Defecation

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Defecation is a complex action requiring coordination and sequential activation of a large number of muscles. It is controlled by the autonomic nervous system, but is also under voluntary control. Defecation is initiated by distension of the rectum by feces arriving from the sigmoid colon. This sensation leads to a chain of events which ends in expulsion of feces from the anus. The act of defecation is voluntarily controlled in healthy, normally functioning people.

Defecography

Defecography, or evacuation proctography, is a radiologic study which produces an anatomic describtion of the changes that occur in the rectum and anal canal during defecation. It also provides information about the movement of the pelvic floor, such as movement of the puborectalis sling during evacuation, squeezing and rest. Defecography is a technique in which a barium contrast medium is introduced into the rectum. Radiographic images are taken in the lateral position by fluoroscopy and videotape while the person is at rest, straining, squeezing, and during defecation. Therefore, it is a dynamic procedure.

Mechanism of Defecation

At the beginning of defecation, the subject voluntarily raises intra-abdominal pressure by muscular contraction of the quadratus lumborum, rectus abdominis, external and internal obliques, transversus abdominis and diaphragm. The puborectalis muscle surrounding the anorectal junction then relaxes so as to allow the straightening of the anorectal angle. Remember that the puborectal sling usually produces an angle of about 90° between the rectal ampulla and the anal canal, so that it is closed off. However, as it straightens, the angle increases to about 130° to 140° so the canal straightens and the feces, or in this case barium, can be evacuated. The external anal sphincter then constricts and lengthens the anal canal. It accentuates the action of the puborectalis by also pulling the anorectal junction forward anteriorly to further increase the anorectal angle. The fatty tissue of the ischiorectal fossa allows for changes in position and size of the anal canal and anus during defecation. During evacuation, the anorectal junction moves down and backwards and the pelvic floor usually descends slightly.

The internal anal sphincter, which usually closes off the upper and middle portion of the canal, relaxes to allow passage. The circular muscles of the rectum then stimulate a wave of contraction to push feces towards the anus. As feces emerges from the anus,

the longitudinal muscles of the rectum and levator ani bring the anal canal back up, the feces is expelled, and the anus and rectum rise back up and forward to return to their normal position. The anal canal is closed tightly once again.

In the video, when the patient performs the squeeze maneuver, the anal canal can be seen tightly closed between the anorectal junction and the external anal orifice. Then after contraction, towards the end of defecation, the rectum is emptied. Notice how the pelvic floor has slightly descended and the anal canal is wide open. Also, notice that the anorectal angle is greater than at rest or squeezing.

Constipation

Constipation is passage of small amounts of hard, dry bowel movements, usually fewer than *three* times a week. People who are constipated may find it difficult and painful to have a bowel movement. Other symptoms of constipation include feeling bloated, uncomfortable, and sluggish.

However, there is no right number of daily or weekly bowel movements. Normal may be three times a day or three times a week depending on the person. Also, some people naturally have firmer stools than others.

At one time or another, almost everyone gets constipated. Poor diet and lack of exercise are usually the causes. In most cases, constipation is temporary and not serious.

NB: ***The clinical definition of constipation is any two of the following symptoms for at least 12 weeks (****not necessarily consecutive****) in the previous 12 months:***

- straining during bowel movements
- lumpy or hard stool
- sensation of incomplete evacuation
- sensation of anorectal blockage/obstruction
- fewer than three bowel movements per week

What causes constipation?

The hard and dry stools of constipation occur when the colon absorbs too much water or if the colon's muscle contractions are slow or sluggish, causing the stool to move through the colon too slowly. Common causes of constipation are

- not enough fiber in the diet
- not enough liquids
- lack of exercise
- medications
- irritable bowel syndrome
- changes in life or routine such as pregnancy, older age, and travel
- abuse of laxatives
- ignoring the urge to have a bowel movement
- stroke (by far the most common)
- problems with the colon and rectum

- problems with intestinal function (chronic idiopathic constipation)

Not Enough Fiber in the Diet

The *most common* cause of constipation is a diet low in fiber found in vegetables, fruits, and whole grains and high in fats found in cheese, eggs, and meats.

Fiber--both soluble and insoluble--is the part of fruits, vegetables, and grains that the body cannot digest. Soluble fiber dissolves easily in water and takes on a soft, gel-like texture in the intestines. Insoluble fiber passes through the intestines almost unchanged. The bulk and soft texture of fiber prevent formation of hard, dry stools that are difficult to pass.

20 to 35 grams fiber daily are recommended by the American Dietetic Association. Both children and adults eat too many refined and processed foods from which the natural fiber has been removed.

In addition, difficulties with chewing or swallowing may force older people to eat soft foods that are processed and low in fiber.

