

Bacterial Patterns, Resistance and Susceptibility to Antibiotic in Patients with Cellulitis

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Abstract : Cellulitis is an infection of the skin and it's underlying tissue with the most often caused by infection of group A Streptococcus or *Staphylococcus aureus*. Patients visited or hospitalized in Adam Malik Hospital for cellulitis between Januari 2013 and September 2016 were included in this retrospective review. The total cases of cellulitis were 62 cases, most of them were male (69,4%), and the most common age were between 40-60 years old (56,5%). The most commonly involved site was the lower extremities (83,8%), followed by upper extremities (8,1%) and face (8,1%). The specimen of the lesion from 21 cases were cultured, of which 28,9% were *Staphylococcus aureus*, 9,5% were *Staphylococcus haemolyticus* and 9.5% were *Pseudomonas aeruginosa*. Isolates were 100% resistance to amoxicilin, piperacillin, carbenicillin and susceptible to vancomycin (92%), tygecyclin (82%) and meropenem(72%). *Staphylococcus aureus* was 100% resistanceto amoxicillin, piperacillin and carbenicilin but still susceptible to vancomycin (100%), tygecyclin (100%) and meropenem (66,7%).

Keywords : cellulitis, resistance, susceptibility, *Staphylococcus aureus*.

Introduction:

Cellulitis is an acute infection of the dermal and subcutaneous layers of the skin, often occurring after a local skin trauma^{1,2,3}. Aetiology is variable from gram-positive to gram-negative bacteria³. *Staphylococcus aureus* and grup A Streptococcus are the most common cause^{4,7}.

Cellulitis is a significant problem affecting hospitalized patients. In the United states in 2010, over 600.000 patients were admitted to the hospital for the evaluation and management of cellulitis, costing the healthcare system \$3.7 billion in 2004. In addition, patient admitted to the hospital with cellulitis stay a mean 7,1 days⁸.

European guidelines recommended penicillin as the initial standard treatment for simple community-acquired erysipelas and cellulitis, while coverage for methicillin-resistant *Staphylococcus aureus*(MRSA) should be considered in peculiar setting².

With increased antibiotic exposure or prolonged hospitalization, patients are at increased for infection with resistant organism. Recognition of the potential for resistant organism can assist in guiding appropriate selection of antibiotic therapy⁹.

Patients and Methods

The study was conducted retrospectively based on medical records from Department of Dermatology and Venereology, Adam Malik Hospital, Medan, Indonesia with the diagnosis of cellulitis from Januari 2013 to September 2016. We recorded data of total cellulitis cases, sex, age and site of involvement. Microbiology data including result of blood cultures and swabs from either infected or uninfected areas were all recorded.

Result and Discussion

The total of 62 patients with cellulitis were visited or hospitalized on dermatology ward during the period of studied. Forty three (69,4 %) were male and 19 (20,6%) female. The male to female ratio was 2.23:1. The previous study found 83 patients (41,5%) were female and 117 patients (58,5%) were male⁶. There was no significant sex-related differences^{6,10}.

On analyzing the frequency of disease by age group, cellulitis were most common in patient aged 40 to 60 year (35 cases), followed by patient aged over 60 years (13 cases), aged 0-20 years (9 cases) and finally those aged 20 to 40 years. Other study found the average age was 58 years (range 14-95 years)⁶.

Tabell1. Patients characteristic

	Year				Total (%)
	2013	2014	2015	2016	
Gender					
Male	11	16	9	7	43 (69,4 %)
Female	6	11	1	1	19 (20,6%)
Aged					
0-20	4	3	2	0	9 (14,5%)
20-40	0	2	1	2	5 (8%)
40-60	11	17	3	4	35 (56,5%)
>60	2	5	4	2	13(21%)

Tabel 2. Distibution of cellulitis indifferent site

Site of cellulitis	Years				Total (%)
	2013	2014	2015	2016	
Face	1	1	0	3	5 (8,1%)
Trunk	0	0	0	0	0 (0%)
Upper extremity	2	1	1	1	5 (8,1%)
Lower extremity	14	25	9	4	52 (83,8%)

The most commonly involved site was the lower extremities (83,8%), followed by upper extremities (8,1%) and face (8,1%). Our study confirm that mostly cellulitis affect the lower limbs similar to previous studies which have reported lower limb involvement at time in excess of 76,2 %¹⁰. An important role in the pathogenesis of leg cellulitis seems to be played by cutaneous fungal infection of the foot¹¹. Such infections may favour penetration of bacteria through the skin, and their treatment is of value to prevent recurrent infections. Therefore, a microbiological diagnosis of foot fungal infection may be included as a routine practice in all cases of recurrent leg cellulitis.^{6,12,13} Cutaneous colonization with methicillin-resistant *S. aureus* (MRSA) is a risk factor for the development of infection due to such micro-organism^{6,11}.

