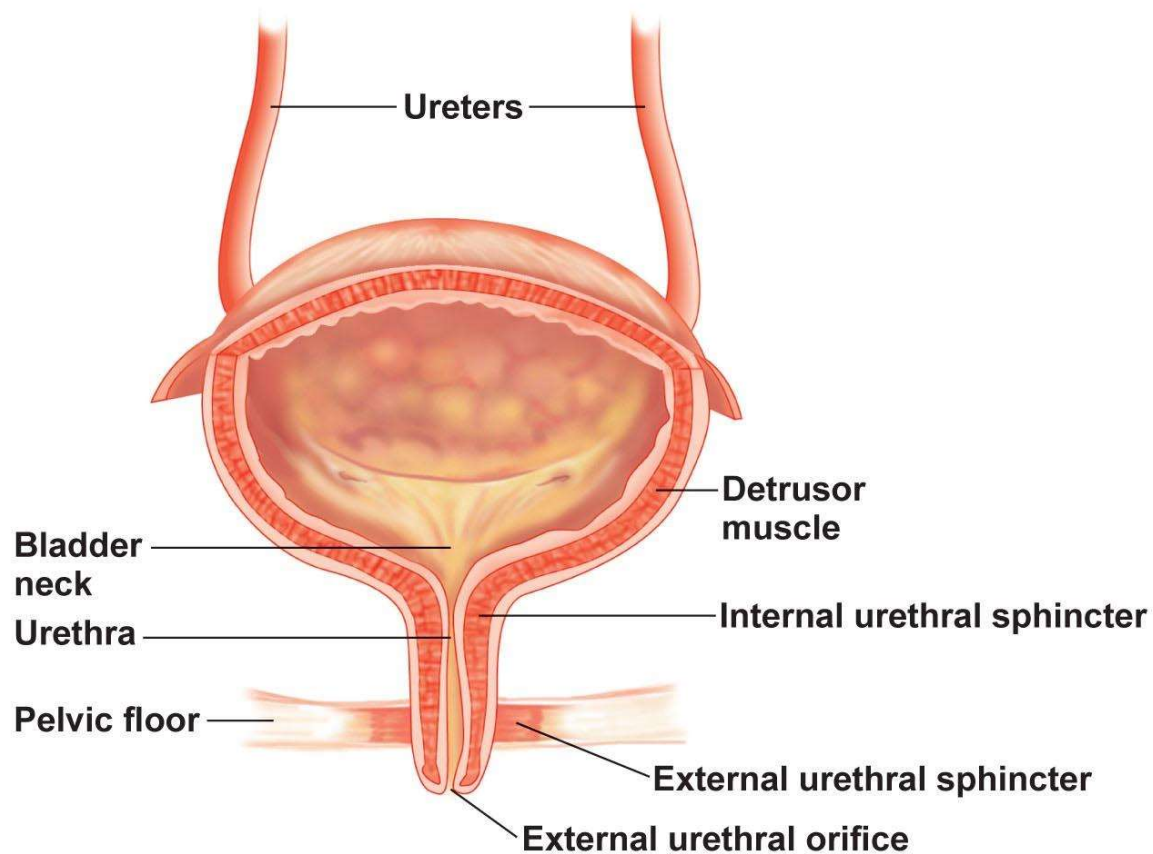




Function of the Lower Urinary Tract



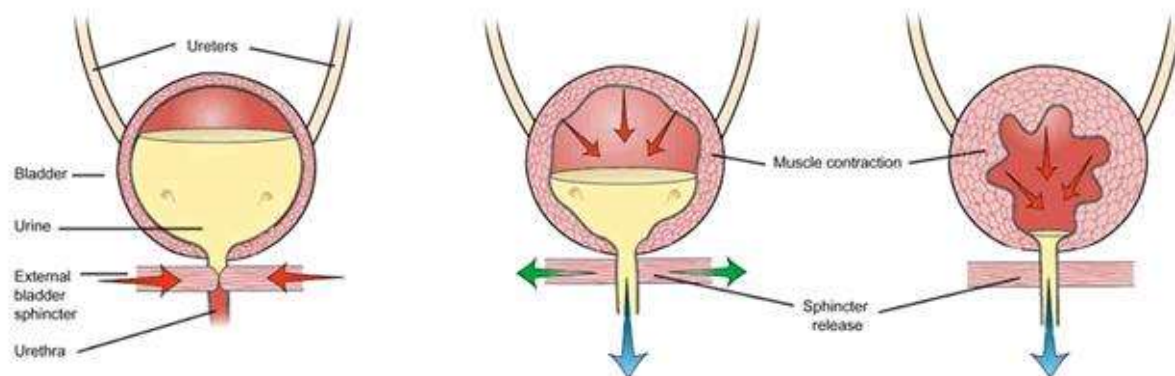
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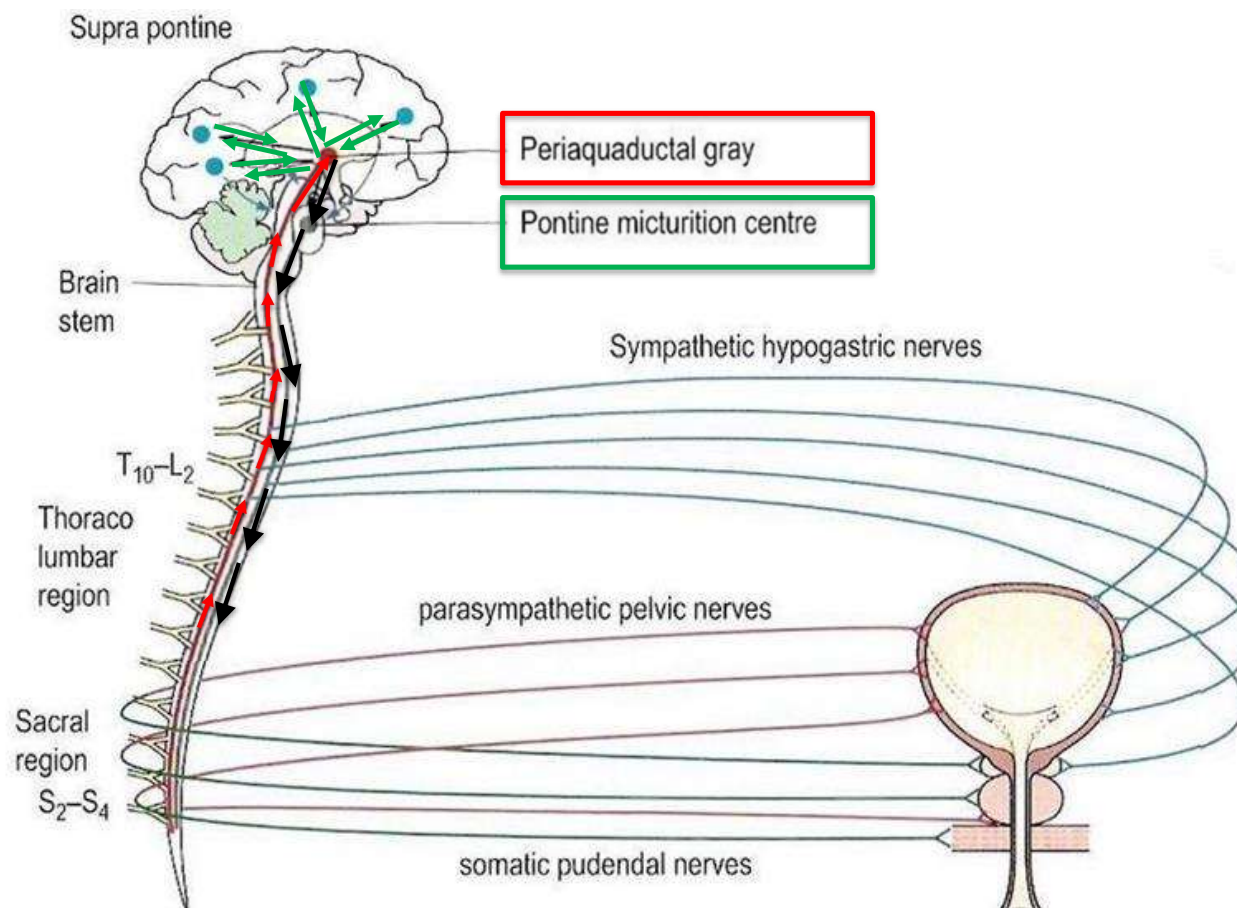


Function of the Lower Urinary Tract





Function of the Lower Urinary Tract





BLADDER

Overactive

1. Detrusor overactivity
2. Urge incontinence

OUTLET

Overactive

1. Detrusor-Sphincter Dyssnergia
2. Retention

CLINICAL PICTURE

1. Detrusor overactivity – incontinence
2. Urinary retention



- What are our goals?
 - Prevent injury to the upper tracts – decrease bladder pressure
 - Allow bladder emptying
 - Prevent incontinence
 - Decrease urinary tract infections



Goal#1: Prevent injury to the upper tracts

- How can we decrease bladder pressure?

