PRE-OPERATIVE DIAGNOSTICS OF COLONIC AND RECTAL DYSFUNCTION

Master Thesis
To Confer the Academic Degree of
Doctor medicinae universae (Dr. med. univ.)
In the Master’s Program
Humanmedizin
STATUTORY DECLARATION

I hereby confirm that I have written the submitted master thesis on my own and independently, without the help of any outer support other than the quoted literature, nor did I use any other sources. The literature I used, either in its literal form or by its meaning, is clearly marked and separately listed.

Linz, 01st June 2022

Mila Dagmar Rathenböck
ABSTRACT

Slow transit constipation (STC) or chronic idiopathic constipation (CIC) is a health condition affecting an increasing number of people due to demographical developments and therefore makes an important differential diagnosis in modern gastroenterology, visceral surgery and general medicine. For a professional diagnosis and a cost-efficient way of evaluating the function of the bowel and the defecation mechanisms, it is necessary to use structured methods regarding the diagnostic steps throughout the entire time of doctor-patient-interaction. A flowchart provided in this thesis offers an evidence-based way of diagnostic practice usable in the daily routine of clinical care for patients with symptoms or a diagnosis of chronic constipation. Additionally, for a better overview of the topic, exact definitions of bowel passage physiology, etiological factors of chronic (functional) constipation, symptoms of functional constipation, description of the available diagnostic tools and an evaluation of a reasonable diagnostic pathway is given in this thesis. Diagnostic guidelines are summarised and critically discussed. Differential diagnoses to chronic functional constipation are listed and an abbreviated review of treatment options, among them surgical procedures, for functional bowel passage disorders is included. Using the flowchart during the process of diagnostics in a person with chronic functional constipation improves the clinical outcome, provides organisational comfort to the doctor and the patient and can be used as a helpful tool in clinical decision-making regarding the sequence of diagnostic steps and further medical care.

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1. INTRODUCTION

1.1. Choice of Subject

With functional bowel passage disorders becoming an increasing challenge in visceral surgery over the upcoming decades due to demographical changes, this topic was very gripping for me from the beginning, when I first started working on this thesis.

Functional bowel passage disorders like slow transit constipation (STC), obstructed defecation syndrome (ODS) and pelvic floor dysfunction (PFD) amongst others are facing a gain of interest as well as increasing importance throughout gastrointestinal medicine and visceral surgery, and are to be investigated more in the future in order to guarantee maximal benefit of treatment for the people affected.

Chronic functional constipation is a tremendous burden to the people affected, both on the physical and the psychological side of the disease. In the wide field of visceral medicine (gastroenterology, visceral surgery, proctologic departments) as well as the area of general medicine in extramural institutions, chronic functional constipation continues to be an important part of modern healthcare.

1.2. In This Thesis

In this thesis, the structures and functionality as well as the physiological process of defecation is described, selected manifestations of dysfunctional defecation are presented and the epidemiological role of chronic functional constipation is discussed. Etiological factors are explained and symptoms of chronic functional constipation are described. Differential diagnoses to chronic functional constipation are listed and diagnostic guidelines are critically reviewed. Additionally, a brief overview is given over the possible (pre-operative and operative) treatment options.

In the focus of this thesis are an extended list and description of the diagnostic tools available for the assessment of chronic functional constipation as well as the development of a flowchart usable for daily clinical routine and care for chronically (functionally) constipated patients. The flowchart can be found in chapter 12.

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2. RESEARCH OBJECTIVES

Colonic and rectal dysfunction is often still being examined in various unstandardised ways which often leaves patients undiagnosed for months, leading to an increased amount of suffering and a delayed start of treatment. Not only is this a burden on the patient's life and physical and mental well-being – a prolonged, possibly disorganised way of diagnosis also correlates to higher costs for the health system.

Before recommending surgical treatment to a patient with a functional bowel passage disorder, it is important to go through a number of diagnostic steps in order to rule out any other potential causes for their symptoms and also make sure to have taken full advantage of conservative methods to avoid potential risks that come with a surgical procedure. For this, it is important to take the individual patient’s situation and history into account so that appropriate decisions can be made from the doctor’s and also the patient’s view.

Therefore, coordinated steps of diagnostics are fundamental to ensure the patient’s comfort during the process while also taking into consideration the available diagnostic tools and their potential, surgical expertise regarding the recommendation of operative treatment options, interdisciplinary medical knowledge and the financial impact on the health system.

This underlines the importance of finding an evidence-based way of a standardised, systematic process of diagnostics. In this thesis, a flowchart has been created to ease the finding of a correct diagnosis of chronic functional constipation from the doctor’s and the patient’s point of view.
## 3. TERMS & ABBREVIATIONS

<table>
<thead>
<tr>
<th>Term/Abbreviation</th>
<th>Explanation/Full Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>STC</td>
<td>Slow transit constipation</td>
</tr>
<tr>
<td>ODS</td>
<td>Obstructed defecation syndrome</td>
</tr>
<tr>
<td>PFD</td>
<td>Pelvic floor dysfunction</td>
</tr>
<tr>
<td>ICC</td>
<td>Interstitial Cells of Cajal</td>
</tr>
<tr>
<td>RAIR</td>
<td>Rectoanal inhibitory reflex</td>
</tr>
<tr>
<td>FBD</td>
<td>Functional bowel disorder</td>
</tr>
<tr>
<td>IBS</td>
<td>Irritable Bowel Syndrome</td>
</tr>
<tr>
<td>CIC</td>
<td>Chronic idiopathic constipation</td>
</tr>
<tr>
<td>GID</td>
<td>Gastrointestinal dysmotility</td>
</tr>
<tr>
<td>IBS-C</td>
<td>Constipation-dominant form of IBS</td>
</tr>
<tr>
<td>NTC</td>
<td>Normal transit constipation</td>
</tr>
<tr>
<td>FGID</td>
<td>Functional gastrointestinal disorders</td>
</tr>
<tr>
<td>NHS</td>
<td>National Health Service (UK)</td>
</tr>
<tr>
<td>VIP</td>
<td>Vasoactive intestinal peptide</td>
</tr>
<tr>
<td>KESS</td>
<td>Knowles-Eccersley-Scott Symptom Score</td>
</tr>
<tr>
<td>CCQ</td>
<td>Chinese Constipation Questionnaire</td>
</tr>
<tr>
<td>BSFS</td>
<td>Bristol Stool Form Scale</td>
</tr>
<tr>
<td>MODS</td>
<td>Modified ODS Longo Score</td>
</tr>
<tr>
<td>DRE</td>
<td>Digital-rectal exam</td>
</tr>
<tr>
<td>LL</td>
<td>Left-lateral</td>
</tr>
<tr>
<td>BET</td>
<td>Balloon expulsion test</td>
</tr>
<tr>
<td>vvBET</td>
<td>Variable volume balloon expulsion test</td>
</tr>
<tr>
<td>SNS</td>
<td>Sacral Nerve Stimulation</td>
</tr>
<tr>
<td>MRI</td>
<td>Magnet-resonance imaging</td>
</tr>
<tr>
<td>EMG</td>
<td>Electromyography</td>
</tr>
<tr>
<td>HAPC</td>
<td>High-amplitude propagating contractions</td>
</tr>
<tr>
<td>MMC</td>
<td>Migrating motor complex</td>
</tr>
<tr>
<td>AIGO</td>
<td>Italian Association of Hospital Gastroenterologists</td>
</tr>
<tr>
<td>SICCR</td>
<td>Italian Society of Colo-Rectal Surgery</td>
</tr>
<tr>
<td>CICI</td>
<td>Chronic Idiopathic Constipation Index</td>
</tr>
<tr>
<td>CSI</td>
<td>Constipation Severity Instrument</td>
</tr>
<tr>
<td>CRQOL</td>
<td>Constipation-Related Quality of Life</td>
</tr>
<tr>
<td>TT</td>
<td>Transit time</td>
</tr>
<tr>
<td>IAS</td>
<td>Internal anal sphincter</td>
</tr>
<tr>
<td>EAS</td>
<td>External anal sphincter</td>
</tr>
<tr>
<td>MACE</td>
<td>Malone Antegrade Colonic Enema</td>
</tr>
</tbody>
</table>

Table 1: Terms & Abbreviations in the order of appearance
4. DEFINITIONS

4.1. Physiological Bowel Passage and Gastrointestinal Transit Time

In addition to the quality and quantity of food, the functionality of bowel passage and the gastrointestinal transit time prove to be an important factor to the body’s ability of sufficient nutrient uptake. “Gastrointestinal transit time may be an important determinant of glucose homeostasis and metabolic health through effects on nutrient absorption and microbial composition, alongside other mechanisms.”

After oral intake food will pass the oesophagus within 10 seconds and will stay in the stomach for 1-7 hours depending on the calorie count. Transit time of the small intestine varies between 2-4 hours and mean passage time of the large intestine lies around 40 hours with an upper normal limit of 84 hours according to a pediatric study until defecation. More information about the normal physiological colon transit time will be provided in chapter 8. Gastrointestinal transit time is dependent on the efficacy of peristalsis, which is determined by the function of smooth muscle structures and enteric innervation as well as the consistency of food or stool. Peristalsis describes the onward transport of digestive content through the gastrointestinal tract.

Smooth muscle structures include the two layers of the muscularis propria (Tunica muscularis): The inner layer (circular stratum/Stratum circulare) and the outer layer (longitudinal stratum/Stratum longitudinale). Enteric innervation comprises two main nervous structures: The myenteric plexus (Plexus myentericus, Auerbach’s plexus) between the inner and outer smooth muscle layers and the submucosal plexus (Plexus submucosus, Meissner’s plexus, Schabadasch’s plexus) between the mucosa (Tunica mucosa) and the muscularis propria. There are nervous connections between the two plexuses. The myenteric plexus contains c-Kit+ interstitial cells of Cajal (ICC) which control peristalsis and act as a pacemaker of intestinal propulsion. These Cajal cells contract 12 times per minute in the proximal bowel and 8 times per minute in the distal ileum, which works as the driving force of peristalsis.

4.2. Reflexes

Bowel passage and transit time is controlled by contractions of the intestinal wall, innervated via gastrointestinal reflexes. “Gastrointestinal reflexes can be divided into intrinsic reflexes, where all components of the reflex are in the gut wall, enteroineretic reflexes, in which a reflex arises in one part of the digestive system and affects a different region, and central reflexes, in which the reflex pathway passes through or originates in the central nervous system.”

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The most common reflex is the gastrocolic reflex – a reflex triggered by filling of the stomach which leads to contractions of the intestine and consecutive transport of digestive tract content. However, the main reflex for successfully coordinated bowel passage and control of defecation is the rectoanal inhibitory reflex (RAIR). Through this reflex, stretching of the rectum controls the opening of the anal canal through relaxation of the internal sphincter and contraction of the external sphincter, and after “sampling” the content in the transformation zone and discriminating between stool or gas, defecation is set in motion through a Valsalva manoeuvre and relaxation of both sphincter muscles if the situation is considered suitable.

Further reflexes concerning induction of defecation are the esophageal-rectal reflex ("[…] seems to be conducted through the myenteric plexus from the esophagus down along the wall to the rectum, initiating rectal contractions"), the gastrorectal reflex, the intrinsic myenteric defecation reflex, the parasympathetic defecation reflex and the perineorectal reflex alongside others.

4.3. Colonic and Rectal Dysfunction

Colonic and rectal dysfunction can be a result of morphological/structural and/or functional pathology. Before diagnosing a functional bowel passage disorder, conditions like intestinal stenosis, stricture, colonic polyp, tumor, inflammation, volvulus and others have to be ruled out. In functional colonic and rectal passage disorders, no morphological correlate to the shown symptoms can be found. "Functional bowel disorders are diagnosed on the basis of a typical constellation of symptoms and the absence of pathological findings that would adequately explain them (exclusive criteria)." Diagnosis of a functional bowel disorder (FBD) requires characteristic symptoms during the last 3 months and onset > or = 6 months ago.

