

Using CT to image the elderly colon

As technology advances, so does radiology and arguably no other medical specialty has moved forward with so much pace in recent years. New imaging techniques are emerging all the time and this clearly holds great significance for all clinicians. **Drs Benjamin Dean, Katherine Wright, Sudhir Singh and Tamara Benerjee** provide an insight into how new radiological techniques can be used to investigate for colonic neoplasia in the elderly.

Colonic cancer is the second leading cause of death in the UK, affecting men and women equally. Every year approximately 35,000 people are diagnosed with the disease and over 90 per cent of those diagnosed are over the age of 55¹. There are several conditions that increase the risk of developing colon cancer, however roughly 75 per cent of all cases occur in patients without specific risk factors. If detected early colorectal cancer is curable by surgery, and there is a clear correlation between survival and the stage of disease.

A large majority of colorectal cancers are adenocarcinomas, which arise from pre-existing adenomatous polyps that develop in the normal colonic mucosa. The adenoma-carcinoma sequence is a well characterised series of events with which specific genetic alterations have been associated. Although most carcinomas progress from adenomas, the majority of adenomas never acquire the genetic mutations to undergo this change. It has also been shown that the majority of smaller polyps (<5mm) are not adenomas, but in fact hyperplastic polyps and normal mucosal tags with no clinical potential to become cancer².

The controversy arises when it comes to considering when a polyp is deemed to be clinically relevant on the basis of size alone. It is widely agreed that polyps of 10mm or more in size should be removed. There is difficulty when considering polyps of between five and 10mm in size. The data

does suggest that polyps of this size have a two to seven per cent chance of containing high grade dysplasia, and the chance of invasive cancer is just under one per cent². These polyps can either be removed or observed, and as yet there is no simple right answer to the problem. The relevance of this dilemma will become clearer later, when seen in the context of new investigations such as computed tomographic colonography (CTC).

The practicalities

CTC, also known as virtual colonoscopy, has been used with increasing frequency over recent years for investigating colonic neoplasia. The concept was developed when researchers searched for an alternative to barium enema, especially when investigating the elderly patient. Similar principles apply to both barium enema and CTC, however there are many different technical approaches to CTC which may go some way to explaining the variations in trial results.

CTC involves full bowel preparation as a standard, although the precise regime varies. Faecal tagging is achieved by getting the patient to ingest small amounts of barium or iodine with their meals prior to imaging, this facilitates the differentiation of faecal matter from polyps. However, faecal tagging is not always used and when it is, it may be with or without bowel preparation. The examination is then performed,

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and this involves insufflation of the colon. The insufflation is controlled by either the patient or the technician. The next stage is the data acquisition followed by the data interpretation, which can be done using different software and approaches. It rapidly becomes rather obvious that CTC can vary a great deal from centre to centre.

An alternative technique to CTC is a minimal preparation CT colon. Minimal-preparation CT colon (MPCT) involves no bowel preparation and only the ingestion of a small amount of oral contrast prior to the investigation. The technique for MPCT also varies slightly between centres. MPCT does not involve insufflation of the colon.

Trial results

Many initial studies evaluated CTC and conventional colonoscopy, giving some promising results regarding the ability of CTC to demonstrate polyps and cancers. More recently a large systematic review⁴ concluded that CTC was sufficiently sensitive and specific in the detection of large and medium polyps, as well as being especially sensitive in the detection of symptomatic cancer. Meta-analysis revealed a sensitivity of 93 per cent for large polyps (>10mm) and sensitivity of 86 per cent for medium-sized polyps (six to nine millimeters). Other studies have also shown that CTC compares well with colonoscopy in detecting cancers and polyps greater than six millimeters in size⁵. Not all studies have found such positive results⁶, and reasons for this include the variation in the study populations' relative risk for neoplasia, the variation in techniques used to prepare patients and carry out the studies, the differences in CTC technology, and the variability in the radiologists' CTC interpretation. Another problem has been assuming that colonoscopy is a perfect test, meaning that many false positive findings at CTC may not be truly false positives after all. For example, in some studies if a lesion is found on CTC but not on colonoscopy, then this result is presumed to be a false positive for CTC.

