Implications of Thyroid Disease in Hospitalized Patients With Hidradenitis Suppurativa

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PRACTICE **POINT**

- Hidradenitis suppurativa (HS) is associated with autoimmune and endocrine conditions, but the association between HS and thyroid disorders is poorly characterized.

To the Editor:

Hidradenitis suppurativa (HS) is a chronic inflammatory skin condition characterized by painful recurrent abscesses. Several autoimmune and endocrine diseases are associated with HS, including inflammatory bowel disease and diabetes mellitus (DM).[1] Notably, the association between HS and thyroid disorders is poorly characterized,[2] and there are no known nationwide studies exploring this potential association in the hospital setting. In this cross-sectional matched cohort study, we aimed to characterize HS patients with comorbid thyroid disorders as well as to explore whether thyroid disease is associated with comorbidities and hospital outcome measures in these patients.

The 2019 National Inpatient Sample (NIS) was weighted in accordance with NIS-assigned weight variables and queried for HS, hypothyroidism, and hyperthyroidism cases using *International Classification of Diseases*, Tenth Revision, codes L73.2, E03, and E05, respectively. Propensity score matching based on age and sex was performed using a nearest-neighbor method in the MatchIt statistical R package. Patient demographics, comorbidities, and outcome variables were collected. Univariable analysis of HS patients with thyroid disease vs those without thyroid disease vs controls without HS were performed using χ^2 and *t*-test functions in SPSS statistical software (IBM). A series of multivariate analyses were performed using SPSS logistic and linear regression models to examine the effect of thyroid disease on hospital outcome measures and comorbidities in HS patients, with statistical significance set at $P=.05$.

A total of 1720 HS patients with comorbid thyroid disease (hyperthyroidism/hypothyroidism), 23,785 HS patients without thyroid disease, and 25,497 age- and sex-matched controls were included in the analysis. On average, HS patients with comorbid thyroid disease were older than HS patients without thyroid disease and controls (49.36 years vs 42.17 years vs 42.66 years [$P<.001$]), more likely to be female (75.58% vs 58.67% vs 59.81% [$P<.001$]), more likely to be in the highest income quartile (17.52% vs 12.18% vs 8.14% [$P<.001$]), and more likely to be Medicare insured (39.07% vs 27.47% vs 18.02% [$P<.001$])(eTable).

On univariate analysis of hospital outcome measures, HS patients with comorbid thyroid disease had the highest frequency of extreme likelihood of dying compared with HS patients without thyroid disease and with controls (6.40% vs 5.38% vs 2.47% [$P<.001$]), the highest mean number of diagnoses (18.31 vs 14.14 vs 8.57 [$P<.001$]), and the longest mean length of hospital stay (6.03 days vs 5.94 days vs 3.73 days [$P<.001$]). On univariate analysis of comorbidities, HS patients with thyroid disease had the highest incidence of the following comorbidities compared with HS patients without thyroid disease and controls: hypertension (34.01% vs 28.55% vs 22.39% [$P<.001$]), DM (48.26% vs 35.63% vs 18.05% [$P<.001$]), obesity (46.80% vs 39.65% vs 11.70% [$P<.001$]), and acute kidney injury (AKI)(21.80% vs 13.10% vs 6.33% [$P<.001$])(eTable).

A multivariate analysis adjusting for multiple potential confounders including age, sex, race, median income quartile, disposition/discharge location, and primary payer was performed for hospital outcome measures and comorbidities. There were no significant differences

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The eTable is available in the Appendix online at www.mdedge.com/cutis.

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TABLE 1. Multivariable Logistic and Linear Regressions of HS Patients for Each Hospital Outcome Measure[a]

	Any thyroid disease		
	OR	95% CI	*P* value
Risk for mortality subclass[b]			
Minor likelihood of dying	Reference	Reference	Reference
Moderate likelihood of dying	0.597	0.144-2.474	.477
Major likelihood of dying	3.189	0.118-86.451	.491
Extreme likelihood of dying	2.247	0.03-167.501	.713
No. of diagnoses on file during current hospitalization	2.281	−1.445 to 6.006	.23
No. of procedures during current hospitalization	0.034	−1.342 to 2.075	.674
Total charges for hospital admission, $	0.647	−39974.32 to 79339.15	.518
Length of hospital stay, d	0.118	−1.22 to 8.229	.146

Abbreviations: HS, hidradenitis suppurativa; OR, odds ratio.