4.4. Description of Selected Manifestations

4.4.1. Functional Constipation

Focusing on chronic bowel passage disorders and long-term constipation, it is important to differentiate between disease-associated constipation, drug-induced constipation, functional

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7 See ibid.


disorders as well as irritable bowel syndrome (IBS). The following table gives an overview over differential diagnoses and causes of each group:\textsuperscript{12}:

**Chronic constipation**

<table>
<thead>
<tr>
<th>Type of constipation</th>
<th>Occurrence (selected examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Disease-associated constipation</td>
<td>• Parkinson’s disease</td>
</tr>
<tr>
<td></td>
<td>• Multiple Sclerosis</td>
</tr>
<tr>
<td></td>
<td>• Hypothyroidism</td>
</tr>
<tr>
<td></td>
<td>• Electrolyte imbalance</td>
</tr>
<tr>
<td>2) Drug-induced constipation</td>
<td>• Pain management (opioids)</td>
</tr>
<tr>
<td></td>
<td>• Antiparkinson medication</td>
</tr>
<tr>
<td></td>
<td>• Anticholinergic medication</td>
</tr>
<tr>
<td>3) Functional disorders</td>
<td>• Chronic idiopathic constipation (CIC)/&quot;Slow transit constipation (STC)&quot;</td>
</tr>
<tr>
<td></td>
<td>• Gastrointestinal dysmotility (GID)</td>
</tr>
<tr>
<td></td>
<td>• Pelvic floor dysfunction (PFD)</td>
</tr>
<tr>
<td>4) Irritable bowel syndrome (IBS)</td>
<td>• Constipation-dominant form (IBS-C)</td>
</tr>
</tbody>
</table>

Table 2: Chronic constipation\textsuperscript{13}

Chronic constipation can be defined through the Rome III and IV criteria. These criteria describe chronic constipation as unsatisfying defecation for 3 months during the last 6 months with 2 additional symptoms of the following: Straining during defecation in >25\%, feeling of incomplete emptying after defecation in >25\%, hard stool or lumps in >25\%, manual manoeuvre to ease defecation in >25\% and frequency of defecation <3x/week.\textsuperscript{14} Additionally, soft stool without laxatives is rarely found and criteria for IBS must be absent.\textsuperscript{15} A closer description of the Rome III/IV criteria can be found in chapter 4.5..

There are several sub-groups of chronic constipation: Slow transit constipation (STC), normal transit constipation (NTC) and obstructed defecation syndrome (ODS). “Slow transit constipation, a functional colonic disorder represents ~15-30\% of constipated patients.”\textsuperscript{16}

Psychological stress in patients is mostly linked to the difficulty of defecation rather than the low stool frequency.\textsuperscript{17} Furthermore, it is important to clinically differentiate between chronic


\textsuperscript{14} See ibid.

\textsuperscript{15} Joachim F. Erckenbrecht, Sven Jonas (Hrsg.). Viszeralmedizin Interdisziplinäres Facharztwissen Gastroenterologie und Viszeralchirurgie. 2015 Springer-Verlag GmbH Berlin Heidelberg. doi: 10.1007/978-3-642-14301-4, p.162


\textsuperscript{17} See ibid.
constipation as a symptom or as a condition. Functional passage and defecation disorders often require detailed anamnesis and diagnostics, as discussed in chapter 8.1.

4.4.2. Rectal Prolapse

The two aboral thirds of the rectum are embedded in mesorectal fatty tissue, while the proximal third lies relatively free in the abdominal cave. The dorsal part is attached to the sacrum. Rectal prolapse usually develops through several stages of changes in the position of tissue. It begins with an (internal) intussusception that is only visible on defecography, then follows a sole external mucosal prolapse. Eventually, a full-thickness protrusion of the rectum through the anus – a rectal prolapse – will occur.

Rectal prolapse at young age mostly occurs in men, while later during life female patients are more likely to experience a rectal prolapse. It is not an entity on its own but rather a symptom of an underlying disorder of the pelvic floor, with the exact etiology being unknown. However, anatomical features like a deep Douglas pouch (rectouterine pouch, Excavatio rectouterina), wide sphincter muscles, relaxed levator ani muscle (M. levator ani) and loose fascia increase the risk of developing a rectal prolapse throughout lifetime.

Rectal prolapse is considered a symptom of an underlying pelvic floor dysfunction rather than an entity on its own.

4.4.3. Pelvic Floor Dysfunction (PFD)

There is no distinctive definition of pelvic floor dysfunction as such, however the condition affects the visceral and urogenital continence structures. Leading symptoms are urinary incontinence and stool incontinence, as well as defecation disorders and different forms of prolapse. Etiological factors include severe physical stress, obesity and constipation-related strain during defecation. Women are more likely to experience pelvic floor dysfunction due to additional etiological factors like pregnancy and childbirth.

Symptoms of pelvic floor dysfunction include urological symptoms (delay or hesitant urination, cystocele, urethrocele, incontinence/involuntary leakage), gynaecological symptoms.

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20 See ibid.
22 See ibid.
23 See ibid.
24 See ibid.
25 See ibid.
dyspareunia, uterine prolapse, vaginal prolapse, enterocele, rectocele), colorectal symptoms (constipation, stool incontinence/smearing, rectal prolapse) and general symptoms like pelvic pain. Focusing on functional bowel passage disorders and defecation, pelvic floor dysfunction is an important cause of chronic constipation. Obstructed defecation syndrome (ODS) is linked to pelvic floor dysfunction and is the most common form of defecation disorder.

The term ODS covers multiple conditions leading to impaired defecation – the following table lists examples of functional vs. morphological disorders as well as combinations:

<table>
<thead>
<tr>
<th>Type of disorder</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Functional disorders</td>
<td>• Pelvic floor</td>
</tr>
<tr>
<td></td>
<td>- Inadequate coordination</td>
</tr>
<tr>
<td></td>
<td>- Anismus</td>
</tr>
<tr>
<td></td>
<td>- Spasticity</td>
</tr>
<tr>
<td></td>
<td>• Colon and rectum</td>
</tr>
<tr>
<td></td>
<td>- Idiopathic inertia recti</td>
</tr>
<tr>
<td></td>
<td>- Dysfunctional autonomous innervation</td>
</tr>
<tr>
<td>2) Morphological-organic disorders</td>
<td>• Pelvic floor</td>
</tr>
<tr>
<td></td>
<td>- Myopathy of the internal sphincter</td>
</tr>
<tr>
<td></td>
<td>- Hypertrophy of the internal sphincter</td>
</tr>
<tr>
<td></td>
<td>- Dorsal dysplasia of the sphincter</td>
</tr>
<tr>
<td></td>
<td>- Anorectal stenosis</td>
</tr>
<tr>
<td></td>
<td>- Fissure in ano</td>
</tr>
<tr>
<td></td>
<td>• Colon and rectum</td>
</tr>
<tr>
<td></td>
<td>- Post-operative inertia recti</td>
</tr>
<tr>
<td></td>
<td>- Intestinal dysganglionosis</td>
</tr>
<tr>
<td></td>
<td>- Insufficient relaxation of the internal sphincter</td>
</tr>
<tr>
<td></td>
<td>- Hirschsprung’s disease</td>
</tr>
<tr>
<td></td>
<td>- Enterocoe</td>
</tr>
<tr>
<td></td>
<td>- Rectocele</td>
</tr>
<tr>
<td></td>
<td>- Rectal prolapse</td>
</tr>
<tr>
<td></td>
<td>- Reduced compliance of the rectum</td>
</tr>
<tr>
<td></td>
<td>- Obstructing tumor</td>
</tr>
</tbody>
</table>
| 3) Combination of 1) and 2)            | Table 3: “Obstructed Defecation Syndrome (ODS) and possible underlying causes”


28 See ibid.

With a wide range of differential diagnoses and the complex etiology of pelvic floor dysfunction, diagnostics include several steps of examination (anamnesis, proctologic examination, imaging and specific examinations in colorectal surgery, urology and gynaecology). The importance of interdisciplinary cooperation will be discussed further in chapter 13.

4.5. Rome III/IV Criteria

In order to obtain standardised clinical diagnosis and treatment, the Rome III/IV criteria provide the examiner with clear information about the features necessary to diagnose chronic constipation. First published in 1989 (Rome criteria) and updated in 1994 (Rome I), 1999 (Rome II) and 2006 (Rome III), the most recent version of the criteria for diagnosis of functional bowel disorders are the Rome IV criteria. "The latest Rome IV consensus was presented in May 2016." The Rome IV criteria categorizes disorders of chronic constipation into four subtypes: (a) functional constipation, (b) irritable bowel syndrome with constipation, (c) opioid-induced constipation, and (d) functional defecation disorders, including inadequate defecatory propulsion and dyssynergic defecation.

In patients with functional bowel passage disorders, especially functional constipation (STC, GID, PFD), the Rome IV criteria must be fulfilled before giving a diagnosis of chronic constipation. Focusing on functional chronic constipation and functional defecation disorders, the Rome IV criteria for these conditions are:

**Rome IV criteria**

<table>
<thead>
<tr>
<th>Functional chronic constipation</th>
<th>Functional defecation disorders</th>
</tr>
</thead>
<tbody>
<tr>
<td>• For both categories, it is important to take into consideration that for a diagnosis of “chronic” constipation and/or defecation disorder, it is necessary to confirm unsatisfying defecation for 3 months during the last 6 months.</td>
<td></td>
</tr>
<tr>
<td>• No fulfilling of the criteria for IBS</td>
<td></td>
</tr>
<tr>
<td>• No consumption of opioids</td>
<td></td>
</tr>
<tr>
<td>• 2 or more symptoms of the following:</td>
<td></td>
</tr>
<tr>
<td>§ Straining stool in &gt;25% of defecations</td>
<td></td>
</tr>
<tr>
<td>§ Lumpy/hard stool in &gt;25% defecations</td>
<td></td>
</tr>
<tr>
<td>§ Incomplete defecation in &gt;25% of defecations</td>
<td></td>
</tr>
<tr>
<td>§ Sensation of anal blockage in &gt;25% of defecations</td>
<td></td>
</tr>
<tr>
<td>• Fulfillment of the criteria for functional chronic constipation or IBS (see below the table)</td>
<td></td>
</tr>
<tr>
<td>• Proof of impaired rectal emptying as shown by the following tests:</td>
<td></td>
</tr>
<tr>
<td>§ Abnormal balloon expulsion test</td>
<td></td>
</tr>
<tr>
<td>§ Abnormal results in anorectal manometry or anal surface electromyography</td>
<td></td>
</tr>
</tbody>
</table>

---


31 See ibid.


33 See ibid.
- Manual manoeuvres necessary in >25% defecations
- <3 spontaneous defecations per week
- Abnormal defecography without structural lesions

Table 4: "Rome IV criteria for functional chronic constipation and functional defecation disorders"34

The Rome IV criteria for the diagnosis of IBS include: Abdominal pain at least once per week that can be associated to change in stool frequency and/or form and the pain being related to defecation.35

The usage of the Roma IV criteria during the diagnostic process of chronic constipation or disordered/dysfunctioning defecation proves to enhance the quality of clinical care.36

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35 See ibid.

36 See ibid.
5. EPIDEMIOLOGY

5.1. Functional Gastrointestinal Disorders (FGID)

Depending on the criteria used for diagnosis of functional bowel disorders, prevalence differs based on different approaches on numbers and surveys. “In a large scale multinational study, [Sperber et al.] found that more than 40% of persons worldwide have FGID, which affect quality of life and health care use.”[^37]

It is important to correctly estimate the prevalence of functional gastrointestinal disorders as these patients have a great impact on health systems and health care providers.[^36]

5.2. Focus on Chronic Constipation and Defecation Disorders

Early reports from the ancient Egyptians and Greeks (Hippocrates) have shown first mentions of therapy with chronic constipation.[^39] “With growing life expectancy there will be an increase of patients with discomfort due to constipation, as at an elder age digestion issues are more likely to appear.”[^40]

15% of Europeans suffer from chronic constipation, while a majority are adults. Women are affected twice as often as men, 30% of people over the age of 65 are affected.[^41]

The epidemiological analysis of functional defecation disorders requires not only fulfillment of the Rome III/IV criteria, but also diagnostic steps to rule out other non-functional conditions. On average, defecation disorders are diagnosed at the age of 44.[^42] The overall incidence per 100,000 lies around 19.3[^43] and the age-adjusted incidence is greater in female patients.[^44]

5.3. Trends and Economic Consequences

Patients with functional bowel passage disorder and/or chronic constipation are likely to seek medical advice more often than people without these conditions. With an ageing population and more people over the age of 65 in the upcoming years as well as higher age being one of the


[^38]: See ibid.


[^40]: See ibid.

[^41]: See ibid.


[^43]: See ibid.

[^44]: See ibid.
risk factors for developing functional bowel passage disorders, prevalence will increase in the upcoming decades.

An important detail to the trend of prevalence of functional chronic constipation is the development of performance and work requirements in the future of the Western world, especially in regards to stress and pressure in and around the workplace. "It is well established that co-morbidity of mood and anxiety disorders in Functional Gastrointestinal Disorder [...] patients are much higher than in general population with rates up to 50% or even more [...]." \(^{45}\) To reduce health costs, it is important to improve interdisciplinary clinical care for patients suffering from psychological disorders that impact gastrointestinal health.\(^{46}\)

In the near future, health care providers from around the world will likely see more patients seeking treatment for their symptoms, which will lead to a greater financial burden on health care systems. In the U.S., more than 230 million dollars are needed to treat the affected Americans (16% of the U.S. population). In Europe, UK, constipation costs the English National Health Service (NHS) an annual 162 million pounds\(^{47}\). It should be considered that functional bowel passage disorders and chronic constipation do not only require large expenditure before given a diagnosis, but also in post-operative or post-interventional care which opens the question to individually reconsider the economic and the medical sense of these operations, and it enhances the importance of carefully assessing the indication to an operation.

