

*Indian Association of
Gastrointestinal Endo Surgeons*



MANUAL OF ENDOSCOPY



Endoscopy Board, IAGES

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Steps of Colonoscopy: Planning, Preparation, and Procedure

Chapter Outline

- ⊙ Indications for Colonoscopy
 - Diagnostic Colonoscopy
 - Screening Colonoscopy
 - Surveillance Colonoscopy
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- ⊙ Caution
- ⊙ Bowel Preparation
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 - Colonoscopy Through Colostomy

Keywords: Diagnostic colonoscopy, bowel preparation, colonoscopy steps

■ INTRODUCTION

Colonoscopic examination is indicated in various lower gastrointestinal (GI) disorders, both for diagnostic and therapeutic purposes. Unlike upper GI endoscopy, it is technically more demanding to navigate the whole colon and hence takes longer to become competent in the art of colonoscopy. This chapter outlines the planning, preparation, and procedure with several useful practical tips.

■ INDICATIONS FOR COLONOSCOPY

Diagnostic Colonoscopy

- All cases of bleeding per rectum (PR)
- Anemia due to occult GI blood loss
- Persistent diarrhea
- To investigate constipation
- To evaluate the colon showing some abnormality in imaging

Screening Colonoscopy

Screening for colonic polyps/cancers in risk groups (family history of colonic polyposis or cancer colon).

Surveillance Colonoscopy

- Long duration of inflammatory bowel disease (IBD) (>10 years)
- Postpolypectomy cases
- Postoperative colonic cancer cases

Therapeutic Colonoscopy

For various therapies, e.g., polypectomy, hemostasis, dilatation, and stenting.

■ CONTRAINDICATIONS

- *Absolute contraindication:*
 - Acute abdomen, e.g., suspected viscus perforation
 - Toxic megacolon
- *Relative contraindication:*
 - Avoid for 3 months after myocardial infarction
 - Avoid during pregnancy with a past history of miscarriage
 - Avoid during acute diverticulitis

■ CAUTION

- In case of severe IBD with large ulcers, postradiation strictures, postoperative cases with fixed loops of bowel (for fear of perforation)

- In cases of cirrhosis with ascites or a patient on peritoneal dialysis, because of the risk of bacterial peritonitis.
- Careful in patients with pacemakers and implantable defibrillators not to use diathermy indiscriminately.

■ BOWEL PREPARATION (FIG. 1)

- Mechanical bowel preparation using a balanced electrolyte solution containing polyethylene glycol is a common practice. Several commercial preparations are available (Peglec, Golytely) (**Fig. 1**) but use one you are familiar and happy with. Avoid the ones that are unpalatable and make the patient vomit. Magnesium salts or sodium picosulphate are also useful. Avoid mannitol because of the risk of an explosion hazard.
- Advise the patient to be on a low-residue diet for 2 days and a liquid diet on the previous day.
- Ask the patient to take the 2 L of prepared solution (polyethylene glycol) over a period of 2 hours in the early morning and report to you once they have passed 5–10 times of clear watery motion.
- Slate the procedure in the early afternoon as a day case. Admit if the patient is a high-risk case or needs major therapeutic intervention.
- Split dosing of bowel preparation is also beneficial. In such a case, ask the patient to take 1 L of the mixed-up solution in the previous day's evening and take only clear liquids afterward. The remaining 1 L can be consumed in the early morning to ensure a clean bowel.
- Water, tender coconut, green tea, or black coffee, and fruit juices can be consumed up to 1–2 hours prior to colonoscopy and do not pose any trouble in bowel preparation.
- Explain to them the importance of a clean bowel for a safe and successful procedure
- A chronically constipated patient may require an additional dosage.



Fig. 1: Peglec powder.

- A patient with an obstructed left-sided colonic tumor or stricture may not succeed in clearing the bowel, and it may even be hazardous. So, instead, give a phosphate enema to evacuate the distal bowel, and then you may proceed to a limited colonoscopy (**Fig. 2**).
- In the case of IBD with severe diarrhea, bowel preparation may not always be necessary.
- In a patient with a defunctioning colostomy, pass a catheter into the distal stoma opening and flush the bowel with saline or tap water, followed by a phosphate enema (**Fig. 3**).
- In a bleeding patient, Ryle's tube-aided lavage or colonoscopy in an unprepared bowel can be considered. A good irrigation and suction system is invaluable during such cases.

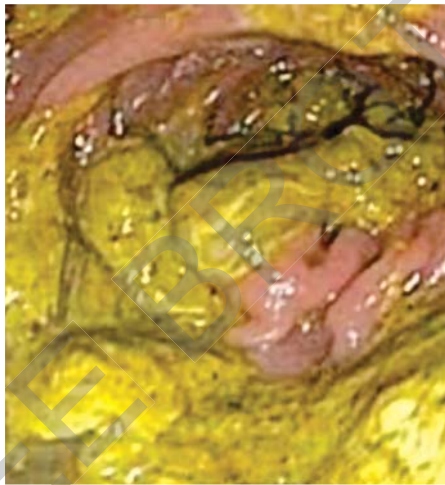


Fig. 2: Unprepared distal bowel.

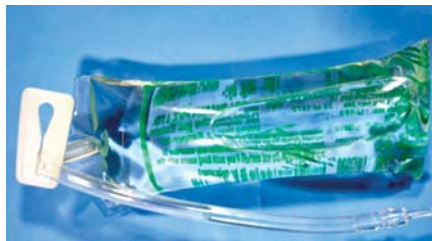


Fig. 3: Sodium phosphate enema.

■ INFORMED CONSENT

Written informed consent is paramount for moral and ethical reasons, and also to prevent any medicolegal consequences.

- Consent should ideally be taken by the colonoscopist himself/herself.
- Ensure that the patient is competent to give consent. Obtain consent from parents or spouses for young children, and unconscious or mentally disturbed patients.
- Consent should be given voluntarily by the patient after receiving sufficient information regarding the colonoscopy procedure, namely why it is done, how it is done, what the benefits and risks of the procedure are, any alternatives to colonoscopy, and the possibility of performing any additional procedures if needed (**Fig. 4**).
- Give a “Patient information leaflet” written in simple and easy-to-follow language with all the details regarding the colonoscopy procedure
- The patient should be encouraged to ask questions and clarify any doubts.
- The patient should sign with their name and address in bold letters with the date and time.
- The consent form should also have the name and signature of the colonoscopist and a witness (next of kin).



Fig. 4: Informed consent.

■ PATIENT INFORMATION LEAFLET

1. *Why do I need a colonoscopy?*

Obviously, your symptoms suggest the possibility of large gut pathology, and hence your doctor asked you to undergo a colonoscopy.

2. *What is a colonoscopy?*

Your doctor would use a video colonoscope, which would allow him to see inside of large gut and rectum to look for any abnormality.

3. *What is a video colonoscope?*

A colonoscope is a long, slim, flexible tube with a tiny camera chip at its tip. This allows us to take video or pictures of the interior of your large gut in fine detail and help in the diagnosis.

4. *When does one need a colonoscopy?*

Patients with bleeding rectum, changes in bowel habits, and unexplained abdominal pain, anemia, unexplained weight loss, and a family history of colonic polyps or cancer would require this novel investigation.

5. *Is there any alternative to colonoscopy?*

Though ultrasound (US) abdomen, computed tomography (CT) abdomen, and barium enemas can be considered, they have several limitations. They won't be as useful as a colonoscopy.

