How I do colonoscopy

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ANATOMY

Anatomy is the single most important and challenging aspect of colonoscopic intubation. The rectum lies in the hollow of the sacrum. The sigmoid is a spiral structure that continues over the bladder anteriorly just above the symphysis pubis and then continues its twist to become the descending colon (posterior). This spiral concept is important in every phase of the colonoscopic examination.

The colon is kept in place by a mesentery attached to the posterior abdominal wall. It is the *stretching of the mesentery* and not distention that is responsible for abdominal discomfort during colonoscopy. Whenever the instrument is advanced, the rectosigmoid mesentery is stretched. In younger persons, especially in women, where the mesentery is more likely to be stretched as the colon wraps around the uterus, pain may be quite severe. The only way to relieve the discomfort is to pull back on the instrument and relax the tension. In elderly or obese patients the mesentery is more lax and stretches more easily, often without pain.

Examination

We both start the examination with the patient in the left lateral position. A change in the patient position may, in some instances, help the colonoscope tip advance, but I use it as a last resort when all other measures are unsuccessful (J.D.W.). Other endoscopists (S.T.G.) always use position change proactively to improve the configuration of the colon, especially the sigmoid and descending colon where the supine or right lateral position often opens up acute angulation and aids advancement of the colonoscope (Fig. 1).

The ability to torque or twist the colonoscope shaft with the right hand is the most important maneuver for colonoscopy. To facilitate torque steering, the scope shaft should be held such that it remains flexible and does not resist torqueing maneuvers. I (J.D.W.) let the scope hang down beside the examining table and hold it in place with my right leg, whereas I (S.T.G.) ensure the shaft is held so that it is not looped or resistant to movements.

The splenic flexure should be a "stop point" for colonoscopy. When the tip reaches that area, withdraw the colonoscope to remove loops and straighten the instrument and to relieve tension in the scope.

Two key maneuvers for any successful colonoscopy are torque and frequent reduction with removal of both internal and external loops to keep the colonoscope straight. There are 6 major concepts that we rely on; these have withstood decades of innovations and technologic advancement in colonoscopy:

1. Keep the colonoscope straight.
2. Torque steering of the instrument shaft.
3. Position change and abdominal pressure.
4. Minimize gas insufflation (S.T.G.).
5. Avoid push unless you know where the tip is going.
6. Never let the left thumb leave the up/down dial.

Keep the colonoscope straight

Pulling back frequently to keep the colonoscope straight cannot be stressed enough, starting as early as 20 cm. A loop occurs during every shaft advance (stretching the mesentery) and should be removed by withdrawal and loop reduction. Whenever pushing the shaft inward does not result in colonoscope advancement, it is because a loop is forming, most often in the sigmoid. Because most withdrawal maneuvers require twist of the instrument, a loop frequently forms in the shaft of the instrument outside the patient. This impedes progress and should be removed by de-rotating the external loop (J.D.W.) and transferring the loop into the umbilicus of the instrument (S.T.G.).

Torque steering of the instrument shaft

The right hand holds the instrument shaft and "does" most of the colonoscopy by colonoscope steering and advancement. Together with up or down deflection of the scope tip, it steers in a left/right direction (tip up with clockwise torque steers right; tip down with clockwise torque steers left). The right/left wheel is used for finer tip steering movements and can be manipulated using the middle finger of the left hand (S.T.G.), although some endoscopists (J.D.W.) bring their right

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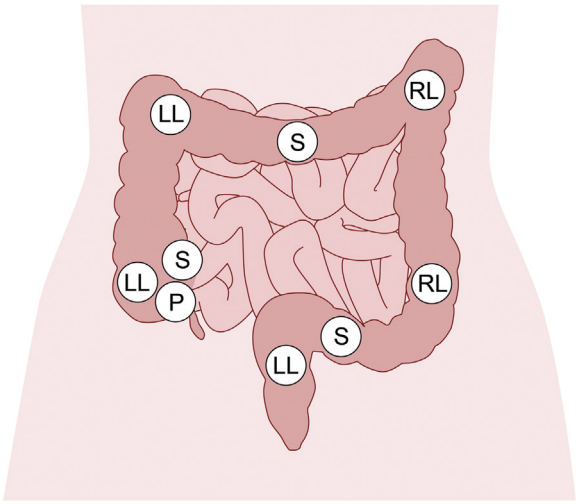

Figure 1. Position change as indicated may aid insertion and optimizes views during extubation. *LL*, left lateral; *S*, supine; *RL*, right lateral; *P*, prone.

hand up from the instrument shaft to control the right/left wheel.

