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Assessment of the Association Between Carcinoembryonic Antigen and TNM Stage in Colorectal Cancer

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Abstract
Our goal was to investigate the correlation between preoperative carcinoembryonic antigen (CEA) levels and TNM (tumour, node, distant metastatic, or metastasis) staging in patients with colorectal cancer in our locality. For the purpose of staging colorectal cancer, the American Joint Committee on Cancer/Union for International Cancer Control used the TNM classification system, which stands for primary tumour, lymph node and metastasis (M). This method was used to classify patients with colorectal cancer into four categories: Stage I (tumour without lymph node involvement up to subserosa), Stage II (tumour without lymph node involvement beyond subserosa), Stage III (tumour without lymph node involvement without metastasis) and Stage IV (metastatic tumour). Data from 772 individuals who received a colorectal cancer diagnosis between 1992 and 2010 were assessed in this research. Out of the 772 patients, 335 (43.2%) and 437 (56.8%) were female. With a median age of 57 years, the mean age was 57.7±15.8 years. There was no statistically significant correlation seen between the CEA levels and tumour diameter, TNM staging, or tumour differentiation level, even though the CEA levels of 52.2% of the patients that were included were within normal ranges. The study suggests that most people with colorectal cancer may have CEA levels within normal ranges. Consequently, a colon cancer diagnosis cannot be ruled out by normal CEA values and it may be inferred that these individuals need further investigation.

INTRODUCTION

It ranks second in terms of cancer-related mortality and is the fourth kind of cancer in both men and women[1]. The glycolyzed antigen known as serum carcinoembryonic antigen (CEA) is released into the lumen subsequent to its expression on the apical surface of colonic epithelial cells[2]. It's an oncofetal antigen when colorectal cancer recurs, its blood levels rise at a rate of 75%. Local recurrences in peritoneal and lung metastases are less responsive to CEA, while levels in hepatic and retro peritoneal metastases are extremely sensitive[3]. Patients with colorectal cancer may have normal or high preoperative CEA levels, high levels are associated with a higher risk of recurrence and a worse prognosis[4]. We looked at whether preoperative CEA levels and tumour stage were related in our research of colorectal cancer patients.

MATERIALS AND METHODS

340 patients tumour, nodemetastasis (TNM) stages were identified. For the purpose of staging colorectal cancer, the American Joint Committee on Cancer/Union for International Cancer Control used the TNM classification system, which stands for primary tumour, lymph node and metastasis (M). This method was used to classify patients with colorectal cancer into four categories: Stage I (tumour without lymph node involvement up to subserosa), Stage II (tumour without lymph node involvement beyond subserosa), Stage III (tumour without lymph node involvement without metastasis)Stage IV (metastatic tumour). During the preoperative phase, the patients' CEA levels were also determined. The hormone laboratory at our university uses a reference range, thus levels <3.4 ng/mL were considered normal, whereas values >3.4 ng/mL were considered excessive.

The SPSS Inc., Chicago, IL, USA, 15.0 Statistical Package for Social Sciences programme was used to analyse the data. T test, Chi square (X2), p value, mean (), frequency value (F)t statistical analysis were all included in the investigations. The p values were obtained from the statistical analysis of the data the degree of significance was shown to be Each participant was told about the study and provided written informed consent. The ethics committee gave its approval to the study protocol.

RESULTS AND DISCUSSIONS

In the present study, data from 772 patients diagnosed with colorectal cancer between 1992 and 2010 were evaluated. Of the 772 patients, 437 (56.8%) were males and 335 (43.2%) were females. The mean age was 57.7±15.8 years the median age was 57 years. The youngest patient was 21 years old, whereas the oldest was 92 years old. Patient data are summarized in Table 1.

The CEA levels of 326 patients could be defined, the CEA levels of samples were within normal limits (CEA = 0-3.4 ng/mL). When lit-erature was reviewed generally, it was observed that patients were classified according to CEA levels below or about 5 g/mL. Therefore, the second classification was performed in the study and it was defined that 59.2% of cases had CEA $\leq$5 ng/mL (Table 2).

The relationship between CEA levels and TNM staging of patients is shown in Table 3. Cases with CEA $\leq$5 ng/mL were predominantly in the Stage III, whereas those with CEA >5 ng/mL were intensely in the Stage IV. Chi square analy-sis was performed no statistically significant correlation was detected between TNM staging and CEA levels ($p>0.05$, Table 3).

When CEA levels were evaluated with tumor differentiation degrees, no statistically significant correlation was detected between cases with CEA =5 ng/mL and those with >5 ng/mL in the Chi square analysis ($p>0.05$, Table 4).

