



Overcoming of Resistance Strategies in Rectal Cancer Chemotherapy

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DESCRIPTION

Locally advanced rectal cancer is a formidable adversary in the world of oncology. Its aggressive nature, coupled with the potential for metastasis, poses a significant challenge to both patients and healthcare providers. To confront this disease effectively, a multimodal approach is often employed, encompassing surgery, radiation therapy, and chemotherapy. Among these, combination chemotherapy has emerged as an important component, offering a multifaceted strategy for combatting locally advanced rectal cancer. While the tumor remains confined to the rectal area, it extends beyond the rectal wall. The standard treatment approach for this stage of rectal cancer typically involves a multimodal strategy, combining surgery, radiation therapy, and chemotherapy. However, this article focuses primarily on the vital role that combination chemotherapy plays in the treatment of locally advanced rectal cancer.

Combination chemotherapy operates on the principle of using multiple drugs, each with distinct mechanisms of action, to target cancer cells from various angles. Neoadjuvant chemotherapy, administered before surgery, aims to reduce the size of the tumor. This downsizing facilitates a more manageable surgical resection by decreasing the tumor's bulk, thereby improving the prospects of achieving complete removal with clear margins. Even when a tumor appears localized, cancer cells may have already disseminated to nearby lymph nodes or distant sites. Combination chemotherapy can effectively target these micrometastases, potentially preventing disease recurrence. When combined with radiation therapy, chemotherapy forms a synergistic approach known as chemoradiation. Chemotherapy sensitizes cancer cells to the effects of radiation, rendering radiation therapy more potent in eradicating tumor cells in the rectal area.

The selection of chemotherapeutic agents in combination therapy for locally advanced rectal cancer depends on a variety of

factors, including the patient's overall health, tumor characteristics, and the clinical stage of the disease.

These drugs inhibit the growth of cancer cells by interfering with their ability to replicate DNA. As a platinum-based chemotherapy agent, oxaliplatin disrupts DNA replication and repair processes within cancer cells, leading to their demise. Irinotecan interferes with DNA replication and transcription, effectively inhibiting tumor growth. In select cases, targeted therapies like cetuximab and bevacizumab may be integrated into the treatment regimen, particularly when tumors exhibit specific genetic mutations or vascular involvement.

The use of multiple drugs with distinct mechanisms of action enhances the likelihood of a robust tumor response. This translates into tumor shrinkage, which, in turn, contributes to more favorable surgical outcomes. Neoadjuvant chemotherapy has been associated with improved overall survival rates. By effectively addressing micrometastases and reducing the risk of disease recurrence, combination chemotherapy plays a significant role in extending the lives of patients.

The combination of chemotherapy and radiation therapy in chemoradiation therapy significantly improves local disease control. This approach minimizes the risk of local recurrence, a frequent concern in locally advanced rectal cancer cases. The selection of chemotherapeutic agents can be tailored to meet each patient's individualized needs. This personalization considers factors such as comorbidities and the specific characteristics of the tumor, ensuring that treatment is optimized for each patient.

Chemotherapy drugs can elicit a range of side effects, including nausea, vomiting, diarrhea, fatigue, and hematologic abnormalities. Effective management of these side effects is important to ensure that patients can complete their treatment regimens. Over time, certain cancer cells may develop resistance to chemotherapy, limiting the effectiveness of treatment. Researchers continually explore strategies to mitigate this challenge. Coordinating surgery after neoadjuvant chemotherapy

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can be a complex endeavor. Surgeons must strike a balance between achieving optimal tumor shrinkage and minimizing delays caused by treatment-related factors. Patients' responses to chemotherapy can vary significantly. Therefore, it is essential to tailor treatment plans based on the individual characteristics and needs of each patient.

Immune checkpoint inhibitors, such as pembrolizumab, are being explored in combination with chemotherapy to enhance the body's immune response against cancer cells. This innovative approach holds promise for further improving treatment outcomes.

Advances in genomic profiling enable the development of more personalized treatment strategies. By identifying specific genetic mutations, clinicians can select the most appropriate chemotherapeutic agents, aligning treatment with the unique genetic makeup of each patient's cancer. Improved imaging techniques, such as Magnetic Resonance Imaging (MRI) and Positron Emission Tomography-Computed Tomography (PET-CT) scans, have revolutionized treatment planning and monitoring. These advanced imaging modalities provide

invaluable insights into treatment response, allowing oncologists to adapt treatment plans as needed for optimal outcomes. Ongoing research efforts focus on developing chemotherapy regimens with reduced toxicity while maintaining their efficacy. These efforts aim to improve patients' quality of life during treatment.

Combination chemotherapy has emerged as a cornerstone in the multidisciplinary approach to treating locally advanced rectal cancer. By employing multiple drugs with distinct mechanisms of action, clinicians can achieve tumor shrinkage, address micrometastases, and enhance overall survival rates. Despite the challenges and potential side effects associated with chemotherapy, ongoing research and advancements in personalized medicine offer a glimpse of even more effective and tailored treatment approaches on the horizon. Ultimately, the integration of combination chemotherapy into the treatment of locally advanced rectal cancer underscores the importance of a comprehensive, patient-centered approach to cancer care, fostering hope for improved outcomes and enhanced patient well-being.