

EC15: ICS Core Curriculum (Free) Conservative Management of Adult Pelvic Floor Dysfunction: a Physiotherapy Approach

Workshop Chair: Margaret Sherburn, Australia
14 September 2016 08:35 - 11:30

Start	End	Topic	Speakers
08:35	08:40	Introduction to the workshop	Margaret Sherburn
08:40	09:00	Definitions, signs and symptoms of pelvic floor dysfunctions and physiotherapy role in conservative management of UI and POP	Chantale Dumoulin
09:00	09:25	Functional anatomy of the pelvic floor, manual and visual assessment of the PFM, clinical reasoning and treatment planning	Margaret Sherburn
09:25	09:50	Principles of teaching PFMT and training regimes: evidence base, clinical application, training progression	Margaret Sherburn
09:50	10:05	Discussion	All
10:05	10:30	Break	None
10:30	10:50	Pelvic floor dysfunction in older adults, assessment and management	Chantale Dumoulin
10:50	11:15	Adjunctive treatments for pelvic floor dysfunction – e-stim, emg & US biofeedback.	Doreen McClurg
11:15	11:30	Questions	All

Aims of course/workshop

The aims of this workshop are to provide:

1. An understanding of physiotherapy assessment of UI and POP and the clinical reasoning to diagnose and plan the conservative management of UI & POP
2. An opportunity to revise functional anatomy of the pelvis and PFM
3. Principles of clinical assessment of pelvic floor dysfunction, including PFM assessment
4. A forum to discuss the principles of teaching PFM exercise for motor control, strength training and functional training, including rationale, evidence base, clinical application and progression
5. A basic understanding of the pelvic floor management in special populations - older age, pregnancy
6. Evidence for the use of electrical stimulation and biofeedback in pelvic floor dysfunction

Learning Objectives

After this workshop participants should be able to:

1. Understand the evidence for physiotherapy in the management of urinary incontinence and pelvic organ prolapse
2. Be able to teach an effective pelvic floor muscle exercise
3. Understand how to alter assessment and management strategies for effective treatment of older adults
4. Know when to apply e-stim and biofeedback in a management program for pelvic floor dysfunction

Learning Outcomes

After the course, the participant will be able to:

1. Describe the function of the pelvic floor muscles and their role in the management of UI and POP
2. Teach effective pelvic floor muscle exercises, and be able to progress this training
3. Know when to use e-stim and emg to enhance PF muscle training
4. Adapt pelvic floor muscle assessment and training for an elderly population

Target Audience

This workshop is aimed at local practitioners, specifically physiotherapists and others interested in physiotherapy management. The course will be presented in both Japanese and English to encourage local clinicians/physiotherapists to attend.

Advanced/Basic

Basic

Conditions for learning

This is a lecture based course, with time for discussion and questions at the end of each section of the course.

Suggested Reading

- Aksac B, Aki S, Karan A, Yalcin O, Isikoglu M, Eskiyurt N. Biofeedback and pelvic floor exercises for the rehabilitation of urinary stress incontinence. *Gynecologic & Obstetric Investigation* 2003;56(1):23–7.
- Berghmans LC, Frederiks CM, de Bie RA, Weil EH, Smeets LW, van Waalwijk van Doorn ES, et al. Efficacy of biofeedback, when included with pelvic floor muscle exercise treatment, for genuine stress incontinence. *Neurourology & Urodynamics* 1996;15(1):37–52.
- Bø K, Sherburn M. (2005) Evaluation of Female Pelvic-Floor Muscle Function and Strength. *Physical Therapy* 85(3):269-282
- Dumoulin C, Glazener C, Jenkinson D. (2011) Determining the optimal pelvic floor muscle training regimen for women with stress urinary incontinence. *Neurourology and Urodynamics*; 30(5):746-753.
- Dumoulin C, Glazener C, Jenkinson D. (2011) Determining the optimal pelvic floor muscle training regimen for women with stress urinary incontinence. *Neurourology and Urodynamics*; 30(5):746-753.
- Eriksen BC, Eik_new S. Long-term electrostimulation of the pelvic floor: primary therapy in female stress incontinence: *Urologia Internationalis* 1989 44(2):90-5
- Fraser S, Elliott V, DeBruin E, Bherer L, Dumoulin C. (2014) The effects of combined video game dancing and pelvic floor training to improve dual-task gait and cognition in women with mixed-urinary incontinence. *Games for Health Journal*; published online, 3(3): 172-178.
- Galea MP, Tisseverasinghe S, Sherburn M. (2013). A randomised controlled trial of transabdominal ultrasound biofeedback for pelvic floor muscle training in older women with urinary incontinence. *Australian and New Zealand Continence Journal*. 19:28-44
- Godec C, Cass S, Ayala GF. Bladder inhibition with functional electrical stimulation. *Urology* 1975;6(6):663-6
- Fraser S, Elliott V, DeBruin E, Bherer L, Dumoulin C. (2014) The effects of combined video game dancing and pelvic floor training to improve dual-task gait and cognition in women with mixed-urinary incontinence. *Games for Health Journal*; published online, 3(3): 172-178.
- Sherburn M, Bird M, Carey M, Bø K, Galea MP (2011) Incontinence improves in older women after intensive pelvic floor muscle training: An assessor-blinded randomized controlled trial. *Neurourology & Urodynamics* 30:317–324
- Sandweiss JH, Wolf SL. *Biofeedback and Sports Science*. New York: Plenum Press, 1985.
- Sherburn M, Bird M, Carey M, Bø K, Galea MP (2011) Incontinence improves in older women after intensive pelvic floor muscle training: An assessor-blinded randomized controlled trial. *Neurourology & Urodynamics* 30:317–324

Chantale Dumoulin

Urinary incontinence and other pelvic floor dysfunctions in older women, assessment and management.

Urinary incontinence (UI) afflicts some 1 in 3 women 15 years and over and approximately 1 in 2 after the age of 50. It engenders significant social problems, embarrassment, and negative self-perception, reducing social interactions and physical activities and, in older women, increasing risk of falls and nursing-home admissions. In short, it impedes a healthy lifestyle and healthy aging; untreated, it can lead to surgery.

The first-line treatment for women with UI is conservative management; however, there is no consensus on which pelvic floor muscle training is best, and how to motivate patients to adhere to pelvic floor muscle training nor is there a clinical prediction rule/tool to help identify which women would benefit from conservative management.

In this presentation, we will discuss:

1. Innovation in the understanding of the pathophysiology of UI and other PFM dysfunction in aging women; from pelvic floor morphometry and function, lower limb strength and balance, to cognition.
2. Innovation in the development of cost-effective, pathology specific physiotherapy treatments for elderly UI-afflicted women.
3. Innovation in the identification of potential beneficiaries of such treatments to better prioritize first line intervention delivery.

Margaret Sherburn

The aim of this part of the workshop is to:

1. Give the participants an opportunity to revise the anatomy and functional anatomy of the pelvic floor
2. Provide a learning opportunity to assess the pelvic floor muscles using visual and tactile feedback
3. Use assessment findings and clinical reasoning to move from assessment to treatment planning
4. Teach the principles of muscle training to progress pelvic floor muscle rehabilitation
5. Apply these principles, using case studies

An understanding of the anatomy and function of the pelvic floor (PF) is essential to understand how PF dysfunctions occur, and then how to manage these dysfunctions. The PF comprises a muscular and fascial sling that forms the base of the pelvis, and attaches to a firm bony ring. All these structures of the PF act together dynamically and provide support for the pelvic organs which they support. When there is failure of any element of this integrated system, a dysfunction can occur. The active elements

of the pelvis are the muscles of the PF, the Levator Ani (LA). This complex of muscles is made up of the Puborectalis, Pubococcygeus and Iliococcygeus muscles. There is a hiatus (called the levator hiatus) in the midline through which pass the pelvic outlets; the urethra, vagina and anus.

The LA muscles acts as a whole in a mass contraction which has three main functions: to close the pelvic outlets, to lift the pelvic organs, and to resist the downward pressure of the abdomen. The PF muscles have constant resting activity ('tone') to provide constant support in the upright position. Muscular weakness then leads to a situation where the pelvic organs sit lower within the pelvis (called prolapse) or even sit within the levator hiatus. Weakness also reduces the sphincter function of the LA muscle and the result is urinary and/or faecal incontinence. If on the other hand, the PF muscles cannot relax, this can lead to pelvic floor pain.

Assessment of the LA muscles is best undertaken by a vaginal examination – the 'gold standard'. A vaginal assessment can also assess the size of the levator hiatus, the ability of the muscle to fully relax, to grade the muscle strength, assess any strictures, pain or other pathophysiology. If a vaginal assessment is not possible, imaging via ultrasound or external visual assessment can be used to assess and then train the muscles.

There is the highest level of evidence for pelvic floor muscle training (PFMT) and PFMT should be the first line of treatment for PF dysfunction. Clinicians therefore should be able to assess and train the PF muscles effectively. Effective muscle training relies mainly on the principle of muscle overload. In practical terms, this is muscle strengthening. The methods of muscle strengthening differ from other areas of the body as the PF muscles are diaphragmatic, and comprise mostly slow twitch muscle fibres. Overload is gained by altering patient position, varying the length of contraction, using repeated muscles contractions while always maintaining correct motor control and full relaxation of the muscles between contractions.

PFMT is not the only form of conservative management for PF dysfunction. Clinical reasoning is required to determine which treatment strategy is best used for any PF dysfunction. Case studies will be used to allow participants to discuss treatment strategies during the workshop.

Doreen McClurg

Adjunctive treatments for pelvic floor dysfunction – electrical stimulation (e-stim), electromyography emg), & ultrasound biofeedback.

The aim of this part of the workshop is to provide an overview of adjuncts commonly used in pelvic floor therapy. Correct contraction of the pelvic floor muscles is sometimes difficult for the patient to perceive, especially if they are weak. Biofeedback (BF) can be defined as being augmented, concurrent or terminal feedback of biological signals that enables a person to identify and modify a bodily function of which they are usually unaware. (Sandweiss 1985). Biofeedback studies are those that use an instrument or device to record the biological signals (e.g. squeeze pressure, electrical activity) during a voluntary pelvic floor muscle contraction and present this information back to the woman in auditory or visual form (for example, a louder sound with a stronger squeeze or an increasing number of lights on a visual display as the strength of the squeeze increased). BF devices vary considerably. They can be inserted into the rectum or vagina or placed on the perineum. Devices include air or water filled balloons inserted into the rectum or vagina to measure pressure. Depending on the number and placement of the balloon catheters it is possible to measure vaginal, anal and intra-abdominal pressure (Aksac 2003). The other main group of BF devices measure electrical activity (that is, electromyography) via surface metal electrodes on vaginal or anal probes (e.g. Berghmans 1996). Another BF option is to show movement, such as lifting the bladder neck, which is possible with real time images from ultrasound (e.g. Galea 2006).

Thus BF typically gives the user an auditory or visual record of the contraction or both. Some devices can only be used in clinic settings because they require a health professional to set up and use the equipment whereas some are very simple and portable and are designed for home use.

Electrical stimulation of the pelvic floor may aim to stimulate motor efferent fibres of the pudendal nerve which may elicit a direct response from the effector organ, for instance a contraction of the PFM (Eriksen 1989).

The object of neuromodulation is to remodel neuronal reflex loops, eliciting an indirect response from the effector organ. Godec's (1997) observation that a detrusor muscle contraction can be inhibited by a PFM contraction induced by ES. Barrington's micturition centre inhibitory loop clamps the urethra and calms the bladder.

Neuromodulation using sacral, penile, clitoral and tibial nerve stimulation will be discussed. The evidence and practicalities will be reviewed.

At the end of this session the attendee should have an overview of adjunctive therapy to facilitate pelvic floor rehabilitation.



Definitions, signs and symptoms of pelvic floor dysfunctions

骨盤底障害の定義、徴候、症状

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Pelvic Floor Dysfunction Standardisation of Terminology



用語はこの論文による

Haylen et al. (2010) An International Urogynecological Association (IUGA)/International Continence Society (ICS) Joint Report on the Terminology for Female Pelvic Floor Dysfunction. *Neurourology and Urodynamics* 29:4–20.
<http://onlinelibrary.wiley.com/doi/10.1002/nau.20798/epdf>

Urinary Incontinence



Definition: 尿失禁とは不随意の尿の漏出

Complaint of involuntary loss of urine (symptom like a fall or a head ache)

Until diagnosis is made (clinical or urodynamic)

Haylen et al. 2010

Stress urinary incontinence



腹圧性尿失禁の定義

Definition:

Complaint of involuntary loss of urine on effort or physical exertion (e.g. sporting activities), or on sneezing or coughing.

いきみ、運動、くしゃみ、セキなどでおこる不随意の尿の漏出

N.B: "activity-related incontinence" might be preferred in some languages to avoid confusion with psychological stress.

活動関連失禁の方が精神的なストレス失禁と誤解されないかも

Haylen et al. 2010

Stress urinary incontinence



腹圧性尿失禁の機序

Mechanism:

Increased intra-abdominal pressure and low closure pressure in urethra cause SUI

腹圧上昇と尿道閉鎖圧低下

Pathophysiology:

- urethral sphincter insufficiency
- endopelvic gascial stretch or tear
- Levator ani weakness
- Pudendal neuropathy

病態

尿道括約筋不全
内骨盤筋膜伸展・損傷
肛門拳筋脆弱
陰部神経障害

Haylen et al. 2010

Urgency urinary incontinence



切迫性尿失禁の定義

Definition:

Complaint of involuntary loss of urine associated with urgency

切迫感に伴う不随意の尿の漏出

Haylen et al. 2010

Urgency urinary incontinence:



切迫性尿失禁の機序

Mechanism:

Uncontrolled detrusor contraction causes UI

制御不能な排尿筋収縮

Pathophysiology:

- Increase bladder sensation
- Urinary infection
- Poorly compliant bladder wall
- Idiopathic

病態

膀胱知覚過敏

感染

低コンプライアンス

原因不明

Haylen et al. 2010

Mixed urinary Incontinence



混合性尿失禁の定義

Definition:

Complaint of involuntary loss of urine as associated with urgency and also with effort or physical exertion or on sneezing or coughing

切迫感およびいきみ、身体活動、くしゃみ、セキに伴う不随意の尿の漏出

Haylen et al. 2010

Other types of urinary incontinence



他の型の尿失禁

Postural urinary incontinence: urine loss associated with change of body position

体位性尿失禁: 体位変換に伴う尿の漏出

Nocturnal enuresis: Complaint of involuntary loss of urine which occurs during sleep

夜間遺尿: 睡眠中の尿の漏出

Continuous urinary incontinence: Complaint of continuous involuntary loss of urine

持続性尿失禁: 持続する不随意の尿の漏出

Haylen et al. 2010

Other types of urinary incontinence



他の型の尿失禁

Insensible urinary incontinence: Complaint of urinary incontinence where the woman has been unaware of how it occurred

無自覚性尿失禁: わからないうちにおこる尿失禁

Coital incontinence: Complaint of involuntary loss of urine with coitus

性交時尿失禁: 性交に伴う不随意の尿の漏出

Haylen et al. 2010

Bladder storage symptoms



膀胱蓄尿症状

Increased daytime urinary frequency: frequent micturition occurring during waking hour

昼間頻尿: 起きている間の頻回の排尿

Nocturia: interruption of sleep because of need to urinate

夜間頻尿: 排尿による睡眠の中断

Haylen et al. 2010

Bladder storage symptoms



膀胱蓄尿症状

Urgency: sudden, compelling desire to pass urine which is difficult to defer

尿意切迫感: 突然の我慢が難しい切迫した尿意

Overactive bladder (OAB, Urgency) syndrome: Urinary urgency, usually accompanied by frequency and nocturia, with or without urgency urinary incontinence, in the absence of urinary tract infection (UTI) or other obvious pathology

過活動膀胱: 尿意切迫感で、通常は頻尿と夜間頻尿を伴い、切迫性尿失禁を伴うこともある
尿路感染症や他の明らかな病態はない

Haylen et al. 2010

Pelvic Organ Prolaps



骨盤臓器脱の症状

Definition (symptom):

A departure from normal sensation, structure, or function, experienced by the woman in reference to the position of her pelvic organs

骨盤臓器の位置に関して女性が経験する正常の感覚、構造、機能からの逸脱

Haylen et al. 2010

Pelvic Organ Prolaps



骨盤臓器脱の徴候

Definition (signs):

The descent of one or more of the following:

- anterior vaginal wall;
 - posterior vaginal wall;
 - uterus (cervix);
 - apex of the vagina (vaginal vault or cuff scar after hysterectomy)
- 膣前壁、膣後壁、子宮、膣断端などの低下