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\(^{46}\) See ibid.

6. ETIOLOGY

It is common knowledge in modern medicine that functional bowel disorders include a significant group of patients, however finding specific etiologies for such still proves to be a rather difficult task. Considering the growing importance of functional bowel disorders (especially chronic functional constipation) as mentioned in chapter 5, pursuing further research in etiologies in order to gain more information about these pathologies and to subsequently find preventive options is to be discussed.

In the following, etiological factors to the development of selected functional bowel passage disorders will be described further. The different etiologies have been divided into innate and/or hereditary etiologies and acquired etiologies. At the end of this chapter potential risk factors will be pointed out and summarised.

6.1. Innate and/or Hereditary Etiological Factors

6.1.1. Functional Constipation

Underlying pathomechanisms of chronic functional constipation have not yet been fully understood, which makes it difficult to determine etiological criteria that represent all variants of clinical presentation of patients with chronic functional constipation. It is recommended to distinguish between primary and secondary functional causes of constipation. Secondary causes can be consequences or manifestations of conditions that are not primarily defined by intestinal presentation.

Primary causes of chronic functional constipation include conditions that are primarily located in the intestines and can potentially be explained through anatomical and/or pathophysiological circumstances in the gastrointestinal tract.

“Dysmotility of the colon is the cause of slow transit constipation, but the etiology and explanation of this dysmotility is poorly understood.” Theories suggest that the cause lies in the dysfunction of both the enteric nervous system as well as the neuroendocrine system, with the Cajal cells playing an important role in the pathophysiology of functional constipation. It has been shown that the number of Cajal cells is reduced in patients with slow transit constipation, however the cause of this decrease remains unexplained.

Furthermore, dysfunctioning enteric nervous system has also been shown to have an impact on the development of slow transit constipation with impaired colonic contraction leading to impaired transit.

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49 See ibid.


51 See ibid.

52 See ibid.
incomplete emptying of the rectum under treatment with laxatives and neurotransmitters.\textsuperscript{53} The neuroendocrine system has also been discussed as an etiological factor to slow transit constipation, with patients showing (individually) abnormal levels of pancreatic polypeptide, serotonin, vasoactive intestinal peptide (VIP), substance P and cholecystokinin.\textsuperscript{54}

It has been shown that especially patients with slow transit constipation also show impaired passage in other locations of the gastrointestinal tract. “It has also been observed that patients with slow transit constipation have other associated motility/transit disorders of the esophagus, stomach, small bowel, gallbladder, and anorectum, thus lending more support to the involvement of a dysfunctional enteric nervous system in slow transit constipation.”\textsuperscript{55}

Chronic constipation as a secondary manifestation of a condition that is likely or partly hereditary, with the primary cause located elsewhere can be found in patients with diabetes mellitus, multiple sclerosis, Parkinson’s disease or paraneoplastic syndrome, however chronic constipation in these cases would rather be defined as “disease-associated chronic constipation” rather than just “functional constipation” (see Table 2).\textsuperscript{56}

The cause for the symptom of chronic functional constipation is the degeneration of Cajal cells.\textsuperscript{57}

\textit{6.1.2. Rectal prolapse}

While the exact etiology of the rectal prolapse is still unknown, certain anatomical features have been found to increase the risk of developing a rectal prolapse throughout life. These features include a deep Douglas pouch, a wide or relaxed sphincter muscle, a relaxed levator ani muscle \textit{(M. levator ani)} of diastatic appearance and loose fascial adhesions.\textsuperscript{58} In some cases, there is a congenital component showing as a defect in the fibrous connective tissue of the pelvis floor and/or a defect in the sphincter muscle that can lead to rectal prolapse in childhood.\textsuperscript{59}

In many cases there will be mucus and blood discharge during defecation as well as consecutive incontinence through the chronic overstretching of the sphincter muscle. 60% of patients suffer from incomplete defecation due to the intussusception of the rectum.\textsuperscript{60}

\textsuperscript{54} See ibid.
\textsuperscript{57} See ibid.
\textsuperscript{60} See ibid.
6.1.3. Pelvic Floor Dysfunction

It is often difficult to differentiate between primary and secondary factors that increase the risk for pelvic floor dysfunction throughout life, however it has been shown that the human’s upright gait and the mechanical strain on the pelvic floor that naturally comes with it are linked to a greater prevalence of PFD.61

6.2. Acquired Etiological Factors

6.2.1. Functional Constipation

It has been found that previous surgical intervention in the pelvic area as well as birth trauma can increase the risk of developing functional bowel passage disorders. “Autonomic nervous system dysfunction has also been proposed as a cause of slow transit constipation. This is demonstrated by the development of slow transit constipation in those who have undergone pelvic surgery or have given birth.”62

Further acquired causes for the development of chronic functional constipation is the regular intake of drugs and/or medication, especially pain medication (opioids), antiparkinson medication and anticholinergic medication.63

Additionally, the correlation to psychological condition should not be ignored – patients with functional bowel disorders are more likely to develop mood and anxiety disorders64, however whether there is a causal connection between constipation and anxiety and depression disorders remains unconfirmed.65

6.2.2. Rectal prolapse

Rectal prolapse as a secondary condition acquired through a different primary condition can derive from pre-existing pelvic floor dysfunction and/or obstructed defecation syndrome. “ODS has been also defined an ‘iceberg syndrome’, as the two most frequent lesions, i.e., rectocele and rectal internal mucosal prolapse, present in more than 90% of patients with ODS, are easily detectable and may be considered ‘emerging rocks’, […]”66.


65 See ibid.

Further factors that increase the risk of developing a rectal prolapse throughout life are physical strain on the area like childbirth and birth trauma and chronic constipation or other factors that increase the abdominal pressure like pregnancy or obesity.67

6.2.3. Pelvic Floor Dysfunction

Excessive exercise, pregnancy and childbirth, obesity as well as severe pressing during defecation are acquired etiological factors of pelvic floor dysfunction. Additionally, previous operations in the area have been found to have predisposing impact. Anatomically weak or loose fascia or ruptures of the arcus tendineus fasciae pelvis can increase the chance of developing a descensus of the pelvic floor compartments, leading to nerve damage and passage disorders like constipation or incomplete evacuation.68

Further factors that might influence the development of pelvis floor dysfunction with an impact on gastrointestinal functions include habitual acts like avoiding urination or defecation.69

6.3. Risk factors

In the following table, examples of risk factors for the selected conditions of functional constipation, rectal prolapse and pelvic floor dysfunction are summarised for better overview, based on the previous subchapters describing the conditions:

<table>
<thead>
<tr>
<th>(Functional) Bowel Passage Disorder</th>
<th>Selected Risk Factors</th>
</tr>
</thead>
</table>
| Functional Constipation            | ▪ Genetic predisposition (enteric nervous system, neuroendocrine system)  
▪ Previous surgical intervention in the area  
▪ Pregnancy and childbirth  
▪ Psychiatric disorders (anxiety, depression) |
| Rectal Prolapse                    | ▪ Congenital tissue or sphincter muscle weakness  
▪ Certain anatomical features (see 6.1.2)  
▪ Chronic overstretching of the sphincter muscle  
▪ ODS  
▪ Pregnancy and childbirth |


| Pelvic Floor Dysfunction | Upright gait
| | Excessive exercise
| | Pregnancy and childbirth
| | Obesity
| | Severe pressing during defecation
| | Weak or loose fascia
| | Avoiding urination and/or defecation

Table 5: Risk factors for the development of selected bowel passage disorders
7. SYMPTOMS FOCUSING ON STC/ODS

In this chapter, important features in the anamnesis and symptoms of Slow Transit Constipation (STC) and Obstructed Defecation Syndrome (ODS) as an important differential diagnosis are described in greater detail. Further information on the exact diagnostic steps including general anamnesis can be found in chapter 8.

7.1. Symptoms of Slow Transit Constipation (STC)

7.1.1. Anamnesis

Asking for a patient’s medical history is an indispensable part of medical care when it comes to diagnosing slow transit constipation. Asking for the patient’s stool frequency, stool consistency and completion/strain during defecation is essential for a professional assessment of the patient’s individual situation.²⁰ For this, it is recommended to use standardised scores for the evaluation of stool habits and severity of symptoms. Scores like the Cleveland Clinic Florida Obstruction Score, the Knowles-Eccersley-Scott Symptom Score (KESS) and the Chinese Constipation Questionnaire (CCQ) provide orientation to the clinician and will be explained further in chapter 8. The Bristol Stool Form Scale (BSFS) provides an option to both the patient and the consulting doctor to objectively assess stool consistency during anamnesis.²¹ It will also be mentioned in chapter 8.

Symptoms like infrequent stool (<3 times per week) and/or missing urge of defecation indicate that slow transit constipation (and/or colonic inertia) are likely the case, however these symptoms are not specific for slow transit constipation (or colonic inertia) which is why the process of diagnostics requires further steps in order to rule out other differential diagnoses.²²

The Rome III/IV criteria, as described in chapter 4.5, can be used for the diagnosis of (functional) chronic constipation. To objectively describe consistency of stool, the Bristol Stool Form Scale (BSFS)²³ can be used for evaluation.

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²¹ See ibid.


Additional symptoms like sensation of pressure or bloating in the upper abdomen are signals for the presence of bowel passage disorders like slow transit constipation, however these symptoms cannot be used as a leading differentiation aspect between bowel passage disorders and obstructed defecation syndrome or pelvic floor dysfunction.

7.2. Symptoms of Obstructed Defecation Syndrome (ODS)

7.2.1. Anamnesis

Obstructed defecation syndrome is a sub-category of chronic constipation, characterised by symptoms that may overlap with other types of chronic constipation like general bowel passage disorders. For evaluation of the grade of constipation, it is recommended to use the same constipation scores listed in 7.1.1. as well as special constipation scores for ODS like Longo’s ODS Score System or the Modified ODS Longo Score (MODS) which will be discussed in chapter 8.

Symptoms of obstructed defecation syndrome include fragmented stools, strain during defecation, incomplete evacuation or sensation of incomplete evacuation, tenesmus (the feeling of bowel movement and the urge to evacuate, even though the patient has just had done so), urgency of defecation, pelvic heaviness and manual manoeuvres (self-digitation).

Certain signs are indicating ODS in a patient, however these signs are not exclusive to obstructed defecation syndrome and can only be used as orientation during anamnesis. These clinical features are: Pressing during defecation, incomplete emptying of the rectum (stool or enema), self-digitation to improve rectal evacuation, difficult defecation with soft stool, no adequate relaxation during digital rectal exam (DRE).

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8. DIAGNOSTICS

In order to meet the goals of a combination between sufficiently and efficiently diagnosing functional constipation with a focus on slow transit constipation, it is important for the practitioner to thoroughly understand the methods of examination. Through bringing these methods in a useful order, maximum efficacy of the available resources can be obtained. In the following, an overview of the steps of examination and the available tools of evaluation of functional constipation with a focus on slow transit constipation (STC) is given and explained.

8.1. Anamnesis and Scores

Like with any contact between a doctor and their patient, it is of utmost importance to ensure that the patient is given enough opportunity and space to provide the doctor with as much information as possible about their condition, which at the time of the initial anamnesis is often unnamed and not yet explored enough to be properly defined. Depending on the complexity of the individual patient’s case, the gathered information respectfully influences the direction and success of care.\(^8^0\) Not only can a proper medical history interview outline the chronicity of the patient’s illness, it can also show accompanying and/or previous conditions for which the patient may not have received sufficient consulting and treatment.\(^8^1\)

In order to cover the most important questions in the setting of a rectoproctologic examination with the focus on (functional) constipation, it is recommended to use scores in order to guarantee a standardised process of diagnostics. This is not only beneficial for creating the best individual plan of treatment for the patient, but it also ensures that communication between the responsible practitioners works smoothly and without biased subjectification of the patient’s symptoms by adhering to objective criteria.

Some of the most commonly used scores are the \textit{Cleveland Clinic Florida Obstipation Score\textsuperscript{(Agachan, Wexner)}, the \textit{Longo’s ODS Score System, the \textit{Modified ODS Longo Score (MODS), the \textit{Knowles-Eccersley-Scott Symptom Questionnaire (KESS) and the Chinese Constipation Questionnaire (CCQ).} In regards to slow transit constipation (STC), it is recommended to use scores that focus on the evaluation of functional constipation and transit abnormalities, which are the \textit{Cleveland Clinic Florida Obstipation Score, the Knowles-Eccersley-Scott Symptom Questionnaire (KESS) and the Chinese Constipation Questionnaire (CCQ).\textsuperscript{82}}

These standardised constipation scores provide an informative tool to distinguish between functional constipation differential diagnoses\textsuperscript{83}: The \textit{Cleveland Clinic Florida Obstipation Score} covers both measurable factors like number of attempts of defecation, defecation occurrences


\(^{81}\) See ibid.


