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A Comparison of International Management Guidelines for Hidradenitis Suppurativa

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Abstract
Hidradenitis suppurativa (HS) is a chronic inflammatory dermatosis that imparts a significant burden on patients and presents a management challenge for healthcare providers. As attention to this debilitating condition has grown over recent years, our understanding of HS pathogenesis and optimal treatment approaches continues to evolve. Nine HS treatment guidelines developed by various expert organizations have been published, encompassing therapeutic modalities ranging from topical agents to systemic therapies to procedural interventions. These guidelines demonstrate significant overlap in treatment recommendations and have all been published within the last 5 years. Therefore, we aim to compare and synthesize the recommendations of international HS treatment guidelines and to encourage inter-organizational communication for the development of consensus or staggered publication of recommendations for HS management.

Introduction

Hidradenitis suppurativa/acne inversa (HS) is a chronic, inflammatory, recurrent, debilitating skin disease of the terminal hair follicle that usually occurs after puberty and presents as painful, deep-seated, inflamed lesions in the apocrine gland-bearing areas of the body, most commonly the axillae, inguinal, and anogenital regions (Dessau definition, 1st International Conference on Hidradenitis suppurativa/Acne inversa, March 30–April 1, 2006, Dessau, Germany) [1, 2]. The estimated prevalence of HS varies from 0.05 to 4.1% [3], with a recent study of a heterogeneous population-based sample in the USA showing a prevalence of 0.1% [4], although true prevalence may be higher due to historic underdiagnosis and delayed time to accurate diagnosis. While the pathogenesis of HS has yet to be fully elucidated, a number of factors have been implicated in the disease process, including follicular occlusion, inherent weakness of the folliculo-pilosebaceous unit, altered immune and inflammatory milieu, and frictional exacerbation [1, 3, 5, 6].

Due to chronic pain, drainage, and malodor associated with HS lesions, this condition imposes a significant bur-

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den on patients' quality of life and psychological well-being [7, 8]. High rates of depression and anxiety have been reported in HS patients (prevalence 42.9 and 3.9%, respectively) [9, 10], as well as feelings of loneliness and stigmatization [11, 12], detrimental effects on sexual health (66.7%) [13], and a nearly 2.5-fold higher suicide risk compared to the general population [14]. Individuals with HS experience financial strain due to the cost of treatment and disease interference with work and steady employment [15–17]. Furthermore, HS can present a challenge to practitioners in long-term management of a debilitating and often treatment-refractory disease.

Management of HS involves a multi-pronged approach that may comprise lifestyle modifications such as smoking cessation and weight loss, topical therapies, systemic antibiotics, anti-inflammatory and biologic agents, laser and phototherapy, and procedural interventions such as deroofing and wide local excision [3]. Over recent years, several HS management guidelines have been put forth by expert groups in North America, South America, and Europe. This review aims to synthesize published guidelines for HS treatment and compare international management recommendations in order to provide a comprehensive view of evidence-based HS management approaches, including recent supporting data for each section where available.

Methods

A comprehensive literature search for published HS management guidelines was conducted in June 2019 using PubMed and EMBASE databases. Search terms included "hidradenitis suppurativa," "acne inversa," "Verneuil's disease," "treatment," "management," "guidelines," "recommendations," "consensus," and "expert." Abstracts were reviewed for relevance. Inclusion criteria were articles in English, publications from groups involving dermatologists, and inclusion of comprehensive HS management guidelines. Articles written in a language other than English and recommendations put forth by non-dermatologist groups were excluded.

Results

Nine guidelines (including one 2-part publication) meeting the inclusion and exclusion criteria were selected (Table 1, presented in chronological order of publication). These guidelines have been established by working groups and organizations including the British Association of Dermatologists [18], US and Canadian HS Foundations [19, 20], HS ALLIANCE (international expert group from Europe and North America) [21], Canadian Dermatology Association [22, 23], European HS Foundation [24], European Academy of Dermatology and Venereology [25], Swiss consensus group [26], and Brazilian Society of Dermatology [27].

HS Assessment

All reviewed guidelines advocate for early diagnosis by a dermatologist or healthcare provider with experience in treating HS, and address recommendations for clinical grading and assessing treatment response. Recommendations for HS management across all guidelines endorse a multidisciplinary approach including dermatology, primary care, gynecology, psychiatry, pain management, and surgery. Communication and collaboration between providers across specialties is deemed essential for building a comprehensive management plan for HS patients.

Clinical Grading

Hurley staging is universally recommended across guidelines as a tool for clinical grading of baseline HS severity [18, 19, 21–27]. Hurley staging classifies HS clinical severity as Hurley stage I for single or multiple abscesses without scarring, Hurley stage II for limited scarring and/or sinus tracts, and Hurley stage III for extensive scarring and/or sinus tracts [28]. Sartorius score is discussed as an alternative grading system in the European S1 and Swiss guidelines [25, 26].

Outcome Measures

Hidradenitis Suppurativa Clinical Response (HiSCR), defined as a >50% reduction in inflammatory nodule count and no increase in tunnel count, is cited by the HS ALLIANCE, Canadian Dermatology Association, Canadian consensus, European HS Foundation, and Brazilian guidelines for assessment of treatment response [21–24, 29]. All except the British, Swiss, and Brazilian guidelines also recommend incorporation of the pain visual analog scale and Dermatology Life Quality Index (DLQI) as patient-reported outcomes [19, 21–25].

Screening for Comorbidities

Screening for comorbidities is discussed in all except the Canadian Dermatology Association guidelines [18, 19, 21, 23–27]. Common comorbidities cited are cardiovascular disease, diabetes mellitus, metabolic syndrome, autoimmune conditions (especially inflammatory bowel disease and inflammatory arthropathies), polycystic ovary syndrome, depression, and anxiety. Early identification of comorbid conditions is crucial for facilitating referrals and establishing a multidisciplinary care team for HS patients.

Table 1. Hidradenitis suppurativa management guideline publications

Organization	Year	Publication	In-text abbreviation
European Academy of Dermatology and Venereology	2015	European S1 guideline for the treatment of hidradenitis suppurativa/ acne inversa [25]	European S1
European HS Foundation	2016	Evidence-based approach to the treatment of hidradenitis suppurativa/acne inversa, based on the European guidelines for hidradenitis suppurativa [24]	European HS Foundation
Swiss consensus group	2017	Swiss practice recommendations for the management of hidradenitis suppurativa/acne inversa [26]	Swiss
Canadian Dermatology Association consensus group	2017	Approach to the management of patients with hidradenitis suppurativa: a consensus document [23]	Canadian consensus
British Association of Dermatologists	2018	British Association of Dermatologists guidelines for the management of hidradenitis suppurativa (acne inversa) 2018 [18]	British
Canadian Dermatology Association	2018	Hidradenitis suppurativa: A novel model of care and an integrative strategy to adopt an orphan disease [22]	Canadian Dermatology Association
HS ALLIANCE	2019	Hidradenitis suppurativa/acne inversa: a practical framework for treatment optimization - systematic review and recommendations from the HS ALLIANCE working group [21]	HS ALLIANCE
US and Canadian HS Foundations	2019	North American clinical management guidelines for hidradenitis suppurativa: a publication from the United States and Canadian hidradenitis suppurativa foundations Part I: diagnosis, evaluation, and the use of complementary and procedural management [19] Part II: topical, intralesional, and systemic medical management [20]	North American
Brazilian Society of Dermatology	2019	Consensus on the treatment of hidradenitis suppurativa – Brazilian Society of Dermatology [27]	Brazilian

Nonpharmacologic Interventions

Smoking Cessation. Smoking cessation is encouraged across all guidelines as adjuvant therapy for HS, citing increased prevalence of smoking among patients with HS compared to the general population and association of tobacco use with more severe disease [18, 19, 21–27]. Although there is limited evidence that smoking cessation reduces HS disease activity [30], discussion of tobacco cessation should be routinely included in HS patient counseling with referral to smoking cessation services when available and appropriate.

Weight Loss. Weight reduction is also universally recommended across guidelines, as higher BMI has been associated with increased HS severity and contributes to frictional exacerbation [18, 19, 21–27]. Weight loss should be encouraged as adjuvant therapy for HS, with regular screening for obesity and metabolic syndrome.

Dietary Modifications. The North American guideline is the only publication to address dietary modifications for HS, although it cites insufficient evidence to recommend avoidance of dairy or brewer's yeast [19].

Wound Care. Discussion of wound care and dressing selection is included in the North American, Canadian consensus, European S1, and Brazilian guidelines [19, 23, 25, 27]. All 4 publications recommend that dressing choice should be customized based on location of the lesion(s) and amount of drainage, and selected based on physician expertise with consideration for cost and patient preference. Dressings should be non-irritating and absorbent to reduce skin surface moisture and limit odor. The Canadian consensus, European S1, and Brazilian guidelines address the lack of HS-specific bandages and highlight the need for studies evaluating dressings and wound care in HS [23, 25, 27].

Mental Health Services. All guidelines emphasize the psychological burden associated with HS and endorse screening for depression and anxiety as a routine component of clinic visits. A multidisciplinary treatment team

including psychosocial services is recommended by all expert groups [18, 19, 21–27]. The European S1 and Canadian consensus guidelines highlight the lack of specific studies assessing the effect of psychosocial support in HS, but suggest that referral to mental health services be conducted in a standardized manner to allow for future analysis [23, 25].

