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Incidence of Myocardial Infarction and Cerebrovascular Accident in Patients With Hidradenitis Suppurativa

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Key Points

Question

Is hidradenitis suppurativa associated with an increased risk of myocardial infarction and cerebrovascular accident?

Findings

In this cohort study of 49 862 patients with hidradenitis suppurativa, significantly increased risk of myocardial infarction or cerebrovascular accident was noted among patients with hidradenitis suppurativa compared with controls. Increased risks were also noted for myocardial infarction alone and cerebrovascular accident alone.

Meaning

Hidradenitis suppurativa appears to be an independent risk factor for cardiovascular events, including myocardial infarction and cerebrovascular accident; patients with hidradenitis suppurativa may benefit from screening and early management of risk mediators.

Abstract

Importance

Although hidradenitis suppurativa (HS) is associated with several cardiovascular risk mediators, information on the risk of myocardial infarction (MI) and cerebrovascular accident (CVA) in this population is sparse.

Objective

To compare risk of MI, CVA, and composite disease (MI or CVA) in patients with HS, stratified by use of biologic agents, with controls without HS.

Design, Setting, and Participants

A retrospective cohort analysis was conducted between January 1, 1999, and April 1, 2019, using a demographically heterogeneous population-based sample of over 56 million unique patients. Individuals with HS (n = 49 862) and without HS (n = 1 421 223) were identified using electronic health records data.

Main Outcomes and Measures

The primary outcome was incidence of composite MI or CVA.

Results

Of the 49 862 patients with HS, 37 981 were women (76.2%), 29 711 were white (59.6%), and mean (SD) age was 38.3 (13.3) years. Crude incidence rate of composite disease was 6.6 (95% CI, 6.3-7.0) per 1000 person-years in patients with HS compared with 6.8 (95% CI, 6.7-6.8) per 1000 person-years in controls. In patients with HS, crude incidence rates were 2.9 (95% CI, 2.6-3.1) per 1000 person-years for MI alone and 4.1 (95% CI, 3.9-4.4) per 1000 person-years for CVA alone compared with 3.2 (95% CI, 3.18-3.25) per 1000 person-years for MI alone in control patients and 4.1 (95% CI, 4.0-4.1) per 1000 person-years for

CVA alone in control patients. In adjusted analysis, patients with HS had a 23% increased risk of composite disease (hazard ratio [HR], 1.23; 95% CI, 1.17-1.30; $P < .001$) and a similar increase in the risk of MI alone (HR, 1.21; 95% CI, 1.12-1.32; $P < .001$) and CVA alone (HR, 1.22; 95% CI, 1.14-1.31; $P < .001$) compared with control patients. The relative difference in composite MI or CVA risk between patients with HS and controls was highest among younger patients HR in subgroup aged 18-29 years: 1.67; 95% CI, 1.37-2.03).

Conclusions and Relevance

Patients with HS appear to have an increased risk of MI and CVA. Early management of modifiable cardiovascular risk mediators may be warranted in patients with HS.

Introduction

Hidradenitis suppurativa (HS) is a chronic inflammatory skin disease of the pilosebaceous unit that affects axillary, inguinal, perineal, and inframammary regions.[1] Hidradenitis suppurativa has been linked to risk mediators of cardiovascular disease, including obesity,[2,3] smoking,[4] diabetes,[5] and the metabolic syndrome.[6,7] However, risk of cardiovascular events among patients with HS is not well established. The purpose of this investigation was to compare the incidence of myocardial infarction (MI) and cerebrovascular accident (CVA), the composite of which we have defined as major adverse cardiac event (MACE), in a population of patients with HS and control individuals in the United States. We also aimed to identify subgroups who may be at higher risk for MI and CVA and evaluate potential risk differences among patients treated with biologic agents.