The presence of any such sign should be correlated with relevant POP symptoms

徴候は症状と関連付けるべき

Haylen et al. 2010

Pelvic Organ Prolaps



骨盤臓器脱の部位による分類

By compartments:

Central prolapse: Uterine/cervical prolapse or vaginal vault (cuff scar) prolapse

中部脱: 子宮、膣断端

Anterior vaginal wall prolapse: (bladder or cystocele)

膣前壁脱: 膀胱、膀胱瘤

Posterior vaginal wall prolapse: (rectocele, enterocele or perineum)

膣後壁脱: 直腸瘤、腸管瘤

Haylen et al. 2010

Pelvic Organ Prolaps (POPQ Staging)



骨盤臓器脱の病期分類

Stage 0: No prolapse is demonstrated

病期0: 脱はない

Stage I: Most distal portion of the prolapse is more than 1 cm above the level of the hymen

病期1: 脱最下端部が処女膜レベルより1センチ以上高い

Stage II: Most distal portion of the prolapse is 1 cm or less proximal to or distal to the plane of the hymen

病期2: 脱最下端部が処女膜レベルの1センチ未満の範囲

Haylen et al. 2010

Pelvic Organ Prolaps (POPQ Staging)



骨盤臓器脱の病期分類

Stage III: The most distal portion of the prolapse is more than 1 cm below the plane of the hymen

病期3: 脱の最下端部が処女膜レベルより1センチ以上低い

Stage IV: Complete eversion of the total length of the lower genital tract is demonstrated

病期4: 膣全長が翻転

Haylen et al. 2010

Role of Physiotherapy in conservative management of UI and POP

尿失禁と骨盤臓器脱の保存的管理における理学療法的作用

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Role of Physiotherapy in conservative management of UI and POP



Bo et al. An International Urogynecological Association (IUGA) / International Continence Society (ICS) joint report on the terminology for the conservative and non-pharmacological management of female pelvic floor dysfunction (In press 2016)

Boら: 女性骨盤底機能障害の保存的・非薬物的治療の用語に関する国際泌尿器婦人科学会と国際禁制学会の合同部会報告

Bo et al. 2016

Physiotherapy



理学療法

Physiotherapy involves “using knowledge and skills unique to physiotherapists” and, “is the service only provided by, or under the direction and supervision of, a physiotherapist”

理学療法とは、理学療法士に特有の知識と技術を用いて、理学療法士の直接もしくはその指導の下で行われる治療行為

It is recommend that the specific treatment is described, e.g. “pelvic floor muscle training, electrical stimulation”, rather than the unspecific term physiotherapy as the latter simply refers to a specific profession

特異的な治療法は、非特異的に理学療法とするのではなく、骨盤底筋訓練、電気刺激、などと記載することが望ましい

Bo et al. 2016

Lifestyle interventions



生活指導

The application of interventions in management of lifestyle-related health problems:

生活様式に関連する健康問題の管理で行う介入

- change to healthy diet (fluid consumption/restriction, diet modification)

健康的な食に変更(水分摂取・制限、食餌調整)

Bo et al. 2016

Lifestyle interventions



生活指導

The application of interventions in management of lifestyle-related health problems:

生活様式に関連する健康問題の管理で行う介入

- regular participation in, or restriction of, physical activity

定期的な身体的活動の参加もしくは制限

Bo et al. 2016

Lifestyle interventions



生活指導

The application of interventions in management of lifestyle-related health problems:

生活様式に関連する健康問題の管理で行う介入

- smoking cessation

禁煙

Bo et al. 2016

Education



教育

Providing patients with knowledge and understanding of their condition thereby empowering them to play an active role in its management

患者に状態に関する知識や理解を与え管理に積極的な役割を与えるよう力づけること

- Anatomy
- Continence mechanism, pathophysiology
- Coping strategies
- Self-care, self efficacy
- Urgency suppression techniques

解剖
失禁の機序・病態
対応戦略
自己ケア、自己効力
切迫感抑制方法

Bo et al. 2016

Scheduled voiding regimes

予定排尿法



Toileting on a fixed schedule around the patient's normal voiding pattern, which includes a progressive voiding schedule using relaxation and distraction techniques for urgency suppression

通常の排尿状態で決めた時間にトイレに行き、リラックスや尿意切迫感を反らす方法で徐々に間を延ばす

Scheduled voiding regimes have been categorised as:

- bladder training
- timed voiding
- habit training
- prompted voiding

分類

膀胱訓練
時間排尿
習慣訓練
促し排尿

Bo et al. 2016

Pelvic floor muscle training



Exercise to improve PFM strength, endurance, power, relaxation or a combination of these parameters

Can be done:

- Individually/group
- Supervised/non-supervised
- Home/clinic
- Assisted with (estim or biofeedback)
- Active/resisted with
(cones or other resistance)

骨盤底筋訓練

骨盤底筋肉の強度、持続、パワー、弛緩、またはこれらの混成を改善する運動
個人・集団、指導の許か否か、自宅か病院、補助(電気刺激やバイオフィードバック)
自発的 抗力的(腔内コーン、他の抵抗)

Bo et al. 2016

Level of evidences for interventions



Condition	Intervention	Level of evidence	Grade of recommendation
Urinary Incontinence	PFMT	1a	A
	Scheduled voiding regimes	1	A
	Lifestyle modifications (weight loss, caffeine)	2	A-C
POP	PFMT	1	A

Abrams, 2013

Level of evidences for interventions

translate to Japanese

証拠のレベル



Condition	Intervention	Level of evidence	Grade of recommendation
状態	介入	証拠のレベル	推奨度
Urinary Incontinence 尿失禁	PFMT 骨盤底筋訓練	1a	A
	Scheduled voiding regimes 定時排尿	1	A
	Lifestyle modifications (weight loss, caffeine) 生活指導(減量・カフェイン調整)	2	A-C
POP 骨盤臓器脱	PFMT 骨盤底筋訓練	1	A

Abrams, 2013

Recommendations

推奨文



Conservative management therapy such as pelvic floor muscle training should be offered as first line therapy to all women with urinary incontinence (stress, mixed and urgency)

骨盤底筋訓練のような保存的治療は、全ての(腹圧性、混合性、切迫性)尿失禁の女性に、第一選択治療として提示すべきである

Conservative management therapy such as pelvic floor muscle training should be offered as first line therapy to all women with with POP.

骨盤底筋訓練のような保存的治療は、全ての骨盤臓器脱を有する女性に、第一治療として提示すべきである

Abrams. 2013

Pelvic floor dysfunction, assessment and management: Adaptation in older women

骨盤底障害のアセスメントと管理
高齢女性における適用

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Canada



Context



- In women 60 and over: **60歳以上の女性では**
- 40-55% suffer from UI **40-55%が尿失禁**
 - MUI > SUI > UUI **混合性>腹圧性>切迫性**
 - 20 to 25% suffer from severe symptoms (>10 episodes/week) (Abrams, 2013) **20-25%は重症 (週に10回以上)**

Context



- Urinary incontinence can:
- Be onerously expensive **尿失禁は・・・ 費用がかかる**
 - Negatively impact QoL **生活の質を悪化**
 - Result in isolation, decline in ADL **孤独、ADL低下を招く**
 - Increase the risk of falls and nursing home admissions (Resnick, 1989, Nygaard, 1996; Johnson, 1998, Wilson, 2005). **老人ホームでの転倒の危険を上げる**

Changes in PFM function with age



骨盤底の加齢変化

- Menopausal oestrogen deficiency **閉経、女性ホルモン欠損**
- Sarcopenia **筋肉量減少**
- Higher body mass index **BMI高値(肥満)**
- Constipation **便秘**
- Previous pelvic surgery **骨盤内手術の既往**
- Comorbidities (ie: diabetes mellitus) **合併症(糖尿病など)**
- Fragility (cognitive decline, lower limb dysfunction) **脆弱性(認知低下、下肢の障害)**

Chen, 2007

Lower limb dysfunction and UI

Morin M, poster



presentation, ICS Barcelona 2013

下肢の障害と尿失禁

Population:
20 MUI/UUI and 20 continent women
≥ 65 years

20人失禁
20人対照
>65歳女性



Method: Cohort study evaluating

- Cognitive function (MMSE)
- Severity of UI (ICIQ-UI Short Form)
- General health status (SF-12 Health Survey)
- Lower limb muscle strength (Biodex)
- Balance (Unipodal Stance Test)
- Balance confidence (ABC scale)
- Mobility (mean gait speed on a 10 meter distance)

評価方法
認知機能
失禁の程度
全般的健康
下肢筋肉強度
片足立ち
平衡感覚
運動能力
(10m歩行速度)

結果



Results:

Older women with MUI/UUI had a general lower physical health status than continent women

失禁高齢女性は全般身体健康度が低下

UI women presented a significantly lower gait speed, balance performance and balance confidence as compared to continent women

失禁女性は歩行速度、平衡感覚が有意に不良



結論



Conclusion:

This study suggests balance and mobility deficits in older women suffering from urge/mixed UI

切迫性・混合性尿失禁を有する高齢女性は平衡感覚や運動能力が低下している

Physiotherapist should consider these findings in treating UI in aging women

高齢女性の尿失禁の治療では理学療法士はこれらの点を配慮すべきである

UI and impaired execution function in aging women

Journal of Clinical and Experimental Neuropsychology, May 2013

高齢女性における尿失禁と運動能力低下

Population: 32 continent / 83 MUI

32人の対照、83人の混合性尿失禁

Method: Cohort study where women were asked to complete the UDI, the IIQ, and a battery of cognitive tests



UDIとIIQ(失禁質問票)と認知機能検査一式

UI and impaired execution function in aging women

Journal of Clinical and Experimental Neuropsychology, May 2013

Results: MUI women demonstrated poorer cognitive performance on executive-function tests and divided-attention tests $p < 0.05$

結果:尿失禁の女性で実行機能と分離注意が不良

Conclusion: Aging women with MUI have difficulties disengaging attention from one task to perform another and coping with interference

結論:混合性尿失禁の高齢女性は、ある作業から他の作業に注意を移すこと、妨害に対応することに困難を有する

PFM dysfunctions related to aging

加齢に関する骨盤底筋の機能障害

- OAB syndrome
- Urgency symptoms
- Frequency
- Nocturia
- Reduced bladder sensation
- Slow and incomplete micturition
- Symptomatic POP
- Mixed urinary incontinence

- 過活動膀胱
- 尿意切迫感
- 頻尿
- 夜間頻尿
- 膀胱知覚の低下
- 尿勢低下・不完全排尿
- 症候性骨盤臓器脱
- 混合性尿失禁

Chen, 2007

Evaluation

評価

- Bladder function (bladder diary, questionnaire)
膀胱機能(排尿日誌、質問票)
- PFM function (observation, palpation)
骨盤底筋機能(観察、触診)
- Co-morbidities
合併症
- Lower limb function (gait, balance, transfer)
下肢機能(歩行、平衡感覚、移動)
- Cognitive function (dual tasking, memory)
認知機能(二重作業、記憶)

RCTs on PFM exercise classes in older women with UI

尿失禁の高齢女性に対する骨盤底筋訓練教室の無作為化比較試験(RCT)

	N	Intervention	Outcomes	Results
Burns, 1990	135 UI women	8-week PFMT vs control group	Number of UI episode	↓ 54% vs ↑ 9%
Kim, 2007	70 SUI women	12-week PFMT + fitness vs control group	Cure rate (being continent)	54.5% vs 9.4%
Kim, 2011	61 UI women	12-week PFMT + fitness vs control group	Cure rate (being continent)	43.4% vs 6.9%

症例数 期間・方法 評価法 結果

RCTs on PFM exercise classes in older women with UI

	N	Intervention	Outcomes	Results
Kim, 2011	127 SUI, MUI, UII women	12-week PFMT + fitness vs control group	Cure rate (being continent)	44.1% cure after 3 months and 39.3% at one year vs 1.6% in control group
Sherburn, 2011	83 SUI women	20-week PFM class vs bladder training	Participants' global perception of change	PFM class 73.6% vs bladder training 36.4%
Pereira, 2011	49 SUI women	6-week PFM class vs individual PFM vs control group	Pad test	↓ 75.5% (classes) vs ↓ 89.3.5% (ind) vs ↓ 5.94%

症例数 期間・方法 評価法 結果

RCTs on PFM exercise classes in older women with UI



	N	Intervention	Outcomes	Results
Sran, 2016	48 UI women with osteoporosis > 55-85	12-week individual PFMT vs osteoporosis education	UI questionnaire	To be added
Mok, 2014	Chinese women with UI > 65 years	PFMT vs pamphlets	UI symptoms Satisfaction QOL	
Kargar, 2015	50 UI women > 60 years	Group PFMT vs no treatment	UI symptoms	

Virtual reality as a treatment approach for older women with mixed urinary incontinence: a feasibility study



Virtual reality as a treatment approach for older women with mixed urinary incontinence: a feasibility study

Elliott V. N&U2012 31(6): 940-41; N&U2014 Janv. 10

混合性尿失禁の高齢女性の治療方法としての仮想現実の応用の試み

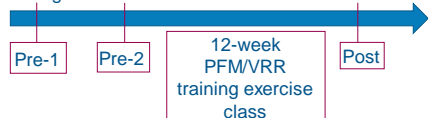


Methods



方法

• **Study Design:** quasi-experimental, pre-test, post-test design.



• **Intervention**



12週間
仮想現実を用いた
骨盤底筋訓練教室

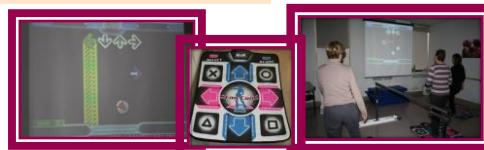
Intervention: PFM/VRR training programme



1回60分/週 12週
12 consecutive 60-minute weekly exercise classes; each class session comprised :

- 10-minute education period on UI **10分: 尿失禁の教育**
- 30-minute session of static PFM training in different positions
- 20-minute VRR training session using a free open-source software dance game, StepMania. **30分: 色々な体位で静的訓練**

20分: ダンスソフトで仮想現実の訓練

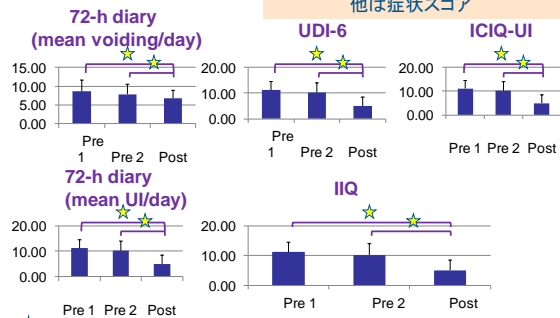


Results: Effectiveness on UI symptoms



結果: 尿失禁への効果

排尿回数(左上) 失禁回数(左下)
他は症状スコア



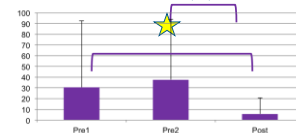
★ = statistically significant

Results : effectiveness on UI symptoms



Outcomes	Pre1 ¹ Mean and SD	Pre2 ² Mean and SD	Post ³ Mean and SD	p-value
One hour pad test	30.42 ± 62.19	37.69 ± 56.23	5.76 ± 14.93	P ¹⁻² =0.313 P ²⁻³ =0.005* P ¹⁻³ =0.008*

1時間
パッドテスト



• Applying a p<0.017 Bonferroni adjustment, the modified one hour pad test changed significantly between pre-1 and post (p=0.008) and pre-2 and post (p=0.005), but not between pre-1 and pre-2 (p=0.313).

Conclusion

結論



This feasibility study demonstrated that the PFM/VRR programme was effective in reducing UI symptoms, enhancing QoL

骨盤底筋仮想現実治療は
尿失禁の軽減とQOLの改善に有効

**A combined PFM/VRR is an effective
functional training approach
for older women with mixed UI**

骨盤底筋訓練と仮想現実の組み合わせは
混合性尿失禁の高齢女性に対する有効な機能訓練である

Case 1: Alice

事例1:アリス



Alice loves to spend time with her friends at the community center, knitting and doing aquagym.

But she is going less and less since she had that big cough this winter.

It's embarrassing, but lately Alice has had difficulty walking to the bathroom without losing her urine.

Can physiotherapy help Alice?

