

REVIEW ARTICLE

# Fecal Incontinence

Part 4 of a Series of Articles on Incontinence

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## SUMMARY

**Background:** The aging of the population will make fecal incontinence an increasingly important socioeconomic problem in the coming decades. Already today, the cost to society of treating incontinence with inserts, diapers, and closed systems exceeds the total cost of all cardiac and anti-inflammatory medications.

**Methods:** This article is based on a selective review of the literature and on clinical experience. No meta-analyses on this topic have yet been published.

**Results:** Surveys in highly industrialized countries in the Western Hemisphere have shown that about 5% of the population suffers from fecal incontinence of varying degrees of severity. This condition will become more common, in both relative and absolute terms, in the coming decades. Various methods of care and therapy are currently available for fecal incontinence, yet many patients do not seek medical help for it because of embarrassment. Thus, its true prevalence is certainly higher than the surveys imply.

**Conclusion:** The challenge today, therefore, is not just to encourage patients to seek medical help early, but also to raise physicians' awareness of fecal incontinence and their readiness to treat it, so that they can provide competent individual counseling and treatment to all patients who suffer from it.

According to the WHO's definition, fecal continence is the acquired ability to "control the time place and of bowel movements."

Fecal incontinence can develop at any age, either as a result of anal malformation or as an acquired disorder. Several causes of this can be identified, but hybrid forms also occur:

- Sensory (loss of anal sensation, usually following surgery)
- Muscular (sphincter defects, pelvic floor insufficiency)
- Neurogenic (central or peripheral causes)
- Impaired reservoir function (tumor surgery, chronic inflammatory intestinal disorders)
- Functional (laxative abuse, overflow incontinence)
- Idiopathic.

Fecal incontinence is significantly more common in women (4 to 5 : 1). The reasons for this are anatomical (shorter anal canal), but it is also often caused by birth traumas. Overall, around 5% of the population suffer from fecal incontinence (2) of varying degrees of severity, ranging from uncontrolled release of gas to complete loss of control.

The significance the clinical picture "fecal incontinence" will acquire in the future as a disorder mainly affecting older patients, and therefore also the need to examine its epidemiology, morphology and pathology, has only been recognized in recent years. There are therefore no analyses with higher levels of evidence.

This article refers to current knowledge of clinical experience and data (*Figure 1*).

## Diagnosis and treatment outlook

A precise clinical history alone usually makes it possible to differentiate between the possible causes of anal incontinence. Involuntary bowel movements are a sign of damage to the internus muscle or sensory function, while urge incontinence is a sign of a weak externus muscle. The patient's history of pelvic surgery or radiation in the pelvic area, as well as a proctological history must be taken.

Continence scores allow severity to be assessed objectively and thereby also allow treatment progress to be monitored (1, 2) (*Table*).

An experienced examiner can assess sphincter function using rectal digital examination alone: the

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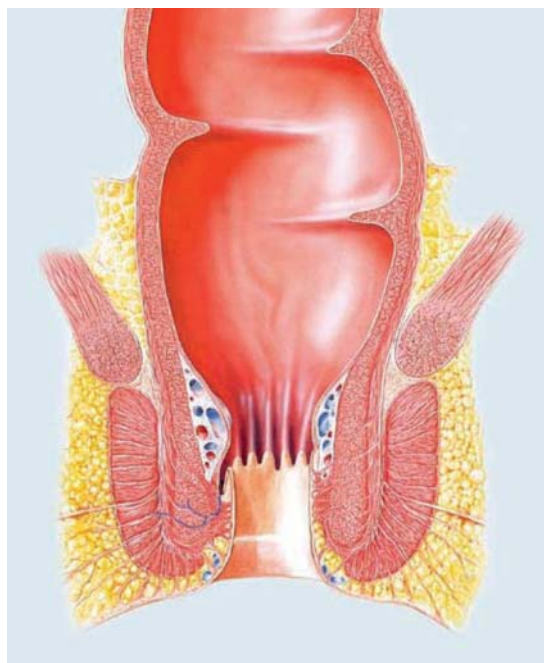
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**Figure 1:**

Anatomy: cross-section of the continence organ; with the kind permission of Dr. Kade Pharmazeutische Fabrik GmbH, Berlin



sphincter ani internus muscle at rest, and the puborectalis sling, the sphincter ani externus muscle and pelvic floor, and the anal canal length when actively tensed. Anorectal disorders such as tumors, fissures, anal or rectal prolapse, and rectocele can be excluded at the same time (3) (Figure 2).

