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Faecal incontinence Protocol

Using the NeuroTrac ETS EMG-Triggered Stimulation, EMG Biofeedback and Neuromuscular Stimulation for Rehabilitation of the Pelvic Floor in Patients with Faecal incontinence

Background Information.

The definition of faecal incontinence is ”Recurrent uncontrolled passage of fecal material for at least one month, in an individual with a developmental age of at least 4 years”(1). It is a socially and psychologically debilitating disorder that causes shame and is the most common reason to institutionalize old people. Faecal incontinence affects men and women of all ages. Daily or weekly episodes occur in about 2% of the adult population and in about 7% of healthy independent adults over the age of 65. Faecal incontinence is the second commonest reason for requesting plcement in a nursing home. A third of elderly people in retrement homes or hospital are incontinent for stool (2).
Vaginal delivery can lead to faecal incotinence due to a mechanical tear of the sphincters or a generalized weakening of the sphincter mechanism and pelvic floor. Overt sphincter damage from a third or fourth degree tear occurs in approximately 0,6% to 3% of women undergoing vaginal delivery. 29 %-48% of these patients develop fecal incontinence between 3 months and 3 years after primary sphincter repair(3). Symptoms of faecal incontinence are reported between 6,8% and 35% of primiparal and 12% and 44% of multiparal women have occult sphincter damage reconized on endoanal ultrasonography (EAUS). From one-third to two thirds of women with such sphincter damage recognized on EAUS have bowel symptoms such as urgency or faecal incontinence (3). Faecal incontinence is commonly caused by structural damage during childbirth and anal surgery, neurological disease, previously corrected congenital anorectal malformations. Rectal prolapse is usually associated with faecal incontinence, and although this improves with prolapse repair, it often persists tbecause of internal anal sphincter weakness. A miscellaneous cause can be inflammatory bowel disease (2), Fecal incontinence is underdiagnosed because of not seeking healthcare and because of the attitude of doctors.

The function of the anorectum is to maintain fecal continence and to allow controlled defecation and passage of flatus. This is achieved by the action of the anal sphincters and pelvic floor muscles. (Fig.1)
The inner circular smooth muscle layer of rectum grows in thickness distally, forming the internal anal sphincter. The internal anal sphincter is controlled by autonomous nerves and contracted at rest.

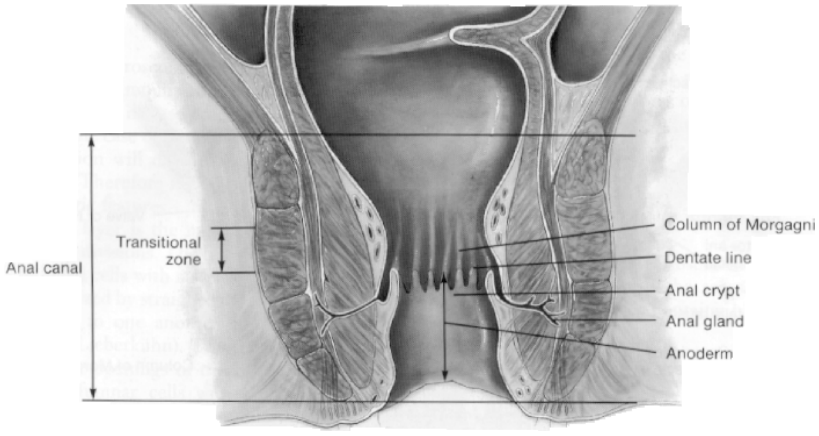

Fig.1 Lining of the anal canal (from the book: Principles and Practice of Surgery for the Colon, Rectum, and Anus 1992)

The external anal sphincter is striated muscle. It surraunds the internal anal sphincter and extends 0,5-1.0 cm further down and joins the puborectal muscle without clearcut anatomic separation. Puborectal muscle forms a sling behind the rectum and is attached in front to pubic bone. The activity of the exteral anal sphincter is continuous even during sleep. (4).

The internal anal sphincter is supplied by both sympathetic (L5) and parasympathetic (S2-S4) nerves. The external anal sphincter is innervated by the perineal inferior haemorrhoidal branches of pudendal nerves (S2, S3, S4), the other parts of levator muscles receive innervation directly from the nerve roots S2-S4. The afferent sensory fibers run directly to the plexus S4 (5).

Fecal continence is depenent on many different factors acting together. Factors maintaining fecal continence are consistency of stool, delivery of colonic contents to the rectum, rectal capacity and complince, anorectal sensation, function of the anal sphincter mechanism and muscles and nerves of the pelvic floor. Psychobehavioral factors have an impact on function of the anorectum to the full defecation process. (6).

Etiological factors for fecal incontinence are

- altered stool consistency-diarrheal
- inadequate reservoir capacity or compliance (inflammatory bowel disease, absent rectal reservoir)
- inadequate rectal sensation (neurologic conditions,overflow incontinene)
- abnormal sphincter mechanism or pelvic floor (anatomic sphincter defect, pelvic floor denervation, congenital abnormalities, miscellaneous) (7).

Assesment

It is important to be able to predict which patients are likely to benefit from biofeedback treatment. These include age, diagnostic parameters such as type and severity of damage (neurological or physical), the duration and severity of incontinence, the amount and type of treatment, and the qualifications of the biofeedback clinician (12).

