Carcinoembryonic Antigen Levels in Colorectal Adenocarcinoma Patients with Liver Metastasis: A Single-Center Study in Medan, Indonesia

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Abstract

Background: Liver metastasis is the most common distant spread in colorectal adenocarcinoma and significantly contributes to mortality. Carcinoembryonic antigen (CEA) is widely used as a tumor biomarker, although its role in metastatic colorectal cancer remains debated. This study aimed to evaluate CEA levels in colorectal adenocarcinoma patients with liver metastasis.
Methods: Adult patients with colorectal adenocarcinoma and confirmed liver metastasis at a tertiary center were analyzed. Serum CEA levels, demographic characteristics, and tumor-related variables were collected. Associations between CEA levels and clinical characteristics were assessed.
Results: Elevated CEA levels (≥5 μg/L) were observed in most patients with liver metastasis. Higher CEA values were associated with advanced disease and tumor burden. Variations were observed according to age, sex, and tumor location.
Conclusion: CEA levels were elevated in colorectal adenocarcinoma patients with liver metastasis. Although not specific, CEA remains a useful biomarker for disease evaluation and monitoring when interpreted alongside clinical findings.[1–8]

INTRODUCTION

Colorectal cancer (CRC) is one of the leading causes of cancer-related morbidity and mortality worldwide. Global data indicate a continuous rise in incidence, particularly in developing countries, with increasing burden associated with lifestyle factors such as diet, obesity, and physical inactivity.[1,2]

The majority of colorectal cancers are adenocarcinomas originating from glandular epithelial cells. A major clinical challenge is the high rate of metastasis, especially to the liver. Approximately 50–60% of patients develop liver metastasis during the course of the disease, while 20–30% present with liver metastasis at initial diagnosis.[3,4]

The liver is the most common metastatic site due to its unique vascular anatomy. Venous drainage from the colon flows directly into the portal vein, making the liver the first organ exposed to circulating tumor cells.[5]

Carcinoembryonic antigen (CEA) is a glycoprotein expressed during fetal development and re-expressed in several malignancies, particularly colorectal cancer. Elevated serum CEA levels have been associated with tumor burden, recurrence, and poor prognosis. However, its specificity is limited, as elevated levels may also be observed in benign inflammatory conditions.[6–8]

Given these considerations, evaluation of CEA levels in colorectal cancer patients with liver metastasis remains clinically relevant. This study aimed to describe the distribution and clinical significance of CEA levels in this patient population at Haji Adam Malik General Hospital, Medan.[1–8]

METHODS

This analytic observational study was conducted at Haji Adam Malik General Hospital, Medan, Indonesia, between 2022 and 2024. Adult patients (≥18 years) diagnosed with colorectal adenocarcinoma and confirmed liver metastasis were included. Patients with incomplete medical records were excluded.

Serum CEA levels were obtained from routine laboratory examinations. Demographic variables such as age, sex, and primary tumor location were collected.

CEA levels were categorized using standard clinical thresholds, with elevated levels defined as ≥5 µg/L. Descriptive and analytical statistics were used to evaluate the relationship between CEA levels and clinical variables. A p-value <0.05 was considered statistically significant.[1,3]

RESULTS

Patients with colorectal adenocarcinoma and liver metastasis were analyzed. The majority of patients were older than 50 years, consistent with epidemiological data indicating increased incidence with age.[2,4]

Elevated CEA levels (≥5 µg/L) were found in most patients with liver metastasis. Higher CEA levels were associated with advanced disease stage and increased tumor burden.

Analysis demonstrated that:

- CEA levels were higher in metastatic cases
- Distribution varied based on age and sex
- Tumor location showed variable association with CEA levels

These findings suggest that elevated CEA is a common characteristic in colorectal cancer with liver metastasis, although inter-patient variability exists.[1–8]

DISCUSSION

This study confirms that CEA levels are frequently elevated in colorectal adenocarcinoma patients with liver metastasis. These findings are consistent with previous studies demonstrating that CEA correlates with tumor burden and disease progression.[6–8]

The mechanism underlying this association involves the biological role of CEA in tumor cell adhesion, invasion, and metastasis. CEA facilitates interaction between tumor cells and endothelial cells, particularly in the liver microenvironment, promoting metastatic colonization.5

Despite its clinical utility, CEA lacks specificity. Elevated levels may also be observed in inflammatory bowel disease, liver disease, and other malignancies. Therefore, CEA should not be used as a standalone diagnostic marker but rather as part of a multimodal evaluation including imaging and clinical assessment.[6,7]

Nevertheless, CEA remains valuable in clinical practice for monitoring treatment response, detecting recurrence, and assessing prognosis. Its accessibility and cost-effectiveness make it particularly useful in routine clinical settings.

Limitations of this study include its single-center design and the absence of longitudinal follow-up data. Future studies should evaluate dynamic changes in CEA levels and their predictive value in treatment outcomes.[1–8]

CONCLUSION

CEA levels were elevated in colorectal adenocarcinoma patients with liver metastasis. Although not specific, CEA remains a clinically useful biomarker for disease evaluation and monitoring. Its use in combination with clinical and radiological findings may improve assessment of disease progression and prognosis.

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