DOI: 10.34057/PPj.2021.40.04.2021-7-7
Pelviperineology 2021;40(4):194-202

Can interstitial cystitis be improved by the Integral Theory's squatting-based pelvic floor exercises used for SUI, urge, nocturia, and emptying symptoms?

Patricia Margaret SKILLING

Previously Kvinno Centre Perth (Retired)

Citation: Skilling PM. Can interstitial cystitis be improved by the Integral Theory's squatting-based pelvic floor exercises used for SUI, urge, nocturia, and emptying symptoms? Pelviperineology. 2021;40(4):194-202.

ABSTRACT

Background: The broadening of the Interstitial Cystitis (IC) definition from the traditional Hunner's ulcer to Chronic pain of unknown origin plus one bladder symptom.

Objective: This study aims to test the hypothesis that IC as now defined and posterior fornix syndrome (PFS) (symptoms of urge, frequency, nocturia, abnormal emptying) are similar conditions, both potentially curable by strengthening uterosacral ligaments by squatting-based exercises.

Materials and Methods: This was a retrospective study of two separate groups comprising 138 women in total who performed squatting-based exercises for SUI (stress urinary incontinence), OAB, pain and emptying symptoms. All patients had validated pelvic questionnaires, pad tests, diaries, ultrasound and urodynamics.

Results: Across both groups of mainly premenopausal women, 61%–80% of the women had >50% improvement in symptoms of SUI, urge, frequency, nocturia, abnormal emptying, and post-void residual urine at a 3-month review. Thirty-seven out of 138 women from the 1st and 2nd studies fulfilled the ICS definition of Interstitial Cystitis (IC), chronic pelvic pain (CPP) and co-occurrence of one bladder symptom, which are the same or similar symptoms, in fact, as those characterizing PFS. The anatomic rationale for the cure was that the squatting-based exercises strengthen the 3 reflex muscles controlling bladder functions and the uterosacral ligaments these muscles contract against.

Conclusion: Whether the conditions IC and PFS are one and the same or different, their component symptoms can, in the main, be >50% improved by a squatting-based exercise regime.

Keywords: Squatting; Integral Theory; interstitial cystitis; posterior fornix syndrome

INTRODUCTION

In the early 2000s, we commenced a new method of pelvic floor rehabilitation (PFR) based on the Integral Theory System of Female Incontinence (ITS) at the PFR section of the Kvinno Centre, Perth Western Australia. This was the first ever squatting-based PFR method. All previous PFR rehabilitations were based

Address for Correspondence: Patricia Margaret Skilling, Previously Kvinno Centre Perth (Retired)
E-mail: patriciamskilling@gmail.com **ORCID:** -
Received: 31 July 2021 **Accepted:** 02 November 2021

on the 1948 Kegel method which involves a voluntary squeeze upwards. The ITS PFR method involves straining downwards to exercise the 3 oppositely-acting reflex muscles which were discovered to close and open the urethral tube in 1990. A 3rd discovery was that these muscles stretched the vagina like a trampoline to support the bladder base stretch receptors from below and prevent them from firing off prematurely to activate micturition. This is interpreted by the cortex as "urge ".[1] These PFR exercises subsequently became known as the "Skilling Method" for PFR.[2-4] The ITS PFR method is very different from the Kegel method, which trains a 4th pelvic muscle, m. puborectalis (PRM), the voluntary "squeezing" muscle ("Kegel" muscle), to lift the bladder, vagina and rectum upwards and forwards. The cadaveric anatomy of PRM and the 3 reflex muscles are detailed in Figure 1, and their functional anatomy in Figures 2 and 3.