アリスは友人と地域集会所で
ニット作りや水中体操が大好き

でも、今年の冬はひどい咳で
だんだんに行かなくなった

恥ずかしいから・・・
最近では、漏れないうちトイレ
まで行くのも難しくなった

理学療法がアリスを救えるか？

Margaret Sherburn 

Affiliations to disclose[†]:

Nil

† All financial ties (over the last year) that you may have with any business organisation with respect to the subjects mentioned during your presentation

Funding for speaker to attend:

- Self-funded
- Institution (non-industry) funded
- Sponsored by:

Workshop EC 15 

Principles of teaching PFMT and training regimes: **evidence base, clinical application, training progression**

骨盤底筋トレーニングにおける原則:
根拠に基づいた臨床応用とトレーニングの漸増法



Margaret Sherburn PhD, FACP
The University of Melbourne, Australia
m.sherburn@unimelb.edu.au

Evidence for PFMT 
骨盤底筋トレーニングに関するエビデンス

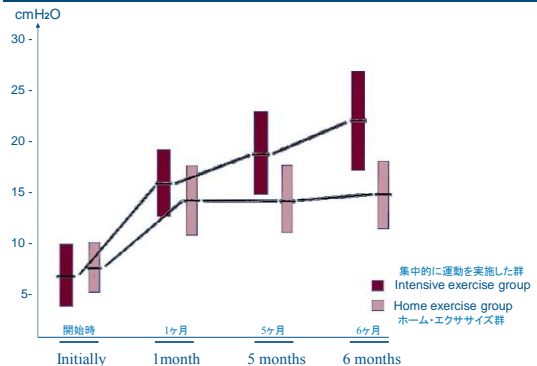
'Pelvic floor muscle training should be offered, as first line therapy, to all women with stress, urge or mixed urinary incontinence'

「骨盤底筋トレーニングは、腹圧性、切迫性、混合性、全ての尿失禁に対して、第一選択治療として提供されるべきである」

Level 1a evidence, Grade A recommendation
5th International Consultation on Incontinence
エビデンス・レベル1a, 推奨グレードA, 第5回国際失禁会議

Abrams et al ICI 2013 (www.ics.org)

Pelvic floor muscle strength 骨盤底筋筋力 
(Bo et al 2014, Ch 6,p124)



PFM training for PF dysfunction – a balance 
骨盤底機能障害に対する骨盤底筋トレーニング-バランス



ミトコンドリアの脱酸素化
酸素の脱飽和
血中の乳酸蓄積
神経筋性疲労

Mitochondrial de-oxygenation
Oxygen desaturation
Blood lactate accumulation
Neuromuscular fatigue

To gain:

- Motor control
- 筋力
- 持久性
- スピード
- 協調性
- タイミング
- Strength
- Endurance
- Speed
- Coordination
- Timing

Overload
Specificity
Periodicity
Recovery
Energy supply
Vascularisation

過負荷
特異性
周期性
リカバリー
エネルギー供給
血管化

Training for Strength 筋力強化を目的としたトレーニング 

High-resistance - near max - ↓ number reps - full recovery between sets 高強度 - ほぼ最大強度 - 低頻度 - セット間での十分なリカバリー

Load that limits exercise to between 4-8 reps (Berger, 1963)
反復回数は4-8回を制限とする

Others suggest 5 or 6 reps 5-6回を推奨している場合も (Atha, 1981)

Load of 80-85% 80-85%の負荷

Isometric contractions held for 3-10 secs (Bø et al 2014)

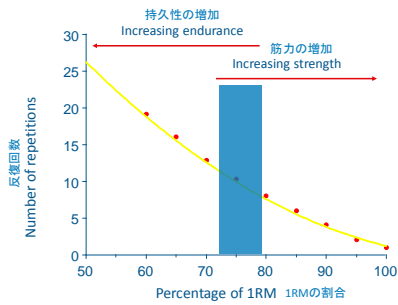
等尺性収縮は3-10秒間保持する

- Time variation for progression in difficulty
困難な場合は保持時間を変更することで対応

Experienced individuals perform all reps at single session

(理学療法士との)セッションにて、全回数の運動を適切に行えるかを確認してから処方

Optimal Training Load 理想的なトレーニング負荷



Training for Endurance 持久性を目的としたトレーニング

Basic principle: 基本的原則

- moderate to light load 中等度から軽度の負荷
- high reps 高頻度
- with short rest between sets and exercises セット間や運動間の休息は短く

Minimise recovery period to: リカバリー期間を短くすることで:

- promote ↑numbers mitochondria, ↑capillary density, ミトコンドリア数の増加や血管密度の増加を促進
- muscle fibre type transformation 筋繊維タイプが変性
- improved lactate capacity 乳酸酸化能が改善

Dosage: 3-4 sets of 10-20 reps. 処方: 10-20回を3-4セット
Rest 30 sec to 2 mins 30秒から2分間の休息をとる

**** Perception of submax effort when PFM are weak??**

骨盤底筋が弱い場合、最大下強度の運動を処方すべきか??

- Do endurance training after strength training 筋カトレーニングの実施後、持久性トレーニングを実施

Repetition Maximum Continuum RMの連続性

RM	≤2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	≥20	
Training Goal	Strength										Strength				Strength		Strength		筋力	
	Power				Power				Power				Power		パワー					
	Hypertrophy				Hypertrophy				Hypertrophy				Hypertrophy		筋肥大					
	Endurance				Endurance				Endurance				Endurance		持久性					

トレーニングの目的

Progression 漸増

Increase exercise volume 運動量を増加

- More important than intensity 運動強度の増加以上に重要



Increase power (force x speed) パワー(力 × スピード)の増強

- Strength component more important than speed スピードの要素以上に筋力要素が重要

Increase load 運動負荷の増加

- Gravity – upright positions 重力 – 起立位
- Contract on forced expiration 努力呼出での収縮

Separate different training regimens by time

時間によって、異なる運動要素のトレーニングを個々に実施

- strength, power, endurance at different time それぞれ異なる時間に、筋力、パワー、持久性のトレーニングを行う

Coordination/ timing: The 'Knack' 協調性 / タイミング: "ナック"

A pre-contraction before a precipitating activity (cough) 突発的誘発活動(咳嗽)前のプレ収縮

Subjects taught this, no other PFMT

被験者はナックについて教えられたのみで、PFMT 等他のトレーニングは実施せず

- Re-tested 1 week later, 73% reduction in urine leakage on deep cough 1週間後の再検査時には、73%が深い咳嗽にて尿失禁が軽減したと報告 (Miller et al 1996)

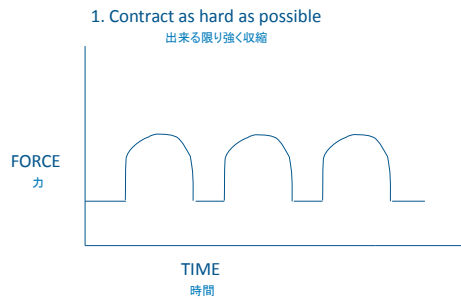
Is this a coordination (timing) or functional exercise?

これは協調性(タイミング)運動、機能的(ファンクショナル)運動のどちらに含まれるか?

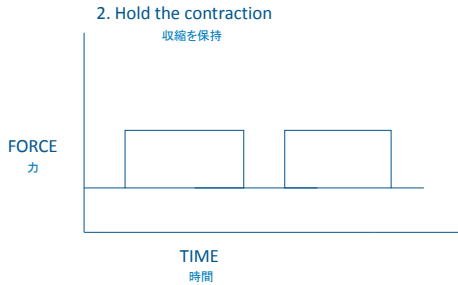
- Effectiveness does depend on having some PFM strength 骨盤底筋筋力の有無によって効果が左右される

Progression of PFM contraction 骨盤底筋収縮の漸増法

(Bo et al 2014, Ch 6, p121)

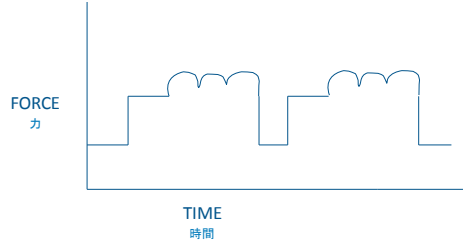


Progression of PFM contraction 骨盤底筋収縮の漸増法 (Bo et al 2014, Ch 6, p121) ICS 2016 TOKYO



Progression of PFM contraction 骨盤底筋収縮の漸増法 (Bo et al 2014, Ch 6, p121) ICS 2016 TOKYO

3. Contract as hard as possible, hold the contraction and add 3 – 4 quick contractions on top of the hold, for a MVC & recruit fast twitch fibres. 最大随意収縮の改善と連筋線維の賦活には、出来る限り強く収縮し、それを保持しながら3-4回の素早い単収縮を入れる

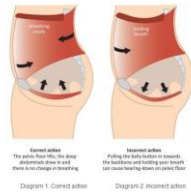


Teaching cues: Facilitation 指導する際のキュー: ファシリテーション ICS 2016 TOKYO

Verbal - squeeze, hold, lift
口頭 - スクイズ、保持(ホールド)、挙上

Visual - anatomy charts, mirror
視覚 - 解剖図、鏡

Kinaesthetic - feel self, tap, sit on firm chair
運動感覚 - 自身で感じる、軽くたたく、硬めの椅子に座る



Imagery イメージ ICS 2016 TOKYO

Floating scarf スカーフをすくい上げる

Move away from a sharp pin 鋭いピンから離すように動かす



Positions for Exercise 運動時の姿勢 ICS 2016 TOKYO



Measuring Pelvic Floor Muscle Function ICS category: Clinician Observation ICS 2016 TOKYO

骨盤底筋機能の測定 ICS分類: 検者による観察

In research, is a secondary outcome measure
研究においては2次的評価項目とみなされる

Methods to evaluate PFM function and strength:

骨盤底筋機能と筋力の評価方法 (Bo & Sherburn 2005)

1. Ability to contract (in previous talk) 収縮能力(前述の通り)
2. Quantification of strength 筋力の定量的評価

1. Ability to contract: visual observation

収縮能力: 視診

Measurement of PFM function and strength cont... PFM機能と筋力の測定 Bo & Sherburn 2005



2. Quantification of strength: Maximal squeeze force

筋力の定量的評価: 最大圧迫 (スクイーズ) 力

- **Manual muscle testing:** Oxford, ICS scales - conflicting reliability
徒手筋力テスト: オックスフォード, ICSスケール - 信頼性の問題
- **Manometry:** various perineometers, and sources of error
マノメトリー (検圧計): **会陰圧測定器の多様性, 誤差の原因**
- **Dynamometers** ダイナモメーター (筋力計) (Dumoulin 2004, 2006)
 - Measures PF muscle force (Newtons) 骨盤底筋筋力を計測 (ニュートン)
- **Vaginal weights/cones:** poor research 経重量 / コーン: エビデンスが不十分

PFM lift measurement: US and MRI 骨盤底筋筋上の計測: 超音波検査とMRI

No single method able to measure elevation and compression force 骨盤底筋の圧迫要素と挙上要素の両方を同時に計測できる方法はない

Methods influenced by subjective judgment, skill and clinical experience 検査者の判断, 技術, 臨床経験によっても結果は左右される

Behaviour change and adherence to PFMT 行動変容と骨盤底筋トレーニングに対するアドヒアランス (能動的治療参加)



No adherent personality アドヒアランスな性格は存在しない (Borello-France et al 2013)

Adherence can be modified by: アドヒアランスは以下によって改善される

- **Knowledge:** personal, from a health professional, trusted source
知識: 個人, 医療従事者によって, 信頼性のある情報源
- **Physical skill:** Mastery of physical skill, has 'bodily' knowledge, mental rehearsal 身体的スキル: 身体的スキルの習得は身体知となる, メンタルリハ
- **Feelings about PFMT:** often negative, no innate reward, guilt when lack of motivation
PFMTに対する思い:モチベーションのない状態では, 消極的, 非内発的報酬, 自責の念などを感じていることが多い
- **Cognitive analysis, planning, and attention:** problem solve to create plan - time, habit, no disruption
認知的分析, 計画, 注意: 問題解決のための戦略を立てる - 時間, 習慣, 集中できる環境
- **Prioritisation:** choices & compromise, social & personal
優先順位: 選択と妥協, 社会と個人
- **Service provision:** available, timing, distance
サービスの提供: 利用可能, タイミング, 距離

(Hay-Smith et al, Frawley et al, McClurg et al. 2011 ICS State-of-the-Science Seminar Research Papers 1-4, NAU 2015)

Motivational Tips モチベーションにおける秘訣



Adherence and motivation アドヒアランスとモチベーション

- Factors most consistently associated with positive outcomes
一貫して効果的な結果に結びつく要因

Knowledge of program 治療内容を知っている

Defined length of program (realistic) 明確な治療期間 (現実的)

Expectations of & benefits to patient 患者の希望や利にかなっている

Convenient & appealing (eg appointment times)
便利で魅力的 (例, 予約時間)

Regular reviews, incl after discharge 定期的なフォローアップ (終了後も含む)

Reminders (eg phone/text messages) 促し (例, 電話/携帯メール)

Associate with other activities (eg brushing teeth)
他の活動と関連させる (例, 歯磨き)

Realistic but positive - check asterisk points
現実的かつ肯定的 - 重要 (アスタリスク) 項目を再評価

Encouragement during plateau 症状が平行状態の際の励まし

Is there a best retraining program? 最も効果的な再トレーニング方法は?



Progressive resistance training program 漸増抵抗運動プログラム

- High volume program 運動量を多くする
- If low intensity - no or modest effect
運動強度が低い場合 - 十分な, もしくは全く効果を得られない

If adequate training, strength gains similar whether young or older

- older adults gain strength not hypertrophy
高齢者の場合, 筋肥大は生じないが, 筋力増強効果は得られる

© DeFronzo (Eliasson 2008)

PRIMA

Recommendations for effective strength training 効果的な筋力トレーニングの推奨 (Haskell et al, ACSM 2007)



- **Specific** 特異的
- **8-12 slow velocity close to maximum contractions (fewer repetitions better to optimize strength and power)**
ゆっくりとした速さでほぼ最大収縮までの収縮を, 8-12回繰り返す (筋力とパワーの増強には, 低頻度で行う方がより効果的である)
- **3 sets** 3セット
- **2-3 (4) days a week** 週に2-3(4)回
- **> 5 months** 5ヶ月以上

PFM training in the ideal world 理想的な骨盤底筋トレーニング



Minimum number of high quality individual consultations
質の高い個人セッションを最小限に行うのが良い (Neumann et al 2005)

With or followed by group exercise sessions
グループセッションとの併用, もしくはフォローアップが必要 (Bo et al 1990)

Plus weight loss where appropriate 必要であれば減量と平行する

Until maximum results gained 最大限の効果が得られるまで継続する

Then continued at maintenance dosage for life
効果が得られた後は, 引き続き決まった運動量を継続していく

Manage PF dysfunction as other chronic diseases & do not withdraw treatment

骨盤底機能障害は他の慢性疾患と同様に治療されるべきであり, 治療を終了させることはない
• Eg. Diabetes, heart disease, arthritis 例, 糖尿病, 心疾患, 関節炎

For full rehabilitation ... 包括的リハビリテーションのために...



Think local 局所の問題を考慮

- High quality PFM training 質の高い骨盤底筋トレーニング

Think functional 機能的かどうかを考慮

- In ADL 日常生活活動において
- Pre-contraction before activity, 'the knack'
活動前のプレ収縮, "ナック"

Think global 全体を捉える

- Neuromuscular rehabilitation 神経筋リハビリテーション
- Lifestyle factors addressed, eg. 生活習慣要因を改善. 例えば,
 - ↓ BMI BMIの減少
 - ↓ Chronic cough 慢性咳嗽の減少
 - ↓ Smoking 禁煙

Affiliations to disclose[†]:

Nil

† All financial ties (over the last year) that you may have with any business organisation with respect to the subjects mentioned during your presentation

Funding for speaker to attend:

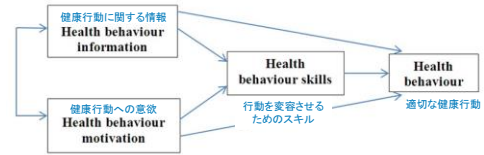
- Self-funded
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Manual and visual assessment of the PFM, clinical reasoning and treatment planning

骨盤底筋の評価(視診・触診),
クリニカル・リーズニング(臨床推論)と治療立案

Margaret Sherburn PhD, FACP
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- To teach correct motor skill 適切なモータースキルを指導するため
- To prescribe a structured exercise program based on sound biological rationale
生物学的根拠に基づいて、体系化された運動プログラムを提供するため
- To educate and motivate for adherence to this program
患者教育的意義、治療に対するモチベーションの維持を促進するため
 - to create a change in health behaviour
患者の(健康)行動に変化をもたらすため



Assessment methods: 評価方法

1. Verbal 口頭によるもの
2. External assessment 体表からの評価
 - Pants on: visual, tactile
下着上: 視診、触診
 - Pants off: visual 検査部を露出: 視診
 - Ultrasound imaging 超音波検査
3. Internal assessment 内診による評価
 1. Per vaginum examination 経膣検査
 2. Per rectum examination 経肛門検査
4. When skin sensitivities; change standard examination method 皮膚が敏感な場合: 標準的な検査方法に加えて工夫が必要
 - Non-allergenic gloves 非アレルギー性の検査用グローブ
 - Examination lubricant 検査用潤滑剤

Requirements for per vaginum examination: 経膣検査における必要条件

- Informed consent / choice インフォームド・コンセント / 選択肢
- Psychological readiness / awareness 心理的準備 / 認知
- The process will be informative and therapeutic 検査に関する十分な情報の提供 / 治療的検査
- The therapist is capable 検査者に十分な能力があること

Vaginal assessment is the 'gold standard' for PFM assessment 経膣評価は骨盤底筋評価における"ゴールド・スタンダード"である

Digital Muscle Testing: **quantitative** tool to assess:

手指を用いた筋力テスト: 定量的評価方法

PFM strength, endurance & fatigue 骨盤底筋筋力、持久性、疲労

AND ...

