Received: 3 December 2023 | Accepted: 27 February 2024

DOI: 10.1111/ddg.15412

GUIDELINE

S2k guideline for the treatment of hidradenitis suppurativa / acne inversa – Short version

Christos C. Zouboulis[1,2] | **Falk G. Bechara**[2,3] | **Klaus Fritz**[4,5] | **Matthias Goebeler**[2,6] | **Frank H. Hetzer**[7] | **Elke Just**[8] | **Natalia Kirsten**[2,9] | **Georgios Kokolakis**[2,10] | **Hjalmar Kurzen**[2,11] | **Georgios Nikolakis**[1,2] | **Andreas Pinter**[2,12] | **Maurizio Podda**[2,13] | **Kerstin Rosinski**[14] | **Sylke Schneider-Burrus**[2,15] | **Klaus-M. Taube**[16] | **Thomas Volz**[17] | **Thomas Winkler**[18] | **Anna Kristandt**[19] | **Dagmar Presser**[2,6] | **Viktor A. Zouboulis**[2,20]

Correspondence
Prof. Dr. med. Prof. honoraire Dr. h.c. Christos C. Zouboulis, Departments of Dermatology, Venereology, Allergology and Immunology, Staedtisches Klinikum Dessau, Brandenburg Medical School Theodor Fontane and Faculty of Health Sciences Brandenburg, Auenweg 38, 06847 Dessau, Germany.
Email: christos.zouboulis@mhb-fontane.de

Summary
The S2k guideline on hidradenitis suppurativa/acne inversa (HS/AI) aims to provide an accepted decision aid for the selection/implementation of appropriate/sufficient therapy. HS/AI is a chronic recurrent, inflammatory, potentially mutilating skin disease of the terminal hair follicle-glandular apparatus, with painful, inflammatory lesions in the apocrine gland-rich regions of the body. Its point prevalence in Germany is 0.3%, it is diagnosed with a delay of 10.0 ± 9.6 years. Abnormal differentiation of the keratinocytes of the hair follicle-gland apparatus and accompanying inflammation form the central pathogenetic basis. Primary HS/AI lesions are inflammatory nodules, abscesses and draining tunnels. Recurrences in the last 6 months with at least 2 lesions at the predilection sites point to HS/AI with a 97% accuracy. HS/AI patients suffer from a significant reduction in quality of life. For correct treatment decisions, classification and activity assessment should be done with a validated tool, such as the *International Hidradenitis Suppurativa Severity Scoring System* (IHS4). HS/AI is classified into two forms according to the degree of detectable inflammation: active, inflammatory (mild, moderate, and severe according to IHS4) and predominantly inactive, non-inflammatory (Hurley grade I, II and III) HS/AI. Oral tetracyclines or 5-day intravenous therapy with clindamycin are equal to the effectiveness of clindamycin/rifampicin. Subcutaneously administered adalimumab,

German Dermatological Society (DDG)
Association of German Dermatologists (BVDD)
German Acne Inversa Patient Association in Formation
German Dermatological Laser Society (DDL)
German Society of Dermatosurgery (DGDC)
German Society of Coloproctology (DGK)
German Association of Plastic, Reconstructive and Aesthetic Surgeons (DGPRÄC)
German Society for Psychosomatic Medicine (DGPM)
European Hidradenitis Suppurativa Foundation e.V. (EHSF)
European Reference Network for Rare Skin Diseases (ERN-Skin)
European Society of Dermatology and Psychiatry (ESDaP)
mullewupp – Acne Inversa Self-help Support Group (SHG)

secukinumab and bimekizumab are approved for the therapy of HS/AI. Various surgical procedures are available for the predominantly non-inflammatory disease form. Drug/surgical combinations are considered a holistic therapy method.

KEYWORDS
acne inversa, classification, guideline, hidradenitis suppurativa, severity, therapy

OBJECTIVES OF THE GUIDELINE

The present S2k guideline is an update of the latest edition of the German guideline from 2012.[1] Several passages have been adopted without changes from the previous version. The general aim of this guideline is to provide dermatologists in offices and clinics with an accepted decision aid for the selection and implementation of appropriate and sufficient therapy of patients with HS/AI. The publication is a short version of the guideline. The long version (www.awmf.org and Zouboulis CC et al.[2]) includes additional information, for example, on author contribution and financing, methods of guideline preparation, situation of care for patients with HS/AI in Germany and needs analysis, psychosomatic and psychosocial aspects, as well as quality of life of patients with HS/AI, pathogenesis, histology, and complications, and a detailed presentation of therapy (Online Supplement S1).

Improvement of the care of patients by implementation of guideline recommendations and optimization of the knowledge of physicians with respect to effectiveness proven in studies

Personal experience and traditional therapeutic concepts of physicians concerning the efficacy of individual therapies of HS/AI shall be complemented and, if necessary, replaced by the consented recommendations.

Aid for stage-related implementation of therapies according to the predominant severity

Especially the presentation of suitable therapeutic options while considering the severity of HS/AI in the therapeutic algorithm is aimed at ensuring a correct therapy.

Reduction of severe courses and scar formation

The comprehensive presentation of systemic therapies with detailed description of their use and information about safety aspects has the aim to overcome reservations concerning these therapeutic procedures among physicians and patients and to ensure their timely, sufficient, and optimal implementation. The timely initiation of sufficient therapies is aimed at reducing severe disease courses that are often accompanied by pronounced scarring. This includes the development of therapeutic objectives and targets used to monitor treatment success and to change the therapy, if necessary.

Promotion of compliance

Compliance is often associated with a ratio of benefit to effort, costs, and adverse effects well acceptable for the patient. The individual selection of particularly effective therapies, taking also the parameters on *quality of life* assessed in new studies into account, has the aim to ensure an especially high therapeutic benefit for the patients.[3] Information about treatment and avoidance of adverse effects is aimed at avoiding or reducing these effects, thus further promoting compliance.

THERAPEUTIC OBJECTIVES OF THE TREATMENT OF HS/AI

Regular control and, if necessary, adjustment of the therapy with respect to a potentially changing disease severity is recommended. This is also advisable to ensure compliance (timely modification of therapy in patients responding inadequately to therapy, or in case of adverse drug reactions). The assessment should be performed according to standardized criteria (see Chapter 7) taking the objectifiable lesions into account, and after recording the disease-related impairment of the quality of life of the patient.

If no significant reduction of the inflammatory activity of the lesions or no improvement of the quality of life is observed after 12 weeks, the therapy should be modified while taking the partly different rates of effectiveness into account. The recommended indicators for assessment are depicted in Chapter 7 "Severity classification and assessment".

WHAT'S New

Since the publication of the old guideline in 2012[1], intensive clinical and experimental research, as well as validation of new therapeutic approaches, have almost completely overhauled the knowledge in the field of HS/AI. According to a recent review, the estimated worldwide prevalence of HS/AI is 0.40% (95% confidence interval [CI] 0.26–0.63%)[4], while it is 0.3% in Germany.[5] The most important pathogenetic factors of the disease are an abnormal differentiation of keratinocytes of the hair follicle-glandular apparatus and a massive accompanying inflammation.[6–8] Although the diagnosis can be established clinically with a high accuracy of 97%,[9] the disease is still relatively unknown as is evident from the delay in diagnosis of 10.0 ± 9.6 years in Germany.[10] Inflammatory nodules, abscesses, and tunnels are the primary lesions of the disease, which enable

the calculation of the disease severity by new validated classification tools, especially the *International Hidradenitis Suppurativa Severity Scoring System* (IHS4).[11,12]

Currently, HS/AI is classified into two forms in relation to the degree of the detectable inflammation, the inflammatory and the predominantly non-inflammatory form.[9,13] While the intensity of the inflammatory form can be subdivided by means of the IHS4 classification in mild, moderate, and severe HS/AI and is treated by medication accordingly, the decision on surgical treatment of the predominantly non-inflammatory form is based on the Hurley grade of the affected localizations, that is, Hurley grade I, II, and III.[9,14]

Concerning the field of classical drug therapy, the effectiveness of systemic oral tetracyclines, which is equal to the effectiveness of oral systemic combination of clindamycin and rifampicin, should be noted.[15] In addition, it is even possible to shorten the total duration of systemic antibiotic therapy to a 5-day systemic intravenous (i.v.) therapy of clindamycin. On the other hand, the number of clinical trials with biologics is constantly increasing. Adalimumab[16] secukinumab[17] and bimekizumab have already been approved as subcutaneous injections for the therapy of HS/AI. Various surgical procedures are available for the predominantly non-inflammatory form of the disease. The combination of a medical therapy to reduce inflammation with a surgical procedure to remove irreversible tissue damage is currently considered a holistic therapeutic approach in HS/AI.[18]

HIDRADENITIS SUPPURATIVA / ACNE INVERSA

Definition

HS/AI is a chronic recurrent, inflammatory, potentially mutilating skin disease of the terminal hair follicle-glandular apparatus manifesting with painful, inflammatory lesions in the apocrine gland-rich regions of the body, especially in the axillary, as well as inguinal and anogenital regions (Dessau definition, *1st International Conference on Hidradenitis suppurativa / Acne inversa*, March 30 to April 1, 2006, Dessau, Germany).[9,19,20]

Epidemiology

In 2010, the prevalence of an already diagnosed HS/AI in Germany was calculated as 0.03% in a representative sample of approximately 2.3 million insured persons.[21] Considering only the inflammatory lesions, a point prevalence of 0.3% was observed in the employed German population. This increased to 3.0% when the non-inflammatory lesions typical of HS/AI (for example, scars) were included in the analysis.[5]

The estimated worldwide prevalence of HS/AI is 0.40% (95% CI: 0.26–0.63%).[4] Depending on the evaluation method (prospective study, registry, questionnaire, or data from insurance companies) and on the country from which the data originate, the reported prevalence of HS/AI shows a large variance with 0.09%–8%.[22] Studies based on clinical samples found a higher pooled prevalence of HS/AI (1.7%) than population-related studies (0.3%). Large regional differences have been reported ranging from 0.05% in the USA to 4.1% in Denmark.[22,23] This highest prevalence was obtained in 507 individuals that underwent screening for sexually transmitted infections.[24] In contrast, a lower prevalence of 0.053% was calculated in the USA based on insurance data of more than 15 million people.[25] A prevalence of 1% was reported in a representative sample of the French population (n = 10,000).[26] Recently, a global initiative was started to analyze the worldwide prevalence of HS/AI based on a standardized questionnaire followed by medically confirmed diagnosis (www.GhiSa.org). A questionnaire survey of the population of Greenland found an HS/AI prevalence of 3.2%. 506 individuals participated in the survey corresponding to 0.9% of the Greenlandic population.[27]

Women are believed to be affected more often. The male-to-female ratio in hospital studies and after the return of questionnaires is 1:2 to 1:5.[24,28] An exception was perianal HS/AI, where the proportion of men appears to predominate.[29] However, the only prospective population studies – conducted to date – from Denmark (793 individuals analyzed after randomization) and Germany (20,112 individuals) reported a balanced prevalence of 1:1.[5,24] Additional studies from Germany confirm a balanced prevalence.[10,30–32]

The annual HS/AI incidence was calculated by means of longitudinal data of the *Rochester Epidemiology Project* in Olmsted County, Minnesota, USA, and estimated at 6.0 per 100,000 inhabitants.[33]

The disease rarely develops before puberty[34,35] or after menopause, although persistence of existing lesions after menopause is quite common. The mean age at initial manifestation is 22 to 23 years.[26,36] An increased HS/AI prevalence was observed in patients with dark skin[37] and low socioeconomic status (SES).[23,38] This may indicate that SES-related factors, such as smoking, stress, and nutrition might be predisposing factors of the disease.[24]

CLINICAL APPEARANCE

Clinical appearance of individual lesions

The primary lesion of HS/AI is a painful, solitary, deep, cutaneous to subcutaneous nodule that may disappear spontaneously, persist, or transform into an abscess. In general, it is a horizontal infestation of the dermis. Abscesses may coalesce at depth, spontaneously rupture outwards, and form tunnels, that is, inflammatory and subsequently epithelialized tracts in various layers of the skin (Figure 1).[9,39,40]

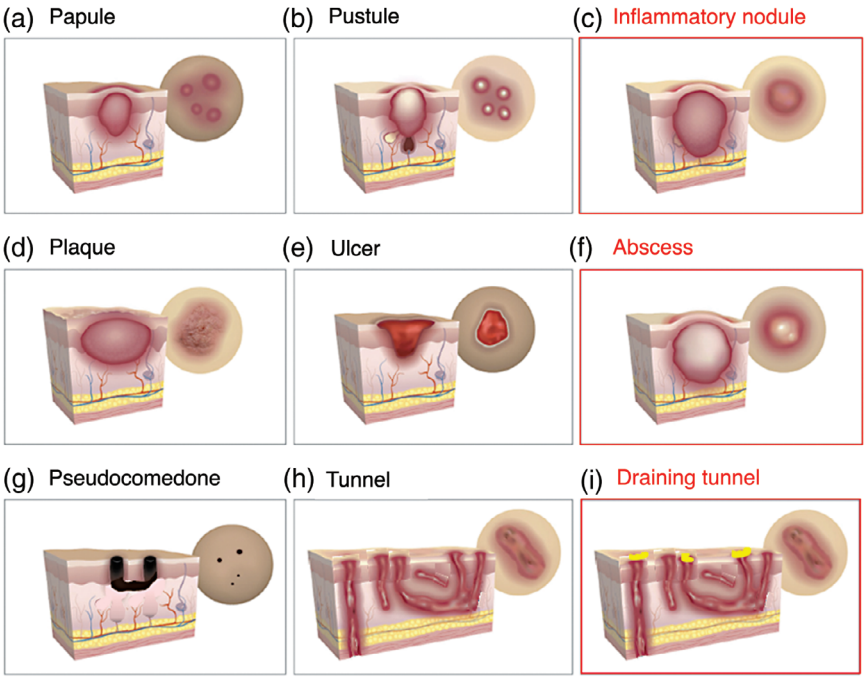

FIGURE 1 Graphic representation of the lesions of HS/AI. (c) Inflammatory nodules, (f) abscesses, and (i) draining tunnels represent the primary lesions of the disease (modified from[40]). (a) papules, (b) pustules, (d) plaques, (e) ulcers, (g) pseudocomedones, and (h) (non-draining) tunnels are not taken into account for the assessment of the severity grade.

