



Universiteit
Leiden
The Netherlands

Towards evidence based practice in pelvic floor physiotherapy

Voorham-van der Zalm, P.J.

Citation

Voorham-van der Zalm, P. J. (2008, February 6). *Towards evidence based practice in pelvic floor physiotherapy*. Retrieved from <https://hdl.handle.net/1887/12590>

Version: Corrected Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/12590>

Note: To cite this publication please use the final published version (if applicable).

Chapter 4

“Diagnostic Investigation of the Pelvic Floor”: A helpful tool in the Approach in Patients with Complaints of Micturition, Defecation and/or Sexual Dysfunction.

Petra J. Voorham – van der Zalm (a), Guus A.B. Lycklama à Nijeholt (a), Hein Putter

(b), Henk W. Elzevier (a), Rob C.M. Pelger (a)

From the Department of Urology (a) and Medical Statistics (b),

Leiden University Medical Center, the Netherlands



The Journal of Sexual Medicine; accepted, September 2007



Introduction

The pelvic floor controls isolated and integrated functions, sustains proper anatomic relationships between pelvic visceral organs and its outlets, and shares the basic mechanism with various visceral organs that control their function (1). The pelvic floor, consisting of muscular and fascial components, is the binding element between these organs. Pelvic floor dysfunction is recognized to be related to lower urinary tract dysfunction and, more recently, to lower gastrointestinal symptoms as well (1). It is also considered to be an influential factor in dysfunction and subsequently behavior of the genital system in both men and women (1). These multisystemic functions point to the importance of caregiver awareness regarding normal pelvic floor function in general and the need for tools to diagnose specific dysfunction in patients with related symptoms.

However, literature is scarce on the topic of the diagnostic investigation of pelvic floor and there is a lack of uniformity in the description of the anatomy per se and the nomenclature of the pelvic floor (2-4). The pelvic floor comprises of several layers: from superior to inferior, the supportive connective tissue of the endopelvic fascia, the pelvic diaphragm (levator ani and coccygeus muscle), the perineal membrane (urogenital diaphragm) and the superficial layer (bulbospongiosus, ischiocavernosus and superficial transverse perineal muscles)(5). The iliococcygeus, pubococcygeus and puborectalis muscles make up the levator ani muscle of and play an important role in prevention of pelvic organ prolapse and incontinence.

The perineal membrane is a fibrous muscular layer directly below the pelvic diaphragm. The current concept is that the muscular contents of this layer are formed by the distal part of the external urethral sphincter muscle (compressor urethrae and urethrovaginalis part of the external urethral sphincter). The bulbospongiosus and ischiocavernosus muscles of the superficial layer also have a role in sexual function, while the superficial transverse perineal muscle has a supportive role.

Pelvic Floor Muscle contraction presumably involves contraction of these muscles groups.

Continence is achieved when the pressure resulting from direct action of the puborectalis muscle as such and the external anal and urethral sphincters is greater than the pressure exerted on the bladder through abdominal Valsalva or bladder smooth muscle contraction (2;3;6;7). Stress urinary incontinence is the complaint of

involuntary leakage on effort or exertion, or on sneezing or coughing. Urge urinary incontinence is the complaint of involuntary leakage accompanied by or immediately preceded by urgency (8).

The assessment of the function of the pelvic floor muscles, e.g. concerning in muscle strength, tone, endurance and coordination, is difficult, because of a lack of simple to use and reliable measurement techniques, and a lack of cut-off values for pathological conditions. Furthermore, the reproducibility of testing is questionable.

Literature describes different techniques for the evaluation of pelvic floor function using transperineal ultrasound, manual muscle testing and squeeze pressure measurements (9-17). A standardization of both biofeedback technology and the methodology for its application to the pelvic floor muscle assessment and rehabilitation is also lacking (18). Kegel (19) was the first to report the efficacy of pelvic floor muscle exercises in treating urinary incontinence in women. Since then, manometric pressure measures and surface electromyography (sEMG) instrumentation have been used as a biofeedback adjunct to pelvic muscle rehabilitation. This feedback helps to isolate the specific muscles and can assist in motivation by visibly displaying pelvic floor muscle activity and progress. sEMG electrodes placed on the abdomen can help prevent the inadvertent overuse of the abdominal muscles when attempting pelvic floor contractions and help train abdominal pelvic synergy in contracting the pelvic floor muscles while experiencing intra-abdominal pressures, such as coughing(20-24). The behavioural approach of biofeedback-assisted pelvic floor rehabilitation focuses on the healthy functioning of the pelvic floor musculature which sets the tone for the whole micturition, defecation and/or sexual function process.