Methods

Patient Population

This was a retrospective cohort analysis using a multihealth system data analytics and research platform (Explorys).[8] Clinical information from electronic medical records, laboratories, practice management systems, and claims systems is matched using the single set of Unified Medical Language System ontologies to create longitudinal records for unique patients. Data are standardized and curated according to common controlled vocabularies and classifications systems including *International Classification of Diseases, Ninth Revision* (*ICD-9*) or *International Statistical Classification of Diseases, Tenth Revision* (*ICD-10*), Systemized Nomenclature of Medicine–Clinical Terms, Logical Observation Identifiers Names and Codes, and RxNorm.[9,10,11,12,13] At present, the database encompasses 27 participating integrated health care organizations. Over 56 million unique lives, representing approximately 17% of the population across all 4 census regions of the United States, are captured. Patients with all types of insurance as well as those who are self-pay are represented. The study was conducted between January 1, 1999, and April 1, 2019. This study was approved with waiver of informed consent by the human subjects committee at the Feinstein Institutes for Medical Research at Northwell Health.

Statistical Analysis

This study was limited to patients aged 18 years or older having at least 1 year of active status in the database since 1999. We excluded patients with a history of MI or CVA at any time before the index date. To identify a population with low baseline risk for cardiovascular disease, we also excluded patients with a history of coronary heart disease or the coronary heart disease Adult Treatment Panel III equivalents of peripheral arterial disease, symptomatic carotid artery disease (including transient ischemic attack), and abdominal aortic aneurysm at any time before the index date. We additionally excluded patients who were missing data on age, sex, or race, or who were missing date information for the primary exposure, outcome, or covariates. Patients with HS were identified using at least 1 *ICD-9* (705.83) or *ICD-10*

(L73.2) diagnosis code. In an independent validation study, a positive predictive value of 79.3% and an accuracy of 90% were observed for diagnosis of HS using this algorithm in a separate electronic medical records database.[14] Patients with HS who received at least 2 prescriptions for the tumor necrosis factor α (TNF) inhibitors adalimumab or infliximab at any point were analyzed as the TNF inhibitor cohort, regardless of any changes to treatment regimen. Patients with HS who were never exposed to a TNF inhibitor composed the TNF inhibitor–naive cohort. For the TNF inhibitor–naive cohort, the index date was defined as the latest of the following: (1) date of first HS diagnosis and (2) the day following a 1-year baseline period in which the patient was free of exclusion conditions described above. For patients with HS who had TNF inhibitor exposure, the index date was defined as the latest of the following: (1) date of first biologic prescription after HS diagnosis and (2) the day following the 1-year baseline period. Index date for control patients was defined as the day following the 1-year baseline period. Follow-up for each of the 3 outcomes ended on the date of last database encounter or the date of the respective outcome diagnosis.

The primary outcome was incidence of MI or CVA. Myocardial infarction was identified using at least 1 *ICD-9* code (410.x) or *ICD-10* code (I21.x-I22.x), and CVA was identified using at least 1 *ICD-9* code (430.x, 431.x, 433.x1, 434 excluding 434.x0, 436) or *ICD-10* code (I60.x, I61.x, I63.x, I64.x). A systematic review of the validity of *ICD-9* and *ICD-10* codes for MI in administrative data found that positive predictive value in most studies was 93% or greater.[15] Positive predictive values for the individual codes used to identify CVA range from 70% to 93% in most validation studies.[16,17] Charlson comorbidity index scores were calculated as of the index date. The presence of baseline hypertension, hyperlipidemia, and type 2 diabetes were determined at index date if at least 2 *ICD-9* or *ICD-10* codes were present.[18] Baseline cardiovascular treatment up to 12 months before the index date was defined for the following drugs: antidiabetic drugs, lipid-lowering agents, thiazide diuretics, angiotensin-converting enzyme inhibitors or angiotensin II receptor blockers, calcium channel blockers, β-blockers, anticoagulants, and platelet inhibitors.