- | | |
|---------------------------------------|---------------------------------------|
| muscle tone 筋緊張 | speed of contraction 収縮速度 |
| lift 拳上 | coordination 協調性 |
| symmetry 対称性 | ability to relax 弛緩させる能力 |
| scarring 瘢痕化 | adhesions 癒着 |
| pain 疼痛 | urogenital /levator hiatus dimensions |
| prolapse 臓器脱 | 尿生殖 / 拳筋裂孔 |
| perineal movement 会陰部の動き | |
| extra-pelvic muscle activity 骨盤周囲筋の活動 | |

Contraindications: 禁忌事項

- No consent 同意のない場合
- Not psychologically ready or aware 心理的に準備・認知ができていない
- Child / adolescent 小児 / 青年期
- Pregnancy < 12 weeks - if pregnancy is unstable 妊娠後12週以内 - 妊娠が安定していない場合
- Non-menstrual vaginal bleeding 月経以外の要因による出血時
- Acute local vaginal/pelvic infection 膣部 / 骨盤内の急性感染症
- Fistula / open wounds / broken skin 瘻 / 開放創 / 皮膚の損傷
- Complete lack of sensation? 感覚消失?

Precautions: 注意事項

- Menstruating 月経時
- Allergy to gloves/lubricant 検査用グローブ / 潤滑剤に対するアレルギー
- Absence of sexual activity 性的行為を行っていない状態
- Chronic local infection 検査部位の慢性感染症
- History/current sexual abuse or pelvic/vulval pain 性的虐待、もしくは骨盤 / 外陰部痛の現病 / 既往歴

Problems with vaginal assessment
経膣評価における問題



X

Increments in scales are not equal 各値(結果)の増加は同等ではない(順序尺度であるため)

No cut-off values for pathological conditions 病態を判定するためのカットオフ値がない

Can't compare findings between scales as large variations in: 下記因子におけるバラツキが大きく、結果の値を比較することが困難:

- Reliability 信頼性
- Findings of 'validity' '妥当性'の結果
- Population tested on 検査対象
- Methods of testing 検査方法
- Vaginal vs anal 経膣 対 経肛門

✓

Attempt at objectivity through use of measurement scales 測定尺度を用いることで客観性を高めている

Can measure several aspects (MVC, endurance, squeeze, lift) 複数要因に対して検査が可能(最大随意収縮, 持久性, スクイーズ, 挙上)

Assessment findings assist treatment 評価結果により適切な治療の選択が可能

ICS Scale (Messelink et al 2005) ICSスケール

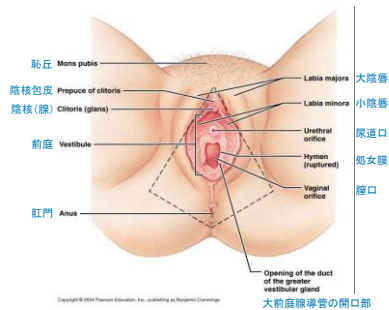


PFM strength scale: 4 point scale for voluntary contraction ('tightening, lifting and squeezing'):
骨盤底筋力スケール: 随意収縮(締める, 挙上, スクイーズ)を4段階スケールで評価

- 0 = no contraction palpable 0 = 収縮を触知できない
- 1 = weak 1 = 弱い
- 2 = normal [??? = moderate] 2 = 正常 [??? = 中等度]
- 3 = strong 3 = 強い

- 'should be tested in both supine and standing position to see if contraction against gravity is possible'
抗重力能力を確認するため, 臥位, 立位の両方で検査すること
- if tested with lying knees bent, knees should be supported
臥位膝屈曲位で検査する場合, 両膝をサポートすること
- Single digit [2 may sometimes be appropriate?]
一手指にて実施 [場合によっては二手指が適切?]

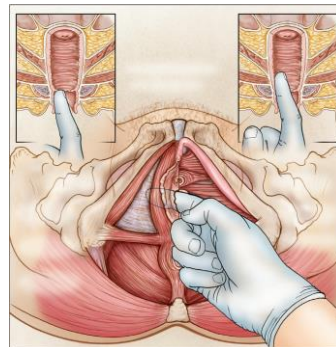
Perineum / Vulva 会陰 / 外陰



PFM assessment: superficial layer
(Sarton 2010, J Sex Med 2010;7:3526-3529)



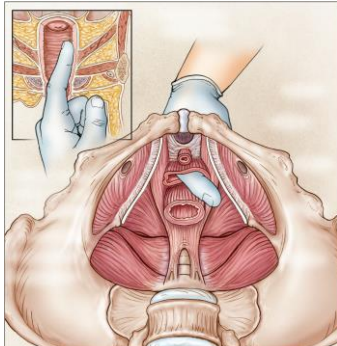
骨盤底筋評価: 表層



PFM assessment: deeper layer
(Sarton 2010, J Sex Med 2010;7:3526-3529)



骨盤底筋評価: 深層



Visual assessment of PFM activity



骨盤底筋活動の視覚的評価

Gives first impression of ability to contract & relax the PFM:
骨盤底筋が収縮・弛緩した際の第一印象を捉える

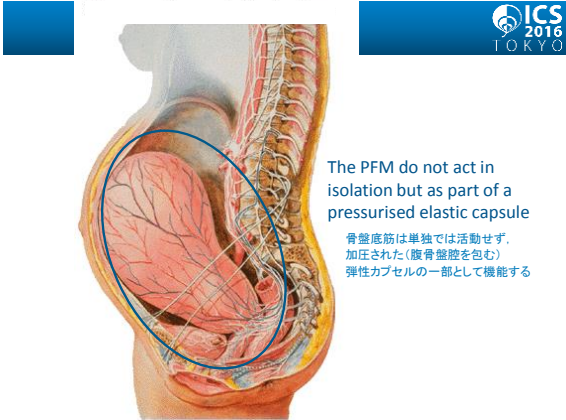
- Correct movement (inward movement of perineum)
適切な動き 会陰部の(骨盤)内方向への動き
- No contraction (no movement of perineum)
収縮なし 会陰部の動きが全くない
- Straining (outward movement of perineum)
いきんだ状態 会陰部の(骨盤)外方向への動き

Position: Crook lying, sitting 姿勢: クロック臥位, 座位

The inward movement cannot be measured with validity
会陰部の内方向への動きを, 妥当性を持って計測することは困難

- May be only the perineal muscles contracting
会陰筋のみ収縮している可能性
- Difficult to observe movement in obese women
肥満傾向の女性では動きを観察することが困難

Now let's practice this では練習してみましょう



The PFM do not act in isolation but as part of a pressurised elastic capsule

骨盤底筋は単独では活動せず、加圧された(腹骨盤腔を包む)弾性カプセルの一部として機能する



Pelvic floor function as part of the abdominal capsule アブドミナル・カプセルの一部としての骨盤底の機能

The pelvic floor muscle (PFM) contracts synergistically with transversus abdominis 骨盤底筋は腹横筋と協働的に収縮 (Sapsford, 2001, Neumann, 2002)

Specifically the lower 1/3 of TrA (Urquhart, 2003) 特に腹横筋下部1/3部分

This is commonly disrupted in PFD, in 43% of subjects 骨盤底機能障害では、多くの場合この協働収縮が消失している(43%)

(Thompson et al 2003)

30% depressed pelvic floor when asked to perform TrA contraction alone (Bo et al 2002)

腹横筋の単独収縮時に、30%の女性が骨盤底を押し下げる方向に運動

Urethral pressure rises before a rise in IAP: S234 reflex arc causing a PFM contraction (Sapsford, 2001)

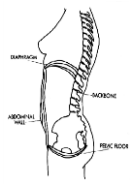
腹腔内圧が上昇する前に尿道内圧が上昇: S234の反射弓が骨盤底筋収縮を誘発

A maximal PFM contraction recruits all abdominal muscles (Bo, 1995)

骨盤底筋の最大収縮は全腹部筋を収縮させる

PFM are more effective with normal lumbar curve (Sapsford, 2001)

腰椎湾曲が適切な場合、骨盤底筋は最も効果的に機能する



PFM and TrA synergy 骨盤底筋と腹横筋の協働作用

Aim of study: To compare the effectiveness of PFM activity on instruction to contract PFM, TrA and combined contraction

(Bo, Sherburn et al NAU 2003)

研究目的: 骨盤底筋、腹横筋の単独収縮、もしくは両方の協働収縮のうち、効果的に骨盤底筋を活動させる方法を比較・検討

- PF imaged on ultrasound; all participants could contract their PFM 超音波検査にて骨盤底を画像化: 全被験者において骨盤底収縮が可能

- Significant difference ($p < 0.05$) in PF displacement with PFM instruction, TrA and combined contraction

骨盤底筋、腹横筋の単独収縮、両方の協働収縮において、骨盤底の移動距離に有意差 ($p < 0.05$) を認めた



ICS 2016 TOKYO

Muscles 筋	Mean Displ mm (95% CI)
PFM 骨盤底筋	11.2 (7.2 – 15.3)*
TrA 腹横筋	4.3 (-0.2 – 8.8)**
PFM + TrA	8.5 (5.2 – 12.0)***

骨盤底筋+腹横筋

*PFM vs TrA; $p = 0.002$

**TrA+PFM vs TrA; $p = 0.003$

***TrA+PFM vs PFM; $p = 0.038$

30% depressed pelvic floor when asked to perform TrA contraction alone 腹横筋単独収縮時に、30%が骨盤底を押し下げる方向に運動

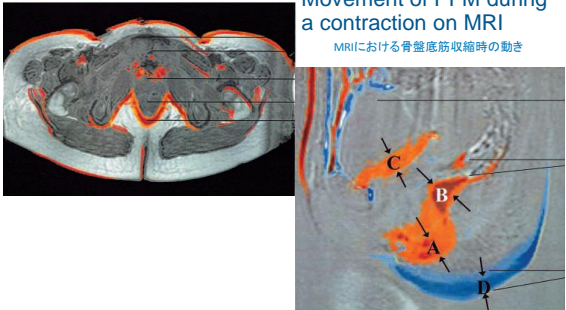
- 33% of these could not counteract this depression with voluntary PFM contraction 内33%はこの下方運動を、骨盤底筋の随意収縮にて修正することができなかった

- Implications for practitioners, esp Pilates and similar who do not visualise the perineum ピラテスや他類似した運動等、会陰部を視覚的に確認せず指導する場合には注意が必要



Movement of PFM during a contraction on MRI

MRIにおける骨盤底筋収縮時の動き



Constantinou et al 2002 BJU



Formulating Treatment 系統立った治療

Putting it all together ... まとめてと...

i.e. Clinical Reasoning

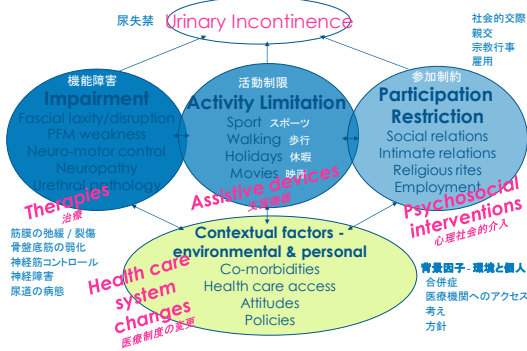
つまり、クリニカル・リーズニング(臨床推論)

Perform your assessment of a particular patient and

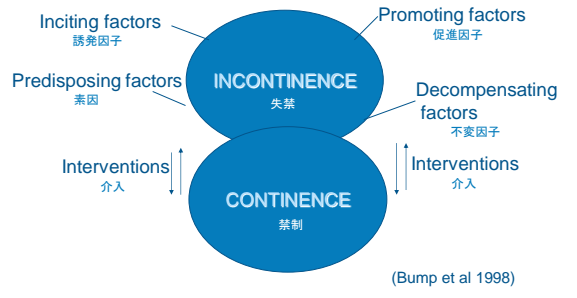
特定の患者に評価を実施した後、

- determine the aims of treatment 治療目的を決定
- prioritise these aims これら目的の優先順位を付ける
- decide on the intervention 治療・介入方法を決定
- undertake the intervention 決定した治療・介入を実施
- assess the intervention 治療・介入の効果を検証

ICF Classification of incontinence, & treatment options
失禁におけるICF分類と治療選択



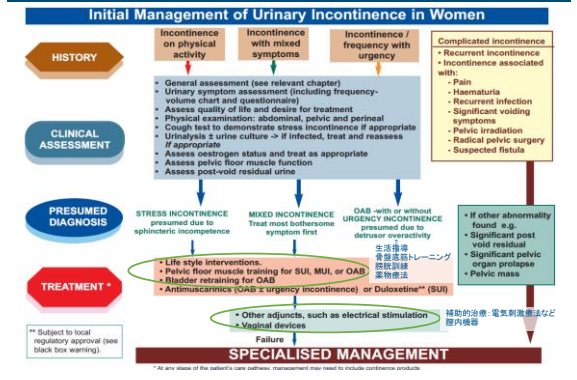
Urinary incontinence model 尿失禁モデル



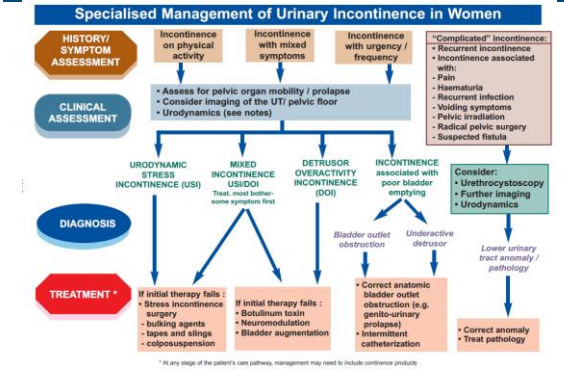
Factors to consider in treatment:
治療上、検討すべき因子

- Predisposing factors: 素因**
- female, older age, family history, congenital defects, connective tissue, neurological defects 女性、高齢、家族歴、先天性欠損、結合組織、神経異常
- Inciting factors: 誘発因子**
- vaginal delivery nerve damage, neurological disease, lung disease, bladder outlet obstruction in men 経膣分娩による神経損傷、神経疾患、肺疾患、男性の膀胱下尿道閉塞
- Promoting factors: 促進因子**
- constipation, straining, obesity, occupation, recreation, smoking, pelvic surgery, menopause, menstrual cycle, medication, UTI, candida, toilet habits 便秘、いきみ、肥満、職業、余暇活動、喫煙、骨盤手術、更年期、月経周期、尿路感染症、カンジダ菌、排泄習慣
- Decompensating factors: 不変因子**
- Ageing, delirium, atrophic vaginitis, medications, mobility/debility, endocrine disorders (Thyroid & T2DM), stool impaction 加齢、せん妄、萎縮性膣炎、薬物療法、可動性/衰弱、内分泌疾患(甲状腺、2型糖尿病)、宿便

www.ics.org ICI 2013 Incontinence, 5th ed
ICS 2013 尿失禁 第5版



www.ics.org ICI 2013 Incontinence, 5th ed
ICS 2013 尿失禁 第5版



A typical patient, Hanako ...
典型的症例、花子さんの場合...

Hanako is a 38 year old mother who presents to your clinic. She is concerned because she has been developing 'a weak bladder' since the birth of her 3rd child 2 years ago.

