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Abbreviations

DCIS Ductal carcinoma in situ
NAC Nipple-areola complex

Introduction

The mastectomy procedure has evolved considerably since the era of the radical mastectomy. In the late 1800s, Halsted and Mayer described the radical mastectomy in individual reports on the treatment of breast cancer. The radical mastectomy involved removal of the breast and pectoral muscles in conjunction with an axillary and infraclavicular lymph node dissection [1, 2]. At a time when no effective adjuvant treatment existed, this en bloc resection provided the best rates of local control. The obvious drawbacks to such a radical procedure included chronic lymphedema, as well as neurologic deficits related to

transection of the long thoracic and thoracodorsal nerves, which was routinely performed at the time.

By the mid-1900s, the modified radical mastectomy, which spared the pectoral muscles, began to gain widespread support as a less morbid procedure that could achieve results equivalent to the radical mastectomy [3–6]. The modified radical mastectomy would in subsequent decades be replaced by the total or simple mastectomy, which eliminated the axillary lymph node dissection. However, around the same time, other groups advocated for a more extensive resection as a means of achieving greater local control, the extended radical mastectomy [7, 8]. The extended radical mastectomy was a more morbid procedure removing not only the infraclavicular and axillary lymph nodes but also the supraclavicular and parasternal lymph nodes.

To address this growing dichotomy in surgical treatment options, the first randomized trials in breast cancer treatment were conceived. These trials examined the debated approaches to local control. As early as 1951, the Danish trial began to enroll patients diagnosed with breast cancer to either simple mastectomy followed by radiation or extended radical mastectomy [9]. In multiple reports from this, as well as other randomized controlled trials, it became evident that there was no difference in survival between the two groups. In the United States, the modified radical mastectomy had replaced the radical mastectomy as the standard therapy for breast cancer by the 1980s [10].

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In the decades that followed, debate centered on the treatment of breast cancer with breast conservation (lumpectomy and radiation) vs. mastectomy. Subsequent randomized controlled trials demonstrated equivalence of the two approaches and have resulted in more women now being treated with breast-conserving surgery [11–14]. However, there are still instances in which mastectomy remains the procedure of choice. The choice of mastectomy technique largely depends on the indication, tumor characteristics, and plans for reconstruction. Currently, several mastectomy techniques can be used including the simple mastectomy, skin-sparing mastectomy, and the nipple-areola-sparing mastectomy.

Indications for Mastectomy

- Presence of contraindications to breast-conserving surgery
 - Multicentric disease
 - Previous chest radiation
- Inability to achieve cosmetically acceptable result with lumpectomy
- Patient preference
- Risk reduction of second ipsilateral or contralateral breast cancer
- Inflammatory breast cancer

Although most women will be candidates for breast-conserving surgery, mastectomy is at times the more appropriate procedure. These situations vary from the presence of an absolute contraindication to breast conservation to patient preference.

Scenario 1

A patient presents following a workup demonstrating a 1 cm mass within the upper outer quadrant of the right breast, with an additional area of microcalcifications within the right lower inner quadrant. Core needle biopsy of both suspicious areas demonstrates invasive ductal carcinoma in the upper outer quadrant and ductal carcinoma in situ (DCIS) in the lower inner quadrant.

This patient has multicentric disease, for which the current recommended treatment is mas-

tectomy. There is some retrospective evidence demonstrating equivalent outcomes with breast-conserving surgery in select cases of multicentric disease [15–17]. However, there are no prospective, randomized trials that have addressed this issue and so for now the standard remains mastectomy.

Scenario 2

A 36-year-old female with a past medical history of mantle radiation as a teenager for Hodgkin's lymphoma presents with a new diagnosis of left breast cancer...

Prior chest wall radiation may be a contraindication to breast-conserving surgery depending on the dose and radiation field. In these cases, details on prior radiation exposure are very important in determining the optimal surgical options of either breast conservation or mastectomy.

