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## Stem Cells and Breast Surgery

New Procedure Uses Fat to Augment Women,  
but Some Are Wary of Effects

By RHONDA L. RUNDLE

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*Yokohama, Japan*

Researchers around the world are seeking ways to regenerate damaged hearts, spines and skin with stem cells. At an operating table here recently, Kotaro Yoshimura leaned over a 51-year-old woman and put stem cells to use for a different purpose: cosmetic breast surgery.

### Popular Procedure

Traditional breast-augmentation surgeries in the U.S.



Notes: The FDA approved silicone implants for cosmetic use in 2006. Fees don't include related costs for implants, facilities and anesthesia.

Source: American Society for Aesthetic Plastic Surgery

Dr. Yoshimura jabbed the underside of the woman's left breast with a thick, long needle, drawing it in and out. At his side, an assistant slowly cranked the handle of a canister filled with an orange-colored mixture, pumping it into the needle through a tube. The substance was a fat concoction from the woman's own body -- which had been processed in an adjoining laboratory to fortify the stem cells it contained. Then it was injected into the patient to enlarge her breasts.

The combination of fat and stem cells -- used to either make breasts larger or repair them after cancer surgery -- has become one of the hottest, and most controversial, corners of cosmetic medicine. Breast surgeries that rely on a person's own fat are being performed in Japan and Europe and are hurtling toward the U.S., where some surgeons are already experimenting.

The "genie is out of the bottle," says Grant Carlson, a plastic surgeon and surgical oncologist at Emory University in Atlanta. He worries that commercialization of the procedure is moving too fast, before data are collected about long-term consequences.

This is uncharted territory for the U.S. Food and Drug Administration, which regulates products and devices but not procedures. However, the FDA says fat augmented with stem cells creates a "biologic product" that would require regulatory approval.

The surgery relies on an old idea: the use of human fat to make a woman's breasts larger. Attempts to use fat transplantations in such a way date back more than a century, but they usually failed because most of the fat grafted onto the breast died, turning into hard lumps or calcifications. The concept has long been frowned upon in the U.S., although fat transfer has been used with limited success in other parts of the body.

Now, surgeons are returning to the idea, spurred by the discovery over a decade ago that fat contains a rich supply of cells similar to the stem cells found in bone marrow.

### **Using Fat as a Cosmetic Tool**

A stem cell is a cell from which other types of cells develop. The theory behind the new procedures is that fat may be processed or handled in a way that allows fragile stem cells to create a blood supply for the transplant that helps the fat survive. During a single operation, fat is siphoned from a woman's thigh or abdomen and then processed using various techniques. The fat is injected back into the breasts. Because the patient is the donor, there is no risk of tissue rejection.

Harvesting stem cells from fat doesn't present the ethical issues that arise when stem cells are retrieved from human embryos. In fact, fat is routinely discarded by plastic surgeons after liposuction, one of the most popular cosmetic procedures. Research is increasingly looking into the therapeutic potential of adult stem cells taken from blood, bone marrow or fat.

The possibility of creating soft, natural-looking breasts has incited interest among cosmetic surgeons. Artificial implants, filled with saline or silicone gel, can rupture, and some say they don't look natural. A small San Diego company, [Cytori Therapeutics Inc.](#), says it has invented a machine that combines fat with a mixture of stem cells and other regenerative cells. The device is being used by some hospitals in Europe and Japan. Cytori is sponsoring human tests in Europe and talking to the FDA about similar efforts in the U.S.

Some doctors worry the fat, when reinjected in the breast, could calcify and interfere with mammographic cancer screening. Another concern is that fat injections could increase the risk of breast cancer, because certain anticancer drugs work in postmenopausal women by inhibiting the production of estrogen, a hormone in fat tissue.

Regardless, some U.S. surgeons are showing before-and-after pictures of breasts they have enlarged, reshaped or repaired using fat grafting. There is no proven technique, but some surgeons say they have been encouraged to experiment after successfully grafting fat to other parts of the body, including faces and hands.

Jafar Koupaie, a cosmetic surgeon in Brookline, Mass., says he performed breast surgeries on two women April 1, using a Korean cell-processing device. He says he is using a patient's own cells and isn't adding anything from outside the human body. One of the patients, he says, was his wife.

