ORIGINAL ARTICLES

Erysipelas and Cellulitis: A Retrospective Study of 122 Cases

J. Concheiro, M. Loureiro, D. González-Vilas, J. García-Gavín, D. Sánchez-Aguilar, and J. Toribio

Departamento de Dermatología, Facultad de Medicina, Complejo Hospitalario Universitario, Santiago de Compostela, A Coruña, Spain

Abstract. *Background.* Erysipelas and cellulitis are relatively common cutaneous infections that can sometimes be the cause of a prolonged hospital admission. The objective of this study was to determine the most relevant epidemiologic factors and their influence on the length of hospital stay, comparing our results with those of previous studies.

Material and methods. We performed a retrospective, observational, cross-sectional study of 122 patients admitted over a 5-year period to the dermatology department of our hospital with a diagnosis of erysipelas or cellulitis.

Results. Patients with a diagnosis of erysipelas or cellulitis represented 8.6 % of all admissions during the study period. The mean age was 58.93 years and the female to male ratio was 1.06:1. The most common site of involvement was on the legs (76.22 %). Overweight or obesity was present in 42.6 % of patients and tinea pedis was detected in 33.6 % of cases. A skin abscess developed in 7.4 % of cases. The mean length of admission was 10.20 days; length of stay increased with age and with the erythrocyte sedimentation rate (ESR) on admission (P<.01 for both differences).

Conclusions. We confirm general epidemiologic factors such as sex and age distributions, predominant site, past history, and length of hospital stay. In view of their predictive value for the length of hospital stay, we propose that age and the ESR on admission should be considered to be indirect indicators of disease severity.

Key words: epidemiology, erysipelas, cellulitis, infection.

ERISIPELAS Y CELULITIS. ESTUDIO RETROSPECTIVO DE 122 CASOS

Resumen *Introducción y objetivos.* ELas erisipelas/celulitis son infecciones cutáneas relativamente frecuentes que en ocasiones requieren una estancia hospitalaria prolongada de los pacientes. Nos proponemos describir los hallazgos epidemiológicos más relevantes y su influencia en el incremento de la estancia hospitalaria, comparando nuestros resultados con trabajos previos.

Material y métodos. Estudio observacional, transversal y retrospectivo a partir de un total de 122 pacientes ingresados con el diagnóstico de erisipela/celulitis en el Servicio de Dermatología de nuestro hospital durante un periodo de 5 años.

Resultados. Las erisipelas/celulitis constituyeron el 8,6 % de todos los casos ingresados durante el periodo estudiado. La edad media fue de 58,93 años, con una relación mujer:hombre de 1,06. La localización más frecuente fue las extremidades inferiores con el 76,22 % de los casos. El 42,6 % presentó obesidad o sobrepeso; el 33,6 % mostró tiña del pie y el 7,4 % desarrolló un absceso cutáneo. La estancia hospitalaria media fue de 10,20 días, aumentando conforme se incrementaba la edad del paciente (p < 0,01) o el valor de la velocidad de sedimentación globular (VSG) al ingreso (p < 0,01).

Conclusiones. Se confirman los preceptos epidemiológicos generales acerca de distribución por sexos y edades, localizaciones predilectas, antecedentes y estancia hospitalaria. Se propone considerar el valor de la VSG al ingreso y la edad como un indicador indirecto de la gravedad del cuadro, dado su valor predictivo de la estancia hospitalaria.

Palabras clave: epidemiología, erisipela, celulitis, infección.

Correspondence
Javier Concheiro Cao.
Departamento de Dermatología.
Facultad de Medicina.
C/ San Francisco, s/n.
15782 Santiago de Compostela.
A Coruña, Spain.
jaime.toribio@usc.es

Introduction

Cellulitis has traditionally been defined as an acute inflammatory process of infectious origin that affects the dermis and subcutaneous cellular tissue. Affected areas become sensitive, erythematous, hot, and swollen, and

have a poorly defined border separating them from healthy surrounding skin.[1] Erysipelas, in contrast, is a form of cellulitis that is limited to the surface layers of the skin. It preferentially affects the dermis, and the skin surface becomes indurated and acquires an orange-peel appearance. The borders separating affected areas from surrounding skin are well defined and lymph system involvement is common.[1,2] Diagnosis in the case of both cellulitis and erysipelas is primarily based on clinical findings. The 2 terms are often confused in English-language literature, hence the proposal by Grosshans et al[3] to use a new, general term, *acute bacterial dermohypodermitis*, as part of a new classification for bacterial infections of the skin.