- Medications
- Botulinum toxin injection
- Surgery (Augment/Ileal conduit)





Goal#2: Allow bladder emptying



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- Paraplegia (i.e. good hand function)
 - Clean intermittent catheterization
- Tetraplegia (i.e. poor hand function)
 - Indwelling catheter
 - Surgery
 - External sphincterotomy and condom catheter
 - Incontinent ileovesicostomy
 - Ileal conduit



Goal#3: Prevent Incontinence

- Medications
- Botulinum toxin injection
- Surgery



Same as Goal #1



Goal#4: Prevent Urinary Tract Infections



- **Toughest problem to treat**
 - Minimize catheterization time
 - Optimize bladder dynamics
 - Provider and patient education



“Normal” Sexual Function



- Arousal
- Lubrication
- Orgasm



- Arousal
- Erection
- Orgasm
- Ejaculation



Sexual dysfunction after SCI





Psychological

- Overall self-confidence
- Body image
- Perception of “ability” compared to others
- Surgical scars
- Incontinence



Psychological

- Sex should be spontaneous
- Sex must involve the genitalia
- Sex must involve penetration
- (And be with 2 perfectly sculpted and manicured people)



Psychological

- Vast majority of men and women have difficulty with physical arousal.
- 50% of men and 75% of women report difficulty with psychological arousal.



Erections after SCI

- 62-75% of men with SCI report erections
 - Depends on level and completeness of injury
- However, for the majority (66%) the erections are short-lived or unreliable.



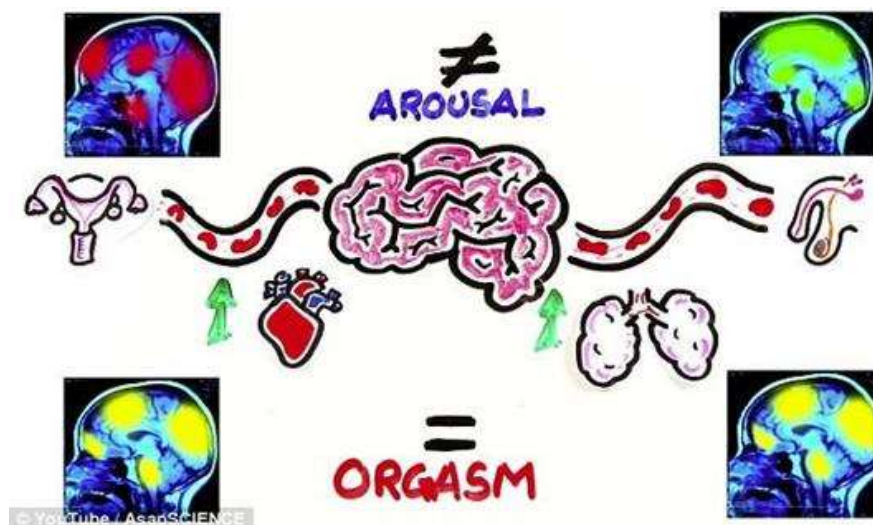
Lubrication after SCI

- Only 50% report adequate lubrication
- 66% of women consider it a top problem during intercourse
- Altered sensation during arousal:
 - Tingling, spasms
 - Headache, pain, shortness of breath



Orgasm after SCI

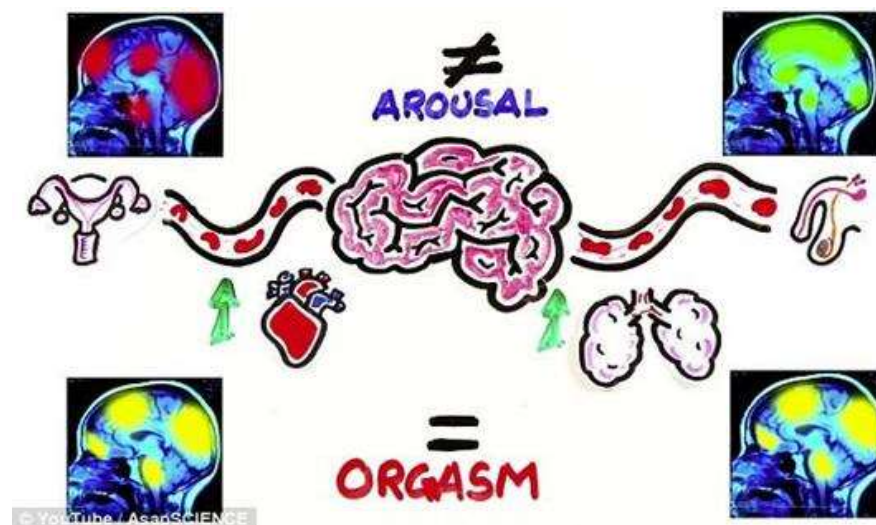
- “Peak” of sexual excitement
 - Vasocongestion and neuromuscular tension.
 - Accompanied by pleasant genital and physical sensations
 - Associated with mental euphoria