Not Enough Liquids

Liquids like water and juice add fluid to the colon and bulk to stools, making bowel movements softer and easier to pass. People who have problems with constipation should drink enough of these liquids every day, *about eight 8-ounce glasses*. Liquids that contain caffeine, like coffee and cola drinks, and alcohol have a dehydrating effect.

Lack of Exercise

Lack of exercise can lead to constipation, although doctors do not know precisely why. For example, constipation often occurs after an accident or during an illness when one must stay in bed and cannot exercise.

Medications

Some medications can cause constipation. They include

- pain medications (especially narcotics)
- antacids (contain aluminum and calcium)
- antihypertensives (calcium channel blockers)
- antiparkinson drugs
- antispasmodics
- antidepressants
- iron supplements
- diuretics
- anticonvulsants

Irritable Bowel Syndrome (IBS)

Some people with IBS, also known as spastic colon, have spasms in the colon that affect bowel movements. Constipation and diarrhea often alternate, and abdominal cramping, gassiness, and bloating are other common complaints. Although IBS can produce lifelong symptoms, it is not a life-threatening condition. It often worsens with stress, but there is no specific cause or anything unusual that can be see in the colon endoscopically or radiologically.

Changes in Life or Routine

During *pregnancy*, women may be constipated because of hormonal changes or because the heavy uterus compresses the intestine. *Aging* may also affect bowel regularity because a slower metabolism results in less intestinal activity and muscle tone. In addition, people often become constipated when *traveling* because their normal diet and daily routines are disrupted.

Abuse of Laxatives

Myths about constipation have led to a serious abuse of laxatives. This is common among people who are preoccupied with having a daily bowel movement.

Laxatives usually are not necessary and can be habit-forming. The colon begins to rely on laxatives to bring on bowel movements. Over time, laxatives can damage nerve cells in the colon and interfere with the colon's natural ability to contract. For the same reason, regular use of enemas can also lead to a loss of normal bowel function.

Ignoring the Urge to Have a Bowel Movement

People who ignore the urge to have a bowel movement may eventually stop feeling the urge, which can lead to constipation. Children may postpone having a bowel movement because of stressful toilet training or because they do not want to interrupt their play.

Specific Diseases

Diseases that cause constipation include neurological disorders, metabolic and endocrine disorders, and systemic conditions that affect organ systems. These disorders can slow the movement of stool through the colon, rectum, or anus.

Several kinds of diseases can cause constipation:

Neurological disorders

- multiple sclerosis
- Parkinson's disease
- chronic idiopathic intestinal pseudo-obstruction
- stroke

- spinal cord injuries

Metabolic and endocrine conditions

- diabetes
- underactive or overactive thyroid gland
- uremia
- hypercalcemia

Systemic disorders

- amyloidosis
- lupus
- scleroderma

Problems with the Colon and Rectum

Intestinal obstruction, adhesions, diverticulosis, tumors, colorectal stricture, Hirschsprung's disease, or cancer can compress, squeeze, or narrow the intestine and rectum and cause constipation.

Problems with Intestinal Function (Chronic Idiopathic Constipation)

Some people have chronic constipation that does not respond to standard treatment. This rare condition, known as idiopathic chronic constipation may be related to problems with intestinal function such as problems with hormonal control or with nerves and muscles in the colon, rectum, or anus. Functional constipation occurs in both children and adults and is most common in women.

Colonic inertia and delayed transit are two types of functional constipation caused by decreased muscle activity in the colon. These syndromes may affect the entire colon or may be confined to the lower or sigmoid colon.

Functional constipation that stems from abnormalities in the structure of the anus and rectum is known as anorectal dysfunction, or anismus. These abnormalities result in an inability to relax the rectal and anal muscles that allow stool to exit.

What diagnostic tests are used?

Most people with constipation do not need extensive testing and can be treated with changes in diet and exercise. The tests the doctor performs depend on the duration and severity of the constipation, the person's age, and whether blood in stools, recent changes in bowel movements, or weight loss have occurred.

Medical History

The doctor may ask a patient to describe his or her constipation, including duration of symptoms, frequency of bowel movements, consistency of stools, presence of blood in the stool, and toilet habits (how often and where one has bowel movements). A

record of eating habits, medication, and level of physical activity or exercise will also help the doctor determine the cause of constipation.

Physical Examination

A physical exam may include a rectal exam with a gloved, lubricated finger to evaluate the tone of the muscle that closes off the anus (anal sphincter) and to detect tenderness, obstruction, or blood. In some cases, blood and thyroid tests may be necessary to look for thyroid disease and serum calcium or to rule out inflammatory, neoplastic, metabolic, and other systemic disorders.