Baseline covariates were summarized using means, SDs, frequencies, and percentages. We calculated crude incidence of composite MI or CVA, MI alone, and CVA alone per 1000 person-years for patients with HS (overall and stratified by TNF inhibitor use), and control patients. Risk of composite disease, MI alone, and CVA alone was compared between these groups using adjusted hazard ratios (HRs) from separate Cox proportional hazards regression models, controlling for age, sex, race, smoking status (ever or never), body mass index (value closest to index date), hypertension, hyperlipidemia, type 2 diabetes, Charlson comorbidity index score, and baseline cardiovascular medication use. Given the small number of patients with HS who had TNF inhibitor exposure, comparisons involving this group of patients were considered exploratory; comparisons involving the overall HS cohort constituted the primary analysis. Interactions between each demographic covariate and HS status (yes or no) were tested individually by including an interaction term between HS status and the covariate of interest in separate Cox proportional hazards regression models. We assessed trends in the association between HS and composite disease over time by including an interaction term between HS status and index year (stratified into 2-year periods) in a separate Cox proportional hazards regression model.

Statistical significance, determined with 2-tailed, unpaired testing, was evaluated at the .05 α level. All analyses were performed using R, version 3.3.1 (R Foundation for Statistical Computing).

Results

We identified 49 862 patients with HS and 1 421 223 patients without HS meeting eligibility criteria (Table 1). Patients with HS had a mean (SD) age of 38.3 (13.3) years and 37 981 were women (76.2%). A total of 29 711 patients in the HS cohort were white (59.6%) and 16 325 were African American (32.7%). There were 837 patients (1.7%) with HS who had TNF inhibitor exposure. Compared with TNF inhibitor–

naive patients, those who received a TNF inhibitor had a higher mean age (39.3 [12.2] vs 38.2 [13.3] years); higher mean body mass index (34.6 [7.3] vs 33.9 [8.9], calculated as weight in kilograms divided by height in meters squared); greater prevalence of cardiovascular risk factors, such as hypertension (266 [31.8%] vs 13 237 [27.0%]); and higher mean Charlson comorbidity index score (0.9 [1.5] vs 0.6 [1.2]).

Among patients with HS, the crude incidence of composite MI or CVA was 6.6 (95% CI, 6.3-7.0) per 1000 person-years, compared with 6.8 (95% CI, 6.7-6.8) per 1000 person-years among control patients. In patients with HS vs control patients, crude incidence rates of MI alone were 2.9 (95% CI, 2.6-3.1) vs 3.2 (95% CI, 3.18-3.25) per 1000 person-years and, of CVA alone, were 4.1 (95% CI, 3.9-4.4) vs 4.1 (95% CI, 4.0-4.1) (Table 2). Adjusted hazard ratios for composite disease, MI alone, and CVA alone are presented in Table 2. Compared with controls, patients with HS had a 23% (HR, 1.23; 95% CI, 1.17-1.30) increase in risk of incident MI or CVA, a 21% (HR, 1.21; 95% CI, 1.12-1.32) increase in risk of incident MI alone, and a 22% (HR, 1.22; 95% CI, 1.14-1.31) increase in risk of incident CVA alone, after adjusting for relevant cardiovascular risk factors. Given the low number of TNF inhibitor–exposed patients with HS, no comparisons for MI or CVA relative to non-HS controls were performed. Risk of composite disease and individual outcomes did not differ significantly between TNF inhibitor–exposed patients with HS and TNF inhibitor–naive patients with HS (composite HR, 1.11; 95% CI, 0.71-1.75, $P = .65$; MI HR, 1.29; 95% CI, 0.69-2.40; $P = .43$; CVA HR, 0.82; 95% CI, 0.42-1.57; $P = .55$) (eTable in the Supplement).

Results of demographic subgroup analyses for the composite outcome are presented in Table 3. Age, sex, and race all significantly modified the association between HS and risk of MI or CVA (age, $P < .001$; sex, $P < .001$; and race, $P = .002$ for interaction). This finding signifies that the association between HS and composite disease differed depending on the demographic subgroup to which patients belonged. Among patients aged 18 to 29 years, those with HS had a 67% increased risk of MI or CVA compared with those without HS (HR, 1.67; 95% CI, 1.37-2.03). The strength of the association between HS and MI or CVA decreased with age. Among women, those with HS had a 33% increased risk of MI or CVA compared with controls without HS (HR, 1.33; 95% CI, 1.25-1.42).