Despite the difficulty of collecting reliable epidemiological data, it has been estimated that erysipelas has an incidence of 10 to 100 cases per 100 000 inhabitants per year.[4] Between 1% and 14% of patients visiting emergency departments are diagnosed with cellulitis,[5] which has an estimated incidence of 24.6 cases per 1000 person-years.[6] Typically, the age of onset of the 2 conditions is between 40 and 60 years.[2] While erysipelas used to affect the face in the majority of patients, it is now, like cellulitis, most common in the lower limbs (over 85% of cases).[1,2] *Streptococcus pyogenes* is the most commonly isolated organism,[7] followed by *Staphylococcus aureus*.[8] Other bacteria include group B hemolytic streptococci (*Streptococcus equisimilis* and *Streptococcus agalactiae*) and certain gram-negative bacilli (*Pseudomona aeruginosa*, *Acinetobacter calcoaceticus,* and *Haemophilus influenzae*).[9,10]

In view of the increase in the number of patients diagnosed with erysipelas and cellulitis in recent years[2,9] and in the absence of clear causes, the aim of this study was to analyze and report relevant epidemiological findings for all the patients admitted to the dermatology department of our hospital with a diagnosis of erysipelas or cellulitis over a period of 5 years.

Material and Methods

We analyzed the cases of 122 patients with erysipelas or cellulitis at any site who had been hospitalized on the dermatology ward of the Complejo Hospitalario Universitario de Santiago de Compostela, a tertiary care hospital that serves approximately 430 000 inhabitants.

The period analyzed was 5 years, from January 1, 2002 through December 31, 2006. The data required (age, sex, infection site, length of hospital stay, etc.) were obtained by chart review.

All the data were collected and processed using version 16.0 of the SPPS statistical package for Macintosh. Qualitative variables were expressed as absolute numbers and relative frequencies (percentages) and quantitative variables as means (SD).
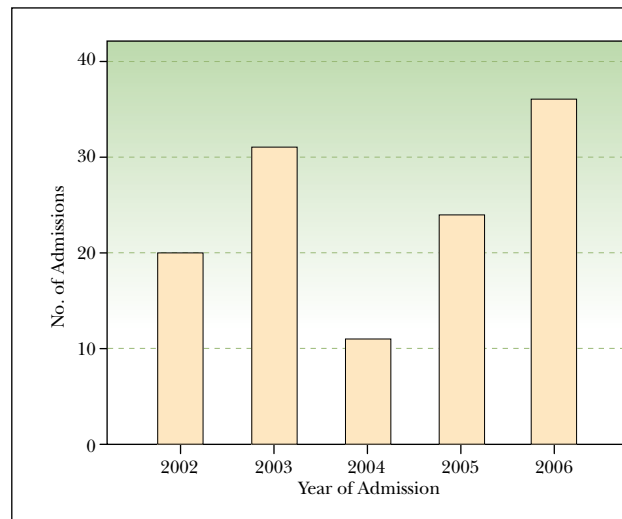

Figure 1. Total admissions per study year.

Associations between hospital stay and age and hospital stay and erythrocyte sedimentation rate (ESR) at admission were analyzed using simple linear regression. The level of statistical significance was set at $P<.01$, with confidence intervals of 99%.

Results

A total of 122 patients with either erysipelas or cellulitis were admitted to the dermatology ward during the period studied. This accounted for 8.6% of all hospitalizations on this ward during this time. The number of patients per year ranged from a minimum of 11 (in 2004) to a maximum of 36 (in 2006) (Figure 1). The highest number of admissions occurred in November, with a total of 19 admissions (15.6% of total), followed by June, May, and September, with 15, 14, and 14 admissions (12.3%, 11.5%, and 11.5%,), respectively. Admissions were least common in February, with just 1 case (0.8%) (Figure 2).

