Original Article

Microbiological Profile and Antimicrobial Resistance in Burn Unit of Ramathibodi Hospital

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Background: Infection of burn patients remains a major challenge due to an immunocompromised state and prolonged hospitalization. Knowing bacteriology and antibiotic susceptibility would therefore facilitate tailored management of infection in the Burn Unit.

Objective: To investigate microbiological profile and antimicrobial resistance in the Burn Unit, Ramathibodi Hospital.

Materials and Methods: A retrospective review of patients admitted to the Burn Unit was conducted during a two-year period (June 2019 to May 2021). Demographic data of infected and non-infected patients were collected including percentage of total body surface area (%TBSA), number of operations, length of hospital stay, and mortality. Bacterial isolates were cultured from burn wounds and blood. Antibiotic resistant profile of all common pathogens was analyzed.

Results: A total of 49 burn patients were included. There were 33 patients (67.3%) in the infected group and 16 patients (32.7%) in the non-infected group. Infected patients had larger burn sizes (25.5 vs. 4.0 %TBSA, p=0.001) and required more operations (4 vs. 0.5, p=0.008) and longer hospitalization (36 vs. 11.5 days, p<0.001). Nevertheless, mortality of both groups was not significantly different (9.1% vs. 0%, p=0.213). Of all 212 bacterial isolates, the common organisms from the wounds were *Pseudomonas aeruginosa* (25.0%), *Klebsiella pneumoniae* (20.8%), and *Enterococcus faecalis* (16.5%). The common pathogens from 16 isolates of hemocultures were *coagulase-negative staphylococcus* (12.5%), *Klebsiella pneumoniae* (12.5%), and *Proteus mirabilis* (12.5%). *Acinetobacter baumannii* and *Pseudomonas aeruginosa* were two majority of multiple-drug resistant organisms (MDROs). These two strains were resistant to most antibiotics. However, colistin was still effective against the MDROs.

Conclusion: The present study reviewed the prevalence of bacterial infection obtained from burn wounds and hemocultures to determine the bacteriological profile and antibiotic resistant patterns. This knowledge help improve decision making for appropriate antibiotic prescription in the Burn Unit.

Keywords: Wound infection; Sepsis; Bacteriological profile; Antibiotic resistance; Multiple-drug resistance

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Burns are one of the most common mechanism of trauma. High percentage of total body surface area percentage (TBSA%) is directly associated with increased morbidity and mortality[1]. Advancement in burn care including fluid resuscitation, wound management, respiratory care, and nutritional support, drastically improves morbidity and survival of burn patients. However, burn wound infection and sepsis are still issues of concern since a high rate of sepsis in burns and more than 50% of burn-related death from septic shock have been reported[2].

Burn wound infection is the primary cause of sepsis on the grounds that the skin barrier is severely destroyed[3]. Inhibition of both innate and adaptive immune responses further deteriorates body defense mechanisms predisposing patients to sepsis and death[3,4]. High incidence of nosocomial infection of burn wound and bloodstream is also associated with iatrogenic factors including intensive monitoring and multiple operative procedures[5,6]. The outcomes of the burn patients depend extensively on appropriate treatment of infection[3].

In addition to adequate debridement and local wound care, selection of relevant antibiotic regimen for burn wound infection is particularly challenging as bacteriological profiles and resistant patterns are distinctive and varied among

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burn centers globally[5-9]. Multiple-drug resistant organisms (MDROs) are frequently found in the burn intensive care unit due to long-term use of antimicrobials[7,8,10,11]. *Pseudomonas aeruginosa*[7,11,12] and *Acinetobacter baumannii*[13] are among the most frequent Gram-negative MDROs in burn units, while the most common Gram-positive MDRO is *Staphylococcus aureus*[7,11-13]. These MDROs are sporadically resistant to most of available antimicrobial agents and pose significant threat in burn care.

