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PURPOSE

The purpose of this guide is to provide the healthcare professional with an understanding of breast and nipple surgeries and their effects upon lactation and the breastfeeding relationship. The effect of breast and nipple surgery upon lactation functionality and breastfeeding dynamics varies according to the type of surgery performed. This guide has delineated discussion of breastfeeding after breast and nipple surgeries according to the three broad categories: diagnostic, ablative, and therapeutic breast procedures, cosmetic breast surgeries, and nipple surgeries. The reasons, motivations, issues, concerns, stresses, and physical and psychological results share some commonalities, but are largely unique to the type of surgery performed. For this reason, each type of surgery and its effect upon lactation will be discussed independently. Methods to assess milk production and an overview of feeding options to maximize milk production when supplementation is necessary are presented. The role of the healthcare professional in assisting mothers to breastfeed after breast and nipples surgeries is discussed and resources are included. A glossary is provided for definition of unfamiliar anatomical or surgical terms.

INTRODUCTION

The lactation functionality that remains after breast and nipple surgeries depends upon the location, number, and orientation of the incisions, the degree of destruction of parenchyma, and the extent of damage to nerves critical to lactation. It is also affected by the functionality of the parenchyma prior to surgery, the post-operative course, the time interval between the surgery and the lactation event, other lactation experiences between the surgery and this lactation event, breastfeeding management, as well as the mother’s attitude toward breastfeeding. In short, however, any surgery to the breast or nipple can reduce lactation functionality.

From the clinical perspective, breastfeeding with reduced functionality can seem to involve a measure of risk that may be outside the realm of comfort for some healthcare providers. When a treatment plan is implemented according to the principles described in this guide, however, no actual risk is incurred. The most important of these principles is that the parents maintain vigilant in constant monitoring of nutritional status of their babies in collaboration with a healthcare provider in order to provide early warning of impending infant deterioration.

A satisfying breastfeeding relationship is not precluded by insufficient milk production. When measures are taken to protect the milk supply that exists, minimize supplementation, and increase milk production when possible, a mother with compromised milk production can have a satisfying breastfeeding relationship with her baby.

PREDICTING LACTATION CAPABILITY AFTER BREAST AND NIPPLE SURGERIES

The aspect of breast and nipple surgeries that is most likely to affect lactation is the surgical treatment of the areola and nipple. The location, orientation, and length of the incision directly affect lactation capability by severing the parenchyma and innervation to the nipple/areolar complex. An incision near or on the areola, particularly in the lower, outer quadrant of the areola, is more likely to sever the fourth intercostal nerve, which is critical to lactation (Neifert, 1992). A horizontal incision across the breast is more likely to sever lactation tissue than a vertical incision that is parallel to the ducts. An incision in the outer and lower portions of the breast is more injurious to lactation capability as lactation tissue is most dense in these quadrants.

Surgeons’ Estimates of Post-Surgical Lactation Capability

When consulting a surgeon prior to breast surgery, women may be advised that the surgery will affect their lactation capability to some degree. Such statements about post-surgical lactation capabilities tend to be remembered vividly when consider breastfeeding. Depending on the surgery, doctors commonly describe the potential capability by stating that there is either no possibility that she will be able to lactate after the surgery, a “50/50” chance, or that it will not affect her lactation capability at all. A surgeon’s projections of lactation capability, however, are often based on the assumption that any lactation is full lactation and may not be qualified by the volume of the mother’s milk supply. The “50/50” chance frequently quoted usually refers to the surgeon’s estimate of a 50 percent chance that she will be able to lactate at all. A woman may be incorrectly informed that if she has any milk, she will be able to exclusively breastfeed, or that if she has no milk, she will not be able to breastfeed at all. The critical information to a future mother, however, is not whether she will be able to lactate at all, but rather how much she will be able to lactate, as almost all mothers who have had breast and nipple surgeries are able to produce some amount of milk.
(barring mastectomy or radiation) (Harris et al, 1992). Because their probable lactation capability was described in absolute terms of having or not having the capacity to lactate, some mothers mistakenly think that if they are able to express any colostrum or milk, then they will produce a full milk supply. Conversely, if they cannot express colostrum during pregnancy or they do not see any milk in the first few days postpartum, they may think they are completely unable to lactate. Many mothers do not understand that the process of lactation, especially after breast and nipple surgeries, is more complex than these basic assumptions.

**Lactation Capability Scenarios**

For some women who have had breast and nipple surgeries, breastfeeding progresses normally and they are pleased to discover that they have full milk production. Their babies excrete copiously and gain well; no difficulties are encountered. In these women, there was minimal damage to the parenchyma and nerves or they experienced sufficient recanalization and reinnervation (see below).

Some babies excrete and gain satisfactorily for the first two to three weeks, but then diaper output and weight gain significantly diminishes. This is often due to milk production that was initially high due to the normally high postpartum blood-serum prolactin levels. When the prolactin levels decrease in response to the transition from Lactogenesis II to Lactogenesis III wherein milk production is driven by milk removal, milk production is decreased. This scenario is consistent with a lactation system that has sufficient glandular and ductal infrastructure, but damaged innervation, such that oxytocin is not produced in sufficient amounts to result in adequate milk ejection. Many mothers discover that they have experienced this scenario when they bring their babies to the 8-week well-baby visit and are told that their babies’ growth percentiles have significantly declined. They may have noticed that their babies were fussy, but attributed the irritability to “colic” rather than hunger.

Some mothers demonstrate suppressed milk production immediately postpartum. Their babies do not have sufficient diaper output or weight gain even in the first few days. In these mothers, the parenchyma and innervation were more extensively damaged during their surgeries.

**Effects of Tissue Regeneration upon Lactation Capability**

Recanalization is a very exciting physiological phenomenon for women who have had breast surgery. It is the process wherein breast tissue is regrown, reconnecting previously severed ducts or connecting new ductal pathways. The most extensive instances of recanalization seem to have occurred in direct response to lactation demand. Any duration of lactation, therefore, prompts the mammary system to reestablish new ducts. The extent to which recanalization will occur seems to be directly correlated with the duration and degree of lactation. A mother whose previous lactation efforts resulted in an incomplete supply may find that future attempts result in a much greater yield. In some mothers, recanalization has resulted in a complete milk supply for subsequent children. Lactation tissue is also formed in response to hormones that occur during menstruation. Therefore, the longer the mother has lactated and the more menstrual cycles she has experienced, the greater the extent of recanalization will be.

