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Original Article

Is Circumferential Assessment of Colonic Carcinoma by Computed Tomography Scan and Colonography enough to Predict the Staging?

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Abstract

Background: The modern treatment of rectal cancer relies on correct diagnosis which is a multidisciplinary approach by medical oncologists, radiation therapists, endoscopists, radiologists, and surgeons. Based on their diagnosis treatment varies from curative versus palliative; radical versus local excision, pre-operative chemoradiation therapy, and postsurgical adjuvant therapy.

Aim of the Study: This study aims to know the role of computed tomography (CT) scan and colonography in assessing the circumferential involvement of colonic carcinoma required for differentiating the stages of colonic carcinoma.

Materials and Methods: A total of 41 patients with colonic carcinoma were investigated with CT scan and colonoscopy to assess the circumferential involvement of the tumor to stage the disease. The final pathological and surgical staging was used as a reference to determine the accuracy of the investigating tools.

Observations and Results: Among the 41 patients, 32 (78.04%) were males and 08 (19.51%) were females. Patients aged 40–50 were 09 (21.95%), aged between 50 and 60 were 19 (46.34%), and aged between 60 and 70 were 13 (31.70%). The mean age was 56.34 ± 3.10. The laboratory investigations of serum carcinoembryonic antigen showed <3.5 ng/mL in 03 (%), 3.5–7.0 ng/mL in 11 (26.82%), 7.0–10 ng/mL in 17 (41.46%), and >10.0 ng/mL in 10 (24.39%) patients. Colonoscopy showed T1 lesions in 3 (7.31%), T2 lesions in 09 (21.95%), T3 lesions in 14 (34.14%), and T4 lesion in 05 (12.19%) patients.

Conclusions: This study showed colonoscopy and CT colonography together have an overall sensitivity of 92.68%, thus has an important role in the diagnosis of colonic carcinoma. Especially, the accuracy helps in staging of T2 and T3 tumors facilitating the choice of treatment.

Key words: Carcinoma, Chemoradiation, Endoscopy, Staging

INTRODUCTION

The incidence rates of colorectal cancer (CRC) are low in India; but apart from geographical variations, the incidences are rising rapidly in India.[1] The world's two most populous countries, China and India, have relatively low incidence rates of 14.2 and 6.1 cases per 100,000 men and women, respectively. However, as their economies have developed, their incidence of CRC has increased.[2] In India, the annual incidence rates (AARs) for colorectal carcinoma in men are 4.4 and 4.1 per 1,00,000, respectively. The AAR for colon cancer in women is 3.9 per 1,00,000. Colonic carcinomas rank 8th and rectal carcinomas 9th among the men in India. Whereas in women, rectal carcinomas do not figure in the top 10 but colonic carcinomas rank 9th.[2] The age-adjusted incidence rates of CRC in all the Indian cancer registries are very close to the lowest rates in the world.[3] In the 2013 report, the highest AAR in men for CRCs was recorded in Thiruvananthapuram (4.1) followed by Bangalore (3.9) and Mumbai (3.7). The highest AAR in women for CRCs was recorded in Nagaland (5.2) followed by Aizawl (4.5).[4] CRCs are classified as those associated with colonic polyposis and those not associated