Position change and abdominal pressure

If position change does not help advance the tip of the instrument because of looping, abdominal pressure can be helpful. Ideally, it is applied in a guided fashion, and when the colonoscope is straight, its purpose is to reduce the chance of loop reformation. If using an image-guided colonoscope, hand pressure can be accurately guided by the lateral view. Pressure over the suprapubic area when the straightened colonoscope tip is between 20 and 30 cm from the anal verge (Fig. 2) or left lower quadrant pressure as the instrument is progressing toward the splenic flexure or transverse colon may reduce loop formation. Pressure should be avoided when a loop is already formed; the loop should be resolved first and pressure used to stop it from re-forming. One exception to this is in deep transverse looping where upward pressure from the lower abdomen may help to advance the tip of the instrument by reducing the loop (Fig. 3). The location of pressure is determined by the endoscopist, not the assistant, and rarely needs to be applied for longer than 30 to 60 seconds.

Gas insufflation

Where possible, carbon dioxide should be used to inflate the bowel rather than air, which lasts longer and can contribute to discomfort. There is disagreement as to minimizing the use of gas (S.T.G.) or to use it freely (J.D.W.). The colon is like a long inflated balloon whose length and diameter decrease with gas removal. When advancing the instrument, as soon as a luminal view is obtained, gas should be aspirated to decrease the tension on the endoscope and render the instrument shaft more stable. This in turn minimizes the length of the colon, withdraws the colon over the colonoscope, and reduces the potential for acute angulation forming upstream.

Avoid push unless you know where the tip is going

Although a full luminal view is often not seen, the direction of the lumen must be known before pushing forward blindly. Position change will often help open up acute bends, revealing a luminal view.

Never let the left thumb leave the up/down dial

The left thumb is not used to reach over to the smaller wheel because it loses control of the large dial and encounters a limited range of motion when stretched to move the right/left wheel. Most sigmoid intubation involves a combination of torque steering the shaft in close coordination with the action of the left thumb on the up/down control. The middle finger may be used to assist with fine tip steering using the right/left dial (S.T.G.), freeing up the right hand to control shaft movements.

DIFFICULT COLONOSCOPY

Sometimes the colonoscope cannot advance through the sigmoid colon because of fixation from adhesions or to tight mesenteric attachments where the angulations are more acute than the flexed tip of the scope can negotiate. In these instances, we change to a pediatric colonoscope or gastroscope, which have a shorter distal bending section and a tighter angle of deflection. Once the smaller colonoscope has passed beyond the acute angulations and the shaft has been straightened, the fixed segment acts like a stent. Almost always the short gastroscope can then be passed to the cecum (whereas if used in a normal colon, it would be subjected to recurrent sigmoid looping and never achieve a complete examination). In long loopy colons a pediatric colonoscope may be too floppy; in that instance switch to an adult colonoscope, which is less prone to looping. Insertion through very fixed or very loopy sigmoids may be assisted with the use of full or partial water immersion. The right lateral or prone position is my position of choice in these situations (S.T.G.).

TERMINAL ILEUM INTUBATION

Entry into the terminal ileum should always be attempted. There are 2 observations that will allow entry into the terminal ileum:

1. The appendiceal orifice is usually crescent shaped. If the crescent is imagined to be a bow, an arrow fitted into that bow will always point toward the ileal orifice.
2. When the tip is near the appendiceal orifice, the valve is always on the closest wall.

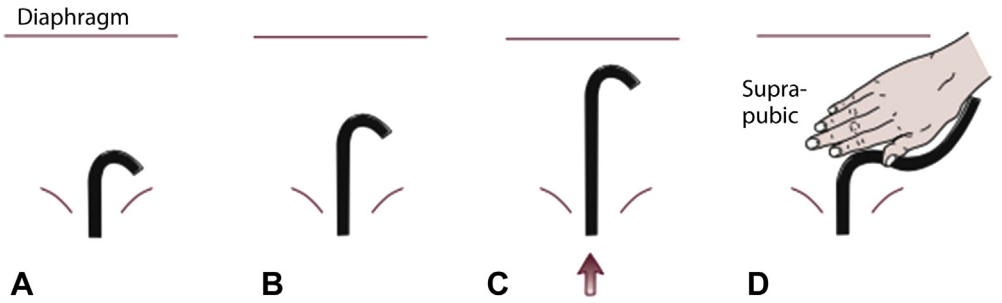

Figure 2. A, B, C, Pushing the scope in often results in stretching of the mesentery. **D,** This may be avoided by applying suprapubic pressure. (From Waye JD, Aisenberg J, Rubin PH. Practical colonoscopy. Hoboken, NJ: Wiley Blackwell, 2013.)

