

# Risk factors, disease management and complications in patients with cellulitis

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## Abstract

**Introduction:** Cellulitis is an acute bacterial infection of deep dermal lymphatics, whereas erysipelas is an acute bacterial infection of superficial dermal lymphatics. In this study, it was aimed to investigate demographic, clinical and laboratory characteristics of adult cellulitis/erysipelas patients followed up in our clinic and to reveal the relationship with disease.

**Material and methods:** Forty-two adult patients who were hospitalized with the diagnosis of cellulitis/erysipelas at Dermatology Clinic were evaluated. Demographic characteristics, habits, presence of facilitating factors, comorbidities, duration of hospitalization, received treatments and complications were investigated and recorded.

**Results:** The mean age of the patients was 58.9±13.1 and the male/female ratio was 1.1. 92.9% of the cases had cellulitis and 7.1% of them were erysipelas. The lesions were located in lower extremities in 88.1% of cases. All patients admitted to hospital for the complaints of swelling and redness while 81% of patients who admitted to hospital had pain. The most frequently detected comorbidity was diabetes. All of patients with recurrent episodes had chronic lymphedema. When local complications were evaluated, in three cases abscess was seen and in 2 cases skin necrosis was seen.

**Conclusion:** In this study, smoking-Maraş Powder use, diabetes, obesity, history of surgical operation, superficial fungal infection were detected in high rates among cellulitis patients. Ampicillin sulbactam treatment was found to be effective in patients with cellulitis/erysipelas. It was found that length of hospital stay is increased for the patients who received antibiotherapy late. Formation of abscess was associated with delayed initiation of antibiotherapy.

**Key words:** cellulitis, erysipelas, risk factors, management, complications

## ЦЕЛЛЮЛИТЫ БАР НАУҚАСТАРДАҒЫ ҚАУІП ФАКТОРЛАРЫ, ЕМДЕУ ЖӘНЕ АСҚЫНУЛАР

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### ТҰЖЫРЫМДАМА

**Мақсаты:** Целлюлит - бұл терең лимфа жүйелерінің жедел бактериялық инфекциясы, ал тілменің қабынуы - беткі лимфа жүйелерінің жедел бактериялық инфекциясы. Осы зерттеудің мақсаты біздің клиникада байқалған целлюлит/тілменің қабынуы бар ересек пациенттердің демографиялық, клиникалық және зертханалық сипаттамаларын зерттеу және аурумен байланысын анықтау.

**Материалдары және әдістері:** Дерматологиялық клиникада целлюлит/тілменің қабынуы диагнозымен ауруханаға жатқызылған 42 ересек науқасты тексердік. Демографиялық сипаттамалар, әдеттер, даму факторлары, ауру-сырқаулар, ауруханада болу ұзақтығы, алынған ем, асқынулар зерттеліп, жазылды.

**Нәтижелері:** Науқастардың орташа жасы 58,9 ± 13,1 жас, ерлер мен әйелдердің қатынасы 1:1 болды. 92,9% жағдайда целлюлит болған, ал 7,1%-ында тілменің қабынуы болған. 88,1% жағдайда зақымданулар аяқтарда локализацияланған. Барлық науқастар ісіну мен қызаруға шағымданып ауруханаға түсті, ал ауруханаға түскен пациенттердің 81% -ы ауырсынуды сезінді. Қант диабеті жиі диагноз қойылатын ауру болды. Қайталанатын эпизодтары бар барлық науқастарда созылмалы лимфедема болған. Жергілікті асқынуларды бағалау кезінде үш жағдайда абсцесс, 2 жағдайда тері некрозы байқалды.

**Қорытынды:** Осы зерттеуде целлюлитпен ауыратын науқастар арасында темекі шегудің жоғары деңгейі анықталды - мараш ұнтағы, қант диабеті, семіздік, хирургия тарихы, саңырауқұлақ инфекциясы. Ампициллин сульбактамымен емдеу целлюлит/тілменің қабынуы бар емделушілерде тиімді екендігі анықталды. Антибиотикалық терапияны кеш қабылдаған пациенттерде ауруханада болу ұзақтығы артады. Абсцестің пайда болуы антибиотикалық терапияның кештіріліп басталуымен байланысты болды.

