Aerobic and Anaerobic Bacteriology of Hidradenitis Suppurativa: A Study of 22 Cases

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Key Words

Acne inversa · Bacteria · Hidradenitis suppurativa · Pathogenesis · Resistance

Abstract

Introduction: Hidradenitis suppurativa (HS) is a chronic inflammatory skin disease of unclear etiology. The role of bacteria in the pathogenesis of disease remains controversial.

Materials and Methods: Specimens were obtained from 22 HS patients by direct percutaneous needle aspiration. The collected material was cultured in aerobic and anaerobic conditions, and sensitivity tests were performed. **Results:** Of the 22 patients, 32% were culture negative and 68% were culture positive. A total of 16 isolates was obtained, 14 aerobic and 2 anaerobic. Aerobic bacteria were present in 86% of the specimens, whereas only anaerobic bacteria were isolated in 7%. The predominant aerobic species were *Proteus mirabilis*, *Staphylococcus haemolyticus* and *Staphylococcus lugdunensis*. The isolated anaerobic bacteria were *Derma-coccus nishinomiyaensis* and *Propionibacterium granulosum*.

Conclusion: A variety of aerobic and anaerobic bacteria was

isolated from the HS lesions of our patients. In contrast to previous studies, fewer patients were found to be culture positive, and *Staphylococcus aureus* was isolated in only 1 of them. More studies are necessary to elucidate the controversial role of bacteria in the pathogenesis of HS.

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Introduction

Hidradenitis suppurativa (HS) is a chronic inflammatory skin condition of unclear etiology. At the first international conference on HS in Dessau, Germany (March 30 to April 1, 2006), HS/acne inversa was defined as a chronic, inflammatory, recurrent, debilitating skin disease that usually presents after puberty with painful, deep-seated, inflamed lesions in the apocrine gland-bearing areas of the body, most commonly the axillary, inguinal and anogenital regions (Dessau definition) [1]. HS is not uncommon. Its prevalence in the general population varies greatly between 0.4 and 4% [2]. Recently, a prevalence of 1% was reported in a sample of a French popula-

tion, with an average age of 23 years at onset [3]. Females predominated with a female to male ratio of 2:1–5:1 [3, 4]. Severity is roughly defined by Hurley's classification, which classifies the patients into three stages largely based on the type and extent of involvement [5]. Another classification system is the Sartorius index, which is mostly applied in clinical trials [6].

HS pathogenesis still remains obscure. In the past, it was considered a disorder of the apocrine glands [7]. However, recent studies suggest that follicular inflammation is the primary event, leading to hyperkeratosis, keratin plugging, stasis and dilatation of the hair follicle. In this context, apocrine involvement is a secondary phenomenon [8–17]. A genetic predisposition for the disease may exist. Fitzsimmons and Guilbert [18] reported that 34% of the first-degree relatives of HS patients also suffered from the disease. HS may segregate as an autosomal dominant trait [19]. Heterozygous mutations in the γ -secretase genes *NCSTN*, *PSENEN* and *PSEN1* have recently been described in a small number of kindred individuals [19–23]. The inflammatory process underlying HS suggests an important pathogenetic role for aberrant immunity. This hypothesis is further supported by the efficacy of immunomodulatory agents in HS [12] as well as its clinical association with Crohn's disease. In the latter, subtle defects in mucosal immunity have been shown to play a critical pathogenetic role [13–14]. Furthermore, female predominance, postpubertal onset, frequent premenstrual flares [24], usual remission of the disease in postmenopausal women [25], and improvement during pregnancy suggest that hormonal factors may also play a part [26].

The role of bacteria remains controversial. HS is not considered to be primarily an infectious disease. A variety of Gram-positive and Gram-negative bacteria have been isolated from the lesions sporadically, including *Staphylococcus aureus*, *Peptostreptococcus* spp., *Propionibacterium acnes*, *Escherichia coli*, *Proteus mirabilis* and *Klebsiella* spp. [27]. However, the clinical relevance of these findings in HS remains unclear: negative cultures from the surface of HS lesions are not uncommon; there is a variety of isolated organisms; infectious complications, such as cellulitis, are rare, and regional lymph nodes remain almost invariably uninvolved [27–30].