Before beginning therapy, specialists use various diagnostic tools such as urodynamics, a voiding diary, defecogram or even Magnetic Resonance Imaging (MRI). However, current diagnostic models have stressed the importance of a physical exam, as well as assessment of the relationship between pelvic floor function, sexual function, isolated functioning and the awareness of the relationship between structures like the bladder, rectum, anus and vagina (7, 17, 25-28). The aim of this study was, in this perspective, before starting treatment, to perform a specific diagnostic work-up focused on pelvic floor function. In our hospital, this diagnostic consultation is indicated as Diagnostic Investigation of Pelvic Floor Function (DIPFF).

Materials and Methods

Patients with complaints of micturition, defecation and/or sexual dysfunction related to pelvic floor dysfunction were retrospectively selected from the database of the Pelvic Floor Center at the Leiden University Medical Center (LUMC). We informed our medical ethical committee on this study.

Before DIPFF, all patients with complaints of micturition, defecation and/or sexual function, underwent comprehensive evaluation, including patient history, physical examination, ultra sonography of the urinary system, a voiding diary, defecogram or MRI (26, 29).

The standardized DIPFF is carried out as follows: DIPFF is done by a pelvic floor physiotherapist and starts with taking medical history using the Pelvic Floor Inventories Leiden (PeLFIs) (29). The questions in the PeLFIs are related to general health, micturition and defecation and to gynaecological, obstetrical and sexual matters. The patients were asked about Quality of life and the degree of complaints for every domain using a Visual Analogue Scale (VAS). The PeLFIs questionnaire has been validated in Dutch and has been translated in English and will be validated in English. An explanation of related relevant anatomy and (patho) physiology is offered, and finally, patients are asked to perform a pad test (in case of incontinence) and to fill in a voiding diary.

A qualitative investigation of the pelvic floor function includes a qualitative physical examination of the pelvic floor function consisting of vaginal and anal visual inspection as well as digital palpation (including the Pelvic Organ Prolapse Quantification, POP-Q). Finally the pelvic floor function is assessed quantitatively by biofeedback registration.

Visual inspection

Before commencing the physical examination patients are fully informed as to what to expect during the physical examination, before starting it. An assessment is discontinued if the patient experiences any symptoms of distress during examination.

In case of complaints of micturition or vaginal prolapse, women undergo the examination in supine position. Men and women with complaints of defecation or anal prolapse are examined in lateral lithotomic position.

Inspection of the vulva, perineum and anus in women and of perineum and anus in men is performed to look for skin pathology and anatomical abnormalities. Testing for pelvic organ prolapse is an integral part of the physical examination of every patient with pelvic floor muscle complaints.

Anal/rectal or vaginal prolapse can be diagnosed by asking the patient to strain. During inspection, the patient is asked to perform one pelvic floor muscle contraction, hereby attempting to prevent the escape of gas or urine. The patient is also asked to cough.

The position of the anus and the perineum are noted at rest and during straining. In the normal situation, a pelvic floor muscle contraction will lead to ventral and cranial movement of the perineum. Extra-pelvic muscle activity is noted. Straining is classified as normal or involuntary relaxation (8).

Digital palpation

A vaginal and rectal exam is part of the investigation. In female patients the ICS POP-Q system was assessed. The POP-Q system has been developed by the International Continence Society (ICS) and was introduced in 1996. It is presently widely used for research purposes but still not yet broadly introduced in clinical practice. In the POP-Q system, nine well defined points and distances are measured: two points of the anterior compartment (Aa and Ba), two points in the middle compartment (C and D) and two points of the posterior compartment (Ap and Bp). These six points are measured during maximal protrusion of the prolapse and are measured in relation to the hymen. Three additional distances are measured: the perineal body (PB), genital hiatus (GH), and the total vaginal length (TVL). The nine measurements are the basis for a five point ordinal staging from stage 0 (no prolapse at all) till stage 4 (complete eversion of the vagina) (30, 31).

