Original Article

Colorectal Polyps in Average-Risk Thais: Evaluation with CT Colonography (Virtual Colonoscopy)

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ABSTRACT

Objective: To find the prevalence of significant colorectal polyps in average-risk Thais, to assess morphology and location distribution of these polyps within the colon, and to correlate them with pathological results after endoscopic removal.

Materials and Methods: Retrospective review of CT colonography (CTC) in average-risk people whose ages were ≥ 50 years old was performed from February 2006 to May 2007. There were 690 people of which 253 (36.7%) were male and 437 (63.3%) were female. Age range was 50-85 years with mean and median age of 62, and 60 years, consecutively. The presence, location, size and morphology of colorectal polyps were assessed in six colonic segments. People whose colonoscopy were performed, histology of all removed polyps was acquired through pathology report and compared with CTC findings.

Results: Of 690 people, 671 had complete data for review. Significant polyps of ≥ 6 mm were found in 66 people (9.8%). Of these 66 polyps, 53 (80.3%) were sessile, 12 (18.2%) were pedunculated, and 1 (1.5%) was plaque, flat lesion. Of these 66 polyps, 47 (71.2%) were found in the distal colon (transverse colon to rectum) and 19 (28.9%) in proximal colon (cecum and ascending colon). Large-size polyps of ≥ 10 mm, considered to be advanced polyp, were found in 13/671 people (1.9%). Of these 13 people, 11 proceeded for colonoscopy and 10/11 (90.9%) polyps were adenomas and 1/11 (9.1%) was hyperplastic polyp. Medium-sized polyps of ≥ 5-9 mm were found in 53/671 people (7.9%). Of these 53 people, 16 proceeded for colonoscopy of which one polyp was not found. Of the remaining 15 medium-sized polyps, 10 (66.7%) were adenomas, 4 (26.7%) were hyperplastic polyps and 1 (6.6%) was inflammatory polyp.

Conclusion: Based upon CTC, the prevalence of significant colorectal polyps of ≥ 6 mm in the average-risk Thais was approximately 10% with 2% to be advanced polyps of ≥ 10 mm. Majority of polyps were found at distal colon and majority were of sessile morphology. If polyps were of medium size (6-9 mm), the chance of being neoplastic adenomas was about 67%. If polyps were of large size (≥ 10 mm), the chance of being neoplastic adenomas was about 91%.

Key words : colorectal polyps, CT colonography, virtual colonoscopy

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Introduction

Colorectal cancer is the 3rd most common cancer worldwide, accounting for approximately 940,000 new cases annually[1]. In Thailand, colorectal cancer is the 3rd most common cancer in male and the 5th most common cancer in female[2]. Colorectal cancer is a curable disease if detected and treated early. Screening for colon cancer decreases its morbidity and mortality rates through early detection and removal of premalignant polyps, before they become invasive cancers[3]. Although colorectal screening in the average-risk group whose age is ≥ 50 years old has been recommended by professional health communities for a long time, its prevalence remains high[4]. There are many possible reasons for the persistence of the high prevalence, including poor compliance to recommendations, poor public education and limitations of screening options[5].

CT colonography (CTC), first described in 1994, is emerging as the preferred technology for colorectal imaging. Data show that CTC can be an effective technique for detecting colorectal polyps and cancers, with sensitivity values ranging from 85%-100% for polyps 6 mm or larger[6-15]. CTC has several advantages as a screening tool. It is minimally invasive, is quick for the patient, and does not require sedation. Our institution has started CTC program in the beginning of 2006 and by first half of 2007, has performed over 800 examinations. We, therefore, conducted a retrospective analysis of CTC in order to find the prevalence of significant colorectal polyps, to asses their morphology and location distribution within the colon, as well as to correlate with pathological results after endoscopic removal of significant polyps.

Materials and Methods

Subjects

Between February 2006 and May 2007, 853 people were examined with CT colonography. Of these 853 people, 163 were excluded from the study secondary to history of known cancers, previous colorectal surgery, symptoms highly suspicious for cancers, or ages under 50 years. The remaining 690 people were, therefore, average-risk people of ≥ 50 years old and were subjects of the study. These people were mostly middle-class Thais who lived in Bangkok or nearby provinces. Of 690 people, 253 (36.7%) were male and 437 (63.3%) were female. Age range was 50-85 years with mean and median age of 62, and 60 years, consecutively.

CT Colonography Technique

Bowel preparation and cleansing are mandatory for CTC. Everyone was instructed to have a soft, low-residue/low-fiber diet for 48 hours prior to the study. Three 45-mL doses of sodium phosphate (Swiff, Berlin Pharmaceuticals, Thailand) were taken orally 24 hours prior to the study. Immediately prior to the CTC examination, people were asked to evacuate any residual fluid at a bathroom in the radiology facility.

