Common findings and pseudolesions at computed tomography colonography: pictorial essay*

Aspectos comuns e pseudolesões na colonografia por tomografia computadorizada: ensaio iconográfico

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Abstract Computed tomography colonography is a minimally invasive method for screening for polyps and colorectal cancer, with extremely unusual complications, increasingly used in the clinical practice. In the last decade, developments in bowel preparation, imaging, and in the training of investigators have determined a significant increase in the method sensitivity. Images interpretation is accomplished through a combined analysis of two-dimensional source images and several types of three-dimensional renderings, with sensitivity around 96% in the detection of lesions with dimensions equal or greater than 10 mm in size, when analyzed by experienced radiologists. The present pictorial essay includes examples of diseases and pseudolesions most frequently observed in this type of imaging study. The authors present examples of flat and polypoid lesions, benign and malignant lesions, diverticular disease of the colon, among other conditions, as well as pseudolesions, including those related to inappropriate bowel preparation and misinterpretation.
Keywords: Colonography; Computed tomography; Colorectal neoplasm; Colonic polyps.

Resumo A colonografia por tomografia computadorizada é um método minimamente invasivo para rastreamento de pólipos e do câncer colorretal, com complicações extremamente incomuns, sendo cada vez mais utilizada na prática clínica. Na última década, a evolução no preparo intestinal, na aquisição das imagens e no treinamento dos examinadores determinou um aumento significativo na sensibilidade do método. A interpretação das imagens é realizada por meio da análise combinada das imagens fontes bidimensionais e de diversos tipos de reconstruções tridimensionais, com sensibilidade ao redor de 96% na detecção de lesões com dimensões iguais ou maiores que 10 mm, quando analisadas por radiologistas experientes. Neste ensaio pictórico selecionamos exemplos ilustrativos das doenças e pseudolesões mais frequentemente observadas neste tipo de exame. Apresentamos exemplos de lesões polipoides e planas, benignas e malignas, moléstia diverticular dos cólons, entre outras afecções, bem como pseudolesões, entre as quais aquelas relacionadas a preparo inadequado e interpretação equivocada.
Unitermos: Colonografia; Tomografia computadorizada; Câncer colorretal; Pólipos do colo.

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INTRODUCTION

Computed tomography colonography (CTC), or virtual colonoscopy, is an imaging method based on the acquisition of multiple sections obtained by multidetector computed tomography (MDCT), generating sectional views of the colon that later can be reformatted in multiple planes and also processed in to allow endoluminal navigation, as in optical colonoscopy (OC)[1]. Among its main advantages, this method is fast, as the examination is performed in less than 15 minutes, without requiring sedation. For over a decade, CTC has been utilized in the investigation of colonic polyps and colorectal cancer (CRC). Developments in the clinical and epidemiological knowledge on CRC and the many technological advances incorporated by CTC have transformed the method from an investigation tool into a viable option for CRC screening[2–4].

The method is less invasive than OC for the screening of polyps and may preferably be utilized in asymptomatic individuals with low risk for development of CRC, in those who do not wish or cannot undergo OC, and in those cases where OC is incomplete[3]. On the other hand, CTC presents some limitations as compared to OC in what concerns the impossibility of performing biopsies and the exposure to ionizing radiation[2].

In spite of CTC having been introduced more than a decade ago, studies locally undertaken and published in the Brazilian literature are still scarce[5,6].

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The present essay is aimed at demonstrating the findings of the most common colonic lesions and pseudolesions observed at virtual colonoscopy and familiarizing the readers with the main technical features of the method.

Patient preparation

Bowel preparation if essential in CTC, in order to facilitate the detection of lesions and minimize the occurrence false-positive findings[7]. It consists of the cleansing of the large bowel by means of a low residue diet for two days, and the use of non-irritating osmotic laxatives (bysacodil or macrogol) and antiflatulent drugs (simethicone). The utilization of either iodinated (ioxitalamic acid) or barium sulphate oral contrast agent is also indicated to label non-eliminated fecal residues and to facilitate the differentiation of pseudolesions[7]. Iodinated contrast agent is most frequently utilized and is administered in the 12 hours preceding the CTC examination, by means of ingestion of 50 ml of the agent diluted in 200 ml of water[7].

