Evaluation and Management of Suspected Immune-Mediated Dermatologic Toxicities

Disclaimer: *This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson's specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient's care. This algorithm should not be used to treat pregnant women.*

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GENERAL RASH MANAGEMENT

PRESENTATION/ASSESSMENT

Patient presents with new rash after initiation of ICI[1] up to 12 months after last dose of ICI

- Full body skin exam
- Oral/genital evaluation

Are blisters, painful skin lesions, > 30% body surface area involvement, or CTCAE[2] Grade 3 rash involvement present?

- Yes → Severe rash:
  - Hold ICI
  - Urgent consult/referral to Dermatology
  - Refer to Pages 4-5 for dermatitis management and Pages 7-8 for bullous dermatoses management
- No → Grade 1 or 2 (mild/moderate rash)
  - Continue ICI
  - Topical steroids for 2 week trial:
    - Triamcinolone 0.1% cream/ointment for body
    - Hydrocortisone 2.5% cream/ointment for face or genital area

  If pruritic:
  - Add oral antihistamines for 2 weeks:
    - Over-the-counter second generation antihistamines (fexofenadine and cetirizine) **and**
    - Hydroxyzine 25 mg PO every 8 hours as needed for pruritus

TREATMENT

Is rash responsive to topical steroids?

- Yes →
  - Continue current management of topical steroids for potential flares after each ICI dose until flare resolves (maximum of 2 weeks if continuous use)
  - Continue current management with oral antihistamines, if started
    - Taper antihistamines as tolerated

  Is there residual pruritus?
  - Yes →
    - Refer to Dermatology
    - See Page 6 for pruritus without rash management
  - No → See Box A on this page
- No →
  - Hold ICI
  - Continue topical steroid management
  - Refer to Dermatology
  - See Page 3 for further assessment/management

A

ICI = immune checkpoint inhibitor

[1] PD-1 inhibitors (pembrolizumab, nivolumab, cemiplimab, dostarlimab), PD-L1 inhibitors (atezolizumab, avelumab, durvalumab), CTLA-4 inhibitor (ipilimumab, tremelimumab)

[2] Refer to Appendix A for Common Terminology Criteria for Adverse Events (CTCAE) Version 5.0

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GENERAL RASH MANAGEMENT - continued

PRESENTATION/ASSESSMENT

Persistent ICI rash despite topical steroid management

Continue to hold ICI

Consider additional workup for specific rash diagnosis, as clinically indicated:
- Skin biopsy
- Oral/genital evaluation
- CBC with differential, CMP, AST/ALT
- Rule out alternative causes:
  - Viral or bacterial cultures
  - Potassium hydroxide (KOH) scraping for tinea/candida/scabies
  - Allergic contact skin patch testing
  - Photosensitivity evaluation/distribution

Specific dermatitis diagnosis identified?

Yes → See Pages 4-5 for dermatitis management

No

TREATMENT

- Escalate topical steroid therapy[1] **and/or**
- Wet wraps **and/or**
- Narrowband ultraviolet-B (NB-UVB) light therapy[2]

Reassess rash in 2 weeks

Is rash improving?

Yes → Continue current therapy → Reassess rash in 4-8 weeks

Rash has decreased to Grade 1[3]?

Yes
- Resume ICI
  - No dose reduction, delay, or discontinuation is necessary
- Complete resolution of rash is not expected as symptoms will flare with repeated infusions. Treat to patient comfort.

No
- If focal rash, consider adding triamcinolone 5-10 mg/mL IL every 4-6 weeks until rash resolves
- If diffuse rash, consider adding prednisone 1 mg/kg PO daily for 7 days[4,5]
  - Taper by increments of 20 mg weekly to 10 mg daily maintenance dose[4,5]

Reassess rash in 2 weeks

Has rash resolved?

Yes
- Resume ICI, if clinically indicated
- Continue prednisone taper[4,5], if applicable

No → See Pages 4-5 for dermatitis management

CMP = comprehensive metabolic panel
ICI = immune checkpoint inhibitor
IL = intralesional

[1] Medium potency for body and low potency for face/genital areas. Refer to Appendix B for classes of topical steroids.
[2] NB-UVB takes 6-8 weeks for full efficacy
[3] Refer to Appendix A for Common Terminology Criteria for Adverse Events (CTCAE) Version 5.0
[4] Initiate *Pneumocystis jiroveci* pneumonia (PJP) prophylaxis for prednisone doses equivalent to ≥ 20 mg for 3 weeks or more. Continue prophylaxis for one month after completion of taper.
[5] Consider Endocrine consult for diabetes management and/or adrenal insufficiency workup