Sixty-three (51.6%) of the patients were women and 59 (48.4%) were men. The female-to-male ratio was 1.06. The mean (SD) age of the group was 58.93 (19.243) years, with a range of 81 years (youngest patient, 15 years; oldest patient, 96 years). On analyzing the frequency of disease by age group, erysipelas and cellulitis were most common in patients aged over 60 years, with a total of 60 cases, followed by those aged 30 to 60 years (48 cases), and finally those aged under 30 years (14 cases) (Table 1).

Of note from the information collected from the patients' histories and summarized in Table 2 is the following: 42.6% of the group (n=52) were either overweight (24.6% [n=30]) or obese (18% [n=22]); 15.6% (n=19) had diabetes mellitus; 18% (n=22) consumed alcohol and the same
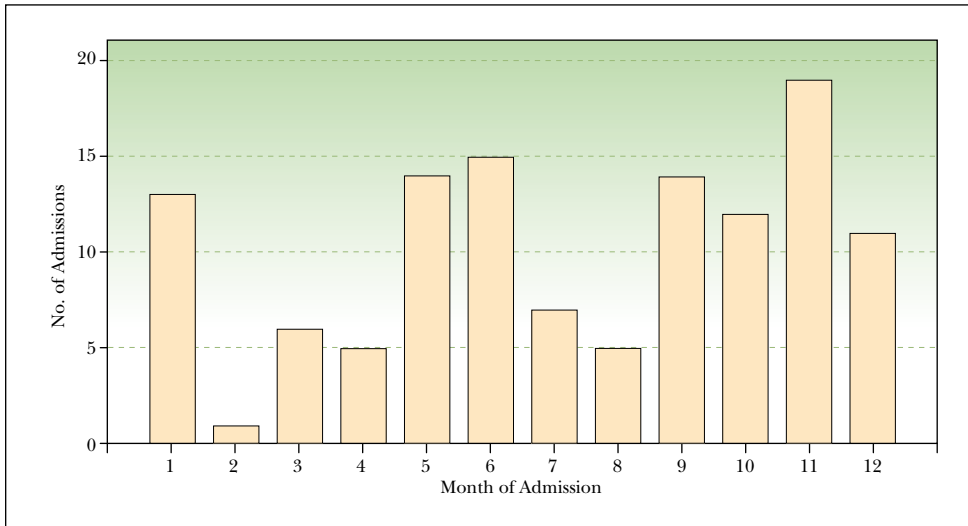
Figure 2. Total admissions per study year.

Table 1. Number of Cases of Erysipelas or Cellulitis by Age Group

Age group, y	% of Group	Cumulative %	No. of Cases
< 30	11.47	11.47	14
30-60	39.34	50.81	48
> 60	49.19	100	60
Total	100	100	122

Table 2. Summary of Clinical Data

Condition	No. of Patients	% of Patients
Obesity	52	42.6
Skin barrier disruption (not including ulcers or eczema)	52	42.6
Chronic venous insufficiency	45	36.9
Dermatomycosis	43	35.2
Tinea pedis	41	33.6
Onychomycosis	2	1.6
Smoking	22	18
Alcohol consumption	22	18
Local surgery	22	18
Diabetes mellitus	19	15.6
Eczema (local or palmoplantar)	18	14.8
Ulcer(s)	16	13.1
Malignant disease	14	11.5
Lymphedema	12	9.8
Heart failure	5	4.1
Local radiotherapy	4	3.3
Concomitant systemic infection	2	1.6
Immunosuppression	2	1.4

percentage smoked; 4.1% (n=5) had heart failure; 11.5% (n=14) had malignant disease or a history of malignant disease; 1.6% (n=2) were immunocompromised; 1.6% (n=2) had a concomitant systemic infection; 42.6% (n=52) had a history of skin barrier disruption (not counting ulcers or eczema); 13.1% (n=16) had 1 or more ulcers; 14.8% (n=18) had a history of local or palmoplantar eczema; 36.9% (n=45) had chronic venous insufficiency (venous edema); 9.8% (n=12) had lymphedema; 18% (n=22) had undergone local surgery (saphenectomy in 1.6 % of these [n=2] and other types of local surgery in the other 16.4%); 35.2% (n=43) had dermatomycosis in the form of tinea pedis (33.6%) or onychomycosis (1.6%); and 3.3% (n=4) had received local radiotherapy.