花子さんは、38歳女性、2年前に3人目を出産してから「膀胱が弱」なってきたことを懸念し、理学療法士を訪問。

What is the key information? 鍵となる情報は何か？

What is her presenting problem? 花子さんが呈している問題は何か？

What might be the cause of her problem(s)? 上記問題を生じている原因として、何が考えられるか？

Do you need further information to refine your hypotheses? 仮説を検証する上で更に必要となる情報はるか？

More about Hanako 花子さんについての追加情報



- She plays volleyball x2/week 週2回バレーボールの練習に参加
- Now has frequent small leaks when she runs or stretches for a ball
最近では、走行やボールに向かってのリーチの際、頻回に少量の尿漏れがある
 - Sometimes has to change her pad during the game
時々、ゲーム中にパッドを交換しなければいけない場合もある

General health excellent, normal BMI, no surgery

一般的健康状態は良好、BMI正常値、手術歴なし

Job is a retail manager of a small to medium business

仕事：中小企業の小売マネージャー

- Works 2 days/week 週2日業務

Has had 3 vaginal births 子供は3人とも経産分娩にて出産

- Last baby was largest at 3500gm, very fast labour, large episiotomy
3人目は一番大きく3500g、分娩は短時間、広範囲の会陰切開あり
- She did PFMT after all babies, but after this baby the 'exercises felt different'

産後は毎回骨盤底筋トレーニングを実施したが、3人目の産後は「何か違う感じ」がしたとのこと

All babies breastfed to about 9 months 全て産後9ヶ月間は授乳

- Other 2 children are 6 & 8yrs 他の2人の子供はそれぞれ6歳と8歳

Objectively, on vaginal examination ...

客観的経産評価にて...



What if her muscles were weak, minimal occlusion, in-coordinate contraction, 4 sec hold, perineal descent with a cough?

骨盤底筋が弱く、締め付けも困難、収縮は非協調的であり、収縮保持は4秒間のみ、咳嗽にて会陰部の下方への動きを確認。この場合、どのように評価結果を考察するか？

versus

What if you found her PFM were strong, responsive, good occlusion, 30 sec hold, with full relaxation, reflex action with a cough?

骨盤底筋は強く、締め付けも良好、反応は良く、収縮保持は30秒間可能、完全に弛緩することもでき、咳嗽にて反射的に骨盤底を活動させることができる。この場合の考察は？

Decide on a treatment plan for Hanako

花子さんの治療計画を立案してみましょう

Yuka Yokoi



Affiliations to disclose[†]:

Nil

Funding for speaker to attend:

- Self-funded
- Institution (non-industry) funded
- Sponsored by:

[†] All financial ties (over the last year) that you may have with any business organisation with respect to the subjects mentioned during your presentation

EC15 Conservative Management of Adult Pelvic Floor Dysfunction: a Physiotherapy Approach



Functional Anatomy of the Pelvic Floor

骨盤底における機能解剖

Yuka Yokoi, Ph.D, RPT

University of Melbourne,

Postgrad Cert Physio

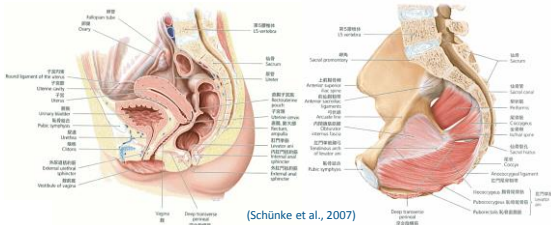
(Continence and pelvic floor rehabilitation)

Contact: yuka_yokoi@yahoo.co.jp

What is the Pelvic Floor? 骨盤底とは?



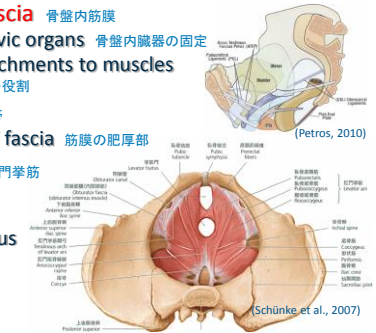
- ❖ Sling of fascia, ligaments and muscles 骨盤内(底)に位置する筋膜, 靭帯, 筋によるスリング
 - ◆ Supporting pelvic organs 骨盤内臓器の支持
 - ◆ Bladder, uterus, bowel 膀胱, 子宮, 腸



What is the Pelvic Floor? 骨盤底とは?



- ❖ Endopelvic fascia 骨盤内筋膜
 - ◆ Stabilises pelvic organs 骨盤内臓器の固定
 - ◆ Provides attachments to muscles 筋の附着部としての役割
- ❖ Ligaments 靭帯
 - ◆ Thickening of fascia 筋膜の肥厚部
- ❖ Levator ani 肛門挙筋
 - ◆ Puborectalis 恥骨直腸筋
 - ◆ Pubococcygeus 恥骨尾骨筋
 - ◆ Iliococcygeus 腸骨尾骨筋

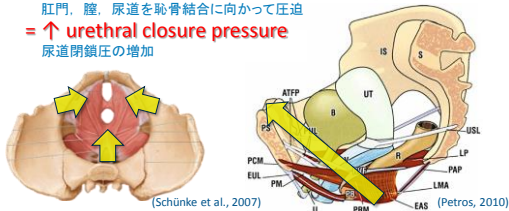


During a Normal PFM Contraction...



骨盤底筋が正常に収縮すると...

- 1) Urethral, vaginal and anal closure 尿道, 膣, 肛門が閉口
- 2) Forward and upward movement of PF 骨盤底が前上方へ運動
 - = Compresses anus, vagina & urethra against PS 肛門, 膣, 尿道を恥骨結合に向かって圧迫
 - = ↑ urethral closure pressure 尿道閉鎖圧の増加

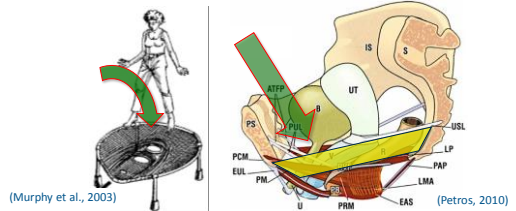


During a Normal PFM Contraction...



骨盤底筋が正常に収縮すると...

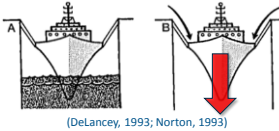
- 3) Resistance to downward movement of organs 臓器の下方への動きに対して抵抗
 - ❖ When PFM is functional 骨盤底筋が機能している場合
 - ◆ ↑ IAP = ↑ urethral closure pressure 腹腔内圧の増加 = 尿道閉鎖圧の増加



“Boat in Dry Dock Theory” 「水の無いドックのボート」理論



- ❖ **PFM = functional** 骨盤底筋 = 機能的
 - ◆ **Fascia & ligaments = under minimal tension**
筋膜と靭帯 = 最小限の負荷
- ❖ **PFM = relax or are damaged** 骨盤底筋 = 弛緩、もしくは損傷
 - ◆ **Fascia & ligaments = under increased tension**
筋膜と靭帯 = 負荷が増大
 - ◆ **Over time connective tissue is stretched & damaged**
膠原組織(筋膜と靭帯)は徐々に伸張、損傷される



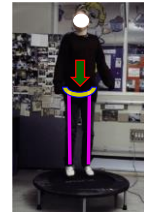
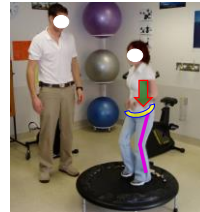
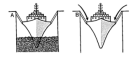
Boat: organs ボート・臓器
Moorings: fascia & ligaments
停留網・筋膜と靭帯
Water: PFM 水: 骨盤底筋

(DeLancey, 1993; Norton, 1993)

Function of PF ① 骨盤底の機能①



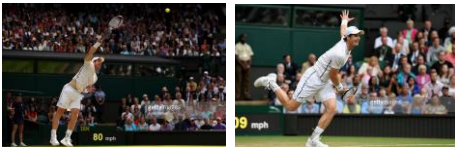
- ❖ **Carries and supports weight of pelvic organs**
骨盤内臓器を支持し、適切な位置に納める
- ◆ “Boat in dry dock theory”
“水の無いドックのボート”理論
- ◆ **Resists downward movement** 下方運動に対して抵抗



Function of PF ② 骨盤底の機能②



- ❖ **Responsive to IAP & postural changes**
腹腔内圧や姿勢の変化に対して反応する
- ◆ **Quick and strong response e.g. striking tennis ball**
素早く、かつ強い反応 例. テニスのストライク時
- ◆ **Ability to relax e.g. after striking**
(収縮のみではなく)弛緩する能力 例. ストライクの後
- ◆ **Pre-contraction of PFM e.g. coughing**
骨盤底筋のプレ収縮 例. 咳嗽

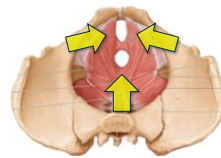


(http://www.wimbledon.com/en_GB/interactive/photos/2016.html#type=galleries&nav=113)

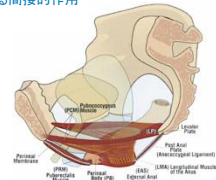
Function of PF ③ 骨盤底の機能③



- ❖ **Closes urogenital hiatus and anus**
尿生殖裂口と肛門を閉口する
- ◆ **Directly by PFM**
骨盤底筋による直接的な作用
- ◆ **Indirectly by working synergistically with sphincter Ms**
括約筋と協働的に活動することによる間接的な作用



(Schünke et al., 2007)



(Petros, 2010)

Function of Sphincter Muscles 括約筋群の機能



- ❖ **Closes urethral lumen** 尿道腔を閉める

1) Internal sphincter

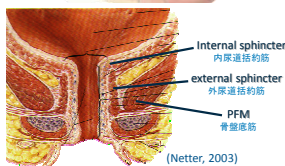
- ◆ **Involuntary**
不随意筋
- ◆ **At bladder neck**
膀胱頸部に位置



(Schünke et al., 2007)

2) External sphincter

- ◆ **Voluntary**
随意筋
- ◆ **At mid-urethra**
尿道中部に位置

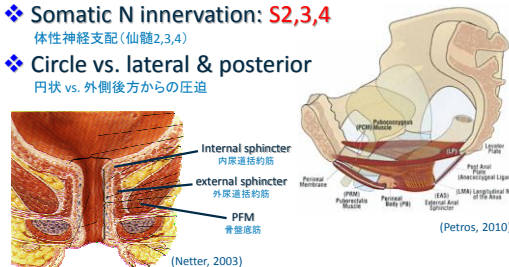


(Netter, 2003)

PFM & Sphincter Muscles 骨盤底筋と括約筋群



- ❖ **Linked anatomically and neurologically**
解剖学的・神経学的な連結あり
- ❖ **Somatic N innervation: S2,3,4**
体性神経支配(仙髄2,3,4)
- ❖ **Circle vs. lateral & posterior**
円状 vs. 外側後方からの圧迫



(Netter, 2003)

(Petros, 2010)

Reference list 参考文献



1. Bø, K., Berghmans, B., Mørkved, S., & Van Kampen, M. (Eds). (2015). *Evidence-Based Physical Therapy for the Pelvic Floor (2nd ed.)*. Croydon: Churchill Livingstone Elsevier.
2. Shünke, M., Schulte, E., Shumacher, U., & Rude, J. 坂井建雄, 松村謙児 監訳 (2007) 『プロメテウス解剖学アトラス 解剖学総論/運動器系』医学書院
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Yuka Yokoi 

Affiliations to disclose[†]:

Nil

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EC15 Conservative Management of Adult Pelvic Floor Dysfunction: a Physiotherapy Approach 

Principles of Teaching PFMT and Training

骨盤底筋トレーニングにおける原則

Yuka Yokoi, Ph.D, RPT
University of Melbourne,
Postgrad Cert Physio
(Continance and pelvic floor rehabilitation)
Contact: yuka_yokoi@yahoo.co.jp

PFMT: a Balance 骨盤底筋トレーニング: バランス 

❖ PFM function 骨盤底筋の機能


- ◆ Tone, strength, endurance & power 筋緊張、筋力、持久性、パワー
- ◆ Response 反応
- ◆ Trunk posture 体幹の姿勢

❖ Load on PF 骨盤底への負荷

- ◆ Obesity 肥満
- ◆ Coughing 咳嗽
- ◆ High impact exercise 衝撃の強い運動
- ◆ Heavy lifting 重労働
- ◆ Constipation 便秘

❖ PF integrity 骨盤底の構造

- ◆ Pelvic surgery 骨盤の手術
- ◆ Pelvic neuropathy 骨盤内の神経障害
- ◆ Childbirth/parity 出産/経産回数
- ◆ Increasing age 加齢

Management of LUT Dysfunctions 下部尿路障害に対するマネージメント 

SUI 腹圧性尿失禁
(↓ fascia, lig & Ms)
筋膜・靭帯・筋の機能低下

MUI 混合性尿失禁
SUI + UII

UII 切迫性尿失禁
(Overactive bladder)
過活動膀胱


Conservative management by physiotherapists
理学療法士による保存療法

↕

Containment by nurses
看護師による管理
◆ Pads/napkin パッド・ナプキン
◆ Catheterization カテーテル法

Medical management by urologist & (uro)gynecologist
泌尿器科・婦人科医による医学的管理

- ◆ Surgery 手術
- ◆ Sacral neuromodulation 仙骨神経刺激療法
- ◆ Medication 薬物療法
- ◆ Oestrogen エストロゲン
- ◆ POP 骨盤臓器脱
- ◆ UTI 尿路感染症

Management of LUT Dysfunctions 下部尿路障害に対するマネージメント 

Conservative management by physiotherapists
理学療法士による保存療法

PFMT
骨盤底筋トレーニング


- ◆ Life-style Interventions 生活指導
- ◆ Bladder Training 膀胱訓練

Release techniques
リリーステクニック

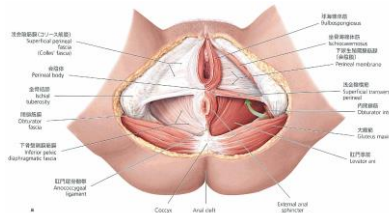
- ◆ E-stim 電気刺激療法
- ◆ sEMG 表面筋電図

Functional training
機能的トレーニング

- "The Knack" ナック
- postural change 姿勢変化
- sports activity スポーツ活動

Principles of PFMT ① PFMTの基本① 

- Introduce the PF &PFMT 骨盤底とトレーニングの説明
 - ◆ Understand anatomy and function 解剖と機能の理解
 - ◆ Search and find own PFM 自身の骨盤底筋を確認



(Schünke et al., 2007)

Principles of PFMT ② PFMTの基本②

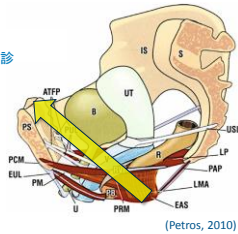
2. Introduce **correct isolated PFM contraction**

= Motor control

骨盤底筋の適切な単独収縮(モーターコントロール)の説明

❖ **Feedback** フィードバック

- ◆ **Vaginal palpation** 経膣触診
- ◆ **Visual feedback**
視覚によるフィードバック
- ◆ **BioFB (sEMG)**
バイオフィードバック(表面筋電図)
- ◆ **Electrical stimulation**
電気刺激療法



(Petros, 2010)

Principles of PFMT ③ PFMTの原則③



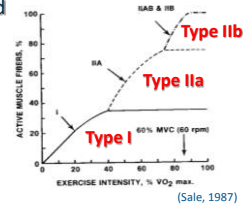
3. Train all aspects of PFM function

骨盤底筋の全ての機能を強化

- ◆ **Motor control (specificity)** モーターコントロール(特異性)
- ◆ **Strength***: maximum voluntary contraction
筋力: 最大随意収縮
- ◆ **Power*** = strength + speed
パワー = 筋力 + スピード
- ◆ **Endurance*** 持久性
= long hold/ repetitions
長時間保持/ 繰り返し
- ◆ **Relaxation** リラクゼーション

*Overload principle

過負荷の原則



(Sale, 1987)

Principles of PFMT ④ PFMTの基本④

4. Progress to **functional use** of PFM

機能的場面での収縮・活動へと発展

❖ **Pre-contraction of PFM: "The Knack"**

骨盤底筋のプレ収縮: ナック

e.g. before coughing, sneezing or activities ↑ IAP

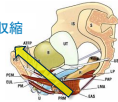
例. 咳嗽やくしゃみ, 腹腔内圧を上昇させる活動の前に収縮

❖ **PFM contraction during ADL**

日常生活活動中における骨盤底筋の収縮

e.g. during walking, bending forward, lifting or sports-specific movements

例. 歩行や前屈, 持ち上げ動作, スポーツ特有の動きの際に収縮



Reference list 参考文献



1. Bø, K., Berghmans, B., Mørkved, S., & Van Kampen, M. (Eds.).(2015). *Evidence-Based Physical Therapy for the Pelvic Floor (2nd ed.)*. Croydon: Churchill Livingstone Elsevier.
2. Abrams, P., Cardozo, L., Khoury, S., & Wein, A. (Eds.). (2013). *Incontinence: 5th International Consultation on Incontinence*. (5th ed.). Arnhem: European Association of Urology.
3. Shünke, M., Schulte, E., Shumacher, U., & Rude, J. 坂井建雄, 松村謙児 監訳 (2007) 『プロメテウス解剖学アトラス 解剖学総論/運動器系』医学書院
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5. Sale, D. G. (1987). Influence of exercise and training on motor unit activation. *Exerc Sport Sci Rev*, 15, 95-151.