Technical features

The images acquisition is done with the patient in dorsal and ventral decubitus, during apnea, after colonic distension with ambient air, according to patient's tolerance[8]. The scans are preferably performed with tomography apparatuses with 16 or more detector rows. In the present study, a 64-detector-row CT apparatus (Brilliance 64; Philips Medical Systems, Cleveland, OH, USA) was utilized, and all the examinations were made with 64 × 0.625 mm collimation, slice thickness of 2 mm, reconstruction interval of 1 mm, pitch of 1079, rotation time of 0.5 s, and 120 kV and 60 mAs per section. The equivalent radiation dose per examination was, on average, 10 mSv, ranging between 6 and 19 mSv depending upon patients' size. No antispasmodic drug was utilized in the present study. The post-processing of the images was performed by means of the software package with volume-rendering capabilities (Philips Brilliance Workspace; Philips Medical Systems, Cleveland, OH, USA), with 2D multiplanar reformation and endoluminal navigation with virtual 3D colon dissection technique (Figures 1, 2 and 3).

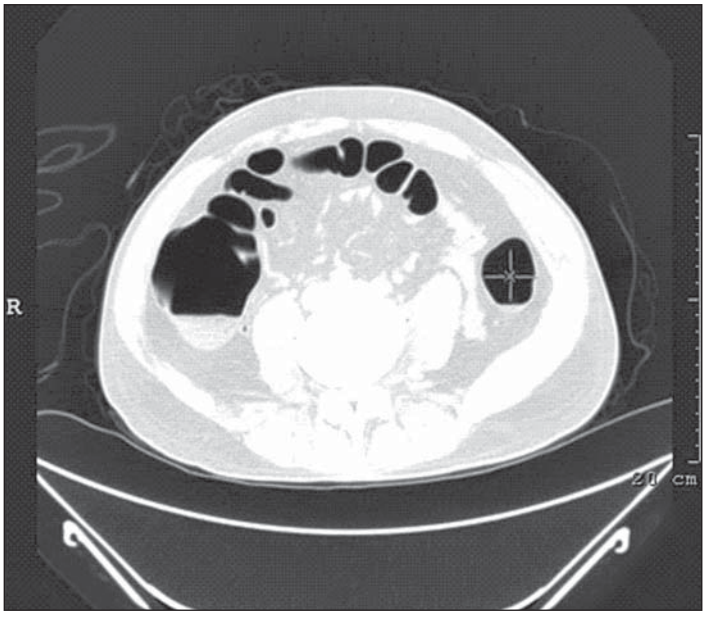

Figure 1. Normal colon. 2D CTC in the axial plane.

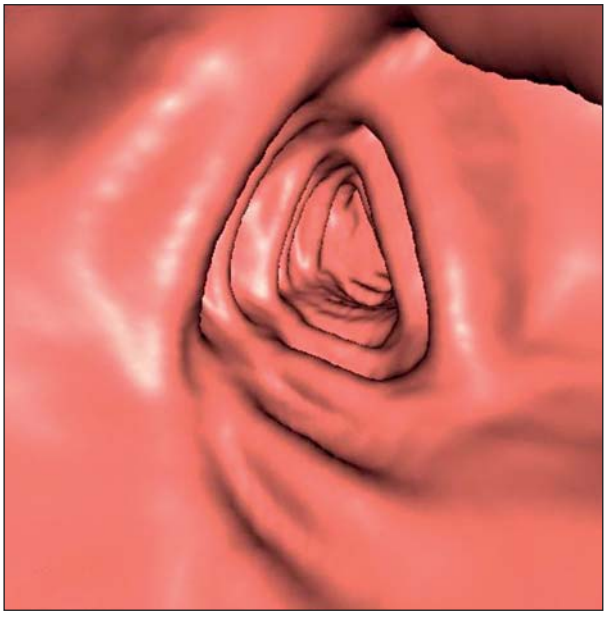

Figure 2. Normal colon. 3D endoluminal view.