Digital vaginal palpation is performed with one (index) finger because two fingers may stretch the pelvic floor muscles and thereby influence the ability to contract. For anal palpation, the patient is put in left lateral position, for vaginal palpation the patient is put in supine position with one pillow under the head, hips and knees flexed to 60°.

Digital palpation is performed to assess qualitatively the pelvic floor muscles and surrounding areas at rest, during contraction and relaxation. The pelvic floor and related muscles, like the external and internal anal sphincter, the puborectal muscle

and the levator ani are palpated circumferentially based on the anatomy. Digital palpation is also used to test for pain and sensitivity of the palpated areas. Digital pressure on the pelvic floor muscles may reproduce or intensify the patient's pain. This sign of pain can be unilateral. The patient is asked to contract and to relax the pelvic floor muscles 10 times. After one minute rest the patient is asked to contract the pelvic floor muscles for 10 seconds, 5 times with one minute rest between. The patients are asked to prevent the escape of urine or gas, to cough and to strain. The quality of the contractions and relaxation is described according to ICS –protocol of ICS terminology procedure (8).

The quantification of a contraction is problematic. There is no validated scale to quantify contractions of the pelvic floor muscles. Therefore quantification, more specific than absent, weak, normal, or strong is not recommended.

EMG

The quantitative investigation of the pelvic floor function consists of EMG registration of the behaviour of the pelvic floor during an identical sequence of tests as described above. Sex-dependent differences are visible in all three planes. Because of the absence of (inter)nationally accepted reference values we defined in women, based on our experience for 18 years, a muscle tone at rest of 1-2 microvolt (μV) as normal and a rest tone above 2 μV as an elevated rest tone. In men the normal rest tone of the pelvic floor is about 2-3 μV .

Because of the clear difference in male and female anatomy, different electrodes are needed in the treatment of pelvic floor dysfunction (11; 32). The Myomed 932® (Enraf Nonius, Delft, the Netherlands) was used for biofeedback registration with a vaginal probe (EMG, 2 rings vaginal probe 2 mm, V.M.P.Bioparc, Auriol, France) or an EMG anal probe (2 rings anal probe 2 mm, V.M.P.Bioparc, Auriol, France). The vaginal probe is inserted up to the thinnest part, at the level of the introitus and the anal probe is inserted with the proximal bulge at the anal verge (33). During a voluntary contraction of the pelvic floor muscles, the intensity of the EMG signal should increase.

When the patient is asked to hold the contraction, a sustained high intensity on the EMG can be observed. At subsequent relaxation, the EMG intensity will fall to baseline or even below. First, the muscle tone at rest is registered during one minute. Then the patient is asked to make 10 voluntary contractions (fast twitch), each lasting

3 seconds, followed by relaxation. A voluntary relaxation after a contraction indicates that the patient is able to relax the pelvic floor muscles on demand. The pelvic floor will return to its resting state. After 1 minute rest the subjects are asked to perform a sustained contraction, resulting in a ventral and cranial movement of the pelvic floor muscles. They should try to hold the contraction for as long as possible up to a maximum of 30 seconds (slow twitch). The patients are asked to continue breathing as normal as possible during the pelvic floor muscle contraction.

Finally, the straining potential is investigated. We instruct the patients to strain as if they are defecating. In our institute the results of this straining are classified as normal or paradoxal behaviour of the pelvic floor.

Results

238 Patients with complaints of micturition, defecation and/or sexual function were included in this study, analysed at the Pelvic Floor Center of the Leiden University Medical Center (July 2004 and July 2006): 97 men with a mean age of 52 years (12-91 years) and 141 women with a mean age of 47 years (18-79 years). In total 134 patients (56.3 %) underwent surgery for their complaints before DIPFF: in 54 men (41%) and 80 women (59%). In our patient population there was a considerable amount of sexual abuse in women and men as assessed by the PeIFIs (Table1).

Table 1: Patient Characteristics.