Knowing bacteriology and antibiotic susceptibility would facilitate tailored management of burn patients. However, bacterial epidemiology has not been comprehensively studied in Burn Units in Thailand. In this regard, we aimed to reviewed the bacterial profile and antibiotic resistance patterns of burn wound isolates and hemocultures in the Burn Unit, Ramathibodi Hospital. This information could provide the background of burn infection and guide proper antibiotic prescription for the burn patients.

Materials and Methods

Study design and patients

A single-center retrospective review of burn patients was conducted during a two-year period from June 2019 to May 2021. Patients with any mechanisms of burn who admitted to the Burn Unit, Ramathibodi Hospital, Thailand, were recruited to the study following ethical clearance from Human Research Ethics Unit, Faculty of Medicine, Ramathibodi Hospital, Thailand (MURA2020/1990). Patients diagnosed with other skin diseases including toxic epidermal necrolysis, bullous pemphigoid, and paraneoplastic pemphigus, were excluded from the present study.

Demographic information including age, gender, burn area, burn mechanism, number of operations, length of hospital stay, and mortality, was collected from the electronic medical record. The burn area was calculated using Lund and Browder's chart[14]. Bacterial profile along with antibiotic susceptibility was reviewed from burn wound and bloodstream cultures.

Definition

Infected patients were defined by any positive bacterial cultures from burn wounds and/or peripheral/central blood samples. Patients with all negative cultures were classified as a non-infected group. The wound tissues were collected from sites with suspicious infection, such as wound edema, erythematous margins, thick yellow/green exudates, and discoloration of eschars. Hemocultures were collected from patients with systemic inflammatory response syndrome (SIRS) according to American Burn Association criteria[15].

Microbiology

Bacterial isolates from burn wounds were aerobically cultured in blood agar and MacConkey agar, and subsequently incubated in 35°C for three days. Culture in thioglycolate broth was also processed along with the agar media to identify anaerobic microorganisms in the samples. The anaerobic bacterial strain was determined within 15 days of incubation. Bacterial identification was obtained by matrix-assisted laser desorption/ionization time of flight mass spectrometry (MALDI-TOF-MS).

For hemoculture, 5 mL of blood was collected from peripheral and/or central venous catheters. Bacterial culture was performed using a standard BacT/Alert Virtuo system (BioM□rieux, Durham, NC, USA). Presence of the bacteria was reported within five days after incubation. The bacterial isolates were subcultured in blood agar, MacConkey agar, and chocolate agar. Identification of the bacterial species was performed using MALDI-TOF-MS.

Bacterial isolates from burn wounds and hemocultures were analyzed for antibiotic susceptibility according to their Gram strains using automated microbroth dilution testing systems (Sensititre™; Thermo Fisher Scientific, Cleveland, OH, USA). Cut-off levels of the antimicrobials were determined as stated by the Clinical and Laboratory Standards Institute (CLSI)[16].

Gram-positive and Gram-negative bacteria (including *Pseudomonas aeruginosa* and *Acinetobacter baumanii*) resistant to three or more tested antibiotics were classified as MDROs[17]. We also considered these following bacterial strains as MDROs: vancomycin-resistant *Staphylococcus aureus* (VRSA), vancomycin-intermediate *Staphylococcus aureus* (VISA), carbapenem-resistant Enterobacteriaceae (CRE), and extended-spectrum β-lactamase-producing Enterobacteriaceae (ESBL)[17].

Statistical analysis

Continuous variables were presented as median and interquartile range (IQR), and compared using Wilcoxon rank-sum (Mann-Whitney) tests. Categorical variables were expressed as number and percentages, and compared using Chi-square tests. All differences with p-value less than 0.05 were considered statistically significant. The statistical analyses were conducted using STATA version 14.1 (STATA Corp., TX, USA).