\(^{83}\) See ibid.
and years of suffering from chronic constipation, as well as personal and subjective factors to the patient like pain during defecation, unsatisfactory defecation and abdominal pain amongst others. While the Knowles-Eccersley-Scott Symptom Questionnaire (KESS) also mentions the consistency of stool, it does not specify on the pain experienced by the patient during defecation specifically, and in the used source, no cut-off value for constipation was given. The Chinese Constipation Questionnaire (CCQ) does not ask about pain and is therefore not as reliable for the assessment of the patient’s discomfort.

Thus, the Cleveland Clinic Florida Obstipation Score in combination with the Bristol Stool Form Scale to evaluate stool consistency offers a sufficient tool for proper judgement of the patient’s defecation, personal discomfort and objective stool issues.

In the following, three selected scores for the evaluation of the grade and severity of slow transit constipation (STC) will be presented in detail:

**Cleveland Clinic Florida Obstipation Score (Agachan, Wexner)**

<table>
<thead>
<tr>
<th>Question</th>
<th>Points in total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>How often does defecation occur?</strong></td>
<td></td>
</tr>
<tr>
<td>Almost daily</td>
<td></td>
</tr>
<tr>
<td>2x/week</td>
<td></td>
</tr>
<tr>
<td>1x/week</td>
<td></td>
</tr>
<tr>
<td>Less than 1x/week</td>
<td></td>
</tr>
<tr>
<td>Less than 1x/month</td>
<td></td>
</tr>
<tr>
<td><strong>How often is defecation difficult and/or painful?</strong></td>
<td></td>
</tr>
<tr>
<td>never</td>
<td></td>
</tr>
<tr>
<td>rarely</td>
<td></td>
</tr>
<tr>
<td>sometimes</td>
<td></td>
</tr>
<tr>
<td>usually</td>
<td></td>
</tr>
<tr>
<td>always</td>
<td></td>
</tr>
<tr>
<td><strong>How often do you have the feeling of unsatisfying defecation?</strong></td>
<td></td>
</tr>
<tr>
<td>never</td>
<td></td>
</tr>
<tr>
<td>rarely</td>
<td></td>
</tr>
<tr>
<td>sometimes</td>
<td></td>
</tr>
<tr>
<td>usually</td>
<td></td>
</tr>
<tr>
<td>always</td>
<td></td>
</tr>
<tr>
<td><strong>How often do you experience abdominal pain?</strong></td>
<td></td>
</tr>
<tr>
<td>never</td>
<td></td>
</tr>
<tr>
<td>rarely</td>
<td></td>
</tr>
<tr>
<td>sometimes</td>
<td></td>
</tr>
<tr>
<td>usually</td>
<td></td>
</tr>
<tr>
<td>always</td>
<td></td>
</tr>
<tr>
<td><strong>How many minutes per defecation attempt do you spend on the toilet?</strong></td>
<td></td>
</tr>
<tr>
<td>&lt;5</td>
<td></td>
</tr>
<tr>
<td>5-10</td>
<td></td>
</tr>
<tr>
<td>10-20</td>
<td></td>
</tr>
<tr>
<td>20-30</td>
<td></td>
</tr>
<tr>
<td>&gt;30</td>
<td></td>
</tr>
<tr>
<td><strong>Supportive measures?</strong></td>
<td></td>
</tr>
<tr>
<td>none</td>
<td></td>
</tr>
<tr>
<td>laxatives</td>
<td></td>
</tr>
<tr>
<td>enema(s); manual evacuation</td>
<td></td>
</tr>
<tr>
<td><strong>How often do unsuccessful attempts of defecation occur per 24h?</strong></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1-3</td>
<td></td>
</tr>
<tr>
<td>3-6</td>
<td></td>
</tr>
<tr>
<td>6-9</td>
<td></td>
</tr>
<tr>
<td>&gt;9</td>
<td></td>
</tr>
</tbody>
</table>

**How long have you been suffering from constipation? [years]**

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1-5</th>
<th>5-10</th>
<th>10-20</th>
<th>&gt;20</th>
</tr>
</thead>
</table>

**Total Score (Max. 30; Constipation >15 points)**

Table 6: *Cleveland Clinic Florida Obstipation Score (Agachan, Wexner)*\(^{85}\)

**Knowles-Eccersley-Scott Symptom Score (KESS)**

<table>
<thead>
<tr>
<th>Question</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Duration of Constipation</td>
<td>0-18 months</td>
<td>18 months – 5 years</td>
<td>5-10 years</td>
<td>10-20 years</td>
<td>&gt;20 years</td>
</tr>
<tr>
<td>2 Use of laxatives</td>
<td>none</td>
<td>only short-term</td>
<td>regularly, long-term</td>
<td>long-term yet inefficient</td>
<td>-</td>
</tr>
<tr>
<td>3 Frequency of stool</td>
<td>1-2x/1-2 days</td>
<td>2x/week</td>
<td>&lt;1x/week</td>
<td>&lt;1x/2 weeks</td>
<td>-</td>
</tr>
<tr>
<td>4 Unsuccessful attempts of evacuation</td>
<td>none, rarely</td>
<td>sometimes</td>
<td>usually</td>
<td>always, manual evacuation necessary</td>
<td>-</td>
</tr>
<tr>
<td>5 Feeling of incomplete evacuation</td>
<td>never</td>
<td>rarely</td>
<td>sometimes</td>
<td>usually</td>
<td>always</td>
</tr>
<tr>
<td>6 Abdominal pain</td>
<td>never</td>
<td>rarely</td>
<td>sometimes</td>
<td>usually</td>
<td>always</td>
</tr>
<tr>
<td>7 Bloating</td>
<td>never</td>
<td>only recognised by the patient</td>
<td>also obvious to others</td>
<td>plenty, feeling of saturation, nausea</td>
<td>plenty, additional vomiting</td>
</tr>
<tr>
<td>8 Enema/Digitation</td>
<td>never</td>
<td>enema(s), occasional use of suppositories</td>
<td>enema(s), regular use of suppositories</td>
<td>sometimes manual evacuation (digitation)</td>
<td>always manual evacuation (digitation)</td>
</tr>
<tr>
<td>9 Time spent on the toilet</td>
<td>&lt;5mins</td>
<td>5-10mins</td>
<td>10-20mins</td>
<td>&gt;30mins</td>
<td>-</td>
</tr>
<tr>
<td>10 Difficult evacuations</td>
<td>never</td>
<td>rarely</td>
<td>sometimes</td>
<td>usually</td>
<td>always</td>
</tr>
<tr>
<td>11 Stool consistency (without laxatives)</td>
<td>Normal, soft</td>
<td>sometimes hard/lumpy</td>
<td>always hard/lumpy</td>
<td>always hard, firm balls</td>
<td>-</td>
</tr>
</tbody>
</table>

**Total Score: 30 points**

**Evaluation: <25% rarely, 25-50% sometimes, >50% always**

Table 7: *Knowles-Eccersley-Scott Symptom Questionnaire*\(^{86}\)

---


Chinese Constipation Questionnaire (CCQ)

<table>
<thead>
<tr>
<th>Question</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occurrence of unsuccessful evacuation attempts</td>
<td>never</td>
<td>rarely</td>
<td>sometimes</td>
<td>usually</td>
<td>always</td>
</tr>
<tr>
<td>Stool frequency &lt;3x/week</td>
<td>never</td>
<td>rarely</td>
<td>sometimes</td>
<td>usually</td>
<td>always</td>
</tr>
<tr>
<td>Feeling of incomplete evacuation</td>
<td>never</td>
<td>rarely</td>
<td>sometimes</td>
<td>usually</td>
<td>always</td>
</tr>
<tr>
<td>Occurrence of lumpy or hard stool</td>
<td>never</td>
<td>rarely</td>
<td>sometimes</td>
<td>usually</td>
<td>always</td>
</tr>
<tr>
<td>Use of laxatives</td>
<td>never</td>
<td>rarely</td>
<td>sometimes</td>
<td>usually</td>
<td>always</td>
</tr>
<tr>
<td>Abdominal bloating</td>
<td>none</td>
<td>rarely, little discomfort</td>
<td>sometimes, moderate discomfort</td>
<td>frequently, strong discomfort</td>
<td>very frequently, very strong discomfort</td>
</tr>
<tr>
<td><strong>Total Score: 0-24 points</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Evaluation: Constipation ≥ 5 points</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the following, two scores for the evaluation of obstipation as a symptom of obstructed defecation syndrome (ODS) are presented:

**Longo’s ODS Score System**

<table>
<thead>
<tr>
<th>Question</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of defecation (answer, points)</td>
<td></td>
<td>0</td>
<td>2x/week or 3 attempts/day</td>
<td>1x/week or 4 attempts/day</td>
<td>&lt;1x/week or 4 attempts/day</td>
</tr>
<tr>
<td>Pressing during defecation</td>
<td></td>
<td>none, light</td>
<td>moderate</td>
<td>intensive</td>
<td></td>
</tr>
<tr>
<td>Intensity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration</td>
<td></td>
<td>short-term</td>
<td>prolonged</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feeling of incomplete evacuation</td>
<td></td>
<td>never</td>
<td>≤ 1x/week</td>
<td>2x/week</td>
<td>&gt; 2x/week</td>
</tr>
<tr>
<td>Rectal/perineal discomfort/pain</td>
<td></td>
<td>never</td>
<td>≤ 1x/week</td>
<td>2x/week</td>
<td>&gt; 2x/week</td>
</tr>
</tbody>
</table>

The Bristol Stool Form Scale (BSFS) is a widely known and commonly used tool to assess the patient’s stool consistency in order to objectify and therefore standardise evaluation of the stool. The Bristol Stool Form Scale has excellent reliability and agreement when used to rate individual stool type by raters.

### Modified ODS Longo Score (MODS)

<table>
<thead>
<tr>
<th>Questions and answers</th>
<th>Points</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication for stool evacuation (Enema, suppositories)</td>
<td>never</td>
<td>&lt;1x/week</td>
<td>1-6x/week</td>
<td>daily</td>
<td></td>
</tr>
<tr>
<td>Difficult defecation</td>
<td>never</td>
<td>&lt;1x/week</td>
<td>1-6x/week</td>
<td>daily</td>
<td></td>
</tr>
<tr>
<td>Digitation for evacuation</td>
<td>never</td>
<td>&lt;1x/week</td>
<td>1-6x/week</td>
<td>daily</td>
<td></td>
</tr>
<tr>
<td>Return to the toilet for defecation</td>
<td>never</td>
<td>&lt;1x/week</td>
<td>1-6x/week</td>
<td>daily</td>
<td></td>
</tr>
<tr>
<td>Feeling of incomplete evacuation</td>
<td>never</td>
<td>&lt;1x/week</td>
<td>1-6x/week</td>
<td>daily</td>
<td></td>
</tr>
<tr>
<td>Strain during defecation</td>
<td>never</td>
<td>&lt;1x/week</td>
<td>1-6x/week</td>
<td>daily</td>
<td></td>
</tr>
<tr>
<td>Time for defecation</td>
<td>&lt; 5mins</td>
<td>6-10mins</td>
<td>11-20mins</td>
<td>&lt; 20mins</td>
<td></td>
</tr>
<tr>
<td>Negative influence on life quality</td>
<td>none</td>
<td>mild</td>
<td>moderate</td>
<td>significant</td>
<td></td>
</tr>
</tbody>
</table>

**Total Score: 0-24 points**

The Bristol Stool Form Scale (BSFS) is a widely known and commonly used tool to assess the patient’s stool consistency in order to objectify and therefore standardise evaluation of the stool. The Bristol Stool Form Scale has excellent reliability and agreement when used to rate individual stool type by raters.

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However, it has been found that when putting clinical stool impressions into categories regarding the Rome III criteria, the BSFS decreased in agreement and liability, especially in the area of type 2 and type 3 as well as type 5 and type 6. In conclusion, the BSFS remains a useful tool for assessing the type and form of stool, but for clinical decision-making further test and evaluation is needed.

In the following, and overview on the *Bristol Stool Form Scale* (BSFS) is given:

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Hard lumps, separate</td>
</tr>
<tr>
<td>II</td>
<td>Lumps stuck together in the shape of a sausage</td>
</tr>
<tr>
<td>III</td>
<td>Dry sausage-form with cracks</td>
</tr>
<tr>
<td>IV</td>
<td>Smooth sausage, easy to pass</td>
</tr>
<tr>
<td>V</td>
<td>Separate blobs, passed easily</td>
</tr>
<tr>
<td>VI</td>
<td>Big fluffy mass, mushy consistency</td>
</tr>
<tr>
<td>VII</td>
<td>Entirely liquid stool</td>
</tr>
</tbody>
</table>

*Figure 1: Bristol Stool Form Scale (Graphic ©Mila Rathenböck)*

The *Bristol Stool Form Scale* (BSFS) is a chart used for the objective assessment of the consistency of stool and therefore allows to draw conclusions about the functioning of the digestive system.

