

# Current Practice in Colonoscopy - A Review

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**Abstract:** *Technology of colonoscope has being advancing from the ancient period where the first proctoscope has used up to the period of latest colonofiberscopes and colonovideoscopes found. Practice of Colonoscopy is increasing as a diagnostic tool and also as a treatment method. Chances of colonic bleeding, perforation, splenic injury etc. are high even with the latest endoscopes. Complication rates of colonoscopy can be minimize by following standard protocol while patient preparation and during the procedure. It will also helpful for increasing the quality of colonoscopy procedure and patients satisfaction. This review article will be described the guidelines and standards of colonoscopy in current practice.*

**Keywords:** Colonoscopy, Guidelines, Standards, protocols

## 1. Introduction

Diagnosis of diseases by using instruments has been practiced since ancient period. Susrutha Samhita can be considered as the first written document where the varieties of proctoscopes are described in the category of tubular instruments as diagnostic tools of the pathological conditions of the body. Further, it is described that diameter of these tubular instruments should be vary according to the orifice, and length should be vary according to the length of the passage [1]. Evidences of proctoscope was found in Egypt and ruins of Pompeii [2]. With the time and advancement of technology, the primitive proctoscope which used natural sunlight as a light source to visualize the lumen has been undergone for many changes and flexible colonofiberscope has being developed to get a view of whole gut. Due to many problems aroused during the procedure, fiber optic electronic endoscopes, ultrathin endoscopes, have being developed along with the facility of magnification and dyeing, with Autofluorescence and infrared light as the light source as well as ultrasonography facility[3] and CT against contrast medium during the endoscopy procedure [4]. For the success of the practice of colonoscopy, knowledge of current standards are necessary. This paper is a review about the current guideline of cleaning colonoscopy instrument and its accessory tools, patients' preparation methods, indications and contra indications along with other current standards of the colonoscopy.

## 2. Parts of the modern video colonoscope, accessory tools and its cleaning and disinfection guidelines

### 2.1 Parts of the colonoscope and accessory tools

There are three main parts of the colonoscope named as control section, insertion tube and universal cord. Control section of the Video endoscope has designed to be held by endoscopist's left hand and insertion tube by right hand. The control section contains remote switches, angulation lock and knob, air/water valve, suction valve and biopsy valve. Boot connects the insertion tube to the control section and

insertion tube ends up at the distal tip. Insertion tube contain air channel, biopsy/suction channel, water channel, wire for stiffness adjustment, angulation wires, light guide bundles, water jet channel. Universal cord having biopsy/suction channel, air channel, water channel, water jet channel and it is in continuation with control section by the side and distal end of the universal cord can be connected to light source connector, air supply connector and water supply connector[5].

Accessory tools of colonoscopy can be listed as snares, retrieval devices such as graspers, baskets, biopsy forceps, injection needles, spray catheters, endoscopic clips, thermal devices and instruments necessary for endoscopic mucosal resection [6]. Snares are used to remove colorectal polyps. It composed as a wire loop continues within a French polymer sheath facilitated to pass through biopsy/ suction channel of the colonoscope and attached to a handle which controls the extension and retraction of the loop in operators end. Snare is connected with electro cautery cord (bipolar or monopolar) and is handled by the endoscopist or by the assistant according to their preference. Retrieval devices are used to extract foreign bodies and polyps from the bowel. Biopsy forceps use to collect tissue samples from mucosa. Biopsy cable is built as a steel cable connected with two biopsy cups to collect the tissue. This flexible wire connects with handle from the other end with the facility to open and close biopsy cups. There is a spike which helps to anchor the mucosa in some forceps. Injection needles enable injection of a solution into tissue. Clips can be used as a haemostatic method [6].

Control section gets contaminated easily during colonoscopy and hidden impurities can harbor in between angulation knobs, suction and biopsy channels. Insertion tube is a part where there is a high chance of contamination. [Fig.1] Hence, proper disinfection methods should be followed after each endoscopic procedure to avoid transmission of infections. Transmission of Salmonella spp., Escherichia coli O157, Hepatitis C virus by colonoscope have been reported. Using disinfectant having low disinfecting activity, inappropriate cleaning methods such as cleaning endoscope inside a bucket instead of running water, improper brushing of channels, insufficient immersing in disinfectant agents, using biopsy

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forceps repeatedly without sterilizing or using ultrasonic cleaning and an autoclave etc. were identified as the causes for it [7].

