
Evolutionary Profile of Cellulitis and Erysipelas of Lower Limbs in a Level-Two Healthcare Facility in Brazzaville, Congo

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Abstract: *Background:* Cellulitis/erysipelas are the most frequent reason for hospitalization in dermatology departments. *Objective:* To describe evolutionary profile of cellulitis/erysipelas and to determine associated factors with the long hospital stay. *Methods:* This was a cross-sectional study carried out from January 2016 to December 2018 in Talangaï Reference Hospital, that included patients hospitalized for cellulitis or erysipelas of the lower limbs. Necrotizing fasciitis cases were excluded. A hospital stay of more than 11 days was considered long. Sociodemographic, clinical and biological data were collected and processed with Epi Info 7.2.1.0. The Chi-square and Fisher tests were used for univariate analysis. Logistic regression was used for multivariate analysis. *Results:* One hundred and five patients were included, with an average age of 50.7 (± 15) years. They were 26 (24.8%) men and 79 (74.2%) women. Antibiotic regimen used was amoxicillin in 19 (18.1%) cases, amoxicillin / clavulanic acid in 40 (38.1%) cases and ceftriaxone in 46 (43.8%) cases. The outcome was favorable in 69 (65.7%) patients. Fever persisted after 5 days-treatment in 19 (28.3%) patients out of 67 initially. Complications were cutaneous necrosis in 19 (18.0%) cases, abscess in 14 (13.3%) cases, severe sepsis and necrotizing fasciitis in 7 and 4 cases, respectively. Two patients died. The average length of hospital stay was 13 days (± 7.5) and 44 (41.9%) cases had a long hospital stay. The bullous forms of cellulitis/erysipelas [aOR=4.8, 95%CI (1.9-12.4); $p=0.001$] and the occurrence of complications [aOR=3.2, 95%CI (1.1-8.7); $p=0.026$] were associated with a long hospital stay. *Conclusion:* Cellulitis and erysipelas are potentially serious. Despite treatment, complications can occur, including necrosis and abscess. Effective management, including early medical treatment, daily thorough monitoring of patients, appropriate local care and collaboration with surgeons, is necessary to improve the prognosis of the disease.

Keywords: Cellulitis, Erysipelas, Complication, Abscess, Hospitalization, Congo

1. Introduction

Cellulitis is an infection of the dermis and hypodermis, manifested by a poorly demarcated erythema, edema and warmth [1]. Erysipelas is a superficial form of cellulitis mainly affecting dermis and involving less the hypodermis, presenting with well demarcated erythema and edema [2, 3]. The

historical distinction between cellulitis and erysipelas, based on different bacterial aetiologies and their treatment options, is becoming obsolete [3]. Several studies suggest a great overlap of the bacteria involved between these two entities [4, 5].

Cellulitis is the most frequent reason of hospitalization for infectious skin diseases in developed and developing countries [6-8]. Medical care must be effective early to avoid complications. Treatment is mainly based on antibiotic

therapy and local care in some cases. Despite published guidelines, the treatment regimens used are various [1]. Most cases of cellulitis are successfully treated with antibiotics, but complications can occur, such as abscess formation, skin necrosis, necrotizing fasciitis and sepsis during the acute period. The short-term complications of cellulitis and erysipelas can be responsible for long hospital stays.

Cellulitis comes to be a major problem in term of morbidity and length of hospital stay [9]. The long hospital stay leads to considerable financial costs worldwide [10]. In order to improve the management of cellulitis/erysipelas, our study aimed to describe the evolutionary profile of cellulitis/erysipelas of lower limbs and to determine the associated factors with long hospital stays in a level-two healthcare facility, in Brazzaville (Congo).

2. Patients and Methods

2.1. Study Design

This was an analytical cross-sectional study, carried out from January 2016 to December 2018 in Dermatology and Infectious Diseases Department of Talangaï Reference Hospital in Brazzaville, Congo. The Talangaï Reference Hospital is a second-level health care facility, according to health system in Congo, and it is a first-line referral hospital for dermatological problems.

2.2. Patients Selection

The study population consisted of patients with cellulitis or erysipelas and hospitalized in Dermatology and Infectious Diseases Department. Patients with cellulitis or erysipelas located on lower limbs were included. Patients with primary necrotizing fasciitis were excluded. The diagnosis of cellulite and erysipelas was based on clinical criteria. The term cellulite used in our study refers to one of the clinical forms, either cellulite or erysipelas.

