Breast Reconstruction

... understanding the options



Kelly R. Kunkel, MD

Pictured: Dr. Kunkel with some of his breast cancer reconstruction patients.

Contents

General Information	2
Definitions	3
Mastectomy: What Is It?	4
Mastectomy incision options	5
Oncoplastic breast reduction/mastopexy	6
Oncoplastic surgery: issues to consider	7
Reconstruction using a tissue expander	8
Tissue expander patient examples	9, 10
Nipple-sparing mastectomy	11
Direct-to-Implant reconstruction	11
Implant-based reconstruction: issues to consider	12
Information about breast implants	13
Breast implant issues	14
Latissimus flaps	15
Latissimus flap patient examples	16
Latissimus flaps: issues to consider	17
TRAM and DIEP flaps	18
TRAM flap patient examples	19
TRAM and DIEP flaps: issues to consider	20
Nipple Reconstruction	21
Mastectomy Without Reconstruction	22
Final Comments	22

Removal of a breast (mastectomy) or part of a breast (partial mastectomy) may be recommended to a woman for a number of reasons. One out of eight women in the United States will be found to have breast cancer. For most women affected by breast cancer, a mastectomy or a partial mastectomy may be advised. Additionally, a woman whose mother and sister had breast cancer might also consider undergoing mastectomies to reduce her likelihood of developing it.

There are many ways to reconstruct a breast. Today beautiful results are frequently accomplished by matching the right technique with the right patient. The different techniques lead to different outcomes, however. Women are sometimes overwhelmed when presented with all of the information about breast reconstruction.

When a woman is told she has breast cancer, her thoughts naturally focus on the affected breast. However, any discussion about breast reconstruction must also take the appearance of the *other* breast into consideration. To achieve symmetry between the reconstructed breast and the opposite breast, sometimes a breast reduction, breast lift, or even breast augmentation of that breast may be necessary.

The optimal time to undergo breast reconstruction is often a matter of personal preference. Frequently breast reconstruction is undertaken at the time of the mastectomy. However, some women prefer to wait. With the exception of oncoplastic reconstruction (see pages 6 and 7), no absolute time frame exists for these procedures. The discussion on the following pages focuses on immediate breast reconstruction (done at the time of the mastectomy), but the same procedures (other than oncoplastic techniques) may be done months or years after a mastectomy.

This booklet is designed to help provide meaningful information about breast reconstruction. The photographs shown are all patients of Dr. Kunkel. Of course, each woman is unique. Each woman has physical attributes and health histories that are different from every other woman. The size, location, type, and genetics of the cancer will differ from one woman to the next. The photographs shown in this booklet are not meant to indicate the exact result an individual woman will receive, because there are so many differences between breast cancer patients. Results will vary. This booklet is meant to be a reference, helping patients and family members understand the issues involved in breast reconstruction.

'Before' and 'after' photographs are shown throughout this booklet. Most of the 'after' photographs were taken several months after surgery. Because of this, many of the scars are still fairly pink. Rest assured, however, that scars fade over time. Rather than focus on the color of the scars, pay close attention to the overall appearance of the breasts. Are the breasts symmetrical? Do the breasts have a nice shape? Can the women in these pictures wear the type of clothing that they desire without feeling self-conscious? To help provide an additional frame of reference, photographs of two women who underwent mastectomies *without* reconstruction are presented on page 22.

Regardless of whether a woman chooses to undergo breast reconstruction, two additional thoughts may be helpful:

- First, take either a small notebook or a smart phone to all of your appointments with doctors. It is easy to think of questions while talking with friends and acquaintances, but many women forget to ask those questions when they're in the doctor's office. Write down those questions (or enter them in note form on your smart phone) and take them with you when you visit with the various doctors.
- Second, the <u>American Cancer Society</u> (ACS) is a valuable resource. The ACS has a large group of breast cancer survivors organized in a group called <u>Reach to Recovery</u>. This group of women volunteers can provide help in ways that few people can. Each of these volunteers has survived breast cancer. Contact the American Cancer Society and ask about the Reach to Recovery Program. A volunteer from the program will contact the patient and be available to provide support and helpful tips about the many issues related to breast cancer treatment.

Definitions

One of the first steps in understanding breast reconstruction is to understand the words and phrases. The following terms are commonly used when discussing breast surgery and breast cancer.

Areola—the colored skin around the nipple.

Axilla—the region of the armpit. It contains lymph nodes, blood vessels, and nerves.

Carcinoma-in-situ—cancer that has not invaded into the deeper layers of tissue.

Chemotherapy-the use of medications, often intravenously, to treat certain types of breast cancer.

<u>DIEP flap</u>— an abbreviation for **D**eep Inferior **E**pigastric artery **P**erforator flap. This is a technique in which skin and fatty tissue, with their associated blood vessels, are detached from the lower abdomen and transferred to the mastectomy site. The surgeon attaches those blood vessels to blood vessels at the mastectomy site, then tailors the tissues to recreate the breast shape. This procedure is similar to a TRAM flap, except in this case no muscle is used and microsurgery is required to attach the blood vessels. See page 18.

Duct—a canal that milk travels through to reach the nipple.

Fat grafting— sometimes fat is taken from the abdomen or the outer thighs using a liposuction technique and then transferred to the reconstructed breast to help smooth contour irregularities.

<u>Latissimus flap</u>—skin, fat, and muscle that is transferred from the back to help reconstruct a breast. Usually an implant is required in addition to the latissimus flap. See page 15.

Lymph nodes—these are like drainage basins. Tumors and infections that start in one area may drain, or spread, to lymph nodes near that area. The breast usually 'drains' to lymph nodes in the axilla or near the breast bone or collar bone.

Malignant—cancerous. An irregular, abnormal growth of certain cell types.

<u>Mastectomy</u>—removal of breast tissue. Most of the skin overlying the breast tissue is not removed. See pages 4 and 5.