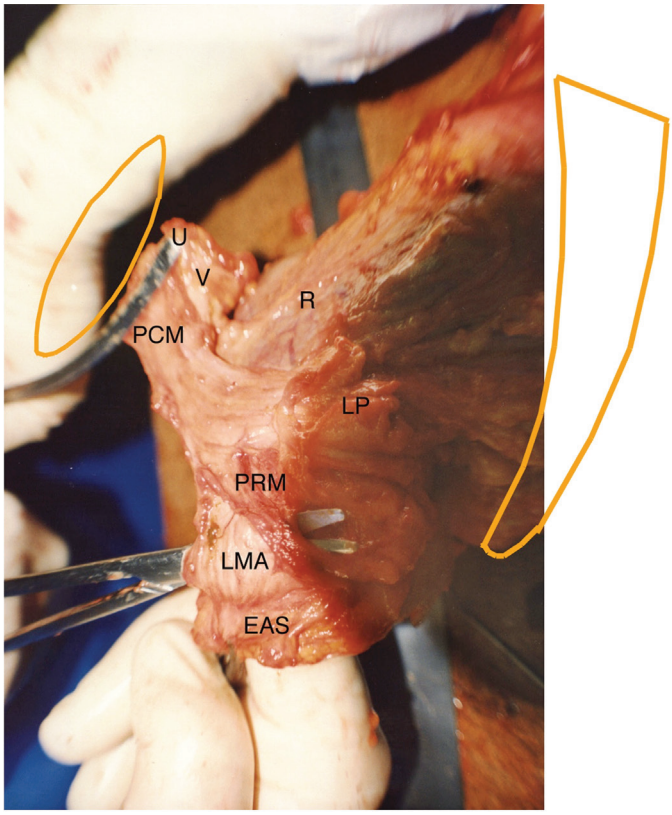

Figure 1. Cadaveric anatomy: The 4 pelvic floor muscles.
This is an anatomical specimen from a female cadaver, cut away from its bony insertions. Bladder and vagina 'V' have been excised at the level of bladder neck. These sweep behind the rectum (R) and merge with the contralateral side to form part of the levator plate (LP) to insert into the posterior wall of the rectum 'R'. Puborectalis muscle (PRM) which sweeps around behind "R" to insert directly into the symphysis. Note how contraction forwards of PRM would lift rectum, vagina, bladder and PCM itself upwards and forwards as in the X-rays, Figures 2 and 3.
U: urethra; PCM: anterior and lateral portion of the pubococcygeus muscle; EAS: external anal sphincter; LMA: Longitudinal muscle of the anus; PUL: insertion of pubourethral ligament into

A rationale for the ITS pelvic floor exercises requires a brief description of the functional anatomy of urethral opening, closure and urge control. Urethral closure is maintained by the elasticity of the vagina and urethra and the slow twitch muscle contraction of all three directional muscle forces (arrows, Figure 2). With effort, for example straining, the fast-twitch fibers are recruited so that the three muscles (Figure 2) stretch the tissues more tightly.

The following transperineal video show the 3 directional forces which close the urethra: forwards, backwards, downwards:

Video link 1: https://www.youtube.com/watch?v=3vJx2OvUYe0

During micturition, the forward force relaxes. This permits the outflow tract to be stretched open by the backward and downward forces (arrows, Figure 2). See the following micturition video:

Video link 2: https://www.youtube.com/watch?v=eiF4G1mk6EA&feature=youtu.be

Central to this theory are the stretch receptors marked as 'N' in Figure 4. The following video from Dr Monteiro, Department of

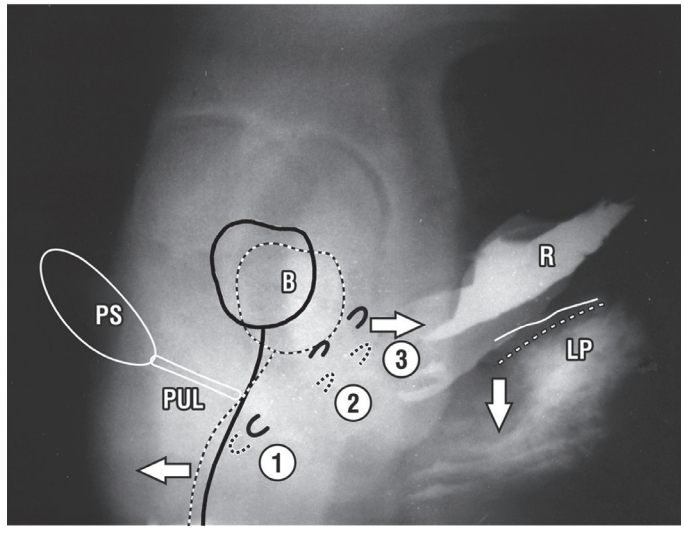

Figure 2. Three directional forces contract against their ligamentous insertions during straining. This figure represents a resting standing lateral X-ray superimposed on a straining X-ray in a normal patient. Solid lines = 'Resting closed' position of structures and broken lines = straining positions. Vascular clips have been applied to the vagina in the area of midurethra '1', bladder neck '2' and 3–4 cm behind bladder base '3'. Radio-opaque dye delineates the Foley catheter balloon (B), rectum (R) and levator plate (LP). position of the pubourethral ligament (PUL); pubic symphysis (PS); white solid lines denote superior border of LP at rest, broken on straining. During 'straining', the bladder neck and upper part of vagina (clips '2' and '3') have been pulled backwards and downwards. The distal part of vagina and distal 2/3 of urethra, however, (clip '1'), have been stretched forwards by an anterior muscle force (arrow), but also downwards. Note how the downward posterior force (downward arrow), angulates the anterior border of levator plate, acting ultimately against the insertion of USL into cervical ring.

Urology, University of Lisbon, shows how digitally stimulating the bladder base may activate the micturition reflex. Note the urine appearing at the external meatus. "Contracves": activation of the micturition reflex by stimulating bladder base stretch receptors: **Video link 3:** https://youtu.be/dWi4_OdhewA

How damage or looseness in ligaments or the fascial connective tissue may cause incontinence. The histological composition of ligaments,[1] pubourethral ligaments (PUL), uterosacral ligaments (USL) and the fascial layer of the anterior vaginal wall are very similar: collagen (structure), smooth muscle (contracture/relaxation), elastin (recoil) nerves (innervation) blood vessels. The most vulnerable element in the ligament is collagen, as it alters shape and strength due to hormonal influences. For example, cervical softening during periods allows for the expulsion of menstrual blood. Collagen damage during labour or breakdown and excretion after the menopause weaken the ligaments and the muscle force of the three directional muscles which contract against them. With reference to Figure 4, as the three muscle forces contract against PUL and USL, laxity in PUL and/or USL will weaken the directional forces, hence the urethra cannot be closed with effort (stress incontinence), it cannot be stretched open during micturition (emptying difficulties) or it cannot be adequately stretched like a trampoline to support stretch receptors "N" (Figure 4) to prevent premature activation of the micturition reflex (urgency).

