

CTC BOWEL INSUFFLATION BY RADIOGRAPHERS



MODULE 3: EQUIPMENT & SET UP

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OUTLINE

- Module 1: Course requirements
(Protocols/Logbook/Supervisor)
- Module 2: Anatomy, indications, risk factors
- **Module 3: Equipment & Preparation**
- Module 4: Technique



LEARNING OUTCOMES

- To become familiar with the advantages of using CO₂ and automatic insufflation in comparison to manual air for CT colonography examinations
- To review the operation of automatic insufflator equipment
- To understand preparation (equipment and patient) required prior to CT colonography examinations.

MODULE 3



Equipment & Preparation



EQUIPMENT

- Automatic insufflation
 - ▣ Automatic CO₂ insufflator
 - ▣ Administration set (tubing + catheter)

- Manual insufflation
 - ▣ Puffer
 - ▣ Tubing + catheter

- Extras
 - ▣ Lubricant
 - ▣ Lidocaine spray ?
 - ▣ Spasmolytics
 - ▣ IV contrast

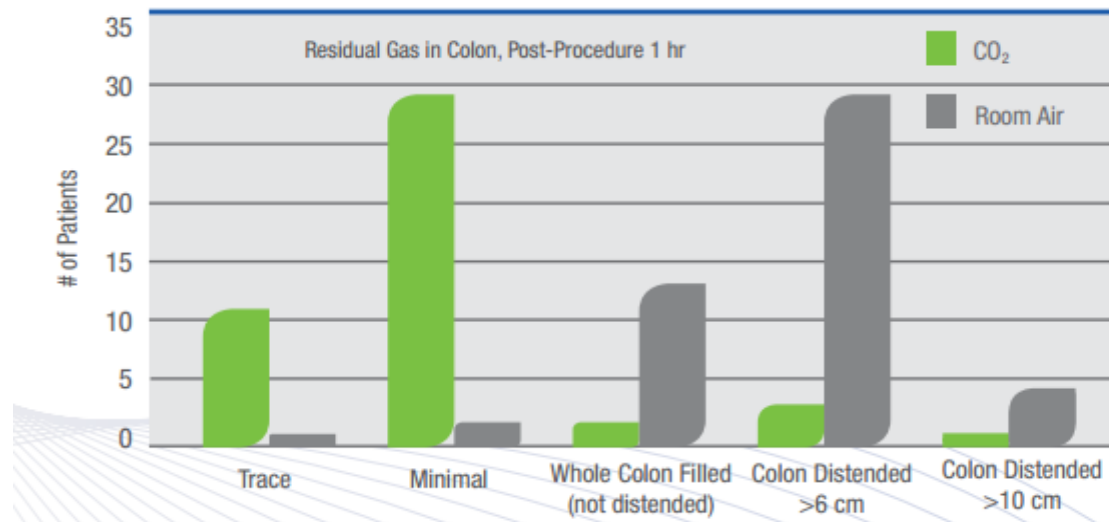


AIR vs CO₂

- CO₂ better absorbed (+ eliminated by lungs)
- Less post procedural discomfort
 - bloating / abdominal pain / cramping
- CO₂ can be monitored + recorded (avoids spikes)

Pickhardt PJ. *Radiology* 2006; 239(2):313-316

After CO₂ insufflation, 94% of patients had only a trace to a minimal amount of residual gas⁶



Sumanac K, et al, *Gastrointestinal Endoscopy* 2002; 56(2): 190-194]



MANUAL vs AUTOMATED

- Automated operation helps reduce staff time during insufflation process.
Dachman AH. *Radiology* 2006; 239(2):317-321
- Automated insufflation with CO₂ results in more consistent distention and less variability between staff
Shinners T, et al. *AJR* 2006; 186: 1491-1496
- *Significantly better luminal distention overall using automated administration than using the manual method."*
Burling D, et al. *AJR* 2006; 186:96-103.



MANUAL vs AUTOMATED

- Manual = simple + cheap
- BUT uncontrolled administration of gas can lead to over-distension or sub optimal distension
- Automatic insufflators introduced in 2002
 - ▣ Less operator dependent
 - ▣ Improved & more consistent distension
 - ▣ Controlled colonic pressure (contains safety features e.g. pressure sensors & alarms, to control flow/pressure)

AUTOMATIC INSUFFLATOR

- Options:
 - Bracco EZ EM
 - Medic sight
 - Others
- CO₂ insufflator
- CO₂ bottles



AUTOMATIC INSUFFLATOR: CONTROLS



1. Gas supply indicator
2. Volume Liters display
3. Volume Reset
4. Flow Stop / Run
5. Pressure Adjust Display
6. Gas output connection to patient
7. Power switch





