CHAPTER I

INTRODUCTION

Background and Rationale

Nowadays trauma is one of the leading causes of death in Thailand. Burn injury is a special kind of trauma that needs management by specialized personnel. The patients with major burn injury (more than twenty percent of body surface area) have high mortality rates especially those with extreme age. Death in these patients usually occur in the two periods. In the early period most of the patients who die do so because of inadequate resuscitation. In burn units, the technique of hemodynamic monitoring and resuscitation are very effective, and most of the patients can survive this early period of burn injury without complication. In the late period the major problem that causes death is infection especially the burn wound infection or sepsis. Burn patients are very susceptible to infection because their skins have lost the protective property and there are systemic immunosuppressive effect of burn injury(1,2). There are a lot of policies to cope with this problem such as isolation of the patients in the burn unit, prevention of cross infection between patient to patient and personnel to patient, use of topical antibiotics in wound dressing, perform early excision of deep burn wound and immediate skin graft. Despite these treatment, some patients still develop burn wound infection or sepsis(3). Physicians fight with infection to try to save life of the patients by therapeutic and supportive treatment, using topical and systemic antibiotics, making the wound clean and close as quickly as they can. The most important thing is immediate identification of the microorganism that causes the infection. Investigation

for microorganism vary among various burn units, such as discharge Gram's stain, surface swab culture, semiquantitative surface culture(4), quantitative burn wound biopsy culture, and burn wound biopsy for histology or frozen section. In each method there are some advantages and disadvantages. For discharge Gram's stain, there is a high percentage of false positive result. The method that is accepted as a gold standard is the quantitative burn wound biopsy culture(5)(biopsy culture). This method is classified as an invasive technique, needs a specialized technician or microbiologist and requires three to five days for the result depending on each laboratory. Surface swab culture is a non-invasive method that can produce the result within two or three days. There is a controversy whether this method has good accuracy or not. In Thailand, a lot of famous burn units still use this method along with quantitative burn wound biopsy culture but there is no definite protocol. There is no study in Thailand on the accuracy of this method or the effect of this method on the outcomes of the patients (such as the duration of wound healing, time until skin graft can be performed successfully on healthy wound, and the mortality rate). From our experiences in the treatment of the patients with major burn in Bhumibol Adulyadej Hospital, we found that there was a high percentage of clinical correlation between surface swab culture and quantitative burn wound biopsy culture especially in burn wounds that had clinical sign of burn wound infection. So if we can show from this study that surface swab culture has a high accuracy in diagnosing the microorganism in burn wound infection and improves outcome of the patients, it will produce the advantages both for the patients and physicians. For the patients, surface swab culture causes less pain than burn wound biopsy culture. For the physicians, the result of surface swab culture can arrive earlier (within two or three days) and they can change or choose the appropriate antibiotics sooner. This method may improve the effectiveness of the treatment in major burn patients and may reduce the morbidity and mortality rates in the patients too.

This study would like to compare the effect of surface swab culture plus burn wound biopsy culture on the result of the outcome(duration from culture to successful skin graft) when compared with burn wound biopsy culture alone.

Review of related literatures

As we know that even though the current treatment modalities have improved survival rate of burn patients, infection continues to be the leading cause of morbidity and mortality in thermally injured patients(3,6). The principles for treatment of infection are early diagnosis and definitive treatment with appropriate antibiotics. It is accepted that the quantitative burn wound biopsy culture is the best way to identify the causal microorganism (a gold standard). However this method has some disadvantages such as it needs a long time, a correct technique in tissue collection, a specialized personnel in doing a procedure and evaluation. So there is still a need to develop or improve new method that can diagnose burn wound infection.

In 1983 Bharadwaj R et al evaluated the patients with burn wound sepsis and found that 62.5 % with positive surface swab culture showed signs of clinical sepsis. In patients with significant bacteria count on burn wound biopsy culture, 87.5% showed signs of clinical sepsis(7). This study didn't compare results of both methods, but only related them to condition of clinical sepsis.

In 1984 Tahlan RN tried to correlate the quantitative burn wound biopsy culture and surface swab culture but the sample size was very small (17 patients) and he found that seven cultures show differences(8).

In 1985 Kim SH et al developed frozen section technique (30 minutes) compared with rapid section method (within 4 hours) that could diagnose invasive infection effectively. This technique still couldn't identify definite type of bacteria even consumed short time in diagnosis of invasion(9).

In 1986 Buchanan K et al compared the semiquantitative culture technique by serial dilution method with quantitative culture technique. The agreement by category counts between the two methods was 96%(10). Although the semiquantitative method could reduce work units and amount of media for specimen processing but it still needed specialized personnel.

In 1987 McManus AT et al studied the correlation between quantitative microbiology and histopathology in divided burn wound biopsy specimens. Agreement of 96.1% was found between negative cultures but histologic invasion occurred in only 36% of specimens with positive cultures(11).

In 1988 Taddonio TE et al correlated Gram-stain results from biopsy homogenates with quantitative culture results. Bacteria seen in 10 oil immersion microscope fields of Gram-stained homogenates was correlated with significant microbial growth(10^5/gram) of the same biopsy homogenate plated on trypticase soy agar but false-negative rate was very high(19.1%)(12).

After 1988 there are few researches about the diagnosis of burn wound infection. Most researches paid attention to other modalities in management of burn patients. After the concept of early excision of bum area and immediate skin graft were accepted in USA, the United Kingdom and the European countries, the problem about burn wound infection was reduced. There were developments in establishing the skin bank that could preserve cadaveric skin for more than two years. The results of treatment of burn patients were improved dramatically. After the report of survival of patients with 80% burn with coverage by the keratinocyte culture was presented and published, most physicians in this field tried to prove the effectiveness of this method and improve it.

Recent surveys(13) suggest that only a small proportion of burn units currently used quantitative bacteriology. In the UK, only two out of 39 burn units (5 percent) use bum wound biopsies routinely, compared with 26 out of 96 burn units (27 percent) in Europe (mainly France and Italy), and 26 out of 55 units (47 percent) in the USA. The

routine use of quantitative swabs is rare; one out of 39 units (2.6 percent) in the UK, and two out of 55 units (3.6 percent) in the USA. Advances in usage of topical and parenteral antibiotics and the practice of early excision have reduced the practicality and benefit of performing quantitative microbiology in recent years(13).

In Thailand there is no skin bank and no laboratory has high technology enough to produce the keratinocyte culture. Burn wound infection and its methods of diagnosis are still the major problems of treatment in burn patients in Thailand. Our surveys in Thailand (Siriraj Hospital, Chulalongkorn Hospital and Ramathibodi Hospital) showed that both surface swab culture and quantitative burn wound biopsy culture are used but there were no definite protocol and guidelines for treatment are different.

For these reasons, a research on the accuracy of surface swab culture will supply us with the sensitivity and specificity of this method under the standard of our laboratory in our burn patients. If this method affects the outcome (duration from culture to successful skin graft), we can establish policy for the management of burn patients, especially protocol for detection, diagnosis and treatment of burn wound.