Orgasm after SCI

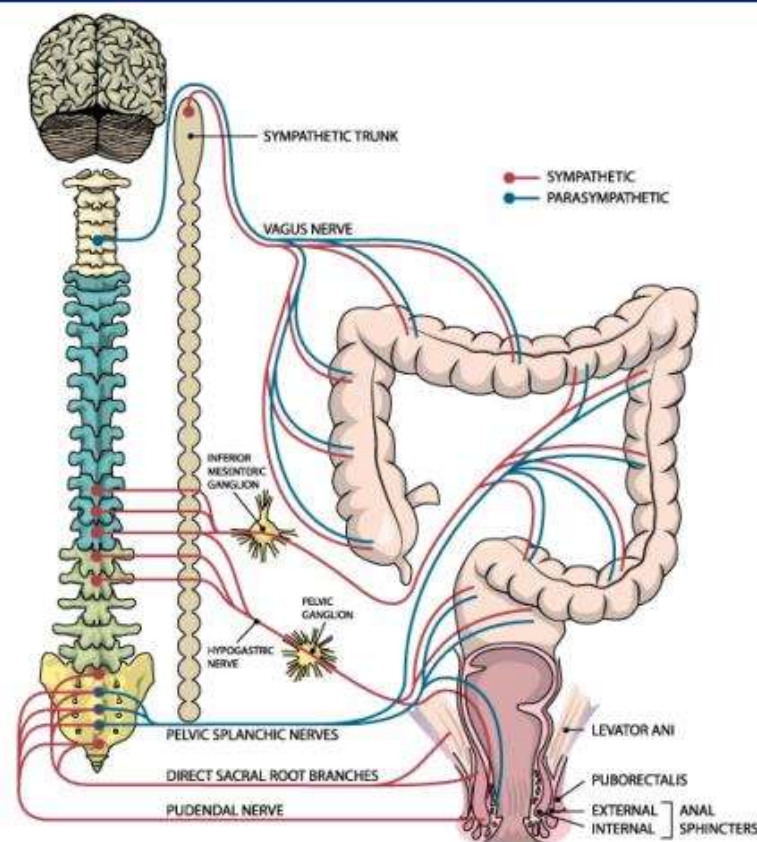
- 40-50% of men and women are able to achieve orgasm: length and intensity of stimulation may need to be greater than prior to injury.
- Vagus nerve bypasses the cord from genital region to brain





Normal Bowel Function

- Function of the colon:
 - Storage of stool
 - Elimination of stool
 - Water absorption
- How do we maintain continence:
 - Stool enters rectum → more rapid colon contractions
 - Stool enters anal canal → internal sphincter relaxes → external sphincter contracts → strong urge to defecate
- How do we eliminate:
 - Voluntary relaxation of the sphincter
 - Valsalva to increase intra-abdominal pressure





