# DETECTED FREQUENCY OF BACTEREMIA IN DECUBITUS ULCER WOUNDS AND FACTORS AFFECTING DECISIONS TO TREAT

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#### Abstract

Aim: Decubitus ulcers are a significant cause of morbidity and mortality, and a source of considerable expense in health expenditures. Bacteremia is a frequently seen complication of decubitus ulcers, although its incidence has yet to be well defined, and there are scarce studies on the subject. The aim in the present study is to assess the frequency of bacteremia of decubitus ulcer origin as an indicator in decisions to start systemic antibiotics in patients with decubitus ulcers. Material and metods: Included in the study were all patients over the age of 18 years receiving palliative care in hospital, and with a decubitus ulcer. All decubitus wounds were washed with sterile saline and a sample was taken using a sterile cotton swab from the deepest and the most solid part of the wounds. we included 76 patients whose 40 (52.6%) were male and 36 (47.4%) were female, with a mean age of  $70.8\pm15.6$  (18-95) years. Among the 76 patients, 75 (65.2%) had decubitus ulcer infections at 115 different sites of the body. Result: The rate of bacteremia in decubitus ulcers was 13.9% (16/115), and the agents were found to be polymicrobial in the wound cultures of 42 (55.2%) of the patients. The most common accompanying bacteria were acinetobacter, Pseudomonas aeruginosa and E.coli. Among the decubitus ulcers, 49 (42.6%), 60 (52.4%) and 6 (5.2%) were evaluated as stage 4, 3 and 2 decubitus ulcers, respectively. Conclusion: The causative agent of decubitus infections was found to be the agent causing bacteremia in 13.9% of the patients with decubitus ulcers in the present study. The agent growing in the wound culture was rarely found to be the causative agent of bacteremia when deciding whether to treat decubitus ulcer infections.

Detected Frequency Of Bacteremia In Decubitus Ulcer Wounds And Factors Affecting Decisions To Treat

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Introduction: Decubitus ulcers are a significant cause of morbidity and mortality, and a source of considerable expense in health expenditures. Bacteremia is a frequently seen complication of decubitus ulcers, although its incidence has yet to be well defined, and there are scarce studies on the subject. The aim in the present study is to assess the frequency of bacteremia of decubitus ulcer origin as an indicator in decisions to start systemic antibiotics in patients with decubitus ulcers.

Material and metods: Included in the study were all patients over the age of 18 years receiving palliative care in hospital, and with a decubitus ulcer. Decubitus wound samples of the patients were taken within the first 24 hours of admission to the hospital. All decubitus wounds were washed with sterile saline and a sample was taken using a sterile cotton swab from the deepest and the most solid part of the wounds. we included 76 patients whose 40 (52.6%) were male and 36 (47.4%) were female, with a mean age of  $70.8\pm15.6$  (18-95) years. Among the 76 patients, 75 (65.2%) had decubitus ulcer infections at 115 different sites of the body.

Result: The rate of bacteremia in decubitus ulcers was 13.9% (16/115), and the agents were found to be polymicrobial in the wound cultures of 42 (55.2%) of the patients. The most common accompanying bacteria were acinetobacter, Pseudomonas aeruginosa and E.coli. Among the decubitus ulcers, 49 (42.6%), 60 (52.4%) and 6 (5.2%) were evaluated as stage 4, 3 and 2 decubitus ulcers, respectively.

Conclusion: The causative agent of decubitus infections was found to be the agent causing bacteremia in 13.9% of the patients with decubitus ulcers in the present study. The agent growing in the wound culture was rarely found to be the causative agent of bacteremia when deciding whether to treat decubitus ulcer infections.