Materials and Methods

The study was conducted at the Second Department of Dermatology and Venereology of the 'Attikon' Hospital, National and Kapodistrian University of Athens, from May 2012 to August

2013. Patients with active HS attending the outpatient clinic were recruited. The diagnosis of HS was based on clinical grounds. The study was approved by the Ethics Committee of the hospital. All patients gave their informed consent. In total, 22 patients were included in the study. For all patients, a detailed history was obtained and a complete clinical examination was performed. Clinical staging was made according to both Hurley's classification and the Sartorius index. Health-related quality of life was assessed by the Dermatology Life Quality Index (DLQI).

Specimens were obtained from abscesses by direct percutaneous needle aspiration, after cleaning the area with povidone-iodine. The collected material was transported to the laboratory in a medium for aerobes and anaerobes (Transwab® Amies MW179; MWE, Wiltshire, UK). The material was processed according to standard procedures at the Department of Microbiology of the National and Kapodistrian University of Athens. Sheep blood (5%), chocolate and MacConkey agar plates were inoculated for the isolation of aerobic bacteria, and chocolate agar was incubated under anaerobic conditions. The identification of isolates was performed on VITEK® 2 automated microbial ID/AST system. The sensitivity test was performed by the Kirby-Bauer method.

Results

Of the 22 patients, 14 were females and 8 were males. The mean age was 35.8 years (range 18–60). The mean age at onset was 28.9 years, and the mean disease duration was 7 years. The mean BMI of the patients was 32.36. The mean Sartorius index score was 54.8 and the mean DLQI score was 13. Most patients (86.4%) were active smokers. Of the patients, 2 were classified as Hurley stage I (0.09%), 10 as Hurley stage II (45.45%) and 10 as Hurley stage III (45.45%). The most commonly affected areas were the inguinal (15/22) and the axillary (14/22) regions. The clinical and epidemiological characteristics of the patients are summarized in table 1.

Of the 22 patients, 7 were culture negative (32%) and 15 were culture positive (68%). A total of 16 isolates was obtained, 14 aerobic and 2 anaerobic. Aerobic bacteria were present in 13 out of 15 specimens (86%), whereas only anaerobic bacteria were isolated in 1 specimen (7%). In one sample, both aerobic and anaerobic species were isolated (7%). Of the 15 culture-positive specimens, one single isolate was obtained from 14, and two isolates from 1.

The predominant aerobic species were *P. mirabilis* (four isolates), *Staphylococcus haemolyticus* (three isolates) and *Staphylococcus lugdunensis* (two isolates). The isolated anaerobic bacteria were the *Dermacoccus nishinomiyaensis* (one isolate) and *Propionibacterium granulosum* (one isolate). The isolates recovered are presented in table 2.

P. mirabilis was isolated from 4 patients (3 females and 1 male). One isolate was resistant to ampicillin and another was resistant both to ampicillin and ticarcillin. *Pseudomonas aeruginosa* resistant to colistin was isolated from 1 specimen. *S. aureus* recovered was pansensitive. In a male patient, *S. lugdunensis* resistant to benzyl penicillin was isolated. Out of the 3 *S. haemolyticus* isolates, 1 was resistant to erythromycin and fosfomycin. Another isolate was resistant to benzyl penicillin, clindamycin and fusidic acid. The third isolate was found to be resistant to clindamycin. Lastly, *S. haemolyticus* resistant to methicillin was recovered. The anaerobic species isolated were *D. nishinomiyaensis*/*Kytococcus sedentarius* and *P. granulosum*. The latter was isolated along with *Staphylococcus epidermidis*.

Discussion

Our study highlights the variety of aerobic and anaerobic bacteria isolated from HS lesions. Almost half of our patients were found to be culture positive, and from most samples, only one isolate was recovered. The majority of isolated species were aerobic bacteria, whereas anaerobic bacteria were isolated in only two samples. The predominant species were coagulase-negative Staphylococci (CNS) and *P. mirabilis*, which was found to be resistant to tetracycline, clindamycin and erythromycin. *S. aureus* was isolated from only 1 patient and it was pansensitive.