Metastasis—spread of cancer cells to other sites.

Radiation therapy—the use of radiation to help minimize the chance of breast cancer coming back in an area.

Saline implant—an implant that is filled with saline, otherwise known as salt water. See pages 13 and 14.

Sentinel node—when a tumor spreads to lymph nodes it typically spreads to one or two lymph node(s) in an area first, then to other nodes. The first lymph node is considered the *sentinel* node. It is possible to identify this node and remove it alone, instead of removing all of the lymph nodes in the area.

Silicone implant—a device filled with silicone gel. See pages 13 and 14.

<u>Tissue expander</u>—a type of temporary implant that may be used in breast reconstruction. Saline may be added gradually over several weeks or months to achieve a desired shape or size. See page 8.

Tissue regeneration matrix— material that is sometimes used during reconstruction to provide support for a breast implant or tissue expander. A woman's own tissue grows into it and may replace it over time. AlloDerm is the most commonly used brand but others exist and may also be used.

<u>TRAM flap</u>—an abbreviation for **Tr**ansverse **R**ectus **A**bdominis **M**usculocutaneous flap. Abdominal skin, fat, and muscle may be transferred to the mastectomy site to reconstruct a breast. Some people consider this to be a breast reconstruction with a "tummy tuck". See page 18.

Mastectomy: what is it?

The term *mastectomy* refers to removal of breast tissue. **The amount of breast tissue to be re-moved is an issue that a patient must discuss with her breast oncology surgeon**. It is important that a woman understands the different types of mastectomies and how these differences may affect her.

In some instances a **partial mastectomy** may be recommended. Related terms include *lumpectomy*, *segmental mastectomy*, and *breast conservation therapy* (BCT). With partial mastectomy surgery, most of the breast tissue is left in place, with only the cancer and a rim of surrounding breast tissue being removed. Often (but not always) the nipple is also preserved. Most commonly the <u>sentinel node</u> is removed at the same time. A woman who chooses a partial mastectomy (lumpectomy) for treatment of her breast cancer will almost always require radiation therapy after surgery as well.

A **total** or **simple mastectomy** results in the removal of essentially all of the breast tissue. In many cases this includes removal of the nipple. When a tumor is small and is located about an inch or more away from the nipple the woman may be a candidate for a <u>nipple-sparing mastectomy</u> (page 11), in which the nipple is not removed. The decision to undergo a nipple-sparing mastectomy is complex and requires input from the breast oncology surgeon, the reconstructive surgeon, and the patient. A woman who has large, droopy breasts may not be a good candidate to undergo a nipple-sparing mastectomy. Women who smoke or use other nicotine products like Juul are not candidates for this procedure.

When a **modified radical mastectomy** is required, all of the breast tissue and the axillary lymph nodes are removed. Modified radical mastectomies are less common today than in previous years, being reserved for special circumstances.

In a **subcutaneous mastectomy**, only the underlying breast tissue is removed. The nipple/areola and axillary lymph nodes are not removed. This type of operation is usually done in women with benign conditions like fibrocystic disease.

The images below illustrate a "traditional" mastectomy. On the left, the black dotted lines indicate the typical location for incisions, with the green area showing the skin that is removed. The image on the right shows the approximate amount of tissue *beneath the skin* that is removed (the purple area). Many women are surprised to learn that so much tissue is removed from below the skin. In a mastectomy most of the breast *skin* remains in place, but a large amount of tissue *below the skin*, extending all the way to the collar bone, is removed. Other incision patterns are often used today. These are discussed on page 5.





Mastectomy Incision Options

Dr. Kunkel and the breast oncology surgeon work together when deciding which incisions may work best for a patient. The location and size of the tumor factor into this decision. The size and shape of the breasts, the overall health of the patient, and a woman's expectations are also important. Each woman is different. The type of incision used on a friend or relative who had breast cancer may be very different than what is recommended to an individual patient. Shown below are some of the incision pattern options. Dr. Kunkel discusses the options with each woman to help her make decisions that will work best for her over time.



This is an image of a "traditional" mastectomy incision pattern. Incisions are made along the dotted black lines. The green area indicates the skin that is removed. In this case it includes removal of the nipple as well. The black dotted lines are pulled together at the end of the procedure. The final scar is oriented transversely across the breast. This is probably the safest mastectomy incision pattern. It may have the least risk of having problems healing.

This is an image of a "vertical" mastectomy incision pattern. As above, the green area indicates the skin that is removed. In this illustration the nipple is removed as well. The black lines are pulled together at the end of the surgery, resulting in a scar that runs up-and-down in the central/lower breast. This is a very good incision to use for many women. The top of the scar, however, may poke out from the top of a bra or bathing suit.



This incision pattern has the highest risk of having problems healing. It may not be a good incision pattern to use in patients who have diabetes, a history of heart disease, women over 70, and in smokers.

This image indicates potential incision sites for a woman undergoing a nipple-sparing mastectomy. In most cases the incision is made either under the breast (shown on her left breast), extending out from the side of the areola, or extending down the center of the breast below the areola (both shown on her right breast).

Variations of an inverted-T pattern may also be used in select cases.

Oncoplastic Breast Reconstruction: [™] partial mastectomy (lumpectomy) combined with tissue rearrangement

The majority of women who have breast cancer do not undergo a mastectomy. Instead, just the cancer itself and a rim of normal surrounding tissue are removed. This is called *breast conservation therapy* because most of the breast tissue is preserved, usually including the nipple (depending on exactly where the cancer is located). Women who undergo this type of treatment also almost always receive radiation of the affected breast after surgery.