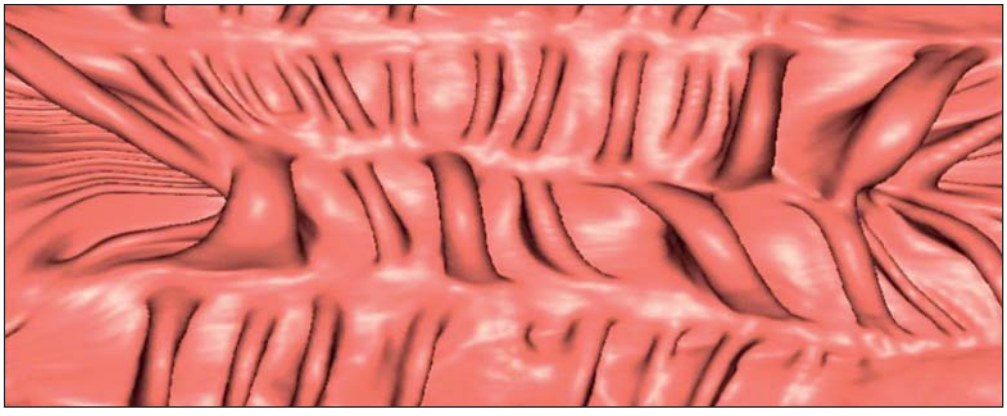

Figure 3. Colon with normal mucosal relief. CTC with virtual dissection.

COMMON LESIONS

Colonic polyps

Most of the CRCs develop from adenomatous polyps. The minute, small and large polyps risk for malignant transformation corresponds to 0.08%, 0.7% and 15.7% respectively[3]. Polyps may be either sessile or pedunculated; the first ones are most frequently found. The prevalence of polyps in the population is high and increases with age, ranging from 20% to 25% at 50 years, to 50% between 75 and 80 years of age. Recent studies on CTC describe a sensitivity of the method of up to 96% in the detection of polyps = 10 mm and 88% for polyps between 6 and 9 mm[9]. At CTC, polyps present soft tissue density, with enhancement after intravenous contrast injection, and are fixed at change in decubitus (Figures 4, 5 and 6).

Colorectal cancer

Adenocarcinoma is the most common primary malignant tumor of the colon, with 30% of the cases being found in the rectum and 20% in the sigmoid. Synchronous carcinomas are present in 5% of the cases, which increases the need to perform CTC in patients whose OCs are incomplete because of the presence of stenosing lesion (Figure 7). A periodic population screening

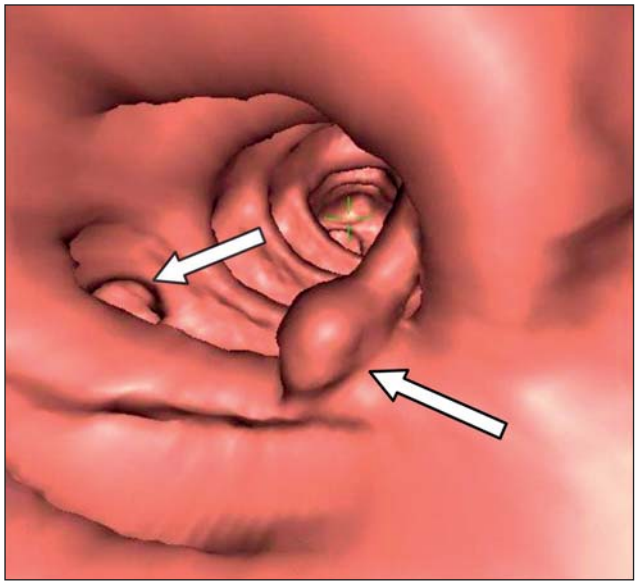

Figure 4. Pedunculated adenomatous polyp with 10 mm (right arrow) and diverticulum (left arrow). Virtual colonoscopy with endoluminal view.

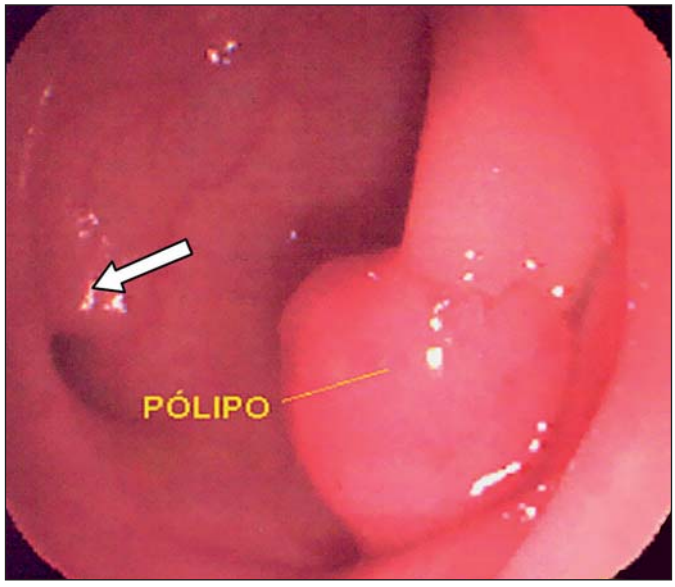

Figure 5. Pedunculated adenomatous polyp measuring 10 mm and diverticulum (arrow). Correlation with colonoscopy findings of the case presented on Figure 4.

