Medical Research on Melanoma Cancer

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Abstract:

Skin cancer is one of the most common cancers in the United States, with melanoma incidence more prominent among older people, and is divided into two subgroups: melanoma and nonmelanoma. Nonmelanoma skin cancer affects the basal and squamous cells, in which this group of cancer is known as basal cell carcinoma and squamous cell carcinoma, while melanoma skin cancer particularly affects the pigment-producing cells in the body (Miguel A Linares, Alan Zakaria, Parminder Nizran, 2015). This paper summarizes the causes, signs and symptoms, and prevention methods of melanoma cancer. Since melanoma cancer requires lifelong monitoring after diagnosis, this paper aims to perform a more in-depth research towards specific treatments that have been proven beneficial in reducing the re-development of melanoma cancer.

Keywords: skin cancer, melanoma, nonmelanoma, skin examinations, side effects, treatment

Introduction:

Background

Melanoma cancer is a type of cancer developed from damaged skin cells. It begins in the melanocytes, which are cells that produce melanin, or pigment that gives the skin color. Melanoma occurs when the DNA from the damaged skin cells trigger mutations and changes in the melanocytes, affecting uncontrollable cell growth and division that may become malignant. Early detection of melanoma cancer is crucial because once the malignant cells spread deeper into the skin and other parts of the body, it becomes more difficult to treat. There are four main types of melanoma:

Superficial spreading melanoma:
This is the most common type of melanoma cancer that appears as a new lesion or mole at the surface of the skin and later penetrates deeper in the skin.

Lentigo maligna:
This cancer is commonly found in older people and typically forms from sun-damaged skin, growing closer to the surface of the skin before spreading deeper inside.

Acral lentiginous melanoma:
This type is typically found in people of color and appear in less conspicuous areas, such as under the nails.

Nodular melanoma:
This is the most aggressive form of melanoma cancer, rapidly becoming invasive as it spreads beneath the skin faster than other types.

(Skin Cancer Foundation, 2024)

Causes

The main cause of melanoma cancer is exposure to ultraviolet (UV) light from direct contact with the sun or through tanning beds. UV rays are carcinogens, and frequent exposure to the light causes damage to the DNA in skin cells, affecting uncontrollable cell growth and division that the body is unable to repair. The accumulation of defective cells form a tumor that can eventually spread throughout the body and cause metastasis, or malignant growth (American Academy of Dermatology, 2024).

Inherited gene mutations raise a person's risk of having melanoma cancer, as well. Inherited melanomas are most likely to have changes in tumor suppressor genes, preventing the genes from functioning properly and, therefore, cannot control cell growth. Additionally, people that inherited changes with xeroderma pigmentosum (XP) genes are more susceptible to developing melanoma as XP genes help repair damaged DNA inside the cell—these changes can cause difficulty for skin cells to repair damaged DNA from the UV rays (American Cancer Society, 2023).

Signs & Symptoms

Melanoma signs include unusual moles, blemishes, lumps, or changes in the way the skin looks or feels. A typical mole maintains its shape, color, and size for many years and is usually brown, tan, or black on the skin. If the mole is changing shape, color, size, and texture, it may suggest that melanoma cancer is developing. Particularly in moles, the ABCDE rule is important to determine whether melanoma cancer is forming:

A (asymmetry) - half a mole/birthmatch is not symmetrical to other
B (border) - edges are ragged and irregular
C (color) - include different shades or color, sometimes with patches of pink, red, white, or blue
D (diameter) - larger than 6 millimeters across
E (evolving) - changing size, shape, or color

Some melanoma do not follow the ABCDE rule, and therefore, it is important to always contact a doctor when there are any changes and suspicious growths that look different from the rest of the moles.

Small portions of melanoma may also begin in other places beside the skin, including inside the iris of one's eyes. Iris melanoma can appear as a pigmented mass found in the iris, often developed in the inferior half of the iris. If there are changes in the shape or size of the pupil or vision problems, iris melanoma may be present.
(American Cancer Society, 2023)

Symptoms depend on the location of the cancer in the body but may include unexplained pain, build up fluid in the abdomen, yellowing of eyes and skin (jaundice), weight loss, etc.

Advanced melanoma occurs when the cancer has spread to another part of the body:

If the cancer spreads to the lymph nodes, which are the system that filters body fluids and fights infections, lymph nodes may feel hard or swollen—it will be difficult to swallow if lymph nodes are swollen in the neck.

Cancer that spreads to the lungs will affect ongoing chest infections and breathlessness. The individual may cough out blood or have a buildup of fluid between the chest wall and the lung, which is known as a pleural effusion.

Melanoma cancer may spread to the bone, causing continuous gnawing pain and weaker bones. There will be raised blood calcium, which affects dehydration, confusion, abdominal pain, etc. Low levels of blood cells will lead to overcrowding by the increase in cancer cells, causing an increased risk of infection. When the cancer spreads to the spinal cord, it can cause pressure on the spinal cord and if not treated will lead to weakness in the legs, paralysis, etc.

