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Complications of Breast Surgery

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ABSTRACT: Surgical procedures performed for diagnosis and treatment of breast disease have become progressively less invasive. As an increasing proportion of breast surgery is performed on an outpatient basis, identification and management of postoperative problems have become a collaborative effort involving the surgeon, the patient, home care services and medical office staff. Although this shift to outpatient care has created a number of challenges, complication rates are no higher when breast procedures are performed on an outpatient or short-stay basis. Perioperative, short-term and long-term complications, including wound complications, injuries to adjacent structures, lymphedema, and pain syndromes are discussed.

INTRODUCTION

In recent decades, surgical procedures performed for diagnosis and treatment of breast disease have become progressively less invasive. As an increasing proportion of breast surgery is performed on an outpatient basis, identification and management of postoperative problems has become a collaborative effort involving the surgeon, the patient, home care services, and medical office staff. Although this shift to outpatient care has created a number of challenges, evidence suggests that the rate of complications is no higher when breast procedures are performed on an outpatient or short-stay basis [1–4].

Morbidity from current breast surgical procedures is generally low, but a variety of perioperative, short-term and long-term complications are recognized.

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WOUND COMPLICATIONS

Wound Infections

Infection rates following breast surgery are generally low but may be reduced further with a single dose of preoperative antibiotics to cover skin flora. Bertin et al. [5] reported a 4% rate of wound infections after breast procedures without antibiotic prophylaxis. This rate was reduced to 0.9% with a single preoperative dose of intravenous cefazolin. Increasing age and obesity were associated with increased risk of infection in this series. Platt et al. [6] reported that a single dose of preoperative cephalosporin reduced infection rates from 12.2% to 6.6%. Not all authors have found significant improvement in infection rates with antibiotic prophylaxis for breast procedures [7,8].

A single dose of preoperative intravenous antibiotics is sufficient prophylaxis for most patients discharged home with closed suction drains. However, it may be appropriate to cover diabetic patients and patients who have received preoperative chemotherapy with oral antibiotics while drains are in place.

The risk of wound infection and other wound problems is increased when open biopsy is required in a previously irradiated breast [9]. Needle biopsy procedures create fewer problems, with no wound problems seen after needle biopsy, as compared with a 30% rate of would complications with open biopsy procedures.

The risk of wound infection is increased in patients having biopsies of subareolar lesions that prove to be caused by duct ectasia (periductal mastitis), or following therapeutic procedures to treat duct ectasia or its complications [10]. Infections occurring in the setting of duct ectasia are most often mixed anaerobic and aerobic infections [11], and antibiotic coverage for anaero-

bic organisms is required for successful treatment.

Hematomas

Although some degree of ecchymosis is common after breast procedures, true hematomas should occur in less than 1% of breast biopsies or other breast procedures. Patients should be instructed to stop aspirin and ibuprofen 5–7 days prior to surgery. Breast and axillary incisions should be of sufficient length to allow for careful visualization of the entire biopsy cavity, and careful hemostasis should be achieved prior to closure. Avoiding the use of epinephrine in the local anesthetic will reduce the chance that a vessel will go into spasm and bleed at a later time.

If a hematoma does occur, it is advisable to evacuate it as soon as possible. Most hematomas in biopsy or lumpectomy incisions will eventually liquefy and drain spontaneously, but this is a very slow, uncomfortable process that often results in significant fibrosis and distortion of breast tissue. Subsequent physical examination and mammography of the area may become quite difficult. It is particularly important to evacuate hematomas arising after excision of a malignancy, as radiation of a hematoma makes it unlikely that the distortion will ever resolve.

Seromas

Seroma formation is common after mastectomy or axillary dissection. The use of closed suction drains reduces but does not eliminate the incidence of seromas. Seromas requiring aspiration occurred in 51% of patients after lumpectomy and axillary dissection when drains were removed at a median time of 4 days after surgery [12]. Infections were more frequent in patients who developed seromas. Seromas occurred in 59.5% of patients undergoing mastectomy or lumpectomy and axillary dissection when drains were kept in place for 4–5 days, with drain output generally less than 50cc in the 24-hour period prior to drain removal [4]. Seromas were seen in 40% of patients when drains were left in place until output fell below 40cc for 24 hours, with no reduction in seroma rates with addition of topical bovine thrombin [13]. Seromas were seen in only 15% of patients whose drains were left in place until output fell below 30cc in the 24-hour period prior to drain removal, which required an average of 9 days after surgery (Smith BL, unpublished data). No seromas were seen in patients whose drain output was < 20cc the day prior to drain removal [14].