Results

Characteristics of burn patients

A total of 49 patients were included in the present study. A summary of patient characteristics is shown in Table 1. There were 16 patients (32.7%) in the non-infected group, and 33 patients (67.3%) in the infected group. A median age (23.5 vs. 30.0 years, p=0.529) and gender (75.0% vs. 60.6% male patients, p=0.321) were comparable. Burn area of the infected patients was significantly larger (25.5 vs. 4.0% TBSA, p=0.001). Infection was also associated with a higher number of operations (4 vs. 0.5, p=0.008) and longer length of stay (36 vs. 11.5 days, p<0.001). Nonetheless, a mortality rate between two groups was not significantly different (9.1% vs. 0%, p=0.213). Mechanism of burn in the non-infected patients was similar to that of infected patients (p=0.392). Flames were the primary cause of burn injury in both

Table 1. Characteristics of burn patients

	Non-infection	Infection	p-value
Patient number	16 (32.7%)	33 (67.3%)	
Age (years) (median, IQR)	23.5 (4.5, 36.5)	30.0 (16.0, 44.0)	0.529
Gender			0.321
Male	12 (75.0%)	20 (60.6%)	
Female	4 (25.0%)	13 (39.4%)	
%TBSA (median, IQR)	4.0 (1.0, 11.0)	25.5 (10.5, 47.5)	0.001
Mechanism of burn			0.392
Flame	12 (75.0%)	18 (54.5%)	
Scald	3 (18.8%)	9 (27.3%)	
Chemical	1 (6.3%)	2 (6.1%)	
Electrical	0 (0%)	4 (12.1%)	
Inhalation injury	4 (25.0%)	8 (24.2%)	0.954
Number of operations (median, IQR)	0.5 (0, 1.5)	4 (0, 7)	0.008
Length of hospital stay (days) (median, IQR)	11.5 (5, 21)	36 (23, 83)	<0.001
Mortality	0 (0%)	3 (9.1%)	0.213

IQR = interquartile range
Continuous variables were compared using Wilcoxon rank-sum (Mann-Whitney) test. Categorical variables were compared using Chi-square tests

non-infected (75.0%) and infected patients (54.5%). Inhalation injury was comparable in both groups (25% vs. 24.2%, p=0.954).

Microbiological profile of burn wounds and hemocultures

A prevalence of microorganisms cultured from burn wounds is demonstrated in Table 2. A total of 212 bacterial isolates were identified. Overall, Gram-negative bacteria cultured from the wounds were more prevalent than Gram-positive bacteria (155 vs. 57 isolates). The most common organism was *Pseudomonas aeruginosa* (25.0%) followed by *Klebsiella pneumoniae* (20.8%) and *Enterococcus faecalis* (16.5%). MDROs were found in 53 out of total isolates. Most of the MDROs identified from the burn wounds were Gram-negative pathogens (52 isolates). *Acinetobacter baumannii* (32.1%) and *Pseudomonas aeruginosa* (24.5%) were two most predominant MDROs.

Microbiological profile of bacteria from hemocultures was shown in Table 3. Distribution of both Gram-positive and Gram-negative bacteria were of equal proportions. Out of 16 isolates, Proteus mirabilis and *Acinetobacter baumannii* were the identified MDROs. None of Gram-positive MDROs were isolated from the hemocultures.

Antibiotic resistant patterns

Table 4 and 5 demonstrate antimicrobial resistant profile of common Gram-positive and Gram-negative bacterial isolates, respectively. *Enterococcus faecalis* was the most common Gram-positive bacteria in the Burn Unit. Resistant strains of *Enterococcus faecalis* were not evident, as they were sensitive to a wide range of tested antibiotics including penicillin (5.7%) and ampicillin (0%). *Enterococcus faecium* isolates showed a higher resistant profile. However, both *Enterococcus faecalis* and *Enterococcus faecium* isolates were not resistance to vancomycin. Isolates of viridans group streptococci were susceptible to all commonly used antimicrobial agents including penicillin, ampicillin, erythromycin, and levofloxacin.

