Abdominal Imaging / Imagerie abdominale

The Accuracy of Colorectal Cancer Detection by Computed Tomography in the Unprepared Large Bowel in a Community-Based Hospital

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Abstract

Purpose: This retrospective study examined the performance of general radiologists in a community-based hospital in detecting colorectal cancer (CRC) with computed tomography (CT) in the unprepared large bowel.
Methods: The pathology database at a community hospital over the past 7 years (2009−2015) was retrospectively analysed for pathologically proven CRC (924 cases). The provincial hospital information profile for these patients was reviewed to determine if they had an abdominal CT for any reason in the year prior to biopsy. Metrics such as age, sex, time between the CT and biopsy or surgery, whether CRC was initially detected by the radiologist, and if this was an emergency presentation was evaluated. In the cases where CRC was not identified, the CT scans were reanalysed to determine if the CRC was identifiable in retrospect. The sensitivity of detecting CRC by CT scan in the unprepared large bowel was calculated.
Results: Of the 924 biopsy proven CRC cases, 22% (207 of 924) of the patients had a CT prior to biopsy. Of these cases, 47% (97 of 207) presented on an emergency basis. Of the cases with imaging in the year prior, about 60% (125 of 207) had cancer prospectively detected by the radiologist. Upon re-examination of the cases in which CRC was not initially detected, 59% were visualized in retrospect.
Conclusions: Community general radiologists can successfully detect CRC with a high degree of accuracy. Reformatted images, bowel wall thickening when regional nodes are prominent, and minimizing oral contrast were helpful in improving detection.

Resumé

Objet : Cette étude rétrospective examine dans quelle mesure les radiologistes généralistes d'un hôpital communautaire réussissent à détecter un cancer colorectal par tomodensitométrie du gros intestin sans préparation.
Méthodes : Une analyse rétrospective de la base de données de pathologie d'un hôpital communautaire a été effectuée (données de 2009 à 2015) afin de relever les cas de cancer colorectal confirmés en pathologie (924 cas). Les chercheurs ont examiné les renseignements figurant au profil hospitalier provincial pour déterminer si les patients ont subi un examen de l'abdomen par TDM, pour quelque raison que ce soit, lors de l'année précédant la biopsie. Des mesures, telles que l'âge et le sexe des patients, le délai entre l'examen par TDM et la biopsie ou la chirurgie, le fait que le cancer colorectal ait été initialement détecté ou non par le radiologiste et s'il s'agissait d'une urgence, ont été analysées. Dans les cas où le cancer colorectal n'a pas été détecté, les chercheurs ont analysé de nouveau les examens par TDM afin de déterminer si le cancer était perceptible de façon rétrospective. Ils ont ensuite calculé la sensibilité des examens par TDM pour détecter le cancer colorectal dans le gros intestin sans préparation.
Résultats : Des 924 cas de cancer colorectal confirmés par biopsie, 207 patients (22 %) avaient subi un examen préalable par TDM. De ces 207 patients, 97 (47 %) étaient des cas urgents. Des 207 patients ayant subi un examen d'imagerie au cours de l'année précédant la biopsie, 125 (environ 60 %) ont fait l'objet d'un diagnostic prospectif par le radiologiste. Dans les cas où le cancer colorectal n'avait pas été détecté initialement, la seconde analyse a permis de déceler le cancer de façon rétrospective chez 59 % des patients.

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Conclusions : Les radiologistes généralistes de l'hôpital communautaire ont pu détecter le cancer colorectal avec une grande précision. Les images reformatées, l'épaississement des parois intestinales là où les ganglions régionaux sont proéminents et l'utilisation d'une quantité minimale de produit de contraste administré par voie orale ont permis une meilleure détection.

