Arab Journal of Gastroenterology 16 (2015) 14–19

Contents lists available at ScienceDirect

Arab Journal of Gastroenterology

journal homepage: www.elsevier.com/locate/ajg

Original Article

Correlation between peritoneal lavage cytology and tumour stage in patients with colorectal cancer

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ARTICLE INFO

Article history:
Received 9 June 2014
Accepted 1 February 2015

Keywords:
Colorectal cancer
TNM staging
Peritoneal lavage cytology

ABSTRACT

Background and study aims: Complete surgical removal of the involved bowel segment in colorectal cancer is the most effective primary treatment. The main prognostic factors for colorectal cancer are penetration of the tumour into different layers of the bowel wall and regional lymph node involvement. Positive lavage cytology has been used to predict peritoneal recurrence, but its effectiveness remains controversial.
This study was conducted to assess the prevalence of positive peritoneal lavage cytology in correlation with the tumour stage in patients with colorectal cancer.
Patients and methods: This prospective cross-sectional study was performed on 20 patients with different cases of colorectal cancer attending the colorectal unit and emergency department of the Kasr Al Ainy Hospital, Cairo University Hospitals, from March 2012 to March 2013.
Results: The patients' gender did not influence the peritoneal lavage cytology results ($p = 0.062$); there is no significant correlation between the TNM staging system and cytology in patients with colorectal cancer ($p = 0.253$).
Conclusion: Although there is a positive linear correlation between the tumour stage and positive peritoneal lavage cytology, it did not reach a statistically significant level. In addition, the greater the depth of invasion, the higher the lavage cytology rate. However, this trend was not statistically significant.

Introduction

Several studies addressed and analysed the significance of free intraperitoneal tumour cells in colorectal cancer and their prognostic value [1,3,8]. The presence of tumour cells in peritoneal lavage cytology, at the time of surgical resection in colorectal cancer, correlates with increased local recurrence and decreased survival, even in the absence of nodal or systemic metastases [2]. Peritoneal cytology has been used to investigate patients with apparently resectable tumours for the presence of free-floating intraperitoneal malignant cells. Cytologic analysis of several malignancies, including the colon, has been examined in an attempt to identify patients with an increased risk of developing local versus systemic recurrence [3]. In 2009, Fujii et al. showed that the incidence of positive peritoneal lavage cytology in colorectal cancer was 1.5% (1/65) in cases classified as T1 and T2, 2.8% (4/142) in T3 cases, 6.5% (4/62) in T4 cases, and 14.2% (4/14) in cases classified as T4 with additional organ infiltration. Thus, it appeared that the greater the depth of invasion, the higher the positive peritoneal lavage cytology rate. However, this trend was not statistically significant [4]. However, in 2012, Temesi et al. showed the presence of a statistically significant correlation between the T stage and peritoneal lavage cytology ($p < 0.001$) in 145 patients. They showed that the incidence of positive peritoneal lavage cytology in T1, T2, T3, and T4 was 0%, 4%, 16%, and 75%, respectively [1].

The aim of this study was to correlate the presence of positive peritoneal lavage cytology with the tumour stage in patients with colorectal cancer.

Patients and methods

This prospective cross-sectional study was performed on 20 patients with different cases of colorectal cancer attending the colorectal unit and emergency department of the Cairo University Hospitals (Kasr Al Ainy) from March 2012 to March 2013.

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http://dx.doi.org/10.1016/j.ajg.2015.02.002
1687-1979/

All cases of non-perforating colorectal cancer with the absence of distant metastases, or macroscopic peritoneal carcinomatosis were included in the study. Patients were excluded if they had final histology confirming malignancy other than adenocarcinoma, distant metastases or peritoneal carcinomatosis, incorrect specimen collection (insufficient volume aspirate), or perforating tumours. All patients underwent full laboratory investigations. They were subjected to chest X-ray, computed tomographic (CT) scan of the abdomen and pelvis, colonoscopy with biopsy, and magnetic resonance imaging (MRI) in the case of rectal cancer.

With patients in the supine position, immediately after exploration of the abdomen with a midline incision (open surgery) or creation of the pneumoperitoneum and insertion of ports (laparoscopic surgery) and before mobilisation of the tumour, 100 ml of saline was injected into the peritoneal cavity over the tumour site or into the Douglas pouch as described by Kanellos et al. [3]. The fluid was aspirated in sterile containers and sent for cytological examination to the department of cytology.

The specimens were processed within 24 h. The entire specimen was centrifuged at 1500 rpm for 3–10 min, using a Cyto-spin 3 cytocentrifuge (Histo-Line Laboratories, Milan, Italy) or EBA 20 (Hetich Zentrifugn, Tuttlingen, Germany), and then the supernatant was decanted and the cell pellet resuspended.

