Risk factors and diagnostic markers of bacteremia in Stevens-Johnson syndrome and toxic epidermal necrolysis: A cohort study of 176 patients

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Background: Sepsis is the main cause of death in Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN).

Objectives: Our aim was to identify admission risk factors predictive of bacteremia and the accompanying clinical or biochemical markers associated with positive blood cultures.

Methods: A retrospective cohort study over a 14-year period (2003-2016) was performed.

Results: The study included 176 patients with SJS (n = 59), SJS-TEN overlap (n = 51), and TEN (n = 66). During hospitalization, bacteremia developed in 52 patients (29.5%), who experienced poorer outcomes, including higher intensive care unit admission ($P < .0005$), longer length of stay ($P < .0005$), and higher mortality ($P < .0005$). There were 112 episodes of bacteremia, and isolates included *Acinetobacter baumannii* (27.7%, n = 31) and *Staphylococcus aureus* (21.4%, n = 24). On multivariate analysis, clinical factors present at admission that were predictive of bacteremia included hemoglobin ≤10 g/dL (odds ratio [OR] 2.4, confidence interval [CI] 2.2-2.6), existing cardiovascular disease (OR 2.10, CI 2.0-2.3), and body surface area involvement ≥10% (OR 14.3, CI 13.4-15.2). The Bacteremia Risk Score was constructed with good calibration. Hypothermia ($P = .03$) and procalcitonin ≥1 μg/L ($P = .02$) concurrent with blood culture sampling were predictive of blood culture positivity.

Limitations: This is a retrospective study performed in a reference center.

Conclusion: Hemoglobin ≤10 g/dL, cardiovascular disease, and body surface area involvement ≥10% on admission were risk factors for bacteremia. Hypothermia and elevated procalcitonin are useful markers for the timely detection of bacteremia. (J Am Acad Dermatol 2019;81:686-93.)

Key words: adverse drug reactions; bacteremia; diagnostic markers; microbiology; risk factors; sepsis; Stevens-Johnson syndrome; toxic epidermal necrolysis.

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Dr Koh and Dr Chai contributed equally to this study.
Funding sources: None.
Conflicts of interest: None disclosed.
Accepted for publication May 29, 2019.

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Published online June 10, 2019.
0190-9622/$36.00

https://doi.org/10.1016/j.jaad.2019.05.096

Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN) are severe cutaneous adverse reactions characterized by epidermal detachment and mucositis.[1] SJS-TEN is a disease continuum differentiated on the basis of the percentage of body surface area (BSA) detached: >30% in TEN, 10%-30% in SJS-TEN overlap, and <10% in SJS.[2] Drug exposures are the leading triggers of SJS-TEN. The incidence of TEN has been estimated to be 1-2 cases/1 million person-years.[3-5]

Mortality ranges from 10% for SJS and up to 50% for TEN.[6] Supportive care in a reference center and the early withdrawal of the culprit drug remains the gold standard of care.[7]

The most common cause of death in SJS-TEN is sepsis, which accounts for 50% of deaths.[8,9] Bacteremia increases the risk of dying by 3-fold, and the risk factors for bacteremia include age >40 years, white blood cell count >10,000 cells/mm^3, and BSA ≥30% on admission.[10] The routine use of prophylactic antibiotics is not recommended.[7,11] However, empiric antibiotic use should be started early if sepsis is suspected.[7,12] Despite such recommendations, various challenges exist. Standard markers of sepsis, such as fever, leukocytosis, and elevated C-reactive protein (CRP), are not specific for infection in SJS-TEN. Likewise, a time-lag exists between the sampling of blood cultures and confirmatory results. Two studies from the reference center in France showed that *Staphylococcus aureus* and *Pseudomonas aeruginosa* were the 2 most common bacteria species, but whether similar species would be identified in other centers or settings, particularly in burn units or intensive care units (ICUs),[9,10] and if the microbial species changes across the period of hospitalization remains unclear. Such challenges result in delayed diagnosis of sepsis and initiation of antibiotics or the inappropriate overuse of antibiotics with the accompanying problems of multidrug-resistant organisms.