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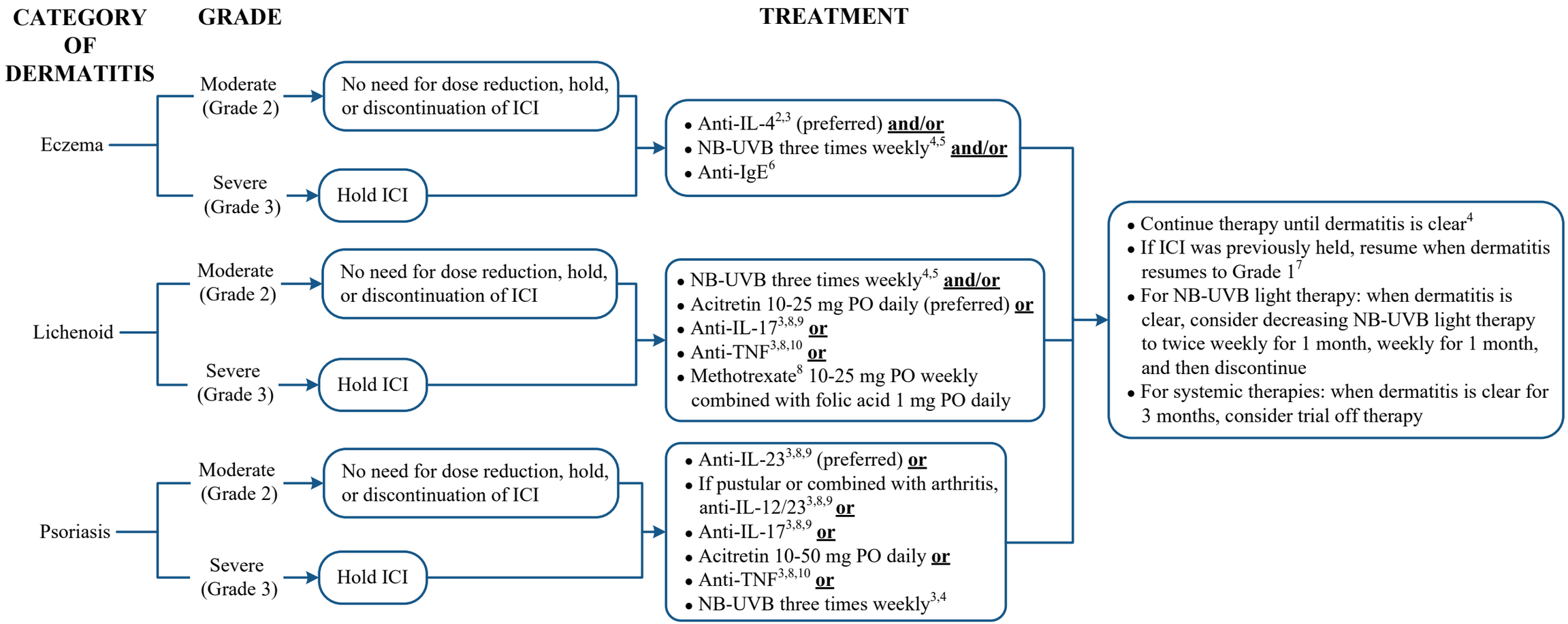
DERMATITIS MANAGEMENT[1]



ICI = immune checkpoint inhibitor
IgE = immunoglobulin E
IL = interleukin
NB-UVB = narrowband ultraviolet-B
TNF = tumor necrosis factor

[1] Management is discussed with Primary Oncologist
[2] FDA dosing for atopic dermatitis
[3] Non-formulary at MD Anderson
[4] NB-UVB takes 6-8 weeks for full efficacy
[5] NB-UVB may be used as monotherapy or in combination with any of the systemic therapies listed
[6] FDA dosing for idiopathic urticaria
[7] Patient may have mild flare-up with ICI infusions but should completely clear between infusions
[8] FDA dosing for psoriasis
[9] Screening tests include HIV, T-spot tuberculosis, and hepatitis B and C. Consider screening for fungal infections, if indicated. Consultation to Infectious Diseases may be beneficial to help with screening.
[10] Non-formulary at MD Anderson except for infliximab or etanercept