Reinnervation is the process whereby damaged nerves regenerate. As the fourth intercostal nerve that innervates the nipple/areolar complex is critical to the process of lactation by stimulating the release of oxytocin, which causes milk ejection, regeneration of this critical neural pathway becomes a key component of increased lactation capability.

The process of reinnervation is not influenced by the process of lactation or previous lactation events, but rather occurs at a predictable rate of one inch per month, typically taking one year to fully regenerate (Shaw, 1997). When women regain normal response to touch and temperature, it indicates that the fourth intercostal nerve infrastructure is functioning well and would therefore conduct the appropriate sensations to the pituitary gland for production of prolactin and oxytocin. Of course, the ability of the mammary system to fulfill the demand is dependent upon the state of the glands and ducts. Nonetheless, the longer the length of time since the surgery, the greater the chances that the nerves critical to lactation have regenerated.

**EFFECTS OF DIAGNOSTIC, ABLATIVE, AND THERAPEUTIC PROCEDURES UPON LACTATION FUNCTIONALITY**

A woman who has been identified as having fibrocystic disease, a cyst (solid or fluid-filled), or a lump may be referred to a breast surgeon for diagnosis and treatment. Diagnosis and treatment may require imaging techniques, ductogram, aspiration, biopsy, or removal of the suspected tissue. Treatment for cardiac and pulmonary dysfunction may also require surgery through the mammary tissue. The effect of the diagnostic or therapeutic procedure upon lactation capability is dependent upon the type of procedure and the state of lactation.

**Imaging Techniques**

Imaging techniques used for diagnosis of breast pathology include ultrasound, mammogram, magnetic resonance imaging (MRI), positron emission tomography (PET) scan, 2-
Methoxy IsoButyl Isonitril (MIBI) scan, electrical impedance tomography (EIT) scan, computed tomography (CT) scan (also known as computer axial tomography (CAT) scan), thermography, or diaphanography. Imaging techniques are non-invasive and do not affect lactation capability.

**Ductogram**

In performing a ductogram, a fine plastic catheter is inserted into a lactation duct through the nipple. A radioactive dye is injected through the catheter into the duct and an x-ray is taken to produce an image of the duct. An endoscopy may also be performed to insert a minute camera into the ducts in order to visualize the internal ductal walls. As no incisions or excisions are made during this procedure, there is generally no impact upon lactation capability.

**Needle Aspiration**

Needle aspiration is a diagnostic procedure used to remove the cellular contents of fluid-filled cysts and galactoceles. It is also used to drain infected abscesses. As the incidence of malignancy in fluid-filled cysts is only one percent (1%) and false positive pathology findings are common, most cysts are aspirated therapeutically, rather than for diagnostic purposes.

In the fine needle aspiration, a small needle is injected directly in several locations above the location of the cyst and the contents of the cyst are drawn into the needle. Bruising and minor bleeding into the cyst are common after a spiration. The impact upon lactation from core biopsy depends upon the extent, location, and direction of the incision as discussed above. Scarring or the complication of an infection or hemATOMA subsequent to a biopsy may have effect upon lactation, depending on the extent.

**Ablative Surgery**

A suspicious mass, such as a fibroma, that may be identified for complete removal. Some surgeons will also excise very large (lemon-sized) fibroadenomas in order to avoid the one percent (1%) incidence of malignancy (cystosarcoma phylloides) (Love, 2000).

As with all breast surgeries, the location, orientation, and extent of the incision dictate the impact upon lactation (Neifert, 1992). Many surgeons attempt to preserve the aesthetic integrity of the breast by placing incisions in less visible areas, such as on the areola or under the inframammary fold. When the incision is placed a distance from the mass, the surgeon must cut into the breast to reach the mass. This greatly increases the risk of severed ducts and lactation disruption. An incision on or around the perimeter of the areola will result in reduced innervation to the nipple/areolar complex, dramatically reducing the neurohormonal lactation response. When the suspected mass resides under the areola or in the nipple, such as in Paget's disease, incisions that avoid the nipple/areolar complex are unavoidable. Orienting them toward the upper and inner quadrants will reduce the likelihood of nerve impairment (Pezzi et al, 2004).

**Wire Localization**

When a mass cannot be palpitated and core biopsy is not possible, a wire localization biopsy procedure may be performed by inserting a needle into the breast, guided by x-ray, through which a thin wire is attached. The wire is positioned at the site of the suspected mass and the surgeon uses the wire to locate and remove the mass. The risk to lactation in this procedure is in the location and direction of initial incision and the amount of tissue removed around the wire. Most importantly, if the incision is near the lower, outer quadrant of the areola and severs the fourth intercostal nerve, lactation will be impaired.

In some circumstances, mastectomy may be necessary. When the surgery is unilateral and occurs during active lactation, and if the mother desires to do so, she can continue to breastfeed on the contralateral breast (Mohrbacher, 2004). By employing protocols to increase the milk supply, it is possible that full milk production can be achieved on that side. If full milk production does not develop, supplementation can be given in a manner that is supportive of breastfeeding.
(see below) so that the breastfeeding relationship is preserved.

**Sternotomy**

Surgery through the breast to treat cardiac or pulmonary dysfunction necessarily carries the risk of lactation impairment. In order to preserve lactation function and minimize scarring, it is common for the incision to be placed in the inframammary fold (transverse submammary incision) (Nakamura et al 1997; Bedard, 1986; Brutel de la Riviere, 1981). A study in 1993 by Deutinger and Deutinger examined the effects of breastfeeding after cardiac operations, when the incision is through the inframammary fold. Their findings were that breastfeeding did not complicate healing from cardiac surgery (Deutinger et al, 1993). An earlier study in 1992 by Deutinger and Domina reported excellent lactation outcomes when the incision for sternotomy is made in the inframammary fold (Deutinger et al, 1992). This is likely to be a consistent finding, although consideration must be given to the extent of the surgery and post-operative healing. Even when the incision is in the inframammary fold, innervation and ductal pathways can be severed. Post-operative infection can also impede lactation function.