A good history and a symptom qestionnare give information for diagnostic evaluation and measuring of treatment efficacy in patients with fecal incontinence (6).

- patient questionnare: consistency of content lost (gas, liquid, solid), use of pads, limitations, sensation at time of defecation, ability to differentiate gas/liquid/silid. Previous therapy for incontinence, associated symptoms, past medical history, obstetric history, relation to deliverers to dysfunction, operative history and relation of operation to dysfunction (7).

Fecal incontinence grading systems (8).

The Pescatori score

A	Incontinence for flatus/mucous	Less than once a week	1
		At least once a week	2
		Every day	3
B	Incontinence for liquid stool	Less yhan once a week	1
		At least once a week	2
		Every day	3
C	Incontinence for solid stool	Less than once a week	1
		At least once a week	2
		Every day	3

AI degree	Points	AI frequency	Points	AI score
A	1	1	1	2
A	1	2	2	3
A	1	3	3	4
B	2	1	1	3
B	2	2	2	4
B	2	3	3	5
C	3	1	1	4
C	3	2	2	5
C	3	3	3	6

AI scor = AI degree + AI frequency.
AI, anal incontinence

The Wexner score

Type of Incontinence	Never	Rarely	Sometimes	Usually	Always
Solid	0	1	2	3	4
Liquid	0	1	2	3	4
Gas	0	1	2	3	4
Wears pad	0	1	2	3	4
Lifestyle Alteration	0	1	2	3	4

Never,0; rarely,<1/month; sometimes, <1/week, >1/month; usually, <1/day, >1/week, always.>1/day
0,perfect; 20, complete incontinence.

The newly developed incontinence score

	Never	Rarely	Sometimes	Weekly	Daily
Incontinence for solid stool	0	1	2	3	4
Incontinence for liquid stool	0	1	2	3	4
Incontinence for gas	0	1	2	3	4
Alteration for lifestyle	0	1	2	3	4

	No	Yes
Need to wear a pad or plug	0	2
Taking constipating medicines	0	2
Lack of ability to defer defecation for 15 minutes	0	4

Never, no episodes in the past four weeks; rarely, 1 episode in the past four weeks; sometimes, >1 episode in the past four weeks but <1 a week; weekly, 1 or more episodes a week but <1 a day; daily, 1 or more episodes a day.
Add one score from each row: minimum score = 0 = perfect continence; maximum score = 24 = totally inconent

- diary gard, one each night for four weeks (7):

Diary card. Each positive answer resulted in a numerical score as listed. Maximum score per day = 10 = worst incontinence

Today				
1.	Did you leak, without being aware of it at first?			Yes/No
If yes, was it:	gas	___(1)	smallstain	___(0,5)
	liquid	___(1,5)	large stain	___(1)

	solid ___(2)	half an egg cup ___(1.5) whole motion ___(2)
2.	Did you have great urgency when you felt you would not make it to the toilet in time to open your bowels?	Yes/No (1)
	If yes, did you actually lose some stool before Getting to the toilet?	Yes/No
	If yes, was it: pea sized ___(1) half an egg cup ___(1.5) whole motion ___(2)	
3.	Did you wear pad or use a plug of tissue paper?	Yes/No (0,5)
	If yes, did it get soiled?	Yes/No (0,5)
4.	Did you take Imodium (loperamide), codeine or any other medicine today?	Yes/no (1)
	If yes, what	

Clinical status (complete physical examination)

Anal endosonography (EAUS provides a morphologic assessment of internal and external anal sphincters, the puborectalis muscle, and the rectovaginal septum).

Anorectal manometry (a Quantitative method of resistance to spontaneous evacuation provided by the anorectal mechanism and sensory capabilities of the rectum to provide a feeling of imminent emptying. It provides useful information in determining the causes of faecal incontinence and allows therapeutic decisions to be based on objective parameters. It also provides a baseline for comparison after treatment.

Defecography (Cinedefecography , radiographic method of evaluting the dynamics of evacuation)

Electromyography (EMG, the main purposes of anal EMG are to assess the functional activity of the anal sphincter and pelvic floor muscles and assess the presence of neurological damage. A disposable anal plug EMG, the longitudinal electrodes have a better correlation with fine wire electrodes than circular ones. Anal plug EMG has now gained widespread clinical use for biofeedback therapy.

Sensory testing (A sensation of rectal filling is essential for normal defecation and plays an important role in the continence mechanism. Rectal sensation can be tested by balloon distension of the rectum. A balloon can be destended either by air or water. Three measurements are taken. The rectal sensory threshold corresponds to the minimum volume felt in the rectum, the sensation of fullness is the maximal volume injected into the rectumthere is an urgent desire to defecate, and the maximum tolerable volume is the volume causing unbearable discomfort.

Anal sensation, (the mucosal electrosensitivity) is a test to quantify anal canal sensation increasing current until sensation is reported, sensory tresholds measured in this way are reproducible (3).