CTC was performed with a 64-detector row CT scanner (SOMATOM Sensation 64, Siemens Medical System, Germany). A flexible rubber catheter was inserted into the rectum. Prior to air insufflation, 10 mg of Hyoscine N-Butylbromide (The Government Pharmaceuticals Organization, Thailand) was given intravenously to relax colon and decreased its peristalsis. The colon was, then, insufflated with room air up to his/her tolerance (approximately 40 puffs). The catheter was left in the rectum, and CT scout image was obtained, with the patient in the supine position, to verify adequate bowel distension. If adequate bowel distension was present, the CT examination was performed. If adequate bowel distension was not achieved, additional air was insufflated into the rectum. After air insufflation, supine CTC was performed in a cephalocaudad direction to encompass the entire colon and rectum. The person was then placed in the prone position. Several additional puffs of air were administered. After a second CT scout image was obtained, the process was repeated over the same range.

CT parameters included 64 × 0.6 mm section collimation, 120 kV, 0.5-second gantry rotation, 100 effective mAs in supine and 50 mAs in prone. CT images were reconstructed as 1-mm-thickness with a 0.7-mm interval.

CT Data Interpretation

Both the supine and prone reconstructed image data sets were transferred to a workstation (Leonardo, Siemens Medical System, Germany) where they were reviewed by experienced radiologists. The data sets were analyzed using 3D endoluminal view as a primary approach. The antegrade and retrograde fly-through passes were performed in both supine and prone, totaling of four passes, in order to optimize data interpretation. If abnormality was detected or suspected, 2D axial, coronal or sagittal views were used to determine the nature of the abnormality.

The presence, location, size and morphology of colorectal polyps were assessed in six colonic segments (cecum, ascending colon, transverse colon, descending colon, sigmoid, and rectum), as recommended by an American Working Group on Virtual Colonoscopy(16).

Colonoscopy

Based upon the American Working Group on Virtual Colonoscopy(16), optical colonoscopy with polyp removal was recommended for all patients whose detected polyps were ≥ 10 mm, except for lipoma and benign submucosal mass. Detected polyps of 6-9 mm were given a choice of colonoscopic removal or 3-year CTC follow-up. People whose colonoscopy were performed, histology of all removed polyps was acquired through pathology report and compared with CTC findings.

RESULTS

Of 690 people, the CTC data was not completed in 19 people and was excluded from the analysis. Of the remaining 671 people, 451 (67.2%) had no polyp, and 220 (33.8%) were reported to have polyps. The detected polyps by CTC were divided into 3 groups; large-sized polyps of ≥ 10 mm, medium-sized polyps of 6-9 mm, and small-sized polyps of ≤ 5mm. If one person had more than one polyp, the largest polyp would be selected and categorized. Of 671 people, 13 (1.9%) found to have large-sized polyps, 53 (7.9%) found to have medium-sized polyps, and 154 people (23.0%) found to have small-sized polyps. However, the small-sized polyps of ≤ 5 mm are regarded as normal, as recommended by American Working Group on Virtual Colonoscopy(16) and no intervention is recommended. Therefore, our results would focus on significant polyps of large and medium sizes, and total number of people with significant polyps in this study was 66 (9.8%).

Of 66 people with significant polyps of ≥ 6 mm, 32 (48.5%) were male, 34 (51.5%) were female. Age range was 50-78 years with mean and median age of 64, and 64 years, consecutively. Of 66 significant polyps, 53 (80.3%) were sessile, 12 (18.2%) were pedunculated, and 1 (1.5%) was plaque, flat lesion. Of these 66 polyps, 6 (9.1%) were located in rectum, 20 (30.3%) in sigmoid colon, 11 (16.7%) in descending colon, 10 (15.1%) in transverse colon, 14 (21.1%) in ascending colon, and 5 (7.6%) in cecum. Management of large-sized and medium-sized polyps is different, of which recommendation for large-sized polyps is endoscopic removal whereas for medium-sized polyps is either endoscopic removal or 3-year follow-up by CTC. Therefore, detail results of each category are separated into two groups, as following.