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with colonic polyposis. Among the colonic polyposis syndromes, familial adenomatous polyposis (FAP) and its variants (Turcot, Gardner, and attenuated FAP) and MYH-associated polyposis are the most common. Hereditary non-polyposis colon cancer or lynch syndrome comprises the non-colonic polyposis category. FAP is characterized by multiple colonic adenomatous polyps appearing in childhood with subsequent transformation to malignancy at an average age of 45 years and is caused by a germline mutation in the APC gene on chromosome 5.[5] MYH-associated polyposis is inherited in an autosomal recessive pattern, with mutations in the base excision repair gene mutY homolog.[6] Environmental factors which play a role in CRCs are 1. Age and gender: Older men are at a high risk (25% higher in men than in women),[7] 2. Ulcerative colitis: The extent, duration, and activity of disease are primary determinants,[8] 3. Ethnicity: The African–American population is at an increased risk, 4. Long-term immunosuppression following organ transplantation, especially renal transplantation: The relative risk is the same as that of the normal population, but aged 20–30 years older,[9] 5. Diabetes mellitus associated with insulin resistance: This linked to the long-term effects of insulin-like growth factors,[10,11] 6. Alcohol consumption: Reduction in alcohol consumption may decrease the incidence of colorectal malignancy, especially among those with a positive family history,[10] 7. Consumption of fresh red meat and processed meat is associated with increased risk,[11,12] and 8. Obesity: [13] Digital rectal examination has a high positive predictive value for the presence of rectal tumors. However, a negative examination does not rule out CRC, as more than 60% of lesions are out of reach of the palpating finger. Laboratory tests include complete blood counts, liver and kidney function tests, carcinoembryonic antigen (CEA) tests, and carbohydrate antigen 19.9 (CA 19.9). Pre-operative CEA levels predict recurrence in patients with stage C (Stage III) disease and in those with stage B (Stage II) disease as well. Rigid sigmoidoscopy instruments limit evaluation to the distal 25 cm of the colon, whereas flexible sigmoidoscopy permits evaluation of the distal 55–60 cm of the colon. Complete colonoscopy (essential) should be attempted in all patients before or after surgery (within a 3-month period if index colonoscopy has not been completed). This is essential to exclude synchronous lesions or polyps. Although computed tomography (CT) colonography can be relatively sensitive and specific in research settings (85%–90%), lesions in the rectosigmoid colon may be missed on CT colonography because of the difficulty in achieving adequate luminal distention in this segment.[14] Histological confirmation of primary neoplasms is preferable, but if this is not feasible, histological confirmation of the metastatic lesion is mandatory before definitive therapy. Pathologic examination should include (essential) the determination of the following, as each of these factors are known to be associated with patient prognosis: Pathologic reporting for gross and microscopic examination includes tumor grade, depth of penetration, number of positive lymph nodes, and number of lymph nodes evaluated (a minimum of 12 lymph nodes should be evaluated). Lymphovascular invasion, perineural invasion, extranodal tumor deposits, status of proximal, distal, and radial (circumferential) margins are additional features to be looked for. For rectal cancers: Circumferential resection margin (CRM) and neoadjuvant therapy effect (tumor regression grade score). A positive CRM is defined as within ≤1 mm. A positive CRM is a more powerful predictor of local recurrence in patients treated with neoadjuvant therapy.[15]

Type of Study

Retrospective study.

Period of Study

This study period was from June 2014 to September 2017.

Institute of Study

This study was conducted at KMCT Medical College, Manassery, Kozhikode, Kerala.

MATERIALS AND METHODS

A total of 41 patients with colonic carcinoma attending the Surgical Outpatient Department of KMCT Medical College Hospital, Manassery, Kozhikode, Kerala, were included in the present study. All the data were collected from medical records section of the hospital.

Inclusion Criteria

1. Patients aged between 40 and 70 are included in the study.
2. Patients of both genders are included.
3. Patients with symptoms of tumor colon are included.

Exclusion Criteria

1. Patients aged below 40 and above 70 were excluded.
2. Patients with a history of surgery on gastrointestinal tract (GIT) were excluded.
3. Patients with other GIT lesions mimicking colonic carcinoma were excluded.

Patients irrespective of gender presenting with symptoms of pain in the abdomen, rectal bleeding, and change of bowel habits for more than 3 months were included and the investigations were analyzed. An Ethical Committee Clearance was obtained. Among the investigations, results of CT scan colonography and flexible colonoscopy to assess the circumferential involvement of the tumor to

stage the disease were used. CT colonography lesions were categorized using the CT colonography reporting and data system[16] as C0: If the study was inadequate. C1: If the study was normal. C2 (indeterminate): Polyps of 6–9 mm and fewer than 3 in number. C3: Lesions include those larger than 10 mm in diameter or if more than three lesions of 6–9 mm are present, for which colonoscopy is recommended. C4: Used to describe a colonic mass with associated luminal narrowing or extracolonic extension, for which urgent referral for consideration of surgery is recommended. The system also recommends categorization of significant extracolonic findings. The final pathological and surgical staging of individual cases was compared to the CT colonography and flexible colonoscopy findings to know the specificity and sensitivity and accuracy of these investigative tools. All the data were analyzed using standard statistical methods.