Treatment

Surgical

- sphincter repair in patients with a defined muscular defect

Conservative,

- drug therapy
- bowel habit (diet, fluid intake, defecation posture)
- biofeedback therapy combined with neuromuscular electrical stimulation
- home functional training program in everyday life

Anorectal Function Re-Education , ETS, Emg EMG Biofeedback combined with Neuromuscular Stimulation

1.Urge incontinence

- without sphincter defects
- with awareness of the patient
- against her/his will because of lack of voluntary control

2. Incontinence after sphincter repair to complete functional results of surgery

The aim:

- to learn to use and control the pelvic floor, which is a dynamic, not a frozen unit
- to improve sensitivity to rectal distension
- to improve co-ordination between rectal distension and voluntary sphincter contraction
- to improve muscle power, endurance and contraction speed

Biofeedback

”Biofeedbck involves measuring and displaying ordinarily unfelt physiological events on order to permit selfregulation of these events. Because Biofedback generally presents information concerning the mechanism of motor controll, it is important to establish the proper scope, to explore the efficacy and to examine the therapeutic mechanism(s).” (9).
The electrical activity or activation of muscles can be measured on the skin surface by attaching surface electrodes. The signals recorded in this way are called electromyograms (EMGs) (Kari L. Keskinen, Keijo Häkkinen 1990).

Feedback is needed for all motor learning ,the trainer can become aware of success and progress.

EMG measurings are very sensitive to different kinds of disturbances; the place and the shape of electrode are important and the electrode must not move during the measuring. The best place for surface electrodes is on the muscular trunk in the middle of the nervous line and the tendon. The models of muscle activation give knowledge of the progress or going out of muscle activation, and of reflective function during muscular action.

Surface EMG appears to have a definite role in the evaluation of sphincter function and in the use of biofeedback training (6). In the alternative type of biofeedback, electromyographic (EMG) sensors are positioned in the anal canal to provide biofeedback on the averaged EMG activity of the pelvic floor(1)

The benefits of of using EMG biofeedback:

- information is provided instant and directly to the patient
- muscular performance is observed all the time with either auditory or visual feedback or both and if the function of the pelvic floor is important for the patient motivation will increase with good results
- threshold target levels will elicit to reach the required level and to maintain the contraction strong enough during required time
- template training using the computer screen improves co-ordination of muscles
- a subjective value of the quality of life is absolutely important nowadays and tells about successfull EMG training under the process
- quantitative scoring of EMG activity gives objective information about the progress throughout the therapy process
- anal-plug with longitudinal electrodes (3) to ensure perfect contact

Neuromuscular stimulation

- neuromuscular electrical stimulation (NMES) is the application of electrical current to elicit a muscle contraction. The use of NMES for neuromuscular rehabilitation has grown significantly in recent years. (10).
- always combined with EMG biofeedback and at the same time with functional exercises

- the best responses to electrical stimulation are obtained when the electrodes are placed close to the pudendal nerves. The position of electrodes is fundamental and the contact area must be as large as possible (10)
- anal-plug with longitudinal electrodes (3) to ensure perfect contact
- the factors to cause neural excitation and subsequent muscle contraction are resistance to flow of current, the size and orientation of electrodes, current intensity and pulse width, current frequency, duty cycle and treatment times (11)
- NMES can ”artifically” activate striated muscle by repeatedly overloading muscles and with electrically eliced contraction targetting and training fast-twitch muscle fibers more effectively than volontial exercise
- increases circulation
- increases muscle bulk
- improves functional activities of pelvic floor
- improves sensation
- decreases pain
- decreases hypertonus of the pelvic floor

Exercise Regime

Functional activities rarely occur either at constant speed or constant muscle strength. All biofeedback sessions, including procedures with active functional movement velocity, freely change. Specific exercises help to identify the pelvic-floor muscles. The stimulation of daily activity is a very important stage whereby a selected ”home stress” or a physical task is given initially to assess a real-life activity. It is especially helpful to have patients perform this program while standing. Successful recuperation of daily activities is only evident if the pelvic-floor muscle strength is coupled with the functional activity during the therapy process.
Without a program in upright position and moving, neuromuscular reeducation is pointless. To be a success, the therapy´s ultimate aim is to regain perineal blockade before stress. During the session she/he is instructed accomplish specific movements such as coughing, rising, squatting, lifting (10).

The first therapy session:

- to interview (motivation, hopes, everyday life, mobility restrictions)
- to explain pelvic floor anatomy and physiology
- a baseline EMG recording for 60 seconds without voluntary activation, resting tone in a sittin position (Table 1.) has to be <8 microvolts