OPERATION OF INSUFFLATOR

- Administers CO₂ at max flow rate 3L p/m
- Value for colonic pressure selected by operator
- Colonic pressure will gradually increase and will be displayed on the Pressure Display on the front panel.
- The flow of CO₂ will gradually decrease when the current pressure approaches the user determined value (on the Pressure Adjust Dial).
- Flow of CO₂ will stop when colonic pressure stabilised at selected value
- During RUN mode, continuous monitoring occurs and additional CO₂ delivered as required



OPERATION OF INSUFFLATOR

- Excessive absorption of CO₂ results from either excessive flow rate and/or excessive pressure.
- The colon can be adequately distended by pressure in the range of **15 to 25** mm Hg.
- Use of pressure ≤ 25 mm Hg will dramatically reduce the likelihood of intravasation of CO₂ gas into open vascular channels. Also, adequate respiration helps avoid problems related to CO₂.



SAFETY FEATURES

- Protects against over-insufflation with automation, over-pressure audible alerts, pressure relief valves, and one-touch flow-stop feature
- Safety shutdown feature for further safety support
- Soft, high-quality catheter for comfortable insertion

ADMINISTRATION SET

- Tubing
- **Hydrophobic filter**
 - ▣ protect the insufflator from cross-contamination
- Syringe
- Fluid collection Bag
 - ▣ captures colon effluent and removes it from the "path" of the CO₂ for proper insufflation
- Catheter





CO₂ INSUFFLATOR

- Contraindications from manufacturer
- The PROTOCO2L™ Colon Insufflator is contraindicated for:
 - **hysteroscopic insufflation**, i.e., it must not be used for intrauterine distention.
 - patients with known or suspected **colonic perforation** or toxic megacolon,
 - It should not be used within 6 days of large forceps or “hot” biopsy, or snare polypectomy.
 - Do not use this product in a **colostomy stoma**.
 - Do not use this product following **recent rectal surgery** or low rectal anastomosis, or when proctitis or other rectal conditions such as inflammatory or neoplastic diseases are suspected.
 - Idiosyncratic reactions: In patients with sickle cell disease or pulmonary insufficiency, use of these devices may pose increased risks of metabolic imbalance related to excessive CO₂ absorption.

MANUAL INSUFFLATOR

- Tubing + catheter
 - ▣ Rigid / thin flexible catheter
 - ▣ +/- balloon
 - ▣ Barium enema bag tubing

- Air puffer





CHOICE OF CATHETER

- First CTC catheters were thick rigid barium enema type with balloons (prevent spill air / barium)
- But rigid large diameter catheters are uncomfortable & associated with perforations ¹
- Current advise: against rigid catheters / large balloons
- Use thin flexible variety eg 20F with small balloon (20-30ml) to reduce patient discomfort
- To avoid obscuring rectal lesion, important to deflate balloon in at least one CTC position (eg prone)

¹ Burling et al (2006) Radiology 239 (2)

CHOICE OF CATHETER

- Sample catheters:
 - a) 20 French gauge with a 30 cm³ balloon (for Protoco2I, Bracco)
 - b) 18 French gauge with a 20 cm³ balloon (for MedicCO2LON, Medicsight)



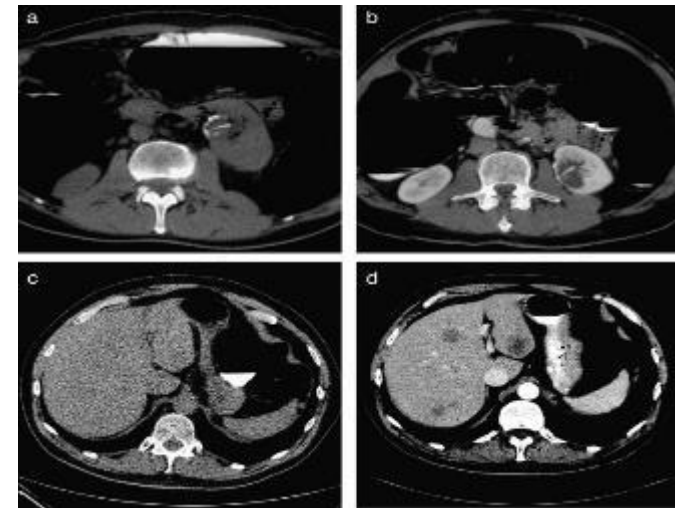
SPASMOLYTICS

- Aim to reduce colonic spasm / improve distension
- ACR: not necessary, ESGAR: preferable to use
- Buscopan (hyoscine butylbromide) 10-20mg
- Glucagen 1mg
- Both rapid onset but wanes off quickly (max 20-30 mins) - administer after catheter introduction and before insufflation
- Caution: know contraindications of both