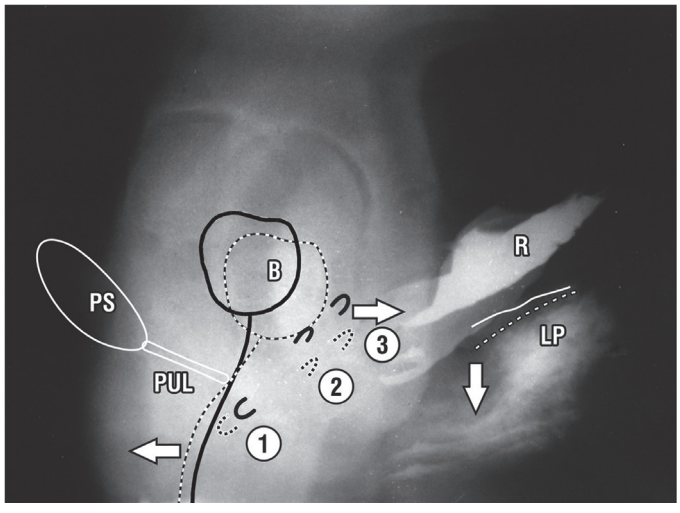

Figure 3. 'Squeezing' activates a fourth directional force. Same patient and labelling as **Figure 4.** This figure represents a resting standing lateral X-ray (unbroken lines) superimposed on a 'squeezing' X-ray (broken lines). Compared to **Figure 2,** the whole levator plate appears to have been lifted upwards and forwards (diagonal arrows), probably by contraction of the underlying puborectalis muscle. This force stretches bladder neck, vagina (clips '2' and '3') and rectum upwards and forwards. Note forward movement of the midurethral part of vagina, clip '1' and upward angulation of the coccyx.

Anatomical rationale for the development of squatting-based exercises

We knew from transperineal ultrasound testing, and video X-ray studies (Figures 2 and 3) that straining and coughing activate all 3 directional forces (large arrows, Figure 4). We also knew from experimental animal work that endurance training demonstrated increased collagen deposition.[5] Therefore, we knew that squatting-based exercises would strengthen the three reflex muscles and create new collagen for the ligaments which they contract against, namely the PUL and USL, *if the patient was premenopausal.*

These same studies also showed that the Kegel "squeezing" method only trains the voluntary puborectalis muscle which contracts directly against the symphysis. PRM does not contract against any ligaments. However, because PRM is an important muscle for general pelvic floor function, and it has a very important role in anorectal closure and evacuation,[6] we included Kegel exercises in our ITS PFR regime.

Aims

The original aim of the ITS PFR regime therefore was to harness the fact that straining causes all three reflex muscles forces to

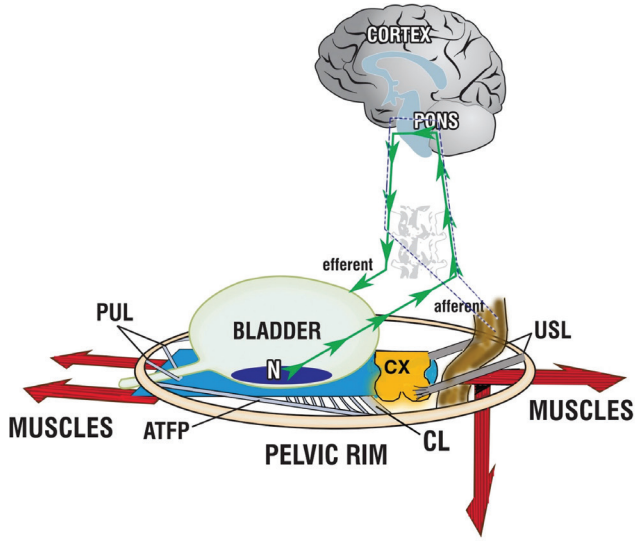

Figure 4. The trampoline analogy for control of urgency.
In the normal patient, the stretch receptors 'N' sense bladder fullness and send afferent signals to the cortex (green afferent arrows) which are controlled centrally and by opposite stretching of the vaginal membrane by muscle forces (arrows) which support the urine column lessening activation pressure on 'N'. At a critical number of afferents from 'N', central inhibition is overcome and the micturition reflex is activated (green efferent arrows); the forward muscles relax; the posterior muscles open out the posterior urethral wall; the detrusor contracts to empty. A similar feedback control system, opposite stretching of the posterior vectors hypothesized to support the anorectal stretch receptors preventing urge fecal incontinence.
CL: cardinal ligaments

contract in order to strengthen them and also the ligaments which they contract against, in order to cure or improve stress urinary incontinence and other symptoms related to PUL and USL weakness as per the algorithm (Figure 5).