2.3. Variables

Data were collected from medical records at the end of each hospitalization. Study variables were demographic, clinical, and biological data. Demographic data were age, sex and occupation. The clinical data were the following: previous history of cellulitis, the consultation period (time between onset of symptom and admission), medical practices used prior to admission, comorbidity (obesity, high blood pressure, liver failure, renal failure, lymphoedema), cosmetic practices, systemic symptoms, clinical type, location of cellulitis, treatment, outcomes and length of hospital stay (LHS). A duration of hospital stay longer than 11 days was defined as long. The biological data were white blood cells (WBC) count and neutrophils, C reactive protein (CRP), aspartate aminotransferase, alanine aminotransferase, creatinine and blood urea.

2.4. Data Management

The collected data were entered into a database created with

the Epi Info software Version 7.2.1.0 (Center for Disease Control and Prevention, Atlanta, GA). The data processing and statistical analysis were performed using Epi Info software.

Quantitative data were expressed as mean and standard deviation (SD). Qualitative data were expressed in number and frequency (percentage). Univariate analysis was performed to identify variables associated with long hospital stay. Data were analyzed using chi-square test and Fisher's test as appropriate. The outcome variable was a "long hospital stay". Multivariate regression analysis was performed in a second step to determine independent associated factors and adjusted Odds ratio (aOR). The significance was considered for a *p*-value less than 0.05 for a 95% confidence interval (CI).

3. Results

3.1. Characteristics of Study Population

A total of 105 patients hospitalized for cellulitis was included. They were 26 (24.8%) men and 79 (75.2%) women. The mean age was 50.4 (\pm 15) years. Four women were pregnant. A previous history cellulitis was found in 19 (18.1%) cases. The average consultation period was 6 (\pm 5) days. Forty-two (40.0%) patients used non-steroidal anti-inflammatory drugs (NSAIDs) prior to admission and 24 (22.9%) used antibiotics. The general characteristics of study population are showed in Table 1.

Table 1. General characteristics of study population.

Characteristics	Distribution N=105 n (%)
Comorbid factors	
Obesity (BMI >30)	15 (14.3)
Diabetes	12 (11.4)
High Blood Pressure (HBP)	30 (28.6)
Lymphoedema	13 (12.4)
Renal failure	6 (5.7)
Depigmenting cosmetic practice	18 (17.1)
Fever	67 (63.8)
Clinical subtype	
Erythematous	48 (45.7)
Erythematous and purpuric	3 (2.7)
Erythematous and bullous	49 (46.7)
Necrotizing	5 (4.8)
Location	
Thigh	1 (0.9)
Leg	75 (71.4)
Leg and foot	20 (19.1)
All the lower limb	9 (8.6)
Neutrophils >12 000/ μ l	40 (38.1)
CRP > 48 mg/L	47 (44.8)
Antibiotic regimen	
Amoxicillin	19 (18.1)
Amoxicillin/ Clavulanic acid	40 (38.1)
Ceftriaxone	25 (23.8)
Ceftriaxone/ Gentamycin	21 (20.0)

BMI=Body mass index, HBP=High blood pressure, CRP=C-reactive protein.

3.2. Evolutionary Profile

Fever persisted after 5 days-treatment in 19 (28.3%)

patients out of 67 initially. Among the 105 patients with cellulitis, 69 (65.7%) had a regression of the disease, 32 (30.5%) developed complications and 4 patients were discharged from the hospital before improvement without medical consent. Complications showed in Table 2 were sometimes combined in the same patient.

Table 2. Complications of cellulite in 105 hospitalized patients.

Characteristics	Distribution n (%)
Cutaneous necrotizing	19 (18,0)
Abscess formation	14 (13,3)
Necrotizing fasciitis	7 (6,7)
Severe sepsis	4 (3,8)

Of the patients who developed necrotizing complications, six were transferred to the surgical department. For the other cases, care was carried out in Dermatology and Infectious Diseases Department in collaboration with the surgeons.

Two patients died from severe sepsis.

The average duration of hospital stay was 13 ($\pm 7,5$) days. The median length of hospital stay was 10 days.