Pain Management

All reviewed guidelines acknowledge the significant pain burden associated with HS, and the majority of guidelines discuss assessing pain severity in HS patients using a validated patient-reported outcome tool such as a pain visual analog scale or numeric rating scale [18, 19, 21–25]. While most guidelines mention pain management as adjuvant treatment for HS, few provide suggestions for specific analgesic agents. Among the guidelines that do discuss specific agents for pain management, topical analgesics and non-steroidal anti-inflammatories are recommended as first-line modalities, and opioid use is discussed only for severe pain uncontrolled with first-line therapies. Pain specialists are broadly recommended as part of the multidisciplinary approach to HS management.

Topical Analgesics. Topical lidocaine is cited in the North American and Canadian consensus guidelines as a useful modality for pain management in HS [19, 23]. Canadian consensus guidelines specifically suggest lidocaine 5% ointment, with diclofenac 1% gel as an alternative topical analgesic [23].

Non-Steroidal Anti-Inflammatory Drugs (NSAIDs). NSAIDs are discussed in the North American, Canadian consensus, and European S1 guidelines as systemic analgesics for pain management in HS [19, 23, 25]. Specific dosing is not mentioned but should generally follow manufacturer recommendations. Special considerations should be made for patients with abnormal liver and kidney function, and use of over-the-counter medications including NSAIDs should be reviewed at routine visits.

Neuropathic Pain Agents. Gabapentin and pregabalin are recommended by the North American and Canadian consensus guidelines for control of HS-associated neuropathic pain, but specific dosing is not addressed [19, 23].

Tramadol. Tramadol is an opioid-like analgesic that binds mu-opioid receptors in the central nervous system and inhibits serotonin and norepinephrine reuptake [31]. The North American guidelines recommend tramadol as a non-opioid alternative for HS pain refractory to topical and over-the-counter analgesics, but specific dosing recommendations are not discussed [19].

Opioids. Opioids are cited in the North American, Canadian consensus, and European S1 guidelines as analgesic agents for severe HS-related pain non-responsive to first-line agents such as topical analgesics and NSAIDs. All 3 guidelines urge judicious prescribing of opioids, restricting use to individualized cases, and involvement of pain specialists for opioid monitoring [19, 23, 25]. The Canadian consensus and European S1 guidelines discuss that there is no clinical evidence supporting the use of opioids in HS [23, 25]. For appropriate cases, the European S1 guidelines list codeine and hydrocodone as preferred opioid agents [25].

Topical/Intralesional Therapies

Recommendations regarding topical and intralesional therapies in HS management are summarized in Table 2. Across all guidelines, topical therapeutic modalities are generally recommended for mild stages of HS and are of most utility in localized disease or as adjuncts to systemic treatment. Topical therapies aim to minimize follicular plugging (keratolytics), decrease bacterial colonization and associated inflammation (antiseptics and antibiotics), and reduce acute pain and inflammation in isolated lesions (intralesional corticosteroids).

Topical Keratolytics

Resorcinol. Resorcinol 15% cream is mentioned for its keratolytic and antiseptic properties in the North American, European S1, Canadian Dermatology Association, Canadian consensus, European HS Foundation, and Brazilian guidelines [20, 22–25, 27], but is not mentioned in the British, HS ALLIANCE or Swiss guidelines. Topical resorcinol administered twice daily during flares has been evaluated in a small case series of Hurley stage I/II patients and is recommended as second-line therapy by the European HS Foundation and Canadian Dermatology Association guidelines [22, 24]. Potential adverse effects of topical resorcinol application include desquamation and irritant contact dermatitis [20, 25]. Of note, resorcinol cream is not freely available in the USA and requires compounding by a specialty pharmacy.

Topical Antiseptics

Topical antiseptics are recommended in 3 guidelines to minimize bacterial colonization and reduce inflammation. Recommended disinfectants vary, and the North American guidelines note that there is no data comparing the efficacy of topical antiseptic agents [20]. Chlorhexidine, benzoyl peroxide, and zinc pyrithione are cited by the North American guidelines [20], while Swiss recommendations men-

Table 2. Topical and intralesional therapy for HS: guideline recommendations

Modality	Recommendations per guideline								
	British Association of Dermatologists [18]	North American (US and Canadian HS Foundations) [20]	HS ALLIANCE [21]	Canadian Dermatology Association [22]	Canadian consensus group [23]	European HS Foundation [24]	European S1 [25]	Swiss consensus group [26]	Brazilian Society of Dermatology [27]
Resorcinol 15% cream	–	Recommended (may induce contact dermatitis)	–	2nd line	Resolve/prevent follicular blockage in mild HS	2nd line	For recurrent lesions in Hurley stage I/II HS BID application during flares	–	Can be useful to shorten mean duration of painful nodule or abscess
Antiseptics	–	Chlorhexidine, benzoyl peroxide zinc pyrithione supported by expert opinion	–	–	–	–	–	Triclosan, ammonium bituminosulfate for all Hurley stages	Advise on adequate local hygiene; no need for soaps with high concentrations of chlorhexidine
Clindamycin 1% solution	Consider in patients with HS	May reduce pustules, carries risk of bacterial resistance	Recommended BID × 3 months in Hurley I/II with localized lesions, especially without deep inflammatory lesions	1st line tx for mild HS; 1% lotion applied BID × 12 weeks	Use as topical anti-inflammatory agent and to prevent secondary infection[1]	Recommended BID × 3 months as 1st line tx in Hurley stage I/ mild stage II, especially without deep inflammatory lesions[1]	BID × 3 months in localized Hurley stage I or mild stage II; can be prolonged if clinically indicated[1]	Recommended in Hurley I/II HS to avoid bacterial superinfection and reduce inflammation	Recommended for Hurley stage I or in cases of superficial lesions during exacerbation
Intralesional corticosteroid injections	Consider for individual lesions in the acute phase	Injection of inflamed lesions or short-term control of flares	May be helpful for acute inflammatory nodules in combination with other tx at all Hurley stages	2nd line	TAC 5–10 mg/mL for rapid reduction of inflammation in acute flares or as rescue therapy adjunctive to systemic tx	2nd line	TAC 5–10 mg/mL for rapid reduction of inflammation in acute flares and for recalcitrant nodules and sinus tracts	Injection of inflamed nodules in Hurley I/II HS	TAC 5–10 mg/mL for tx of acute inflammation and abscesses, refractory nodules, tunnels

BID, twice daily; HS, hidradenitis suppurativa; TAC, triamcinolone acetonide; tx, treatment; –, not specifically mentioned. [1] Recommendation based on randomized controlled trial(s) in HS.

tion triclosan and ammonium bituminosulfonate [26]. Brazilian guidelines do not recommend specific antiseptics, but state that high concentration of chlorhexidine is unnecessary [27]. Availability of these antiseptics varies by region, as the US Food and Drug Administration removed triclosan from the market in December 2018 due to lack of demonstrated efficacy and safety data [32]. Ammonium bituminosulfonate, also known as ichthammol, is a cream or ointment derived from shale oil that is available over-the-counter in both the USA and Europe, but is more commonly recommended for dermatologic use in European medical literature [33].

Topical Antibiotics

Clindamycin. Clindamycin 1% topical lotion or solution is recommended across all guidelines as a first-line modality for HS treatment [18, 20–27]. Clindamycin has activity against anaerobic, streptococcal, and staphylococcal species, and plays a role in decreasing cutaneous inflammation and inhibiting biofilm formation in HS [34]. Topical clindamycin has greatest efficacy in less severe disease (Hurley stage I or mild stage II) with predominantly superficial pustules and without deep abscesses. Per the European S1, European HS Foundation, and HS ALLIANCE guidelines, the recommended regimen is twice daily application for up to 3 months [21, 24, 25]. Several guidelines caution against prolonged use due to the development of bacterial resistance [20, 21, 24, 25].

Intralesional Corticosteroids

Intralesional corticosteroid injections are recommended by all guidelines as treatment for individual acutely inflamed HS lesions, either as monotherapy or in the setting of concomitant systemic treatment [18, 20–27]. Injection of triamcinolone 5–10 mg/mL (volumes ranging from 0.2 to 2 mL) has been shown to decrease size, redness, edema, and suppuration of HS lesions, and provides rapid reduction of patient-reported pain within 1–3 days [20, 23, 35]. Complications may include skin atrophy and telangiectasias, and intralesional corticosteroid injections are contraindicated if overt bacterial infection is suspected [25, 27].

Systemic Therapies

International guideline recommendations for systemic agents in the treatment of HS are compiled in Table 3.

Systemic Antibiotics

Systemic antibiotics are a mainstay of HS treatment, with mechanisms of action including reduction of inflammation as well as antibacterial effects. They are key agents in treating widespread disease when application of topical agents is difficult and impractical. Oral tetracyclines are consistently recommended across guidelines as first-line therapy, with a combination regimen of clindamycin and rifampicin as second-line treatment. Third-line options include dapsone or metronidazole/moxifloxacin/rifampin triple therapy, but limited guidance is provided regarding considerations for selecting a third-line agent. Intravenous ertapenem is reserved for cases refractory to oral antibiotics.

Tetracyclines. Oral tetracycline antibiotics (e.g., doxycycline and minocycline) are recommended for use in mild-to-moderate HS, especially when lesions are widespread or involve multiple anatomical sites. The British, North American, HS ALLIANCE, and Brazilian guidelines suggest a treatment period of 12 weeks [18, 20, 21, 27]. British guidelines recommend holding treatment after 12 weeks to assess the need for continuation and to decrease the likelihood of developing antibiotic resistance [18]. The European HS Foundation and European S1 guidelines recommend oral tetracycline use for up to 4 months [24], while Swiss guidelines suggest a course of 3–6 months [26]. The North American guidelines also discuss long-term use of oral tetracyclines as maintenance therapy [20]. Tetracyclines should be avoided in pregnant women and in children due to the risk of tooth discoloration and interference with bone growth resulting from calcium chelation, although a recent systematic review found that the current literature does not support an association between doxycycline and these potential adverse effects [36].