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gastrointestinal peristalsis and the transit time of the stool. It has been shown that “[...] a stool form scale can be used to monitor change in intestinal function.”

8.2. Inspection

8.2.1. Inspection of the Abdomen

With a focus on functional constipation, inspection of the abdomen plays a minor role for diagnosis and is only recommended to confirm the exclusion of differential diagnoses such as surface structural lesions and/or injuries.

8.2.2. Inspection of the Anus

The left lateral (LL) position enables the examiner to provide the patient with the maximum comfort during the proctologic examination – a study from 2009 has shown that the majority of patients favoured the LL position, also known as the Sims’ position, over a knee-chest position or other positions during examination.

It is recommended to start the examination with the inspection of the anal, perianal, genital, inguinal, gluteal and presacral area. To exclude other differential diagnoses and/or to strengthen the suspicion of functional constipation, it is important to look out for structural marks such as scars, ulcers on the skin, prolapsed haemorrhoids, perianal vein thromboses, skin tags, rectal and/or vaginal prolapse, fistulas and anal fissures amongst others. “The anus and especially the perineum are to be inspected in relaxation, in pinching state (maximum tension of the pelvic floor muscles) and in straining state (maximum pressing-out of the anus).” During straining, other conditions like rectal prolapse, a rectocele or cystocele can be found. It is possible to inspect the patient’s anus when the patient is sat on a mirrored chair, for example when the diagnosis in LL position is not possible or not confirmed enough.

8.3. Auscultation

Auscultation of the abdomen to assess bowel sounds is a tool to distinguish other, especially severe, differential diagnoses. While in a constipated patient bowel sounds may appear reduced or muffled, it is important for the examiner to exclude structural illnesses like ileus or stenosis, also taking other factors like the medical history and the acuteness of the bowel impairment described by the patient into account. Auscultation to diagnose bowel obstruction has been

96 See ibid.
98 See ibid.
found to be an only moderately useful tool of examination. “Accuracy and inter-observer agreement was generally low. Clinical decisions in patients with possible bowel obstruction should not be based on auscultatory assessment of bowel sounds.”

8.4. Palpation and Digital Rectal Examination (DRE)

8.4.1. Palpation of the Abdomen

Palpation of the abdomen should generally be performed after auscultation in order to avoid manipulation of the bowel sounds through the mechanical stimulation. It is to be performed as a part of the basic abdominal examination to differentiate between differential diagnoses, such as structural lesions that result in resistances in the abdomen or (in)digestive masses that result from the accumulation of stool due to incomplete defecation.

8.4.2. Palpation of the Anus and Digital Rectal Examination (DRE)

Palpation with the index finger “assesses the perianal region, the anal canal, the rectum as well as the surrounding structures: The retroperitoneum, vaginal region, prostate, uterus, os coccygis, muscular parts of the pelvic floor and ligaments of the pelvis.”

It is important to look out for tumors, scars and other lesions and to test the strength of the sphincter muscle by rating the resistance to the finger during relaxation as well as during pinching of the sphincter muscle when asking the patient to do so.

8.5. Proctoscopy and Rectoscopy

8.5.1. Proctoscopy

Following the digital rectal examination, it is recommended to perform a proctoscopic examination on the patient using a proctoscope to evaluate the anatomical structures of the proximal and distal rectum (proctum). Using various proctoscopes of different lengths and viewpoint angles, important features like the anoderm, the dentate line (linea dentata), the transitional zone and the distal mucosa of the anal canal and approximately 5cm of the distal rectum can be assessed by the practitioner.

Functional proctoscopy describes the observation of pelvic floor function during the insertion of a proctoscope when asking the patient to alternately relax and pinch the sphincter muscle. Through this, for example a functional inner mucosal prolapse can be simulated.


8.5.2. Rectoscopy

Rectoscopy is the endoscopic examination of the rectum up to a depth of 20-25cm, using rectoscopes of variable length and diameter. After spontaneous, enema- or laxative-triggered evacuation of the rectum and slight insufflation of the lumen using air, structural mucosal lesions like inflamed tissue, tumors and polyps and cancerous tissue can be evaluated properly.\textsuperscript{103}

8.6. Anorectal Manometry

Anorectal manometry is a tool to measure the pressure proportions in the anal canal in order to assess the function of the inner and the outer sphincter muscle, which is especially important during the evaluation of the patient’s ability to contain stool and/or defecate willingly.\textsuperscript{104} The resting pressure correlates with the function of the inner sphincter muscle, the squeezing pressure corresponds to the function of the outer sphincter muscle.\textsuperscript{105} The procedure of anorectal manometry shows most benefit in the diagnostic process of chronic constipation, chronic stool incontinence and chronic pain.\textsuperscript{106}

It is recommended to perform a proctologic and/or endoscopic examination prior to the procedure in order to definitely exclude structural lesions like carcinoma or chronic inflammatory bowel disease.\textsuperscript{107} “The patient should be examined in the most physiological natural state, hence evacuation of the rectum before the examination is not advised. For a free rectal ampulla (Ampulla recti) it is often necessary to apply an enema 1-2 hours before examination.”\textsuperscript{108} After testing the pudendal reflex using a cotton swab and conducting the electromyographical measurement of the activity of the sphincter muscles, a balloon catheter is inserted into the lumen. The pressure in resting position and the pressure during pinching are measured, where the pinching pressure in healthy patients lies at an increase of $\geq 50\%$ in under 30 seconds. The pressure values depend on age and biological gender.\textsuperscript{109}

The examination of the rectoanal inhibitory reflex (RAIR) is an obligatory step in anorectal manometry, as a lack of RAIR is typical for differential diagnoses like Hirschsprung’s disease.\textsuperscript{110} This is conducted by rapidly inflating the inserted balloon to 10-50mL volume, which

\begin{itemize}
\item \textsuperscript{105} See ibid.
\item \textsuperscript{109} See ibid.
\end{itemize}
physiologically results in an increase of rectal pressure, followed by a decrease in pressure in the internal anal sphincter and an increase in pressure, thus a contraction, in the external anal sphincter. Alongside its benefits in the process of diagnosing Hirschsprung’s disease, the evaluation of RAIR can also be used to test rectal function of a patient showing little compliance during examination.

“The pressing is expected to result in relaxation of the anal canal in asymptomatic patients, however it can lead to falsely pathological findings due to the unphysiological measuring, the LL position and especially in patients with inhibitions.” Measuring the pressing pressure can give information about the state of dyssynergic defecation, mainly present in one of the three main types:

The three main types of dyssynergic defecation

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>Paradox increase of intraanal pressure values with adequate expulsion forces and an increase in intrarectal pressure</td>
</tr>
<tr>
<td>Type II</td>
<td>No attainment of adequate expulsion forces, no adequate intrarectal pressure increase – simultaneously paradox increase in intraanal pressure as seen in Type I</td>
</tr>
<tr>
<td>Type III</td>
<td>Sufficient increase in intrarectal pressure, however relaxation in the anal sphincter is inadequate (&lt; 20%) or absent</td>
</tr>
</tbody>
</table>

Pathological findings are to be supported by other measures of detection.

8.7. Balloon Expulsion Test

Closely associated with anorectal manometry, the balloon expulsion test (BET) is an examination tool of “high sensitivity and specificity for the discovery of dyssynergic defecation”. With the patient lying in left lateral position, an empty 4 cm long balloon covered with lubricating jelly and tied to a flexible catheter (external diameter, 6 mm) is placed in the

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112 See ibid.

113 See ibid.


rectum.” After filling the balloon with 50mL of air, the patient is asked to push the balloon out – in the case of not being able to expel the balloon within the first minute, the BET is documented as abnormal. An individual amount of air – the volume needed to produce constant desire of evacuation (vBET) is then filled into the balloon and the examination is repeated.

Measuring of sensory is an obligatory step in the procedure of anal manometry and is to be performed using the function of rectal balloon distension and measuring the threshold of perception and the subjective feeling of defecation urge during constant distension of the balloon, only judging the first ten seconds of urge to avoid artefacts through the adaption of the rectum. It has been shown that polyethylenic barostat bags correlate with better compliance regarding the measured values than latex balloons. The BET has been approved as a helpful tool in primary care setting due to its easy handling and quick availability.

8.8. Endoanal Ultrasound

In order to diagnose functional disorders like constipation or stool incontinence, endoanal ultrasound provides the examiner with a quick, easy-to-handle way of assessing the patient’s pelvic floor and sphincter muscle function. In a normal endoanal ultrasound exam, the inner sphincter muscle appears hypoechoic with a thickness of 1.5-4mm while the outer sphincter muscle is hyperechoic. With age it is likely for the inner sphincter muscle to gain echogenicity and width, so it is important to take the age of the patient into account while also considering the differences in diameter between the used endoanal probes. The outer sphincter muscle can be divided into three parts – the deep, superficial and subcutaneous part (Partes profunda, superficialis et subcutanea), which can sometimes be distinguished in the ultrasound. It is important to keep in mind the gender differences in the anatomy of the anal canal, with biological men having a 0.5-1.0cm longer anal canal than biological women. Also, in women the structures fade into each other and are not as easily kept apart than in men. The end of the anal canal is marked by the U-turn of the puborectalis muscle.

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118 See ibid.
119 See ibid.
121 See ibid.
124 See ibid.
125 See ibid.
When suspecting chronic functional constipation, it is important to assess the inner sphincter muscle, as a thickening of the muscle tissue would support the presumed pathology. In stool incontinence for example, it is important to evaluate the integrity of both sphincter muscles to exclude structural defects that would cause the symptoms. "The clinical interpretation of potential sphincter defects requires sufficient experience, as not every sphincter defect is to be treated surgically. If there is no morphological defect to be found, operation is contraindicated. Patients will rather benefit from stool modification, sufficient pelvic floor- and biofeedback training and possibly sacral nerve stimulation (SNS), in case the previously named therapy options are not successful."

8.9. Colon Transit Time

"In functional disorders of the colon transit time and in chronic constipation, measuring of the colon transit time can be a helpful tool." The patient is asked to consistently swallow one capsule containing 24 radiopaque markers (pellets) per day for six days. On the seventh day, an X-ray will be run and the visible pellets will be counted. One pellet counts for one hour. Segmental colon transit time will be calculated through dividing the abdominal X-ray picture into three sectors. This will give an insight into the colon transit time through the ascending colon, the descending colon, the rectosigmoid and ultimately the sum of the three sectors – the total colon transit time.

In the following table, normal physiological colon transit time and upper and lower limits will be summarised:

<table>
<thead>
<tr>
<th>Location</th>
<th>Number of pellets (= transit hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right colon</td>
<td>11 ± 2</td>
</tr>
<tr>
<td>Left colon</td>
<td>12 ± 2</td>
</tr>
<tr>
<td>Rectosigmoid</td>
<td>14 ± 2</td>
</tr>
<tr>
<td>Total colon transit time – upper limit</td>
<td>65-72</td>
</tr>
<tr>
<td>Total colon transit time – lower limit</td>
<td>12-24</td>
</tr>
</tbody>
</table>

Table 12: Normal physiological colon transit time in pellets (or transit hours)

In slow transit constipation, colon transit time will be pathological. If slow transit constipation is a part of a more global transit disorder like Gastrointestinal Dysmotility (GID), other functional
abnormalities are likely to be found, for example in oesophageal manometry. Normal transit time in chronically constipated patients is often found in patients with irritable bowel syndrome (IBS).

8.10. Defecography

8.10.1. Conventional Defecography

Defecography is used to visualise the dynamics of defecation and evacuation of the rectum in order to support diagnoses like rectocele, intussusception, rectal prolapse, enterocoele and anismus. Through the application of 250ml barium sulfate suspension and a following x-ray in lateral view, it is possible to view the dynamics of the anorectal angle and the pelvic floor in resting position, during contraction and defecation.

Through measuring the anorectal angle in resting position (normal angle 70°-130°) and during the defecation process (normal angle 80°-155°), information about the presence of potential functional and/or structural/morphological disorders can be gathered.

8.10.2. MRI-Defecography (Gold Standard)

Avoiding exposure to radioactivity, MRI-supported (magnet resonance tomography-supported) defecography offers a gentle way to assess a patient’s defecation process by naturally depicting soft tissue structures better than radioactive imaging devices like a standard X-ray. Depending on the institution, either the bladder, vagina and rectum or the rectum only are highlighted with contrast material.