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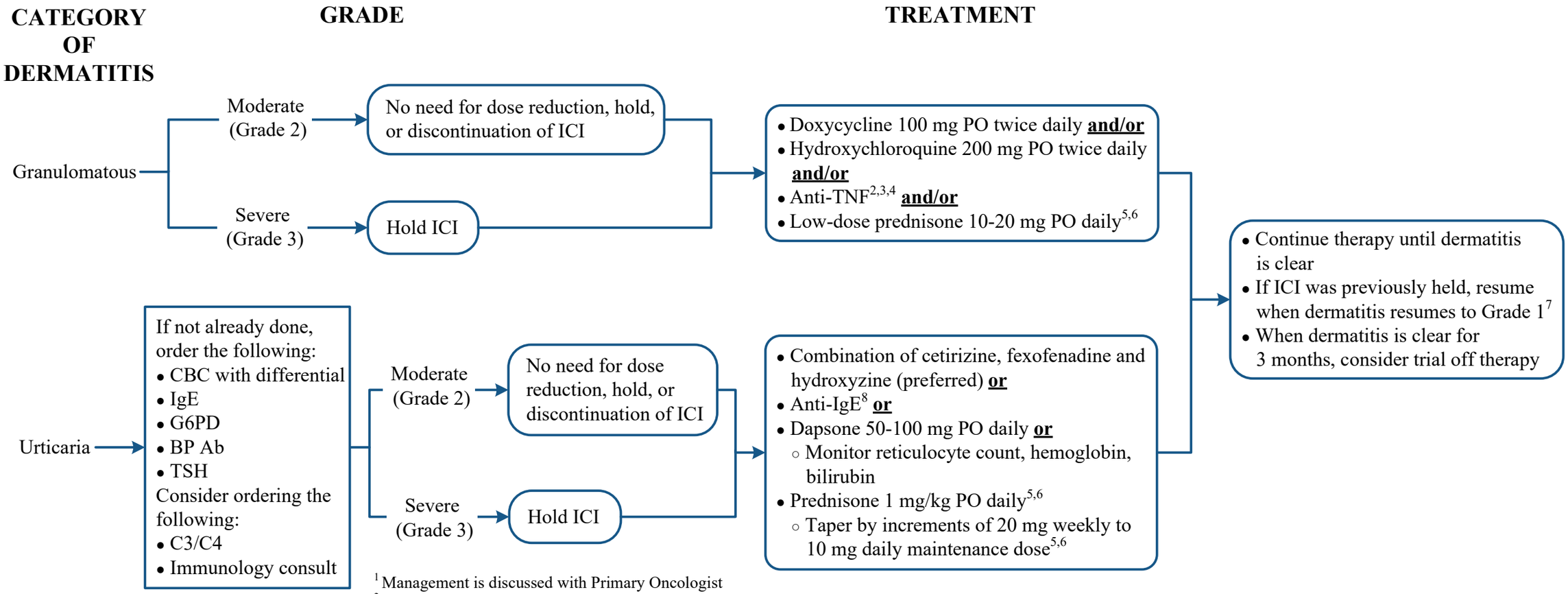
Evaluation and Management of Suspected Immune-Mediated Dermatologic Toxicities

DERMATITIS MANAGEMENT[1] - continued



BP Ab = bullous pemphigoid antibody
C3/C4 = Complement 3/4
G6PD = glucose-6-phosphate dehydrogenase
ICI = immune checkpoint inhibitor
IgE = Immunoglobulin E
TNF = tumor necrosis factor
TSH = thyroid stimulating hormones

[1] Management is discussed with Primary Oncologist
[2] FDA approved dosing for psoriasis
[3] Screening tests include HIV, T-spot tuberculosis, and hepatitis B and C. Consider screening for fungal infections, if indicated. Consultation to Infectious Diseases may be beneficial to help with screening.
[4] Non-formulary at MD Anderson except for infliximab or etanercept
[5] Initiate *Pneumocystis jiroveci* pneumonia (PJP) prophylaxis for prednisone doses equivalent to ≥ 20 mg for 3 weeks or more. Continue prophylaxis for one month after completion of taper.
[6] Consider Endocrine consult for diabetes management and/or adrenal insufficiency workup
[7] Patient may have mild flare-up between ICI infusions but should completely clear between infusions
[8] FDA dosing for chronic urticaria

Evaluation and Management of Suspected Immune-Mediated Dermatologic Toxicities

PRURITUS WITHOUT RASH MANAGEMENT

PRESENTATION

Patient presents with pruritus without visible rash after initiation of ICI[1] up to 12 months after last dose of ICI without other identifiable causes

ASSESSMENT

Systemic workup for pruritus causes:
- CBC with differential
- CMP
- TSH
- Stool ova and parasite (O&P), if clinically indicated

Are all labs within normal limits?

Yes

Referral to Dermatology

Consider:
- Labs:
  - BP Ab
  - IgE
- Procedures:
  - Skin biopsy
  - Check for dermatographism
  - Scabies prep

Is this identified dermatitis or bullous disorder?

Yes

Refer to Pages 4-5 for dermatitis management and Pages 7-8 for bullous dermatoses management

No

No

If treatable abnormality, address identifiable cause, reassess for improvement in two months after treatment initiated

Is pruritus still present?

Yes

Return to "Referral to Dermatology"

No

Monitor patient as needed duration of ICI therapy

TREATMENT

- Optimize OTC topicals: Sarna®, bland emollients, capsaicin **and/or**
- Optimize oral antihistamines (combination of non-drowsy antihistamines: cetirizine 10 mg and fexofenadine 180 mg PO daily in the morning and drowsy antihistamines: hydroxyzine 25-50 mg daily at bedtime)
- Consider adding:
  - Gabapentin 100 mg twice daily and increase as tolerated to 600 mg 3 times a day
  - Anti-IL-4[2] off-label indication; use atopic dermatitis dosing

Monitor patient at 3 month intervals for duration of ICI therapy

CMP = comprehensive metabolic panel
BP Ab = bullous pemphigoid antibody
ICI = immune checkpoint inhibitor
IgE = Immunoglobulin E
OTC = over the counter
TSH = thyroid stimulating hormones