# INTRODUCTION

The term "decubitus ulcer" refers to localized tissue damage in the skin or subcutaneous tissue resulting from tears and/or friction, generally together with pressure in areas of bone protrusion. Decubitus ulcers

can develop in any area where bone protrusions are exposed to pressure, and develop most frequently on the sacrum, coccyx or heels in supine position, on the hips and ankle joints of patients lying continuously on the same side, and most frequently on the hips in the sitting position. [1] They are commonly found on bedridden patients with comorbidities or on those with limited mobility. The prevalence of decubitus ulcers has been reported in the range of 4.7–37.1%. [2], and 11.7% in every 1000 day of hospitalisation in the intensive care units of hospitals. [3] The same rate is found to be 8.5% in long-term nursing homes, and has been reported to be up to 33% in palliative care centers in Turkey [4]. The prevalence of decubitus ulcers in hospitalized geriatric patients has been reported to be 5.8% [2]. Decubitus ulcers are a significant cause of morbidity and mortality, and a source of considerable expense in health expenditures [3].

It is a significant health problem in long-term bedridden patients, lowering their quality of life, despite the development of various preventive and treatment methods [5]. Bacteremia is a frequently seen complication of decubitus ulcers, although its incidence has yet to be well defined, and there are scarce studies on the subject [5-7].

Studies investigating the bacteremia associated with decubitus ulcers are rare, and ulcers mostly could not be documented as the source of bacteremia [6, 8]. Decubitus ulcers may not be the focus of bacteremia, since many of the factors that could cause a growth in blood cultures are already present in this patient group (vascular access, catheters and tracheostomy, etc.) [3]. The detection of the causative agent can aid in antibiotic selection and when making the decision whether or not to treat decubitus ulcer infections. The causative agent is not always singular, and colonized bacteria are mostly detected, and there is therefore a lack of consensus whether or not to administer antibiotics every time a growing agent is detected in the culture. Systemic antibiotics are suggested for use in the presence of systemic signs such as a positive blood culture, cellulitis, fasciitis, osteomyelitis and sepsis, according to the International Pressure Wound Prevention panel. [9, 10]

The aim in the present study is to assess the frequency of bacteremia of decubitus ulcer origin as an indicator in decisions to start systemic antibiotics in patients with decubitus ulcers. The aim in this regard is to demonstrate how frequent the agent causes a growth in the decubitus ulcer when deciding to treat it with systemic antibiotics.

### MATERIALS AND METHOD

The study was launched after permission was granted by the Republic of Turkey, Health Sciences University, Erzurum Region Education and Research Hospital, dated February 11, 2018 and numbered 37732058-514.10. Included in the study were all patients over the age of 18 years receiving palliative care in hospital, and with a decubitus ulcer. Decubitus wound samples of the patients were taken within the first 24 hours of admission to the hospital. All decubitus wounds were washed with sterile saline and a sample was taken using a sterile cotton swab from the deepest and the most solid part of the wounds. Patients using local antibiotics for wound treatment were excluded from the study, as were patients with a positive urine, catheter or tracheal aspirate culture.

### Statistical analysis

All statistical analyses were performed using IBM SPSS Statistics (Version 22.0. Armonk, NY: IBM Corp.) software. A p-value of <0.05 was considered statistically significant. Demographic data were presented as frequencies and percentages, and continuous variables were presented as mean and standard deviation (SD). For the descriptive analyses, mean and SD were used for continuous variables, and percentages for categorical variables.

# Results

A total of 76 patients hospitalized in 2018 in the Palliative Care Service with various diagnoses, and who had clinical findings of decubitus ulcers during hospitalization and a positive wound swab culture that was considered clinically significant, were included in the study. Among these patients, 40 (52.6%) were male and 36 (47.4%) were female, with a mean age of  $70.8\pm15.6$  (18-95) years. Among the diagnoses of the patients, Alzheimer's disease, CVA and cancer were the most frequently encountered. The distribution of the diagnoses of the patients is presented in Table 1.

Among the 76 patients, 75 (65.2%) had decubitus ulcer infections at 115 different sites of the body. As expected, ulcers were generally found at the sacrum, costa and hips. The distribution of decubitus ulcer infections in terms of location are presented in Table 2. The rate of bacteremia in decubitus ulcers was 13.9% (16/115), and the agents were found to be polymicrobial in the wound cultures of 42 (55.2%) of the patients. The most common accompanying bacteria were acinetobacter, Pseudomonas aeruginosa and E.coli.

