



By: Joshua A. Katz, M.D., General Surgeon, Memphis Surgery Associates; Baptist Memorial Hospital; Saint Francis Hospital; and Methodist Le Bonheur Healthcare System, Memphis, TN and Bruce A. Orkin, M.D., Chief, Colorectal Surgery, Department of General Surgery and Professor, Department of General Surgery, Rush University Medical Center, Chicago, IL



International Foundation for Gastrointestinal Disorders (www.iffgd.org)

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Introduction

Cancer of the colon and rectum remains one of the most deadly forms of cancer. It is the third most common cancer in the United States, yet it is quite curable by surgery when found in its early stages. Since it involves the lower gastrointestinal tract, treatment of colon and rectal cancer frequently affects bowel function and, at times, continence. This article will attempt to show how colorectal cancer therapy, both surgical and medical, may affect fecal continence.

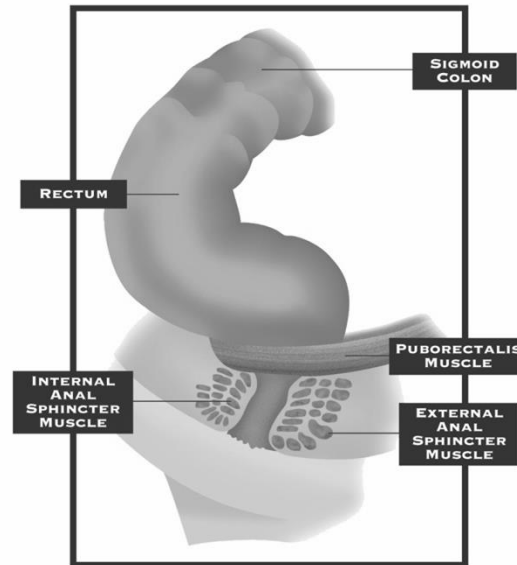
What is Continence?

Fecal continence is the ability to delay defecation in a controlled manner to a socially acceptable time and place. Continence is a complex phenomenon, involving the way the body functions (physiology), anatomy, sensation, and awareness or thinking (cognition). In the normal healthy adult, the small intestine transfers approximately two to three liters (2000–3000 milliliters or 2–3 quarts) of liquid stool per day to the colon through the *ileocecal valve* [a valve that connects the bottom end of the small intestine (ileum) and the upper part of the large intestine (cecum)]. The colon then concentrates this stool by absorbing water and electrolytes until approximately 250 milliliters or 1 cup of stool reaches the rectum. The rectum is the last portion of the colon and is approximately 15 cm or 6 inches long. It functions as a stretchable (compliant) reservoir and is able to expand (dilate) to accommodate a fecal load. The rectum ends at the anus, which consists of the internal and external anal sphincters lined by both rectal mucosa and a highly sensitive skin. (Figure 1) Sensory nerves, lubricating anal glands, internal and external hemorrhoidal blood vessels, and a complex blood supply make the anus one of the most complex and sophisticated parts of the body.

Defecation occurs when the rectum becomes distended with stool. Rectal distention causes a reflex relaxation of the normally contracted internal anal sphincter. The contents of the rectum descend through the anal canal, which detects whether there is gas, liquid or solid matter. The brain receives this information and decides whether to pass the rectal contents or not. The external sphincter muscle along with other pelvic floor muscles may be voluntarily relaxed to allow passage of the stool. This relaxation helps to straighten the rectum and anus and is followed by a *Valsalva maneuver* as the diaphragm and abdominal muscles bear down, increasing the pressure on the rectum and encouraging the stool to pass through the anal canal. Alternatively, these muscles may be contracted, pushing the stool back up into the rectum and

deferring defecation. The rectum will then relax for a time, but as additional stool enters, a more demanding urge will be felt as the rectum again contracts.

Figure 1
Anatomy of the Rectum and Anal Canal



Continence thus depends on:

- Volume and consistency of stool
- Capacity and compliance of the colon and rectum
- Function of the internal and external sphincters
- Sensory *innervation* [supply of nerves or nerve stimuli] of the rectum and anal canal
- Motor innervation of the sphincter muscles and pelvic floor muscles
- Cognitive function

Some patients have problems with control prior to surgery due to anal sphincter muscle injuries, birthing trauma or limited cognitive capacity. Additionally, many general medical problems such as diabetes and neurologic disorders may compromise motor and sensory function.

