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Emerging Trends in Cancer Treatment: A Review

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Abstract:

Cancer is a complex and challenging disease that continues to affect millions of lives worldwide. Over the years, significant advancements have been made in the field of cancer treatment, leading to improved outcomes and enhanced quality of life for patients. This review aims to provide an overview of the emerging trends in cancer treatment, focusing on the latest developments, innovative therapies, and promising approaches that are transforming the landscape of oncology. We will explore cutting-edge strategies such as immunotherapy, precision medicine, targeted therapies, gene editing, and more, shedding light on their potential to revolutionize cancer care. By staying abreast of these developments, healthcare professionals, researchers, and patients can better understand the evolving options and make informed decisions regarding cancer management.

1. Introduction

Cancer is a complex and devastating group of diseases characterized by the uncontrolled growth and spread of abnormal cells in the body. It represents a significant global health challenge, affecting millions of individuals and their families every year. This introduction provides an overview of cancer, including its causes, common types, risk factors, and the impact it has on society(Fidler, Bray, and Soerjomataram 2018)(Ferlay et al. 2021). Cancer, also known as malignancy, is a group of diseases that involve the uncontrollable division and growth of abnormal cells. These cells can invade nearby tissues and spread to other parts of the body through the blood and lymphatic systems. This unregulated growth and invasion can lead to the

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formation of tumors and the disruption of normal bodily functions(Soerjomataram and Bray 2021)(Siegel et al. 2022). The fundamental abnormality resulting in the development of cancer is the continual unregulated proliferation of cancer cells. Rather than responding appropriately to the signals that control normal cell behavior, cancer cells grow and divide in an uncontrolled manner, invading normal tissues and organs and eventually spreading throughout the body. The generalized loss of growth control exhibited by cancer cells is the net result of accumulated abnormalities in multiple cell regulatory systems and is reflected in several aspects of cell behavior that distinguish cancer cells from their normal counterparts(Hanahan 2022)(Fidler, Bray, and Soerjomataram 2018)(Parkin 2001). Cancer can result from abnormal proliferation of any of the different kinds of cells in the body, so there are more than a hundred distinct types of cancer, which can vary substantially in their behavior and response to treatment. The most important issue in cancer pathology is the distinction between benign and malignant tumors. A tumor is any abnormal proliferation of cells, which may be either benign or malignant. A benign tumor, such as a common skin wart, remains confined to its original location, neither invading neither surrounding normal tissue nor spreading to distant body sites. A malignant tumor, however, is capable of both invading surrounding normal tissue and spreading throughout the body via the circulatory or lymphatic systems (metastasis). Only malignant tumors are properly referred to as cancers, and it is their ability to invade and metastasize that makes cancer so dangerous. Whereas benign tumors can usually be removed surgically, the spread of malignant tumors to distant body sites frequently makes them resistant to such localized treatment(Joly et al. 2015)(Joly et al. 2015)(Kapałczyńska et al. 2018).

Both benign and malignant tumors are classified according to the type of cell from which they arise. Most cancers fall into one of three main groups: carcinomas, sarcomas, and leukemias or lymphomas. Carcinomas, which include approximately 90% of human cancers, are malignancies of epithelial cells. Sarcomas, which are rare in humans, are solid tumors of connective tissues, such as muscle, bone, cartilage, and fibrous tissue. Leukemias and lymphomas, which account for approximately 8% of human malignancies, arise from the blood-forming cells and from cells of the immune system, respectively. Tumors are further classified according to tissue of origin (e.g., lung or breast carcinomas) and the type of cell involved. For example, fibrosarcomas arise from fibroblasts, and erythroid leukemias from precursors of erythrocytes (red blood cells)(English et al. 1997)(Hoadley et al. 2018)(Soussi 2000).