Affiliations to disclose[†]:

Chair of the ICS Physiotherapy Committee

Chair of the UK Pelvic, Obstetric and Gynaecological Physiotherapy sub-committee of the Chartered Society of Physiotherapy.

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Adjunctive treatments for pelvic floor dysfunction –

骨盤底機能障害に対する補助的治療 –

Biofeedback, Electrical stimulation and Ultrasound

バイオフィードバック, 電気刺激療法, 超音波療法

nmahp-ru
Nursing, Midwifery and Allied Health Professions Research Unit

Improving health through research  CHIEF SCIENTIST OFFICE

Doreen McClurg

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Adjunct 補助

- An adjunct is an aide
補助とは支援である
- Patient Understanding – why and how
患者による理解 – 何故, どのように
- Patient belief – self-efficacy
患者の思い – セルフ・エフィカシー(自己効力感)
- Patient adherence to do enough exercises to make a difference
患者のアドヒアランス – 変化を生じるための十分な運動の実施

Principles of feedback フィードバックの原則

- **Feedback** studies are those which use a clinician mediated method of giving information about a voluntary pelvic floor muscle contraction back to the woman performing the contraction.

フィードバックとは、随意的骨盤底筋収縮に対し、それを実施した被験者に、臨床家が通常使用する方法を用いて情報を提供することである

- In practice, this means verbal feedback from observation or palpation of the perineum, vagina or anus during a contraction.

これは臨床において、筋収縮中に、会陰部、膣、肛門の視診・触診にて得られた情報を、口頭のフィードバックにて提供することである

Herderschee R, Hay-Smith EJC, Herbison GP, Roovers JP, HeinemanMJ. Feedback or biofeedback to augment pelvic floor muscle training for urinary incontinence in women. *Cochrane Database of Systematic Reviews* 2011, Issue 7. Art.No.: CD009252. DOI: 10.1002/14651858.CD009252.

Biofeedback バイオフィードバック

Biofeedback (BF) studies use an instrument or device to record the biological signals (e.g. squeeze pressure, electrical activity, movement) during a voluntary pelvic floor muscle contraction and present this information back to the woman in auditory or visual form (for example, the sound gets louder or more lights show on a visual display as the strength of the squeeze increases).

バイオフィードバック(BF)は、随意的骨盤底筋収縮中に、生体信号(例. 圧迫力, 電気活動, 動き)を記録する機器を用い、この情報を聴覚, もしくは視覚信号に変換して、被験者に提示するものである(例. 筋活動による圧迫力が強くなるに従い、画面上の光が強くなる, もしくは音が大きくなる, 等)

ICS definition ICSによる定義

- ‘the technique by which information about a normally unconscious physiologic process is presented to the patient and/or therapist as a visual, auditory or tactile signal’

“通常、無意識下で行われている生理的過程に関する情報を、視覚、聴覚、触覚信号を用いて、患者や検者に提示する技術”

Useful for : - 以下の状態において有用: -

- **Weak pelvic floor - loss of proprioception**
骨盤底の弱化 – 固有受容感覚の消失
- **Substitution of other muscle groups**
他筋群による代償運動
- **Loss of motivation**
モチベーションの消失

Feedback/Biofeedback tools

フィードバック / バイオフィードバック手段

- Digital vaginal palpation 手指による経膣触診
- Digital self-palpation 自己の手指による触診
- Digital vaginal palapation with pressure to increase proprioception to identify PFM
骨盤底筋を確認するために、手指経膣触診時の圧迫を強め、固有受容感覚を刺激する
- Mirror 鏡

Biofeedback tools

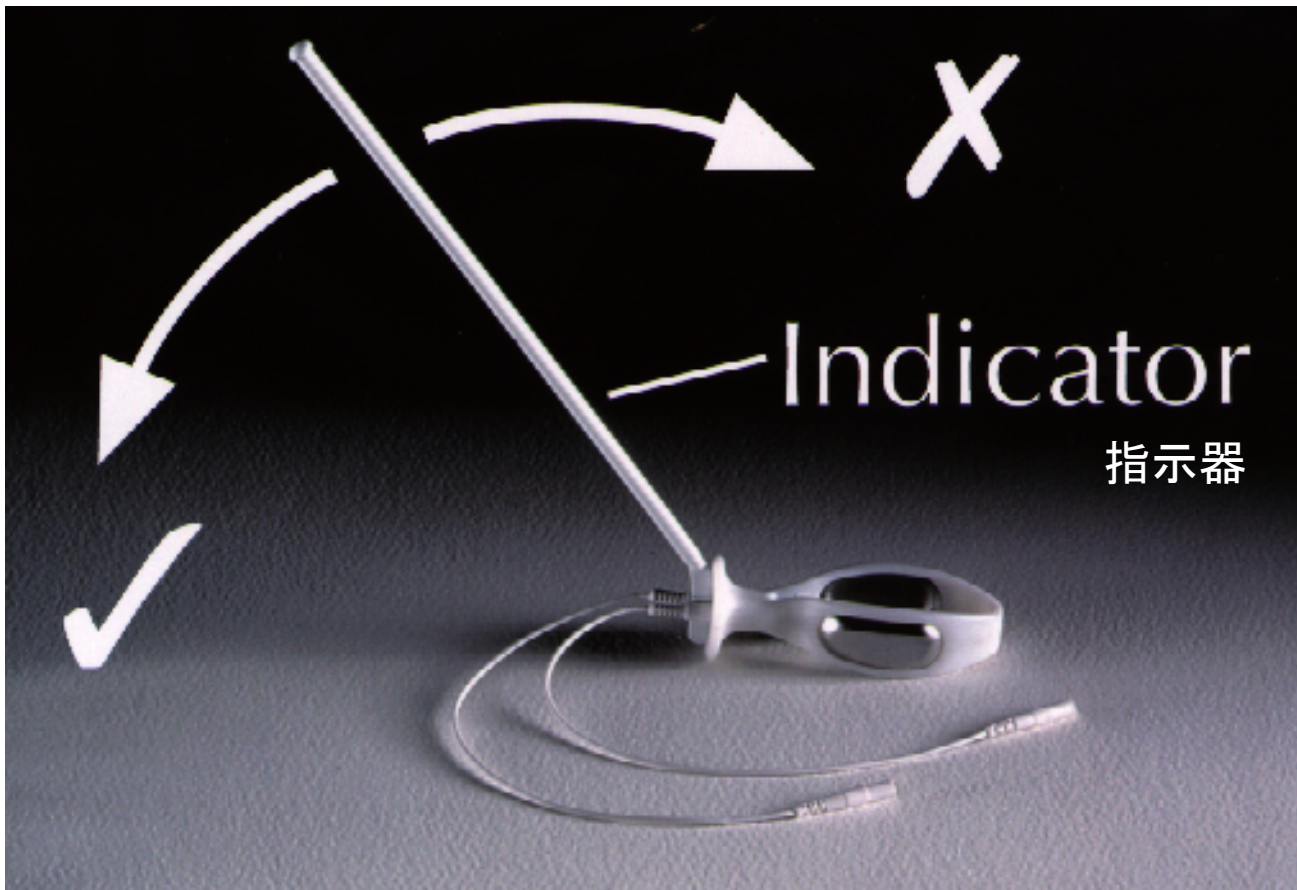
バイオフィードバック手段

- Educator Vaginal cones 教育的膣コーン
- Manometry マノメトリー(検圧計)
- Electromyography 筋電図
- Dynamometry ダイナモメトリー(筋力測定法)
- Ultrasound 超音波検査

Simple pelvic floor biofeedback

Periform electrode with indicator stick

シンプル骨盤底バイオフィードバック：ペリフォーム電極と指示棒



Manometric 压测定



EMG biofeedback 筋電図バイオフィードバック

EMG is the study of muscle function through the enquiry of the electrical signal which the muscle emanates

筋電図は筋線維が発生する電気信号を加算することで、筋機能を評価するものである

Basmajian & DeLuca 1985

...the recording of muscle bio-electrical activity - a practical indicator of its contractility

筋の生体電気活動を記録したもの - 筋収縮性の実用的指標となる

Vodusek 1994



Electromyography 筋電図検査



Surface sEMG Biofeedback – data collection

表面筋電図バイオフィードバック – データ収集

Onset time : Normal < 1 second 収縮開始時間: 通常1秒以内

Work average – μV 収縮時平均 – μV

Rest average – μV 休息時平均 – μV

Average deviation 平均偏差

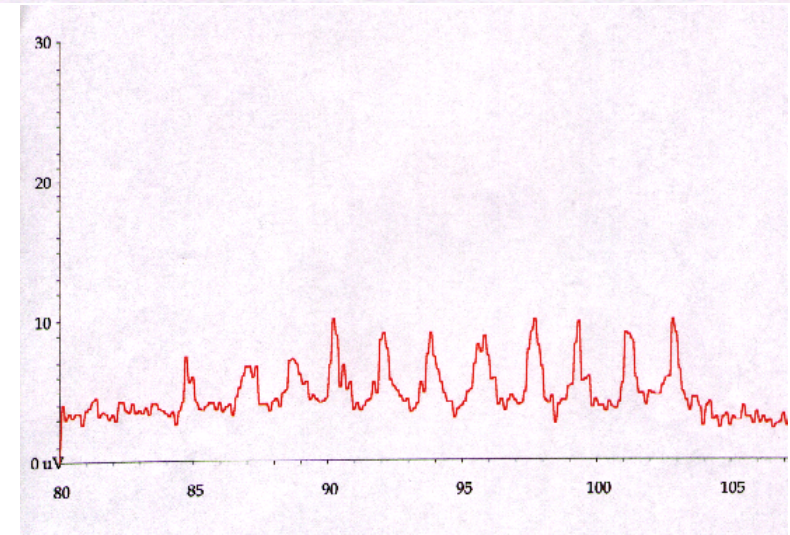
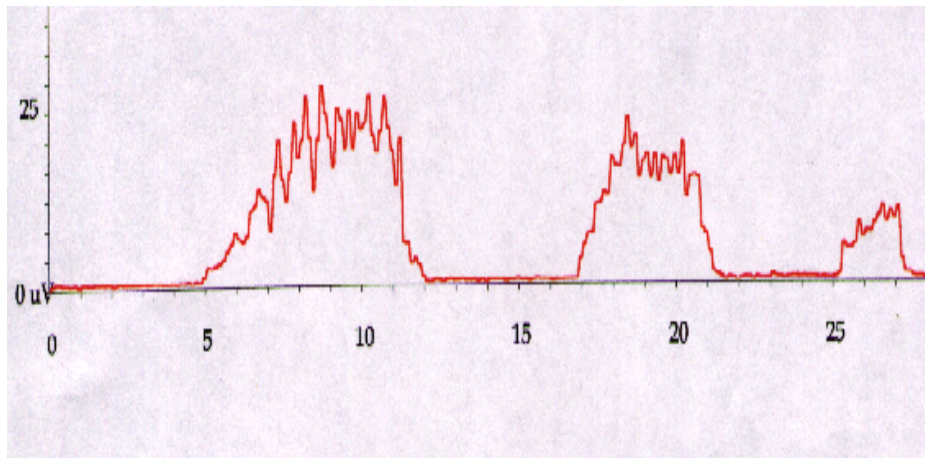
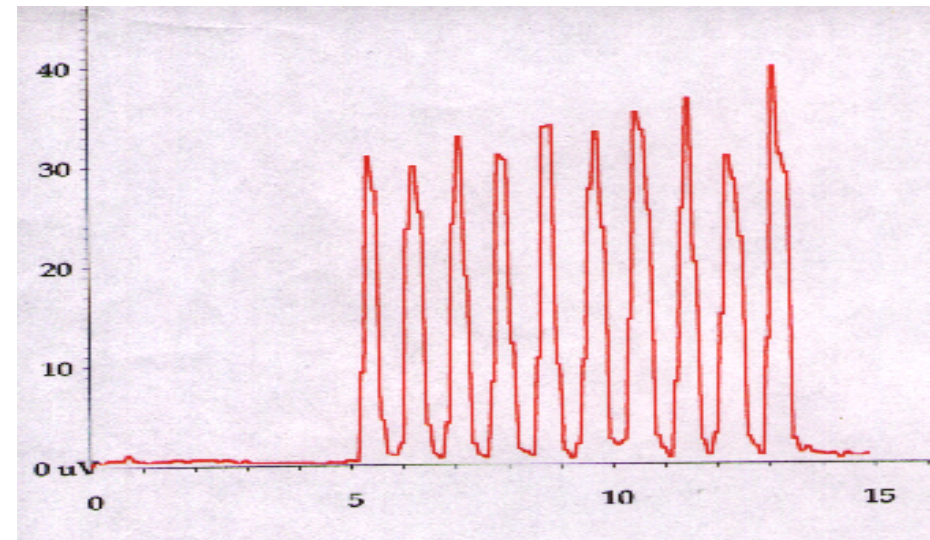
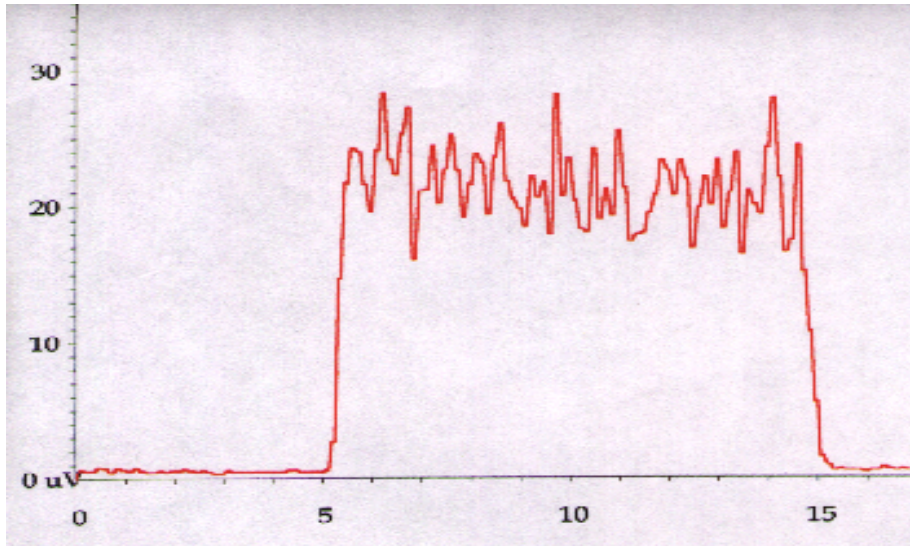
Hold time 保持時間

