

A comparison of Mepitel Ag vs antibiotic ointment when used with a soft cast technique for the treatment of pediatric hand and foot burns, a prospective study

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COMIRB Protocol

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- I. **Hypotheses:** Mepitel Ag in combination with the soft cast technique improves wound healing in pediatric partial to deep partial thickness hand and foot burns by decreasing the length of healing time, decreasing the risk of yeast infection, and decreasing pain associated with multiple dressing changes.
- II. **Specific Aims:**
 - 1) To examine the efficacy of Mepitel Ag for use in pediatric partial to deep partial thickness hand and foot burns.
 - 2) To evaluate Mepitel Ag to triple antibiotic ointment when used in combination with a soft cast technique comparing healing time, yeast infection rates and pain levels at time of dressing change.

II. Background and Significance:

There is currently no gold standard dressing when it comes to treating hand or foot burns, specifically in the pediatric population. Our institution currently utilizes a soft cast technique (SCT) on all of our hand and foot burns. The SCT provides optimal positioning of the wounded hand or foot, allows for a moist wound environment, and offers protection of the injured extremity as the wound heals. Our current SCT uses triple antibiotic ointment (TAO) impregnated Adaptic gauze, kling or kerlex, cast padding, gypsoma plaster, soft cast material, and coban. This dressing is applied two to three times during the first 2 weeks post injury. To reduce the risk of the development of yeast overgrowth, the underlying dressing is changed to nystatin impregnated Adaptic gauze, kling or kerlex, cast padding, gypsoma plaster, soft cast material, and coban for the remainder of treatment time or until OR is indicated for surgical debridement and grafting of wounds..

A review of the current literature demonstrates silver sulfadiazine (SSD) to be the most frequently used dressing for burn wound treatment in many clinics nationwide.²⁸ The use of SSD is associated with once to twice daily painful dressing changes and wound exposure that "may lead to disruption of newly formed epithelium, wound colonization, subsequent wound infection and deepening of the burn".^{23, 28} One major benefit of the SCT is the reduction in

required dressing changes, as the soft cast can stay in place for 7-10 days while maintaining optimal hand or foot positioning. This eliminates the need for frequent painful dressing changes.

Occasionally, We have observed yeast infections when patients require serial casting and all have been treated with antibiotics. Other complications we have experienced include: occasional drying out of the adaptic gauze leading to a painful dressing removal and interruption of the newly epithelialized wound bed.

Mepitel Ag, a new soft silicone dressing produced by Molnlycke Health Care, combines Safetac technology with a silver compound to provide a broad spectrum of antimicrobial coverage. The safetac technology “protects the wound and the skin. It prevents an outer dressing from sticking to the wound, therefore minimizes trauma and pain”.¹⁵ The highly pliable nature and antimicrobial properties of the dressing make it an ideal alternative to TAO and SSD for the treatment of pediatric partial to deep partial thickness hand and foot burns. The silver compound lasts up to 8 days, while minimizing damage to the new epithelium and creating a moist wound environment. As Mepitel Ag is a relatively new product, there are currently no studies analyzing its efficacy and effectiveness when compared to other burn treatment methods.

The aim of this study is to compare Mepitel Ag to triple antibiotic ointment impregnated Adaptic gauze when used with the soft cast technique to assess overall time to healing, yeast infection rate and parents perception of pain level at time of dressing change on a scale of 1-10. The hypothesis is that Mepitel Ag in combination with the soft cast technique improves wound healing in pediatric partial to deep partial thickness hand and foot burns by decreasing the length of healing time, decreasing the risk of yeast infection, and decreasing pain associated with dressing changes.

III. Preliminary Studies/Progress Report:

A review of current literature found studies comparing SSD to other silver type dressings, SSD to Mepitel, and silver type dressings to topical antibiotic ointments. Search results failed to return articles on the soft cast technique for the treatment of burn wounds or the use or efficacy of Mepitel Ag. According to the literature, many silver containing products including SSD, Acticoat (silver rayon mesh), and Aquacel Ag (hydrofibre with silver ion) are indicated for partial to full thickness wounds, suggesting silver's ability to penetrate deeper burn injuries to promote wound healing.¹ Many studies found the silver type dressings to be associated with shorter healing time when compared to SSD and antibiotic impregnated gauze.

One important component of a burn dressing is “the creation of a moist wound-healing environment, the prevention of crust formation, and the physical protection of the wound against mechanical disturbances”.²⁸ In one review, antibiotic ointment impregnated gauze demonstrated adherence to the wound bed, causing damage to newly epithelialized cells during the dressing change.²⁸ In addition, Bacitracin, a component of TAO has been linked to promoting yeast colonization on healed wounds.⁷ Another study found yeast infections rates to be higher among children in the 1-16 year old age range, contributing this finding to “a higher sensitivity for Candida infections during childhood”.²⁰