The need for continuous innovation in cancer treatment

All cancer treatments aim to counteract the disease process. Although few are curative, most can extend life or ameliorate suffering. Patients are often eager to obtain access to new treatments that show tangible effects on tumor size and disease progression, even if overall survival (OS) data are not yet available. However, these treatments also come with significant side effects, are expensive, and are potentially harmful. The tension between providing timely access to promising treatments and ensuring treatment efficacy has given rise to a debate about the acceptability of so-called surrogate endpoints for regulatory approval of oncology

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treatments(PCAST 2016)(Kim and Prasad 2015). Some policy commentators have advocated for broader use of surrogate endpoints to support regulatory approvals. For example, a 2012 report by the President's Council of Advisors on Science and Technology recommended that the U.S. Food and Drug Administration (FDA) "should make full use of accelerated approval for all drugs meeting the statutory standard of addressing an unmet need for a serious or life threatening disease, and demonstrating an impact on a clinical endpoint other than survival or irreversible morbidity, or on a surrogate endpoint, likely to predict clinical benefit". Similarly, the 21st Century Cures Act, signed into law in December 2016, encourages greater reliance on surrogate endpoints in drug development(Cheema and Burkes 2013)(Fernández-López et al. 2019)(Antonoff 2021).

Immunotherapy

The pillars of human cancer therapy have historically been surgery, radiotherapy, and chemotherapy, but a fourth modality of immunotherapy has been well documented since 1890 when Coley demonstrated that bacterial products had benefits for inoperable cancers and the subsequent application of Bacillus Calmette-Guerin (BCG) and other crude immunostimulants showed benefits that led to regulatory approval of their use in some solid tumors such as bladder cancer(Ding et al. 1994). In the 1970s and 1980s, immunologists searched for antibodies that would bind to tumors in the serum of cancer patients, and lymphocytes activated with lectins or with interleukin-2 (IL-2) were found to target tumor cells in vitro. Cytokines were then investigated in large-scale clinical trials for breast cancer, renal cell cancer (RCC), glioblastoma, lymphoma, and melanoma in the 1980s(NAUTS, FOWLER, and BOGATKO 1953)(Nathanson 1976)(Yang, Ning, and Tang 2022). It was during this same period of discovery and early clinical use that interferon-α (IFN-α) was first investigated. Initial experiments with IFN-α were predicated on the erroneous belief that human sarcomas were of viral origin; however, at this same time, IFN-α had demonstrated antitumor activity in hairy cell leukemia, melanoma, RCC, and other solid tumors. Recombinant IFN-α2, a member of the type I IFN family, was shown to be highly pleiotropic, demonstrating immunoregulatory, antiproliferative, differentiation-inducing, apoptotic, and antiangiogenic properties in multiple malignancies, and objective tumor response rates of 10% to 20% were observed in phase 1/2 trials for metastatic disease(Grimm et al. 1982)(H. Z. Zhang, Grimm, and Rosenberg 1982).