With respect to clinical manifestations, 98.4% (n=120) had erythema, 97.5% (n=119) had spontaneous pain or pain on palpation, 93.4% (n=114) had increased local temperature, 88.5% (n=108) had edema at the lesion site, and 42.6% (n=52) had fever.

The most common lesion sites were the lower limbs (93 cases), with no significant differences between the right or left limb, the upper limbs (14 cases), and the face (12 cases) (Table 3).

A skin swab was performed in 14 patients, 5 of whom (4.1% of total group) tested positive and 9 of whom (7.4% of total) tested negative. Of the 9 blood cultures

performed, just 4 (3.3% of total) were positive and the rest were negative (4.1% of total). Only 1 patient underwent a biopsy and was diagnosed with superficial perivascular dermatitis; there was no evidence of vasculitis. Leukocyte counts at admission were noted in 121 patients, with a mean value of 12 702/mL. The mean hemoglobin level at admission, measured in 120 patients, was 13.175 g/dL. The acute-phase reactants, ESR and C-reactive protein, were measured in 88 and 30 patients, respectively, with the following mean results: 54.69 mm/h and 78.28 mg/L. Antistreptolysin-O titers were measured in 30 patients, with a mean result of 403 IU/mL (Table 4).

S aureus was the organism isolated in the greatest number of patients (n=2). A variety of other bacteria were found in isolation in other patients. These were group G β-hemolytic streptococcus, coagulase-negative staphylococcus, methicillin-resistant *S aureus*, and group A β-hemolytic streptococcus. Three patients had 2 bacteria: *Proteus vulgaris* and *Klebsiella oxytoca*, *Staphylococcus haemolyticus* and group G β-hemolytic streptococcus, and *S aureus* and group A β-hemolytic streptococcus. The causative organism was not identified in 92.6% of cases. Table 5 shows a summary of these data.

The most common local complication was the presence of an abscess, which affected 7.4% of patients (n=9), followed by arthritis (3.3% [n=4]), and necrosis of the affected tissue (n=1). Two patients developed systemic complications: acute renal failure, probably drug-induced, and temporal-spatial disorientation and agitation. It is also noteworthy that 41% of the patients (n=50) had received outpatient antibiotic treatment prior to admission, and that 33.6% (n=41) had taken nonsteroidal anti-inflammatory drugs (NSAIDs) or paracetamol before hospitalization. In total, 54.9% of the patients (n=67) had been following some form of therapy at home before being admitted to hospital.

The mean (SD) length of hospital stay was 10.20 (4.139) days, with a minimum of 3 and maximum of 29 days (range, 26 days). Simple linear regression analysis revealed statistically significant differences between

hospital stay and both age and ESR at admission. The comparison between age and mean hospital stay yielded a statistically significant difference of 0.01 (*P*=.006). We also saw that the slope of the regression line drawn through the scatterplot of data (Figure 3) was both positive and linear. R was 0.249, b (the slope) was 0.054, and *k* was 7.041, meaning that hospital stay increased with age.

We also found a statistically significant difference between ESR at admission and mean hospital stay of 0.01 (*P*<.001). The slope of the regression line was also positive and linear in this case. The values obtained were 0.457 for R, 0.065 for the slope b, and 6.634 for *k*. In other words, the higher the ESR at admission, the longer the hospital stay (Figure 4). For an ESR cutoff of 50 mm/h, the difference remained statistically significant at 0.01 (*P*=.012).

Discussion

Erysipelas and cellulitis have traditionally been defined as acute inflammatory processes of infectious origin that primarily affect the dermis (in the case of erysipelas) or

Table 3. Lesion Sites

Lesion Site	No. of Patients	% of Patients	Cumulative %
Face	12	9.8	9.8
Trunk	2	1.6	11.5
Upper limbs	14	11.5	23.0
Right lower limb	46	37.7	60.7
Left lower limb	47	38.5	99.2
Genitals	1	0.8	100.0
Total	122	100.0	100.0

Table 4. Laboratory Test Results at Admission

	No. of Patients	Range	Minimum	Maximum	Mean	SD
Hemoglobin, g/dL	120	7.5	8.9	16.4	13.175	1.5241
Leukocytes, count/mL	121	29 970	4090	34 060	12 702.41	5 487.433
ESR, mm/ha	88	122	3	125	54.69	28.853
CRP, mg/L	30	243	4	246	78.28	69.825
ASLO, IU/mL	30	3499	52	3551	403.00	677 655

Abbreviations: ASLO, antistreptolysin-O; CRP, C-reactive protein; ESR, erythrocyte sedimentation rate.