[1] PD-1 inhibitors (pembrolizumab, nivolumab, cemiplimab, dostarlimab), PD-L1 inhibitors (atezolizumab, avelumab, durvalumab), CTLA-4 inhibitor (ipilimumab, tremelimumab)
[2] Non-formulary at MD Anderson

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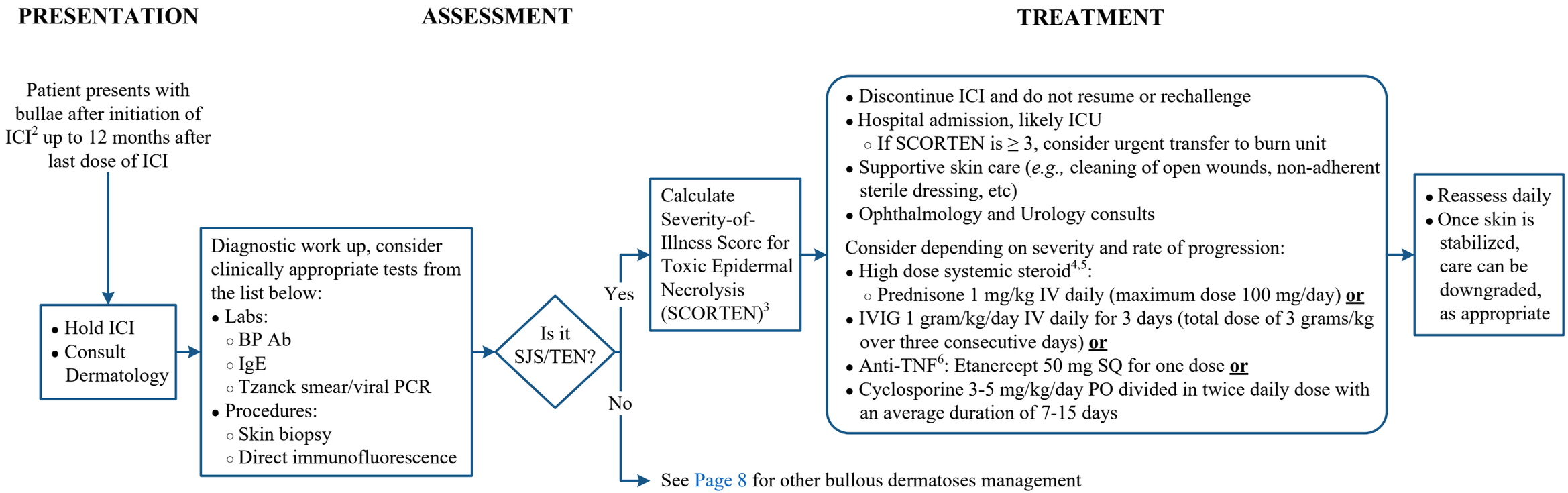
BULLOUS DERMATOSES MANAGEMENT[1]