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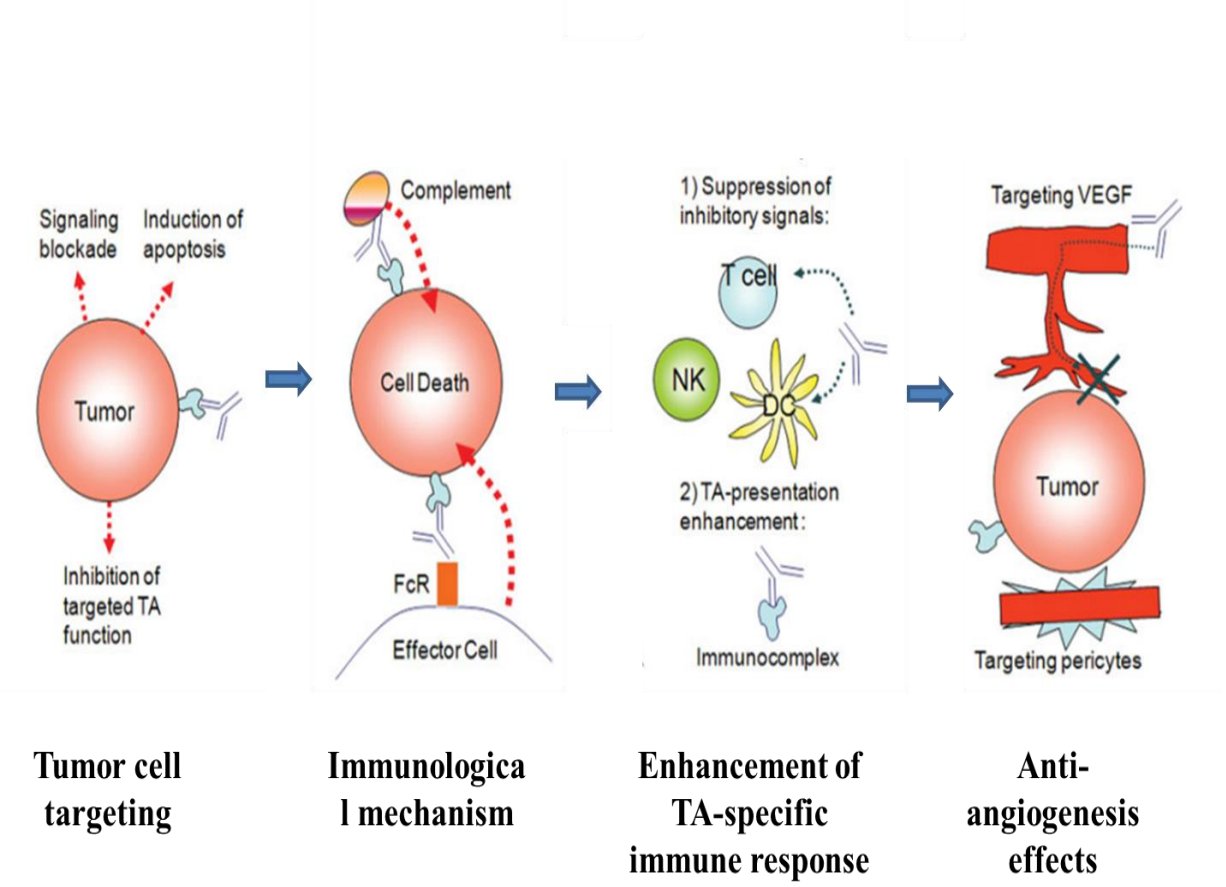

FIGURE 6: Mechanisms Underlying the Antitumor Activity of Monoclonal Antibody-Based Immunotherapy. TA indicates tumor antigens; FcR, Fc receptor; NK, natural killer; DC, dendritic cell; VEGF, vascular endothelial growth factor(Miao, Zhang, and Huang 2021)(Chen et al. 2021).

Checkpoint inhibitors

A type of drug that blocks proteins called checkpoints that are made by some types of immune system cells, such as T cells, and some cancer cells. These checkpoints help keep immune responses from being too strong and sometimes can keep T cells from killing cancer cells. When these checkpoints are blocked, T cells can kill cancer cells better. Examples of checkpoint proteins found on T cells or cancer cells include PD-1/PD-L1 and CTLA-4/B7-1/B7-2. Some immune checkpoint inhibitors are used to treat cancer(Shiravand et al. 2022). Checkpoint proteins, such as PD-L1 on tumor cells and PD-1 on T cells, help keep immune responses in check. The binding of PD-L1 to PD-1 keeps T cells from killing tumor cells in the body. Blocking the binding of PD-L1 to PD-1 with an immune checkpoint inhibitor (anti-PD-L1 or anti-PD-1) allows the T cells to kill tumor cells(Picardo, Doi, and Hansen 2020). Checkpoint proteins, such as B7-1/B7-2 on antigen-presenting cells (APC) and CTLA-4 on T cells, help keep the body's immune responses in check. When the T-cell receptor (TCR) binds to antigen and

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major histocompatibility complex (MHC) proteins on the APC and CD28 binds to B7-1/B7-2 on the APC, the T cell can be activated. However, the binding of B7-1/B7-2 to CTLA-4 keeps the T cells in the inactive state so they are not able to kill tumor cells in the body. Blocking the binding of B7-1/B7-2 to CTLA-4 with an immune checkpoint inhibitor (anti-CTLA-4 antibody) allows the T cells to be active and to kill tumor cells(Albarrán et al. 2022)(H. Wang et al. 2020).

