Breast Reconstruction

...Understanding the Options

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Contents

General information

Removal of a breast, or part of a breast, may be done for a number of reasons. One out of eight women in the United States will develop breast cancer. For many people affected by breast cancer, a mastectomy or a partial mastectomy may be recommended. However, while breast cancer may be the most common reason for mastectomies, other problems also can lead a person to undergo this operation. Women with severe fibrocystic disease may be candidates for mastectomies, and women with strong family histories of breast cancer may consider prophylactic mastectomies.

Over the years a number of techniques have been developed to help reconstruct breasts. Today beautiful breast reconstructions are frequently accomplished by matching the right technique with the right patient. However, so many options exist that women are almost overwhelmed when presented with all of the information. Sometimes it is difficult to make a choice, and it is easy to forget some of the information.

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 timing of breast reconstruction is a matter of personal preference. Frequently breast reconstruction is started at the time of the mastectomy. However, some women prefer to wait. No absolute time frame exists for these procedures. This booklet focuses on immediate breast reconstruction (done at the time of the mastectomy), but the same procedures may be done months or years after a mastectomy. One of the goals of this booklet is to provide enough information to help a woman feel comfortable with her decision about reconstruction.

Many 'before and after' photographs of Dr. Kunkel's patients are included in this booklet to help illustrate each type of reconstructive procedure described. Most of the photographs were taken just a few months after surgery. Because of this, many of the scars are still fairly pink. Rest assured, however, that these 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, pictures of women who have undergone mastectomies without reconstruction at the time of the mastectomies are provided for comparison on page 21.

This booklet is designed to help take away some of the mystery about breast reconstruction. The surgical options available are presented in language that is easy to understand. Information regarding just how an operation works is provided, and real case examples are shown. Characteristics of women who are good candidates, and just as importantly women who are *not* good candidates, for particular operations are included. Risks of the operations are noted, and a few pages for taking notes and jotting down questions are also provided.

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 doctor appointments. 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 American Cancer Society (ACS) is a valuable resource. The ACS has a large group of breast cancer survivors organized in a group called Reach to Recovery. This group of women volunteers can provide help in ways that no one else can. Each of these women has survived breast cancer. A patient or one of her doctors may 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.

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

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.

DIEP flap– an acronym for Deep Inferior Epigastric artery Perforator flap. This is a technique in which skin and fatty tissue, with the associated artery that supplies blood to them, are detached from the lower abdomen and transferred to the mastectomy site. There the blood vessel is hooked-up to a blood vessel at the mastectomy site and the tissue is tailored 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 together.

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.

Latissimus flap-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 11.

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.

Mastectomy-removal of breast tissue. Most of the skin overlying the breast tissue is not removed. See page 4.

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 9 and 10.

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 in the area. The first lymph node is considered the sentinel node. It is now 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 9 and 10.

Tissue expander-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 5.

Tissue regeneration matrix– material that is sometimes used during reconstruction to provide an internal sling for an implant. A woman's own tissue grows into it and may replace it over time. AlloDerm is the most commonly used brand.

TRAM flap-abdominal skin, fat, and muscle that 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 14.

Mastectomy: what is it?

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

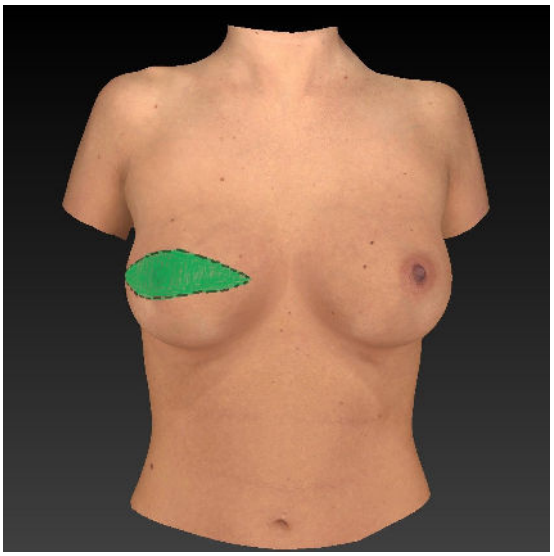
In some instances a **partial mastectomy** may be recommended. Related terms include *lumpectomy* and *breast conservation surgery*. All of the breast tissue is not removed with this option. In fact, most of the breast tissue is left in place, including the nipple and areola. Most commonly either a formal axillary node or a sentinel node dissection is performed at the same time. A woman who chooses a partial mastectomy (lumpectomy) for treatment of her breast cancer is likely to require radiation therapy as well.