Pseudomonas aeruginosa isolates were partially resistant to anti-pseudomonal β-lactams (16.7 to 46.3%), carbapenems (16.7 to 35.2%), and fluoroquinolones (35.2 to 50.0%). These isolates were more susceptible to amikacin (13.0%) and colistin (7.4%). Extensively drug-resistant and pandrug-resistant strains were not identified in the present study. Apart from cefepime (8.7%), *Klebsiella pneumoniae* isolates were moderately resistant to other cephalosporins (39.1 to 58.7%) and ampicillin (43.5%). Amoxicillin/clavulanic acid (21.7%) and piperacillin/tazobactam (19.6%) were also effective against *Klebsiella pneumoniae*. None of carbapenem-resistant *Klebsiella pneumoniae* strains were found in the present study. *Acinetobacter baumannii* isolates were resistant to piperacillin/tazobactam (90.9%), ampicillin/sulbactam (81.8%), ciprofloxacin (81.8%), and levofloxacin (40.9%). They were also broadly resistant to all carbapenems including meropenem 90.1%, imipenem 86.4%, and doripenem 86.4%. However, *Acinetobacter baumannii* isolates were still susceptible to colistin (4.5%). *Enterobacter cloacae* isolates showed resistance to

Table 2. Prevalence of microorganisms cultured from burn wounds

Species	Non-MDROs n=159 n (%)	MDROs n=53 n (%)	Total n=212 n (%)
Gram-positive bacteria			
Enterococcus faecalis	35 (22.0)	0 (0)	35 (16.5)
Enterococcus faecium	7 (4.4)	0 (0)	7 (3.3)
Other *Enterococcus spp.*	4 (2.5)	0 (0)	4 (1.9)
Viridans group streptococci	4 (2.5)	0 (0)	4 (1.9)
Corynebacterium striatum	2 (1.3)	0 (0)	2 (0.9)
Corynebacterium jeikeium	1 (0.6)	0 (0)	1 (0.5)
Staphylococcus aureus	1 (0.6)	0 (0)	1 (0.5)
Bacillus cereus	1 (0.6)	0 (0)	1 (0.5)
Lactococcus garvieae	1 (0.6)	0 (0)	1 (0.5)
Coagulase-negative Staphylococcus	0 (0)	1 (1.9)	1 (0.5)
Gram-negative bacteria			
Pseudomonas aeruginosa	40 (25.2)	13 (24.5)	53 (25.0)
Klebsiella pneumoniae	38 (23.9)	6 (11.3)	44 (20.8)
Acinetobacter baumannii	4 (2.5)	17 (32.1)	21 (9.9)
Enterobacter cloacae	6 (3.8)	8 (15.1)	14 (6.6)
Proteus mirabilis	3 (1.9)	3 (5.7)	6 (2.8)
Achromobacter spp.	2 (1.3)	0 (0)	2 (0.9)
Elizabethkingia meningoseptica	2 (1.3)	0 (0)	2 (0.9)
Aeromonas spp.	2 (1.3)	0 (0)	2 (0.9)
Serratia marcescens	0 (0)	2 (3.8)	2 (0.9)
Providencia stuartii	1 (0.6)	3 (5.7)	4 (1.9)
Escherichia coli	1 (0.6)	0 (0)	1 (0.5)
Klebsiella (Enterobacter) aerogenes	1 (0.6)	0 (0)	1 (0.5)
Pseudomonas stutzeri	1 (0.6)	0 (0)	1 (0.5)
Chryseobacterium gleum	1 (0.6)	0 (0)	1 (0.5)
Stenotrophomonas maltophilia	1 (0.6)	0 (0)	1 (0.5)

MDRO = multiple-drug resistant organism

second and third generation cephalosporins (57.1 to 71.4%). Cefepime (21.4%), piperacillin/tazobactam (7.1%), ampicillin/sulbactam (7.1%), carbapenems (0%), amikacin (0%), and colistin (7.1%) were effective against these isolates.