CAR T-cell therapy

CAR T-cell therapy, has also generated substantial excitement among researchers and oncologists. Although CAR T-cell therapies are not as widely used as immune checkpoint inhibitors, they have shown the same ability to eradicate very advanced leukemias and lymphomas and to keep the cancer at bay for many years. It is a type of treatment in which a patient's T cells (a type of immune cell) are changed in the laboratory so they will bind to cancer cells and kill them. Blood from a vein in the patient's arm flows through a tube to an apheresis machine (not shown), which removes the white blood cells, including the T cells, and sends the rest of the blood back to the patient. Then, the gene for a special receptor called a chimeric antigen receptor (CAR) is inserted into the T cells in the laboratory. Millions of the CAR T cells are grown in the laboratory and then given to the patient by infusion. The CAR T cells are able to bind to an antigen on the cancer cells and kill them(Han et al. 2021)(Boettcher et al. 2022)(Denlinger, Bond, and Jaglowski 2022).

Table 1: FDA approved CAR T-cell therapies

Sr. No.	Generic Name	Brand Name	Target Antigen	Target Disease	Patient population
1.	Tisagenlecleucel	Kymriah	CD19	B-cell acute lymphoblastic leukemia (ALL)	Children and young adults with refractory or relapsed B-cell ALL
				B-cell non-Hodkin lymphoma (NHL)	Adults with relapsed or refractory B-cell NHL
2.	Axicabtagene ciloleucel	Yescarta	CD19	B-cell non-Hodkin lymphoma (NHL)	Adults with relapsed or refractory B-cell NHL
				Follicular lymphoma	Adults with relapsed or refractory follicular lymphoma
3.	Brexucabtagene autoleucel	Tecartus	CD19	Mantle cell lymphoma (MCL)	Adults with relapsed or refractory MCL
				B-cell acute lymphoblastic leukemia (ALL)	Adults with relapsed or refractory B-cell ALL
4.	Lisocabtagene	Breyanzi	CD19	B-cell non-Hodkin	Adults with relapsed

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	maraleucel			lymphoma (NHL)	or refractory B-cell NHL
5.	Idecabtagene vicleucel	Abecma	BCMA	Multiple myeloma	Adults with relapsed or refractory multiple myeloma
6.	Ciltacabtagene autoleucel	Carvykti	BCMA	Multiple myeloma	Adults with relapsed or refractory multiple myeloma

(Leick, Maus, and Frigault 2021)(He et al. 2023)(C. King, PharmD, BCOP and S. Orozco, PharmD 2019)(Denlinger, Bond, and Jaglowski 2022)

Targeted Therapies for Cancer:

The US Food and Drug Administration (FDA) has considered targeted therapy as a drug with an approved label in which there is a specific reference to a simultaneously or previously approved diagnostic test that must be performed before the patient can be considered eligible to receive the drug(Zhou and Li 2022).

Table 2: Targeted Anticancer Antibody Therapeutics

Drug Name	**Brand Name**	**Type**	**Target**	**Indication**	**References**
Alemtuzumab	Campath	Monoclonal antibody, humanized; anticancer, immunologic; multiple sclerosis treatment; immunosuppressant	CD52	CLL	(Lee, Tan, and Oon 2018)
Rituximab	Rituxan	Monoclonal IgG1; chimeric; anti- cancer, immunologic; antiarthritic, immunologic; immunosuppressant	CD20	NHL	(Lheureux et al. 2017)
Trastuzumab	Herceptin	Monoclonal IgG1 humanized; anticancer, immunologic	p185neu	Breast cancer	(Wu et al. 2020)
Gemtuzumab	Mylotarg	Monoclonal IgG4 humanized	CD33/calicheamicin	AML (patients >60 y)	(Augoff et al. 2022)
Edrecolomab	Panorex	Monoclonal IgG2A murine; anticancer	EpCAM	Colorectal cancer	(Montoya et al. 2021)