Clindamycin/Rifampicin. Clindamycin exhibits activity against *Streptococci*, *Staphylococci,* and anaerobes, while rifampicin is effective against Gram-positive and intracellular bacterial species. The efficacy of combination therapy is thought to be driven by rifampicin, with clindamycin added to limit rifampicin resistance [37]. A combination regimen of clindamycin and rifampicin is recommended by all guidelines as second-line treatment for mild-to-moderate HS unresponsive to topical agents and oral tetracyclines [18, 20–27]. North American and European HS Foundation guidelines also suggest use as first-line or adjunctive therapy for moderate-to-severe HS [20, 24]. Recommended dosing is clindamycin 300 mg twice daily with rifampicin 300 mg twice daily or 600 mg once daily for a treatment period of 8–12 weeks [18, 20–27]. Brazilian guidelines urge judicious use of rifampicin as it is the first-line medication for the treatment of tuberculosis, which is prevalent in the region with growing multi-agent resis-

Table 3. Systemic therapy for HS: guideline recommendations

Modality	Recommendations per guideline								
	British Association of Dermatologists [18]	North American (US and Canadian HS Foundations) [20]	HS ALLIANCE [21]	Canadian Dermatology Association [22]	Canadian consensus group [23]	European HS Foundation [24]	European S1 [25]	Swiss consensus group [26]	Brazilian Society of Dermatology [27]
Antibiotics Tetracyclines	Doxycycline or lymecycline for ≥12 weeks. Consider tx breaks to assess efficacy and decrease risk of antimicrobial resistance	In mild-moderate HS × 12 weeks or as long-term maintenance[1]	Recommended in Hurley I/II × 12 weeks[1]	500 mg BID × 4 months for mild HS (1st line)[1]	500 mg BID[1]	500 mg BID as 1st line tx in moderate HS or widespread Hurley I/II for up to 4 months[1]	500 mg BID × 4 months; can be prolonged if clinically indicated[1]	Doxycycline 50–200 mg daily × 3–6 months in Hurley I/II HS	500 mg BID × 10–12 weeks, 1–2 courses
Clindamycin + rifampicin	Clindamycin 300 mg BID and rifampicin 300 mg BID × 10–12 weeks for patients unresponsive to oral tetracyclines[1]	2nd line for mild-moderate HS, 1st line or adjunct for severe HS[1]	Clindamycin and rifampicin 300 mg each BID × 10 weeks[1]	Clindamycin 300 mg BID + rifampicin 600 mg daily × 10 weeks in moderate HS or mild-moderate HS unresponsive to tetracyclines (1st line)[1]	Clindamycin 300 mg BID + rifampicin 600 mg once daily or 300 mg BID × 10 weeks[1]	Clindamycin 300 mg BID + rifampicin 600 mg once daily or 300 mg BID × 10 weeks as 1st line tx for moderate PGA[1]	Clindamycin 300 mg BID + rifampicin 600 mg once daily or 300 mg BID ×10 weeks[1]	Clindamycin and rifampicin each 300 mg BID × 3 months	Clindamycin 300 mg BID + rifampicin 600 mg daily × 10 weeks
Metronidazole/ moxifloxacin/ rifampin	–	2nd/3rd line in moderate-severe HS	Rifampicin 10 mg/kg once daily + moxifloxacin 400 mg once daily + metronidazole 500 mg TID (× 6 weeks only) may have efficacy in Hurley I/II patients	–	–	–	Effective in tx-resistant Hurley stage II/III HS at 12 weeks	–	–
Dapsone	Consider in HS unresponsive to abx therapies	May be effective for minority of Hurley I/II patients as long-term maintenance	Evidence from single study	3rd line	Efficacy in HS reported in case reports	3rd line	Reserve for patients with mild-moderate HS when standard 1st and 2nd line agents fail	50–150 mg daily in refractory Hurley II/III disease	May be considered after failure of 1st or 2nd line abx
Ertapenem	–	For severe disease as one-time rescue, bridge to surgery or maintenance tx	IV ertapenem 1 g/day in selected patients with severe HS × 6 weeks	–	–	–	–	–	–
Supplements Zinc	Insufficient evidence	–	Combination tx of oral zinc gluconate 30 mg TID + topical triclosan 2% in Hurley I/II	Zinc gluconate as 2nd line tx	Zinc sulfate recommended as adjuvant therapy	Zinc gluconate as 2nd line tx	Zinc gluconate initiated at 90 mg/day as maintenance tx in Hurley I/II	Zinc gluconate 30 mg TID as adjunct to abx in Hurley I/II HS	30mg TID as maintenance tx in Hurley stage I/II HS Long-term use limited by zinc-induced impairment of iron and copper absorption
Retinoids Acitretin	0.3–0.5 mg/kg daily in men and nonfertile women unresponsive to abx	Consider as 2nd/3rd line tx; contraindicated in women of reproductive potential	3rd line tx for mild-moderate HS	2nd line	0.25–0.88 mg/kg daily can be initiated in early HS stages, may be used in chronic stages with sinus tracts and scarring	2nd line	Can be initiated in early HS stages, may be used in chronic stages with sinus tracts and scarring Dosing ranges from 0.25 to 0.88 mg/kg daily × 3–12 months	0.2–0.5 mg/kg daily in Hurley II/III HS refractory to abx	Preferred over isotretinoin due to higher response rates, but not appropriate in women of childbearing age
Isotretinoin	Do not offer unless concomitant moderate-severe acneiform lesions of face or trunk	Consider only as 2nd/3rd line tx or in patients with severe concomitant acne	–	3rd line	Not proven effective in HS even with concomitant acne	3rd line	Not recommended for use in tx of HS	–	Use of isotretinoin over acitretin justified in women of childbearing age
Biologics Adalimumab (anti-TNF-α)	40 mg SC weekly for patients ≥12 years old with moderate-severe HS unresponsive to conventional systemic tx[1]	Recommended at 40 mg SC weekly to improve HS severity and QoL in moderate-severe HS[1]	First choice biologic in moderate-severe HS after failure of conventional tx[1]	160 mg SC week 0, 80 mg week 2, then 40 mg weekly for moderate-severe HS unresponsive to abx (1st line)[1]	40 mg SC weekly for patients with moderate-severe HS[1]	160 mg SC week 0, 80 mg week 2, then 40 mg weekly as 1st line tx for moderate-severe HS[1] Consider other tx modalities if HiSCR not achieved by 16 weeks	40 mg SC weekly for moderate-severe HS[1]	160 mg SC week 0, 80 mg week 2, then 40 mg weekly for Hurley II/III HS refractory to abx	160 mg SC week 0, 80 mg week 2, then 40 mg weekly[1] Once inflammation controlled, consider excision of residual active areas or scarring
Infliximab (anti-TNF-α)	Consider at 5 mg/kg q8 weeks in moderate-severe HS unresponsive to adalimumab	Recommended for moderate-severe HS Dose ranging studies needed to determine optimal dosage	Consider as 2nd line biologic for moderate-severe HS	2nd line[1]	No significant difference vs. placebo in HiSCR[1]	5 mg/kg IV at weeks 0, 2, 6 and q2 months thereafter × 12 weeks as 2nd line in moderate-severe HS unresponsive to adalimumab	5 mg/kg IV at weeks 0, 2, 6, then q2 months[1]	–	5 mg/kg IV at weeks 0, 2, 6, then q2 months[1]

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Table 3 (continued)

