rmatology books, visit our website www.jaypeebrothers.com, for detailed information on dermatology books





Management of Psoriasis

Neena Khanna
Sachin Gupta
Bela Bhat
Vichitra

JAYPEE

Contents

Section 1: Pathogenesis and Clinical Features

1. Epidemiology 3
2. Pathogenesis 5
3. Mucocutaneous Manifestations 14
4. Nail Changes 45
5. Arthritis 52
6. Comorbidities 57

SECTION 2: Diagnosis and Treatment

7. Investigations 63
8. Differential Diagnosis 70
9. General Principles of Treatment 81
10. Topical Therapy 83
11. Phototherapy and Photochemotherapy 102
12. Systemic Therapy 129
13. Biologicals Therapy 171
14. Combination Therapy 194
15. Approach to a Patient with Psoriasis 200

SECTION 3: Annexures

16. Annexures 207

Index 227

CHAPTER

11

Phototherapy and Photochemotherapy

JAYPEE BROTHERS

Introduction

Phototherapy is the use of nonionizing radiation for therapeutic benefit while photochemotherapy is the use of light in the presence of chemicals for the same purpose. The methods available include:

- Heliotherapy and balneophototherapy
- Broad band ultraviolet B (UVB)
- Narrow band UVB
- Lasers
- Ultraviolet A (UVA)-1
- Psoralen plus ultraviolet A (PUVA)/PUVA sol.

Heliotherapy and Balneophototherapy

- *Heliotherapy:* It is the use of sunlight in the treatment of various dermatoses because Sun is a rich source of both UVA and UVB. Since psoriasis is responsive to therapy with UVA and UVB, heliotherapy is one of the safest alternatives in the treatment of psoriasis, in the modern world of aggressive medications.
- *Balneophototherapy:* It uses saltwater bathing in combination with heliotherapy.

Dead Sea Therapy

Basis of Dead Sea Therapy

The Dead Sea is a popular location for balneophototherapy because:

- Sun shines almost constantly for 300 days in a year.
- The Dead Sea is the lowest point (>396 m below sea level) in the world, with high oxygen pressure.[1]

[1]Because of high atmospheric pressure.

- Even after prolonged exposure, the risk of developing sunburn is low because the sun rays falling on the Dead Sea contain mainly UVA and longer wavelengths of UVB and very little of erythemogenic short wavelength UVB because:
  - Shorter wavelengths of UVB[2] are filtered out by the atmosphere which is thick[3] and contains large amount of water vapor.
  - Shorter wavelengths of UVB are also scattered more than longer wavelength ultraviolet light (UVL).
- The Dead Sea has an average salinity of 30% and is very rich in natural minerals and other chemicals, e.g., the Dead Sea water contains about 2.3 g/L of bromine. The salts present probably have a keratolytic effect and also enhance the effect of UV radiation (UVR) on the skin.
- Rest and relaxation further contribute to the treatment success.

Response

- Recommended duration of the Dead Sea therapy is 3–4 weeks.[4]
- Two-thirds of psoriatic patients either go into remission or show excellent response and only 2% show no improvement—these are patients with resistant psoriasis such as erythroderma, pustular psoriasis, or palmoplantar psoriasis.

Broad Band Ultraviolet B Therapy

Broad band (BB) UVB is UVR with wavelength of 270–390 nm.

Treatment Protocols

- Broad band-ultraviolet B (BB-UVB) has been used in a thrice weekly schedule, after application of emollients.
- *Goeckerman's regimen:* BB-UVB therapy is used in combination with coal tar as part of Goeckerman's regimen.
- *Combination therapy:* BB-UVB is also used in combination with several other topical and systemic antipsoriatic agents such as

[2]*Short wavelength UVB*: It causes erythema and sunburn.
[3]The Dead Sea is the lowest point in the world.
[4]The stay of 3–4 weeks works out cheaper than hospitalization. So, the visit to the Dead Sea is a therapeutic holiday.

JAYPEE BROTHERS

anthralin, calcipotriol, tazarotene, topical steroids, acitretin, and methotrexate in patients with moderate-to-severe disease.

Adverse Effects

Acute

The only significant short-term side effect is erythema.

Chronic

The important long-term side effect is photoaging.