Gene Editing and Gene Therapy

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In recent years, the level of interest in gene therapy from industry and spinout companies has been unprecedented. This reflects growing confidence in the field based on increasingly frequent reports of therapeutic efficacy and the recent licencing of the first gene therapy products, approved by the EMA in 2012. More recently, the first CAR T cell therapy product, Kymriah (known as tisagenlecleucel-T and CTL019) developed by Novartis, was approved by the FDA in August 2017. Soon after, approval for another CAR T cell therapy, comprising axicabtagene ciloleucel marketed as Yescarta by Kite Pharma and Luxturna, marketed by Spark Therapeutics was granted by the FDA in October and December, respectively(H. Zhang et al. 2021)(D. Zhang et al. 2022). One significant paradigm shift since our 2012 review has been the increased focus on alternatives to gene-addition strategies, including gene editing and targeted recombination, antisense oligonucleotide-induced exon skipping, and RNA interference, all of which have now entered the clinic. Such strategies will be particularly important in the context of dominant disease processes in which the simple addition of a functionally normal gene is insufficient; the significance of RNAi (e.g. to genetically down-regulate gene expression) was recognized in 2006 when Fire and Mello received the Noble Prize in Physiology or Medicine(Hussen et al. 2023)(Karn et al. 2022).

Therapeutic Advances in Radiation Therapy

Activation of natural antitumor T-cell responses requires uptake and cross-presentation of tumor-derived antigens by DCs to T cells. This process is dependent on type I interferon (IFN-I), which is necessary for DC recruitment to tumors and for their activation. Preclinical studies show that IFN-I production by DCs is induced by DNA derived from dying tumor cells that activates the stimulator of interferon genes (STING) pathway. It is important to note that radiation amplifies the STING-mediated pathway of IFN-I production by enhancing tumor DNA delivery to DCs, thus promoting the priming of antitumor T cells. In addition, radiation-induced cell death generates 3 key molecular signals, shown to promote uptake and presentation of tumor-derived antigens by DCs. Calreticulin translocation from the endoplasmic reticulum to the cell surface acts as a signal for uptake of dying cancer cells by DCs.14 Release of the nuclear protein high-mobility group box-1 (HMGB1), which binds to toll like receptor (TLR)-4 on DCs promotes antigen cross-presentation, while adenosine triphosphate (ATP) activates the inflammasome via the P2XR7 receptor with downstream release of interleukin (IL)-1β(B. Zhang et al. 2021)(Diamond et al. 2022)(Khajeali, Khodadadi, and Pirayesh Islamian 2020).

An important barrier to tumor rejection is the poor homing of effector T cells to tumors. T-cell trafficking is driven by chemokines. Radiation can improve the homing of effector T cells to tumors by inducing expression and release by the cancer cells and/or infiltrating immune cells of chemokines, such as CXCL16 and CXCL10. Cancer-aberrant tumor vasculature with a dysfunctional endothelium constitutes a powerful barrier to tumor infiltration by T cells. Macrophages play a pivotal role in promoting angiogenesis, and radiation has been shown to reprogram tumor macrophages, leading to improved T-cell infiltration and vascular normalization in amouse pancreatic cancermodel. Interestingly, inducible nitric oxide synthetase

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expression by the macrophages was required for this effect, which occurred after a single low-dose radiation fraction(Peng et al. 2021)(L. Chang et al. 2015).