Smear and cytospin preparations were made from the suspension. For each patient, three smears were used and then staining was performed using conventional cytological stains including Papanicolaou (PAP), haematoxylin–eosin (H&E), May–Grunwald and Giemsa (MGG), periodic acid–Schiff (PAS), and diastase periodic acid–Schiff (DPAS). Slides for PAP and H&E staining were fixed in 95% ethyl alcohol immediately on preparation. Slides for MGG, PAS, and DPAS were air-dried before fixation, and then fixed with methanol. The preparations were mounted with a mounting medium and covered with a cover glass. Cells were examined under a light microscope in 109 and 409 magnification. All the conventionally stained cytological preparations were examined by a consultant cytopathologist. The smears were classified according to their cytologic features, as follows: (1) positive for tumour cells: cells arranged mainly in loose clusters with the occasional presence of floating cells, disturbed nuclear cytoplastic rate, usually eccentric nuclei with a thick nuclear membrane, large prominent nucleoli, and coarsely granular chromatin; or (2) negative for tumour cells: normal cells present or cells showing only milder changes of chromatin. The appropriate clinical information was present in the cytopathology request. The findings of metastases were all confirmed histologically.

The statistical associations between categorical factors and the presence of malignant cells, in the association of continuous variables, were described in terms of mean ± standard deviation (±SD), median and range, or frequencies and percentages when appropriate. A comparison of the numerical variables between the study groups was carried out using the Mann–Whitney *U* test for independent samples. For comparison of categorical data, the chi-squared (χ^2) test was performed. Fisher's exact test was used instead when the expected frequency was <5. The *p*-values <0.05 were considered statistically significant.

Results

This study included 20 patients. The mean age was 57 ± 16.84 years. Twelve (60%) patients were males, while eight (40%) patients were females.

The study included 13 patients with left-sided colonic cancer (65%), four patients with rectal cancer (20%), and three patients with right-sided colonic cancer (15%) (Fig. 1).

Left hemicolectomy was performed in 50% of cases (13 cases), low anterior resection in 25% of cases (three cases), right hemicolectomy in 20% of cases (three cases), and abdominoperineal resection in 5% of cases (one case).

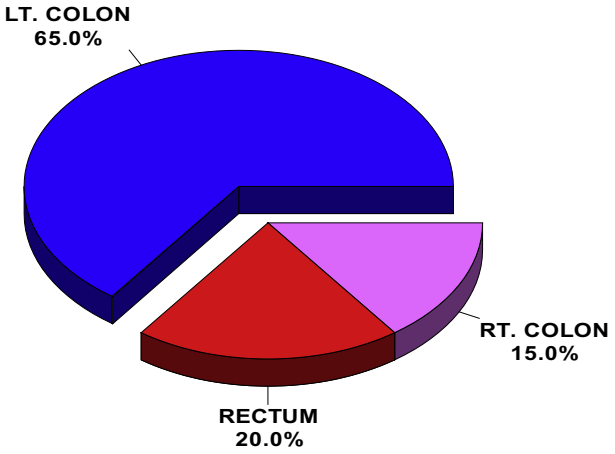

Fig. 1. Site of the tumour.

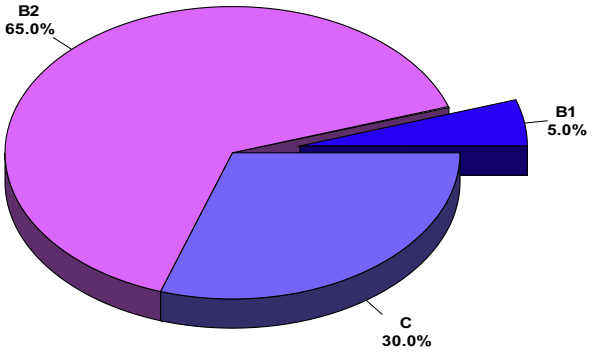

Fig. 2. Staging according to the Dukes staging system.

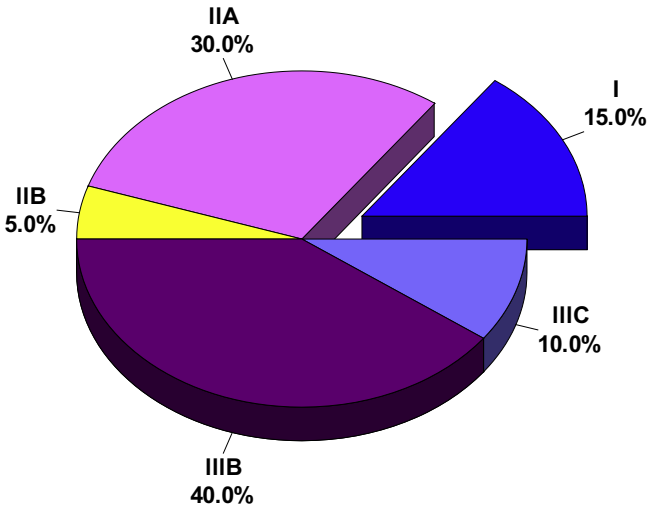

Fig. 3. Staging according to the American Joint Committee on Cancer TNM staging system.

Staging

According to the Dukes staging system, 65% of cases (13 cases) were Dukes B2, 30% of cases (six cases) were Dukes C, and 5% of cases (one case) was B1 (Fig. 2).