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BRIEF COMMUNICATION

Are we underutilising computer tomography colonography in Australia?

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Abstract

Computed tomography colonography (CTC) is a safe and accurate tool for colorectal cancer (CRC) screening in both symptomatic and asymptomatic patients. CTC requires dedicated radiological expertise and demonstrates a high sensitivity and specificity in polyp detection, which is similar to optical colonoscopy (OC). Newer preparation techniques for CTC, such as faecal tagging without catharsis might further improve both the tolerability and accuracy of the test. While exposure to ionising radiation, lack of capacity for therapeutic intervention and potentially diminished sensitivity for flat serrated polyps are limitations of CTC, the technique has a role in select populations. CTC should be considered in frail or elderly patients at high anaesthetic risk for OC, patients with stricturing colonic lesions as well as incomplete colonoscopy, or in patients at risk of delayed access to timely OC. With an ever-growing demand for endoscopic services, increased utilisation of CTC could reduce waiting times for colonoscopy, thereby broadening access to timely and effective CRC screening. Further research is required to improve further the detection of flat lesions, including sessile serrated polyps.

Colorectal cancer (CRC) is the third most common cancer in Australia with an age-standardised incidence rate of 55 cases per 100 000 cases, accounting for the second highest cancer-related death rate.[1] Optical colonoscopy (OC) remains the current mainstay investigation in CRC screening. Despite advancements in OC technology, colonoscopy costs remain high at $1300 per procedure with indirect costs of time off work associated with bowel preparation and anaesthesia.[2] In addition, OC carries risk of complications, including perforation, bleeding, infection, anaesthetic-related side-effects and death. Furthermore, OC might be limited by both technical and pathological factors, including failure of caecal intubation and obstructing malignancy.[3]

Computed tomography colonography (CTC) is a minimally invasive investigation that requires dedicated radiological expertise to produce a two- or three-dimensional view of an air or carbon dioxide-filled distended colon to detect the presence of colonic pathology. CTC was developed for CRC detection in both asymptomatic patients and symptomatic patients who are at high risk for OC. In Australia, indications for CTC include CRC screening in asymptomatic and symptomatic patients at higher risk for an invasive procedure, incomplete colonoscopy, and evaluation of synchronous CRC in patients with obstructing tumours preventing passage of the colonoscope.

Following the roll out of the National Bowel Cancer Screening Program, demand for colonoscopy has outstripped the resources of endoscopic services nationwide.[2] This has led to long waiting lists for colonoscopy, potentially depriving patients of an opportunity for early cancer detection. In the setting of such resource demand, the question might be asked whether we are underutilising CTC? This report outlines a rationale for CTC uptake in Australia and proposes select populations in whom CTC use may be considered.

Discussion

CTC is highly sensitive and specific for the detection of CRC and colonic polyps, with studies showing rates comparable with OC.[3] Meta-analysis data report the

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sensitivity of CTC for polyps 6 mm or larger and 10 mm or larger as 85.3% and 90.8% respectively.[3] A limitation of CTC is a lack of sensitivity for detection of flat serrated polyps; however, adherent contrast material coating these polyps may aid in their identification.[4] A prospective, randomised-controlled population-based CRC screening trial carried out in The Netherlands compared the participation and yield of non-cathartic CTC with OC for patients aged 50–75 years. The participation rate of CTC was significantly better than OC (RR: 1.56; 95% CI: 1.46–1.68; $P < 0.0001$).[5] When diagnostic yield of advanced neoplasia was assessed based on participation rate per 100 invitees, both CTC and OC had similar diagnostic yield (RR: 0.74; 95% CI: 0.53–1.03; $P = 0.07$).[5] Thus, CTC could be considered as an alternative to OC for population screening of CRC, particularly where participation rates are low or access to OC is limited by prohibitive waiting times.

Uptake of CTC has been truncated by concerns relating to the potential for missed lesions, in particular flat serrated lesions, which are increasingly recognised as a cause of interval CRC, particularly in younger patients.[6] Nevertheless, a study reported that oral contrast in CTC improved sessile serrated polyps and traditional serrated polyp detection with an odds ratio of 40.4 (95% CI: 10.1−161.4).[7] Furthermore, a recent study suggested that the post-CTC interval CRC of 4.42% (95% CI: 3.03−6.42) was similar to the post-OC interval CRC of 2.9–8.6% in a 3-year follow-up duration in patients aged 18–96 years.[8] The post-CTC interval CRC revealed a slight predisposition towards the proximal colon, which is in keeping with the distribution of serrated polyps.[8] As such, quality assurance processes and technical advancements in CTC should focus on improving the detection of right-sided lesions.

Accuracy of CTC is improved by bowel preparation, which facilitates adequate visualisation of the gastrointestinal mucosal. Bowel preparation for CTC might be achieved by a conventional catharsis with orally administered laxatives, followed by insufflation with air or carbon dioxide using a rectally inserted catheter. Alternatively, faecal tagging with minimal catharsis might be performed, labelling faecal residue with high-density contrast, such as gastrografin. Faecal tagging allows delineation of residual faecal matter from the colonic mucosa to optimise lesion detection. CTC with faecal tagging is better tolerated and obviates potential risks associated with catharsis, especially in older patients and those with renal failure and diabetes mellitus.