**Effects of Anesthesia During Diagnostic or Ablative Surgery**

Local anesthetic medications do not transfer into milk in clinically relevant levels. There is no need for a mother to interrupt breastfeeding when local anesthetic medications have been used (Hale, 2006).

It is safe for a mother to nurse her baby or pump her milk as soon as she awakens fully from general anesthesia as anesthetic medications have brief plasma half-lives and are rapidly metabolized. When the mother is no longer soporific, the anesthetic medications are no longer active in her milk (Spigset, 1994; Hale, 2006).

**Effects of Diagnostic or Ablative Surgery During Lactation**

It is common for mothers to be instructed to wean for days, weeks, or months prior to diagnostic imaging or aspiration or biopsy. Diagnostic imaging techniques are more difficult to interpret during lactation, but it is not impossible to do so. Weaning is neither practical nor necessary (Helewa, 2002; Scott-Connor, 1999). Abrupt weaning can be psychologically traumatic for both the mother and her nursing, without regard to his age. It also introduces the possibility of plugged ducts and infectious mastitis from sudden milk stasis.

Surgeons may not be aware that Lactogenesis III is a gradual process; milk can continue to be produced for many months. There is almost certain to be residual milk in the ducts when surgery is performed on a recently lactating woman. Although it may be cumbrous for the surgeon during the procedure, the milk is bioactive, containing anti-infectious and anti-inflammatory agents, and will therefore, rather than contaminating the wound, will reduce the likelihood of infection and accelerate healing. A breast that has been thoroughly drained by nursing or pumping immediately prior to the diagnostic or ablative surgery will minimize obstruction of the procedure.

**Breastfeeding and Cancer**

Many myths have been perpetuated about breastfeeding when a mother has cancer or after her cancer has been removed. For instance, mothers have been warned that cancer can be transmitted to their babies by suckling a cancerous breast. This has never been documented in humans and is highly unlikely. Another myth is that a baby will refuse to suckle a cancerous breast. This is not necessarily true, although babies have been known to occasionally refuse a breast when the milk taste changes or the milk supply decreases as a result of a malignant mass (Tralins, 1995). There is no evidence that breastfeeding increases the risk of breast cancer recurrence, or that it carries any health risk to the child (Helewa, 2002).

In consideration for a mother with cancer, she may be told that weaning is necessary in order to “conserve her strength.” In fact, lactation decelerates the maternal metabolism, rendering it more efficient (Illingworth, 1986). Breastfeeding is also more convenient and less time-consuming than bottle-feeding. Most importantly, it provides an emotional connection and intimacy that is nurturing to both her and her baby when they need it most.

**Effects of Diagnostic Procedures upon Milk Safety**

Ultrasound, aspiration, and biopsy procedures do not affect the quality or safety of the milk and are wholly compatible with breastfeeding. The safety of radioactive diagnostic procedures while breastfeeding depends upon the type of radiation used.

Radiation and radioactive agents are common tools used in diagnostic procedures. The compatibility of the radioactive procedure with breastfeeding depends upon the type of radiation used.

Radiation exists in two forms: pure energy and particulate. X-rays use pure energy and are similar to visible light, but contain more energy. The effects of an x-ray can be likened to using a flash while taking a photograph; after the x-ray is taken, the radiation is no longer present in the same way that the light from a camera is no longer present after the flash.
has discharged. Mammograms and CT scans use pure energy x-ray radiation, produced with a specialized light bulb. It is not uncommon for mothers to be advised to "pump and dump" their milk for an arbitrary period of time subsequent to mammographic testing. This is not necessary. While x-ray radiation does have the ability to mutate DNA such that any live cells that have been exposed to it may mutate, resulting in cellular dysfunction or uncontrolled replication (i.e., cancer), the pure energy type of radiation used in mammogram and CT scan testing does not collect in the milk and is therefore compatible with uninterrupted breastfeeding.

Radioactive agents contain particulate radiation, which consists of atoms with unstable nuclei that release radiation when they deteriorate, which is useful in diagnostic imaging to delineate subtle tissue structures. Ingestion or injection of a radioactive agent results in radiation residing in the body until the radiation completely disintegrates or is excreted. Consumption or injection of particulate radiation, such as during a ductogram, MRI, MIBI scan, or PET scan, during lactation will result transference of radioactive substances into the milk during milk synthesis. The radioactive toxicity and compatibility with breastfeeding depends upon the substance used. The radiopaque and radiocontrast agents typically used in the ductogram, MRI, MIBI scan, or PET scan diagnostic tests are extremely inert and are virtually unabsorbed after oral administration (Hale, 2006). These products are commonly used in pediatrics for diagnostic purposes and no effects have been reported among babies who have ingested milk subsequent to radioactive agent imaging procedures (Kubik-Hutch, 2000; Nielsen et al, 1987). It is not necessary to interrupt breastfeeding when radiopaque and radiocontrast agents are used in imaging procedures (Kubik-Hutch, 2000; Rofsky, 1993; Nielsen et al, 1987; Fitz-John, 1982).

The use of radioactive isotopes during diagnostic testing or therapy, however, is contraindicated during breastfeeding as such compounds accumulate in milk and are, therefore, hazardous to the infant who ingests it. It is not necessary for mothers to wean with the intention of complete cessation of breastfeeding in order to undergo a procedure employing radioactive isotopes. She need only interrupt breastfeeding temporarily, feeding her infant previously pumped milk or formula until her milk is demonstrated by testing to be no longer radioactive (most hospital radiology departments are able to perform the tests). Frequent pumping during this time will protect her milk supply and accelerate removal of radiation from her body (Mohrbacher, 2004).

**Implications for Breastfeeding After Radiation Therapy**

Therapy with pure energy radiation is injurious to all breast tissue, including the parenchyma. This effect is usually permanent (Neifert, 1992; David, 1985; Higgins and Haffty, 1994). An irradiated breast is likely to produce a substantially reduced milk supply, even to the point of no milk at all. However, lactation will be unaffected on the breast that did not receive radiation. If radiation therapy is administered during active lactation, the mother can continue to breastfeed on the contralateral breast (Mohrbacher, 2004). By employing protocols to increase milk production, it is possible that a full milk supply can be achieved on that side. If full milk production does not develop, supplementation can be given in a manner that is supportive of breastfeeding (see below) so that the breastfeeding relationship is preserved.