Modality	Recommendations per guideline								
	British Association of Dermatologists [18]	North American (US and Canadian HS Foundations) [20]	HS ALLIANCE [21]	Canadian Dermatology Association [22]	Canadian consensus group [23]	European HS Foundation [24]	European S1 [25]	Swiss consensus group [26]	Brazilian Society of Dermatology [27]
Anakinra (anti-IL-1)	Insufficient evidence	100 mg daily may be effective; dose ranging studies needed to determine optimal dosage	Consider as 3rd line biologic for moderate-severe HS	–	Significant improvement in disease severity score and HiSCR[1]	–	–	–	Not available in Brazil
Canakinumab (anti-IL-1β)	–	–	–	–	–	–	–	–	Used successfully in sparse care reports
Ustekinumab (anti-IL-12/23)	Insufficient evidence	45–90 mg q12 weeks may be effective; dose ranging studies needed to determine optimal dosage	Potentially effective tx for moderate-severe HS	–	–	–	Three 45 mg SC injections at 0, 4, and 16 weeks with cumulative 33% response rate in 3-patient case series	–	45–90 mg SC q12 weeks; higher dose may be needed for HS tx
Secukinumab (anti-IL-17A)	–	–	–	–	–	–	–	–	Success in a case of severe tx-refractory HS
Etanercept (anti-TNF-α)	Do not offer[1]	Limited evidence does not support use in HS management[1]	Not effective[1]	–	No significant difference vs. placebo[1]	–	No significant difference vs. placebo[1]	–	Variable data on efficacy in HS; unable to draw conclusions about its potential utility
Immunosuppressive agents									
Systemic corticosteroids	–	Short-term steroid pulse can be considered for acute flares or bridge to other tx Long term: taper to lowest possible dose in severe HS	Low-dose prednisolone 10 mg/day (or equivalent) may be effective adjunct tx in recalcitrant HS Use with caution long term	2nd line	–	2nd line	Recommend dose of 0.5–0.7 mg/kg oral prednisolone for short-term use in acute flares, taper over following weeks	Prednisolone 0.5–0.7 mg/kg daily in refractory disease	Short course may be indicated for tx of flares
Cyclosporine					Efficacy in HS reported in case reports	3rd line	Reserved for cases unresponsive to standard 1st, 2nd, or 3rd line tx Reported dosing in HS varies from 2 to 6 mg/kg for 6 weeks to 7 months	2–6 mg/kg daily in refractory disease	Data not robust; consider only as 3rd line option for long-term control of inflammation
Hormonal agents									
Metformin	Consider in HS patients with concomitant DM, PCOS or pregnancy	Consider metformin 500 mg BID-TID in appropriate female patients as monotherapy for mild-moderate or as adjunctive tx in severe HS	–	–	May be beneficial in patients with HS and PCOS	–	–	500–1,500 mg daily in refractory disease	May consider in women of childbearing age who have failed systemic abx
Cyproterone acetate + ethinyl estradiol	Insufficient evidence	Consider in appropriate female patients as monotherapy for mild-moderate or as adjunctive tx in severe HS[1]	–	–	~1/2 of patients exhibited clearance No significant difference in PaGA between cyproterone acetate + ethinyl estradiol vs. ethinyl estradiol + norgestrel at 6 months[1]	3rd line	100 mg cyproterone acetate daily for female patients with menstrual abnormalities, signs of hyperandrogenism, or high levels of DHEA, androstenedione or SHBP	–	May consider in women of childbearing age for whom systemic abx has failed
Finasteride	Insufficient evidence	Consider 1.25–5 mg/day in appropriate female patients as monotherapy for mild-moderate or as adjunctive tx in severe HS	–	–	–	–	–	–	1–5 mg/day in children <12 years old with HS refractory to topical/oral abx
Spironolactone	Insufficient evidence	Consider spironolactone 100–150 mg daily as monotherapy in women with mild-moderate HS or as adjunctive tx in severe HS	–	–	–	–	–	–	Consider in female HS patients for whom systemic abx has failed

Abx, antibiotics; BID, twice daily; DHEA, dehydroepiandrosterone; DLQI, Dermatology Life Quality Index; DM, diabetes mellitus; HS, hidradenitis suppurativa; IV, intravenous; PGA, Physician's Global Assessment; PaGA, Participant's Global Assessment; PCOS, polycystic ovary syndrome; QoL, quality of life; SC, subcutaneously; SHBP, sex hormone-binding protein; TID, three times daily; tx, treatment; –, not specifically mentioned. [1] Recommendation based on randomized controlled trial(s) in HS.

tance [27]. Prolonged use of clindamycin and rifampicin beyond 10 weeks was found to be safe in a recent study [37], but concerns regarding rifampicin resistance should be taken into account when considering extension of therapy [38]. Practitioners should advise patients about red-orange discoloration of body fluids with rifampicin and should be vigilant for potential drug-drug interactions, as rifampicin is an inducer of cytochrome P450.

Metronidazole/Moxifloxacin/Rifampin. Triple therapy with moxifloxacin, metronidazole, and rifampin is recommended as second- or third-line treatment in moderate-to-severe HS by North American and European S1 guidelines [20, 25], and for use in mild-to-moderate HS by the HS ALLIANCE [21]. Metronidazole is effective against anaerobic bacteria, while moxifloxacin exhibits activity against Gram-positive, Gram-negative, and anaerobic species [39, 40]. Triple therapy with rifampin provides broad-spectrum coverage and decreases rifampin resistance [40]. Recommended dosing is moxifloxacin 400 mg daily, metronidazole 500 mg 3 times a day, and rifampin 300 mg twice daily or 10 mg/kg once daily [20, 21]. The aforementioned guidelines note that metronidazole should be discontinued after 6 weeks to avoid neurotoxicity [20, 21].

Dapsone. Dapsone is reserved as third-line treatment for HS refractory to other antibiotic regimens, discussed in the British, North American, Canadian Dermatology Association, European HS Foundation, Swiss, and Brazilian guidelines [18, 20, 22, 24, 26, 27]. Dosing ranges from 25 to 200 mg daily with courses of at least 3 months' duration [20, 26, 27]. Prior to initiation of dapsone, glucose-6-phosphate dehydrogenase (G6PD) levels should be obtained to assess for G6PD deficiency that could result in hemolytic anemia with administration of sulfa drugs [26].

Ertapenem. Intravenous ertapenem is cited only in the North American and HS ALLIANCE guidelines as an option for HS non-responsive to oral antibiotic therapy [20, 21]. Ertapenem is a broad-spectrum carbapenem antibiotic given daily by an indwelling central catheter with activity against Gram-positive and Gram-negative aerobic and anaerobic species, and exhibits resistance to inactivation by beta-lactamases [41]. Treatment with 1 g intravenous ertapenem daily led to remission in Hurley stage I/II disease and significant improvement in quality of life in Hurley stage III patients [42]. Ertapenem is considered as third-line treatment to be used as a one-time 6-week course for rescue therapy or as a bridge to surgical intervention [20], as daily infusions are not feasible for long-term therapy, and peripherally inserted central catheters may increase the risk of infection.

Supplements

Zinc. Zinc is thought to play an anti-inflammatory role that may serve as efficacious adjunctive treatment in HS, as low serum zinc levels have been identified in HS patients compared to healthy controls [43]. Zinc has been found to inhibit neutrophil chemotaxis and keratinocyte expression of toll-like receptor 2, both of which are prominent in HS lesional skin [44–47]. The HS ALLIANCE, Canadian Dermatology Association, European HS Foundation, European S1, Swiss, and Brazilian guidelines recommend oral zinc gluconate in mild-to-moderate HS as second-line or adjunctive therapy with topical antiseptics or oral antibiotics [21, 22, 24–27]. Canadian consensus guidelines specifically recommend zinc sulfate rather than gluconate [23]. Four guidelines state recommended dosing, with the HS ALLIANCE, Swiss, and Brazilian guidelines suggesting 30 mg 3 times a day [21, 26, 27] and European S1 guidelines recommending 90 mg daily [25]. Only the Brazilian guidelines mention impaired copper and iron absorption with zinc supplementation, but do not provide specific recommendations for copper and iron replacement [27].

Vitamin D. Vitamin D has been suggested to have a beneficial effect in HS via stimulation of cutaneous innate immunity and modulation of keratinocyte proliferation and hair growth cycling [48–50]. Vitamin D supplementation is mentioned only in the North American guidelines, which cite insufficient evidence to recommend its use [19].

Retinoids

Retinoids are vitamin A analogs that regulate keratinocyte turnover. Their use in HS is aimed at decreasing follicular keratin plugging that can initiate inflammation in the folliculo-pilosebaceous unit. Acitretin is included across all guidelines as a second- or third-line treatment modality for HS after failure of antibiotics, while the use of isotretinoin is controversial.

Acitretin. Acitretin has demonstrated efficacy in HS and is recommended by all guidelines as second- or third-line therapy in HS non-responsive to topical and oral antibiotics [18, 20–27]. Suggested dosing ranges from 0.2 to 0.88 mg/kg daily [18, 23, 25, 26], and is recommended as a second- or third-line agent for use in early or chronic HS. As with all systemic retinoids, reliable contraceptive use is necessary for women of child-bearing potential due to the risk of teratogenicity. British, North American, and Brazilian guidelines state that acitretin is contraindicated in women of childbearing age [18, 20, 27], while European S1 and Swiss guidelines call for close monitoring and routine pregnancy testing in this population [25, 26].

Isotretinoin. Recommendations regarding the use of isotretinoin in HS treatment are conflicting. Canadian consensus and European S1 guidelines recommend against isotretinoin use due to lack of demonstrated efficacy [23, 25]. British and North American guidelines suggest isotretinoin as a second- or third-line option only for HS patients with moderate-to-severe concomitant acne [18, 20]. The Canadian Dermatology Association and European HS Foundation recommend isotretinoin only as a third-line treatment option after failure of standard therapies [22, 24]. Brazilian guidelines state that isotretinoin is preferred over acitretin for refractory HS in women of childbearing age [27].

Biologics

International guidelines recommend consideration of biologics for the treatment of moderate-to-severe HS unresponsive to systemic antibiotics. Signaling molecules targeted by biologics for the treatment of HS include tumor necrosis factor-alpha (TNF-α; adalimumab, infliximab), interleukin (IL)-1 (anakinra, canakinumab), IL-12/23 (ustekinumab), and IL-17 (secukinumab), which have been shown to be elevated in the skin and serum of HS patients [51–54]. Adalimumab is the only biologic approved for HS and is recommended as the first-line biologic across all guidelines, with infliximab cited as the recommended second-line option in the majority of guidelines. Anakinra and ustekinumab may be considered following failure of anti-TNF agents, but evidence to support their efficacy in HS is limited.

Adalimumab. Adalimumab is a fully-human monoclonal antibody targeting TNF-α and is recommended across all reviewed guidelines as the first-line biologic for Hurley stage II/III HS unresponsive to systemic antibiotics [18, 20–27]. It was approved as the first and only biologic for moderate-to-severe HS in Europe and the USA in 2015 and in Canada in 2016 [55, 56], and its safety and efficacy have been evaluated in randomized controlled trials (RCTs) [57–59]. Adalimumab is administered as a 160-mg loading dose injected subcutaneously at week 0, followed by an 80-mg subcutaneous injection at week 2, and 40-mg subcutaneous injections weekly thereafter. Adverse events associated with anti-TNF-α agents include increased risk of infection [18, 20–27], although long-term studies of TNF-α inhibitors support an encouraging risk-benefit ratio [60].