6. *How is a colonoscopy done?*

- You will be given 2 L of bowel cleansing fluid to drink [e.g., polyethylene glycol (Peglec)] over a period of 2 hours. This means you will be having >5–10 times of motion to clean the large gut sufficiently to enable the surgeon to have a good look inside your gut.
- Your blood pressure (BP) and pulse, and body weight will be checked and the nurse will ask you and note down your other medical illnesses, previous abdominal surgery, any medication, and any history of allergies. Kindly bring all your medical prescriptions and investigation reports, and films.
- You will be changed to a hospital gown, and a Venflon needle may be placed on the back of your hand if any injection is to be given.
- You will be asked to sign the informed consent form. You could ask any relevant questions.
- You will be administered oxygen by a nasal cannula and asked to lie down in the examination couch on your left side. You may be given injections to calm you down to ease the discomfort of the procedure. You could sleep, but often you would be awake and able to converse with the surgeon during the whole procedure and watch the screen to look at any abnormality noted.
- At first, the surgeon will perform an examination of your back passage with his creased right index finger to examine your rectum and anus and then start a colonoscopic procedure by gently inserting the scope tip into your back passage.
- As he puts in the air to distend the large gut to enable smooth navigation of the scope, you may feel a bit bloated and uncomfortable. But if it becomes very painful, let the surgeon know so that he can think of some remedial measures.
- Colonoscopy usually takes about 20–30 minutes. So, try to relax and lie still, and concentrate on your breathing while the surgeon completes the procedure.

- The procedure is usually recorded, and any abnormality noted will also be taken as still images for reporting and printing.
- Additional procedures such as biopsy and removal of any abnormal tissue might be done as and when required.

7. *What happens after the procedure?*

- Once the colonoscopy is over, you will be taken to a recovery area to recuperate. You may want to get to the toilet for few more times to pass motion or flatus to ease the tummy, and it is quite expected.
- You will be allowed to take liquids 30 minutes after and solids 1 hour after the procedure.
- You may feel drowsy if sedation was given, and in that case, you will not be able to drive your car or ride a motorbike for a day.
- You may be asked to get admitted if any therapy was given.
- If any biopsy was done, then the specimen will be sent to the histology lab and the results will take a few days.

8. *Are there any risks with the procedure?*

- Colonoscopy is a reasonably safe procedure
- You may feel a bit bloated and have the urge to pass flatus or feces soon after the examination
- If you have severe abdominal pain, kindly inform the medical personnel.
- Some unexpected complications could rarely happen to 1 in 500 patients such as heart or chest difficulties, bleeding, and perforation in the gut. If any of the problems happen, then you may have to stay in the hospital and even require surgery in rare instances.

9. *When should you contact us?*

If you have persistent abdominal pain, bleeding rectum, or fever, then do not hesitate to contact the hospital.

You will be given an appointment with a doctor to discuss the result of the colonoscopy and all other reports and decide about further therapy.

■ ABOUT THE HARDWARE OF COLONOSCOPE

- The insertion section is longer, and wider, but more flexible than gastroscopes. Standard colonoscopes are 130 cm long, while long colonoscopes with 160–180 cm lengths are also available. It has an 11–13 mm outer diameter with a 3.2–3.8 mm channel for accessories.
- The compact but complex design of the Insertion section allows for the best combination of flexibility, column strength, and torque ability.
- The distal 40 cm insertion section is more flexible as it is covered by the soft outer polymer. The proximal portion (50–160 cm) is a bit stiffer due to the hard resin covering. Colonoscopes with variable stiffness have a tensioning wire that runs the length of the insertion section. The amount

of tension in this wire is controlled by rotating a knob at the top end of the insertion section just below the control head.

- Note the size of the channel and where it exits at the scope tip. It is usually 3.2 mm in diameter. When you pass a biopsy forceps through the access channel, see where it comes out in the picture seen in the monitor. Imagine the monitor like a big clock with the top middle of the monitor as 12 o'clock and the bottom middle at 6 o'clock. The biopsy forceps will be seen exiting at the 5 o'clock position. This is very important to understand for the successful conduct of various therapeutic interventions. So, treat the monitor like a clock! It is always better to rotate the scope to bring any colonic lesion to the bottom half of the monitor so tissue sampling or endotherapy would be easy to perform.
- Variable stiffness colonoscopes are also available. They are armed with a twisting control unit at the junction of the control head with the insertion section. It enables stiffening of the shaft of the scope to avoid relooping of the bowel.

■ ABOUT THE COLONOSCOPY ROOM LAYOUT (FIG. 5)

- Large, spacious, well-ventilated room with optional C-arm X-ray facility for monitoring scope position. Magnetic imaging is nowadays available, e.g., a scope guide by Olympus.
- Patient lying in the left lateral position (Fig. 6).
- Endoscopist standing to face the patient's back and viewing the ergonomically placed monitors.
- One assistant at the head end of the patient to administer drugs and to monitor the patient.
- Another staff member to assist the endoscopist with the procedure and help with accessories.



Fig. 5: Colonoscopy room layout.



Fig. 6: Left lateral position.

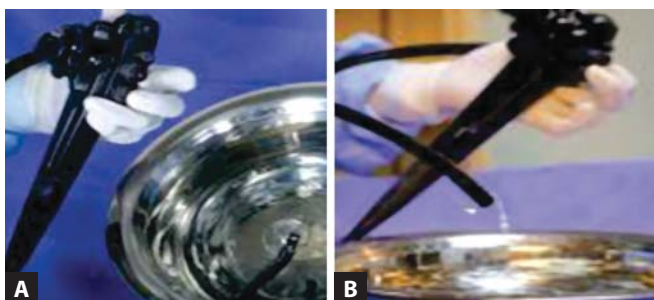
- Energy sources and irrigation, and suction system.
- Facility for image and video recording and printing.

■ PREPROCEDURE PATIENT CHECKLIST

- Check for indication of colonoscopy
- Look for any comorbidity such as ischemic heart disease (IHD)/diabetes mellitus (DM)/hypertension (HT).
- *Drug history:* Warfarin, aspirin, clopidogrel, and diabetic and hypertensive drugs
- Any history of (H/O) drug allergy.
- Previous abdominal surgery and pacemaker insertion.
- Bowel preparation is adequate as per the inquiry.
- Documentation of vital signs and blood reports.
- Informed consent form signed.

■ INSTRUMENT CHECKLIST

- Clean, disinfected, and leak-tested colonoscope is ready for use.
- The video processor and light source are on, and the image display is seen on the monitor.
- The water bottle is full, and the air pump is working.
- The suction and irrigation system is functioning (**Figs. 7A and B**).



Figs. 7A and B: Checking air and water feeding.

■ MEDICATION AND MONITORING DURING COLONOSCOPY

- Conscious sedation, along with analgesics, is the common practice
- Use midazolam along with fentanyl, pethidine, or tramadol. Intravenous (IV) propofol can also be used (**Fig. 8**).
- No sedation colonoscopy requires an understanding patient and a skillful. It is only practiced in a few centers.
- Rational use of antispasmodic drugs like IV 20 mg of hyoscine N-butylbromide (Buscopan) is often helpful, and we routinely use it.
- We administer 2 mg of midazolam, 50 mg of tramadol, and 20 mg of Buscopan IV bolus for all our adult patients routinely.
- Give prophylactic antibiotics in needy high-risk patients (infective endocarditis protocol). Give a single IV dose of gentamicin (120 mg) with amoxicillin 1 g and a further oral dose of amoxicillin (500 mg) 6 hours later.
- Use of CO₂ instead of air during colonoscopy minimizes pain, especially in patients with diverticular disease or IBS.
- Ensure venous access catheter, nasal O₂, electrocardiogram (ECG) monitoring, and pulse oximetry.
- Be alert about the patient's pain intensity and restlessness.
- Avoid rash or undue force during colonoscopy. Be gentle and always be watchful.



Fig. 8: Medication given during colonoscopy.

■ SINGLE OR TWO-PERSON COLONOSCOPY

Single-person colonoscopy means the surgeon himself controls the wheels and buttons with his left hand and holds the moving shaft with his right hand. We strongly recommend this technique (**Fig. 9**).

Hold the shaft about 20–25 cm from the anal verge using a gentle finger grip. Hold the shaft of the scope gently like a pen with a piece of gauze and avoid gripping the scope like a tennis racket (**Figs. 10A and B**).

