Cancer what it is and how it’s treated

Cancer is an umbrella term for any malignant tissue growth. Cancer is determined by the behavior of a group of abnormal cells within a group of normal cells. The abnormal cells display aggressive growth, invasion, and eventual destruction of the surrounding normal cells. Cancer can affect any tissue in the body for example the bone marrow, lymphatic tissue, rectum, brain, colon, breast, esophagus, pancreas, lung, uterus, prostate, and testicles. The cells that are cancerous are less specialized than normal cells. This allows them to divide more rapidly and move to other parts of the body. When cancer moves to other organs or parts of the body it is called metastasis, or metastatic cancer. Some cancers, such as lung, prostate, or colon cancer, form a solid mass of cancerous tissue called tumors, while others, such as leukemia’s and lymphoma’s do not.

History of Cancer

Cancer has been around in animal and plant species before humans evolved, so it is no surprise that bone tumors can be found in the fossilized remains of prehistoric animals. Cancer has also been described in the beginning of modern record keeping within the Egyptian culture. In the Egyptian medical papyrus texts, hard lumps had been described being removed from the body. These are assumed to be malignant tumors; The Egyptians also claimed that there was no treatment for the condition. The word for cancer can be found from the Greek physician Hippocrates who described the tumors as carcinomas, the Greek word crab. The treatment for cancer in ancient Grease had been based on Hippocrates’ humor theory which emphasized bloodletting along with other fluids of the body. It was not until the 16th century that true medical understanding of cancer started. Giovanni Morgagni was the first to preform autopsies on deceased patients. This lead to discovering the causes of death and to discovering internal tumors that were previously unnoticed. The first surgical solution to cancerous tumors came from the surgeon John Hunter who believed that removing the solidified tumor could prevent the metastatic development of the cancer. After the discovery and subsequent invention of anesthetics, more drastic surgical treatments could be done, such as the full mastectomy.

Causes of Cancer

Because cancer is a collection of varying, yet structurally similar, diseases rather than one specific type of disease, there are many different causes of cancer. Genetics is closely connected to breast and ovarian cancer. Specific genes that can be inherited from mother to daughter can place the daughter at a higher risk of breast and/or ovarian cancer if the mother had either disease. Ageing of a person can also contribute to the natural possibility of getting cancer. A patient’s age is among the most significant risk factors for cancer. As a person grows older their body fails to regulate cell growth as well, which can allow cancers to take hold more easily in rapidly dividing tissues. While natural genetics and the inevitable aging process play important roles in the possibility of getting cancer, environmental factors, such as chemical exposure, hormone imbalance, oxidization of tissue, viruses, parasites, and certain wavelengths of light, are all causes of certain types of cancer. For Industrial workers and smokers, constant exposure to polycyclic hydrocarbons (eg. Methylcholanthrene, Benzopyrene, and Dibenzanthracene) increase the chances of skin cancer, lung cancer, cancer of the larynx, and cancer of the oral cavity. Hormone imbalance is another cause of cancer and why breast cancer is significantly more prevalent among women rather than men. Estrogens, the main sex hormone in women, are carcinogenic and have been shown to cause cancer in the reproductive tissue of mice when injected with estrogen. The same results were confirmed in humans in 1975. Free radical un-bonded oxygen molecules, while not a significant or causing force of cancer, can bind to DNA, disrupting it and causing it to make errors in transcription which can increase the risk of cancer. Radiation, both ionizing, the kind found in elements like uranium and plutonium, ultraviolet, X-rays, and Gamma rays all can cause cancer. While the cancers they can cause are different, the mechanism of how they work is similar. Particles, from whether it be decaying uranium or the sun’s ultraviolet light, are launched into the body and can damage cell tissue, structure, and DNA causing cancerous mutations. Viruses can also cause cancer in humans as well as many animals. The Papova group of viruses include two known carcinogenic viruses, Polyoma and Papilloma. The Polyoma virus has been observed to cause tumors in both hamsters and rabbits, while the Papilloma virus, or more commonly known as HPV (Human Papilloma Virus) can cause ovarian cancer in women.

Types of Cancer

There are many different types of cancers that affect each type of tissue differently and have different operating mechanisms, this is part of why it is so difficult to cure cancer successfully. Some of the most common cancers are lung cancer, leukemia (cancer of the white blood cells), breast cancer, and melanoma (a type of skin cancer).

Lung cancer

Cancer of the lungs is the second most common form of cancer in the United States (only second to breast cancer). The lungs, due to their frequent exposure to the air, are highly susceptible to cancer caused by environmental toxins. Arsenic, chromium, iron, lead, nickel, and radioactive elements all, when inhaled, can cause cancer. Workers in element mines are at the highest risk of getting lung cancer from these types of toxins. Other compounds are also carcinogenic when exposed to the lungs, such as asbestos. Asbestos has been responsible for thousands of cases of lung cancer due to its wide usage from naval vessels, structural bricks, insulation, and acid resistance coatings. Because the lungs have a large network of capillaries, it is easy for the cancer to metastasize to the bones and other parts of the body. This causes serious complications in treatment and can make it impossible to remove all the cancerous tissue via surgery. Early diagnosis is often the deciding factor in the treatment of lung cancer. When the cancer has progressed too far, treatment options become less numerous, and the effectiveness of those treatments diminishes.

Leukemia

Leukemia’s are a group of cancers that all primarily interact and affect the lymphatic system and the mononuclear phagocyte system. The center of lymphocytes, the bone marrow, is where leukemia is located Depending on the type of leukemia, it can over produce, under produce, or mutate the cell all together. Leukemia can lead to hemorrhaging in organs and subsequent destruction of those organs. Often times the liver and spleen are over enlarged. Hemorrhaging, the destruction of brain tissue, commonly affects acute leukemia patients.. Both genetics and Ionizing radiation are the two major causes of leukemia cases.

