

Growing Patient Education in Dermatology: An Upside-Down Tree Analogy for Immunomodulatory Therapies

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ABSTRACT

As patient autonomy gains momentum in the era of readily accessible health information, dermatologists bear a growing responsibility in patient education. With the rapid evolution and development of targeted therapies for dermatologic conditions, clinicians are faced with questions from patients regarding the mechanisms of action and side effects of novel therapeutic agents. We present an educational aid to be used in patient counseling to describe and compare the mechanisms of traditional immunosuppressive medications and targeted agents such as biologics and small molecule inhibitors. Using an upside-down tree as an analogy for the immune system, traditional immunosuppressives can be represented by an axe, chopping at large branches (ie, upstream immune pathways), while targeted immunomodulators can be represented by pruning shears, trimming select small branches and leaves (ie, specific downstream effectors). This approachable visual aid can guide practitioners in explaining the complexities of the immune system and immunomodulatory therapies with the goal of augmenting patient understanding and addressing patient concerns regarding new medications.

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In an age of increasing respect for the ethical principle of autonomy, patient education is growing exponentially. Abundant medical information is readily available online, emboldening patients to play a more active role in their health-care. Meanwhile, physicians are gaining greater appreciation for patient education and informed consent, and the role of physician as educator is now more important than ever before.

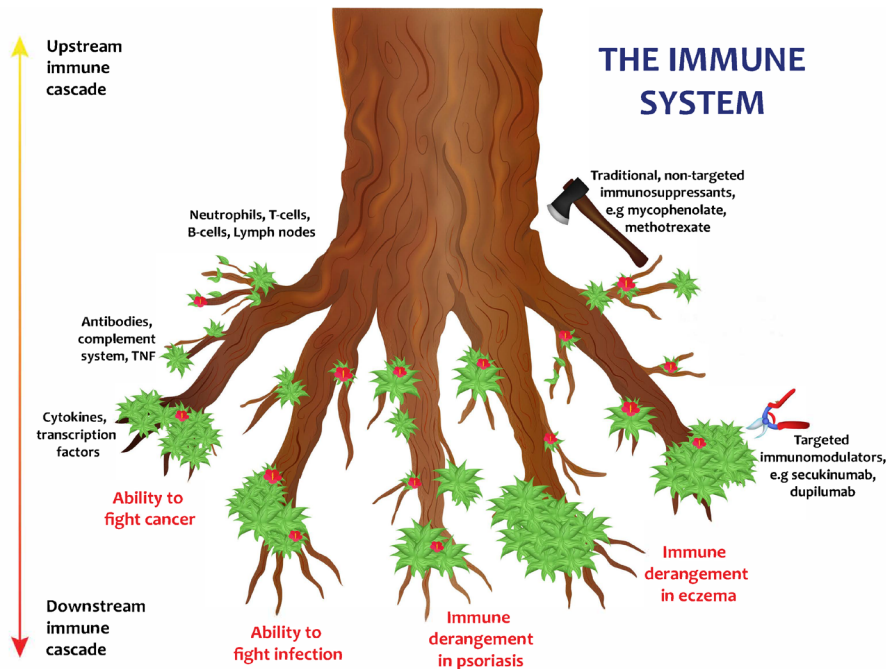
In 2003, alefacept became the first Food and Drug Administration (FDA)-approved biologic for psoriasis.¹ Dozens of immune-targeting therapies have since been approved for myriad dermatologic conditions from psoriasis, atopic dermatitis and hidradenitis suppurativa to cutaneous malignancy, with novel agents continuously in development. The advent of these immunomodulators, such as monoclonal antibodies and small molecule inhibitors, introduces the corresponding need for improved patient education. The burden on the dermatologist to distill the complexities of the immune system, and mechanisms of drugs which target it, is steadily increasing as more patients transition from traditional immunosuppressive medications to newer immunomodulator therapies. Many have been treated with traditional immunosuppressives such as cyclosporine, mycophenolate mofetil, or methotrexate for years, and are naturally curious about the mechanisms of their new treatments.

In the 2016 “Voice of the Patient” forum hosted by the FDA, psoriasis patients expressed concerns about potential side effects and “compromising the immune system” as significant deterrents to initiating biologics.² Studies of non-dermatologic

diseases have demonstrated similar patient concerns regarding side effects and immunocompromise,^{3,4} suggesting that enhanced patient education on immunomodulators’ mechanism of action may improve willingness to use and compliance with biologics over traditional immunosuppressives.

Psoriasis serves as the archetype for immunomodulatory therapy, but given the increasing number of dermatoses treated via these agents, a broad and understandable approach to explaining the mechanism of action of targeted therapies may be valuable to augment patient understanding, reduce fears associated with treatment regimens, improve willingness to transition to or begin immunomodulators, and bolster medication adherence. We propose the following educational aid to help clinicians explain the immune system and mechanisms of immune targeting therapies in a succinct, relatable fashion (Figure 1).

When counseling patients, the complex immune system can be simplified and compared to an upside-down tree. The trunk represents the immune system as a whole. Large branches arising from the trunk are analogous to upstream immune pathway targets, ie, various cell types and physical barriers. Each large branch further divides into smaller branches, which represent more specific downstream immunological pathways. Finally, the leaves represent effectors of the immune system which characterize both immunocompetence and immune-mediated disease.

FIGURE 1. Upside-down tree analogy for traditional immunosuppressive vs. targeted immunomodulatory agents.

Traditional immunosuppressive therapies inhibit upstream targets within the immune pathway, analogous to an axe chopping large branches. In inhibiting upstream targets, the immunological component responsible for a certain disease may be cut off, but the axe may have also chopped off a branch that fights infection or guards against cancer. Just as with an axe to a tree, the closer to the trunk that these medications take action, the more of the tree (the components of the immune system) will be affected. Targeted therapies are analogous to pruning shears, clipping off small branches in hopes of inhibiting only the parts of the immune system responsible for a disease. Directed use of pruning shears rather than an axe targets specific derangements in the immune pathway while leaving others intact, with the goal of maximizing treatment efficacy while minimizing side effects.

Two medications commonly used in psoriasis treatment, methotrexate and rizankizumab, can be compared using this model. Methotrexate is a traditional immunosuppressive that interferes with DNA replication. As all cells must synthesize new DNA, methotrexate can potentially act on many immune cell types in addition to the overactive lymphocytes causing inflammatory disease. Therefore, methotrexate is analogous to an axe, chopping at large branches of the tree. Rizankizumab is an immunomodulator specifically targeting IL-23, a prominent cytokine in psoriasis pathogenesis. Consequently, rizankizumab acts as pruning shears, cutting off smaller branches of the immune system "tree."

The wealth of therapeutic options available to dermatologists is rapidly expanding. As we move forward in this era of emerging

targeted treatments, our counseling methods must expand and evolve in parallel to new therapeutic options. Simplified, relatable, and visually engaging instruments such as this upside-down tree will aid clinicians in their responsibilities as patient educators.

DISCLOSURES

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