Pattern of involvement of HS/AI – extension of disease

One of the most obvious features of HS/AI is the limitation to typical skin regions, although aberrant skin lesions may occur. The disease usually manifests symmetrically, almost exclusively limited to the convex/inverse skin surfaces, in areas with apocrine glands: inguinal (90%), axillary (69%), perianal and perineal (37%), gluteal (27%), submammary (18%), genitofemoral, in mons pubis, and more rarely on the face, in thoracic and retroauricular regions, and on scalp, eyelids, and back.[9,39,41,42] In approximately 90% of the patients, more than one region is affected. Pilonidal sinus disease is present in 23%–30% of HS/AI patients.[43,44] If this manifests as solitary disease, it may initially be considered as unilocalized type of HS/AI.[44,45] At disease onset, axillary and anogenital regions are commonly affected, and additional localizations are increasingly affected during disease progression. While axillary HS/AI is more common in men, genitofemoral manifestations are more often observed in women.[46]

Clinical phenotypes of HS/AI: Active, inflammatory versus inactive, predominantly non-inflammatory forms

Currently, HS/AI is generally classified into two forms in relation to the degree of the always detectable inflammation, the active, inflammatory and the inactive, predominantly non-inflammatory forms (Figure 2).[9,13,14]

Complications

In case of pronounced and/or long-lasting HS/AI, local and systemic complications may occur.

Local complications

Acute local complications are predominantly cutaneous superinfections. While they are more common in HS/AI patients they result very rarely in severe local (erysipelas, phlegmon), extracutaneous, or systemic dissemination. Acute local infections may mimic or contribute to disease flares.

Chronic local complications include lymphedema including scrotal elephantiasis, especially due to long-lasting anogenital inflammation.[47] Concomitant reactive lymphadenopathy is usually associated with a late disease stage, sometimes as a result of secondary infections.[48,49] Especially in advanced HS/AI (severe HS/AI and Hurley grade III), scarring, contracture, and blockade of lymphatics may result in accumulation of lymphatic fluid in interstitial tissue and/or proximal bag-like dilation of lymphatic vessels.[50–52] In a systematic review, a total of 27 patients with HS/AI at an average age of 46 years (30–58 years) developing lymphedema during the disease course were identified. The localizations affected most often were scrotum (59%), followed by penis (44%), labia majora (15%), perineal and inguinal region (11%), buttocks (7%), and abdomen (4%). In 22% of the cases, lymphedema affected two or more localizations.[53] Chronic lymphedema presents

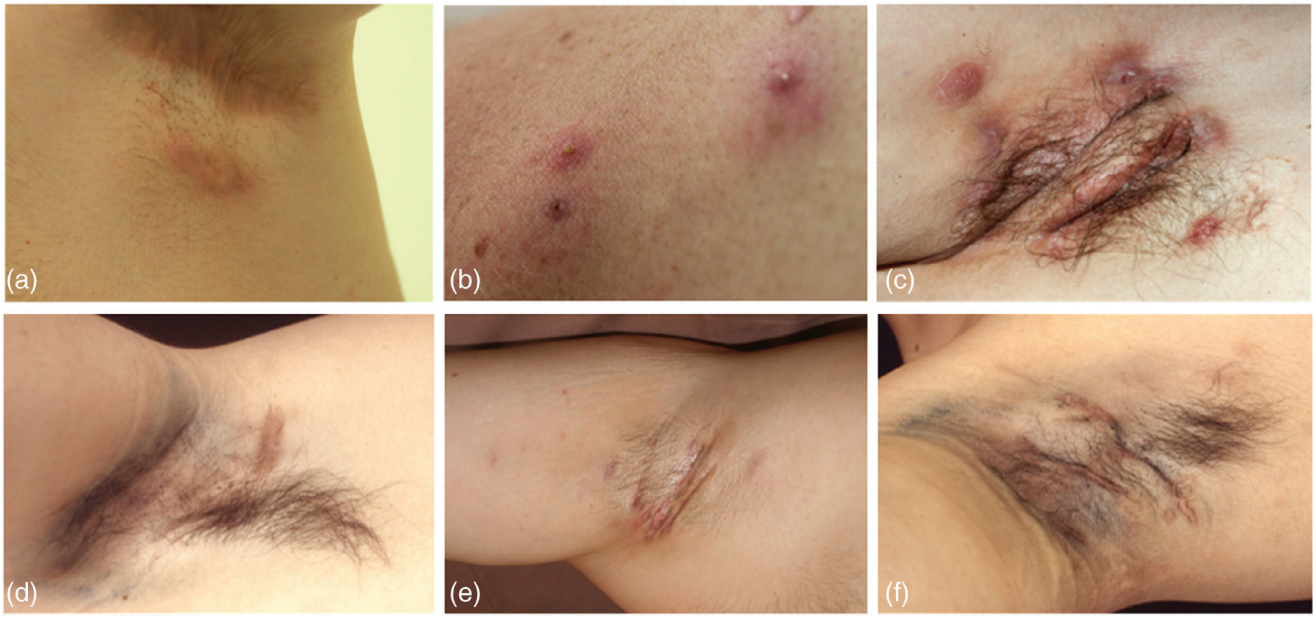

FIGURE 2 (a–c) Inflammatory and (d–f) predominantly non-inflammatory forms of HS/AI. The intensity of the inflammation is assessed according to the International Hidradenitis Suppurativa Severity Scoring System (IHS4) classification: (a) mild HS/AI (there is one inflammatory nodule here: IHS4 = 1), (b) moderate HS/AI (2 abscesses: IHS4 = 4), (c) severe HS/AI (one draining tunnel, 3 abscesses, one inflammatory nodule: IHS4 = 11). The recommendation for surgical treatment is decided according to the Hurley grade of the affected location: (d) Hurley grade I (no need for surgery), (e) Hurley grade II (if necessary, surgery of the individual lesions), (f) Hurley grade III (if necessary, radical excision of the affected axilla) (modified from[9]).

a risk of recurrent infections.[54] Another unusual and very rare complication in case of anogenital localization of the disease is the formation of fistulas with involvement of urethra, bladder, rectum, or peritoneum. When fistulas are present, exclusion of Crohn's disease is paramount.[47]

Scarring in severe HS/AI may result in movement restrictions due to the developing scar tracks (especially in case of axillary manifestation). Anogenital localization may result in strictures on urethra, anus, and rectum, while pararectal and paraurethral fistulas are occasionally observed.

Squamous cell carcinoma (SCC) presents as complication of chronic, untreated HS/AI and exhibits androtropism (78%),[55] early, high risk of metastasis (54%), and poor prognosis (59% mortality).[55–58] The most common localizations of SCC are gluteal, perianal, genital, and perineal regions.[59] Main risk factors for SCC development are long HS/AI duration, nicotine consumption, and human papilloma virus (HPV) infection.[59] The mean duration of HS/AI prior to manifestation of SCC was estimated at 25.5 years.[55] However, cases with a much earlier manifestation of SCC have been reported. Moreover, Jourabchi et al.[60] detected β- and α-HPV in 88% and 73% of HS/AI-associated SCC, respectively.

	Strength	Agreement
• Chronic HS/AI lesions shall be monitored regularly, especially those in the gluteal, perianal, genital, and perineal regions.	⇑⇑	Consensus
• In case of clinical suspicion of SCC, histological analysis shall be performed.[61]	⇑⇑	Strong consensus

In a study with 22,468 HS/AI patients, Jung et al.[62] found that especially patients with moderate to severe HS/AI have a higher risk of developing Hodgkin lymphomas, oral cavity and pharyngeal carcinomas, neoplasms of the central nervous system, SCC, as well as prostate and colorectal malignancies.

Systemic complications

Chronic systemic complications may significantly impair the quality of life of patients.[52] Systemic complications include chronic pain[63] and, less often, systemic amyloidosis with subsequent damage to kidneys, heart, and central nervous system, anemia, and hypoproteinemia.[64,65] In patients with severe HS/AI, screening for microalbuminuria or proteinuria should be performed, and renal biopsy should be considered, if necessary.[64,66] Early diagnosis and treatment of HS/AI is a key component for controlling disease activity and avoiding systemic complications.

HS/AI may cause severe mental distress, often resulting in restrictions of social contacts and social withdrawal of the patients, and may even cause the development of depression.[67]

Comorbidity

HS/AI is characterized by chronicity (longer than 6 months) and recurrence (more than 2 x in the last 6 months).[9,39] As chronic-inflammatory skin disease with systemic

TABLE 1 Key comorbidities to look for in HS/AI, screening tools and frequency.

Comorbidity	Frequency	Tools	Suggested measures
Smoking	First visit and follow-up	History	Patient consultation
Alcohol	First visit and follow-up	History	Patient consultation
Psoriasis	First visit and follow-up	Physical examination	Dermatological assessment
Psychiatric diseases	First visit and follow-up at least once a year	Questionnaire	Referral to cooperating specialist
Inflammatory bowel diseases	In case of perianal tunnels and/or chronic digestive disorders	Clinical examination, questionnaire, respective laboratory (potentially)	Referral to gastroenterologist
Spondylitis	First visit and follow-up	Physical examination, questionnaire	Referral to rheumatologist
Arthritis of small and medium-sized joints	First visit and follow-up	Physical examination	Referral to rheumatologist
Cardiovascular risk	First visit* and follow-up at least once a year	History and physical examination, laboratory tests**	Referral to cardiologist
Diabetes mellitus and endocrinological diseases	First visit and follow-up at least once a year	History and physical examination, laboratory tests***	Referral to specialist

*Includes determination of systolic and diastolic blood pressure
**Urea, creatinine, aminotransferases, total cholesterol, total triglycerides, LDL, HDL
***Glucose and glycated hemoglobin (HbA1c), T3, T4, TSH

inflammatory component, HS/AI is accompanied by comorbidity of clinical relevance, which, when diagnosed early enough, must be considered during selection of the treatment approach and modified by implementation of suitable interventions (Table 1).

Axial spondyloarthritis

Irrespective of age and gender, HS/AI is associated with an increased risk of spondyloarthritis.[68,69] Patients with axial spondyloarthritis may have a higher disease activity. A cross-sectional study found a higher prevalence of HS/AI in a cohort of patients with axial spondyloarthritis compared to the general population and showed a higher disease activity score for axial spondyloarthritis irrespective of HS/AI severity.[69] A meta-analysis showed that HS/AI patients have a threefold increased risk of developing inflammatory arthritis, especially spondyloarthritis and its subtypes, ankylosing spondylitis, and rheumatoid arthritis.[70]

	Strength	Agreement
• Patients with HS/AI exhibiting osteoarticular symptoms, especially pain in the lower back, should be examined for the existence of spondyloarthritis.	⇑	Consensus

Inflammatory bowel diseases

Among inflammatory bowel diseases (IBD), Crohn's disease and ulcerative colitis play a major role in HS/AI patients. Crohn's disease is characterized by an inflammatory process affecting the entire length of the intestine and the full thickness of the intestinal wall,[71] while ulcerative colitis is restricted to the colon mucosa. Recently, a significant association of HS/AI with IBD was found in a meta-analysis of observational studies.[72]

	Strength	Agreement
• HS/AI patients with gastrointestinal symptoms and/or perianal tunnels should be examined gastroenterologically for the existence of IBD.[73]	⇑	Consensus

Cardiovascular diseases

A large cohort comparing 6,147 HS/AI patients with 24,993 controls revealed a significant association between HS/AI and diseases of the metabolic syndrome, such as obesity, hypertriglyceridemia, diabetes mellitus, and smoking.[73] Moreover, multivariate analysis of a cohort study considering age, gender, SES, smoking, comorbidity, and drug therapy showed that HS/AI is associated with a significantly increased risk of cardiovascular events.[74] The observed ORs were 1.8 (95% CI: 1.1–2.2) for myocardial infarction, 1.3 (95% CI: 1.0–1.8) for ischemic strokes, 2.0 (95% CI: 1.4–2.7) for cardiovascular-related deaths, and 1.5 (95% CI: 1.3–1.9) for severe adverse cardiovascular events. Adipokines and cytokines, such as interleukin (IL)-32, that play a role in cardiovascular diseases were identified at higher concentrations in serum, but also in lesional skin of HS/AI patients compared to healthy controls.[75]

	Strength	Agreement
• HS/AI patients should be examined for modifiable cardiovascular risk factors, such as hypertension, diabetes mellitus, physical inactivity, smoking, overweight/obesity, and dyslipidemia and advised accordingly.	⇑	Consensus

Acne, pilonidal sinus disease, and folliculitis et perifolliculitis capitis abscedens et suffodiens

Together with HS/AI, acne, pilonidal sinus disease, and folliculitis et perifolliculitis capitis abscedens et suffodiens present the so-called acne tetrad. The three diseases may also occur individually together with HS/AI. Usually, they are detected more often in young men.[34,35]

Other comorbidities

HS/AI has also been associated with a higher risk of alopecia areata,[76] Down syndrome,[56] congenital keratin diseases (pachyonychia congenita, Dowling-Degos disease),[56] keratitis-ichthyosis-deafness (KID) syndrome,[56] long-term opioid consumption,[77] Adamantiades-Behçet disease,[56] psoriasis,[78] pyoderma gangrenosum,[56,79] SAPHO syndrome (synovitis, acne, pustulosis, hyperostosis, and osteitis)[56], and vitiligo.[79] The development of epithelial tumors on HS/AI lesions – apart from SCC, for example, adenocarcinoma – is attributed to the chronic inflammation.[56]

	Strength	Agreement
• At initial diagnosis of HS/AI and upon a change in symptoms, an appropriate screening shall be performed to allow for early detection of potential comorbidity and evidence-based treatment.	⇑	Consensus

Syndromal HS/AI

In rare cases, HS/AI may be associated with other diseases and occur in the context of complex (autoinflammatory) syndromes. Various syndromes have been described, the most important are PASH, PAPASH, PASS, and PsAPASH:[80–82]

- PASH refers to the combination of pyoderma gangrenosum, acne, and HS/AI. Presumably, it is mediated by IL-1 and IL-18.
- PAPASH is the combination of pyoderma gangrenosum, acne, HS/AI, and sterile arthritis. It can be mediated by IL-1, IL-17A, IL-18, and tumor necrosis factor (TNF)-α.
- PASS is the abbreviation of pyoderma gangrenosum, acne, HS/AI, and ankylosing spondylitis.[83]
- PsAPASH is the abbreviation of psoriasis arthritis, pyoderma gangrenosum, acne, and HS/AI.