### Instrument-based diagnosis

#### Endoscopy

Endoscopy is part of the diagnostic procedure, particularly for new-onset fecal incontinence and/or changes in bowel habits. Procto/rectoscopy and coloileoscopy should identify organic causes (tumors/inflammation) (4). In particular, procto/rectoscopy that requires no major preparation shows changes in the anal canal (plexus hemorrhoidalis) and the rectum.

Anorectal functional diagnostics can investigate individual components of the continence function, which is usually impaired in various ways.

#### Manometry

In particular circumstances, the pressure characteristics of the continence organ are measured in static and dynamic conditions (5).

Manometry, usually perfusion manometry with a perforated catheter, allows the pathophysiology of fecal incontinence to be examined. It provides reproducible results for individual examiners but is not a

standardized examination technique. There is no direct correlation between clinical symptoms, continence, and manometric measurements. Manometry is useful for differential treatment design and especially for monitoring treatment.

#### Defecography

Defecography is contrasted radiological representation of the dynamic rectal evacuation. After administration of the contrast substance, the anorectal angle, the anal canal, and the condition of the pelvic floor can be viewed. In the dynamic phase, evacuation, wall structure (intussusception), and the behavior of the pelvic floor can be seen. Because of the high levels of radiation used, this indication must be targeted.

#### Magnetic resonance imaging (MRI)

As with the rest of the gastrointestinal tract, functional MRI diagnostics is now a significant alternative, as is defecation MRI. This is because a tomography of the abdomen and pelvis can be obtained without using radiation (Figure 3).

#### Anal endoscopic ultrasound

Anal endoscopic ultrasound allows the anatomy of the sphincter apparatus to be examined in detail. Muscular defects in particular can be shown with high resolution using an ultrasound probe introduced transanally (frequency 6.5 to 10 MHz). However, other lesions, such as abscesses, fistulas, and tumors, can also be identified using this technique. Today this is the gold standard for morphological examination of the anal sphincter. However, sensitivity and specificity are dependent on the examiner.

#### Neurophysiological diagnostics

Using neurophysiological diagnostics, an examiner can differentiate between neurogenic and myogenic causes of incontinence. Denervation can be confidently identified. As this is an invasive examination, it has been replaced by other examination techniques and is reserved only for specific matters (see Box).

### Supportive therapy

#### Optimizing stool consistency and frequency

Stool consistency and frequency can be altered using dietary measures. For example, increased coffee consumption leads to stronger gastrocolic responses, resulting in increased colonic motility. However, fiber-rich, expanding foods and carbonated beverages/beer can also provoke or exacerbate incontinence, as they reduce continence by increasing stool frequency and decreasing stool consistency (6). Basic treatment, including after surgery, is therefore first to optimize stool consistency and frequency and bowel habits. This, alone, can often improve continence.

#### Nutrition

A balanced intake of fiber and fluids is essential. In addition, wheat bran, plantain seed, or psyllium can be eaten. Bananas, apples, and yoghurt are also beneficial.

Documenting nutrition and simultaneously keeping a stool diary discipline patients and can reveal other trigger factors (lactose/fructose intolerance).

**Toilet training**

Specific toilet training must avoid excessive forcing and lengths of time on the toilet. Patients with incomplete evacuation benefit from evacuation aids such as enemas, Bisacodyl and/or Lecicarbon CO<sub>2</sub> suppositories. For overflow incontinence, the intestines must be completely emptied before any other therapeutic measures can be taken.

**Care provision**

Patients who are immobile and require care benefit substantially from careful hygiene. Regularly changing clothes and/or positions prevents damage to the perianal skin. Creams, ointments and pastes can be used after bowel movements and cleaning/showering, either prophylactically or to treat skin irritation or lesions.