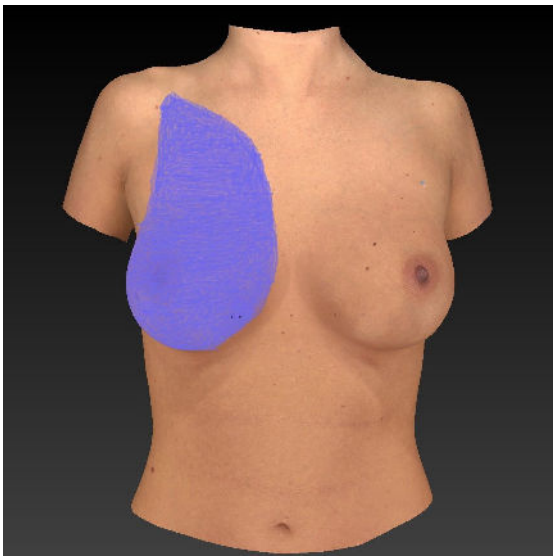
A **total** or **simple mastectomy** results in the removal of the breast tissue. In most cases this includes removal of the nipple and areola. Removal of the axillary lymph nodes is not done with this procedure. Usually removal of only the sentinel node (or nodes, if more than one is encountered) is performed with 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, usually being reserved for special circumstances.

In a **subcutaneous mastectomy**, only the underlying breast tissue is removed. The nipple and areola are not removed and there is no dissection of the axillary lymph nodes. This type of operation is usually done in women with benign conditions like fibrocystic disease.

The photographs below illustrate a "typical" mastectomy. On the left, the black dotted lines indicate the usual location for the incisions, with the green area showing the skin that is often removed. Note that the majority of the breast skin is left intact, but the nipple is usually removed. The image on the right indicates the approximate amount of tissue beneath the skin that is removed, shown in purple. Most people are not aware that so much tissue is actually removed. Remember, the skin overlying the purple area remains in place, but a large amount of tissue below the skin, extending all the way to the collar bone (clavicle) is removed.

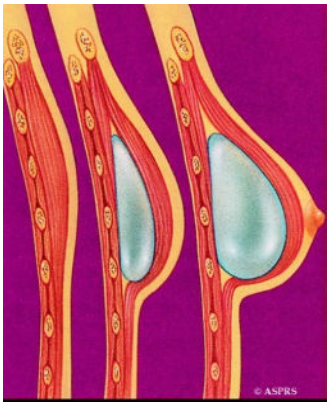




Tissue Expanders

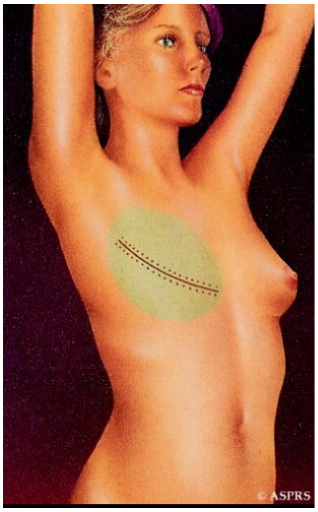
Tissue expanders are temporary devices that help to stretch the tissues, helping create a breast shape. An expander must be replaced at a later date, usually after about 6 months, with a more long-lasting breast implant. This technique offers some flexibility in final breast size and is often chosen 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 TRAM, latissimus, or other flaps may also be candidates for the tissue expansion technique.

This diagram demonstrates, from a side view, the effects of a tissue expander. 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.



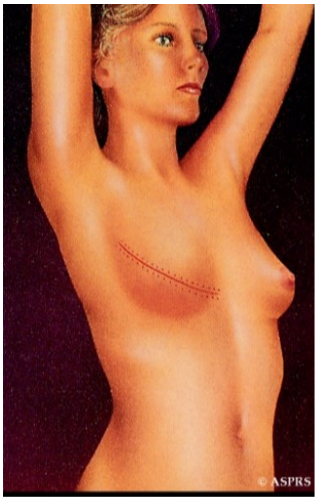
With initial placement of the tissue expander only a relatively small volume of saline is added to the expander. Over the following several weeks and months, more saline is added during visits to the surgeon's office. The tissue expander has a small rubber dome built into it. A needle may be placed through the skin into this rubber dome. Saline is then injected through the needle into the rubber dome of the expander.

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



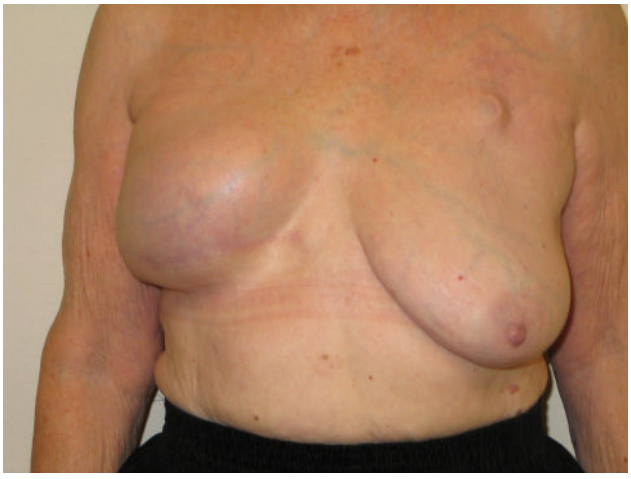
Saline is added to or removed from the expander over several weeks to obtain a breast 'mound'. This 'mound' will often be created to be a little larger than the opposite breast. A second, outpatient, operation is then required to replace the tissue expander with a more long-term implant. This implant may be filled with saline, silicone, or a combination of saline and silicone, depending on the patient's wishes.