Key Words: Colorectal carcinoma; Computed tomography

In Canada, colorectal cancer (CRC) is the second most common cancer in men and third most common in women [1]. In the United States, the incidence of developing CRC is low in the fourth and fifth decades; however, it dramatically increases in the sixth and seventh decades with the probability increasing from 0.85% to 3.96% in men and 0.65% to 3.06% women [2]. In 2015, 25,000 Canadians were diagnosed with CRC [1]. Despite the availability of screening tests, only 37% of eligible patients are screened [3]. Unfortunately, a subset of patients with CRC present emergently (eg, bowel obstruction, bleeding) and have higher morbidity and mortality, longer hospital stays, advanced pathologic stage, and poor long-term survival [4]. The accuracy of detecting CRC in unprepared bowel on CT has been estimated to have an accuracy of 80% in one study [5] with sensitivities of 75%−100% and specificities of 86%−96% in other studies [6−9]. However, these studies had low numbers, or an inconsistent gold standard, and results were generally interpreted by subspecialized radiologists.

Our hypothesis is that radiologists can reduce the number of carcinomas that present acutely if the large bowel is examined diligently on routine, noncolonographic abdominal CTs. After determining which patients with pathology proven CRC had a CT within a year of diagnosis (before the diagnosis was known), the primary aim of this study was to evaluate the sensitivity of general radiologists in detecting CRC on routine CT in a community hospital setting.

Materials and Methods

Study Design and Patient Population

This study was approved by our institutional review board and a waiver of informed consent was obtained in this retrospective analysis (REB approval number H14-03335). A list of all patients who had a diagnosis of CRC in our hospital information database was extracted between the years of 2009−2015 (924 cases). This list was cross-matched with our provincial radiology information database to determine which patients underwent noncolonographic abdominal CT within a year prior to biopsy for any indication. Patient demographics are listed in Table 1. All prospective CT scans were read by 11 general radiologists (5−25 years of experience) at a community hospital. The missed CRC cases were subjected to further review by 2 experienced senior radiologists (S.B., A.S.) in consensus. Both reviewing radiologists were aware that a CRC was present in the missed cases but unaware of the site.

CT Technique

CT scans of the abdomen or pelvis were performed depending on the clinical indication on a 64-slice multidetector CT (GE Healthcare, Milwaukee, WI). Intravenous contrast with 100 cm^3 ioversol (Optiray 300) was utilised when appropriate. Intravenous contrast was not used in cases where contraindicated or for CT KUB and use of positive oral contrast varied depending on the clinical indication. The scans were reconstructed at 5-mm slice thickness in axial, coronal, and sagittal planes (with archived raw data available at the workstation). The scanning parameters were the following: rotation time = 0.8 seconds; beam collimation = 20 mm; section thickness and intervals = 1.25 mm; helical pitch = 1.375; table movement = 27.5 mm/rotation, scanning field of view = 40-52 cm. Bowel wall thickness when comparing adjacent segments, polypoid or sessile masses, or obvious annular lesions are generally accepted methods for detecting CRC [10].

Endoscopy

All colonoscopy was done by board certified gastroenterologists or general surgeons who were credentialed endoscopists. Olympus (Center Valley, PA) video colonoscopies were used in the study period. Bowel preparation was mainly with sodium phosphate (Fleet Laboratories, Lynchburg, VA) and an osmotic laxative.

Descriptive and Statistical Analysis

The number of CRC cases that had a CT performed within a year of diagnosis and how the patients presented (described on the requisition history) is listed in Table 2. The clinical presentation and location within the large bowel of CRC cases that were prospectively seen and missed is listed in Tables 3 and 4. The cases of CRC that were missed prospectively and re-reviewed by 2 radiologists in consensus is described in Table 5 and the sensitivity of general radiologists at detecting CRC by CT scan was calculated (Table 6).

Table 1
Summary of patient demographics

	CRC-positive cases	CT scan within year
Patients	924	207
Mean age (range), years	71 (21−97)	74.2 (37−97)
Sex	M 512 F 412	M 95 F 112

CRC = colorectal cancer; CT = computed tomography.