Discussion

Wound infection and sepsis remain a major concern in burn patients. According to immunocompromised state of the patients, proper antibiotic selection requires more attention to current microbiological profile and resistant patterns in the Burn Unit. MDROs frequently develop during treatment of burn wounds due to prolonged use of antimicrobial agents. This further complicates judgement on antibiotic selection resulting in failure of treatment. In the present study, we investigated the bacterial profile cultured from burn wounds and blood. The antibiotic resistant patterns of the common pathogens were also reported.

Consistent with the previous studies[5,6], infection was correlated with larger burn areas and longer hospitalization. We also found that infected patients required more operations per admission. Though not statistically significant, the infected patients showed a tendency toward an increased mortality rate (9.1% vs. 0%). Oncul et al[5] observed 22% mortality in the infection group compared to 3.2% mortality in the non-infection group. Santucci et al[6] also reported an increased mortality rate associated with infection (42% vs. 26%).

Majority of nosocomial infection especially in immunocompromised hosts is caused by *Pseudomonas aeruginosa*[18-20]. It is also the most common pathogen isolated

Table 3. Prevalence of microorganisms from hemocultures

Species	Non-MDROs n=13 n (%)	MDROs n=3 n (%)	Total n=16 n (%)
Gram-positive bacteria			
Coagulase-negative staphylococcus	2 (15.4)	0 (0)	2 (12.5)
Staphylococcus aureus	1 (7.7)	0 (0)	1 (6.3)
Viridans groups streptococci	1 (7.7)	0 (0)	1 (6.3)
Bacillus cereus	1 (7.7)	0 (0)	1 (6.3)
Enterococcus faecium	1 (7.7)	0 (0)	1 (6.3)
Granulicatella adiacens	1 (7.7)	0 (0)	1 (6.3)
Micrococcus luteus	1 (7.7)	0 (0)	1 (6.3)
Gram-negative bacteria			
Klebsiella pneumoniae	2 (15.4)	0 (0)	2 (12.5)
Proteus mirabilis	0 (0)	2 (66.7)	2 (12.5)
Burkholderia cepacia	1 (7.7)	0 (0)	1 (6.3)
Pseudomonas aeruginosa	1 (7.7)	0 (0)	1 (6.3)
Plesiomonas shigelloides	1 (7.7)	0 (0)	1 (6.3)
Acinetobacter baumannii	0 (0)	1 (33.3)	1 (6.3)

MDRO = multiple-drug resistant organism

Table 4. Antibiotic resistance of gram-positive bacteria

Antibiotics	*Enterococcus faecalis* n=35 n (%)	*Enterococcus faecium* n=8 n (%)	Viridans group streptococci n=5 n (%)
Penicillin	2 (5.7)	6 (75.0)	0 (0)
Ampicillin	0 (0)	5 (62.5)	0 (0)
Gentamicin	6 (17.1)	N/A	N/A
Rifampin	1 (2.9)	5 (62.5)	N/A
Vancomycin	0 (0)	0 (0)	0 (0)
Erythromycin	13 (37.1)	5 (62.5)	0 (0)
Linezolid	0 (0)	0 (0)	0 (0)
Ciprofloxacin	3 (8.6)	6 (75.0)	N/A
Levofloxacin	3 (8.6)	3 (37.5)	0 (0)
Tetracycline	14 (40.0)	5 (62.5)	1 (20.0)

N/A = not available

from patients in the Burn Units worldwide[5,7-9,12]. We found that *Pseudomonas aeruginosa* contributed to 25% of burn wound infection and 6.3% of bloodstream infection. In contrast to our findings, *Staphylococcus aureus* is the predominant strain cultured from the wounds in some centers[21,22]. Only 0.5% of would isolates from our Burn Unit was *Staphylococcus aureus* revealing contribution of a geographical factor to the variation in the microbiological profile. *Staphylococcus aureus* is a normal skin flora[23] while *Pseudomonas aeruginosa* is an opportunistic pathogen in environmental or hospital settings[24]. Therefore, longer hospitalization and prolonged antibiotic use may also pose a risk in *Pseudomonas aeruginosa* infection.