Extensive testing usually is reserved for people with severe symptoms, for those with sudden changes in number and consistency of bowel movements or blood in the stool, and for older adults. Additional tests that may be used to evaluate constipation include

- colorectal transit study
- anorectal function tests

Because of an increased risk of colorectal cancer in older adults, the doctor may use tests to rule out a diagnosis of cancer, including

- barium enema x ray
- sigmoidoscopy or colonoscopy

Colorectal transit study. This test, reserved for those with chronic constipation, shows how well food moves through the colon. The patient swallows capsules containing small markers that are visible on an x ray. The movement of the markers through the colon is monitored with abdominal x rays taken several times 3 to 7 days after the capsule is swallowed. The patient follows a high-fiber diet during the course of this test.

Anorectal function tests. These tests diagnose constipation caused by abnormal functioning of the anus or rectum (anorectal function). Anorectal manometry evaluates anal sphincter muscle function. For this test, a catheter or air-filled balloon inserted into the anus is slowly pulled back through the sphincter muscle to measure muscle tone and contractions.

Defecography is an x ray of the anorectal area that evaluates completeness of stool elimination, identifies anorectal abnormalities, and evaluates rectal muscle contractions and relaxation. During the exam, the doctor fills the rectum with a soft paste that is the same consistency as stool. The patient sits on a toilet positioned inside an x ray machine and then relaxes and squeezes the anus to expel the paste. The doctor studies the x rays for anorectal problems that occurred as the paste was expelled.

Barium enema x ray. This exam involves viewing the rectum, colon, and lower part of the small intestine to locate any problems. This part of the digestive tract is known as the bowel. This test may show intestinal obstruction and Hirschsprung's disease, a lack of nerves within the colon.

The night before the test, bowel cleansing, also called bowel prep, is necessary to clear the lower digestive tract. The patient drinks a special liquid to flush out the bowel. A clean bowel is important, because even a small amount of stool in the colon can hide details and result in an incomplete exam.

Because the colon does not show up well on x rays, the doctor fills it with barium, a chalky liquid that makes the area visible. Once the mixture coats the inside of colon and rectum, x rays are taken that reveal their shape and condition. The patient may feel some abdominal cramping when the barium fills the colon, but usually feels little discomfort after the procedure. Stools may be a whitish color for a few days after the exam.

Sigmoidoscopy or colonoscopy. An examination of the rectum and lower (sigmoid) colon is called a sigmoidoscopy. An examination of the rectum and entire colon is called a colonoscopy.

The patient usually has a liquid dinner the night before a sigmoidoscopy and takes an enema early the next morning. A light breakfast and a cleansing enema an hour before the test may also be necessary.

To perform a sigmoidoscopy, the doctor uses a long, flexible tube with a light on the end called a sigmoidoscope to view the rectum and lower colon. First, the doctor examines the rectum with a gloved, lubricated finger. Then, the sigmoidoscope is inserted through the anus into the rectum and lower colon. The procedure may cause a mild sensation of wanting to move the bowels and abdominal pressure. Sometimes the doctor fills the colon with air to get a better view. The air may cause mild cramping.

To perform a colonoscopy, the doctor uses a flexible tube with a light on the end called a colonoscope to view the entire colon. This tube is longer than a sigmoidoscope. The same bowel cleansing used for the barium x ray is needed to clear the bowel of waste. The patient is lightly sedated before the exam. During the exam, the patient lies on his or her side and the doctor inserts the tube through the anus and rectum into the colon. If an abnormality is seen, the doctor can use the colonoscope to remove a small piece of tissue for examination (biopsy). The patient may feel gassy and bloated after the procedure.

How is constipation treated?

Although treatment depends on the cause, severity, and duration, in most cases dietary and lifestyle changes will help relieve symptoms of constipation and help prevent it.

Diet

A diet with enough fiber (**20 to 35 grams each day**) helps in forming soft, bulky stool. A doctor or dietitian can help plan an appropriate diet. High-fiber foods include beans, whole grains and bran cereals, fresh fruits, and vegetables such as asparagus, brussels sprouts, cabbage, and carrots. For people prone to constipation, limiting foods that have little or no fiber, such as ice cream, cheese, meat, and processed foods, is also important.

Bran is the brown, outer covering of cereal grains such as wheat, rye, oats, barley, corn and rice. The body does not digest it as we lack the enzymes needed to break down this complex carbohydrate. As it goes through your gastrointestinal system, it absorbs water and swells. Any food that is undigested is excreted in the stool, as are other waste products.

Research has studied the relationship between high fiber diets and lowering the incidence of colon cancer and diverticulosis. Also, researchers are looking at high fiber diets for lowering the cholesterol level in the blood and managing diabetes. Because fiber stimulates the intestinal peristalsis (movement), food travels through the intestine faster.