It has been estimated by the American Cancer Society that there would be 1,170,000 new cases of invasive cancer diagnosed in the United States in 1993. New technologies have allowed for a more precise cancer assessment and diagnosis of those patients initially seen with local and/or regional disease. To improve the potential for local control, multiple therapies have been investigated suggesting that more effective means of improving local and regional control would result in significant improvement in the potential for long-term survival without recurrent disease (Delclos and Smith 1975)(Nguyen et al. 2021). They have also been associated with an improvement in survival rates. All of these efforts are based on major technological advances in terms of trained radiation oncologists, equipment, clinical treatment planning, physics, and dosimeter. These improvements in treatment in radiation oncology, along with a better understanding of basic biologic principles, allow for unique implementation of the principles associated with repair, oxygenation, repopulation, and redistribution of tumor cells during the process of the radiation therapy. Without these major advances in the application of radio biologic principles in clinical radiation oncology, progress to- ward improved local and regional control would not have been possible(Brady et al. 1993).

- **Stereotactic body radiation therapy (SBRT) :**

For men with localized prostate cancer, the typical treatment with dose-escalated external beam radiation therapy (EBRT) involves fractionated radiation therapy using Daily doses of 1.8-2.0 Gy for eight to nine weeks. In addition, clinical data suggest that hypo fractionated radiation therapy may be radio biologically favorable to Smaller fraction sizes in prostate cancer radiotherapy due to a potentially greater sensitivity of prostate cancer to larger daily radiation fractions(Fowler 2005). Stereotactic body radiation therapy (SBRT) uses even larger daily fractions of radiation to take further advantage of this postulated radiobiological advantage. Early investigations of SBRT were performed with radiation delivery systems that did not allow continuous tracking of the prostate's location with intrafractional adjustment of beam targeting if motion was detected(Madsen et al. 2007).

- **Proton therapy :**

Proton therapy has become an enticing treatment modality for NSCLC, largely based on the physical property of the Bragg peak, where the majority of the proton dose is deposited across a very narrow range, with very little to no 'exit dose' to normal structures in the thorax. The planning and delivery of proton therapy can be broadly divided into two main categories: passively scattered proton therapy (often called passive scattering; PS) and active scanning proton therapy (often referred to as pencil beam scanning proton therapy; PBS)(Wink et al. 2014). This complex task can be further subdivided into two elementary components: dispersal

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of particles in a plane that is orthogonal to the entry of the beam and dispersal of particles in a plane that is parallel to the entry of the beam(Slater et al. 1992)(Liu and Chang 2011).

- **MR-guided radiation therapy:**

Image guided radiotherapy currently relies on cone-beam CT for imaging the patient prior to irradiation. With integrated MRI accelerator systems, it becomes feasible to use the superior soft-tissue contrast of MRI and image the patient not only prior to, but also during irradiation. To integrate a MRI with an accelerator, challenges needed to be overcome: active shielding of the magnet is modified so that critical components of the accelerator can be placed in a zero magnetic field environment, close to the scanner(Cao et al. 2017)

Radiation therapy has advanced in leaps and bounds over the last few decades. The introduction of accurate dose calculation algorithms, intensity modulated radiation therapy (IMRT), image-guided radiotherapy (IGRT) and stereotactic body radiotherapy (SBRT) has changed our clinical practices. For example, in our clinic, it is now routine practice to treat early stage lung cancer patients definitively with SBRT when in years past surgery was the standard of care(J. Y. Chang et al. 2015)(Rusthoven, Kavanagh, and Karam 2015)(Shirvani et al. 2014)(Shirvani, Chang, and Roth 2013).

7. Emerging Approaches in Chemotherapy:

Currently, different chemotherapeutic agents are used effectively for anticancer therapy by targeting specific multiple pathways. However, repeated treatment with these single drug agents can result in resistance to the chemotherapies or development of multi-drug resistance (MDR)(J. Q. Wang et al. 2021). Over the years, combination therapy has been adopted in clinics that have addressed the problems associated with single chemotherapeutic cancer treatment. Combination therapy generally refers to two or more therapeutic agents co-delivered simultaneously or a combination of different therapies, such as chemotherapy, hormone therapy, immunotherapy and radiotherapy. Above all approaches, the co-delivery of different chemotherapeutic agents is the most common combination therapeutic modality in clinical practice regarding effective cancer treatment(Lehár et al. 2009).

