



Biochemical study of Cancer Antigen CEA and CA 19-9 as prognostic markers in colorectal cancer (CRC)

Ananthi N¹, Padmini Habbu*²¹Department of Biochemistry, Saveetha University, Chennai, Tamil Nadu, India²Research Scholar, Department of Biochemistry, Saveetha University, Chennai, Tamil Nadu, India**Article History:**

Received on: 09 Oct 2020
 Revised on: 15 Nov 2020
 Accepted on: 02 Dec 2020

Keywords:

CRC,
 CEA,
 CA19-9,
 Prognosis

ABSTRACT

Colorectal cancer is one of the most common types of cancer in the world. Several factors have been shown to put individuals at risk to CRC and these include age, the presence of polyps, inflammatory bowel disease, lifestyle, genetic background and family medical history. In the present study, we were related to the cancer antigen CEA and CA19-9 as prognostic markers in colorectal cancer. This may be helping us to detect colorectal cancer in an early stage. In this study, we have included 60 patients diagnosed with colorectal cancer. These patients were categorized as 10 patients between stage I-IV with disease dissemination and recurrence; 50 patients in between stage I-IV without dissemination and recurrence; 60 healthy controls. The cancer antigen CEA and Ca 19-9 were analyzed as prognostic markers in colorectal cancer. The statistical analysis was done by using SPSS software and expressed in terms of mean \pm standard deviation. The p values ($p < 0.005$) were considered as statistically significant value. Person correlation between the cancer antigen CEA and CA-19-9 were analyzed. The cancer antigen CEA and Ca19-9 level were significantly increased in colorectal cancer patients as compared to the healthy controls group ($p < 0.005$). The significant Person correlation was observed in between CEA and CA19-9. The level of CEA and CA19-9 were significantly prognostic indicator in colorectal cancer. CEA and CA19-9 can be used as a diagnostic and prognostic marker for the screening of both colon and rectum cancer.

***Corresponding Author**

Name: Padmini Habbu
 Phone: 7038699499
 Email: phabbu18@gmail.com

ISSN: 0975-7538

DOI: <https://doi.org/10.26452/ijrps.v11iSPL4.4548>

Production and Hosted by

IJRPS | <https://ijrps.com>

© 2020 | All rights reserved.

only 60%~70%. Surgical resection is the main treatment for colorectal cancer (Böckelman *et al.*, 2018; Ueda *et al.*, 1994). According to an Indian statistical survey, about 10%~40% of patients still die of tumor recurrence or metastasis after CRC radical surgery (Reiter *et al.*, 2000; McLeod and Murray, 1999). Therefore, there is an urgent need for a method to predict the changes and progression of colorectal cancer. The purpose of this study is to analyze and study the clinical significance of CEA and CA19-9 in determining the prognosis of colorectal cancer by monitoring the levels of CEA and CA19-9 in the serum of patients after CRC (Moldrich *et al.*, 2010).

INTRODUCTION

In India, the incidence of colorectal cancer (CRC) is on the rise year by year. The 5-year survival rate is

Cancer antigen CEA is the commonly used tumor marker in colorectal cancer follow-up. CEA is

expressed in adults in several solid malignancies, including colorectal cancer. CEA expression and secretion by tumor cells might promote metastatic spread by enhancing an inflammatory environment that supports tumor formation. As the tumor size increases, more CEA is observed to accumulate in the blood (Chen *et al.*, 2016; Jeong *et al.*, 2017). CEA is therefore used as a marker to follow the activity of these malignancies. Carbohydrate antigen (CA19-9) is a high molecular weight glycoprotein used in gastric, pancreatic malignancies and in CRC diagnostics. CRC is a biochemically and molecularly heterogeneous disease, CA19-9 as an intracellular adhesion molecule may influence cells synthesizing various tumor markers (Chen *et al.*, 2016; Jeong *et al.*, 2017).

Our aim was to evaluate the cancer antigen of serum CEA and CA19-9 as prognostic markers in colorectal cancer patients. With regard to possible early-prediction of recurrences of the disease, which may play a vital role in prolonging the survival rate of CRC patients.

MATERIALS AND METHODS

Study area

The present study was undertaken to relate the Cancer Antigen CEA and CA 19-9 as prognostic markers in colorectal cancer (CRC). This study was conducted in Saveetha medical college and hospital Chennai over a period of 1 year after taking consent from subjects. Ethical clearance was taken from the institutional Ethical Committee.

In this study, we have included 60 patients diagnosed with colorectal cancer. These patients were categorized as 10 patients in between stage I-IV with disease dissemination and recurrence; 50 patients in between stage I- IV without dissemination and recurrence; 60 healthy controls.