Large-sized polyps of > 10 mm (Table 1)

Of 13 people whose CTC revealed large-sized

Table 1. Location, morphology, size, and pathology of 12 large-sized polyps

Case number	Location	Morphology	Size (cm)	Pathology
1	Rectum	Pedunculated	1.7	Adenoma
2	Rectum	Plaque, flat	3.2	Adenoma
3	Rectum	Sessile	1.0	Adenoma
4	Sigmoid	Pedunculated	1.0	Adenoma
5	Sigmoid	Pedunculated	1.5	Adenoma
6	Sigmoid	Pedunculated	1.1	Adenoma
7	Sigmoid	Pedunculated	1.3	Adenoma
8	Sigmoid	Sessile	1.6	Adenoma#
9	Descending	Pedunculated	1.1	Adenoma
10	Descending	Sessile	1.3	Hyperplastic
11	Descending	Sessile	3.0	Benign submucosal mass*
12	Transverse	Sessile	1.0	Adenoma
13	Ascending	Sessile	1.2	Lipoma*

#Additional infiltrative adenocarcinoma of the rectum was detected at endoscopy, but misinterpreted as poor distension at CTC (Figure 6).
*Pathology is based on typical CT findings (Figure 4, 5).

polyps, polyps ranged in sizes from 1.0 cm to 3.2 cm. Of these 13 large polyps, 6 (46.2%) were sessile, 6 (46.2%) were pedunculated, and 1 (7.6%) was plaque, flat lesion (Figure 1-3). Of these 13 large polyps, 3 polyps (23.1%) were located in rectum, 5 (38.4%) in sigmoid colon, 3 (23.1%) in descending colon, 1 (7.7%) in transverse colon, and 1 (7.7%) in ascending colon. Of these 13 large polyps, 1 was lipoma and 1 was benign submucosal mass which were diagnosed on typical CT findings (Figure 4, 5) and did not have further colonoscopy. Of the remaining 11 polyps, all proceeded to endoscopic polyp removal. Of these 11 polyps, 10 (90.9%) were adenomas, and 1 (9.1%) was hyperplastic polyp. However, in one case (case number 8), colonoscopy confirmed adenomatous polyp as detected at CTC, but additional infiltrative adenocarcinoma at the rectum was detected. This abnormality was misinterpreted as poor distension by radiologist (Figure 6). Table 1 summarized CTC findings of these 13 large polyps with pathological correlation.

Medium-sized polyps of 6-9 mm (Table 2)

Of 53 people whose CTC revealed medium-sized polyps (6.0-9.0 mm), 47 (88.7%) were sessile, and 6 (11.3%) were pedunculated (Figure 7, 8). Of these 53 medium-sized polyps, 3 polyps (5.7%) were located in rectum, 15 (28.3%) in sigmoid colon, 8 (15.1%) in descending colon, 9 (17.0%) in transverse colon, 13 (24.5%) in ascending colon and 5 (9.4%) in cecum. Of these 53 people, only 16 proceeded for colonoscopy.

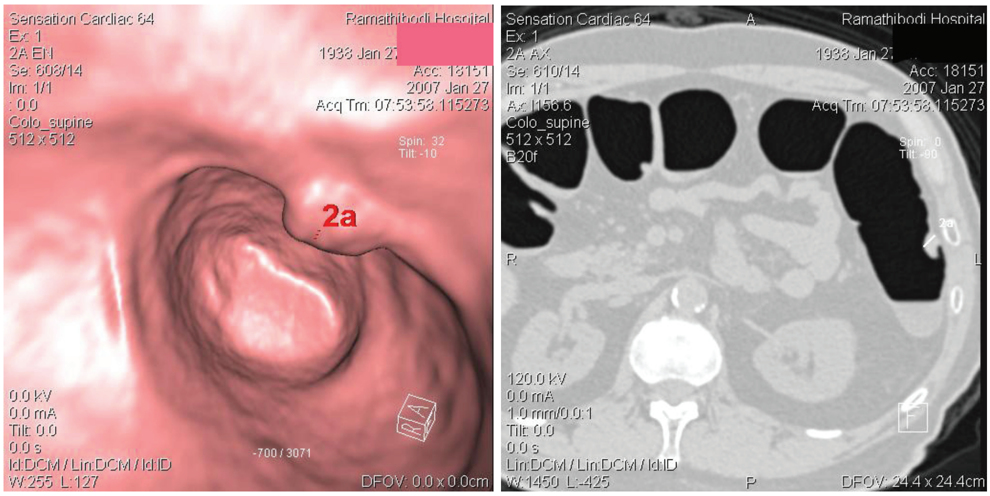

Figure 1. 3D endoluminal view and 2D axial view of a 1.3 cm, large-sized sessile polyp in the descending colon. Pathology after endoscopic removal revealed the lesion to be a hyperplastic polyp.