Release time : Normal < 1 second 弛緩時間: 通常1秒以内

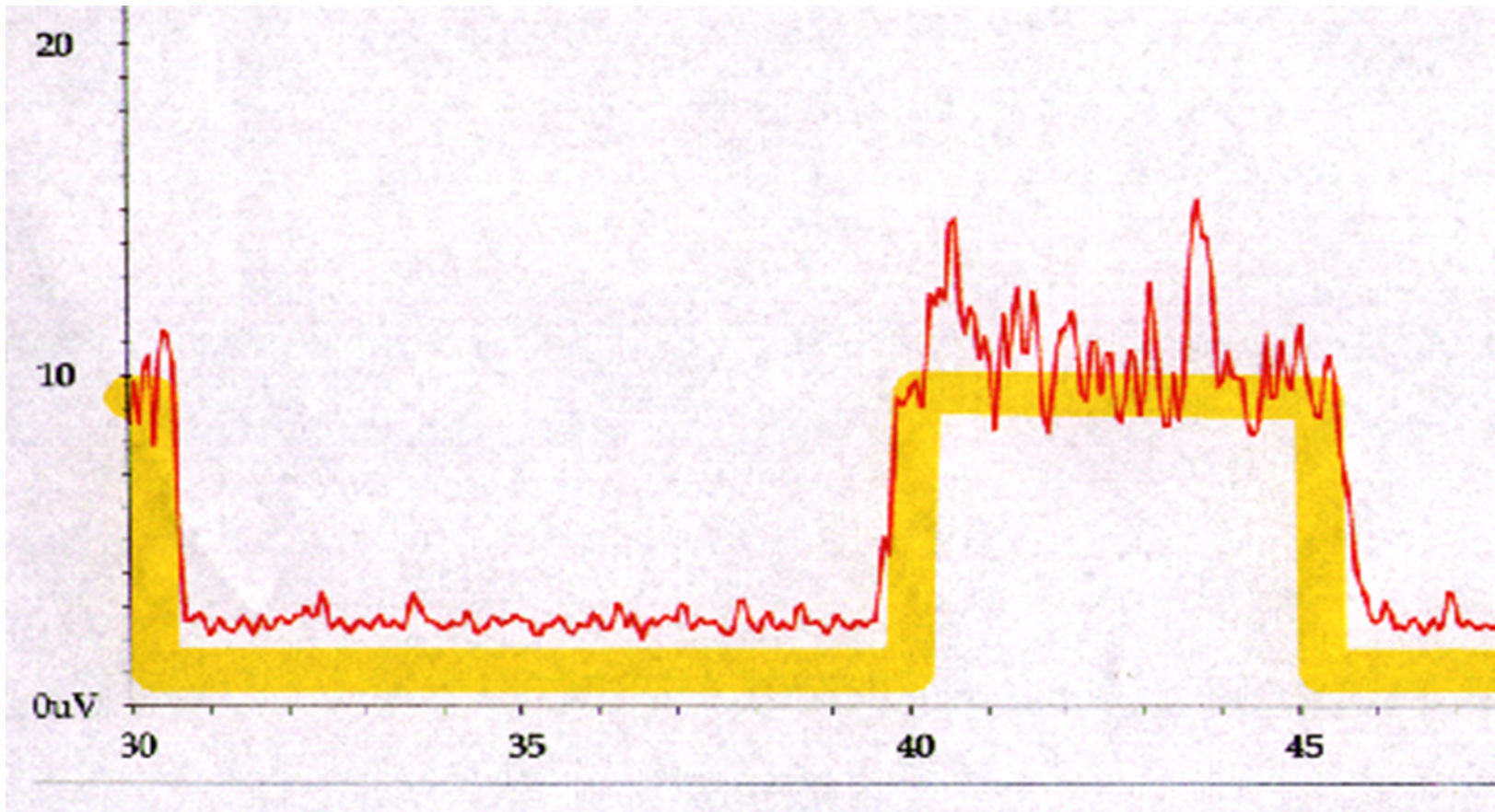
Maximum μV : varies 最大 μV : 様々

sEMG Biofeedback

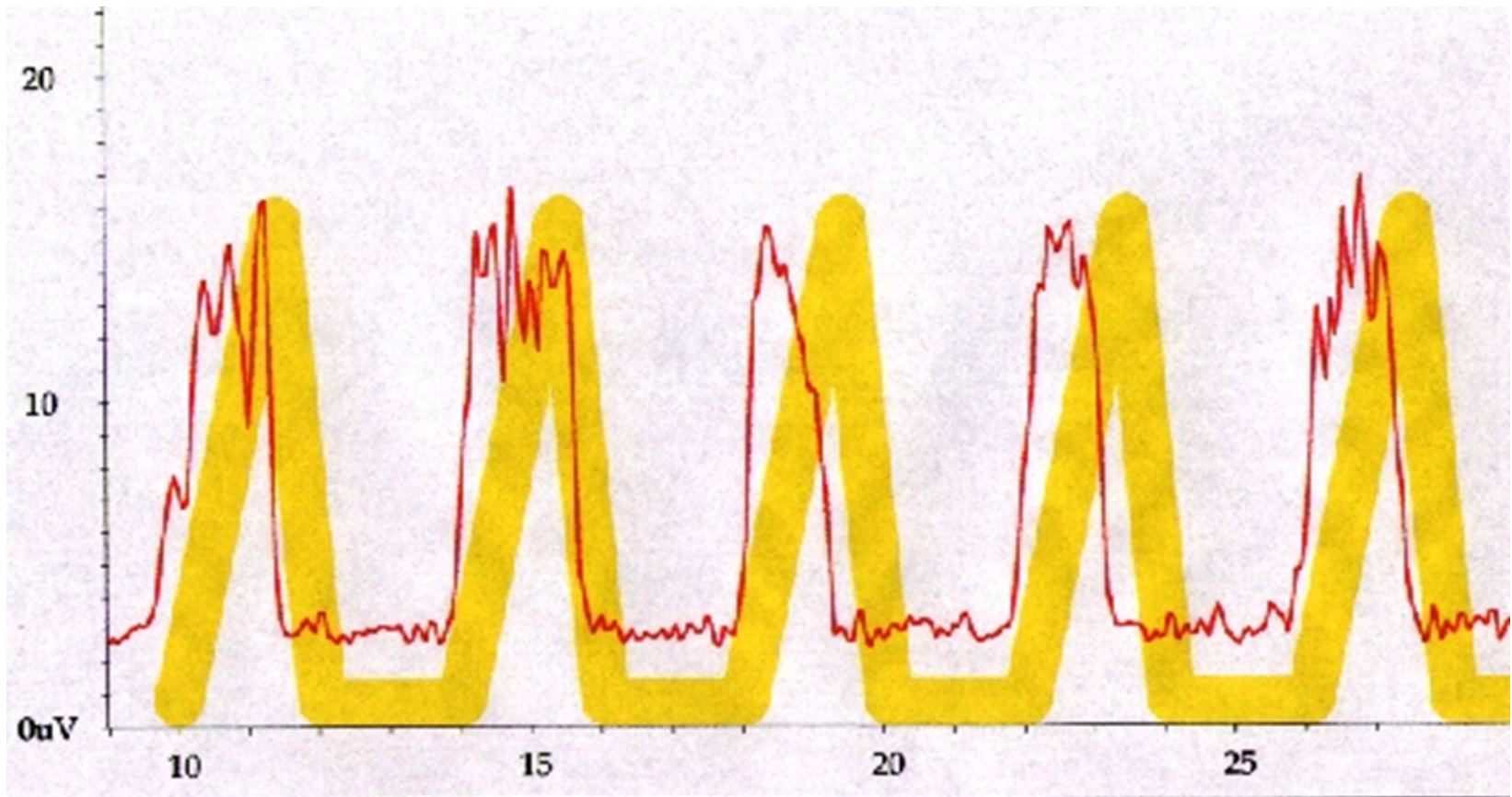
表面筋電図バイオフィードバック



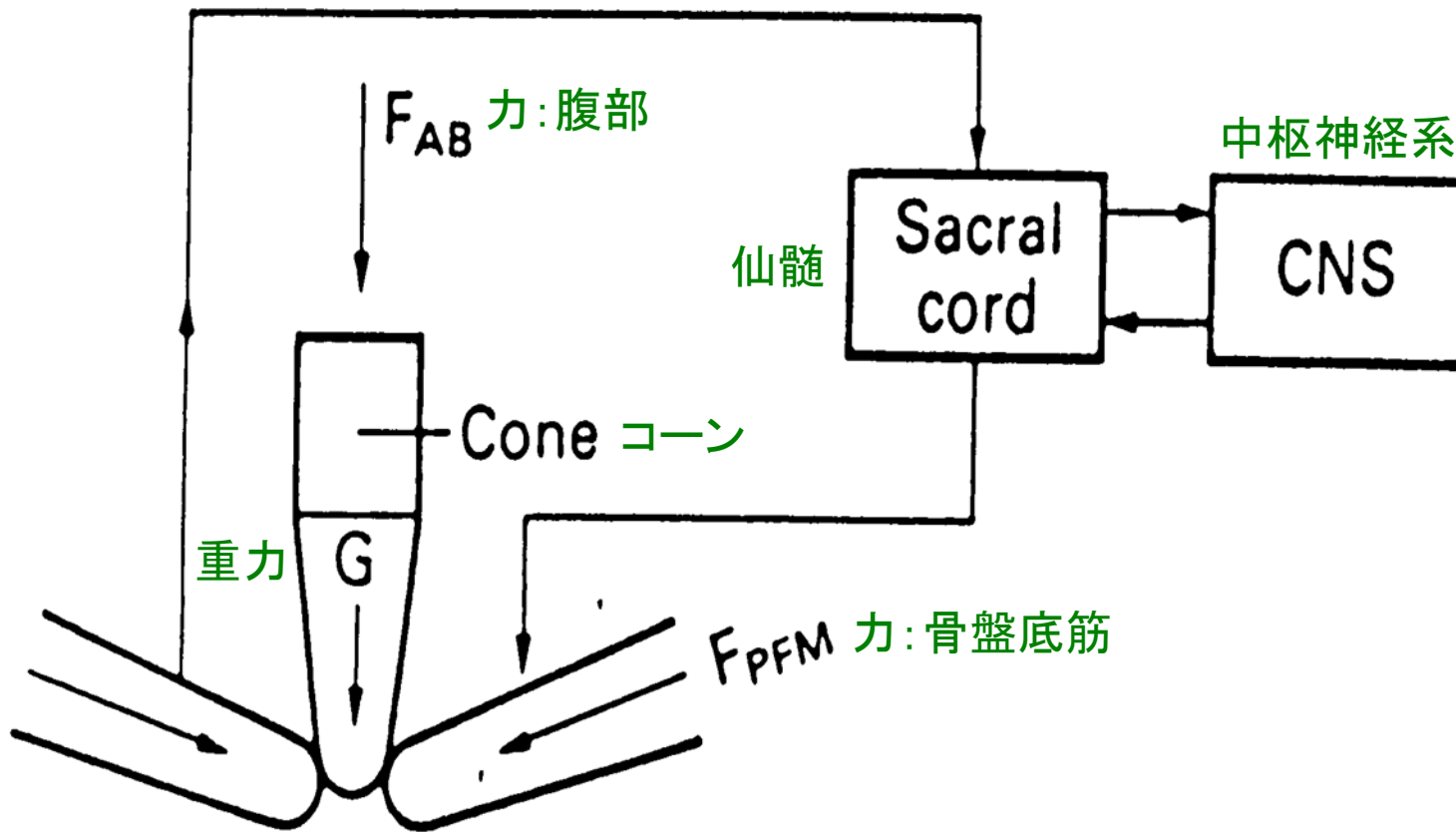
Endurance training 持久性トレーニング



Power パワー



Cones コーン



from Peattie (1988)

Aquaflex アクアフレックス



Vielle – now Boots (own brand)

バイエル – 現在ブーツ
(自己ブランド)



Regimen 処方

- 1 x per day 8 – 12 weeks
1日1回, 8-12週間
- Retain maximum weight +/- smallest size shell for up to 20 minutes
最大重量 +/- 最小形状のコーンを20分間保持
- Add activities of daily living e.g. climbing stairs, making bed
日常生活活動の中に取り入れる 例. 階段昇降, ベッドメイキング
- Useful as a progression from clinic sessions e.g. EMG Biofeedback
来診後の漸増法として有用 例. 筋電図バイオフィードバック

Principles of electrical stimulation(ES)

電気刺激療法(ES)の原則

2 major forms 電気刺激療法における2大療法

- Neuromuscular stimulation 神経筋刺激法
- Neuromodulation 神経変調療法

Intravaginal/anal ES 経膣/経肛門 ES

Primarily in the UK it is maximal ES used at high-intensity stimulus (just below pain threshold) for a short duration (15-30mins) several times a week

イギリスにおいてESは多用されており、通常、最大強度(疼痛閾値の直前)、短時間(15~30分間)、週に数回の使用が一般的である

- Assist with pelvic floor muscle contraction
骨盤底筋の収縮を助長
- Neuromodulation 神経変調療法

Parameters for Stress urinary

incontinence- Pelvic floor muscle stimulation

腹圧性尿失禁に対する設定 – 骨盤底筋刺激

- Bi-phasic constant current 二相性定電流
- Pulse rate 35-40Hz パルス頻度 35-40Hz
- Pulse width 250 msec パルス幅 250msec
- 5 sec stimulation and 10 seconds rest
5秒間刺激, 10秒間休止
- Maximum-tolerated intensity 耐える最大の強度
- Active assisted exercises 自動介助運動

Choice of electrodes 電極の選択

- Size of vagina 膣の大きさ
- Condition of tissues 組織の状態
- Use of lubricating gel 潤滑剤の使用



In clinic and or at home

クリニック, もしくは自宅にて



Neuromodulation 神経変調療法

Urgency incontinence – Sensory inhibition via a feedback loop

切迫性尿失禁 – フィードバック回路による感覚抑制

Frequency 5 - 10Hz 周波数 5-10Hz

Continuous biphasic 持続的二相性

4s stimulation 4s rest 4秒間刺激, 4秒間休止

Fall & Lindstrom (1991)
Erikson (1989)

Contraindication to use of intravaginal/ intranal ES 経腔/経肛門ES使用の禁忌

- Inability to understand/Lack of informed consent
実施することの理解が困難/ インフォームド・コンセントの欠如
- Vaginal infection 腔感染
- Known pregnancy 妊娠中
- Cancer in the area*** 局所の悪腫瘍
- Implanted pacemaker 埋込み式ペースメーカー

Contraindication to use of intravaginal/ intranal ES 経腔/経肛門ES使用の禁忌

- Recent haemorrhage 最近の出血
- Haematoma 血腫
- Tissue damage 組織損傷
- Atrophic vaginitis (treat prior to NMES)
萎縮性膣炎(神経筋電気刺激療法の前に治療が必要)
- UTI (treat before commencing NMES)
尿路感染症(神経筋電気刺激療法開始前に治療が必要)

Electrical stimulation (cont'd)

電気刺激療法(続き)

- Could try... 可能性として...
- Vital Compact neuromuscular electrical stimulation (NMES) via external garments, without the need for an internal probe
バイタル・コンパクトの神経筋電気刺激療法(NMES)を使用: 衣服を介して刺激するため, 内部プローブを使用する必要がない
- BUT limited research to support
しかし効果に関するエビデンスは不十分



ES using surface electrodes

表面電極を使用したES

Transcutaneous electrical stimulation (TENS)

経皮的電気刺激療法(TENS)

- Suprapubic 恥骨上
- Sacral or penile/clitoral attachment of electrodes
仙骨, もしくは陰茎/陰核に付着
- Plantar/thigh 足底/大腿
- Lower back 腰部

Neuromodulation: 神経変調療法

- Any medical intervention which acts on nerves to alter the neurotransmission processes of other nerves and alter the function of an organ – the bladder
神経を刺激することで、その神経伝達過程を変化させ、臓器(-膀胱)機能を変化させる医療的介入全般を示す
- Stimulation can be electrical, magnetic, chemical
刺激としては、電氣的、磁氣的、化学的なものがある

Recent advances in technology and improved knowledge of micturition physiology have coincided with the growth of neuromodulation for the treatment of **urinary urgency, urge incontinence and non-obstructive urinary retention. NOT SUI**

近年における技術発展と、排尿生理に関する知識の改善により、尿意切迫、切迫性尿失禁、非閉塞性尿閉の治療として神経変調療法が著しく発展したが、これは腹圧性尿失禁に対するものではない。

- Stimulation of afferent sacral nerves in either the pelvis or lower extremities increases the inhibitory stimuli to the efferent pelvic nerve and reduces detrusor contractility.

骨盤内, もしくは下肢の仙骨神経(上行性)に対する刺激が脊髄における抑制性伝達を促進し, 骨盤神経(下行性)を興奮させた結果, 排尿筋収縮が抑制される

- Thought to have its effect via somatic afferent nerves which modulate efferent outflow to detrusor and reduce the sensation of urgency and detrusor overactivity.