MPCT has been used in different populations to CTC. The sensitivity of MPCT for detecting colorectal cancer certainly comes out on average at well above 80 per cent, with some studies giving sensitivities up to 100 per cent⁷. It must be remembered that these study populations consist of the very frail and elderly, and are very different to those examined by CTC. MPCT is acknowledged to

Table 1. Pros and cons

	Advantages	Disadvantages
Sigmoidoscopy	Safe and therapeutic	Misses all right sided lesions
Colonoscopy	Therapeutic	0.2% perforation risk Right sided miss rate Poorly tolerated by elderly
Barium Enema	Cheap with low complication rates	Poor polyp sensitivity
CT colonography	Sensitive for cancer and significant polyps	0.05% perforation risk radiation dose
MPCT Colon	High sensitivity for cancer Well tolerated by elderly	Low sensitivity for polyps

have a poor sensitivity in detecting polyps or lesions of less than one to two centimeters in size⁸.

The pros and cons

The traditional approaches for investigating the colon are sigmoidoscopy, colonoscopy and barium enema. Sigmoidoscopy is safer and easier to perform than a colonoscopy, but is limited to detecting lesions within its reach and therefore will miss right-sided lesions which make up over 30 per cent of colorectal cancers. Colonoscopy can be used to examine the whole colon and may be used therapeutically to remove early cancers and polyps. Its disadvantages include a higher rate of perforation (around 0.2 per cent) than sigmoidoscopy (0.01 per cent). Colonoscopy also requires greater levels of sedation, which is poorly tolerated by the elderly. The barium enema has a low sensitivity for large polyps of greater than 10mm but is still used widely in the UK. Notably almost a third of colonoscopies and barium enemas undertaken in the elderly result in incomplete demonstration of the colon. It must also be noted that colonoscopy has a significant miss rate for right-sided colon cancers⁹.

Full bowel preparation is required for colonoscopy, barium enema and CTC. This can be particularly uncomfortable and distressing for the elderly patient. It can also be linked to fluid and electrolyte abnormalities in elderly patients and those with co-morbidities. In fact, it is not uncommon for the elderly patient to be admitted into hospital for the bowel preparation to take place.

Key points

- CT colonography is highly sensitive and specific for detecting colorectal cancer and medium to large sized polyps.
- The risk of perforation is significantly lower with CTC than with colonoscopy.
- Minimal preparation CT is extremely sensitive and specific for detecting colorectal cancer in the elderly MPCT is very well tolerated by frail elderly patients.

CT colonography is not a risk-free procedure. A study in the UK found that CTC had a symptomatic perforation rate of 0.03 per cent; perforation was frequently associated with underlying disease. The total perforation rate, which included symptomatic and asymptomatic perforations, was 0.05 per cent¹⁰. Most other studies have shown the symptomatic perforation rate to be less than 0.05 per cent, and this is more than four times lower than that for colonoscopy. Most studies in which patient preferences were evaluated for colonoscopy and CTC have shown CTC to be the favoured test. CTC does require bowel preparation, but there is no need for sedation which is obligatory for a colonoscopy. One disadvantage of CTC is its radiation dose, which equates to roughly one abdominal CT scan. Another problem is the significant number of patients who require a colonoscopy as a result of the findings at CTC, this group therefore have to endure two procedures. However, CTC has several potential clinical indications: in patients who have failed a colonoscopy, in the evaluation of the colon proximal to an obstructing lesion and in patients with contraindications to colonoscopy or those who refuse other investigative options.

MPCT colon has the great advantage of needing no bowel preparation, making it ideal for frail elderly patients. Obviously MPCT and CTC involve a significant radiation dose, but this is not a particular concern for elderly patients.

Conclusion

All investigations must be tailored to suit the individual patient and take into account many factors, including the risks and benefits of any

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investigation and the patient's particular preferences. There will obviously be circumstances when it is entirely appropriate not to investigate the elderly patient at all. In certain cases investigating may put individuals at unjustifiable risk¹¹. There is no shortage of evidence as regards the considerable mortality of colorectal surgery in the elderly¹².

CT colonography and MPCT are clearly useful new tools for the diagnosis of colon cancer. The differing profiles of these tests mean there are instances where they demonstrate clear advantages over older methods. MPCT is a new minimally invasive test that enables diagnosis in the frail and elderly. CT colonography is still an emerging technique but has proved to be impressively sensitive for both cancer and polyps in several studies. As trials and techniques are improved and become more standardised, it appears CTC will increasingly become a viable alternative to colonoscopy.

Conflict of interest: none declared.