Infliximab. Infliximab is a chimeric monoclonal antibody against TNF-α that is recommended by all except Swiss and Canadian consensus guidelines as the second-line biologic for moderate-to-severe HS refractory to adalimumab [18, 20–22, 24, 25, 27]. Although not approved specifically for the treatment of HS, infliximab administered intravenously at 5 mg/kg at weeks 0, 2, and 6 has been evaluated in an RCT. No significant difference between infliximab and placebo was observed for >50% improvement in inflammatory nodules, but the improvement rate of 25–50% was significantly higher for infliximab compared to placebo [61].

Anakinra. Anakinra is an IL-1 receptor antagonist that has demonstrated some success in a small RCT involving 20 Hurley stage II/III patients [62]. HS ALLIANCE and North American guidelines note that anakinra may be considered as a third-line treatment option for HS refractory to TNF inhibitors [21], but British and North American guidelines also highlight the need for additional studies to demonstrate efficacy and determine optimal dosing in HS [18, 20].

Canakinumab. Canakinumab is a monoclonal antibody targeting IL-1β, cited only by the Brazilian guidelines as a third-line biologic for the treatment of HS due to unavailability of anakinra in Brazil [27].

Ustekinumab. Ustekinumab is a monoclonal antibody that modulates IL-12 and IL-23 signaling [63]. In a cohort of 17 patients receiving ustekinumab 45- or 90-mg (for those weighing >100 kg) subcutaneous injections at weeks 0, 4, 16, and 28, 82% achieved at least a 25% reduction in modified Sartorius score and 47% achieved HiSCR at week 40 [64]. Based on these findings, ustekinumab is cited as a potentially efficacious HS treatment by the North American, HS ALLIANCE, European S1, and Brazilian guidelines [20, 21, 25, 27], although further studies are needed to establish optimal dosing [20].

Secukinumab. Secukinumab is a monoclonal antibody targeting IL-17A and has demonstrated success in a recent pilot study and several case reports of moderate-to-severe HS [65–69]. Secukinumab is cited only in the Brazilian guidelines as a therapeutic consideration for HS that necessitates further evaluation to determine efficacy and HS-specific dosing [27].

Etanercept. Etanercept is a fusion recombinant protein TNF receptor that binds TNF-α with greater affinity than the endogenous receptor, thereby interfering with TNF-α signaling [70]. The British, North American, HS ALLIANCE, Canadian consensus group, and European S1 guidelines recommend against its use in HS treatment [18, 20, 21, 23, 25], as a double-blind RCT evaluating etanercept 50-mg subcutaneous injection versus placebo twice weekly in HS patients identified no significant difference between etanercept and placebo after 3 months [70]. Brazilian guidelines state that conclusions about the

efficacy of etanercept in HS cannot be drawn due to conflicting study results and lack of additional trials [27].

Traditional Immunosuppressive Agents

Broadly immunosuppressive agents such as corticosteroids and cyclosporine are mentioned in the majority of guidelines as third-line therapeutic options for refractory HS. These agents serve to suppress the inflammatory cascade driving HS flares but should be considered for use only after failure of first-line biologics.

Systemic Corticosteroids. Use of systemic corticosteroids in HS management is reserved for short-term courses to treat acute flares or as a bridge to other systemic therapy as cited in the North American, HS ALLIANCE, Canadian Dermatology Association, European HS Foundation, European S1, Swiss, and Brazilian guidelines [20–22, 24–27]. North American, European S1, and Swiss guidelines recommend dosing at 0.5–0.7 mg/kg oral prednisolone with tapering to the lowest possible dose if considered for long-term use [20, 25, 26]. The HS ALLIANCE, Canadian Dermatology Association, European HS Foundation, and Brazilian guidelines do not provide specific dosing recommendations.

Cyclosporine. Cyclosporine is an immunosuppressive agent that inhibits T-cell activation, and is cited as a possible third-line treatment option for HS refractory to standard therapies [20, 22–27]. Although mentioned in the North American, Canadian Dermatology Association, Canadian consensus group, European HS Foundation, European S1, Swiss, and Brazilian guidelines, only the Swiss publication discusses cyclosporine dosing at a proposed regimen of 2–6 mg/kg daily [26].

Hormonal Agents

Hormonal fluctuations and imbalance are thought to contribute to HS pathogenesis, as many female patients report disease flares corresponding to menstrual cycle [71, 72]. Androgen receptor stimulation also promotes sebum production and follicular occlusion [73], contributing to acneiform-type HS lesions in susceptible individuals. Hormonal regulation may serve as an effective adjunctive treatment in women with comorbidities such as diabetes, polycystic ovary syndrome, or hyperandrogenism. Metformin and antiandrogen therapy are recommended by about half of the guidelines for use in specific subsets of female HS patients.

Metformin. Metformin is cited by the British, North American, Canadian Dermatology Association, Swiss, and Brazilian guidelines for use in specific subgroups of HS patients, including those with concomitant diabetes, polycystic ovary syndrome, or who are pregnant [18, 20, 23, 26, 27]. Recommended dosing according to North American and Swiss guidelines is 500 mg 2–3 times daily [20, 26], while British, Canadian, and Brazilian guidelines did not specify dosing regimen.

Cyproterone Acetate plus Ethinyl Estradiol. Cyproterone acetate is an antiandrogen agent suggested in the North American, European HS Foundation, European S1, and Brazilian guidelines as monotherapy for female patients with mild-to-moderate HS or those with signs of hyperandrogenism [20, 24, 25, 27]. A randomized double-bind trial compared cyproterone acetate plus ethinyl estradiol versus ethinyl estradiol plus norgestrel contraceptives in 24 female HS patients, and demonstrated clearance of HS lesions in about half of the subjects without a significant difference in response rate between the 2 groups at 6 months. Free androgen index (calculated as total testosterone divided by sex hormone-binding globulin) decreased significantly in both groups, without a difference between the 2 treatment arms [74]. British, HS ALLIANCE, Canadian Dermatology Association, Canadian consensus group, and Swiss guidelines did not address antiandrogen therapy.

Finasteride. Finasteride is a 5α-reductase inhibitor that blocks conversion of testosterone to dihydrotestosterone in peripheral tissues and may help to inhibit androgen-driven HS exacerbation. Finasteride 1–5 mg daily is discussed as a third-line treatment option in the North American and Brazilian guidelines for use in female or pediatric HS patients, as efficacy has been documented in a limited number of case reports [20, 27].

Spironolactone. Spironolactone is an aldosterone receptor antagonist with antiandrogen properties that may be efficacious in female HS patients. Spironolactone is discussed in the North American and Brazilian guidelines, with North American guidelines recommending use as monotherapy for women with mild-to-moderate HS or as adjunctive treatment in severe HS [20], and Brazilian guidelines proposing use in women for whom systemic antibiotics have failed [27]. North American guidelines cite a case series in which spironolactone 100–150 mg daily led to clinical improvement in 17 of 20 female HS patients within 3–6 months of treatment, with 11 of the 20 experiencing complete disease clearance [75].

Procedural Management

Guideline recommendations for light-based therapies and surgical approaches in HS treatment are summarized in Table 4. Procedural management for HS includes light-based therapy, lasers, and surgical intervention. Interna-

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Table 4. Laser, Phototherapy and surgical approaches for HS: guideline recommendations

Modality	Recommendations per guideline								
	British Association of Dermatologists [18]	North American (US and Canadian HS Foundations) [19]	HS ALLIANCE [21]	Canadian Dermatology Association [22]	Canadian consensus group [23]	European HS Foundation [24]	European S1 [25]	Swiss consensus group [26]	Brazilian Society of Dermatology [27]
Light-based therapy									
Photodynamic therapy	Insufficient evidence	Variable success based on small, uncontrolled studies	–	–	Cited	–	Variable success reported with PDT Additional studies needed to establish role of PDT in HS tx	–	–
Intense pulsed light	Insufficient evidence	Supported by case reports	–	–	Cited	Significant improvement maintained at 12 months	Additional studies needed to establish role of IPL in HS tx	–	Option for laser hair removal as adjuvant tx to reduce flares and appearance of new lesions Can provide favorable results even in Hurley II/III disease
Lasers									
Nd:YAG laser	Insufficient evidence	Recommended in Hurley II/III disease[1] Recommended in Hurley stage I HS based on expert consensus	–	–	Cited	Significant improvement in HS-LASI at 3 months at sites treated with Nd:YAG monthly + topical antimicrobials vs. topical antimicrobials alone[1]	Significant improvement at sites treated with Nd:YAG monthly + topical antimicrobials alone[1] Additional studies needed to establish Nd:YAG as standard HS tx	–	Option for laser hair removal or treatment of superficial lesions
CO_2 ablative laser	–	Appropriate for extensive chronic lesions in Hurley II/II HS	Effective alternative to electrosurgical or cold steel techniques	Consider for Hurley stage II/III disease	Cited	Recurrence rate in treated areas ranging from 1.1 to 29%	Can be used for excision and marsupialization of skin areas with less bleeding and better visualization than in standard excisions	Consider in widespread or severe HS	Consider for targeted vaporization and excision of lesions separated by healthy tissue
Procedural and surgical interventions									
Incision and drainage	–	Recommended only for acute abscesses to relieve pain	May be performed in acute situations for tense/painful abscesses; recurrence nearly inevitable	–	May be performed in patients with mild HS	–	–	–	Performed on acute lesions for symptomatic relief
Deroofing or limited excision	–	Recommended for recurrent nodules and tunnels	May be used for solitary lesions, recurrent lesions at fixed locations, or fistula formation in limited areas	Consider for Hurley stage II/III disease	Can be attempted in early/mild disease	17% lesion recurrence rate after deroofing	Effective and fast surgical technique that can be performed in-office	Recommended only in localized, well-circumscribed Hurley I/II HS	For localized disease
Wide local excision	To minimize recurrence when conventional systemic tx have failed	Appropriate for extensive chronic lesions Post-surgical healing by secondary intention, primary closure, delayed primary closure, flaps, grafts, and/or skin substitutes	Perform in Hurley stage III HS to prevent further recurrence	Consider for Hurley stage II/III disease	Only potentially curative tx for severe HS	Accepted therapeutic modality	Treatment of choice for HS with healing by secondary intention, primary closure, grafts, or flaps according to size/location of defect	Consider in widespread or severe HS Recommend healing by secondary intention ± partial closure negative pressure-assisted healing	In chronic cases of moderate-severe HS Recommend healing by secondary intention > primary closure > grafts > flaps