Trends in the incidence of composite MI or CVA between patients with HS and control patients according to study index year are presented in Table 4. Patients with HS whose index year was within 2000-2001 had 1.71 (95% CI, 1.34-2.20) times the risk of composite disease compared with control patients with the same index years. The association between HS and composite MI or CVA weakened with increasing index year, with patients with HS having somewhat lower risk in more recent index years. Mean [SD] follow-up time was greatest for patients with index year in 2000-2001 (15.4 [3.9] years and 15.8 [3.0] years for patients with HS and control patients, respectively), and decreased for patients with later index years (0.5 [0.3] years for both patients with HS and control patients with index year in 2018-2019).

Discussion

In this analysis, we observed a 23% increase in the incidence of MI or CVA in patients with HS compared with those without HS. This risk is independent of the incremental risk already conferred by traditional cardiovascular covariates, such as tobacco smoking, obesity, hypertension, and type 2 diabetes. The increase in risk for incident MI alone and CVA alone was similar to that of composite disease.

The strength of association between HS and composite MI or CVA declined with increasing age groups. Risk in younger patients may be more directly associated with HS-related inflammation, as factors that mediate cardiovascular risk were less prevalent in younger age groups in both the HS and control groups. In contrast, composite risk in older individuals with HS may be more strongly associated with cardiovascular risk mediators that are also seen with HS, such as type 2 diabetes,[5] the prevalence for which increases with age. Patients with HS whose index year was 2000-2001—the group with the longest average follow-up time—had the largest increase in risk of composite disease compared with controls. We hypothesize that the association between HS and cardiovascular risk may take several years, or even

decades, to manifest, which may explain the large effect size in this subgroup. Although our analysis did not consider duration of HS disease, duration of inflammation in patients who develop HS at an earlier age may also influence the risk of MI and CVA.

There was no significant difference in risk of composite disease among patients with HS exposed to TNF inhibitors, although the observed risk was highest for this cohort. We speculate that patients with HS who were exposed to TNF inhibitors also had higher greater global comorbidity burden compared with those unexposed, which also may have influenced the risk.

To our knowledge, one other study has examined the risk of MI and CVA in an HS population.[19] In a Danish analysis, the incidence rate ratios for MI and ischemic CVA were 1.57 and 1.33, respectively, which are similar to adjusted risk estimates in our analysis. However, the Danish analysis did not adjust for body mass index or exclude patients with a history of transient ischemic attack, unstable angina, or Adult Treatment Panel III equivalents from their analysis. Moreover, the results of the Danish study may not be generalizable to the US population, where African American patients are disproportionately affected by HS,[20] and in whom baseline prevalence of cardiovascular disease may be greater.[21] The crude incidence of MI and CVA among controls in the present analysis is approximately 4 times higher than among controls in the Danish analysis.

As a chronic inflammatory disease associated with significant comorbidity,[22] HS may be a prime candidate for also understanding the link between cutaneous inflammation and consequential cardiovascular disease. Chronic local inflammation in the skin may promote distant vascular inflammation and thrombosis.[23,24,25] Elevated levels of circulating inflammatory markers, including TNF-α, C-reactive protein, and IL-6,[26,27,28] may contribute to endothelial dysfunction and promote oxidative stress and thus may predispose to atherosclerosis.[29,30] Other inflammatory diseases, including psoriasis,[31,32] rheumatoid arthritis,[33,34] inflammatory bowel disease,[35,36] and periodontal disease,[37,38] which share inflammation profiles, have also been independently associated with MI and CVA.