Cancer that spreads to the brain will cause memory problems, severe headaches, seizures, etc. (Cancer Research UK)

Prevention Methods

Although there is no guaranteed way to prevent melanoma cancer, because it can be influenced by genetic factors, there are preventative measures that can help minimize the chances of developing the cancer. Since the most common cause of melanoma cancer is through the exposure to UV rays, limiting one's contact toward the sun or tanning beds will significantly reduce the chances of developing melanoma cancer. Tanning beds or sun lamps give off UV rays, which have been linked to an increase in melanoma, especially for those that started before the age of 30. In addition, being aware about abnormal moles and checking one's skin regularly will prevent late detection of melanoma and help improve outcomes by enabling early intervention. However, a routine removal of moles is not a recommended way to remove melanoma since some melanoma do not develop from moles. Having a weakened immune system increases the risk of getting melanoma, as well. When the immune system is weakened, its ability to detect and fight cancerous cells is minimal, allowing potential malignant cells to grow and spread without being destroyed (American Cancer Society, 2023).

Treatment Options
Melanoma cancer treatment often depends on the stage of the cancer and other factors, but treatment options may include:

Surgery:
This is the main treatment for most melanomas and usually cures early-stage melanomas.

Surgery options include:

Wide excision is utilized to cut out the site of the tumor, along with normal skin around the margins of the tumor. The margin size varies depending on the thickness of the tumor as well as the location of the melanoma.

Mohs surgery may also be performed for very early-stage melanoma, where the skin is removed in very thin layers. The skin will be quickly frozen, and if cancer cells are visible, the doctor continues to remove layers until there are no signs of cancer.

Chemotherapy:
Chemotherapy utilizes drugs, which are given through an IV into a vein, and travel through the bloodstream to attack cancerous cells that spread beyond the skin. It is used to treat advanced melanoma after other treatments failed to remove the cancerous cells from the body.

Ways of giving chemo:

Isolated limb perfusion (ILP) and isolated limb infusion (ILI) are manners to treat melanoma that are confined to an arm or leg but cannot be removed through surgery. This procedure is used to allow doctors to give high doses of chemotherapy into the area of the tumor without exposing other parts of the body to the doses. Both ILP and ILI involve tubes that allow the blood to exit the limb through the tubes and then re-enters after the chemotherapy is added.

Radiation therapy:
This therapy uses high-energy rays to kill cancer cells, but is not often used for treatment of melanoma. However, this might be an option for early stage melanoma if surgery cannot be done or may be used as an adjuvant treatment if there is a high risk of the cancer to reoccur.

Types of radiation therapy:

Stereotactic radiosurgery (SRS) is used for tumors that spread to the brain. High doses of radiation are aimed at the tumors through either a machine called Gamma Knife or a linear accelerator, which is a machine that creates radiation.

Stereotactic body radiation therapy (SBRT) has a similar approach to SRS but is used for tumors in other parts of the body.
*(*American Cancer Society)

Research Question:

What treatment strategies are effective in promoting dormancy in melanoma cancer while also addressing the patient's overall well-being and awareness towards precautionary measures to extend relapse-free survival?

Methods:

The first study that will be examined is toward patients receiving adjuvant interferon alfa-2b therapy. This study establishes effective strategies to manage certain side effects as a result of melanoma through the examination of the toxicity profile of adjuvant interferon IFN alfa-2b therapy (Rubin KM, Vona K, Madden K, McGettigan S, Braun IM, 2012).

The second study explores skin examinations and their role in minimizing the risk of having melanoma cancer (Mujumdar UJ, Hay JL, Monroe-Hinds YC, Hummer AJ, Begg CB, Wilcox HB, Oliveria SA, Berwick M, 2009).

Results:

Study 1 notes that the assistance of adjuvant high-dose IFN alfa-2b (or HDI) has significantly prolonged the relapse-free survival, which is the length after treatment where the patient does not experience symptoms or a recurrence of the cancer melanoma. However, there are some risks from HDI therapy, where the majority of the patients would receive side effects such as flu-like symptoms, fatigue, anorexia, or more. Though there are risks, nurses have played an important role in managing these side effects through different strategies that would benefit the patients from HDI therapy.

The statistics from Study 2 reveal the utilization of SSE (or skin self-examination) and its relation to the presence of moles, the higher sun-protection self-efficacy, and the usage of sun protection (specifically for females). With the utilization of SSE, the researchers collected through the confidence interval that there is a 95% probability that the given range of values likely contains the true value, and the odds ratio of being more likely to use skin self-examination is 4.2 times as likely with the presence of moles, 14.4 times as likely if have higher sun protection self-efficacy, and 2.8 times as likely if female.

Conclusion:

The results discovered through this research question will impact the melanoma treatment as well as the patient's quality of life because the patient's care is prioritized and recognized from the added psychological support and skin self-examinations.The implementation of regular skin examinations and support groups can help reduce the recurrence of melanoma and manage side effects. Based on Study 1, the high risks of recurrence for melanoma makes HDI therapy more beneficial than costly. There have been strategies to minimize the negative effects of HDI

therapy, but the assistance of oncology nurses and other support groups improved the patients' comfort and mindset, influencing the patients to adhere to the treatment plan. From Study 2, the results were statistically significant, meaning that the data was not caused by random chance but from accuracy and real association. The skin self-examination boosted the likelihood of recognizing moles, protecting one's skin, and applying sunscreen to prevent individuals from getting melanoma or having the recurrence of this cancer.

Limitations of Results

Limitations of this study occur due to potential biases and quality of the sources reviewed. Especially in Study 2, bias could be present since the researchers collected the data through an interview. Recall bias may be because of the participant's inability to remember certain behaviors from the past when being asked about the number of times the participants had gone to a skin examination. Additionally, observation bias could take place when participants are aware that they are being observed and alter their responses in response to societal expectation and pressures. Further research needs to be done to evaluate the long-term effects of HDI therapy on patients and the different strategies to enhance the patient's care for melanoma.

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