There are two types of fiber: insoluble and soluble. **Insoluble fiber** is effective at increasing stool size and bulk and helps reduce constipation and hemorrhoids. Insoluble fiber includes wheat bran, whole cereal grains and vegetables. Researchers have suggested that insoluble fibers may reduce colon cancer and diverticulosis.

On the other hand, **soluble fiber** forms a gelatin-like substance in the intestines and increases the water content in stool. Soluble fiber is found in citrus fruit, legumes (dried beans and peas), oats, barley and "gums" which are found in oatmeal and dried beans. Researchers have suggested that soluble fiber decreases blood cholesterol and results in a lower blood sugar after meals for diabetics. Perhaps you have seen all the oat bran advertising in the media and your grocery store.

Lifestyle Changes

Other changes that can help treat and prevent constipation include drinking enough water and other liquids such as fruit and vegetable juices and clear soups, engaging in daily exercise, and reserving enough time to have a bowel movement. In addition, the urge to have a bowel movement should not be ignored.

Laxatives

Most people who are mildly constipated do not need laxatives. However, for those who have made diet and lifestyle changes and are still constipated, doctors may recommend laxatives or enemas for a limited time. These treatments can help retrain a chronically sluggish bowel. For children, short-term treatment with laxatives, along with retraining to establish regular bowel habits, also helps prevent constipation.

A doctor should determine when a patient needs a laxative and which form is best. Laxatives taken by mouth are available in liquid, tablet, gum, powder, and granule forms. They work in various ways:

- **Bulk-forming laxatives** generally are considered the *safest* but can interfere with absorption of some medicines. These laxatives, also known as fiber supplements, are taken with water. They absorb water in the intestine and make the stool softer.
- **Stimulants** cause rhythmic muscle contractions in the intestines. Brand names include Correctol, Dulcolax, Purge, and Senokot. Studies suggest that phenolphthalein, an ingredient in some stimulant

laxatives, might increase a person's risk for cancer. The Food and Drug Administration has proposed a ban on all over-the-counter products containing phenolphthalein. Most laxative makers have replaced or plan to replace phenolphthalein with a safer ingredient.

- **Stool softeners** provide moisture to the stool and prevent dehydration. These laxatives are often recommended after childbirth or surgery. Products include Colace and Surfak.
- **Lubricants** grease the stool enabling it to move through the intestine more easily. Mineral oil is the most common example.
- **Saline laxatives** act like a sponge to draw water into the colon for easier passage of stool. Laxatives in this group include Milk of Magnesia and Haley's M-O.

People who are dependent on laxatives need to slowly stop using them. A doctor can assist in this process. In most people, this restores the colon's natural ability to contract.

Other Treatments

Treatment may be directed at a specific cause. For example, the doctor may recommend discontinuing medication or performing surgery to correct an anorectal problem such as rectal prolapse.

People with chronic constipation caused by anorectal dysfunction (anismus) can use *biofeedback* to retrain the muscles that control release of bowel movements. Biofeedback involves using a sensor to monitor muscle activity that at the same time can be displayed on a computer screen, allowing for an accurate assessment of body functions. A health care professional uses this information to help the patient learn how to use these muscles.

Colectomy may be an option for people with severe symptoms caused by *colonic inertia*. However, the benefits of this surgery must be weighed against possible complications.

Complications of constipation

Sometimes constipation can lead to complications. These complications include *hemorrhoids* caused by straining or *anal fissures* caused when hard stool stretches the sphincter muscle.

Sometimes straining causes *partial rectal prolapse* that may lead to secretion of mucus from the anus. Usually eliminating the cause of the prolapse, such as straining or coughing, is the only treatment necessary. Severe or chronic prolapse requires surgery to strengthen and tighten the anal sphincter muscle or to repair the prolapsed lining.

Fecal impaction occurs most often in children and older adults. An impaction can be softened with mineral oil taken by mouth and by an enema. After softening the impaction, the doctor may break up and remove part of the hardened stool by inserting one or two fingers into the anus.

Points to Remember

- Constipation affects almost everyone at one time or another.
- Many people think they are constipated when, in fact, their bowel movements are regular.
- The most common causes of constipation are poor diet and lack of exercise.
- Additional causes of constipation include medications, irritable bowel syndrome, abuse of laxatives, and specific diseases.
- In most cases, following these simple tips will help relieve symptoms and prevent recurrence of constipation:
    - Eat a well-balanced, high-fiber diet Drink plenty of liquids.
    - Exercise regularly.
    - Set aside time after breakfast or dinner for undisturbed visits to the toilet.
    - Do not ignore the urge to have a bowel movement.
    - Understand that normal bowel habits vary.
    - Most people with mild constipation do not need laxatives. However, doctors may recommend laxatives for a limited time for people with chronic constipation.