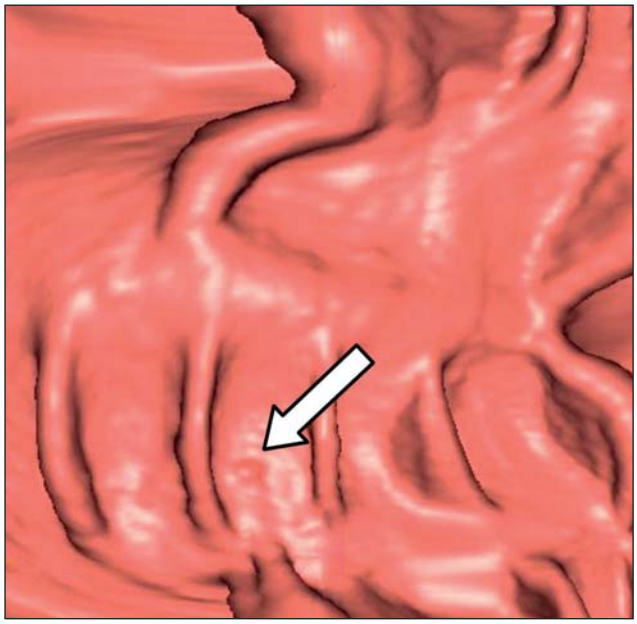

Figure 6. Minute hyperplastic polyp (arrow) in the descending colon. CTC: endoluminal view with virtual dissection.

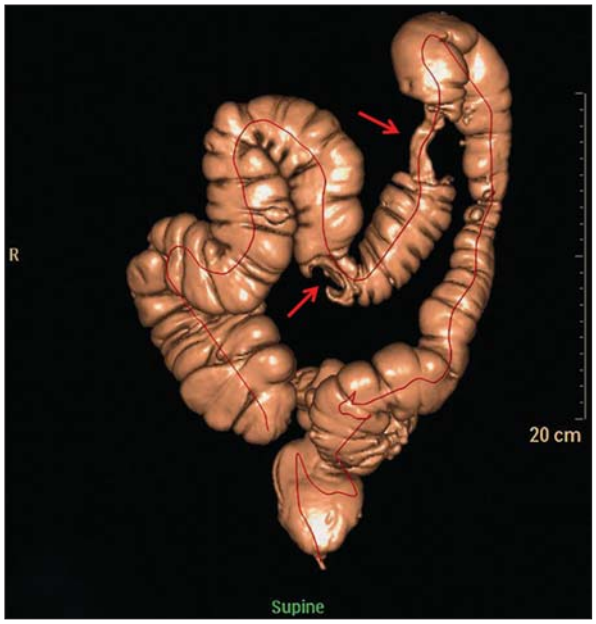

Figure 7. Synchronous cancer in transverse colon. Stenosing and infiltrative lesions (arrows). View of the colic frame at 3D CTC reconstruction.

is recommended after the age of 50. CTC presents sensitivity and specificity of 96% in the detection of CRC[3,9]. An additional advantage of CTC is allowing, simultaneously, distant staging after intravenous contrast injection (Figures 8 and 9). At CTC, infiltrating CRC is characterized by asymmetrical, irregular parietal thickening that may extend to the pericolic fat and structures.

Inflammatory colorectal disease

Crohn's disease and ulcerative rectocolitis are the most common inflammatory disorders. Ulcerative rectocolitis typically initiates in the rectum and extends towards the proximal colon, with inflammation restricted to the mucosa and the submucosa (Figures 10 and 11). Crohn's disease is a granulomatous inflammatory disease which may affect the whole gastrointestinal tract, but is most frequently observed in the terminal ileum and in the cecum[10]. The utilization of CTC in cases of intestinal inflammatory disorders and hereditary colon syndromes is controversial and is routinely contraindicated. Notwithstanding such a controversy, CTC may be useful as an alternative strategy with a supplementary character in the diagnosis[11].

Figure 8. Pulmonary lesions with a secondary appearance at axial CTC images with pulmonary window.

