



ORIGINAL RESEARCH PAPER

Radiodiagnosis

COLONBODY CT: QUICK AND ACCURATE STAGING IN COLORECTAL CANCER

KEY WORDS: Colorectal Cancer; Multislice CT; Virtual Colonoscopy; CT Colonbody.

Furio Sandrucci	Medical Radiologist, Villa Benedetta Roma (Italy).
Sergio Valdarchi	Radiologic Technologist graduated from Department of Radiological Sciences, Institute of Radiology, Fondazione Policlinico Universitario A. Gemelli, Rome, Italy.
Serena Francesca D'Andrea	Radiologic Technologist Giovanni Paolo II Hospital, Lamezia Terme (Italy).
Domenico Vito Di Molfetta*	Medical Radiologist Ospedale Generale Regionale Miulli, Acquaviva delle Fonti (Ba), Italy. *Corresponding Author
Ippolita Valentina Di Molfetta	Medical Radiologist at Ospedale Israelitico, Roma (Italy).

ABSTRACT In diagnosis of Colorectal Cancer the Virtual Colonoscopy (VC) is a well validated exam, with radiation dose that is actually very low. When a colon cancer is detected, if the Traditional Colonoscopy is not complete, a Virtual Colonoscopy has to be performed to exclude synchronous polyps. In both cases a Whole Body CT is necessary for staging. In 48 patients Virtual Colonoscopy and Whole Body CT are combined in order to have a quick and accurate staging and a total radiation dose reduction.

INTRODUCTION

CT colonography is a well validated diagnostic medical test for the diagnosis of intestinal polyps > 6 mm. It is less invasive than conventional optical colonoscopy, easy to perform and standardized. According to a well validated evidence from the Literature, the sensitivity of VC in screening for large polyps (>= 1 cm) is similar to that of conventional optical colonoscopy. [1] The *low dose* protocols used in VC do not allow the evaluation of extracolonic findings or, in some cases, the real extension of colorectal cancer. A new protocol called *Colonbody* is performed: it consists in the combination of VC with a normal Whole body CT with administration of intravenous contrast agent. The aim of the study consists in the evaluation of the potentialities of the new protocol which allows the evaluation of the cancer, synchronous lesions and the detection of the most frequent target organs of metastases such as regional lymph nodes, abdomen (especially liver), chest and brain.

MATERIALS AND METHODS

Between September 2009 and July 2015, 48 patients with a mean age of 71, were included in the study: 28 of them were men and 20 were women. Their clinical features are described in the table 1.

The technique consists of four consecutive steps: bowel cleansing, colon distention, CT protocol and image analysis.

Table 1. Casuistry of patients

PATIENTS	48
Males	28
Females	20
Average age	69
Family history of polyps	2
Family history of cancer	8
Family history of cancer and polyps	3
TRADITIONAL COLONOSCOPY	26
Complete Traditional Colonoscopy	2
Incomplete Traditional Colonoscopy	24

FECAL OCCULT BLOOD TEST	
Not done	29
Done	19
Positive	9
Negative	10

BOWEL CLEANSING

As described in Literature, residual stools may mimic polyps or may hide a real colonic lesion. A general agreement regards dietary restriction, bowel purgation and fecal tagging. The low-fiber diet allows the reduction of fecal volume and its inhomogeneity, favoring an optimal tagging.

Colonic purgation may be obtained through the use of Polyetilenglicole-PEG, sodium phosphate or magnesium citrate.

Regarding the tagging, we refer to the scheme of preparation of Candiolo - Torino, which consists of an oral solution made of 500 ml of water and 70 ml of Gastrografin administered two hours before the exam and 500 ml of water thirty minutes before the exam.

In our experience we prefer the administration of this oral solution six hours before the exam; then the patient has to drink at least 1500 ml of water or another drink (such as sugary or carbonated drinks) during the last four hour before the exam.

After tagging, the residual bowel content become hyperdense.

Hyoscine butylbromide is recommended unless contraindications because it may provide better distension, in particular of the sigmoid colon in the case of diverticular disease or a severe stenosing cancer.

COLON DISTENTION:

Due to high intrinsic contrast between air and colic wall, the colic distention is mandatory because it simplifies the

interpretation of the study and greatly increases the diagnostic accuracy. In fact, a collapsed segment can hide an intraluminal lesion. We perform a retrograde manual insufflation with carbon dioxide.

CT PROTOCOL:

A multidetector 64 rows CT scanner (SIEMENS) is used for all patients.

In our study protocol, we performed the evaluation of chest and abdomen exactly like a CT for staging cancer with the association of colonic distention.

After the distention of the colon, achieved by slow insufflation of small boluses of carbon dioxide, the patient was supine, using a small-gauge soft-latex catheter inserted several centimeters in the rectum.