OBSERVATIONS AND RESULTS

Among the 41 patients, there were 32 (78.04%) males and 08 (19.51%) female patients. Patients aged 40–50 were 09 (21.95%), aged between 50 and 60 were 19 (46.34%), and aged between 60 and 70 were 13 (31.70%). The mean age was 56.34 ± 3.10 [Table 1].

The laboratory investigations of serum CEA showed <3.5 ng/mL in 03 (%), 3.5–7.0 ng/mL in 11 (26.82%), 7.0–10 ng/mL in 17 (41.46%), and >10.0 ng/mL in 10 (24.39%) patients [Table 2]. The mean serum CEA level in the study was 5.20 ± 1.50. Similarly, the serum CA 19.9 levels were >37 U/mL in 14 and >37 U/mL in 27 patients [Table 2]. The mean CA19.9 level was 42.35 ± 2.40 in the study.

On colonoscopy, the tumor lesions were observed at various levels in the patients of this study. The following Table 3 summarizes the breakup of the lesion in the study.

In the present study, colonoscopy showed T1 lesions in 3 (7.31%), T2 lesions in 09 (21.95%), T3 lesions in 14 (34.14%), and T4 lesion in 05 (12.19%) patients [Table 4 and Figure 1a, c and d]. The T colonography showed C0 findings in none, C1 findings in 04 (9.75%), C2 lesions in 24 (58.53%), and C3 lesions in 13 (31.70%) patients [Table 4]. Among the patients with T2, T3, and T4 lesions 38/41 (92.68%), the CGT colonography findings of C2 and C3 were seen. There was statistical significant correlation between the colonoscopy findings and CT colonography findings in the study with a $P = 0.001$. All the patients underwent biopsy and their histopathological reports showed in 32/41 (78.04%) the cell type was adenocarcinoma, in 06 (14.63%) the cell type was mucinous adenocarcinoma, and in 03 (9.75%) it was small cell carcinoma [Table 4].

Table 1: The demographic data and symptoms in the study (*n*=41)

Observations	*n* (%)
Age (years)	
40–50	09 (21.95)
50–60	19 (46.34)
60–70	13 (31.70)
Male	32 (78.04)
Female	08 (19.51)
Pain abdomen	41 (100)
Blood stained stools	36 (87.80)
Change in bowel habits	30 (73.17)
Weight loss	41 (100)
Anemia	23 (56.09)

Table 2: The laboratory investigations of CEA and CA 19.9 serum levels in the study (*n*=41)

Observations	*n* (%)
CEA (ng/mL)	
<3.5	03 (7.31)
3.5–7.0	11 (26.82)
7.0–10	17 (41.46)
>10	10 (24.39)
Carbohydrate antigen 19.9 (U/mL)	
<37	14 (34.14)
>37	27 (65.85)

CEA: Carcinoembryonic antigen

Table 3: The site of lesions in the colon (*n*=41)

Site of lesion	*n* (%)
Sigmoid colon	07 (17.07)
Descending colon	09 (21.95)
Splenic flexure	11 (26.82)
Transverse colon	08 (19.51)
Hepatic flexure	06 (14.63)

DISCUSSION

In the presence of symptoms, specific to colorectal carcinoma needs for screening with available investigative tools arises. In majority of cases, the colonoscopy helps in diagnosis of advanced disease. When the efficacy of endoscopy and barium enema in the diagnosis of colonic carcinoma are compared with colonoscopy, it seems reasonable to conclude that colonoscopy would be the most effective examination for the large bowel and terminal ileum, since it permits direct identification of the tumor, histologic examination through biopsy, diagnosis and removal of synchronic polyps, and staging attempts through endoscopic ultrasound techniques.[17] Barium enema sensitivity for the diagnosis of CRC in patients with positive fecal occult blood testing remains between 50%

Table 4: The grading of lesions observed on colonoscopy and CT colonography in the study (*n*=41)