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



Tissue expander reconstruction:
A case example, including the time sequence

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 mastectomy with tissue expander breast reconstruction. Note that both breasts have a "droopy" appearance ("ptosis").



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

This photograph was taken 9 months after the photograph above. Each breast now has a silicone breast implant. She had a left mastopexy to lift the nipple. She likes the shape and size of her breasts and has elected not to have a nipple reconstructed on her right breast.

Tissue expander reconstruction: More examples

More examples of women who have undergone tissue expansion breast reconstruction are shown below. Note that it is very common to have something done to the other breast when undergoing breast cancer treatment and reconstruction.

This 50 year-old woman was found to have right breast cancer behind the nipple. She underwent a right mastectomy and tissue expander reconstruction. The right tissue expander was replaced with a silicone implant 7 months later, and she had a small implant placed behind her left breast to obtain symmetry. Her nipple was reconstructed and the areola tattooed. The tattoo fades a bit over time. The 'after' photograph was taken 16 months after the 'before' photograph.

This 33 year-old woman was found to have cancer in her left breast. She underwent mastectomies and tissue expander reconstruction. Her tissue expanders were replaced with silicone implants eight months later and fat was grafted into the upper parts of the breasts to provide a smooth transition from the chest to the breasts. Her nipples were reconstructed later, with areola tattoos as the final piece of her breast reconstruction.

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.

Tissue expanders and implants: issues to consider

Tissue regeneration matrix-this material is often helpful in tissue expander reconstruction, especially when the reconstruction is done at the same time as the mastectomy. It serves as a "sling" or "hammock" along the lower part of the breast. This hammock function takes some of the weight of the tissue expander off of the lower breast tissues, which may allow for improved healing. The matrix also serves as a template, allowing your own tissues to grow into it and replace it, creating a little extra thickness of tissue covering the expander in the lower part of the reconstructed breast.

Length of surgery-placement of a tissue expander or adjustable implant usually takes about an hour. 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-if done at the time of the mastectomy, usually one night. If done months or years after the mastectomy the procedure may be done as an "outpatient".

Drains-one or two (per reconstructed breast). Each drain will be removed in the office as the drainage decreases to a fairly minimal amount. Drains typically remain in place for 2 to 4 weeks, but may be left in place for prolonged periods as well.

Recovery: in the hospital-patients are often asked to sit in a chair on the evening of the surgery, then walk in the hallway outside their room on the first day after surgery. Some discomfort is present at the mastectomy site. The patient is sent home after she begins to eat and walk well, usually the day after the operation (if the reconstruction was done on the same day as the mastectomy).

Recovery: at home-It is best to make arrangements to have someone available to help at home for two or three days, longer if possible. For example, if a mastectomy and tissue expander reconstruction are scheduled on a Monday, it is advisable for someone to be available to be at home with the patient beginning that Tuesday (see *length of stay* above). Dressing changes and help with the drains may be necessary.

Driving a car is not allowed for 1 or 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 weeks before full activity may be resumed.

The final implant-If a tissue expander is used, it must be replaced with a long-term implant. This implant may contain either silicone gel or saline. This second operation usually takes place approximately 4 to 8 months after the mastectomy surgery. For more information about breast implants, see page 9.

Scars-will be present at the mastectomy site. These usually fade over 8-12 months.

Nipple reconstruction-see page 18.

Risks

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

Asymmetry-the breasts may not be perfectly symmetrical. In some instances revision may be necessary.

Ripples-ripples that may be felt or seen can occur. This is more common in thin women using large saline implants.

Leakage-all long-term 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. While relatively uncommon, if an infection develops around a tissue expander or a long-term prosthesis, it may have to be removed.

Breast implant issues

There has been a great deal of discussion about the safety of breast implants, particularly since the early 1990's. In 1992 the Food and Drug Administration (FDA) placed restrictions on the use of silicone gel implants out of concern about long-term safety. At that time no studies existed to show whether silicone gel implants were safe. Since 1992 large numbers of women have undergone breast reconstruction using either saline-filled or silicone-gel filled implants, and numerous studies have been completed showing the safety of these implants. After evaluating dozens of studies and after conducting hearing with both opponents of proponents of silicone breast implants, the FDA removed the restrictions it had placed on round silicone gel breast implants in November 2006.

Whenever a long-term implant is placed in a body, the body recognizes that this is a foreign substance and reacts by forming a scar around it. This is true for heart valves, artificial joints, and pacemakers as well as breast implants. 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 it may be more common with silicone gel filled implants than with saline filled implants.

