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Chemotherapeutic Agents and Dermatologic Side Effects

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Chemotherapy Category	Examples of Chemotherapeutic Agents (Brand Name)	Dermatologic Side Effects	Other Notes
EGFR inhibitors ^a	Cetuximab (Erbix), gefitinib (Iressa), erlotinib (Tarceva)	Folliculitis, papulopustular reaction in seboreic distribution, callus and blister formation on hands and feet, hand-and-foot syndrome, ^b paronychia, trichomegaly, anaphylactic infusion reaction (cetuximab only)	Presence of skin eruption has been shown to correlate with better clinical response to therapy
BRAF inhibitors ^a	Vemurafenib (Zelboraf)	Epidermal growths such as AK, SCC, keratoacanthoma, SK, hand-and-foot syndrome, ^b diffuse eczematous eruption	Presence of hand-and-foot syndrome has been shown to correlate with improved clinical outcome
Multikinase inhibitors ^a	Sorafenib (Nexavar), sunitinib (Sutent), dasatinib (Sprycel)	Epidermal growths such as AK, SCC, keratoacanthoma, SK, hand-and-foot syndrome, ^b diffuse eczematous eruption	
Other protein kinase inhibitors	Imatinib (Gleevec), regorafenib (Stivarga)	Hypopigmentation, SJS (imatinib only), pityriasis rosea-like eruption (imatinib only), exacerbation of psoriasis (imatinib only), hand-and-foot syndrome ^b (regorafenib only)	Imatinib can be used off label for mastocytosis and DFSP
Alkylating agents	Mechlorethamine (Mustargen), chlorambucil (Leukeran), cisplatin (Platinol), cyclophosphamide (Cytoxan), ifosfamide (Ifex), melphalan (Alkeran), carmustine (BiCNU), busulfan (Myleran), dacarbazine (DTIC), temozolomide (Temodar)	Irreversible pigmented bands of teeth (cyclophosphamide only), hand-and-foot syndrome, ^b SJS, diffuse hyperpigmentation, irreversible alopecia (busulfan only), flushing (mechlorethamine only), porphyria (cisplatin only)	

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Chemotherapy Category	Examples of Chemotherapeutic Agents (Brand Name)	Dermatologic Side Effects	Other Notes
Antimetabolites	5-FU (Aducril), 6-MP (Purinethol), capecitabine (Xeloda), cladribine (Leustatin), cytarabine (Ara-C), fludarabine (Fludara), gemcitabine (Gemzar), hydroxyurea (Hydrea), methotrexate (Trexall)	Angiokeratomalike lesions on tongue, AK inflammation (5-FU and capecitabine only), DSAP (5-FU and capecitabine only), serpentine supravenuous hyperpigmentation (5-FU only), photosensitivity, leg ulcers (hydroxyurea only), dermatomyositislike eruption on dorsal hands (hydroxyurea only), diffuse hyperpigmentation, radiation recall, nail pigmentation, pseudocellulitis (gemcitabine only), NEH, pseudosclerodermatous reaction (gemcitabine only), eccrine squamous metaplasia, “flag sign” of hair (methotrexate only), accelerated rheumatoid nodulosis (methotrexate only), hand-and-foot syndrome ^b	
Anthracyclines	Daunorubicin (Cerubidine), doxorubicin (Adriamycin), actinomycin (Cosmegen), bleomycin (Blenoxane), mitomycin (Mutamycin)	Flagellate hyperpigmentation (bleomycin only), Raynaud phenomenon (bleomycin only), nail pigmentation, NEH (bleomycin only), sticky skin syndrome (doxorubicin + ketoconazole only), eccrine squamous metaplasia, localized or systemic skin sclerosis	
Topoisomerase inhibitors	Topotecan (Hycamtin), irinotecan (Camptosar), etoposide (Etopophos), teniposide (Vumon), mitoxantrone (Novantrone)	Flushing, radiation recall	
Mitotic inhibitors	Paclitaxel (Taxol), docetaxel (Taxotere), vinblastine (Velban), vincristine (Oncovin)	Onycholysis, serpentine supravenuous hyperpigmentation, SK inflammation, DSAP, sclerodermalike reaction (paclitaxel only), localized or systemic skin sclerosis	
Proteasome inhibitors	Bortezomib (Velcade)	Herpes zoster activation	
Antiestrogens	Fulvestrant (Faslodex), tamoxifen (Nolvadex), toremifene (Fareston)	Hirsutism, acne, dermatomyositis (tamoxifen only), hair color change (tamoxifen only)	
Monoclonal antibodies	Rituximab (Rituxan), alemtuzumab (Campath)	SJS, TEN, flushing, fatal infusion reaction (rituximab only)	Rituximab can be used off label for blistering dermatoses
Immunotherapy	IL-2 (Aldesleukin), interferon alfa (Roferon), ipilimumab (Yervoy)	Vitiligo, toxic shock syndrome, psoriasis, erosions within scars, LABD, flushing, TEN/SJS	One of few classes of chemotherapy agents that does not cause alopecia
Immunomodulatory agents	Thalidomide (Thalomid), lenalidomide (Revlimid)	Venous thromboembolism, peripheral edema, neuropathy	

Abbreviations: EGFR, epidermal growth factor receptor; AK, actinic keratosis; SCC, squamous cell carcinoma; SK, seborrheic keratosis; SJS, Stevens-Johnson syndrome; DFSP, dermatofibrosarcoma protuberans; 5-FU, 5-fluorouracil; 6-MP, 6-mercaptopurine; DSAP, disseminated superficial actinic porokeratosis; NEH, neutrophilic eccrine hidradenitis; TEN, toxic epidermal necrolysis; LABD, linear IgA bullous dermatosis.

^aSubset of protein kinase inhibitors.

^bHand-and-foot syndrome also is known as chemotherapy-induced acral erythema and palmoplantar erythrodysesthesia.

Practice Questions

- 1. Which of the following chemotherapy agents has demonstrated the ability to cause accelerated rheumatoid nodule formation?**
 - a. cisplatin
 - b. methotrexate
 - c. paclitaxel
 - d. rituximab
 - e. tamoxifen
- 2. Which of the following chemotherapy agents can cause sticky skin syndrome when combined with ketoconazole?**
 - a. doxorubicin
 - b. etoposide
 - c. imatinib
 - d. sorafenib
 - e. thalidomide
- 3. Which of the following agents is not a protein kinase inhibitor?**
 - a. bortezomib
 - b. cetuximab
 - c. erlotinib
 - d. imatinib
 - e. sorafenib
- 4. Which of the following chemotherapy agents can be used off label in the treatment of dermatofibrosarcoma protuberans?**
 - a. etoposide
 - b. imatinib
 - c. interferon alfa
 - d. lenalidomide
 - e. methotrexate
- 5. What chemotherapy agent has been shown to cause deep venous thromboembolism?**
 - a. daunorubicin
 - b. doxorubicin
 - c. erlotinib
 - d. paclitaxel
 - e. thalidomide

Fact sheets and practice questions will be posted monthly. Answers are posted separately on www.cutis.com.