Therefore, in our study, we aimed to validate potential risk factors for bacteremia that were present in patients upon admission, identify clinical and laboratory findings that might enable rapid prediction of positive blood cultures, and highlight the trends in bacteremia in SJS-TEN patients managed in a reference center.

CAPSULE SUMMARY

- Sepsis is associated with high mortality in Stevens-Johnson syndrome and toxic epidermal necrolysis.
- The Bacteremia Risk Score, which assesses the presence of hemoglobin ≤10 g/dL, cardiovascular disease, and ≥10% body surface area involvement on admission, is useful in predicting the development of bacteremia. Hypothermia and procalcitonin ≥1 μg/L help in the timely detection of bacteremia during hospitalization.

METHODS

Patients and data collection

This cohort study was conducted over a 14-year period (2003-2016) at Singapore General Hospital, the national referral center for SJS-TEN. We adopted a hybrid model of care for SJS-TEN in which patients are nursed in the burns unit (if BSA involved is >10%) or in the general ward (if BSA involved is <10%) with dermatologists being the primary provider. Intensive care facilities are available in burn units. Diagnosis and classification of epidermal necrolysis was based on established criteria[2] with supportive histologic evidence. On admission, supportive care is instituted, consisting of specialized nursing, fluid and electrolyte resuscitation, nutritional supplementation, and medical involvement of other specialties as needed. In terms of skin care, we prescribed irrigation with normal saline and utilized tulle gras as primary dressing and Gamgee as secondary dressing to absorb exudates. These were held in place with a vest, with alternate day wound reviews. No prophylactic antibiotics, operative debridement, skin grafting, or use of skin substitutes were done. Immunomodulatory treatment prescribed during the study period included cyclosporine[13] and intravenous immunoglobulin.[14]

To determine risk factors associated with bacteremia, data on patient demographics, clinical features, laboratory investigations, and SCORTEN (SCORe for TEN) collected within the first 24 hours of hospitalization were recorded and analyzed.[15]

To determine the clinical and biochemical markers associated with positive blood cultures, temperature and laboratory results taken within 24 hours of blood culture collection were recorded and analyzed.

Microbiologic samples and definitions

Blood cultures consisted of standard aerobic and anaerobic paired samples (two 10-mL blood vials) taken at admission, when there was clinical suspicion of bacteremia or every 48 hours until re-epithelialization.

A patient was defined as having bacteremia when a recognized pathogen was identified in at least 1 blood culture or when the same normal-appearing

Abbreviations used:

BRS:	Bacteremia Risk Score
BSA:	body surface area
CI:	confidence interval
CRP:	C-reactive protein
ICU:	intensive care unit
OR:	odds ratio
SCORTEN:	severity-of-illness score for TEN
SJS:	Stevens-Johnson syndrome
TEN:	toxic epidermal necrolysis

skin commensal (mainly coagulase-negative staphylococci) was isolated from >1 blood culture within a 48-hour period. Polymicrobial bacteremia was defined as the recovery of ≥2 pathogens from the same blood culture. Isolation of different species from different samples or isolates of the same species from samples with an intervening negative sample (indicating resolution of the initial bacteremia, followed by a recurrence) were considered separate bacteremia episodes.

Data presentation and statistical analysis

Data were presented as medians for continuous data and percentages for categorical data. For univariate analyses, categorical data were analyzed by using χ^2 analysis or Fisher's exact test and continuous data was analyzed by using the Mann-Whitney *U* test. Cutoff values were defined according to either a clinically significant threshold (eg, hemoglobin ≤10 g/dL) or an established threshold used in the literature (eg, BSA ≥10%[15]). Variables with $P < .10$ in univariate analyses, which were clinically relevant, were selected for entry into a multivariate logistic regression model. A penalized regression method with stepdown variable selection at $P < .01$ was used to alleviate model overfitting, which enabled the development of a more accurate risk prediction model.[16] This method is also recommended in the TRIPOD checklist for developing and validating prediction models.[17] SCORTEN[15] was not entered into the multivariate model because it is a composite score encompassing other variables.