**Effects of Chemotherapy upon Lactation Functionality**

Breastfeeding during chemotherapy is absolutely contraindicated, as the medications used to eradicate the cancer are highly toxic and transfer into the milk (Hale, 2006; Helewa, 2002). Although weaning prior to the first chemotherapy session is necessary, eliminating feedings in a gradual manner may help minimize the emotional and physical impact. Breastfeeding after chemotherapy has been completed may be possible, either by relactation or another pregnancy, depending upon the exact nature and mechanism of the drugs that were used.

**EFFECTS OF COSMETIC BREAST SURGERIES UPON LACTATION FUNCTIONALITY**

**Augmentation Mammoplasty**

Augmentation mammoplasty is a prevalent cosmetic procedure in North America. In 2005 in the US alone, 364,610 women received augmentation mammoplasty, which is a 260% increase from 1997 (American Society for Aesthetic Plastic Surgery, 2005). As in reduction mammoplasty, the psychological motivations to undergo this surgery are more compelling than the physical. They simply wish to feel more normal and attractive. A 2003 study by Didie and Sarwer examined the factors that motivate women to seek cosmetic breast augmentation surgery. The results of the study were that that breast augmentation patients were more motivated by their feelings about their breasts than by either influences from external sources, such as romantic partners, or sociocultural representations of beauty (Didie et al, 2003). This clearly refutes the common stereotype of the narcissistic woman with breast implants. In Surgery of the Breast: Principles and Art (Spear, ed.), it is noted:

"Descriptions of women seeking augmentation mammoplasty are very consistent, with a common thread being their doubts about their femininity, which motivate them to request the surgery. It is further postulated that preoccupation with breast size in women seeking augmentation mammoplasty does not
arise suddenly but usually either dates to adolescence or develops after childbirth. Among women seeking augmentation mammoplasty, there is a higher incidence of divorce, unhappy marriages, emotional discomfort, diminished feelings of femininity, and elevated levels of depression than in the general population. Most women seeking augmentation mammoplasty do so while in their thirties and are likely to report concerns about their appearance and preoccupation with inadequate breast size...Most women are not seeking to outdo other women in breast size; rather they want to catch up” (Spear, 2005).

Another study by Banbury et al in 2004 examined the outcomes of subpectoral augmentation surgery with regard to body image, muscle, and nerve function. They determined that augmentation surgery positively affect all three aspects.

In considering lactation capability, the original state of the breasts prior to augmentation is a critical determiner of inherent lactation potential, even before the impact of surgery. Although small breast size alone is not a marker for lactation insufficiency, certain breast types are known to be markers for hypoplasia (Neifert, 1985). These types include tubular-shaped breasts, widely spaced breasts, and undeveloped breasts, such as Poland’s Syndrome, and asymmetrical breasts. In Surgery of the Breast: Principles and Art, Spear notes that, “Although management of the tuberous breast and other complex anomalies may at first appear like a variant of cosmetic breast surgery and augmentation mammoplasty, in fact, many of these cases require techniques more akin to breast reconstruction” (Spear, 2005). When so little parenchyma exists, lactation capability is significantly diminished.

Most women report that they are not advised that they may have an inherent hypoplasia or that augmentation mammoplasty can reduce lactation capability (Spear, 2005). However, as with all breast surgeries, the location, orientation, and extent of the incision dictate the impact upon lactation (Neifert, 1992). Many surgeons attempt to preserve the aesthetic integrity of the breast by placing incisions in less visible areas, such as on the areola or in the inframammary fold. In addition to the likelihood of severed ducts, an incision on or around the perimeter of the areola, particularly in the lower, outer quadrant, will result in reduced innervation to the nipple/areolar complex, dramatically reducing the neurohormonal lactation response.

Augmentation mammoplasty performed as reconstructive surgery following mastectomy will not result in lactation capability as the parenchyma has been entirely removed.

It is important to note that augmentation mammoplasty is frequently repeated for reasons of mastopexy (most common), capsulectomy, change of implant type, change of implant location, change of implant size, capsulotomy, capsulorrhaphy, and scar revision. The average duration to revision was seven years. Spear, the author of a 2003 study that examined the incidence of revision augmentation mastopexy, notes, “Revision augmentation mastopexy is not an uncommon procedure, occurring half as often as primary augmentation/mastopexy in our series” (Spear, 2003).

Complications from augmentation mammoplasty more particularly in subsequent augmentation surgeries may potentially impact lactation capability (Henriksen, 2003). Capsular contracture (internal scarring), in particular, can exert sufficient pressure to decrease milk production (Strom, 1997).

**Research Evidence of Impact of Augmentation Mammoplasty Upon Lactation**

Although it is conceptually clear that that augmentation mammoplasty carries inherent risk to lactation capability, there have been few studies that specifically examine the relationship between augmentation mammoplasty and lactation capability. The definitive study on this topic was published by Hurst in 1996 and retrospectively compared the lactation outcomes of breast-augmented women with nonaugmented women. There was a significantly lower lactation outcome in women who had received augmentation mammoplasty. Most importantly, this study revealed that the periareolar incision was most significantly associated with lactation insufficiency, although the submammary-axillary incision was also statistically correlated with decreased lactation capability (Hurst, 1996).

Caputy and Flowers have also documented copious post-surgical galactorrhea, not associated with pregnancy, following augmentation mammoplasty in a 1994 study. The lactation spontaneously developed an average of 6.6 days post-operatively and was self-limited with an average duration of 5.2 days. The only statistically significant factor found was gravidity. The relationship between the galactorrhea and mature lactation following pregnancy was not investigated (Caputy et al, 1994).