[a]Covariables included age, sex, race, median income quartile, primary payer, disposition, and comorbidities.

[b]Risk for mortality was assessed via the Healthcare Cost and Utilization Project using software developed by 3M Health Information System.

in hospital outcome measures between HS patients with comorbid thyroid disease vs those without thyroid disease ($P>.05$)(Table 1). Thyroid disease was associated with increased odds of comorbid DM (odds ratio [OR], 1.242 [95% CI, 1.113-1.386]), obesity (OR, 1.173 [95% CI, 1.057-1.302]), and AKI (OR, 1.623 [95% CI, 1.423-1.851]) and decreased odds of comorbid nicotine dependence (OR, 0.609 [95% CI, 0.540-0.687]), skin and soft tissue infections (OR, 0.712 [95% CI, 0.637-0.797]), and sepsis (OR, 0.836 [95% CI, 0.717-0.973]) in HS patients (Table 2).

We found that HS patients with thyroid disease had increased odds of comorbid obesity, DM, and AKI compared with HS patients without thyroid disease when adjusting for potential confounders on multivariate analysis. A 2019 nationwide cross-sectional study of 18,224 patients with thyroid disease and 72,896 controls in Taiwan showed a higher prevalence of obesity (1.26% vs 0.57% [$P<.0001$]) and a higher hazard ratio (HR) of type 2 DM (HR, 1.23 [95% CI, 1.16-1.31]) in the thyroid disease group vs the controls.[3] In a 2024 claims-based national cohort study of 4,152,830 patients with 2 or more consecutive thyroid-stimulating hormone measurements in the United States, patients with hypothyroidism and hyperthyroidism had a higher incidence risk for kidney dysfunction vs patients with euthyroidism (HRs, 1.37 [95% CI, 1.34–1.40] and 1.42 [95% CI, 1.39-1.45]).[4] In addition, patients with and without DM and thyroid disease had increased risk for kidney disease compared to patients with and without DM and euthyroidism (hypothyroidism: HRs, 1.17 [95% CI, 1.13-1.22] and 1.52 [95% CI, 1.49-1.56]; hyperthyroidism: HRs, 1.34 [95% CI, 1.29-1.38] and 1.36 [95% CI, 1.33-1.39]). Furthermore, patients with and without obesity and thyroid disease had increased risk for kidney disease compared to patients with and without obesity and with euthyroidism (hypothyroidism: HRs, 1.40 [95% CI, 1.36-1.45] and 1.26 [95% CI, 1.21-1.32]; hyperthyroidism: HRs, 1.34 [95% CI, 1.30-1.39] and 1.35 [95% CI, 1.30-1.40]).[4] However, these studies did not focus on HS patients.[5]

Hidradenitis suppurativa has a major comorbidity burden, including obesity, DM, and kidney disease.[5] Our findings suggest a potential additive risk for these conditions in HS patients with comorbid thyroid disease; therefore, heightened surveillance for obesity, DM, and AKI in this population is encouraged. Prospective and retrospective studies in HS patients assessing the risk for each comorbidity while controlling for the others may help to better characterize these relationships.

Using multivariate analysis, we found that HS patients with comorbid thyroid disease had no significant differences in hospital outcome measures compared with HS patients without thyroid disease despite significant differences on univariate analysis ($P<.05$). Similarly, in a 2018 cross-sectional study of 430 HS patients and 20,780 controls in Denmark, the HS group had 10% lower thyroid-stimulating hormone levels vs the control group, but this did not significantly affect HS severity and thyroid function on multivariate analysis.[6] In a 2020 cross-sectional analysis of 290 Greek HS patients, thyroid disease was associated with higher HS severity using Hurley classification (OR, 1.19 [95% CI, 1.03-1.51]) and International Hidradenitis Suppurativa Severity Score System 4 classification (OR, 1.29 [95% CI, 1.13-1.62]); however, this analysis was univariate

