

Faecal Incontinence Protocol

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Using the NeuroTrac 5™ EMG Biofeedback for Rehabilitation of the Pelvic Floor
in Patients with Faecal Incontinence Protocol

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Background information

Faecal incontinence is one of anorectal symptoms and disorders. It is a socially and psychologically debilitating disorder that causes shame and is the most common reason to institutionalize old people. Faecal incontinence is reported in 3%-8% of the population and in 30% in nursing home residents.

Vaginal delivery can lead to faecal incontinence due to a mechanical tear of the sphincters or a generalized weakening of the sphincter mechanism and pelvic floor. Symptoms of faecal incontinence are reported 13% of primiparous women,

After second vaginal delivery 20% and 7% of multiparous women (Haadem K et al. 1997, Kamm MA 1994, Sultan AH et al. 1997, Tetzchner T et al. 1996). Faecal incontinence is under diagnosed because of not seeking healthcare and because of the attitude of doctors.

The function of the anorectum is to maintain faecal 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. (Höckerstedt K et al. 1998).

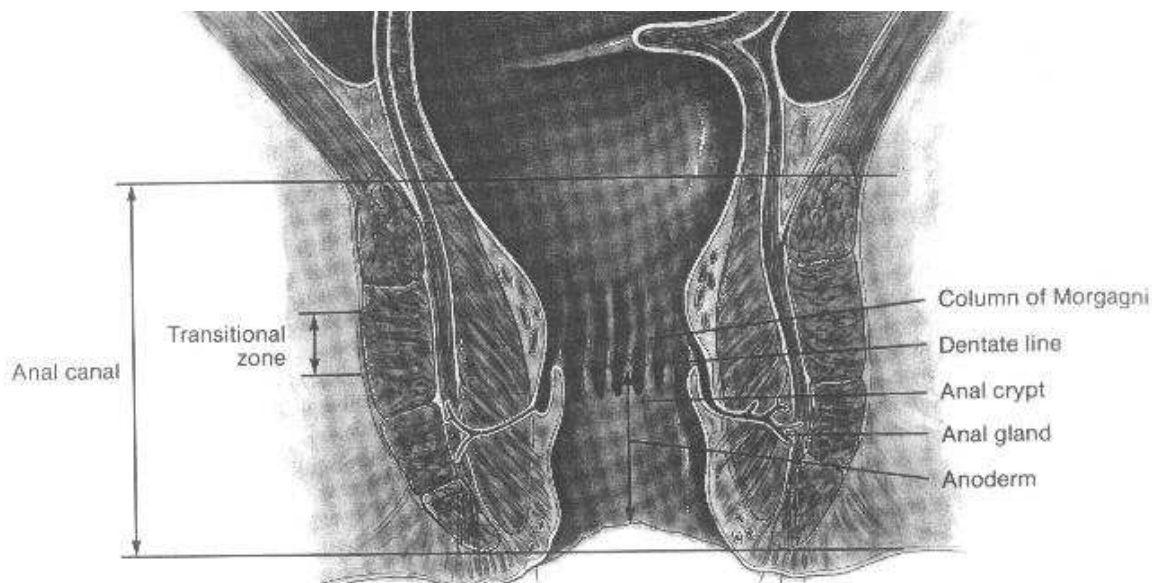


Fig.1 Lining of the anal canal (from the book: Principles and Practice of Surgery for the Colon, Rectum, and Anus 1992)

The external anal sphincter is striated muscle. It surrounds the internal anal sphincter and extends 0,5-1.0 cm further down and joins the puborectal muscle without clear-cut anatomic separation. Puborectal muscle forms a sling behind the rectum and is attached in front to pubic bone. The activity of the external anal sphincter is continuous even during sleep. (Höckerstedt K et al. 1998, Marcio J et al. 1997).

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 hemorrhoidal 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 (Marcio J et al. 1997, Sagar PM et al. 1996).

Faecal continence is dependent on many different factors acting together. Factors maintaining faecal continence are consistency of stool, delivery of colonic contents to the rectum, rectal capacity and compliance, anorectal sensation, function of the anal sphincter mechanism and muscles and nerves of the pelvic floor. Psycho behavioral factors have an impact on function of the anorectum to the full defecation process. (the American Gastroenterological Association 1999).