3.3. Factors Associated with Long Hospital Stays

Of all cases, 44 (41.9%) patients had a hospital stay more than 11 days. Table 3 shows the factors associated with a long hospital stay in univariate analysis.

Table 3. Associated factors with long hospital stay in 105 hospitalized patients, in univariate analysis.

Variable	Long hospital		OR 95% CI	p-value
	Yes, n (%)	No, n (%)		
Diabetes				
Yes	8 (66.7)	4 (33.3)	3.1 [0.7-15.3]	0.063
No	36 (38,7)	57 (51,3)		
High Blood pressure				
Yes	11 (36.7)	19 (63.3)	0.7 [0.2-1.9]	0.321
No	33 (44,0)	42 (56,0)		
Lymphoedema				
Yes	5 (38.5)	8 (61.5)	0.8 [0.2-3.2]	0.517
No	39 (42,4)	53 (57,1)		
Obesity (BMI >30)				
Yes	10 (66.7)	5 (33.3)	3.3 [0.9-13.2]	0.030
No	34 (37,8)	56 (62,2)		
NSAIDs use				
Yes	21 (50.0)	51 (50.0)	1.7 [0.7-4.1]	0.120
No	23 (36,5)	40 (63,5)		
Bullous forms of cellulitis				
Yes	32 (65.3)	17 (34.7)	6.7 [2.6-18.1]	<0.001
No	12 (21,4)	44 (78,6)		
Complications				
Yes	21 (65.6)	11 (34.4)	4.0 [1.5-11.1]	0.001
No	23 (31,5)	50 (68,5)		
Neutrophils count >12 000/mL				
Yes	24 (60.0)	16 (40.0)	3.3 [1.7-8.3]	0.003
No	20 (30,8)	45 (69,2)		
CRP > 48 mg/L				
Yes	24 (51.0)	23 (49.0)	1.9 [0.9-13.2]	0.030
No	20 (34,5)	38 (65,5)		

BMI=Body mass index, NSAIDs=non-steroidal anti-inflammatory drugs.

The factors associated with long hospital stays in multivariate analysis were Bullous forms of cellulitis and the occurrence of complications (Table 4).

Table 4. Associated factors with long hospital stays in 105 hospitalized patients, in multivariate analysis.

Variable	aOR 95% CI	p-value
Obesity (BMI >30)	2.4 [0.6 -9.0]	1.192
Bullous forms	4.8 [1.9-12.4]	0.001
Complications	3.1 [1.1- 8.7]	0.026
Neutrophils >12 000/ μ l	1.3 [0.5 - 3.7]	0.551

BMI=Body mass index.

4. Discussion

This study aimed to determine evolutionary profile of

cellulitis and to identify associated factors with long hospital stay. The choice of 11 days to determine the long hospital stay was based on the operational definitions of level-two healthcare facilities.

One of the limitations of this study is the monocentric character. Indeed, a larger study also including internal medicine departments would be of great interest. The other limitation is the retrospective nature of the data collection. Data collection was continuous over the three years of the study, but it was carried out after discharge. However, all the patients were examined by a dermatological specialist and the medical records correctly informed the condition of patients.

The length of hospital stay exceeded 11 days for 41.9% of patients. The average length and median of hospital stay were 13 and 10 days respectively. A previous study at Teaching

Hospital of Brazzaville reported a length of hospital stay between 21 and 30 days [11]. Studies in sub-Saharan Africa report varying values. In Senegal, in a study of 194 cases, the average LHS was 14.6 days [12]. In Togo, the LHS was 21 days in a series of 104 cases, but which included necrotizing fasciitis [13]. A study in Morocco reported an average LHS of 15 days in a series of 100 cases [14]. In France and Portugal, the hospital stays for cellulitis reported are 11 days for the respective series of 111 and 348 patients [15, 16]. In Cameroon, the median duration was 14 days [17]. Cellulitis is an acute infectious disease needed to be treated efficiently and the hospital stay must be as short as possible. What's more, lower-limbs location exposes to complications of decubitus. A long hospital stay can be an economic burden for affected families when there is no funding for health care. In Congo, patients who are hospitalized in a level-2 hospital have no social care. They fund their care themselves, including drug costs and hospital stay fees. Lengthy hospital stays also affect the professional activities of individuals. Indeed, all income-generating activities are stopped during the hospitalization period.