Scenario 3

A 54-year-old woman with scleroderma presents with a diagnosis of breast cancer...

Patients with active collagen vascular disease such as systemic lupus erythematosus or scleroderma may not be candidates for radiation therapy (therefore not candidates for breast conservation therapy) secondary to poor wound healing and subsequent complications.

Scenario 4

A 29-year-old woman at 14 weeks gestation presents with right breast invasive ductal carcinoma...

As radiation therapy cannot be given to patients during pregnancy, breast conservation may not be a feasible option during early pregnancy. This depends on the stage of gestation and whether or not radiation therapy can be timely administered after delivery in relation to chemotherapy,

if indicated. Some women will simply prefer to have a mastectomy as definitive treatment during pregnancy.

Scenario 5

A 39-year-old female with a BRCA gene mutation is recently diagnosed with a right invasive ductal carcinoma and presents to your office desiring bilateral mastectomies...

Mastectomy may be a better option for the patient who is found to have a BRCA gene mutation, as they are certainly at a very high risk of a new primary and contralateral breast cancer. Increasingly common is the election of bilateral mastectomies in this population.

Scenario 6

A 65-year-old woman presents with inflammatory breast cancer...

The treatment of inflammatory breast cancer mandates a mastectomy. This occurs after the completion of neoadjuvant chemotherapy, with a modified radical mastectomy being the procedure of choice in this scenario.

Mastectomy Techniques

There are several techniques by which a mastectomy can be performed. The procedure involves the removal of the entire breast parenchyma with varying degrees of skin, with or without removal of the nipple-areola complex. The choice of technique depends largely on the size of the breast and whether or not immediate reconstruction is planned. Incision choice is often dictated by the technique as well as the size and shape of the breast and to some extent surgeon and patient preference. The choice of incision also depends on the existence of previous biopsy or lumpectomy incisions and whether or not the tumor is adherent to the skin. In all techniques, the limits

of resection are the clavicle superiorly, the lateral border of the sternum medially, the inframammary crease inferiorly, and the anterior border of the latissimus dorsi laterally.

Simple Mastectomy (Non-Skin-Sparing)

The simple mastectomy is well suited for those patients who will not have immediate reconstruction. In this type of mastectomy, most of the skin is removed. On completion, the incision is expected to lie flat against the chest wall without leaving excess amounts of tissue at the medial and lateral limits of the incision. This allows proper positioning of prosthesis and limits potential discomfort resulting from redundant skin.

The simple mastectomy removes all the breast parenchyma with the nipple-areola complex and the skin, leaving just enough skin to close the wound without undo tension. The most commonly used incision is the Stewart elliptical incision, which extends medially from the sternum to the latissimus laterally and will encompass most tumors located central and laterally. Depending on the position of the tumor, the Stewart incision can also be placed obliquely as in the modified Stewart or Orr incision (Fig. 14.1). These oblique incisions can be placed with the medial aspect

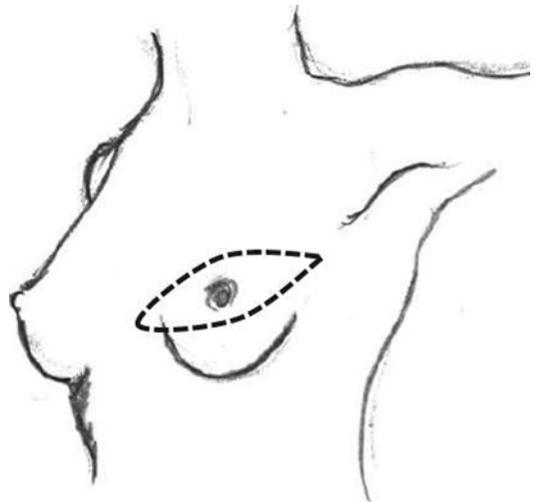


Fig. 14.1 Oblique elliptical incision for simple mastectomy

directed cephalad to encompass tumors in the upper inner quadrant and lower outer quadrant of the breast. They can also be positioned so that the medial aspect is pointing caudad to encompass tumors located in the lower inner quadrant or upper outer quadrant. The incision should encompass any previous lumpectomy scars and any area of the skin that is adherent to the tumor.