**Effects of Silicone Transfer into Milk**

Well-publicized reports in previous decades of concerns about the transfer of silicone into human milk have raised public awareness of this issue. Silicone is a plastic containing silicon. In a 1998 study by Semple, it was stated, “…lactating women with silicone implants are similar to control women with respect to levels of silicon in their breast milk and blood. Silicon levels are 10 times higher in cow's milk and even higher in infant formulas” (Semple, 1998). In a 1996 study by Berlin, it was noted, “…silicone is widely present in the environment and avoiding ingestion is difficult. Silicone drops have been used for years in both the U. S. and Europe for colic.” It was concluded that there should be no absolute contraindication to breastfeeding by women with silicone
breast implants (Berlin, 1996). It is also reassuring to note that silicone is considered inert and unlikely to be absorbed by the baby’s digestive tract (Hale, 2006).

**Common Augmentation Mammoplasty Techniques**

As illustrated in the research studies discussed above, the location of the augmentation mammoplasty incision has a direct bearing upon lactation capability. A periareolar or transareolar incision will reduce neural response more than an inframammary or transaxillary incision. Placement of the implant can also affect lactation functionality. A submammary implant positioned under the parenchyma is more likely put pressure on the parenchyma and thereby reduce milk supply than a subpectoral or transrectus implant positioned under the chest muscle.

**Inframammary Augmentation Mammoplasty**

The purpose of the Inframammary Incision technique, commonly referred to as the crease incision, for augmentation mammoplasty is to insert the implant without creating visible scarring. It is the most common breast augmentation procedure and works well for both subglandular and subpectoral implant placement. It avoids the parenchyma and preserves nipple/areolar innervation.

**Surgical Technique**

An incision of 4-5 cm in length is made at the site of what is anticipated to new inframammary fold. A pocket is developed either under or on top of the pectoral muscle for the implant, which is then inserted and filled. By filling the implant after placing it in the pocket, the surgeon can use a smaller incision. If gel implants are used, the incision must be longer as they are pre-filled. Once placement and filling of the implant is complete, the incision is sutured.

**Implications for Lactation**

Placement of the implant through an incision under the breast is likely to yield the greatest lactation outcome as neither the parenchyma or innervation is affected. However, if the implant is placed on top of the pectoral muscle, it can exert pressure on the lactiferous ducts and glands, reducing lactation functionality.

**Transaxillary Augmentation Mammoplasty**

In order to minimize visible scarring, the Transaxillary incision technique requires placement of an incision in the extreme upper, outer region of the breast, near the juncture (“pit”) of the arm to the torso. The incision is hidden within the axilla and is generally invisible even with the arm raised. Implants are usually placed below the muscle.

**Surgical Technique**

An incision of 4-5 cm is made in the first axillary crease. A pocket is created to receive the implant. The implant is positioned and filled. The incision is sutured. An endoscopy may be used to facilitate precise placement of the implant, which is notoriously difficult to position through this incision.

**Implications for Lactation**

In the Transaxillary incision technique, parenchyma and innervation are largely preserved so that the impact to lactation should be minimal. As with the other incision techniques, placement of the implant above the muscle will result in greater impairment to lactation than placement below.

**Transumbilical Endoscopic Augmentation (TUBA) Mammoplasty**

The Transumbilical incision technique, commonly called Transumbilical Breast Augmentation (TUBA), is performed by inserting the implant through an incision in the navel and moving it into place in the breast. In this technique, no incisions are made on the breast or into the breast tissue, although the breast tissue is disrupted and perhaps damaged as the implant is brought into position. Insertion through the umbilicus makes it difficult to position the implant accurately, requiring the use of an endoscopy. It also only permits placement above the muscle.

**Surgical Technique**

An incision is made in the umbilicus in the shape of a J or C. An endotube is inserted to tunnel from the umbilicus to the breasts. An endoscope is inserted to ascertain the correct formation and placement of the tunnel. After the tunnels have been successfully created either above or below the pectoral muscle, the endoscope is removed. Next, a tissue expander is placed through the endotube or pushed through the abdominal tunnels on its own and situated under or on top of pectoral muscle. The expander is then inflated. After the tissue has been successfully expanded, the expander is deflated and removed. A long fill tube is then inserted into an empty breast implant and inserted into the end of the endotube. After the breast implants have been positioned inside their respective pockets either under or on top of the pectoral muscles, they are filled and the fill tubes removed. The endotube is removed. The incision is then sutured.

**Implications for Lactation**

Like the Transaxillary incision technique, the Transumbilical incision technique preserves glandular function and innervation so that the impact to lactation should be minimal. As with the other incision techniques, placement of the
implant above the muscle will result in greater impairment to lactation than placement below.

**Periareolar Augmentation Mammoplasty**

The Periareolar Incision technique requires placement of an incision on or around the areola in order to hide scarring. Placement of the implant in this location results in significant duct, glandular, and nerve damage.

**Surgical Technique**

An incision of 4-5 cm is made in a semi-circle around the lower part of the areolar. A pocket is carved either above or below the muscle to receive the implant. The implant is inserted into the pocket and filled. The areolar incision is sutured.

**Implications for Lactation**

This technique carries significant risk to lactation as nipple sensation and lactation functionality will almost certainly be negatively affected by an incision in this region of the fourth intercostal nerve. Ducts and glands are likely to be severed because the incision penetrates deeply through the breast tissue. If the implant is placed above the muscle, it may further impede lactation function by pressure upon the parenchyma.

**Reduction Mammoplasty**

Reduction mammoplasty is surgery to reduce the size and volume of the breast. There are many reasons that women with hypertropic breasts choose to have reduction mammoplasty, which occurred at a rate of 160,531 in the US in 2005, which is 235% increase from 1997 (American Society for Aesthetic Plastic Surgery, 2005), and may be influenced by the fact that many US health insurance companies will underwrite the expense of the surgery if certain physical criteria are met. These criteria may include an estimate of a minimum amount of breast tissue that will be removed and striking indicators of excessive breast weight, such as shoulder grooves from bra straps. In addition, the woman may have back or shoulder pain, neuromuscular dysfunction, including headaches and spinal nerve damage, and posture and breathing difficulties. It is not uncommon for women with hypertropic breasts to have frequent yeast infections in the inframammary fold and premature, exaggerated ptosis. Hypertropic breasts can also interfere with aerobic exercise and physical activities. A woman who has unilateral reduction mammoplasty in combination with augmentation on the contralateral breast may do so to correct the manifestation of Poland’s Syndrome or hypoplasia, which would then reduce the functionality of the higher functioning breast.

