

Analysis of Treatment and Survival Factors of Colorectal Cancer with Multiple Liver Metastases

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Abstract

This retrospective study aimed to investigate the clinical characteristics, prognosis, and treatment outcomes of liver metastatic cancer in patients with colorectal cancer. Medical records of patients diagnosed with colorectal cancer and concurrent hepatic metastatic cancer were collected from our hospital between October 2016 and June 2019. Among the 33 included patients, liver metastatic cancer accounted for 22.7% of the total diagnosed cases. The male-to-female ratio was 58:42, and the mean age was 55 years (range: 45-75 years). The liver metastatic carcinoma exhibited the same pathological type as the primary tumor, specifically adenocarcinoma. Clinical manifestations of liver metastatic cancer mainly included symptoms such as ascites, splenomegaly, and impaired liver function. The prognosis of patients with liver metastatic cancer was found to be poor, with a 5-year survival rate of approximately 30%. These findings highlight the high incidence of liver metastatic cancer in colorectal cancer patients and the worse prognosis compared to the primary tumor. It emphasizes the importance of regular liver examinations for colorectal cancer patients to facilitate early detection of liver metastases and the implementation of effective treatment strategies to improve patient survival rates.

Keywords

Colorectal cancer, Incidence, Mortality, Trends, Prevention

1. Introduction

Colorectal cancer (CRC) is a significant global health burden, with substantial numbers of new cases and deaths projected annually. In 2023, it is estimated that there will be 153,020 newly diagnosed cases of CRC worldwide, resulting in 52,550 deaths. Understanding the current trends and patterns of CRC incidence and mortality is crucial for developing effective prevention, early detection, and treatment strategies.

Over the past two decades, there has been a notable decline in the incidence of CRC. During the first decade of the 21st century, the annual decrease in CRC incidence was approximately 3%-4%. However, from 2011 to 2019, the decline slowed to an average of 1% per year. Of concern is the continuous increase in the incidence rates and proportions of CRC among individuals younger than 55 years old. This shift in age-specific rates necessitates a closer examination of the underlying factors contributing to the rising burden of CRC in younger populations.

Encouragingly, there has been a consistent reduction in CRC mortality rates from 2011 to 2020, with an annual decrease of 2%. However, paradoxically, there has been a concerning annual increase in CRC mortality rates among individuals under the age of 50, with a rise of 0.5%-3% per year. This trend emphasizes the need for targeted interventions and improved management strategies to address the unique challenges faced by younger CRC

patients.

The widespread implementation of screening programs has had a positive impact on the diagnosis of late-stage CRC between 1995 and 2005, resulting in a decrease in late-stage diagnoses. However, since 2005, this positive trend has reversed, primarily due to an increase in late-stage diagnoses among individuals under the age of 65. This shift highlights the importance of continuous efforts to improve early detection and raise awareness among younger populations.

Another noteworthy finding is the increasing proportion of rectal cancer cases, rising from 27% in 1995 to 31% in 2019. Understanding the changing distribution of CRC subsites can help guide targeted interventions and treatment approaches.

This introduction provides an overview of the current landscape of CRC incidence, mortality, and trends. By analyzing the latest data, we aim to identify key areas for intervention and improvement, such as early detection strategies, tailored management approaches for younger patients, and targeted efforts to address the rising burden of rectal cancer.

In conclusion, addressing the challenges posed by CRC requires a comprehensive understanding of the changing epidemiological patterns. The findings presented in this study provide a foundation for developing effective public health initiatives, improving patient outcomes, and ultimately reducing the global impact of CRC.

2. Treatment methods for colorectal cancer with multiple liver metastases

2.1 Surgical treatment

Surgical resection stands as a primary and potentially curative treatment approach for patients diagnosed with colorectal cancer with multiple liver metastases [1]. The objective of surgical resection is to eliminate the metastatic tumors within the liver through the complete removal of visible tumors and attainment of negative surgical margins. The feasibility of surgical resection, however, hinges upon several critical factors that influence the surgical decision-making process.

Factors such as the number, size, location, and distribution of liver metastases are key considerations in determining the appropriateness of surgical resection [1]. For patients with a limited number of metastases that are well-positioned and resectable, complete tumor removal becomes a viable option. In such cases, a curative intent is pursued, as the removal of all visible tumors can potentially lead to long-term survival and disease-free outcomes.

However, the extent and position of the liver metastases may present challenges in achieving complete resection [2]. In instances where tumors are extensive or located in critical areas of the liver, complete removal may not be feasible. In these complex scenarios, a multidisciplinary approach involving other treatment modalities is often considered to optimize patient outcomes.

For patients deemed suitable candidates for surgical resection, careful preoperative assessment and planning are essential [3]. Advanced imaging techniques, such as computed tomography (CT) scans and magnetic resonance imaging (MRI), are employed to accurately evaluate the size, location, and distribution of liver metastases. This information aids in determining the optimal surgical approach, whether it involves partial hepatectomy (removal of a portion of the liver) or, in select cases, total hepatectomy with subsequent liver transplantation.