**Specific treatment**

**Causal drug-based treatment**

This is used when there is a causative underlying disease, such as the chronic inflammatory intestinal diseases Crohn's disease and ulcerative colitis. Corticosteroids, immunosuppressants and salicylates are used in such cases.

Chologenic diarrheas that place excessive demand on continence are treated with cholestyramine.

**Non-specific drug-based measures**

These work mainly by slowing passage through the intestines and increasing reabsorption of fluids. This results in increased stool consistency on the one hand and decreased stool frequency on the other. The opioid loperamide and a combination of diphenoxylate and atropine are used. In Germany, loperamide (3 to 4 x 2 to 4 mg/day) is standard treatment. Several placebo-controlled studies (7) have shown reduced stool frequency and urge, longer colonic transit time, reduced stool weight, and increased resting anal pressure. The enkephalinase inhibitor racecadotril is now also available as additional treatment for diarrhea. Racecadotril is an antisecretory and reduces intestinal hypersecretion of water and electrolytes.

Ongoing clinical studies are investigating the efficacy of the 5HT<sub>3</sub> antagonist alosetron in the treatment of incontinence. Alosetron seems to be particularly useful as an alternative to the well-known drugs in patients with severe diarrhea.

Meanwhile, experimental studies have also shown that the use of alpha 1-adrenergic antagonists results in increased resting anal pressure and improved voluntary contraction strength.

Topical use of phenylephrine (concentration 30%) leads to short-term increases in resting anal pressure of up to 33% in healthy subjects and incontinent patients (6). This treatment seems to be especially useful in patients with reduced sphincter tone and those with "idiopathic" age-related sphincter weakness.

**TABLE**

Severity of fecal incontinence: Jorge-Wexner Scoring System, 1993

Incontinence episode	Frequency				
	Never	Rarely	Sometimes	Usually	Always
Solid	0	1	2	3	4
Liquid	0	1	2	3	4
Gas	0	1	2	3	4
Wear a pad	0	1	2	3	4
Lifestyle alteration	0	1	2	3	4

0 points = perfect continence; 20 points = complete incontinence  
 Never = 0; rarely = <1/month;  
 sometimes = <1/week; usually = <1/day to >1/week; always = >1/day

**Physiotherapy**

**Targeted muscle training**

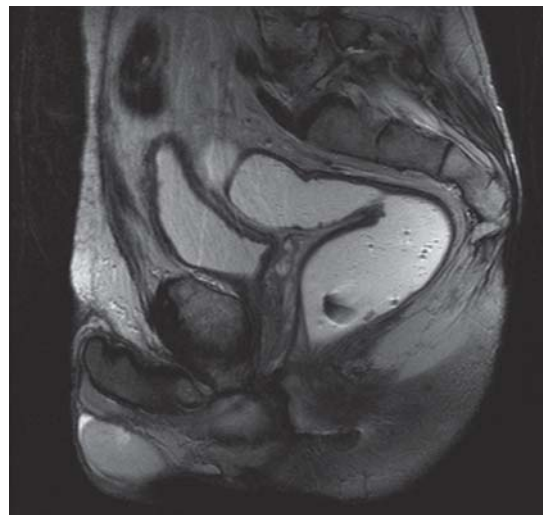
Special instruction and physical measures performed by specialized physiotherapists according to this diagnosis are of great benefit in the treatment of fecal incontinence (10, 11). The main focus here is on stabilizing the pelvic floor and sphincter apparatus. The phases of pelvic floor training involve development of targeted awareness, isolated muscle contraction and relaxation, exercising in functional muscle chains and with modulated weight-bearing, and integration of activity into everyday weight-bearing (automation). A home exercise program is also developed gradually from the beginning of therapy onwards and is constantly monitored. Rectal balloon techniques are used when the reflex response to rectal dilation needs to be renewed. Biofeedback and/or electrostimulation can also be used in individual cases.