The psychological motivations for reduction mammoplasty surgery are often more compelling than physical discomforts to the woman considering the surgery, although they may be reluctant to discuss them candidly. These women may feel tremendous peer and familial pressure to look normal and “fit in.” In a society that equates large breasts with promiscuity, a young woman with hypertropic breasts will attract attention that may make her very uncomfortable. Sexual harassment is quite common and can be humiliating and frightening. Even mothers of such girls who understand the value of breastfeeding may urge their daughters to have the surgery in order to protect them from sexual harassment. Because their physical appearance differs so greatly from their peers, young women with hypertropic breasts often have a poor self-image and perceive themselves as having a severe physical abnormality. They frequently find that they are not respected for their intellectual abilities. Reduction mammoplasty transforms their bodies into the range of normal body size and can significantly redeem their self-esteem. The American Society of Plastic Surgeons (ASPS) cites this surgery as having the highest degree of satisfaction (Collins, 2002).

**Research Evidence of Impact of Reduction Mammoplasty upon Lactation**

Many intriguing research studies have examined the question of breastfeeding after breast reduction surgery. The most basic question to be addressed is whether reduction mammoplasty impacts lactation at all. In a 1993 meta-analysis, Widice found that lactation outcomes after reduction mammoplasty ranged from zero to 70%, depending upon the type of surgery performed (Widice, 1993). A Brazilian study in 2003 by Souto, Giugliani, Giugliani, and Schneider examined the impact of reduction mammoplasty surgery on breastfeeding performance. A group of 49 Brazilian women who had undergone breast reduction surgery using transposition techniques were compared with 96 controls. The women who had received reduction mammoplasty had a significantly shorter breastfeeding duration (defined as any breastfeeding), ranging from 5 days to 2 months. The duration of any breastfeeding in the control group ranged 3 months to 6 months. The researchers in this study concluded that breast reduction surgery might have a negative impact on breastfeeding performance (Souto, 2003).

**Research Comparison of Reduction Mammoplasty Techniques**

As there are many surgical techniques for reduction mammoplasty, correlations between surgical techniques and lactation outcome provide evidence for superiority of some techniques for the preservation of lactation function. One frequently referenced study by Harris et al. queried women who received the inferior pedicle reduction mammoplasty. It reported a 100% lactation rate (defined as any observable lactation), but only a 35% rate of successful breastfeeding...
A study in 1994 by Marshall determined that the Inferior Pedicle reduction mammoplasty technique was correlated with improved lactation outcomes when compared to reduction mammoplasty using the free-nipple graft technique (Marshall, 1994).

An important study, published in 2000 by Ahmed and Kolhe, compared the nipple and areolar sensations after breast reductions employing the free nipple and inferior pedicle surgical techniques. They found some degree of recovery of nipple and areolar sensation in all patients, with areolar sensation being similar in the two groups, but nipple sensation being superior in the inferior pedicle group (Ahmed and Kolhe, 2000). This was particularly interesting because it had always been widely believed that the free nipple technique resulted in complete loss of nipple and areola sensation, which would have a severe impact upon lactation since milk production depends up on the nerve stimulation response during suckling. This study gives new hope to those who received the free-nipple reduction mammoplasty technique, especially those for whom sufficient time for recanalization and reinnervation has elapsed.

A study by Sandsmark et al in 1992 compared the effects of the superior and inferior pedicle techniques. The 292 patients studied had received surgery between 1984 and 1990. Two hundred and thirty-three received the superior pedicle technique, 29 received the inferior pedicle technique, and 23 had other types of reduction surgery. Not surprisingly, the authors found that the inferior pedicle technique yielded better results in terms of increased sensitivity, particularly of the nipple-areola complex, and better lactation (Sandsmark et al, 1992).

A study in 2003 by Hefter, Lindholm, and Elvenes evaluated lactation outcomes when the inferior (lateral) pedicle reduction mammoplasty technique involving a process of leaving structures untouched within the nipple/areolar pedicle with increased dimension was used. Although the sample size was small (13), 54% of the women in the study breastfed successfully without supplementation for between two and 14 months following surgery, 16% were classified as unsuccessful and 30% did not breastfeed at all. The women reported that success of breastfeeding was limited by the influence of medical personal. Interestingly, 62% who had children preoperatively improved their rate of breastfeeding after surgery. No correlation was demonstrated between measured sensitivity and breastfeeding. No significant correlation was found between the resected tissues and breastfeeding. No relation was observed between the duration of breastfeeding and the period of time between the surgery and childbirth (Hefter et al, 2003).

Research Observations of the Impact of Breastfeeding Counseling upon Lactation Outcomes after Reduction Mammoplasty

A study published in 2000 by Brzozowski specifically investigated the impact of the inferior pedicle reduction technique upon lactation. A significant limitation of the study is the definition of successful breastfeeding as the ability to feed at the breast for equal to or greater than two weeks, a duration of time that is not sufficient for establishing a stable rate of milk production. Nonetheless, the study did observe significant lactation outcomes with the women who had received the inferior flap mammoplasty technique. It also observed that specific patient encouragement to breastfeed resulted in statistically significant improved lactation outcomes (Brzozowski, 2000).

An important finding to healthcare professionals who seek to assist women to breastfeed after breast reduction surgery is a study by Deutinger and Deutinger that a reduced incidence of breastfeeding as a direct result of discouragement from medical personnel. 105 patients who received McKissock, Pitarangu, and Strombeck reduction mammoplasty or mastopexy were examined and questioned about breastfeeding post-operatively. The researchers observed a low incidence of breastfeeding as a result of specific counsel to not breastfeed. They also noted only two patients in whom no lactation was noted (Deutinger et al, 1990).