Two-person colonoscopy means the surgeon takes control of the control head with both his hands while his assistant manipulates the shaft (**Fig. 11**).

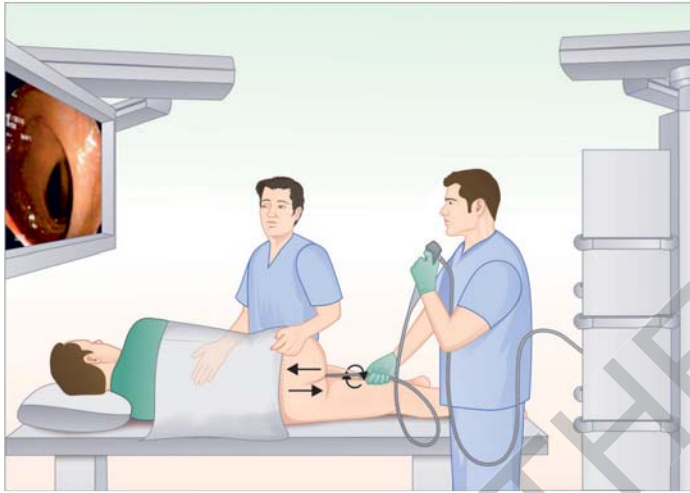
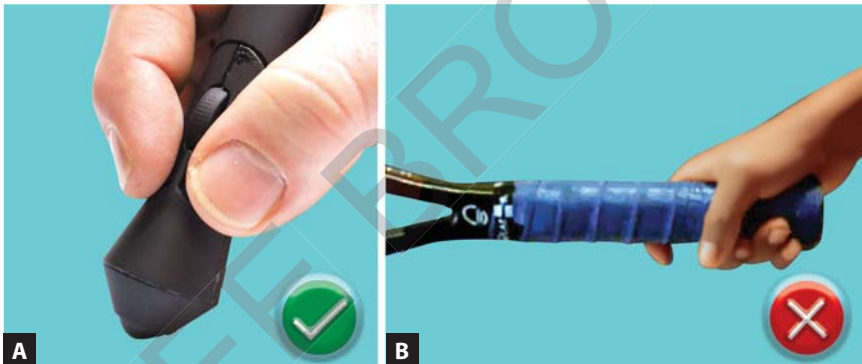


Fig. 9: Single-person colonoscopy.



Figs. 10A and B: Handling of colonoscopy.

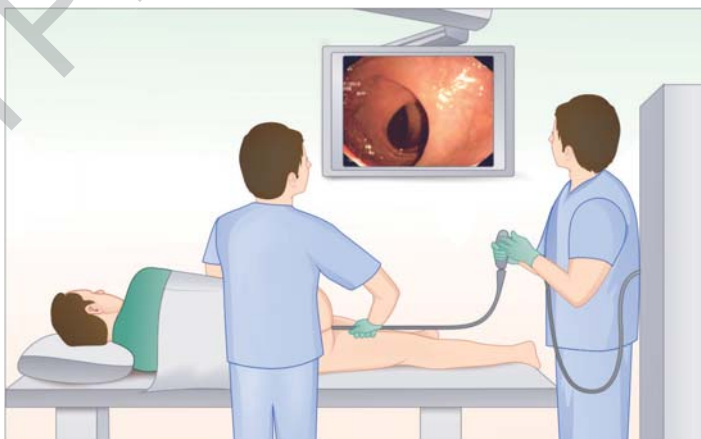


Fig. 11: Two-person colonoscopy.

■ UNDERSTANDING BASIC COLONOSCOPIC ANATOMY

- **Rectum (Fig. 12):**
 - Dentate line forms the boundary between the anal canal and the rectum
 - Rectum has smooth and reflective mucosa
 - More prominent vascular patterns compared to the rest of the colon
 - Crescent-shaped rectal valves of Houston
 - 15 cm length
- **Sigmoid colon (Fig. 13):**
 - Composed of tortuous bowel with round or oval-shaped lumen and shiny, smooth surface.
 - Looping can occur due to its mobility.
- **Descending colon (Fig. 14):**
 - Runs mostly straight for 20–30 cm and has an oval-shaped lumen.
 - The bottom half of the lumen may be filled with fluid.
 - Bluish discoloration of the spleen heralds the arrival of the splenic flexure.
- **Transverse colon (Fig. 15):**
 - Characteristic triangular lumen with pronounced haustrations.
 - Bluish discoloration due to the liver is appreciable at the hepatic flexure.
- **Ascending colon and cecum (Figs. 16 and 17):**
 - Widest part and usually triangular lumen and thin wall.
 - Note the curved, thick, yellowish ileocecal fold, often with an indentation at its center.
 - Cecal pole with appendicular opening is recognized as a crow's foot due to converging taenia.

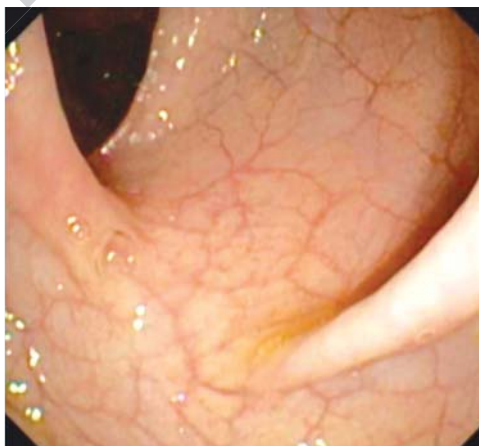


Fig. 12: Rectum.

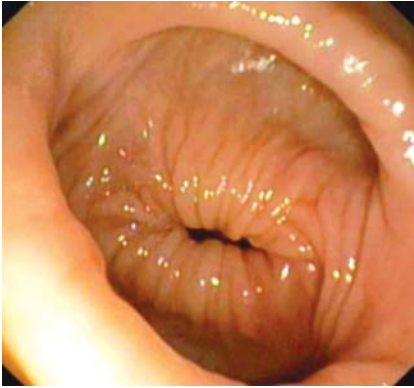


Fig. 13: Sigmoid colon.

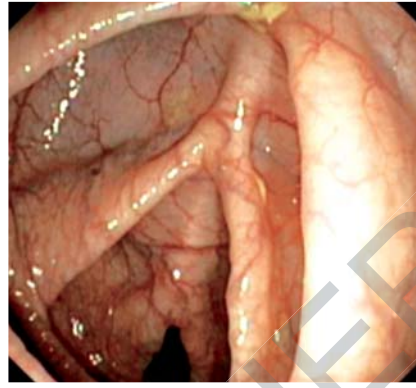


Fig. 16: Ascending colon.

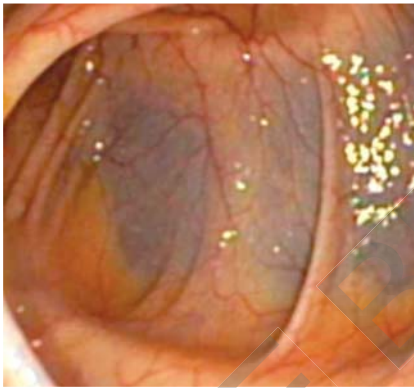


Fig. 14: Splenic flexure.

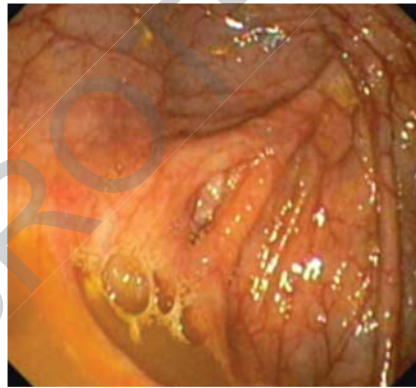


Fig. 17: Cecal pole.