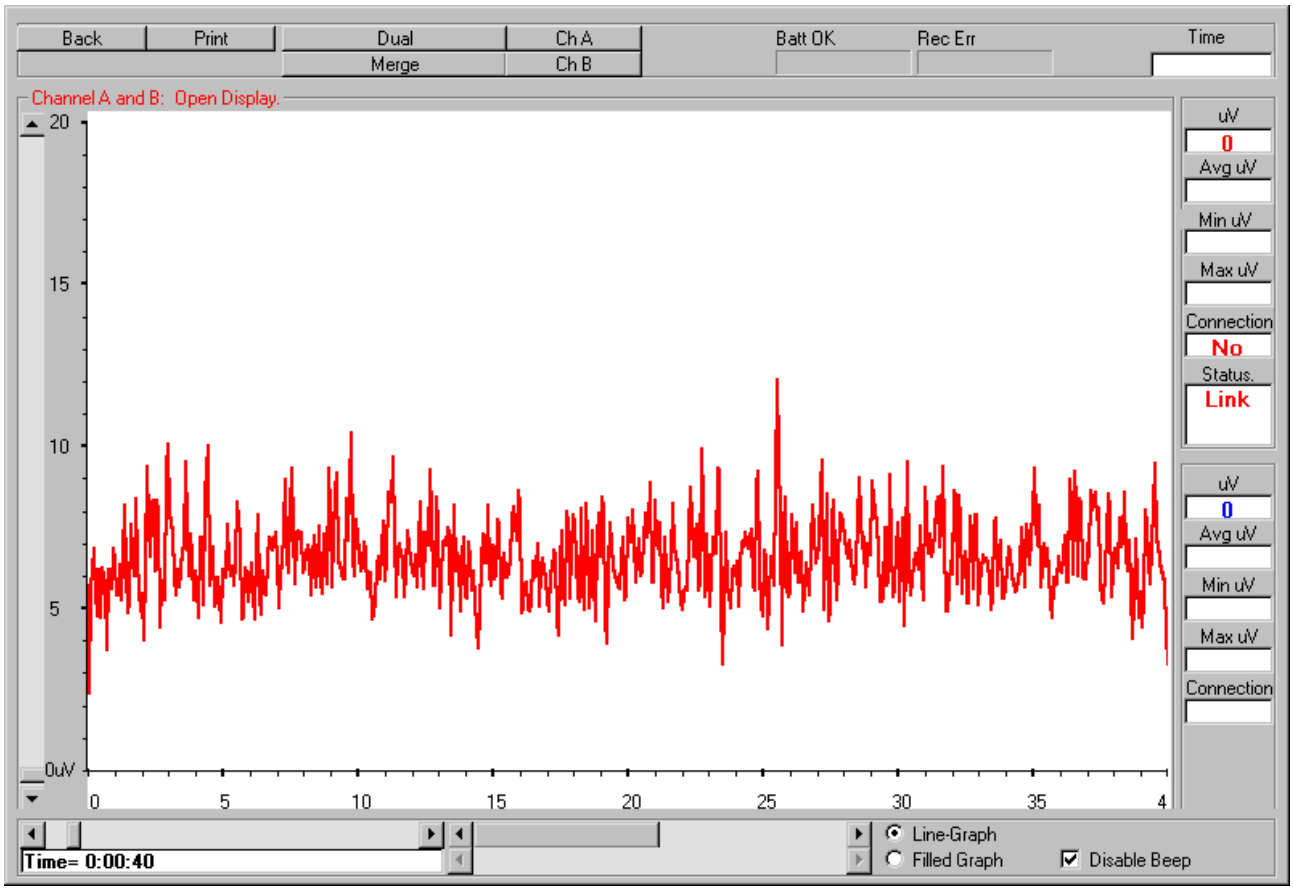

Table 1. Resting tone in a sitting position.

- to contract the muscles of the pelvic floor only (isolated, open display) the contraction has to be light; Strong contractions activate the deep abdominal muscles (13)
- quality of life score factor, faecal incontinence has a significant impact on both social and work related aspects of quality of life, e. g. The Impact Questinnare.. (14)
- investigation of pelvic floor muscle ”behaviour” recording the activity during goughing (open display); the pubococcygeus reveals activity patterns similar to the urethal and anal sphincters at most detection sites: continuous activity at rest, some increace of activity during bladder filling, reflex increases in activity during any activation manoeuvre performed by the object (talking, deep breathing, coughing) (15) (Table 2.)

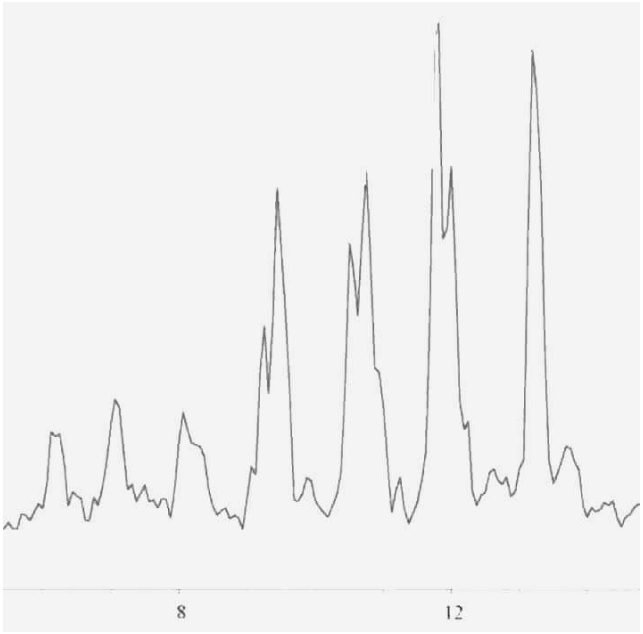

Table 2. Increase of muscle activity during coughing in standing position.

- awareness of the pelvic floor musculature, to proper voluntary muscle control using different kinds of body positions (standing, sitting, taking steps up and down, squatting) (Table 3., Fig 2., Fig. 3.)