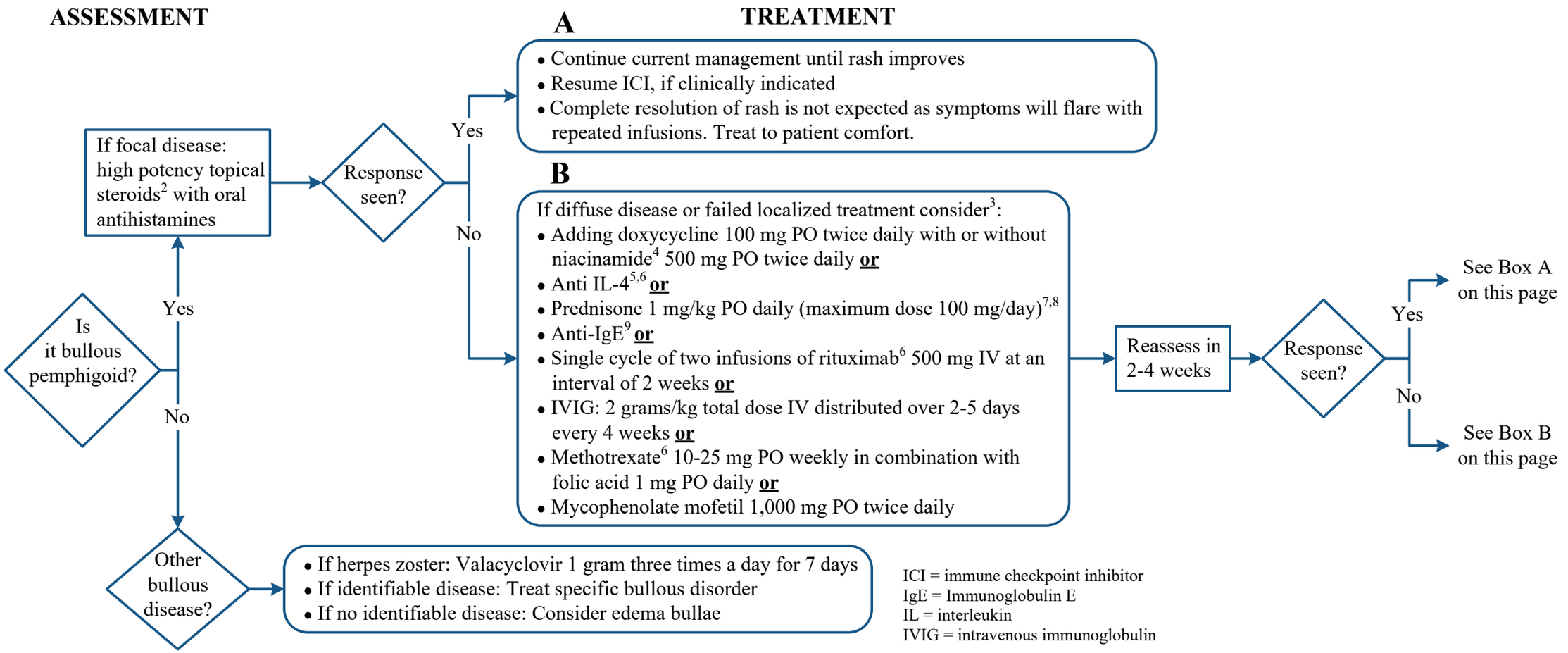


BP Ab = bullous pemphigoid antibody
ICI = immune checkpoint inhibitor
IgE = Immunoglobulin E
IVIG = intravenous immunoglobulin
SJS = Stevens-Johnson syndrome
TEN = toxic epidermal necrolysis
TNF = tumor necrosis factor

[1] Management is discussed with Primary Oncologist
[2] PD-1 inhibitors (pembrolizumab, nivolumab, cemiplimab, dostarlimab), PD-L1 inhibitors (atezolizumab, avelumab, durvalumab), CTLA-4 inhibitor (ipilimumab, tremelimumab)
[3] Refer to Appendix C for SCORTEN scale
[4] Initiate *Pneumocystis jiroveci* pneumonia (PJP) prophylaxis for prednisone doses equivalent to ≥ 20 mg for 3 weeks or more. Continue prophylaxis for one month after completion of taper.
[5] Consider Endocrine consult for diabetes management and/or adrenal insufficiency workup
[6] Screening tests include HIV, T-spot tuberculosis, and hepatitis B and C. Consider screening for fungal infections, if indicated. Consultation to Infectious Diseases may be beneficial to help with screening.

Evaluation and Management of Suspected Immune-Mediated Dermatologic Toxicities

BULLOUS DERMATOSES MANAGEMENT[1] - continued



ICI = immune checkpoint inhibitor
IgE = Immunoglobulin E
IL = interleukin
IVIG = intravenous immunoglobulin

[1] Management is discussed with Primary Oncologist
[2] High potency for body and low potency for face/genital areas. Refer to Appendix B for classes of topical steroids.
[3] Evaluate the patient's disease status and the potential need for ICI rechallenge in cancer management
[4] Non-formulary at MD Anderson
[5] FDA dosing for atopic dermatitis
[6] Screening tests include HIV, T-spot tuberculosis, and hepatitis B and C. Consider screening for fungal infections, if indicated. Consultation to Infectious Diseases may be beneficial to help with screening.
[7] Initiate *Pneumocystis jiroveci* pneumonia (PJP) prophylaxis for prednisone doses equivalent to ≥ 20 mg for 3 weeks or more. Continue prophylaxis for one month after completion of taper.
[8] Consider Endocrine consult for diabetes management and/or adrenal insufficiency workup
[9] FDA dosing for chronic urticaria

APPENDIX A: Common Terminology Criteria for Adverse Events (CTCAE) Version 5.0

Skin and Subcutaneous Tissue Disorders					
CTCAE Term	**Grade 1**	**Grade 2**	**Grade 3**	**Grade 4**	**Grade 5**
Rash maculo-papular	Macules/papules covering < 10% BSA with or without symptoms (*e.g.,* pruritus, burning, tightness)	Macules/papules covering 10-30% BSA with or without symptoms (*e.g.,* pruritus, burning, tightness); limiting instrumental ADL; rash covering > 30% BSA with or without mild symptoms	Macules/papules covering > 30% BSA with moderate or severe symptoms; limiting self care ADL	N/A	N/A

ADL = activities of daily living
BSA = body surface area

APPENDIX B: Class (Potency) of Topical Corticosteroids

High potency topical corticosteroids	Moderate potency topical corticosteroids	Low potency topical corticosteroids
• Clobetasol propionate (0.05%) • Betamethasone dipropionate (0.05%) • Halcinonide (0.1%)	• Desoximetasone (0.05%) • Triamcinolone acetonide (0.1%) • Fluocinonide acetonide (0.025%)	• Desonide (0.05%) • Hydrocortisone acetate (2.5%)