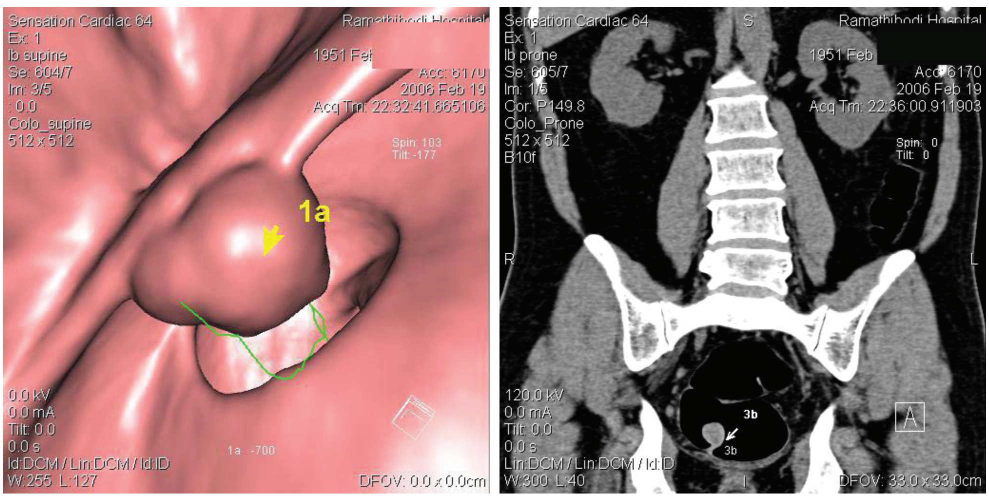

Figure 2. 3D endoluminal view and 2D coronal view of a 1.7 cm, large-sized pedunculated polyp in the rectum. Pathology after endoscopic removal revealed the lesion to be an adenoma.

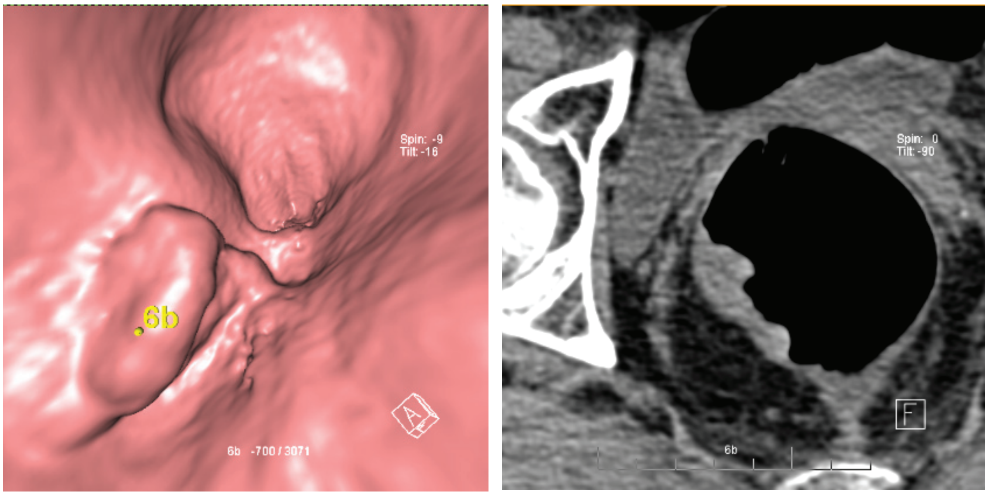

Figure 3. 3D endoluminal view and 2D axial view of a 3.2 cm, large-sized polyp with a flat, plaque-like appearance, locating in the rectum. Pathology after endoscopic removal revealed the lesion to be a tubulovillous adenoma.

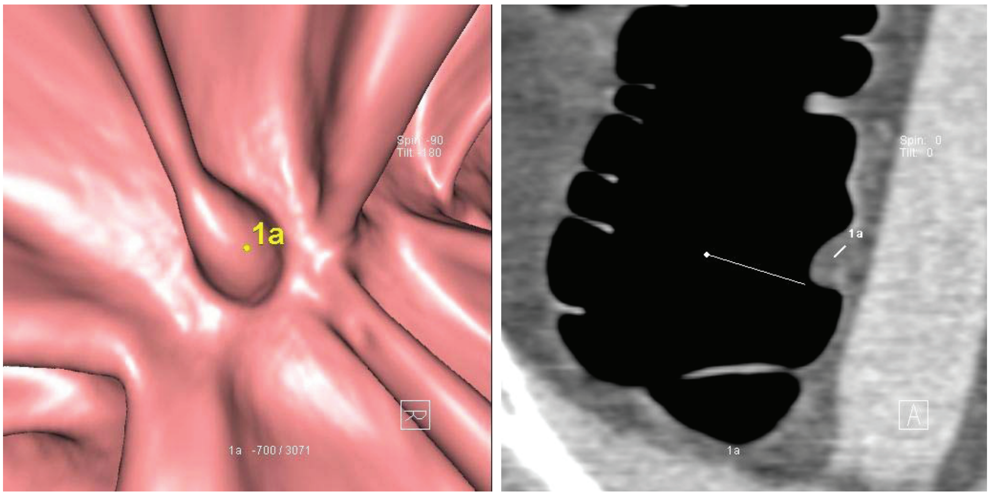

Figure 4. 3D endoluminal view and 2D coronal view of a 1.2 cm sessile polyp in the ascending colon. This lesion shows fat attenuation on 2D image, characteristic of a lipoma.