## 2.2 Cleaning and disinfection of colonoscope

Standard guidelines for cleaning and disinfection of endoscopes have been introduced by many organizations such as Japanese Gastroenterological Endoscopy Technicians Society Safety Management Committee (JGETS), Society of gastroenterology nurses and associates, World Gastroenterology Organization/World Endoscopy Organization etc. According to JGETS, health professionals should wear apron, gloves and mask in appropriate way and cleaning of endoscope should be carried out to reduce bio burden and resistive substances. Cleaning should be done immediately after use while connecting to the light source. Cleaning can be done by wiping out the external surface of endoscope with warm water or detergent. Then 200ml detergent should suction and flush to clean the suction channel. Water bottle connector tube and light source connector where low level of contamination occurs can be cleaned by wiping with alcohol or immersing in disinfectant. Water, suction and biopsy buttons should be removed and brushing should be done under running water or detergent. After cleaning the endoscope, disinfection can be done by immersing the endoscope in 2% Glutaraldehyde (for 10 min) or Phtharal and peracetic acid. Then disinfectant agent should be rinsed off by using running water. Channel should be dried by using more than 10 ml of 70% of isopropyl alcohol and 70% ethanol for each channel followed by aerating or suctioning with water. Biopsy forceps, snare and clipping devices (removed from outer sheath) should be immersed in enzyme detergent and clean in ultrasonic cleaning device for 30 minutes followed by cleansing and sterilization (by autoclave or ethylene oxide gas method). Outer sheath of grasping and basket forceps should fill with cleansing solution followed by cleaning in ultrasonic cleaning device. JGETS recommended to get random culture from surface and channels of endoscope [7].

## 3. Patient Preparation

Colonoscopy is an invasive method in which patient may have to face various types and degree of risks. Hence standard guidelines should be followed prior and during the colonoscopy procedure. Nature of the risk, magnitude and probability and post procedure complications which can be occurred after period of time should be informed to the patient before taking the consent [8].

### 3.1 Bowel preparation

Bowel preparation is a main factor which helps to improve the quality of colonoscopy procedure and it includes laxative, enema and clear fluid intake. Bowel preparation can be defined as a preparation that allows detecting the colonic polyps 5 mm or larger [fig. 2] [9]. In reference to Aronchick scale of bowel preparation, excellent bowel preparation [fig.3] is defined as a small volume of clear liquid or greater than 95% of mucosal surface seen [10]. Along with

Aronchick Scale there are many bowel preparation scales developed to assess the quality of bowel preparation such as, Ottawa Bowel Prep Scale [11], Harefield Cleansing Scale [12], Chicago Bowel Preparation Scale (CBPS) [13], Marden Bowel preparation scale [14] and Boston Bowel Preparation scale (BBPS) [15]. Aronchick Scale is based on the amount of semisolid or liquid fecal matters which obstructs the field to visualize the mucosa of whole colon. There are two Ottawa Bowel Prep Scales; one scale is graded according to necessity and ability of suction to gain clear field of each segments of the colon and scoring of second one is done as per amount of fluid in whole colon. Harefield Bowel preparation scale is based on the amount of solid/liquid stool in each segment of colon. There are two CBPSs. Among them, one scale is introduced according to visibility of mucosa after suction and cleaning in bowel segments and the other one is rated according to *the amount of fluid in the whole colon* [13]. Boston Bowel Preparation scale (BBPS) is scored considering visibility of mucosa of each colon segment due to retained materials even after cleaning [Fig.4]. Aronchik, Ottawa and Chicago preparation scales are recognized as most commonly used scales [14]. BBPS is validated by Kim in 2014 [16], Calderwood in 2010 [17], Gao in 2013 [18] and is identified as most validated scale by the study of Parmar R, 2016 [19].

