Diagnosis of Impaired Defecatory Function with Special Reference to Physiological Tests

Masatoshi OYA, Masashi UENO, and Tetsuichiro MUTO

Department of Surgery, Cancer Institute Hospital

Abstract: Detailed assessment of clinical symptoms is the first and most important step for the accurate diagnosis for patients complaining of defecatory dysfunction. Organic diseases such as colorectal cancer and inflammatory bowel disease should then be ruled out with physical examination including digital rectal examination, proctoscopy, colonoscopy, and double contrast enema. Diabetes, endocrine disease, and disorders of nervous system are possible causes of defecatory dysfunction. Physiological tests include transit time measurement, anorectal manometry, anorectal sensory tests, rectoanal inhibitory reflex, and defecography. Since currently available physiological tests are not perfect as diagnostic modality, the results should be carefully correlated with clinical symptoms. Furthermore, psychological and psychiatric assessment is very important in determining the indication for aggressive treatment such as surgery.

Key words: Anorectal physiology; Anal manometry; Anorectal sensation; Defecography

Introduction

Diagnosis of impaired defecatory function is commenced with detailed history-taking, visual inspection, palpation, and anoscopy. These basic diagnostic procedures are the most important tools for the accurate diagnosis. Then, colonoscopy and barium enema should be performed to exclude organic diseases. Physiological tests are performed as the final step to explore the mechanism of symptoms. In the treatment of impaired defecatory function, the evaluation of psychological and psychiatric conditions is also essential. In this article, we describe various physiological tests and their abnormalities associated with diseases and conditions presenting symptoms of impaired defecatory function.

History

Symptoms of impaired defecatory function
are those such as frequent bowel movement, fecal incontinence and soiling (involuntary leakage of a small amount of stool), constipation, evacuation difficulty, defecatory urgency (difficulty in deferring defecation), and tenesmus, and are closely correlated with their mechanisms. Frequent bowel movement, fecal incontinence, defecatory urgency, and tenesmus suggest impaired anal sphincter function, decreased rectal capacity or impaired discrimination between feces and flatus by the anal canal mucosa. Constipation and difficult evacuation suggest delayed intestinal transit or anorectal outlet obstruction.

Some symptoms are associated with organic diseases of the anorectum. Others occur after anorectal surgery. In addition, endocrine diseases such as diabetes mellitus and hyper- or hypothyroidism, and systemic neurological disorders also cause symptoms of impaired defecatory function. In such cases, treatments of diseases that impair defecatory function are mandatory as well as the treatment of impaired defecatory function itself.

**Physical Examination and Endoscopy**

Visual inspection, palpation, and digital examination may reveal organic diseases such as hemorrhoid, anal fistula, rectal cancer, and rectal prolapse. Colonoscopy and barium enema should be performed routinely to exclude large bowel cancer and inflammatory bowel disease.

**Physiological Tests for Defecatory Dysfunction**

1. **Transit study**

   Transit study is indicated in patients complaining of diarrhea or constipation. Sequential abdominal x-ray following oral administration of radio-opaque markers (commercially available in US; Fig. 1) is a simple and useful test. Many patients complaining of diarrhea or constipation have normal intestinal transit times.1)

2. **Anorectal manometry**

   Anal sphincter is constituted of the internal anal sphincter, which is a smooth and involuntary muscle, and the external anal sphincter, which is a striated and voluntary muscle. Anorectal manometry quantifies functions of these two muscles.

   With patients in the left lateral position, a pressure sensor is inserted into the rectum. Asking patients to relax the anus, the pressure sensor is gently pulled out from the rectum. When the pressure sensor enters the high-pressure zone (HPZ) formed by the internal anal sphincter, a rise in pressure is recorded. The highest pressure in the HPZ at rest is
maximum resting pressure (MRP), and the longitudinal length of the HPZ is the functional length of the anal canal. In HPZ, a small regular change in pressure with approximately 15 cycles per second, termed basic rhythmic wave, shows the activity of the internal anal sphincter at rest (Fig. 2).

The internal anal sphincter prevents leakage of rectal content at rest. Fecal incontinence and soiling in the early postoperative period after rectal resection for rectal cancer and ulcerative colitis are thought to be due to the impaired function of the internal anal sphincter. Decreased MRP, shortened functional length of the anal canal, and diminished amplitude and frequency of basal rhythmic wave are recorded. In contrast, patients with hemorrhoids and those with chronic anal fissure have increased MRP due to a spasm of the internal anal sphincter.

The external anal sphincter function is evaluated by maximum squeeze pressure (MSP), which is the highest pressure recorded during maximum voluntary contraction of the pelvic floor muscles, with the pressure sensor mobilized within HPZ. The external sphincter prevents fecal leakage when the rectum is distended due to the arrival of flatus or feces, or the rise in intra-abdominal pressure due to a change in posture or coughing. Severe impairment of the external sphincter function causes fecal incontinence. Injury to the external sphincter due to obstetric trauma and operation for complex anal fistula, and damage to the pudendal nerve are associated with decreased MSP.