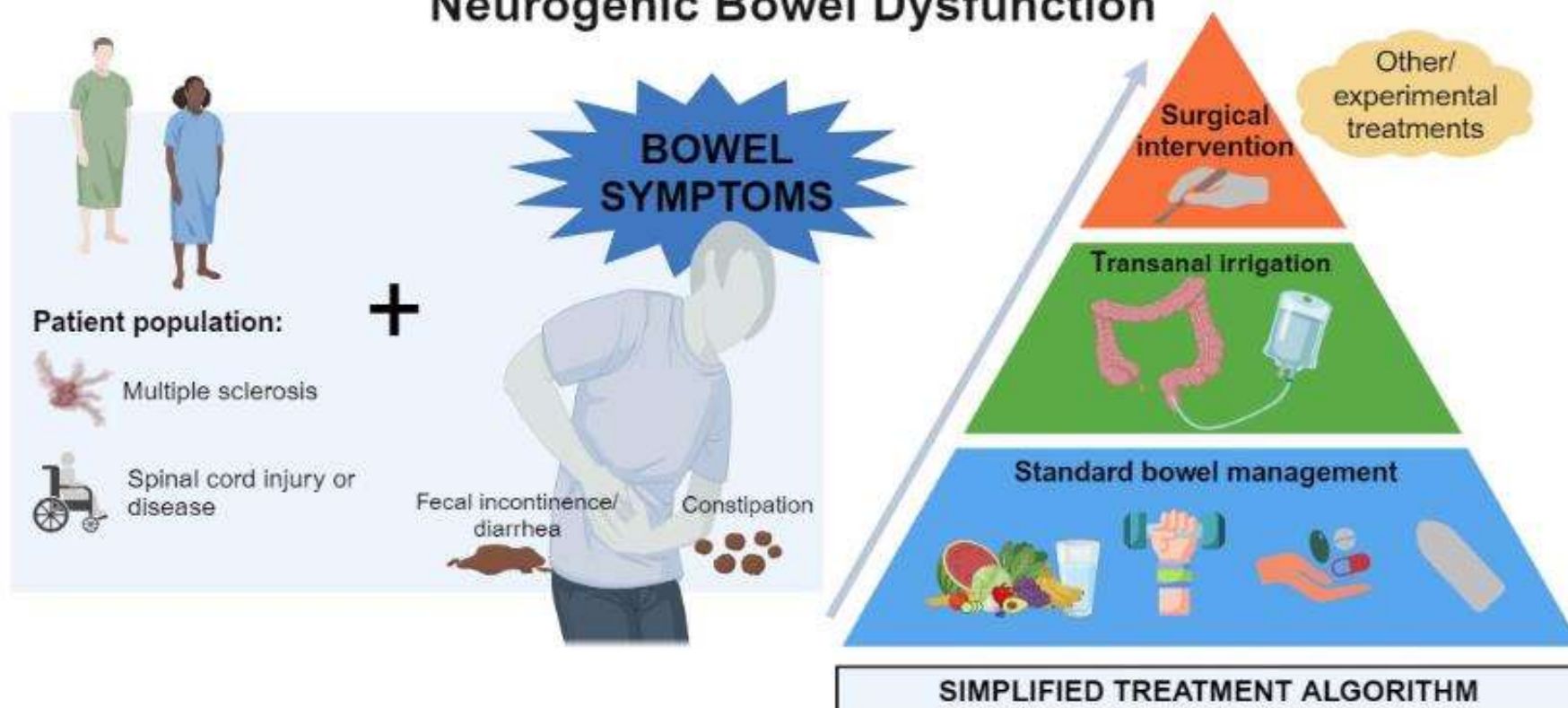
Bowel Dysfunction after SCI

- Loss of voluntary control of external anal sphincter
 - Impaired colonic peristalsis
 - Loss of synergy between colon and anal sphincter
 - Loss of sensation of bowel fullness
-
- Constipation
 - Prolonged bowel movement
 - Occasional bowel incontinence
 - Frequent gas incontinence



Bowel Dysfunction after SCI

Updated and simplified treatment algorithm for persons with **Neurogenic Bowel Dysfunction**





What are we missing and how can we get there?



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- Voluntary control



- Sensation
- Education

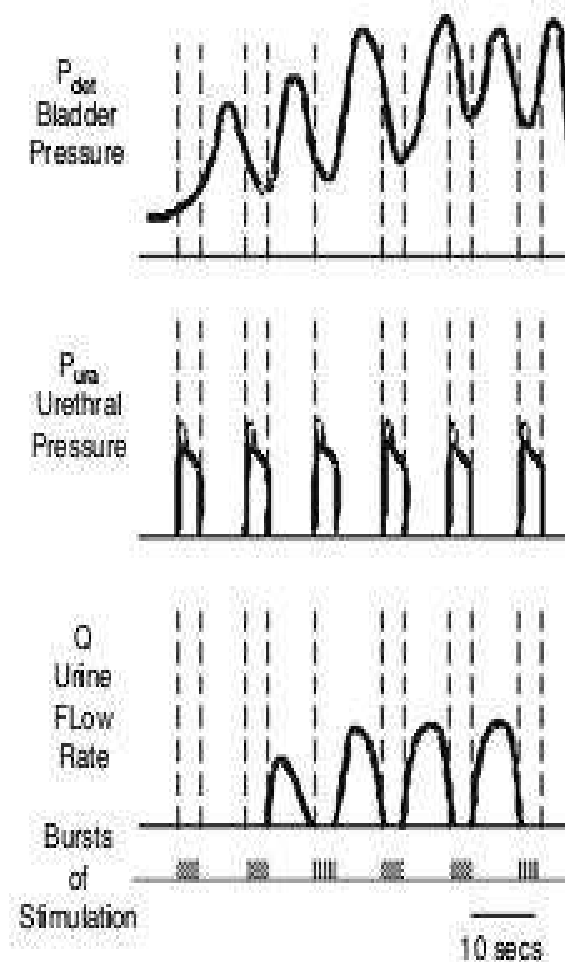
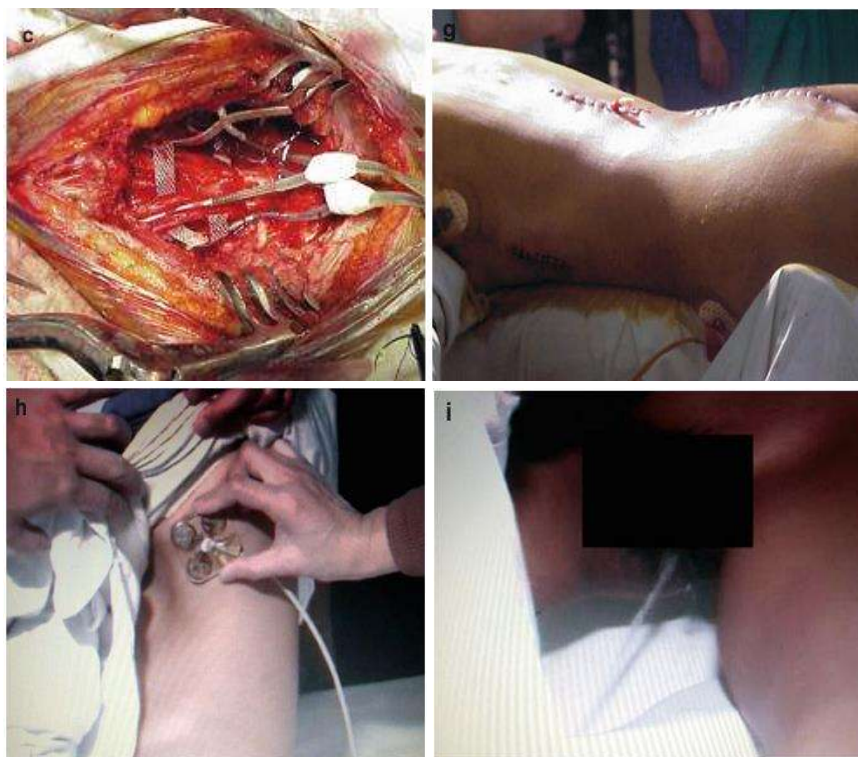