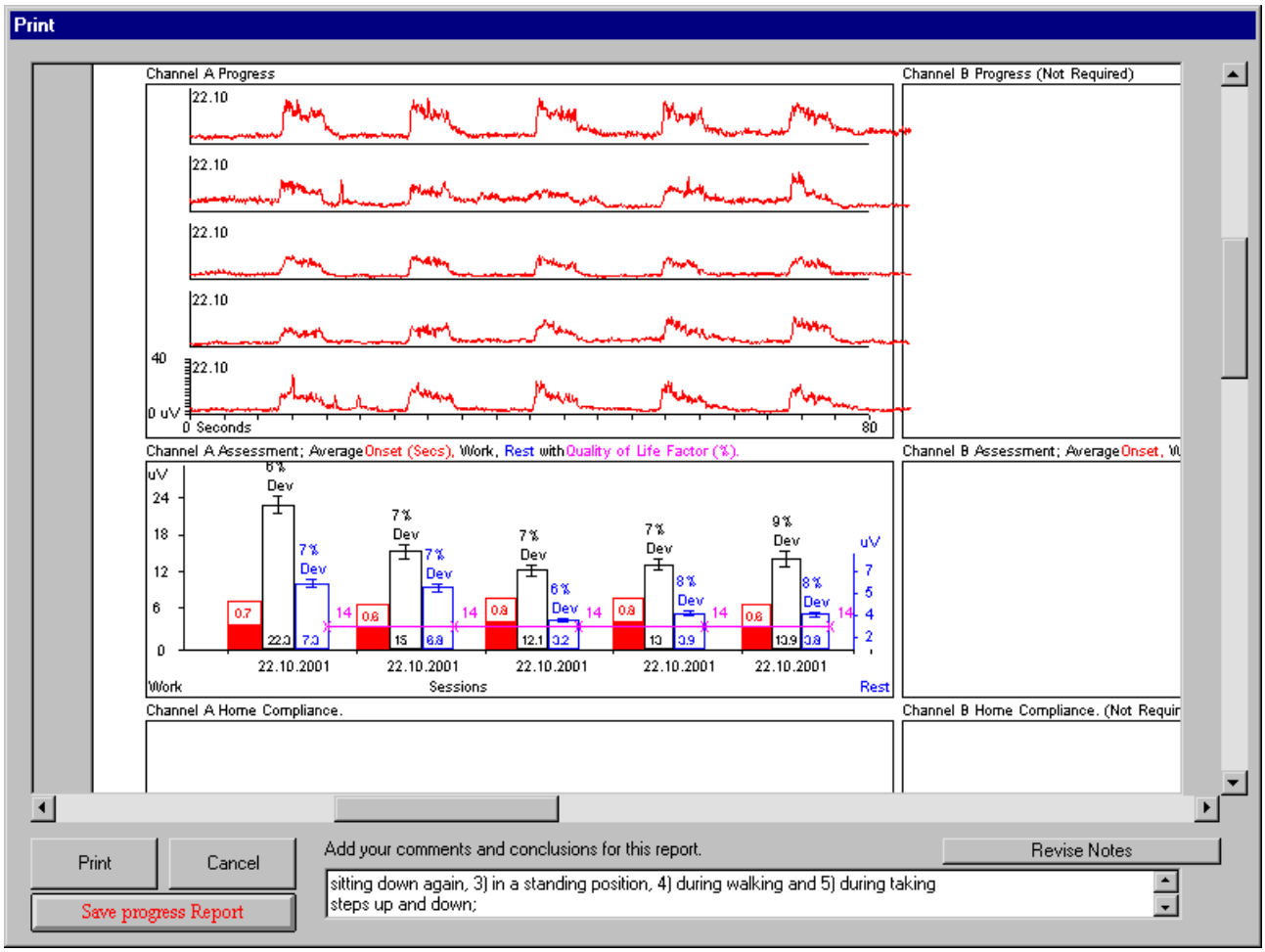

Table 3. A functional test , a voluntary activation of pelvic floor muscles: 1) in sitting position, 2) standing up and sitting down again, 3) in a standing position, 4) walking and 5) taking steps up and down.

