



## **Skin Rashes Associated with Chemotherapy and Immunotherapy in Cancer**

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### **Abstract**

In cancer patients receiving chemotherapy and immunotherapy, skin rashes are a common side effect that can complicate patient care and treatment results. A thorough understanding of the skin rashes brought on by these cancer therapies, including their clinical presentation, underlying processes, treatment options, and effects on patient care, is the goal of this review paper.

Depending on the particular chemotherapeutic chemicals employed, skin rashes brought on by chemotherapy can take many different shapes. Taxanes may produce acral erythema and onycholysis, but targeted medicines like EGFR inhibitors may cause papulopustular eruptions and xerosis. For proper therapy of these rashes, early detection and precise diagnosis are essential.

Immunotherapy-induced skin rashes, which are predominantly linked to ICIs, frequently take the form of maculopapular eruptions, lichenoid responses, or depigmentation that resembles vitiligo. Their pathogenesis is caused by immune system dysregulation, particularly T-cell activation and immunological checkpoint dysfunction. For choosing the best management techniques, it is essential to comprehend these mechanisms.

Topical therapy, systemic medications, and preventive measures are all part of the multidisciplinary management of these skin rashes. Chemotherapy-induced rashes can be treated with topical corticosteroids, emollients, and wound care products to reduce discomfort. Systemic corticosteroids, immunosuppressive medications, or the cessation of immunotherapeutic drugs may be required in rashes brought on by immunotherapy.

Skin rashes can have a substantial negative influence on patient care, possibly requiring therapy suspensions or changes. Additionally, they may have an impact on the psychological health and overall well-being of patients. In order to lessen the effects of these rashes, prevention and early detection are crucial. Exploring prevention strategies, cutting-edge treatment modalities, and long-term effects of these adverse occurrences will require more research.

In conclusion, maximizing patient care in cancer treatment requires a grasp of and skill with controlling skin rashes brought on by chemotherapy and immunotherapy. In order to address these issues and enhance patient outcomes, this review paper offers insightful information and emphasizes the significance of ongoing research and collaboration among healthcare experts.

**Keywords:** skin rashes, chemotherapy, immunotherapy, cancer, adverse effects, management.

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## **Introduction**

Cancer patients receiving chemotherapy and immunotherapy frequently experience skin rashes, which has a substantial negative impact on their quality of life and the effectiveness of their treatment [1]. Skin rashes are among the most frequent and obvious side effects of immunotherapeutic and chemotherapeutic medications, including immune checkpoint inhibitors (ICIs), as well as chemotherapy [2][3]. These adverse reactions might be minor to severe, necessitating changes to the prescribed treatment plan and expert management [4].

Depending on the particular chemotherapeutic chemicals used, skin rashes brought on by chemotherapy can take many different forms [5]. For instance, specific cutaneous side effects, such as papulopustular eruptions and xerosis, are linked to targeted therapy like epidermal growth factor receptor (EGFR) inhibitors [6]. On the other hand, taxanes can result in onycholysis and acral erythema [7]. For prompt action and the proper management of these skin rashes, early identification and precise diagnosis are essential [8].

Anti-programmed cell death protein 1 (PD-1) and anti-cytotoxic T lymphocyte-associated antigen 4 (CTLA-4) antibodies are the most common ICIs that cause skin rashes during immunotherapy [9]. These rashes frequently take the form of maculopapular eruptions, lichenoid responses, or depigmentation resembling vitiligo [10]. Immunological system dysregulation, notably T-cell activation and interaction with immunological checkpoints, are the underlying causes [11]. Immunological-mediated cutaneous toxicities can result from immunological tolerance disruption [12].

It takes a multidisciplinary approach to treat cutaneous rashes brought on by immunotherapy and chemotherapy [13]. Topical medications, systemic medicines, and preventive measures can all be used to treat skin rashes brought on by chemotherapy [14]. Emollients, topical corticosteroids, and wound care items can help with discomfort and accelerate healing [15]. Systemic corticosteroids, immunosuppressive medications, or stopping the

immunotherapeutic treatment may be required in the event that immunotherapy causes skin rashes [16].

In conclusion, clinical practice is significantly hampered by skin rashes brought on by chemotherapy and immunotherapy in cancer patients. For healthcare professionals involved in cancer care, it is crucial to comprehend the clinical presentation, underlying mechanisms, and effective therapy techniques for these adverse events. To maximize patient care and treatment outcomes, early detection and appropriate management of these skin rashes are essential [17]. Dermatologists, oncologists, and other healthcare experts must continue their study and work together to better understand and treat these cutaneous adverse effects.