Etiological factors for faecal incontinence are

- ◇ altered stool consistency-diarrheal
- ◇ inadequate reservoir capacity or compliance (inflammatory bowel disease, absent rectal reservoir)
- ◇ inadequate rectal sensation (neurologic conditions, overflow incontinence)
- ◇ abnormal sphincter mechanism or pelvic floor (anatomic sphincter defect, pelvic floor denervation, congenital abnormalities, miscellaneous) (J. Marcio N. Jorge, Steven D. Wexner 1993)

Assessment

A good history and a symptom questionnaire give information for diagnostic evaluation and measuring of treatment efficacy in patients with faecal incontinence (the American Gastroenterological Association 1999)

Patient questionnaire: consistency of content lost (gas, liquid, solid), use of pads, limitations, sensation at time of defecation, ability to differentiate gas/liquid/solid. Previous therapy for incontinence, associated symptoms, past medical history, obstetric history, relation to deliveries to dysfunction, operative history and relation of operation to dysfunction (J. Marcio N. Jorge, Steven D. Wexner 1993)

Faecal incontinence grading systems (CJ Vaizey, E Carapeti, JA Cahill, MA Kamm: Prospective comparison of faecal incontinence grading systems, 1999)

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 than 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 score = 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	Sometime s	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 incontinent

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)
	liquid		(1.5)
	solid		(2)
		small stain	(0,5)
		Large stain	(1)
		Half an egg cup	(1.5)
		Whole motion	(2)
<hr/>			
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)
<hr/>			
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)
<hr/>			
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

Anorectal manometry

Defecography

Electromyography

Sensory testing

balloon distension, used to detect the threshold for three common sensations, the first detectable sensation (rectal sensory threshold), the sensation of urgency to defecate, and the sensation of pain (often defined as maximum tolerable volume

anal canal sensation with electrical stimulation of anal canal, to quantify anal canal sensation increasing current until sensation is reported, sensory thresholds measured in this way are reproducible (Ho YH, Goh HS 1995)

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 training program

Anorectal Function Re-Education, 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 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

"Biofeedback involves measuring and displaying ordinarily unfelt physiological events in order to permit self-regulation of these events. Because Biofeedback generally presents information concerning the mechanism of motor control, it is important to establish the proper scope, to explore the efficacy and to examine the therapeutic mechanism(s)." (David E. Krebs 1990)

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 measuring 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 . (Heikki Kyröläinen 1995)

"Surface EMG appears to have a definite role in the evaluation of sphincter function and in the use of biofeedback training" (The American Gastroenterological Association 1999).

The benefits 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 successful EMG training under the process
- ◇ Quantitative scoring of EMG activity gives objective information about the progress throughout the therapy process
- ◇ Intra-anal probe 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." (A.P.Bourcier & al.1999)
- ◇ Always combined with EMG biofeedback
- ◇ "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." (Bourcier & al. 1999)

- ◇ intra-anal probe 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 (J Laycock, S Plevnik 1994)
- ◇ NMES can "artificially" activate striated muscle by repeatedly overloading muscles and with electrically enticed contraction targeting and training fast-twitch muscle fibres more effectively than volitional 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 standing position, especially with movement, 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". (Alain P. Bourcier, Jean C. Juras 1995)

The First Therapy Session:

- ◇ to explain pelvic floor anatomy and physiology
- ◇ to contract the muscles of the pelvic floor only (isolated) the contraction has to be light; Strong contractions activate the deep muscles of abdominal wall (V. Gill, P. Neumann 1999) and " The muscular and ligamentous relationships composing the lumbosacral connection are of extreme importance in stabilising the lumbar vertebrae and sacrum during the transfer of energy from the upper body to the lower extremities " (F.H. Willard 1999)
- ◇ quality of life score factor.
- ◇ investigation of pelvic floor muscle "behaviour" recording the activity during coughing (open display); " the pubococcygeus reveals activity patterns similar to the urethral and anal sphincters at most detection sites: continuous activity at rest, some increase of activity during bladder filling, reflex increases in activity during any activation manoeuvre performed by the object (talking, deep breathing, coughing)" (D. B. Vodusek 1994)

(Table 1)