In most of these syndromes, genetic abnormalities in genes relevant for IL-1 and TNFα signaling pathways have been described. It has been found that HS/AI may be more pronounced and more refractory to treatment in theses syndromes than in the normal population. In view of the rarity of these diseases, there is no evidence for an individual recommendation concerning the treatment of the syndromes mentioned above. It seems advisable to follow a multidisciplinary approach with an appropriate specialist.

Socioeconomic implications

There is clear evidence that HS/AI has significant effects on the work productivity of patients and impairs their career opportunities.[84,85] A recent study demonstrated a significant impairment of work ability and productivity for patients with HS/AI in Germany resulting in an estimated loss of gross income of altogether 12.6 billion Euros per year in Germany. The extent of the impairment of work ability and productivity correlates with the disease activity, as well as depressiveness and pain.[84] 46% of the employed patients with HS/AI reported that they were unable to work due to their disease for 35.8 days in the last 6 months (standard deviation [SD] 44.2).[84]

DIAGNOSIS

Diagnostic workup including laboratory tests

The diagnosis of HS/AI is made primarily clinically by inspection, palpation, and, if necessary, tunnel exploration. In this context, attention must be paid to the presence of follicle-related, inflammatory, painful nodules, abscesses, presence of tunnels and scars both at predilection sites (axillary, submammary, inguinal, genital, and perineal regions), but also at other localizations (for example, nuchal region) (Figure 3).[9] Recurrence of such lesions in the last 6 months with at least two lesions at predilection sites indicate the presence of HS/AI with an accuracy of 97%.[86]

A fraction of the patients with HS/AI have a positive family history (up to 30%[87]), which needs to be obtained accordingly. Information on tobacco consumption and determination of the BMI are also required, given that both obesity and nicotine consumption present established risk factors for the manifestation of HS/AI.[88–90] Elevated erythrocyte sedimentation rate (ESR) and increased C-reactive protein (CRP) levels are indicators for an increased disease activity. If superinfection is suspected, smears

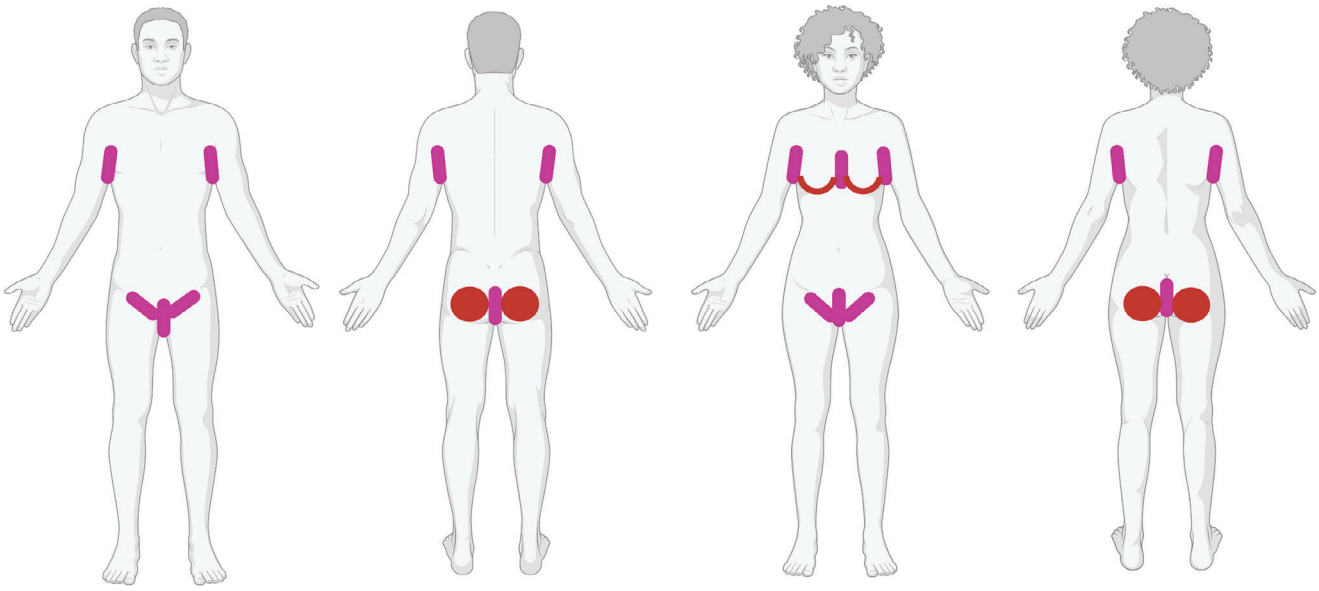

FIGURE 3 Predilection sites of HS/AI in both sexes (created with BioRender.com).

must be taken from deep, affected tissue areas and not only from the skin surface. High-resolution ultrasound analysis may be useful to detect the extension of subclinical HS/AI lesions.[91,92] If the perianal region is affected, depth extension and localization of tunnels may be determined by magnetic resonance imaging (MRI).[93] The implementation of long-wave medical infrared thermography has enabled the documentation of inflammatory processes in skin tissue together with their extension.[94]

According to recent studies, the diagnosis of HS/AI is made with a delay of 7.2 ± 8.7 years.[95] In Germany the diagnostic delay is 10.0 ± 9.6 years.[10] An earlier manifestation of HS/AI causes, especially in children, a diagnostic delay that is associated with severe disease at the time of diagnosis.[35]

Differential diagnosis

In the perianal region, mainly Crohn's disease, anorectal abscess, and presence of pilonidal sinus disease (as uniocular type of HS/AI[44]) must be considered in differential diagnosis.[96] During the initial stage, it is difficult to differentiate recurrent folliculitis from incipient HS/AI in the inverse skin regions. Furthermore, the presence of a neoplasm has to be included as potential differential diagnosis, especially in the perianal region.

7 SEVERITY CLASSIFICATION AND ASSESSMENT

Based on its phenotype, HS/AI is classified into a non-inflammatory and an inflammatory form. Clinical scores are used for classification of HS/AI, assessment of its severity, and documentation of the disease course (Online Table S1).

Already in 1996, a classification into three grades was suggested by Hurley.[97] This score is a classification score, and while it is suitable for documenting the decision of surgical therapy, especially for the non-inflammatory HS/AI phenotype, it cannot reflect the dynamics of the inflammatory phenotype. The use of the Hurley score for the documentation of disease activity of HS/AI is not useful, given that the intensity of inflammation is not depicted.

	Strength	Agreement
• The Hurley score shall be used for documenting the decision of surgical therapy.	⇑⇑	Consensus

Within the last years and especially since the development of new systemic therapies for HS/AI, a number of dynamic severity scores have been developed that record both the severity of the disease and the response to medical therapies.[11–13,16,98–107] In general, the scores currently in use can be divided into tools for classification (static grading)[11,13,16,97] and dynamic scores (measurement tools for the response of therapies).[11,12,98–105,107]

It is a central problem of all scores that lesions have to be counted, which involves a great deal of time and is hardly possible in Hurley grade III due to confluent and extensively inflamed areas without clear delimitation of individual nodules and abscesses. Therefore, the IHS4, which utilizes weighting of primary HS/AI lesions, thus reducing interindividual and intraindividual differences, as well as limiting the placebo effect, is particularly well suited as a measurement tool to assess the response of therapies.[108,109]

Apart from scores assessing the disease severity from the medical perspective, *patient-reported outcome measures*

TABLE 2 Classification and severity rating tools for HS/AI and their grade of recommendation (from the European guideline for the treatment of HS/AI, submitted).

Shall be recommended (⇑⇑)
- IHS4 (use in both clinical trials and daily clinical practice)
- Hurley staging refined

Should be recommended (⇑)
- SAHS
- HS-PGA
- Sartorius score
- Hurley score (only to select the surgical treatment approach for the examined body region)

May be considered (⇔)
- HASI-R
- MSS
- AISI
- ADDI

Shall not be recommended (⇓⇓)
- Hurley score
- HSSI

(PROMs), for example, *Dermatology Life Quality Index* (DLQI), *Visual Analog Scale* (VAS), *Pain Index*, and other tools are available to assess impairment of quality of life and pain from the perspective of the patient.[12,100,105,108–115] However, no HS/AI-specific PROMs that may be preferred or recommended are available yet. Accordingly, the DLQI – even though it is not HS/AI-specific – is still predominantly used. For the assessment of pain, reliable results have already been obtained with the *Pain Index*.[112]

Ingram et al.[116] have systematically evaluated the scores used for HS/AI in clinical trials. They found that 90% of the measurement tools used in trials were not validated. Among the evaluated scores, only the *Hidradenitis Suppurativa Clinical Response (HiSCR) score* showed a relatively high validity, although even this score was outside an acceptable range compared to the *Hurley Score* and the *Modified Sartorius Score* (MSS) (rho > 0.6). The IHS4, published in 2017, was the first score exhibiting a sufficiently high measurement validity (rho > 0.6) compared to *Hurley Score*, *Hidradenitis Suppurativa-Physician's Global Score* (HS-PGA), and MSS.[109]

	Strength	Agreement
• A validated classification tool, especially the IHS4, shall be used to document the disease activity of HS/AI in daily practice (Table 2).	⇑⇑	Consensus
• A validated dynamic measurement tool, especially the IHS4, shall be used to document the course of HS/AI – both in clinical trials and in daily practice (Table 2).	⇑⇑	Consensus
• A validated measurement tool suitable for patient use (PROM) should be used to assess impairment of quality of life and pain in HS/AI – both in clinical trials and in daily practice.	⇑⇑	Majority agreement

THERAPY

Overview of therapeutic options

Currently, the TNFα inhibitor adalimumab, the IL-17A inhibitor secukinumab and the IL-17A/F inhibitor bimekizumab are the only approved substances for the medical treatment of HS/AI. Adalimumab is approved for the treatment of moderate to severe active HS/AI in patients aged 12 years and older with inadequate response to conventional systemic HS/AI therapy.[117,118] Secukinumab[17] and bimekizumab are indicated for the treatment of adult patients with moderate to severe active HS/AI and inadequate response to conventional systemic HS/AI therapy. **All other therapeutic options – except for monotherapy with antibiotics – discussed in this guideline should be considered *off label***. The recommendations for the treatment methods of HS/AI are summarized in Table 3 taking publications published or accepted for publication until December 31, 2022 into account.

Although smoking is one of the pathogenetic factors of HS/AI, there are no studies indicating that sustained cessation of tobacco consumption results in short-term clinical improvement.

Conventional surgery

Within chronic-inflammatory skin diseases, HS/AI is characterized by a disease course with inflammatory skin changes that may result in irreversible tissue damage responding inadequately to medical therapy. In contrast to other inflammatory skin diseases like psoriasis or atopic dermatitis, surgery therefore plays an important role in the therapeutic treatment options of HS/AI.[119] Similar to the gradual treatment with drugs, surgical intervention will become indispensable with increasing disease severity and irreversible tissue damage like tunnel and scar formation.

In case of acute abscess formation, incision and drainage are useful options, followed by mandatory medical therapy or further surgical treatment. In severe HS/AI, extensive, complete resection of the damaged tissue is indicated, especially for the predominantly non-inflammatory form (Figure 2). Currently, several surgical techniques are available (Table 4).[120–125]

However, the general surgical concept is to remove the entire irreversibly damaged tissue. Frequently, surgery has to be combined with systemic anti-inflammatory treatments to achieve maximum efficacy. Surgical treatment remains the mainstay in the treatment of both individual, deep, and scarring lesions (Hurley grade II) and the extensive forms of HS/AI (Hurley grade III), especially of the predominantly non-inflammatory form.[126–128]

TABLE 3 Summary of the guidelines for HS/AI treatment.

The following therapies **shall be recommended**

- topical therapy with clindamycin 1% solution in mild HS/AI,
- oral systemic therapy with doxycycline 2 × 100 mg/d (alternatively, 2 × 50 mg/d) in patients with moderate to severe HS/AI,
- at the latest after 3 months on antibiotic therapy, verification of the usefulness of an extended therapy duration and potential switch to another therapeutic form,
- hormonal antiandrogen therapy (ethinylestradiol in combination with cyproterone acetate) in female patients with moderate to severe HS/AI and PCOS,
- initiation of hormonal antiandrogen therapy in cooperation with a specialist in gynecology,
- continued prescription of hormonal antiandrogen therapy by a dermatologist experienced in this therapy,
- therapy of moderate to severe HS/AI with adalimumab s.c. from the age of 12 at the registered dose,
- systemic combination therapy of moderate to severe HS/AI with adalimumab s.c. at the registered dose and antibiotics p.o.,
- combination of adalimumab s.c. with surgical intervention in moderate to severe HS/AI,
- therapy of moderate to severe HS/AI with secukinumab s.c. at the registered dose,
- complete surgical excision of irreversible tissue damage in predominantly non-inflammatory HS/AI form.

The following therapies **should be recommended**

- regular skin care to improve the barrier function in the affected areas,
- combination therapy of IPL+RF and topical clindamycin as alternative for topical clindamycin monotherapy in mild and moderate HS/AI,
- monotherapy with IPL+RF as maintenance therapy,
- topical therapy with clindamycin 1% solution as concomitant medication of systemic or surgical therapy in moderate to severe HS/AI,
- intralesional corticosteroid therapy for treatment of acute inflammatory lesions,
- systemic i.v. clindamycin therapy for 5 days (3 × 600 mg/d) in patients with moderate to severe HS/AI prior to another systemic therapy,
- oral systemic clindamycin 2 × 300 mg/d in combination with rifampicin 2 × 300 mg/d in moderate to severe HS/AI,
- oral hormonal antiandrogen therapy with ethinylestradiol/cyproterone acetate in case of cycle-associated changes of HS/AI activity in female patients,
- combination of adalimumab s.c. with surgical intervention in moderate to severe HS/AI,
- systemic i.v. therapy of moderate to severe HS/AI with infliximab,
- systemic s.c. therapy of moderate to severe HS/AI with bimekizumab,
- *deroofing* of superficial tunnels,
- excision of individual nodules and abscesses,
- primary closure for local excision of individual nodules and abscesses in case of Hurley grade II,
- secondary wound healing after complete surgical excision of irreversible tissue damage,
- split-thickness skin graft with or without vacuum-assisted therapy after complete surgical excision of irreversible tissue damage and adequate wound conditioning,
- ablation of HS/AI lesions with CO_2 laser as therapeutic alternative for classical surgery,
- use of long-pulsed Nd:YAG laser to inhibit inflammation and destroy hair follicles as secondary prevention of HS/AI.