An incision is made through the dermis and the skin is elevated using penetrating skin hooks. A dissection plane is developed in the avascular plane between the breast parenchyma and the subcutaneous tissue ensuring preservation of the subcutaneous vasculature. The dissection proceeds utilizing electrocautery as necessary or with a scissors or knife depending on surgeon preference. The mastectomy skin flaps are then created, allowing removal of all breast parenchyma while leaving a layer of subcutaneous fat. Acceptable flap thickness varies by patient and amount of subcutaneous fat present. Skin flaps should not be so thin as to compromise blood supply and lead to skin necrosis. However, creating flaps that are too thick will leave behind breast tissue that may lead to an increased risk of tumor recurrence.

Once the skin flaps have been dissected superiorly to the clavicle, inferiorly to the inframammary fold, medially to the sternal border, and laterally to the latissimus dorsi, the breast is removed from the pectoralis major muscle. Elevation of the breast from the pectoralis major is usually performed with electrocautery. The superior margin of the breast is grasped and retracted caudad, while the pectoralis fascia is removed with the breast leaving the underlying pectoralis major muscle intact. At times when the tumor is abutting or invading the pectoralis muscle, this area of muscle can be removed with the specimen. Perforating vessels should be controlled with electrocautery, clips, or ties. As the dissection progresses inferolaterally, care is taken to preserve the fascia of the serratus muscle. Toward the axillary tail, the lateral mammary branches entering the breast are ligated and divided. The breast is divided at the axilla, which is recognized by visualization of the clavicular fascia.

Skin-Sparing Mastectomy

The skin-sparing mastectomy as described by Toth and Lappert [18] achieves removal of all breast parenchyma with the nipple-areola complex and minimal skin excision (figure 14.2). This technique is well suited for patients who are having immediate tissue or implant reconstruction.

Nipple-Areola-Complex-Sparing Mastectomy

First described in the 1960s by Freeman [19] as the subcutaneous mastectomy, the nipple-areola-complex (NAC)-sparing mastectomy was intended to achieve an improved cosmetic result by preserving the NAC. This procedure was initially performed selectively at very few institutions, as there were concerns for oncologic outcomes as well as appropriate selection criteria. In women undergoing prophylactic mastectomy, nipple-areola-sparing mastectomy is well accepted as a safe procedure. There remains controversy regarding its use in women with invasive cancer. However, an increasing body of evidence supports nipple-areola-sparing mastectomy in select patients. This includes women who have small (<3.5 cm), peripherally located tumors that are >2 cm from the nipple, a negative axilla and have not been treated with neoadjuvant chemotherapy [20–23]. Frozen sections are routinely sent in patients with invasive cancer or DCIS to confirm a negative nipple margin before proceeding with nipple-areola-sparing mastectomy. In our experience, the overall rate of nipple involvement was 10.6 % [24].

There are several incisions that can be used for the NAC-sparing mastectomy, including the inframammary fold, various lateral incisions, vertical incision, and an incision that incorporates a reduction mastectomy (Fig. 14.3). The choice of incision is largely predetermined by the size of the breast as well as the extent of ptosis. A well-placed incision facilitates removal of all breast parenchyma within the boundaries of a traditional mastectomy. In women who present with