During the scan, patients are asked to alternatingly relax and contract their pelvic floor. In order to receive sufficient information through the imaging process, it is important to increase compliance by adequately explaining the indication and procedure of the MRI to the patient beforehand. For evaluation of the range of motion of the organs of the pelvic floor – as with conventional defecography – the pubococcygeal line is measured as a reference line. The MRI picture of the pelvis is then split into three compartments – the front, middle and back compartment for further analysis. The disadvantage of the MRI defecography lies in the non-physiological horizontal position of the patient, which is why in some institutions open 0.5 Tesla devices which allow examination in a sitting position are favoured over 1.5-3 Tesla devices.


134 See ibid.

135 See ibid.


137 See ibid.
The method of MRI-defecography is still discussed in its efficacy, however in clinically uncertain cases it has proven to be a helpful tool of diagnosing functional defecation disorders.\(^{138}\)

### 8.11. Electromyography

Electromyography (EMG) of the external anal sphincter offers a way of measuring the activity and potential contraction of the sphincter muscles in order to evaluate the motor unit potential (MUP) and the interference patterns.\(^{139}\) It is used for the detection of absence or change due to re- or denervation and misfunction of the muscle groups in the anal canal as for example seen in anismus.\(^{140}\) EMG of the outer anal sphincter muscle can either be performed via a more invasive needle electromyography or through applying surface electrodes to the perineal skin.\(^{141}\) It has been shown that the latter technique yields commensurable results in comparison to the needle EMG, and is preferred in cases of inconsistent reaction of the anal sphincter.\(^{142}\)

### 8.12. Colonic Manometry

Colonic manometry is a tool of examination rarely used in adult patients and more common in children. The main focus of this diagnostic step is to evaluate the colonic high-amplitude propagating contractions (HAPC) in normal non-food-related circumstances, in postprandial state and after the application of bisacodyl in the proximal colon.\(^{143}\) Bisacodyl is a stimulant laxative that “[…] acts locally in the large bowel by directly enhancing the motility, reducing transit time, and increasing the water content of the stool.”\(^{144}\) Testing the presence and efficacy of HAPC using bisacodyl, it is important to consider the time needed for the laxative to show its full pharmacological potential, which may take between ten to 40 minutes.\(^{145}\) Regarding clinical significance, some patients suffering from slow transit constipation (STC) have been documented to show fewer HAPC than the control group.\(^{146}\) With the ability to propel colonic content, HAPC seems to be important during the phase of preparation for defecation,


\(^{140}\) See ibid.


\(^{142}\) See ibid.


however there has not been found a direct causal connection to the process of defecation itself.\textsuperscript{147}

Despite its limited availability in clinical care centres and its unusual employment in the diagnostics in adults, colonic manometry offers a modern opportunity for understanding the (patho-)physiology in chronically constipated patients and can be useful in pursuing differential diagnoses regarding defecation disorders or inertia coli.\textsuperscript{148}

\textbf{8.13. Small Bowel Manometry/Gastrojejunal Manometry}

“Small bowel manometry can identify patterns suggestive of myopathy, neuropathy or obstruction,”\textsuperscript{149} It is important to test the motility of all gastrointestinal segments, in order to locate the disorder if possible. While multilumen recording probes, inserted into the lumen of the small intestine and adapted to the diameter of the intestinal section, used to be the standard tool for manometric examination, today’s state-of-the-art are solid-state catheters that are run without perfusion.\textsuperscript{150}

By analysing the migrating motor complex (MMC) – a pattern consisting of three measurable phases of contraction in the upper gastrointestinal tract, beginning in the distal oesophagus reaching until the terminal ileum – it can be determined whether it is possible to appropriately move bowel content forward, depending on fasting- or fed-state.\textsuperscript{151}

Small bowel manometry enables the examiner to narrow down potential differential diagnoses regarding intestinal neuropathy and myopathy. However, in many cases it is not possible to fully differentiate between pathological findings solely based on the manometric measures and their potentially abnormal findings.\textsuperscript{152} It is recommended to first examine the potential presence of organic and/or metabolic disorders in a patient before performing small intestinal manometry, as its invasiveness is an important factor to consider, keeping the individual patient’s state in mind. Occasional technical difficulties make it advisable to prolong the examination to a 24-hour observation of the gastrointestinal motility.\textsuperscript{153}

\textbf{8.14. Histological and Immunohistochemical Analysis in Slow Transit Constipation}

Slow transit constipation is a functional disorder with its pathophysiology unknown as of today, however certain abnormalities regarding visceral neuropathy – more specifically abnormalities in


\textsuperscript{148} See ibid.

\textsuperscript{149} Hansen MB. Small intestinal manometry. Physiol Res. 2002;51(6):541-56. PMID: 12613464.


\textsuperscript{151} See ibid.

\textsuperscript{152} See ibid.

\textsuperscript{153} See ibid.
the enteric nervous system and the parasympathetic nervous system – have been found in patients with idiopathic constipation. Altered neurotransmitters, loss of argyrophilic neurons and neurofilament, hypoganglionosis in the myenteric plexus and a quantitative reduction of Cajal cells have been described in histological reports.

Biopsies of the mucosa and the muscular layer give information about the (patho-)physiological state of the structures responsible for adequate bowel motion and provide a reliable tool for the exclusion of differential diagnoses like Hirschsprung’s disease and intestinal neurodysplasia amongst others. Immunohistochemical analysis offers further examination of patients with suspected slow transit constipation in a more detailed manner.

8.15. Pudendal Nerve Conduction

The paired pudendal nerve (N. pudendus, S2-S4) can be seen as a part of the sacral plexus (Plexus sacralis) and plays a major role in the control of somatic muscles during penile and clitoral erection as well as the innervation of the external anal and external urethral sphincter muscles, therefore its unimpaired function is crucial for the integrity of fecal and urinary continence as well as adequate sexual function.

Pudendal nerve conduction describes the measuring of the morphological status of the pudendal nerve by calculating the nerve’s ability to conduct nerval stimuli. This tool can detect lesions like “peripheral damage by overstretching of the nerve which is an important step of prognosis in the pre-operative management of anal reconstruction surgery”. Due to the financially expensive and time-consuming procedure, it is often difficult to include pudendal nerve conduction into the daily routine of proctologic assessment. Compared to other methods of testing the physiological function of the sphincter muscles (endoanal sonography with a median of 73% for the detection of sphincter defects, anal manometry with a median of 88% for a general pathological finding and digital rectal examination during relaxation and pinching state with a median of 74-78% sensitivity), with a median of only 59% this method of examination proves to be significantly lower in diagnostic validity.


156 See ibid.


160 See ibid.
8.16. Blood Testing

Given the functional feature of chronic functional constipation, blood testing is not expected to give any diagnostic value and is therefore only recommended for the exclusion of morphological and/or metabolic differential diagnoses.\textsuperscript{161}

9. REVIEW OF DIAGNOSTIC GUIDELINES

Guidelines ensure high-standard care and patient management in the environment of in- and outpatient care. “The purpose of guidelines is to improve the quality of care for patients and improve clinical effectiveness by implementation of evidence-based care in daily practice.”\(^{162}\) It is important to consider the quality of guidelines as well as their impact on results and follow-up situations for the patient.\(^{163}\)

In the following, published guidelines\(^{164}\) regarding the functionality and efficacy of diagnostic steps of functional bowel passage disorders like chronic functional constipation and obstructed defecation (syndrome) are put into clinical perspective and described in a detailed manner:

9.1. Consensus statement AIGO/SICCR diagnosis and treatment of chronic constipation and obstructed defecation (part I: diagnosis)\(^{165}\)

Published in April 2012, the consensus statement by the Italian Association of Hospital Gastroenterologists (AIGO) and the Italian Society of Colo-Rectal Surgery (SICCR) was created to ensure multidisciplinary maximum patient benefit in the diagnosis and treatment of functional constipation, specifically slow transit constipation (STC) and obstructed defecation syndrome (ODS).\(^{166}\)

9.1.1. Pre-Instrumental Diagnostic Steps and Their Reasoning

As mentioned in chapter 8, anamnesis is an important part of professional examination of patients living with the consequences of chronic constipation.\(^{167}\) “A thorough medical history should always be taken in patients with chronic constipation.”\(^{168}\) This is beneficial not only for exact evaluation of the experienced symptoms, but also for the exclusion of red flags such as weight loss, bloody stools, anaemia and positive family history for colonic cancer, lifestyle factors, drug and medication abuse, psychiatric and neurological conditions and post-surgical

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\(^{163}\) See ibid.


\(^{165}\) See ibid.

\(^{166}\) See ibid.


It is not possible to differentiate between the multiple types of chronic constipation just by talking to the patient, neither are there pathognomonic symptoms known just in functional constipation. Analysing the quantity of occurrence of symptoms (see chapter 7) is a crucial part of diagnosing chronic constipation in patients.

Furthermore, it is agreed and recommended that physical examination is an obligatory step in the diagnostic pathway of chronic functional constipation. This includes inspection of the anorectal area and rectum to detect any anal disease, prolapse and/or descension. A digital rectal examination should always be included, whereas blood testing does not provide any useful information in the diagnostics of functional chronic constipation and is only recommended in the differential diagnosis of secondary (morphological) causes of chronic constipation.

“Functional chronic constipation is defined as a primitive condition and is not accompanied by any organic or biochemical alterations, being associated instead with a ‘functional’ pathology of visceral motility.” Regarding diagnostic steps like colonoscopy, barium enema or computerised tomographic colonography, there is no evidence supporting their significance for the diagnosis of chronic functional constipation – they should however always be conducted in patients showing red flags, patients >50 years or patients with a positive family history of colon cancer.

9.1.2. Scoring Systems

Scores provide the opportunity to give an objective overview over an individual’s situation and symptoms. “These systems are particularly important in a subjective, functional disease, such as constipation, to evaluate the results of therapy.” According to the consensus statement, an early scoring system called the Chronic Idiopathic Constipation Index (CICI) has been published.


170 See ibid.


172 See ibid.


174 See ibid.

The statement describes the **Cleveland Clinic Florida Obstructed Defecation Score** as the most used tool of scoring constipation in patients. Further description of the **Cleveland Clinic Florida Obstructed Defecation Score** is given in chapter 8. Later in 2002, a Symptom Scoring System for Constipation has been released but has remained barely used, until the Constipation Severity Instrument (CSI) has been developed to distinguish between constipation variants. In 2008 the **Obstructed Defecation (ODS) Score (Altomare et al.)** was published and sufficiently validated.

Scores not mentioned in this consensus statement but mentioned in this thesis in chapter 8 include the following:

- The **Knowles-Eccersley-Scott Symptom Score (KESS)** which has been created for further differentiation of the subtypes in pathophysiology in constipated patients and which has been validated in 2000.
- The **Chinese Constipation Questionnaire (CCQ)** validated in 2005 and recommended for usage in studies regarding the epidemiology in frequency and severity of constipation as well as interventional studies.
- The **Longo’s ODS Score System** which has been presented in 2006 but is not as scientifically evaluated as Altomare’s ODS Score (see above).
- The **Modified ODS Longo Score (MODS)** which is based on Longo’s ODS Score System.

Further description of the scores not mentioned in this consensus statement can be found in chapter 8.

The consensus statement from 2012 describes the Constipation Severity Instrument (CSI) and the ODS Score (Altomare et al.) as the scores with the most reliability.
9.1.3. Additional Scores

The consensus statement describes two Quality of Life scores as suitable for patients suffering from chronic constipation and/or obstructed defecation: The Patient Assessment of Constipation Quality of Life, published in 2005, and the Constipation-Related Quality of Life (CRQOL), validated and published in 2009. The latter Quality of Life score has been appraised as the preferred tool for evaluation by the consensus committee.

9.1.4. Imaging Diagnostic Steps and Their Reasoning

The consensus statement from 2012 describes the only available imaging techniques for the diagnostics of chronic functional constipation to be colonic transit time (TT) studies, X-ray videoproctography and colpo-cysto-entero-defecography, magnet resonance tomography defecography and sonography of the pelvic floor. It is possible to make a difference between total and segmental colonic transit disorder and outlet obstruction/obstructed defecation in patients using the analysis of the radiopaque markers in colonic transit time examinations. However, due to differences considering the standard practice of this procedure, it is difficult to put the results between centres into relation.

Defecography is to be preferred over colpo-cysto-entero-defecography in patients showing the possibility of conditions like puborectalis dysfunction, rectocele and intussusception amongst others, unless more than one anatomical compartment seems to be affected. In the latter case, colpo-cysto-entero-defecography is recommended in the consensus statement.

The use of contrast radiography has not been recommended as the leading tool of evaluation in terms of deciding for or against (surgical) treatment of chronic constipation. MRI defecography is a favoured alternative for patients who especially benefit from an examination without exposure to radioactivity, namely young patients, female patients during reproductive age, pregnant patients and patients not suitable for contrast medium examinations.

