
792 **Exoskeleton Robot Using 3-Dimensional Modeling in Burn Patient**

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Introduction: Hands are the part of the body that are most commonly involved in burns, and the main complications are finger joint contractures and nerve injuries. Hypertrophic scarring cannot be avoided despite early management of acute hand burn injuries, and some patients may need application of an exoskeleton robot to restore hand function. To do this, it is essential to individualize the customization of the robot for each patient. Three-dimensional (3D) technology, which is widely used in the field of implants, anatomical models, and tissue fabrication, makes this goal achievable.

Methods: Therefore, this report is a study on the usefulness of an exoskeleton robot using 3D technology for patients who lost bilateral hand function due to burn injury. Five burn patients with upper limb dysfunction after a flame and chemical burn injury, with resultant impairment of manual physical abilities.

Results: After wearing an exoskeleton robot made using 3D printing technology, the patients could handle objects effectively and satisfactorily.

Conclusions: This innovative approach provided considerable advantages in terms of customization of size and reduction in manufacturing time and costs, thereby showing great potential for use in patients with hand dysfunction after burn injury.

Surgical Care, Acute Non-reconstructive 2
R-233

793 **"Minimally Invasive" Skin Grafting with Enzymatic Debridement and Autologous Skin Cell Suspension**

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Introduction: Minimally invasive surgery has become standard of care across numerous subspecialties. However, burn surgery has lagged behind; as the mainstay of treatment still involves excision with a knife and a split thickness skin graft (STSG) with a painful donor site. Enzymatic debridement with bromelain and autologous skin cell spray (ASCS) have independently been STSG use and decrease the donor site size. Due to constraints with the time course of these products only being available via studies before one was FDA approved, these technologies have not been utilized together in the United States until recently. Little literature exists regarding their use in combination. The current study characterizes a series of patients who received "minimally invasive" skin grafts with enzymatic debridement and ASCS as proof of concept.

Methods: This was a retrospective study of a single academic burn center's experience using bromelain and ASCS together. Data collection included demographics, injury characteristics, length of stay, complications, and measurements of donor sites, STSGs, and ASCS treatment. Donor site size:total area treated with ASCS and/or STSG was calculated. Length of stay (LOS) was qualitatively compared to expected using a factor of 1.1days:%TBSA, and O/E LOS ratio was calculated. Data was reported in medians with interquartile ranges. Patients with 1-30%TBSA qualified for the bromelain study and were treated according to protocol. Those deemed to have enough residual dermis were treated with ASCS, while 3rd degree areas received meshed split thickness skin patch grafts with ASCS overspray.

Results: Eleven patients were included in the study. Four patients received ASCS alone, while 7 patients received a meshed STSG on portions of their burn. Median burn size was 13% TBSA (IQR:5,20), while DPT+FT size was 9% TBSA (IQR:5,16). Patients had a median of 1067 sq cm (IQR:772,2183) of burn operatively treated with ASCS, and 351 sq cm (IQR:0,457) treated with meshed autograft. Donor site size (ASCS and STSG) was 225 sq cm (IQR:72,315), and ratio of donor site area to total treatment area was 0.0125 (IQR:0.01,0.32), suggesting an expansion

of 80:1. Median LOS was 11 days (IQR:7,21), 0.84 days per %TBSA (IQR:0.5,1.16). Expected LOS was 14.3 days, with an O/E ratio of 0.77. Two patients developed infection; one required reoperation with STSG on half of his burned areas (5% TBSA).

Conclusions: Enzymatic debridement and ASCS can be used to treat burn injury with a “minimally invasive” approach. Donor sites were much smaller than expected had they been treated with a conventional meshed STSG on deep 2nd degree and 3rd degree areas. The data also suggests that length of stay was lower than expected. Further study is needed to determine which subsets of patients and burn wounds are optimal for this combination of technologies.

794 Use of Cultured Epithelial Autografts After Biodegradable Temporizing Matrix in Massive Burns

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Introduction: As burn care advances, patients are surviving with larger burn injuries, that previously would have been fatal. However, the need for autologous skin coverage continues to be an unmet need for massive burn injuries. Several attempts have been made to address this with various dermal substitutes, temporary coverage, and skin substitutes. For 25 years, Cultured Epithelial Autografts (CEA) have been used to treat large burn injuries, but this was met with variable success and has a mandatory pre-requisite lab time before it is ready for use. In 2018, Biodegradable Temporizing Matrix (BTM) that can be placed immediately on excised burns was first studied in burn patients, which has led to its increased use in subsequent years. This case series seeks to examine our experience using CEA following the application and ingrafting of BTM on large burns.

Methods: A retrospective review was conducted from 2017-2020 of adult burn patients admitted to an ABA verified burn center who underwent placement of both BTM and CEA. Demographics, mechanism of injury, burn characteristics, surgeries, and outcome data were collected. Surgical technique was early excision, BTM placement, a BTM integration period, repeat superficial excision, fibrin/thrombin spray, split thickness skin grafting with usually 6:1 mesh autograft, and finally CEA application. CEA was managed per manufacturer protocols. Descriptive statistics and univariate analyses were performed with Microsoft Excel.

Results: Eight patients met inclusion criteria. The average age was 29.3±5.3 years, 2nd degree TBSA 22.5±22.6%, 3rd degree TBSA 55.8±21%, and total TBSA was 78.3±4.4%. Four patients died during their hospital course and four survived to discharge. For survivors, the age length of stay was 135±23.6 days and they underwent an average of 8.5±1.5 total excision and/or grafting procedures. All patients had severe complications including severe sepsis/septic shock (n=8), gastrointestinal bleeds (n=2), acute respiratory distress syndrome (n=3), acute kidney injury or renal failure (n=4), pulmonary embolism (n=1) and myocardial infarction (n=1). The average time to 95% wound closure was 5 (79-147) days for survivors.

Conclusions: There continues to be an unmet need for autologous skin coverage in massive burn injuries when there is insufficient donor skin. In this series, we describe eight patients with massive burn injuries who underwent initial BTM placement, followed by 6:1 meshed autograft and CEA application. Although four patients died during their treatment course, the four surviving patients had acceptable wound closure rates and length of stay for their burn size.