**Негізгі сөздер:** целлюлит, тілменің қабынуы, қауіп факторлары, емдеу, асқынулар

# ФАКТОРЫ РИСКА, ЛЕЧЕНИЕ И ОСЛОЖНЕНИЯ У ПАЦИЕНТОВ С ЦЕЛЛЮЛИТОМ

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## РЕЗЮМЕ

**Цель:** Целлюлит является острой бактериальной инфекцией глубоких кожных лимфатических систем, тогда как рожистое воспаление является острой бактериальной инфекцией поверхностных кожных лимфатических систем. Целью настоящего исследования было изучить демографические, клинические и лабораторные характеристики взрослых пациентов с целлюлитом/рожистым воспалением, которые наблюдались в нашей клинике, и выявить связь с заболеванием.

**Материалы и методы:** Обследовано 42 взрослых пациента, которые были госпитализированы с диагнозом целлюлит/рожистое воспаление в дерматологическую клинику. Были исследованы и зарегистрированы демографические характеристики, привычки, наличие факторов, способствующих развитию, сопутствующие заболевания, продолжительность госпитализации, полученное лечение и осложнения.

**Результаты:** Средний возраст пациентов составил 58,9±13,1 года, а соотношение мужчин и женщин составило 1:1. В 92,9% случаев был целлюлит, а у 7,1% - рожистое воспаление. Поражения локализовались в нижних конечностях в 88,1% случаев. Все пациенты госпитализированы с жалобами на припухлость и покраснение, в то время как 81% пациентов, поступивших в больницу, испытывали боль. Наиболее часто выявляемым сопутствующим заболеванием был диабет. У всех пациентов с рецидивирующими эпизодами была хроническая лимфедема. При оценке местных осложнений в трех случаях наблюдался абсцесс, а в 2 случаях - некроз кожи.

**Заключение:** В настоящем исследовании, среди пациентов с целлюлитом, были обнаружены высокие показатели курения - использование порошка мараш, диабет, ожирение, история хирургического вмешательства, поверхностная грибковая инфекция. Обнаружено, что лечение ампициллин сульбактамом эффективно у пациентов с целлюлитом/рожистым воспалением. Выяснилось, что длительность пребывания в стационаре увеличивается у пациентов, которые поздно получали антибактериальную терапию. Формирование абсцесса было связано с отсроченным началом антибактериальной терапии.

**Ключевые слова:** целлюлит, рожистое воспаление, факторы риска, лечение, осложнения

## Introduction

Cellulitis is an acute infection of deep dermis and hypodermis. When the superficial dermis is infected, it is called erysipelas. The etiologic agents that are responsible for these infections are mainly *Streptococcus pyogenes* and *Staphylococcus aureus*. Pain, rash, rise in temperature, edema, fever and lymphadenopathy all which form clinical features of the disease are usually sufficient for the diagnosis [1]. Cellulitis is mostly seen on the lower extremities. Lymphedema that is seen on the lower extremities, traumatic injury characterized by impaired skin integrity along with venous insufficiency, leg ulcers, toe web intrigo, tinea pedis and excoriated leg dermatosis are the factors that facilitate the development of cellulitis [2]. During the course of cellulitis, there could be some complications. These complications are abscess formation, superficial necrosis and deep vein thrombosis [3]. In this study, it was aimed to scan the data of the patients who were hospitalized with the diagnosis of cellulitis or erysipelas retrospectively and to investigate the clinical and laboratory features of the disease.

## Material and methods

Local ethics committee approval was received for the study (date:14.02.18, decision number: 26, session: 2018/4). Demographic, clinical and laboratory data of the 42 patients who were hospitalized with the diagnosis of cellulitis/erysipelas between January 2015 - February 2018 in Dermatology Clinic was examined retrospectively. Body mass indexes (BMI) were calculated from the height and weight values of the patients. According to the World Health Organization definition, those with a BMI of <18.5 were considered as underweight, 18.5-24.9 were considered as normal weight, 25-29.9 were considered as overweight, 30-39.9 were considered as obese and ≥40 were considered as morbid obese. The followings are investigated and recorded: age, sex, history of smoking and alcohol-drug or Maraş Powder use, diabetes, other co-morbidities, lymphedema, the conditions which can cause skin disintegrity (tinea pedis, excoriation on legs, scratches etc.), the initial values of skin temperature, leukocytes, percentage of neutrophils, sedimentation, CRP and albumin levels of the patients, the time between the appearance of complaints and the initiation of antibiotherapy, the antibiotherapy that was used, the length of hospital stay and also it was investigated that the patients