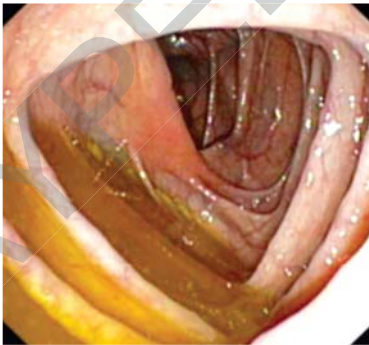


Fig. 15: Transverse colon.

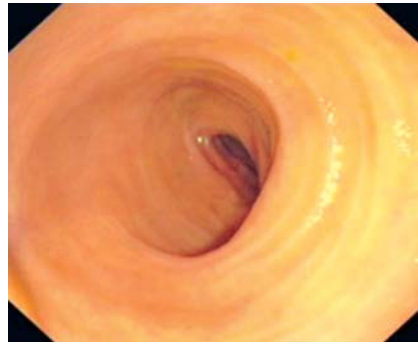


Fig. 18: Terminal ileum.

■ **Terminal ileum (Fig. 18):**

- Velvety granular mucosa with less prominent vascular pattern.
- May have some prominent lymphoid follicles.

■ 10 KEY STEPS OF COLONOSCOPY

Examination of Anal Canal and Rectum

- Inspect the anal region for any skin tags, external piles, fistula, and fissure or prolapse rectum.
- Use 2% xylocaine jelly and lubricant for rectal examination and feel for sphincter tone, luminal pathology such as growth and polyps, and prostate. Also, look for any evidence of malena or fresh blood on the finger stalls (**Fig. 19**).
- Finger-guided insertion of the well-lubricated colonoscope through the anal sphincter (**Fig. 20**).

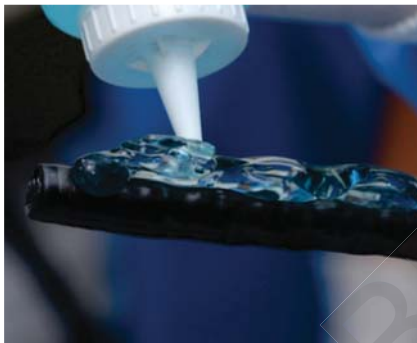


Fig. 19: Lubricant application in colonoscopy.

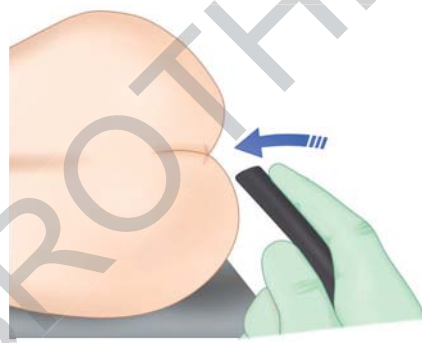


Fig. 20: Inserting the colonoscope.

- Liberal lubrication of the bending section is the key to the smooth insertion of the colonoscope.
- Visualize the lumen of the rectum and insufflate and proceed to the rectosigmoid junction at 15 cm from the anal margin.
- Upper rectum is examined on the way in, while the lower rectum is better visualized on the way out (retroflexion of colonoscope)
- Air leakage due to a lax sphincter would be a challenge. Apply a cotton pad to the perineal body and press against the colonoscopy to minimize air leakage in such cases.
- Anticipate the difficult rectosigmoid junction in young and thin patients with previous pelvic surgery or radiotherapy. Gentle torque steering and repeated small jiggling movements would help to cross the acute rectosigmoid angle.

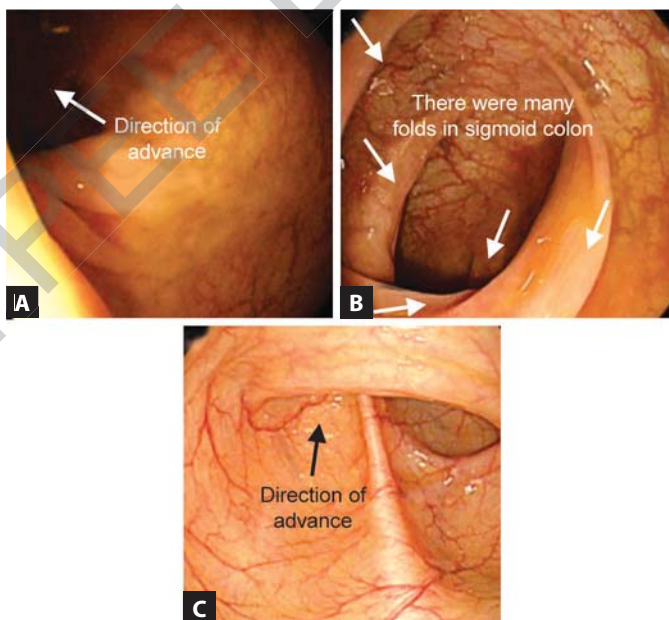
Sigmoid Navigation (**Fig. 21**)

- Be slow and gentle with minimal insufflation.
- Right-hand torque steering is the key to successful navigation.



Fig. 21: Sigmoid navigation.

- Keep the lumen at the center or the top right corner of the monitor.
- Pass the sigmoid colon under vision and reach the sigmoid descending colon junction.
- Presumed directions of bends are shown by the shadowing and also by the direction of the taenia coli (**Figs. 22A to C**).



Figs. 22A to C: Inside view of sigmoid navigation.

- Repeated “pull-backs” would help. So, prepare to take “One step forward but two steps backward” (Fig. 23).

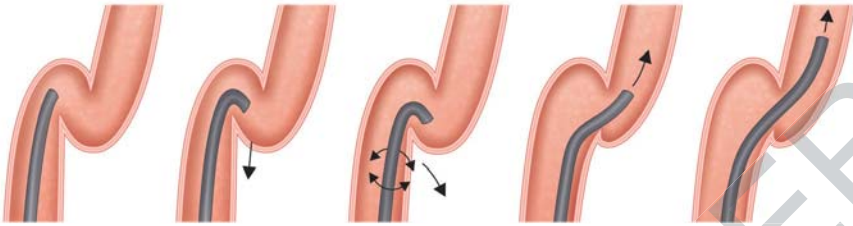
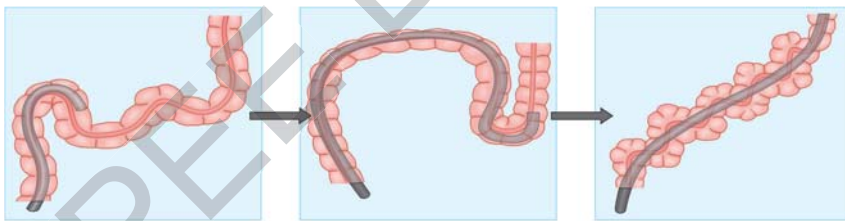


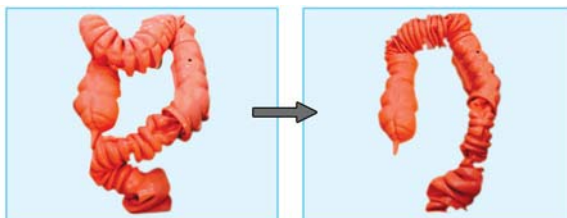
Fig. 23: Tips in navigating sigmoid.

- *Suspect bowing or looping of the scope:*
 - If there is no 1:1 progress of the scope inside
 - If there is any paradoxical movement
 - Stiffness of control wheels
 - Onset of severe pain
- Recognize N-loop formation due to the acute angle at the sigmoid descending colon junction. Pull back, suck, and apply suprapubic external pressure (Figs. 24 and 25).



N loop
Pullback/Suctions/Suprapubic pressure

Fig. 24: N loop reduction.



Before/after loop reduction

Fig. 25: N loop reduction.