The FDA says it has only sketchy details about Dr. Koupaie's procedure. "If you're mixing stem cells with fat cells, that requires FDA approval," said Karen Riley, an agency spokeswoman. When told of the FDA's comment, Dr. Koupaie said, "If they want more information, they can come and see we put only the patient's fat into the machine."

Sydney Coleman, a New York plastic surgeon, published a breast study last year about fat grafting in *Plastic and Reconstructive Surgery*, a medical journal. He has been grafting fat to the breast, without adding a stem-cell mixture, for many years, although other doctors have had difficulty adopting his technique. Cytori has begun working with plastic surgeons in Japan, Israel, Italy and France who are using its device.

Even the medical establishment is revisiting the issue: The American Society for Aesthetic Plastic Surgery's research arm is funding a breast-augmentation study. Patients are being recruited at [ClinicalTrials.gov](http://ClinicalTrials.gov).

The cost of fat-grafting procedures for cosmetic breast surgery ranges widely, from \$15,000 to \$30,000 or more depending on the surgeon and clinic.

Fat transplantation "has moved into center stage from the backroom," says Scott Spear, a plastic surgeon at Georgetown University in Washington, D.C., who is conducting the study. He says he hopes it will validate the safety and efficacy of fat grafting in the breast. But Dr. Spear says the study won't answer a key question: how much the processing of fat-derived stem cells contributes to the success of the surgery. It is possible that the transplanted fat alone contains enough stem cells to do the job, he says.

So far, neither Cytori nor Dr. Yoshimura -- who uses his own, manual process to supplement stem cells in fat -- has provided sufficient evidence to demonstrate that bolstering fat with more stem cells improves graft survival, Dr. Spear says. Dr. Yoshimura and Cytori, who are working separately, both say their studies are promising but agree more research is needed.

### **'Natural Looking Forever'**

Dr. Yoshimura says he began testing his technique in patients in 2003. He has performed about 200 operations, mostly on Japanese women, but also on some from the U.S. and Canada. He operates on Saturdays out of the luxurious, wood-paneled Cellport Clinic in the Tokyo suburb of Yokohama.

The clinic, which includes a cell-processing laboratory, was built two years ago at a cost of \$26 million by Japan's Biomaster Inc. The venture-capital-backed company's chairman, Ryuji Kuwana, says he is talking with potential partners about constructing similar clinics outside Japan.

Dr. Yoshimura, who calls his operation "cell-assisted lipotransfer," starts with a liposuction procedure to obtain fat, typically from a woman's thigh. He divides the fat in two: Half is processed through a centrifuge, yielding a concentrated stem-cell mixture that is then recombined with the other half. The cell-supplemented graft is delivered through a syringe at four injection sites into the breast. The surgery takes three to four hours, he says.

Like other surgeons who perform fat-transfer procedures, he can't predict exactly how much of a graft will survive, but says most of the tissue volume stabilizes within three months. Dr. Yoshimura says his average graft survival rate is 54%. That makes it difficult to give a woman an augmentation of more than one bra-cup size, from an "A" to a "B," for instance. But the procedure can be repeated. A handful of Dr. Yoshimura's patients have returned for a second augmentation surgery. One Canadian woman says she paid about \$20,000 for the first operation and \$15,000 for the second.

Such surgeries are also being done at two other clinics in Japan, the Seishin Cosmetic Clinic in Tokyo and Kyushu Central Hospital in Fukuoka. Surgeons at both places process stem cells using the machine developed by Cytori.

By automating the cell-processing procedure at bedside during a surgery, Cytori hopes to make fat transplantation easier, faster and more predictable. It says it is aiming for a total procedure time of about one hour with new machines developed with its partner, [Olympus Corp.](#), the Japanese maker of cameras and medical equipment.

To tout its procedure, the Seishin clinic recently ran pictures of a bikini-clad woman showing how her natural bust was augmented by surgery. Speaking through a translator, the woman, Erika Igarashi, said in an interview she was unhappy about her flat chest and began

researching Internet sites last fall. She found the Seishin clinic and volunteered. After a consultation, she stopped dieting to have enough body fat for the operation, which was performed Nov. 7. Ms. Igarashi said she didn't pay for the procedure.