Removal of the cancer and some of the adjacent breast tissue, followed by radiation, is very effective treatment for breast cancer. However, it results in a loss of volume in the area where the cancer was located. Depending on the size and shape of the breast and the amount of tissue removed, this could result in a very noticeable indentation. Techniques have been developed to help fill these defects at the time of the lumpectomy using the woman's own tissue. Women who have large breasts, for instance, may benefit by undergoing breast reduction surgery at the same time. Some nearby breast tissue may be rearranged and placed into the area from which the cancer was removed, partially filling that space. This is referred to as *oncoplastic* breast surgery. In this situation *both breasts* are reduced in an attempt to provide nice overall shape and symmetry. In a similar fashion, a woman who has droopy breasts might also be a candidate for local tissue rearrangement once the cancer is removed, resulting in a breast lift. In other situations it may be necessary to use tissue from somewhere else, like a woman's back or side, to appropriately fill the defect. Oncoplastic breast reconstruction typically results in nice shape and size of the breasts while usually also keeping the nipples.

Not all women are candidates for partial mastectomies, and not all women are candidates for an oncoplastic breast reduction or mastopexy. For those who are, however, the results can be amazing!



This 47 year-old woman had cancer in the upper central part of her left breast. She underwent a partial mastectomy and oncoplastic reduction of her left breast and a right breast reduction at the same time. She received radiation of her left breast beginning 5 weeks after her surgery. The pink color of her left breast is related to the radiation.



This 62 year-old woman had cancer in the central area of her left breast. She underwent a partial mastectomy and oncoplastic reduction of her left breast and a right breast reduction. The photograph on the right was taken 7 months after she completed radiation of her left breast.

Length of surgery: typically 2½ -5 hours.

Length of stay in the hospital: most often this procedure is accomplished as an outpatient; the woman goes home the same day after spending a few hours in the recovery room. On occasion a woman may end up staying one night in the hospital but that is relatively uncommon.

Drains: in many cases drains are not required.

Recovery: women who undergo oncoplastic technique breast surgery tend to feel tired for a few days but they are up and walking right away. Women who work may often return to work in one or two weeks, but no strenuous activities are allowed for six weeks.

Radiation: *required* as part of this type of cancer treatment. It usually begins about 6 weeks after the surgery. A woman goes to the radiation facility every weekday for about 6 weeks. Each treatment takes just a few minutes. It effectively treats cancer cells but does also cause shape and size changes in the radiated breast.

Breast <u>cancer</u> surgery, not breast <u>reduction</u> surgery: the most important goal of this surgery is to remove all of the cancer. The secondary benefit is reshaping and resizing the breasts. Before the surgery starts, the breast cancer surgeon has an idea of how much tissue needs to be removed, and from where it will be removed. Findings during the surgery sometimes make the breast oncology surgeon change plans, maybe having to remove more tissue than was originally thought. Because of this, Dr. Kunkel's plans may also change during the surgery. Incision patterns may have to be changed and that could lead to different scars than originally intended. In the majority of cases the nipple may be preserved. However, if a large segment of breast tissue has to be removed from directly behind the nipple, the nipple may have to be removed during the procedure. The tissue that is removed is evaluated by a pathologist. The final result of that evaluation will not be known for three to seven days. It is possible that a pathologist, when looking at the tissue under a microscope, finds cancer cells at the very edges of the tissue that was removed. That is called a "positive margin". If that happens, the patient may require additional surgery.

Women tend to be very happy with the result of their oncoplastic surgery. However, this is *not cosmetic surgery*. Oncoplastic breast reconstruction is different from a 'typical' breast reduction performed on someone who undergoes a reduction to relieve pain in her back and neck from the weight of her breasts. In a typical breast reduction there are few variables. A plan created before surgery is carried out with few if any changes. In *oncoplastic* surgery there are more variables during surgery that may cause significant changes in the operation and therefore the final result. From a purely aesthetic point of view, breasts that are shapely, proportional, symmetrical, and pleasing to the patient are goals of all breast surgery. The aesthetic goals in cancer surgery are similar, but more importantly the cancer has to be completely removed. The final result may be breasts that are exactly the look, size, and symmetry that the woman hoped for. However, it is also possible that the breast with cancer may end up with a different scar pattern than the other breast, the breasts may be larger or smaller than she thinks is ideal, and the breasts are not likely to be exactly symmetrical.

Risks

<u>Asymmetry</u>- the breasts may end up having different sizes and shapes from each other, and different scar patterns.

<u>Fat necrosis</u>- Firm lumps may develop in either breast from decreased circulation to fatty tissues.

<u>Wound healing problems</u>— It is possible to develop problems with the tissues and how they heal. More

surgery could be necessary if this happens.

Loss of the nipple – Blood flow to either nipple could be compromised and this could result in the loss of one or both nipples.

<u>Loss of sensation</u>– It is possible to lose feeling of the nipples and possibly some breast skin.

Bleeding- There is some blood loss

during the procedure. A blood transfusion could be necessary. A localized collection of blood, called a hematoma, could occur. If that were to happen surgery could be required to drain it.

<u>Infection</u>– Although uncommon, if an infection occurs it could require antibiotics and even additional surgery.

Reconstruction using a Tissue Expander

Tissue expanders are temporary devices that are used to gradually stretch the tissues, helping create a new breast shape. An expander may be placed at the time of the mastectomy. Some women wait months or even years after their mastectomy to undergo reconstruction with a tissue expander. During the surgical procedure the device is placed and then either saline, air, or carbon dioxide is added to the expander (there are different types of expanders. One type of expander uses carbon dioxide, others use either saline or air). The images and discussion below explain how the tissue expansion process works. An expander must be replaced at a later date, usually after about 3 to 5 months, with a more long-term <u>breast implant</u> (see pages 13 and 14). Breast reconstruction with a tissue expander offers the woman the opportunity to help decide her final breast size and shape. This technique is often chosen by women who do not desire the complexities and risks of one of the "flap" procedures. Women whose overall health makes them poor candidates for latissimus, DIEP, other flaps may also be candidates for the tissue expansion technique.