The catheter was taped to the patients buttocks to prevent dislodgement. Insufflation starts with the patient in the right lateral decubitus position, and then the insufflation is continued in the supine position.

With the scanogram of thorax and abdomen the radiologist assesses the adequacy of colonic distension: if the scanogram revealed inadequate colonic distension, additional air insufflation was performed before scanning. Through a cannula in an antecubital vein, the iodine contrast (350 mg/ml) was administered.

A full radiation dose was preferred for the evaluation of chest and abdomen.

All patients have been imaged first in supine position (after iv contrast administration) and then in right-side lateral position.

CT was performed using the following parameters: for the supine position a full radiation dose is preferred, with collimation thickness of 1 mm, pitch of 0.9, reconstruction interval of 3.0, 120 kv, and mA depending on the Patient size, through the use of the "Care dose", a software by Siemens which optimized the radiation dose for each Patient.

For the right-lateral-side position we performed a low dose CT using the following parameters: collimation thickness of 1 mm, pitch of 0.9, reconstruction interval of 1.0, 100 kv, and mA depending on the patient size, through the use of the "Care dose".

Scanning was performed during breath-holding acquisition.

In the supine position, the first scan corresponds to the arterial phase on the upper abdomen: it is acquired using bolus tracking technique: a ROI is traced on sub diaphragmatic aorta; a threshold intensity of 120 HU is chosen. Then a portal phase includes the chest, the abdomen and the pelvis.

Regarding the second acquisition of the colon we prefer the right side position because it enables a better distention of the sigmoid colon. Additional air insufflation was performed if needed.

After six minutes from IV contrast administration, the evaluation of the cranium was performed.

RESULTS

Initially this protocol has been applied not only in cases of full-blown malignancy but also when, during the virtual colonoscopy, the presence of an unrecognized disease that involved the colonic wall, occurred.

In this case when the protocol of Colonbody has been applied

as integration to VC, this one eliminated the suspicion of a latent tumor.

According to C-RADS classification in our casuistry we have:

- C1 (absence of colonic injuries) for sixteen patients. We treated eight patients with a colorectal cancer history; six patients with suspected malignancy of the sigmoid following a traditional colonoscopy found to be incomplete for the presence of a stenosis; one for a severe weight loss and one for fecal occult blood.
- C2 (polyps ranging in size between 6 and 9 mm) concerned six patients. One of them, whose medical history had shown the presence of hepatic lesion, had a 6 mm polyp; the Colonbody revealed the presence of breast cancer and a liver cystadenoma.

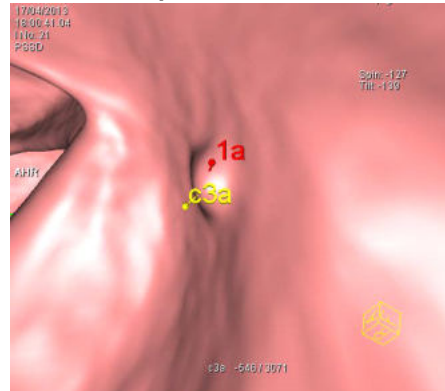


Figure 1. Polyp of six mm in Transverse Colon

- C3 (more synchronous lesions of 6-9 mm or one or more lesions \geq 1cm). We treated four patients with this diagnosis, including a woman with a previous uterine cancer and metastases to the spine treated with radiation therapy.
- C4 (presence of a tumor). In twenty of the selected patients a colonic mass was found. Twelve patients had been subjected to a previous traditional colonoscopy which was incomplete; in seven patients the cancer had already been diagnosed.
- E7 (extracolonic disease) One among the three patients with liver lesions, presented liver cancer; in a man with transverse colonic stenosis another tumor was found in the bladder. In a woman with severe abdominal pain and change of bowel habits, the diagnosis was ovarian cancer with sigma infiltration.

DISCUSSION

Twenty-six among forty-eight Patients subjected to Colonbody protocol had performed the traditional colonoscopy before CT. Except for two patients, these colonoscopies were incomplete for the presence of a stenosis which prevented the progression of the endoscopic probe. The incomplete conventional colonoscopy was the first indication for CT colonography also recognized in gastroenterology environment [2]. The percentage of incomplete colonoscopies varies between 6% and 26% due to anatomical reasons (dolico-sigma, spasms, malrotation), pathological reasons (stenosing masses, diverticular disease), iatrogenic reasons (post-surgical adhesions) and reasons related to the Patients (age, poor tolerability of the procedure, inadequate bowel preparation). Although conventional colonoscopy is considered the best method for the preoperative evaluation of the colon, a comprehensive study is possible only in 42-60% of cases. Furthermore, on the basis of the data reported in the literature, the presence of synchronous lesions in patients diagnosed with colorectal cancer varies between 0.6% and 14% [3]. Synchronous neoplastic lesions are dual or more lesions that grow up at the