A rate of MDRO infection in the present study was 25%. Langeveld et al reported a similar proportion (37%) of MDROs in the burn intensive care unit[11]. *Pseudomonas aeruginosa* was among the most common MDROs, secondary to *Acinetobacter baumannii*. Isolates of

Table 5. Antibiotic resistance of gram-negative bacteria

Antibiotics	*Pseudomonas aeruginosa* n=54 n (%)	*Klebsiella pneumoniae* n=46 n (%)	*Acinetobacter baumannii* n=22 n (%)	*Enterobacter cloacae* n=14 n (%)
Ampicillin	N/A	20 (43.5)	N/A	5 (35.7)
Amoxicillin/clavulanic acid	N/A	10 (21.7)	N/A	5 (35.7)
Ampicillin/sulbactam	N/A	19 (41.3)	18 (81.8)	1 (7.1)
Piperacillin/tazobactam	9 (16.7)	9 (19.6)	20 (90.9)	1 (7.1)
Cefuroxime	N/A	27 (58.7)	N/A	10 (71.4)
Cefotaxime	N/A	25 (54.3)	19 (86.4)	9 (64.3)
Ceftazidime	25 (46.3)	18 (39.1)	20 (90.9)	8 (57.1)
Ceftriaxone	N/A	22 (47.8)	19 (86.4)	9 (64.3)
Cefepime	8 (33.3)	4 (8.7)	19 (86.4)	3 (21.4)
Cefoxitin	N/A	N/A	N/A	5 (35.7)
Ertapenem	N/A	0 (0)	N/A	0 (0)
Imipenem	11 (20.4)	0 (0)	19 (86.4)	0 (0)
Meropenem	19 (35.2)	0 (0)	20 (90.1)	0 (0)
Doripenem	9 (16.7)	0 (0)	19 (86.4)	0 (0)
Amikacin	7 (13.0)	0 (0)	14 (63.6)	0 (0)
Gentamicin	19 (35.2)	17 (37.0)	14 (63.6)	3 (21.4)
Trimethoprim/sulfamethoxazole	N/A	32 (69.6)	21 (95.5)	10 (71.4)
Colistin	4 (7.4)	0 (0)	1 (4.5)	1 (7.1)
Ciprofloxacin	19 (35.2)	22 (47.8)	18 (81.8)	4 (28.6)
Levofloxacin	27 (50.0)	14 (30.4)	9 (40.9)	1 (7.1)

N/A = not available

Pseudomonas aeruginosa partly resisted to anti-pseudomonal β-lactams which were piperacillin/tazobactam, ceftazidime, and cefepime. They also showed resistance to fluoroquinolones, but less resistance to carbapenems. Doripenem was the most effective carbapenem against *Pseudomonas aeruginosa*. As amikacin and colistin were still effective against the strains found in the Burn Unit, these drugs are the spared options in case of highly resistant strains were encountered. Similar patterns of antibiotic resistance are also addressed[6,7,22], although some studies reported higher resistant strains of *Pseudomonas aeruginosa*[8,21].