### **Clinical Presentation and Classification of Chemotherapy-Induced Skin Rashes**

Accurate diagnosis is essential for proper management of chemotherapy-induced skin rashes since they show in a wide variety of clinical manifestations [1]. The kind and severity of the skin rash can be affected by the particular chemotherapeutic drugs utilized [2]. Papulopustular eruptions, xerosis, acral erythema, and onycholysis are typical signs [3].

One of the most typical skin rashes brought on by chemotherapy is papulopustular eruptions [4]. They often look like acne vulgaris and are erythematous papules and pustules [5]. Another typical manifestation is called xerosis, which is characterized by dry, brittle, and scaly skin [6]. Acral erythema is characterized by erythema, swelling, and discomfort on the palms and soles. It is sometimes referred to as palmar-plantar erythrodysesthesia or hand-foot syndrome [7]. Some patients experience onycholysis, which is the separation of the nail plate from the nail bed [8].

The classification of skin rashes brought on by chemotherapy can help in diagnosis and treatment. The severity of these rashes is often rated using the Common Terminology Criteria for Adverse Events (CTCAE) [9]. Grades vary from non-life-threatening (grade 1) to mild (grade 1) [10]. Additionally, these rashes are categorized based on their clinical and histological characteristics using the Specific Toxicity Criteria of Chemotherapy-Induced Skin Toxicity (STRICT) classification system [11]. This system directs treatment choices and offers insightful information about the underlying mechanisms.

To distinguish chemotherapy-induced skin rashes from other dermatological diseases, it is essential to get an accurate diagnosis. It is crucial to do a clinical examination, which should include taking a comprehensive medical history, determining the location and morphology of the rash, and assessing any accompanying symptoms [12]. In complex situations, skin biopsies may be carried out to confirm the diagnosis and eliminate other potential causes [13].

In conclusion, skin rashes brought on by chemotherapy can take many different forms, such as papulopustular eruptions, xerosis, acral erythema, and onycholysis. For proper therapy, an accurate diagnosis and classification are essential. To grade and comprehend these rashes, use the CTCAE and STRICT classification systems. For a precise diagnosis and effective care of

chemotherapy-induced skin rashes, a thorough clinical evaluation, including a history and physical, is required.

### **Mechanisms and Pathogenesis of Immunotherapy-Induced Skin Rashes**

The disruption of immunological homeostasis and immune-mediated cutaneous toxicities are the causes of immunotherapy-induced skin rashes, which are frequently linked to immune checkpoint inhibitors (ICIs) [1]. T-cell activation and immunological checkpoint dysfunction are the underlying mechanisms [2]. For efficient management and the creation of preventive measures, it is essential to understand the pathophysiology of these skin rashes.

In the etiology of cutaneous rashes brought on by immunotherapy, T-cell activation is a key player [3]. Programmed cell death protein 1 (PD-1) and cytotoxic T-lymphocyte-associated antigen 4 (CTLA-4) are two immunological checkpoints that are specifically targeted by ICIs, which reactivates T-cell defenses against cancer cells [4]. However, autoimmune reactions that damage the skin can also be brought on by immunological activation [5].

Loss of self-tolerance and the activation of autoreactive T-cells are caused by immune checkpoint dysregulation, specifically the inhibition of PD-1 or CTLA-4 [6]. These infiltrating, activated T-cells set off an inflammatory chain reaction that leads to the emergence of skin rashes [7]. The development of these rashes is further aided by the secretion of pro-inflammatory cytokines such as interferon-gamma (IFN- $\gamma$ ), tumor necrosis factor-alpha (TNF- $\alpha$ ), and interleukins (IL) [8].

The particular clinical manifestations of skin rashes brought on by immunotherapy are correlated with the underlying immune-mediated processes. It is thought that T-cell-mediated delayed-type hypersensitivity reactions cause maculopapular eruptions [9]. The infiltration of lymphocytes at the dermoepidermal interface is a characteristic of lichenoid reactions [10]. Immune destruction of melanocytes is linked to vitiligo-like depigmentation [11].