Internal validation was performed by using the bootstrap technique with 200 resamples. The bootstrap-corrected C-statistic and bias-corrected calibration curve were generated to assess discrimination and calibration, respectively. The mean absolute error was also reported to measure the predictive accuracy of the model. A C-statistic 0.7-0.9 indicates fair-to-good discrimination, and a calibration curve close to the ideal y = x line indicates good calibration.

Table I. Baseline characteristics of SJS-TEN patients

Parameters	Value, N = 176
Age, y, median (IQR)	57 (44-71)
Sex	
Female	104 (59.1)
Male	72 (40.9)
Ethnicity	
Chinese	121 (68.8)
Malay	41 (23.3)
Others	14 (8.0)
Disease classification	
SJS	59 (33.5)
SJS-TEN overlap	51 (29.0)
TEN	66 (37.5)
SCORTEN, median (IQR)	2 (1-3)
Medical history	
Hypertension	84 (47.7)
Hyperlipidemia	43 (24.4)
Diabetes	43 (24.4)
Cardiovascular disease	39 (22.2)
Liver disease	8 (4.5)
Renal disease	27 (15.3)
Malignancy	34 (19.3)
Autoimmune disease	19 (10.8)
AIDS	6 (3.4)

Values are n (%), unless stated otherwise.
IQR, Interquartile range; *SCORTEN*, SCORe for TEN; *SJS*, Stevens-Johnson syndrome; *TEN*, toxic epidermal necrolysis.

Subsequently, scores were constructed by converting the regression coefficients of independently significant variables in the multivariate model into integers. A total score, named Bacteremia Risk Score (BRS), was then calculated by summing up the assigned scores for each predictive factor.

We considered $P < .05$ statistically significant. Statistical analysis was performed with IBM SPSS version 25 (Armonk, NY) and R version 3.4 (R Foundation for Statistical Computing, Vienna, Austria). This study was approved by the Singhealth Institutional Review Board (CIRB Ref 2014/2011).

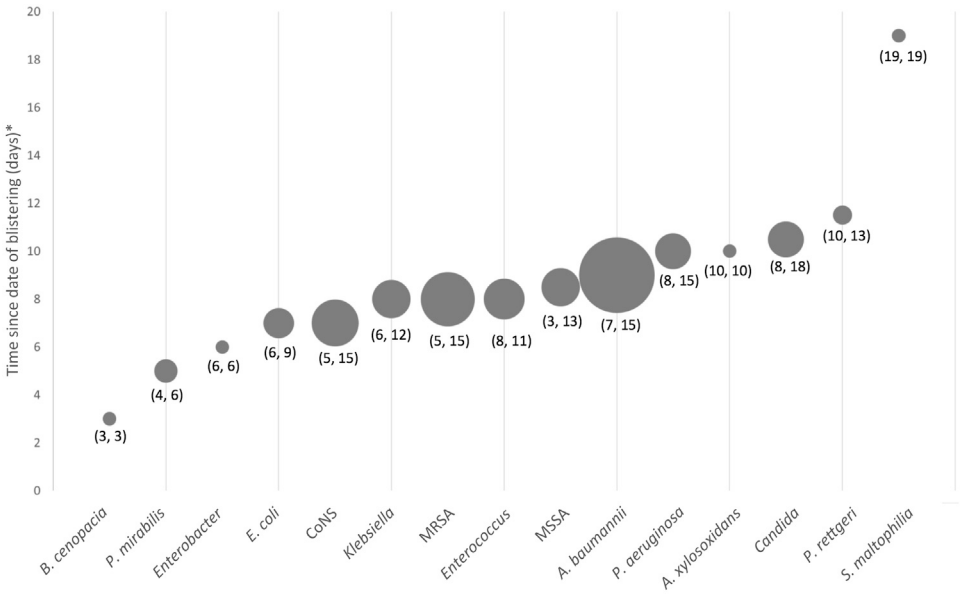
RESULTS

Patient characteristics

The study included 176 patients, comprising 59 cases of SJS (33.5%), 51 cases of SJS-TEN overlap (29.0%), and 66 cases of TEN (37.5%). The median age was 57 (interquartile range 44-71) years. Baseline characteristics of patients are summarized in Table I.