In psoriasis, the increase in risk of MACE is estimated to range from 8% to 71%,[31,33,39,40,41] and estimates may be higher for young patients with severe psoriasis.[39] In a comparative analysis, however, there was no significant difference in risk of MI or CVA between patients with HS and patients with severe psoriasis.[19]

Limitations and Strengths

This retrospective analysis has limitations that warrant consideration when interpreting the results. Our analysis is subject to the limitations inherent to research based on electronic health record data. We could not capture patients with HS who did not seek care in health systems included in the database. There is potential for misclassification of exposure, outcome, or covariates owing to erroneous documentation or misdiagnosis. To mitigate the influence of possible misclassification bias, we used validated case definitions to identify patients with HS and comorbidities. Cardiovascular-related death was not included in the definition of MACE, since this information is not made available in the database. Data on other potentially relevant covariates, such as socioeconomic status, that are not typically collected in the course of routine health care are also generally unavailable in electronic record or claims data. We could not reliably ascertain use of aspirin as a risk-mitigating strategy because this medication is available without prescription. Biologic treatment in HS represents a more recent therapeutic strategy, which likely formed the basis for a relatively low exposure count to biologics in the HS cohort. This analysis may have been underpowered to detect significant differences in the treatment cohort given the relatively low number of MACE events in the group receiving biologics.

Despite these limitations, this population-based analysis describes important data on the risk of MI and CVA among patients with HS. The quantity of lives included in the analysis permitted evaluation of an uncommon occurrence, as well as subgroup analyses that allowed identification of patients at highest risk. The analysis involved a comprehensive approach to assessment of potential confounders. We also attempted to evaluate the association between disease severity in HS and risk of MACE through TNF inhibitor exposure stratification. Because the population sample is drawn from various health care settings across US census regions, this study overcomes selection biases associated with tertiary single or multicenter investigations. Given the size and demographic heterogeneity of the HS cohort, we believe these results may be generalized to the US health care–seeking population.

Conclusions

Hidradenitis suppurativa appears to be associated with increased risk of MI and CVA independently of traditional cardiovascular risk factors. Periodic assessment of cardiovascular risk with early management of modifiable risk factors, including smoking, obesity, diabetes, dyslipidemia, and hypertension, may be warranted for patients with HS.

Notes

Supplement.

eTable. Incidence of Myocardial Infarction and Cerebrovascular Accident Among Patients With HS According to Biologic Use

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Figures and Tables

Table 1.

Demographic and Clinical Characteristics

Variable	Patients, No. (%)			
	All HS (n = 49 862)	HS Without Biologic (n = 49 025)	HS With Biologic (n = 837)	Control (n = 1 421 223)
Age, mean (SD), y	38.3 (13.3)	38.2 (13.3)	39.3 (12.2)	44.7 (15.8)
Sex				
Male	11 881 (23.8)	11 630 (23.7)	251 (30.0)	596 942 (42.0)
Female	37 981 (76.2)	37 395 (76.3)	586 (70.0)	824 281 (58.0)
Race				
White	29 711 (59.6)	29 207 (59.6)	504 (60.2)	1 120 703 (78.9)
African American	16 325 (32.7)	16 056 (32.8)	269 (32.1)	163 741 (11.5)
Other	3826 (7.7)	3762 (7.7)	64 (7.6)	136 779 (9.6)
BMI, mean (SD)	33.9 (8.9)	33.9 (8.9)	34.6 (7.3)	29.2 (7.3)
Comorbidity				
Smoking status	24 024 (48.2)	23 610 (48.2)	414 (49.5)	371 997 (26.2)
Hypertension	13 503 (27.1)	13 237 (27.0)	266 (31.8)	105 496 (7.4)
Hyperlipidemia	10 359 (20.8)	10 154 (20.7)	205 (24.5)	70 543 (5.0)
Type 2 diabetes	6227 (12.5)	6073 (12.4)	154 (18.4)	38 916 (2.7)
CCI score, mean (SD)[a]	0.6 (1.3)	0.6 (1.2)	0.9 (1.5)	0.1 (0.7)
Cardiovascular medication use				
Antidiabetic	5191 (10.4)	5039 (10.3)	152 (18.2)	34 667 (2.4)
Lipid lowering	4778 (9.6)	4654 (9.5)	124 (14.8)	53 558 (3.8)
Thiazide diuretic	4119 (8.3)	4040 (8.2)	79 (9.4)	33 755 (2.4)
ACE inhibitor or ARB	5809 (11.7)	5656 (11.5)	153 (18.3)	61 468 (4.3)
β-Blocker	4305 (8.6)	4200 (8.6)	105 (12.5)	52 114 (3.7)
Calcium channel blocker	2613 (5.2)	2559 (5.2)	54 (6.4)	28 135 (2.0)
Anticoagulant	550 (1.1)	534 (1.1)	16 (1.9)	10 828 (0.8)
Antiplatelet	2480 (5.0)	2434 (5.0)	46 (5.5)	45 183 (3.2)