APPENDIX C: Severity-of-Illness Score for Toxic Epidermal Necrolysis (SCORTEN) Scale

Risk Factor	Point
Age > 40 years old	1 Point
Malignancy	1 Point
Heart rate > 120 beats per minute	1 Point
Initial epidermal detachment BSA > 10%	1 Point
Serum urea > 10 mmol/L	1 Point
Serum glucose > 14 mmol/L	1 Point
Bicarbonate < 20 mmol/L	1 Point

Score Range: 0-7

SCORTEN Score Interpretation

Number of Risk Factors	Mortality Rate
0 or 1	3.2%
2	12.1%
3	35.3%
4	58.3%
5 or more	> 90%

SUGGESTED READINGS

Altan, M., & Patel, A. B. (2021). Management of cutaneous immunotherapy toxicities. *Clinical Lung Cancer, 22*(5), e783. https://doi.org/10.1016/j.cllc.2021.02.017

Barrios, D. M., Phillips, G. S., Geisler, A. N., Trelles, S. R., Markova, A., Noor, S. J., . . . Lacouture, M. E. (2021). IgE blockade with omalizumab reduces pruritus related to immune checkpoint inhibitors and anti-HER2 therapies. *Annals of Oncology, 32*(6), 736-745. https://doi.org/10.1016/j.annonc.2021.02.016

Bastuji-Garin, S., Fouchard, N., Bertocchi, M., Roujeau, J.-C., Revuz, J., & Wolkenstein, P. (2000). SCORTEN: A Severity-of-Illness Score for Toxic Epidermal Necrolysis. J*ournal of Investigative Dermatology, 115*(2), 149-153. https://doi.org/10.1046/j.1523-1747.2000.00061.x

Brown, A. M., Masterson, W., Lo, J., & Patel, A. B. (2023). Systemic treatment of cutaneous adverse events after immune checkpoint inhibitor therapy: A review. *Dermatitis, 34*(3), 201-208. https://doi.org/10.1097/der.0000000000000776

Bur, D., Patel, A. B., Nelson, K., Huen, A., Pacha, O., Phillips, R., & Heberton, M. (2022). A retrospective case series of 20 patients with immunotherapy-induced bullous pemphigoid with emphasis on management outcomes. *Journal of the American Academy of Dermatology, 87*(6), 1394-1395. https://doi.org/10.1016/j.jaad.2022.08.001

Chen, W. S., Tetzlaff, M. T., Diwan, H., Jahan-Tigh, R., Diab, A., Nelson, K., . . . Curry, J. L. (2018). Suprabasal acantholytic dermatologic toxicities associated checkpoint inhibitor therapy: A spectrum of immune reactions from paraneoplastic pemphigus-like to Grover-like lesions. *Journal of Cutaneous Pathology, 45*(10), 764-773. https://doi.org/10.1111/cup.13312

Cheng, S., Kirtschig, G., Cooper, S., Thornhill, M., Leonardi-Bee, J., & Murphy, R. (2012). Interventions for erosive lichen planus affecting mucosal sites. C*ochrane Database of Systematic Reviews, 2015*(12), CD008092. https://doi.org/10.1002/14651858.CD008092.pub2

Cho, S. I., Lee, J., Lim, J., Park, J. S., Kim, M., Kim, T.-Y., . . . Jo, S. J. (2019). Pruritus in patients under targeted anticancer therapy: A multidimensional analysis using the 5-D itch scale. *Acta Dermato-Venereologica, 99*(4), 435-441. https://doi.org/10.2340/00015555-3129

Cubiró, X., Planas-Ciudad, S., Garcia-Muret, M. P., & Puig, L. (2018). Topical timolol for paronychia and pseudopyogenic granuloma in patients treated with epidermal growth factor receptor inhibitors and capecitabine. *JAMA Dermatology, 154*(1), 99-100. https://doi.org/10.1001/jamadermatol.2017.4120

Dobry, A. S., Himed, S., Waters, M., & Kaffenberger, B. H. (2022). Scoring assessments in Stevens-Johnson Syndrome and toxic epidermal necrolysis. *Frontiers in Medicine, 9*, 883121. https://doi.org/10.3389/fmed.2022.883121

Erickson, S., Nahmias, Z., Rosman, I. S., & Kim, B. S. (2018). Immunomodulating agents as antipruritics. *Dermatologic Clinics, 36*(3), 325-334. https://doi.org/10.1016/j.det.2018.02.014

Geller, S., Xu, H., Lebwohl, M., Nardone, B., Lacouture, M. E., & Kheterpal, M. (2018). Malignancy risk and recurrence with psoriasis and its treatments: A concise update. *American Journal of Clinical Dermatology, 19*(3), 363-375. https://doi.org/10.1007/s40257-017-0337-2

He, A., Alhariri, J. M., Sweren, R. J., Kwatra, M. M., & Kwatra, S. G. (2017). Aprepitant for the treatment of chronic refractory pruritus. *BioMed Research International, 2017*, 4790810. https://doi.org/10.1155/2017/4790810