**Biofeedback training**

Biofeedback training, a learning strategy derived from psychology, is an established form of treatment. The activity of the sphincter ani externus muscle is measured using an anal EMG sensor and fed back to the patient using optical and/or acoustic signals. Regular, active, controlled training motivates patients and increases the efficacy of exercises. This should increase the contraction strength of the anal sphincter, shorten the latency period between rectal distension stimulus and sphincter contraction, and improve awareness of rectal distension stimuli. The plateau contraction should be maintained for 10 to 20 seconds and the relaxation cycles should last for 20 to 30 seconds in sessions lasting approximately 15 to 30 minutes (11).

With an inflammatory or scarring rectal disease, biofeedback cannot be used. Also, reduced resting pressure is of questionable value, as it points to weakness of the sphincter ani internus muscle.

**Figure 2:**  
Rectal prolapse;  
triggered on the  
lavatory



**Figure 3:** MRI scan of the sphincter area with contrast substance

Numerous uncontrolled and a few randomized controlled studies demonstrate the value of training. In a review of the literature, Enck gives an average improvement rate for all patients of around 80% (12).

It has not yet been possible to demonstrate conclusively that treatment success rates can be further improved using a combination of biofeedback, sphincter exercises, and pelvic floor training and/or electrostimulation (13, 14).

#### Electrostimulation

Electrostimulation is used to provide proprioceptive awareness of the pelvic floor muscles and to make muscle fiber recruitment easier. Patients feel the “passive” muscle contraction, and this leads to better understanding, for targeted, active muscle work. Electrotherapy should involve a frequency of 40 to 50 Hz, impulses lasting 5 seconds, and 5-second pauses for approximately 20 minutes. Perianal or anal electrostimulation is only sensible when the nerve supply is intact.

In a review of the literature, Hosker, Cody, and Norton determined that electrostimulation has a therapeutic effect (15). Electrostimulation with anal biofeedback and exercises leads to success in the short term and is more effective than vaginal biofeedback with exercises. However, other studies have shown no additive efficacy of electrostimulation, biofeedback, and exercises.

#### Surgery

##### Indications

In relation to the number of sufferers, surgery is rarely indicated to improve continence. Some methods have been tested for several decades (16), while others have been developed more recently using modern techniques or implants.

As continence cannot always be fully restored, the indication and choice of treatment are of great importance.

Long-established forms of treatment have a calculated risk and measurable results. Modern, technically sophisticated methods should therefore be secondary to standard treatment.

#### Sphincter surgery

Reconstruction of a dehiscence sphincter (sphincter ani externus muscle, puborectalis muscle) is carried out when there is damage caused by a birth trauma (perineal tear), usually caused by the obstetrician (17). The failure rate with functional defects is 10% to 59% (18, 19). Secondary repair of the sphincter is also possible after a long period of latency. This involves transecting superficial scar tissue and then locating the laterally-retracted muscle ends and sewing them together in a ring.

Early results of secondary defect reconstruction are satisfactory, particularly of defects caused by birth traumas. In long-term follow-up, results deteriorate again, with full continence in less than 50% of patients.

Risk factors are age, concomitant diseases, wound dehiscence, and muscle denervation (18). As sphincter reconstruction surgery has a limited risk, attempted reconstruction is always indicated in appropriate cases, as quality of life will be improved, though possibly only for a limited time.

If sphincter reconstruction is not indicated or if it fails, plastic sphincter replacements may be used. These are gracilis plastic and artificial bowel sphincters (ABSs). The indication is identical for both methods.

With dynamic gracilis plastic, the gracilis muscle is mobilized from the inner thigh and led subcutaneously around the anal canal. An implanted pacemaker causes tonic contraction and, in the long term, a transformation of the implanted striated muscle fibers. The system is switched off percutaneously to allow defecation.

ABSs are also fully implanted. An ABS consists of a circular plastic cuff around the anal canal, a pump system,



and a fluid reservoir. The pump valve is implanted in the labia or scrotum and controls the filling of the cuff.