Colon and Rectal Cancer: Basic Concepts

Treatment of cancer may impact many of the factors affecting continence. Understanding how requires some knowledge of how colon and rectal cancer develops and spreads and how it is approached surgically and medically. Colon and rectal cancers arise from the inner lining of the bowel, known as the

mucosa. Normal mucosal cells grow in a highly controlled fashion, which is controlled by their *genes*. Cancers develop when changes, or *mutations*, occur in a series of genes. Some of these abnormal genes may be inherited or passed from parents to children. However, most mutations occur spontaneously. Certain gene changes allow mucosal cells to grow rapidly and in an uncontrolled manner. These abnormal cells often look different than normal cells when examined under a microscope – this is called *dysplasia*. As these cells multiply they form abnormal structures called *polyps*. A polyp is an overgrowth of the mucosal lining, which may be seen during endoscopy. Often, they may be removed with the *colonoscope* and then they will not develop into a cancer.

Colonoscopy

Colonoscopy is a fiberoptic (endoscopic) procedure in which a thin, flexible, lighted viewing tube (a *colonoscope*) is threaded up through the rectum for the purpose of inspecting the entire colon and rectum and, if there is an abnormality, taking a tissue sample of it (biopsy) for examination under a microscope, or removing it.

With time and additional changes in the genes, the cells acquire the ability grow into the deeper muscular walls of the intestine. Once this mass of cells, now called a *tumor*, invades the deeper bowel wall, it is called a cancer because it has demonstrated the ability to spread. Invasion into adjacent tissues and spread to the *regional lymph nodes* located in tissue next to the intestine, called the *mesentery*, are the hallmarks of colorectal cancer. Cancer cells may further spread through the lymphatic channels and the blood stream to distant sites including the liver, lungs, and other parts of the body. This process is called *metastasis*.

Cancer located within the inner wall of the colon is considered Stage I. If removed (resected) surgically at this point there is a 90% five year survival rate and no additional therapy is needed. Cancers that penetrate more deeply into the wall or into surrounding tissues are considered Stage II and have approximately a 75% five year survival rate. When there is cancer detected in the lymph nodes in the mesentery, the cancer is considered Stage III and has an approximately 25% five year survival rate. However, this may be improved to 50–60% with additional therapy discussed below. When cancer has spread to other organs such as the liver or lungs, it is considered Stage IV and usually not curable. Selected patients with limited disease in the liver or lungs may be cured with additional surgery. Overall Stage IV survival at five years is about 5%.

Adjuvant therapy is treatment used in addition to surgery and denotes the use of either chemotherapy or radiation therapy or both. Chemotherapy using drugs designed to destroy cancer cells has been shown to prolong life in both Stage III and Stage IV colorectal cancer. Radiation therapy is used primarily for patients with rectal cancer. It may both

increase survival and decrease the rate of local recurrence of the tumor in the pelvis where the rectum was removed.

The first step in treating a patient with colorectal cancer is to determine if the cancer has spread or not. Treatment may then be recommended to attempt a cure, or, if the cancer has spread widely, the patient may be treated for *palliation*. Palliative therapy serves to relieve or prevent symptoms, slow the progression of disease and maintain quality of life.

Continence and Colon Cancer

Treatment of colon cancer (as opposed to rectal cancer) rarely results in permanent incontinence. When a segment of the colon is removed, the length of colon available to absorb fluid is reduced. Thus, stools may be more liquid. Generally, this returns to normal over time. However, if the liquid stool volume is too high for the remaining colon to handle, a large amount of liquid will fill the rectum. This may overwhelm both the rectal storage capacity and the sphincter *tone* [muscle tension]. Certain chemotherapy drugs, such as 5-fluorouracil or Irinotecan, may worsen this problem by causing significant diarrhea due to their effects on both normal and cancerous tissues.

When incontinence does occur in this setting it can usually be managed with dietary fiber, antidiarrheal agents, and careful hygiene. If the person was continent prior to surgery and did not have any injury to or surgery on the anal sphincter muscles, incontinence should be limited and eventually improve.

Continence and Rectal Cancer

Treatment of rectal cancer often directly affects continence. Preservation of continence in the patient with rectal cancer poses several challenges. Continence is threatened by a number of factors:

- Position of the cancer low in the rectum
- Proximity to and possible invasion of the anal sphincters
- Use of transanal versus radical surgical technique
- Role of radiation and chemotherapy
- Use of a temporary ileostomy
- Use of a colorectal, coloanal, or coloanal J-pouch reconstruction.

For many years the surgical standard of care required that five centimeters of normal bowel be taken in front of and behind (proximal and distal) to the tumor. Hence, any tumor that occurred within 5 cm of the anal sphincters was treated by removing the entire rectum and anus with a permanent colostomy – *abdominoperineal resection (APR)*. While this technically does not involve incontinence it does represent a complete and permanent loss of normal defecation.

