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imaging update

VIRTUAL COLONOSCOPY



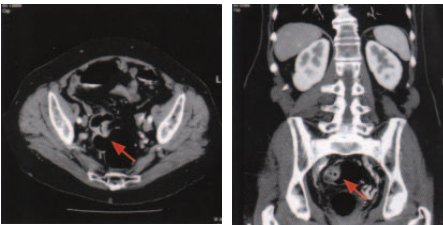
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VIRTUAL COLONOSCOPY/ CT COLONOGRAPHY

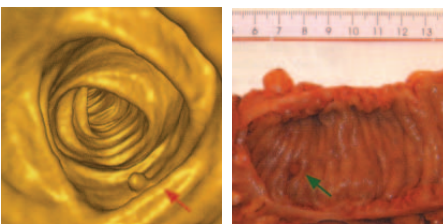
Virtual colonoscopy, also known as computed tomographic colonography, is the acquisition and review of a volumetric (3D) dataset of the colorectum. This data is obtained using a multislice CT and is analysed using specialised computer software to detect small cancers and polyps. Virtual colonoscopy continues to undergo technical improvements. The most recent studies indicate that virtual colonoscopy is a highly sensitive, full structural screening examination of the colon.



Colon Cancer.

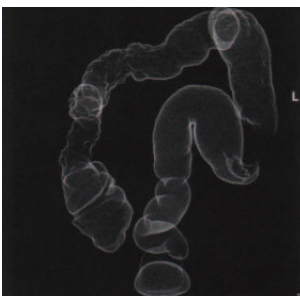


Multislice CT of a cancer in the sigmoid colon (arrows). Note that in multislice CT, secondary reformations show the same spatial resolution as the original axial images.



Single 3mm polyp (arrow), reconstructed from a multislice CT dataset (1 mm slice thickness).

Surgical specimen confirming the findings of CT colonography.



"Virtual double contrast" of the colon in a patient with long-standing ulcerative colitis (reconstruction based on a 1 mm dataset). The patient had multiple pseudopolyps in the ascending and transverse colon and an occluding polyp (benign) in the descending colon.

TECHNIQUE

Bowel cleansing regimen

Some centres use a full colonoscopy preparation, but a number of studies have demonstrated more than adequate bowel cleansing with a double barium enema preparation (low residue diet, a solution of magnesium citrate orally and a suppository). This is much better tolerated by patients than a full colonoscopy preparation.

Air Enema

On entering the CT suite, a standard barium enema tube is inserted into the rectum. The colon is inflated to maximum patient tolerance (i.e. without pain) using room air. Adequate colonic distension is then confirmed with CT fluoroscopy.

Multislice Scan

Prone and supine multislice scans are performed (each in a single breath hold). With Toshiba multislice scanners, each scan only takes approximately 25 seconds to complete. The Scans are performed with 2mm collimation with a 1.8mm reconstruction interval and are stacked to 4mm. Prone imaging increases virtual colonoscopy sensitivity by redistributing colonic fluid and reducing false-negatives due to luminal collapse and faecal residue.

IMAGE INTERPRETATION

The supine and prone axial images are interrogated for polyps etc. 2D multiplanar reconstructions (MPR) and 3D endoluminal or "fly-through" images can be generated on the workstation to confirm a finding and increase diagnostic confidence. The "fly-through" and endoluminal images mimic the colonoscopic appearances. These images however are time consuming to construct on the workstation and therefore only segments of the colon are reconstructed in this fashion to confirm a finding. The "virtual camera" can be advanced along the centreline of the colonic lumen with simple "mouse-clicks". Correlation of axial, 2D MPR and 3D endoluminal images is necessary for accurate interpretation. True polyps demonstrate polypoid morphology on both 2D and 3D images and possess internal soft tissue attenuation.

Correlation of supine images with prone images increases sensitivity by:

- decreasing perceptive errors
- re-inflating collapsed segments
- moving retained fluid to dependent colonic segments
- confirming the location of filling defects and therefore reducing false-positive examinations (faecal matter generally changes location between supine and prone scans).

Review of the 2D images on lung window settings reduces false-negative errors due to volume averaging of small colonic polyps with adjacent air.

Virtual colonoscopy, unlike the barium enema, can display intraluminal density:

- colonic polyps and cancers demonstrate homogeneous internal soft tissue density
- lipomas demonstrate internal fatty density
- stool:-
 - lacks clear point of attachment to colonic wall
 - heterogeneous internal density or small internal locules of air
 - changes position between supine and prone scans

Colonic Cancer: Annular carcinomas have abrupt borders (not tapered), show persistent non-distension on supine and prone views and demonstrate contour irregularity. Invasive carcinomas may show stranding in the peri-colic fat, lymphadenopathy or metastases.

CLINICAL RESULTS

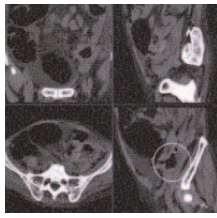
Studies indicate a sensitivity for the detection of polyps greater than or equal to 1cm, of between 75 - 100% compared to colonoscopy (95% sensitivity) and a specificity of greater than 90% for most of the studies.

FUTURE DIRECTIONS

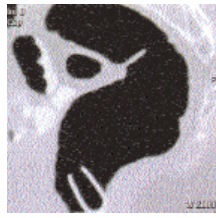
Faecal tagging or "virtual bowel preparation" is an exciting new possibility in CT colonography. This involves administering oral contrast material before CT colonography to alter the attenuation of stool within the colon. Soft-tissue density polyps could therefore be distinguished from high density stool. This could dramatically improve patient acceptance and compliance without reducing test performance.