#### 3.1.1 Poor bowel preparation

The American Society for Gastrointestinal Endoscopy has recommended the target level of adequate bowel preparation is as 85%. Rate of inadequate bowel preparation is varying from 20-60% as recorded in previous studies [20]. Many studies have been conducted to identify the causes for poor bowel preparation in colonoscopy. Among them, a study conducted by Hautefeuille and colleagues, including 101 gastroenterologists and 202 patients found that, causes for bowel cleansing failure are incomplete intake of the preparation (30%), constipation (42%), and treatment with psychotropic drugs (17%) [21]. A study conducted by Julia McNabb-Baltar and colleagues have identified advancing age is a predictor for poor bowel preparation [22]. History of cerebrovascular disease, gastrectomy, appendectomy [23], diabetes, colorectal resection, hysterectomy [24] also found as predictors in another study.

Poor bowel preparation leads to obstruct the field and good preparation should be achieved to reduce the time spent for irrigation (consume 1.3%- 1.5% from total time for examination) and suction (consume 6%-9% from total time for examination). A study concluded that inadequate bowel preparation is more time consuming (M=25.83, SD=9.15) compared to time taken to complete total procedure (M = 20.13, SD = 9.21) in the group with adequate bowel preparation. The time taken to caecal intubation also longer in previous group (M=12.65, SD=5.61 vs M = 10.06, SD = 6.52). (Mean cecal intubation time is  $11 \pm 14$  minutes) [25]. But it does not affect to withdrawal time [26]. Rate of complete colonoscopy procedure with visualization of ileocecal valve was higher (96.8%) among the subjects with good or fair bowel preparation than the subject had poor bowel preparation (62.3%) [27].

Inadequate bowel preparation also a causative factor to increase prevalence of missed adenoma (47.9%) [28]. There are evidences that partial bowel preparation increase the risk of bowel gas explosion due to residual stools above the lesions which enhance gas production [29].

So, discomfort for the patient, increase risk and rate of complications may occur as a result of poor bowel preparation. Hence, Proper bowel preparation should be achieved to reduce cost for colonoscopy and to prevent unnecessary early repetitions [30].

Ideal bowel cleansing agent should have qualities of reliability, no or less harmful to colonic microbes, consumes short time for bowel cleaning, safe to use [31], cost effective and easy to administer. Common Drugs used for bowel preparation are high volume or low volume polyethylene glycol preparations (PEG), sulfate free PEGs, as Isosmotic agents and oral sodium sulfate, and oral sodium sulfate along with PEG, Sodium picosulfate, Magnesium citrate as hyper osmotic agents [32].

### 3.2 Sedation

Generally, colonoscopy performs with sedation due to intolerance of pain and discomfort for the patients. According to Standards of Practice Committee of the American Society for Gastrointestinal Endoscopy (ASGE), objectives of sedation during colonoscopy are to relieve anxiety and discomfort, to achieve the aims of colonoscopic procedure and diminish the patient's memory. A study conducted by Rodney WM, 1993 was concluded that sedation is associated with a higher percentage of complete colonoscopies [33].

But, a study conducted with 258 non sedated subjects found that 61 % patients complained no pain or 8% complained mild pain and they are willing to perform their next colonoscopy without sedation [34].

### 3.3 Patient positioning

Changing the patients' position during colonoscopy is in practice and is depend on the colonoscopist experience. Best positions to examine different parts of the colon are indicated as, examination of hepatic flexure in the left lateral position, transverse colon in the supine position, and the splenic flexure and descending colon in the right lateral position [35]. Ball et al says 2015 says that changing of the position allows the movement of bowel, air and fluid and makes the view optimize [36]. In 2016 Scarborough and colleagues found that the time taken to reach cecum was longer in patients stayed in prone position compared to the patient stayed in left lateral position (700 s vs. 525 s;  $p < 0.05$ ) throughout the procedure [37]. Another study concluded that right side of the colon examination (on withdrawal) in the left lateral position significantly improved polyp detection rate (26.2% vs 17.7%;  $P = .01$ ) and luminal distension (mean = 4.0 vs 3.5;  $P < .0001$ ) [36].