(Continues)

TABLE 3 (Continued)

The following therapies **may be considered**

- topical therapy with resorcinol peeling 15% in patients with mild to moderate HS/AI,
- oral systemic therapy with zinc gluconate in patients with mild to moderate HS/AI,
- oral systemic therapy with clindamycin 2 × 300 mg/d in patients with moderate to severe HS/AI,
- systemic i.v. therapy with ertapenem 1 g/d in patients with moderate to severe HS/AI in exceptional cases,
- oral systemic therapy with corticosteroids,
- oral systemic therapy with acitretin,
- oral systemic therapy with alitretinoin,
- oral systemic therapy with metformin,
- oral systemic therapy with dapsone,
- oral systemic therapy with cyclosporin A,
- oral systemic therapy with apremilast in patients with moderate to severe HS/AI,
- transient dose intensification of adalimumab s.c. in patients with moderate to severe HS/AI and partial response or reduction of response to adalimumab over time,
- transient dose intensification of infliximab i.v. in patients with moderate to severe HS/AI and partial response or reduction of response to infliximab over time,
- systemic s.c. therapy of moderate to severe HS/AI with anakinra,
- systemic s.c. therapy of moderate to severe HS/AI with ustekinumab,
- systemic s.c. therapy of moderate to severe HS/AI with ixekizumab,
- systemic p.o. therapy of moderate to severe HS/AI with upadacitinib,
- systemic s.c. therapy of moderate to severe HS/AI with brodalumab,
- therapy with botulinum toxin,
- use of other conservative lasers (except Nd:YAG laser) to destroy hair follicles as secondary prevention of HS/AI,
- incision and drainage of abscesses in acute cases,
- primary wound closure or partial closure in certain anatomical regions after complete surgical excision of irreversible tissue damage in case of Hurley grade III,
- reconstruction by flap surgery in certain anatomical regions after complete surgical excision of irreversible tissue damage in case of Hurley grade III.

Treatment of the operation defect

Closure of the operation defect after radical excision by secondary intention healing (SIH) – without reconstruction – is a standard option after radical HS/AI surgeries. Conditioning of the wound bed of the operation defect by suitable wound dressings or negative pressure wound therapy is recommended.[129–133] Primary wound closure should be avoided. Defect coverage by split-thickness skin graft after sufficient formation of granulation tissue (usually 10–14 days) presents an alternative possibility. Only after radical excision in axillary manifestation may primary wound closure by flap surgery be considered in individual cases due to the low recurrence rate (4%–8%).[125,127,134]

Recurrence rates

The recurrence rate of the disease is quite significant and depends on both the surgical procedure (Table 4) and the localization of the disease.

	Strength	Agreement
• Complete surgical excision of irreversible tissue damage in the predominantly non-inflammatory form of HS/AI shall be recommended.	⇑⇑	Consensus
• For the treatment of superficial tunnels, *deroofing* should be recommended.	⇑	Strong consensus
• Excision of individual nodules and abscesses should be recommended.	⇑	Consensus
• Primary closure for local excision of individual nodules and abscesses in Hurley grade II should be recommended.	⇑	Consensus
• After complete surgical excision of irreversible tissue damage, secondary wound healing should be recommended.	⇑	Majority agreement
• After compete surgical excision of irreversible tissue damage and adequate wound conditioning, split-thickness skin graft with or without vacuum-assisted therapy should be recommended.	⇑	Consensus
• After compete surgical excision of irreversible tissue damage, reconstruction with flap surgery may be considered in certain anatomical regions.	⇔	Majority agreement
• Primary wound closure or partial closure after complete surgical excision of irreversible tissue damage in Hurley grade III may be considered in certain anatomical regions.	⇔	Consensus
• Incision and drainage of abscesses may be considered in acute cases. Incision and drainage of abscesses does not present an exclusive therapeutic option.	⇔	Majority agreement

Light amplification by stimulated emission of radiation (LASER) treatment

While the effectiveness of the various conservative laser procedures seems to be promising, it has not been validated in larger studies. The use of the Nd:YAG laser is suggested by multicentric, prospective studies showing disease control in mild HS/AI or Hurley grade I–II. Photoepilation (irrespective of laser type) might reduce the development of nodules and abscesses as secondary prevention and may be considered for removal of terminal hair follicles as causal preventive approach.[135]

	Strength	Agreement
• Ablation of HS/AI lesions with CO_2 laser should be recommended as therapeutic alternative for classical surgery.	⇑	Majority agreement
• The use of long-pulsed Nd:YAG laser as alternative anti-inflammatory therapy in patients with mild to moderate HS/AI should be recommended.	⇑	Consensus
• The use of long-pulsed Nd:YAG laser for the destruction of hair follicles as secondary prevention of HS/AI should be recommended.	⇑	Consensus
• Currently, the use of other conservative lasers for the destruction of hair follicles as secondary prevention of HS/AI may be considered.	⇔	Consensus

Other instrumental therapies

	Strength	Agreement
• Combination therapy of IPL+RF and topical clindamycin **should be recommended**.	⇑	Consensus
• Monotherapy with IPL+RF **should be recommended** as maintenance therapy.	⇑	Majority agreement

Conservative topical and intralesional therapy

Topical therapy

Local application of topical antibiotics (clindamycin, erythromycin, fusidic acid) and application of topical antiseptics (triclosan, chlorhexidine, iodine) in HS/AI is widely used internationally.[136] The entire evidence for all applied substances is, however, rather dissatisfying.

	Strength	Agreement
• Regular skin care to improve the barrier function in the affected areas should be recommended.	⇑	Consensus
• Topical therapy with clindamycin 1% solution shall be recommended in mild HS/AI.	⇑⇑	Consensus
• Topical therapy with clindamycin 1% solution shall be recommended as concomitant medication of systemic or surgical therapy of moderate to severe HS/AI.	⇑	Consensus
• Topical therapy with resorcinol peeling 15% may be considered in patients with mild to moderate HS/AI.	⇔	Consensus

TABLE 4 Surgical techniques for HS/AI treatment.

Method	Number of treated patients or meta-analysis studies	Recurrence rate	Follow-up time	Reference
Deroofing	44 patients	17%	Median 3 years	van der Zee et al.[120]
CO_2 laser evaporation	58 patients	29%	1 year	Mikkelsen et al.[121]
CO_2 laser excision	61 patients	1.1%	1 to 19 years	Hazen and Hazen[122]
Wide excision	63 patients	24%	5 years	Cuenca-Barrales et al.[123]
Wide excision	97 studies	5%	Median 2 years	Ovadja et al.[124]
Surgical procedures	33 studies	8%	Mean 3 years	Riddle et al.[125]

Intralesional therapy

Intralesional injections with corticosteroids may achieve transient improvement of individual lesions.[137] The therapy may be offered both as monotherapy and as adjuvant therapy of Hurley grade I lesions. The clinical response with spontaneous flattening, detachment, or spontaneous draining of lesions is usually observed after 48–72 hours.[138,139]

	Strength	Agreement
• Intralesional corticosteroid therapy shall be recommended for the treatment of acute inflammatory lesions.	⇑	Consensus

Classical systemic therapy

Systemic antibiotics

The reduction of the bacterial colonization of hair follicles is less important as mode of action of systemically administered antibiotics in HS/AI than the modulation of inflammatory processes. Therefore, there is no linear dose-response relation.

Dosage regimen and duration of therapy

Clindamycin/rifampicin: clindamycin 2 × 300 mg/d p.o., rifampicin 2 × 300 mg/d p.o. for a maximum of 12 weeks[15,140–142]

Doxycycline 2 × 100 mg/d (alternatively, 2 × 50 mg/d) p.o. for maximum of 12 weeks[15]

Clindamycin 3 × 600 mg/d i.v. for 5 days[143]

Therapy duration depends on the response. An intermittent therapy may be indicated for relapsing disease courses.

	Strength	Agreement
• Laboratory tests (blood count, liver function tests) may be considered prior to antibiotic therapy.	⇔	Majority agreement
• Regular controls of liver and renal kidney function parameters, as well as blood count shall be recommended on therapy with rifampicin.	⇑⇑	Strong consensus
• Intravenous clindamycin therapy for 5 days (3 × 600 mg/d) should be recommended in patients with moderate to severe HS/AI prior to another systemic therapy.	⇑	Consensus
• Therapy with doxycycline 2 × 100 mg/d (alternatively, 2 × 50 mg/d) p.o. shall be recommended in patients with moderate to severe HS/AI.	⇑⇑	Majority agreement
• Therapy with clindamycin 2 × 300 mg/d and rifampicin 2 × 300 mg/d p.o. shall be recommended in patients with moderate to severe HS/AI.	⇑	Majority agreement
• Therapy with clindamycin 2 × 300 mg/d p.o. may be considered in patients with moderate to severe HS/AI.	⇔	Consensus
• Therapy with ertapenem 1 g/d i.v. may be considered in patients with moderate to severe HS/AI in exceptional cases.	⇔	Consensus
• At the latest after 3 months of systemic antibiotic therapy, verification of the usefulness of an extended therapy duration and the potential switch to another therapeutic form (biologics, surgical excision) shall be recommended.	⇑⇑	Majority agreement

Hormonal antiandrogens

Hormonal antiandrogens are used, in particular, in female patients with polycystic ovarian syndrome (PCOS).[144]

Dosage regimen and duration of therapy

Ethinylestradiol 30 µg/cyproterone acetate 2 mg for ≥ 6 months (in case of ineffectiveness, addition of 50 mg cyproterone acetate)[145]

	Strength	Agreement
• Oral hormonal antiandrogen therapy with ethinylestradiol/cyproterone acetate should be recommended in case of cycle-associated changes of HS/AI activity in female patients.	⇑	Majority agreement
• Hormonal antiandrogen therapy (ethinylestradiol in combination with cyproterone acetate) shall be recommended for female patients with moderate to severe HS/AI and PCOS.	⇑⇑	Majority agreement
• It shall be recommended to initiate the hormonal antiandrogen therapy in cooperation with a specialist for gynecology.	⇑⇑	Consensus
• It shall be recommended to put the continued prescription of the therapy with hormonal antiandrogens in the hands of dermatologists experienced in this therapy.	⇑⇑	Majority agreement
• It shall be recommended to consider the increased risk of thrombophilia when initiating the therapy with hormonal antiandrogen and to perform a respective examination with risk information.	⇑⇑	Consensus
• It shall be recommended to perform a regular risk assessment and benefit analysis of the therapy with hormonal antiandrogens in relation to the therapeutic outcome and a maintenance therapy taking the patient-specific risk factors into account.	⇑⇑	Consensus
• Hormonal antiandrogen therapy shall not be recommended as primary monotherapy of HS/AI.	⇓⇓	Majority agreement

Retinoids

Oral isotretinoin is, in contrast to acitretin and alitretinoin, virtually ineffective in treating HS/AI.

Dosage regimen and duration of therapy

- Acitretin[146]

Initial dose: acitretin 0.2–0.5 mg/kg body weight (BW)/d (individual therapy duration)

Adjustment: individually – with optimal dosage dry lips to a minor degree (potential criterion for determination of the optimal dosage[147])

Termination of therapy: disease in remission – long-term therapy is generally not recommended

- Alitretinoin[148]

10 or 30 mg/d for up to 24 weeks depending on the response

No data on long-term therapy available.

	Strength	Agreement
• Oral systemic therapy with acitretin may be considered.	⇔	Consensus
• Oral systemic therapy with alitretinoin may be considered.	⇔	Consensus
• Oral systemic therapy with isotretinoin should not be recommended.	⇓	Majority agreement

Metformin

Metformin is effective in HS/AI patients with abnormal hormone levels, diabetes mellitus, or PCOS.[149] Metformin may improve insulin resistance which presents a comorbidity of HS/AI. In a similar manner, PCOS, which is more common in patients with HS/AI, may also benefit from treatment with metformin.

Dosage regimen and duration of therapy

500 or 1000 mg/2 x day for up to 24 weeks depending on the response

No data on long-term therapy available.

	Strength	Agreement
• Oral systemic therapy with metformin may be considered.	⇔	Consensus

Dapsone[150]

Dosage regimen and duration of therapy

25–150 mg/d for 4 to 12 weeks

	Strength	Agreement
• Oral systemic therapy with dapsone may be considered.	⇔	Consensus

Zinc gluconate[151]

Dosage regimen and duration of therapy

90 mg/d for 3 months

	Strength	Agreement
• Oral systemic therapy with zinc gluconate may be considered in patients with mild to moderate HS/AI.	⇔	Consensus

Immunosuppressants

	Strength	Agreement
• Oral systemic therapy with corticosteroids may be considered.[152]	⇔	Strong consensus
• Oral systemic therapy with cyclosporin A may be considered.[153]	⇔	Consensus

Apremilast[154]

Dosage regimen and duration of therapy

2 × 30 mg/d p.o. for 16 weeks

	Strength	Agreement
• Oral systemic therapy with apremilast may be considered in patients with moderate to severe HS/AI.	⇔	Consensus

THERAPY WITH BIOLOGICS

TNFα inhibitors

Adalimumab

Adalimumab is a *medicinal product approved by the EMA* for the treatment of active moderate to severe HS/AI indicated for patients (>12 years) with inadequate response to conventional systemic HS/AI therapy. Antibiotic treatment may be continued during therapy with this biologic.[117]

Adalimumab is a fully human therapeutic monoclonal antibody. It corresponds to human immunoglobulin IgG1 and contains variable regions of heavy and light chains with specificity for human TNFα.[118] Adalimumab binds with high affinity and specificity to soluble and membrane-bound TNFα. This prevents the binding to TNFα receptor (p55 and p75) and blocks the biological effect of TNFα.

