

Pelvic Floor Rehabilitation

according to the Integral Theory

**Towards a more time efficient method for pelvic floor rehabilitation
and with a wider symptom scope**

5.1 Introduction

The scope of traditional pelvic floor rehabilitation methods is mainly confined to Kegel exercises for improvement in stress incontinence, and 'bladder drill' to improve urgency symptoms. 'Bladder drill' can be explained as a 'training' of the neural inhibitory circuits from the cortex to all the inhibitory centres to maximal efficiency.

The Integral Theory System for pelvic floor rehabilitation (PFR) differs from traditional methods in four major ways:

1. It addresses symptoms of urgency, nocturia, frequency, abnormal emptying and pelvic pain in addition to stress incontinence
2. It introduces special techniques to strengthen the 3 directional muscle forces, and their ligamentous insertions.
3. It combines electrotherapy, hormones, fast and slow twitch exercises.
4. It is designed to seamlessly fit into a patient's daily routine.

The anatomy of traditional Kegel Exercises

'Squeezing', upward pulling of the pelvic diaphragm as described by Kegel (1948) is the core element of all traditional PFR methods. It involves a trained voluntary upward stretching of the organs, figs. 6-18 and 5-01

All organs and even levator plate (LP) are actively pulled upwards and forwards with 'squeezing' (figs 5-01,6-18). Only voluntary contraction of puborectalis can explain these movements. This movement does not pull directly against any of the pelvic ligaments, although it is likely that PCM reflexly contracts to pull the hammock forwards against the pubourethral ligament.

Although urge symptoms are not addressed with conventional pelvic floor exercises, anecdotal reports of patients controlling urge symptoms by 'crossing their legs and squeezing' are consistent with the pelvic muscles having a role in control of urgency symptoms. This can be explained by the pelvic muscles stretching the vaginal membrane upwards to support the stretch receptors (cf trampoline analogy).

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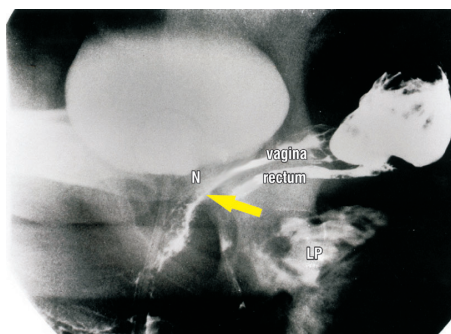


Fig. 6-18 Kegel exercise -voluntary pelvic floor contraction of m. puborectalis (arrow). The levator plate (LP), vagina, rectum and bladder are pulled upwards and forwards to lift and close the urethra from behind..

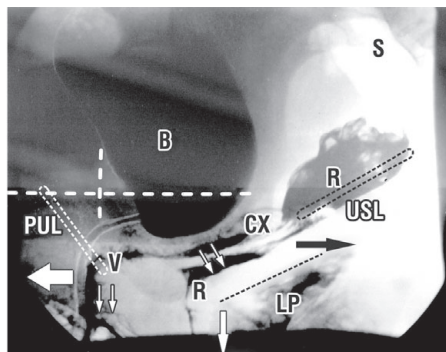


Fig. 2-21 Urethral closure during effort (coughing or straining),-same patient as fig. 6-18. The forward muscle force (arrow) stretches the distal vagina (V) forwards against the pubourethral ligament (PUL) to close the distal urethra, 'urethral closure mechanism'; the backwards and downwards muscle forces (arrows), stretch and angulate the upper vagina and urethra around PUL to 'kink' the proximal urethra, 'bladder neck closure mechanism'

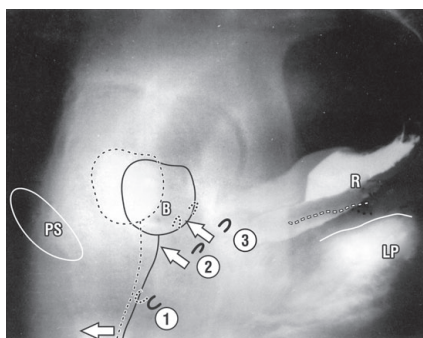


Fig. 5-01 The muscle movements during 'squeezing' are upwards and forwards. LP = levator plate; B = Foley balloon; R = rectum. Note the difference with the movements in figure 5-02. Because 'squeezing' is not the natural mechanism, it must be learned (fig 5-02). (Kegel 1948)

Rest = unbroken lines
Squeeze = broken lines

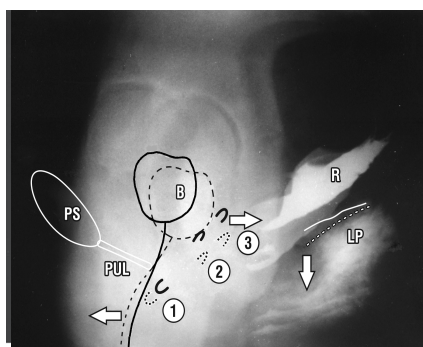


Fig. 5-02 Reflex muscle movements during coughing and straining. Same patient and labelling as figure 5-01. Note how the 3 different directional movements and downward angulation of levator plate pull against the pubourethral and uterosacral ligaments.