Burn dressing changes have been reported as being some of the most traumatic and painful procedures for children.^{10, 23} In addition, daily dressing changes are rather time consuming and costly.²⁸ When determining acute burn wound care, it is important to utilize dressings that optimize wound healing while decreasing dressing frequency and subsequent patient pain. Mepitel, a grid like soft silicone coated nylon dressing that adheres only to intact skin, was found to demonstrate shorter wound healing time, less eschar formation, decreased pain, and lower cost when compared to SSD in one clinical trial.^{28,5} According to a study by Briggs et al, “silicone –based non-adherent dressings are especially beneficial in reducing pain during dressing changes in children.”³

This is due to the fact that “soft silicone dressing have been shown to prevent trauma to the wound bed and periwound skin and have been described as ‘atraumatic’”.¹⁴ Other benefits of soft silicone dressings include the ability to conform to anatomical contours, a reduction in scar development, and reduced overall cost secondary to improved wound healing and need for less frequent dressing changes.¹⁴

Mepitel Ag, a hybrid type soft silicone dressing impregnated with a silver compound was recently approved for use in partial thickness burns and partial and full thickness grafts.¹⁵ This combination of soft silicone and silver provides a relatively pain free dressing with broad spectrum antibiotic coverage. The aim of this study is to demonstrate that Mepitel Ag in combination with a soft cast technique is a superior alternative to antibiotic ointment impregnated gauze and soft cast for the treatment of pediatric hand and foot burns due to decreased healing time, decreased patient pain and lower yeast infection rates.

IV. Research Methods

A. Outcome Measure(s):

Primary outcomes utilized in this study include overall wound outcome, measured in length of days to re-epithelialization or need for surgical intervention, clinical assessment and wound progression photographs. Secondary outcomes include number of patients requiring surgical debridement, presence of infection based on odor, rash, deep red appearance or puritis. These wounds will not be cultured, patient pain level with dressing change based on the FLACC (Face, Legs, Activity, Cry, Consolability) scale, parents perceived level of pain, pain level at home based on family reported pain and pain medication use. We will also assess cost effectiveness of dressings including the number of clinic visits, number of soft casts, and the cost and amount of dressings used over the course of treatment.

B. Description of Population to be Enrolled:

Patients to be included in this study will be all Children's Hospital Colorado burn patients between the ages of 31 days and 18 years with newly diagnosed partial to deep partial or full thickness hand or foot burns, including bilateral or unilateral injury. Each injured extremity will serve as a separate data point. Exclusions include age > 18 years at start of study, silver allergy, silicone allergy, electrical or chemical burn, past medical history of immunodeficiency disorders such as diabetes mellitus, AIDs, or HIV, pregnant women, prisoners children under the protection of the department of human services, and the decisionally challenged.

C. Study Design and Research Methods

New burn clinic patients identified with a partial to deep partial or full thickness hand or foot burn will be randomized into either the Mepitel Ag group or the control group on their first clinic visit based on burn wound severity and age using RedCap. The randomization scheme in RedCap will be independently created by a statistician. Parental consent and or patient assent will be obtained prior to initial dressing. Burn severity will be clinically determined by one provider and one burn nurse during initial exam based on a 10 point burn severity classification scale in regards to the following parameters: 1) Superficial first degree- wound appears pink or red, involves epidermis only, no blisters present, dry; 2) Second degree, superficial partial thickness- burn involves epidermis + dermis, red or bright pink in color with blisters and or swelling, blanches, moist appearing; 3) Second degree, majority superficial partial thickness, minority superficial- burn involves majority ($\geq 66\%$) superficial partial thickness, epidermis + dermis, red or bright pink in color with blisters and or swelling, blanches, moist appearing, minority ($\sim 33\%$ or less) superficial first degree with areas of redness but no blistering; 4) Second degree, majority partial thickness, minority deep partial thickness- majority of burn ($\geq 66\%$) epidermis + dermis, red or bright pink in color, moist, less than half of burn ($\sim 33\%$ or less) is deep with pale pink-white areas, may or may not have a marbled or mosaic appearance; 5) Second degree, deep partial thickness- involves epidermis + dermis, pale pink to white in color, may have thin white moist eschar, may or may not have a marbled or mosaic type appearance, moist; 6) Second degree, majority deep partial thickness, minority superficial partial thickness- minority of burn ($\sim 33\%$ or less) involves epidermis + dermis, red or bright pink in color, moist, majority ($\geq 66\%$) of burn is deep with pale pink-white areas having a marbled or mosaic appearance, may or may not have thin white moist eschar, skin buds may or may not be present; 7) Second degree, deep partial thickness with areas of full thickness- majority of burn ($\geq 66\%$) involves epidermis + dermis, pale pink to white in color, may have thin white moist eschar, may or may not have a marbled or mosaic type appearance, moist, skin buds may or may not be present, minority of burn ($\sim 33\%$ or less) demonstrates thin to thick area of eschar white, brown or black in color, may need skin graft to heal; 8) Third degree full thickness with minority partial thickness- majority of burn ($\geq 66\%$) involves entire dermis + epidermis, thin to thick eschar that is white, brown or black in color, dry appearing, minority of burn ($\sim 33\%$ or less) is pink or red and moist, with blisters and or swelling, blanches; 9) Third degree full thickness- involves entire dermis + epidermis, thin to thick eschar that is white,

brown or black in color, dry appearing; 10) Fourth degree- third degree + muscle and or bone involvement. The provider and burn nurse will each give the patient a number and the severity will be determined based on the average of the 2 numbers. Any patient given a number 2, 3 or 4, will be placed into the "partial thickness" category, any patient given a 5, 6, or 7 will be placed into the "deep partial thickness" category, and lastly, any patient given an 8 or 9 will be placed into the "full thickness" category for burn severity.