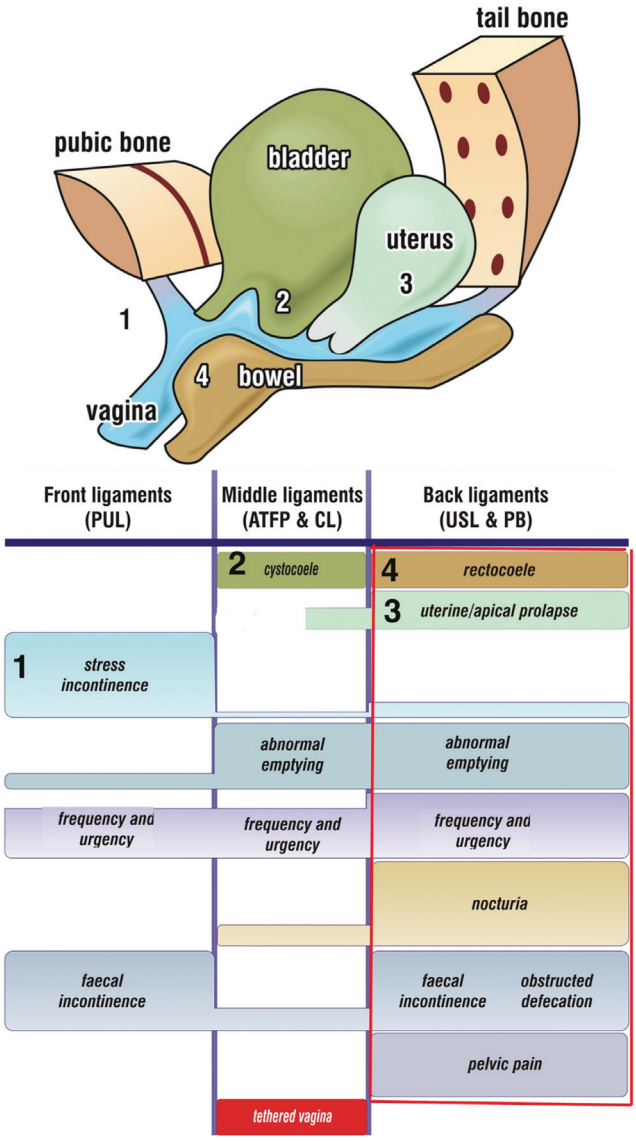

Figure 5. Pictorial algorithm
Symptoms indicate which ligaments are damaged. The numbers indicate the sites of damage.
The height of the bar indicates probability of association of a symptom with a particular zone. The connective tissue structures causing prolapse and pelvic symptoms fall naturally into three zones.
Anterior zone: external meatus to bladder neck pubourethral ligament (PUL); *Middle zone:* bladder neck to anterior cervical ring. Cardinal ligament (CL); arcus tendineus fascia pelvis (ATFP).
Posterior zone posterior cervical ring to perineal body (PB): USL uterosacral ligaments; perineal body (PB). The rectangle indicates the symptoms associated with USL laxity and the posterior fornix syndrome.
Chronic pelvic pain and nocturia are uniquely caused by uterosacral (USL) ligament laxity.

There was no thought of curing interstitial cystitis (IC) at the time of which these studies were performed. At that time, the definition of Interstitial cystitis comprised painful bladder symptoms, evidence of glomerulations and Hunner's ulcer. However, the new definitions for IC as of 2017 caused us to review our original data from the Kvinno Centre and compare it with published data concordant with the new definitions.

The current International Continence Society (ICS) definition for interstitial cystitis/bladder pain syndrome[5] is *"persistent or recurrent chronic pelvic pain, pressure, or discomfort perceived to be related to the urinary bladder, accompanied by at least one other urinary symptom such as an urgent need to void or urinary frequency diagnosed in the absence of any identifiable pathology which could explain these symptoms."* Hunner's lesion and glomerulations, previously hallmarks of IC, are no longer considered essential for diagnosis.[7]

MATERIALS AND METHODS

Diagnosis

We used a semiquantitative questionnaire, perineal ultrasound and urodynamic tests to achieve a greater

accuracy in diagnosis than that afforded by the simplified pictorial algorithm (Figure 5).[2] Objective stress and 24-hour pad

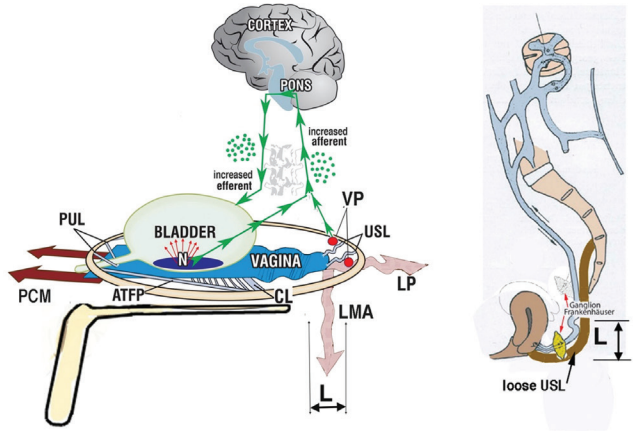

Figure 6. Diminution of urge by "simulated operations".
"Simulated" operations work by mechanically supporting loose or damaged ligaments "L".
Left; The speculum is very gently inserted into the apex of the vagina to mechanically support the uterosacral ligaments (USL) and visceral plexuses (VP) which, unsupported, send afferent impulses to the cortex which it interprets as pain.
The mechanical support restores firmness to the USL insertion point, so the vagina can now be stretched by the muscle forces (arrows) to support "N" and diminish afferent impulses to the brain micturition center. These send out afferent impulses which are interpreted as pain.
Right; Schematic sagittal view of sacrum, afferent/efferent nerves to the spinal cord. Loose USLs "L" cannot support the visceral plexuses.

tests indicated the severity of the problem. The patient was assessed in terms of age, activity, hormonal status, other disease states, posture, occupation, motivation and commitment to PFR.