When comparing conventional (X-ray) defecography results with the results of MRI defecography, the difference is not significant with tendency to slightly better results provided by MRI defecography despite the unnatural horizontal position during the examination.

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185 See ibid.

186 See ibid.

187 See ibid.

sonography examination, especially ultrasound of the perineum, vaginal introitus, anal canal and vagina, it has been agreed on the benefits for the evaluation of evacuation disorders of the mentioned anatomical areas, however in regards to rectal evacuation it has not been found useful in the analysis of pelvic floor abnormalities.

Endovaginal sonography is a tool for the general assessment of the pelvic floor structures due to their neighbouring location, while 2D endoanal sonography has not been recommended as a reliable step in diagnostics due to the unnatural object in the anal canal affecting the outcome of the examination. In comparison to the 2D ultrasound, 3D endoanal sonography has gained value in the process of excluding structural differential diagnoses and has therefore increased its importance in the diagnostic pathway of chronic (functional) constipation.\(^{189}\)

It has been agreed in the consensus statement of 2012 that the measuring of colonic transit time (TT) is the preferred way of diagnosing constipation and ODS, followed by X-ray defecography. MRI defecography and sonographic examination is to be seen as a convenient addition to the other imaging tools, provided that adequately trained practitioners are present.\(^{190}\)

9.1.5. Instrumental Diagnostic Steps and Their Reasoning

The diagnostic methods discussed by the consensus statement of 2012 are: Anorectal manometry, balloon expulsion test, electromyography, colonic manometry, pathological examination of the colon using histological investigation, and gastrojejunal manometry.

Anorectal manometry offers great reproducibility but the quality of the examination relies on the practitioner’s experience. With multiple catheters being available at different cost use ratio (solid-state microtransducers, perfusion catheters and vector volume manometry), anorectal manometry provides a multitool step of evaluation of pelvic floor function considering the different norm parameters depending on biological gender and age.\(^{191}\)

“The main indication for anorectal manometry is obstructed defecation”\(^{192}\), hence why anorectal manometry is recommended to always be used in patients showing chronic constipation and/or obstructed defecation as well as patients not responding to first-line treatments for chronic constipation.\(^{193}\) Anorectal manometry provides information about the (patho-)physiology of the anal canal structures and defecation dynamics, however according to the consensus statement from 2012 there is no gold standard as of yet for the diagnosis of obstructed defecation, thus the

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\(^{190}\) See ibid.

\(^{191}\) See ibid.


\(^{193}\) See ibid.
diagnosis requires further instrumental tests including defecography alongside other imaging
techniques, a balloon expulsion test and electromyography.\textsuperscript{194}

The physiological parameters, their correlating structures and their interpretations that need to
be gathered during anorectal manometry are described in the following table, based on the
version included in the consensus statement of 2012:

\textbf{Interpretation of data from anorectal manometry}

<table>
<thead>
<tr>
<th>Test/Function</th>
<th>Parameter</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resting pressure</td>
<td>Internal anal sphincter (IAS) - 70% of resting pressure, external anal sphincter (EAS) - 30% of resting pressure</td>
<td>Increased pressure as an indicator of hypertonic sphincter (IAS and/or EAS), oral nitroglycerin can identify the sphincter involved as it relaxes the IAS but not the EAS</td>
</tr>
<tr>
<td>Squeeze pressure</td>
<td>EAS</td>
<td>The fatigue rate index can be calculated based on the pressure and duration of the contraction (however the usefulness in constipated/incontinent patients is not validated)</td>
</tr>
<tr>
<td>Rectoanal inhibitory reflex</td>
<td>IAS relaxation during inflation</td>
<td>Absent: Possible Hirschsprung’s disease If present with elevated volume inflation: Megarectum</td>
</tr>
<tr>
<td>Rectal sensitivity</td>
<td>Rectal sensory function at different volumes</td>
<td>Elevated sensory tresholds may be linked to changes in rectal biomechanics (megarectum) or afferent pathway dysfunction</td>
</tr>
<tr>
<td>Rectal compliance</td>
<td>Mechanical rectal function</td>
<td>Increased compliance: Megarectum</td>
</tr>
<tr>
<td>Attempted defecation</td>
<td>Synchronisation between the increase in rectal pressure and the decrease in anal pressure during the attempt of defecation</td>
<td>Three types of defecation (see chapter 8.6.) may be detected</td>
</tr>
</tbody>
</table>

Table 13: “Interpretation of data from anorectal manometry”\textsuperscript{195}

The fatigue rate index mentioned in the table above serves as a parameter of testing the
external anal sphincters response to muscular fatigue. “Fatigue rate index is a simple measure


of external sphincter integrity, which may be used in assessment of sphincter function and future treatment protocols.\textsuperscript{196}

Obstructed defecation is characterised by absent or insufficient relaxation of the anal sphincter muscle, possibly combined with paradoxical muscle contraction during straining, known as dyssynergia in defecation.\textsuperscript{197} The ratio of maximal pressure in the rectum to minimal residual pressure in the anus – the ‘defecation index’ – can be used for quantification of the physiology between the rectum and the anal canal during the attempt of defecation.\textsuperscript{198}

The balloon expulsion test is an inexpensive, simple way of testing the function to expel and therefore defecate. It can support a suspected diagnosis of dyssynergia, however it should not be used as the gold standard of detecting defecation dyssynergia and should for that reason only be combined with additional testing of the anorectal function.\textsuperscript{199}

While colonic transit time is mainly known as the leading step of examination regarding the diagnostic pathway of slow transit constipation (STC), colonic manometry offers an alternative in terms of helping in the decision of therapy, namely deciding between conservative and surgical treatment.\textsuperscript{200} Colonic manometry is best conducted via the bisacodyl test.\textsuperscript{201} “This procedure tests the stimulation of residual colonic propulsive activity, and it can be used to identify the subgroup of patients with severe slow transit constipation or ‘inertia coli’, one incontrovertible indication for total colectomy.”\textsuperscript{202}

It is mentioned by the consensus committee that changes in histological neurological structures in the enteric nervous system and/or the parasympathetic nervous system can be found in biopsies of patients with suspected slow transit constipation or idiopathic constipation.\textsuperscript{203} A decrease in the number of Cajal cells has been described.\textsuperscript{204} Regarding the type of biopsy necessary for adequate histological analysis of slow transit constipation, mucosal biopsies are


\textsuperscript{198} See ibid.

\textsuperscript{199} See ibid.


\textsuperscript{201} See ibid.


\textsuperscript{203} See ibid.

\textsuperscript{204} See ibid.
not sufficient for information about the pathogenesis of slow transit constipation – muscle layer biopsies are required. In order to respect differential diagnoses like intestinal neurodysplasia, amyloidosis, Hirschsprung’s disease and others, it is necessary to take four suction biopsies between 2cm and 10cm from the dentate line (Linea dentata). Concerning immunohistochemical examinations, the consensus statement of 2012 recommends this type of examination in patients with suspected slow transit constipation.

Gastrojejunral manometry is advised to be conducted before surgery in patients with slow transit constipation, as small bowel motility is often pathologically altered during postprandial and/or fasting periods due to changes in the enteric nervous system, the myenteric plexus and most of all, the interstitial cells of Cajal.

9.1.6. Conclusion of the Consensus Statement

Thorough anamnesis, clinical scoring systems and scores to evaluate the patient’s quality of life enable the examiner to build a solid basis of medical history in order to coordinate further diagnostic steps regarding the differentiation between structural or functional disorder.

Imaging tools like the measuring of colonic transit time (TT), X-ray videoproctography, colpo-cysto-entero-defecography, magnetic resonance tomographic defecography and sonography of the pelvic floor are possible steps of diagnostic for further evaluation of the anatomical structures and the dynamics of bowel motion and defecation, taking into consideration the individual patient features like biological gender, age, state of pregnancy amongst others. Colonic transit time (TT) studies are one of the most important steps in the diagnostics of chronic functional constipation.

Instrumental tools that are available during a clinical exam or after biopsies of the mucosa and muscular layer of the intestines are anorectal manometry, balloon expulsion test, electromyography, colonic manometry and small intestinal manometry. Anorectal manometry is always recommended in patients showing chronic constipation, the balloon expulsion test offers an inexpensive way of assessing the dynamics of (un-)willing defecation. Manometry measurements of the bowels are more invasive ways of examining the motion dynamics. Biopsy results may add to the suspected diagnosis of slow transit constipation, although as of today, little is known about possible histopathological correlations between the pathology and the found histological abnormalities. Immunohistochemical testing is recommended.


See ibid.

10. DIFFERENTIAL DIAGNOSES TO STC

There is a wide range of differential diagnoses around chronic constipation, reaching from structural causes to constipation due to comorbidities or medication. When focusing on chronic functional constipation however, two main differential diagnoses to slow transit constipation are to be taken into consideration: Gastrointestinal dysmotility (GID) and pelvic floor dysfunction (PFD) or obstructed defecation syndrome (ODS)\(^{209}\).

Slow transit constipation (STC, also known as chronic idiopathic constipation CIC) affects the colon and manifests as a disorders of colonic transit time. Gastrointestinal dysmotility (GID) describes the case where more than the colon, sometimes the whole gastrointestinal system is showing inadequate transit. The most common and also most diverse pathologies in the spectrum of functional bowel passage disorders are disorders of the pelvic floor – pelvic floor dysfunction (PFD) or obstructed defecation syndrome (ODS)\(^{210}\), however they “represent a collective term for several clinical pictures”\(^{211}\).

Differentiating between these forms of chronic functional constipation requires a detailed step-by-step pathway of diagnostics that includes proper anamnesis, clinical examination, instrumental testing and imaging to exclude morphological causes to the symptoms. The following table summarises symptoms that could indicate the different chronic functional constipation disorders, however these symptoms are not specific for these pathologies:

<table>
<thead>
<tr>
<th>Type of chronic functional constipation</th>
<th>Symptoms (not specific)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic-Idiopathic Constipation (CIC), Slow Transit Constipation (STC)</td>
<td>Frequency of &lt;3 defecations per week, absent urge to defecate</td>
</tr>
<tr>
<td>Irritable Bowel Syndrome (IBS-C)</td>
<td>Abdominal pain, meteorism, relief of symptoms through defecation</td>
</tr>
<tr>
<td>Pelvic Floor Dysfunction (PFD) or Obstructed Defecation Syndrome (ODS)</td>
<td>Strain during defecation, insufficient emptying of stool or enemas, digitation for evacuation, difficult defecation even when stool is soft, no adequate relaxation during squeezing in digital-rectal examination (DRE)</td>
</tr>
</tbody>
</table>

Table 14: “Overview on selected chronic functional constipation disorders and symptoms”\(^{212}\)


\(^{210}\) See ibid.


The following table describes a division of the chronic functional bowel disorders in combination with or without common side findings, what tests and examinations would show and a short note on frequency and patient features.

**Clinical categorisation of chronic functional constipation**

<table>
<thead>
<tr>
<th>Type of chronic functional constipation</th>
<th>Test/Finding</th>
<th>Note</th>
</tr>
</thead>
</table>
| CIC or STC with/without megacolon/megarectum | • Pathological colon transit time  
• Potentially diagnosed through empty abdomen X-ray or through endoscopy | • rare  
• Megacolon/megarectum often in patients with intellectual disability |
| CIC or STC as a part of GID | Patients show further functional disorders (in e.g. oesophageal manometry) alongside colonic transit abnormalities | very rare |
| PFD/ODS with anatomic variations | MRI-defecography provides the best method of diagnostics (e.g. Hirschsprung’s disease, descensus of the pelvis floor compartments, rectocele, sigmoidocele, intussusception, rectal procapse, …) | Frequent; Almost always start with conservative treatment first |
| PFD/ODS without anatomic variations | Clinical diagnosis is best; MRI-defecography only for confirmation of diagnosis (e.g. anismus, paradox contraction of the puborectalis muscle, levator spasm, rectal pain of unknown genesis) | Often “stressed” patients (frequent suppression of the urge to defecate), not a surgical patient |
| Combined CIC and PFD/ODS disorder | Pathological transit time, pathological defecography | Never pursue primary surgical treatment |
| Constipation with normal transit | - | Usually in IBS |

Table 15: “Categorisation of chronic functional constipation”

Through taking into consideration the different aspects of chronic functional disorders to confirm or disprove STC, as well as conducting thorough anamnesis and performing adequate examinations on the patient, diagnosis of STC should be possible.

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11. AN OVERVIEW ON THERAPY OPTIONS AND COMPLICATIONS

With the focus of this thesis being on the diagnostic steps and evaluation and exact diagnosis of chronic functional constipation, only short notice will be given to the available therapy options and complications for the treatment of patients with (functional) chronic constipation. For greater detail, other literature and theses are to be consulted.