A tissue expander may be placed either in front of the pectoralis major muscle or behind it, depending on the details of the particular case. This diagram demonstrates, from a side view, a tissue expander that has been placed *behind* the muscle. In the first picture the ribs and the pectoralis muscle overlying them are seen. In the middle picture an expander is present between the ribs and the muscle, and a small volume of saline is present in the expander. In the picture to the far right, more volume has been added to the expander and the breast shape is becoming more well-defined. More commonly today the expander is placed *in front* of the muscle.



When the tissue expander is initially placed, a certain volume of saline (or air or carbon dioxide) is added to the device. Over the following several weeks and months more saline (or carbon dioxide) is added and more shape obtained.

The green in this diagram demonstrates the location of the tissue expander. The mastectomy scar is also represented.

Saline (or carbon dioxide) is added to the expander over several weeks or months to obtain a breast 'mound'. A second operation is then required to replace the tissue expander with a more long -term implant. The second operation is accomplished as an "outpatient"; an overnight stay in the hospital is not required. The final implant may be filled with saline or silicone. Dr. Kunkel and his office staff discuss the advantages and disadvantages of the various implants with patients as they go through the expansion process.

This diagram represents the appearance of the breast after the tissue expander has been inflated to the desired volume.



Unilateral (one-sided) Breast Reconstruction Using a Tissue Expander: A Case Example



This 71 year-old woman was found to have cancer in her right breast. She lives a very active lifestyle and elected to undergo a right mastectomy and reconstruction using a tissue expander. The photograph to the left shows her breasts before she underwent her mastectomy. Note that both breasts have a "droopy" appearance.



This photograph was taken seven months after her right mastectomy. She has a tissue expander in her right breast and is now ready to undergo the next reconstructive procedure. The right breast tissue expander will be replaced with a silicone gel implant. She will also undergo a breast lift and placement of a small silicone implant on her left side.



This photograph was taken 9 months after she underwent her second operation. Her right breast tissue expander was replaced with a silicone gel implant, and she also underwent a left breast lift ("mastopexy") and placement of a small silicone gel implant in the left breast. Each breast now has a silicone breast implant. She likes the shape and size of her breasts and has elected not to have a nipple reconstructed on her right breast.

Page 10

Bilateral (both sides) Breast Reconstruction with Tissue Expanders

Examples of women who underwent bilateral mastectomies and reconstruction with tissue expanders are shown below.



This 60 year-old woman was found to have right breast cancer. She underwent bilateral mastectomies and reconstruction with tissue expanders. The tissue expanders were replaced with 800 ml silicone gel implants 5 months later. Her nipples were reconstructed 4 months after that.

Before the mastectomies

After reconstruction completed



Before the mastectomies



After reconstruction completed

This 73 year-old woman avid golfer had cancer in her right breast. She underwent bilateral mastectomies and reconstruction with tissue expanders. The tissue expanders were later replaced with 500 ml silicone gel breast implants. Her nipples were reconstructed a few months after that.



Before the mastectomies



After reconstruction completed

This 47 year-old woman had undergone breast augmentation surgery 21 years before cancer was found in her left breast. Her implants were removed at the time of her mastectomies and tissue expanders and tissue regeneration matrix were placed. Five months later the expanders were replaced with 550 cc silicone gel implants. She is thin and did not have much fat to build a nipple, so a tissue regeneration matrix was used to help reconstruct her nipples 11 months after her mastectomies. The tattoos were completed 3 months later.

Additional Reconstruction Options

Nipple-sparing mastectomy

A nipple-sparing mastectomy may be possible when a tumor is small and is located more than an inch away from the nipple. The mastectomy incision may be beneath the breast, on the side of the breast, or vertically directly below the nipple (see page 5). The underlying breast tissue is removed but essentially all of the skin of the breast is left in place. The breast is reconstructed immediately using either a tissue expander, an implant, or one of the flap procedures described on pages 15-20. Nipple-sparing mastectomies work best for women with moderate sized breasts without much ptosis ("droopiness").

Direct-to-implant reconstruction

Many women undergoing implant-based breast reconstruction are candidates to skip the tissue expansion process altogether. It may be possible to have the final implant placed at the time the mastectomy is performed. Having the final implant placed instead of a tissue expander has the advantages of creating a nice shape immediately and minimizing additional operations. If a woman who undergoes direct-to-implant reconstruction likes the size, shape, and symmetry of her breasts after surgery, she may not have to undergo any more breast surgery. Disadvantages of this type of reconstruction include not being able to adjust the result (unlike a tissue expander, saline or silicone cannot be added to or removed from a final breast implant), the breasts may be smaller or larger than a woman wants, and it may be difficult to make substantial changes later. Direct-to-implant reconstruction works best for women with moderate-size or slightly enlarged breasts.

Examples of Direct-to-Implant, Nipple Sparing Mastectomies:



(before her mastectomies)



(after her mastectomies and implant reconstruction)

This 69 year-old woman had cancer in her right breast. She underwent bilateral nipple-sparing mastectomies and both breasts were reconstructed with 415 ml round silicone gel implants. No tissue expanders were required.



(before her mastectomies)

(after her mastectomies and implant reconstruction)

This 42 year-old woman had undergone cosmetic breast augmentation several years before being diagnosed with right breast cancer. She underwent bilateral nipple-sparing mastectomies. Her breasts were reconstructed with 520 ml round silicone gel breast implants. No tissue expanders were used.

Implant-based Breast Reconstruction: **Issues to Consider**

Length of surgery: placement of a tissue expander or implant usually takes about $1-1\frac{1}{2}$ hours per breast. If the procedure is done at the time of the mastectomy, this is *in addition* to the time it takes for the mastectomy.

Length of stay in the hospital: it is possible for a woman to undergo mastectomies and reconstruction with tissue expanders or implants as an outpatient. A woman may be able to go home the same day the surgery takes place, sleep in her own bed, and have whatever food she likes. However, most women spend one night in the hospital and leave by about lunchtime the next day. If the reconstruction is done months or years after the mastectomy, the procedure is accomplished as an outpatient and the woman goes home the same day.