Treatment

We tailored the regime to the needs of the individual patient. Bladder suppressant drugs were rarely, if ever, used. At all times, the patient made the decision as to whether to undergo PFR or keyhole surgery. In general, those patients who lose >2 gm of urine on cough stress testing or >10 gm per 24 hours respond less well to PFR. However, our policy was that all patients should be encouraged to continue PFR. Some successful outcomes had been achieved even in those patients losing more than 30 gm per 24 hours. As vaginal discharge only accounts for 2–3 gm loss per 24 hours, we considered anything more than 4 gm as signifying incontinence, surgically and non-surgically.

Treatment comprised of four visits over a 12-week period, though these could be reduced to three or even two visits for busy or out-of-town women. Based on the algorithm (Figure 5), PFR was carried out in the distal vagina or posterior fornix or both. To assist compliance, the patient was required to complete a daily diary. It was explained to the patient that even if surgery was required, PFR assists by improving the tissues and, in the longer term, maintaining replacement was considered an important factor in management.

Electrotherapy was introduced at the first visit. A specially designed low-cost simplified battery operated electrical stimulator was used, the Pelvitoner 2000 (Medhealth Pty Ltd, Perth WA, Australia). This delivered a square 50 Hz pulse every 2 seconds. The principal aim was to activate and strengthen the fast twitch muscles. Patients were encouraged to contract their muscles in time with the flashing light or to voluntarily contract their muscles on feeling the commencement of the involuntary contraction induced by the electrical stimulation. For posterior defects, the probe was inserted into the posterior fornix for 20 min/day. For stress urinary incontinence (SUI), the probe was placed just inside the introitus for 20 min/day and, also, into the posterior fornix for 20 min/day for a period of 4 weeks.

Pelvic floor exercises

First visit

Kegel exercises were performed in lots of 12, six times per day, with legs apart according to the methods of Bo. Endocavity electrical stimulation was used daily for 4 weeks. Squatting was encouraged as a universal slow-twitch exercise, if possible, for a total of 20 min/day. The aim was to weave this activity into the patient's daily routine. At all times, the patient was to substitute squatting for bending. If a patient had arthritis, she was allowed to sit on the end of a chair with her legs apart. By explaining the principles behind the exercises and encouraging the patients to plan and record their daily routine, compliance was vastly improved.

Second visit

A reverse downward thrust was taught. The patient pressed upwards with one finger to one side of the urethra, approximately 2 cm inwards from the introitus, and strained downwards. The downward thrust was then alternated with the Kegel squeezes in lots of 12, for a total of six times per day. The downward-acting exercises strengthen the fast twitch fibers of all three directional muscle forces. A simple way to weave the exercises into a daily routine was to recommend that every time the patient goes to the toilet, she was to perform one group of 12 exercises.

Third visit

The patient compliance was checked (via the diary), how she had incorporated the programme into her daily routine was discussed and the aims and principles of the programme were re-enforced. At the 3-month review (fourth visit), in consultation with the patient, a decision was made whether to proceed to keyhole surgery or continue with the maintenance PFR.

Maintenance PFR

By the end of 3 months, it was assumed that the patients had incorporated the exercises into their normal routine. Squeezing was alternated with the downward thrust for a total of six sets of 12 exercises per day. Squatting was by now an acquired habit. Electrotherapy was performed 5 days/month. The patients were advised to continue this routine for the rest of their lives.

RESULTS

The first group who completed the full regime comprised 60 patients aged 15–86 (mean age: 55 years).[2] Assessment at 3 months for specific symptoms was performed independently by an external expert in female incontinence (MK) using the same semiquantitative patient-administered questionnaire. The improvement rates for symptoms are summarized in Table 1. An improvement rate of 50% was taken as the cut-off point for inclusion in Table 1, i.e., a 0-50% improvement was considered a failure and 17% of patients were in this category. The median improvement rate per symptom for the remainder (83%) was 65%. With regard to interpretation of Table 1, 78% of patients reported a minimum 50% improvement in their SI symptoms,

Table 1. Improvement rates for symptoms		
Study (n=60)		
Condition	**n**	**Improvement (%)**
Stress	42	78
Urge	39	61
Frequency	53	62
Nocturia	24	75
Pelvic pain	20	65
Leakage	50	68
Bowel problems	28	78
n: Number		

61% in their urge symptoms etc. Three patients reported significant worsening of their stress symptoms. On a quality-of-life assessment (QOL), only 12% of patients reported less than 50% improvement. On a total symptom basis, the median QOL improvement reported was 66%. Co-occurrence of emptying occurred, but missing data in some patients did not allow for its inclusion in the results. Three patients reported significant worsening of their stress symptoms. These were referred for ambulatory keyhole surgery. These minimally invasive surgical techniques have the same objective as our PFR regime. They create artificial neo-ligaments, using polypropylene knitted tapes[5] positioned in the exact position of the natural ligaments. There were no cases of Hunner's ulcer noted.