Voluntary control





Voluntary control





Sensation (via neuromodulation?)



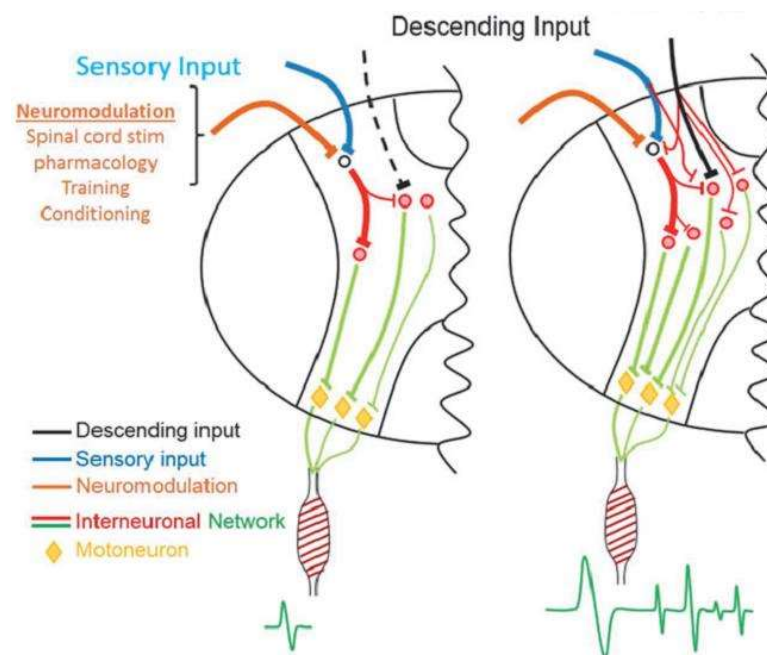
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Non-invasive Neuromodulation of Spinal Cord Restores Lower Urinary Tract Function After Paralysis

A Proof-of-Concept Study of Transcutaneous Magnetic Spinal Cord Stimulation for Neurogenic Bladder

- **Spinal neuromodulation**

- Based on the idea that most injuries are incomplete
- Stimulation induces plasticity of neural fibers and restoration of inputs from higher centers





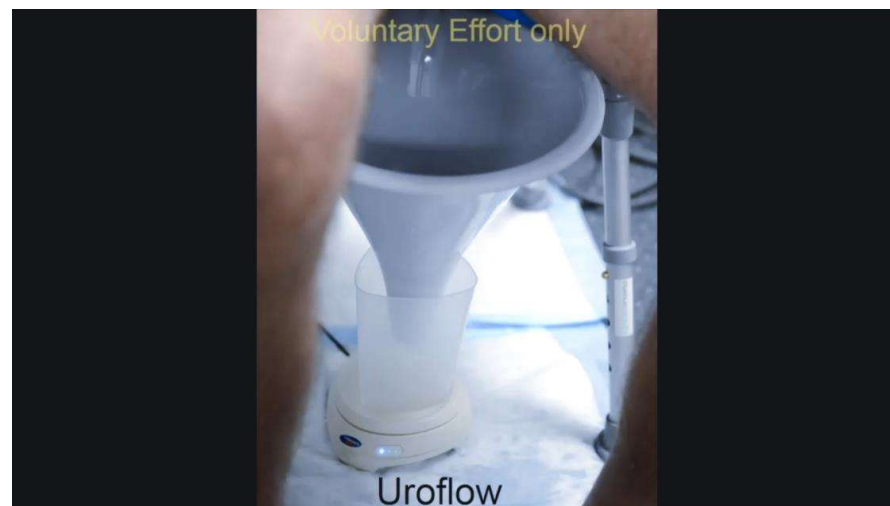
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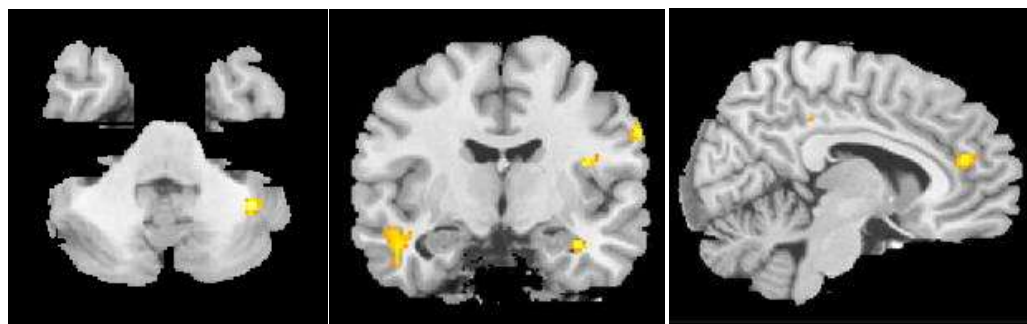
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Sensation (via neuromodulation?)