Narrow Band Ultraviolet B Therapy

Wavelength

- The wavelength of therapeutic UVR for psoriasis is 290–320 nm with the best optimal therapeutic index[5] at 312 nm. This is because shorter wavelengths are more erythemogenic and longer wavelengths less therapeutic.
- Narrow band-ultraviolet B (NB-UVB) is UVR with wavelength of 311 ± 2 nm. It is produced by fluorescent lamps (Philips TL-01), coated with phosphor which emits UVR with a peak emission at 311 nm (± 2 nm) and a minor peak at 305 nm.

Mechanism of Action

Narrow band-ultraviolet B has immunosuppressive properties and acts in psoriasis by:

- Depleting the immunocompetent T-cells from the epidermis and dermis by inducing apoptosis[6] due to direct cytotoxic effect on the infiltrating lymphocytes.
- Suppressing the function of antigen presenting cells (Langerhans' cells) by causing photoisomerization of trans to cis-urocanic acid.
- Lowering the peripheral NK cell activity.
- Inhibiting cytokine production by both Th1 (IL-2, IFN-γ) and Th2 (IL-10) cells.

[5]*Optimal therapeutic dose*: It is defined as the lowest fraction of minimal erythema dose required to remit psoriatic lesions.
[6]*Apoptosis*: Programmed cell death.

JAYPEE BROTHERS

It is more effective than BB-UVB because:

- Of its deeper penetration
- Higher doses (more joules/exposure) of NB-UVB can be delivered to the patient, due to its lower erythemogenic potential than BB-UVB.[7]

Side Effects

The following side effects may be encountered during NB-UVB therapy:

- *Dry skin:* Dryness and itching is not uncommon but can easily be treated with liberal use of emollients and antihistamines.
- *Acute sunburn*: Mild erythema occurs occasionally, but a burn (intense erythema, edema, or bullae formation) is rare. Burns should be treated with:
  - Application of ice packs
  - Oral nonsteroidal anti-inflammatory drugs
  - Topical steroids
  - Subsequent scheduled NBUVB treatment should be avoided and later follow the missed appointment schedules as given on page 108.
  - Adjustment of future doses of UVB.
- *Pigmentation:* Tanning and freckling occur occasionally but are less common than with PUVA therapy. Prevented by protecting uninvolved skin.
- *Folliculitis:* Use of emollients compounded by warmth and perspiration which occurs during the therapy, leads to blocking and irritation of the hair follicles.
- Long-term studies regarding development of skin cancers are not available but are probably only a remote possibility.

Use in Psoriasis

Indications

Narrow band-ultraviolet B is indicated in:

- Moderate-to-severe psoriasis involving >20% body surface area and/or Psoriasis Area and Severity Index (PASI) score of >10.
- Long standing psoriasis, not responding to conventional topical medical treatment.

[7]BB-UVB contains substantial amount of the more erythemogenic UV, i.e., shorter wavelengths around 290–300 nm.

JAYPEE BROTHERS

- Psoriasis in patients in whom antipsoriasis drugs are contraindicated, e.g., pregnancy.

Contraindications

Narrow band-ultraviolet B should not be given in patients with:

- Photoaggravated psoriasis
- Photosensitivity disorders such as systemic lupus erythematosus, Bloom's syndrome, etc.
- History of previous cutaneous malignancies
- Unsure about attending the treatment schedule regularly

Treatment Protocols

Two protocols are followed for NB-UVB:

- Minimal erythema dose (MED)-based
- Skin phototype-based

Minimal Erythema Dose-based Protocol

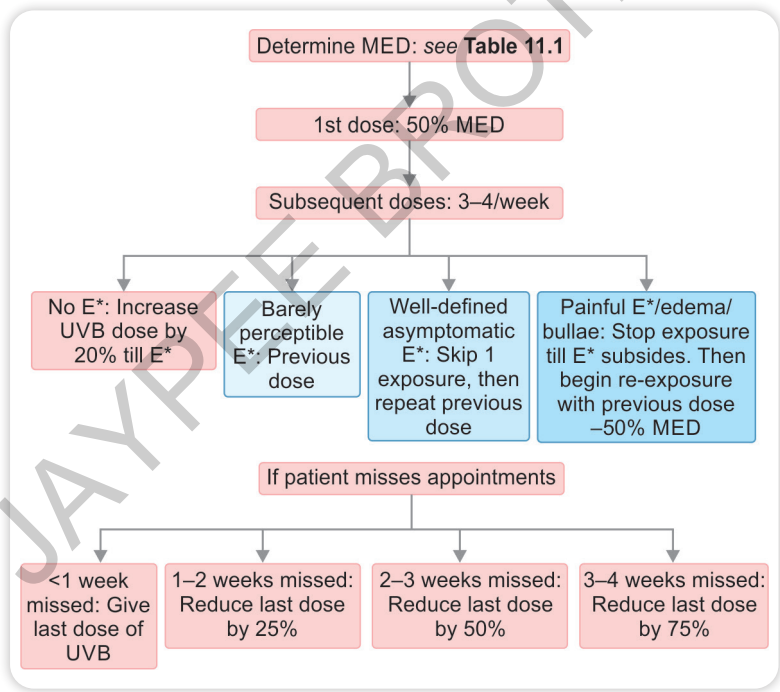
- *Pretreatment assessment:*
  - A thorough medical history, physical examination, and clinical assessment of the patient, including PASI score, is necessary.
  - *Determination of MED*:[8] Prior to therapy, MED for NB-UVB is determined in each patient:
    - Determined on unaffected upper back or volar aspect of forearm (always sun protected area).
    - The test sites are irradiated with increasing doses **(Table 11.1)** of UVB (311 nm). For Indian patients, (skin types IV, V, and VI), 500, 750, 1,000, 1,200, 1,400, 1,600, 1,800, and 2,000, mJ/cm^2 is a sensitive dose ladder to determine MED.
    - Exposed sites are examined at 24 hours and the minimum dose of UVB which causes visual erythema is taken as MED. Erythema should be identifiable and within the margin of photo-tested parts.
- *Dose of NB-UVB* **(Flowchart 11.1)**: Schedule usually used for NB-UVB is a MED-based, low percentage incremental, 3–4 times

[8]*MED*: It is the minimum dose of UVB that produces faint uniform erythema at 24 hours.

JAYPEE BROTHERS

TABLE 11.1: Dose (mJ/cm^2) of narrow band-ultraviolet B (NB-UVB) given to determine minimal erythema dose (MED).

Skin phototypes I–III	Skin phototypes IV–VI
400	500
600	750
800	1,000
1,000	1,200
1,200	1,400
1,400	1,600
	1,800
	2,000



E*: Erythema

Flowchart 11.1: Minimal erythema dose (MED)-based protocol for narrow band-ultraviolet B (NB-UVB) therapy.