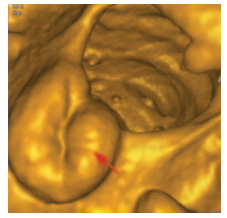
X-ray projection imaging of the colon.



MPRs showing colon cancer.



Sagittal Reconstruction from multislice CT.



Virtual endoscopy based on multislice CT data showing a closed ileocecal valve (arrow) and multiple small polyps ranging in size from 2 to 5mm in the cecum.

ADVANTAGES OF VIRTUAL COLONOSCOPY

Clinical

- Full structural examination of the colon (like colonoscopy and B.E.)
- Requires no additional testing before therapeutic polypectomy
- Highly accurate and reproducible.
- Does not suffer from superimposition of structures (unlike B.E.)
- Demonstrates intra lesion density (unlike B.E.)
- Visualises peri colonic tissues
- Allows review of entire abdomen and pelvis:- potentially lifesaving discovery of asymptomatic conditions is possible (e.g. Abdominal Aortic Aneurysm/Renal Cell Carcinoma)

Patient

- Better patient acceptance and tolerance
- Preparation is simple compared to colonoscopy
- Not as uncomfortable as colonoscopy
- No IV sedation required
- Can return immediately to work or home
- Lower risk of complications (eg perforation, bleeding)
- Fast examination - performed in less than 10 minutes
- Less costly
- If faecal tagging is further developed, current bowel preparations could be circumvented, further increasing patient acceptance.

DISADVANTAGES

- Biopsy and polypectomy cannot be performed.
- Less sensitive than colonoscopy for detection of small polyps less than 1 cm.

INDICATIONS FOR VIRTUAL COLONOSCOPY

- Screening individuals at high risk for colonic cancer
- Failed or incomplete colonoscopy (due to redundant loops, hernias, masses and malrotation). No need for repeat bowel preparation.
- Patients unwilling to undergo routine or follow-up colonoscopy due to discomfort/phobia/IV sedation etc.

Virtual Colonoscopy is an exciting new development which has become possible with multislice CT. It is of clinical use now for selected indications and shows great potential as a screening test for colonic cancer in the future.

Dr. John McGuire. MBBS,FRANZCR.



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VIRTUAL COLONOSCOPY

The examination described in this edition of Imaging Update can be conducted at three QDI sites: Strathpine, Holy Spirit Northside and Holy Spirit Hospital (City). To request an examination, write "CT Abdomen and virtual colonoscopy". There is an out of pocket expense for this procedure.

NUCLEAR MEDICINE PARTNERSHIP

Regular readers may be aware that QDI and the Nuclear Medicine Departments at St Andrew's and Allamanda Hospitals have joined forces. This partnership affords QDI an opportunity to build its service offering with respect to Nuclear Medicine and Cardiology examinations. Dr Fred Khafagi and Dr John Arnold join QDI as full partners and their associates, technicians and administrative staff will work within the QDI network in delivering excellence in Nuclear Medicine Services.

BULK BILLING FOR HEALTHCARE CARD HOLDERS

QDI continues to waive private fees for pensioners and health care card holders at all QDI sites for diagnostic radiology services. Please ask your patient to present their cards to QDI staff on arrival.

CARDIAC SCORING IN THE CITY AND SUBURBS

QDI now offers coronary artery calcification screening in two convenient locations. Sub-second multislice scanners at our HSH City and HS Northside locations have Scimage cardiac scoring packages with ECG-gating. This is state of the art technology when it comes to imaging calcium deposits in the coronary arteries. As a screening procedure, the examination is not rebatable by Medicare and a fee of \$250 applies. For bookings call 3832 8838 (City) or 3256 3322 (Northside).

NUCLEAR MEDICINE AND CARDIOLOGY @ HSN

The new QDI Department at Holy Spirit Northside has a state of the art Nuclear Medicine Facility, specialising in Cardiac Nuclear Medicine. The examinations include:

- Echocardiogram
- Exercise ECG
- Gated Heart Pool Scan
- Thallium/Sestamibi Scan.
- Holter Monitoring
- Ambulatory BP Monitoring

in addition to the full range of nuclear medicine services. Dr Fred Khafagi will conduct sessions at the site several times a week. There are no waiting times at present, appointments can be made by calling 3256 3322.

LIAISON OFFICER

Jason Chandler has been appointed as QDI's first doctor liaison officer. Jason's role is to ensure that referring doctors and their staff are aware of QDI service offerings in the area and also to gather important feedback to ensure that we are meeting your needs for medical imaging. Jason will also assist Francis Mullane in our electronic delivery of reports rollout. If you would like Jason to visit your surgery, please contact him on 0403 469 716.

DIGITAL IMAGE TRANSFER QUESTIONNAIRE

With the digital age upon us, QDI is investigating the future of image transfer and handling. A survey was recently mailed to 1500 doctors in the Southeast Queensland Region to assess levels of computerisation and the future demand for images to be able to be transferred and stored digitally. It is still sometime in the future, but with your assistance in completing the survey, we will be in a better position to understand your needs and issues around this important topic.

Enquiries should be directed in the first instance to **QDI Information Officer**
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