CASE REPORT

MDCT diagnosis of synchronous primary gastrointestinal tract carcinoma and other solid malignancies: case series study

Adel El-Badrawy1, Haytham Shebel2* and Heba M. Abou El Atta3

Abstract
Background: The presentation of synchronous multiple primary tumors is rare. The aim of this report was to report an uncommon series of cases diagnosed with synchronous gastrointestinal tract carcinoma and other solid malignancies by multidetector computed tomography.

Case presentation: Our report included 34 patients with synchronous gastrointestinal tract carcinoma and other solid malignancies from November 2009 to September 2019. They were 14 men and 20 women (mean age, 65.5 year; range, 52–82 years). The highest number of GIT cases were colonic carcinomas detected in 70% (24/34) of the patients. The most frequent extra-gastrointestinal primary malignancy sites were renal cell and breast carcinomas, 17.6% (6/34) of each.

Conclusions: Careful preoperative evaluation is recommended to detect this pattern of synchronous extra-gastrointestinal tumors. More reports of such cases should help to clarify the pathogenesis of this phenomenon and may lead to a new treatment strategy for synchronous gastrointestinal malignancy and other solid malignancies.

Keywords: Synchronous gastrointestinal tract carcinomas case report, Multidetector computed tomography, Primary solid malignancy

Background
The incidences of multiple primary malignancies have increased in recent years due to the increasing proportion of elderly patients in the general population, regular medical check-ups, and the increased number of cancer survivors [1].

Colorectal cancer (CRC) is the fourth most common malignancy and is the second leading cause of cancer-related mortality in the USA. Accurate preoperative staging is the most critical step for determining the optimal treatment option and surgical planning for patients with CRC [2]. Gastric cancer has reduced prevalence but poor prognoses. To improve the treatment, early detection and better evaluation should be sought [3].

MDCT scanning is an accurate imaging modality for the evaluation of synchronous double malignancies [4]. Warren and Gates studied the multiple primary malignant tumors condition and established some diagnostic criteria in 1932, after reviewing over 1200 case reports. These criteria are still being accepted at present [5]. Multiple primary malignancies (MPMs) in a single patient are rare. In literature reviews, the overall incidence is between 0.73 and 11.7% [6]. Our report reviews the MDCT findings of a series of cases with synchronous primary gastrointestinal tract malignancy and other solid primary malignancies.
Case presentation
This report was approved by the institutional research ethics review committee. Informed consent from the patient was waived. Our report included 34 patients with synchronous gastrointestinal tract carcinoma and other solid malignancies from November 2009 to September 2019—fourteen men and 20 women (mean age, 65.5 year; range, 52–82 years).

The triphasic abdominal and whole-body CT scanning were performed using 64 MDCT scanners (Brillance 64; Philips Healthcare, Best, The Netherlands). MDCT diagnosed thirty-four patients with sixty-eight malignancies and pathologically proved to have primary gastrointestinal tract carcinoma with other primary malignant tumors. The highest number of GIT cases were colonic carcinomas detected in 70% (24/34) of the patients. The most frequent extra-gastrointestinal primary malignancy sites were renal cell and breast carcinomas, 17.6% (6/34) for each. The remaining types of tumors and their prevalence and their TNM staging are illustrated in Table 1 and Figs. 1, 2, 3 and 4. The main CT features of these tumors include the colonic and gastric carcinoma with irregular wall thickening, more than 10 mm. Periampullary malignancies diagnosed by pancreatic head mass with double duct signs. The main CT appearance of renal cell and hepatocellular carcinomas were enhancement in arterial phase, washout on portal and delayed phases. The breast carcinoma was soft tissue mass with speculated margins. The prostatic carcinoma was enlarged heterogeneous prostate with disruption of prostatic capsule. The urinary bladder carcinoma was diagnosed by localized irregular wall thickness, more than 10 mm. The lymphoma was diagnosed with malignant lymphadenopathy. The ovarian carcinoma was diagnosed by cystic lesion with solid component and thick septae. The endometrial carcinoma was diagnosed by endometrial thickness, more than 18 mm. The bronchogenic carcinoma was diagnosed by lung mass of about 25 mm with speculated margins and associated with ipsilateral mediastinal malignant lymphadenopathy. The thyroid carcinoma was diagnosed by thyroid mass of about 45 mm across with irregular margins and fine granular calcifications.