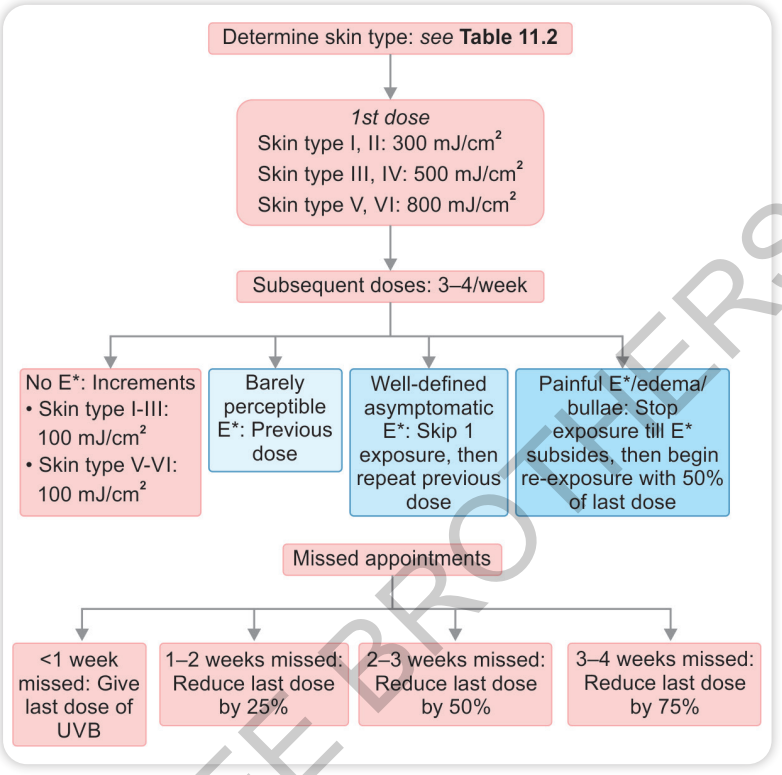
JAYPEE BROTHERS

a week regimen. The dosage of NB-UVB should never exceed four times MED.
  - *Initial dose of UVB:* 50–70% of MED. Safest to begin with 50% of MED.
  - *Increments of UVB:* At each visit the dose of NB-UVB is increased, based on the erythema response to the previous dose:
    - *No erythema:* 20% increment at next visit.
    - *Grade 1 erythema* (barely perceptible erythema):
      - Repeat previous dose
    - *Grade 2 erythema* (well-defined asymptomatic erythema):
      - Skip one exposure
      - Repeat previous dose at next visit
    - *Grade 3 erythema*: Painful erythema, persisting for >24 hours, edema, or bullae:
      - No further exposure till erythema has subsided.
      - When treatment is restarted, UVB dose is reduced by 50% of patient's MED.
- *Missed appointments:*
  - *If <1 week missed*: Give the last dose of UVB.
  - *1–2 weeks missed*: Reduce last dose by 25%.
  - *2–3 weeks missed*: Reduce last dose by 50%.
  - *3–4 weeks missed:* Start from beginning.
- *End point of treatment:* The treatment is stopped either when:
  - Lesions have cleared.
  - Are in a state of minimal activity for four treatments.

Skin Phototype-based Protocol (Flowchart 11.2)

- *Pretreatment assessment:*
  - A thorough medical history, physical examination, and clinical assessment of the patient, including PASI score, is necessary.
  - *Determination of skin phototype of patient:* This is based on the tanning and burning ability of patient's skin **(Table 11.2)**.
- *Dose of NB-UVB:* Prefixed in this protocol, the dose used is based on skin color.
  - *Initial dose of UVB:* It is based on the skin phototype **(Table 11.3)**.
  - *Increments of UVB:* At each visit, the dose of NB-UVB is increased based on erythema response to the previous dose:

JAYPEE BROTHERS



E*: Erythema

Flowchart 11.2: Skin phototype-based protocol for narrow band-ultraviolet B (NB-UVB) therapy.

TABLE 11.2: Determination of skin phototype.

Skin phototype	Constitutive skin color	Ability to burn	Ability to tan
I	White	High	Very poor
II	White	High	Poor
III	White	Moderate	Good
IV	Olive	Low	Very good
V	Brown	Very low	Very good
VI	Black	Very low	Excellent

JAYPEE BROTHERS

TABLE 11.3: Initial dose of narrow band-ultraviolet B (NB-UVB) for treatment of psoriasis based on skin phototype.

Skin phototype	Initial dose (mJ/cm^2)
I, II	300
III, IV	500
V, VI	800

TABLE 11.4: Increments of dose of narrow band-ultraviolet B (NB-UVB) for treatment of psoriasis based on skin phototype.

Skin type	Increment (mJ/cm^2)
I–IV	100
V–VI	150

- *No erythema:* Increment as per **Table 11.4**.
- *Grade 1 erythema* (barely perceptible erythema): Previous dose
- *Grade 2 erythema* (well-defined asymptomatic erythema):
  - Skip one exposure
  - Repeat previous dose at next visit
- *Grade 3 erythema*: Painful erythema, persisting for >24 hours, edema, or bulla:
  - No further exposures till erythema has subsided.
  - When treatment is restarted, UVB dose is reduced to half of last dose.
  - Followed by increments as mentioned in **Table 11.4**.
- *Missed appointments:* As for MED-based protocol (page 108).
- *End point of treatment:* The treatment is stopped as for the MED-based protocol.
- *The maximum dosage of NB-UVB:* Should not exceed 3,000 and 5,000 mJ in skin type IV–VI respectively.

Maintenance Therapy

If psoriasis has cleared by >95%.

- 1 exposure/week of NB-UVB for 4 weeks, keeping the dose same, as the last dose.
- 1 exposure/2 weeks of NB-UVB for 4 weeks, at 75% of highest dose of UVB.
- 1 exposure/4 weeks of NB-UVB, at 50% of highest dose of UVB.