Rest = unbroken lines
Strain = broken lines

The anatomical basis for the Integral Theory System for pelvic floor rehabilitation (PFR)

It is emphasized that the urethral closure induced by Kegel-type muscle contractions (figs 5-01&6-17) differs radically from natural urethral closure, which is fully explained in Chapter 2, and summarized in figs 2-21 & 5-02.

Why the Integral Theory System for pelvic floor rehabilitation was developed

It was evident from radiological studies (Petros & Ulmsten 1993), that the organ and muscle movements observed during Kegel exercises, were radically different from those observed during coughing and straining, in that widely different muscles and ligaments were involved. It was evident that the pubourethral (PUL), and uterosacral ligaments (USL), were major insertions for the 3 directional muscle forces. It was already known that simultaneous surgical reinforcement of the PUL by a midurethral sling, and USL by a posterior sling (Petros 1997), gave high cure rates for symptoms of stress incontinence (SI), urgency, frequency, abnormal emptying, and pelvic pain. It was reasoned that using exercises such as squatting and straining would strengthen the natural closure muscles, and their ligamentous insertions, PUL and USL. It was also reasoned that if the Theory was valid, not only SI, but a much wider range of symptoms such as urgency, frequency, abnormal emptying, and pelvic pain should also be curable simply by including squatting type exercises. This proved to be so. The methods and results of the 1st and 2nd applications of the Integral Theory System PFR (Skilling & Petros, 2001, 2004) are detailed below in Tables I&II.

Towards a more time efficient method for pelvic floor rehabilitation – use of a “fit ball”

Despite conscientious application and follow-up, the dropout rate for the PFR methods used in the 1st and 2nd studies was 50%. On analysis, it appeared that a principal reason many of the patients discontinued was lack of time. It was reasoned that sitting on a rubber “fitball” would strengthen the same slow twitch pelvic muscles and ligaments as the squatting exercise. Therefore patients were advised to use a rubber “fitball”, fig.5-03, instead of a chair at work or at home, and to develop a habit of squatting instead of bending. It was also reasoned that the Kegel exercises could be dispensed with, as they did not address the natural closure muscles (figs. 2-21 & 5-02). The initial results in a pilot study of 12 working women with families was encouraging. All agreed to use the rubber fitball at work. The dropout rate at 6 weeks was zero, and the initial improvement rates appeared equivalent to the more involved techniques used in the studies 1&2.

This is a promising method which needs to be more fully evaluated with larger numbers of patients, and preferably, an RCT, with or without intravaginal electrotherapy.

*Methodology for the 1st and 2nd studies, Tables I&II.**Summary*

The main innovation was the addition of squatting-type exercises. It was proven that a significant improvement could be obtained with symptoms of urgency, nocturia, bladder emptying, pelvic pain, and stress incontinence.

The 1st study (Petros & Skilling, 2001) directly challenged the Integral Theory. It is known that strengthening a muscle also strengthens its tendinous insertions. It was



Fig. 5-03 The patient sits on a rubber ball instead of a chair. The act of balancing enforces correct posture, and slowtwitch contracture of the abdominal, pelvic, and thigh muscles.

reasoned that as the pubourethral and uterosacral ligaments are major insertions for the 3 directional muscle forces (fig 2-21), then using exercises such as squatting and straining would not only strengthen the natural closure muscles, they would also strengthen their ligamentous insertions. If this hypothesis, and indeed the Theory itself were valid, improvement could be expected in not only stress incontinence, as per the Kegel method, but also symptoms said to derive from uterosacral ligament laxity, urgency, nocturia, frequency, pelvic pain and abnormal bladder emptying

The 2nd study, Table 2, which was more rigorously conducted, confirmed the results of the 1st study.

Results of the First study (Petros & Skilling, 2001)

Sixty patients completed the study. Improvement was defined as >50% improvement in their symptoms (see Table 1).

Fate of Individual Symptoms (n=60)	
condition	>50% improvement
stress (n=42)	78%
urge (n=39)	61%
frequency (n=53)	62%
nocturia (n=24)	75%
pelvic pain (n=20)	65%
leakage (n=50)	68%
bowel problems (n=28)	78%

Results of the Second Study (Skilling, PM and Petros PE (2004), Table 2.