The material inside an implant (saline or silicone gel) is surrounded by a silicone rubber "shell". It is this outer layer that is in contact with the body tissues. The outer surface may be smooth or "textured". Textured surfaces were created to minimize the frequency of capsular contracture after implant surgery. Capsular contracture may be more common with silicone gel filled implants, but the textured surface has been shown to decrease the frequency of this occurrence. However, in some patients textured surface implants may be more visible, and ripples may be noticeable in the skin, particularly over the lower and outer aspects of the breast.

While implants may last a long time, the exact length of time an implant will remain intact is not known. Almost any device implanted into a patient will eventually wear out, and breast implants are the same in this regard. Breast implants should not be considered "lifetime" devices. Both saline and silicone implants will eventually leak or rupture. While this may take place 10, 20, or even more years after the time of implantation, implants may also leak after a short time. 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 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 studies done to evaluate the change show a rupture. When a silicone implant has ruptured, it is probably advisable to have it replaced. This may also be accomplished in a short outpatient operation.

A common concern with breast implants is that they may interfere with mammograms. Silicone gel-filled implants are opaque to x-rays, meaning that the implant may mask surrounding breast tissues on ordinary mammograms. Saline implants are less opaque to x-rays but could also make interpretation of mammograms slightly more difficult. A woman with breast implants should have mammograms done at a center that does a lot of mammograms. Some cities and towns have centers in which only mammograms are done. Special views, using what is called the Eklund technique, are necessary to help optimize the viewing of breast tissue in women who have breast implants.

Another concern that has been expressed is that implants may cause or exacerbate autoimmune responses or connective tissue disorders. However, numerous studies (Harvard, Mayo Clinic, Johns Hopkins, Emory University, University of Michigan, University of Maryland, others) have revealed no association between silicone gel-filled implants and connective tissue disease. The FDA has approved round and shaped silicone gel breast implants for both cosmetic and reconstructive breast surgery.

Saline and silicone implants: A comparison of advantages and disadvantages

Saline-filled implants: Advantages compared to silicone

- Saline
- Possibly lower incidence of capsular contracture
- Mammograms easier to interpret than with silicone gel-filled implants

Saline-filled implants: **Disadvantages** compared

- Leak leads to deflation, causing loss of volume of the breast; this is noticeable
- Visible or palpable ripples more likely than with silicone gel
- Do not feel as "soft" or "natural" as silicone gel implants

Silicone gel-filled implants: Advantages compared to saline

- Feel is "softer" or "more natural" than saline-filled implants
- Visible or palpable ripples less likely than with saline-filled implants
- Leak or rupture may not cause any apparent change in the implant or breast
- "More natural" breast shape (?)

Silicone gel-filled implants: **Disadvantages** compared to saline

- Capsular contracture possibly more likely
- Leak or rupture may not cause any apparent change in the implant or breast
- Mammograms more difficult to interpret than with saline-filled implants
- Should not be used in women who have pre-existing autoimmune disease or fibromyalgia

Latissimus dorsi flaps

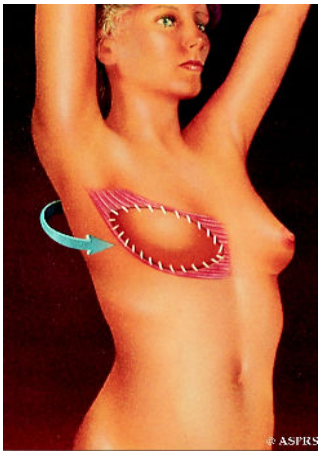
The latissimus dorsi is a muscle located on a person's back. It serves many of the same functions on the back as the pectoralis major muscle serves on the front of the chest. The latissimus muscle helps pull the arm and shoulder in toward the body, and it helps rotate the shoulder and arm toward the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

The latissimus muscle has a specific blood vessel that runs lengthwise through it. The blood vessel sends small branches through the muscle to the overlying fatty tissue and skin. This anatomical arrangement allows these tissues (latissimus muscle, fat, skin) to be transferred through a tunnel beneath the skin to the mastectomy defect 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 in the mastectomy. Most of the time an implant of some type is used in addition to the latissimus flap tissues to provide a good breast volume. This means that if a latissimus flap operation is chosen, it is likely that either a tissue expander or some type of long-term implant will also be used. This implant is placed beneath the latissimus muscle to help provide volume to the reconstructed breast.

This diagram shows the location of the latissimus dorsi muscle. Usually some skin and subcutaneous 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 site on the person'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.

