We constantly hear that we are on the brink of developing personalized cancer treatments, but how much of that is really true? A sobering study published in the New England Journal of Medicine takes a grim look at the issue and concludes that tailoring therapies to effectively target cancer is more difficult and nuanced than originally hoped.

For instance, after analyzing one region of a kidney carcinoma, researchers from the Cancer Research UK London Research Institute found gene expression patterns that were associated with a good prognosis, yet another region in the same tumor was associated with a less favorable treatment outcome.

As lead author Dr. Marco Gerlinger elegantly surmises, A new world has been anticipated in which patients will undergo a needle biopsy of a tumor in the outpatient clinic, and a little while later, an active treatment will be devised for each patient on the basis of the distinctive genetic characteristics of the tumor. But a serious flaw in the imagined future of oncology is its underestimation of tumor heterogeneity.

Tumor heterogeneity, ACSH's Dr. Josh Bloom explains, means that a cancerous tumor is not just a big mass of identical cells. Instead, tumors contain multiple cell types, some of which do not respond to the targeted medication.

That's one reason why it's unlikely that a single site tumor biopsy will provide complete genetic information of the cancer simply because one peek into a tumor will not reveal the multiple mutation types.

This is largely due to how potential targeted therapies are evaluated. "A major roadblock in oncology research is the relevance of the animal models used to the human situation, says Dr. Bloom. Currently, scientists implant homogenous (uniform) cancer cells into mice, allowing them to grow into tumors that are then treated with agents designed to attack that particular tumor. This often works quite well in the lab, but in a real life situation, tumor heterogeneity rears its ugly head, and the surviving cells grow into new tumors.

Nevertheless, says ACSH's Dr. Gilbert Ross, with incremental improvements, hopefully we can figure out how to attack the main tumor abnormalities, while making progress in combating subsidiary pathways of resistance as well.
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