Surgical Management for Defecation Dysfunction

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Abstract: Typical defecation dysfunction includes difficulty with defecation and fecal incontinence, which cause remarkable deterioration of QOL. When such dysfunction is treated, it is essential to understand the mechanism of normal defecation, as well as the anatomical and physiological characteristics of the anal region. Before operation, manometric study of the anal canal, electromyography, and defecography should be performed to exactly identify the abnormalities. Depending on the results, appropriate surgical procedures should be selected for the individual patient. PPH to treat defecation problems due to mucosal prolapse syndrome, levator myoplasty for rectocele, and sphincteroplasty and postanal repair for fecal incontinence are effective procedures. To treat complete sphincter failure, attempts have been made to construct a neoanal sphincter by transposition of muscles and implantation of prosthetic sphincter devices.

Key words: Defecation dysfunction; Difficulty with defecation; Fecal incontinence; Surgery

Introduction

Typical defecation dysfunction includes difficulties in the act of passing feces or flatus, as well as fecal incontinence. Such dysfunction is symptomatically intolerable for the patient, resulting in a pronounced decline in the quality of life. Despite the seriousness of these conditions, the pathology of defecation dysfunction is not widely understood among the physicians involved in treatment. Because of the sense of shame felt by the patient, as well as indifference among physicians, defecation dysfunction is often overlooked and fails to receive appropriate treatment by specialists. To treat these conditions, it is essential to fully understand the causative disease and the anatomical problems in the perineal region. The pathology and management, particularly surgical therapy, of defecation dysfunction are described in this article.
Defecation can be defined as the act of evacuating feces from the rectum, where fecal material that has been transported through the colon is stored temporarily. Normal defecation occurs at an appropriate time and in an appropriate place. In other words, when sufficient stool or flatus enters the rectum, the pressure inside the rectum increases, and an urge to defecate is generated. The increase in pressure is perceived by pressure receptors present in the rectal wall and transmitted to the central nervous system. Then reflex relaxation of the internal anal sphincter muscle occurs to allow the stool to enter the anal canal. This process, called the anorectal reflex, occurs involuntarily.

Whether the material that has moved into the anal canal is stool or flatus is perceived via somatic nerves. If the situation permits defecation, both the levator ani muscle and the external sphincter dilate in conjunction with the voluntary act of straining, and defecation is accomplished. If the situation is inappropriate, the external sphincter is contracted volitionally to send the fecal material back into the rectum. Accordingly, if the anorectal reflex is impaired, the urge to defecate is not evoked, and the internal sphincter fails to relax. Consequently, feces cannot pass through the anal canal. In some cases, the levator ani muscle and the external sphincter fail to dilate or even conversely contract at the time of straining. This contraction is called a paradoxical contraction. If it occurs, stool can never pass through the anus, however strongly the subject strains. If contraction of the external sphincter is inappropriate, fecal continence can be lost, leading to leakage of stool through the anus before the subject is ready to defecate on the toilet.

Anatomic features of the anal region

The circular muscle in the wall of the anal canal is double-layered (Fig. 1a). The internal layer is called the internal anal sphincter, which is an involuntary muscle innervated by the autonomic nervous system. The outer layer consists of the levator ani muscle, which is a voluntary muscle that wraps around the internal sphincter in the shape of a funnel and is innervated by somatic nerves, the puborectalis...
When excessive straining is repeated during defecation attempts for some reason, it results in prolapse of the rectal mucosa, solitary rectal ulcer, or rectocele, leading to aggravation of difficulty with defecation. Once this vicious cycle is established, vigorous straining is repeated to facilitate defecation, leading to perineal descent. This results in the nerves innervating the anus and rectum becoming stretched and injured, resulting in neuropathy and damage to the musculature of the pelvic floor. Eventually, rectal prolapse and fecal incontinence may arise from such secondary injury.

The pathology of defecation dysfunction can be easily diagnosed by fluoroscopy with injection of barium into the rectum. The movements of defecation can be reproduced while the bolus of barium in the rectum is eliminated in the same way as feces.

**Surgical management for difficulty with defecation**

In rectal mucosal prolapse syndrome, the mucosa of the anterior wall of the rectum becomes redundant and obstructs the anal canal, preventing the passage of stool. The redundant mucosa of the anterior rectal wall is excised via a transanal approach, and the wound is closed with sutures. Attempts have
been made recently to treat this syndrome by a simple procedure using an instrument that removes a mucosal tube including the redundant mucosa and anastomoses the cut ends. This procedure is called PPH^3) (Fig. 2).

Rectocele is a condition in which the anterior wall of the rectum protrudes into the posterior wall of the vagina. Stool enters the cele during straining at the time of defecation and accumulates, resulting in incomplete evacuation of the rectum. To treat this, transverse perineotomy is made between the rectum and the posterior wall of the vagina. Through the incision, the rectum and the posterior wall of the vagina are divided from each other bluntly and widely up to the upper margin of the cele, exposing the bilateral limbs of puborectalis muscle. The anterior wall of the rectum is reinforced through taking up slack by gathering the bilateral limbs of puborectalis muscle with stitches. This procedure is called anterior levator myoplasty and is reported to be the most effective.