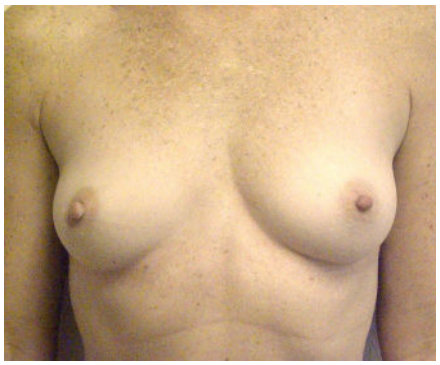
In this diagram the latissimus flap tissues have been transferred to the mastectomy site and sutured into place. An implant is not shown in this picture but, as discussed above, some type of implant is commonly used.



During a mastectomy the nipple and areola are usually removed. By removing the nipple and areola, part of the vertical (up and down) dimension of the breast skin is lost. If the incision site is closed without replacing this vertical component, the breast will be 'shorter'. A latissimus flap allows replacement of the skin that has been removed, helping preserve the vertical dimension of the breast. This is very helpful in situations where the other breast has moderate ptosis.

Latissimus dorsi flap: cases


This 49 year-old woman underwent a right mastectomy, with latissimus flap and tissue expander reconstruction. 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 43 year-old woman with right breast cancer. She underwent a right mastectomy with latissimus flap and tissue expander reconstruction. Five months later the tissue expander was replaced with a silicone gel implant, and she also had a breast lift of her left breast at that time. 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 or 2 nights.

Drains-2 or 3 per breast. The nursing staff will instruct the patient how to take care of the drains. The drains will be removed in the office as the drainage decreases, usually from 2 to 4 weeks after surgery.

Recovery: in hospital-In most cases patients will be expected to 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 post-operative 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 or second 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 3-5 days after the patient is sent home. For example, if surgery is scheduled for a Monday, the woman should anticipate going home on Tuesday or Wednesday (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. These usually fade over 8-12 months.

Nipple reconstruction-may be performed as a short outpatient procedure once the patient decides that she is pleased with her breast size and shape. Usually this takes place about one year after the initial steps of breast reconstruction have taken place. See page 18.

Risks

Beautiful results are often obtained when using latissimus flap reconstruction, but a few risks exist. Among the more notable are:

Weakness-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.

Seroma-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.

Infection-although 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.

Rupture of the implant-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 16 and 17 for more information about implants.

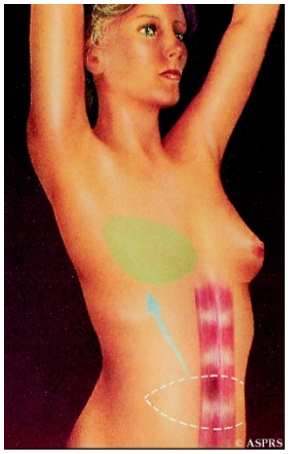
Loss of the flap-the latissimus muscle typically has a robust blood supply. It is possible that the blood vessel supplying the muscle could be injured or kinked as the muscle is moved to the breast. If that happens the entire flap may need to be removed. This is an uncommon event.

TRAM flaps

'TRAM' is an acronym for the words 'transverse rectus abdominis musculocutaneous'. A 'flap' refers to the use of living tissue that has its own blood supply. In a TRAM flap operation a woman's own healthy abdominal tissue is used to reconstruct a breast.

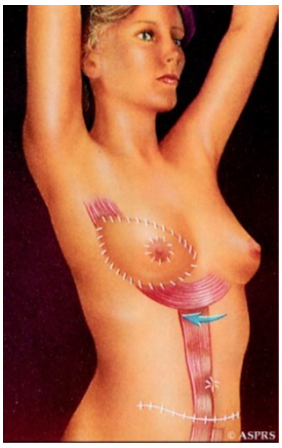
Each person has two rectus abdominis muscles. These muscles start at the lower end of the ribs and extend down to the pubic bones. The two muscles are found just to the left and right of the midline of the abdomen. They are the muscles that give the appearance of a "six-pack" abdomen in someone who is in really good shape. These are the "sit-up" muscles, making it easy to sit up from a flat position. The TRAM flap operation works because each of these muscles has a small blood vessel that runs length-wise through it. Near the level of the umbilicus (belly button) the blood vessel sends small branches into the overlying fatty tissue and skin. It is this combination of muscle, fat, and skin that is used to reconstruct the breast.

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. These tissues are transferred through a "tunnel" created under the skin between the mastectomy site and the abdominal incision site, outlined by the white dotted lines.

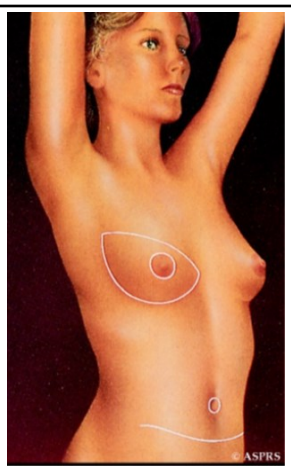


The rectus abdominis muscle is divided near the pubic bone, but the end of the muscle attached to the ribs is left intact. This preserves the blood flow going into the muscle from near the ribs. The muscle and overlying fatty tissue and skin are then rotated through the tunnel to the mastectomy site. The tissues are trimmed and contoured to achieve the final result. On occasion both muscles may be used to help optimize blood flow to these tissues.