TABLE 2. Multivariate Binary Logistic Regressions for Thyroid Disease as a Predictor of Common HS Comorbidities[a]

Comorbidity	OR	95% CI	*P* value
Skin and soft tissue infection	0.712	0.637-0.797	<.001
Hypertension	1.05	0.939-1.175	.392
Diabetes mellitus	1.242	1.113-1.386	<.001
Nicotine dependence	0.609	0.540-0.687	<.001
Obesity	1.173	1.057-1.302	.003
Acute kidney injury	1.623	1.423-1.851	<.001
Sepsis	0.836	0.717-0.973	.021

Abbreviations: HS, hidradenitis suppurativa; OR, odds ratio.

[a]Covariables included age, sex, race, income quartile, primary payer, and disposition.

and did not account for confounders.[7] Taken together, our study and previous research suggest that thyroid disease is not an independent prognostic indicator for hospital outcome measures in HS patients when cofounders are considered and therefore may not warrant extra caution when treating hospitalized HS patients.

Nicotine dependence was an important potential confounder with regard to the effects of comorbid thyroid disease on outcomes of HS patients in our study. While we found that the prevalence of nicotine dependence was higher in HS patients vs matched controls, HS patients with comorbid thyroid disease had a lower prevalence of nicotine dependence than HS patients without thyroid disease. Furthermore, thyroid disease was associated with decreased odds of nicotine dependence in HS patients when adjusting for confounders. Previous studies have shown an association between cigarette smoking and HS. Smoking also may affect thyroid function via thiocyanate, sympathetic activation, or immunologic disturbances. Smoking may have both prothyroid and antithyroid effects.[6] In a 2023 cross-sectional study of 108 HS patients and 52 age- and sex-matched controls in Germany, HS patients had higher thyroid antibody (TRAb) levels compared with controls (median TRAb level, 15.4 vs 14.2 [P=.026]), with even greater increases in TRAb in HS patients who were smokers or former smokers vs never smokers (median TRAb level, 1.18 vs 1.08 [P=.042]).[2]

There was a lower frequency of thyroid disease in our HS cohort compared with our matched controls cohort. While there are conflicting reports on the association between HS and thyroid disease in the literature, 2 recent meta-analyses of 5 and 6 case-control studies, respectively, found an association between HS and thyroid disease (OR, 1.36 [95% CI, 1.13-1.64] and 1.88 [95% CI, 1.25-2.81]).[1,8] Notably, these studies were either claims or survey based, included outpatients, or were unspecified. One potential explanation for the difference in our findings vs those of other studies could be underdiagnosis of thyroid disease in hospitalized HS patients. We found that HS patients were most frequently Medicaid or Medicare insured compared to controls, who most frequently were privately insured. Increased availability and ease of access to outpatient medical care through private health insurance may be a possible contributor to the higher frequency of diagnosed thyroid disease in control patients in our study; therefore, awareness of potential underdiagnosis of thyroid disease in hospitalized HS patients is recommended.

Limitations of our study included those inherent to the NIS database, including potential miscoding and lack of data on pharmacologic treatments. Outcome measures assessed were limited by inclusion of both primary and secondary diagnoses of HS and thyroid disease in our cohort and may have been affected by other conditions. As with any observational study, there was a possibility of unidentified confounders unaccounted for in our study.

In conclusion, in this national inpatient-matched cohort study, thyroid disease was associated with increased odds of obesity, DM, and AKI in HS inpatients but was not an independent risk factor for worse hospital outcome measures. Therefore, while increased surveillance of associated comorbidities is appropriate, thyroid disease may not be a cause for increased concern for dermatologists treating hospitalized HS patients. Prospective studies are necessary to better characterize these findings.