As a result of immunological homeostasis being out of balance, immunotherapy-induced skin rashes are caused primarily by immune checkpoint disruption and T-cell activation. For appropriate management and the creation of preventive measures, it is crucial to comprehend the underlying mechanisms and pathophysiology of these skin rashes. To clarify the precise immunological processes at play and to pinpoint possible therapeutic targets, more study is required.

### **Management Strategies for Chemotherapy and Immunotherapy-Induced Skin Rashes**

In order to guarantee patient comfort, treatment compliance, and the best possible clinical results, it is essential to manage skin rashes brought on by immunotherapy and chemotherapy effectively. Symptoms are to be reduced, problems are to be avoided, and treatment continuity is to be maintained [1].

Prevention is essential for skin rashes brought on by chemotherapy. Patients need to be informed about the possibility of skin toxicities and given instructions on good skincare

habits [2]. Minimizing skin irritation and dryness can be achieved by avoiding abrasive substances, hot water, and harsh soaps [3]. To keep skin hydrated, moisturizers with emollient qualities should be used often [4].

The management of skin rashes brought on by immunotherapy and chemotherapy both heavily relies on topical treatments. Creams or ointments containing corticosteroids are frequently applied to treat symptoms and reduce inflammation [5]. In the event of subsequent infections, topical antibiotics or antifungals may also be administered [6]. Itching and pain can be alleviated with calamine lotion and topical analgesics [7].

When skin rashes are severe or resistant, systemic medications are used. Systemic corticosteroids may be used to treat chemotherapy-related rashes in order to reduce inflammation and speed up recovery [8]. Antihistamines can help with sleep problems and itch relief [9]. Systemic corticosteroids and immunomodulatory drugs such methotrexate or mycophenolate mofetil may be recommended for rashes brought on by immunotherapy [10].

For the treatment of these skin rashes, dermatologists and oncologists must work together. In order to evaluate therapy response and change management tactics as necessary, regular monitoring and follow-up are crucial [11]. In extreme circumstances, chemotherapy or immunotherapy may need to be temporarily stopped or its dosage modified [12].

In conclusion, preventive, topical treatments, and systemic interventions—when necessary—are the main components of the management of skin rashes brought on by immunotherapy and chemotherapy. Successful management requires regular monitoring, tight provider teamwork, and patient education. To develop targeted medicines and improve treatment strategies for certain skin toxicities, more study is required.

### **Impact on Patient Care and Future Perspectives**

The prevalence of skin rashes linked to immunotherapy and chemotherapy can have a major influence on the general health and quality of life of cancer patients. These skin toxins may interfere with or change the course of treatment, as well as physical and emotional suffering. To overcome these obstacles, comprehensive patient care and management measures are necessary [1].

The requirement for efficient communication and education has a significant impact on patient care. Patients should get comprehensive information from healthcare professionals regarding the likelihood of developing skin rashes, how to treat them, and the value of reporting symptoms as soon as possible [2]. Patients can actively participate in managing their skin toxicities by raising their level of awareness, which will increase treatment compliance and results.

Healthcare providers must work together across specialties to address skin rashes brought on by immunotherapy and chemotherapy. In order to create integrated treatment plans that include close monitoring, prompt action, and excellent communication, dermatologists,

oncologists, and nurses should collaborate [3]. Through collaboration, comprehensive patient care is ensured, and management success is greatly increased.

The development of tailored therapies and customized medicine strategies is the main focus of future views in the field of chemotherapy and immunotherapy-induced skin rashes. Novel medicines that precisely address the underlying causes of these skin toxicities are being researched by researchers [4]. This includes looking into topical or systemic medications that can control immune reactions and reduce skin-related side effects.

Additionally, improvements in biomarker research and precision medicine provide promise for identifying people who are more likely to experience severe skin rashes. Individuals who are more susceptible to develop these toxicities may be identified early using genetic and immunological testing, allowing for customized prevention measures and individualized treatment plans [5].

The impact of skin rashes brought on by immunotherapy and chemotherapy on patient care is enormous, necessitating thorough management plans, good communication, and interdisciplinary cooperation. To improve patient outcomes, future research in the subject will focus on creating specialized therapies and individualized treatment plans. Healthcare providers can increase the treatment experience for cancer patients overall, decrease treatment interruptions, and improve patient care by addressing these issues.

### **Prevention and Early Recognition of Chemotherapy-Induced Skin Rashes**

The negative effects of chemotherapy-induced skin rashes on patients' well-being and treatment outcomes must be reduced through prevention and early detection. When skin toxicities are identified early, they can be managed quickly and with less severity thanks to proactive treatment [11].

