

RESEARCH COMMUNICATION

Colorectal Cancer Screening by Double Contrast Barium Enema in Thai People

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Abstract

Purpose: The incidence of colorectal cancer (CRC) has been increasing in Asian countries including Thailand. Double contrast barium enema (DCBE) is one of the investigation tools used in CRC screening. This study aimed to determine the incidence of colorectal neoplasm detected at screening by DCBE in Thai people. **Methods:** The computerized radiology database of screening DCBE in Thai adults between June 2009 and October 2011 at the Faculty of Medicine, Siriraj Hospital, was reviewed. DCBE examination performed in a surveillance program after curative CRC resection or the removal of colorectal polyps was also considered as a screening DCBE. **Results:** A total of 819 screening DCBEs performed during this 28-month period were analyzed. The mean age of patients was 59.8 ± 13.6 years. Of the total, 467 (57%) were male. A family history of CRC and a previous history of curative CRC resection or polyp removal were noted in 34 patients (4%) and 124 patients (15%), respectively. A total of 31 patients (3.8%; 95% CI = 2.7%-5.3%) were reported to have colorectal polyp or mass demonstrated on DCBE. Of these, follow-up endoscopy was performed in 20 cases (65%). According to pathological results, the incidence of advanced adenoma and CRC detected at screening DCBE was 0.7% (95% CI = 0.3%-1.6%; n=6) and 0.4% (95% CI = 0.1%-1.1%; n=3), respectively. **Conclusions:** The screening DCBE performed in Thai adults had a diagnostic yield of 0.7% for advanced adenoma and 0.4% for CRC.

Keywords: Colon cancer - screening - barium enema - neoplasm - adenoma - Thai

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Introduction

Colorectal cancer (CRC) is the leading cause of cancer-related death worldwide. The lifetime risk of developing CRC in the general population was reported to be approximately 5% in both genders (Jemal et al., 2010). Over the past decade, the incidence of CRC has been increasing in many Asian countries including Thailand, in which CRC is the third leading cause of cancer-related death (Khuhaprema & Srivatanakul, 2008). The crude rate of CRC in Thai people was about 8.9 per 100,000 in male and 7.4 per 100,000 in female (Martin & Patel, 2003). As most of CRC arise from adenomatous polyp, the best strategy to reduce the incidence and mortality of CRC is to detect and remove precancerous adenomas, and to detect early-staged CRC by screening.

The current international practice guidelines and expert consensus statements recommend CRC screening for average-risk people start at the age of 50 years using various screening tools (Levin et al., 2008; Sung et al., 2008; Segnan et al., 2010). Among these tools, double contrast barium enema (DCBE) is a non-invasive investigation which provides a complete colonic evaluation. DCBE demonstrated sensitivities of 33%-45% for any adenoma (Winawer et al., 2000), 70-80% for large adenomas (Steine et al., 1993), and 85%-97% for CRC,

respectively (Levin et al., 2008). A recent survey among Thai general surgeons showed that DBCE was the third popular investigation used in CRC screening (Lohsiriwat et al., 2009). However, there has been limited data about CRC screening in Thailand, particularly in the diagnostic yield of screening DCBE for colorectal neoplasm. The aim of this study was therefore to determine the incidence of colorectal neoplasm detected at screening DCBE for Thai people in a University Hospital.

Materials and Methods

After obtaining approval from the Siriraj Institutional Review Board (SIRB), the computerized radiology database of screening DCBE performed in Thai adults between June 2009 and October 2011 at the Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand was reviewed. DCBE examination performed as a part of surveillance program after curative CRC resection or removal of colorectal polyp was also considered as a screening DCBE. Incomplete studies e.g. patient was unable to hold barium or the colon was inadequately visualized were excluded. Written informed consent was given by all the patients before they underwent a fluoroscopic DCBE.

Of note, all DCBE studies were performed with

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a standard protocol using digital fluoroscopes. The examinations were performed by a radiology resident and a staff radiologist under a fluoroscopic guidance. The progression of the barium column, colon distention and barium coating were monitored at fluoroscopy. Spot digital radiographs were obtained in the following order: the rectum, the sigmoid colon, the descending colon, the splenic flexure, the transverse colon, the hepatic flexure, the ascending colon and the cecum. Next, overhead radiographs were obtained with the anteroposterior view, posteroanterior view and both lateral decubitus views of the abdomen, together with a lateral view of the rectum. Post-evacuation overhead images were routinely obtained at the end of the study. The findings of DCBE were interpreted and reported by a staff gastrointestinal radiologist.