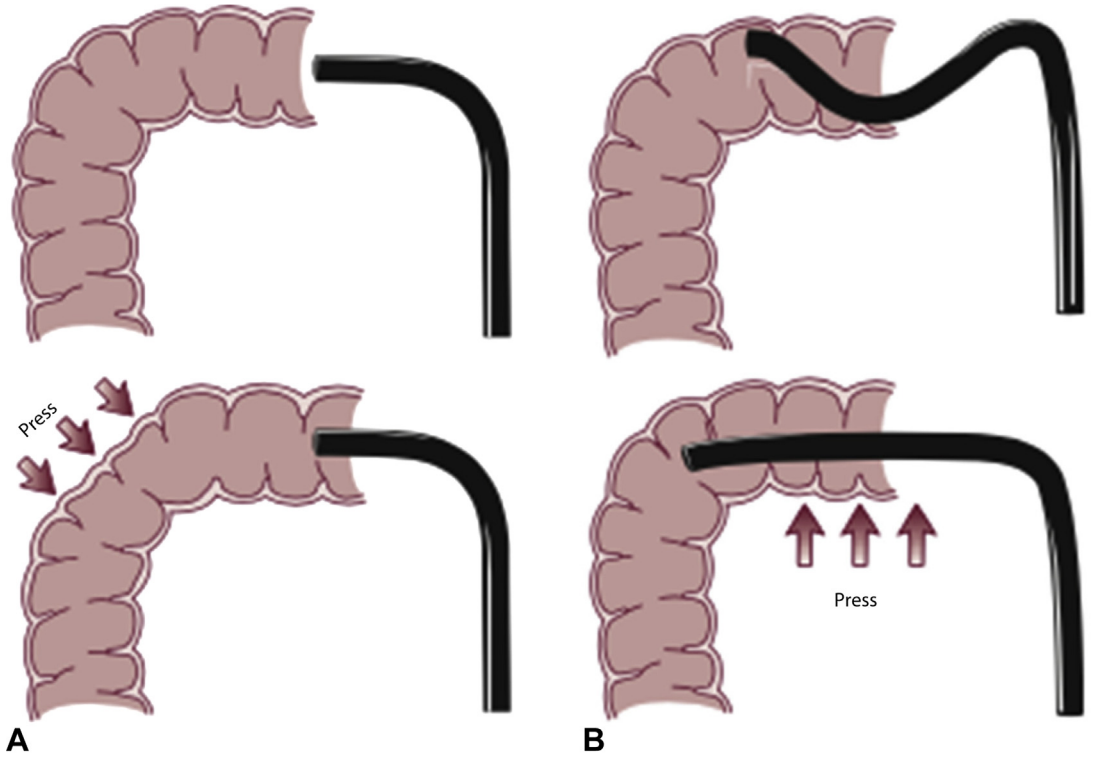

Figure 3. Abdominal pressure may help to advance the scope, either by pushing the colon over the scope (**A**) or by pushing on the scope (**B**). (From Waye JD, Aisenberg J, Rubin PH. Practical colonoscopy. Wiley Blackwell 2013.)

With the tip in the cecum and pointed toward the valve, aspirate air and withdraw the scope. The right hand guides the deflected tip during withdrawal. If the tip misses the valve, aspiration returns it into the caput for further attempts. Position change may facilitate this maneuver.

RETROFLEXION

We always attempt retroflexion in the rectum. Fully inflate the rectum, and then manipulate the shaft gently into a U-turn position; using the lateral wheel may help deflect the tip to improve the view. If resistance or pain is felt, pushing should be discontinued.

EXTUBATION TECHNIQUE

Close examination of the colonic mucosa is best done during extubation. The key points to remember are as follows:

1. Inflate enough to get clear views (then aspirate once a segment has been examined).
2. Rotate fluid to the 6 o'clock position so it is easily and accurately suctioned.
3. Take care to examine behind flexures and folds.

4. Reinsert the colonoscope if you fall back too quickly to avoid missing sections of mucosa.
5. Consider using position change to optimize the view.

SUMMARY

Whenever we start a colonoscopy, we expect to reach the terminal ileum. To do so, the colonoscope must be pulled back often to straighten the shaft. Always keep in mind that the patient deserves your full attention and skill to achieve a safe and complete colonoscopy.

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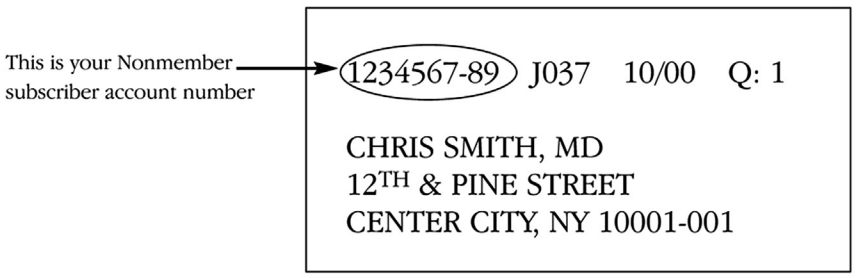

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