Dosage regimen and duration of therapy

The approved dosage for HS/AI is:

For adults: 160 mg s.c. on day 1, 80 mg on day 15, from day 29 and later, adalimumab may be administered in the form of 40 mg per week or 80 mg every 2 weeks. When adalimumab is discontinued, it can be reintroduced at a dosage of 40 mg per week or 80 mg every 2 weeks.

Patients ≤ 12 years of age and ≤ 30 kg: 80 mg s.c. week 0, followed by 40 mg every 2 weeks from week 1. If no effect is obtained, adalimumab may be administered at a dose of 40 mg every week or at a dose of 80 mg every other week.

Adalimumab is administered as subcutaneous injection.

There is no approved dose adjustment for patients with obesity (body mass index [BMI] > 30).

In long-term continuous treatment (at least 2 years), the efficacy remains constant in patients responding to therapy and the safety profile is acceptable.[155]

In patients with improvement in the number of abscesses and inflammatory nodules by less than 25% after 12 weeks, treatment with adalimumab should be discontinued. In patients not achieving HiSCR, but a 25–50% improvement in the number of abscesses and inflammatory nodules (partial response) after 12 weeks, continuation of the treatment for another 3 months should be considered, given that it was shown that 73% of patients with partial response in week 12 achieved HiSCR.[118] In the short term, studies show recurrence of lesions 11–12 weeks after discontinuation of treatment.[117]

In patients with partial response or reduction of response to adalimumab over time, short-term therapy intensification (80 mg/week s.c. for at least 1 month) may achieve a significant increase in effect.[156,157]

In patients with HS/AI treated with adalimumab, the cumulative indirect costs were considerably lower and the total work impairment improved significantly compared to placebo.[38,158]

Therapy combinations

The combination with surgical intervention is supported by a randomized, double-blind placebo-controlled phase IV trial on adalimumab in combination with surgical intervention.[18] Compared to the placebo group, no increased risk of postoperative wound infections, complications, or bleeding was observed on adalimumab. Adalimumab was effective in combination with extensive surgery and subsequent secondary wound healing without the need of interrupting the treatment before surgery. There was, however, no evidence for a reduction in the size of the surgical areas on adalimumab compared to placebo.

Limitations

Exclusion of acute infection, exclusion of tuberculosis according to the current national guidelines for the use of TNFα inhibitors. Infection with human immunodeficiency virus (HIV) or viral hepatitis should be excluded by appropriate history, clinical and/or laboratory evidence. The patients should be made aware that the course of infections during treatment may be more severe and atypical and that they must consult a physician at an early stage in unclear cases.

	Strength	Agreement
• Systemic s.c. therapy of moderate to severe HS/AI with adalimumab from the age of 12 at the approved dose shall be recommended.	⇑⇑	Majority agreement
• Combination therapy of moderate to severe HS/AI with adalimumab s.c. at the approved dose and antibiotics p.o. shall be recommended.	⇑⇑	Majority agreement

	Strength	Agreement
• The combination of adalimumab s.c. with surgical intervention in moderate to severe HS/AI shall be recommended.	⇑⇑	Majority agreement
• Transient dose intensification of adalimumab s.c. in patients with moderate to severe HS/AI and partial response or reduction of response to adalimumab over time may be considered.	⇔	Strong consensus

Infliximab

Infliximab is a medicinal product effective in HS/AI, but not approved for this indication.[100,159] It is a chimeric (mouse/human) monoclonal antibody against TNFα. It binds specifically to both soluble and transmembrane, receptor-bound TNFα. Soluble TNFα is ligated and its proinflammatory activity is neutralized. Infliximab has a serum half-life of approximately 8 to 9.5 days. The elimination time is up to 6 months.

Pretreatment and screening examinations are the same as for adalimumab.

Dosage regimen and duration of therapy

5 mg/kg i.v. in the weeks 0, 2, and 6, and then every 8 weeks

Knowledge of the long-term effect is only based on a small monocentric case series with patients with moderate to severe HS/AI treated for 1 year with infliximab and experiencing a significant reduction in the number of specific skin changes and flares.[160]

In patients with inadequate response or with adequate response declining over time, dose intensification (7.5–10 mg/kg every 4 weeks) may be administered to improve the therapeutic outcome.[161]

For the combination of infliximab with surgical procedures, only low-quality studies are available (case series).

	Strength	Agreement
• Systemic i.v. therapy of moderate to severe HS/AI with infliximab **should be recommended**.	⇑	Consensus
• Transient dose intensification of infliximab i.v. in patients with moderate to severe HS/AI and partial response or reduction of response to infliximab over time **may be considered**.	⇔	Consensus
• The combination of infliximab i.v. with surgical intervention in moderate to severe HS/AI **may be considered**.	⇔	Consensus

Adalimumab biosimilars

In recent years, the use of approved adalimumab biosimilars as alternative to the originator for the treatment of moderate to severe HS/AI has increased.[162] Due to their pharmaco-economic effects, the breakthrough of biosimilar drugs has made the overall use of adalimumab more accessible. The switch from the adalimumab originator to biosimilars, taking medical aspects into account, has now been sufficiently analyzed.[163–166] In well-controlled patients, the switch from the adalimumab originator to a biosimilar might create problems with respect to effectiveness and compliance. Therefore, the therapy change of patients in remission maintenance therapy is viewed critically. A careful integration of pharmaco-economic measures with a thorough assessment of the risk-benefit ratio of a non-medical switch from originators to biosimilars is still indispensable to offer the best therapeutic option to every HS/AI patient.

IL-17 inhibitors

In several studies, an increased number of Th17 cells and an overexpression of IL-17 were identified in HS/AI providing a rational for IL-17 inhibition as therapeutic strategy.[167–169]

Secukinumab

Secukinumab is a *medicinal product approved by the EMA* for the treatment of adult patients with moderate to severe active HS/AI with inadequate response to conventional systemic HS/AI therapy.[17] Secukinumab is a human, monoclonal antibody against IL-17A.

Dosage regimen and duration of therapy

The *approved dosage* for HS/AI is:

300 mg s.c. with initial doses in the weeks 0, 1, 2, 3, and 4, followed by monthly maintenance doses. Based on the clinical response, the maintenance dose may be increased to 300 mg every 2 weeks.

Secukinumab is administered as subcutaneous injection.

	Strength	Agreement
• Systemic s.c. therapy of moderate to severe HS/AI with secukinumab shall be recommended.	⇑⇑	Consensus

Bimekizumab

Bimekizumab is a *medicinal product approved by the EMA* for the treatment of adult patients with moderate to severe

active HS/AI with inadequate response to conventional systemic HS/AI therapy. It is a humanized monoclonal IgG antibody of full length selectively inhibiting both IL-17A and IL-17F. The inhibition of both cytokines might produce an additional effectiveness in HS/AI.[170] The results of the phase III studies, which led to the approval of bimekizumab for the treatmnt of HS/AI, have not been published yet.

Dosage regimen and duration of therapy

320 mg s.c. every 2 or 4 weeks for 48 weeks.

Bimekizumab is administered as subcutaneous injection.

	Strength	Agreement
• Systemic s.c. therapy of moderate to severe HS/AI with bimekizumab should be recommended.	⇑	Consensus

Brodalumab

Brodalumab is a human, monoclonal antibody against the IL-17 receptor not approved for the therapy of HS/AI.

Dosage regimen and duration of therapy

210 mg s.c. every 2 weeks or weekly.[171,172] In participants with draining tunnels, administration every 2 weeks resulted in rapid reduction of acute symptoms with slow recurrence of tunnel drainage and pain.

	Strength	Agreement
• Systemic s.c. therapy of moderate to severe HS/AI with brodalumab may be considered.	⇔	Consensus

Ixekizumab

Ixekizumab is a humanized monoclonal antibody against the cytokine interleukin-17A (IL-17A) not approved for the therapy of HS/AI.

Dosage regimen and duration of therapy

160 mg s.c. week 0, followed by 80 mg in the weeks 2, 4, 6, 8, 10, and 12[173]

	Strength	Agreement
• Systemic s.c. therapy of moderate to severe HS/AI with ixekizumab may be considered.	⇔	Consensus

IL-1 inhibitors

Anakinra

Anakinra is a recombinant IL-1 receptor antagonist not approved for the therapy of HS/AI.

Dosage regimen and duration of therapy

100 mg/d s.c. for 12 weeks[174]

	Strength	Agreement
• Systemic s.c. therapy of moderate to severe HS/AI with anakinra may be considered.	⇔	Consensus

IL-12p40/IL-23 inhibitors

Ustekinumab

Ustekinumab is a recombinant, fully human IgG1 antibody not approved for the therapy of HS/AI. It binds with high specificity and affinity to the common p40 subunit of the cytokines IL-12 and IL-23.

Dosage regimen and duration of therapy

45 mg/week s.c.[175] (in patients with a BW > 100 kg 90 mg/week s.c.[176]) weeks 0, 4, 16, and 28

	Strength	Agreement
• Systemic s.c. therapy of moderate to severe HS/AI with ustekinumab may be considered.	⇔	Consensus

Therapy with Janus kinase (JAK) inhibitors

JAK inhibitors are oral, low-molecular inhibitors targeting Janus kinases, an important regulator of proinflammatory cytokine signaling pathways that play a role in various immunological diseases.

Upadacitinib

Dosage regimen and duration of therapy

15 mg/d p.o. for 24 weeks (in case of non-response, 30 mg/d from week 4)[177]

	Strength	Agreement
• Systemic p.o. therapy of moderate to severe HS/AI with upadacitinib may be considered.	⇔	Consensus

OTHER THERAPEUTICS

Botulinum toxin[178,179]

Dosage regimen and duration of therapy

Botulinum toxin (50 U/ml) 0.05–0.1 mL intradermally at a distance of 1–1.5 cm between injection sites in the affected area and perilesional (maximum total dose 4000 U every 3 months)[180]

	Strength	Agreement
• Subcutaneous therapy with BTX may be considered.	⇔	Consensus

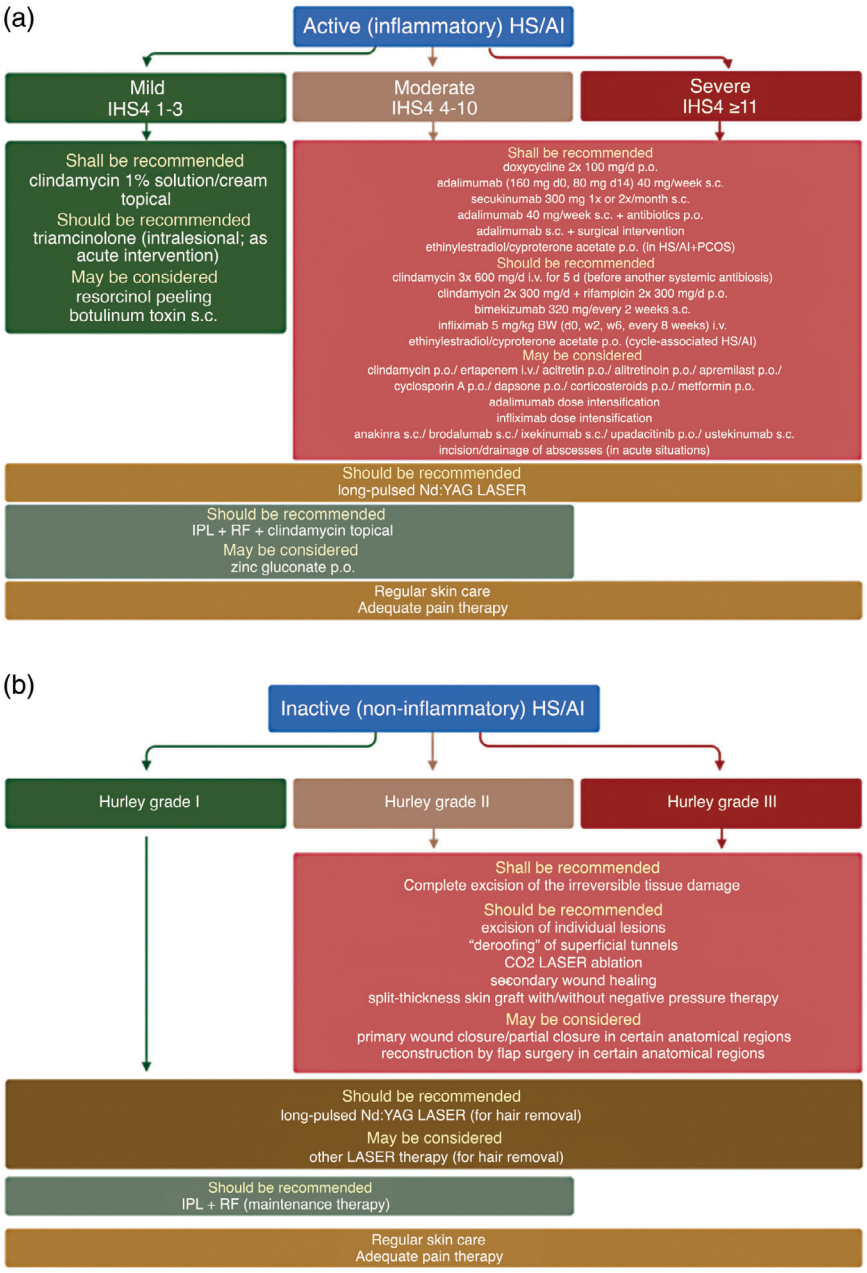

FIGURE 4 HS/AI treatment algorithm. (a) Therapy of active (inflammatory) HS/AI. (b) Therapy of inactive (non-inflammatory) HS/AI (created with BioRender.com)

Pain therapy

Pain is a key symptom of HS/AI and has a significant impact on the quality of life of the patients.[112] Successful treatment of inflammatory HS/AI may alleviate the pain symptoms, but the symptoms may persist in a substantial minority. Pain may be associated with depression, an accepted comorbidity of HS/AI.[181,182] Given that the assessment of pain can be complex,[112] referral to a general practitioner or pain specialist for individual treatment should be considered.