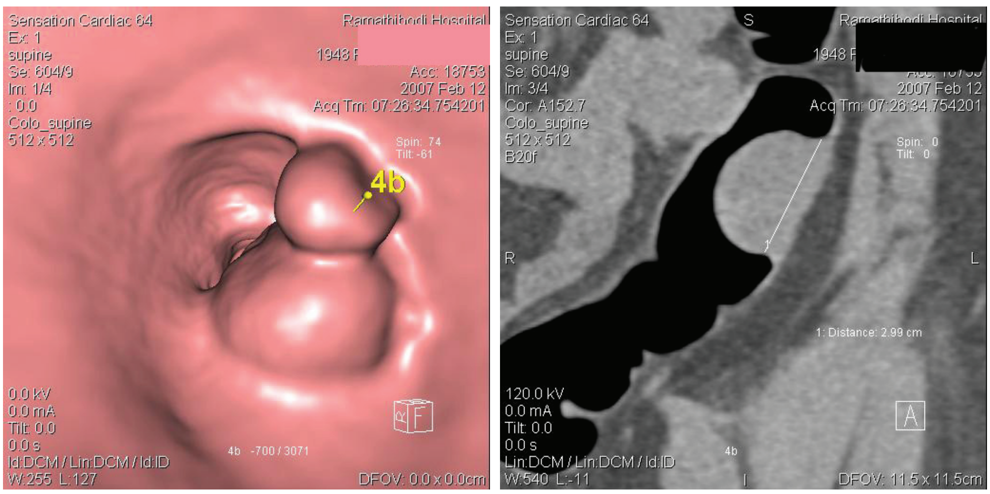

Figure 5. 3D endoluminal view and 2D coronal view show a 3.0 cm broad-based, smooth surfaced mass in the descending colon, characteristic of a benign submucosal mass.