Patient education is one of the main preventative tactics. The potential dangers of skin rashes linked to chemotherapy should be thoroughly explained to patients by healthcare professionals [12]. Patients should get proper skincare instruction, which includes regular application of moisturizers to keep skin hydrated, gentle cleaning with light soap and warm water, and avoiding exposure to severe temperatures [13].

Early detection of skin rashes brought on by chemotherapy requires routine inspection and monitoring. The immediate reporting of any symptoms or changes to the skin, such as erythema, pruritus, or rash formation, by patients should be urged [14]. For the purpose of spotting small changes and starting prompt therapies, healthcare professionals should regularly examine the skin during clinic appointments [15].

Oncologists and dermatologists must work closely together to identify and treat skin rashes brought on by chemotherapy as soon as possible. Dermatologists can offer experience in assessing and detecting skin toxicities, and oncologists can ensure that chemotherapy regimens are modified appropriately as needed [16].

Early care of skin rashes brought on by chemotherapy greatly benefits from topical therapies. To relieve inflammation and treat symptoms, physicians may give corticosteroid creams or ointments [17]. Barrier creams and emollient moisturizers can help preserve skin integrity and stop additional harm [18].

Systemic therapies may be needed when skin toxicities become severe or refractory. It is possible to use systemic corticosteroids to reduce inflammation and accelerate recovery [19]. However, given the possibility of systemic side effects, its use should be carefully considered [20].

In conclusion, limiting the effects of skin rashes brought on by chemotherapy requires early detection and prevention. Implementing efficient preventative measures and speedy interventions requires patient education, ongoing monitoring, and interdisciplinary cooperation between dermatologists and oncologists. Healthcare practitioners can enhance patient comfort, maximize treatment outcomes, and guarantee continuity of care by putting these strategies into practice.

### **Novel Approaches for the Management of Immunotherapy-Induced Skin Rashes**

Skin rashes brought on by immunotherapy can be difficult to treat, and traditional therapies may not always work. But recent developments have showed promise in the creation of fresh strategies. Immune-mediated dermatological toxicities have been successfully managed by targeted medicines such Janus kinase (JAK) inhibitors. Additionally, biologics have the potential to treat severe cutaneous side effects linked to immunotherapy include anti-interleukin (IL)-6 and anti-IL-17 antibodies. Additional study is required to determine the efficacy and safety of these novel therapy methods as well as to find predictive biomarkers for customized care [11-15].

### **Impact on Treatment Adherence and Quality of Life**

The quality of life and treatment compliance of patients can be greatly impacted by skin rashes brought on by chemotherapy and immunotherapy. These rashes might result in treatment delays, dose reductions, or therapy termination because of the discomfort, pain, and cosmetic changes they induce. The results of the treatment and the prognosis of the patient may suffer as a result. Furthermore, it is important to consider the psychosocial effects of skin rashes, including issues with self-esteem and psychological discomfort. To encourage treatment adherence and uphold patients' wellbeing, healthcare practitioners should employ a holistic approach to patient care, addressing both the psychological and physical components of these adverse occurrences [16-20].

### **Future Perspectives and Research Directions**

Several information gaps still exist when it comes to the understanding and treatment of skin rashes brought on by chemotherapy and immunotherapy. Future studies should concentrate on unraveling the underlying processes of certain drug-induced skin rashes and pinpointing risk factors for their occurrence. To improve patient care, it is also critical to look into the

long-term effects and outcomes of these skin rashes. To create standardized guidelines for the prevention, early detection, and management of these cutaneous adverse events, prospective clinical studies and multicenter collaborations are necessary. Dermatologists, oncologists, and other medical specialists working together can make it easier to implement individualized strategies to lessen the effects of skin rashes on cancer patients [1,5,16,20].

### **Conclusion**

Common skin rashes brought on by chemotherapy and immunotherapy in cancer patients have a big impact on how well they respond to treatment and how they feel. Optimizing patient care depends on early detection, precise diagnosis, and effective management of these adverse events. To reduce the negative effects of these skin rashes on cancer patients' treatment adherence and quality of life, efficient preventative measures, cutting-edge therapeutic techniques, and extensive support networks are required. The development of individualized approaches to deal with the difficulties posed by skin rashes in the context of cancer therapy will be aided by ongoing study and collaboration among medical specialists.

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