whether developed superficial necrosis, deep vein thrombosis or abscess formation or not. The follow-up of the treatment was based on clinical improvement of the lesion and improvement in symptoms.

SPSS 17.0 package program was used to evaluate data which were obtained from the study. Continuous data are summarized as average and standard deviation, while categorical data are summarized in numbers and percentages. Independent T test was used to evaluate the relationship between two parametric variables and Pearson correlation test was used to evaluate the relationship between two continuous variables. P values which are below 0.05 were considered statistically significant.

## Results

The demographic characteristics of the patients with cellulitis/erysipelas are given in Table 1, the clinical features in Table 2, and the laboratory features in Table 3. In two (66.7%) of erysipelas cases, the disease was on the face and in 1 (33.3%), it was on the lower extremity. When patients' complaints are taken

**Table 1** Demographic features of patients with cellulite/erysipelas

Sex % (n)	
Male	52.4 (22)
Female	47.6 (20)
Mean age (years)	58.9±13.1 (min-max: 34-85)
Co-morbidities % (n)	
Diabetes mellitus	64.3 (27)
Coronary artery disease	11.9 (5)
Breast cancer	2.4 (1)
Habits % (n)	
Alcohol-drugs	0 (0)
Cigarette	28.6 (12)
Maraş Powder	9.5 (4)

into consideration at the time of diagnosis, it was determined that all patients had erythema and edema and 81% (n=34) of the patients described sensitivity. All 5 cases with recurrent cellulitis had chronic lymphedema, 2 had diabetes, and 3 had tinea pedis. A history of surgical operation that could lead to lymphatic or venous insufficiency was investigated in patients. There was a history of surgical bypass in 5 patients (11.9%), mastectomy and axillary lymph node dissection in 1 patient (2.4%), and hip replacement surgery in 1 patient (2.4%). Venotropic drug use

**Table 2** Clinical features of patients with cellulitis / erysipelas

Clinical diagnoses % (n)	92.9 (39)
Cellulitis	7.1(3)
Erysipelas	
Cellulitis frequency % (n)	88.1 (37)
Those with the first episode	11.9 (5)
Those with recurrent episodes	
The location of the lesions % (n)	88.1 (37)
Lower extremities	7.1 (3)
Upper extremities	4.8 (2)
Face	
Cases according to body mass index % (n)	26.2 (11)
Normal weight (18.5-24.9)	21.4 (9)
Overweight (25-29.9)	42.9 (18)
Obese (30-39.9)	9.5 (4)
Morbid obese $\geq 40$	
The first measured body temperature % (n)	33.3 (14)
$\geq 38.3$	66.7 (28)
$< 38.3$	
Presence of a facilitating skin lesion % (n)	24 (10)
No lesion	16.7 (7)
Traumatic wound	45.2 (19)
Superficial fungal infection	14.4 (6)
Chronic lymphedema	
Complications % (n)	0 (0)
Deep vein thrombosis	7.1 (3)
Abscess formation	4.8 (2)
Skin necrosis	

**Table 3** Laboratory features of patients with cellulitis / erysipelas

Number of leukocytes ( $\mu\text{l/ml}$ )	12.735 $\pm$ 5.238 (min-max:3.490-26.590)
Neutrophil percentage	67.3 $\pm$ 16.5 (min-max:12.4-90.8)
C reactive protein (mg/L)	81.1 $\pm$ 70 (min-max:8.7-228)
Erythrocyte sedimentation rate (mm/hour)	52.1 $\pm$ 17.9 (min-max:19-92)
Fasting blood sugar (mg/dl)	184.8 $\pm$ 101.9 (min-max:85-431)
Albumin (g/dl)	3.6 $\pm$ 0.6 (min-max:2.6-4.4)

was detected in 5 (11.9%) of the cases. Chronic lymphedema was present in the lower extremity in 1 patient who was operated for hip replacement and 4 patients with morbid obesity and in the upper extremity in 1 patient with mastectomy.