Observations	*n* (%)
Colonoscopy findings	
T1	03 (7.31)
T2	14 (21.95)
T3	19 (34.14)
T4	05 (12.19)
CT colonography findings	
C0	0 (0)
C1	03 (9.75)
C2	25 (58.53)
C3	13 (31.70)
Histopathology	
Adenocarcinoma	32 (78.04)
Mucinous adenocarcinoma	06 (14.63)
Undifferentiated carcinoma	03 (9.75)

CT: Computed tomography

and 75%.[18] The limitations of colonoscopy are in poor bowel preparation, the presence of blind regions behind large mucosal folds and in segments where intubation was technically demanding. The sensitivity for colonoscopy to detect cancerous and precancerous lesions has been estimated to be >95%.[19] The efficacy of CT scanning to diagnose a primary tumor may be limited by tumor size or location.[19] The limitation of CT colonography is that its interpretation of lesions of <5 mm (and limitation in detection of flat lesions) is not accurate. Other validations by endoscopy, pathological node and tumor analysis, tumor markers, and surgical techniques are used in the definitive clinical staging of colorectal carcinoma in such cases.[20,21] All initial diagnostic investigations require rigorous bowel cleansing preparation. For diagnosing colonic carcinoma, colonoscopy is regarded as the standard method of investigation. Colonoscopy is known to have high sensitivity and specificity for detection of cancer, premalignant adenomas and other symptomatic colonic diseases. Sensitivity can be defined as a diagnostic intervention with very high sensitivity will detect the vast majority of patients with CRC and very few patients with the disease will be missed, whereas specificity is a diagnostic intervention with very high specificity will identify only those patients who truly have CRC and it will not falsely identify as positive, those patients who do not have the disease. When such two investigations are combined, the overall success rate of diagnosing colonic carcinoma is enhanced. Colonoscopy also has the added advantage of biopsy and removal of benign tumors in the same sitting.[22] In the present study, the colonoscopy was used to grade the tumors in 38/41 patients (%). Chaparro *et al*.[23] reported sensitivities ranging from 28 to 100% for all types of polyps measuring more than 6 mm with an overall pooled sensitivity of 66% with CT colonography. Mulhall *et al*.[24]

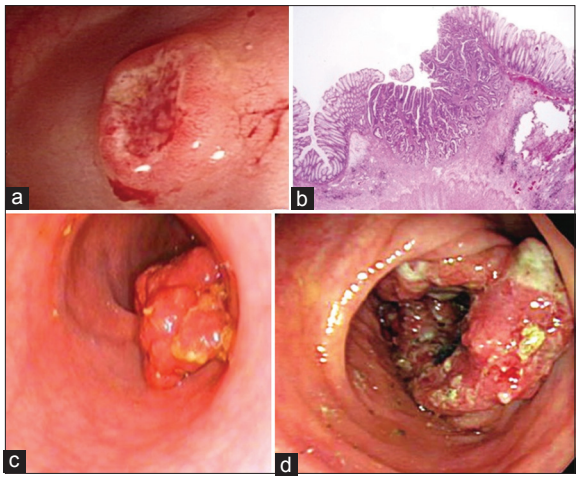

Figure 1: (a and b) The flexible colonoscopy findings in advance colonic carcinoma, (c) the colonoscopy view of the tumor and histopathological picture, (d) the colonoscopy view and corresponding computed tomography colonography picture

reported sensitivity ranging from 21 to 90% with an overall pooled sensitivity of CT colonography of 83%. The sensitivity and specificity of CT colonography increasing with increase in the size of the tumor as reported by Halligan *et al*.[25] In the present study, the sensitivity was 92.68%. The colonoscopy findings I, the study varied from a moderate cauliflower-like growth to extensive growth involving the entire circumference of the colon [Figure 1a and b]. Histopathological reports in this study showed in 32/41 (78.04%) the cell type was adenocarcinoma, in 06 (14.63%) the cell type was mucinous adenocarcinoma, and in 03 (9.75%) it was small cell carcinoma [Table 4] [Figure 1c].

CONCLUSIONS

This study showed colonoscopy and CT colonography together have an overall sensitivity of 92.68%, thus has an important role in the diagnosis of colonic carcinoma. Especially, the accuracy helps in staging of T2 and T3 tumors facilitating the choice of treatment.

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