Imadojemu, S., & Rosenbach, M. (2019). Advances in inflammatory granulomatous skin diseases. *Dermatologic Clinics, 37*(1), 49-64. https://doi.org/10.1016/j.det.2018.08.001

Johnson, D., Patel, A. B., Uemura, M. I., Trinh, V. A., Jackson, N., Zobniw, C. M., . . . Diab, A. (2019). IL17A blockade successfully treated psoriasiform dermatologic toxicity from immunotherapy. *Cancer Immunology Research, 7*(6), 860-865. https://doi.org/10.1158/2326-6066.cir-18-0682

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SUGGESTED READINGS - continued

Jour, G., Glitza, I. C., Ellis, R. M., Torres-Cabala, C. A., Tetzlaff, M. T., Li, J. Y., . . . Curry, J. L. (2016). Autoimmune dermatologic toxicities from immune checkpoint blockade with anti-PD-1 antibody therapy: a report on bullous skin eruptions. *Journal of Cutaneous Pathology, 43*(8), 688-696. https://doi.org/10.1111/cup.12717

Karri, P. V., Tahseen, D., & Patel, A. B. (2021). Treatment of checkpoint inhibitor–induced vitiligo in a patient with metastatic renal cell cancer. *Dermatitis, 32*(4), e68-e69. https://doi.org/10.1097/DER.0000000000000670

Keiser, M. F., Patel, A. B., & Altan, M. (2021). Cutaneous toxicities in lung cancer patients on immune checkpoint inhibitor therapy. *Clinical Lung Cancer, 22*(3), 195-200. https://doi.org/10.1016/j.cllc.2021.01.006

Kubicki, S. L., Welborn, M. E., Garg, N., Aung, P. P., & Patel, A. B. (2018). Granulomatous dermatitis associated with ipilimumab therapy (ipilimumab associated granulomatous dermatitis). *Journal of Cutaneous Pathology, 45*(8), 636-638. https://doi.org/10.1111/cup.13267

Liang, S. E., Hoffmann, R., Peterson, E., & Soter, N. A. (2019). Use of dapsone in the treatment of chronic idiopathic and autoimmune urticaria. *JAMA Dermatology, 155*(1), 90-95. https://doi.org/10.1001/jamadermatol.2018.3715

Lo, J., Hanania, H. L., Keiser, M. F., & Patel, A. B. (2023). Immune checkpoint inhibitor-induced vitiligo in cancer patients: Characterization and management. *Archives of Dermatological Research, 315*(6), 1697-1703. https://doi.org/10.1007/s00403-023-02577-7

Lo, J. J., Heberton, M. M., Pacha, O., Huen, A. O., & Patel, A. B. (2022). Biologic therapies for checkpoint inhibitor-induced cutaneous toxicities: A single-institution study of 17 consecutively treated patients. *Supportive Care in Cancer, 30*(2), 989-994. https://doi.org/10.1007/s00520-021-06548-4

Marques-Piubelli, M. L., Seervai, R. N. H., Mudaliar, K. M., Ma, W., Milton, D. R., Wang, J., . . . Curry, J. L. (2023). Gene expression profiling and multiplex immunofluorescence analysis of bullous pemphigoid immune-related adverse event reveal upregulation of toll-like receptor 4/complement-induced innate immune response and increased density of TH 1 T-cells. *Journal of Cutaneous Pathology, 50*(7), 661-673. https://doi.org/10.1111/cup.14442

Martel, J., Cho, W. C., Runge, J. S., Patel, A. B., Tayar, J., Woodman, K., . . . Heberton, M. (2022). Durvalumab-associated generalized morphea with overlapping vitiligo. *JAAD Case Reports, 30*, 83-86. https://doi.org/10.1016/j.jdcr.2022.10.007

Martel, J., Hanania, H. L., & Patel, A. B. (2023). Immune checkpoint inhibitor-induced cutaneous toxicities: A review of histopathologic and clinical features. *Human Pathology, 140*, 144-172. https://doi.org/10.1016/j.humpath.2023.04.016

Masterson, W. M., Brown, A. M., Al Ameri, M. A., & Patel, A. B. (2022). A retrospective chart review of management strategies for lichenoid eruptions associated with immune-checkpoint inhibitor therapy from a single institution. *Cancer Treatment and Research Communications, 30*, 100506. https://doi.org/10.1016/j.ctarc.2021.100506

McNally, M. A., Vangipuram, R., Campbell, M. T., Nagarajan, P., Patel, A. B., Curry, J. L., & Heberton, M. (2021). Paraneoplastic pemphigus manifesting in a patient treated with pembrolizumab for urothelial carcinoma. *JAAD Case Reports, 10*, 82-84. https://doi.org/10.1016/j.jdcr.2021.02.012

Messer, A., Drozd, B., Glitza, I. C., Lu, H., & Patel, A. B. (2020). Dermatomyositis associated with nivolumab therapy for melanoma: A case report and review of the literature. *Dermatology Online Journal, 26*(8), 1-8. https://doi.org/10.5070/D3268049887

