

Guest Columnists

STEM CELLS AND THE REGENERATIVE POTENTIAL OF TRANSPLANTED FAT

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Even though promising applications for embryonic stem cells have been on the horizon for more than a decade, and the world has spent trillions of dollars on research, we have not yet developed any clear-cut clinical applications for embryonic stem cells. On the other hand, plastic surgeons have recently discovered actual cures for such pathologic conditions as scarring, radiation burns, and vocal cord paralysis using autologous human fat grafts. The most likely mechanism for these cures is the presence of stem cells or repair cells inherent in the transplanted fat and the effects of these cells on surrounding tissue.



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PIVOTAL OBSERVATION: THE EFFECTS OF FAT GRAFTING ON SURROUNDING TISSUES

In the early to mid 1990s, I began noticing that fat appeared to be doing more than simply providing volume when transplanted. My initial observation was that there seemed to be an improvement in the quality of the tissues into which fat was grafted. For example, fat placed into damaged muscle fibers precipitated not only an increase in volume, but also a recovery of muscle strength. I also noticed that there usually was a gradual, long-term improvement in skin quality. Wrinkles softened, pore size decreased, and pigmentation improved for up to 10 years after fat grafting. About 1995, I noticed that fat grafted under depressed scars not only relieved the depression, but also softened or even completely eliminated the specific scar tissue, making it look like normal skin. I began routinely treating depressed scars, acne scars, and even old chemical burns by grafting fat.

In the last 4 years, Dr. Gino Rigotti, Dr. Henry Kawamoto, and I have reported that grafted fat repairs skin and other tissues damaged by therapeutic irradiation. I have recently observed remarkable healing of recently traumatized tissue after fat grafts.

ADIPOSE-DERIVED STEM CELLS: A PLAUSIBLE EXPLANATION FOR THE EFFECTS OF FAT

We now know that fatty tissue has the highest percentage of adult stem cells of any tissue in the body. *The repair cells (stem cells) in transplanted fat may be restoring damaged tis-*

sue. However, what actually happens when fatty tissue is transplanted in humans has yet to be confirmed. Studies are needed to delineate the role of adipose-derived stem cells and pre-adipocytes in the repair of damaged tissue both in normal physiologic conditions and after free transplantation of fat.

INTERNATIONAL PERSPECTIVE

I have had a unique opportunity to follow the worldwide experience with fat grafting over the last decade because of close communications with plastic surgeons and other physicians from all over the world who have shared their knowledge with me. My international experience began in 1995, when Dr. Guy Magalon, the director of the largest plastic surgery department in France, visited me to observe my fat-grafting technique. In 1998, Dr. Magalon and I organized a large, well-attended symposium in Marseilles about fat grafting. This symposium effectively introduced my technique for fat grafting to Europe, especially France. Since then, the French have been actively grafting fat, and they refer to successful fat grafting as “Coleman” fat grafting. In 2006, the French Society of Plastic Surgery presented 18 scientific papers on fat grafting in its general session. Of particular interest are the French experiences using fat grafting to treat subacute trauma and chronic ulcers of the legs.

Recently, Italian plastic surgeons have achieved remarkable clinical results using this fat-grafting technique for treating pathologic processes. Dr. Rigotti has been treating end-stage radiation dermatitis and breast scarring with fat grafting. A craniofacial surgeon in Los Angeles, Dr. Kawamoto, has reported favorable healing of irradiated ulcerating skin after treatment with fat grafts.

At New York University, we have developed murine models to study the effects of transplanted human fat on irradiated skin. Our initial studies have shown that ulcers from radiation burns heal within 2 weeks after treatment with human fat.

A recent report by an otolaryngologist, Dr. Giovanna Cantarella, working with a plastic surgeon, Dr. Riccardo Mazzola, in Milan, shows remarkable recovery of paralyzed or scarred vocal cords in dozens of cases after injecting fat directly into the cords using the Coleman technique. Drs. Mazzola and Cantarella will soon publish their research on vocal cord tissue regeneration mediated by mesenchymal stem cells in adipose tissue.

In 2006, Dr. Mazzola, president of the European Association of Plastic Surgery, organized a 2-hour panel that focused on the regenerative aspects of fat grafting. Because of the success of that event, we have subsequently organized two additional symposia in Milan with the same focus, and we are now planning to collaborate on a book, *Fat Injection: From Filling to Regeneration*, which will focus on the worldwide clinical experience of the regenerative uses of fat grafting.

Stem Cells and the Regenerative Potential of Transplanted Fat—

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Surgeons in the rest of Europe, South America, Korea, Japan, mainland China, and Africa are also reporting noteworthy clinical experiences in similar situations, such as the successful treatment of chronic ulcerations with fat grafting, the use of adipose-derived stem cells to aid bone growth, and the use of fat grafts to aid the healing of skin grafts and their donor sites.

FUTURE

We have an abundance of clinical evidence that fat grafting may accelerate healing processes. Grafted fat has the potential to improve the quality of scarred skin and heal radiation damage and chronic ulcers. Just how grafted fat causes these changes remains unanswered. We know that fat can perform amazing feats in a glass tube and in some animal models; however, we have little insight into what happens to fat when it is grafted from one part of the human body to another part.

My 20-year experience with grafting fat is full of anecdotal evidence of the regenerative effects of fat grafting. However, those clinical experiences are now being repeated, expanded, and studied at a rapid pace by other physicians worldwide. ■

Mastopexy After Massive Weight Loss—

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tethered in an inappropriate position and/or points in an undesirable direction. If this occurs, a cautery may be used to incise the dermis partway around the nipple to release the tethering and allow the nipple to point forward. Intradermal sutures are used to complete the closure, and suction drains are placed in each lateral breast. Complications observed with this procedure have been limited to wound dehiscence and hematoma. We have seen no cases of nipple loss or detectable fat necrosis. ■

References

1. Rubin JP. Mastopexy after massive weight loss: dermal suspension and total parenchymal reshaping. *Aesthetic Surg J*, 26:214-222, 2006.
2. Graf R, Biggs TM. In search of better shape in mastopexy and reduction mammoplasty. *Plast Reconstr Surg* 110:309-317, 2002.
3. Frey M. A new technique of reduction mammoplasty: dermis suspension and elimination of medial scars. *Br J Plast Surg* 52:45-51, 1999.
4. Qiao Q, Sun J, Liu C, et al. Reduction mammoplasty and correction of ptosis: dermal bra technique. *Plast Reconstr Surg* 111:1122-1130, 2003.
5. Gulyás G. Mammoplasty with a periareolar dermal cloak for glandular support. *Aesthetic Plast Surg* 23:164-169, 1999.
6. Holmström H, Lossing C. The lateral thoracodorsal flap in breast reconstruction. *Plast Reconstr Surg* 77: 933-943, 1986.