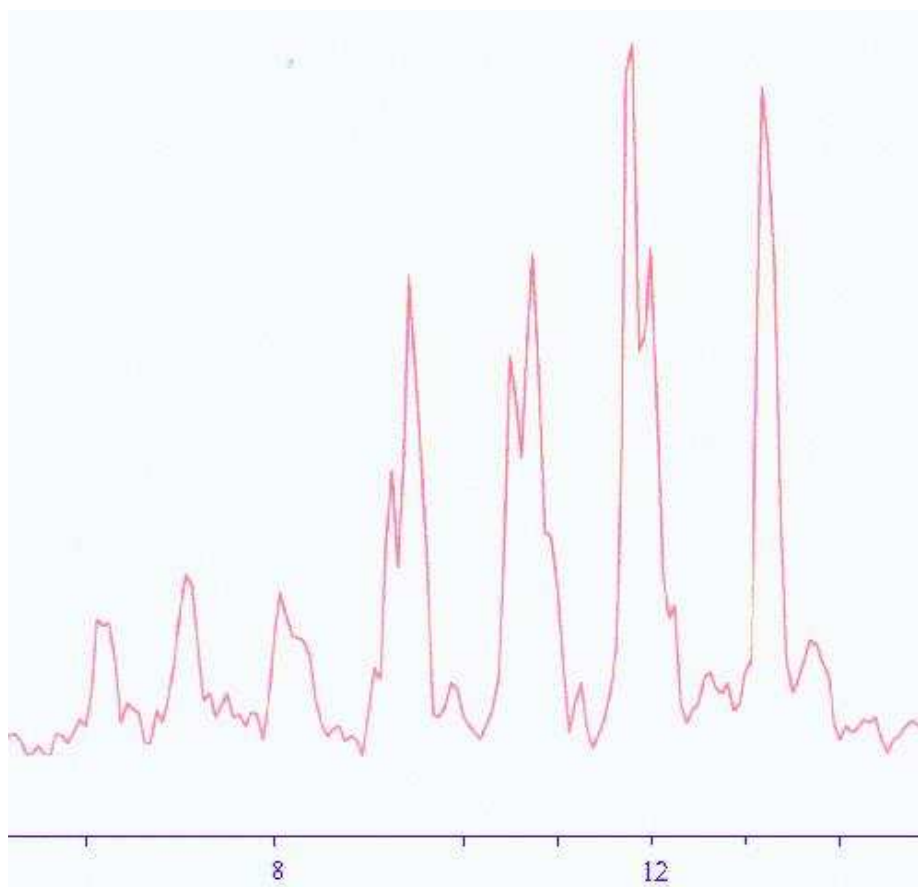


Table 1. Coughing 7 times, position: standing

- ◇ Awareness of the pelvic floor musculature, to proper voluntary muscle control using different kinds of body positions (standing, sitting, crawling, squatting)
- ◇ To explain the importance of the external 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), you can use so-called "evaluation test", on the ground of five, clear sub maximal repetitions; you can determine 1RM (repetition maximum), 5RM is 82% (+/- 5%). (T.Pöyhönen 1995)

(Table 2)