- Suspect alpha loop formation (**Fig. 26**) when the scope passes through the descending colon relatively easily and reaches the splenic flexure with a 90 cm mark in the scope. Reduce the loop in the sigmoid by counterclockwise torque, pressure on the lower abdomen, and repeated pullback.
- A successful colonoscopy depends on the smooth and sleek navigation of the sigmoid colon.
- The secret of conquering the sigmoid is clockwise torque steering!



Alpha loop
Pullback and clockwise torque

Fig. 26: Alpha loop reduction.

Descending Colon

Descending colon is relatively straight and oval in shape, and with evenly spaced haustrations, and often you notice a typical fluid level. Try not to suck the fluid and navigate above the fluid levels with minimal insufflations (**Fig. 27**).

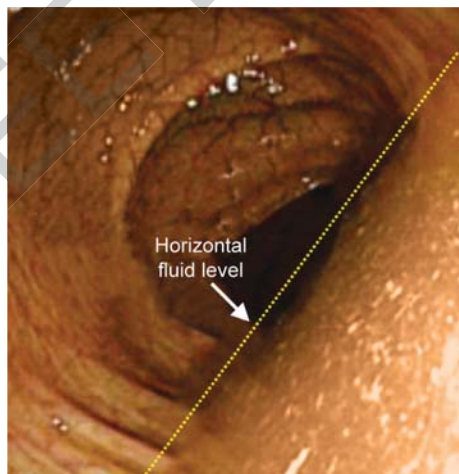
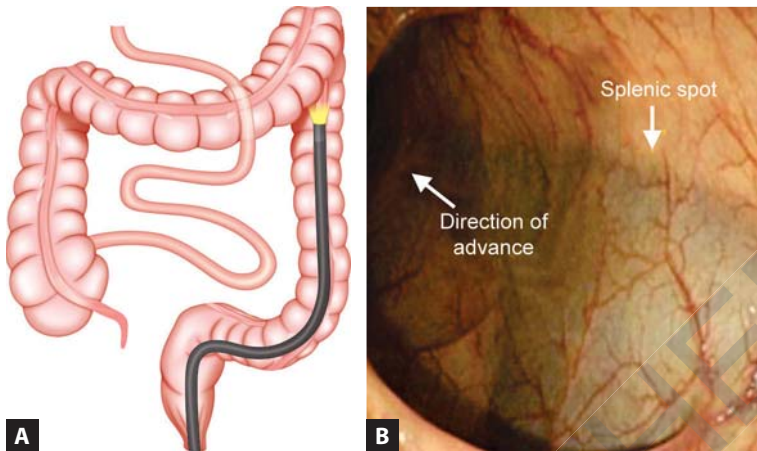


Fig. 27: Descending colon.

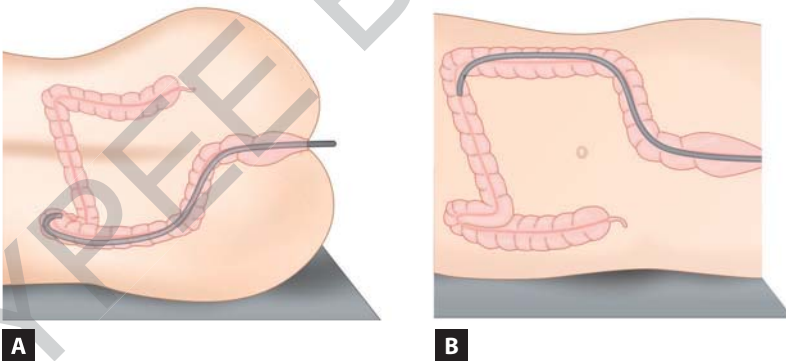
Reaching Splenic Flexure (Figs. 28A and B)

- A visible fold in the lumen on the other side of this segment (usually at 9 o'clock in the monitor) and the appearance of bluish coloration of the spleen indicate that we have reached the splenic flexure.



Figs. 28A and B: Reaching the splenic flexure.

- Fluid around the flexure may hinder navigation. So, suck or surf above the fluid to cross the flexure.
- If the lumen is not clearly seen, follow the course of the taenia coli to cross the bend or consider changing the patient to the right lateral position to obliterate the acute angle at the flexure (**Figs. 29A and B**).

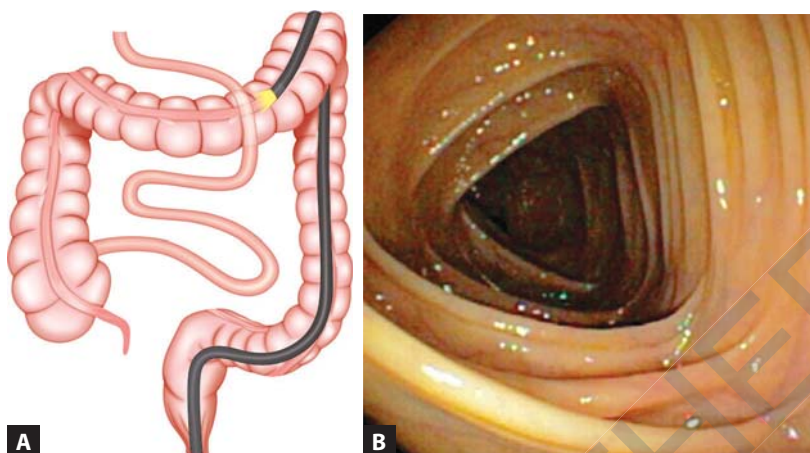


Figs. 29A and B: (A) Left and (B) right lateral position.

- Ask the patient to breathe in deeply to bring the left dome and hence the splenic flexure down.
- If the scope is straight with no looping in sigmoid, the splenic flexure is usually reached with a 40 cm mark in the scope.

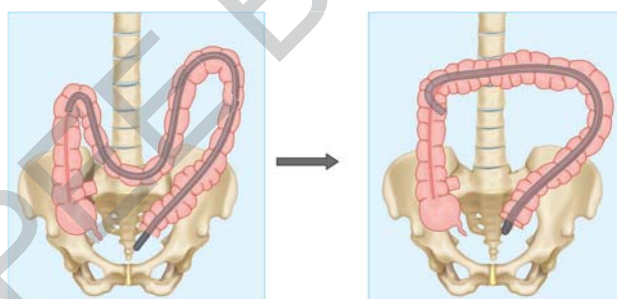
Travel Through the Transverse Colon (Figs. 30A and B)

- The transverse colon is triangular in shape and with evenly spaced haustrations.



Figs. 30A and B: Traveling transverse colon.

- Proceed to hepatic flexure by using a combination of advancing/withdrawing and external hand pressure.
- Occasionally, a gamma loop may form due to redundant transverse colon and may need anticlockwise torque with pull back of the scope for correction (**Fig. 31**).

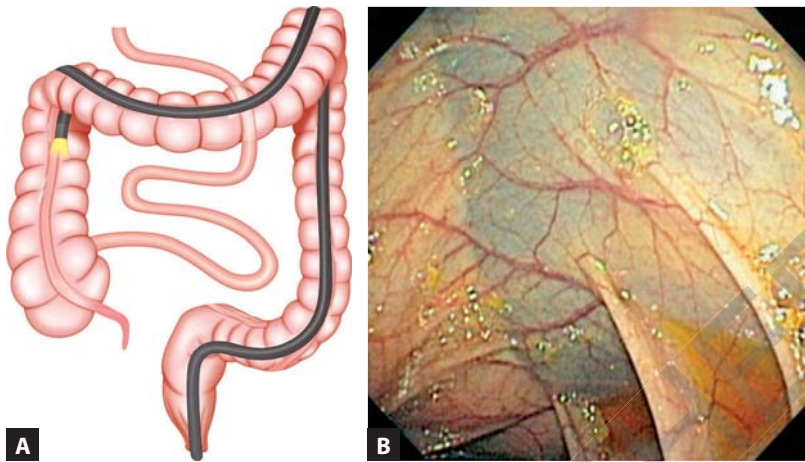


Gamma loop: Pullback/anticlockwise torque central abdominal upward pressure

Fig. 31: Gamma loop reduction.