Risk factors for seroma formation in different series include increased volume of drainage, number of nodes removed, obesity, and increasing age [12–14]. In some series, there was no decrease in seroma formation by immobilizing the arm for 7 days post-operatively, as compared with beginning exercise one day post-operatively [15,16]. Some authors have found that reducing activity decreases seroma frequency (6% vs. 78%), at the expense of increased time for return of shoulder mobility (5 weeks vs. 2.6 weeks) [17].

Seromas should be allowed to resolve prior to initiation of radiation therapy. If a seroma is radiated, a thick fibrous capsule may form which prevents resolution of the seroma. These chronic seromas may make physical examination and mammography difficult.

Flap Necrosis

The blood supply of mastectomy skin flaps is often tenuous, with arterial inflow and venous outflow limited to small subdermal vessels. Necrosis of the edges of these flaps leaves an area of dry, avascular eschar. Adjacent vascularized tissue will grow inward from the periphery of the eschar over several weeks. The edges of he eschar may be trimmed as normal tissue undermines it. Use of topical antibacterial agents such as bacitracin or betadine will minimize the risk of infection during this process.

The risk of flap necrosis is higher in diabetics, smokers and other patients with small vessel disease. Such patients should be cautioned that they might require an extended period of time for complete healing of their wounds. Flaps designed with inadequate length, and requiring excessive tension for closure, are also at risk for

necrosis. Longer flaps, such as may be created in a skin-sparing mastectomy, may also be at risk for areas of necrosis. The viability of skin flaps in a skin-sparing mastectomy procedure may be assessed with florescence or other dyes and trimmed accordingly.

Mondor's Disease

Mondor's disease, superficial thrombophlebitis of breast and/or chest wall veins, may occur after an otherwise uncomplicated surgical procedure on the breast. This complication was seen in 0.95% of 9657 breast procedures, with increased frequency in cases when a circumareolar incision was used and a > 3cm tunnel was required to reach the lesion [18]. Mondor's disease presents as a tender cord along the course of a vein, often extending along the chest wall lateral or inferior to the breast itself. The process is self-limiting, but complete resolution may take 2–3 months. Treatment includes warm packs and non-steroidal anti-inflammatory agents.

INJURIES TO OTHER STRUCTURES DURING BREAST SURGERY

Injuries to axillary motor nerves, the long thoracic, thoracodorsal, and medial pectoral nerves should be uncommon. Careful identification and protection of these structures during full axillary dissection will help in avoiding injury. Particular care must be taken during sentinel node biopsy, as motor and sensory nerves are not formally identified to minimize the extent of dissection. Injury to motor nerves may also be minimized by using only short-acting muscle relaxants for intubation.

Sensory nerve injuries are common during axillary dissection if special care is not taken to preserve the intercostobrachial nerve and its branches. Division of this nerve results in numbness of the upper inner arm in a majority of patients, although sensation improves over time [19,20]. In 30 patients whose nerves were preserved, sensation was much more likely to be intact [19]. Patients undergoing mastectomy with or without reconstruction should be made aware that anterior chest wall numbness is expected.

Injuries to the brachial plexus should be exceedingly rare, as dissection should not be carried out that high in the axilla.

Injuries to the axillary artery and vein should be extremely rare and may be avoided by careful identification of anatomy. Anatomic variants, such as multiple parallel small vein branches rather than a single large axillary vein, should be recognized, and care taken not to ligate major veins draining the arm.

COMPLICATIONS OF SPECIFIC PROCEDURES

Missed Lesions on Breast Biopsy

A variety of technical factors may lead to failure to remove a non-palpable breast lesion during needle localized breast biopsy, and even during biopsy for a palpable breast lesion. For non-palpable lesions, the localizing wire may become dislodged prior to surgical excision of the lesion, or may have been initially placed at too great a distance from the targeted lesion for accurate intraoperative identification and excision. Specimen radiography is essential to recognize that this complication has occurred. If the lesion is not contained in the specimen radiograph, the surgeon may choose to attempt additional limited resection during the same procedure. Care should be taken, however, to avoid resection of large amounts of breast tissue in an attempt to include the lesion. It is preferable to close and bring the patient back for additional imaging and localization as soon as compression can be tolerated, generally within 4–8 weeks [21].