Among the decubitus ulcers, 49 (42.6%), 60 (52.4%) and 6 (5.2%) were evaluated as stage 4, 3 and 2 decubitus ulcers, respectively.

The microorganisms identified in the decubitus ulcer and blood cultures are presented in Table 3.

### DISCUSSION

Decubitus ulcers are prone to infection, and the growing agent varies according to the location, and may frequently be polymicrobial. The most commonly isolated bacteria are staphylococci, enterococci, Proteus mirabilis, Escherichia coli and P. aeruginosa; along with anaerobic bacteria, peptostreptococci, Bacteriodes fragilis and clostridium species. Bacteria on the surface of the skin may invade the underlying tissue and cause infection. Signs of sepsis and cellulitis, and osteomyelitis due to sepsis, may be seen [4, 8].

The diagnosis of decubitus ulcer infection is challenging. A good microbiological and clinical evaluation, in addition to imaging studies and deep tissue biopsy, are recommended [11]. A clinical examination is important for the determination of decubitus ulcers as occult foci of infection. Increased temperature, erythema, local tenderness, bad odor and purulent discharge are valuable signs during a clinical evaluation. Although tissue biopsy samples and aspiration fluid cultures have been recommended for the microbiological diagnosis of decubitus ulcer infection, they are not generally preferred due to the difficulty in clinical use and their invasive nature [4, 11]. The obtaining of bacterial swab cultures is a noninvasive procedure that provides preliminary knowledge on the bacterial density of the wound. Surface wound cultures show colonization rather than infection, although the colonizing bacteria may cause local infection if they continue to proliferate, delaying wound healing [12]. The rate of bacteremia due to the decubitus ulcers was found to be 13.9% in our study, but was reported to be higher in another study [3]. This difference may be attributable to the stages of the wounds in the studies, as the frequency of bacteremia may be higher in advanced stages. There was a large number of patients with stage 3 wounds in the present study.

Bacterial contamination on the surface of decubitus ulcers is common, and such contaminations, in turn, may lead to serious life threatening problems such as bacteremia and sepsis by diffusing into deep tissues, resulting in infection [4]. Bacteremia due to decubitus ulcers should be considered in patients presenting with fever and with no other focus of infection. The optimum approach to the diagnosis of wound site infection is tissue biopsy or aspiration [13]. Sterile swabs were used in this present study, given their non-invasive ease of use.

The most common colonizing microorganisms in decubitus ulcers are gram negative bacteria such as acinetobacter baumanni, pseudomonas aeruginosa and enterobacteriaceae, and staphylococcus aureus. The frequency of infection and/or colonization by microorganisms with multi-drug resistance is increasing gradually in decubitus ulcers. Aerobic cultures generally reveal methicillin resistant S. aureus or multi drug resistant gram negative bacilli, and may lead to local and systemic infection [12].

The sacrum was the most common location for decubitus ulcers in the present study, concurring with other studies in literature [8, 14, 15]. The reason for this may be the elevated head position of patients due to alleviate the risks associated with aspiration. The risk of infection has been reported to be high in stage 3–4 decubitus ulcers [4]. In line with previous studies, most decubitus ulcers were found to be stage 3 [4]. Due to the high risk of infection, the prevention of colonization in stage 3 and 4 decubitus ulcers may decrease the risk of infection and bacteremia.

Decubitus ulcer-associated bacteremia was identified in 16 of the 21 patients in the study by Jeffrey et al. [7], while decubitus ulcer-associated bacteremia was found in six out of the 27 patients with decubitus ulcers in the study by Peromet et al. [16]. The rate of bacteremia in decubitus ulcers was 53,6%. [3]

In our study, the incidence of polymicrobial bacteremia was found to be increased in accordance with the literature. [6-8].