Epidemiology of bacteremia

Bacteremia developed in 52 (29.5%) patients during their hospitalization; 86 cases of bacteremia



* Date of blistering is counted as Day 0.
§ Size of circle represents the count of organisms
◊ Enclosed within brackets are the 25th and 75th percentile of time since date of blistering (days) for each organism

Fig 1. Median time of onset of bacteremia caused by each microorganism. Size of circles represents the number of organisms. Enclosed within brackets are the 25th and 75th percentiles of time since date of blistering (in days) for each organism. *CoNS*, Coagulase-negative staphylococci; *MRSA*, methicillin-resistant *Staphylococcus aureus*; *MSSA*, methicillin-sensitive *S. aureus*.

were recorded in these 52 patients over 3181 patient-days (27.0/1000 patient-days). Twenty of 176 (11.4%) patients had polymicrobial infections, with 14 patients (8.0%) experiencing 1 polymicrobial episode each and 3 patients (1.7%) experiencing 2 polymicrobial episodes each. In total, 112 microorganisms were identified, mainly *A. baumannii* (27.7%, n = 31), *S. aureus* (21.4%, n = 24), other gram-positive pathogens (18.8%, n = 21), and *Enterobacteriaceae* (15.2%, n = 17) (Fig 1).

The median time that elapsed between detachment to bacteremia was 9 (interquartile range 6-14) days.

Patient outcomes

The overall in-hospital mortality rate was 23.9%. Patients with bacteremia were more likely to require ICU admission (odds ratio [OR] 6.8, 95% confidence interval [CI] 3.1-15.0), invasive mechanical ventilation (OR 6.6, 95% CI 2.3-18.4), and dialysis (OR 18.3, 95% CI 3.9-85.3) and had longer hospital lengths of stay ($P < .0005$) and higher mortality (OR 4.4, 95% CI 2.1-9.1).

After adjusting for SCORTEN, which has been shown to be a significant risk factor for bacteremia (Table II), patients who received cyclosporine (n = 34) ($P = .797$) and intravenous immunoglobulin (n = 78) ($P = .064$) were not found to be significantly associated with bacteremia.

Admission risk factors associated with bacteremia

Univariate analysis of the clinical factors recorded within the first 24 hours of admission indicated that BSA ≥10%, hemoglobin ≤10 g/dL, and existing cardiovascular disease and hypertension were significantly associated with bacteremia ($P < .1$) (Table II). After multivariate analysis, the final model obtained contained 3 significant risk factors: hemoglobin ≤10 g/dL (OR 2.4, 95% CI 2.2-2.6), existing cardiovascular disease (OR 2.1, 95% CI 2.0-2.3), and BSA ≥10% (OR 14.3, 95% CI 13.4-15.2) (Table III). The model developed with these 3 covariates has good discrimination (bootstrap-corrected C-statistic 0.76) and a good performance on the basis of the calibration plot. The mean absolute error was low (0.029), indicating the model was a good fit for the data.

The BRS was calculated on the basis of the score assigned to each factor (Table III). A plot of patients' predicted probability versus their total risk score was examined (not shown herein), and the following 4