The average time between the onset of complaints and the initiation of antibiotherapy was 3.6 $\pm$ 1.7 (min-max: 1-10) days. There was a statistically significant correlation between the time before initiation of antibiotherapy and length of stay in hospital ( $r=0.436$ ,  $p=0.004$ ). It was found that intravenous ampicillin sulbactam treatment was started in all patients during their hospitalization. 78.6% ( $n=33$ ) of the cases were administered ampicillin-sulbactam 1.5 gram for 4 times a day and 21.4% of the cases were administered ampicillin-sulbactam 1 gram for 4 times a day. In 5 cases with recurrent episodes, ciprofloxacin 2x750 mg oral treatment was given simultaneously with ampicillin sulbactam. All patients were given intravenous antibiotics during their hospital stay. When the length of hospital stay was evaluated, the average length of hospital stay for those who had an episode for the first time was 8.6 $\pm$ 2.9 (min-max: 4-20) days. The mean length of hospital stay in patients with recurrent attacks was 8.6 $\pm$ 3.1 (min-max: 7-14) days. When the two groups were evaluated in terms of length of hospital stay, there was no statistically significant difference between them ( $p=0.997$ ).

## Discussion

Cellulitis and erysipelas which are common in society are acute bacterial infections of lymphatics that are located in the superficial and deep dermis. In a study involving 416 patients diagnosed with cellulitis which is conducted by Dong et al., the average age of patients was reported to be 46 [4]. In a study conducted in our country, the average age of patients with cellulitis was reported to be 58.7, similar to the results of this study [5]. In the literature, different results have been obtained in studies evaluating gender in cellulitis patients. While the male/female ratio was equal in the study of Turhan et al., in the study of Karppelin et al., cellulitis was found to be higher in male gender [5,6]. In this study, the male/female ratio was 1.1. Erythema, edema, rise in temperature and tenderness, which are the cardinal signs of inflammation, are frequently seen in cellulitis/erysipelas clinic. The features that distinguish erysipelas, in which superficial dermis are affected, from cellulitis are erythema being vivid and bright and lesion border being well-defined. In studies conducted, redness, swelling and pain were the most common findings in cellulitis [4,6]. In this study, erythema and rise in temperature were present in all patients, while 81% of them described sensitivity.

This may be related to the fact that symptoms which can be seen disturb patients more. Fever, tachycardia, confusion, and hypotension are symptoms that may accompany skin findings [7]. In this study, fever was detected in 1/3 of the cases. In a study of patients with cellulitis, leukocytosis was found to be the most common laboratory finding. In addition to clinical findings, infection markers were investigated in the diagnosis of the disease. Among these, the average levels of white sphere, ESR and CRP were determined as high, while the neutrophil percentage and the average levels of albumin were determined within the reference ranges. It is known that ESR increases with increasing age. Considering the average age of the patients in the study group, it can be said that the levels of white blood cell and CRP being high has a stronger relationship with cellulitis/erysipelas. In a study in which 123 cellulitis patients were evaluated by Hadzovic et al., in 71% of the cases lower extremities are affected, in 12% upper extremities are affected, in 13% neck is affected, in 25% trunk is affected. In this study, in 81% of the cellulitis/erysipelas cases, the disease was located in the lower extremities. In a study conducted by Pavlotsky et al. in patients with erysipelas, it was found that erysipelas mostly affects the lower limbs and to a lesser extent it affects the head and upper limbs [8]. In this study, in 66.6% of erysipelas cases, the disease was located on the patients' face. This situation may be related to the fact that erysipelas on the lower extremities are misdiagnosed with cellulitis, due to their similar clinical appearances. Abscess formation, skin necrosis, and deep vein thrombosis are local complications of cellulitis. In this study, abscess formation was seen in 3 cases, skin necrosis was seen in 2 cases, and deep vein thrombosis was not seen in any case. In a study conducted by Pitche et al., risk factors associated with abscess formation in cellulitis patients in African countries were investigated. Delayed antibiotic therapy and nicotine addiction have been identified as major risk factors [2]. In this study, the time before initiating antibiotherapy in patients with abscess was 5.7 days and was above the study average. In a study by Lewis et al. smoking was identified as an independent risk factor for cellulitis [9]. In a study done in our country by Mehdi et al., percentage of smoking and alcohol use in patients with cellulitis were similar to Turkey's average of percentage [10]. In this study,