JAYPEE BROTHERS

Instructions to Patients

- Patients are advised to stop all oral and topical medications that increase cutaneous photosensitivity. Most common being: non steroidal anti-inflammatory drugs (NSAIDs), retinoids, antibiotics (sulphonamides, tetracycline, demeclocycline, quinolones), antihypertensives (ACE inhibitors, calcium channel blockers, hydrochlorothiazide) cardiovascular drugs (amiodarone), phenothiazines, etc. Newer drugs include BRAF inhibitors like vemurafenib and EGFR inhibitors.
- Adjuvant treatment is restricted to emollients (except on scalp, face and in flexures, where conventional therapy can be continued).
- Before exposure to UVB, patients are instructed to apply mineral oil, Vaseline or petrolatum to the psoriatic plaques, to reduce scattering of light. However, preparations containing salicylic acid[9] and calcipotriol[10] should be avoided.
- Eyes, breasts, genitals, and chronically photoexposed areas are protected during phototherapy unless lesions are present at these sites. Eyes are protected using UV protective goggles while breasts and genitalia are protected using a sunscreen as well as wearing garments.

Advantages

It has several advantages over PUVA therapy:

- Absence of drug-induced nausea
- No phototoxicity or photoallergic reaction
- Lesser darkening of skin
- No drug cost
- Safe for use in children and pregnant women
- Does not require posttreatment eye protection
- Low/no risk of cutaneous malignancies
- No waiting period between drug and exposure

Also has several advantages over BB-UVB therapy:

- Less frequent episodes of painful erythema and burning
- Lower risk of photocarcinogenesis

[9]*Salicylic acid*: It acts as a sunscreen but may even increase photosensitivity.
[10]*Calcipotriol*: It may be applied after the day's photoexposure.

JAYPEE BROTHERS

- Faster resolution of skin lesions, using easy-to-administer, sub-erythemogenic doses
- Longer duration of remissions

Disadvantages

- May be less effective in thick lesions because of lower penetration, (*c.f.* PUVA therapy more effective).
- More frequent maintenance therapy (usually weekly) generally required than with PUVA (even as infrequent as monthly).

Sources of Narrow Band-Ultraviolet B

- Narrow band-ultraviolet B phototherapy chambers contain fluorescent TL-01/PL-01 tubes or compact fluorescent tubes (CFLs) as the source of irradiation and are available either as factory assembled units (Waldmann, National Biological Corporation, etc.) or can be customized at site with the cost of the chamber and lamps varying considerably between countries and brands.
- Tubes are available as Philips TL-01 series in 6'(100W), 4'(40W), and 2'(20W) and the compact fluorescent lights (CFLs) are available as Philips PL series as long (36W) and short (9W) CFLs. Some of these tubes can be used to convert BB-UVB (using FS or FSX series of Philips tubes) or UVA chambers (using F series of Philips tubes) to NB-UVB chambers.
- Longer 6' tubes are used for whole body cabinets, while 4' used for partial body exposure and the 2' tubes and CFLs used for treatment of small areas (hand and foot units for palmoplantar psoriasis and combs for scalp psoriasis). Sleek foldable home units are also available. The TL-01 lamps can be incorporated in the equipment either alone or in combination with UVA tubes. Combination chambers take longer to administer a treatment dose and so, although they provide flexibility, they may represent an unsatisfactory compromise for a busy phototherapy unit.

Home Narrow Band-Ultraviolet B

For patients who cannot travel to a phototherapy center. Hand-held devices are available for home use.

JAYPEE BROTHERS

Laser Therapy

Excimer Laser

- Available as Xtrac ultra® and Xtrac velocity excimer laser.
- Emits monochromatic light at 308 nm with spot size of 3.2 cm^2 using a handheld device.
- Minimal erythema dose is determined and multiples (2–6 times) of MED delivered to site to be treated. Light delivered either in paint mode or tile mode.
- Total of 8–10 treatments given, as twice weekly exposures are adequate for clearance of plaques.
- Side effects are minimal and localized (blistering, hyperpigmentation) but data on long-term remissions unavailable.

Pulsed Dye Laser

- The Food and Drug Administration (FDA) approved for treating localized plaques of psoriasis.
- Destroy the tiny blood vessels that contribute to formation of psoriasis plaques.
- Given as 15–30-minute sessions every 3 weeks. Patient responds in 4–6 sessions.
- The commonest side effect is bruising and a small risk of scarring.

Photochemotherapy

Photochemotherapy is the therapeutic use of a combination of UVA (wavelength 320–400 nm) with a photosensitizing chemical (psoralens).