Patients will be randomized into one of two groups, Mepitel Ag or standard TAO, using RedCap and based on a random clinical trial excel spread sheet balanced by burn severity. A statistician will provide a randomization scheme for investigators to follow. Photographs will be taken prior to dressing application at the initial visit and each subsequent visit. ~~Patient wounds will be dressed in either Mepitel Ag, kling or kerlex, cast padding, gypsoma plaster, soft cast material and coban for up to 21 days or until complete re-epithelialization of the wound occurs or unless surgery is indicated; the control, standard dressing of Triple Antibiotic Ointment impregnated adaptic gauze, kling or kerlex, cast padding, gypsoma plaster, soft cast material and coban for 10-14 days, or Nystatin impregnated adaptic, kling or kerlex, cast padding, gypsoma plaster, soft cast material and coban for 8-21 days or until complete re-epithelialization of the wound occurs or surgery is indicated. The SCT is applied by Occupational and Physical trained in casting and positioning. The soft cast provides optimal positioning while eliminating friction on the burn area. Dressing changes will occur every 3-10 days and will be determined by the provider, based on burn wound severity. Upon each return clinic visit, the patient will have their wound severity assessed by the following scoring system: 1=0% healed, 2=20% healed; 3=40% healed; 4=60% healed; 5=80% healed; 6=100% healed. This will be established by provider and burn nurse examination of the wound. This will be recorded in RedCap:_____~~

A member of the nursing team will also complete a questionnaire at each follow up visit to indicate pain level with dressing change based on the FLACC scale, parents perceived level of pain during dressing change, parental reported pain level at home, use of home pain medications, type of home pain medication- narcotic vs non-narcotic, clinical assessment of yeast rash including odor, visible rash, use of fluconazole, ease of dressing application, and amount and type of product used in dressing change.

D. Description, Risks and Justification of Procedures and Data Collection Tools:

A photography release will be distributed and signed by parent at initial visit.

Anursing questionnaire will be completed by nursing staff at each follow up appointment.

Local wound care including cleansing, wound measurement and dressing change will be performed by burn team including nursing staff and occupational and physical therapists. Although punch biopsy with histological analysis is considered the 'gold standard' in assessing burn wound depth, it is invasive and time consuming.¹⁸ Clinical assessment remains the most frequent and rapid method.¹⁸ Due to the time sensitive nature of the proposed trial and in order to avoid delaying wound care and initial dressing application, a 10 point clinical assessment scale has been created, as listed above for use in determining initial burn wound severity. Patient wound depth will be clinically determined by the average of the scores from the provider and the burn nurse.

The wound will also be assessed by the provider and nurse on subsequent visits using the following scoring tool: 1=0% healed, 2=20% healed; 3=40% healed; 4=60% healed; 5=80% healed; 6=100% healed. This will be established by provider and burn nurse examination of the wound. This will be recorded in RedCap.

The overall risk for this study is minimal, with no foreseen adverse reactions. The risk of a silver allergy or adverse reaction to silicone is very rare.

E. Potential Scientific Problems:

Limitations to the proposed study design include varying diagnostic opinions between provider and burn nurse for the determination of superficial vs deep partial thickness burn wounds based on clinical assessment, provider or nurse bias based on dressing preference, and possible uneven trial groups.

F. Data Analysis Plan:

Analysis Plan: Demographic and clinical characteristics will be summarized and compared between the two treatment groups using chi-squared and two-sample t-tests for categorical and continuous data, respectively. For analysis of the primary outcome, time to wound healing, we will use Kaplan-Meier curves, the log-rank test and a Cox proportional hazards model to determine the difference in days to re-epithelialization between the TAO and Mepitel Ag soft cast methods. Patients that require surgical intervention will be censored at the time of surgery. Logistic regression will be used to analyze the secondary outcomes, need for surgical debridement and occurrence of yeast infection. Pain level outcomes and pain medication use will be compared using two-sample t-tests and chi-squared tests. Cost effectiveness outcomes will also be analyzed.

1. Sample size: A statistical power analysis was performed to estimate power, based on results reported in A Soft casting Technique to Manage Pediatric Hand Burns: Less Pain, Greater Gain.²² Considering the simplest between group comparison and assuming a standard deviation of 0.3, alpha of 0.05 and 50 subjects per group there is over 90% power to detect a difference of 2 days between the treatment groups. Thus, we expect that our proposed sample size of 100 burns will be adequate for the main objective of this study.

G. Summarize Knowledge to be Gained:

To demonstrate that Mepitel Ag in combination with a soft cast technique improves wound healing in pediatric partial to deep partial thickness hand and foot burns by decreasing the length of healing time, decreasing the risk of yeast infection, and decreasing pain associated with dressing changes.

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