Seventy percent of patients benefit from sphincter replacement, measurably via improved continence. However, repeat operations due to infections and technical flaws are relatively frequent, as foreign materials are implanted (19, 20). Because of the technological complexity, the high cost, the experience required, and the intensive patient care, this is major surgery.

#### Surgery for neurogenic fecal incontinence

For neurogenic incontinence, the aim is to achieve better muscular abutment by plicating the available muscles (postanal repair, anterior levatorplasty, total pelvic floor repair). The crura of the puborectalis on both sides and the externus muscles are plicated, but long-term results are disappointing, with full continence at only 14% (21). The extent of neurogenic damage limits the success of treatment. This option must therefore be seen and presented as an attempt at treatment.

A new treatment option, sacral nerve stimulation (SNS) is ideal for neurogenic incontinence. It is unsuitable for muscle defects. In a test phase, electrodes are inserted over the foramina of the os sacrum to the pudendal nerves. When nerve endings are intact along their length, the sphincter is stimulated and contracts. If this successful result is demonstrated, the stimulation system is fully implanted subcutaneously and controlled percutaneously. The risk of infection is low, as the implantation is carried out at a distance from the anus. This is not a primary treatment option, but a specialized clinic will reach a success rate of up to 75% (14).

#### Surgery for sensory incontinence

Sensory incontinence due to so-called whitehead damage (radical removal of the hemorrhoidal tissue and the anoderm) is now found only rarely. Reconstruction is carried out by moving the sensitive perianal skin into the anal canal (using the Ferguson technique). Results with irritation-free healing are good (22).

Anal prolapse (hemorrhoids) is now treated with single-stage or multiple-stage closed or partially closed (Parks/Longo) hemorrhoid removal.

#### Surgery for rectal prolapse

Rectal prolapse is a common cause of incontinence in proctological practice. It is treated using abdominal resection rectopexy (26), usually using minimally invasive techniques.

In this operation, the rectum is separated from the tissues around the anus as far as the pelvic floor, encased in plastic mesh (various materials and structures), and secured to the promontory/os sacrum. Bowel resection is not compulsory. Sixty to ninety percent of patients achieve subjectively satisfactory continence following surgery.

Older patients with increased surgical risk may benefit from perineal intervention. Rehn-Delorme mucosal

#### BOX

### Fecal incontinence diagnosis procedure

- Clinical history
  - Classification according to the continence score
- Physical examination
  - In particular: rectal digital examination
- Endoscopy
  - First procto/rectoscopy, then colonoscopy
- Manometry
  - No standardized examination method, only internally comparable results
- Imaging
  - Ultrasound (particularly suitable for muscular defects)
  - Defecography (dynamic contrasted examination)
  - MRI/functional (evacuation and anatomy can be shown)

As it is highly invasive and stressful, neurophysiological examination with perianal puncture is now reserved only for specific matters.

resection and Altemeier rectosigmoid resection more frequently lead to relapses, although Cochrane analysis (admittedly using a small number of cases) was unable to confirm differences from other treatments (16). Evaluation of treatments demonstrates that so far there is no gold standard for the treatment of rectal prolapse.

#### Recent developments

Augmentation of the sphincter by inserting non-reabsorbable bulking agents (silicone, hyaluronic acid, etc.) are new forms of treatment, but to some extent had earlier precursors. As yet there are no reports on larger numbers of cases and no prospectively randomized research has been performed (23). This type of implantation usually only achieves a narrowing of the lumen.

Stem cell implantation is also still in the experimental phase.

Application of high-frequency energy to the muscles of the anal canal and lower rectum should lead to a remodeling of the lower rectum via a temperature-controlled collagen contraction. This method has not yet become widely used (24, 25).

#### Conflict of interest statement

The authors declare that no conflict of interest exists according to the guidelines of the International Committee of Medical Journal Editors.