History

- History of photochemotherapy dates back to over 2000 years with discovery in Egypt of seeds of plant *Ammi majus* which grew on the banks of the river Nile.
- The usefulness of this plant in vitiligo was demonstrated as recently as 1947 by an Egyptian dermatologist, El Mofty and the active chemical was identified as methoxsalen (8-methoxypsoralen).

JAYPEE BROTHERS

for detailed information on dermatology books, visit our website **www.jaypeebrothers.com**, for detailed infor

Management of Psoriasis

Salient Features

- *Comprehensive coverage:* In-depth discussion on the management of psoriasis across various skin types and healthcare settings.
- *Updated treatment options:* Includes the latest advancements in pharmaceutical treatments, with a focus on new drugs and biological agents.
- *Practical approach:* Emphasizes practical, step-by-step guidance for diagnosing and managing psoriasis effectively.
- *Recent guidelines:* Features the most recent guidelines for monitoring patients on new therapies, ensuring safe and effective use of medication.
- *Monitoring flowcharts:* Introduces new flowcharts for the monitoring of drug therapies, providing clear, visual guidance for clinicians.
- *Enhanced visuals:* Contains updated clinical pictures and illustrations to aid in the accurate assessment and treatment planning.

Neena Khanna is currently the Professor and Head of the Department of Dermatology and Venereology at Amrita Hospital, Faridabad, Haryana, India. She brings a wealth of experience from her nearly four-decade tenure at the All India Institute of Medical Sciences (AIIMS), New Delhi, where she served in various capacities, including as Dean (Academics) and Professor and Head of the same department. Dr Khanna is a graduate of the renowned Christian Medical College, Vellore, Tamil Nadu, and completed her postgraduate studies at AIIMS, New Delhi.

As an astute clinician and a prolific researcher, Dr Khanna has authored the widely acclaimed undergraduate textbook "Illustrated Synopsis of Dermatology and Sexually Transmitted Diseases." Her extensive work includes over 170 publications in indexed journals and delivering more than 200 lectures worldwide.

Bela Bhat is an Assistant Professor and Consultant in Dermatology at Amrita Hospital, Faridabad, Haryana with over 9 years of experience. She completed her MBBS and MD in Dermatology, Venereology, and Leprosy from Government Medical College, Jammu. Known for her compassionate approach to patient care, she is highly skilled in diagnosing and managing various skin conditions, tailoring treatments to individual patient needs. Her areas of expertise include laser treatments for hair removal, pigmentation, scar reduction, and chemical peels. She is particularly adept at treating chronic skin conditions such as vitiligo, psoriasis, and autoimmune disorders. Her research and patient-centered approach reflect her commitment to advancing dermatological science while promoting holistic skin health.

Sachin Gupta earned his MBBS and MD in Dermatology from AIIMS Delhi, followed by a DNB in Dermatology from the National Board of Examinations. He is currently a Senior Resident at Amrita Hospital, Faridabad, Haryana where he focuses on treating chronic skin conditions, with a particular interest in pediatric dermatology. Dr Gupta has several publications to his credit and is actively involved in AI-driven research aimed at improving dermatological outcomes. Alongside his clinical work, he is passionate about teaching and mentoring medical students, helping them gain practical dermatological expertise.

Vichitra is a Senior Resident at Amrita Hospital, Faridabad, Haryana, India. She completed her MBBS from Kasturba Medical College (KMC), Manipal, and her MD in Dermatology from ELMC&H, Lucknow, Uttar Pradesh. Specializing in clinical and aesthetic dermatology and dermatosurgery, Dr Vichitra is known for her compassionate care and personalized treatment plans. She is actively involved in academic activities, research, and clinical trials, with numerous published papers in academic journals, as well as poster and oral presentations. Staying up-to-date with the latest advancements, she ensures her patients receive the best possible care for their skin health and well-being.

Printed in India

Available at all medical bookstores or buy online at www.ejaypee.com

JAYPEE BROTHERS
Medical Publishers (P) Ltd.
EMCA House, 23/23-B, Ansari Road,
Daryaganj, New Delhi - 110 002, INDIA
www.jaypeebrothers.com

Join us on facebook.com/JaypeeMedicalPublishers
Follow us on instagram.com/JaypeeMedicalPublishers

Shelving Recommendation
DERMATOLOGY

ISBN 978-93-5696-767-0