All sixty-eight malignancies in our report underwent needle biopsy and histopathological evaluation. This agrees with the previous report that confirms the pathological proof of synchronous primary solid malignancies and establishes the histological origin of the primary neoplasm [11]. Elderly age is a risk factor for developing second primary malignancies [12], which manifested with our result, as the mean age was 65.5 years.

Our report used Multidetector CT scanning, which has an accurate assessment for preoperative evaluation of gastrointestinal malignancies [1, 13–15] and other primary sites in different body parts [16–21].

Incidentally detected renal cell tumors are generally smaller in size. The incidence of its detection is steadily growing due to the widespread use of imaging modalities for other medical problems [22, 23]. This agrees with our results as all six patients with renal cell carcinoma are incidental.

The MDCT findings of renal cell and hepatocellular carcinomas in the multiple primary malignancies are similar to that of RCC and HCC-alone patients [4]. This agrees with our results as characteristic CT findings were detected in all six patients with renal cell carcinoma and four patients with hepatocellular carcinoma.

The incidences of primary intra-abdominal malignancies such as renal, hepatic, and pancreatic cancer were higher in the synchronous group than in other groups.
Table 1  Characteristics of 34 patients with synchronous primary gastrointestinal tract carcinoma and other solid malignancies

| Case no | Age/sex | Colonic carcinoma | Extra-colonic malignancy |
|---------|---------|--------------------|--------------------------|
|         |         | TNM staging        | Site         | TNM staging |
|         |         |                    |             |             |
| Colonic carcinoma |         |                    |             |             |
| 1       | 68/F    | T4a N1b M0 IIIB    | Renal       | T1a N0 M0 I |
| 2       | 68/M    | T4a N1b M0 IIIB    | Renal       | T1b N0 M0 I |
| 3       | 58/M    | T4a N2b M0 IIIC    | Renal       | T1a N0 M0 I |
| 4       | 65/F    | T3 N1a M0 IIIB     | Renal       | T1a N0 M0 I |
| 5       | 67/M    | T4a N2a M0 IIIC    | Renal       | T1b N0 M0 I |
| 6       | 54/F    | T4a N2b M0 IIIB    | Breast      | T2 N0 M0 IA |
| 7       | 65/F    | T4a N2b M1C IV     | Breast      | T2 N0 M0 IA |
| 8       | 60/F    | T4b N0 M0 IIIC     | Breast      | Recurrent   |
| 9       | 65/F    | T4a N0 M0 IIIB     | HCC         | A (BCLC     |
| 10      | 66/M    | T3 N1 M0 IIIB      | HCC         | C (BCLC     |
| 11      | 64/F    | T4b N1 M0 IIIC     | HCC         | C (BCLC     |
| 12      | 76/M    | T3 N2a M0 IIIB     | Prostate    | T3a N0 M0   |
| 13      | 82/M    | T3 N0 M0 IIIA      | Prostate    | T2c N0 M0   |
| 14      | 71/M    | T4a N0 M0 IIIB     | Prostate    | T2c N0 M0   |
| 15      | 52/M    | T3 N2a M0 IIIB     | UB          | T3b N0 M0 IA |
| 16      | 74/M    | T3 N0 M0 IIA       | UB          | T3b N0 M0 IA |
| 17      | 52/F    | T3 N2a M1a IVA     | Ovarian     | Local       |
| 18      | 65/F    | T3 N2a M1a IVA     | Ovarian     | I (FIGO     |
| 19      | 53/F    | T4a N0 M0 IIIB     | Endo        | IB (FIGO    |
| 20      | 66/F    | T4a N1 M0 IIIB     | Endo        | III C (FIGO |
| 21      | 69/M    | T4a N1 M1a IVA     | NHL         | III (Ann    |
| 22      | 60/F    | T2 N2a M0 IIIB     | HD          | II (Ann     |
| 23      | 68/M    | T4a N2a M0 IIIC    | Thyroid     | T3a N1b M0  |
| 24      | 66/F    | T3 N0 M0 IIA       | Lung        | T1c N2 M0   |
|         |         |                    |             |             |
| Gastric carcinoma |         |                    |             |             |
| 25      | 65/F    | T3 N0 M0 IIA       | HCC         | B (BCLC     |
| 26      | 66/F    | T3 N3 M1 IV        | Breast      | T4b N2a M0  |
| 27      | 75/F    | T3 N2 M0 IIIB      | Breast      | T3 N1 M0    |
| 28      | 66/F    | T4a N3a M0 IIIC    | NHL         | II (Ann     |
| 29      | 58/M    | T3 N0 M0 IIA       | HD          | I (Ann      |
| 30      | 60/F    | T3 N0 M1 IV        | Endo        | Ib (FIGO    |
|         |         |                    |             |             |
| Periampullary |         |                    |             |             |
| 31      | 65/F    | T3b N0 M0 IIIB     | UB          | T2b N0 M0   |
| 32      | 80/M    | T3b N0 M0 IIIB     | UB          | T3b N0 M0   |
| 33      | 74/M    | T1 N0 M0 IA        | Renal       | T1a N0 M0   |
|         |         |                    |             |             |
| Carcinoma |         |                    |             |             |
| 34      | 64/F    | T2 N0 M0 II        | Breast      | T4b N2a M0  |