CO_2, carbon dioxide; f/u, follow-up; HS, hidradenitis suppurativa; HS-LASI, HS Lesion, Area and Severity Index; IPL, intense pulsed light; Nd:YAG, neodymium-doped yttrium aluminum garnet; PDT, photodynamic therapy; tx, treatment; WLE, wide local excision; –, not specifically mentioned. [1] Recommendation based on randomized controlled trial(s) in HS.

tional recommendations regarding these modalities are somewhat inconsistent, with the exception of carbon dioxide (CO_2) ablative laser treatment, deroofing, and wide local excision, which are cited as effective interventions in nearly all guidelines. As a general trend, European guidelines tend to be less procedure-intensive compared to North American and Brazilian guidelines.

Light-Based Therapy

Photodynamic Therapy (PDT). PDT has been used in HS with variable success and is mentioned as a potential treatment option in the North American, Canadian consensus, and European S1 guidelines [19, 23, 25]. PDT utilizing aminolevulinic acid as the sensitizer has yielded variable results in treating HS [76–80]. The HS ALLIANCE, Canadian Dermatology Association, European HS Foundation, and Swiss guidelines make no mention of PDT as a treatment modality for HS, and British guidelines cite insufficient evidence for recommendation. No guidelines mention use of a specific sensitizing agent or distinguish red versus blue light PDT.

Intense Pulsed Light (IPL). IPL for hair reduction is used in HS with the goal of minimizing recurrence. IPL is cited as a potential therapeutic modality by the North American, Canadian consensus, European HS Foundation, European S1, and Brazilian guidelines [19, 23–25, 27], although European S1 and North American guidelines encourage additional research to establish the role of IPL in HS treatment [18, 19, 25]. One split-body RCT demonstrated significant improvement at sites treated twice weekly with IPL compared to untreated sites in Hurley stage II/III subjects [81]. British guidelines cite insufficient evidence to recommend IPL, and the HS ALLIANCE and Canadian Dermatology Association do not discuss IPL as a treatment modality.

Lasers

Neodymium-Doped Yttrium Aluminum Garnet (Nd:YAG). Nd:YAG laser therapy is recommended by the North American, Canadian Dermatology Association, European HS Foundation, European S1, and Brazilian guidelines for use in Hurley stage II/III disease [19, 23–25, 27], based on an RCT demonstrating significant improvement at sites treated with Nd:YAG and topical antimicrobials compared to topical antimicrobials alone [82]. North American guidelines specifically suggest Nd:YAG as a treatment option for Hurley stage I disease on the basis of expert consensus [19].

CO_2 Ablative Laser. CO_2 ablative laser therapy is recommended by all except the British guidelines for extensive chronic HS lesions in Hurley stage II/III disease [19, 21–27]. The European S1 and Brazilian guidelines note that CO_2 laser ablation may be preferable over standard excision due to less bleeding and better visualization of the affected areas with sparing of healthy tissue [25, 27].

Procedures

Incision and Drainage (I&D). I&D is recommended in the North American, HS ALLIANCE, Canadian consensus, and Brazilian guidelines for pain relief associated with acute, isolated inflammatory HS lesions [19, 21, 23, 27].

Deroofing. Deroofing is an effective in-office procedure suggested by all except the British guidelines as an intervention for recurrent nodules and sinus tracts, either in localized areas of mild disease or in more extensive Hurley stage II/III HS [19, 21–27].

Wide Local Excision (WLE). WLE is recommended by all guidelines as a surgical intervention to treat advanced regional disease. WLE is reserved for HS refractory to systemic therapy and is recommended for severe but localized disease [18, 19, 21–27]. North American, European S1, Swiss, and Brazilian guidelines discuss that healing after WLE may occur via secondary intention, primary closure, grafts, or flaps according to the size and location of the surgical defect [19, 25–27].

Discussion

Several HS treatment guidelines have emerged since 2015, published by dermatologic organizations and expert working groups in North America, South America, and Europe. While these publications generally share common ground of included studies and case reports, noticeable discrepancies can also be found between recommendations. While there is generally agreement on first-line agents, recommendations for second- and third-line therapeutic options vary significantly and are usually not supported by large-scale high-quality trials. Treatment modalities with strong and uniform support across guidelines include topical clindamycin, oral tetracyclines, combination clindamycin and rifampicin therapy, adalimumab, and WLE. The majority of these widely supported interventions have been evaluated in RCTs in HS patients, establishing a solid foundation for recommendation and use in regular practice. Although targeted biologics are recommended by several guidelines, issues with insurance coverage are likely to be encountered for those agents not yet indicated for HS in countries without so-

cialized healthcare systems. Furthermore, a lack of consensus in the use of outcome measurements for HS adds to the variability in assessment of treatment response. This variation could be minimized or potentially solved through the establishment of a core HS outcome set.

All reviewed guidelines place an emphasis on a comprehensive and multidisciplinary approach to treatment of HS patients. This involves patient education, regular communication between specialists, and assessment of HS-related factors such as tobacco use, wound care, depression, and chronic pain. These challenging aspects of day-to-day HS management further highlight the importance of close communication between patients and dermatologists, as well as between dermatologists and providers in the fields of mental health, pain management, and surgery. Complementary and alternative medicine approaches are thoroughly addressed in the North American guidelines [19], but comprehensive information on these modalities is not included in Brazilian, Canadian, or European publications. All reviewed guidelines are put forth by authors from developed regions, but lifestyle modifications and complementary approaches may be of added value in developing nations where medical and surgical interventions are impractical or not readily available.

In an article published recently in the *British Journal of Dermatology*, Jemec [83] highlights the difficulties encountered in developing guidelines, as new evidence in the field of HS research necessitates regular review and reevaluation of treatment recommendations. There are several targeted agents for HS treatment in the drug development pipeline, further underscoring the importance of timely and comprehensive updates [84]. By coordinating updated guideline publications internationally, experts in HS management can consolidate efforts to publish timely guidelines without duplicating work and with agreement between organizations. The current era represents an exciting time in the treatment of HS with the investigation of new therapeutic modalities and evolution of our understanding of disease pathogenesis. Through international collaboration between dermatologists and with our colleagues in other specialties, we aim to improve the development of comprehensive management guidelines that will lead to optimized care for HS patients.

Key Message

Some variation exists across international management guidelines for hidradenitis suppurativa. Collaboration between organizations to put forth unified and updated recommendations would be beneficial to HS patients and providers.

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References

1 Kurzen H, Kurokawa I, Jemec GB, Emtestam L, Sellheyer K, Giamarellos-Bourboulis EJ, et al. What causes hidradenitis suppurativa? Exp Dermatol. 2008 May;17(5):455–6.
2 Fimmel S, Zouboulis CC. Comorbidities of hidradenitis suppurativa (acne inversa). Dermatoendocrinol. 2010 Jan;2(1):9–16.
3 Saunte DM, Jemec GB. Hidradenitis Suppurativa: Advances in Diagnosis and Treatment. JAMA. 2017 Nov;318(20):2019–32.
4 Garg A, Kirby JS, Lavian J, Lin G, Strunk A. Sex- and Age-Adjusted Population Analysis of Prevalence Estimates for Hidradenitis Suppurativa in the United States. JAMA Dermatol. 2017 Aug;153(8):760–4.
5 Danby FW, Jemec GB, Marsch WC, von Laffert M. Preliminary findings suggest hidradenitis suppurativa may be due to defective follicular support. Br J Dermatol. 2013 May;168(5):1034–9.
6 Kelly G, Prens EP. Inflammatory Mechanisms in Hidradenitis Suppurativa. Dermatol Clin. 2016 Jan;34(1):51–8.
7 Patel ZS, Hoffman LK, Buse DC, Grinberg AS, Afifi L, Cohen SR, et al. Pain, Psychological Comorbidities, Disability, and Impaired Quality of Life in Hidradenitis Suppurativa [corrected]. Curr Pain Headache Rep. 2017 Nov;21(12):49.
8 Matusiak Ł. Profound consequences of hidradenitis suppurativa: a review. Br J Dermatol. 2018, Epub ahead of print.
9 Vazquez BG, Alikhan A, Weaver AL, Wetter DA, Davis MD. Incidence of hidradenitis suppurativa and associated factors: a population-based study of Olmsted County, Minnesota. J Invest Dermatol. 2013 Jan;133(1):97–103.