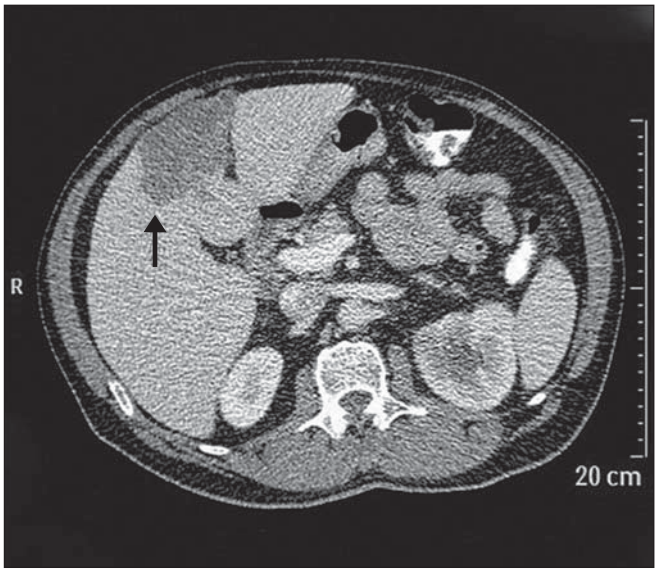

Figure 9. Secondary hepatic hypovascular lesion (arrow) observed at CTC after intravenous contrast injection in a patient with colon neoplasia.

Figure 10. Ulcerative rectocolitis in the left colon with diffuse loss of haustra in transverse and descending colon. 3D CTC view of the colic frame.

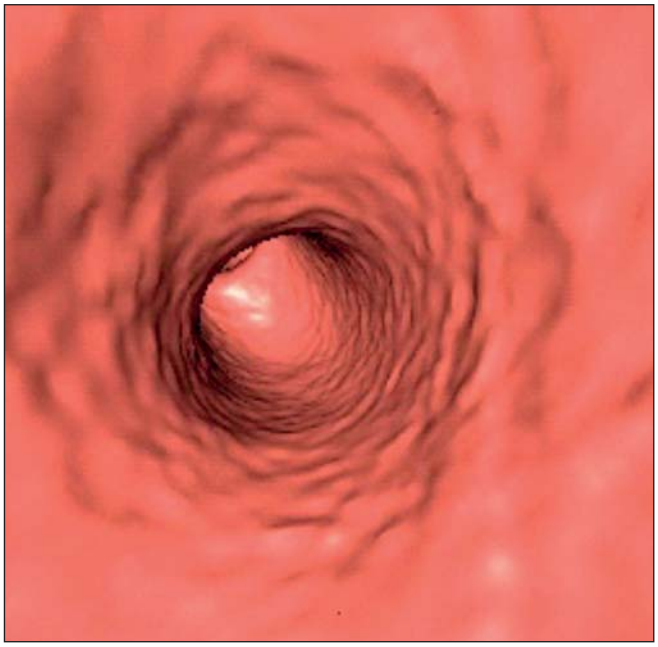

Figure 11. Ulcerative rectocolitis in the left colon with diffuse loss of haustra. Endoluminal CTC view.

Colonic diverticular disease

Colonic diverticular disease is the most common colonic disease, associated with diet-related factors, and may affect any part of the large bowel, but it is most commonly found in the sigmoid and very rarely in the rectum. At CTC, cases of advanced diverticular diseases are frequently observed, with segmental parietal thickening[11] (Figure 12). In order to avoid complications, CTC should be performed between four and six weeks after the conservative treatment of diverticulitis and previously performed biopsies[8,11].

Intestinal lipoma

Lipoma is the most common mesenchymal tumor, which develops from the submucosa and may be large, with a predominantly extraluminal appearance. The ileocecal valve is most commonly affected. The CTC allows the diagnosis confirmation based on the presence of fat content[11] (Figures 13 and 14).

