**Introduction**

Virtual colonoscopy is the popular term used for a technique used to examine the internal anatomy of the colon to detect abnormalities, such as polyps and colorectal cancer. It uses helical (spiral) computer assisted tomography and image processing computer software to create a two or three dimensional display of the inner surface of the colon. The clinical term for this technology is computed tomography (CT) colonography (or CTC). Another type of virtual colonoscopy, using magnetic resonance imaging (MR colonography or MR colonoscopy), is also being investigated, but thus far, CTC has been studied and used more extensively.

Before CT colonography, the bowel is cleansed and air or carbon dioxide is pumped into the colon to improve image quality (these procedures generally cause patient inconvenience and discomfort). The patient is required to hold their breath for up to a minute for the duration of the scan. A radiologist who is trained to interpret these images analyzes the results.

The most common methods currently used to investigate the colon (alone or in combination) include:

- fecal occult blood testing (FOB) - laboratory testing for blood in the stool
- barium enema – a real-time X-ray of the bowel following a cleansing enema and pumping of air and barium into the colon
- sigmoidoscopy – examination of the rectum and lower part of the colon with a sigmoidoscope (a flexible fibreoptic tube about 50 cm long), and
- endoscopic colonoscopy – use of a flexible, lighted, endoscope with a video camera to visualize the interior of the colon

Most of the studies to date have compared CT colonoscopy to traditional endoscopic colonoscopy. According to a recent Minnesota evaluation, the advantages of CTC as compared with traditional colonoscopy are:

- it allows visualization of the colon in less time, without sedation, and with no risk of bowel perforation, and
- the whole colon and rectum can be imaged and gaps in the imaging are reduced.
Virtual colonoscopy (Computed Tomography Colonography)

However, the limitations to CTC are:

- it is not cost-effective, in comparison to endoscopic colonoscopy,
- the sensitivity and specificity of CTC need improvement,
- there is a significant learning curve involved in interpreting the images,
- interpretation of the images is time-consuming,
- positive CTC test results require further investigative procedures and may require another bowel preparation, and
- patients are exposed to radiation during CTC.

Virtual colonoscopy has been promoted as less invasive and more appealing to patients – perhaps encouraging greater compliance. However, a recent study by McQuaid et al. found that patients reported more discomfort with virtual colonoscopy than with conventional endoscopic colonoscopy (patients are sedated for endoscopic colonoscopy).

**Research Questions**

A provincial ministry of health asked CCOHTA for information on virtual colonoscopy. The research question posed is “How does virtual colonoscopy compare with conventional technologies that image the colon?”

**Assessment Process**

Preliminary literature searches were run on the PubMed, The Cochrane Library and the HTA databases. The web sites of several major HTA agencies were checked, particularly those involved in horizon scanning activities and sites not indexed by the HTA database, such as the Institute for Clinical Systems Improvement (ICSI), Hayes Inc., and ECRI. Two HTA agencies with recent publications or work in progress (MSAC in Australia, and DACEHTA in Denmark) were contacted for further information. The U.S. VA Technology Assessment Program provided further information from their recent survey of member agencies of the International Network of Agencies for Health Technology Assessment (INAHTA.)

**Summary of Findings**

Several HTA agencies are currently working on assessments of this technology or have assessed virtual colonoscopy within the past few years. The table below shows the assessments identified.
## Virtual Colonoscopy (Computed Tomography Colonography)