Psychological therapy

The following aspects are recommended to improve the psychosomatic and psychosocial status of patients with HS/AI:

- Information about disease cause and course (psychoeducation)
- Addressing subjective perceptions and needs of the patients

- Understanding for the multifaceted burden caused by the disease
- Observing and addressing the signs of mental disorders like depression, social anxieties, and suicidal tendencies
- Observation of mental changes, also during therapy
- Motivation to a healthier life style, cessation of smoking, calorie-conscious nutrition, and physical activity
- Offer or mediate support in case of psychosocial problems
- In case of increased comorbidity of mental disorders, search for cooperation with specialists for psychotherapy

STAGE-BASED THERAPEUTIC ALGORITHM

Based on consensual recommendations, the expert group has outlined the following therapeutic algorithm of active inflammatory HS/AI and inactive, predominantly non-inflammatory HS/AI for the stage-related therapy of HS/AI (Figure 4).

CONFLICT OF INTEREST STATEMENT

The conflicts of Interest of the authors have been obtained by means of the AWMF Table on the Declaration of Interests and the Handling of Conflicts of Interest. Based on the AWMF regulation, lectures for the industry on topics related to the guideline were considered as low. Consulting and expert activities/third-party-funded research were considered as moderate, while ownership interests, such as patents, and predominant activity for the industry were considered as high. The categories "moderate" and "high" resulted in abstention of voting.

AFFILIATIONS

[1]Departments of Dermatology, Venereology, Allergology and Immunology, Staedtisches Klinikum Dessau, Brandenburg Medical School Theodor Fontane and Faculty of Health Sciences Brandenburg, Dessau, Germany

[2]Hidradenitis Suppurativa Foundation e.V., Dessau, Germany

[3]Department of Dermatology, Venereology and Allergology, Ruhr-University Bochum, Bochum, Germany

[4]Dermatology and Laser Consultation Center, Landau, Germany

[5]Dermatology II, Colentina Clinical Hospital, Carol-Davila University of Medicine and Pharmacy, Bucharest, Romania

[6]Department of Dermatology, Venereology and Allergology, Würzburg University Hospital, Würzburg, Germany

[7]Praxis Bellaria/Klinik im Park, Zurich, Switzerland

[8]German Acne Inversa Patient Association in Formation, Kreis Coesfeld, Germany

[9]Institute for Health Services Research in Dermatology and Nursing (IVDP), University Medical Center Hamburg-Eppendorf (UKE), Hamburg, Germany

[10]Department of Dermatology, Venereology and Allergology, Charité-Universitätsmedizin Berlin, Berlin, Germany

[11]Freising Skin and Laser Center, Freising, Germany

[12]Department of Dermatology, Venereology and Allergology, University Hospital Frankfurt, Frankfurt am Main, Germany

[13]Department of Dermatology, Medical Center Darmstadt, Darmstadt, Germany

[14]mullewupp – Acne inversa Support Group, Kiel, Germany

[15]Center for Dermatosurgery, Havelklinik Berlin, Berlin, Germany

[16]Department of Dermatology and Venereology, Martin Luther University Halle-Wittenberg, Halle (Saale), Germany

[17]Department of Dermatology and Allergology, Technical University of Munich, Munich, Germany

[18]Patient Representative, Lüdinghausen, Germany

[19]Brandenburg Medical School Theodor Fontane, Neuruppin, Germany

[20]Faculty of Medicine, University Medical Center Hamburg-Eppendorf (UKE), Hamburg, Germany

ORCID

Christos C. Zouboulis https://orcid.org/0000-0003-1646-2608

Matthias Goebeler https://orcid.org/0000-0001-7095-9848

REFERENCES

1. Zouboulis CC, Bechara FG, Fritz K, et al. S1–Leitlinie zur Therapie der Hidradenitis suppurativa /Acne inversa (ICD-10 Ziffer: L73.2). *J Dtsch Dermatol Ges*. 2012;10(Suppl 5):S1-31.
2. Zouboulis C, Bechara F, Fritz K, et al. S2k-Leitlinie zur Therapie der Hidradenitis suppurativa /Acne inversa (ICD-10-Code: L73.2). *Akt Dermatol*. 2024;50:30-83.
3. Kirsten N, Frings V, Nikolakis GD, et al. Epidemiologie, Patientenlebensqualität und Behandlungskosten der Hidradenitis suppurativa/Acne inversa. *Hautarzt*. 2021;72:651-657.
4. Jfri A, Nassim D, O'Brien E, et al. Prevalence of Hidradenitis Suppurativa: A Systematic Review and Meta-regression Analysis. *JAMA Dermatol*. 2021;157:924-931.
5. Kirsten N, Zander N, Augustin M. Prevalence and cutaneous comorbidities of hidradenitis suppurativa in the German working population. *Arch Dermatol Res*. 2021;313:95-99.
6. Dajnoki Z, Somogyi O, Medgyesi B, et al. Primary alterations during the development of hidradenitis suppurativa. *J Eur Acad Dermatol Venereol*. 2022;36:462-471.
7. Zouboulis CC, Nogueira da Costa A, Makrantonaki E, et al. Alterations in innate immunity and epithelial cell differentiation are the molecular pillars of hidradenitis suppurativa. *J Eur Acad Dermatol Venereol*. 2020;34:846-861.
8. Zouboulis VA, Zouboulis KC, Zouboulis CC. Hidradenitis suppurativa and comorbid disorder biomarkers, druggable genes, new drugs and drug repurposing – a molecular meta-analysis. *Pharmaceutics*. 2021;14:44.
9. Zouboulis CC, Del Marmol V, Mrowietz U, et al. Hidradenitis suppurativa/acne inversa: Criteria for diagnosis, severity assessment, classification and disease evaluation. *Dermatology*. 2015;231:184-190.
10. Kokolakis G, Wolk K, Schneider-Burrus S, et al. Delayed diagnosis of hidradenitis suppurativa and its effect on patients and healthcare system. *Dermatology*. 2020;236:421-430.
11. Zouboulis CC, Tzellos T, Kyrgidis A, et al. Development and validation of the International Hidradenitis Suppurativa Severity Score System (IHS4), a novel dynamic scoring system to assess HS severity. *Br J Dermatol*. 2017;177:1401-1409.
12. Tzellos T, van Straalen KR, Kyrgidis A, et al. Development and validation of IHS4-55, an IHS4 dichotomous outcome to assess treatment effect for hidradenitis suppurativa. *J Eur Acad Dermatol Venereol*. 2023;37:395-401.
13. Horváth B, Janse IC, Blok JL, et al. Hurley staging refined: A proposal by the Dutch Hidradenitis Suppurativa Expert Group. *Acta Derm Venereol*. 2017;97:412-413.
14. Zouboulis CC, Bechara FG, Dickinson-Blok JL, 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;33:19-31.
15. van Straalen KR, Tzellos T, Guillem P, et al. The efficacy and tolerability of tetracyclines and clindamycin plus rifampicin for the treatment of hidradenitis suppurativa: Results of a prospective European cohort study. *J Am Acad Dermatol*. 2021;85:369-378.
16. Kimball AB, Kerdel F, Adams D, et al. Adalimumab for the treatment of moderate to severe Hidradenitis suppurativa: a parallel randomized trial. *Ann Intern Med*. 2012;157:846-855.
17. Kimball AB, Jemec GBE, Alavi A, et al. Secukinumab in moderate-to-severe hidradenitis suppurativa (SUNSHINE and SUNRISE): week 16 and week 52 results of two identical, multicentre, randomised, placebo-controlled, double-blind phase 3 trials. *Lancet*. 2023;401:747-761.
18. Bechara FG, Podda M, Prens EP, et al. Efficacy and safety of adalimumab in conjunction with surgery in moderate to severe hidradenitis suppurativa: The SHARPS randomized clinical trial. *JAMA Surg*. 2021;156:1001-1009.
19. Kurzen H, Kurokawa I, Jemec GBE, et al. What causes hidradenitis suppurativa? *Exp Dermatol*. 2008;17:455-456; discussion 457-472.
20. Zouboulis CC, Benhadou F, Byrd AS, et al. What causes hidradenitis suppurativa? –15 years after. *Exp Dermatol*. 2020;29:1154-1170.
21. Kirsten N, Petersen J, Hagenström K, Augustin M. Epidemiology of hidradenitis suppurativa in Germany – an observational cohort study based on a multisource approach. *J Eur Acad Dermatol Venereol*. 2020;34:174-179.
22. Jemec GBE, Kimball AB. Hidradenitis suppurativa: Epidemiology and scope of the problem. *J Am Acad Dermatol*. 2015;73(5 Suppl 1):S4-7.
23. Ingram JR. The epidemiology of hidradenitis suppurativa. *Br J Dermatol*. 2020;183:990-998.
24. Jemec GB, Heidenheim M, Nielsen NH. The prevalence of hidradenitis suppurativa and its potential precursor lesions. *J Am Acad Dermatol*. 1996;35 2 Pt 1:191-194.
25. Cosmatos I, Matcho A, Weinstein R, et al. Analysis of patient claims data to determine the prevalence of hidradenitis suppurativa in the United States. *J Am Acad Dermatol*. 2013;68:412-419.
26. Revuz JE, Canoui-Poitrine F, Wolkenstein P, et al. Prevalence and factors associated with hidradenitis suppurativa: results from two case-control studies. *J Am Acad Dermatol*. 2008;59:596-601.
27. Botvid SHC, Storgaard Hove L, Bouazzi D, et al. Hidradenitis suppurativa prevalence in Nuuk, Greenland: Physician validation of a hidradenitis suppurativa questionnaire in a Greenlandic setting. *Acta Derm Venereol*. 2023;103:adv00847.
28. Wolkenstein P, Loundou A, Barrau K, et al. Quality of life impairment in hidradenitis suppurativa: a study of 61 cases. *J Am Acad Dermatol*. 2007;56:621-623.
29. Kurzen H, Schönfelder-Funcke S, Hartschuh W. Surgical treatment of acne inversa at the University of Heidelberg. *Coloproctology*. 2000;22:76-80.
30. Nikolakis G, Karagiannidis I, Vaiopoulos AG, et al. Endokrine Mechanismen bei der Pathophysiologie der Hidradenitis suppurativa. *Hautarzt*. 2020;71:762-771.
31. Schneider-Burrus S, Lux G, van der Linde K, et al. Hidradenitis suppurativa – prevalence analyses of German statutory health insurance data. *J Eur Acad Dermatol Venereol*. 2021;35:e32-5.
32. Schneider-Burrus S, Tsaousi A, Barbus S, et al. Features associated with quality of life impairment in hidradenitis suppurativa patients. *Front Med (Lausanne)*. 2021;8:676241.
33. Vazquez BG, Alikhan A, Weaver AL, et al. Incidence of hidradenitis suppurativa and associated factors: a population-based study of Olmsted County, Minnesota. *J Invest Dermatol*. 2013;133:97-103.
34. Vaiopoulos AG, Nikolakis G, Zouboulis CC. Hidradenitis suppurativa in paediatric patients: a retrospective monocentric study in Germany and review of the literature. *J Eur Acad Dermatol Venereol*. 2020;34:2140-2146.
35. Di Cesare A, Nikolakis G, Kanni T, et al. Identification of clinical features affecting diagnostic delay in paediatric hidradenitis suppurativa: results from a multicentre observational study. *Br J Dermatol*. 2022;187:428-430.
36. Loget J, Saint-Martin C, Guillem P, et al. Errance médicale des patients atteints d'hidradénite suppurée: un problème majeur et persistant. Étude "R-ENS Verneuil". *Ann Dermatol Venereol*. 2018;145:331-338.
37. Zouboulis CC, Goyal M, Byrd AS. Hidradenitis suppurativa in skin of colour. *Exp Dermatol*. 2021;30(Suppl 1):27-30.
38. Zouboulis CC. The socioeconomic burden of hidradenitis suppurativa/acne inversa. *Br J Dermatol*. 2019;181:7-8.
39. Zouboulis C, Brunner M, Lippert U, et al. Hidradenitis suppurativa /Acne inversa: Aktuelles zur Definition, Epidemiologie, Pathogenese, Klassifikation und Evidenz-basierten Therapie. *Akt Dermatol*. 2015;45:185-199.
40. Frew JW, Lowes MA, Goldfarb N, et al. Global harmonization of morphological definitions in hidradenitis suppurativa for a proposed glossary. *JAMA Dermatol*. 2021;157:449-455.
41. Canoui-Poitrine F, Revuz JE, Wolkenstein P, et al. Clinical characteristics of a series of 302 French patients with hidradenitis suppurativa, with an analysis of factors associated with disease severity. *J Am Acad Dermatol*. 2009;61:51-57.
42. Poli F, Wolkenstein P, Revuz J. Back and face involvement in hidradenitis suppurativa. *Dermatology*. 2010;221:137-141.
43. Benhadou F, Van der Zee HH, Pascual JC, et al. Pilonidal sinus disease: an intergluteal localization of hidradenitis suppurativa/acne inversa: a cross-sectional study among 2465 patients. *Br J Dermatol*. 2019;181:1198-1206.
44. von Laffert M, Stadie V, Ulrich J, et al. Morphology of pilonidal sinus disease: some evidence of its being a unilocalized type of hidradenitis suppurativa. *Dermatology*. 2011;223:349-355.
45. Breuninger H. Therapie des Pilonidalsinus und der Acne inversa. *Hautarzt*. 2004;55:254-258.
46. Sabat R, Tsaousi A, Ghoreschi K, et al. Sex-disaggregated population analysis in patients with hidradenitis suppurativa. *Front Med (Lausanne)*. 2022;9:1028943.
47. Zouboulis CC, Desai N, Emtestam L, et al. European S1 guideline for the treatment of hidradenitis suppurativa/acne inversa. *J Eur Acad Dermatol Venereol*. 2015;29:619-644.
48. Nazzaro G, Passoni E, Veraldi S, Marzano AV. Lymph node involvement in hidradenitis suppurativa: Ultrasound and color Doppler study of 85 patients. *Skin Res Technol*. 2020;26:960-962.
49. Wortsman X, Revuz J, Jemec GBE. Lymph nodes in hidradenitis suppurativa. *Dermatology*. 2009;219:22-24.
50. Alikhan A, Lynch PJ, Eisen DB. Hidradenitis suppurativa: a comprehensive review. *J Am Acad Dermatol*. 2009;60:539-561;quiz:562-563.
51. Menter A. Recognizing and managing comorbidities and complications in hidradenitis suppurativa. *Semin Cutan Med Surg*. 2014;33(3 Suppl):S54-56.
52. Yuan JT, Naik HB. Complications of hidradenitis suppurativa. *Semin Cutan Med Surg*. 2017;36:79-85.
53. Micieli R, Alavi A. Lymphedema in patients with hidradenitis suppurativa: a systematic review of published literature. *Int J Dermatol*. 2018;57:1471-1480.
54. Grada AA, Phillips TJ. Lymphedema: Pathophysiology and clinical manifestations. *J Am Acad Dermatol*. 2017;77:1009-1020.
55. Sachdeva M, Mufti A, Zaaroura H, et al. Squamous cell carcinoma arising within hidradenitis suppurativa: a literature review. *Int J Dermatol*. 2021;60:e459-465.
56. Fimmel S, Zouboulis CC. Comorbidities of hidradenitis suppurativa (acne inversa). *Dermatoendocrinol*. 2010;2:9-16.
57. Blum FR, Miles JA, Farag SW, et al. Characterizing the immune checkpoint marker profiles of cutaneous squamous cell carcinomas in patients with hidradenitis suppurativa. *J Eur Acad Dermatol Venereol*. 2023;37:e316-318.
58. Pena ZG, Sivamani RK, Konia TH, Eisen DB. Squamous cell carcinoma in the setting of chronic hidradenitis suppurativa; report of a patient and update of the literature. *Dermatol Online J*. 2015;21:13030/qt9q9707dp.