Patients' characteristics, findings of DCBE (number, size, location of each colorectal polyp), endoscopic finding and pathologic results (if any) were extracted from prospectively collected electronic reports. Polyps detected during screening DCBE were measured without correcting for magnification. The polyps were subsequently divided into 2 groups based on the size of the lesion: < 1 cm and ≥ 1 cm. Performing follow-up endoscopy and polyp removal were dependent on an attending physician's discretion. In this study, the advanced adenoma was defined as an adenoma with a diameter of ≥ 1 cm, or displaying significant villous features (>25%), high-grade dysplasia, or early invasive cancer (Winawer & Zauber, 2002).

All data were prepared and compiled using the Statistical Package for the Social Sciences program version 11.3 for Windows (SPSS Inc, Chicago, IL). Pearson chi-square test or Fisher's exact test was used for comparing categorical data. A P-value of less than 0.05 was considered statistically significant. Results were given as mean ± standard deviation, or a number (percentage). The incidence of colorectal neoplasm detected at screening DCBE was analyzed with 95% Confidence Interval (95%CI) Analysis for Windows (Statistics with Confidence, 2nd Edition, BMJ Books, London 2000).

Results

A total of 819 screening DCBE performed during this 28-month period were analyzed. The mean age of patient was 59.8 ± 13.6 years. According to age group, 158 patients (19.3%) were younger than 50 years old, 258 (31.5%) were 50-59 years old, 192 (23.4%) were 60-69 years old, 147 (17.9%) were 70-79 years old, and 64 (7.8%) was older than 79 years old. Four hundred and sixty-seven patients (57%) were men. A family history of CRC and a previous history of curative CRC resection or polyp removal were noted in 34 patients (4.2%) and 124 patients (15.1%), respectively. There was no complication related to DCBE examination.

A total of 31 patients (3.8%; 95%CI = 2.7%-5.3%) were reported to have colorectal polyp or mass demonstrated on DCBE. Of these patients, follow-up sigmoidoscopy or colonoscopy was performed in 20 cases (64.5%). The median interval between the DCBE examination and endoscopy was 4 weeks (range 1-24). Colorectal

Table 1. The True-Positive and False-positive Rate of 31 Patients with the Radiological Diagnosis of Colorectal Polyps on DCBE. Results are Given as Number (Percentage)

Polyp size	No. of patient (n=31)	Follow-up endoscopy (n=20)	True-Ve+ lesions	False-Ve+ lesions
< 1 cm	22 (2.7)*	12	10 (83)	2 (17)
≥ 1 cm	9 (1.1)*	8	7 (88)	1 (12)

*Percentages were calculated out of 819 DCBE examinations

adenomatous polyps detected during endoscopic examination were confirmed in 17 cases (2.1%; 95%CI = 1.3%-3.3%). Table 1 shows the true-positive and false-positive rate of 31 patients with the radiological diagnosis of colorectal polyps on DCBE. Advanced adenomas were detected in 6 cases (0.7%; 95%CI = 0.4%-1.6%). Three cases (0.4%; 95%CI = 0.1%-1.1%) were found to have CRC: two stage-I cancer of the sigmoid colon, and one stage-II cancer of the ascending colon. The incidence of advanced colorectal neoplasm was highest in patients with the age of 50-59 years (10 of 258 patients; 3.9%). There was no significant difference in the incidence of advanced colorectal neoplasm detected at screening DCBE between average-risk individuals and high-risk individuals (0.7% vs 0.6%; P= 0.67).

Discussion

There is strong evidence that CRC screening reduces the incidence of CRC by 20-30% and decreases the CRC-related death by 15-43% (Mandel et al., 1993; Hardcastle et al., 1996; Kronborg et al., 1996; Atkin et al., 2010). In 2008, the American Cancer Society, the US Multi-Society Task Force on Colorectal Cancer, and the American College of Radiology released a comprehensive guideline for screening and surveillance for the early detection of CRC and adenomatous polyps (Levin et al., 2008). In this update recommendation for CRC screening, DCBE was classified as a screening tool that not only identifies cancer early and but also detects colorectal adenomas. Although DCBE has been adopted as a CRC screening option by the American Cancer Society since 1997, there is a relatively few published studies evaluating the diagnostic yield and efficacy of screening DCBE in the general population (Johnson et al., 1996; Kung et al., 2006; Toma et al., 2008).