The abdomen and mastectomy sites are sutured closed at the end of the procedure. At times a synthetic mesh may be used to help close or reinforce the abdominal closure. This is common when both muscles are used or when both breasts are reconstructed with TRAM flaps.

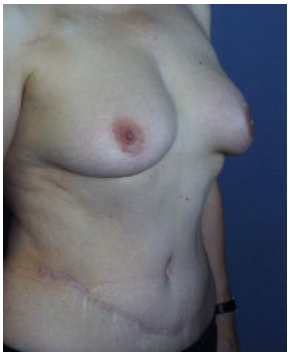


The resulting incision sites take a little time to heal and the scars fade over time. A nipple and areola may be reconstructed, usually at a later date.



TRAM flaps: cases

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 flaps: issues to consider

Length of surgery-3-5 hours. If the TRAM flap is being done immediately after the mastectomy, this 3-5 hours is *in addition* to the time required for the mastectomy.

Length of stay in the hospital-usually 2 or 3 nights.

Drains-most of the time 2 or 3 drains are placed at the mastectomy/reconstruction site, and another 2 or 3 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-patients are asked to sit in a chair on the evening of the surgery. They sit in a chair again the next morning, and begin walking with assistance shortly after that. Gradually on the first day after the operation they become more independent in walking. The nursing staff shows them how to manage the drains. Patients may eat whatever they choose as soon as they feel comfortable doing so. Some discomfort is present at the mastectomy site and in the lower abdomen. Medication is provided to help with this. Patients are discharged to home after they start walking and eating well, usually on the second or third day after surgery.

Recovery: at home-women 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. For example, if surgery is scheduled for a Monday, the woman should anticipate going home on Wednesday (see *length of stay* above). She should make arrangements for someone to stay with her from Wednesday through at least the following Monday, and preferably longer. 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 flap operations may provide outstanding results, there are also many potential complications. Dr. Kunkel will discuss these with you, but some of the more common risks include:

Asymmetry– the reconstructed breast may not look just like the other breast.

Fat necrosis- Firm lumps may develop in the reconstructed breast or the abdomen and this could require more surgery to remove the lumps.

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

Hernia- Hernias may develop in the abdomen, and this could require surgical repair. This is more likely when both breasts are reconstructed using this technique.

Weakness- It may be difficult to sit up from a lying down position after this surgery.

Malposition of the umbilicus- The umbilicus might be a little to the left or right, or a little higher or lower, than it was before the surgery.

Seroma- Fluid may build up within the tissues of the reconstructed breast or the abdomen. This could require more surgery.

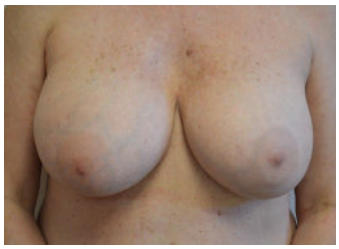
Bleeding- Although relatively uncommon, substantial bleeding could occur during or even shortly after the TRAM flap operation. This could require transfusions and even surgical drainage.

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

Special Circumstances

Nipple-sparing mastectomy

For some women a nipple-sparing mastectomy may be recommended. The nipple and areola are not removed in this type of mastectomy and reconstruction, potentially resulting in a more natural looking breast. In this procedure an incision is made that preserves the nipple, usually extending from the areola out toward the side of the breast and chest and sometimes extending toward the center of the chest. The underlying breast tissue is removed but essentially all of the skin of the breast is left intact. The breast is reconstructed immediately, either using a tissue expander, an implant, or one of the flap procedures described previously. Not all women are eligible for this operation, however. Candidates include women who have tumors located more than 2 cm (about an inch) from the areola, with tumors no larger than 3 cm, and without known involvement of the lymph nodes or lymphatic system. This technique works best for women with moderate sized breasts without much ptosis ("droopiness"). Examples are shown below.




A 60 year-old woman with right breast cancer.


43 year-old woman with right breast cancer.

Note the bathing suit tan lines on the postoperative photographs of both of these women!

Direct-to-implant reconstruction

Some women undergoing implant-based reconstructive surgery are candidates to leave out the tissue expansion process altogether. In these women the final breast implant is placed at the time the mastectomy is performed. Having the final implant placed instead of a tissue expander at the time of the mastectomy has the advantages of creating a nice shape immediately and minimizing additional operations. Disadvantages include not being able to adjust the result (saline or silicone cannot be added to or removed from a final breast implant but can be increased or decreased in a tissue expander), the implant can move out to the side which makes the breasts look far apart, the breasts may be slightly smaller than before, and if the woman does not like her final result it may be difficult to make changes. Direct-to-implant reconstruction works best for women with moderate volume breasts; women with breasts that are substantially large or relatively small may not achieve optimal results with this technique. An example is shown below.