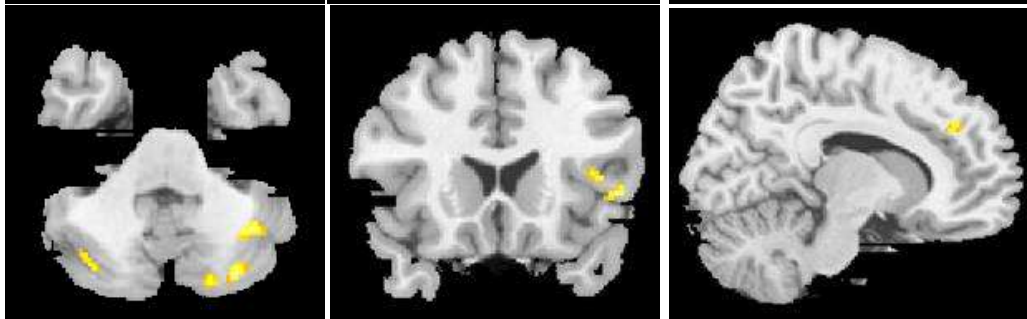
Healthy Controls



Stroke
↓ Cerebellum
↓ Insula
↓ Prefrontal cortex



Post-stim Stroke
↑ Cerebellum
↑ Insula
↑ Prefrontal cortex





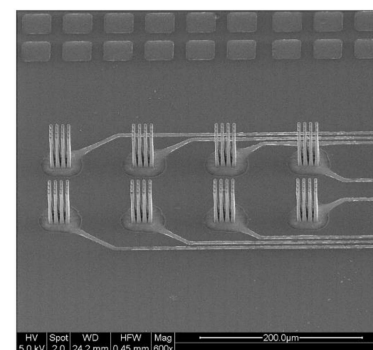
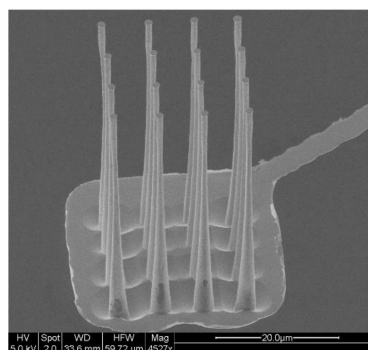
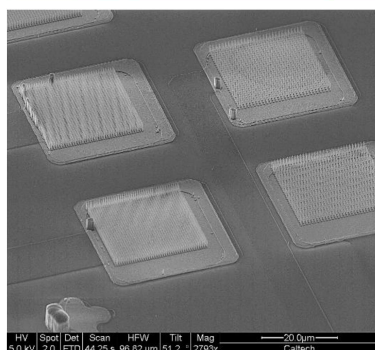
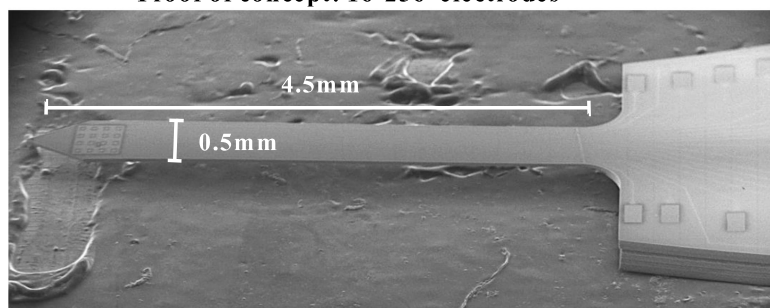
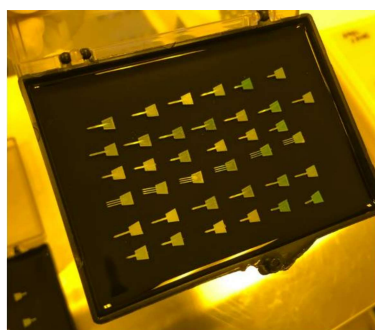
Sensation (via stimulation)