Drains: one or two drains are placed per reconstructed breast. Each drain will be removed in the office as the drainage decreases. Drains typically remain in place for 2 to 4 weeks.

Recovery: in the hospital - women who spend the night in the hospital are helped out of bed to sit in a chair on the evening of the surgery, then walk in the hallway outside their room on the first morning after surgery. The patient is sent home after she begins to eat and walk well, usually the day after the mastectomy/reconstruction procedure. While there may be some pinching sensation and tightness, most women do not actually have much pain.

Recovery: at home - It is best to make arrangements to have someone help at home for at least three to five days. For example, if a mastectomy and reconstruction are scheduled to take place on a Tuesday, it is advisable for someone to be available to be at home with the patient beginning that Wednesday. Help with dressing changes and the drains may be necessary.

Driving a car is not allowed for at least 2 weeks. The woman should not lift, push, or pull anything or do any strenuous activity for 6 weeks. Some women return to limited duty work after 1 or 2 weeks. It usually takes 6 to 8 weeks before full activity may be resumed.

The final implant: if a tissue expander is used, it must later be replaced with a long-term implant. This implant may contain either silicone gel or saline. This second operation usually takes place approximately 3 to 5 months after the mastectomy surgery. For more information about saline and silicone breast implants, see pages 13 and 14.

Tissue regeneration matrix: this material is used in all cases of direct-to-implant reconstruction and in some tissue expander cases as well. The matrix serves as a template, allowing the woman's own tissues to grow into it, creating extra thickness of tissue covering the implant or expander. This material is not specifically FDA-approved for breast reconstruction cases. It's use is considered "off label". There are dozens of studies published in scientific journals indicating the safety and effectiveness of its use in this manner.

Nipple reconstruction: If nipples are removed at the time of the mastectomy, new nipples may be reconstructed at a later date. See page 21.

Risks

Wonderful results are possible using implants, but complications may occur. Some of the most important include:

perfectly symmetrical. In some instances revision may be necessary.

<u>Ripples</u>- sometimes ripples in the surface of the implant may be seen under the skin.

Asymmetry- the breasts may not be Leakage- all breast implants will leak at some time. If a saline implant leaks the implant becomes flat and will need to be replaced. Silicone gel implants will also leak but this may be more difficult to detect. Ultrasounds and MRI's may help detect

leakage or rupture in these cases. Infection- this is a risk that is present with any surgical procedure. If an infection develops around a tissue expander or a breast implant it may have to be removed.

Information about Breast Implants

There are currently four companies making breast implants that are FDA-approved for use in the United States: <u>Mentor</u>, <u>Sientra</u>, <u>Allergan Natrelle</u>, and <u>Ideal Implant Inc</u>. The implant companies compete with each other, each company believing its implants have advantages over its competitors. It is almost impossible for a woman undergoing breast reconstruction with tissue expanders and implants to be able to understand all of the details of the various types of implants. Dr. Kunkel uses his knowledge of the often subtle differences in the implants to help select which implants are likely to create the best final outcome for the particular patient. More information about breast implants may be found on page 14. This page focuses on general concepts and ideas related to breast implants.

Breast implants are silicone rubber shells that are filled with either silicone gel or saline. Silicone gel implants are used more frequently in breast reconstruction than saline implants because they tend to feel more like a breast to a hand touching the reconstructed breast than saline implants do. Dr. Kunkel and his staff provide each patient the opportunity to look at and hold different implants before she decides which to use, but ultimately the majority of women choose silicone implants.

Implants used in cosmetic and reconstructive breast surgery in the United States today are typically round and have a smooth surface. Examples of round implants from Sientra are shown below. Note that some implants have smooth surfaces, as shown on the pictures on the left, and some have textured surfaces, shown on the right. Textured surface breast implants and tissue expanders are rarely used today.



The images to the right of this paragraph demonstrate shaped silicone gel implants from the Sientra corporation. These types of implants have a definite shape to them and may provide a different final look than round implants. One potential disadvantage of shaped implants is that they may rotate into a different position. If that happens, the shape of the breast will change and that may be bothersome. Shaped implants were used primarily between 2000 and 2015. As silicone gel technology has changed, smooth surface round implants are used in almost all implant-based breast reconstruction cases today.



The use of Sientra implants in the images above is not a specific endorsement of Sientra products. The implants and implant company used will vary from patient to patient, depending on specific findings, situations, and desires.

Breast implant issues

In the early 1990's questions were raised about the safety of breast implants. At that time no studies existed to show whether silicone gel implants were actually safe. In 1992 the U.S. Food and Drug Administration (FDA) placed restrictions on the use of silicone gel implants until studies could be completed. Numerous studies took place between 1992 and 2006 and were published in medical journals. In 2006 the FDA, after evaluating dozens of studies and after conducting public hearings, removed the restrictions it had placed in 1992.

Breast implants, like almost any device implanted into a patient (including knee joints, pacemakers, and heart valves) will eventually wear out. Both **saline and silicone implants will eventually leak or rupture** and should not be considered to be devices that will last a woman's entire life. Additional surgery will likely eventually be necessary related to the implant(s). While leakage or rupture may take place 10, 20, or even more years after the initial surgery, implants may also leak after a shorter time. The exact length of time an implant will remain intact is not known. When a saline implant leaks, the body absorbs the saline and the implant deflates. This produces a very noticeable change in the breast. Most women in this situation elect to have the implant replaced, which may be done in a short outpatient surgical procedure. Leakage or rupture of a silicone implant may be harder to detect. Rupture of a silicone implant may be "silent" in that the woman may not notice any changes in the breast but a mammogram or ultrasound of the breast may demonstrate a leak. In other cases women notice that a breast that used to be soft becomes more firm or painful, and radiology studies done to evaluate the change show a rupture. When a silicone implant has ruptured, the FDA recommends that it be removed. A new implant may be placed, and this surgery is accomplished in a short outpatient operation.

