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# Comparison of four measures in reducing length of stay in burns: An Asian centre's evolved multimodal burns protocol



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## ABSTRACT

**Introduction:** Multidisciplinary burns care is constantly evolving to improve outcomes given the numerous modalities available. We examine the use of Biobrane, micrografting, early renal replacement therapy and a strict target time of surgery within 24h of burns on improving outcomes of length of stay, duration of surgery, mean number of surgeries and number of positive tissue cultures in a tertiary burns centre.

**Methods:** A post-implementation prospective cohort of inpatient burns patients from 2014 to 2015 (n=137) was compared against a similar pre-implementation cohort from 2013 to 2014 (n=93) using REDCAP, an electronic database.

**Results:** There was no statistically significant difference for comorbidities, age and percentage (%) TBSA between the new protocol and control groups. The protocol group had shorter mean time to surgery (23.5–38.5h) ( $p < 0.002$ ), 0.63 fewer operative sessions, shorter mean length of stay (11.8–16.8 days) ( $p < 0.04$ ), less positive tissue cultures (0.59–1.28) ( $p < 0.03$ ).

**Discussion/Conclusion:** The 4 measures of the new burns protocol improved burns care and validated the collective effort of a multi-disciplinary, multipronged burns management supported by surgeons, anesthetists, renal physicians, emergency physicians, nurses, and allied healthcare providers. Biobrane, single stage onlay micrograft/allograft, early CRRT and surgery within 24h were successfully introduced. These are useful adjuncts in the armamentarium to be considered for any burns centre.

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## 1. Introduction

Singapore General Hospital (SGH) Burns Center is a regional and national burns unit, managing 93% of adult burns patient in Singapore with an average of 220 inpatients a year. It is the only specialized burns centre in Singapore and the major burns referral centre for the South-east Asia region. We receive

oversea transfers and repatriation of Singaporeans and international burn victims (e.g.: Bali and Jakarta bomb blasts, US army helicopter crashes). It is a fully equipped burns facility comprising of an 8-bedded intensive care unit, a specialized burns operating theatre, rehabilitation rooms and a Skin Bank. The Skin bank unit processes and stores allografts, as well as produces GMP (Good Manufacturing Process) grade cultured epithelial autografts (CEA) [1].

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Traditionally, within 48h, major burns patient (>30% TBSA) receive early excision and allograft coverage upon completion of fluid resuscitation. Minor burns will undergo operations on scheduled theatre days three times a week only.

### 1.1. Change in protocol

Since 2014, we selectively adopted new therapies. These include the addition of biosynthetic skin substitutes Biobrane [2] (Smith and Nephew, United States, Fig. 1), the use of dual layer on-lay micrografts-allografts sandwiches [3] for temporary coverage of major burns (>30% TBSA) (Fig. 2), as well as early aggressive renal replacement therapy in critically ill burns patient with renal failure (Fig. 3). Time to surgery target for rapid skin coverage for all new burns patients was also enforced to be within 24h of admission. We have published

each of these measures and their individual benefits in literature though we have yet to publish their combined effects [2-4].

We examine the hypothesis that the implementation of these 4 measures in an updated multimodal burns protocol improved our burns practice by reducing the length of hospital stay, number of surgery sessions, and quicker rehabilitation using a case-control analysis.

### 1.2. The SGH burns database

A growing demand has prompted an initiative to set up a prospective electronic database to review and improve our clinical practice. In 2014, a REDCAP (Research Electronic Data Capture) funded registry under the OBIEE (Oracle Business Intelligence Enterprise Edition) support grant was initiated for



**Fig. 1** – Biobrane is a biosynthetic skin substitute used for superficial partial dermal to mid dermal burn. Surgery should be performed within 24h of injury for the best outcome. This figure depicts scald burn of the chest (a) after scrubdown, (b) application of biobrane with adhesive plaster, and (c) fully epithelized burns wound one week after removal of Biobrane.



**Fig. 2** – Micrografting is an integral part of treatment for extensive burns where autograft donor site is limited. In our institution, we combined the use of micrograft with on-lay allograft to achieve wide and rapid skin coverage. This figure depicts (a) the preparation of micrografts in a clean procedure room, (b) and (c) on-lay micrograft-allograft sandwiches before application onto recipient wound.

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