Table II. Patient and clinical characteristics on admission by bacteremia group

Factor	Bacteremia		*P* value
	No, n = 124	Yes, n = 52	
Demographics			
Age ≥40 y	98 (79.0)	43 (82.7)	.579
Sex			
Female	75 (60.5)	29 (55.8)	.562
Male	49 (39.5)	23 (44.2)	
Ethnicity			
Chinese	82 (66.1)	39 (75.0)	.458
Malay	32 (25.8)	9 (17.3)	
Other	10 (8.1)	4 (7.7)	
Parameters			
BSA ≥10%	67 (54.0)	50 (96.2)	.001*
SCORTEN, median (IQR)	2 (1-3)	3 (2-4)	<.0005*
Laboratory findings†			
Urea ≥10 mmol/L	28 (23.1)	18 (34.6)	.117
HCO_3 ≤20 mmol/L	28 (23.5)	18 (34.6)	.133
Glucose ≥14 mmol/L	8 (7.5)	4 (8.7)	.755
Sodium <125 or >145 mmol/L	9 (7.4)	5 (9.6)	.761
Potassium <3 or >5 mmol/L	13 (10.7)	9 (17.3)	.227
Creatinine ≥75 mmol/L	67 (54.5)	30 (57.7)	.695
Bilirubin ≥68.4 μmol/L	3 (2.6)	0 (0)	.557
Hemoglobin ≤10 g/dL	23 (18.9)	21 (41.2)	.002*
Total WBC ≥11 × 10^9/L	31 (25.4)	12 (24.0)	.846
Platelets ≤150 × 10^9/L	25 (20.5)	14 (27.5)	.318
Absolute eosinophil count, ≥0.8 × 10^9/L	3 (4.8)	2 (5.7)	1.000
Atypical lymphocytes present	13 (10.5)	5 (9.6)	.862
Medical history			
Chronic steroid therapy	22 (17.7)	6 (11.5)	.305
Malignancy	24 (19.4)	10 (19.2)	.985
AIDS	5 (4.0)	1 (1.9)	.672
Liver disease	6 (4.8)	2 (3.8)	1.000
Renal disease	16 (12.9)	11 (21.2)	.166
Cardiovascular disease	21 (16.9)	18 (34.6)	.010*
Hypertension	52 (41.9)	32 (61.5)	.018*
Hyperlipidemia	27 (21.8)	16 (30.8)	.205
Diabetes	27 (21.8)	16 (30.8)	.205
Autoimmune disease	12 (9.7)	7 (13.5)	.460
Drug allergy	27 (21.8)	11 (21.2)	.927
SJS-TEN	3 (2.4)	0 (0)	.556

Values are n (%), unless stated otherwise.

BSA, Body surface area; *CRP*, C-reactive protein; *HCO_3*, bicarbonate; *IQR*, interquartile range; *SCORTEN*, SCORe for TEN; *SJS*, Stevens-Johnson syndrome; *TEN*, toxic epidermal necrolysis; *WBC*, white blood cell.

*P value < .1; variable is significant for predicting development of bacteremia during the hospital stay.

†Laboratory findings for each patient were recorded within first 24 hours of each hospital admission.

risk categories for in-hospital bacteremia occurrence were created: low (BRS 0-1), moderate (BRS 2, 4), high (BRS 5), and very high (BRS 6). The mean predicted probability of bacteremia was 3.1% for the low-risk category, 31.4% for the moderate-risk category, 52.4% for the high-risk category, and 71.6% for the very high−risk category. A cutoff score of BRS ≥2 is strongly predictive (negative predictive value 98.2% [95% CI 92.1%-99.8%] and positive predictive value 43.1% [95% CI 34.4%-52.2%]).

Predictive markers for positive blood cultures

Univariate analysis of temperature and laboratory variables obtained within 24 hours of blood culture collection indicated that hypothermia (temperature ≤36.0°C), CRP, and procalcitonin were significantly associated with bacteremia (P < .1) (Table IV). Hypothermia, CRP ≥100 mg/L, and procalcitonin ≥1 μg/L were selected for entry into multivariate analysis, which showed that concurrent hypothermia (OR 2.4, 95% CI 1.1-5.3; P = .03) and

Table III. Multivariate analysis of hospital admission factors for predictors of bacteremia during hospital stay and corresponding score assigned for each significant factor in the BRS

Factor	OR (95% CI)	*P* value	Beta coefficient	Score
Hemoglobin ≤10 g/dL	2.4 (2.2-2.6)	<.0001	0.88	1
Cardiovascular disease	2.1 (2.0-2.3)	<.0001	0.74	1
BSA ≥10%	14.3 (13.4-15.2)	<.0001	2.66	4

Low risk (BRS 0-1): 3.1% predicted probability of bacteremia. Moderate risk (BRS 2, 4): 31.4% predicted probability of bacteremia. High risk (BRS 5): 52.4% predicted probability of bacteremia. Very high risk (BRS 6): 71.6% predicted probability of bacteremia.

BRS, Bacteremia Risk Score; *BSA*, body surface area; *CI*, confidence interval; *OR*, odds ratio.

procalcitonin ≥1 μg/L (OR 2.4, 95% CI 1.1-4.8; $P = .02$) to be predictive of blood culture positivity.