IV CONTRAST

- Not required for colonic evaluation but improves evaluation of extracolonic organs
- Should be used for all patients with known CRC to facilitate staging
- Portal venous phase
- Administer during supine position
- If used, standard dose (mAs) should be applied but reduced dose ($<50\text{mAs}$) can be used for unenhanced acquisition





QUESTION SLIDE

The benefits of using CO₂ instead of air for insufflation during CT colongraphy are

- a) CO₂ is better absorbed (+ eliminated)
- b) CO₂ is associated with less post procedural discomfort (bloating / pain / cramping)
- c) CO₂ can be monitored + recorded
- d) CO₂ is less expensive



QUESTION SLIDE

Balloon catheters for CT colonography procedures

- a) Should be the rigid variety
- b) Should be deflated on at least one CTC position (prone or supine) to avoid obscuring a rectal lesion
- c) Should be inflated to a minimum of 50cc
- d) Should be used for all patients



EQUIPMENT SET UP

- Assembling equipment
- Preparing insufflator



OPENING / CLOSING CO₂

- Set up the CO₂ tank and insufflator if you have not already done so.
- Use the key to open up the gas in the tank
- Make sure the clamp is tightly closed at the end of each exam and in between uses to avoid leakage of gas
- Check the CO₂ insufflator to see if on or off
 - ON: click the volume reset button
 - OFF: check the plug and turn on
- Pressure + Volume should read ZERO

OPENING / CLOSING CO₂





INSUFFLATOR SET UP

- PRESSURE: set to 25mm Hg
- Site preferences may vary (15-25mm acceptable)
- Prepare administration set:
 - Place the fluid collection bag in the holder on the cart.
 - Keep the catheter tip in the bag or on a clean surface.
 - Prepare the syringe that comes in the kit for inflating the balloon cuff of the rectal tube.



PATIENT PREPARATION

- Patient changed into gown
- Explain procedure in full
- Obtain patient consent
- Obtain patient history to identify risk factors
 - previous surgery, colonoscopy, active colitis, inguinal hernias, diverticular disease, etc



PATIENT CONSENT

- Be familiar with local & national policy
 - Eg: HSE: National Consent Policy (2014)
- Must be valid, genuine & voluntary
- Information regarding procedure as well as potential risks / complications
- Tends to be verbal



PATIENT PREPARATION

- Check bowel preparation
- If patient has not used toilet in last hour – ask them to visit once more
- Placed in lateral decubitus position on table



BOWEL PREPARATION

- Mandatory for proper detection of polyps and CTC
- May include dietary restriction, oral contrast agent and bowel purgation
- Should be straight forward and simple to ensure compliance
- Information leaflets should be supplied



PATIENT POSITION

- No evidence that order of positioning influences bowel distension
- Lateral decubitus for tube insertion
- Additional pillows if needed, particularly for the heavier patient, underneath a patient's sternum and/or pelvis to improve colonic distention while in the prone position. By elevating these portions of a patient's anatomy, the abdominal cavity should distend more freely and redistribute the patient's weight on the CT table.



DIGITAL RECTAL EXAMS

- Recommended in some patients with the following symptoms:
 - ▣ Symptoms of rectal cancer, e.g. rectal bleeding
 - ▣ Poor anal tone
- Helpful for the following reasons:
 - ▣ To detect an occlusive tumor thus avoiding a potentially unsafe rectal catheter insertion
 - ▣ To assess anal sphincter tone
- As a Radiographer, you can ask the patient if he/she has rectal bleeding. If yes, you can report to the radiologist who would then do the actual rectal exam.
- Not required if referring physician / colonoscopist has already performed



PREPARE TO INSERT CATHETER

- Lubricate the catheter tip by putting some jelly on a piece of gauze and applying the jelly to the catheter tip.
- If the patient has tenderness or hemorrhoids, you may spray some lidocaine on the jelly (if agreed as part of local policy)
- Some departments carry lidocaine jelly as well. Lidocaine jelly is often included in Foley catheter insertion kits or packaged separately.



QUESTION SLIDE

Which of the following are **essential** patient preparation in advance of CT colonography examinations

- a) Patient changed into gown
- b) Explain procedure in full
- c) Obtain patient consent
- d) Check bowel preparation
- e) Obtain patient history to identify risk factors
- f) Perform a digital rectal examination
- g) Get patient to go to the toilet



SUMMARY

- Assemble and ready all equipment in advance of patient entering room
- Need to be familiar with each piece of equipment and local guidelines re use (e.g. insufflator pressure)
- Vital to check patient preparation & risk factors in advance of CTC examination to reduce potential complications



REFERENCES

- Bracco Imaging website. CT Colonography
www.braccoimaging.com
- Burling D, et al. *AJR* 2006; 186:96-103.
- ESGAR (2015). Consensus statement on CT colonography
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- Pickhardt PJ. *Radiology* 2006; 239(2):313-316
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