Micturition in Healthy people



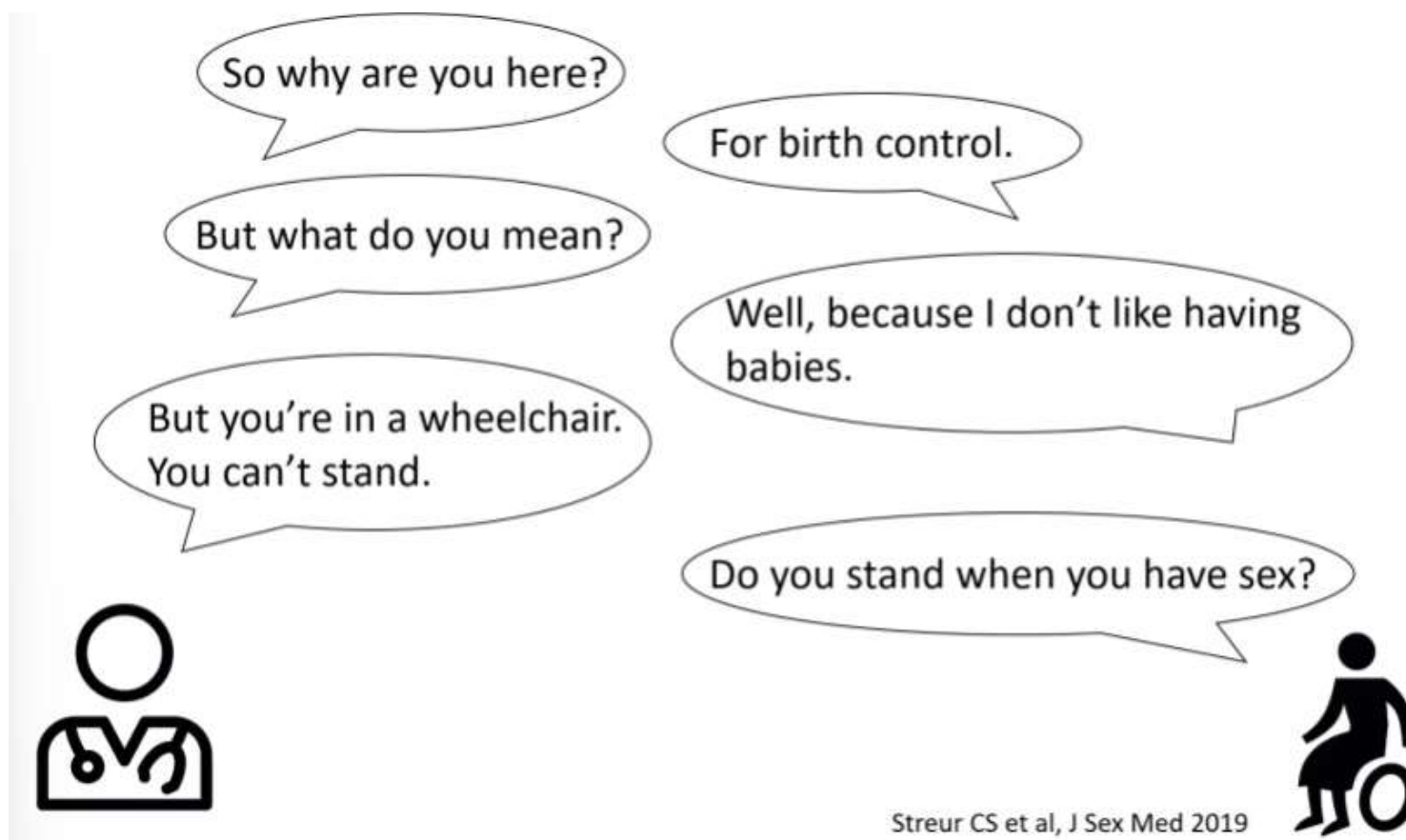
Sensation (via stimulation)

Proof of concept: 16-256 electrodes





Education



Streur CS et al, J Sex Med 2019



- **Bowel dysfunction is a hot potato**
 - Not many **gastroenterologists** are interested
 - **Colorectal surgeons** focus on surgical interventions
 - **Urologists** are not experts
- **Solutions???**
 - Neurogenic bowel as an integral part of GI or colorectal surgery curriculum
 - Incentivize neurogenic bowel care
 - Multidisciplinary rounds/teams





Conclusions



- Bladder, sexual and bowel dysfunctions are (mostly) not life-threatening
- However...
 - they are almost universal in patients with SCI
 - they have tremendous impact on quality of life
- Focus on *restoration and education*



תודה
Dankie Gracias
Спасибо
Merci Takk
كشكر
Köszönjük Terima kasih
Grazie Dziękujemy Dèkojame
Ďakujeme Vielen Dank Paldies
Kiitos Täname teid 谢谢
Thank You Tak
感謝您 Obrigado Teşekkür Ederiz
감사합니다
Σας ευχαριστούμε ขอบคุณ
Bedankt Děkuje vám
ありがとうございます
Tack