DISCUSSION

Our study showed that bacteremia affects up to 30% of SJS-TEN patients and is associated with poorer outcomes of mortality, ICU admission, the need for dialysis, and longer lengths of stay. Recommendations for sepsis management include early transfer to a reference center, reverse barrier nursing, avoidance of prophylactic antibiotics, regular sampling for culturing, and early institution of empiric antibiotics. Nonetheless, several challenges remain, including identification of high-risk patients, timely detection of bacteremia, and appropriate choice of empiric antibiotics on the basis of local trends in microbial agents. Our study has tried to answer some of these existing gaps.

Identification of high-risk patients on admission

Among various clinical and laboratory markers evaluated, BSA ≥10%, hemoglobin ≤10 g/dL, and existing cardiovascular disease were found to be significant predictors of bacteremia. This finding complements prior results from the French reference center showing BSA to be a possible risk factor.[10] Cardiovascular disease and anemia were unique risk factors identified in our cohort. Wang et al previously showed that coronary artery disease increases the risk of sepsis in a longitudinal cohort of community adults.[18] Likewise, the odds of hospital-acquired bacteremia is increased by the presence of anemia.[19] Utilizing these 3 risk factors, we were able to construct a validated and discriminatory risk score—the BRS. SJS-TEN patients can be risk stratified into 1 of 4 groups, with corresponding risk of bacteremia ranging 3%-72%. The utility of risk stratification is manifold; risk stratification aids in the determination of appropriate monitoring and blood culture sampling, identification of patients who might need early treatment, and prognostication.

We found higher SCORTEN to be significantly associated with increased risk of bacteremia ($P < .0005$). SCORTEN, a severity-of-illness score, has been widely used to predict mortality in SJS-TEN. Sepsis is the main cause of mortality in SJS-TEN, accounting for ~50% of deaths. The close-knit relationship between sepsis and mortality in SJS-TEN explains our findings. Our results also affirm the value of SCORTEN in offering important prognostic information. However, BRS remains superior to SCORTEN in predicting bacteremia (nonbootstrap-corrected C-statistic BRS 0.781 vs SCORTEN 0.698; Hosmer–Lemeshow test BRS $P = .990$ vs SCORTEN $P = .816$). These findings highlight the strength and importance of BRS in identifying patients at risk of bacteremia.

Timely detection of bacteremia

The routine use of prophylactic antibiotics is not recommended because this practice has not been shown to be beneficial and is also associated with longer lengths of hospital stay.[20,21] In many centers,[12] including ours, frequent blood culture sampling is performed to pick up bacteremia early, notwithstanding a lag-time of at least 48 hours before confirmatory results are available. Predictive clinical and laboratory markers for sepsis are needed to balance early empiric antibiotic treatment versus prophylactic or inappropriate antibiotic use and the risk of emergence of multidrug-resistant organisms. The utility of standard indicators, such as leukocytosis and elevated CRP and procalcitonin, remains unclear in this group of patients. In a small case series of 8 patients with severe adverse reactions without infections, procalcitonin was found to be mildly elevated in an SJS patient (0.53 μg/L) and a DRESS (drug reaction with eosinophilia and systemic symptoms) patient (3.96 μg/L).[22] In a recent series of 42 SJS-TEN patients, those with systemic infections had higher levels of procalcitonin than those with cutaneous infections and no infections.[23] Utilizing a procalcitonin cutoff of 0.65 ng/mL, estimated sensitivity was 85% and specificity 90%. In this study, CRP was not useful.