59. Li Pomi F, Macca L, Motolese A, et al. Neoplastic Implications in Patients Suffering from Hidradenitis Suppurativa under Systemic Treatments. *Biomedicines*. 2021;9:1594.
60. Jourabchi N, Fischer AH, Cimino-Mathews A, et al. Squamous cell carcinoma complicating a chronic lesion of hidradenitis suppurativa: a case report and review of the literature. *Int Wound J*. 2017;14:435-438.
61. Chapman S, Delgadillo D, Barber C, Khachemoune A. Cutaneous squamous cell carcinoma complicating hidradenitis suppurativa: a review of the prevalence, pathogenesis, and treatment of this dreaded complication. *Acta Dermatovenerol Alp Pannonica Adriat*. 2018;27:25-28.
62. Jung JM, Lee KH, Kim Y-J, et al. Assessment of Overall and Specific Cancer Risks in Patients With Hidradenitis Suppurativa. *JAMA Dermatol*. 2020;156:844-853.
63. Jedrzejczak MJ, Ingram JR, Lowes MA, et al. Expert Knowledge, Attitudes, and Practices in Management of Hidradenitis Suppurativa Pain. *JAMA Dermatol*. 2021;157:464-466.
64. Helvacı Ö, Güz G, Adışen E, et al. Hidradenitis Suppurativa: a lesser-known cause of AA amyloidosis. *Hippokratia*. 2020;24:33-37.
65. Kridin K, Amber KT, Comaneshter D, Cohen AD. Amyloidosis in hidradenitis suppurativa: a cross-sectional study and review of the literature. *Clin Exp Dermatol*. 2020;45:565-571.
66. Utrera-Busquets M, Romero-Maté A, Castaño Á, et al. Severe hidradenitis suppurativa complicated by renal AA amyloidosis. *Clin Exp Dermatol*. 2016;41:287-289.
67. Ooi XT, Choi E, Han H, et al. The psychosocial burden of hidradenitis suppurativa in Singapore. *JAAD Int*. 2023;10:89-94.
68. Fauconier M, Reguiai Z, Barbe C, et al. Association between hidradenitis suppurativa and spondyloarthritis. *Joint Bone Spine*. 2018;85:593-597.
69. Rondags A, Arends S, Wink FR, et al. High prevalence of hidradenitis suppurativa symptoms in axial spondyloarthritis patients: A possible new extra-articular manifestation. *Semin Arthritis Rheum*. 2019;48:611-617.
70. Almuhanna N, Finstad A, Alhusayen R. Association between hidradenitis suppurativa and inflammatory arthritis: A systematic review and meta-analysis. *Dermatology*. 2021;237:740-747.
71. Gomollón F, Dignass A, Annese V, et al. 3rd European evidence-based consensus on the diagnosis and management of Crohn's disease 2016: Part 1: Diagnosis and Medical management. *J Crohns Colitis*. 2017;11:3-25.
72. Chen W-T, Chi C-C. Association of hidradenitis suppurativa with inflammatory bowel disease: A systematic review and meta-analysis. *JAMA Dermatol*. 2019;155:1022-1027.
73. Tzellos T, Zouboulis CC. Which hidradenitis suppurativa comorbidities should I take into account? *Exp Dermatol*. 2022;31(Suppl 1):29-32.
74. Tzellos T, Zouboulis CC, Gulliver W, et al. Cardiovascular disease risk factors in patients with hidradenitis suppurativa: a systematic review and meta-analysis of observational studies. *Br J Dermatol*. 2015;173:1142-1155.
75. Thomi R, Yerly D, Yawalkar N, et al. Interleukin-32 is highly expressed in lesions of hidradenitis suppurativa. *Br J Dermatol*. 2017;177:1358-1366.
76. Horissian M, Maczuga S, Kirby JS, Nelson AM. Increased risk of alopecia areata for people with hidradenitis suppurativa in a cross-sectional study. *J Am Acad Dermatol*. 2019;81:1431-1432.
77. Reddy S, Orenstein LAV, Strunk A, Garg A. Incidence of long-term opioid use among opioid-naive patients with hidradenitis suppurativa in the United States. *JAMA Dermatol*. 2019;155:1284-1290.
78. Kjaersgaard Andersen R, Saunte SK, Jemec GBE, Saunte DM. Psoriasis as a comorbidity of hidradenitis suppurativa. *Int J Dermatol*. 2020;59:216-220.
79. Lee JH, Kwon HS, Jung HM, et al. Prevalence and comorbidities associated with hidradenitis suppurativa in Korea: a nationwide population-based study. *J Eur Acad Dermatol Venereol*. 2018;32:1784-1790.
80. Broderick L, Hoffman HM. IL-1 and autoinflammatory disease: biology, pathogenesis and therapeutic targeting. *Nat Rev Rheumatol*. 2022;18:448-463.
81. Garcovich S, Genovese G, Moltrasio C, et al. PASH, PAPASH, PsAPASH, and PASS: The autoinflammatory syndromes of hidradenitis suppurativa. *Clin Dermatol*. 2021;39:240-247.
82. Nikolakis G, Kaleta KP, Vaiopoulos AG, et al. Phenotypes and pathophysiology of syndromic hidradenitis suppurativa: different faces of the same disease? A systematic review. *Dermatology*. 2021;237:673-697.
83. Leuenberger M, Berner J, Di Lucca J, et al. PASS syndrome: An IL-1-driven autoinflammatory disease. *Dermatology*. 2016;232:254-258.
84. Schneider-Burrus S, Kalus S, Fritz B, et al. The impact of hidradenitis suppurativa on professional life. *Br J Dermatol*. 2023;188:122-130.
85. Hamzavi IH, Sundaram M, Nicholson C, et al. Uncovering burden disparity: A comparative analysis of the impact of moderate-to-severe psoriasis and hidradenitis suppurativa. *J Am Acad Dermatol*. 2017;77:1038-1046.
86. Vinding GR, Miller IM, Zarchi K, et al. The prevalence of inverse recurrent suppuration: a population-based study of possible hidradenitis suppurativa. *Br J Dermatol*. 2014;170:884-889.
87. Jemec GB. The symptomatology of hidradenitis suppurativa in women. *Br J Dermatol*. 1988;119:345-350.
88. Garg A, Papagermanos V, Midura M, Strunk A. Incidence of hidradenitis suppurativa among tobacco smokers: a population-based retrospective analysis in the U.S.A. *Br J Dermatol*. 2018;178:709-714.
89. Kromann CB, Ibler KS, Kristiansen VB, Jemec GBE. The influence of body weight on the prevalence and severity of hidradenitis suppurativa. *Acta Derm Venereol*. 2014;94:553-557.
90. Seyed Jafari SM, Knüsel E, Cazzaniga S, Hunger RE. A retrospective cohort study on patients with hidradenitis suppurativa. *Dermatology*. 2018;234:71-78.
91. Lyons AB, Zubair R, Kohli I, Hamzavi IH. Preoperative ultrasound for evaluation of hidradenitis suppurativa. *Dermatol Surg*. 2019;45:294-296.
92. Martorell A, Giovanardi G, Gomez-Palencia P, Sanz-Motilva V. Defining fistular patterns in hidradenitis suppurativa: Impact on the management. *Dermatol Surg*. 2019;45:1237-1244.
93. Griffin N, Williams AB, Anderson S, et al. Hidradenitis suppurativa: MRI features in anogenital disease. *Dis Colon Rectum*. 2014;57:762-771.
94. Zouboulis CC, Nogueira da Costa A, Jemec GBE, Trebing D. Longwave medical infrared thermography: A clinical biomarker of inflammation in hidradenitis suppurativa/acne inversa. *Dermatology*. 2019;235:144-149.
95. Saunte DM, Boer J, Stratigos A, et al. Diagnostic delay in hidradenitis suppurativa is a global problem. *Br J Dermatol*. 2015;173:1546-1549.
96. Saunte DML, Jemec GBE. Hidradenitis suppurativa: Advances in diagnosis and treatment. *JAMA*. 2017;318:2019-2032.
97. Hurley H. Axillary hyperhidrosis, apocrine bromhidrosis, hidradenitis suppurativa and familial benign pemphigus. Surgical approach. In: Roenigk RK, Roenigk HH Jr, eds. *Dermatologic Surgery – Principles and Practice*. 2nd edn. New York: Marcel Dekker, Inc.; 1996:623-645.
98. Sartorius K, Emtestam L, Jemec GBE, Lapins J. Objective scoring of hidradenitis suppurativa reflecting the role of tobacco smoking and obesity. *Br J Dermatol*. 2009;161:831-839.
99. Chiricozzi A, Faleri S, Franceschini C, et al. AISI: A new disease severity assessment tool for hidradenitis suppurativa. *Wounds*. 2015;27:258-264.
100. Grant A, Gonzalez T, Montgomery MO, et al. Infliximab therapy for patients with moderate to severe hidradenitis suppurativa: a randomized, double-blind, placebo-controlled crossover trial. *J Am Acad Dermatol*. 2010;62:205-217.
101. Hessam S, Scholl L, Sand M, et al. A novel severity assessment scoring system for hidradenitis suppurativa. *JAMA Dermatol*. 2018;154:330-335.