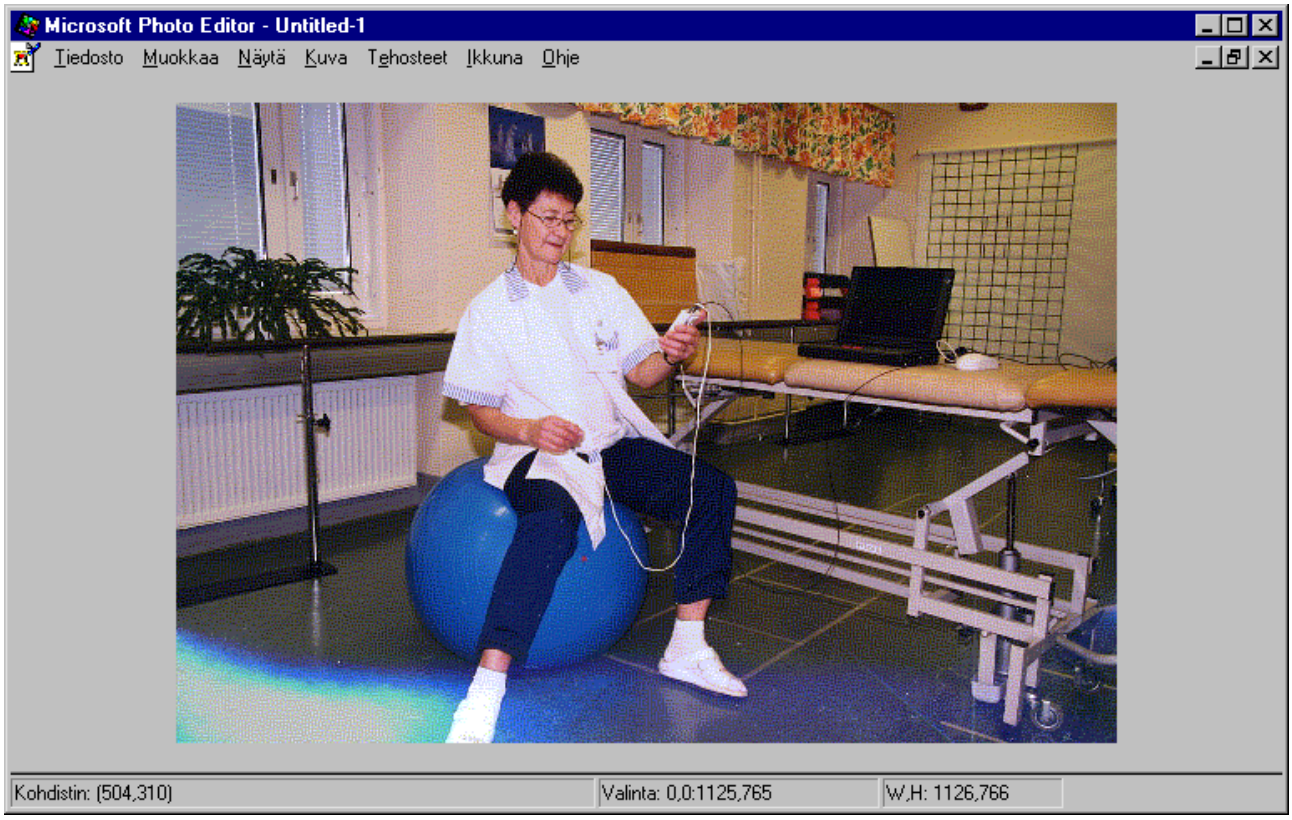

Fig 2. Voluntary pelvic floor activation in a sitting posture.

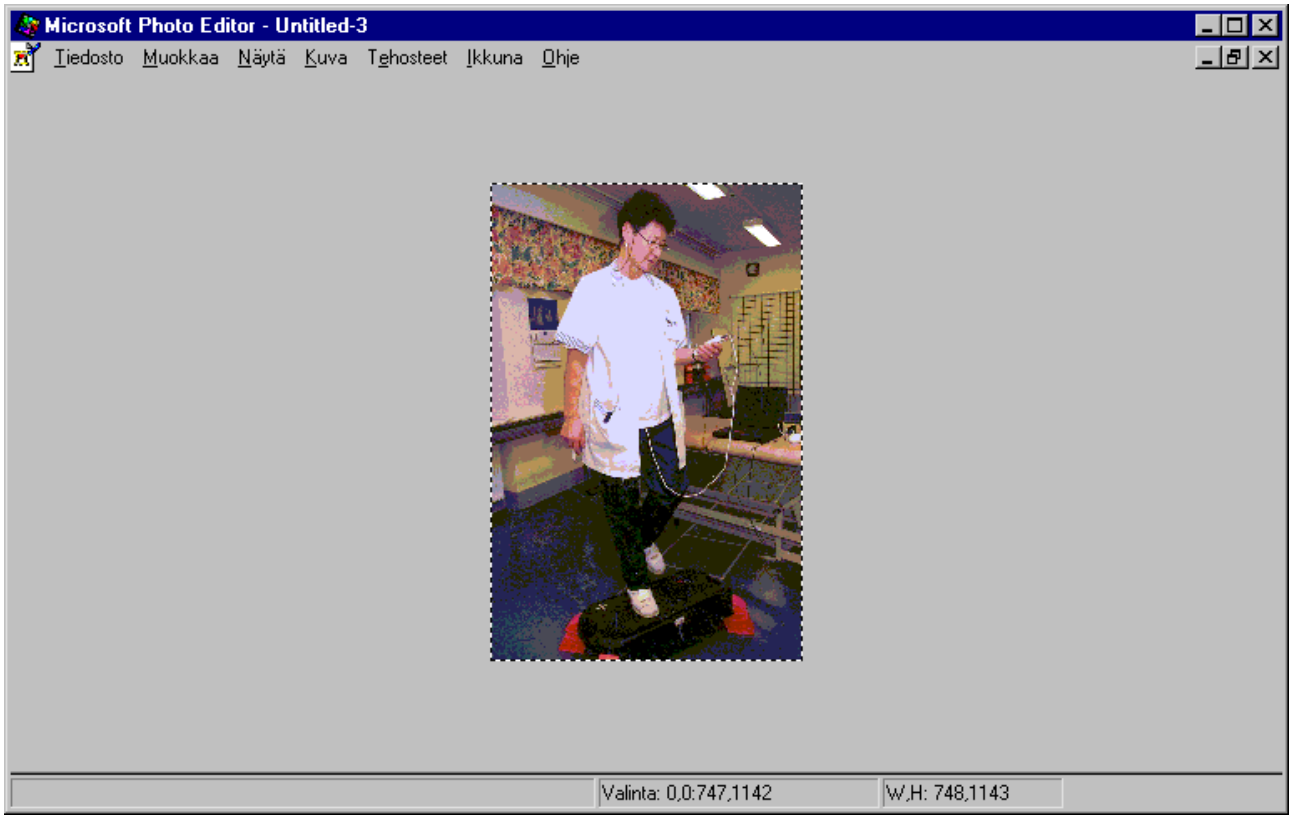

Fig 3. Steps up and down, voluntary activation of the pelvic floor muscles.