When the correlation between CEA levels and tumor diameters of patients was compared, no statistically significant correlation was detected in the Chi square analysis ($p>0.05$, Table 5).

Ninety percent of primary colorectal cancer patients have high blood levels of CEA, which may also be identified at high levels in lung and breast malignancies. An essential component that controls promoter activities in intracellular adhesion and aggregation is CEA. As a result, it is thought that CEA plays a significant part in both defining metastasis and tumour invasion[5,6]. In 2009, Filiz[7] found that 58.8% of patients with colorectal cancer had normal preoperative CEA levels in their study of 151 individuals. In that investigation, no statistically significant relationship was found between preoperative CEA levels and tumour size, location, or degree of differentiation. Duffy[8] looked at the relationship between patient differentiation degree and CEA levels in another research. CEA levels were low in patients with weak and poorly differentiated tumours, but high in those with well and moderately differentiated tumours. Low CEA levels in individuals with poorly differentiated or undifferentiated tumours at an advanced stage were thought to be the cause of this disease. In the previously stated research, tumour differentiation was found to be mild or undifferentiated in patients whose CEA levels were more than 5 ng/mL well or moderate in situations where the CEA levels were <5 ng/mL. It should be noted that the criterion lacked statistical significance. Huh[5] looked at the relationship between 474 patients' TNM staging and CEA levels for colorectal cancer. Patients with CEA values greater than or <5 ng/mL were split into two groups. However, the research only included individuals with colorectal cancer that had not

Table 1: Median age, gender, tumor localizationTNM stages of cases

Median age, years	58 (22-93)
Gender	
Male	437 (56.6%)
Female	335 (43.3%)
Total	772 (100%)
Tumor localization	
Cecum	35 (4.6%)
Ascending colon	68 (9.0%)
Transverse colon	23 (3.0%)
Descending colon	83 (10.9%)
Sigmoid colon	135 (17.8%)
Rectum	411 (54.4%)
Total	755 (100%)
TNM staging	
I	25 (7.5%)
II	71 (21.5%)
III	102 (30.9%)
IV	132 (40%)
Total	330 (100%)

T: primary tumor, N: lymph node, M: metastasis

Table 2: CEA levels and frequency values

CEA	Frequency	Percentage
≤5 ng/mL	193	59.2
>5 ng/mL	133	40.7
Total	326	100

Table 3: CEA levels and TNM staging

	TNM staging									
	Stage I		Stage		Stage		Stage		Total	
CEA	Freq.	%	Freq	%	Freq III	%	Freq IV	%	Freq	%
≤5 ng/mL	15	9.6	36	23.2	54	34.8	50	32.2	155	100
>5 ng/mL	7	6.8	22	21.5	26	25.4	47	46.0	102	100
Total	22	8.5	58	22.5	80	31.1	97	37.7	257	100

T: primary tumor, N: lymph node, M: metastasis, CEA: carcinoembryonic antigen, Freq: frequency

Table 4: CEA level and differentiation degree

	Differentiation degree				
CEA	Mild Mo	derate Well Undifferentiated			Total
≤5 ng/mL	11	62	23	1	97
>5 ng/mL	12	34	6	1	53
Total	23	96	29	2	321

Table 5. CEA level and tumor diameters

	CEA level		
Tumor diameter	≤5 ng/mL	>5 ng/mL	Total
< 3 cm	34	31	61
3-6 cm	59	32	89
6-9 cm	32	22	52
>9 cm	30	17	45
Total	155	102	257

spread to other locations. The study's findings established a statistically significant association between patients' TNM staging and their CEA levels. Prior to surgery, CEA levels were normal in the remaining patients, however they were elevated in 33.1% of cases. There was no discernible relationship found between the patients' differentiation degrees, tumour location CEA levels. A preoperative CEA level of 5 ng/mL was approved by Lee[6] as the cut-off point. those with Stage I and II TNM classification had low CEA levels (66%) while those with more advanced cancer had high CEA levels, this link was statistically significant. 52.2% of the patients in our research had CEA levels found within normal limits there was no statistically significant correlation found between CEA levels and TNM staging, tumour diameter, or tumour differentiation degree. Given this knowledge, it should be remembered that many people with colorectal illness may have CEA levels within normal ranges; as a result, in suspected instances of colorectal cancer, abnormal CEA levels cannot rule out a diagnosis of the disease. Furthermore, no discernible relationship has been found between the TNM staging of patients and CEA levels, proving that further research on this topic is necessary.

CONCLUSION

Given its significant role in both our nation and the rest of the globe in terms of mortality and morbidity, more research should be done on colorectal cancer. The TNM stage and CEA level are meaningfully related.

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