In the literature, previous reports regarding HS bacteriology are controversial. Jemec et al. [28] performed cultures from active lesions as well as serological analysis of circulating IgG antibodies in 41 patients. Bacteria were isolated in 49% of all active lesions. It was suggested that *S. aureus* plays a temporary role in the early phase of the disease. Lapins et al. [27] used carbon dioxide laser surgery to obtain samples from different and the deepest levels of the lesions and found 16 different species or subspecies. The bacterial cultures were positive from at least one level in all cases, and from deep levels in all but 3 cases. *S. aureus* and CNS were the species most frequently isolated.

In a retrospective research over a period of 6 years, Brook and Frazier [29] obtained a total of 17 specimens from axillary lesions by direct percutaneous needle aspiration or during surgical drainage. They highlighted the polymicrobial nature as well as the predominance of anaerobic bacteria in axillary HS. The predominant aerobic bacteria were *S. aureus*, *Streptococcus pyogenes* and *P. aeruginosa*. Sartorius et al. [30] obtained bacterial cul-

Table 1. Clinical and epidemiological characteristics of 22 patients with HS

Mean age, years	35.8 (18–60)
Female/male	14/8
Mean age of HS onset, years	28.86 (14–58)
Mean HS duration, years	7.05 (1–20)
Sartorius index	54.8 (5–120)
BMI	32.36 (20.9–57.96)
Height, m	1.69 (1.55–1.87)
Weight, kg	91.38 (57–115)
DLQI	13 (1–30)
Smoking, yes/former/no	19/1/2
Region, axillary/breast/anal/groin/recta/buttocks/scalp	14/8/6/15/3/5/1
Hurley stage, I/II/III	2/10/10

Values are expressed as range or numbers.

Table 2. Microbiological findings of 22 HS patients

Patient No.	Aerobes	Anaerobes
1	<i>S. haemolyticus</i>	
2	No isolation	
3	<i>S. lugdunensis</i>	
4	<i>S. haemolyticus</i>	
5	No isolation	
6	No isolation	
7		<i>D. nishinomiyaensis</i> / <i>K. sedentarius</i>
8	No isolation	
9	No isolation	
10	<i>P. mirabilis</i>	
11	<i>E. coli</i>	
12	<i>S. lugdunensis</i>	
13	<i>P. aeruginosa</i>	
14	<i>P. mirabilis</i>	
15	No isolation	
16	<i>P. mirabilis</i>	
17	<i>S. aureus</i>	
18	<i>S. haemolyticus</i>	
19	<i>P. mirabilis</i>	
20	<i>Pseudomonas fluorescens</i>	
21	<i>S. epidermidis</i>	<i>P. granulosum</i>
22	No isolation	

tures from the skin surface (before surgery) and from deeper layers (during surgery) of the lesions. At each level, two samples were taken, one with a punch biopsy and one by pressing a soft agar gel against the skin. CNS were the most common bacteria. However, *S. aureus* was not

found in any cultures from acute inflammatory HS nodules. CNS were found in the deep layers in all 10 patients. Among anaerobic microorganisms, Gram-positive cocci were the most common bacteria. Matusiak et al. [31] conducted a study on 69 patients with HS. The majority of the patients had a polymicrobial flora with up to 5 species. Staphylococci and bacteria of the intestinal flora predominated. The highest effectiveness against isolates was observed for carbapenems, penicillins with β -lactamase inhibitors and fluoroquinolones. The authors suggested that in daily practice, penicillins with β -lactamase inhibitors or fluoroquinolones could serve as first-line therapy for HS.

The findings of our study differ from previous experience in that fewer patients were found to be culture positive, and all but 1 of these patients had only one bacterium isolated. In contrast to previous reports where *S. aureus* was the most common isolate, in the present study, it was isolated in only 1 of our patients. These differences can be attributed, partly at least, to the sampling method. In our study, the sample was obtained by deep aspiration from active nodules in order to avoid contamination with normal superficial skin flora. Nevertheless,

it must be noted that some of our isolates may represent normal inhabitants of the skin flora, supporting the theory that bacterial contamination may be a secondary phenomenon. On the other hand, a high number of CNS were isolated in our patients, in accordance with previous studies.

An important limitation of our study is the low number of patients examined. Further studies with a larger number of patients as well as consensus on the most appropriate sampling method are necessary to elucidate the controversial role of bacteria in the pathogenesis of HS.

Statement of Ethics

The patients have provided their informed consent for the publication of their cases, and our study complies with the human rights.

Disclosure Statement

The authors have no conflicts of interest to declare.

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