## 4. When to use colonoscopy and when not to use

Colonoscopy can be used as a diagnostic tool as well as a therapeutic procedure. The indications of diagnostic colonoscopy are, unexplained gastro intestinal bleeding, for the confirmation of abnormality of barium enema, screening for carcinoma, Inflammatory bowel disease, diarrhea with unexplained origin, Positive fecal occult blood test, rectal bleeding or melena with negative upper GI endoscopy, colonic symptoms other than bleeding [38].

Colonoscopy should not perform for patients who refuse to consent, un-cooperated patients, having known perforation, toxic mega colon, and fulminant colitis. Relative contra indications are, diagnosed acute diverticulitis, hemodynamic instability, myocardial infarction or pulmonary embolism, immediate postoperative stage, aortic aneurism, pregnancy [38].

Colonoscopy is considered as the gold standard method to diagnose the colonic pathologies [39]. Complete colonoscopy is called when colonoscope reach the end of the colon [40]. Rate of crude completion (all cases) varies as 77.9% -93.6 [40] , [41] and adjusted rate (cases exclude with poor bowel preparation and disease as causes of incompleteness) varies as 85.0%- 98.8% [40] , [41] Incompletion is due to the fecal matters in the colon, colonic disease and pain or tortuosity [40]. Bleeding, female gender and increasing age also reported as causes for incomplete colonoscopy [42].

## 5. Complications in colonoscopy procedure

Colonoscopy is a procedure which has chances for occurrence of minor and major complications. Overall complications can be categorized as complications occurred due to preparations, sedation and procedure and as post procedure complications. Severity of complications occurred due to colonoscopy can be categorized as asymptomatic, self-limiting and serious [43]. In one study it was found that major complications are rare (0.05%) [44] and in another study, rate of serious complications are 4.7 per 1000 screening colonoscopies and 6.8 per 1000 follow-up colonoscopies [45]. Further, a study carried out with 16, 318 cases, serious complications occurred 0.8 per 1000 colonoscopies without biopsy or polypectomy and in colonoscopies with biopsy or polypectomy, complications occurred 7.0 per 1000 serious. Perforations occurred in 0.9 per 1000 colonoscopies [46]. Following standard guidelines is useful to decrease risk.

## 6. Reporting

Normal colonoscopy is mentioned as 'negative' colonoscopy and there are terms and particular meaning for those terms in a standard report. One nomenclature is called as "OMED" (Organisation Mondial d'Endoscopy Digestive) and another one is named as Organization of the Minimal Standard Terminology (MST). A standard colonoscopy report is necessary for proper communication and for proper medical

recording. A standardized Colonoscopy Reporting and Data System (CO-RADS) was published in 2007 by Quality Assurance Task Group of the National Colorectal Cancer Roundtable (NCCRT). A standard format for colonoscopy has been introduced by them including patients demographic and history, patients risk and comorbidity, indication, procedure, assessment, interventions/ unplanned events, follow up plan [47].

## 7. Conclusion

Standard methods of pre procedural, procedural and post procedural colonoscopy can be used to improve the quality of procedure and it is important for decreasing complications of procedure.

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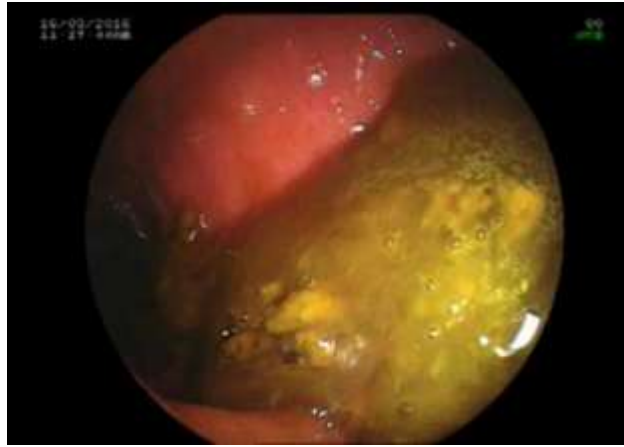
**Figure 1:** white arrow indicates the parts of colonoscopy having maximum chance of contamination



**Figure 2:** Good preparation: preparation allows detecting the colonic polyps 5 mm or larger



**Figure 3:** Excellent bowel preparation



**Figure 4:** Poor bowel preparation