Information on tumor size, lymph node status, lymphatic or vascular vessel invasion, mucinous cell type and tumor differentiation was retrieved from pathological records. Information about family history was obtained preoperatively through written questionnaires. Information on clinical stage, cancer recurrences were obtained from surgical and oncological hospital records.

Study design

This is a descriptive hospital based case control study.

Inclusion criteria

Patients with known colorectal carcinoma were considered to be eligible for inclusion in the study.

Exclusion criteria

To avoid false positive results, care was taken to exclude patients with renal hepatobiliary disorders, systemic lupus erythematosus, renal failure, acquired immunodeficiency syndrome as well as malignancies other than colorectal cancer.

Methods

To diagnose colorectal cancer, CEA and CA 19-9 were measured. CEA (Carcinoembryonic Antigen) and CA 19-9 were measured by Biomerix kit using two steps immunoassay sandwich method with final fluorescent detection (ELFA) by using mini Vidas.

Statistical analysis

The analysis of data was done by student t test and SPSS-17 software. The difference in mean values of various parameters was calculated and expressed in terms of the p value. Correlations between the parameters were evaluated in all study subjects and calculated by Pearson's method.

RESULTS

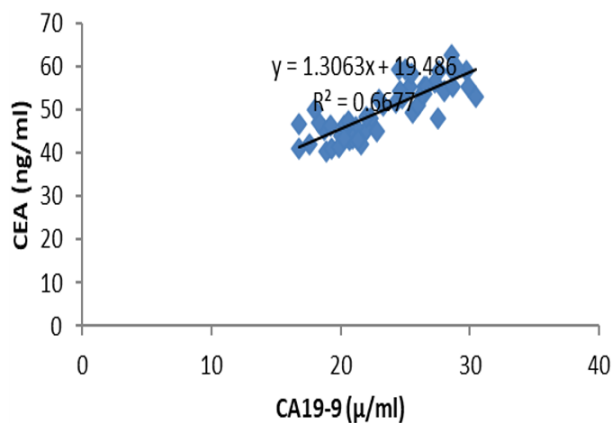


Diagram 1: Showing Person correlation between Cancer antigen CEA and CA19-9 with their r value

The present study was undertaken to investigate the relationship cancer antigen CEA and CA19-9 in colorectal cancer patients.

Table 1, shows a highly significant increased in diagnostic markers CEA and CA 19-9 as compared to control value. Table 2, Suggest the highly significant ($p < 0.001$) rise in cancer antigen markers CEA and CA19-9 in various stages of colorectal cancer. Table 3, Shows that CEA and CA19-9 were significant rise ($p < 0.01$) in recurrence patients as compared to controls.

In scattered Diagram 1, r values were indicating a positive correlation between CEA and CA19-9 as prognostic markers in colorectal cancer patients.

Table 1: Showing cancer antigen CEA and CA19-9 in CRC and control patients

Parameters	Case of CRC Mean \pm SD	Control Mean \pm SD	p value
CEA (ng/ml)	35.53 \pm 12.27	2.2 \pm 0.72	p < 0.001***
CA 19-9(u/ml)	56.30 \pm 7.31	22.68 \pm 8.37	p < 0.001***

p < 0.001*** Highly significant. p < 0.01** More significant. p > 0.05 not significant

Table 2: Demonstrates the CEA and CA19-9 in different stages of colorectal cancer with their p value

Parameters	CRC Cases stage wise distribution					p value
	Stage 0	Stage I	Stage II	Stage III	Stage IV	
CEA	18.52 \pm 1.29	20.38 \pm 1.63	27.05 \pm 2.28	44.54 \pm 5.01	52.12 \pm 6.12	p < 0.001***
CA 19-9	41.62 \pm 1.41	45.45 \pm 2.34	55.40 \pm 3.90	60.05 \pm 3.74	64.84 \pm 3.11	p < 0.001***

p < 0.001*** Highly significant. p < 0.01** More significant. p > 0.05 not significant

Table 3: Summarizes levels of CEA and CA19-9 in CRC with recurrences and controls with their significant values

Parameters	Case of CRC with Recurrences Mean \pm SD	Control Mean \pm SD	p value
CEA	52.82 \pm 7.01	2.2 \pm 0.72	p < 0.001***
CA 19-9	54.64 \pm 4.80	22.68 \pm 8.37	p < 0.01**

p < 0.001*** Highly significant. p < 0.01** More significant. p > 0.05 not significant

DISCUSSION

The diagnostic accuracy of serum CEA and CA19-9 has been underestimated. The evidence were supporting the clinical value of serum CEA and CA19-9 on increasing the eligibility of curative resection of recurrent disease detected in asymptomatic patients and successively on survival is available. Our study emphasizes parameters that predict the diagnosis of CRC. In the present study, we found that the levels of CEA and CA 199 have significantly increased in CRC and they may serve as high sensitivity tumor markers in CRC when used together.