In Thailand, DCBE is widely used for total colonic evaluation and CRC screening because of its safety, relative simplicity and high availability (Lohsiriwat et al., 2009). However, to the best of our knowledge, there was no report from Thailand regarding the diagnostic yield of DCBE for CRC screening. According to our retrospective study of 819 screening DCBE examination in both average-risk individuals and high-risk individuals, 31 patients (3.8%) were reported to have colorectal polyp or mass. As recommended by a joint guideline from the American Cancer Society, the US Multi-Society Task Force on Colorectal Cancer, and the American College of Radiology (Levin et al., 2008), patients with the findings of polyps > 6 mm on DCBE should undergo further endoscopic examination. Accordingly, only 20 of the 31

patients (65%) underwent follow-up endoscopy. Based on endoscopic examination, the true-positive rate of polyps detected on these screening DCBE examinations, mainly those larger than 6 mm, was 83-88%. Meanwhile, the false positive rate of polyps detected on our screening DCBE was 12-17%. Based on pathologic results, this study showed that the diagnostic yield of screening DCBE for advanced adenoma and CRC was 0.7% and 0.4%, respectively.

The incidence of advanced adenoma detected during this screening DCBE was lower than that discovered during screening colonoscopy in our hospital during a comparable period of time, in which the screening colonoscopy of 1594 asymptomatic Thai adults had the advanced adenoma detection rate of 2.7% (Aswakul et al., 2011). However, the CRC detection rate of screening DCBE (0.4%) was comparable to the screening colonoscopy in Thai people (0.6%). Although the diagnostic accuracy of DCBE was inferior to colonoscopy for the overall detection rate of colorectal neoplasm (Smith & O'Dwyer, 2001; Ramos et al., 2009), DCBE is still a viable option for CRC screening because this non-invasive study demonstrates the anatomical configuration and any abnormality of the entire colon with a high sensitivity for clinically significant colorectal neoplasms (Levine et al., 2002). In general practice, the DCBE examination has been shown to have a sensitivity of about 70-80% for polyps larger than 6 mm (Steine et al., 1993) and a sensitivity of 85%-97% for CRC (Levin et al., 2008). DCBE is also a supplement investigation in the case of incomplete colonoscopic examination.

The diagnostic findings of screening DCBE could be different among ethnics, age group and radiologic interpretation. For example, the incidence of advanced colorectal neoplasm was fewer in Asian population compared to that in Western population (Soon et al., 2005). In a recent study of average-risk US population, the diagnostic yield of DCBE for advanced adenoma and CRC was 6.2% and 0.7%, respectively (Kung et al., 2006). Meanwhile, the incidence of colorectal neoplasm detected during screening colonoscopy and fecal immunochemical testing in a large number of asymptomatic European adults 50 to 69 years of age was 1.9% and 0.9% for advanced adenoma, and 0.1% for CRC, respectively (Quintero et al., 2012). Technique of barium study and the interpretation of the findings on DCBE examination by radiologists also affect the accuracy of CRC detection. For instance, the sensitivity of DCBE for CRC was greater than that for single-contrast barium enema (85% vs 82%) (Rex et al., 1997). Double reporting of DCBE by different radiologists significantly reduced the miss rate and perceptible errors (Ott, 2000).

Since the best test for CRC screening does not exist (Glick, 2000), a patient and a physician should discuss about various investigation tools which have different advantages and disadvantages. For example, colonoscopy appears to have the highest efficiency, but it is expensive and it has the greatest risk of complication including colonic perforation (Lohsiriwat, 2010). Meanwhile, DCBE is safer but there is a lack of therapeutic modality. Interestingly, a mathematical model suggested that DCBE

could be the most cost-effective screening tool for high-risk individuals such as those with a family history of CRC (Eddy et al., 1987). For our stand point of view in CRC screening, a diagnostic yield of advanced colorectal neoplasm detected during screening process in Thai people was relatively low; 0.7% for advanced adenoma and 0.4% for CRC in the present study of screening DCBE, and 2.7% for advanced adenoma and 0.6% for CRC in screening colonoscopy (Aswakul et al., 2011). Moreover, flexible endoscopy is not available nationwide and it could be associated with some serious complications. Hence, non-invasive investigation of the entire colon such as DCBE could be a useful initial screening tool for CRC screening in Thai population.

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