same time with colorectal cancer. Instead, for metachronous lesions (appeared later in one or more segments of the large intestine) the percentage falls between 1% and 8%. So, early identification of these lesions, with a careful study of the entire colon and the organs most frequently site of metastases, such as liver (in 20% - 40% of cases), lung (20%) and, to a lesser extent, the brain, improves the prognosis of the disease, thereby preventing the consequent delay in diagnosis, changing the surgical strategy and increasing the likelihood of a radical therapy. [4] The whole body CT is usually used in the follow up of the colorectal cancer, although the guidelines do not consider the VC a standardized option for surveillance after surgery [5]. However some authors have shown the usefulness of the method in the follow up [6]. Most of the cases of recurrence of the disease consists in distant metastasis, while loco-regional recurrences are characterized by an extraluminal component: therefore they are not visible to traditional colonoscopy. The latter, moreover, appears to be an examination very difficult because of the fibrosis of the wall and visceral adhesion that derived from the disease. Furthermore, the addition of a VC to a study Whole Body CT would increase the efficacy of this screening technique [7].

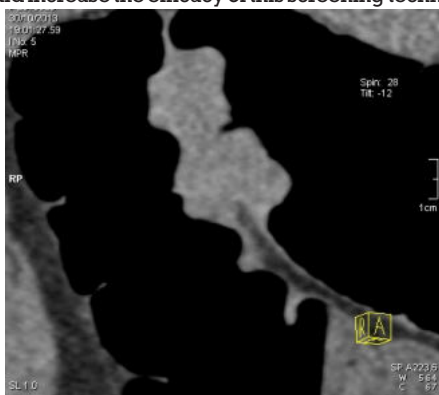


Figure 2 . Cancer of right colic flexure

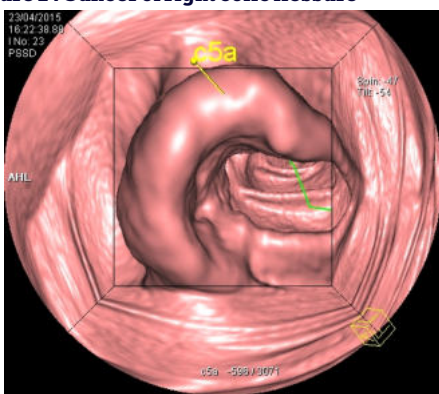


Figure3. Cancer of ascending colon

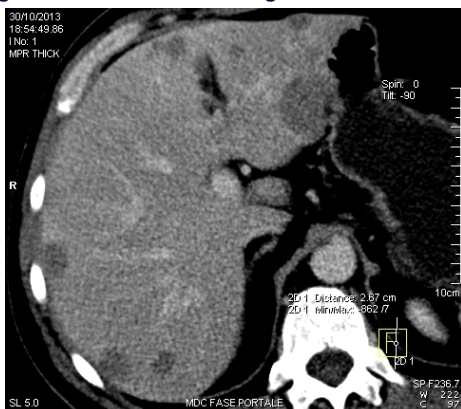
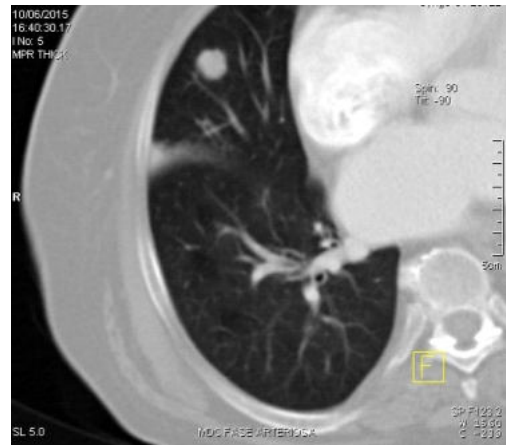


Figure 4. Liver Metastasis and Lung Metastasis



CONCLUSIONS

The VC associated with a Whole Body CT provides an excellent evaluation of the colon upstream of a stenosis or an obstruction and is well tolerated because, if done immediately after the Traditional Colonoscopy, it requires only the assumption of a small amount of oral contrast medium (50 ml Gastrografin) and a small additional insufflation of air. In addition, the CT Colonbody allows accurate localization of the neoplastic lesion and, at the same time, the intraparietal and extraparietal extension and the involvement of pericolic and paracolic lymph nodes. Finally, due to IV administration of the contrast agent, it is able to offer the staging of the disease in the abdomen, chest and encephalon. Furthermore CT Colonbody is more tolerated by the patient because he is subjected to a single fasting and a single bowel cleansing; it also reduces the time of cancer staging allowing a timely treatment. Moreover the exposure dose is lower because the patient is subjected to a CT Colonography and a Whole Body CT at the same time.

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