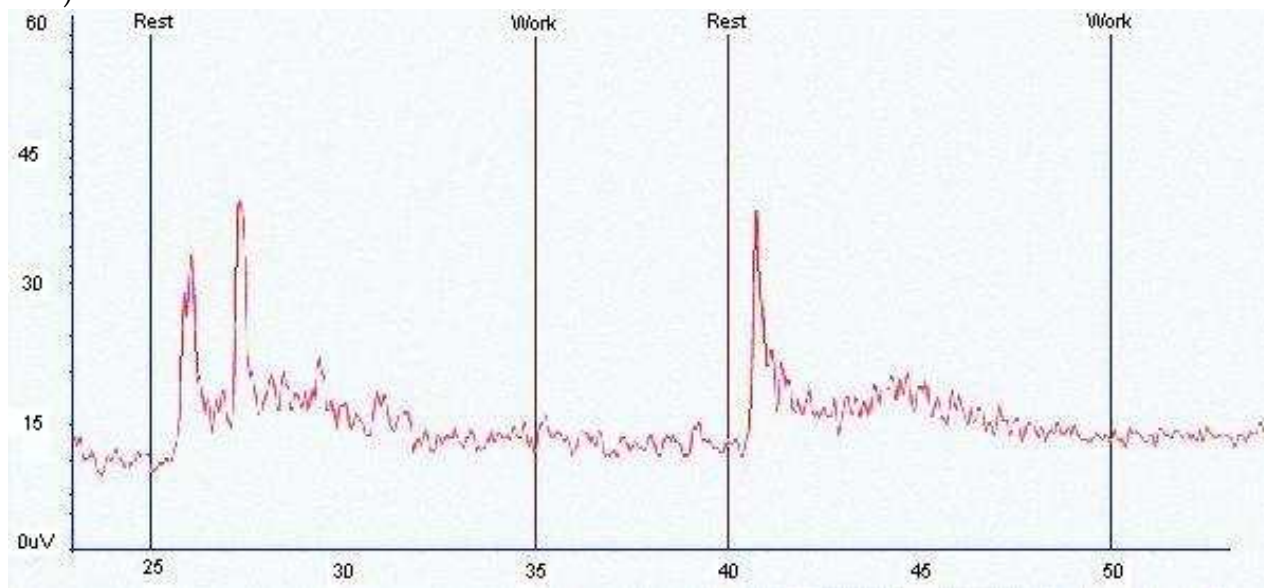


Table 2, Work/Rest, position: standing

EMG Statistics

Total Trials 5

Work Statistics		Rest Statistics	
Work Seconds	5	Rest Seconds	10
	Channel A		Channel A
Average	15,0 uV	Average	10,7 uV
Average Deviation	1,7 uV	Average Deviation	1,0 uV
Peak	54,5 uV	Minimum	3,0 uV
Average Onset	0,3 Secs	Average Release	0,1 Secs

After some minutes individual structured patient EMG template design 0,5-1minutes to see the co-ordination of pelvic-floor muscles

(Table 3)

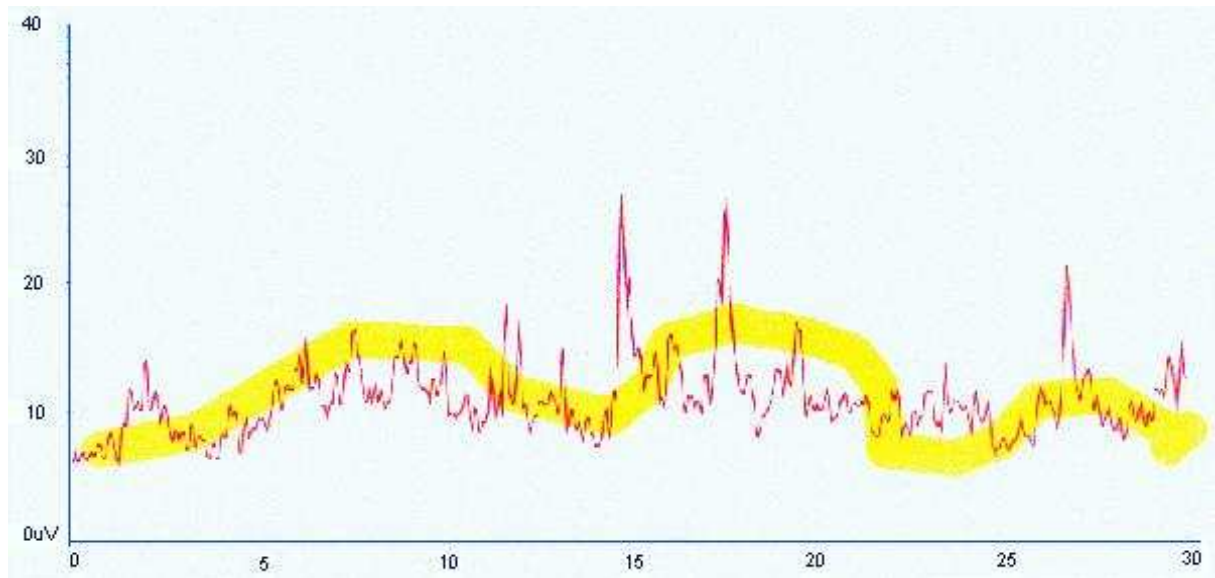


Table 3, position: standing

- ◇ Test positions: standing, sitting or crawling, there is no sense to test in lying.
- ◇ "The anal canal has a greater variety of afferent nerve endings than the rectum, and they are located in the mucosa rather than in the surrounding mesentery, the simplest technique to quantify canal sensation is to increase the current until sensation is reported. Sensory thresholds measured in this way are reproducible". (American Gastroenterological Association, AGA 1998)

The Second Therapy Session

- ◇ EMG Assessment 5 trials , two positions at least; standing: variety of the posture for the contraction time; walking: double steps for the contraction time; sitting: standing up.
- ◇ template training on the ground of the previous results
- ◇ sensory training with the current (stimulation 2-4 minutes)
- ◇ EMG Controlled Stimulation (3-4 minutes only)
- ◇ 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 2 times a day, five days a week
- ◇ exercises in daily living activities

The Next Outpatient Sessions (6-7)

- ◇ Progressively make the sessions more difficult
- ◇ It is important to observe muscle fatigue
- ◇ Weekly or monthly measurements, new individual program and motivation to continue exercising
- ◇ After these sessions it is time to evaluate, is the course right, both subjectively and objectively.

Assessment and visit to the physician after treatment; follow up at 3-6 -12 month's intervals.

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