Clinical Practice Committee
Virtual Colonoscopy

Data Source [Methodology for choosing sources]

Clinical Question
In a general patient population undergoing colorectal cancer (CRC) screening is virtual colonoscopy superior to standard colonoscopy in detection of polyps, patient comfort, or cost?

Bottom Line
According to this systematic review, CT colonography has high specificity but the reported sensitivities have a broad range. Collimation, type of scanner, and mode of imaging account for some of the variability. Until these issues are resolved, inconsistency in test performance will remain problematic. It is too early to recommend virtual colonoscopy for the general patient population.

Study Design
Meta-analysis

Synopsis
CRC is one of the leading causes of cancer-related death in the U.S. Guidelines for screening have been widely recommended because of its long preclinical phase and improved prognosis when detected early. Only a fraction of eligible patients undergo screening for CRC and it is believed that this may be due in part to poor acceptance of current screening methodologies. CT colonography (virtual colonoscopy) has emerged as a potential alternative to standard colonoscopy. Some advantages that have been attributed to it include comfort and acceptability by patients. When looking at the overall literature however, it is not clear whether test performance is comparable between the two screening modalities. Wide ranges in sensitivity and specificity have been reported, and the reasons for these differences are not clearly evident. Potential explanations have included the type of scanner used, imaging software utilized, as well as the expertise of the radiologists reading the scan.

The majority of studies have been done on patients felt to be at higher risk for polyps or cancer based on personal or family history. The above study is a systematic review of the literature which aimed to assess the performance of CT colonography compared with colonoscopy or surgery. It also attempted to explain the source of conflicting results. **Only 3 of the studies in this meta-analysis were designed to study average-risk patients.** The authors of this meta-analysis conducted a systematic review of the available literature on CT colonography where standard colonoscopy or surgery was used as the gold standard. PubMed, EMBASE, MEDLINE, and Cochrane were reviewed from 1975-2005. Based on defined inclusion criteria, 33 prospective studies were identified involving 6393 patients. Data on sensitivity and specificity for polyps <6mm, 6-9mm, and >9mm in size were abstracted and these were weighted by sample size. Per-patient sensitivity varied from 21%-96%. Sensitivity for <6mm polyps was 48% (CI, 25-70%), 70% (CI, 55-84%) for polyps 6-9mm, and 85% (CI, 79-91%) for polyps >9mm. Specificity results were less variable: 91% (CI, 89-95%) for <6mm polyps, 93% (CI, 91-95%) for 6-9mm, and 97% (CI, 96-97%) for polyps >9mm.
The prior studies which are referenced in this meta-analysis have not convincingly demonstrated differences in terms of comfort, or patient acceptability. After extensive review of various variables, this meta-analysis could not clearly explain the wide variability in reported sensitivities (multiple possibilities include: collimation thickness, number of detectors, mode of imaging, type of contrast used, expertise of radiologists, and software limitations). The authors recommend further study before this technology can be recommended for general use in CRC screening. The more recently available fly-through technology appears to have considerably better sensitivity; however this is only based on two published studies. Further study on CRC screening using CT colonography will likely involve this technology.

The Gastroenterology Department has created a patient education piece regarding virtual colonoscopy.

Annotated Bibliography
(Selected references)

Findings: Similar numbers of advanced neoplasms were identified in both the routine colonoscopy group and the CT colonography group. 3163 subjects were in the colonoscopy group and 3120 subjects were in the CT group. 7.9% of patients in the CT colonography group (246) were referred for colonoscopy, and advanced neoplasia was confirmed in 100 of these patients. 107 cancers were identified in the colonoscopy group. There were 7 colon perforations in the colonoscopy group and none in the CT colonography group. More polyps were identified in the colonoscopy group than in the CT group (1189 vs. 404)
Limitations: This was a non-randomized study of 2 consecutive low risk populations adults referred for screening. The two groups were unbalanced with respect to the numbers of individuals with a prior history of colon cancer (more in the colonoscopy group). The authors did not comment on false positive or false negative rates for either procedure. 246 patients out of 3120 in the colonography group had to be referred for colonoscopy.
Comments: This is a confusing report of a large non-randomized clinical experience with a new modality. The authors can claim that the new technique of CT colonography is safe and feasible, but they do not answer the question as to whether it is more useful or accurate than the standard colonoscopy.

Findings: 615 subjects were referred for routine colon screening at 9 hospital centers. Subjects were randomly allocated to either CT colonography(CTC) or routine colonoscopy. 827 lesions were identified in 308 subjects who underwent both procedures. The sensitivity of CTC in detecting one or more lesions at least 6 mm was 39% and for lesions > 10 mm it was 55%. The sensitivity of routine colonoscopy for these lesions was 99 and 100% respectively. The specificity of CTC and routine colonoscopy for detecting lesions at least 6 mm was 96 and 100% respectively. CTC missed 2 of 8
cancers. The accuracy of CTC varied significantly between centers but seemed to improve over the
course of the study.
Comments: This moderate sized multicenter study with a randomized cross-over design strongly
suggests that CTC is not yet a practical technique for screening and requires substantial experience on
the part of the operators to achieve reasonable accuracy.

Levin B, Brooks D, Smith RA, Stone A. Emerging Technologies in screening for colorectal
cancer: CT colonography, immunochemical fecal occult blood tests and stool screening using

Findings: This is a consensus statement from the scientific advisory board of the American Cancer
Society on emerging screening technologies for colorectal cancer. In their review the authors felt that
results from major US centers show that CT colonography (CTC) is comparable to conventional
colonoscopy for polyps greater than 10 mm with few false positives in experienced hands (90%
sensitivity). For polyps less then 10 mm the sensitivity drops to 50% in published studies. Studies also
suggest that CTC can detect frank colon cancers with a sensitivity of 100% and no false positives. The
authors comment that there are very few randomized studies examining efficacy in the screening
population. Limitations of CTC according to the authors are 1) high false positive rates (15 %?); 2) an
unknown ability to detect flat adenomas; 3) lack of standards for performance, training; reading of
scans; 4) cost.
Limitations: This is an “expert consensus”, not patient-oriented data.
Comments: The advisory group concluded that CTC was a compelling technology that shows
considerable promise. However, there is inadequate patient-centered clinical data to support its use in a
routine clinical setting.