Continued on next page

SUGGESTED READINGS - continued

Patel, A. B., Farooq, S., Welborn, M., Amaria, R. N., Chon, S. Y., Diab, A., . . . Haydu, L. E. (2022). Cutaneous adverse events in 155 patients with metastatic melanoma consecutively treated with anti-CTLA4 and anti-PD1 combination immunotherapy: Incidence, management, and clinical benefit. *Cancer, 128*(5), 975-983. https://doi.org/10.1002/cncr.34004

Patel, A. B., & Pacha, O. (2022). Skin reactions to immune checkpoint inhibitors. In A. Naing, & J. Hajjar (Eds.), Immunotherapy. Advances in experimental Medicine and Biology (volume 1342). Springer, Cham. https://doi.org/10.1007/978-3-030-79308-1_11

Phillips, G. S., Wu, J., Hellmann, M. D., Postow, M. A., Rizvi, N. A., Freites-Martinez, A., . . . Lacouture, M. E. (2019). Treatment outcomes of immune-related cutaneous adverse events. *Journal of Clinical Oncology, 37*(30), 2746-2758. https://doi.org/10.1200/jco.18.02141

Qian, J., Kubicki, S. L., Curry, J. L., Jahan-Tigh, R., Benjamin, R., Heberton, M., & Nelson, K. C. (2022). Pembrolizumab-induced rash in a patient with angiosarcoma. *JAAD Case Reports, 29*, 21-24. https://doi.org/10.1016/j.jdcr.2022.08.030

Rios, A., Cen, P., Dinh, B., Mays, S. R., & Patel, A. B. (2019). Dramatic response of nivolumab-associated psoriasiform dermatitis to etoposide. *European Journal of Cancer, 107*, 97-99. https://doi.org/10.1016/j.ejca.2018.11.025

Seervai, R. N. H., Heberton, M., Cho, W. C., Gill, P., Murphy, M. B., Aung, P. P., . . . Curry, J. L. (2022). Severe de novo pustular psoriasiform immune-related adverse event associated with nivolumab treatment for metastatic esophageal adenocarcinoma. *Journal of Cutaneous Pathology, 49*(5), 472-481. https://doi.org/10.1111/cup.14185

Stull, C., Lavery, M. J., & Yosipovitch, G. (2016). Advances in therapeutic strategies for the treatment of pruritus. *Expert Opinion on Pharmacotherapy, 17*(5), 671-687. https://doi.org/10.1517/14656566.2016.1127355

Thandar, Y., Maharajh, R., Haffejee, F., & Mosam, A. (2019). Treatment of cutaneous lichen planus (part 2): A review of systemic therapies. *The Journal of Dermatological Treatment, 30*(7), 633-647. https://doi.org/10.1080/09546634.2018.1544411

Thompson, J. A., Schneider, B. J., Brahmer, J., Andrews, S., Armand, P., Bhatia, S., . . . Scavone, J. L. (2019). Management of immunotherapy-related toxicities, version 1.2019. *Journal of the National Comprehensive Cancer Network, 17*(3), 255–289. https://doi.org/10.6004/jnccn.2019.0013

Tziotzios, C., Brier, T., Lee, J. Y. W., Saito, R., Hsu, C.-K., Bhargava, K., . . . McGrath, J. A. (2018). Lichen planus and lichenoid dermatoses: Conventional and emerging therapeutic strategies. *Journal of the American Academy of Dermatology, 79*(5), 807-818. https://doi.org/10.1016/j.jaad.2018.02.013

Welborn, M., Kubicki, S. L., Garg, N., & Patel, A. B. (2018). Retrospective chart review of cutaneous adverse events associated with tremelimumab in 17 Patients. *American Journal of Clinical Dermatology, 19*(6), 899-905. https://doi.org/10.1007/s40257-018-0376-3

Welborn, M., Kubicki, S. L., Garg, N., & Patel, A. B. (2020). Twelve cases of acneiform eruptions while on anti-CTLA4 therapy. *Supportive Care in Cancer, 28*(6), 2499-2502. https://doi.org/10.1007/s00520-020-05381-5

Welborn, M. E., Kubicki, S. L., & Patel, A. B. (2018). Pyoderma gangrenosum following initiation of immune checkpoint inhibitor therapy. *Journal of Immunotherapy and Precision Oncology, 1*(2), 82-84. http://doi.org/10.4103/JIPO.JIPO_11_18

Wu, J., & Lacouture, M. E. (2018). Pruritus associated with targeted anticancer therapies and their management. *Dermatologic Clinics, 36*(3), 315-324. https://doi.org/10.1016/j.det.2018.02.010

DEVELOPMENT CREDITS

This practice consensus statement is based on majority opinion of the Immune-mediated Dermatologic Toxicity experts at the University of Texas MD Anderson Cancer Center for the patient population. These experts included:

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