Breast Cancer

Cancers of the mammary glands are the most common cancers in the United States today. Most cases are non-fatal as early detection is easy and common. Women have access to mammogram machines that coupled with the light fatty tissue of the breast, allow for high contrast of the tumor for easy detection. In addition to the easy and wide spread use of technology, a majority of the carcinogenic tumors are hard and lumpy and can be detected by a physical self-examination. Many of the carcinomas have irregular patterns that are not uniform with other tumors if others are present. The metastatic spread of breast cancers, while significantly less common than other cancers, do happen. The large lymph node system that is in the breast can allow for the cancer to travel to the arteries and lodge in bone, however; it usually stays proximal and rarely is found in the distal bones of the body. Treatment of breast cancer is usually a surgical procedure rather than a radiotherapy or chemotherapy which have both been proven to be only moderately effective. However, now, a combination is usually used of surgical removal and radiotherapy and/or chemotherapy in order to kill any carcinoma cells left over by the surgeon. When surgery is being considered there are 3 types. There is the lumpectomy, which removes small portions and leaves the overall breast intact. The lumpectomy is less invasive but may require additional surgeries to remove leftover cells and has a higher risk of a recurrence of the cancer. The other option is a full mastectomy, which removes the entire breast. This significantly lowers the chance of recurrence, but it results in the loss of the entire breast. The loss of the breast is often restructured with synthetic implants by a plastic surgeon. The third option is a double mastectomy which is the removal of both breasts.

Melanoma (Skin Cancer)

Cancer of the skin is the most common form of cancer in Caucasian Americans. The most common cause is ultra-violet radiation from solar rays. This is why people with occupations outdoors, with more sun exposure, have greater risks of contracting skin cancer. Most skin cancers, such as basal cell and squamous cell carcinoma are less aggressive and easily treatable when caught early. Melanoma however, will often progress faster and will more easily use the reginal lymph nodes to metastasize to other organs such as the lungs, spleen, liver, brain, or intestines. Malignant melanoma is often characterized by abnormal dark spots that resemble moles. The can change size and shape in short time periods and have irregular borders. When caught in the early stages, when the cancer has only reached through the epidermis, dermis, and the reticular dermis, surgery is the best and most viable option in treatment. After it reaches and spreads through the bottom subcutaneous layer, does surgery become less effective. At this point radiation and cytotoxic drugs will be employed to help kill the carcinoma.

Treatment Advances

The treatment of cancer is a large field, and one that is a big part of the medical community. Each year hundreds of millions of dollars are put into extending research in the treatment of cancer. Currently the most widely employed methods are physical surgical removal, focused radiation therapy, and using cytotoxic drugs, also called chemotherapy, or it can be just shorted to “chemo”.

Surgery

The surgical removal of cancer is the quickest acting method in the removal of cancer. It is usually employed in early detections of most cancers. When caught early enough, and if the cancer is not by any vital structures, such as arteries or major veins, the malignant tumor can be removed. However it is not always the case that just the tumor can be removed. Often the entire area will have to be removed. In breast cancer it is common for full mastectomies to be performed to ensure complete removal of cancerous tissues. In some cases of leukemia full amputation of limbs is necessary. In vital organs such as the lungs, the entire organ will often have to be removed and replaced with s donor organ. The problems that surgery bring up are that the patient will be physically damaged and may be in pain for prolonged amounts of time following the surgery. The patient may also be losing limbs, organs, or other parts. This will require prosthetics, donor organs, or cosmetic surgery to help correct. While surgery is the fastest acting and most important weapon in treatment, even the most skilled surgeon cannot remove every single cancerous cell with one hundred percent accuracy. This is why surgery will be combined with radiation or chemotherapy.

Radiation

Radiotherapy is one of the newest advancements in treating cancer. It uses ionizing gamma rays from decaying elements, such as radium, uranium, and cobalt 60. The effects of radiation are damaging to all cells in the body, not just the cancer. Because of this widespread damage, only a certain amount of exposer can be employed and when exposed, the rays will be focused on where the tumors are. To protect the rest of the body lead vests and drapes will be placed over the non-target areas to prevent unnecessary exposure. During treatment there are many side effects, mild radiation poisoning is often common resulting in the loss of body hair, loss of appetite, and a severely hindered immune system which puts patients at an elevated risk of contracting a serious infection.

Cytotoxic Drugs

In chemotherapy cytotoxic drugs are used to kill the rapidly dividing cancer cells. This of course kills off all other rapidly dividing cells like the haemopoietic system, cochlear hair cells, and the mucosal lining of the intestines and stomach. One of the main and oldest class of cytotoxic medicine is alkylating agents. The first uses of alkylating agents came from studying the effects of Sulphur mustard gas and nitrogen mustard gas, both that were once agents of war during the First World War. The action mechanism of this class of drugs attacks the DNA of cells preventing the, from carrying on essential functions for life and reproduction.

The most common method of administering the drugs is through intravenous and intra-arterial routs. This is to keep the drug stable as it enters the body. Some side effects of this method of treatment are loss of body hair, loss of appetite, loss of energy and chronic pain, and loss of the immune system.

Conclusion

Cancer has afflicted multicellular life since the beginning. It is not an external invader but a physical malfunction that spirals out of control. There are many factors that play into the risks of getting cancer, like exposure to carcinogenic substances, solar radiation, ionizing radiation, and even genetics and our body’s own hormones. Advancements show a promising future for the eventual cure of cancer, but due to the extreme variations of the many types of cancers, a one size fits all treatment does not seem likely. It will take more research and time to create cures of each individual type.

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