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APPENDIX

eTABLE. Demographic and Hospital Outcome Measures for HS Patients With and Without Thyroid Disease and Controls Without HS

Characteristic	Mean (SD)			*P* value
	HS patients with thyroid disease (n=1720)	HS patients without thyroid disease (n=23,785)	Controls (n=25,497)	
Age, y	49.36 (15.98)	42.17 (15.05)	42.66 (15.22)	<.001
Sex				<.001
Male	420 (24.42)	9830 (41.33)	10,247 (40.19)	
Female	1300 (75.58)	13,955 (58.67)	15,250 (59.81)	
Race				<.001
White	995 (58.53)	8475 (36.26)	19,414 (79.12)	
Black	475 (27.94)	11,640 (49.81)	2019 (8.23)	
Hispanic	130 (7.65)	2145 (9.18)	1954 (7.96)	
Asian	25 (1.47)	235 (1.01)	300 (1.22)	
Native American	15 (0.88)	190 (0.81)	365 (1.49)	
Other	60 (3.53)	685 (2.93)	485 (1.98)	
Median income quartile[a]				<.001
0-25	620 (37.46)	9885 (42.25)	9942 (39.69)	
26-50	390 (23.56)	5915 (25.28)	7992 (31.91)	
51-75	355 (21.45)	4745 (20.28)	5074 (20.26)	
76-100	290 (17.52)	2850 (12.18)	2039 (8.14)	
Disposition/discharge location				<.001
Routine discharge	1060 (61.63)	15,940 (67.02)	20,879 (81.97)	
Short-term hospital admission	25 (1.45)	375 (1.58)	1265 (4.97)	
Another facility[b]	230 (13.37)	2305 (9.69)	1659 (6.51)	
Home health care	380 (22.09)	4475 (18.81)	835 (3.28)	
Left against medical advice	25 (1.45)	555 (2.33)	675 (2.65)	
Died	0 (0)	130 (0.55)	160 (0.63)	
Primary payer status				<.001
Medicare	670 (39.07)	6530 (27.47)	4473 (18.02)	
Medicaid	415 (24.20)	8405 (35.35)	6963 (28.05)	
Private insurance	440 (25.66)	6570 (27.63)	9322 (37.56)	
Self-pay	140 (8.16)	1450 (6.10)	2499 (10.07)	
Other	50 (2.92)	820 (3.45)	1565 (6.30)	

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eTABLE. (continued)

Characteristic	Mean (SD) HS patients with thyroid disease (n=1720)	HS patients without thyroid disease (n=23,785)	Controls (n=25,497)	*P* value
Risk for mortality subclass[c]				<.001
Minor likelihood of dying	695 (40.41)	13,455 (56.57)	18,815 (73.79)	
Moderate likelihood of dying	580 (33.72)	5630 (23.67)	3839 (15.06)	
Major likelihood of dying	335 (19.48)	3420 (14.38)	2179 (8.55)	
Extreme likelihood of dying	110 (6.40)	1280 (5.38)	630 (2.47)	
No. of diagnoses on file during current hospitalization	18.31 (7.13)	14.14 (6.85)	8.57 (5.44)	<.001
No. of procedures during current hospitalization	1.63 (2.09)	1.96 (2.68)	1.24 (1.73)	<.001
Total charges for hospital admission, $	61,347.97 (100,780.836)	61,767.00 (91647.80)	29,340.41 (51,038.29)	<.001
Length of hospital stay, d	6.03 (5.74)	5.94 (7.44)	3.73 (6.69)	<.001
Comorbidities				
Skin and soft tissue infections	530 (30.81)	9755 (41.01)	1694 (6.64)	<.001
Hypertension	585 (34.01)	6790 (28.55)	5708 (22.39)	<.001
Diabetes mellitus	830 (48.26)	8475 (35.63)	4603 (18.05)	<.001
Nicotine dependence	455 (26.45)	7930 (33.34)	5868 (23.01)	<.001
Obesity	805 (46.80)	9430 (39.65)	2984 (11.70)	<.001
Acute kidney injury	375 (21.80)	3115 (13.10)	1614 (6.33)	<.001
Sepsis	220 (12.79)	3575 (15.03)	1480 (5.80)	<.001

Abbreviation: HS, hidradenitis suppurativa.

[a]Patient median income quartile represents median household income relative to the patient's area of residence.

[b]Includes patients discharged to another level of care (eg, long-term, residential, and other).

[c]Risk for mortality was assessed via the Healthcare Cost and Utilization Project using software developed by 3M Health Information System.