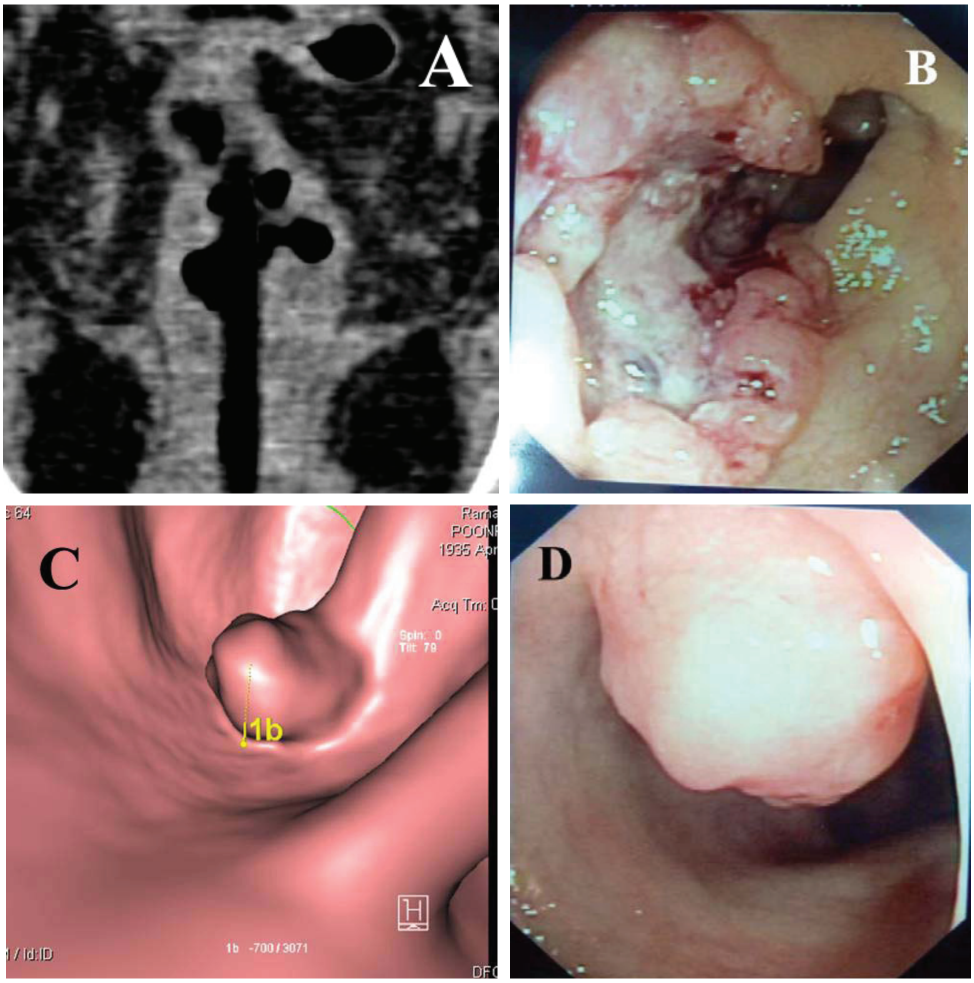

Figure 6. 2D coronal view (A) shows diffused rectal wall thickening, which was interpreted as poor distension by CTC. However, colonoscopy revealed an infiltrative mass (B), which proved to be an adenocarcinoma. Another 1.6 cm, large-sized sessile polyp was noted in the sigmoid colon, as shown by 3D endoluminal view (C) with endoscopic correlation (D). This polyp was proved to be an adenoma.

Table 2. Location, morphology, size, and pathology of 15 medium-sized polyps

Case number	Location	Morphology	Size (mm)	Pathology
1	Sigmoid	Sessile	7	Adenoma
2	Sigmoid	Sessile	9	Adenoma
3	Sigmoid	Pedunculated	8	Adenoma
4	Sigmoid	Sessile	8	Adenoma
5	Sigmoid	Sessile	7	Adenoma
6	Sigmoid	Sessile	6	Adenoma
7	Sigmoid	Sessile	6	Adenoma
8	Descending	Pedunculated	7	Hyperplastic
9	Transverse	Sessile	6	Inflammatory
10	Ascending	Sessile	7	Adenoma
11	Ascending	Sessile	8	Hyperplastic
12	Ascending	Sessile	8	Hyperplastic
13	Ascending	Sessile	7	Adenoma
14	Cecum	Sessile	7	Hyperplastic
15	Cecum	Sessile	9	Hyperplastic

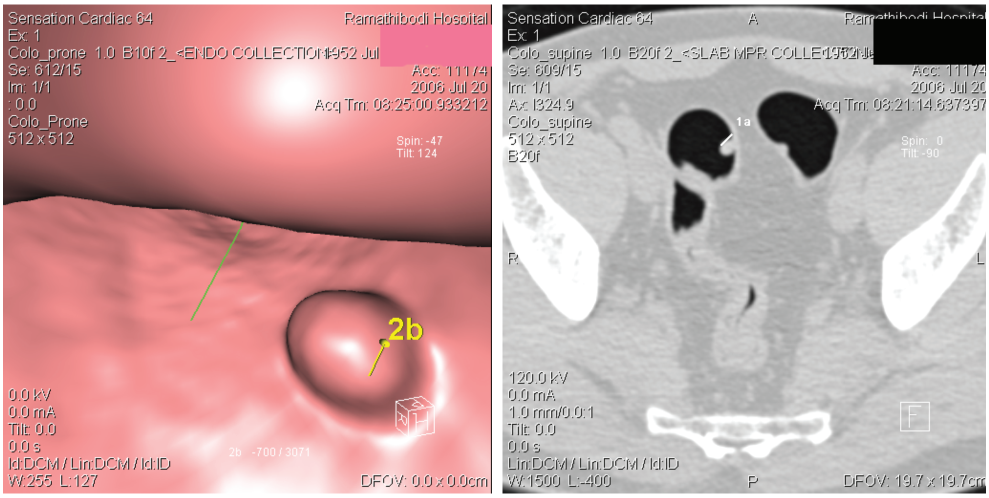

Figure 7. 3D endoluminal view and 2D axial view of a 9 mm, medium-sized sessile polyp in the sigmoid colon. Pathology after endoscopic removal revealed the lesion to be an adenoma.