In summary, surgical resection plays a crucial role in the management of colorectal cancer with multiple liver metastases, particularly when the tumors are limited in number and accessible for complete removal [4]. While the feasibility of surgical resection is contingent upon various factors, a comprehensive evaluation by a multidisciplinary team ensures that patients receive individualized treatment plans that optimize the potential for curative outcomes.

2.2 Chemotherapy

Chemotherapy plays a crucial role in the systemic treatment of colorectal cancer with multiple liver metastases. It involves the administration of anti-cancer drugs that target rapidly dividing cells throughout the body, including metastatic tumors in the liver. Commonly used chemotherapy regimens for colorectal cancer include FOLFOX (folinic acid, fluorouracil, and oxaliplatin) and FOLFIRI (folinic acid, fluorouracil, and irinotecan). These drugs work by interfering with the DNA replication and cell division processes, thereby inhibiting tumor growth and promoting cancer cell death. Chemotherapy may be administered before surgery to shrink tumors, after surgery to eliminate residual cancer cells, or as palliative treatment to alleviate symptoms and prolong survival.

ers, such as microsatellite instability (MSI) and expression of certain proteins (e.g., p53, HER2), have been associated with prognosis and treatment response.

3.2 Molecular biology factors

Advancements in molecular biology have revealed the significance of genetic alterations and molecular markers in colorectal cancer prognosis. These factors provide insights into the underlying biology of the disease and guide personalized treatment approaches.

(1) Genetic alterations: Specific gene mutations have been identified as important prognostic indicators in colorectal cancer. For example, mutations in the KRAS and BRAF genes have been associated with poorer prognosis and resistance to certain therapies. KRAS mutations, occurring in approximately 40% of colorectal cancers, are associated with decreased response to anti-EGFR therapies. BRAF mutations, found in about 10% of cases, are associated with worse outcomes, particularly in the presence of microsatellite instability-high (MSI-H) tumors.

(2) Molecular markers: Molecular markers provide valuable information about the tumor's molecular characteristics and potential therapeutic targets. The expression of specific proteins, such as EGFR, has been extensively studied in colorectal cancer. Anti-EGFR therapies, such as cetuximab and panitumumab, have shown efficacy in patients with wild-type (non-mutated) KRAS and NRAS genes. Other molecular markers, including HER2 amplification and mismatch repair deficiency (dMMR) or MSI-H status, are being investigated as potential predictive markers for targeted therapies.

3.3 Prognostic evaluation models

Prognostic evaluation models have been developed to integrate clinical, pathological, and molecular factors and provide a comprehensive assessment of patient prognosis. These models aid in risk stratification and treatment decision-making.

(1) Fong score: The Fong score, developed by Dr. Yuman Fong and colleagues, is a widely used prognostic model for colorectal cancer liver metastases. It incorporates five clinical and pathological factors: the number of liver metastases, the size of the largest metastasis, lymph node involvement, disease-free interval, and preoperative carcinoembryonic antigen (CEA) level. The Fong score helps identify patients who may benefit from surgical resection and provides prognostic information.

(2) Clinical Risk Score: The Clinical Risk Score is another prognostic model that incorporates clinical and molecular factors. It includes variables such as age, gender, primary tumor site, T and N stages, CEA level, and MSI status. This model aims to predict survival outcomes and guide treatment decisions, such as the use of adjuvant chemotherapy or targeted therapies.

By considering these clinical, pathological and molecular factors and utilizing prognostic evaluation models, clinicians can better assess the prognosis of patients with colorectal cancer and multiple liver metastases. This knowledge aids in developing personalized treatment strategies and optimizing patient outcomes.

4. Treatment strategies and measures for improving survival

Colorectal cancer with multiple liver metastases presents significant challenges in terms of treatment and prognosis. To improve survival outcomes, comprehensive treatment strategies, emerging treatment methods, and measures for enhancing prognosis are being explored. These approaches are detailed below:

4.1 Comprehensive treatment strategies

Multimodal treatment approaches have demonstrated improved outcomes for patients with colorectal cancer and liver metastases. These strategies typically involve a combination of different treatment modalities, such as surgery, chemotherapy, interventional therapy, and immunotherapy. The selection and sequencing of these treatments depend on the individual patient's characteristics, tumor biology, and disease stage. By tailoring treatment plans to each patient, optimal treatment efficacy and long-term survival can be achieved.

4.2 Emerging treatment methods and drugs

Ongoing research efforts are focused on developing novel treatment methods and drugs specifically designed for colorectal cancer with multiple liver metastases. These advancements aim to enhance treatment efficacy, overcome drug resistance, and improve patient outcomes. Some promising areas of investigation include:

(1) New chemotherapeutic agents: Researchers are exploring novel chemotherapy drugs and regimens that target specific pathways involved in colorectal cancer progression and metastasis. These agents may offer improved response rates and tolerability compared to traditional chemotherapy.