History	Men N=97	Women N=141	Total N=238
Age (years)	52 (12-91)	47 (18-79)	50 (12-91)
Surgery (%)	41	59	56.3
Sexual abuse (%)	14.4	32.0	24.8

Based on the referral diagnosis 224 patients (94.1%) had complaints of micturition, 199 of defecation (82.7%) and 154 on sexuality (64.7%, PelFIs). However, stratification of patients according to their complaints at first visit results in 3 subgroups: patients with one single complaint (micturition, defecation or sexual), a combination of two complaints or complaints in all compartments of the pelvic floor (Table 2).

Table 2. Complaints of patients

Complaints (%)	Men N=97	Women* N=141	Total N=238
Micturation	91.1	96.2	94.1
Defecation	86.1	80.2	82.7
Sexual	63.5	65.7	65.2
One compartment of pelvic floor	10.3	14.2	12.6
Two compartments of pelvic floor	40.2	24.8	31.1
Three compartments of pelvic floor	49.5	60.3	55.9

* One woman became free of complaints on the waiting list

In the total group 34 patients (14.3%) used medication for micturition during their first visit, 20 for defecation (8.4%) and 4 for sexual dysfunction (1.7 %, men only). A total of 16 patients (6.7%) used anti depressants: 7 men (7.2%) and 9 women (6.4%) (Table 3).

Table 3. Medication.

Medication (%)	Men N= 97	Women N= 141	Total N= 238
Micturition	16.5	12.8	14.3
Defecation	8.2	8.5	8.4
Sexual function	4.1	0.0	1.7
Anti depressants	7.2	6.48	6.7

The mean rest tone of the pelvic floor was 5 μ V in men (0.0-12.0 μ V) and 3.8 μ V in women (0.5-16.0 μ V). Based on our definition a normal rest tone, an elevated rest tone of the pelvic floor was found in 141 patients (69.3 %): 79 men (81.4 %) and 86 women (61.0 %). In patients with complaints of micturation an elevated rest tone was found in 69.2 % (70 men and 85 women), with complaints of defecation in 72.4 % (68 men and 76 women) and with sexual dysfunction in 74 % (53 men and 61 women).

A history of sexual abuse as assessed by the PeLFIs questionnaire was documented in 59 patients (24, 8 %): in 14 men (14.4%) and in 45 women (32.0%). This gender difference in sexual abuse was significant ($p = 0.002$). The mean age of women with a history of sexual abuse was 45.5 years and in men 51.6 years.

In the group of patients with a history of sexual abuse 47 patients (80.0%) were found to have an overactive rest tone of the pelvic floor: 13 men (92.9 %) and 34 women (75.6 %) (Table 4)

Table 4: Biofeedback registration comparing men and women.

Biofeedback	Total N = 238	Men N = 97	Women N = 141
Resttone (μV)	4.4 (0-16.0)	5.0 (0.0-12.0)	3.9 (0.5-16.0)
Fast twitch (μV)	11.3 (0.0-30.0)	14.1 (0.0-30.0)	9.3 (0.5-30.0)
Slow twitch (μV)	8.8 (0.0-30.0)	10.8 (0.0-30.0)	7.4 (0.0-30.0)
Ivoluntary relaxation (%)	77.3	81.4	74.7
Elevated rest tone (%)	69.3	81.4	61.0

Discussion

The lower urinary tract, the anorectal channel and the internal genitals as well as the pelvic floor are closely related to each other, both anatomically and, what is becoming more and more apparant, functionally. Hence, it is mandatory in patients with complaints of micturition, defecation and/or sexual dysfunction to take into account the function of all these organs including the pelvic floor rather than focusing on isolated organs. This is true for history taking, diagnostic investigations and treatment. The Dutch Urological Association states in its guidelines that, in cases of urge and stress urinary incontinence and urgency/frequency, pelvic floor physiotherapy is a first choice treatment option. An overactive bladder (OAB), with or without incontinence, negatively affects women's sexual health, reducing sexual desire and ability to archieve orgasm. Given the impact of OAB on sexual health, sexual health should be routinely assessed by clinicians and addressed by researchers (34). In this respect, it does not make sense that medical specialists focus their diagnostic attention

to the bladder, rectal, anal and/or sexual function solely. Attention should be focused on the DIPFF.