Tabel 3. Bacterial pattern of micro-organism isolated from skin lesion in patient with cellulitis

Micro-organism	Type of specimen		No. isolates
	Pus (n)	Swab (n)	n (%)
<i>Staphylococcus aureus</i>	6	0	6 (28,5%)
<i>Staphylococcus haemolyticus</i>	2	0	2 (9,5%)
<i>Pseudomonas aeruginosa</i>	1	1	2 (9,5%)
<i>Klebsiella pneumonia</i>	2	0	2 (9,5%)
<i>Staphylococcus hominis</i>	1	0	1 (4,7%)
<i>Staphylococcus epidermidis</i>	1	0	1 (4,7%)
<i>Acinetobacterbaumanni</i>	0	1	1 (4,7%)
<i>Proteus vulgaris</i>	1	0	1 (4,7%)
<i>Kocuriakristinae</i>	1	0	1 (4,7%)
<i>Citrobacterfreundii</i>	1	0	1 (4,7%)
<i>Enterobacter cloacae complex</i>	0	1	1 (4,7%)
<i>Sphingomonaspaucimobilis</i>	1	0	1 (4,7%)
<i>Stenotrophomonasmaltophilia</i>	1	0	1 (4,7%)
Total	18	3	21 (100%)

The specimen of the lesion from 21 cases were cultured and *S. aureus* was the organism isolated in the greatest number. We also found 3 other varieties of staphylococcus: *S. haemolyticus*, *S. Hominis* and *S. Epidermidis*. The last micro-organism often considered as skin contaminant⁵. Similar findings were reported that *S. aureus* accounted for 51% cases of cellulitis compared with only 27% for group A Streptococcus⁵.

Tabel 4. Resistance pattern of isolate to antibiotic

Type of antibiotic	Resistant isolate n	Percentage (%)
Amoxicilin	12/12	100
Piperacillin	10/10	100
Carbenicillin	10/10	100
Cefazolin	13/17	76
Ciprofloxacin	13/19	68
Erythromycin	7/11	64
Clindamycin	7/11	64
Oxacillin	7/11	64
Ceftazidime	11/18	61
Levofloxacin	12/20	60

Table 5. Resistance pattern of 3 most common microorganism to antibiotic

Type of antibiotic	<i>S. Aureus</i> n=6		<i>S. haemolyticus</i> n=2		<i>P. Aeruginosa</i> n=2	
	R	S	R	S	R	S
Amoxicillin	6	0	2	0	0	0
Piperacilin	6	0	2	0	0	0
Carbenicilin	6	0	2	0	0	0
Cefazolin	2	4	2	0	2	0
Ciprofloxacin	2	4	1	1	2	0
Erythromycin	2	4	2	0	0	0
Clindamycin	2	4	2	0	0	0
Oxacillin	2	4	2	0	0	0
Ceftazidime	2	4	2	1	1	1
Levofloxacin	2	4	2	0	1	1

R :resistance S:susceptible

The isolates were 100% resistance to amoxicillin, piperacillin and carbenicillin. *S. aureus* was 100% resistance to amoxicillin, piperacillin, carbenicillin, and 33% resistance to cefazolin and ciprofloxacin. Unlike penicillinase-mediated resistance, which is narrow in its spectrum, methicillin resistance is broad beta lactam antibiotic class resistance to penicillins, cephalosporin and carbapenem¹⁴.

The incidence of infection caused by MRSA has been steadily increasing. MRSA now account for approximately 60% of all *S. aureus* isolate from nosocomial infection in the US¹⁵.

Table 6. Susceptibility pattern of isolate to antibiotic

Type of antibiotic	Susceptible isolate n	Percentage (%)
Vancomycin	9/10	90
Tigecyclin	14/17	82
Meropenem	13/18	72
Tetracyclin	7/11	64
Ertapenem	8/14	57
Gentamycin	12/21	57
Piperacillin-tazobactam	10/19	53
Ofloxacin	6/12	50
Trimethoprim-sulfamethoxazole	9/18	50
Cefotaxim	6/13	46

Table 7. Susceptibility pattern of 3 most common microorganism to antibiotic

Type of Antibiotic	<i>S. Aureus</i> n=6		<i>S. haemolyticus</i> n=2		<i>P. Aeruginosa</i> n=2	
	R	S	S	S	R	S
Vancomycin	0	6	0	2	0	0
Tigecyclin	0	6	0	2	2	0
Meropenem	2	4	2	0	2	0
Tetracyclin	3	3	1	1	0	0
Ertapenem	2	4	2	0	0	0
Gentamycin	2	4	2	0	1	1
Piperacillin-tazobactam	5	1	2	0	0	2
Ofloxacin	2	4	2	0	0	0
Trimethoprim sulfamethoxazole	1	5	1	0	2	0
Cefotaxim	2	4	2	0	0	0

R : resistance S:susceptibility

The isolates were susceptible to vancomycin (100%), tigecyclin (82%) and meropenem (72%). *S. aureus* was susceptible to vancomycin (100%), tigecyclin (100%) and meropenem (66,7%).

Meropenem is active against methicillin susceptible *S. aureus* and most strain of methicillin susceptible coagulase-negative staphylococcus. However meropenem has poor activity against MRSA and methicillin-resistant coagulase-negative staphylococcus¹⁵.

Vancomycin has been considered to be the reference standard for the treatment of invasive MRSA infection as a result of its relatively clean safety profile; its durability against the development of resistance¹⁶.

Conclusion

The most common identified cause of cellulitis is *S. Aureus* and there is increasing incidence of *S. Aureus* resistance to antibiotic. However *S. aureus* still susceptible to vancomycin, tygecyclin and meropenem.

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