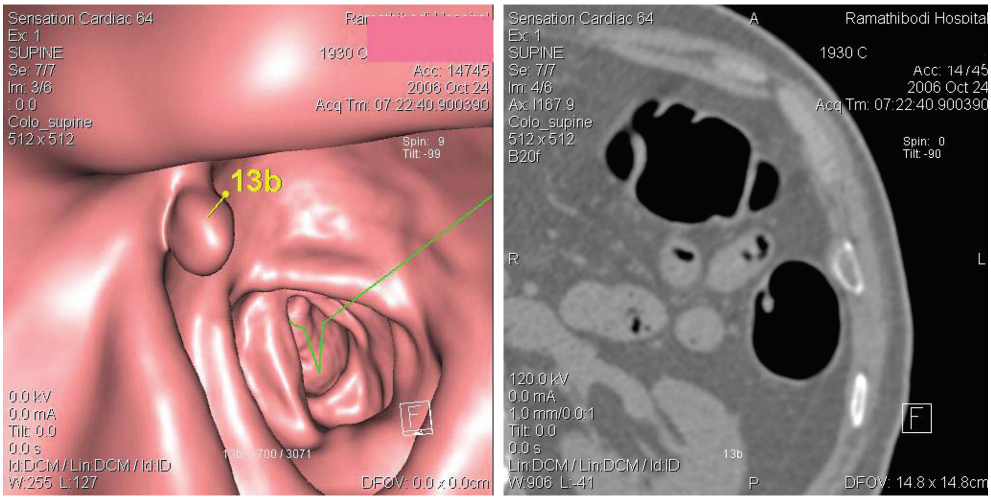

Figure 8. 3D endoluminal view and 2D axial view of a 7mm, medium-sized pedunculated polyp in the descending colon. Pathology after endoscopic removal revealed the lesion to be a hyperplastic polyp.

Of these 16 polyps detected at CTC, 1 polyp of 6 mm was not found at colonoscopy. Other 15 polyps, 10 (66.7%) were adenomas, 4 (26.7%) were hyperplastic polyps and 1 (6.6%) was inflammatory polyp. Table 2 summarized CTC findings of these 15 medium-sized polyps with pathological correlation.

DISCUSSION

Although colorectal screening in the average-risk group whose age is ≥ 50 years old has been recommended by professional health communities for a long time, the standard of practice for screening and surveillance in Thailand is still controversial and the target population is not yet decided[17]. Therefore, published data regarding the prevalence of colonic polyps in the average-risk Thais is lacking. However, the Asian data accumulated from multiple nations estimated the prevalence of colonic polyps in asymptomatic Asians to be approximately 18% and advanced polyps to be about 4%[18]. The results from our study showed that the prevalence of significant polyps of ≥ 6 mm detected by CT colonography (CTC), among the average-risk Thais whose age was ≥ 50 years old, was approximately 10%. The prevalence of large-sized polyps of ≥ 10 mm, which is considered the size of advanced polyps, was about 2%. Our prevalence is slightly lower than the Asian data, which may reflect the difference in studied population as well as difference in methods of measurement. Asian data was composed mostly by

Korean and Chinese people, while our study represented middle-class Thais who lived in Bangkok or nearby provinces. Also, our data was based upon CTC findings whereas the Asian results were based upon endoscopic findings.

From our study, significant polyps were found almost equally between male and female (49% vs. 51%), in contrast to Asian data which found male to be of higher prevalence than female[18]. This is probably secondary to higher number of female (63%) than male (34%) coming for screening in our study. It is interesting that in our population, female was more conscious about health prevention than male, at least in the area of CTC for colorectal screening. It is possible that male prefer optical colonoscopy to CT virtual colonoscopy. However, more data is needed to support this speculation. In this study, about 71% of significant polyps were found in the distal colon (transverse to rectum) and 29% in proximal colon (cecum and ascending colon). Therefore, sigmoidoscopy, if performed alone, would have missed certain percentage of significant polyps.

Based upon the American Working Group on Virtual Colonoscopy, the polyps detected by CTC are categorized into 3 groups; large-sized polyps of ≥10 mm, medium-sized polyps of 6-9 mm, and small-sized polyps of ≤ 5 mm[16]. Small-sized polyps are usually non-neoplastic polyps, such as hyperplastic polyps, mucosal tags or adhered feces[19]. This group of polyps is considered normal and routine CTC surveillance in 5 years is recommended[16]. Even though about 30% of small-sized polyps could also represent neoplastic adenomas, they are safe to wait for a routine surveillance in 5 years[20]. If they grow bigger at the interval follow-up, the colonoscopic removal would be safely done without increased the risk of malignancy. To remove every diminutive polyps is not necessary and may actually result in more complications and unnecessary cost[21].