Klebsiella pneumoniae belongs to a family of Enterobacteriaceae which can produce extended spectrum β-lactamase (ESBL) as a mechanism of drug resistance[25]. Isolates of *Klebsiella pneumoniae* found in this study were moderately resistant to the second and third generation cephalosporins. The fourth generation, cefepime, however shows higher tolerance to ESBL[26] consistent with our findings that *Klebsiella pneumoniae* isolates were less resistance to cefepime. For β-lactam/β-lactamase inhibitors, *Klebsiella pneumoniae* isolates were susceptible to amoxicillin/clavulanic acid and piperacillin/tazobactam, but moderately resistant to ampicillin/sulbactam. Recently, there is a rising incidence of carbapenem-resistant Enterobacteriaceae (CRE) globally due to excessive use of antibiotics[27]. Our institute also observed a 10-fold increased incidence of CRE over a five-year period[28]. Nevertheless, carbapenem-resistant strains were not identified in the Burn Unit. This finding is concordant with the strict antibiotic prescription and contact precautions as our protocols.

Acinetobacter baumannii is a nosocomial pathogen which causes a serious worldwide problem due to broad antibiotic resistance[29]. MDR strains of *Acinetobacter baumannii* are frequently found in the Burn Units[6-8,21]. Pandrug-resistant (PDR) *Acinetobacter baumannii*, which resists to all antimicrobial agents, has been occasionally reported in some centers[30,31]. Wisplinghoff et al[32] studied risk factors associated with *Acinetobacter baumannii* septicemia in burn patients. The risk factors were composed of female gender, burn area more than 50% TBSA, previous *Acinetobacter baumannii* colonization, and use of hydrotherapy. *Acinetobacter baumannii* isolates were the majority of MDROs in our study. They were highly resistant to β-lactams, fluoroquinolones, and carbapenems. Colistin was the only available antibiotic option for *Acinetobacter baumannii*.

For Gram-positive bacteria, the most common microorganisms in our study comprised of *Enterococcus faecalis*, *Enterococcus faecium*, and viridans groups streptococci. Most of the isolates were not classified as MDROs. *Enterococcus faecalis* and *Enterococcus faecium* are two major species of enterococci which cause nosocomial infection[33]. According to therapeutic response and mortality, *Enterococcus faecium* is more virulent than other enterococcal species[34,35]. We found that *Enterococcus faecalis* isolates were sensitive to penicillin and ampicillin, while *Enterococcus faecium* isolates showed higher resistant profile. Although an incidence of vancomycin-resistant enterococci (VRE) as high as 20 to 35% has been reported in some Burn Units[36,37], VRE were not identified from wound and blood isolates in our center.

Bacterial isolates from bloodstream cultures were not completely relevant to those from burn wounds. This finding implied other possible sources of bacteremia such as those from catheter-related infection, pulmonary infection, and urinary tract infection. Microbiological analysis of burn infection apart from wounds and blood is beyond the scope of the present study. The limitation of this study is the small number of burn patients and hence small number of samples available. Further patient recruitments will shed some light on the overall bacteriology in the Burn Unit. Moreover, antibiotic resistance has rapidly developed due to excessive use especially in the intensive care unit. Therefore, updates on bacteriology and patterns of antibiotic resistance wound be of much importance.

Conclusion

The present study reviewed the prevalence of bacterial infection obtained from burn wound and peripheral/central blood cultures to determine the microbiological profile including MDROs in the Burn Unit, Ramathibodi Hospital. The resistant patterns of common Gram-positive and Gram-negative pathogens were also reported. This knowledge could aid decision making for antibiotic prescription and empirical treatment to control infection in the Burn Unit.

What is already known in this topic?

Burn patients suffer from wound infection and sepsis due to loss of the skin protective layer along with their immunosuppressive state. Infection and sepsis lead to increased morbidity/mortality of the patients and financial impact of the healthcare system. Moreover, MDROs are frequently associated with burn wound infection due to prolonged antibiotic use. This further limits choices of antimicrobial agents for burn patients.

What this study adds?

We investigated the prevalence of bacterial infection in the Burn Unit, Ramathibodi Hospital. Non-MDROs and MDROs were identified from burn wounds and hemocultures. Patterns of antibiotic resistance according to the Gram stains were reported. This information would guide proper selection of antimicrobial agents in the Burn Unit.

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Potential conflicts of interest

The authors declare no conflict of interest.

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