When she woke up, she says, "I looked down and saw big breasts." She felt pain in her thighs where fat was harvested and her breasts initially felt "hard and heavy." Now, more than nine months later, her breasts are a bit smaller, but the size has stabilized, she says. Her new form gives her "lots of confidence," she says, adding she can wear "a greater variety of clothing," including low-cut dresses. The 22-year-old university graduate works part-time in a nightclub and is looking for a job in the cosmetics industry.

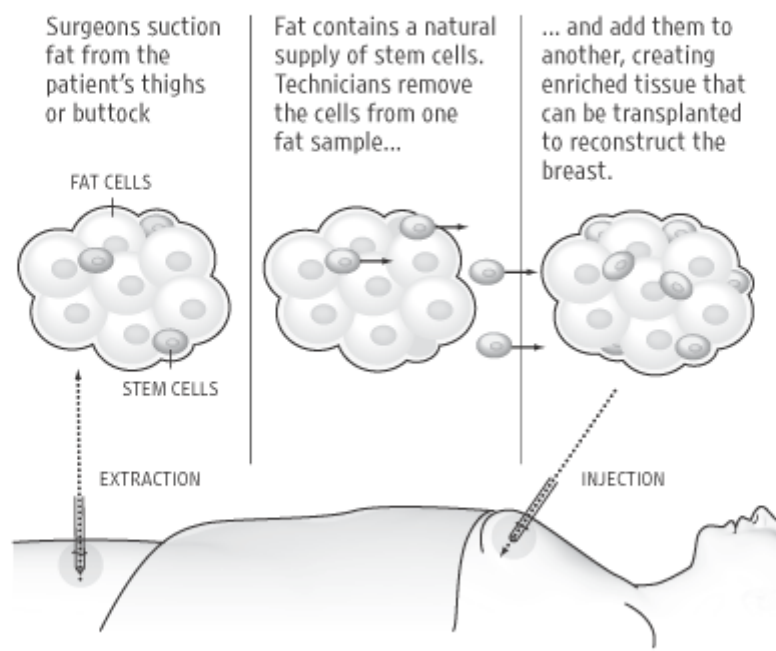
Cytori says it has invested about \$100 million in researching and developing its device, which looks like a portable dishwasher and is priced between \$75,000 and \$100,000.

With commercialization moving ahead in Japan and Europe, Cytori is now taking aim at the U.S. It hopes the FDA will allow it to begin human tests with its device next year to reconstruct breasts damaged by cancer surgery. It has also retained Dr. Coleman, the New York surgeon, as a consultant. Cytori hopes its device will eventually be used to regenerate tissue for treating cardiovascular disease, orthopedic damage, gastrointestinal disorders and pelvic health conditions.

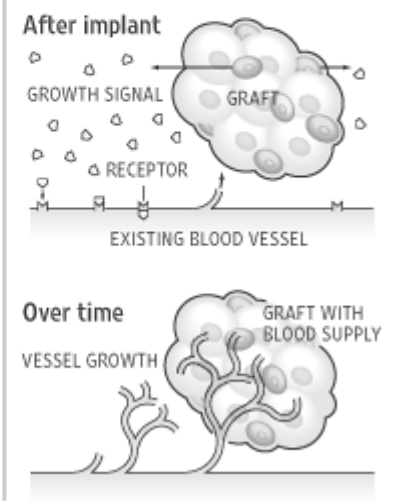
**Write to Rhonda L. Rundle at [rhonda.rundle@wsj.com](mailto:rhonda.rundle@wsj.com)**

# New Use for Stem Cells

Researchers are working to transplant fat from one part of the body into damaged tissue elsewhere. By enriching the fat with stem cells, the resulting graft may survive longer than unadulterated fat transplants, which often atrophy and die. Here's how the procedure could be used for breast augmentation or reconstruction:



Once implanted, the stem cells signal nearby blood vessels to grow toward the graft, nourishing it, and helping to promote its survival



Source: J. Peter Rubin, MD, University of Pittsburgh