The second group comprised 147 patients, mean age 52.5 years (range: 25–76) and mean parity 2.25 (range: 0–5). They commenced the full regime.[4] Ten patients were nulliparous. Surgery included, the dropout rate was 47% over 3 months, leaving 78 patients who completed the study. Improvement rates for individual symptoms are summarized in Table 2. Urine loss for cough stress testing reduced from a mean of 2.2 g (range: 0–20.3 g) to 0.2 g (range: 0–1.4 g), $p<0.005$ (Student's t-test), and Urine loss for 24-h pad loss decreased from a mean of 3.7 g (range: 0–21.8 g) to a mean of 0.76 g (range: 0–9.3 g), $p<0.005$. The patients reported that control of urine loss, when achieved, happened even when not "en guarde". The cut-off point for determining frequency improvement was eight times per day and nocturia two times per night.

Total number of frequency events for the twelve patients with only frequency reduced from 140 to 80 per day ($p<0.005$). The total number of nocturia events for the 32 patients reduced from 98 events per night to 25 per night ($p<0.005$). In 23 patients with residual urine greater than 50 ml, there was a pre-treatment mean of 202 ml (range: 50–550 ml) and the post-treatment residual was reduced to 71 ml (range: 15–450 ml) ($p<0.005$). Thirteen patients (9% of the total) elected to have surgery prior to completion of their course due to non-improvement or worsening of stress incontinence. Three patients reported significant worsening of their stress symptoms, and no improvement was noted in nine others. Three patients reported worsening of their urge symptoms, and no improvement was noted in six others. It was not always possible to predict an outcome. The highest cough stress test loss was 20.3 g and this reduced to 0 g on re-testing. The highest 24-hour test loss was 21.8 g and this reduced to 2.3 g. Yet other patients with far less objective loss required surgery. All patients complied with hormone replacement therapy treatment during the 3-month period.

Table 2. Fate of individual symptoms*	
Symptom (n=78 women)	**>50% improvement**
Stress incontinence (n=69)	57 (82%)
Urge incontinence (n=44)	33 (68%)
Frequency only (n=12)	10 (83%)
Nocturia (n=32)	29 (90%)
Pelvic pain (n=17)	13 (76%)
Residual urine >50 ml (n=23)	**mean 202 ml to 71 ml**
*Most patients had overlapping symptoms. n: prevalence of the syndrome. n: Number	

DISCUSSION

Thirty-seven out of 138 women from the first and second studies fulfilled the ICS definition of IC, chronic pelvic pain CPP and co-occurrence of one bladder symptom.[7] In the first group, 20 out of 60 women had collective symptoms of CPP and 158 bladder symptoms; 65% reported a minimum 50% improvement in CCP and also bladder symptoms (Table 1). In the second group, 17 out of 78 women had collective symptoms of CPP and 174 bladder symptoms; 76% reported 50% improvement in CPP and bladder symptoms (Table 2).

Though the data for 37 women fit the ICS definition for IC, they also fit the definition of Posterior Fornix Syndrome (PFS): predictably grouped symptoms of urge, frequency, nocturia, chronic pelvic pain and abnormal emptying/retention, rectangle (Figure 5) caused by USL laxity and cured or improved by repair thereof.[8] This group of 37 raises the question, also raised by Scheffler et al.[9] who reported the first validated cure of IC and Hunner's ulcer with a TSF cardinal/USL sling repair, *"Is IC in women the same as PFS?"* It is worth noting that by his own admission, Scheffler did not set out to cure IC. He followed the Integral System's paradigm for cystocele repair: sling for cardinal ligament repair and pubocervical fascia repair (without vaginal excision) and USL repair with a posterior sling and rectovaginal

fascia repair (without vaginal excision). The patient had similar symptoms to those in Tables 1 and 2 (from this study) and Table 3;[10] the Hunner's ulcer finding was serendipitous as was its cure.

Comparison with known IC diagnosis in Table 3 indicates that the prevalence of symptoms from our studies seems very similar to those reported by Butrick[10] in known IC patients who were treated with bladder installations. Butrick[10] reports a high incidence of voiding dysfunction, frequency, urge and SUI.

Table 3. Similarity between interstitial cystitis symptoms and the Posterior Fornix Syndrome

Butrick Interstitial cystitis (n=408)	Goeschen Posterior Fornix Syndrome (n=78)
Bladder installations	Squatting-based PFR
Bladder pain/interstitial cystitis (n=157)	Voiding dysfunction (PVR>50 ml) (n=23)
Chronic pelvic pain (n=98)	Urge incontinence (n=44)
Vulvodynia/dyspareunia (n=40)	SUI (n=69)
Voiding dysfunction (n=70)	Chronic pelvic pain (n=17)
Dyspareunia (n=54)	Nocturia (n=32)
SUI (n=24)	
POP (n=21)	
Hunner's ulcer (n=18)	No Hunner's ulcer reported
Butrick. Int Urogynecol J Pelvic Floor Dysfunct 2009; 9: 1047-53.	Goeschen K, Gold D. Pelviperineology 2017; 36: 84-8.