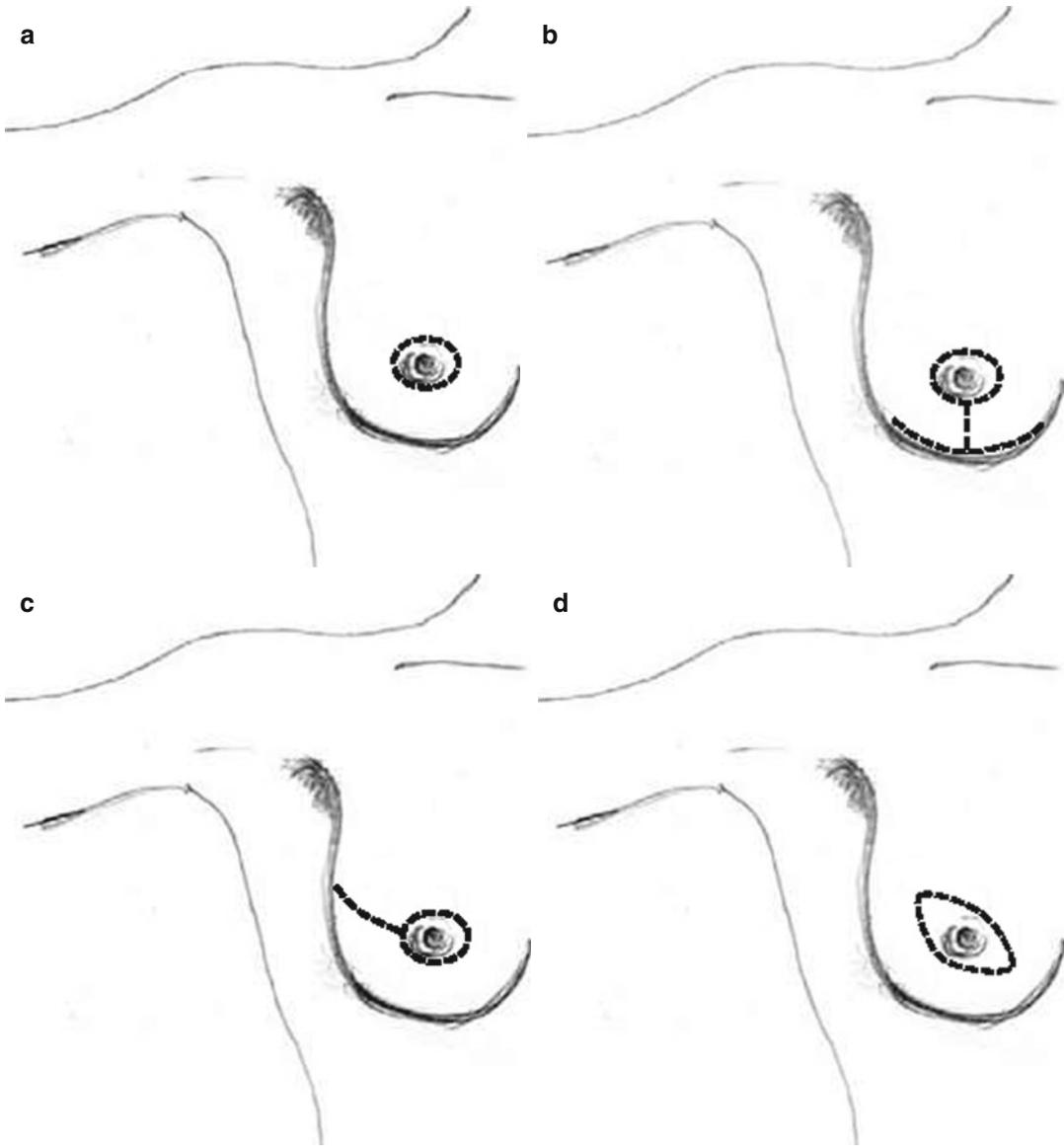


Fig. 14.2 Skin-sparing mastectomy incisions: (a) peri-areolar, (b) reduction, (c) tennis racquet, (d) modified ellipse

small, non-ptotic breasts, this can be done through an inframammary incision. However, in the larger ptotic breast, a variation of the lateral or vertical incision is better suited for performing an oncologically safe procedure with survival of the breast skin.