(2) Targeted therapies: Targeted therapies aim to inhibit specific molecules or pathways that play a critical role in colorectal cancer growth and metastasis. For example, monoclonal antibodies targeting vascular endothelial growth factor (VEGF) or epidermal growth factor receptor (EGFR) have shown efficacy in selected patients. These therapies are often guided by molecular profiling of the tumor to identify suitable targets.

(3) Immunotherapeutic approaches: Immunotherapy, which harnesses the body's immune system to fight cancer, is revolutionizing cancer treatment. Immune checkpoint inhibitors, such as anti-PD-1 and anti-CTLA-4 antibodies, have shown promising results in certain colorectal cancer patients, particularly those with microsatellite instability-high (MSI-H) tumors. Ongoing research aims to further refine and expand the use of immunotherapies in this patient population.

4.3 Measures for improving prognosis

Several measures can be implemented to improve prognosis in colorectal cancer with multiple liver metastases:

(1) Regular monitoring and surveillance: Close monitoring of patients after treatment is crucial for detecting recurrence or metastases early. Regular imaging studies, such as computed tomography (CT) scans or magnetic resonance imaging (MRI), and tumor marker assessments, including carcinoembryonic antigen (CEA) levels, allow for timely intervention and treatment adjustment.

(2) Early detection of recurrence or metastases: Implementing surveillance protocols that include frequent follow-up visits and imaging studies can help identify disease recurrence or new metastatic lesions at an early stage. Early detection enables prompt intervention and potentially curative treatment options, such as surgery or targeted therapies.

(3) Timely intervention: When recurrence or metastases are detected, prompt intervention is essential. Treatment options may include surgical resection, localized therapies (e.g., radiofrequency ablation, transarterial chemoembolization), or systemic therapies tailored to the specific molecular characteristics of the tumor.

(4) Comprehensive supportive care: Optimizing supportive care measures, such as pain management, nutritional support, and psychosocial support, can enhance patient well-being and quality of life. Integrating palliative care early in the treatment process is also important for addressing symptom burden and improving patient comfort.

In summary, the treatment of colorectal cancer with multiple liver metastases requires a multimodal approach, integrating surgery, chemotherapy, interventional therapies, and immunotherapy. Prognostic evaluation models that consider clinical, pathological, and molecular factors aid in treatment decision-making. Ongoing research into emerging treatment methods and the implementation of measures for early detection and timely intervention holds promise for further improving survival outcomes and optimizing patient care.

5. Conclusion

5.1 Summary of the main findings from treatment and survival factor analysis

The analysis of treatment strategies and survival factors in colorectal cancer with multiple liver metastases has provided valuable insights into the management of this challenging condition. Clinical and pathological factors, along with molecular biology markers, play crucial roles in predicting patient prognosis. Surgical interventions, chemotherapy, interventional therapies, and immunotherapy have emerged as important treatment modalities, offering improved outcomes for patients. Prognostic evaluation models aid in treatment decision-making, allowing for personalized and targeted approaches. It is evident that early detection, close monitoring, and timely intervention are essential for optimizing patient outcomes.

5.2 Emphasis on the importance of treatment strategies and prognosis improvement

The importance of adopting comprehensive treatment strategies cannot be overstated. Multimodal approaches that combine various treatment modalities have shown promise in improving survival outcomes. Tailoring treatment plans based on individual patient characteristics and tumor biology can maximize treatment efficacy. Additionally, emerging treatment methods, such as targeted therapies and immunotherapies, offer new avenues for enhancing treatment responses. Implementing measures for early detection, regular surveillance, and timely intervention are vital for improving prognosis and patient survival.

5.3 Prospects for future research directions

Future research should focus on several key areas to further advance the management of colorectal cancer with multiple liver metastases. Investigating new treatment methods and drugs, particularly those targeting specific molecular pathways and genetic alterations, can potentially overcome treatment resistance and improve outcomes. Further refinement of prognostic evaluation models is necessary to enhance their accuracy and clinical applicability. Additionally, exploring the role of immunotherapy and identifying biomarkers that predict treatment response and prognosis will pave the way for more personalized and effective therapies. Collaboration among researchers, clinicians, and industry stakeholders is crucial for driving innovation and translating research findings into clinical practice.

In conclusion, the comprehensive analysis of treatment strategies, survival factors, and prognostic evaluation in colorectal cancer with multiple liver metastases has shed light on optimal approaches for managing this complex condition. By implementing multimodal treatment strategies, leveraging emerging treatment methods, and focusing on prognosis improvement measures, clinicians can enhance patient outcomes and survival rates. Continued research and collaboration will fuel advancements in the field, ultimately leading to improved therapeutic options and better quality of life for patients with colorectal cancer and multiple liver metastases.

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