Another issue hampering the research of pelvic floor dysfunction is the total lack of standardization of both biofeedback technology and the methodology for its application to pelvic floor muscle assessment and rehabilitation. Both the small number of studies and this lack of standardized technology and protocols are limiting factors in generalizing our findings. It is also of note that to date, the mechanisms responsible for therapeutic efficacy have not been clarified beyond doubt. Pelvic floor muscle biofeedback is effective in the treatment of urinary incontinence. In the majority of studies, biofeedback is statistically superior to comparable treatments and controls; moreover no study was superior to biofeedback (11).

Also, electrostimulation (ES) was found to be a safe and effective therapy in women with sexual dysfunction. The lack of controlled parameters has made it difficult to evaluate the true efficacy of intravaginal ES. Moreover the stimulation equipments as well as the treatment regimens are not standardized, and it is difficult to draw conclusions about electrical parameters of frequency, pulse duration, pulse-to-rest ratio, length of treatment, power and accurate success rates (36).

The nomenclature of the ICS does not define the rest tone of the pelvic floor and no reference values are available (8). In literature protocols of biofeedback showed a wide variation in descriptions on patient education, contraction parameters, numbers of training sessions, numbers of repetitions, duration of training, use of accessory muscles, patient positioning, etc. (11).

Using our definition of the normal rest tone we were impressed by the number of patients with an elevated rest tone of the pelvic floor. Remarkable as well was the high prevalence of patients with a history of sexual abuse (24.8 %: men 14.4%, women 32.0%).

Being a referral center sexual dysfunctions are presented as quite prevalent and multifaceted problems, but they are continuously underrecognized and undertreated in mixed patient populations (37). Pelvic-floor complaints are correlated with sexual abuse and asking about abuse should be a routine part of screening as well. Considering the fact that many practitioners have difficulty enquiring about abuse, we have suggested earlier that a questionnaire may be helpful in improving the recognition and management of patients who have a history of sexual abuse.

In our center the use of these questionnaires is standard of care (38, 39).

In contrast to our population the frequency of sexual abuse was mentioned to be rare on routine screening for sexual abuse by health care practitioners and gynaecologists (respectively 1.3 and 0.5%) (37, 40).

In relation to the technique of pelvic floor investigation placement and design of probes are relevant in pelvic floor dysfunction (33) and the resulting rest tone measurements may vary depending on the type of probe used, the placement of the probe and used equipment. To our knowledge there is no means of calibrating the different types of probes and equipment used in pelvic floor practice. Furthermore, literature provides scarce knowledge and consensus on treatment of an elevated pelvic floor rest tone.

In the standardization on terminology of pelvic floor dysfunction by the ICS it is stated that overactivity of pelvic floor muscles is a situation in which the pelvic floor muscles do not relax, or even may contract when relaxation is functionally needed for example during micturition or defecation. This condition is based on symptoms such as voiding difficulty, obstructed defecation, or dyspareunia and on signs like the absence of voluntary pelvic floor muscle relaxation.

In daily practice this definition is not sufficient to explain the findings in patients. We feel it is important to be able to differentiate between the activities of the pelvic floor in terms of relax capacity and contract capacity. We believe that the elevated rest tone is related to symptoms as mentioned in the ICS definition and not the activity of the pelvic floor as such.

Although we describe a relationship between an elevated rest tone and a dysfunction of the bladder, vagina and/or rectum, the exact mechanism of this relationship remains unclear. However, we are convinced that in order to break through the vicious circle of an elevated rest tone, treatment should be focused on pelvic floor relaxation instead of straining (“pelvic floor exercises”) (11;33;41, 42).

Based on this conviction, we recommend an individual assessment of patients rather than treatment solely based on complaints. In case of an elevated rest tone, the primary target is relaxation and restoration of the coordination of pelvic floor muscles (43). In contrast, when a weakness of the pelvic floor is diagnosed, the primary target is strengthening and training of the endurance of the pelvic floor. Biofeedback therapy is known to be effective in conditions as mentioned above (13, 27, 33, 42, 44, 45)

The DIPFF may be a helpful diagnostic tool, but further randomized controlled studies are necessary to validate this intervention.

Conclusion

Pelvic floor dysfunction is correlated with urinary, sexual or gastroenterological complaints. In our retrospective study we found that 77, 2 % of patients who presented to the clinic with urinary, gastro or sexual complaints had measurable pelvic floor dysfunction (69, 3 % overactive rest tone and 7, 9 % under active rest tone). In relation to the ICS terminology there is a need for a well defined normal versus elevated rest tone of the pelvic floor.