When an implant of any type is placed in a body, the body recognizes that this is a foreign substance and reacts by forming a scar around it. With breast implants, some people form firm, fibrous scars called a "capsule". On occasion the capsule may become thick and cause constriction of the breast implant. This is called **capsular contracture** and may cause the implant to become firm and uncomfortable. Capsular contracture is more common in women who require radiation than women who do not. Additional surgery may become necessary if capsular contracture occurs.

Another concern that has been expressed is that implants may cause or exacerbate autoimmune responses or connective tissue disorders. Numerous studies (including from places like Harvard, the Mayo Clinic, Johns Hopkins, and the University of Michigan) have revealed no association between silicone gel-filled implants and connective tissue disease. A study from doctors at MD Anderson Cancer Center in 2018 indicated women with silicone implants have an increased risk of Sjogren Syndrome, rheumatoid arthritis, and scleroderma. While the percentages and numbers of women who actually developed these issues were very small, an increased risk was found. Some women who have breast implants describe symptoms like fatigue, hair loss, headaches, chills, rash, body odor, anxiety, brain fog, sleep disturbance, and depression and think their implants contribute to or even cause these issues. While there is no actual clinical diagnosis, these women refer to this as **breast implant illness**. Some women report an improvement in these symptoms when their breast implants are removed.

In 2011 the FDA identified a possible association between breast implants and the development of <u>anaplastic large cell lymphoma</u> (BIA-ALCL), a rare type of lymphoma. By 2019 the FDA reported there have been approximately 600 known cases of BIA-ALCL in women with breast implants worldwide (out of an estimated 15 million women who have breast implants). Information to date suggests that women with breast implants may have a *very low* but *increased* risk of developing ALCL. This rare disease process seems to be related to textured surface breast implants. To date, no woman who has only had smooth surface breast implants has developed this problem. Textured surface tissue expanders and breast implants are rarely used today.

Few medical devices have undergone the degree of scrutiny and speculation that silicone breast implants have. With current knowledge from studies published in numerous scientific and medical journals, there is a tremendous amount of evidence to support the safety of silicone breast implants.

The latissimus dorsi is a muscle located on a person's back. It serves many of the same functions on the back as the pectoralis major muscle serves on the front of the chest. The latissimus muscle helps pull the arm and shoulder in toward the body, and it helps rotate the shoulder and arm toward the back.

The latissimus muscle has a specific blood vessel that supplies it. The blood vessel sends small branches through the muscle to the overlying fatty tissue and skin. Because of this, these tissues (latissimus muscle, fat, skin) may be transferred through a tunnel beneath the skin from the back to the mastectomy site to help reconstruct a breast. A "flap" refers to the use of skin, fat, and muscle that has its own blood supply and is transferred as a unit to reconstruct the breast.

The latissimus dorsi muscle and its attached fat and skin rarely provide enough tissue to completely match the amount of tissue removed during the mastectomy. Most of the time either a tissue expander or a long -term breast implant is used in addition to the latissimus flap. The implant is placed beneath the latissimus muscle to add more shape and volume.

This diagram shows the location of the latissimus dorsi muscle. Usually some skin and fatty tissue are taken with this muscle to help reconstruct the breast. These tissues are shown within the white dotted lines. Using these tissues requires an incision on a woman's back. The scar that results is often concealed within the bra line. Although in theory it is possible to have some weakness in the shoulder, studies have demonstrated that this rarely occurs.

In this diagram the latissimus flap tissues have been transferred to the mastectomy site and sutured into place. An implant is not shown in this picture but, as discussed above, some type of implant is almost always used.

It may be recommended that the nipple and areola be removed during a mastectomy. By removing the nipple and areola, the final shape of the central part of the breast changes. A latissimus flap allows replacement of the skin that has been removed, helping preserve the original shape of the breast. This may be helpful in situations where the other breast is moderately droopy.





Latissimus dorsi flap: case examples



This 49 year-old woman underwent a right mastectomy and reconstruction with a latissimus flap and tissue expander. The expander was replaced with a 550 cc silicone gel implant 7 months later. The nipple was reconstructed 8 months after that. The photograph on the right was taken 23 months after the photograph on the left.



This 44 year-old woman underwent bilateral mastectomies to treat her right breast cancer. Each breast was reconstructed with a latissimus flap and tissue expander. The expanders were replaced with silicone implants six months later. Her nipples were reconstructed five months after that.



Preoperative and postoperative views of a 56 year-old woman who had cancer in her right breast. She underwent a right mastectomy and the breast was reconstructed with a latissimus flap and tissue expander. The expander was replaced with a 371 cc silicone gel implant six months later. Her nipple was reconstructed a few months after that.

Latissimus flaps: Issues to Consider

Length of surgery: about 3 hours per breast. If the latissimus flap is being done immediately after the mastectomy, this 3 hours is *in addition* to the time required for the mastectomy. If both breasts are reconstructed with latissimus flaps and each breast takes about three hours, the total time involved for the reconstruction is about 6 hours.

Length of stay in the hospital: usually 1 night.

Drains: 2 or 3 per breast. The hospital nursing staff instructs the patient and her family how to take care of the drains. The drains will be removed in the office as the drainage decreases, usually about 2 to 4 weeks after surgery.

Recovery: in the hospital - In most cases patients will sit up in a chair on the evening of surgery and early the following morning. They begin walking with assistance in the hospital on the morning of the first postoperative day, then gradually become more independent in walking through the day. Patients may eat whatever they want as soon as they feel comfortable doing so. Some discomfort is present at the mastectomy site and in the back. Medication is provided to help with this. Patients are discharged to home after they start walking and eating well, usually on the first day after surgery.