Of 147 patients (mean age 52.5years), 53% completed the programme. Median QOL improvement reported was 66%, mean cough stress test urine loss reduced from 2.2 gm (range 0-20.3 gm) to 0.2 gm (range 0-1.4 gm), $p < 0.005$ and 24 hour pad urine loss from a mean of 3.7 mg (range 0-21.8 mg) to a mean of 0.76 mg (range 0-9.3 gm), $p < 0.005$. Frequency, nocturia were significantly improved ($p < 0.005$). Residual urine reduced from mean 202 ml to mean 71 ml ($p < 0.005$) (See Table 2 for improvement in individual symptoms).

Table 2	
Fate of Individual Symptoms (n=78)	
condition	>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%)

5.2.1 Indications

There were no exclusion criteria in the descriptions below. Any patient, regardless of the seriousness of her condition, was accepted for PFR. Patients who lost less than 2 gm urine with the cough stress test, or less than 10 gm in a 24 hour period, were particularly encouraged to do PFR.

Design

The regime consists of four visits in three months. The Pictorial Diagnostic Algorithm (fig 1-11) guides diagnosis of anatomical defects in the anterior, middle and posterior zones of the vagina. Hormone replacement therapy (HRT) is administered to thicken epithelium and prevent collagen loss. Electrotherapy is given for 20 minutes a day for the first four weeks to improve neuromuscular transmission. The patients do slow twitch muscle exercises – squatting or sitting on a rubber ‘fit’ball – for a total of 20 minutes per day.

First Visit

The patient is instructed in a Kegel exercise routine, two lots of twelve, three times per day. The exercises are performed in bed, face downwards, morning and night with legs apart, according to the methods of Bo (1990). The remaining 24 squeezes are performed at lunchtime or during visits to the toilet. It is helpful for the patient to

visualise squeezing the sides of a lemon inwards, or to pretend she is cutting off her urine stream. Endocavity electrical stimulation of 20 minutes per day is prescribed for four weeks. With any anterior zone defect, the probe is placed just inside the introitus on alternate days and in the posterior fornix every other day. The aim is to strengthen both PCM and LP. With pure posterior zone defects, the probe is placed in the posterior fornix only. Squatting or sitting on a 'fit ball' for a total of 20 minutes per day if possible is encouraged as a universal slow-twitch exercise. The aim is to integrate this activity into the patient's daily routine. For instance, the patient is encouraged to substitute squatting for bending at all times. If a patient has arthritis, she may sit on the end of a chair with legs apart or on a fitball. Compliance is vastly improved by explaining the principles behind the exercises, and encouraging patients to plan and record their daily routine.

Second Visit

In patients without a cystocele, a reverse downward thrust is taught on the second visit. The patient presses upwards with the probe or a finger placed approximately 2 cm inwards from the introitus, and strains downwards. The downward thrust is now alternated with the Kegel squeezes, each three times per day. The downward-acting exercises strengthen the fast twitch fibres of all three directional muscle forces.

Third Visit

The attendant checks the patient compliance (diary), discusses how she has incorporated the programme into her daily routine, and reinforces the aims and principles of the programme.

At the three month review (fourth visit), in consultation with the patient, a decision is made whether to proceed to surgery, or continue with Maintenance PFR

Maintenance PFR

By the end of three months, it is assumed that the patients have incorporated the exercises into their normal routine. Squeezing is alternated with the downward thrust, a total of six sets of 12 exercises per day. Squatting is by now an acquired habit. Electrotherapy is performed five days per month. The patient is advised to continue this routine for the rest of her life.

Comments

Those patients improved of their stress incontinence symptoms reported that they did not leak even when caught "off guard", in contrast to improvement with Kegel exercises. Kegel patients almost invariably leak when caught "off guard".

Almost 70% of patients who completed the treatment seemed unwilling to perform the reverse pushdown exercises. Squatting, Kegel and electrotherapy were well received.

Electrotherapy was found very useful (Skilling & Petros 2004), in that a marked improvement was noted within 2 weeks of commencing, a positive factor for patients to continue the programme.

Conclusions

The Integral Theory System for pelvic floor rehabilitation closely mimics the natural muscle movements, and provides improvement for a much wider spectrum of symptoms than traditional Kegel exercises. One disadvantage is that the squatting exercises may worsen stress incontinence in a small group of patients. A natural evolution of this system is the use of the rubber “fitball” instead of a chair. This is a very simple method, and extremely time efficient. Though the initial results are promising, it requires rigorous scientific testing, preferably with an RCT with or without electrotherapy, before it can be routinely recommended.

Acknowledgement:

The routine presented is that practised by Dr Patricia M. Skilling, Kvinno Centre, Perth, Australia.