What is the difference between Kegel and squatting-based PFR?

When stress urinary incontinence (SUI) is cured with squatting-based PFR, the patient does not need to "lift up" before a cough (Kegel exercise). The SUI is naturally cured. Also, other bladder and pain symptoms are cured or improved by the squatting method (Tables 1 and 2).

It is not anatomically possible for Kegel to cure urge, nocturia, or emptying, as these are caused by lax USLs (Figure 5). Kegel does not contract against USL and therefore, it cannot strengthen it.

Differential cadaveric and functional anatomy of PRM and PCM/LP.

With reference to Figure 1 (anatomy), it is clear that puborectalis (PRM) is a very different muscle from pubococcygeus (PCM), which passes behind the rectum to unite with the other PCM and iliococcygeus to form the levator plate (LP), which then inserts into the posterior wall of rectum. In contrast, PRM loops around the rectum and does not insert into it. It attaches directly into the posterior symphysis medial to the PCM. PRM is sited below the LP. This explains how PRM contraction (squeezing) lifts the vagina, bladder, levator plate and the rectum itself upwards and forwards. It is this forward/upward movement which closes the urethra with squeezing (Kegel) exercises (Figure 3). Clearly, Kegel exercises cannot strengthen either PUL or USL as they do not contract against them. In contrast, on straining, the 3 directional forces contract against both PUL and USL, strengthening the muscle and the ligaments they contract against.

Are squatting-based PFRs effective in older women?

Our experience that women well past their menopause do not respond well to squatting-based PFR methods fits with that of Wiegersma et al.[11] whose RCT between an exercise group and placebo found that the "difference between the groups was below the presumed level of clinical relevance".

Why are pelvic exercise results poorer in post-menopausal women?

The answer may be found in a recent study by Shkarupa et al.[12] who performed native tissue cardinal/uterosacral ligament repair in two groups of women, pre-menopausal and post-menopausal. They reported high cure rates for OAB/nocturia and prolapse at 18 months (Table 4) but extremely poor results in post-menopausal women for the same period. They attributed the poorer results to collagen breakdown and excretion from the ligaments because of estrogen cessation at the menopause. Shkarupa recommended slings for post-menopausal women because they create new collagen to reinforce collagen-weakened ligaments. Shkarupa's hypothesis was seemingly validated by Inoue et al.[13,14] who reported only a 10% drop in anatomical (and symptom) cure rates at both 4 and 5 years after polypropylene tape reinforcement of cardinal/uterosacral ligaments.[13-24]

Is it possible to diagnose IC caused by USL laxity?

A standard test in our clinic was the speculum test (Figure 6).We found 70%–80% of symptoms of CPP and urge can be relieved by the speculum test.[25]

CONCLUSION

Looked at from the perspective of the Integral System, patients with symptoms of chronic pelvic pain, urge, frequency, nocturia or abnormal emptying, whether they have been diagnosed as IC or PFS, providing that they pass the speculum test for lax USLs, there is a high possibility that their symptoms can be 50% improved by a squatting-based PFR regime.

Table 4. Cure rate (%) of POP and overactive bladder symptoms at different points of follow-up

POP/OAB symptoms	Pre-menopausal group (n=40)	Post-menopausal group (n=48)
3 months		
Frequency	75	62.5
Urgency	87.5	77
Nocturia	95	68.8
POP	97.5	89.6
6 months		
Frequency	77.5	50
Urgency	85	68.8
Nocturia	97.5	62.5
POP	87	52
12 months		
Frequency	62.5	39.6
Urgency	82.5	31.3
Nocturia	75	29.2
POP	80	20.8
18 months		
Frequency	60	14.6
Urgency	67.5	16.7
Nocturia	87.5	18.8
POP	80	16.7

POP: Pelvic organ prolapse; OAB: Overactive bladder; n: Number
By permission Shkarupa et al.[12]

ETHICS

Ethics Committee Approval: Since the National Code on Clinical Trials had declared that ethics approval is not necessary for retrospective studies, it is not obtained.

Informed Consent: Retrospective study.

Peer-review: Both internally and externally peer-reviewed.

DISCLOSURES

Financial Disclosure: The authors declared that this study received no financial support.