11.1. Overview

Before starting any form of treatment for chronic constipation, the potential presence of warning signs and/or symptoms that indicate the need for more urgent or more detailed care has to be evaluated. Examples for possible warning signs are: Bleeding, unexplained weight loss of >10%, anaemia, malnutrition, or any abnormalities during the anamnesis (recent onset) or the clinical examination (palpable lesions).214

There are multiple treatment options that can roughly be divided into a group of conservative, non-interventional and non-surgical methods and a group of interventional/surgical methods. In the following subchapters, a short overview of the available possibilities is provided.

11.2. Conservative Treatment

11.2.1. General Measures/Lifestyle

Physical activity and an increased amount of water intake (minimum 1.5 – 2 litre/d) as well as patient education about the physiological habits of the gastrointestinal tract throughout the day is recommended. Patients are encouraged to make use of the gastrocolic reflex in the morning and train their bowel to naturally defecate. Glycerol or Lecicarbon suppositories are supportive measures. Nutrition consultation regarding the intake of fibre is advised.215 Biofeedback training/training of the pelvic floor offers an easily available, patient-centered approach to reduce the symptoms of chronic functional constipation.216

11.2.2. Medication

Laxatives provide a conservative option for the relief of chronic constipation symptoms.217 The decision between plant-based laxatives (e.g. linseed) and/or synthetic substances (e.g. lactulosis, macrogols) is to be made individually. Newer medications use hormonal pathways.


215 See ibid.

216 See ibid.

217 See ibid.
(e.g. prucalopride), electrolyte pathways (e.g. lubiprostone) or molecular pathways (e.g. linaclotide) to stimulate peristalsis, soften stool and therefore ease defecation.\textsuperscript{218}

### 11.3. Interventional/Surgical Treatment

Focusing on the surgical treatment of chronic idiopathic constipation (CIC)/slow transit constipation (STC), multiple ways of procedure are to be considered, including the following:

**Surgical treatment options for CIC/STC**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malone Antegrad Colonic Enema (MACE)</td>
<td>Irrigation of the colon through a stoma from the appendix or – in case of st. p. appendectomy – via colon conduit</td>
</tr>
<tr>
<td>Sacral Nerve Stimulation (SNS)</td>
<td>Reversible two-stage procedure for stimulating the sacral nerves through the sacral foramina (foramina sacralia) of the sacrum (os sacrum), best response is to be expected at S3</td>
</tr>
<tr>
<td>Colon Segmental Resection</td>
<td>Open surgery or laparoscopically, resection of the segment not working adequately; 75% success rate</td>
</tr>
<tr>
<td>(Sub-)total Colectomy</td>
<td>Open surgery or laparoscopically, resection of the whole colon; 90% success rate</td>
</tr>
</tbody>
</table>

Table 16: Surgical treatment options for CIC/STC\textsuperscript{219}

For a combined disorder of CIC and PFD/ODS, two-stage procedural sacral nerve stimulation or sacral nerve modulation are to be considered possible surgical treatment options. These interventions can be used to test out nerve function and treatment response before a final resection.\textsuperscript{220}

#### 11.3.1. Indication

“The most important [feature] in functional operations is the correct indication.”\textsuperscript{221} It is of highest relevance that before surgical treatment conservative measures have been tried out and proven to not be successful, as surgery in patients suffering from chronic functional constipation should be seen as a non-routine, exceptional pathway of medical care.


The decision pro surgery requires sufficient pre-operative diagnostics including anamnesis, clinical examination, measuring of the colon transit time before and after conservative treatment, imaging and informing of the patient about the benefits and disadvantages of functional surgery.  

11.3.2. Post-operative Care and Complications

During operation, the risk of complication – depending on the procedure – like insufficiency of the anastomosis, injury of the ureter or peritonitis/other infections, is immanent. During proctologic operations, bleeding has shown to be the most relevant complication. Injection of local anaesthetics (e.g. 1% xyclocaine-epinephrine) may reduce the risk of bleeding and can be used for better preparation of the anal structures.

Post-operatively, short-term complications include bleeding and stool irregularities as well as sexual function disorders, with the latter two sometimes taking several months to re-normalise.

11.3.3. Long-term Outcome

Depending on the type of procedure, different complications reaching from stoma issues in MACE patients, infections or psychological disorders are to be considered and monitored. "The most common long-term complications are adhesions, which lead to 15% re-hospitalisation and 10% re-operation. […] Especially bad results are to be expected in additional presence of rectal hyposensitivity."

11.4. Summary

Surgery offers an ultima ratio way of treatment of chronic functional constipation and should be taken into consideration when conservative treatment options have been fully exploited and proven to be insufficient. Due to the potential complications during and after procedures, long-term complications and side effects of surgery, the indication for functional operations requires adequate examining, testing and patient information.

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224 See ibid.

12. RESULTS

Using the step-by-step diagnostic pathway suggested by literature and the findings of this thesis, a flowchart for clinical use during the consultation of patients suffering from chronic (functional) constipation has been created. A flowchart offers orientation to the doctor while performing examinations and deciding on further steps of diagnostics and, subsequently, individual treatment options suitable for the patient.

In the beginning of consultation thorough anamnesis, the use of scores like the Cleveland Clinic Florida Obstipation Score and a proper basic clinical examination including the inspection and palpation (DRE) of the anal canal and accompanying structures are of utmost importance. Structured and respectful first contact with the patient eases further communication and provides a better outcome of the diagnostic process, especially in patients with chronic functional constipation and potential comorbidities like mood and anxiety disorder. Laboratory tests and colonoscopy are tools for the exclusion of morphologic conditions possibly responsible for the symptoms of constipation, like for example colon or rectum carcinoma.

Physiological tests are used for the evaluation of the normal nerve function of the peristaltic pattern and defecation apparatus, including the measurement of the colon transit time using radiopaque markers, measuring the sphincter pressure using anal manometry, defecography (MRI as the gold standard) for imaging of the defecation mechanism and the analysis of the pudendal nerve conduction. Depending on the findings of these tests, it is to be decided between a colon disorder – disordered defecation affecting the colon or the whole gastrointestinal tract – and an evacuation disorder – dysfunction of the rectum and the anal canal structures responsible for the physiological process of defecation.

Regarding colon disorder, step-by-step treatment can be tried and re-evaluated during the process of consulting, including laxatives, biofeedback training, repetition of the measuring of the colon transit time, combination of biofeedback training and laxatives and – if pathological transit time is given – new medication (prucalopride, linaclotide) and as an ultima ratio solution, surgical procedures for the relief of symptoms. Psychiatric consults are recommended at different stages of the diagnostic process. In the case of gastrointestinal dysmotility (GID), surgery is not to be suggested as the condition affects both the upper and lower gastrointestinal system.

As for evacuation disorders, symptomatic treatment including enemas, suppositories and irrigation is a first step during the consultation, followed by a reevaluation and repetition of the scores in the case of unsuccessfulness. Psychiatric consults are suggested for the exclusion of psychologically driven defecation disorders. Surgical procedures provide an ultima ratio solution for the relief of constipation symptoms.

Below, a flowchart for the process of diagnostics in chronic constipated patients with a focus on the assessment of functional constipation is provided.

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Figure 2: Flowchart for the Diagnostics of Chronic (Functional) Constipation (Graphic © Mila Rathenböck)
13. DISCUSSION

Flowcharts offer a systematic tool for the appropriate progression of diagnostics in patients suffering from chronic (functional) constipation. However, the flowchart provided in this thesis only provides orientation for the consulting doctor and does not replace clinical decisions made by the doctor and/or the patient. During every doctor-patient-contact, individuality in interaction, consultation and the given recommendations is of utmost importance and should therefore be of priority throughout all the steps of diagnostics.

Further investigation should be made regarding the patient collective, epidemiological development of functional constipation and the available methods of treatment as well as their benefits and adverse effects in order to be able to provide detailed information to the patient during clinical decision-making.

In regards to the decision between surgical and non-surgical treatment, it is important to consider the severity of the symptoms and the benefits of each separate operative procedure and thus decide on an advantageous goal of treatment for the individual patient. The place and time of the decision-making for or against surgery are depicted in the flowchart. The expected effect as well as technique and potential complications are to be researched using further literature and reports.

Interdisciplinary cooperation in order to achieve the best possible care for the patient is recommended, especially regarding psychological care and medical subject areas that also focus on the urogenital tract and/or the defecation process, like urology and gynaecology. In patients that are yet to be diagnosed properly, examinations in multiple medical specialties for the exclusion of morphological diseases and/or the proper evaluation of the function of the organs of the lower abdomen and pelvic floor should be considered. The establishment of interdisciplinary boards for the discussion of patient cases regarding (functional) pelvic floor conditions would offer a structured intramural opportunity to improve clinical care for these patients. Further evaluation of the benefit of a pelvic floor board is to be conducted.
14. CONCLUSION

As of today, a large percentage of people in the Western world suffer from chronic constipation. In order to distinguish between morphologically triggered symptoms (i.e. colon or rectum carcinoma, anatomical varieties) and functionally based symptoms (i.e. chronic idiopathic constipation/slow transit constipation, pelvic floor dysfunction), it is important to analyse the patient’s individual case while following an evidence-based, standardised diagnostic process. For the systematic progression of diagnostics in chronic (functional) constipation, the flowchart provided in this thesis offers a convenient tool for every-day clinical practice. The flowchart takes the exclusion of warning signs including bleeding, anaemia, family history of colorectal carcinoma and sudden onset of strong symptoms amongst others into consideration and leads the consulting doctor through a sensible and useful proceeding of diagnostics.

Alongside the clinical benefits of following the flowchart during the process of diagnostics of chronic functional constipation, it also provides a forethoughtful tactic of diagnosing the patient regarding the economic cost of the examinations, including imaging operations like MRI-defecography and/or the measuring of colon transit time using radiopaque marker pellets. Through that, the subspecialty of medicine treating patients suffering from chronic functional constipation is respectfully taking its place in the budget of modern healthcare.

Chronic functional constipation is a tremendous burden to the patient that affects the individual person not only physically but also psychologically, which is why it should be considered a substantial part of visceral medicine (gastroenterology, visceral surgery, proctologic departments). Regarding the demographic development in Western countries with the general population’s average age rising over the upcoming decades, chronic functional constipation will be gaining importance in the area of visceral medicine as well as the area of general medicine in extramural institutions.228

This thesis provides an efficient tool in the process of diagnosing patients with chronic functional constipation forms like slow transit constipation in order to structure the diagnostic process and provide a clear pathway of proceeding to both the doctor and the patient.

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15. ACKNOWLEDGEMENTS

This thesis is part of the finishing process of my medical studies, and I would like to use this opportunity to thank my parents and my grandparents for their continuous support throughout my time at university. With your strong support I was able to grow my medical knowledge and give my very best at all times. Thank you.

Thank you to my supervisors Prim. Univ.-Doz. Dr. Andreas Shamiyeh and OA Dr. Günther Klimbacher who are idols to me. I am looking forward to putting what I learned from you into practice once I am working as a doctor myself. Thank you for supervising me during the process of writing this thesis.
16. **PICTURE REFERENCES**

**Page 32: Figure 1:** M Rathenböck, Dec 21, Bristol Stool Form Scale, created using Microsoft Word 2021, inserted in thesis 05.12.21

**Page 57: Figure 2:** M Rathenböck, Dec 21, Flowchart for the Diagnostics of Chronic (Functional) Constipation, created using a free to use for non-/commercial projects online software (visme.co, https://www.visme.co/?utm_source=visme.com), 04.12.21
17. TABLE REFERENCES

Table 1: Terms & Abbreviations in the order of appearance

Table 2: Chronic constipation;

Table 3: Obstructed Defecation Syndrome (ODS) and possible underlying causes;

Table 4: Rome IV criteria for functional chronic constipation and functional defecation disorders;

Table 5: Risk factors for the development of selected bowel passage disorders

Table 6: “Cleveland Clinic Florida Obstipation Score (Agachan, Wexner)”;

Table 7: “Knowles-Eccersley-Scott Symptom Questionnaire”;

Table 8: “Chinese Constipation Questionnaire (CCQ)”;

Table 9: “Longo’s ODS Score System”;

Table 10: “Modified ODS Longo Score”;

Table 11: “The three main types of dyssynergic defecation and their description in pressure”;

Table 12: Normal physiological colon transit time in pellets (or transit hours)

Table 13: “Interpretation of data from anorectal manometry”;
and


**Table 14:** “Overview on selected chronic functional constipation disorders and symptoms”;


**Table 15:** “Categorisation of chronic functional constipation”;


**Table 16:** Surgical treatment options for CIC/STC;

18. BIBLIOGRAPHY

All used literature sources are listed and link to the quotations here in the bibliography, in the order of appearance throughout this thesis.


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and
