Melanoma Mechanism and Characteristics

Developing melanoma is associated with increased sunlight exposure, and is more common in fair-skinned people, along with those with many moles. Melanoma, in roughly 40% of patients, is driven by activating a mutation in B-RAF kinase. These initially grow via the radial growth phase, which can be resected and is most often does not metastasize. Later, during the vertical growth phase, these tumors have a higher potential for metastases.



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Mechanism

Associated with Sunlight Exposure

Beam of Sunlight

UV radiation from sunlight exposure and tanning beds is a carcinogen. The p16 pathway is favored at low doses of UV radiation and results in cell-cycle arrest. On the contrary, the p53 pathway is more responsive to higher doses and induces apoptosis depending on p53 mutation status.

Mutation in B-RAF kinase

Mutant B-Raft Kite-ace

About 40% of human melanomas contain activating mutations affecting the structure of the B-Raf kinase protein.

Large Number of Moles

Numerous Moles

Moles, or nevi, are often precursors to melanoma. Thus patients with many moles should monitor those that are irregular in color or shape and treat them as candidates for melanoma.

Fair-Skinned People at Higher Risk

Fair-Skinned Guy

The risk of melanoma is more than 10 times higher for whites than for African Americans. Whites with red or blond hair, blue or green eyes, or fair skin that freckles or burns easily are at increased risk.

Growth Phases

Radial Growth Phase

Radial-tire

The early stage of the disease is known as the radial growth phase when the tumor is less than 1 mm thick. Because the cancer cells have not yet reached the blood vessels lower in the skin, it is very unlikely that this early-stage cancer will spread to other parts of the body. If the melanoma is detected at this stage, it can usually be completely removed with resection.

No Metastasis

No Metastasis-Mitt Signs

As the cancer cells have not yet reached the blood vessels lower in the skin, it is very unlikely that this early-stage cancer will metastasize to other parts of the body.

Vertical Growth Phase

Vertical Growth

The following step in the process is the invasive melanoma, the vertical growth phase. The tumor attains invasive potential, allowing it to grow into the surrounding tissue and can spread around the body through blood or lymph vessels. The tumor thickness is usually more than 1 mm and involves the deeper parts of the dermis.

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Depth of Tumor Correlates with Risk of Metastasis

Tumor-guy Metastasis-Mitt

During the vertical growth phase, the depth of tumor invasion correlates with the risk of metastasis.

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