This 53 year-old woman had multiple medical issues and was a high-risk candidate for surgery. She desired breast reconstruction but was could not undergo more than one operation. At the time of her mastectomies 400 cc silicone gel breast implants were placed instead of tissue expanders. Her postoperative result is shown 4 months later. She did not undergo nipple reconstruction. As with the photographs above, note the bathing suit tan lines!

Nipple reconstruction

Once the final breast shape and size have been achieved, a decision is made as to whether to reconstruct a nipple or not. 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, at a glance, looks like a nipple but it 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 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. The most common technique involves deciding where on the breast the nipple will look best, then wrapping some skin in that area around a small amount of fat that is pulled up from just beneath the skin. The color of the areola is later created using a tattoo technique, done in the office. Although this may sound painful, usually the reconstructed breast is actually numb around the desired site for the nipple. Local anesthesia, typically Xylocaine, may be used for the tattoo procedure.

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 is actually possible to use part of that nipple as a graft to reconstruct the nipple on the involved breast. 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.

These photographs show a 56 year-old woman who underwent a latissimus flap/tissue expander reconstruction of her right breast. The tissue expander was replaced with a silicone gel implant 6 months later. The pictures on the left show her before she underwent reconstruction of the nipple using the technique described above. The pictures on the right show her result after completion of right nipple reconstruction and tattoo of the areola.

This 65 year-old woman underwent a left mastectomy for her cancer. Seven months later she underwent a prophylactic right mastectomy and bilateral tissue expander reconstruction. Eight months later her tissue expanders were replaced with 400 cc silicone gel implants, with the result shown in the middle picture. She did not desire additional surgery for nipple reconstruction and chose to just have tattoos placed. The final result is shown on the right.

Which operation is best for me?

With so many options, it is sometimes difficult to determine which operation is right for a person. Some women are candidates for any of these procedures. However, most women have one or more factors in their lives that make certain operations less attractive, or less likely to produce a favorable result. On the next two pages certain characteristics are listed that might make a woman a candidate for a particular operation, or perhaps as importantly, NOT a candidate for that procedure.

TRAM and DIEP flaps

Characteristics of women for whom a TRAM or DIEP flap might be an option

- □ Good health
- □ Does not smoke cigarettes
- □ No previous abdominal surgery (or possibly only a previous C-section or hysterectomy)
- □ Near "ideal" body weight for height
- □ "Younger"
- □ Previous lumpectomy or mastectomy and radiation, where the radiation has caused problems with the breast skin or disfigurement of the breast
- □ Good support structure at home. This includes:
  - -someone who may stay with the patient 24 hours a day for about 5-7 days after she is discharged from the hospital
  - -a person who is able to drive the woman to and from the surgeon's office frequently in the first few weeks after surgery
  - -someone who can take over carpools for about 4 weeks
  - -a person or people that the woman would not mind seeing her without clothing. Dressing changes are often necessary.
- □ Live within 45 minutes of the surgeon's office
- □ An understanding employer

Characteristics of women who probably should *not* undergo a TRAM or DIEP flap operation

- □ Worried about a long visible scar below the umbilicus (belly button)
- □ Smoker
- □ Diabetes
- □ History of heart problems
- □ History of lung problems
- □ Significantly overweight
- □ Multiple previous abdominal operations
- □ Wide or deep abdominal scar from one previous operation
- □ Lives alone
- □ Lives in a rural area or more than an hour from the surgeon's office
- □ Poor support structure at home
- □ Transportation problems
- □ "Older"
- □ An employer that may not be very understanding
- □ A person who, for whatever reason, does not follow instructions well

Tissue expanders

Characteristics of women for whom tissue expanders might be a good option:

- □ Bilateral mastectomies
- □ Thin or average body size
- □ Wants an operation with the easiest recovery and return to work
- □ Young woman who may want to have children in the future
- □ No one available to help during the first week after surgery
- □ Smoker
- □ Diabetes or other health issues
- □ Woman in her 60's or 70's
- □ Significant concerns about the risks of the other operations

Characteristics of women who should probably *not* undergo reconstruction with tissue expanders:

- □ Concerned about the use of implants
- □ Previous mastectomy with radiation of the mastectomy site
- □ Absolutely not willing to consider surgery on the opposite breast

Latissimus dorsi flaps

Characteristics of women for whom a latissimus flap might be a good option:

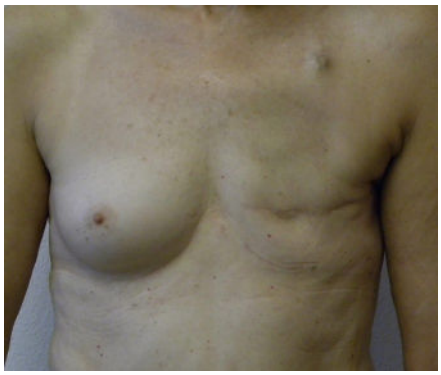
- □ Mild or moderate ptosis of the opposite breast
- □ The mastectomy may require removal of a moderate amount of skin in addition to the nipple, areola, and breast tissue
- □ Several previous abdominal operations
- □ Previous lumpectomy or mastectomy and radiation, where the radiation has caused problems with the breast skin or disfigurement of the breast
- □ Health is not bad, but may not be excellent
- □ Minimal to moderate tobacco use
- □ Good support structure at home. This includes:
  - -someone who may stay with the patient 24 hours a day for about 5-7 days after she is discharged from the hospital
  - -a person who is able to drive the woman to and from the surgeon's office frequently in the first few weeks after surgery
  - -someone who can take over carpools for about 4 weeks
  - -a person or people that the woman would not mind seeing her without clothing. Dressing changes are often necessary.

Characteristics of women who should probably *not* undergo a latissimus flap operation:

- □ A rock climber or someone who swims competitively
- □ Poor overall health (severe diabetes, pulmonary problems, poorly controlled high blood pressure)
- □ Previous surgery on the chest, lung, or ribs on the involved side
- □ Someone who already has limited mobility of the involved shoulder, or rotator cuff problems on the involved side
- □ Lives alone
- □ Lives in a rural area more than an hour from the surgeons' office
- □ Transportation problems
- □ Age over 70 (this may be negotiable depending on overall health)
- □ Concerned about the use of implants

What about 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 often do quite well, many come into the office months or years later to inquire about reconstruction. On the previous pages photographs were presented of women who underwent mastectomies and reconstruction. For comparison, the photographs below show fairly typical appearances of women who undergo mastectomy without reconstruction.



This 65 year-old woman (also shown on page 20) underwent a left mastectomy six months before this photograph was taken.

This 34 year-old woman underwent a right mastectomy and radiation. She later underwent a left mastectomy and bilateral latissimus flap and tissue expander reconstruction.

Other reconstructive techniques

The methods of breast reconstruction discussed in this booklet are those that are most frequently performed by Dr. Kunkel. Other methods exist, and you should be aware of them. These procedures require microvascular surgical techniques. Your own tissue is used, most commonly from the lower abdomen but sometimes from the buttock or upper-inner thigh, and implants may or may not be required. During these procedures the tissues that will be used to reconstruct the breast are temporarily detached from the body. Small blood vessels that are removed with that tissue are then sutured to blood vessels around the mastectomy site. When successful, this allows for good circulation to the tissue that was transferred to reconstruct the breast. Some of the names of these types of procedures are listed below:

- DIEP flap (**d**eep **i**nferior **e**pigastric artery **p**erforator flap)
- SGAP flap (**s**uperior **g**luteal **a**rtery **p**erforator flap)
- TUG flap (**t**ransverse **u**pper **g**racilis flap)
- SIEA flap (**s**uperficial **i**nferior **e**pigastric **a**rtery perforator flap)

These procedures require close monitoring for several days after surgery and usually require a hospital stay of 4 or 5 days. These operations most often take 4-8 hours. They offer an advantage of potentially not requiring an implant. Some disadvantages include having a scar on the abdomen or thigh that may be fairly wide and noticeable, and the recovery may be prolonged compared to the other methods described previously.

Helpful websites

Listed below are some websites that may provide additional helpful information:

American Society of Plastic Surgeons:
http://www.plasticsurgery.org/reconstructive-procedures/breast-reconstruction.html

American Cancer Society:
http://www.cancer.org/cancer/breastcancer/moreinformation/breastreconstructionaftermastectomy/breast-reconstruction-after-mastectomy-toc

National Cancer Institute at the National Institute of Health (NIH):
http://www.cancer.gov/cancertopics/factsheet/Therapy/breast-reconstruction

Final comments

For a variety of reasons many women choose not to undergo breast reconstruction at the time of their mastectomies. Often women do not want to think about undergoing more surgery and just want to focus on eliminating the cancer; reconstruction becomes something for future consideration. 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. In some cases the possibility of reconstructive surgery is never mentioned by the surgeon who does the mastectomy so the woman does not even know that it is available.

When considering a mastectomy it is extremely important that the 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*. Knowing about the types of mastectomies and the postoperative consequences of each, and the types of reconstructive procedures with the potential postoperative results allows a woman to make decisions that fit her life and lifestyle. Treatment of cancer is mandatory, and reconstruction, while often beneficial, is perhaps a little more optional.

So, understanding what all is involved in a mastectomy and the many possible reconstructive procedures will help a woman make a truly informed choice regarding her surgical treatment. This booklet has attempted to demonstrate the reconstructive options, with advantages and disadvantages of each, to help women make these important but difficult choices.

Reconstructive procedures do not always work out perfectly for each patient. As a generalization, women who are near their ideal body weight have a better outcome 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.

Notes

This page has intentionally been left blank. Please use it to jot down notes and questions. Our contact information is listed below.

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