BCLC: Barcelona Clinic Liver Cancer staging classification, Endo.: Endometrial carcinoma, FIGO: the International Federation of Gynecology and Obstetrics, HCC: hepatocellular carcinoma, HD: Hodgkin disease, NHL: Non-Hodgkin lymphoma, RCC: renal cell carcinoma, UB: urinary bladder
Fig. 1  A 58-year-old male presented with bleeding per rectum. MDCT scan revealed right renal mass (arrows). It revealed enhancement on arterial phase (A), washout on portal (B) and delayed phases (C). Pathologically proved RCC. (D–F) MDCT scan revealed caecal mass (arrows) pathologically proved colonic carcinoma.

Fig. 2  76-year-old male presented with follow-up during treatment for prostatic carcinoma. MDCT scan of pelvis revealed cecal mass (arrows) (A–C) with prostate carcinoma proved by transrectal biopsy (arrows) (D–F).
Most primary synchronous malignancies were detected during the preoperative workup, which revealed most were located in the intra-abdominal cavity [24]. This is with our report as synchronous extra-gastrointestinal tract primary malignancies represent 70% of abdominal malignancies, as illustrated in Table 1. The exact relationship between synchronous primary gastrointestinal tract malignancy and other primary malignancies remains unclear. It would be of clinical benefit to clarify what types of other primary malignancies occur in synchronous gastrointestinal tract malignancy.

**Conclusion**

In conclusion, Careful preoperative evaluation is recommended to detect this pattern of synchronous extra-gastrointestinal tumors. More reports of such cases should help clarify the mechanisms of this phenomenon and may lead to a new treatment strategy for synchronous gastrointestinal malignancy and other solid malignancies.

**Abbreviations**

CRC: Colorectal cancer; MPM: Multiple primary malignancies; AJCC: American Joint Committee on Cancer; MDCT: Multidetector CT; CT: Computed
tomography; BCLC: Barcelona clinic liver cancer; RCC: Renal cell carcinoma; HCC: Hepatocellular carcinoma.

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Authors’ contributions
AE was responsible for the idea, searching and collection of the data from the archiving system, in addition to writing the manuscript. HS was responsible for planning for the study design CT, in addition to writing, reviewing, and submission of the manuscript. HA was responsible for obtaining the authorization for searching the archiving system with substantial involvement in the writing and reviewing the whole manuscript. All authors read and approved the final manuscript.

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Availability of data and materials
The datasets used during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The institutional research ethics review committee approved the report (Mansoura University/Faculty of Medicine/ Egypt). IRB reference number is “R·20.06.895” . Informed consent from the patient was waived due to the retrospective design of this report.

Consent for publication
Written informed consent was waived.

Competing interests
The authors declare that they have no competing interests.

Author details
1 Radiology Department, Faculty of Medicine, Mansoura University, Mansoura, Egypt. 2 Radiology Department, Faculty of Medicine, Urology and Nephrology Center, Mansoura University, El Gomhoreya St., Mansoura, Egypt. 3 Radiology Department, Faculty of Medicine, Student Hospital, Mansoura University, Mansoura, Egypt.

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