Reaching Hepatic Flexure (Figs. 32A and B)

- Hepatic flexure is noted by the sharp angling of the lumen. Again, by advancing/withdrawing the scope, changing the patient to supine or even right lateral position, and external hand pressure, we should reach the ascending colon.
- At times, ask the patient to breathe in and hold so as to bring the hepatic flexure down along with diaphragm movement and thereby aiding successful passage.



Figs. 32A and B: Reaching hepatic flexure.

- Intermittent suction and withdrawal of the scope often leads to paradoxical forward movement of the scope tip and helps to reach the hepatic flexure! (**Fig. 33**).
- Remember that an air-distended colon is a long colon, while suction helps to shorten the colon and aids in easy intubation of the right colon!

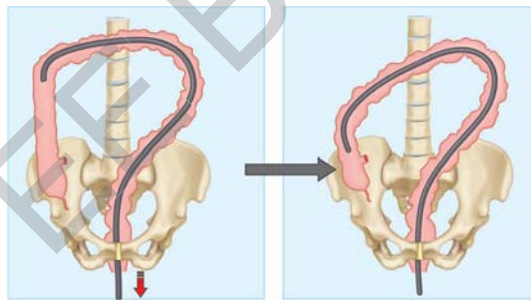
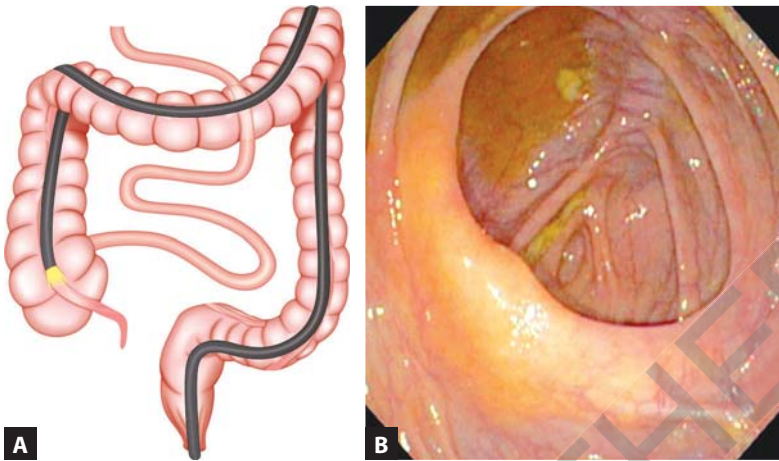


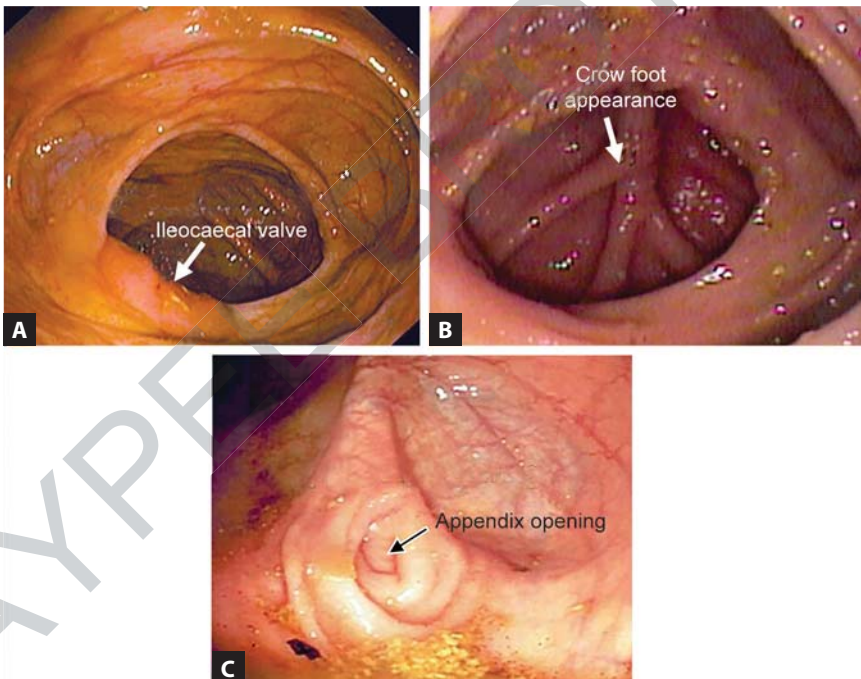
Fig. 33: Suction and withdraw the scope.

Right Colon Down to Cecum (Figs. 34A and B)

- The cecum is identified by the typical crow's foot appearance due to three converging taenia (Mercedes Benz Sign). Appendix opening is usually seen at its center as a semicircular opening.
- Cecum is reached with a 60 cm level in a shortened straight scope.
- The ileocecal fold is seen as a thick lipomatous shiny fold just above the cecum and is usually seen in the bottom half of the monitor (**Figs. 35A to C**).
- A 90–95% cecal intubation rate is the anticipated standard we should strive to achieve.



Figs. 34A and B: Reaching cecum.



Figs. 35A to C: Landmarks to confirm the cecum.

Terminal Ileum

- The bow and arrow sign (**Fig. 36**) is often helpful to locate the ileocecal valve. Locate the appendix orifice. Imagine the appendix lumen as a bow, and an imaginary arrow is shot from it. Its direction would be normally pointing toward the ileocecal valve, and hence angulate the scope in that

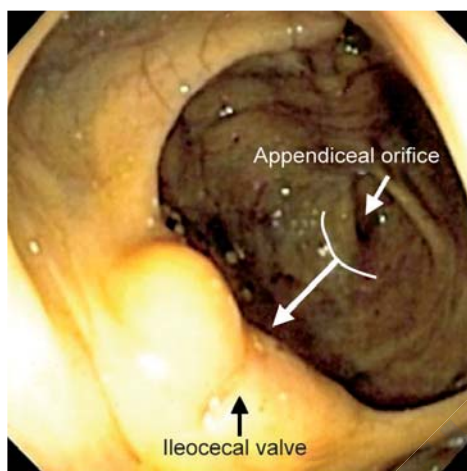
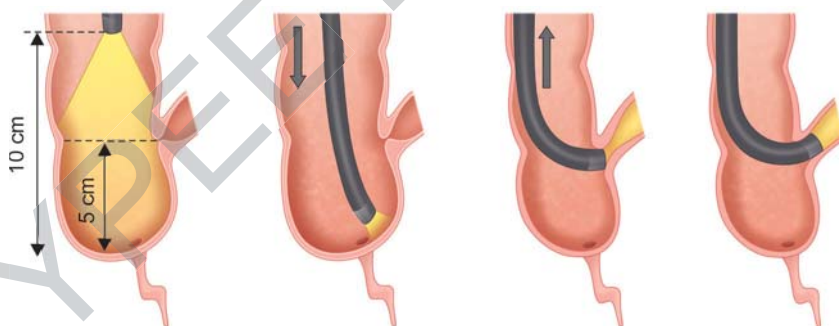


Fig. 36: Bow and arrow sign.

direction (Turn the big wheel away from you) and pull the scope back to reach the proximal lip of the ileocecal valve. Gently insufflate (**Fig. 37**).

- Various types of ileocecal valve can be seen volcano like, wide mouthed or slit like with thin or thick lips. It is usually found hidden just below the lipomatous thick ileocecal fold.



Look down, pullback, and insufflate

Fig. 37: Ileal navigation.

- Normally ileocecal valve would be seen at the 6–7 o'clock position in the monitor. Shifting the patient to the supine position can also bring the valve to a favorable position for intubation. We should be able to intubate the ileum with downward deflection of the big wheel and anticlockwise torque of the scope while withdrawing the scope from the cecal pole (**Fig. 38**).