In complete rectal prolapse, the full thickness of the rectal wall turns inside out and comes down the anal canal to be extruded through the anus. Prolapse of the rectum can be corrected in two ways. In one method, the transabdominal approach is used to raise and fix the prolapsed rectum. In the other method, which is only palliative, the transperineal approach is used to gather the rectal mucosa with sutures and to strengthen the muscles of the pelvic floor. Technical details of these procedures are not described in this article.

The surgical therapy for diseases associated with difficulty in defecation was described above. Even if a pathological condition is repaired surgically, however, recurrence is unavoidable if straining at defecation is repeated. Consequently, it is important to instruct the patient to avoid straining during defecation and to provide drugs to facilitate defecation. The patient must follow the instructions strictly and continue drug therapy over the long term.

### Surgical management for fecal incontinence

#### 1. Pathology of fecal incontinence

Fecal incontinence is defined as involuntary passage of the rectal contents, ranging from flatus and watery stools to solid feces. In general, leakage of flatus and watery stools is associated with disorders of the internal sphincter, whereas the leakage of solid feces (which is more serious) occurs when the puborectalis muscle and external sphincter are defective.

Fecal incontinence arises when the defecation dysfunction that was described above persists for many years. In addition, it occurs secondary to defects or disorders of structures in the anorectal region caused by trauma and diseases of the spinal cord. Trauma that leads to loss of the circular structure of the anal canal due to transection of the puborectalis muscle and the internal and external sphincters can cause fecal incontinence, with such trauma including anal surgery for internal hemorrhoids and anal fistula, obstetric perineal laceration, and traffic accidents.

In general, leakage of flatus or slight leakage of stool that merely stains the underwear is commonly caused by interruption of the internal sphincter or disorders of the autonomic nervous system. Because medical therapy is often effective for such mild incontinence, surgery is not performed. If the external sphincter, a voluntary muscle, is disrupted by trauma, closure of the anal canal cannot be maintained, giving rise to serious fecal incontinence.

If the pudendal nerves that innervate the puborectalis muscle and the external sphincter, are impaired or injured because of spinal cord disease, persistent defecation dysfunction, and obstetric injury, the anorectal angle becomes obtuse. If so, the anal canal will not remain closed at rest when the intraabdominal pressure rises, leading to fecal incontinence.

#### 2. Surgical therapy

Surgical procedures to treat fecal incontin-
nence due to the pathological conditions described above include sphincter repair to restore the circular structure of the sphincter muscles and procedures to restore an acute anorectal angle by gathering the puborectalis muscle with sutures behind the rectum.

(1) Sphincter repair

If the sphincter has been cut by trauma, for example, and the cut ends have retracted into scar tissue, the tissue containing the cut ends is divided and mobilized en bloc (Fig. 3a). Then the cut ends of both internal and external sphincters are anastomosed en bloc to the opposing cut ends with sutures (Fig. 3b). The
wound is closed with sutures primarily. To prevent bacterial contamination of the wound, defecation is not allowed for one week after the operation, so nothing is allowed by mouth and the patient is maintained on total parenteral nutrition. If these measures are taken, a temporary colostomy is unnecessary.

(2) Post-anal repair

This is a surgical procedure that aims to produce an acute anorectal angle. With the patient lying in the jackknife position, a V-shaped incision starting from 1 cm posterior to the 6 o’clock position on the anal verge is made. The skin and subcutaneous tissue are divided up to the insertion of the external anal sphincter muscle. Then the external and internal sphincters are divided precisely to expose the puborectalis muscle and the levator ani muscle (Fig. 4a). The puborectalis muscle forming the lower end of levator ani is tightened by folding it with sutures behind the rectum to move the rectum forward and thus produce an acute anorectal angle (Fig. 4b). Then the skin incision is closed by a V-Y plasty to avoid cutaneous tension.

(3) Construction of a neoanal sphincter

When surgical procedures to repair the injured sphincter and produce an acute anorectal angle failed to restore continence, or the ability of the sphincters to maintain continence was completely abolished, a permanent colostomy was once mandatory. However, various surgical procedures to construct a neoanal sphincter have recently been developed. One involves transposition of the gracilis muscle, with which the anal canal is encircled to replace the defective sphincter. Subsequently, contraction of the transplanted muscle is maintained with continuous electric stimulation and this neoanal sphincter permits defecation by discontinuation of the stimulation. Another method involves transplantation of the gluteal muscles, into which the pudendal nerves have been implanted, around the anal canal. The third method involves implantation of a prosthetic valve to replace the defective sphincter. Such procedures have mainly been reported to be successful in Europe and the United States. In Japan, these new surgical procedures have only been used at a few institutions. If the construction of a neoanal sphincter becomes more common, many unhappy patients will be relieved.

Conclusion

The pathology of difficulties and disorders of defecation that cause fecal incontinence was described along with surgical management for these conditions. It is important for surgeons and other medical workers to treat defecation dysfunction after making an effort to ensure that the patient fully understands the pathology and undergoes treatment with knowledge. In order to perform surgery and obtain satisfactory results, the pertinent surgical procedure should be determined for each patient after thoroughly studying the pathology preoperatively by manometric study, assessing defecation dynamics by defecography, and performing electromyography. Also, postoperative defecation should be strictly regulated to prevent recurrence.

REFERENCES