Abbreviations: ACE, angiotensin-converting enzyme; ARB, angiotensin II receptor blocker; BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); CCI, Charlson Comorbidity Index; HS, hidradenitis suppurativa.

[a]Excluding the CCI components diabetes, myocardial infarction, cerebrovascular disease, and peripheral arterial disease component of peripheral vascular disease.

Table 2.

Incidence of MI and CVA Among Patients With HS and Control Patients

Variable	All HS (n = 49 862)	Control (n = 1 421 223)
Composite MI or CVA		
Total person-years of follow-up	210 798.6	11 588 783.2
No. of events	1393	78 386
Crude incidence rate per 1000 person-years (95% CI)	6.6 (6.3-7.0)	6.8 (6.7-6.8)
Crude HR (95% CI)	1.24 (1.18-1.31)	1 [Reference]
P value (crude HR)	<.001	NA
Adjusted HR (95% CI)[a]	1.23 (1.17-1.30)	1 [Reference]
P value (adjusted HR)	.001	NA
MI Alone		
Total person-years of follow-up	213 427.1	11 738 744.7
No. of events	612	37 756
Crude incidence rate per 1000 person-years (95% CI)	2.9 (2.6-3.1)	3.2 (3.18-3.25)
Crude HR (95% CI)	1.17 (1.08-1.26)	1 [Reference]
P value (crude HR)	<.001	NA
Adjusted HR (95% CI)[a]	1.21 (1.12-1.32)	1 [Reference]
P value (adjusted HR)	<.001	NA
CVA Alone		
Total person-years of follow-up	212 400.5	11 694 847.1
No. of events	878	47 481
Crude incidence rate per 1000 person-years (95% CI)	4.1 (3.9-4.4)	4.1 (4.0-4.1)
Crude HR (95% CI)	1.29 (1.20-1.38)	1 [Reference]
P value (crude HR)	<.001	NA
Adjusted HR (95% CI)[a]	1.22 (1.14-1.31)	1 [Reference]
P value (adjusted HR)	<.001	NA

Abbreviations: CVA, cerebrovascular accident; HR, hazard ratio; HS, hidradenitis suppurativa; MI, myocardial infarction; NA, not applicable.

[a]Cox proportional hazards regression models were adjusted for age, sex, race, hypertension, hyperlipidemia, diabetes, smoking status, body mass index, Charlson Comorbidity Index, and baseline medication use.

Table 3.

Incidence of Composite MI or CVA Among Subgroups of Patients With HS and Control Patients

Subgroup	All HS (n = 49 862)			Control (n = 1 421 223)			Group-Specific (HS vs Control)	
	No. of Events	Subgroup, No.	Incidence Rate per 1000 Person-Years (95% CI)	No. of Events	Subgroup, No.	Incidence Rate per 1000 Person-Years (95% CI)	Crude HR	Adjusted HR[a]
Age, y								
18-29	104	15 322	1.7 (1.3-2.0)	2320	303 392	1.0 (1.0-1.1)	2.12 (1.74-2.58)	1.67 (1.37-2.03)
30-39	248	13 639	4.3 (3.8-4.9)	5626	268 316	2.5 (2.5-2.6)	2.28 (2.01-2.59)	1.53 (1.34-1.74)
40-49	433	10 284	9.2 (8.3-10.1)	13 279	287 153	5.1 (5.0-5.2)	2.35 (2.14-2.59)	1.46 (1.32-1.60)
50-59	354	6947	11.7 (10.5-13.0)	20 967	275 988	8.8 (8.7-8.9)	1.79 (1.61-1.99)	1.05 (0.95-1.17)
60-69	180	2852	15.6 (13.4-18.1)	23 485	196 814	14.6 (14.5-14.8)	1.47 (1.27-1.70)	0.84 (0.73-0.97)
70-79	63	716	23.2 (17.8-29.7)	11 705	80 379	22.7 (22.3-23.1)	1.26 (0.98-1.62)	0.77 (0.60-0.99)
≥80	11	102	41.4 (20.7-74.0)	1004	9181	38.7 (36.3-41.1)	1.09 (0.60-1.97)	0.76 (0.42-1.38)
Sex								
Male	394	11 881	8.3 (7.5-9.2)	41 110	596 942	8.8 (8.7-8.9)	1.21 (1.09-1.33)	1.03 (0.94-1.15)
Female	999	37 981	6.1 (5.7-6.5)	37 276	824 281	5.4 (5.3-5.4)	1.46	1.33