Recovery: at home - Arrangements should be made to have a person available to stay with the patient for 24 hours a day for 3 to 5 days after the patient is sent home. For example, if surgery is scheduled for a Tuesday, the woman should anticipate going home on Wednesday or Thursday (see *length of stay* above). She should make arrangements for someone to stay with her from the day she goes home until at least three to five days later. Because dressing changes are necessary, the person staying with the patient should be someone that the patient is comfortable seeing her without clothing.

Driving a car is not allowed for 2 or 3 weeks. Several follow-up visits are necessary in the first few weeks so arranging a driver is necessary as well. No strenuous activity is allowed for 6 weeks after surgery. Women tend to return to work after 3 to 6 weeks.

Scars: will be present at the mastectomy site and on the back. The scar on the back is usually in or below the bra line. Scars fade over 8-12 months.

<u>Nipple reconstruction</u>: may be performed as a short outpatient procedure once the patient decides that she is pleased with her breast size and shape. See page 21.

Risks

Beautiful results are often obtained when using latissimus flap reconstruction, but there are some risks. Among the more important are:

<u>Weakness</u>— although it may be possible to have some weakness in the shoulder, this rarely occurs. Women most likely to notice weakness include competitive swimmers or mountain climbers.

<u>Seroma</u>– Fluid (serum) may accumulate in the reconstructed breast or in the back. Drains are used to prevent this. If fluid does build up, surgery may be necessary.

Asymmetry- the reconstructed

breast may not look exactly like the other breast.

<u>Infection</u>— while unlikely, infection may occur. If an implant is used with the latissimus flap, it may have to be removed in a case of severe infection.

<u>Rupture of the implant</u>— No implant will last for the lifetime of a woman. At some time an implant will leak or rupture and could require replacement. Refer to pages 13 and 14 for more information about implants.

Loss of the flap— the latissimus muscle typically has a robust blood supply. It is possible that the blood vessel supplying the muscle could be injured or kinked as the muscle is moved to the breast. If that happens the entire flap may need to be removed. This is an uncommon event.

TRAM flaps and DIEP flaps

A 'flap' refers to the use of living tissue that has its own blood supply. In TRAM flap and DIEP flap operations a woman's own healthy abdominal tissue is used to reconstruct the breast.

Each person has two rectus abdominis muscles. These are often referred to as the "six pack" muscles. The rectus muscles start at the lower end of the ribs and extend down to the pubic bones. The two muscles are found on the right and left sides of the abdomen, one on each side of the midline. The rectus muscle has a small blood vessel that runs length-wise through it. Near the level of the belly button the blood vessel sends small branches into the overlying fatty tissue and skin. In TRAM flap ('TRAM' is an abbreviation for transverse rectus abdominis musculocutaneous) operations, this combination of muscle, fat, and skin around and below the umbilicus is used to reconstruct the breast.

'DIEP' is an abbreviation for the words 'deep inferior epigastric perforator'. This operation uses the same abdominal tissues around and beneath the belly button that are used in a TRAM flap. However, in DIEP flap surgery the *muscle* is *not* used. Instead, the skin and fatty tissues (but not the muscles) are completely removed from the abdomen and transferred to the mastectomy site. The small blood vessels that supply blood to this tissue are then attached to blood vessels in the mastectomy site. Dr. Kunkel does not do DIEP flap reconstruction but there are plastic surgeons in Fort Worth who do.

In the diagram to the right the area shaded green represents the mastectomy site. The two rectus abdominis muscles are shown running vertically near the midline of the abdomen. The area outlined by the white dotted lines represents the tissues that will be transferred to make the breast with either a TRAM flap or a DIEP flap procedure. The primary difference between a TRAM flap and a DIEP flap is that the muscles are used to carry the blood vessels in a TRAM flap but *not* in a DIEP flap. The same tissues (outlined by the white dotted lines) are used to shape and reconstruct the breast with either technique.

In a TRAM flap procedure the rectus abdominis muscle is divided near the pubic bone, but the end of the muscle attached to the ribs is left intact. This preserves the blood flow going into the muscle from near the ribs. The muscle and overlying fatty tissue and skin are then rotated through the tunnel to the mastectomy site. The tissues are trimmed and contoured to achieve the final result. This diagram shows a TRAM flap. A DIEP flap would have a similar appearance, but the muscle would not have been used.

The abdomen and mastectomy sites are sutured closed at the end of the procedure, indicated by the white line below the umbilicus in this diagram.

The resulting incision sites take a little time to heal and the scars fade over time. The overall shape and appearance of the reconstructed breast and the abdomen are fairly similar regardless of whether a TRAM flap or a DIEP flap technique is used.







TRAM flaps: Case Examples









Preoperative views of a 52 year-old woman with cancer of her left breast. Note the indented abdominal scar from a previous hysterectomy.

The same patient 8 months after her TRAM flap reconstruction. The nipple and areola have also been reconstructed. The breasts are symmetrical and the abdomen has an improved appearance.









Preoperative views of a 42 year-old athletic woman with cancer of her right breast.

Postoperative views of the same patient 2 months after surgery. She decided not to have her nipple reconstructed. Note the pink scars and compare these with the first patient shown on this page (her postoperative views were taken 8 months after her surgery). The scars fade over time.

TRAM and DIEP flaps: Issues to Consider

Length of surgery: 3 - 5 hours.

Length of stay in the hospital: about 2 nights for a TRAM flap, possibly 3-5 nights for a DIEP flap.

Drains: 1 or 2 drains are placed at the mastectomy/reconstruction site, and one or two more drains are placed in the abdomen. These will be taken out as the drainage decreases but are often in place for 2 or 3 weeks, and sometimes longer.

Recovery: in hospital: Typically a woman will sit in a chair the morning after surgery and begin walking with assistance shortly after that. Gradually on the first day after the operation she begins walking more independently. The nursing staff shows the patient and her family how to manage the drains. She may eat whatever she chooses as soon as she feels comfortable doing so. Some discomfort is present at the mastectomy site and in the lower abdomen. Medication is provided to help minimize discomfort.

