

Gene therapies for regenerative surgery are getting closer, says review in PRS

May 29 2013

Experimental genetic techniques may one day provide plastic and reconstructive surgeons with an invaluable tool—the ability to promote growth of the patient's own tissues for reconstructive surgery. A review of recent progress toward developing effective gene therapies for use in "regenerative surgery" appears in the June issue of [*Plastic and Reconstructive Surgery*](#).

Over the past ten years, researchers have developed several promising gene therapy techniques to grow skin, bone, and other tissues for [reconstructive surgery](#). But they still face many challenges in developing gene-based approaches that can make the leap from the research lab to the [operating room](#), according to the review by Dr. Giorgio Giatsidis and colleagues of Padua University Hospital, Italy.

Gene Therapy Approaches Studied for 'Almost Every Tissue'...

Dr. Giatsidis and coauthors reviewed the state of the art in research on gene therapy techniques for treatment of local disorders and injuries—the first such review in more than a decade. They found studies using gene therapy to promote the growth of "almost every different tissue" for use in regenerative surgery. "Gene therapy may represent a leading strategy to develop more efficient regenerative surgical treatments for numerous clinical needs," they write.

Gene therapy has the potential to provide reconstructive surgeons with a new approach to solving one of their most difficult problems: the lack of adequate tissues to correct deformities of a specific area or structure. For example, in patients with relatively small burns, plastic and reconstructive surgeons have designed a wide range of skin flaps for use in transferring healthy tissue to the burned area.

But for patients with [burns](#) involving larger areas, the lack of suitable tissues for coverage may severely limit the reconstructive options. Using gene techniques to promote growth of specific [types of tissues](#) would be a major step forward in the ability to perform truly regenerative surgery.

...But Translation from Lab to OR Poses Many Challenges

Several research groups are pursuing gene therapy approaches to regenerate skin, such as using genes to control expression of growth factors involved in skin healing. One small study reported promising results with tissue-engineered products to promote healing of diabetic skin ulcers.

Researchers are also targeting growth factors involved in new bone formation, with promising results in techniques using transplantation of genetically modified donor bone. One study reported clinical benefits using gene therapy to regenerate joint cartilage in patients with rheumatoid arthritis. Techniques to promote healing of tendons, regeneration of injured nerves, and growth of skin flaps for reconstructive surgery are all being explored.

But despite progress in all of these areas, translating experimental gene therapy methods into regenerative surgery techniques for use in the operating room will remain a difficult challenge. Even after the technical

problems are addressed, more work will be needed to develop regenerative surgery techniques that are productive and cost-effective.

"After two decades, regenerative surgery is an adolescent looking forward to growing up," Dr. Giatsidis and coauthors write. "Despite extensive preclinical approaches, translation of gene therapy strategies into clinical trials is still a difficult and expensive process."

So far, the studies of diabetic ulcers and rheumatoid arthritis mentioned above are the only methods to show evidence of clinical effectiveness in human patients. "Even so," the authors add, "cutting-edge [gene therapy](#)-based strategies in reconstructive procedures [are close] to setting valuable milestones for development of efficient treatments in a growing number of local diseases and injuries."

Provided by Wolters Kluwer Health

Citation: Gene therapies for regenerative surgery are getting closer, says review in PRS (2013, May 29) retrieved 23 June 2024 from <https://medicalxpress.com/news/2013-05-gene-therapies-regenerative-surgery-closer.html>

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