体性神経(上行性)を介して, 排尿筋を支配している下行性神経を変調することで, 切迫感や排尿筋過活動の減少に繋がると考察される

- Exact mechanism of action has yet to be fully understood

明確な機序に関しては, まだ完全に解明されていない

- Urodynamically increases in cystometric capacity shown and reduced detrusor contractility

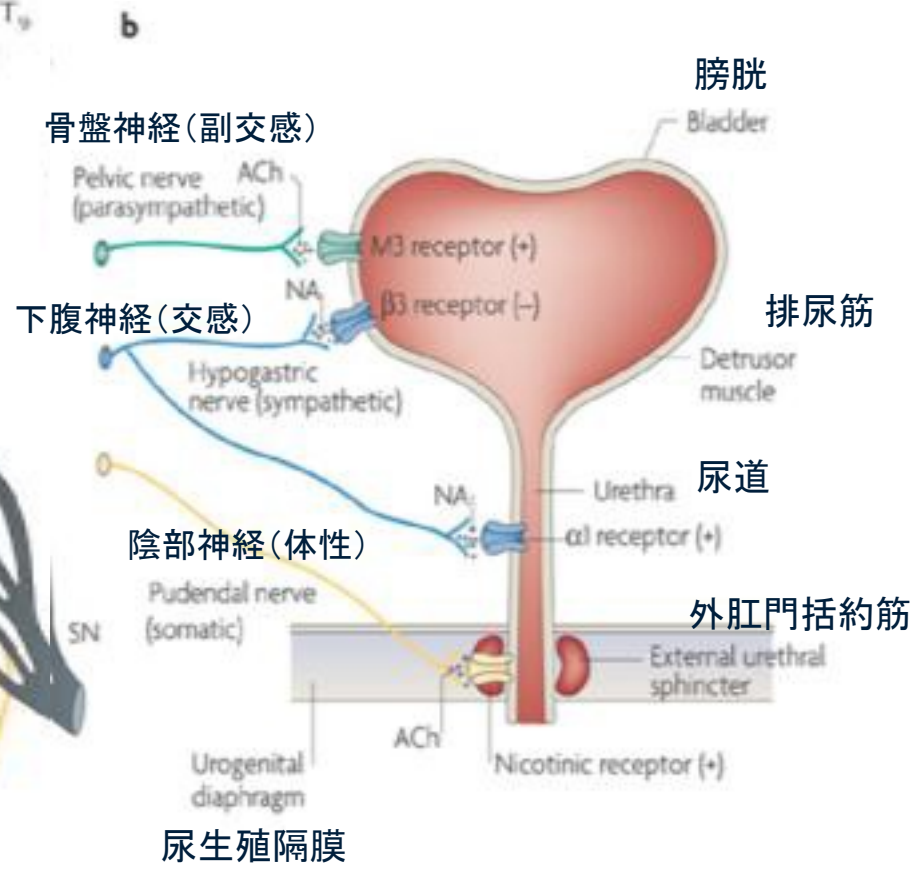
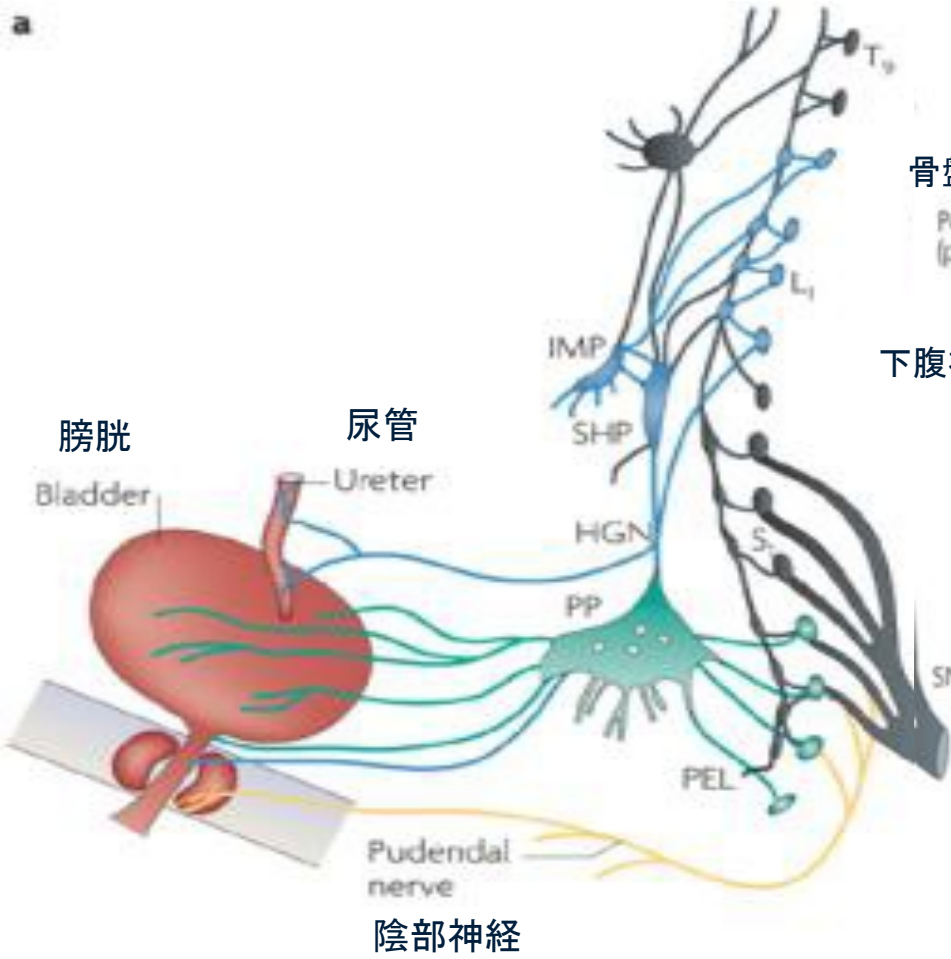
膀胱内圧測定時の膀胱容量が増加することから, 尿流動態学的にも排尿筋収縮性の低下を認めている

Posterior Tibial Nerve Stimulation – how does it work? Transcutaneous or percutaneous

後脛骨神経刺激法 – どのように機能するのか？ 経皮的, もしくは経皮穿刺

PTNS modulates the sacral nerve plexus indirectly via the posterior tibial nerve, a mixed nerve branch of the sciatic nerve that originates from the same spinal segments as the nerves controlling the bladder and pelvic floor (S2-S4).

後脛骨神経刺激法は, 膀胱と骨盤底を支配している神経(S2-4)と同様の脊髄分節から分岐する後脛骨神経(坐骨神経の分枝)を刺激することで, 間接的に仙骨神経叢を変調させる

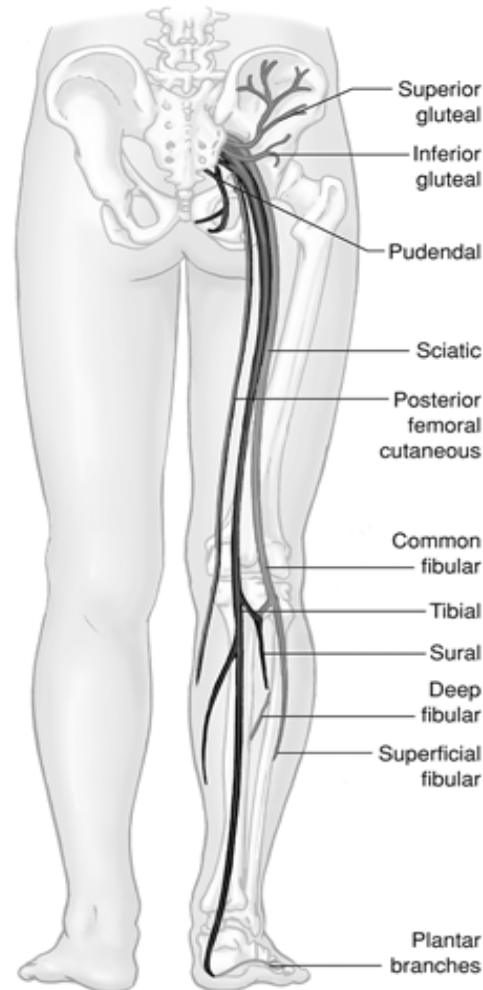


The Posterior Tibial Nerve Origins

後脛骨神経の起始

仙骨神経叢 The Sacral Plexus

Key: 前面を支配
■ = Anterior divisions
■ = Posterior divisions
後面を支配



上殿神経

下殿神経

陰部神経

坐骨神経

後大腿皮神経

脛骨神経

腓腹神経

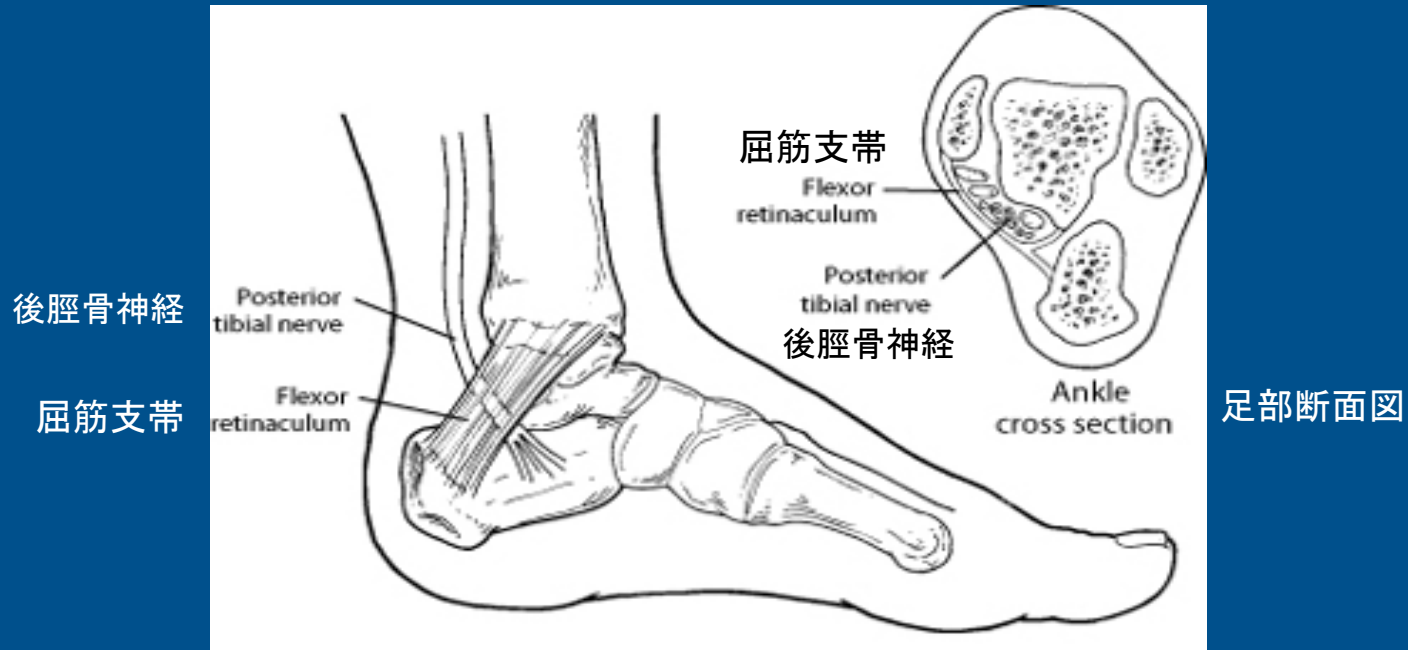
深部線維

表層線維

足底分枝

Posterior Tibial Nerve

後脛骨神經



TPTNS example protocol used in Treat-UI study

切迫性尿失禁に対する後脛骨神経刺激法の例

- Stimulation sessions delivered via two surface electrodes:
2つの表面筋電を用いて刺激を入力
 - negative electrode placed behind the medial malleolus
マイナス極は内果のすぐ後方に付着
 - positive electrode 10cm proximal.
プラス極は10cm近位部に付着
- Correct positioning determined by hallux reaction.
母趾の反応を確認しながら適切な位置に付着
- Stimulation protocol: 刺激の処方
 - fixed frequency of 10 Hz 10Hzの固定周波数
 - pulse width of 200ms パルス幅 200ms
 - continuous mode delivery 持続モード
- Stimulation intensity determined by hallux reaction and participant comfort level (range 1-90mA)
刺激強度は母趾の反応と被験者の主観的感覚をもとに決定(1-90mA)



Evidence base for transcutaneous posterior tibial nerve stimulation for bladder dysfunction

根拠に基づいた、膀胱機能障害に対する経皮的後脛骨神経刺激法

Nine studies, of variable quality 9研究, 研究の質は様々

- Six RCTs involving 202 adults (183 women) with OAB
 過活動膀胱を呈する202名の被験者(内183名が女性)を含む6つのRCT
- 3 case series involving 170 adults (158 neurogenic OAB)
 170名の被験者(内158名は神経因性過活動膀胱)を含む3つの症例研究
- 48% – 68% reported cure or improvement
 48-68%が改善, もしくは完治を報告

Transcutaneous posterior tibial nerve stimulation

経皮的後脛骨神経刺激法

- Indications that it may be effective for bladder dysfunction (small trials)

膀胱機能障害に対して効果的であることが示唆（試行実験にて）

- No safety concerns 安全性に対する懸念はなし
- Could be first-line treatment – alternative to drugs
第一選択治療になりうる – 薬物療法の代用
- Time commitment needed but can be self-managed at home

使用においては慣れるまで時間を要するが、自宅でのセルフ・マネージメントとして活用可能

- Low cost and accessible

低コスト, 利用しやすい

- Need definitive evidence of effect and application e.g. in stroke-related bladder and bowel dysfunction, Parkinson's, MS

効果や適応方法に関して, より確実で具体的なエビデンスが必要 例. 脳卒中によって生じた膀胱・直腸機能障害, パーキンソン病, 多発性硬化症に対して

Percutaneous posterior tibial nerve stimulation

経皮穿刺後脛骨神経刺激法

- Effective therapy for OAB and lower urinary tract dysfunction
 過活動膀胱と下部尿路機能障害に対する効果的治療
- Recommended by NICE for OAB treatment, as effective in short and medium term (2013)
 過活動膀胱の治療として短中期的効果を認めており、NICE(国立医療技術評価機構)により推奨されている
- No safety concerns 安全性に対する懸念はなし
- Second line treatment – after conservative approaches
 第2選択治療 – 保存療法後
- Requires significant time commitment by patient
 患者にとって時間的拘束が大きい
- Cost implications – equipment, secondary care, specialist delivery
 time implications
 費用負担 – 機器, 二次医療, 専門家を介すことによる時間的負担

Posterior Tibial Nerve 後脛骨神経

- Since 2005 Uroplasty has marketed the Urgent PC Neuromodulation System, the only PTNS device commercially available to-day



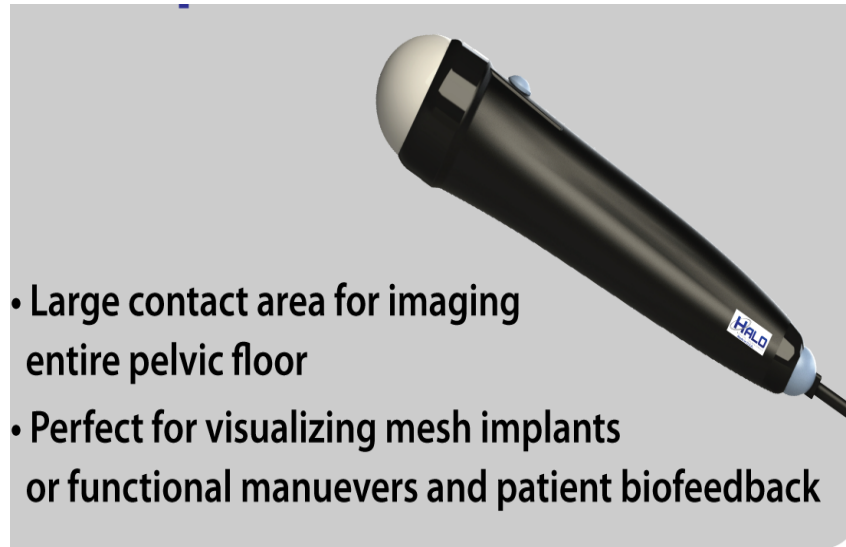
2005年より、ユーロプラスティが Urgent® PC Neuromodulation を販売し、これが現在までに唯一の市販の後脛骨神経刺激機器である

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Ultrasound 超音波検査

- All ultrasound is based on interpreting a returning echo
全ての超音波はエコーの反射を映像化したものである
- An echo is formed as the sound wave hits a tissue interface
エコーは音波が対象物(組織間の境界)に当たることで生成される
- The delay of the returning signal tells us the depth of the tissue interface
反射信号の遅れは組織の境界が深部にあることを示す



- 骨盤底全体を画像化するため、接触面を大きくしている
- メッシュ・インプラントの確認や機能的活用、患者のバイオフィードバックとして有用



The sound wave 音波

- Echogenicity エコ-輝度
- Different tissues reflect the sound wave differently 各組織は音波に対して異なった反射を示す
 - Bone: White 骨: 白
 - Liquid: Black 液体: 黒

e.g. striated muscle contains less fluid than smooth muscle therefore able to detect internal & external sphincters on endo-anal ultrasound scan

例. 横紋筋は平滑筋よりも液体含有量が少ないため、経肛門超音波検査にて内外括約筋を判別することが可能

Ultrasound 超音波檢查

- Transperineal 經會陰的
- Transabdominal 經腹的