For palpable lesions, the injection of local anesthetic may make a previously palpable lesion difficult to identify. This difficulty can be minimized by marking the position of the lesion on the skin prior to injection of any local anesthetic. Inadequate local anesthesia, with resulting patient discomfort, may also make identification of the lesion difficult. Careful attention

to achieving an appropriate block of the target area with local anesthetic, and consideration of the use of intravenous sedation, will minimize the risk of this problem.

COMPLICATIONS OF SENTINEL NODE BIOPSY

The introduction of sentinel node biopsy has significantly reduced the morbidity of axillary staging [22,23]. Pain, seroma formation, and intercostobrachial nerve injury are reduced, and lymphedema rates are extremely low with follow-up to date. Giuliano [24] reported a complication rate of only 3% in 67 patients undergoing sentinel node biopsy alone (one superficial cellulitis and one seroma), as compared with a complication rate of 35% in 58 patients having sentinel node biopsy followed by axillary dissection, (9 seromas, 3 wound infections, 4 hematomas, and 4 chronic lymphedema). None of the sentinel node biopsy alone patients in this series had intercostobrachial nerve injury.

Certain other complications may be seen with sentinel node biopsy. Failure to identify the sentinel node occurs more frequently during the learning curve of the procedure [22–24]. With increasing experience, success rates rise to 95% to 99% [25,26]. Use of both technetium sulfur colloid and isosulfan blue has been found to increase the success of mapping over mapping with either agent alone [26,27]. Failure to identify the sentinel node may be more common in elderly or obese patients.

A false negative sentinel node biopsy is of concern as it results in a patient being understaged, and potentially inadequately treated. False negative rates are higher for less experienced surgeons, with false negative rates falling after 15–30 cases, and stabilizing at 2-5% with increasing experience [28,29]. No single technical or patient factor has been identified that predicts an increased risk for false negative sentinel node biopsy [24], although isotope-alone mapping may have a higher false negative rate for lateral lesions [25], and isotope plus blue dye mapping may have a higher false negative rate in elderly patients or with very medial lesions [29].

The accuracy of sentinel node biopsy after neoadjuvant chemotherapy remains controversial, with false negative rates of 12% [30] and 25% [31] reported in small series.

Follow-up of patients treated with sentinel node biopsy should include careful examination of the axilla to allow for early identification of axillary relapse. Rates of axillary relapse remain low after a negative sentinel node biopsy and no further axillary treatment. No axillary recurrences were seen in 67 patients with negative sentinel nodes at median follow-up of 39 months [24].

Effects of Isosulfan Blue in Node Mapping

Isosulfan blue injection for node mapping has been associated with prolonged intraoperative decreases in Spo_2 as measured by pulse oximetry, although blood gas pO_2 measurements remain unchanged. Vokach-Brodsky et al. reported a decrease in Spo_2 in a majority of patients injected with 5cc of 1% isosulfan blue, with a maximal decrease of 3% occurring 25 minutes after injection [32]. Others have found similar decreases in Spo_2 [33] due to interference with pulse oximetry measurements by circulating blue dye.

Hypotension and anaphylaxis has also been reported with isosulfan blue injection [34,35]. In one such patient, subsequent skin testing with isosulfan blue yielded a 5mm skin wheal within 20 minutes [34].

Persistent blue staining of the skin may be seen in some patients after isosulfan blue injection [36]. Although this risk may be reduced with lower injection volumes, patients should be made aware of this possible outcome.

LONG-TERM COMPLICATIONS

Lymphedema

For many patients, lymphedema of the arm is one of the most feared complications of axillary

surgery for breast cancer. Estimates of the frequency of lymphedema vary widely with the approaches used to identify edema and the duration of follow-up. Lymphedema as measured by a >2cm increase in arm circumference was observed in 13.5% [4] and 16% [37] of women undergoing axillary dissection, with a 3.5% incidence of hand swelling [4]. Lymphedema defined as a > 200cc increase in arm volume was present in 10% [38] and 25% [39] of women after axillary dissection. Lymphedema rates were 8.3% after axillary radiation alone, 7.4% after axillary clearance, and 38% after axillary clearance and axillary radiation. Ivens et al. reported a 24% rate of arm swelling by patients' subjective reports, but only a 10% rate of swelling using objective criteria in the same patients [20]. Early edema was seen in 7.6% [40], and late edema in 17% [41] in other series.