In our current study, we evaluated several clinical and laboratory markers at the point of blood culture sampling and correlated them to eventual blood culture positivity. On multivariate

Table IV. Univariate analysis of temperature and laboratory variables obtained within 24 hours of blood culture collection

Factor	Bacteremia		*P* value
	No	Yes	
Fever ≥38.3°C	87 (29.6)	15 (21.4)	.172
Hypothermia <36°C	83 (28.5)	31 (44.3)	.011
WBC count, 10^3 μL, median (IQR)	7.9 (5.4-12.3)	9.3 (5.6-13.5)	.218
CRP, mg/L, median (IQR)	89.9 (35.1-165.0)	122.5 (66.2-202.0)	.006
Procalcitonin, μg/L, median (IQR)	0.7 (0.2-2.6)	1.3 (0.5-3.6)	.052

Values are n (%), unless stated otherwise.
CRP, C-reactive protein; *IQR*, interquartile range; *WBC*, white blood cell.

analysis, only 2 factors (hypothermia and procalcitonin ≥1 μg/L) were significantly associated with blood culture positivity. Although fever is generally used to support diagnosis of bacteremia and sepsis,[24,25] this factor is not predictive in SJS-TEN patients. Anecdotal evidence has suggested that hypothermia might be useful as a marker of infection,[20] and our study validated this observation. The presence of both hypothermia and procalcitonin ≥1 μg/L has a specificity of 86.2% and sensitivity of 25.0% in predicting bacteremia. The procalcitonin threshold that we utilized in this study is similar to that used in another study on the prediction of bacteremia.[26]

Epidemiology of bacteremia

Prior studies have identified *S. aureus*, *P. aeruginosa*, and *Enterobacteriaceae* as the most common causes of bacteremia in SJS-TEN patients.[9,10,21,27] Although *S. aureus*, *Enterobacteriaceae*, and *Pseudomonas* sp. were common in our cohort, accounting for 21%, 15%, and 6% of cases, respectively, the most common isolate was *A. baumannii*, which accounted for 28% of cases. Such variation might result from the patients being managed in a burns unit with ICU facilities or from the local tropical environment. A 5-year review among 352 burns patients showed the most common isolated organisms were *A. baumannii*, *P. aeruginosa*, and methicillin-resistant *S. aureus*, which is similar to our findings.[28] *A. baumannii* is an emerging nosocomial pathogen, particularly in burns units and ICUs.[28-30] In countries with temperate climates, *A. baumannii* also shows seasonal variability, being more commonly isolated during the warmer, summer months, potentially explaining in part the higher prevalence in warmer climates. Risk factors for developing multidrug-resistant *A. baumannii* include invasive procedures (such as central venous catherization), ICU admission, mechanical ventilation, and use of broad-spectrum antibiotics.[29,30]

The median time to bacteremia was 9 days from the onset of disease, supporting the fact that the risk of bacteremia was highest during the active phase of the disease. We have also demonstrated a temporal pattern to the emergence of pathogens. In general, the earliest pathogens were more likely gram-negative bacteria and *Enterobacteriaceae*, followed by gram-positive bacteria and nosocomial infections, such as *Acinetobacter*, *Candida*, and *Stenotrophomonas*. The exception was *Pseudomonas*, which tended to appear later than the other species of gram-negative organisms. Such information might help practitioners predict possible pathogens and tailor empiric antimicrobial treatments accordingly.

Limitations

Our study had some limitations. This study was retrospective and included the flaws inherent in that design choice. As the national reference center for SJS-TEN, our data are prone to referral bias. In the setting of a burns unit and burns ICU, the microbial data might be skewed toward nosocomial organisms. Our bacteremia risk scoring system, though internally validated, would need to be prospectively evaluated. These limitations might have affected the generalizability of results to other centers and populations. Nonetheless, there were certain strengths. Our cohort is one of the largest series of SJS-TEN patients used for evaluating the risk of bacteremia. Cases were managed in the same center, under the same protocol, thereby obviating the bias attributed to center effect. This study yielded data obtained from patients nursed predominantly in a burns unit, thus, this study might have practical utility for other patients managed in a similar care setting.

Conclusions

Although there has been considerable interest and emphasis on the use of immunomodulatory agents in the treatment of SJS-TEN, a gap remains regarding

the optimization of supportive care, wound care, and sepsis management for this disease.[31] Our study has yielded additional perspectives, including a strategy for identifying high-risk patients, the timely prediction of bacteremia via markers (such as hypothermia and elevated procalcitonin), as well as highlighting the temporal trends and epidemiology of bacteremia in SJS-TEN patients. Taken together, such information would enable the early detection and management of sepsis, which remains the major cause of mortality.

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