Recovery: at home - these patients tend to walk a little "hunched-over" for a few days after the surgery. It is best to keep a few pillows beneath the knees and several more behind the head and shoulders when in bed for the first 5 -7 days at home. This keeps tension off of the abdomen. Arrangements should be made to have a person available to stay with the patient for 24 hours a day for 5-7 days after the patient is sent home. Because dressing changes are necessary, the person staying with the patient should be someone that the patient is comfortable seeing her without clothing.

Driving a car is not allowed for about 3 weeks. Several follow-up visits are necessary in the first few weeks so arranging a driver is necessary as well. No strenuous activity is allowed for 6 weeks after surgery. Women tend to return to work after 4 to 6 weeks.

Risks

While TRAM and DIEP flap operations may provide outstanding results, there are some risks. Some of the more important risks include:

<u>Asymmetry</u>— the reconstructed breast may not look just like the other breast.

.....

<u>Fat necrosis</u>— Firm lumps may develop in the reconstructed breast or the abdomen and this could require more surgery to remove the lumps.

<u>Wound healing problems</u>– The abdomen or the reconstructed breast may have trouble healing and could require more surgery, possible even skin grafts.

<u>Hernia</u>— Hernias may develop in the abdomen, and this could require surgical repair. <u>Weakness</u>— It may be difficult to sit up from a lying down position after this type of surgery.

<u>Malposition of the umbilicus</u>— The belly button might be a little to the left or right, or a little higher or lower, than it was before the surgery.

<u>Seroma</u>— Fluid may build up within the tissues of the reconstructed breast or the abdomen. This could require more surgery.

<u>Bleeding</u>— Although relatively uncommon, substantial bleeding could occur during or even shortly after the TRAM or DIEP flap operation. This could require transfusions and even surgical drainage.

Infection— Also relatively uncommon, infections could require intravenous antibiotic therapy or even more surgery.

<u>Tissue circulation problems</u>– The tissue transferred to reconstruct the breast may develop problems with blood flow and circulation. If this happens additional surgery may be required to try to improve the circulation or remove tissue that is injured as a result of loss of circulation.

Nipple Reconstruction

If a nipple was removed at the time of a mastectomy, there are some good options available for a woman who decides she wants to have a nipple. Some women decide not to undergo nipple reconstruction because they are comfortable with how they look in clothing and that's all they really want. Some women want a nipple but do not want to undergo additional surgery. Tattoo placement works well for them, providing something that looks like a nipple but has no projection (front-to-back dimension). Many women, most commonly between the ages of 20 and 60, want to have a nipple with projection. For them a small additional surgical procedure is necessary.

For women who desire a nipple with projection, in most cases the nipple is created using tissue already present on the reconstructed breast. The procedure takes about 20 minutes per nipple. After deciding where a nipple might look best, a small incision is made at that site. Fat present deep to this is pulled forward. Skin surrounding that area is wrapped around the small mound of fat. Voilà: a nipple! The color of the areola is later created in the office using a tattoo technique. The procedure is much easier on a woman than the mastectomy/reconstruction operation. She shouldn't do strenuous activity for a few weeks after surgery, though.

Other procedures exist for nipple reconstruction, but the technique described above is the most common. If a woman has a large nipple on the opposite breast, it may be possible to use part of that nipple to reconstruct the nipple on the mastectomy site. Other options for nipple reconstruction, include use of cartilage, silicone rubber implants, and tissue from other sources; these options are much less commonly used today.

If a woman decides not to have surgery but instead just to have a tattoo, that's pretty easy. She helps decide what colors she wants. A tattoo done in the office takes about an hour per breast. She shouldn't go swimming for a few days, but there aren't many physical restrictions with this technique.



This 65 year-old woman underwent bilateral mastectomies and reconstruction with tissue expanders related to her right breast cancer. Her expanders were replaced with silicone gel breast implants four months later, with the result shown in the middle photograph. She did not want to undergo more surgery so her nipples were recreated using only a tattoo technique. The photograph on the right shows her final result.

Mastectomy without Reconstruction:

Some women do not undergo reconstruction after a mastectomy. For those women, external prostheses and special bras may be all they ever want or need. While women who undergo mastectomy without reconstruction usually do quite well, some decide to undergo reconstruction months or years later. Photographs of women who underwent mastectomies and reconstruction were shown on previous pages. For comparison, the photographs below show women who underwent mastectomy without reconstruction.



This 65 year-old woman underwent a left mastectomy six months before this photograph was taken.



This 34 year-old woman underwent a right mastectomy followed by radiation.



A woman may choose not to undergo breast reconstruction at the time of her mastectomy. She may not want to think about undergoing more surgery and instead wants to just focus on eliminating the cancer. Uncertainty regarding the stage of breast cancer and the possible need for radiation therapy are common reasons for delaying reconstruction or not undergoing reconstruction at all.

When considering breast cancer surgery it is important that a woman is as comfortable as possible with her decisions. If there is something she does not understand, she should ask. *Knowledge is a powerful tool*. The different cancer operations (partial mastectomies, total mastectomies, nipple-sparing mastectomies) and different reconstruction options (oncoplastic techniques, tissue expanders, breast implants, latissimus flaps, DIEP flaps) provide different outcomes. Every physician involved in a breast cancer patient's care wants the best possible outcome for that patient. Empowering a patient with knowledge about procedures and outcomes allows the woman to choose the treatments that best fit her life, lifestyle, and expectations. Treatment of the *cancer* is *mandatory*. Reconstruction, while often beneficial, is more optional.

Reconstructive procedures do not always work out perfectly for each patient. In general, women who are near their ideal body weight have better outcomes than women who are significantly overweight. The pictures shown in this booklet illustrate the procedures described and are not intended to imply or guarantee a specific result.