it was determined that 38.1% of the cases smoked cigarette or Maras weed while there was no alcohol and drug users. Maras weed is a form of smokeless tobacco widely used in the Eastern Mediterranean region, and its nicotine content is 6-10 times higher than cigarette [11]. Smoking and Maras weed use was found high in patients with cellulitis in this study. Inflammatory destruction of the lymphatic ducts, followed by the development of lymphedema, is the main element in the pathogenesis of recurrent cellulitis/erysipelas [12]. In this study, all patients with recurrent cellulite episodes had chronic lymphedema. Lymphedema makes it easier for cellulitis to occur. It also occurs as a result of cellulitis. In a case-controlled study, predisposing factors for cellulitis were investigated. In multivariate analysis, chronic edema of the limb, disintegration of the cutaneous barrier, and obesity were independently associated with acute cellulitis [5]. In another study conducted in our country, diabetes, lymphedema and tinea pedis were identified as the main risk factors for cellulitis [10]. Apart from all these, venous insufficiency, saphenectomy, history of cellulitis and impaired skin integrity have also been shown as risk factors for first and recurrent episodes [12]. In a study conducted by Carratala et al., similar to our study, diabetes was found to be the most common comorbidity associated with cellulitis [13].

Considering the facilitating factors for cellulitis to occur; in this study, using cigarette and maras weed, obesity, diabetes, the history of surgery which may lead to venous or lymphatic insufficiency, chronic lymphedema, and superficial fungal infection were highly detected among the patients with cellulitis. Group A  $\beta$ -hemolytic streptococci and *Staphylococcus aureus* are the most common etiologic agents for cellulitis/erysipelas. In studies conducted in pediatric and adult patients with cellulitis, blood culture positivity was reported as 2% [14,15]. In this study, no blood culture was used to isolate the factor and empirical treatment was given. When looking at cellulitis treatment in the literature, it has been shown that antibiotics from many different groups such as cefazolin, ampicillin-sulbactam,

dicloxacillin, nafcillin, cefuroxime, cephalexin, erythromycin, clindamycin, doxycycline and vancomycin are effective in treatment [16]. In this study, i/v ampicillin sulbactam treatment was given to all patients and in a few cases it was combined with ciprofloxacin. In a study in which 122 cellulitis cases were evaluated retrospectively, the duration of hospitalization of patients varied between 3-29 days, but it was reported as an average of 10.2 days [17]. In this study, similar to the literature, the average length of hospital stay in all patients was 8.6 $\pm$ 2.9 days and it was 4 days at least and 20 days at most for a patient. We think that wet dressing and leg elevation, which are performed effectively in our clinic, also contributed to treatment in a positive way. In a study investigating the factors affecting the length of hospital stay, it was concluded that advanced age, living alone, lymphedema, ulcer in the affected area and high creatinine levels were effective on the length of hospital stay [18]. In this study, it was observed that the length of hospital stay increased as the time between onset of complaints and initiation of antibiotherapy extends. For patients who clinically improved in less than 10 days, the treatment was continued after discharge with oral amoxicillin clavulanate 3x1 gram with total duration of antibiotherapy is completed to 10 days. In the study conducted by Figtree et al., risk factors related to mortality were investigated in the patients who hospitalized with the diagnosis of cellulitis. In the study in which 395 cases were evaluated retrospectively, the mortality rate was found to be 2.5% [19]. None of the cases followed up in this study had any death due to cellulitis or its complications.

Cellulitis is a skin and soft tissue infection that is frequently seen in the society and if it is not managed well, there could be complications. Having more information about the risk factors and complications related to the disease will contribute to the management of the disease.

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