While CTC with faecal tagging and minimal preparation is appealing, there is a paucity of data exploring accuracy compared with conventional CTC with full bowel preparation. In two studies directly comparing faecal tagging with conventional preparation, faecal tagging was associated with a pooled non-statistical higher sensitivity of 88.0% and specificity of 90.9% compared with conventional preparation.[9,10] Another study revealed similar results with an 88% polyp detection rate with faecal tagging compared to 59% using conventional preparation.[11]

CTC is an emerging technology which may assist in reducing demand for diagnostic colonoscopy while offering comparable accuracy for CRC and polyp detection (Table 1). The health economic rationale for CTC is appealing. In the year 2020, more than 849 399 colonoscopies were conducted in Australia (item numbers 32222–32229), while only approximately 5669 CTC were performed each year (item number 56553).[12] In Australia, colonoscopy waiting lists are categorised into three groups according to indication. A retrospective review at a Western Australia hospital showed that Category 1 patients (requiring colonoscopy within 30 days) had their colonoscopies on time, while both Category 2 (within 90 days)

Table 1 CTC in Australia

Broad indications
Diagnosis of colorectal neoplasia
Abdominal symptoms suggestive of CRC
Following incomplete colonoscopy
Contraindications to colonoscopy
Evaluation of synchronous CRC in patients with obstructing tumour which prevents the passage of a colonoscope
Following curative-intent resection of CRC when colonoscopy is not feasible
Post-polypectomy surveillance following high-risk polypectomy when colonoscopy is not feasible
Contraindication
Symptomatic or high-grade bowel obstruction
Risk of colonic perforation
Specific population who may benefit from CTC versus OC
Elderly or frail patients at higher anaesthetic risk
Patients with stricturing colonic lesions and incomplete colonoscopy
Patients with positive FOBT and anticipated delay to OC due to prolonged hospital waiting times
Health economic rationale
In 2020, an estimated of 849 399 colonoscopies and 5669 CTC were performed
Delayed OC resulted in delayed diagnosis and treatment of CRC
CTC for the specific patient groups would likely reduce OC burden and waiting times
CTC utilisation can reduce the healthcare burden as compared to OC by $767 per encounter (including inpatient/day hospital stay, nursing, anaesthetic and procedural costs). The necessity for OC post CTC needs to be considered and could be practicably approached by availability of same-day procedures for patients who have already undergone cathartic bowel preparation

CRC, colorectal cancer; CTC, computed tomography colonography; FOBT, faecal occult blood test; OC, optical colonoscopy.

and Category 3 (within 365 days) patients had delayed waiting times of 113 and 258 days respectively, which resulted in delayed diagnosis and treatment of CRC.[13]

The National Bowel Cancer Screening Program (NBCSP) 2021 monitoring report recorded a median time from positive faecal occult blood test (FOBT) to OC of 45 days in the private healthcare system and 69 days in the public healthcare system. This suggests a median delay in CRC screening in both private and public healthcare system of 15 and 39 days respectively.[14] Symptomatic patients and those requiring surveillance are likely to experience more prolonged delays given the current colonoscopy resource limitations. Opportunity cost associated with diagnostic delay due to lack of access to OC also supports the case for expanding the use of CTC, especially in the public sector where a delay is frequently anticipated due to resource burden. Other patient groups who might benefit from CTC are more elderly or frail patients at higher anaesthetic risk and those with stricturing colonic lesions impassable using OC. Nevertheless, it should be recognised that CTC is not recommended for patients with active inflammatory bowel disease, including Crohn disease and ulcerative colitis, nor for diverticulitis, due to a conceptual increased risk of bowel perforation.[15]

CTC utilisation might plausibly reduce overall healthcare burden by reducing the cost of CRC screening and detection. The findings from The Netherlands population-based colonoscopy or colonography for screening (COCOS) study further substantiates that CTC is more cost-effective than colonoscopy screening, taking into consideration a higher participation rate of CTC than OC, where the incremental cost-effectiveness ratio (ICER) of CTC was €3162 per quality-adjusted life-years gained at 5-yearly intervals.[5] In Australia, the Medicare rebate for CTC is A$532.55, while the estimated cost of OC is A $1300, including inpatient/day hospital stay, proceduralist, nursing, and anaesthetic costs, resulting in a cost saving of $767 per study.[2,12] However, the cost savings are in part offset by the need for follow-up OC in positive CTC cases. In the COCOS study, the CTC positivity rate was 17% for polyps ≥6 mm, indicating that less than 1 in 5 patients would require follow-up OC and therefore support considerable cost savings despite this.[16]

The uptake of CTC in routine care is widely variable internationally. Where CTC is in more common use, such as in the National Health Service, England, similarly to OC, guidelines have been published as to appropriate bowel preparation and reporting. Appropriate training in CTC performance and reporting with application of rigorous standards would help to engender clinician confidence in CTC in countries, such as Australia with lower rates of utilisation.

The prospect of same-day OC for patients with a positive CTC finding who have undergone cathartic preparation was raised in a retrospective study of 2688 CTC-detected lesions from a single centre. CTC showed a positive predictive value of overall, polypoid and nonpolypoid colorectal lesion detection of 88.8%, 91.2% and 79.4% respectively compared with OC.[16] In this study, a collaborative effort between endoscopists and radiologists following real-time reporting of CTC-detected lesions led to same-day OC, eliminating the necessity for separate-day bowel preparation.

Exposure to ionising radiation is an important risk to bear in mind with CTC, especially in young patients who might be subjected to repeat testing. However, advances in CT technology, such as spectral filtration and iterative reconstruction, are associated with significantly lower doses of ionising radiation.

CTC is an accurate tool for the detection of CRC and colonic polyps. CTC is likely underutilised in the Australian setting, yet the health-economic rationale for its incorporation into existing pathways is resounding. CTC with faecal tagging and minimal preparation is appealing and might increase screening uptake for CRC. Widespread uptake of CTC would require an expansion in dedicated radiological expertise, but could assist in reducing colonoscopy waiting times in a resource-starved environment. Furthermore, a greater awareness of the utility of CTC might promote further research into improving the detection of flat lesions, in particular, sessile serrated polyps.

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