CEA and CA19-9 were most important and commonly used serum tumour marker in clinical practice and is recommended for determining prognosis, surveillance followed after curative resection, and as a monitoring therapy in advanced CRC Mitsuya Murashige, (Murashige *et al.*, 1996).

The factors affecting serum levels of CEA and CA19-9 in patients with CRC are: disease stage, differentiation grade, liver disease, tumour site, bowel obstruction, smoking and ploidy status of the tumour. A high level of CEA and CA19-9, were taken preoperatively, is associated with adverse prognosis in patients with CRC, and these patients may not benefit from adjuvant chemotherapy based on the increased level of CEA and CA19-9. Increased postoperative CEA and CA19-9 is associated with early

recurrence (Ueda *et al.*, 1994).

Zheng (2001) investigated the prognostic value of CEA and CA 19-9, in colorectal cancer patients by evaluating Dukes stages and tumor marker values and found that patients with advanced stage had significantly increased levels of CEA and CA 19-9 (Wanebo *et al.*, 1978).

Compared preoperative CEA values and Dukes stages in CRC patients and determined the association between tumor marker and disease in different stages. In our study, we were observed that cancer antigen markers level were increased concomitantly from stage 0 to IV, suggesting the severity and the distance spread of the disease of colorectal cancer patients.

CONCLUSIONS

The level of CEA and CA19-9 were significantly prognostic indicator in colorectal cancer and this marker can be used as a diagnostic and prognostic marker for the screening of both colon and rectum cancer. CEA and CA19-9 values in CRC patients showed the association between tumor markers and disease in different stages. Both markers were shows the highest sensitivity for colorectal cancer. Early detection of CRC by evaluating diagnostic and prognostic markers may serve as screening tools for CRC in clinical practice.

ACKNOWLEDGEMENT

The authors wish to express their deepest gratitude to all the patients and healthy volunteers who have participated in this study.

Funding Support

The authors declare that they have no funding support for this study.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

REFERENCES

- Böckelman, C., Beilmann-Lehtonen, I., Kaprio, T., Koskensalo, S., Tervahartiala, T., Mustonen, H., Stenman, U.-H., Sorsa, T., Haglund, C. 2018. Serum MMP-8 and TIMP-1 predict prognosis in colorectal cancer. *BMC Cancer*, 18(1).
- Chen, S.-L., Li, J.-P., Li, L.-F., Zeng, T., He, X. 2016. Elevated Preoperative Serum Alanine Aminotransferase/Aspartate Aminotransferase (ALT/AST) Ratio Is Associated with Better Prognosis in Patients Undergoing Curative Treatment for Gastric Adenocarcinoma. *International Journal of Molecular Sciences*, 17(6):911–911.
- Jeong, D. S., Kim, Y. H., Kim, K. J. 2017. Surgical Outcomes and Risk Factors in Patients Who Underwent Emergency Colorectal Surgery. *Annals of Coloproctology*, 33(6):239–244.
- McLeod, H. L., Murray, G. I. 1999. Tumour markers of prognosis in colorectal cancer. *British Journal of Cancer*, 79(2):191–203.
- Moldrich, G., Lange, P., Strik, H. 2010. Carcinoembryonic antigen in the CSF of cancer patients—the value of intrathecal synthesis and correlation with IgA-diffusion dynamics. *Acta neurologica belgica*, 110(4):314–320.
- Murashige, M., Miyahara, M., Shiraishi, N., Saito, T., Kohno, K., Kobayashi, M. 1996. Enhanced Expression of Tissue Inhibitors of Metalloproteinases in Human Colorectal Tumors. *Japanese Journal of Clinical Oncology*, 26(5):303–309.
- Reiter, W., Stieber, P., Reuter, C., Nagel, D., Lau-Werner, U., Lamerz, R. 2000. Multivariate analysis of the prognostic value of CEA and CA 19-9 serum levels in colorectal cancer. *Anticancer research*, 20(6D):5195–5198.
- Ueda, T., Shimada, E., Urakawa, T. 1994. The clinicopathologic features of serum CA 19-9-positive colorectal cancers. *Surgery Today*, 24(6):518–525.
- Wanebo, H. J., Rao, B., Pinsky, C. M., Hoffman, R. G., Stearns, M., Schwartz, M. K., Oettgen, H. F. 1978. Preoperative Carcinoembryonic Antigen Level as a Prognostic Indicator in Colorectal Cancer. *New England Journal of Medicine*, 299(9):448–451.
- Zheng, C. X. 2001. The prognostic value of preoperative serum levels of CEA, CA19-9 and CA72-4 in patients with colorectal cancer. *World Journal of Gastroenterology*, 7(3):431–433.