Despite the treatment, 30.5% of patients developed complications. The most common complication was the occurrence of skin necrosis. It is often difficult to distinguish from an initial necrotizing soft tissue infection that was underdiagnosed. In necrotizing soft tissue infection, cutaneous necrosis progresses rapidly a few hours after the onset of erythema and edema of limb [18]. An appropriate daily examination of patients leads to early diagnosis of necrotizing soft tissue infection. At Teaching Hospital of Brazzaville, another study of 54 cellulitis patient reported complications in 77.7% of cases [19]. Among these, skin necrosis was found in 73.8% of cases [19]. Necrosis require surgical debridement care which exacerbates ulceration. Health care professionals providing cellulitis care must monitor the appearance of this complication. The abscess formation is the second complications found in 13.3% of our patients. It is close to the finding of a multicenter study in 8 countries in sub-Saharan Africa (11.2%) and in Morocco (11%) [20, 21]. These sub-Saharan African countries were Togo, Senegal, Mali, Côte d'Ivoire, Guinea, Burkina Faso, Central African Republic and Cameroon [20]. In Greece, abscess was found in 17% of cellulite cases [22]. Abscess formation was less frequent (8%) in a study in France [23]. The diagnosis of the abscess should be early and suspected if the pain and fever persist. Examination of the leg in search of fluctuation may be supplemented by imaging tools. Other complications of cellulite have been observed in Senegal [12]. These were myositis and osteitis.

Our study identified the bullous form of cellulitis and the occurrence of complications as associated factors with long hospital stays. The bullae are generally consecutive to the edema associated with erythema in patients with cellulitis. They lead to the formation of ulcers. The length of hospital stay depends on the healing process of post-bullous ulcers. Other factors associated with long hospital stays were identified in various studies. Roda found that occurrence of

complications, increased age, previous episode of cellulitis/erysipelas, high level of CRP and leukocytosis are associated factors with LHS [16]. Mascitti found diabetes, obesity (BMI=28), immunosuppression and leucocytosis greater than 13000/ μ l as associated factors [15]. In Morocco, Titou found that days of hospitalization were increased in patients with complicated erysipelas [21]. In the New Zealand, Morpeth found that use of diuretics, neutrophil count $>10 \times 10^9/l$ and extended edema were associated with long hospital stay [24]. Our study did not show a significant association with leukocytosis greater than 12000/mL or obesity in multivariate analysis. The association with immunosuppression had not been analyzed because not all patients had been assessed on their immunity. In Australia, Aly found that lengthy stays for lower-limbs cellulitis in a tertiary teaching hospital were associated with surgical intervention or intercurrent problems [25]. He also found that 15% of patients remained in hospital longer than 10 days for no clear indication [25].

In our study, four patients were discharged from the hospital without medical consent. In our society, this practice is sometimes observed when patients believe in a metaphysical origin of a disease. These beliefs are called "*mouandza*" in popular language. In these situations, patients go to traditional healers and refuse modern care.

Our observations show the need for a daily evaluation of hospitalized patients with cellulitis. Initial bullae or their appearance during evolution requires adequate local care to limit secondary ulcers. The daily examination also aims to detect complications early to ensure their management.

5. Conclusion

Cellulitis and erysipelas are potentially serious. Despite treatment, complications can occur of which necrosis and abscess are most frequent. Hospitalization is lengthy in almost of the cases. Bullous forms of cellulitis/erysipelas and the occurrence of complications are associated factors with long hospital stays. Management of cellulitis/erysipelas need early medical treatment and daily thorough monitoring of patients. Effective management of complications, including careful local care and collaboration with surgeons, is necessary to reduce the burden of illness of cellulitis and erysipelas.

Abbreviations

aOR	Adjusted Odds Ratio
BMI	Body mass index
CI	Confidence interval
CRP	C reactive protein
HBP	High blood pressure
LHS	Length of hospital stay
NSAIDs	Non-steroidal anti-inflammatory drugs
OR	Odd Ratio
SD	Standard Deviation
WBC	White blood count

Conflicts of Interest

None.

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Ethical Approval and Consent for Participation

The study was not carried out directly on human subjects.

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