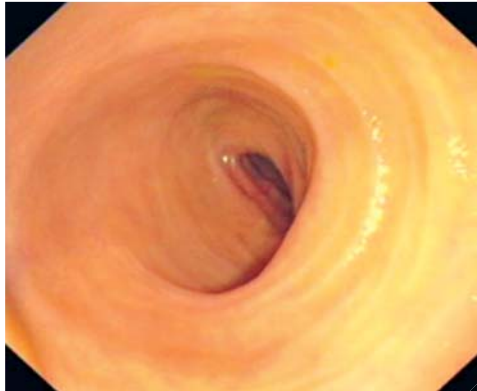


Fig. 38: Ileum.

- Frothy small bowel secretion greets you at the valve, and the granular appearance of the mucosa confirms successful intubation of the ileum. At times, a biopsy forceps can be inserted into the ileum and used as a guide to pass the scope through (**Fig. 39**).
- Examine at least 2 feet of the terminal ileum to look for any lesions.

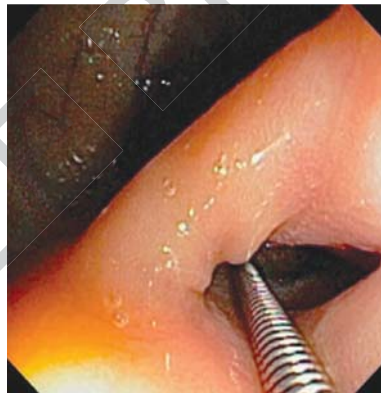
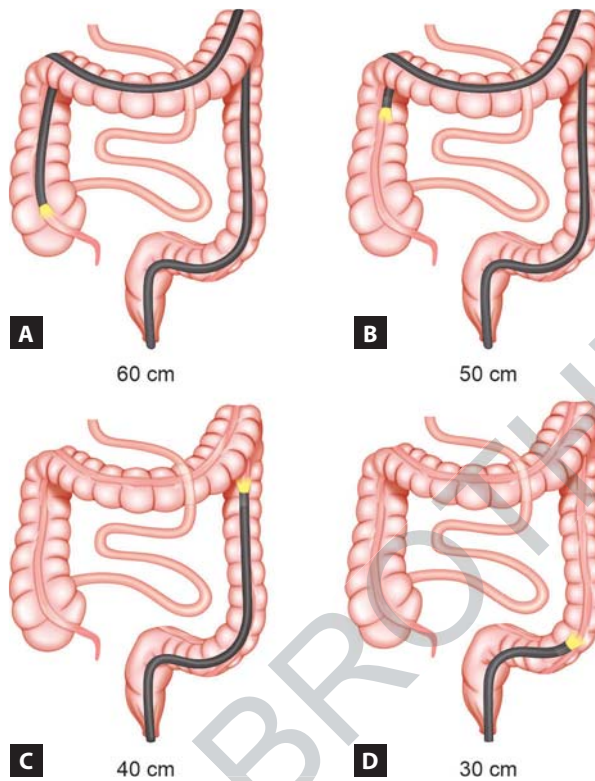


Fig. 39: Navigating the ileum with a guidewire.

Cecum to Rectum Withdrawal

- Do a slow withdrawal of the scope from the cecum to the rectum, taking care to look for blind spots like the area behind the haustral folds and flexures.
- On withdrawal, the cecum is found at 60 cm, the splenic flexure at 40 cm, and the sigmoid colon at 30 cm level (**Figs. 40A to D**).
- A minimum of 6 minutes is to be spent on the withdrawal so as not to miss any small flat lesions.

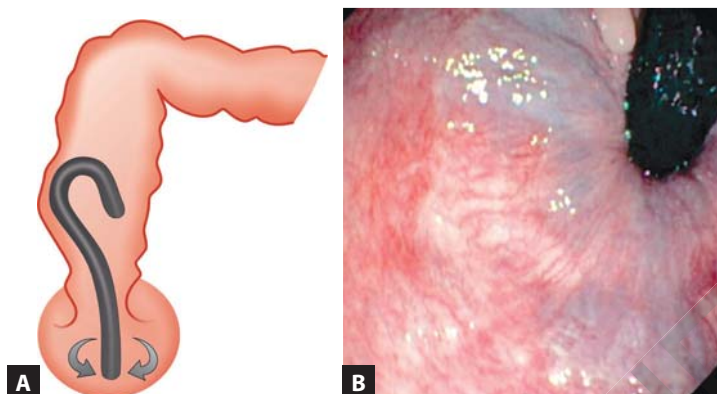


Figs. 40A to D: Scope length in withdrawal.

- *Beware of the following blind spots while performing a colonoscopy:*
 - Ileocecal valve
 - Behind haustral folds
 - Inner fold of hepatic flexure
 - In the pool of fluid near the splenic flexure
 - Behind the rectal valves of Houston

Retroflex in Rectum (Figs. 41A and B)

- Retroflex the scope in the rectum to look for any lower rectal lesions and piles.
- Turn both small and big wheels fully toward you when the scope is in the mid rectum, and then push the scope in and rotate all around to have a panoramic view of the lower rectum and pectinate line (**Fig. 42**).
- Avoid this step in patients with diseased rectum, like IBD, for want of distensibility.
- Document all the findings with relevant pictures and discuss with the patient and relatives regarding the final diagnosis and further management.



Figs. 41A and B: Retroflexion.

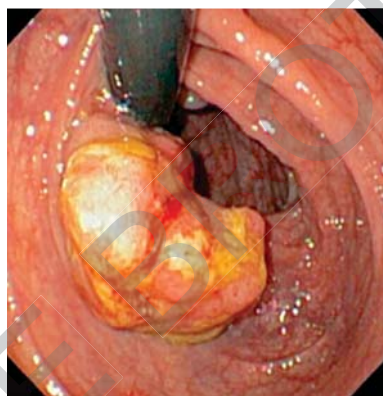


Fig. 42: Growth at the dentate line.

■ TOP 10 TIPS FOR A SUCCESSFUL COLONOSCOPY

1. *Be slow and gentle:*
 - Do not be in a hurry, as loops tend to form and the patient becomes uncomfortable.
 - Remember the rabbit and turtle story! Be slow and steady to win the race!
2. *Minimal insufflation:*
 - Minimal air insufflation to distend the bowel should suffice.
 - Distension makes the bowel loops longer and more tortuous, and hence the procedure becomes more difficult.
3. *Straight scope:* Ensure that the scope is straight with one-to-one movement.
4. *Art of torque steering:* Clockwise twisting of the shaft of the insertion tube while pushing the scope aids in easy navigation.

5. *Keep the lumen at the center or the top right corner of the screen:* Steering the scope in such a way as to keep the lumen in view.
6. *Loop recognition and reduction (Fig. 43):*
 - N loop, alpha and reverse alpha loops, and gamma loop formation are well appreciated if we use the C arm or scope guide.
 - We should know all the tricks to reduce the loops and proceed further with the least discomfort to the patient
7. *One step forward and two steps backward:* To undo loops and to avoid blind entry around a corner, never hesitate to withdraw the scope to orient and then proceed again. Repeated such maneuvers help in proper navigation.
8. *Benefit of abdominal wall pressure:* External hand pressure by your assistant does help to contain the loop and seamless progression
9. *Importance of change of position:* Though the whole procedure can be done in the left lateral position in most cases, at times, patient position change would help us to get through some tough angles.
10. *Success with suction:* Periodic suction of the bowel lumen will not only decompress the bowel but also shorten the bowel to make navigation easy.

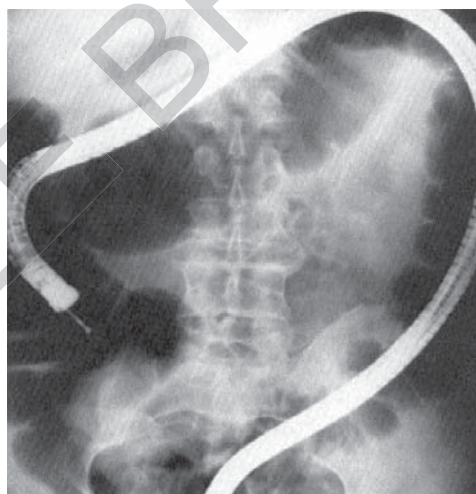


Fig. 43: Loop recognition with C arm.