This finding was replicated and expanded in a French study in 2002 by Aillet, Watier, Chevrier, et al that examined the effect of breastfeeding after reduction mammoplasty performed during adolescence. A questionnaire was submitted to 109 women who had undergone breast reduction as adolescents to determine the factors that influenced their breastfeeding experiences. Of 65 respondents, only 17 had given birth (25 infants). The average interval between the surgery and the first lactation event was 7.7 years. Of the 17 mothers, only 5 had breastfed, with an average duration of 11.3 days, ranging from 3 days to 1 month. The 12 mothers who did not breastfeed cited reasons of breast surgery to personal or work issues. There was no statistical relationship between breastfeeding and women's satisfaction with their surgery or between breastfeeding and surgical technique. “Despite a deliberate effort to inform these young women about breastfeeding during preoperative and postoperative consultations, 63 percent of those replying to the questionnaire stated that they had not been informed.” The researchers concluded that “...the mistaken idea breastfeeding is bad for the breasts might have particular influence on a woman who has had surgery to improve the shape of her breasts.” They also noted that preserving breast function does not appear to be a priority for women seeking...
breast reduction surgery, particularly in adolescents. This finding is consistent with anecdotal observations in North America, as well. It must also be considered, however, that these women may not be simplistically oriented to the concept of aesthetic perfection so much as they wish to feel more normal and remove the cause of sexual harassment (Aillet et al, 2002).

**Implications for Breastfeeding after Reduction Mammaplasty**

As evidenced in the research described above, the surgeries that have resulted in the greatest lactation capability are those in which the areolas and nipples were not completely severed, even though they may have been moved, such as the Inferior Pedicle technique. Many women believe their areolas and nipples were severed because they have a scar around the outside of the areola. They may also know that the areola and nipple were moved, and therefore assume they must have been severed to do so. With surgical techniques performed since 1990, this is unlikely to be the case. Most current breast reduction surgical techniques reposition the areola and nipple attached to a pedicle that contains the still-connected lactiferous ducts and nerves. If damage to the lactation system occurs in these types of surgeries, it is more likely to be a result of cuts deeper in the breast tissue, where glands, fatty tissue, ducts, and nerves were removed and severed.

**Common Reduction Mammaplasty Techniques**

The techniques in use today vary according to the surgeons’ and the patients’ outcome goals. Some surgeons and patients seek minimal scarring at the expense of shape, some prefer a better shape with moderate scars, others prefer more scarring with better preservation of nerve, blood, and lactation tissue.

Unfortunately, it cannot be determined precisely which surgical technique was used by observing the shape of reduction mammaplasty scars as several scar patterns are identical even though the surgical techniques are different and result in diverse lactation capabilities. The only way to be certain of the surgical technique is for the mother to obtain her surgical record or consent form from the surgeon or the hospital where the surgery was performed.

The description and analysis of the reduction mammaplasty surgical techniques that follow are presented in a subjective ranking in order of least to most impact upon lactation capability. Those whose surgery involved the techniques presented first will most likely yield the greatest milk supplies.

Please note that while speculation about the impact of the following surgeries upon lactation is based on both research and logic, the actual anatomical and physiological outcome will depend upon the surgeon’s skill and motivation to preserve lactation tissue, the woman’s original breast size, her unique anatomy, and the interval between the surgery and lactation. These estimates of lactation capability apply only to the first lactation experience. Subsequent lactation experiences will almost always benefit from the effects of recanalization and reinnervation, which will result in a greater milk supply than the first experience.

**Liposuction Reduction Mammaplasty**

One surgical technique favored by some surgeons for a small subset of women who require only minimal reduction and who do not have significant ptosis is reduction mammaplasty by liposuction alone. This process is attractive in that it leaves minimal scarring and nerve damage. Further, in the appropriate surgical candidate, the nipple-areola complex need not be surgically moved to a higher, proportional level, because the removal of the weight of fat from the breasts naturally causes the nipple-areola complex to rise to a proportional level. The areola will also naturally decrease in size when the breast is reduced in volume and tension on the areola decreases. For these reasons, however, it is usually suggested that this technique be used only for reductions of two or fewer cup sizes (Spear, 2005).

**Surgical Technique**

The usual incision is a cut of only about a half-inch directly under the inframammary fold underneath the breast, close to the rib cage. Occasionally, an incision is made on the edge of the areola to reach the upper breast tissue. Other small incisions can also be made elsewhere on the breast to access fat deposits. A cannula is inserted through the incision(s) and removes fat tissue from the breast. The same suction machine used in liposuction of other body parts is used in this surgery. This technique can also be improved with the use of ultrasonic equipment, which may permit the surgeon to avoid the mammary lobes (Spear, 2005).

This technique is occasionally used in conjunction with traditional reduction mammaplasty procedures as a means of removing only fat tissue from the breast, while leaving the maximum amount of parenchyma and stroma intact.

**Implications for Lactation**

It is possible for the cannula to remove lactation tissue, especially when a sharper instrument is used (Spear, 2005). If an incision is required in the areola in order to reach the upper breast tissue, damage to the nerves of the areola is
also possible. Therefore, it cannot be assumed that this surgery is guaranteed to preserve the patient’s complete lactation capability. However, when lactation is known to be a priority so that a blunt cannula is used and no incision is made near the areola, full lactation capability is far more probable with this reduction mammoplasty surgery than with any other. It should be noted, though, that the use of this surgical technique seems to be somewhat rare.

This surgical technique may be ideal for women who have had previous reduction mammoplasty by other techniques, but who have experienced repeated breast growth and wish to again reduce breast volume, while minimizing the risk of further vascular or nerve damage to the nipple and areola (Spear, 2005).

**Inferior Pedicle Reduction Mammoplasty**

The Inferior Pedicle surgical technique, often called the McKissock technique, is the most common reduction mammoplasty technique currently performed in North America. It is a highly versatile technique, being well suited for most types of breasts. A hallmark of this surgery is that the reduction is accomplished without compromising the nerve or blood supply to the nipple-areolar complex, which, although moved, remains attached to a pedicle containing the nerves, blood supply, and ductal tissue. The majority of tissue removed is from the perimeter of the breast, which ensures that the greatest proportion of lactation tissue remains.

### Surgical Technique

The skin around the outside circumference of the areola that is not desired is removed, along with other breast skin inside the incision lines. The new area for the nipple and areola (above the previous location) is prepared by removing all skin layers inside the incision lines.