If the cancer invades the anal sphincter muscles, patients may actually have symptoms of incontinence due to disruption of sphincter function and leakage of blood, stool, and mucus around the tumor. Surgical cure in this situation will require an APR.

The most critical determinants of survival are in fact the precision of the surgical technique, and proper removal of the rectal lymphatic tissues (utilizing a technique called *total*

mesorectal excision). When this can be accomplished without resecting the anal sphincters, reconstruction of the gastrointestinal tract is possible. The procedures that accomplish this connect the remaining colon to the remaining rectum or anal canal after removal of the tumor.

When a cancer is located in the middle or upper rectum, that portion of rectum along with the sigmoid colon and the regional lymph nodes in the mesentery are removed, and the colon is attached to the remaining low rectum (*low anterior resection with a colorectal anastomosis – LAR*). This preserves the anal canal and muscles and allows stool to pass through the normal route. However, depending on the amount of rectum removed, most patients will experience increased frequency of bowel movements, some degree of urgency, and even soiling. This occurs because the rectum, which functions as a reservoir to hold stool, has been replaced with colon, which is not as compliant (stretchable). Over time this colon will tend to dilate and become more compliant, but this can take up to a year or more.

In selected cases where the cancer is located in the lower rectum, the entire rectum may be removed and the colon is brought deep into the pelvis and attached to the anus (*coloanal anastomosis – CAA*). Because all of the rectum is lost, bowel movements after this operation are usually small and frequent. Again, these symptoms tend to improve with time.

With very low anastomoses and loss of much or all of the rectum, the surgeon may create a *colonic J-pouch* to the reconstruction. A J-pouch is designed to increase the volume that the attached colon will hold, thereby increasing stool size and decreasing the frequency of bowel movements. A colonic J-pouch is created by folding the end of the colon back on itself for about 5 to 10 cm in a “J” shape and opening the 2 sides to create one larger space. This creates a double sized pouch that is then attached to the anus. This often improves bowel function, especially in the first 6–12 months after surgery.

In highly selected cases of early stage cancers of the rectum, *transanal excision* may be attempted. In these cases, the tumor with a small margin of normal tissue is removed from within the rectum by operating through the anus. This technique may also be used in certain patients who cannot tolerate the major abdominal surgery necessary to remove the rectum. Radiation therapy may be also used in addition to transanal excision for these high-risk patients. While these techniques may spare the patient an abdominal operation, they do require anal dilation, which can injure the anal muscles and compromise continence.

Ileostomy

An *ileostomy* is a surgically created opening from the small intestine (ileum) to the skin of the abdominal wall. This allows the intestinal contents to empty into an appliance (bag) that sticks to the skin around the ileostomy. An ileostomy may be constructed as an *end ileostomy (Brooke)* or as a *loop ileostomy*. An end ileostomy is made when the small intestine is cut all the way across [usually at the end of the ileum, which is the lowest part of the small intestine] and the cut end is brought out through the abdominal wall. A loop ileostomy is made by bringing a loop or knuckle of the bowel out and

opening it one half way across the intestine so there are upstream (proximal) and downstream (distal) sides.

In many cases, patients undergoing surgery for rectal cancers may have a temporary loop ileostomy as part of their initial procedure. This diverts the stool into an appliance so that it does not pass down through area of the colorectal anastomosis (connection). This temporary measure reduces the risk of a leak from the anastomosis, one of the most significant complications of rectal cancer surgery. If a leak occurs without a loop ileostomy, stool spills into the pelvis resulting in a severe infection. The ileostomy is closed 2–3 months later when the patient has recovered from the first procedure and the anastomosis has been tested for leaks. This is a second operation, although relatively small. Some patients receiving chemotherapy or radiation will keep the ileostomy until their adjuvant therapy has been completed.

Radiation Effects

Radiation is often used to treat pelvic cancers – including those of the rectum, prostate, bladder, uterus, cervix and vagina – with or without surgery. Radiation kills rapidly dividing cells in its path, which include cancer cells but also mucosal cells. In the short term, radiation causes injury to the lining of the rectum, vagina and bladder and can result in inflammation and ulcers. The rectal effects are termed *early radiation proctitis*. Symptoms include bleeding, mucous and bloody discharge, spasm of the rectal wall, urgency, and incontinence. Late radiation proctitis symptoms result from scarring of the rectal and anal muscles with loss of some of the small blood vessels. The rectum becomes stiff and noncompliant and abnormal blood vessels may develop (*vascular ectasias*). In addition, the anal sphincter muscles may scar and lose strength. Patients can experience frequent bowel movement, urgency, bleeding and incontinence.

Treatment of radiation proctitis includes all the methods listed below as well as direct treatment of bleeding sites. In severe cases, fecal diversion with a colostomy or even removal of the rectum may be options.