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<th>Type of Report Identified</th>
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- Available studies compare CTC to colonoscopy but not to other screening methods.  
- "At this time, evidence does not support the use of CTC as a screening tool." |
| HTA                       | Virtual colonoscopy | Canberra: Medicare Services Advisory Committee (MSAC); 2001. (Horizon scanning no. 001). Available: http://www.msac.gov.au | - Although it appears to be safe when used for the diagnosis of colorectal cancer on an individual level, the safety of virtual colonoscopy as a population-based screening tool has not yet been evaluated.  
- Professional training and accreditation are needed.  
- Results from recent clinical trials should provide more evidence of the sensitivity / specificity of virtual colonoscopy as a population-based screening tool.  
- The Australian Safety and Efficacy Register of New Intervventional Procedures - Surgical (ASERNIP-S) considers virtual colonoscopy to be a "short term" technology (a new or emerging technology identified up to one year before its expected introduction into Australasian health care services) |
| HTA                       | Computed tomographic colonography for detection of colorectal polyps and neoplasms | Bloomington (MN): Institute for Clinical Systems Improvement; 2001 no. 58 of Technology assessment series. Available: http://www.icsi.org/ta/T58abr.pdf | "The exact clinical role of CTC is still being determined. CTC is potentially useful for initial screening (including patients who refuse or are not suited for colonoscopy) and follow-up testing after incomplete colonoscopy."  
- To date, there are no data on the value of CTC in a screening population and CTC should not be considered as a screening tool..."  
- "With the present data acquisition and interpretation protocols, CTC is not as sensitive or specific as conventional colonoscopy." |
### Virtual Colonoscopy (Computed Tomography Colonography)

**CCOHTA**

| HTA | Place de la coloscopie virtuelle dans le dépistage du cancer colorectal | Paris: Agence Nationale d’Accréditation et d’Évaluation en Santé (ANAES); 2001. Available: http://www.anaes.fr/ANAEs/framedef.nsf/WebMaster/pag71e60e94c17622ae1c256670023974b?OpenDocument (full report in French), or http://www.anaes.fr/ANAEs/framedef.nsf/WebMaster/pag71e60e94c17622ae1c256670023974b?OpenDocument (summary report in French) | - Virtual colonoscopy is still at a developmental stage and is not yet fully optimized. The studies to date have typically been from high-risk populations and may have limited validity. - Diagnostic performance varies. The advantage of the technology is that it is not as invasive as colonoscopy, however, it still requires preparation of the patient, similar to colonoscopy. This may slow down the acceptance of virtual colonoscopy, in comparison with the simpler fecal occult blood (FOB) test. As with the FOB test, virtual colonoscopy will require a traditional colonoscopy in the event of a positive result. The data available at this time do not make it possible to recommend virtual colonoscopy. |
| HTA | Virtual colonoscopy for detection of colorectal cancer and polyps | Plymouth Meeting (PA): ECRI; 2002. Target report no. 761. Available to subscribers or by purchase: http://www.ecri.org | - Virtual colonoscopy may have a role in colorectal cancer screening in the future, as the technology develops. - The current evidence does not support the use of virtual colonoscopy as a screening tool for colorectal cancer and polyps. |
| HTA | Virtual colonoscopy (computed tomography colonography) | Lansdale (PA): Hayes Inc.; 2000. Available to subscribers only, or by purchase: http://www.hayesinc.com | n/a |
| Forthcoming | Técnicas endoscópicas y radiológicas en el diagnóstico de cáncer colo-rectal. Evaluación de variabilidad de uso y aceptabilidad. | Vitoria-Gasteiz, País Vasco (SP): Osteba; [forthcoming]. Information available at: http://www.euskadi.net/sanidad/osteba/inv01_c.htm | - This is a primary study being carried out at the University Hospital in Aarhus. The aim of the study is “to evaluate the future role of virtual colonoscopy in the Danish health care system in the diagnostic work-up on patients with colorectal cancer and its precursors: adenomatous polyps”. |
| Forthcoming | Virtual colonoscopy: a reliable alternative to conventional colonoscopy? | Copenhagen: Danish Centre for Evaluation & Health Technology Assessment (DACEHTA); forthcoming Spring, 2003. Further contact information and details are available at: http://www.cemtv.dk/projekter/216_uk.asp | - This is a primary study being carried out at the University Hospital in Aarhus. The aim of the study is “to evaluate the future role of virtual colonoscopy in the Danish health care system in the diagnostic work-up on patients with colorectal cancer and its precursors: adenomatous polyps”. |
| Forthcoming | The role of computed tomographic colonography (CTC) | London: National Coordinating Centre for Health Technology Assessment (NCCHTA); (HTA Commissioning Brief: 02/02). | - The UK NHS is commissioning a primary research study on CT colonography. |
Conclusion

Several other HTA agencies have recently assessed virtual colonoscopy and others have work underway. At this point, CCOHTA will not duplicate these efforts and will wait until further evidence becomes available.

References