REFERENCES

1. Petros PE, Ulmsten U. An Integral Theory of female urinary incontinence. Acta Obstet Gyn Scan 1990;69 Suppl 153:1-79.
2. Petros PE, Skilling PM. Pelvic floor rehabilitation according to the Integral Theory of Female Urinary Incontinence. First report. Eur J Obstet Gyn R B 2001; 94: 264-9.
3. Petros PE, Skilling PM. The physiological basis of pelvic floor exercises in the treatment of stress urinary incontinence. Br J Obstet Gynaecol 1999; 106: 615-6.
4. Skilling PM, Petros PE. Synergistic non-surgical management of pelvic floor dysfunction: second report. Int Urogynecol J 2004; 15: 106-10.
5. Kovanen V, Suominen H, Risteli J, Risteli L. Type IV collagen and laminin in slow and fast skeletal muscle in rats - effects of age and life-time endurance training. Collagen Rel Res 1988; 8: 145-53.
6. Petros PE, Swash M. The Musculoelastic Theory of anorectal function and dysfunction. Pelviperineology 2008; 27: 89-121.
7. Doggweiler R, Whitmore KE, Meijlink JM, et al. A standard for terminology in chronic pelvic pain syndromes: a report from the chronic pelvic pain working group of the international continence society. Neurourol Urodyn 2017; 36: 984-1008.
8. Petros PE, Ulmsten U. The posterior fornix syndrome: a multiple symptom complex of pelvic pain and abnormal urinary symptoms deriving from laxity in the posterior fornix. Scand J Urol Nephrol 1993; 27 Suppl 153: 89-93.
9. Scheffler KU, Oliver W, Hakenberg OW, Petros PE. Cure of interstitial cystitis and non-ulcerating Hunner's Ulcer by cardinal/uterosacral ligament repair. Urol Int 2021; 105: 920-3.
10. Butrick CW, Sanford D, Hou Q, Mahnken JD. Chronic pelvic pain syndromes: clinical, urodynamic and urethelial observations. Int Gynecol J Pelvic Floor Dysfunct 2009; 20:1047-53.
11. Wiegersma M, Panman CMCR, Kollen BJ, Berger MY, Lisman-Van Leeuwen YH, Dekker JH. Effect of pelvic floor muscle training compared with watchful waiting in older women with symptomatic mild pelvic organ prolapse: randomised controlled trial in primary care BMJ 2014; 349: g7378.
12. Shkarupa D, Zaytseva A, Kubin N, Kovalev G, Shapovalova E. Native tissue repair of cardinal/uterosacral ligament cures overactive bladder and prolapse, but only in pre-menopausal women. Cent European J Urol 2021; 74: 372-8.
13. Inoue H, Kohata Y, Sekiguchi Y, Kusaka T, Fukuda T, Monnma M. The TFS minisling restores major pelvic organ prolapse and symptoms in aged Japanese women by repairing damaged suspensory ligaments – 12 – 48 month data, Pelviperineology 2015; 34: 79-83.
14. Inoue H, Kohata Y, Fukuda T, et al. Repair of damaged ligaments with tissue fixation system minisling is sufficient to cure major prolapse in all three compartments: 5-year data J Obstet Gynaecol Res 2017; 43: 1570-7.
15. Petros PE. New ambulatory surgical methods using an anatomical classification of urinary dysfunction improve stress, urge, and abnormal emptying. Int Urogynecol J Pelvic Floor Dysfunct 1997; 8: 270- 8.
16. Wagenlehner F, Muller-Funogea I-A, Perletti G, et al. Vaginal apical prolapse repair using two different sling techniques improves chronic pelvic pain, urgency and nocturia: a multicentre study of 1420 patients. Pelviperineology 2016; 35: 99-104.
17. Liedl B, Goeschen K, Yassouridis A, et al. Cure of underactive and overactive bladder symptoms in women by 1,671 Apical Sling operations gives fresh insights into pathogenesis and need for definition change. Urol Int 2019; 103: 228-34.

18. Goeschen K, Gold DM. Surgical cure of chronic pelvic pain, associated bladder & bowel symptoms by posterior sling in 198 patients validates the Pescatori iceberg principle of pelvic symptom co-occurrence. Pelviperineology 2017; 36: 84-8.
19. Liedl B, Inoue H, Sekiguchi Y, et al. Is overactive bladder in the female surgically curable by ligament repair? Cent Eur J Urol 2017; 70: 53-9.
20. Abendstein B, Brugger BA, Furtschegger A, et al. Role of the uterosacral ligaments in the causation of rectal intussusception, abnormal bowel emptying, and fecal incontinence-a prospective study. Pelviperineology 2008; 27; 118-21.
21. Petros PEP, Richardson PA. TFS posterior sling improves overactive bladder, pelvic pain and abnormal emptying, even with minor prolapse–a prospective urodynamic study. Pelviperineology 2010: 29: 52-5.
22. Himmler M, Rakhimbayeva A, Sutherland SE, Roovers J-P Yassouridis A, Liedl B. The impact of sacrospinous ligament fixation on pre-existing nocturia and co-existing pelvic floor dysfunction symptoms. Int Urogynecol J 2020; 32: 919-28.
23. Richardson P. Surgical cure of nocturia using 4 different methods based on strengthening the structural supports of the vaginal apex – a short review. Pelviperineology 2015; 34: 92-3.
24. Liedl B, Goeschen K, Sutherland SE, Roovers JP, Yassouridis A. Can surgical reconstruction of vaginal and ligamentous laxity cure overactive bladder symptoms in women with pelvic organ prolapse? BJU Int 2019; 123: 493-510.
25. Wu Q, Luo L, Petros PE. Case report: Mechanical support of the posterior fornix relieved urgency and suburethral tenderness. Pelviperineology 2013; 32: 55-6.