

Experimental SkinGun heals burns using stem cells

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Story highlights

Patient's stem cells are harvested, treated, sprayed on a burn with a SkinGun

Nearly 500,000 burn injuries require medical treatment each year

(CNN) — An experimental technology offers new hope to patients who have suffered a severe burn.

The product, from New York biotech firm RenovaCare, is rooted in cutting-edge stem cell research. The CellMist System harvests a patient's stem cells from a small area of unwounded skin (usually one square inch) and

suspends them in a water-based solution. The SkinGun sprays the solution onto the wound, where new skin begins to grow at the cellular level.

"We don't modify the cells," said Thomas Bold, an engineer and president and CEO of RenovaCare. "We don't do anything with the cells. We just isolate them from the surrounding tissue, put them in a syringe within a water-based solution, and we spray them.

"What we're doing is all natural," he added.

The survival of cells shooting out of the SkinGun is instrumental, since cells "injured" in the process of spraying might not grow properly. According to Bold, 97% of the cells in the syringe remain viable, and so the chances of healing the wound are great.

Feasible but experimental

Though the patented product has not been approved by the Food and Drug Administration, experimental treatments (PDF) have been conducted in Pennsylvania.

"We've seen already a couple dozen patients, and we're very happy about the results," Bold said.

A case report was published in the journal *Burns*, though experts outside the company as well as insiders say it may take years to commercialize the product. Photos from the company show remarkably little scarring after treatment.

"Our work in Pittsburgh on the pre-product procedure really shows only good results, with now 47 patient treatments at UPMC Mercy Hospital Burn and Trauma Units," said Dr. Jörg Gerlach, lead author of the case report

and a professor in the department of surgery at the University of Pittsburgh. He added that he and his colleagues are "only now entering the phase of planning clinical studies with RenovaCare."

Gerlach receives royalties from RenovaCare for his work.

Dr. Robert Glatter, an emergency physician at Lenox Hill Hospital in New York, believes CellMist and SkinGun are promising, based on his knowledge of existing studies as well as one ongoing human trial in Argentina using stem cells to heal wounds.

"Human studies have shown that this is feasible, but it's certainly experimental at this point," said Glatter, who is not affiliated with RenovaCare. He added that the SkinGun technology is an improvement on current stem cell research, though the results "need to be borne out in further studies" before it can be embraced by the burn center community.

Though a lot of stem cell research for use in healing burns is happening now, "unfortunately, there are very few big randomized controlled studies to date," noted Dr. Tom Rohrer, a dermatologic surgeon and board member of national organizations including the American Society for Dermatologic Surgery and the American Society for Laser Medicine and Surgery.

"Researchers have used stem cells from bone marrow, fat and skin cells," said Rohrer, who is not affiliated with RenovaCare. "It appears as if the stem cells from bone marrow and fat work better than those from the skin, but it is a bit too early to tell."

"Gaining FDA approval is what we are working on right now," Bold said.

The company is hoping to expand the range of possible applications of the CellMist System. Not only is the SkinGun an effective treatment for burns and other skin disorders, according to Bold, the scarring is also minimal compared with grafting.

Burn victims may seek the help of a dermatologist after they've healed, since they often have debilitating scars, noted Dr. Cameron Rokhsar, an associate professor of dermatology at Mount Sinai Hospital and fellow of the American Society for Dermatologic Surgery.

Recently, another innovative product has transformed this often-necessary aftercare for burn patients.

Help after healing

Not only are patients bothered psychologically, sometimes, their "scars are painful, they're itchy, they're thick, and they cause loss of function," said Rokhsar, who is not affiliated with RenovaCare. Function loss is a result of "contracture," in which the scar tissue constricts and lessens mobility. After they heal, some burn victims cannot use their limbs.

"One of the breakthroughs in the past couple of years is the use of fractionated CO2 lasers to release the tension on those type of scars, where people can actually get function back," Rokhsar said. He explained that these lasers have been in use for various purposes about 10 years.

"The laser evaporates tiny microscopic zones of tissue, almost like it drills tiny holes in the skin in a microscopic fashion, and that allows the scar to remodel itself," Rokhsar said. He added that the efficacy has been established in studies involving veterans who were burned in explosions. Today, many dermatologists use these lasers on burn victims "post facto": once they've healed.

"We've been using it. It's pretty amazing," Rokhsar said, adding that the lasers release the tension and patients get function back "almost immediately."

Rohrer also finds the results of these lasers "dramatic" but says they're only the tip of the iceberg when it comes to new laser treatments.

"We are also looking at putting stem cells down these vaporized holes to further improve the texture of the skin," he said. "We also use pulsed dye lasers to improve the red color of scars. These devices also help normalized skin texture a bit as well. In addition, we are injecting scars with steroids and, more importantly, now antimetabolite drugs originally used to treat cancer to improve scar texture."

Severe burns

An estimated 486,000 burn injuries require medical treatment each year, and nearly 40,000 lead to hospitalization, according to the American Burn Association.

Success rates are high when treating burns: From 2005 through 2014, the association calculates a nearly 97% survival rate for patients admitted to burn centers, which average over 200 annual admissions.

Severe burns -- second- or third-degree -- require excision, explained Glatter.

A first-degree burn harms only the epidermis or the outermost layer of skin; a second-degree burn penetrates the dermis, the middle layer; and a third-degree burn affects epidermis, dermis and the innermost layer, the subcutis.

Excision, an operating room procedure, begins with removing the dead skin and grafting healthy skin to the area, explained Glatter. Donor skin is removed from one area of the patient's body -- most of us possess about 21 square feet of skin -- and implanted on the damaged area.

Though this is the standard approach, it is not without difficulties. The surgical procedure to remove healthy skin is painful and leaves the patient with another wound that must heal, Glatter noted.

"Infection is often a problem, and grafting rates are often poor," he said. "A good percentage of grafts won't take." Usually, skin grafts that do take are not cosmetically appealing, with different skin colors.

New techniques using stem cells address these issues, he said. Stem cells functionally work better: "If you burn your shoulder and you used a stem cell technique, it would look the same as the skin on your shoulder. It would not appear different."