Prolonged and ambulatory recording of anal pressure using a portable system equipped with micro-tip pressure transducer and digitrapper has made it possible to evaluate the influence of activities such as diet and sleep on anal pressure.

3. Other methods for evaluation of the anal sphincter function
Ultrasonography of the anal sphincters has an advantage of minimal invasiveness and the ability to identify sphincter defect and tear. Electromyography is useful in discriminating causes of impaired external anal sphincter function being neurogenic or myogenic. Anismus, which is a paradoxical contraction of the external anal sphincter during attempt of defecation resulting in difficult evacuation, is also detectable with electromyography. Pudendal nerve terminal motor latency is measured using a dedicated endo-anal probe, the tip of which is equipped with an electrode stimulating the pudendal nerve and the root of which has an electrode recording the contraction of the external anal sphincter. Prolonged motor latency suggests pudendal neuropathy.

4. Sensory tests of the rectum and anus
The measurement of sensory threshold, maximum tolerable volume, and compliance is commonly performed as a test of rectal sensation. A latex balloon is placed in the rectum and inflated with air. Sensory threshold is the inflated volume when a subject first feels the presence of flatus in the rectum. After this sensation spontaneously disappears, the patient begins to constantly feel the presence of flatus if the inflation of the balloon is continued. Further inflation of the balloon finally becomes impossible because the subject feels a strong desire to evacuate or discomfort. The volume of the balloon at this situation is the maximum tolerable volume. Rectal compliance is calculated by recording the change in intra-rectal pressure during the inflation of the balloon.

Patients after rectal resection for disease such as rectal cancer have decreased sensory thresholds and maximum tolerable volume, resulting in frequent bowel movement. In contrast, these values are abnormally increased in some patients with chronic constipation or megarectum.

Anal canal sensation is a somatic sensation conducted by sensory fibers of the pudendal nerve. This sensation is important in the discrimination of the content entering the rectum,
and is quantified as the sensory threshold to constant electrical current stimulus. Patients with fecal incontinence due to pudendal neuropathy have a high sensory threshold, which means reduced sensation. In addition, patients with hemorrhoids also present with reduced sensation due to a downward displacement of insensitive rectal mucosa into the anal canal.

5. Rectoanal inhibitory reflex

Rectoanal inhibitory reflex is a relaxation of the internal anal sphincter in response to rectal distention. It is recorded using a pressure sensor placed in the anal HPZ during balloon distension of the rectum. A quick reduction of the anal canal pressure is recorded several sec. after the balloon distension (Fig. 2). The reduced pressure is transient and the pressure is usually restored after 10 to 30 sec. However, as the extent of rectal distension increases, the reduction of the anal pressure becomes profound and prolonged, and finally the anal pressure becomes continuously reduced.

Normal rectoanal inhibitory reflex shows intact intramural nerve routes of the rectum and anus. In Hirschsprung’s disease, rectoanal inhibitory reflex is absent due to the loss of intramural nerve plexus. In patients with severely impaired internal anal sphincter function and those after rectal resection, this reflex is occasionally absent.

6. Defecography

Defecography is a test for dynamic assessment of anatomical change of the pelvic floor and anorectum during pelvic floor contraction and defecation. We prepare artificial stool having similar consistency to stool by mixing barium powder and rice bran, and introduce the artificial stool into the rectum. We obtain static lateral x-ray images at rest, during maximum pelvic floor contraction, and during evacuation effort. We use ordinary contrast medium for x-ray fluoroscopy apparatus and a portable commode (Fig. 3). Video images during evacuation are also recorded.

Patients with outlet obstruction, which is an impaired evacuation at the anorectum, are
unable to evacuate introduced artificial stool due to a failure to relax pelvic floor muscles. Morphological abnormalities such as rectal prolapse, rectocele, and endorectal intussusception, and the presence of paradoxical contraction of the pelvic floor muscles during attempted defecation (anismus) can be visualized with defecography (Fig. 4). Dynamic MRI imaging and scintigraphic defecography are also methods available for assessment of evacuation.7)

7. Evaluation of psychological condition

Psychological condition not only affects clinical symptoms of impaired defecatory function but also interferes with the results of treatment. Mental support is important in medical treatment, and is essential in patients for whom surgical treatment is considered.8)

Conclusion

Diagnosis of impaired defecatory function was described with special reference to physiological tests. Physiological tests are not direct diagnostic tools such as double contrast enema and colonoscopy. Moreover, currently available physiological tests do not completely evaluate abdominal function. In the diagnosis of impaired defecatory function, therefore, accurate and detailed history-taking is most important. It should always be examined whether the results of physiological tests are consistent with the patients’ clinical symptoms.

REFERENCES