Abbreviations: CVA, cerebrovascular accident; HR, hazard ratio; HS, hidradenitis suppurativa; MI, myocardial infarction.

[a]Hazard ratios compare patients with HS with control patients (referent). Hazard ratios were based on Cox proportional hazards regression models, controlling for age, sex, race, hypertension, hyperlipidemia, diabetes, smoking status, body mass index, Charlson Comorbidity Index, and baseline medication use, and including interaction terms for HS status and the relevant demographic variable. Interaction terms for HS*sex, HS*age, and HS*race were assessed individually in separate regression models.

Table 4.

Incidence of Composite MI or CVA According to Index Year

Index Year	All HS (n = 49 862)			Control (n = 1 421 223)			Group-Specific (HS vs Control)	
	No. of Events	Average Follow-up, y	Incidence Rate per 1000 Person-Years (95% CI)	No. of Events	Average Follow-up, y	Incidence Rate per 1000 Person-Years (95% CI)	Crude HR	Adjusted HR[a]
2000-2001	62	15.4	9.4 (7.2-12.1)	18 375	15.7	6.0 (5.9-6.1)	1.57 (1.22-2.02)	1.71 (1.34-2.20)
2002-2003	42	13.8	4.8 (3.4-6.4)	10 878	13.5	6.1 (6.0-6.2)	0.75 (0.55-1.01)	0.84 (0.62-1.14)
2004-2005	132	11.7	7.6 (6.4-9.0)	10 294	11.5	6.5 (6.4-6.7)	1.12 (0.94-1.33)	1.33 (1.12-1.58)
2006-2007	171	9.8	8.0 (6.8-9.2)	10 724	9.6	7.0 (6.9-7.1)	1.10 (0.95-1.28)	1.26 (1.08-1.46)
2008-2009	149	7.8	5.8 (4.9-6.8)	8812	7.5	7.1 (6.9-7.2)	0.79 (0.67-0.93)	0.97 (0.82-1.14)
2010-2011	239	6.2	6.6 (5.8-7.5)	8995	5.8	7.9 (7.7-8.1)	0.82 (0.72-0.93)	1.00 (0.88-1.13)
2012-2013	298	4.5	6.8 (6.0-7.6)	6249	3.9	8.1 (7.9-8.3)	0.82 (0.73-0.92)	0.96 (0.86-1.08)
2014-2015	201	2.7	5.8 (5.1-6.7)	2898	2.3	8.4 (8.1-8.7)	0.67 (0.58-0.77)	0.80 (0.69-0.92)
2016-2017	86	1.5	6.0 (4.8-7.4)	1049	1.2	10.5 (9.9-11.2)	0.56 (0.45-0.69)	0.67 (0.54-0.84)
2018-	13	0.5	6.9 (3.7-11.7)	112	0.5	16.3 (13.4-19.6)	0.42	0.51

Abbreviations: CVA, cerebrovascular accident; HR, hazard ratio; HS, hidradenitis suppurativa; MI, myocardial infarction.

[a]Cox proportional hazards regression models were adjusted for age, sex, race, hypertension, hyperlipidemia, diabetes, smoking status, body mass index, Charlson Comorbidity Index, and baseline medication use.