- to explain the importance of the external sphincter muscle and levator ani in the process of maintaining continence using the patient´s own test results. (EMG Assessment 5 trials of 5 seconds work and 10 seconds rest or 5 seconds work and 5 seconds rest or 10 seconds work and 10 seconds rest). (Table 4)

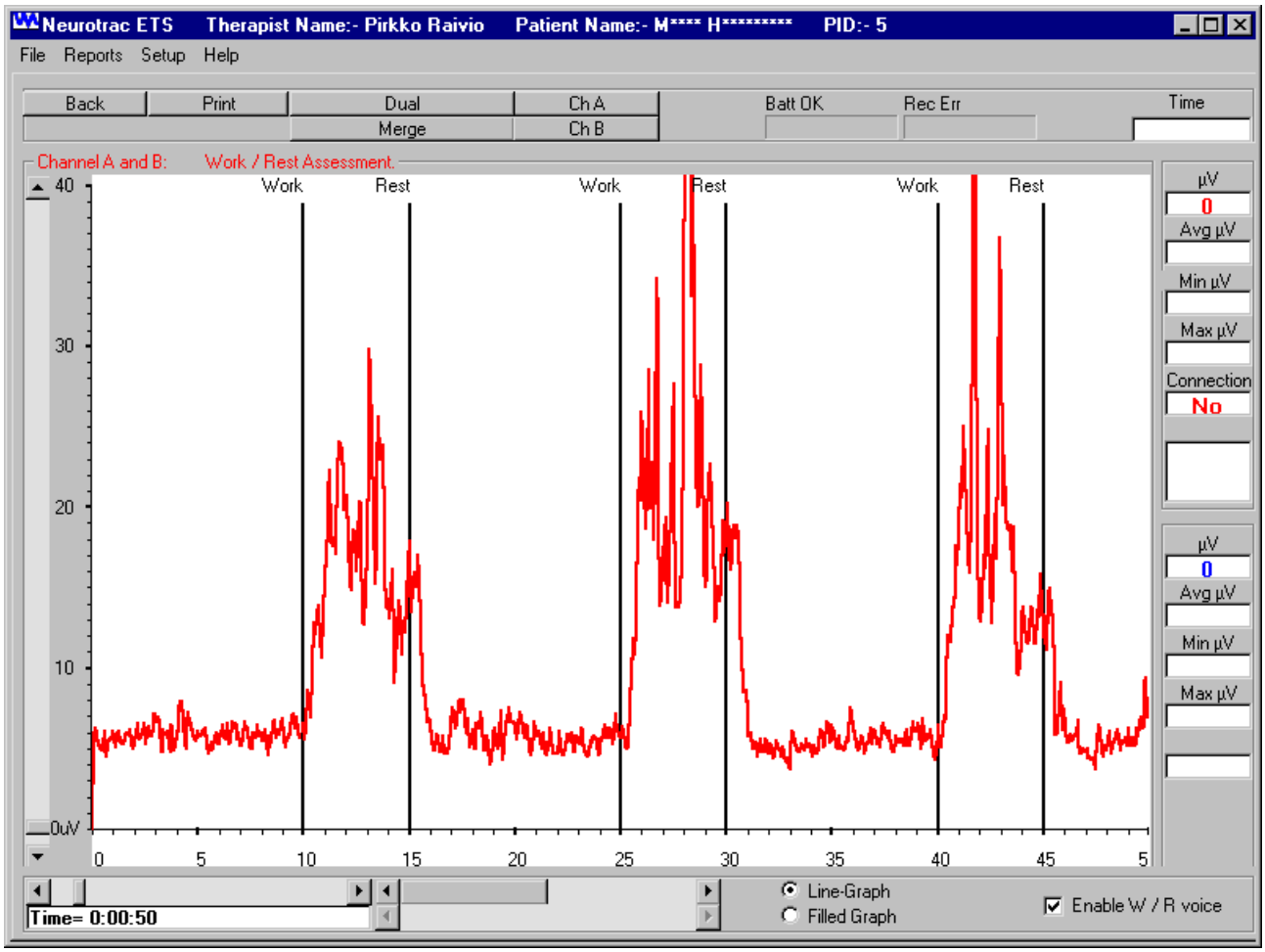

Table 4. Work/Rest, steps up and down.

- after some minutes individual structured patient EMG template design 0,5-1,5 minutes to see the coordination of pelvic-floor muscles (Table 5).