Reference List

1. Bourcier, A. P.; McGuire, E. J.; Abrams, P. Pelvic Floor Disorders. New York. Harcourt Publishers Ltd; 2007. p.Foreword.
2. Janda, S., van der Helm, F. C., and de Blok, S. B. Measuring Morphological Parameters of the Pelvic Floor for Finite Element Modelling Purposes. *J.Biomech.* 2003; 36(6):749-57.
3. Marani, E, The Pelvis; another view. Enschede/Leiden: Twente University Press; 2002.
4. Shafik, A., Mostafa, R. M., El Sibai, O., and Shafik, I. A. Electromotor Activity of the Cecum and Ascending Colon: the Concept of 'Individual Pacemakers'. *Eur.Surg.Res.* 2004; 36(5):308-12.
5. Stoker, J. The Anatomy of the Pelvic floor and Sphincters. Bartram CI and DeLancey, J. O. Imaging pelvic floor disorders. New York: Springer Verlag, 2002. Pp.1-26.
6. Kearney, R., Sawhney, R., and DeLancey, J. O. Levator Ani Muscle Anatomy Evaluated by Origin-Insertion Pairs. *Obstet.Gynecol.* 2004; 104(1):168-73.
7. Shafik, A. The Role of the Levator Ani Muscle in Evacuation, Sexual Performance and Pelvic Floor Disorders. *Int.Urogynecol.J.Pelvic.Floor.Dysfunct.* 2000; 11(6):361-76.
8. Abrams, P., Cardozo, L., Fall, M., Griffiths, D., Rosier, P., Ulmsten, U., Van Kerrebroeck, P., Victor, A., and Wein, A. The Standardisation of Terminology in Lower Urinary Tract Function: Report From the Standardisation Sub-Committee of the International Continence Society. *Urology* 2003; 61(1):37-49.
9. Aksac, B., Aki, S., Karan, A., Yalcin, O., Isikoglu, M., and Eskiyurt, N. Biofeedback and Pelvic Floor Exercises for the Rehabilitation of Urinary Stress Incontinence. *Gynecol.Obstet.Invest* 2003; 56(1):23-7.
10. Dorey, G., Speakman, M., Feneley, R., Swinkels, A., Dunn, C., and Ewings, P. Randomised Controlled Trial of Pelvic Floor Muscle Exercises and Manometric Biofeedback for Erectile Dysfunction. *Br.J.Gen.Pract.* 2004; 54(508):819-25.
11. Glazer, H. I. and Laine, C. D. Pelvic Floor Muscle Biofeedback in the Treatment of Urinary Incontinence: a Literature Review. *Appl.Psychophysiol.Biofeedback* 2006; 31(3):187-201.
12. Van Kampen, M., De Weerd, W., Van Poppel, H., De Ridder, D., Feys, H., and Baert, L. Effect of Pelvic-Floor Re-Education on Duration and Degree of

Incontinence After Radical Prostatectomy: a Randomised Controlled Trial. *Lancet* 8-1-2000; 355(9198):98-102.