Table 5. Organisms Isolated in Patients Studied

	No. of Patients	% of Patients	Cumulative %
Not identified		92.6	92.6
Staphylococcus aureus	2	1.6	94.2
Methicillin-resistant *S aureus*	1	0.8	95
Coagulase-negative staphylococcus	1	0.8	95.8
Group G β-hemolytic streptococcus	1	0.8	96.6
Group A β-hemolytic streptococcus	1	0.8	97.4
Group A β-hemolytic *S aureus*	1	0.8	98.2
Staphylococcus haemolyticus and group G β-hemolytic streptococcus *S aureus*	1	0.8	99
Proteus vulgaris and *Klebsiella oxytoca*	1	0.8	99.8

Figure 3. Scatterplot and regression line showing relationship between age and length of hospital stay.

Figure 4. Scatterplot and regression line showing relationship between erythrocyte sedimentation rate (ESR) and length of hospital stay.

the dermis and subcutaneous cellular tissue (in the case of cellulitis).[1] Our series included 122 patients admitted to the dermatology department at our hospital over a period of 5 years with erysipelas or cellulitis. This accounts for 8.6% of all the patients hospitalized in the department during this period. In agreement with reports of previous series, we found no significant sex-related differences.[2,11] The mean age of onset detected in our series also coincided with figures published to date.[2,12-14] Previous studies have suggested a possible seasonal admission pattern, with a greater incidence of cases in the hotter months of the year, which is when local traumas are more common.[6,15,16] We did not detect a clear association between admission and season of the year, with the majority of admissions in our case occurring in November.

The mean hospital stay was 10.20 days and we observed statistically significant differences between the length of hospital stay and ESR at admission, with the number of days increasing with increased ESR values, both in general and using an ESR cutoff of 50 mm/h. ESR at admission might, therefore, be a potential indirect marker of disease severity, as has been previously proposed.[11] Such a marker would be of particular interest in assessing the need for in-hospital treatment. We also found statistically significant differences on comparing age and mean hospital stay (longer stays with increased age) (Figures 3 and 4). We failed to detect significant associations for other values
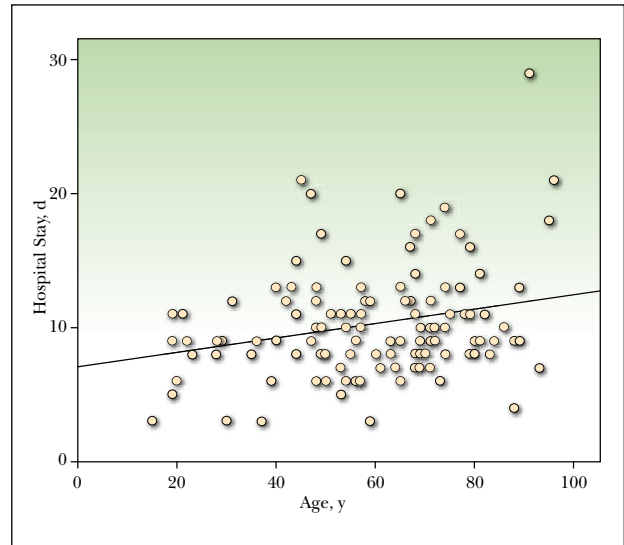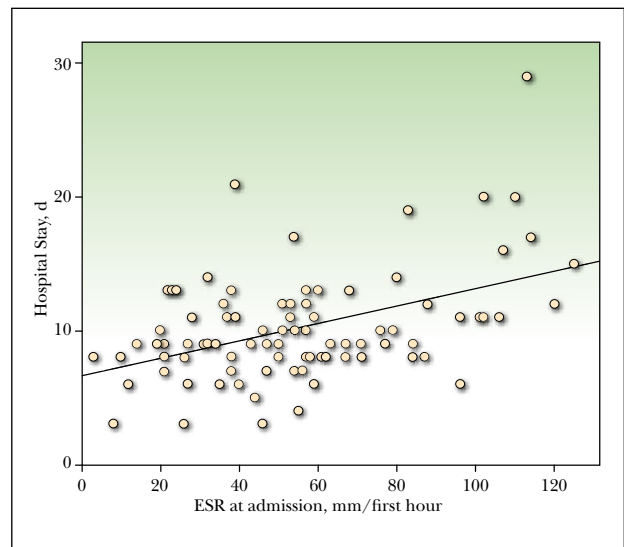
reported as significant in the literature such as leukocyte count and C-reactive protein and hemoglobin levels at admission.[11] The data presented are very important in terms of contributing to the establishment of specific admission criteria for patients with erysipelas and cellulitis as consensus in this area is currently lacking.[13,17] Accordingly, a patient with a potentially longer hospital stay (calculated on the basis of age and ESR at admission) would possibly have more serious disease and therefore be a candidate for in-hospital treatment.