■ ANCILLARY MEASURES FOR DIFFICULT COLONOSCOPY

- *External abdominal pressure (Figs. 44A to C):*
 - Suprapubic pressure to prevent sigmoid loop formation.
 - Epigastric upward pressure to prevent transverse colon loop formation.
 - Pressure on the right lateral wall to aid passage of the scope through the hepatic flexure and the ascending colon.



Figs. 44A to C: External abdominal pressure. (A) Suprapubic pressure for sigmoid; (B) Upper abdomen pressure for transverse colon; (C) Right loin pressure for ascending colon.

- **Change of position of the patient (Fig. 45):**
 - Routinely patient is lying left lateral during the start of the procedure.
 - In case of difficulty at the sigmoid-descending colon or at the splenic flexure, consider turning the patient to supine or even right lateral for easy passage.
 - Passage across the hepatic flexure and down through the ascending colon could be aided by the right lateral position.
- **Successful suction:** Suction decompression of the colon helps in easier intubation, especially in the proximal part. Air-distended colon is wider and longer, while a decompressed colon is shorter and could easily be crossed.
- **Breath-holding technique:** Breath holding on deep inspiration brings both colonic flexures down, making them less acute and easier to navigate.



Fig. 45: Change of position of a patient.

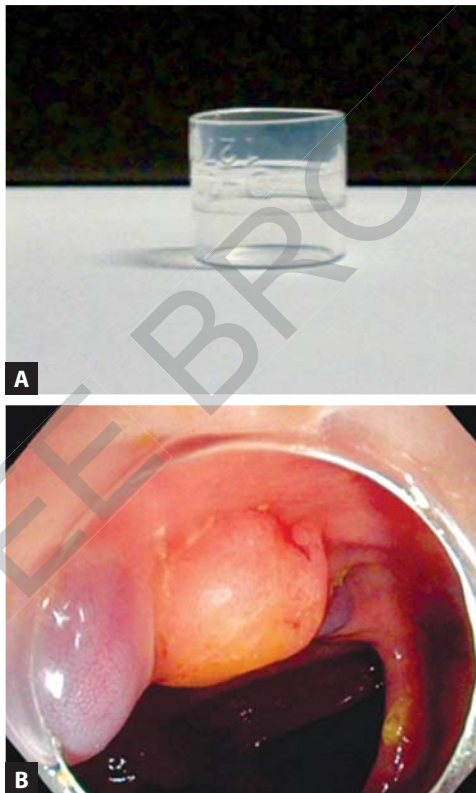
- **Water infusion colonoscopy (Fig. 46):**
 - CO₂ colonoscopy is relatively pain-free, but on occasion, we could consider water infusion using an irrigation pump.
 - As it keeps the sigmoid bends less acute, an underwater colonoscopy is able to pass through the bends more efficiently.



Fig. 46: Water infusion colonoscopy.

- *Variable stiffness colonoscope:*
 - Distal 60 cm of insertion section can be stiffened by turning a knob just below the access channel in certain versions of colonoscope. It makes the distal part of the insertion section stiffer and hence helps in easy navigation and prevents loop formation.
- *Scope guide:*
 - Loop formation during colonoscopy is uncomfortable for the patient, and it will also hinder cecal intubation.
 - Though fluoroscopy is useful to know the shaft position, radiation risks deter its routine use.
 - The scope guide (Olympus) works on the principle of magnetic resonance and clearly depicts the scope shaft position, thereby helping the surgeon for the loop recognition and loop reduction. The addition of the hand probe helps us to apply the abdominal pressure at the exact place to prevent loop formation.
 - Scope pilot-NCU-7000 is a navigation system technology by Pentax designed to provide a three-dimensional (3D) live representation of the colonoscope shape and position inside the patient's large bowel.
- *CO₂ colonoscopy:*
 - Instead of room air, use CO₂ for colonoscopy.
 - Absorbed from the colon 160 times faster than nitrogen and 12 times faster than oxygen (main component of air), CO₂ is transported via the bloodstream to the lungs and rapidly exhaled.
 - This ensures less pain, and also there is no risk of explosion during any diathermy use
 - Well tolerated and safe even in patients with chronic obstructive pulmonary disease (COPD).
 - It is also very easy to set up with the help of a dedicated CO₂ insufflator (Olympus).

- **Cap colonoscopy (Figs. 47A and B):**
 - Putting a transparent cap at the scope tip keeps the mucosa from coming in contact with the lens.
 - Helps in better anticipation of turns and also minimizes the chance of loop formation.
 - Better and faster cecal intubation rate with this technique makes you wonder why we should not use cap colonoscopy routinely!
- Also consider a pediatric colonoscope, a double balloon colonoscope, a gastroscope, an enteroscope, or even an overtube in cases of difficult colonoscopy.



Figs. 47A and B: Cap colonoscopy.

Colonoscopy after Colonic Resections

- Surveillance colonoscopy is usually done 1 year after resection of the carcinoma colon.
- After sigmoid resection, the colon is straighter and shorter, and after right hemicolectomy, you reach the ileo-transverse anastomosis fairly easily.

- Staple line or suture line with granuloma or characteristic white scar should be recognized. Recognize the type of anastomosis (End-to-end or end-to-side, or side-to-side). Look for any stenosis or local recurrence. Look for any polyps.

Colonoscopy Through Colostomy (Fig. 48)

- It can be done both through end and loop colostomy stomas.
- Inspect and perform digital palpation of the stomal opening prior to inserting the colonoscopy.
- Parastomal hernia would make the examination challenging at times.
- Air leakage is a constant problem, and hence, keep a cotton pad around the scope at the stomal opening.



Fig. 48: Colonoscopy through colostomy.

KEY MESSAGES

- Good bowel preparation is the key for a successful colonoscopy.
- Key steps for successful navigation during colonoscopy.
- Repeated pullback
- Clockwise torque steering
- Secrets for consistent cecal intubation
- Practice, practice, and practice

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Expert's Comment

Colonoscopy is a complex procedure that requires a deep understanding and has a long learning curve.

It is also difficult to describe complex colonoscopy techniques in easy and understandable language. This chapter describes the colonoscopy procedure in a very crisp manner with nice illustrations.

As a surgeon, we are well versed with digital rectal examination (DRE) and it helps us a lot. After the DRE, just gently put the colonoscope into the rectum, and your colonoscopy journey will start. As we know, surgeons will not stop at the rectum but rather try to insert the scope further and end up at the cecum.

Once we understand how to navigate the tortuous colon with wheel movements and torque of the insertion section, make early diagnosis of various loop formations, and pass the scope gently with minimal insufflation, we will slowly but surely become a master colonoscopist.

Practice, practice, and practice is the mantra of the art of colonoscopy.

Avoid undue force and blind push; you will conquer the colon. Perspire till you perform a perfect 100 plus cases to know all the tips and tricks as described in this chapter by the author.

Professor Easwaramoorthy is a global star in the field of endoscopy and an academic leader. His effort for endoscopy training for surgeons is exceptional.

I am proud to be a member of his academic group.

Dr Masfique Ahmed Bhuiyan

Bangladesh

MANUAL OF ENDOSCOPY

This *IAGES Manual of Endoscopy* contains 20 chapters in the art and science of flexible endoscopy. All the tips and tricks of various diagnostic and therapeutic procedures are vividly described in this training manual. In addition, an expert column in each chapter highlights the key practical points. This will be a fabulous quick-learning guide for all endoscopy enthusiasts who are keen to acquire endoscopy skillset in this era of minimal access surgery. Future is bright and full of scopes for the flexible endoscopists.



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