Endometriosis

It is estimated that 12% to 37% of the women with endometriosis also present implants in the gastrointestinal tract, with the rectum and the sigmoid colon the most affected locations[11]. At CTC, endometriosis presents as a lesion with extramucosal retractile appearance and as focal intestinal wall thickening (Figure 15). The usefulness of CTC in endometriosis lies in the definition of the extent of the disease in cases where submucosal and infiltrative

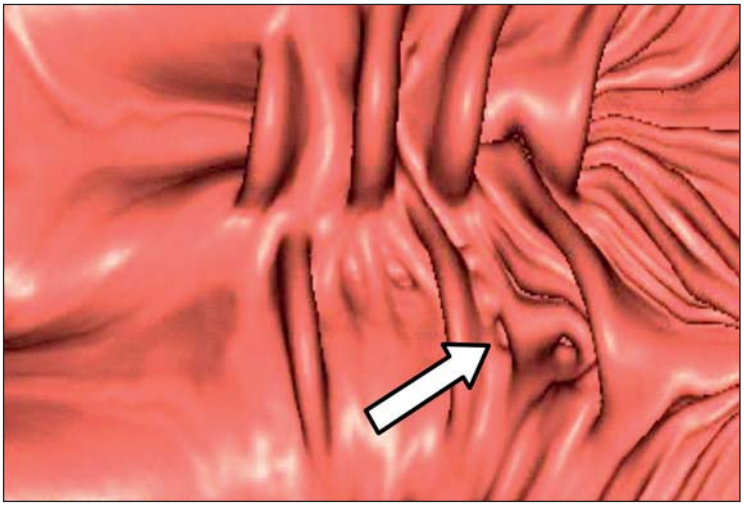

Figure 12. Colonic diverticulum (arrow). Endoluminal CTC view with virtual dissection.

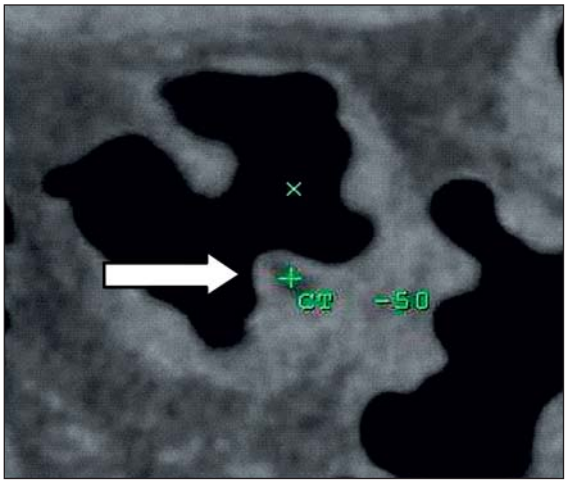

Figure 13. Lipoma simulating a polyp. Submucosal nodule (arrow) with smooth surface and negative density on axial image (UH: –50).

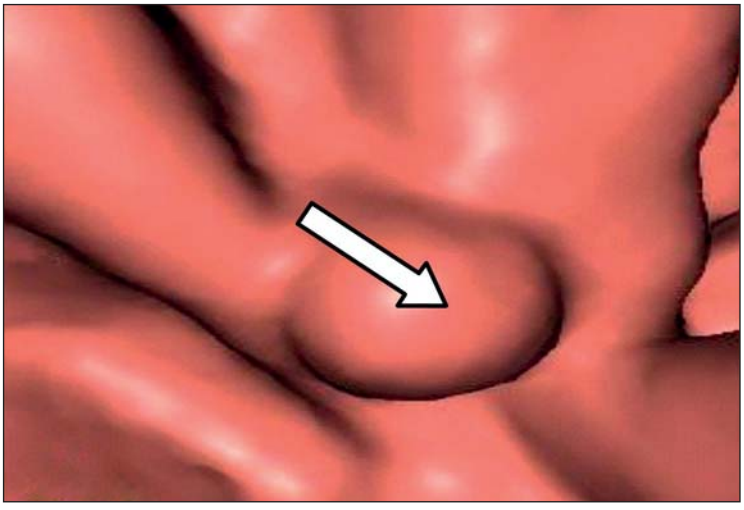

Figure 14. Lipoma simulating a polyp. Polypoid lesion with smooth endoluminal surface (arrow).