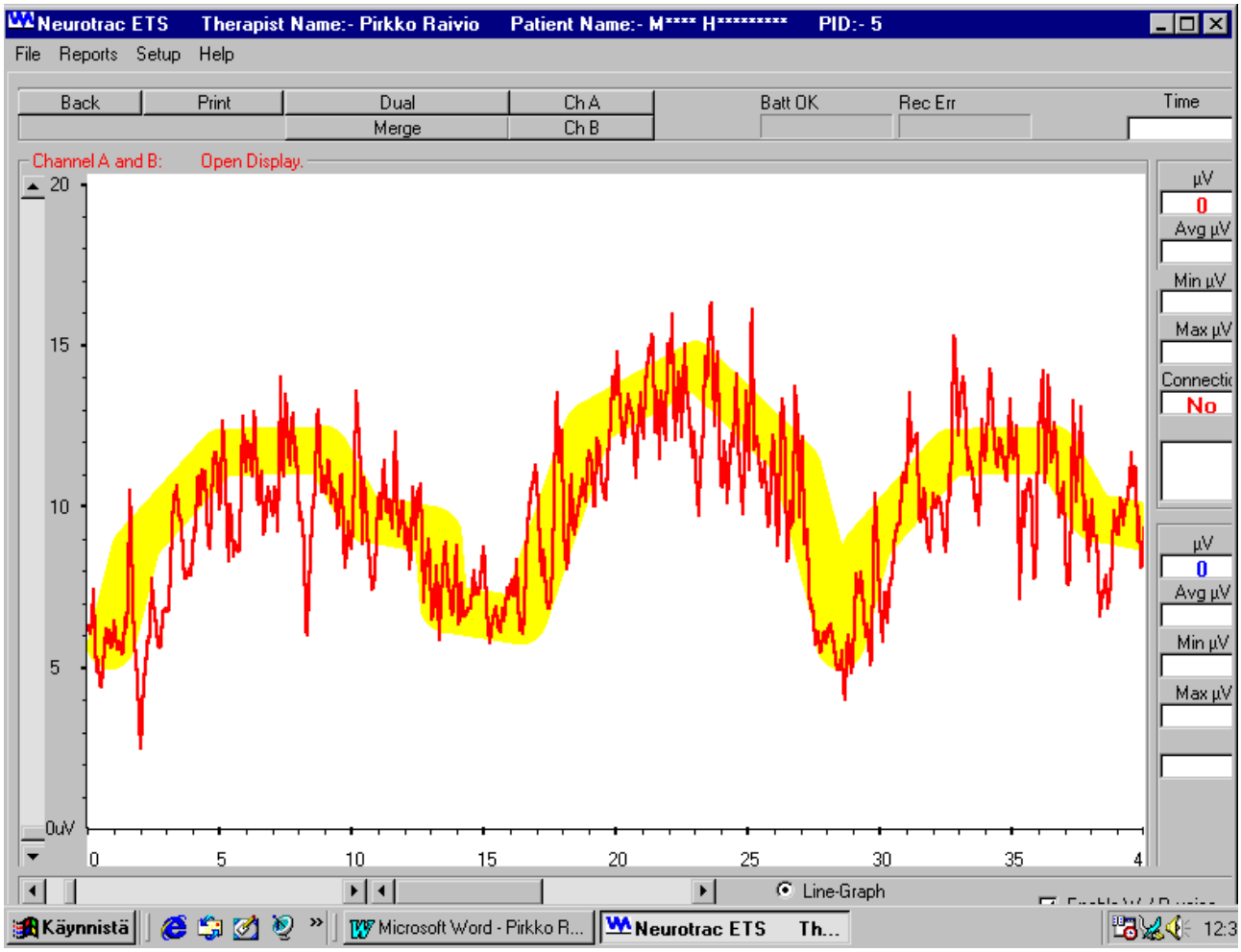

Table 5. A coordination test. In standing position with pelvic movements from side to side.

Anal canal sensation

- With anal-plug increasing the current until sensation is reported (different pulse rates i. g. 20, 30,40, 50 Hz)
- Work/rest periods 5 secons, during 3-4 minutes, the lowest mA level for sensation is the treshold
- If sensation is bad, change Pulse width and some times Ramp up time too
- Lack of sensitivity is worth therapy

Date	Pulse rate	Pulse width	Rump up time	Treshold of sensation mA
05/08/2002	20	250	0,8	25
	30	250	0,8	18
	50	250	0,8	15

Discussion:

What was in good condition and what kind of exercises are required
Aims for a term of one/two/ three months and then for a term of the whole life
Home training programme planning

The second therapy session

- Work/Rest training 5 trials , funtional exercises on the ground of assessment five seconds work ten seconds rest
- It is important to observe muscle fatique
- template training on the ground of the previous results, very difficult but helps to contro the pelvic floor
- sensory training with the current (stimulation 2-4 minutes)
- ETS, EMG triggered stimulation 2-3 minutes
- Neuromuscular stimulation both on sensory (no contraction) and motory (contraction) levels, pulse rate from 20-40Hz, 2-3 minutes, a good rest between the trials, change pulse rates after every trial of neuromuscular electrostimulation, the patient contracts on work periods and rest period is rest.
- individual program for home training with (Lock Function Mode) or without device; keeping a training diary if without device; 4-6 repeated contractions with adequate rest periods, at least twice the contraction time, the program 1-2 times a day, five days a week in daily living activities i. g. up-and downstairs and walking out of doors

The next outpatient sessions (6-7)

- at least five outpatient sessions (12)
- progressively the sessions more difficult, work/rest training, 10/10 secons, then work/rest training 10/5 seconds
- template training
- ETS five minutes, functional training
- neuromuscular stimulation, on motory levels, five minutes at a time, functional training
- sensory training if nesessary
- it is important to observe muscle fatique
- weekly or monthly measurements, new individual program and motivation to continue exercising
- after these sessions it is time to evaluate, is the course rihgt, both subjectively and objectively

Assessment (similar to the first time) and visit or at least raport to the physician after treatment; follow up at 3-6 –12 month´s intervals

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