102. Goldfarb N, Lowes MA, Butt M, et al. Hidradenitis Suppurativa Area And Severity Index Revised (HASI-R): Psychometric property assessment. *Br J Dermatol*. 2021;184:905-912.
103. Garg A, Zema C, Kim K, et al. Development and initial validation of the HS-IGA: A novel hidradenitis suppurativa-specific investigator global assessment for use in interventional trials. *Br J Dermatol*. 2022;187:203-210.
104. Marzano AV, Chiricozzi A, Giovanardi G, et al. Creation of a severity index for hidradenitis suppurativa that includes a validated quality-of-life measure: The HIDRAscore. *J Eur Acad Dermatol Venereol*. 2020;34:1815-1821.
105. Kimball AB, Sobell JM, Zouboulis CC, et al. HiSCR (Hidradenitis Suppurativa Clinical Response): A novel clinical endpoint to evaluate therapeutic outcomes in patients with hidradenitis suppurativa from the placebo-controlled portion of a phase 2 adalimumab study. *J Eur Acad Dermatol Venereol*. 2016;30:989-994.
106. Rondags A, van Straalen KR, van Hasselt JR, et al. Correlation of the refined Hurley classification for hidradenitis suppurativa with patient-reported quality of life and objective disease severity assessment. *Br J Dermatol*. 2019;180:1214-1220.
107. Sartorius K, Lapins J, Emtestam L, Jemec GBE. Suggestions for uniform outcome variables when reporting treatment effects in hidradenitis suppurativa. *Br J Dermatol*. 2003;149:211-213.
108. Zouboulis CC, Gulliver W, Ingram J, et al. Endpoints of clinical trials for Hidradenitis Suppurativa: Proceedings of a round-table session. *Exp Dermatol*. 2020;29(Suppl 1):67-72.
109. Zouboulis CC, Matusiak Ł, Jemec GBE, et al. Inter-rater and intrarater agreement and reliability in clinical staging of hidradenitis suppurativa/acne inversa. *Br J Dermatol*. 2019;181:852-854.
110. Kimball AB, Sundaram M, Banderas B, et al. Development and initial psychometric evaluation of patient-reported outcome questionnaires to evaluate the symptoms and impact of hidradenitis suppurativa. *J Dermatolog Treat*. 2018;29:152-164.
111. Miller I, Lynggaard CD, Lophaven S, et al. A double-blind placebo-controlled randomized trial of adalimumab in the treatment of hidradenitis suppurativa. *Br J Dermatol*. 2011;165:391-398.
112. Zouboulis CC. Pain Index: a new prospective hidradenitis suppurativa patient-reported outcome measure instrument. *Br J Dermatol*. 2021;184:1203-1204.
113. Zouboulis CC, Chernyshov PV. Hidradenitis suppurativa-specific, patient-reported outcome measures. *J Eur Acad Dermatol Venereol*. 2021;35:1420-1421.
114. Chiricozzi A, Bettoli V, De Pità O, et al. HIDRAdisk: an innovative visual tool to assess the burden of hidradenitis suppurativa. *J Eur Acad Dermatol Venereol*. 2019;33:e24-26.
115. Peris K, Lo Schiavo A, Fabbrocini G, et al. HIDRAdisk: validation of an innovative visual tool to assess the burden of hidradenitis suppurativa. *J Eur Acad Dermatol Venereol*. 2019;33:766-773.
116. Ingram JR, Hadjieconomou S, Piguet V. Development of core outcome sets in hidradenitis suppurativa: systematic review of outcome measure instruments to inform the process. *Br J Dermatol*. 2016;175:263-272.
117. Kimball AB, Okun MM, Williams DA, et al. Two phase 3 trials of adalimumab for hidradenitis suppurativa. *N Engl J Med*. 2016;375:422-434.
118. Zouboulis CC. Adalimumab for the treatment of hidradenitis suppurativa/acne inversa. *Expert Rev Clin Immunol*. 2016;12:1015-1026.
119. Zouboulis CC, von Stebut E. Hidradenitis suppurativa/Acne inversa: Von „orphan disease" zu heilbarer entzündlicher Hauterkrankung. *Hautarzt*. 2021;72:647-650.
120. van der Zee HH, Prens EP, Boer J. Deroofing: A tissue-saving surgical technique for the treatment of mild to moderate hidradenitis suppurativa lesions. *J Am Acad Dermatol*. 2010;63:475-480.
121. Mikkelsen PR, Dufour DN, Zarchi K, Jemec GBE. Recurrence rate and patient satisfaction of CO2 laser evaporation of lesions in patients with hidradenitis suppurativa: a retrospective study. *Dermatol Surg*. 2015;41:255-260.
122. Hazen PG, Hazen BP. Hidradenitis suppurativa: successful treatment using carbon dioxide laser excision and marsupialization. *Dermatol Surg*. 2010;36:208-213.
123. Cuenca-Barrales C, Montero-Vílchez T, Sanchez-Diaz M, et al. Patterns of Surgical Recurrence in Patients with Hidradenitis Suppurativa. *Dermatology*. 2023;239:255-261.
124. Ovadja ZN, Zugaj M, Jacobs W, et al. Recurrence rates following reconstruction strategies after wide excision of hidradenitis suppurativa: A systematic review and meta-analysis. *Dermatol Surg*. 2021;47:e106-110.
125. Riddle A, Westerkam L, Feltner C, Sayed C. Current surgical management of hidradenitis suppurativa: A systematic review and meta-analysis. *Dermatol Surg*. 2021;47:349-354.
126. Ritz JP, Runkel N, Haier J, Buhr HJ. Extent of surgery and recurrence rate of hidradenitis suppurativa. *Int J Colorectal Dis*. 1998;13:164-168.
127. Altmann S, Fansa H, Schneider W. Axillary hidradenitis suppurativa: A further option for surgical treatment. *J Cutan Med Surg*. 2004;8:6-10.
128. Ellis LZ. Hidradenitis suppurativa: Surgical and other management techniques. *Dermatol Surg*. 2012;38:517-536.
129. Calibre C, Bouhanna A, Salmin J-P, et al. Hidrosadénite axillaire: une stratégie thérapeutique en un temps. *Ann Chir Plast Esthet*. 2013;58:670-675.
130. Chen E, Friedman HI. Management of regional hidradenitis suppurativa with vacuum-assisted closure and split thickness skin grafts. *Ann Plast Surg*. 2011;67:397-401.
131. Pearce FB, Richardson KA. Negative pressure wound therapy, staged excision and definitive closure with split-thickness skin graft for axillary hidradenitis suppurativa: a retrospective study. *J Wound Care*. 2017;26:S36-42.
132. Ge S, Orbay H, Silverman RP, Rasko YM. Negative pressure wound therapy with instillation and dwell time in the surgical management of severe hidradenitis suppurativa. *Cureus*. 2018;10:e3319.
133. Tchero H, Herlin C, Bekara F, et al. Two-stage surgical repair in 31 patients with stage II-III hidradenitis suppurativa. *Int J Dermatol*. 2018;57:745-747.
134. Mehdizadeh A, Hazen PG, Bechara FG, et al. Recurrence of hidradenitis suppurativa after surgical management: A systematic review and meta-analysis. *J Am Acad Dermatol*. 2015;73 (5 Suppl 1):S70-77.
135. Paasch U, Zidane M, Baron JM, et al. S2k-Leitlinie: Lasertherapie der Haut. *J Dtsch Dermatol Ges*. 2022;20:1248-1270.
136. Frew JW, Hawkes JE, Krueger JG. Topical, systemic and biologic therapies in hidradenitis suppurativa: pathogenic insights by examining therapeutic mechanisms. *Ther Adv Chronic Dis*. 2019;10:2040622319830646.
137. Revuz J. Hidradenitis suppurativa. *J Eur Acad Dermatol Venereol*. 2009;23:985-998.
138. Nikolakis G, von Stebut E. Lokale und neue apparative Therapien der milden Hidradenitis suppurativa. *Hautarzt*. 2021;72:676-685.
139. Jemec GBE. Clinical practice. Hidradenitis suppurativa. *N Engl J Med*. 2012;366:158-164.
140. Bettoli V, Zauli S, Borghi A, et al. Oral clindamycin and rifampicin in the treatment of hidradenitis suppurativa-acne inversa: a prospective study on 23 patients. *J Eur Acad Dermatol Venereol*. 2014;28:125-126.
141. Dessinioti C, Zisimou C, Tzanetakou V, et al. Oral clindamycin and rifampicin combination therapy for hidradenitis suppurativa: a prospective study and 1-year follow-up. *Clin Exp Dermatol*. 2016;41:852-857.
142. Yao Y, Jørgensen A-HR, Ring HC, Thomsen SF. Effectiveness of clindamycin and rifampicin combination therapy in hidradenitis suppurativa: a 6-month prospective study. *Br J Dermatol*. 2021;184:552-553.
143. Nikolakis G, Kristandt A, Hauptmann M, et al. Efficacy of short-term intravenous clindamycin prior to oral clindamycin-rifampicin treatment in hidradenitis suppurativa: a retrospective case series. *Br J Dermatol*. 2021;185:1270-1272.
144. Zouboulis CC, Rabe T. Hormonelle Antiandrogene in der Aknetherapie. *J Dtsch Dermatol Ges*. 2010;8(Suppl 1):S60-74.

145. Sawers RS, Randall VA, Ebling FJ. Control of hidradenitis suppurativa in women using combined antiandrogen (cyproterone acetate) and oestrogen therapy. *Br J Dermatol*. 1986;115:269-274.
146. Matusiak L, Bieniek A, Szepietowski JC. Acitretin treatment for hidradenitis suppurativa: a prospective series of 17 patients. *Br J Dermatol*. 2014;171:170-174.
147. Gollnick HP, Dümmler U. Retinoids. *Clin Dermatol*. 1997;15:799-810.
148. Verdolini R, Simonacci F, Menon S, et al. Alitretinoin: a useful agent in the treatment of hidradenitis suppurativa, especially in women of child-bearing age. *G Ital Dermatol Venereol*. 2015;150:155-162.
149. Nikolakis G, Kyrgidis A, Zouboulis CC. Is there a role for antiandrogen therapy for hidradenitis suppurativa? A systematic review of published data. *Am J Clin Dermatol*. 2019;20:503-513.
150. Kaur MR, Lewis HM. Hidradenitis suppurativa treated with dapsone: A case series of five patients. *J Dermatolog Treat*. 2006;17:211-213.
151. Brocard A, Knol A-C, Khammari A, Dréno B. Hidradenitis suppurativa and zinc: A new therapeutic approach. A pilot study. *Dermatology*. 2007;214:325-327.
152. Wong D, Walsh S, Alhusayen R. Low-dose systemic corticosteroid treatment for recalcitrant hidradenitis suppurativa. *J Am Acad Dermatol*. 2016;75:1059-1062.
153. Anderson MD, Zauli S, Bettoli V, et al. Cyclosporine treatment of severe Hidradenitis suppurativa–A case series. *J Dermatolog Treat*. 2016;27:247-250.
154. Vossen ARJV, van Doorn MBA, van der Zee HH, Prens EP. Apremilast for moderate hidradenitis suppurativa: Results of a randomized controlled trial. *J Am Acad Dermatol*. 2019;80:80-88.
155. Zouboulis CC, Okun MM, Prens EP, et al. Long-term adalimumab efficacy in patients with moderate-to-severe hidradenitis suppurativa/acne inversa: 3-year results of a phase 3 open-label extension study. *J Am Acad Dermatol*. 2019;80:60-69.e2.
156. Zouboulis CC, Hansen H, Caposiena Caro RD, et al. Adalimumab dose intensification in recalcitrant hidradenitis suppurativa/acne inversa. *Dermatology*. 2020;236:25-30.
157. Sánchez Martínez EM, Murray G, Alfageme Roldán F, et al. Adalimumab dose intensification in hidradenitis suppurativa: effectiveness and safety results of a multicentre study. *Br J Dermatol*. 2021;185:863-865.
158. Tzellos T, Yang H, Mu F, et al. Impact of hidradenitis suppurativa on work loss, indirect costs and income. *Br J Dermatol*. 2019;181:147-154.
159. Shih T, Lee K, Grogan T, et al. Infliximab in hidradenitis suppurativa: A systematic review and meta-analysis. *Dermatol Ther*. 2022;35:e15691.
160. Lesage C, Adnot-Desanlis L, Perceau G, et al. Efficacy and tolerance of prolonged infliximab treatment of moderate-to-severe forms of hidradenitis suppurativa. *Eur J Dermatol*. 2012;22:640-644.
161. Ghias MH, Johnston AD, Kutner AJ, et al. High-dose, high-frequency infliximab: A novel treatment paradigm for hidradenitis suppurativa. *J Am Acad Dermatol*. 2020;82:1094-1101.
162. Grau-Pérez M, Rodríguez-Aguilar L, Roustan G, Alfageme F. Drug survival of adalimumab biosimilar vs adalimumab originator in hidradenitis suppurativa: Can equivalence be assumed? A retrospective cohort study. *J Eur Acad Dermatol Venereol*. 2023;37:e678-680.
163. Kirsten N, Ohm F, Gehrdau K, et al. Switching from adalimumab originator to biosimilar in patients with hidradenitis suppurativa results in losses of response-data from the German HS registry HSBest. *Life (Basel)*. 2022;12:1518.
164. Burlando M, Fabbrocini G, Marasca C, et al. Adalimumab originator vs. biosimilar in hidradenitis suppurativa: A multicentric retrospective study. *Biomedicines*. 2022;10:2522.
165. Roccuzzo G, Rozzo G, Burzi L, et al. Switching from adalimumab originator to biosimilars in hidradenitis suppurativa: What's beyond cost-effectiveness? *Dermatol Ther*. 2022;35:e15803.
166. Montero-Vilchez T, Cuenca-Barrales C, Rodriguez-Tejero A, et al. Switching from adalimumab originator to biosimilar: Clinical experience in patients with hidradenitis suppurativa. *J Clin Med*. 2022;11:1007.
167. Moran B, Sweeney CM, Hughes R, et al. Hidradenitis suppurativa is characterized by dysregulation of the Th17:Treg cell axis, Which is corrected by anti-tnf therapy. *J Invest Dermatol*. 2017;137:2389-2395.
168. Schlapbach C, Hänni T, Yawalkar N, Hunger RE. Expression of the IL-23/Th17 pathway in lesions of hidradenitis suppurativa. *J Am Acad Dermatol*. 2011;65:790-798.
169. Kelly G, Hughes R, McGarry T, et al. Dysregulated cytokine expression in lesional and nonlesional skin in hidradenitis suppurativa. *Br J Dermatol*. 2015;173:1431-1439.
170. Glatt S, Jemec GBE, Forman S, et al. Efficacy and safety of bimekizumab in moderate to severe hidradenitis suppurativa: A phase 2, double-blind, placebo-controlled randomized clinical trial. *JAMA Dermatol*. 2021;157:1279-1288.
171. Frew JW, Navrazhina K, Grand D, et al. The effect of subcutaneous brodalumab on clinical disease activity in hidradenitis suppurativa: An open-label cohort study. *J Am Acad Dermatol*. 2020;83:1341-1348.
172. Frew JW, Navrazhina K, Sullivan-Whalen M, et al. Weekly administration of brodalumab in hidradenitis suppurativa: an open-label cohort study. *Br J Dermatol*. 2021;184:350-352.
173. Esme P, Botsali A, Akoglu G, Caliskan E. An anti-interleukin-17a monoclonal antibody, ixekizumab, in the treatment of resistant hidradenitis suppurativa: A case series. *Skin Appendage Disord*. 2022;8:342-345.
174. Tzanetakou V, Kanni T, Giatrakou S, et al. Safety and efficacy of anakinra in severe hidradenitis suppurativa: A randomized clinical trial. *JAMA Dermatol*. 2016;152:52-59.
175. Blok JL, Li K, Brodmerkel C, et al. Ustekinumab in hidradenitis suppurativa: clinical results and a search for potential biomarkers in serum. *Br J Dermatol*. 2016;174:839-846.
176. Montero-Vilchez T, Pozo-Román T, Sánchez-Velicia L, et al. Ustekinumab in the treatment of patients with hidradenitis suppurativa: multicenter case series and systematic review. *J Dermatolog Treat*. 2022;33:348-353.
177. Kozera E, Flora A, Frew JW. Real-world safety and clinical response of Janus kinase inhibitor upadacitinib in the treatment of hidradenitis suppurativa: A retrospective cohort study. *J Am Acad Dermatol*. 2022;87:1440-1442.
178. Ravi M, Trinidad J. Botulinum toxin in hidradenitis suppurativa: A systematic review. *J Drugs Dermatol*. 2022;21:408-412.
179. Geoghegan L, Rodrigues R, Harrison CJ, Rodrigues JN. The use of botulinum toxin in the management of hidradenitis suppurativa: A systematic review. *Plast Reconstr Surg Glob Open*. 2022;10:e4660.
180. Grimstad Ø, Tzellos T, Dufour DN, et al. Evaluation of medical and surgical treatments for hidradenitis suppurativa using real-life data from the Scandinavian registry (HISREG). *J Eur Acad Dermatol Venereol*. 2019;33:1164-1171.
181. Chernyshov PV, Zouboulis CC, Tomas-Aragones L, et al. Quality of life measurement in hidradenitis suppurativa: position statement of the European Academy of Dermatology and Venereology task forces on quality of life and patient-oriented outcomes and acne, rosacea and hidradenitis suppurativa. *J Eur Acad Dermatol Venereol*. 2019;33:1633-1643.
182. Chernyshov PV, Finlay AY, Tomas-Aragones L, et al. Quality of life in hidradenitis suppurativa: An update. *Int J Environ Res Public Health*. 2021;18:6131.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Zouboulis CC, Bechara FG, Fritz K, et al. S2k guideline for the treatment of hidradenitis suppurativa / acne inversa – Short version. *JDDG: Journal der Deutschen Dermatologischen Gesellschaft*. 2024;:1-22. https://doi.org/10.1111/ddg.15412