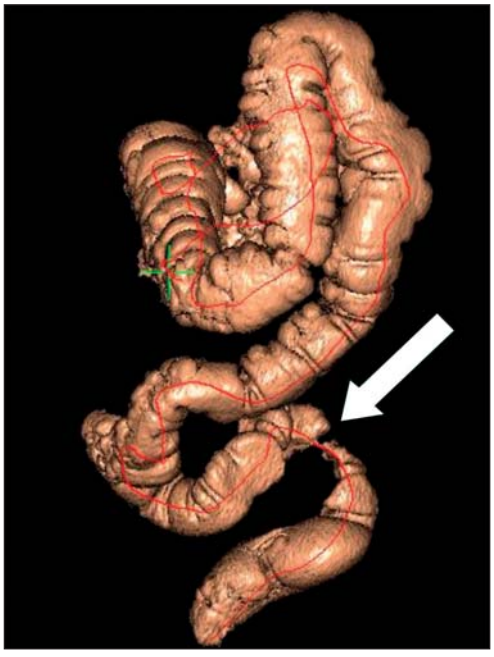

Figure 15. Deep endometriosis in the rectosigmoid transition zone (arrow). The serous implant determines focal stenosis of the loop. 3D CTC view of the colic frame.

lesions simulating CRC are identified at OC[11].

PSEUDOLESIONS

Fecal residue (polypoid-like)

It is the most common pseudolesion and differs from true polyps for being mobile, presenting heterogeneous attenuation and many times with intermingled gas, tending to present geometrical morphology. The bowel preparation with contrast agent ingestion is useful for labeling non-eliminated fecal residues, allowing their differentiation from true polyps[11] (Figures 16 and 17).

Ileocecal valve

Ileocecal valve is a lip-shaped structure and frequently accumulates fat, sometimes simulating polypoid lesions and lipomas[11] (Figure 18).

Appendicular stump

The presence of an inverted appendicular stump after appendectomy may simulate a polyp. The typical location and coronal reformation may be useful for recognizing such pseudolesion[7] (Figures 19 and 20).

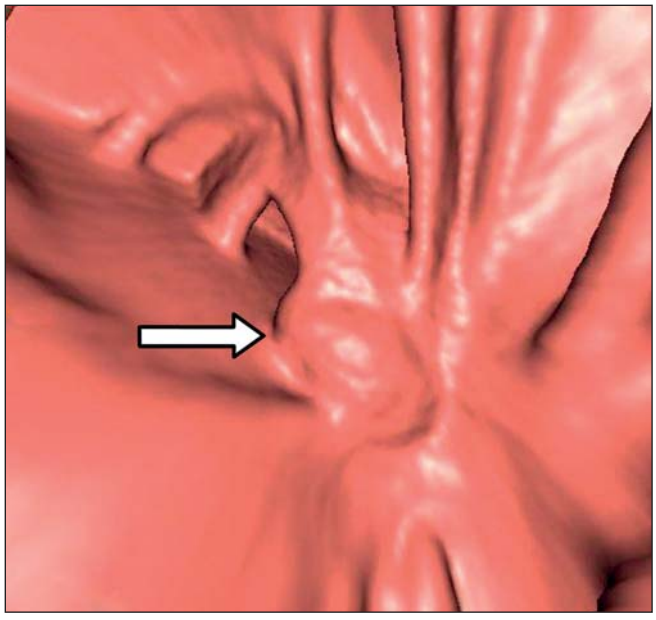

Figure 16. Fecal residue (arrow) simulating flat lesion on endoluminal view.

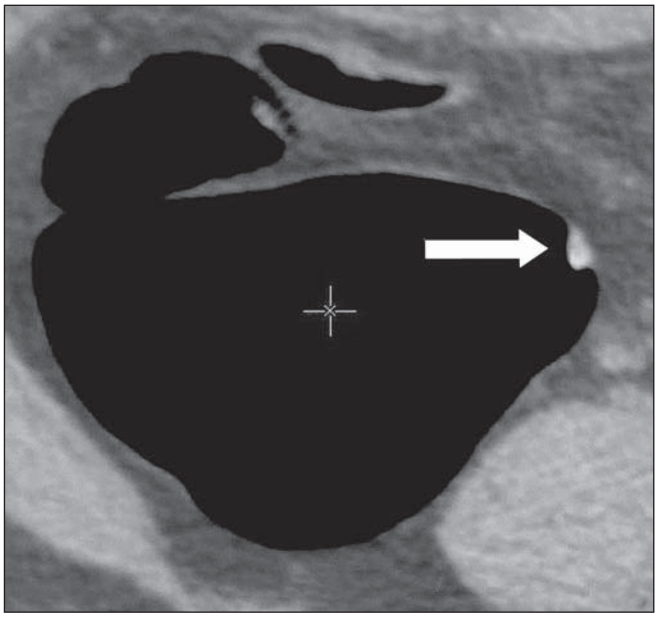

Figure 17. Barium-labeled fecal residue (arrow) simulating a polyp on axial image.