No clinical or epidemiological sign is present for the prediction of the causative agent of bacteremia in chronic wounds, since the local infection of decubitus ulcers is polymicrobial, and the risk of colonization with new microorganisms is high. Microorganisms of the flora may grow in the cultures. [17] Accordingly, as a starting antibiotherapy, agents with antimicrobial effects against staphylococcus aureus, gram negative enteric bacilli and anaerobic microorganisms, including Bacteroides fragilis, taking into account also local resistance rates, should be considered [14]. Antibiotic treatment should be adjusted based on blood culture results. [8]

The most commonly isolated bacteria were gram negative enteric bacteria (klebsiella and e. coli), followed by staphylococcus aureus in second place, and pseudomonas and acinetobacter in third place. A vast majority of the patients were transferred from hospital beds and had previously been admitted to the intensive care unit. In addition to the bacteria that cause bacteremia, many factors such as the patient's age, immune status, comorbid conditions, feeding, hospitalization period, frequency of interventional procedures etc. are effective. [18].

### **CONCLUSION:**

Decubitus ulcers are a significant cause of mortality in long-term bedridden patients, with the most common causative agents being gram negative enteric bacteria, staphylococcus aureus, pseudomonas aeruginosa and acinetobacter baumannii. The recommended criteria for the start of treatment in such patients is the presence of systemic signs or positive blood cultures. The causative agent of decubitus infections was found to be the agent causing bacteremia in 13.9% of the patients with decubitus ulcers in the present study.

The agent growing in the wound culture was rarely found to be the causative agent of bacteremia when deciding whether to treat decubitus ulcer infections. Accordingly, we recommend that the identification of the agent causing the decubitus ulcer infection through a swab culture alone should not be a determinant.

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Table 1. Distribution of the Diagnosis of the Patients and Laboratory Findings

	n	%
Age(Year)	70,8	$\pm 15.6$
Sex(Male)	40	% 52.6
Cerebrovascular Accident	28	$36,\!84\%$
Neurodegenerative Diseases (Alzheimer's, Parkinson Etc.)		$26,\!32\%$
Cancer	9	11,84%
Amyotrophic Lateral Sclerosis	4	5,26%
Peripheral Vascular Diseases	4	5,26%
Trauma-Fracture	4	5,26%
Chronic obstructive pulmoner disease	3	3,95%
Heart Failure	2	$2,\!63\%$
Multiple Sclerosis	1	$1,\!32\%$
Botulism Intox	1	$1,\!32\%$
	76	100,00%
	mean	$\pm sd$

	n	%
Hospitalisation Day	62.17	79,48
Urinary Catheter (yes)	54	71
Cantral Venoz Catheter(yes)	38	50
Tracheostomy (yes)	39	$51,\!3$
White Blood Cell $(x10^3 mm^3)$	10,98	$5,\!42$
Hemoglobin $(gr/dl)$	11,07	$2,\!30$
Platelets $(x10^3 mm^3)$	296.071	128,70
Albumine (gr/dl)	2,82	0,52
Creatinine (mg/dl)	0,88	$0,\!58$
Blood Urea Nitrogen(mg/dl)	$28,\!45$	$22,\!48$
Vitamine D(ng/ml)	20,56	$25,\!54$
C Reactive Protein (mg/dl)	51.92	$52,\!33$
Proteine(gr/dl)	$5,\!88$	0,94

Table 2. Decubitus ulcer locations

Sacrum	55 (%48)
Costa	13 (%12)
Hip	16 (% 14)
Heel	13~(%12)
Leg	15~(%13)
Scalp	3(%1)
Total	115 (%100)

Table 3. Microorganisms identified in ulcer and blood cultures.

MICROORGANISMS	ulcer culture	blood culture	bacteremia
Escherichia coli	12	2	2
Proteus spp.	2	1	1
Klebsiella spp.	8	3	3
Serratia spp	1	-	-
Pseudomonas aeruginosa	18	4	2
Acinetobacter baumannii	14	5	2
Stenotrophomas maltophilia	1	1	1
Enterococcus spp.	5	3	1
Staf. aureus	7	5	4
Staf. epidermidis	4	3	-
Staf. haemolyticus	2	9	-
Candida albicans	1	3	-
Candida Parapsilosis	-	6	-
Staf Cohnii	-	2	-
Staf Simulans	-	2	-
Corynebacterium Macruthotii	-	1	-
burkholderia gladioli		2	
Toplam	75	52	16