Once the skin incision has been made, flaps are raised in the usual fashion. The creation of skin flaps for the nipple-areola-sparing mastectomy is often more challenging than with the

simple mastectomy or skin-sparing mastectomy. The use of a knife, scissors, or electrocautery depends on surgeon preference. As progress is made along the flap, a lighted retractor may be useful to ensure adequate retraction and flap thickness. The nipple is dissected from the underlying duct tissue sharply; this may be done with or without nipple tumescence. We have found that insertion of a 2-0 silk stitch through the nipple allows the assistant to elevate the nipple,

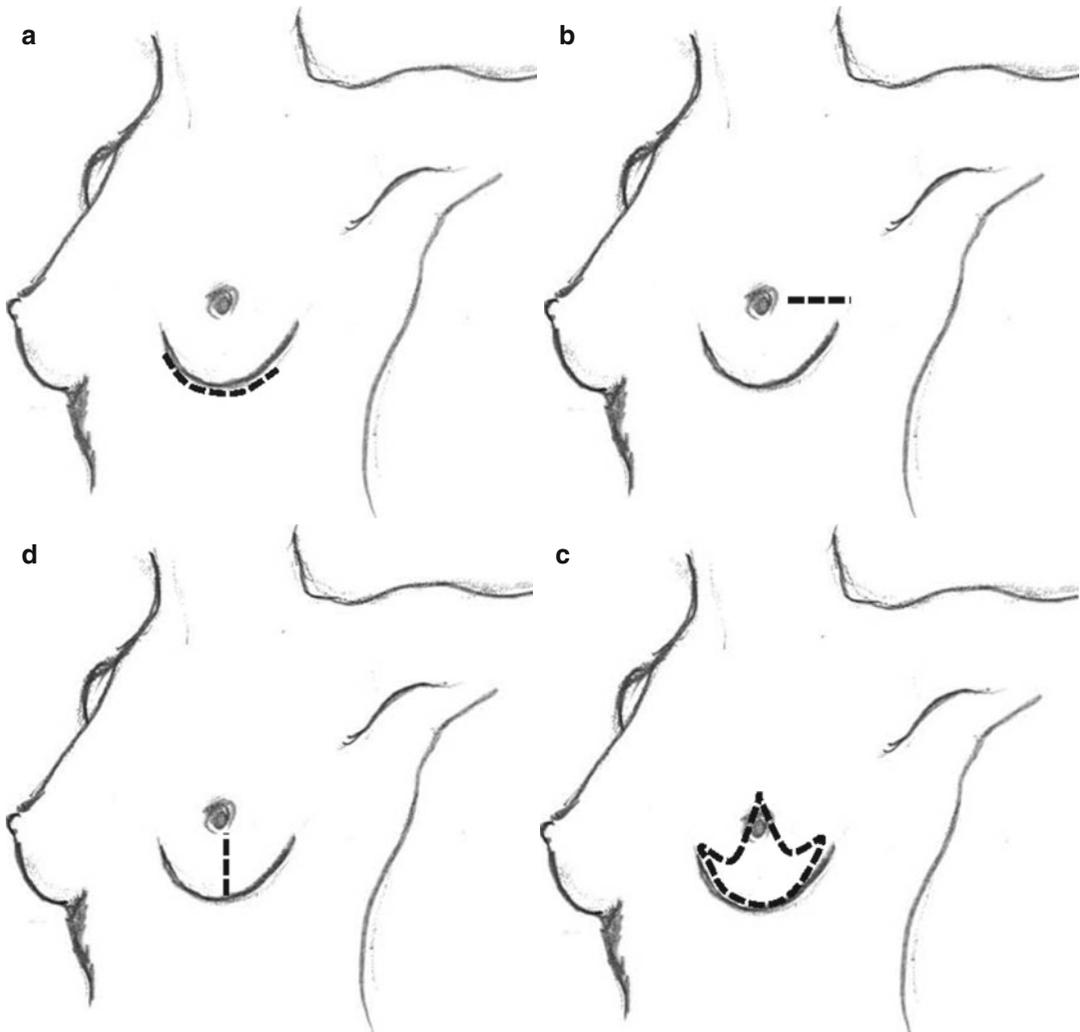


Fig. 14.3 Nipple-areola-complex-sparing incisions: (a) inframammary, (b) lateral, (c) vertical, (d) reduction

which facilitates dissection of the underlying ductal tissue.