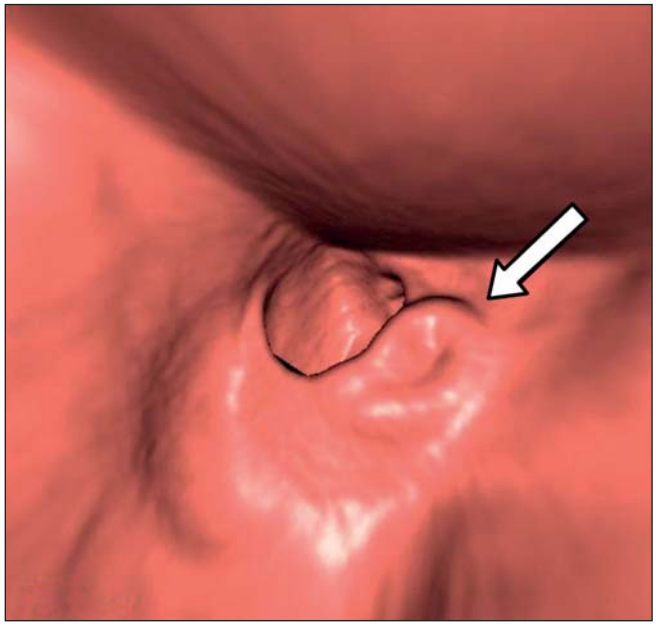

Figure 18. Normal appearance of ileocecal valve (arrow) at CTC. Endoluminal image.

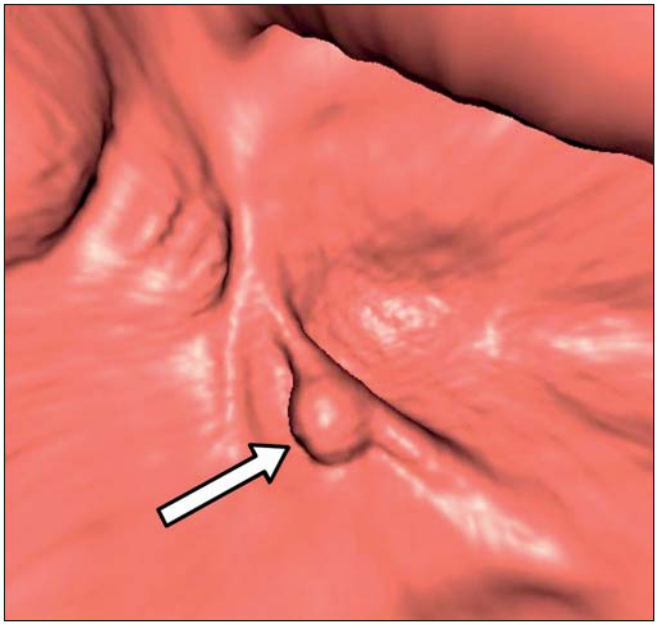

Figure 19. Appendicular stump (arrow) after appendectomy, simulating a polyp. Endoluminal view.

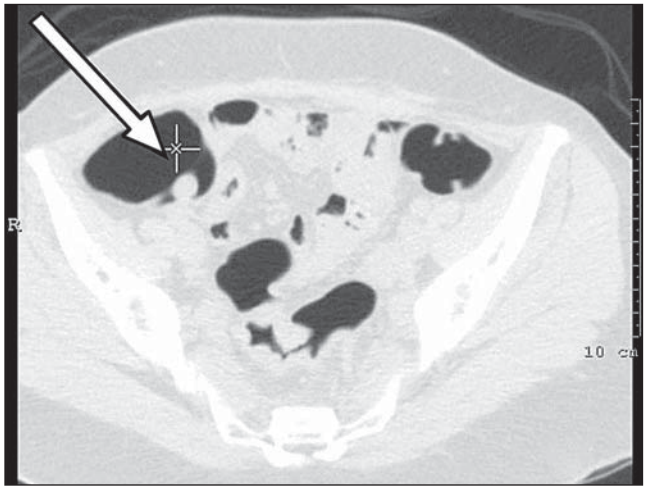

Figure 20. Appendicular stump (arrow) after appendectomy simulating a polyp on 2D axial image.

CONCLUSION

The technical aspects related to bowel preparation and acquisition of CTC images, as well as the knowledge of the main characteristics of lesions and pseudolesions are of utmost importance to ensure the high performance of the method in the screening for colorectal neoplasias.

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