13. Wang, A. C., Wang, Y. Y., and Chen, M. C. Single-Blind, Randomized Trial of Pelvic Floor Muscle Training, Biofeedback-Assisted Pelvic Floor Muscle Training, and Electrical Stimulation in the Management of Overactive Bladder. *Urology* 2004; 63(1):61-6.
14. Laycock, J. Incontinence. Pelvic Floor Re-Education. *Nursing. (Lond)* 25-7-1991; 4(39):15-7.
15. Sapsford, R, Bullock-Saxton J, and Marwell S, *Women's Health: A Textbook for Physiotherapists*. London: WB Saunders Company; 1998.
16. Thompson, J. A., O'Sullivan, P. B., Briffa, N. K., and Neumann, P. Assessment of Voluntary Pelvic Floor Muscle Contraction in Continent and Incontinent Women Using Transperineal Ultrasound, Manual Muscle Testing and Vaginal Squeeze Pressure Measurements. *Int.Urogynecol.J.Pelvic.Floor.Dysfunct.* 2006; 17(6):624-30.
17. Dietz, H. P., Wilson, P. D., and Clarke, B. The Use of Perineal Ultrasound to Quantify Levator Activity and Teach Pelvic Floor Muscle Exercises. *Int.Urogynecol.J.Pelvic.Floor.Dysfunct.* 2001; 12(3):166-8.
18. Glazer, H. I., Jantos, M., Hartmann, E. H., and Swencionis, C. Electromyographic Comparisons of the Pelvic Floor in Women With Dysesthetic Vulvodynia and Asymptomatic Women. *J.Reprod.Med.* 1998; 43(11):959-62.
19. Kegel, A. H. The Physiologic Treatment of Poor Tone and Function of the Genital Muscles and of Urinary Stress Incontinence. *West J.Surg.Obstet.Gynecol.* 1949; 57(11):527-35.
20. Both, S. and Laan, E. Simultaneous Measurement of Pelvic Floor Muscle Activity and Vaginal Blood Flow: a Pilot Study. *J.Sex Med.* 2007; 4(3):690-701.
21. Brown, W. J. and Miller, Y. D. Too Wet to Exercise? Leaking Urine As a Barrier to Physical Activity in Women. *J.Sci.Med.Sport* 2001;4(4):373-8.
22. Van, der, Velde J, and Everaerd, W. Voluntary Control Over Pelvic Floor Muscles in Women With and Without Vaginistic Reactions. *Int.Urogynecol.J.Pelvic.Floor.Dysfunct.* 1999; 10(4):230-6.
23. Van, der, Velde J, Laan, E., and Everaerd, W. Vaginismus, a component of a General Defensive Reaction. An Investigation of Pelvic Floor Muscle Activity During Exposure to Emotion-Inducing Film Excerpts in Women With and Without Vaginismus. *Int.Urogynecol.J.Pelvic.Floor.Dysfunct.* 2001; 12(5):328-31.

24. Van, der, Velde J, and Everaerd, W. The Relationship Between Involuntary Pelvic Floor Muscle Activity, Muscle Awareness and Experienced Threat in Women With and Without Vaginismus. *Behav.Res.Ther.* 2001; 39(4):395-408.
25. Bo, K., Sherburn, M., and Allen, T. Transabdominal Ultrasound Measurement of Pelvic Floor Muscle Activity When Activated Directly or Via a Transversus Abdominis Muscle Contraction. *Neurourol.Urodyn.* 2003; 22(6):582-8.
26. Sherburn, M., Murphy, C. A., Carroll, S., Allen, T. J., and Galea, M. P. Investigation of Transabdominal Real-Time Ultrasound to Visualise the Muscles of the Pelvic Floor. *Aust.J.Physiother.* 2005; 51(3):167-70.
27. Aksac, B., Aki, S., Karan, A., Yalcin, O., Isikoglu, M., and Eskiyurt, N. Biofeedback and Pelvic Floor Exercises for the Rehabilitation of Urinary Stress Incontinence. *Gynecol.Obstet.Invest* 2003; 56(1):23-7.
28. Terra, M. P., Dobben, A. C., Berghmans, B., Deutekom, M., Baeten, C. G., Janssen, L. W., Boeckxstaens, G. E., Engel, A. F., Felt-Bersma, R. J., Slors, J. F., Gerhards, M. F., Bijnen, A. B., Everhardt, E., Schouten, W. R., Bossuyt, P. M., and Stoker, J. Electrical Stimulation and Pelvic Floor Muscle Training With Biofeedback in Patients With Fecal Incontinence: a Cohort Study of 281 Patients. *Dis.Colon Rectum* 2006; 49(8):1149-59.
29. Voorham-van der Zalm PJ; Stiggelbout, A. M.; Aardoom, I; Greve, IG; Deckers, S.; Lycklama à Nijeholt, A. A. B.; Pelger, R. C. M. Development and Validation of the Pelvic Floor Inventories Leiden (PelFIs). *Neurourol.Urodyn.* 2007.
Ref Type:e-Pub
30. Bump, R. C., Hurt, W. G., Theofrastous, J. P., Addison, W. A., Fantl, J. A., Wyman, J. F., and McClish, D. K. Randomized Prospective Comparison of Needle Colposuspension Versus Endopelvic Fascia Plication for Potential Stress Incontinence Prophylaxis in Women Undergoing Vaginal Reconstruction for Stage III or IV Pelvic Organ Prolapse. The Continence Program for Women Research Group. *Am.J.Obstet.Gynecol.* 1996; 175(2):326-33.
31. Vierhout, M. E., Stoutjesdijk, J., and Spruijt, J. A Comparison of Preoperative and Intraoperative Evaluation of Patients Undergoing Pelvic Reconstructive Surgery for Pelvic Organ Prolapse Using the Pelvic Organ Prolapse Quantification System. *Int.Urogynecol.J.Pelvic.Floor.Dysfunct.* 2006; 17(1):46-9.
32. Hussain, S. M. Normal Imaging findings. Hussain, S. M. *Imaging Anaorectal Diseases.* London: Greenwich Medical Media LTD; 1998. pp.29-54.
- 33 Voorham-van der Zalm PJ, Pelger, R. C., Heeswijk-Faase, I. C., Elzevier, H. W., Ouwkerk, T. J., Verhoef, J., and Nijeholt, G. A. Placement of