Treatment

Treatment of fecal incontinence is discussed in detail in other publications available from the IFFGD [See below: Articles of Related Interest]. Briefly, initial therapy includes bowel management and dietary changes. The use of dietary fiber, fluids, a regulated diet, and scheduled meals help to make bowel movements predictable. Local care using pads, barrier agents, frequent baths, and clothing changes help to protect the perianal skin and lessen the impact of incontinence episodes. The next step is to add antidiarrheal agents such as Imodium and Lomotil that decrease the frequency and volume of bowel movements. Daily rectal cleansing enemas [as directed by your physician] may stimulate bowel movements on a scheduled basis. Biofeedback therapy, which improves rectal sensation, sphincter strength and muscle coordination, also often helps.

Further treatment is generally based in anorectal physiologic evaluation. Various surgical options are available. Of course, the ultimate resolution of fecal incontinence is a colostomy or ileostomy. Detailed discussions are available in

the IFFGD publications on fecal incontinence – medical and surgical treatment. Additional information is available from the American Society of Colon and Rectal Surgeons and the National Association for Continence.

Conclusion

The primary goal of the treatment of colon and rectal cancer is to cure the disease, however preservation of continence is an important additional consideration. Most patients will be treated surgically and will have good to excellent bowel function afterwards. Before undergoing surgical therapy for colon and rectal cancer it is important to understand the overall plan as well as the risks and benefits. When the cancer arises in the rectum, changes in bowel function are likely, due to surgical changes as well as the effects of adjuvant chemotherapy and radiation. Evaluation by a specialist in the areas of colorectal cancer and fecal incontinence is often useful if initial treatment attempts are not helpful. Treatment options include diet, medications, bowel management, biofeedback, surgery, or diversion. Function often improves over time.

Articles of Related Interest

Lowry AC. Surgical treatment of fecal incontinence. IFFGD Fact Sheet No. 303. 2006.

Lowry AC. Medical management of fecal incontinence. IFFGD Fact Sheet No. 306. 2009.

Plummer MK. Strategies for establishing bowel control. IFFGD Fact Sheet No. 302. 2007.

Plummer MK, Tries J. Biofeedback & bowel disorders: teaching yourself to live without the problem. IFFGD Fact Sheet No. 112. 2012.

Glossary

Abdominal Perineal Resection: An operation for cancer in which the sigmoid colon, rectum, and anal sphincters are removed.

Adjuvant Therapy: The use of drugs and/or radiation before or after surgical excision of a cancer. When given before surgery, this is known as neoadjuvant therapy.

Cancer: The uncontrolled growth of abnormal tissue that invades normal tissue.

Coloanal anastomosis: Connecting the remaining colon to the anus after resection of the rectum.

Colonic J-pouch: A surgically created pouch made by folding the end of the colon back on itself for about 5 to 10 cm in a “J” shape and opening the 2 sides to create one larger space. This increases the volume that the attached colon will hold, thereby increasing stool size and decreasing the frequency of bowel movements. This often improves bowel function, especially in the first 6–12 months after surgery.

Fecal continence: The ability to delay defecation in a controlled manner to a socially acceptable time and place.

Ileostomy: A surgically created opening from the small intestine (ileum) to the skin of the abdominal wall. This allows

the intestinal contents to empty into an appliance (bag) that sticks to the skin around the ileostomy.

Low anterior resection with a colorectal anastomosis: Removal of a cancer located in the middle or upper rectum along with the sigmoid colon and the regional lymph nodes. The colon is attached to the remaining rectum. This preserves the anal canal and muscles and allows stool to pass through the normal route.

Lymphatic channels: A fluid circulation system that parallels the blood circulation system. Lymphatic fluid travels through the lymphatic system to carry cells that help fight infections and other diseases.

Palliative therapy: Treatment of cancer to relieve or prevent symptoms, slow the progression of disease and maintain quality of life.

Radiation proctitis: Bleeding, mucous and bloody discharge, spasm of the rectal wall, urgency and incontinence due radiation-induced damage to the rectum. Late symptoms result from scarring of the rectal and anal muscles with loss of some of the small blood vessels. The rectum becomes stiff and noncompliant and abnormal blood vessels may develop.

Regional lymph nodes: Lymph nodes located outside and around the original cancer site.

Transanal excision: Removal of the tumor with a small margin from within the rectum by operating through the anus.

Valsalva maneuver: Voluntary increasing pressure in the abdominal cavity with the diaphragm and abdominal muscles to bear down on the rectum to facilitate defecation.

About IFFGD

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IFFGD

537 Long Point Road, Suite 101
Mt Pleasant, SC 29464

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