The Dilemma of Multiple Primary Tumours (MPMs) as Rare Medical Condition

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My opinion

Introduction:
Multiple Primary Malignancies (MPMs) were originally described by Billroth in 1889 and defined as two or more independent malignancies in one individual. The diagnostic criteria for MPMs were established by Warren and Gates in 1932. According to this definition, each tumour must be definitely malignant by histopathology, each must be histologically distinct, and the possibility of one being a metastasis from the other must be excluded. (1)

Only limited data are available on the incidence of MPMs. Nevertheless, quadruple primary malignancies are extremely rare and have been reported mainly as case studies. The mechanism of MPMs is not fully understood.

Some studies suggested that there is a causal relationship between exposures to carcinogens and somatic mutations of specific genes in several malignancies.

Mutation of the tumor suppressor gene p53 (TP53) is the most well-known mutation in human carcinogenesis. Recently, there have also been reports that smoking is strongly associated with the specific mutation of TP53 in lung and bladder cancer, and this genetic predisposition might be related to the development of MPMs (2).

Another study has shown the prevalence of second primary tumors in patients with a diagnosis of non-small cell lung cancer (NSCLC) in their history or at follow-up. Furthermore, they studied survival in subgroups of those patients. And conclude that nevertheless, patients with a second tumor tend to have an overall better survival rate than patients without second primaries (3).

 Evaluation of the hypotheses:
To evaluate this hypothesis, we should culture two cancer cell lines known to be from same underlying mutation and provide it with all essential nourishments and ideal growth atmosphere. Then we should culture each cell line at opposite edges of the media. Also we can put pseudo barrier such as nitrocellulose paper to guarantee the exchange of inhibitory signals and to avoid cannibalism. This can give more opportunity for distant inhibitory signaling which can be achieved by dividing the media into two halves, so it can be observed to figure which type of cell lines is dominating. Moreover, the extent of domination can be measured. This will allow us to study the behavior of the two cell lines toward each other, then we can analyze the proteins residues of inhibitory signaling within the media to have more broad scope of dealing with mutant receptors. The trials can be conducted by different methods; either by culturing one of the cell lines before the other or to culture the cell lines at the same time and observe the amount of inhibitory signaling (this experiment can be repeated using different cancerous cell lines with different amount of cells).

Discussion

Inhibition of another primary tumour will depend on the signaling type and strength that is secreted by the first one (depends also on the amount of dilution within the body fluids), so if the signaling is equivalent to two or more tumours then there will be cancer coexistence or MPMs. But in this case the growth pattern will be in slow rate and will hence increase the patient's survival, thus considering the immune system as third party in the relationship dimension. Also it is very important that the tumour is not initiated by one of tumour viruses because such involvement can give rise to more aggressive type of tumour.

This theory explains that although the patient might have the underlying genetic factors and environmental stress to grow multiple types of primary tumour, still it remains as a rare condition. Second primary tumour will only be able to appear after treatment or removal of the first one, as it is suppressed by the inhibitory signaling which produced by the first primary tumour.
The cancer cells do not arise suddenly. They grow silently until they find the opportunity to expand. At this point, the body experiences some difference i.e. the moment of disease occurrence. We find that between the cancer formation stage and symptoms appearance there are many events that occur within the body. When the body contains the underlying genetic mutation together with environmental factors, this can allow many types of cancer to develop. But we only find one tumour at a time, existence of multiple primary tumours is considered to be rare.

Cancer has strong ability to use the surrounding environment to guarantee growth and survival. This theory explains cancer inhibitory signaling influence toward other primary tumours during early tumourgenesis processes. Rising of other primary tumours, will be only after treating or removing the first one. In addition, the inhibitory signaling and the mutant receptors for this signaling vary between different types of cancer. Equivalent strength of inhibitory signaling is the main reason for multiple primary tumours. Therefore, such theory can be highly beneficial on target therapy to cure many types of cancer without destroying normal tissues of the body. This can be achieved by targeted inhibitory signaling toward cancer during early stages. Also, we can analyze the specific type of inhibitory signals to be used as a diagnostic tool or screening of other cancer risks.

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References

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