Probes in Electrostimulation and Biofeedback Training in Pelvic Floor Dysfunction. *Acta Obstet.Gynecol.Scand.* 2006; 85(7):850-5.

34. Coyne KS, Margolis MK, Jumadilova Z, Bavendam T, Mueller E, Rogers R. Overactive bladder and women's sexual health: what is the impact? *J Sex Med* 2007;4: 656-666
35. Giuseppe PG, Pace G, Vicenti C. Sexual function in women with urinary incontinence treated by pelvic floor transvaginal electrical stimulation. *J Sex Med* 2007; 4: 702-777.
36. Smith JJ III. Intavaginal stimulation randomized trial. *J.Urol* 1996;155: 127-130
37. Maheux, B., Haley, N., Rivard, M., and Gervais, A. Do Physicians Assess Lifestyle Health Risks During General Medical Examinations? A Survey of General Practitioners and Obstetrician-Gynecologists in Quebec. *CMAJ.* 29-6-1999; 160(13):1830-4.
38. Laumann, E. O., Paik, A., and Rosen, R. C. Sexual Dysfunction in the United States: Prevalence and Predictors. *JAMA* 10-2-1999; 281(6):537-44.
39. Elzevier HW, Voorham- van der Zalm PJ, Pelger RCM. How reliable is a self-administered questionnaire in detecting sexual abuse: a retrospective study in patients with pelvic floor complaints and a review of literature. *J Sex Med* 2007;4: 956-963
40. Peschers, U. M., Du, Mont J., Jundt, K., Pfurtner, M., Dugan, E., and Kindermann, G. Prevalence of Sexual Abuse Among Women Seeking Gynecologic Care in Germany. *Obstet.Gynecol.* 2003; 101(1):103-8.
41. Balmforth, J. R., Mantle, J., Bidmead, J., and Cardozo, L. A Prospective Observational Trial of Pelvic Floor Muscle Training for Female Stress Urinary Incontinence. *BJU.Int.* 2006; 98(4):811-7.
42. Bo, K. Can Pelvic Floor Muscle Training Prevent and Treat Pelvic Organ Prolapse? *Acta Obstet.Gynecol.Scand.* 2006; 85(3):263-8.
43. Rosenbaum, T. Y. Pelvic Floor Involvement in Male and Female Sexual Dysfunction and the Role of Pelvic Floor Rehabilitation in Treatment: a Literature Review. *J.Sex Med.* 2007; 4(1):4-13.
44. Berghmans, L. C., Frederiks, C. M., de Bie, R. A., Weil, E. H., Smeets, L. W., van Waalwijk van Doorn ES, and Janknegt, R. A. Efficacy of Biofeedback, When Included With Pelvic Floor Muscle Exercise Treatment, for Genuine Stress Incontinence. *Neurourol.Urodyn.* 1996; 15(1):37-52.
45. Dumoulin, C., Lemieux, M. C., Bourbonnais, D., Gravel, D., Bravo, G., and Morin, M. Physiotherapy for Persistent Postnatal Stress Urinary Incontinence: a Randomized Controlled Trial. *Obstet.Gynecol.* 2004; 04(3):504-10.