Our study confirms that erysipelas and cellulitis mostly affect the lower limbs, a finding in agreement with those of other studies, which have reported lower limb involvement at times in excess of 85% of patients.[2,15,17,18] The percentage of patients with lower limb lesions in our series was 76.22%, with the face, the classic site, occupying third place.

Several authors have attempted to identify predisposing factors by analyzing data from each patient's history and classifying these as local and general risk factors.[15] Significant associations have recently been found for overweight within the category of general risk factors,[19] and skin barrier disruption (including ulcers), lymphedema, chronic venous insufficiency, tinea pedis, onychomycosis, and edema of the lower limbs (except that of venous origin) within the category of local risk factors.[19-21] In our series, we found similar values to those reported for previous series with respect to obesity,[22] diabetes mellitus,[23] alcohol and tobacco consumption, skin barrier disruption, chronic venous insufficiency, and lymphedema.[24] We also found a similar prevalence of dermatomycosis of the feet to that reported in other series.[25]

The classic clinical manifestations of erysipelas and cellulitis are erythematous plaques, heat, and pain accompanied by fever and general discomfort.[1] These manifestations were also largely detected in our series, with prevalence rates of over 88% for symptoms such as erythema, pain, increased local temperature, and edema. Only 42.6% of our patients, however, had fever but this might be because half of the group had received treatment at home (mostly antibiotics, NSAIDs, and paracetamol) before being admitted to hospital.

Complementary tests do not tend to be of much diagnostic value in erysipelas or cellulitis and are normally used for differential diagnosis. Indeed, blood cultures tend to be positive in just 5% of cases,[12,26] a figure similar to the 3.3% observed in our series.

Furthermore, it is not uncommon for up to 50% of patients with erysipelas or cellulitis to have a normal leukocyte count.[4] Our study confirmed this. In agreement with the literature, we found that the most common complication was the development of a skin abscess.[24]

The organisms isolated in our series differ slightly from those reported in the literature, with *S aureus* isolated in 4 patients, one of whom had a methicillin-resistant strain and another of whom had *S aureus* in association with group A β-hemolytic streptococcus. We also found 2 other varieties of staphylococcus: *S haemolyticus* and coagulase-negative staphylococcus. It has traditionally been believed that group A β-hemolytic streptococci were the cause of most cases (58%) of erysipelas and cellulitis, followed by *S aureus*, although considerably less frequent (10%).[7,8,27] Nonetheless, as we have already seen, this was far from true in our series. Other more uncommon bacteria have also been described in the literature.[28]

To conclude, in the present study we have confirmed numerous epidemiological assumptions with respect to aspects of erysipelas and cellulitis such as distribution by sex, location of lesions, type of complications, and disease history. Furthermore, with respect to the absence of criteria to guide hospital admission in the literature, we believe that age and ESR at admission are important factors to take into account as they can predict prolonged hospital stays and the presence of potentially more serious disease.

Conflicts of Interest

The authors declare no conflicts of interest.

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