Increased rates of lymphedema were associated with obesity [4], higher volumes of axillary drain output [14], with radiation immediately following surgery rather than after an intervening course of chemotherapy [40], and with extent of axillary surgery and number of positive axillary nodes [39].

Lymphedema occurring at different times after axillary treatment may have different clinical implications. Patients with swelling in the first year after treatment, commonly after an episode of increased physical activity involving the arm, may have resolution of their edema with conservative measures such as compression and elevation, and may not suffer recurrent episodes. Lymphedema appearing 18 months or longer after treatment is less likely to resolve completely, and may require chronic treatment.

With new onset lymphedema, axillary or supraclavicular node recurrence should be ruled out as a causative factor. Axillary vein thrombosis from other causes including indwelling catheters or from hypercoagulable states should also be considered.

In recent years, there has been increasing interest in active treatment of lymphedema, with the addition of complex decongestive therapy to former options of compression garments and sequential pumps (reviewed in [42]). These therapies control rather than eliminate lymphedema, and must become part of the daily routine of a patient suffering from this condition.

Chronic Breast Edema and Cellulitis

Chronic edema of the breast may occur after lumpectomy and radiation for breast cancer, particularly when full axillary dissection and/or radiation have also been administered [43]. Some of these patients will have delayed or recurrent episodes of cellulitis, analogous to recurrent arm cellulitis in women with lymphedema of the arm. In one series, chronic breast edema occurred in 5% of patients, with cellulitis episodes lasting 4 months to greater than one year [44]. Another series noted this complication in 1% of patients, with an increased frequency among women who had developed axillary seromas requiring aspiration [45]. Episodes of late breast cellulitis have also been shown to occur more often in women with chronic fluid collections at their lumpectomy site [46]. This problem may be avoided if seromas are allowed to resolve prior to initiation of radiation therapy.

Episodes of cellulitis in patients with arm or breast edema are treated with antibiotics, recognizing that several weeks of therapy may be required to clear the infection in a radiated, edematous breast. Consideration may be given to longer-term antibiotic suppression therapy in women with recurrent infections. Other authors have reported improvements in erythema and congestion with a course of non-steroidal anti-inflammatory agents, suggesting that there may be a non-infectious factor contributing to the erythema in patients with chronic breast and arm edema [43].

Cellulitis that does not clear completely with antibiotic treatment may actually represent recurrent tumor, and skin biopsy should be performed.

Pain Syndromes and Mobility Problems

The incidence of prolonged pain after surgery for breast cancer has been regarded as uncommon, but recent series suggest that pain is a significant problem for many patients following

both mastectomy and breast-conserving procedures. [47,48]. In a telephone survey of 408 mastectomy patients, 175 (43%) reported that they have ever suffered from a post-mastectomy pain syndrome [49]. In this series, pain was more common in younger women. In a series of women undergoing axillary dissection, 27% reported weakness, 24% reported swelling, and 15% reported stiffness [20]. Arm and shoulder stiffness was reduced by early mobilization [17]. Maunsell et al. [50] reported minimal improvement in arm symptoms 15 months after breast cancer surgery relative to symptoms at 3 months, with 82% of patients reporting at least one arm problem. Weakness was reported in 26%, limited range of motion in 32%, stiffness in 40%, pain in 55%, and numbness in 58% [50].

Phantom breast pain was present one year after mastectomy in 24.5% of patients surveyed, with 22% also reporting persistent incisional pain [51].

Other perioperative factors may influence the development of pain and mobility problems. Full return to normal activities occurred sooner in women discharged the same day as their surgical procedure, compared to those who remained in the hospital after surgery [52]. These findings were supported by other series [1,3]. Patients identified as having reduced range of motion at early post-operative visit should be referred for physical therapy consultation.

Patients with increased pain, arm problems, or lymphedema report greater psychological distress and decreased quality of life scores [53,54,50], highlighting the importance of preventing and appropriately treating these problems.

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