For medium-sized polyps of 6-9 mm, the recommendation is either colonoscopic removal or CTC follow-up in 3 years. The chance of polyps to be neoplastic adenoma is about 50%[20]. The decision to wait for 3 years is also justified because half of these polyps would be non-neoplastic polyps with no need for removal. If these polyps are adenoma, shorter follow-up in 3 years will show interval growth and removal at that time would not increased risk of adenocarcinoma. This is because natural history of adenoma-carcinoma sequence takes place over 10 years, allowing safe interval for follow-up[20]. In our study, medium-sized polyps were found in about 8% (53/671) of people. Majority of polyps (89%) were sessile and the remaining were pedunculated. Majority of medium-sized polyps (66%) located at the distal colon (transverse colon to rectum), of which sigmoid colon was the most common site. The remaining 34% were in proximal colon (cecum and ascending colon). Of 16 people who proceeded for colonoscopy, only one person was negative for polyp, confirming high sensitivity of CTC, which has been widely published in the literature[6-15]. Of 15 polyps that were endoscopically removed, about 67% (10/15) were neoplastic adenoma, and 33% (5/15) were non-neoplastic polyps. The chance of being adenomas in medium-sized polyps in our study was higher than expected. This is probably secondary to relatively small numbers of pathological proven subjects in our study.

For large-sized polyps of ≥ 10 mm, the recommendation is to remove them endoscopically. This is because large polyp has a high chance of about 80% to be adenoma which is a precursor to adenocarcinoma, and about 1-5% to harbor malignant cells[20]. In our study, large-sized polyps were found in about 2% (13/671) of people. Both pedunculated and sessile morphology were equally common. Flat lesion, defined as a shallow, plaque-like or broad-based lesion with height less than half the width or height less than 3 mm[22,23], and considered a rare morphology, was found in one person in our study. Majority of large-sized polyps (92%) located at the distal colon (transverse colon to rectum), of which rectosigmoid colon was the most common site. The remaining 8% was in proximal colon (cecum and ascending colon). Of these 13 large polyps, one was a lipoma showing characteristic CT appearance of fat attenuation. The other was a submucosal mass showing broad-based appearance with smooth surface, characteristic of a benign submucosal tumor. These two lesions had no need for endoscopic removal and no further colonoscopy was performed. The rest of 11 people proceeded for colonoscopy as recommended by our staff. All 11 polyps were found, confirming high sensitivity of CTC, and all were endoscopically removed. Of the 11 polyps, about 91% (10/11) were adenomas, and 9% (1/11) was non-neoplastic, hyperplastic polyps. These percentages are concurrent with the current concept that large-sized polyps have a high chance of being adenomas[20]. One case (case number 8, Table 1) whose CTC revealed a

1.6 cm polyp at sigmoid colon, which proved to be an adenoma, had an additional rectal adenocarcinoma detected at colonoscopy. This area was misinterpreted as poor distension at CTC. Unfortunately, this is one pitfall of CTC[24]. Infiltrative adenocarcinoma showing diffuse thickened wall may be easily misinterpreted as poor distension, resulting in false negative as shown in this case. Vice versa, poor distension may be misinterpreted as infiltrative cancer, leading to false positive result. In spite of this pitfall, CTC is still a valuable tool for colorectal examination. Careful analysis in prone and supine as well as intravenous contrast injection may help decreasing this pitfall in suspicious and problematic cases.

There are a few limitations in our study. In this study, we were not able to assess the sensitivity and specificity of CTC in polyp detection, as this requires that all subjects undergo both CTC and colonoscopy. In our study, only people who found to have significant polyps were recommended for endoscopic removal. However, it is encouraging that in subjects with a positive finding at screening CTC who proceeded for colonoscopy, most polyps were detected. Nevertheless, we learned that we missed one adenocarcinoma because of misinterpretation as poor distension (false negative case). Also, colonoscopy could not find one medium-sized polyp reported by CTC (false positive case). Another limitation is that the population in this study reflects an average-risk group of relatively well-educated, middle-class people in central region of Thailand. CTC is a new technology for colorectal screening that has just emerged in the Thai health care system. Since Thai government has not yet endorsed colorectal screening as the national supported program, people who came for colorectal screening by CTC were relatively wealthy and well-educated. Therefore, the prevalence in our study represents a small subset of Thai people. Larger data base is required if the real prevalence of colorectal polyps in Thai population is needed.

In conclusion, based upon our CTC study, the prevalence of significant colorectal polyps of ≥ 6 mm in the average-risk Thais was approximately 10% with 2% to be advanced polyps of ≥ 10 mm. Majority of polyps were found at distal colon and majority were of sessile morphology. If polyps were of medium size (6-9 mm), the chance of being neoplastic adenomas was about 67%. If polyps were of large size (≥ 10 mm), the chance of being neoplastic adenomas was about 91%. It is hoped that this relatively safe and noninvasive imaging technique may help increase compliance for colorectal cancer screening. CTC is expected to compliment other screening options, and jointly achieve the higher rate of colorectal screening that should eventually lead to reduction of morbidity and mortality of colon cancers.

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