3D Printed Bandages

Lead Inventor

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Unmet Need

Burns are a major cause of serious soft tissue injury in the United States and around the world. Despite improvements in burn and bandage technology, burns remain a significant cause of hospitalization and death worldwide. In 2015, fire and heat resulted in 67 million injuries resulting about 2.9 million hospitalizations and 176,000 deaths worldwide[1]. The American Burn Association states in the United States, hospitalizations related to burn injury number ~40,000 annually, including 30,000 at hospital burn centers.

Treating severe burns is difficult and there are often complications such as secondary infection, delayed wound healing, and skin graft failure[2]. There is a need for an improved bandage used in the treatment of burns.

Invention and Opportunity

The emergence of widespread reliable 3D printing technology has presented a unique opportunity for wound care technology. The inventors believe their 3D printed bandages could improve treatment outcomes for burn victims with second degree, or partial thickness, burns.

Second degree burn wounds require a wound cover which (a) minimizes infection by isolation from the external environment (a protective barrier); (b) provides a fibrous structure to entrap fibroblasts for new tissue formation; and (c) demonstrates ease of removal after new tissue has been formed.

The St. Joseph's University 3D printed bandages are constructed of scaffolded mats that can be produced with a wide variety of 3D printing methods. The mats are customizable in material, dimension, and may be coated with various polymers, pharmaceutical compounds, or infused with biological compounds to promote improved outcomes in burn patients.

Burns account for a significant number of hospitalizations in the United States and are also expensive to treat, with the average cost of treatment for a severe burn running over 1 million dollars[2].

The market size is substantial. A recent study by Grand View Research estimated the overall burn care market size to reach $2.98 billion USD by 2025 and to grow at a robust 6.8% CAGR.

Grandview anticipates the partial-thickness (2nd degree) burn segment, which this invention addresses, to show the highest growth due to increasing cases of burns causing more than 15.0% damage to the victim's body.

Unique Attributes

The investigators believe while some current products work well, they have identified three areas for improvement over the current form, which:

1. Use animal-derived components, prone to infection and contamination,
2. Employ collagen which does not have good "barrier" properties, and

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[1] World Health Organization. September 2016.
[2] National Business Group on Health. 2013.

3. Further, it has an additional silicone layer which serves as a backing membrane and must be removed after new tissue formation.

The Jonnalagadda-Singh device comprises a 3-D printed mat with the following features:

- An interlaced structure with high surface area to enable attachment of fibroblasts and promote new tissue formation;
- Excellent barrier properties, practically impermeable for the 2 to 6-week duration of treatment;
- Prepared from biodegradable / bioresorbable polymers that can be obtained from synthetic sources;
- Can load a topical antibiotic such as neomycin, and maintain effective concentrations for the 2 to 6-week duration of treatment; and
- Has potential to further incorporate growth factors such as Epidermal Growth Factor (EGF) and Vascular Endothelial Growth Factor (VEGF) to promote new tissue formation.

Further, these 3D printed bandages can be produced with any suitable material in a wide variety of 3D printing methods, in any shape and desired dimension, and can be coated or infused with diverse pharmaceutical and / or biological compounds.

Clinical Applications

3D printed bandages are designed for dermal wound care.

Stage of Development

Prototype.

Intellectual Property

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Collaboration or Licensing Opportunity

Actively seeking opportunity for study in dermal wound applications.

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