- **Nanotechnology-based drug delivery**

Although combination chemotherapeutic strategies help to some extent toward the better treatment of cancer, their triumph is largely hindered as a result of the inadequate accessibility of antineoplastic agents to tumor tissue, requiring high doses, rapid abolition, poor solubility and inconsistent bioavailability(Greco and Vicent 2009). Thus, to mitigate the difficulty associated with conventional chemotherapy, there is a call for developing a drug delivery system that could optimize the pharmaceutical action of drugs while reducing toxic side effects. The application of nanotechnology to cancer drug delivery is widely expected to create novel therapeutics for

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successful cancer treatment. Nanotechnology has a crucial role in cancer therapy regarding the use of different Nano carriers such as liposomes, dendrites, micelles, carbon nanotubes (CNTs), polymer–drug conjugates and NPs(Parhi, Mohanty, and Sahoo 2012).

- **Metronomic chemotherapy:**

Metronomic chemotherapy was then defined as the chronic administration of chemotherapeutic agents at relatively low, minimally toxic doses, and with no prolonged drug-free breaks. it is thought this type of chemotherapy inhibits tumor growth primarily through anti-angiogenic mechanisms while significantly reducing undesirable toxic side effects. Further in vitro and in vivo data strengthened the rationale for using metronomic chemotherapy in the clinic(Kerbel and Kamen 2004)(Gasparini 2001)(Kieran et al. 2005).

Metronomic chemotherapy was shown to be associated with clinical activity and a low incidence of adverse effects in patients with advanced-stage breast cancer(Colleoni et al. 2002). Ideal agents for metronomic chemotherapy should be oral, inexpensive and well tolerated. In patients with advanced-stage breast cancer, treatment is intended to prevent tumor progression for an extended period of time. Since the cumulative doses administered over the course of long-term metronomic treatments can be similar or even higher than those administered in conventional MTD regimens, ideal agents should have no or minimal Cumulative toxicity(Browder et al. 2000)(Miller, Sweeney, and Sledge 2001)(Sweeney et al. 2001).

- **Immunomodulatory agents:**

The enhancement of immune effector cell activity is an appealing strategy for the treatment of various cancers. The development of clinically applicable therapies, however, requires preclinical assays that allow for the study of immunological interactions as well as novel agents that exert immunomodulatory effects(McMillin et al. 2010). The immunomodulatory properties of a specific drug depend on a series of factors, including the interplay between the cancer cells, the immune effector cells, tumor microenvironment and the drug itself(McMillin et al. 2012). The development of immunotherapeutic for oncology is based on the insight that the development of cancer, which involves progressive mutations, is monitored by the immune system. Most incipient tumors are eliminated by a process termed immunoediting or immune surveillance. The durable benefit produced by high-dose interleukin-2 (IL-2) or cytotoxic T lymphocyte antigen 4 (CTLA4) blockade is proof of principle that immunotherapy can result in sustained antitumor responses. A subset of cancer mutations generate protein coding sequence changes called neoantigens, which can be processed into peptide antigens that are presented by the major histocompatibility complex (MHC) and recognized as foreign by T cells(Schreiber, Old, and Smyth 2011). The pattern of Cytokine signaling seems to reflect a consistent trend across different datasets and with different profiling platforms. Patients with those tumors, which elicit a stronger T helper 1 (Th1) cytotoxic T-lymphocyte (CTL) response, have a better

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prognosis than do those whose tumors skew toward a T helper 2 (Th2) response or trigger a larger influx of tumor-associated macrophages via colony-stimulating factor 1 (CSF1) secretion(DeNardo et al. 2011).