Once the ductal tissue is removed, the nipple is inverted and an additional nipple margin is taken and sent for frozen section. After the skin flaps have been created, removal of the breast from the chest wall including the pectoral fascia with the specimen must be accomplished. Often this dissection is most easily done by beginning at the lateral aspect of the breast and proceeding medially and inferiorly until the breast is completely removed up to the sternum. The breast can then be delivered through the incision and reflected cranially to facilitate

dissection of the superior aspect away from the chest wall. If the mastectomy has been performed through an inframammary incision, then separation of the breast parenchyma beginning at the inframammary crease and progressing superiorly toward the clavicle is more feasible.

Management of the Axilla

The mastectomy procedure (non-skin-sparing, skin-sparing, or nipple-areola-sparing) can be combined with either a sentinel lymph node

biopsy for staging of the axilla or a formal axillary lymph node dissection.

The mastectomy incision may also provide access to the axilla for dissection or sentinel lymph node biopsy. In those instances where the incision does not allow axillary access, a small counterincision in the axilla can be made or a lateral extension can be added to the primary incision. In cases where there is a preexisting incision on the breast, the mastectomy incision is designed to incorporate the previous incision. If it is not possible to include the previous incision, the area can be excised separately as long as this can be done without compromising the blood supply to the intervening skin bridge.

In the case of a patient with a positive axilla, a modified radical mastectomy is performed which combines a simple mastectomy, skin-sparing mastectomy, or nipple-areola-sparing mastectomy in an en bloc resection with the axillary lymph node dissection.

Complications

Complications of mastectomy include early and late events. In the early postoperative period, one must be vigilant for ongoing bleeding and hematoma formation, a complication reported in less than 5 % of patients [25]. The use of closed suction drainage will often allow early detection of ongoing bleeding, and a firm swelling on the chest wall usually indicates subsequent hematoma formation. This is often accompanied by complaints of increased pain from the patient. In these situations, the patient should be evaluated by the surgeon and a decision made whether to attempt compression or immediate evacuation. Flap ischemia or necrosis may also be seen in the early postoperative period and are often managed with watchful waiting and delayed debridement of nonviable tissue. Large areas of skin loss requiring debridement may necessitate split-thickness skin grafts or rotational flaps for coverage.

Late complications include infection and seroma formation. Manifestations of infections include superficial cellulitis, wound drainage, and skin breakdown. This may be treated with a

combination of antibiotics, aspiration, or debridement. Particularly in the presence of a foreign body (tissue expander or implant), careful attention must be paid to the expedient administration of intravenous antibiotics. Infectious complications are generally handled in conjunction with the plastic surgeon when an expander or implant is present. Seroma formation is the most common complication after mastectomy, reported in 10–30 % of patients [26, 27]. While small fluid collections without evidence of infection may be observed, larger symptomatic seromas require aspiration and sometimes placement of a drainage catheter.

Nipple-sparing mastectomy has particular considerations. The presence of occult metastasis detected on permanent pathology should be treated with resection of the nipple. Partial or complete nipple necrosis may also occur, requiring debridement of the nipple.

Considerations for the Plastic Surgeon

Currently, the treatment of breast cancer with mastectomy includes the proper screening and selection of patients for breast reconstructive surgery. While some patients will decline reconstruction for various reasons, most will meet a plastic surgeon in advance of their operation in order to better understand their options for reconstruction. Once the decision to proceed with mastectomy has been made, the patient should be referred to plastic and reconstructive surgery for consultation. Communication between the breast surgeon and plastic surgeon is important for optimal surgical planning. Decisions on mastectomy technique as well as incision are often made with the input of the patient, breast surgeon, and plastic surgeon.

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