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REFERENCES

1. Wagner TH, Hu TW: Economic costs of urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 1998; 9: 127–8.
2. Enck P et al.: Epidemiologie der Stuhlinkontinenz. *Kontinenz* 1994; 2: 59–66.
3. Rockwood TH: Incontinence severity and QOL scales for fecal incontinence. *Gastroenterology* 2004; 126: 106–13.
4. Jorge JM, Wexner SD: Etiology and management of fecal incontinence. *Dis Colon Rectum* 1993; 36: 77–97.
5. De Lillo AR, Rose S: Functional bowel disorders in the geriatric patient: constipation, fecal impaction and fecal incontinence. *Am J Gastroenterol* 2000; 95: 901–5.
6. Herold A, Bruch HP: Stufendiagnostik der anorektalen Stuhlinkontinenz. *Zentralbl Chir* 1996; 121: 632–8.
7. Tuteja AK, Rao SS: Recent trends in diagnosis and treatment of fecal incontinence. *Aliment Pharmacol Ther* 2004; 19: 829–40.
8. Rao SS: Diagnosis and management of fecal incontinence. *American College of Gastroenterology Practice Parameters Committee. Am J Gastroenterol* 2004; 99: 1585–1604.
9. Cheetham MJ, Malouf AJ, Kamm MA: Fecal incontinence. *Gastroenterol Clin North Am* 2001; 30: 115–30.
10. Carriere B: *Beckenboden*. G. Stuttgart: Thieme 2003: 427–51.
11. Rief W, Birbaumer N: *Biofeedback Therapie*. Stuttgart: Schattauer 2000: 2.
12. Enck P: Biofeedback training in disordered defecation. A critical review. *Dig Dis Sci* 1993; 38: 1953–60.
13. Norton C, Cody JD, Hosjer G: Biofeedback and/or sphincter exercises for the treatment of fecal incontinence in adults. *Cochrane databasis of Systemic Reviews* 2006; Issue 3; Art. No: CD002111. DOI:10.1002/1465/1858. CD 002111.pub 2
14. Pages IH: Biofeedback versus Elektrostimulation bei der Behandlung der Stuhlinkontinenz. *Phys Med Rehab Kur Med* 2003, 13: 325–9.
15. Hosker G, Cody JD, Norton CC: Electrical stimulation for fecal incontinence in adults. *Cochrane Database of Systematic Reviews* 2007; Issue 3; Art No CD 001310. DOI: 10.1002/14651858. CD001310. Pub 2
16. McCann FJ: Note on an operation for the cure of the prolapse of the rectum in the female. *Lancet* 1928, 1: 1072.
17. Venkatesh KS, Ramanujam PS, Larson DM, Haywood MA: Anorectal complications of vaginal delivery. *Dis Colon Rectum* 1989; 32: 1039–41.
18. Pinta TM, Kylänpää-Bäck ML, Salmi T, Järvinen HJ, Luukkonen P: Delayed sphincter repair for obstetric ruptures: analysis of failure. *Colorectal Dis* 2003; 5: 73–8.
19. Pinta TM et al.: Primary sphincter repair: are the results of the operation good enough. *Dis Colon Rectum* 2004; 47: 18–23.
20. Baeten CG, Uludag O: Second-line treatment for fecal incontinence. *Scand J Gastroenterol Suppl* 2002; 236: 72–5.
21. Parker SC, Spencer MP, Madoff RD, Jensen LL, Wong WD, Rothenberger DA: Artificial bowel sphincter: long-term experience at a single institution. *Dis Colon Rectum* 2003; 46: 716–21.
22. Körsgen S, Deen KI, Keighley MR: Long-term results of total pelvic floor repair for postobstetric fecal incontinence. *Dis Colon Rectum* 1997; 40: 835–9.
23. Buchmann P, De Lorenzi D, Müller A: Reeingriffe bei sekundärer Inkontinenz. *Chirurg* 1996; 67: 491–7.
24. Altomare DF, La Torre F, Rinaldi M, Binda GA, Pescatori M: Carbon coated microbeads anal injection in outpatient treatment of minor fecal incontinence. *Dis Colon Rectum* 2008; 51: 432–5.
25. Takahashi-Monroy T, Morales M, Garcia-Osogobio S, et al.: SECCA-procedure for the treatment of fecal incontinence: results of five-year follow-up. *Dis Colon Rectum* 2008; 51: 355–9. Epub 2008 Jan 19.

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