10 Shavit E, Dreiher J, Freud T, Halevy S, Vinker S, Cohen AD. Psychiatric comorbidities in 3207 patients with hidradenitis suppurativa. J Eur Acad Dermatol Venereol. 2015 Feb;29(2):371–6.
11 Matusiak L, Bieniek A, Szepietowski JC. Psychophysical aspects of hidradenitis suppurativa. Acta Derm Venereol. 2010 May;90(3):264–8.
12 Kouris A, Platsidaki E, Christodoulou C, Efstathiou V, Dessinioti C, Tzanetakou V, et al. Quality of Life and Psychosocial Implications in Patients with Hidradenitis Suppurativa. Dermatology. 2016;232(6):687–91.
13 Sampogna F, Abeni D, Gieler U, Tomas-Aragones L, Lien L, Titeca G, et al. Impairment of Sexual Life in 3,485 Dermatological Outpatients From a Multicentre Study in 13 European Countries. Acta Derm Venereol. 2017 Apr;97(4):478–82.
14 Thorlacius L, Cohen AD, Gislason GH, Jemec GB, Egeberg A. Increased Suicide Risk in Patients with Hidradenitis Suppurativa. J Invest Dermatol. 2018 Jan;138(1):52–7.
15 Kluger N, Ranta M, Serlachius M. The Burden of Hidradenitis Suppurativa in a Cohort of Patients in Southern Finland: A Pilot Study. Skin Appendage Disord. 2017 Mar;3(1):20–7.
16 Matusiak L, Bieniek A, Szepietowski JC. Hidradenitis suppurativa markedly decreases quality of life and professional activity. J Am Acad Dermatol. 2010 Apr;62(4):706–8.e1.
17 Kirby JS, Miller JJ, Adams DR, Leslie D. Health care utilization patterns and costs for patients with hidradenitis suppurativa. JAMA Dermatol. 2014 Sep;150(9):937–44.
18 Ingram JR, Collier F, Brown D, Burton T, Burton J, Chin MF, et al. British Association of Dermatologists guidelines for the management of hidradenitis suppurativa (acne inversa) 2018. Br J Dermatol. 2019 May;180(5):1009–1017.
19 Alikhan A, Sayed C, Alavi A, Alhusayen R, Brasasard A, Burkhart C, et al. North American Clinical Management Guidelines for Hidradenitis Suppurativa: a Publication from the United States and Canadian Hidradenitis Suppurativa Foundations: Part I: Diagnosis, Evaluation, and the use of Complementary and Procedural Management. J Am Acad Dermatol. 2019 Jul;81(1):76–90.
20 Alikhan A, Sayed C, Alavi A, Alhusayen R, Brasasard A, Burkhart C, et al. North American Clinical Management Guidelines for Hidradenitis Suppurativa: a Publication from the United States and Canadian Hidradenitis Suppurativa Foundations: Part II: Topical, Intralesional, and Systemic medical Management. J Am Acad Dermatol. 2019 Jul;81(1):91–101.
21 Zouboulis CC, Bechara FG, Dickinson-Blok JL, Gulliver W, Horváth B, Hughes R, et al. Hidradenitis suppurativa/acne inversa: a practical framework for treatment optimization - systematic review and recommendations from the HS ALLIANCE working group. J Eur Acad Dermatol Venereol. 2019 Jan;33(1):19–31.
22 Gulliver W, Landells ID, Morgan D, Pirzada S. Hidradenitis Suppurativa: A Novel Model of Care and an Integrative Strategy to Adopt an Orphan Disease. J Cutan Med Surg. 2018 Jan/Feb;22(1):71–7.
23 Alavi A, Lynde C, Alhusayen R, Bourcier M, Delorme I, George R, et al. Approach to the Management of Patients With Hidradenitis Suppurativa: A Consensus Document. J Cutan Med Surg. 2017 Nov/Dec;21(6):513–24.
24 Gulliver W, Zouboulis CC, Prens E, Jemec GB, Tzellos T. Evidence-based approach to the treatment of hidradenitis suppurativa/acne inversa, based on the European guidelines for hidradenitis suppurativa. Rev Endocr Metab Disord. 2016 Sep;17(3):343–51.
25 Zouboulis CC, Desai N, Emtestam L, Hunger RE, Ioannides D, Juhász I, et al. European S1 guideline for the treatment of hidradenitis suppurativa/acne inversa. J Eur Acad Dermatol Venereol. 2015 Apr;29(4):619–44.
26 Hunger RE, Laffitte E, Läuchli S, Mainetti C, Mühlstädt M, Schiller P, et al. Swiss Practice Recommendations for the Management of Hidradenitis Suppurativa/Acne Inversa. Dermatology. 2017;233(2-3):113–9.
27 Magalhães RF, Rivitti-Machado MC, Duarte GV, Souto R, Nunes DH, Chaves M, et al. Consensus on the treatment of hidradenitis suppurativa - Brazilian Society of Dermatology. An Bras Dermatol. 2019 Apr;94(2 Suppl 1):7–19.
28 Hurley H. Axillary hyperhidrosis, apocrine bromhidrosis, hidradenitis suppurativa, and familial benign pemphigus. In: Roenigk H, Roenigk R, editors. Dermatologic surgery, principles and practice. New York: Marcel Dekker; 1989. pp. 729–39.
29 Dehesa L, Abuchar A, Nuno-Gonzalez A, Vitiello M, Kerdel FA. The use of cyclosporine in dermatology. J Drugs Dermatol. 2012 Aug;11(8):979–87.
30 Simonart T. Hidradenitis suppurativa and smoking. J Am Acad Dermatol. 2010 Jan;62(1):149–50.
31 Grond S, Sablotzki A. Clinical pharmacology of tramadol. Clin Pharmacokinet. 2004;43(13):879–923.
32 U.S. Food and Drug Administration: Q&A for Consumers: Health Care Antiseptics, 2017.
33 Boyd AS. Ichthammol revisited. Int J Dermatol. 2010 Jul;49(7):757–60.
34 Ring HC, Bay L, Nilsson M, Kallenbach K, Miller IM, Saunte DM, et al. Bacterial biofilm in chronic lesions of hidradenitis suppurativa. Br J Dermatol. 2017 Apr;176(4):993–1000.
35 Riis PT, Boer J, Prens EP, Saunte DM, Deckers IE, Emtestam L, et al. Intralesional triamcinolone for flares of hidradenitis suppurativa (HS): A case series. J Am Acad Dermatol. 2016 Dec;75(6):1151–5.
36 Cross R, Ling C, Day NP, McGready R, Paris DH. Revisiting doxycycline in pregnancy and early childhood—time to rebuild its reputation? Expert Opin Drug Saf. 2016;15(3):367–82.
37 Albrecht J, Baine PA, Ladizinski B, Jemec GB, Bigby M. Long-term clinical safety of clindamycin and rifampicin combination for the treatment of hidradenitis suppurativa. A Critically Appraised Topic. Br J Dermatol. 2019 Apr;180(4):749–55.
38 Hambly R, Kirby B. Prolonged clindamycin and rifampicin for hidradenitis suppurativa: resist to prevent resistance. Br J Dermatol. 2019 Apr;180(4):702–3.
39 Caeiro JP, Iannini PB. Moxifloxacin (Avelox): a novel fluoroquinolone with a broad spectrum of activity. Expert Rev Anti Infect Ther. 2003 Oct;1(3):363–70.
40 Join-Lambert O, Coignard H, Jais JP, Guet-Revillet H, Poirée S, Fraitag S, et al. Efficacy of rifampin-moxifloxacin-metronidazole combination therapy in hidradenitis suppurativa. Dermatology. 2011 Feb;222(1):49–58.
41 Zhanel GG, Johanson C, Embil JM, Noreddin A, Gin A, Vercaigne L, et al. Ertapenem: review of a new carbapenem. Expert Rev Anti Infect Ther. 2005 Feb;3(1):23–39.
42 Join-Lambert O, Coignard-Biehler H, Jais JP, Delage M, Guet-Revillet H, Poirée S, et al. Efficacy of ertapenem in severe hidradenitis suppurativa: a pilot study in a cohort of 30 consecutive patients. J Antimicrob Chemother. 2016 Feb;71(2):513–20.
43 Poveda I, Vilarrasa E, Martorell A, García-Martínez FJ, Segura JM, Hispán P, et al. Serum Zinc Levels in Hidradenitis Suppurativa: A Case-Control Study. Am J Clin Dermatol. 2018 Oct;19(5):771–7.
44 Jarrousse V, Castex-Rizzi N, Khammari A, Charveron M, Dréno B. Zinc salts inhibit in vitro Toll-like receptor 2 surface expression by keratinocytes. Eur J Dermatol. 2007 Nov-Dec;17(6):492–6.
45 Hunger RE, Surovy AM, Hassan AS, Braathen LR, Yawalkar N. Toll-like receptor 2 is highly expressed in lesions of acne inversa and colocalizes with C-type lectin receptor. Br J Dermatol. 2008 Apr;158(4):691–7.
46 Dreno B, Trossaert M, Boiteau HL, Litoux P. Zinc salts effects on granulocyte zinc concentration and chemotaxis in acne patients. Acta Derm Venereol. 1992 Aug;72(4):250–2.
47 Lima AL, Karl I, Giner T, Poppe H, Schmidt M, Presser D, et al. Keratinocytes and neutrophils are important sources of proinflammatory molecules in hidradenitis suppurativa. Br J Dermatol. 2016 Mar;174(3):514–21.
48 Amor KT, Rashid RM, Mirmirani P. Does D matter? The role of vitamin D in hair disorders and hair follicle cycling. Dermatol Online J. 2010 Feb;16(2):3.
49 Demay MB. The hair cycle and Vitamin D receptor. Arch Biochem Biophys. 2012 Jul;523(1):19–21.
50 Guillet A, Brocard A, Bach Ngohou K, Graveline N, Leloup AG, Ali D, et al. Verneuil's disease, innate immunity and vitamin D: a pilot study. J Eur Acad Dermatol Venereol. 2015 Jul;29(7):1347–53.