8. Advancements in Early Detection:

The genesis of cancer is characterized by aberrant cell division, the accumulation of genetic mutations, and resistance to apoptosis(Hanahan and Weinberg 2011). One important use of liquid biopsy techniques is the early diagnosis of cancer through a screening programme for high-risk and healthy persons. If the illness is identified early enough, many people can be successfully treated with current therapeutic approaches; nonetheless, metastatic disease is still incurable with very few exceptions (small liver metastases in colon cancer, for instance)(Bardelli and Pantel 2017). Selecting the right biomarkers is essential for early detection. Carcinoembryonic antigen (CEA), which is currently used to monitor colorectal carcinoma treatment, is one example of a biomarker that can be detected and validated in cancer patients with advanced disease but may lack specificity and sensitivity for early detection. In addition, elevated levels of CEA have been found in gastric, pancreatic, lung and breast cancers as well as in certain non-neoplastic conditions. Because the biology of these two disease states differs and these markers are often found in lower quantities in early stages of cancer than in late stages, a late stage marker may not be appropriate for identifying tiny tumors in the early stages of the illness(Cohen et al. 2018).

- **Liquid biopsies for early cancer detection:**

The examination of circulating tumor samples is the basis of "liquid biopsies." tumor-derived cells (TDCs), circulating tumor DNA (ctDNA), or extracellular vesicles excreted by malignancies and their locations of metastasis into the blood. Numerous investigations have detailed How to get molecular information about parent tumors from liquid biopsies and several thorough evaluations were just released regarding CTCs(Bardelli and Pantel 2017)(Alix-Panabieѐres and Pantel 2013)(Alix-Panabières and Pantel 2014)(Alix-Panabières and Pantel 2016)(Haber and Velculescu 2014)(Yu et al. 2011)(Pantel and Speicher 2016).

In fact, the majority of cancers are not discovered in the first 90% of their lives because the disease is brought on by a progressive sequence of changes in certain cancer genes that impact the activity of particular pathways and often takes many decades to develop(Vogelstein et al. 2013). There is a lot of promise for liquid biopsies to overcome these current sampling constraints. These biopsies involve the collection and examination of liquid biological sources, usually blood, in order to diagnose, test for, and assess the prognosis of cancer. Liquid biopsies can employ the "tumor circulome," which is a subset of circulating components produced from cancer tissue, as a direct or indirect source of cancer biomarkers(De Rubis, Krishnan, and Bebawy 2018)(Ali, Pathak, and Mandal 2023).

9. Supportive Care and Quality of Life:

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Patients with cancer who have just received a diagnosis and long-term survivors must deal with an unknown future. Their physical and mental health is always in danger due to pain, suffering, loneliness, worry, sadness, exhaustion, and deformity. As a constant reminder of the illness and its consequences, these symptoms reinforce one another. Most patients have a reduced quality of life (QOL) as a result of the disease itself and the side effects of cancer therapy(Dorval et al. 1998)(Ferrell et al. 1995)(Ganz 1994).

We gave complimentary presentations at the 1977–1981 American Society of Clinical Oncology (ASCO) meetings, highlighting the importance of diet, exercise, and improving patient contact with doctors and friends/family using audiotapes(Thune and Haridas 2022)(E. H. Rosenbaum and Rosenbaum 1980)(E. Rosenbaum and Rosenbaum 1987)(Brennan et al. 2022)(Parise et al. 2023)(Cross et al. 2021).

SCSCP aims to:

1. Enhance the quality of life for cancer patients, including freshly diagnosed and long-term survivors.

2. To lessen the intensity of cancer-related adverse effects and its medical care.

3. To offer encouraging activities, such as counseling, physical activity, and supplementary and alternative courses and diet, as well as weariness and alternative medicine counseling on pain control for patients as well as relatives.

4. To offer cancer sufferers' loved ones and friends through seminars educating people about their sickness, courses, books, media, websites, and assistance collectives(Afiyanti, Milanti, and Putri 2018)(Edib et al. 2016).

Conclusion

This review explores the exciting and dynamic field of cancer treatment, emphasizing the ongoing pursuit of innovative strategies and their potential to improve the lives of cancer patients. It underscores the importance of collaboration between researchers, healthcare professionals, and patients in the fight against cancer and the pursuit of a brighter, cancer-free future.

Conflict of Interest: Nill

Funding: Nill

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