51 van der Zee HH, de Ruiter L, van den Broecke DG, Dik WA, Laman JD, Prens EP. Elevated levels of tumour necrosis factor (TNF)-α, interleukin (IL)-1β and IL-10 in hidradenitis suppurativa skin: a rationale for targeting TNF-α and IL-1β. Br J Dermatol. 2011 Jun;164(6):1292–8.
52 Witte-Händel E, Wolk K, Tsaousi A, Irmer ML, Mößner R, Shomroni O, et al. The IL-1 Pathway Is Hyperactive in Hidradenitis Suppurativa and Contributes to Skin Infiltration and Destruction. J Invest Dermatol. 2019 Jun;139(6):1294–305.
53 Thomi R, Cazzaniga S, Seyed Jafari SM, Schlapbach C, Hunger RE. Association of Hidradenitis Suppurativa With T Helper 1/T Helper 17 Phenotypes: A Semantic Map Analysis. JAMA Dermatol. 2018 May;154(5):592–5.
54 Matusiak Ł, Szczęch J, Bieniek A, Nowicka-Suszko D, Szepietowski JC. Increased interleukin (IL)-17 serum levels in patients with hidradenitis suppurativa: implications for treatment with anti-IL-17 agents. J Am Acad Dermatol. 2017 Apr;76(4):670–5.
55 AbbVie. AbbVie's HUMIRA® (Adalimumab) Receives First and Only U.S. Food and Drug Administration Approval for Moderate to Severe Hidradenitis Suppurativa. 2015. Available from: https://news.abbvie.com/news/abbvies-humira-adalimumab-receives-first-and-only-us-food-and-drug-administration-approval-for-moderate-to-severe-hidradenitis-suppurativa.htm
56 AbbVie. AbbVie's HUMIRA® (Adalimumab) Receives First and Only Health Canada Approval for Moderate to Severe Hidradenitis Suppurativa. 2016. Available from: https://www.newswire.ca/news-releases/abbvies-humira-adalimumab-receives-first-and-only-health-canada-approval-for-moderate-to-severe-hidradenitis-suppurativa-564353901.html.
57 Kimball AB, Kerdel F, Adams D, Mrowietz U, Gelfand JM, Gniadecki R, et al. Adalimumab for the treatment of moderate to severe Hidradenitis suppurativa: a parallel randomized trial. Ann Intern Med. 2012 Dec;157(12):846–55.
58 Kimball AB, Okun MM, Williams DA, Gottlieb AB, Papp KA, Zouboulis CC, et al. Two Phase 3 Trials of Adalimumab for Hidradenitis Suppurativa. N Engl J Med. 2016 Aug;375(5):422–34.
59 Miller I, Lynggaard CD, Lophaven S, Zachariae C, Dufour DN, Jemec GB. A double-blind placebo-controlled randomized trial of adalimumab in the treatment of hidradenitis suppurativa. Br J Dermatol. 2011 Aug;165(2):391–8.
60 Lim SY, Oon HH. Systematic review of immunomodulatory therapies for hidradenitis suppurativa. Biologics. 2019 May;13:53–78.
61 Grant A, Gonzalez T, Montgomery MO, Cardenas V, Kerdel FA. Infliximab therapy for patients with moderate to severe hidradenitis suppurativa: a randomized, double-blind, placebo-controlled crossover trial. J Am Acad Dermatol. 2010 Feb;62(2):205–17.
62 Tzanetakou V, Kanni T, Giatrakou S, Katoulis A, Papadavid E, Netea MG, et al. Safety and Efficacy of Anakinra in Severe Hidradenitis Suppurativa: A Randomized Clinical Trial. JAMA Dermatol. 2016 Jan;152(1):52–9.
63 Gulliver WP, Jemec GB, Baker KA. Experience with ustekinumab for the treatment of moderate to severe hidradenitis suppurativa. J Eur Acad Dermatol Venereol. 2012 Jul;26(7):911–4.
64 Blok JL, Li K, Brodmerkel C, Horvátovich P, Jonkman MF, Horváth B. Ustekinumab in hidradenitis suppurativa: clinical results and a search for potential biomarkers in serum. Br J Dermatol. 2016 Apr;174(4):839–46.
65 Giuseppe P, Nicola P, Valentina C, Elena C, Salvatrice C, Rosario G, et al. A Case of Moderate Hidradenitis Suppurativa and Psoriasis Treated with Secukinumab. Ann Dermatol. 2018 Aug;30(4):462–4.
66 Jørgensen AR, Yao Y, Thomsen SF. Therapeutic Response to Secukinumab in a 36-Year-Old Woman with Hidradenitis Suppurativa. Case Rep Dermatol Med. 2018 Apr;2018:8685136.
67 Prussick L, Rothstein B, Joshipura D, Saraiya A, Turkowski Y, Abdat R, et al. Open-label, investigator-initiated, single-site exploratory trial evaluating secukinumab, an anti-interleukin-17A monoclonal antibody, for patients with moderate-to-severe hidradenitis suppurativa. Br J Dermatol. 2019 Sep;181(3):609–11.
68 Schuch A, Fischer T, Boehner A, Biedermann T, Volz T. Successful Treatment of Severe Recalcitrant Hidradenitis Suppurativa with the Interleukin-17A Antibody Secukinumab. Acta Derm Venereol. 2018 Jan;98(1):151–2.
69 Thorlacius L, Theut Riis P, Jemec GB. Severe hidradenitis suppurativa responding to treatment with secukinumab: a case report. Br J Dermatol. 2018 Jul;179(1):182–5.
70 Adams DR, Yankura JA, Fogelberg AC, Anderson BE. Treatment of hidradenitis suppurativa with etanercept injection. Arch Dermatol. 2010 May;146(5):501–4.
71 Vossen AR, van Straalen KR, Prens EP, van der Zee HH. Menses and pregnancy affect symptoms in hidradenitis suppurativa: A cross-sectional study. J Am Acad Dermatol. 2017 Jan;76(1):155–6.
72 Riis PT, Ring HC, Themstrup L, Jemec GB. The Role of Androgens and Estrogens in Hidradenitis Suppurativa - A Systematic Review. Acta Dermatovenerol Croat. 2016 Dec;24(4):239–49.
73 Clayton RW, Göbel K, Niessen CM, Paus R, van Steensel MA, Lim X. Homeostasis of the sebaceous gland and mechanisms of acne pathogenesis. Br J Dermatol. 2019 Oct;181(4):677–90.
74 Mortimer PS, Dawber RP, Gales MA, Moore RA. A double-blind controlled cross-over trial of cyproterone acetate in females with hidradenitis suppurativa. Br J Dermatol. 1986 Sep;115(3):263–8.
75 Lee A, Fischer G. A case series of 20 women with hidradenitis suppurativa treated with spironolactone. Australas J Dermatol. 2015 Aug;56(3):192–6.
76 Gold M, Bridges TM, Bradshaw VL, Boring M. ALA-PDT and blue light therapy for hidradenitis suppurativa. J Drugs Dermatol. 2004 Jan-Feb;3(1 Suppl):S32–5.
77 Saraceno R, Teoli M, Casciello C, Chimenti S. Methyl aminolaevulinate photodynamic therapy for the treatment of hidradenitis suppurativa and pilonidal cysts. Photodermatol Photoimmunol Photomed. 2009 Jun;25(3):164–5.
78 Schweiger ES, Riddle CC, Aires DJ. Treatment of hidradenitis suppurativa by photodynamic therapy with aminolevulinic acid: preliminary results. J Drugs Dermatol. 2011 Apr;10(4):381–6.
79 Strauss RM, Pollock B, Stables GI, Goulden V, Cunliffe WJ. Photodynamic therapy using aminolaevulinic acid does not lead to clinical improvement in hidradenitis suppurativa. Br J Dermatol. 2005 Apr;152(4):803–4.
80 Rose RF, Stables GI. Topical photodynamic therapy in the treatment of hidradenitis suppurativa. Photodiagn Photodyn Ther. 2008 Sep;5(3):171–5.
81 Highton L, Chan WY, Khwaja N, Laitung JK. Treatment of hidradenitis suppurativa with intense pulsed light: a prospective study. Plast Reconstr Surg. 2011 Aug;128(2):459–65.
82 Mahmoud BH, Tierney E, Hexsel CL, Pui J, Ozog DM, Hamzavi IH. Prospective controlled clinical and histopathologic study of hidradenitis suppurativa treated with the long-pulsed neodymium:yttrium-aluminium-garnet laser. J Am Acad Dermatol. 2010 Apr;62(4):637–45.
83 Jemec GB. Evidence-based hidradenitis suppurativa guidelines - and now all together please. Br J Dermatol. 2019 May;180(5):975.
84 Maarouf M, Clark AK, Lee DE, Shi VY. Targeted treatments for hidradenitis suppurativa: a review of the current literature and ongoing clinical trials. J Dermatolog Treat. 2018 Aug;29(5):441–9.