The areola-nipple complex is then separated from the underlying adipose (fatty) tissue and lifted into the new location, remaining attached to a mound (pedicle) of tissue containing the blood and nerve supplies, as well as lactiferous ducts, that extend down to the level of the new inframammary fold.

The wedges of tissue inside the lower incision lines on either side of the lower portion of the nipple-areola pedicle are then cut away and removed. The incision edges are brought together and sutured, as is the nipple-areolar complex, where it resides in its new position. Finally, the bottom of the flaps is sutured to the skin at the chest wall, creating the new inframammary fold.

### Implications for Lactation

The Inferior Pedicle technique is renowned for being among the most effective reduction mammoplasty techniques for preservation of lactation tissue. It accomplishes this goal by removing tissue on the outermost parts of the breast, which allow more of the ducts and lobes to remain, while at the same time leaving the critical nipple-areola complex attached to the nerve, blood, and ductal supplies. Almost inevitably, some of the lobes and ducts will be cut; however, this surgery respects the lactiferous infrastructure and therefore preserves the ability of the breast to produce milk, often to a significant degree.

**Periareolar Reduction Mammoplasty—“The Round Block”**

“The Round Block” surgical technique was first introduced in Europe in 1983. It is the reduction technique with the least amount of visible scarring. The only incision is made around the areola. The outer portions of the areola are frequently removed, however, to provide an areola that is more symmetrical and proportional to the new breast size. Because the areola is not moved in order to preserve a natural appearance, this technique is only appropriate for women with slight to moderate breast enlargement. From an aesthetic perspective, this surgical technique results in only a barely noticeable scar, but a breast shape that may not be ideal (Spear, 2005).

### Surgical Technique

An incision is made around the areola and any undesired portion of the areola is cut away. The skin that surrounded the areola is retracted while the areola remains attached to the breast and is not moved. The breast tissue is removed in a similar fashion to the inverted T technique that characterizes the inferior pedicle technique, with the exception that the breast skin is not cut. The breast sections are removed in sections through the areolar opening. The decision as to what breast tissue is removed is determined by the future desired shape of the breast, rather than by differentiation of glandular tissue from fatty tissue (Spear, 2005).

An important aspect to this surgery is the use of a special suturing technique wherein the areola is reattached with stitches that begin and end at the top of the areola in a sort of “purse string,” as the surgeons describe it. This special suture does not produce tension on the areolar scar, preventing enlargement of the future areola or areola scar, as well as flattening of the areolar mound (Spear, 2005).

### Implications for Lactation

This is the only surgical technique in which the areola remains attached and unmoved, although removing the outer
portion may reduce the circumference. Because the areola is not moved, the possibility of nerve and blood supply damage is greatly reduced. However, reducing the size of the areola may still impact the critical fourth intercostal nerve. Also, because significant wedges of tissue are removed from the breast without regard to avoiding the glands and ducts (which admittedly are difficult to identify in the non-lactating woman), and because the ideal candidate for this surgery is the woman who only has moderately large breasts, which contain less fat than larger breasts, a significant amount of the lactiferous lobes may be removed or damaged.

The ability to lactate to some degree is most certainly preserved with this surgical technique (Spear, 2005). However, because of the possibility of damage to the fourth intercostal nerve, as well as the removal of significant amounts of lactation tissue, it must be expected that this surgery would not yield a full milk supply for the first episode of lactation. Over time, recanalization and reinnervation may compensate for any deficits, yielding a more copious milk supply for subsequent children.

Central Mound Reduction Mammoplasty

The Central Mound technique was developed to correct the “bottoming out,” flat breast profile that is a problem commonly found with breasts altered by the Inferior Pedicle technique. Like the Inferior Pedicle technique, the central mound technique preserves the nipple-areola blood, nerve, and ductal connections. It differs significantly, however, in that it greatly disrupts regions of the breast where the ducts and nerves are most likely to be seated. Because there are several variations to this technique, the degree of disruption of the lactation tissue varies (Frey, 1999).

Surgical Technique

Incisions are made in outline of the new parameters of the breast, cutting around the circumference of the areola, removing portions of the areola that are not desired. The skin inside of the incision lines is removed. The skin covering the breast is separated from the breast tissue, which is then lifted by traction off the chest wall. Tissue is then shaped and resected until the desired shape is achieved. The skin flaps are replaced and temporarily sutured at the vertical line beneath the areola, which is temporarily under the skin. The folded flaps that result are cut away so that the new inframammary fold appears. The sutures are then cut and the new area for the nipple-areola complex is prepared. When the nipple-areola complex has been properly positioned, it is sutured in place. The vertical incision lines are then permanently sutured, as is the inframammary fold.

Implications for Lactation

This technique preserves the nipple and areola pedicle, but thoroughly disrupts the delicate arrangement of the lactation infrastructure. The shaping and resectioning of the interior breast tissue are potentially quite destructive to the ducts and nerves. Fortunately, the odds are that at least some will survive intact and, for those that do, the nipple-areola will be in a very excellent condition to receive them. Therefore, it seems that while lactation tissue is greatly disrupted by this technique, there may nonetheless be a good lactation outcome with the Central Mound technique.

Periareolar Reduction Mammoplasty with Mesh Support—The “Double Skin” Technique

The “Double Skin” technique was first introduced and popularized in Brazil in the 1980s. The addition of a mesh component was added in 1990 to improve the shape of the reduced breast, which is a problem with the round block technique. It is also the objective of the Double Skin technique to reduce the possibility of future sagging. Like the Round Block surgery, this technique involves an incision only around the areola, but may include reduction of the areolar circumference (Spear, 2005).

Surgical Technique

The basic method of this technique is similar to that of the Round Block technique wherein the removal of breast tissue occurs only through the incision around the areola. The greatest portion of the tissue that is removed is taken from the top of the breast. A wedge from the bottom is taken only occasionally. The skin is separated from the breast tissue and mesh is applied beneath the skin to the entire outer area of the breast in order to provide lasting structure and optimal form (Spear, 2005).

Implications for Lactation

One interesting facet of this method is that a much larger wedge of breast tissue is removed from the top of the breast than from the lower portion. This is positive for lactation because a somewhat greater proportion of glandular tissue is located in the lower portion of the breast than in the upper. Still, as with the Round Block technique, the incisions around the areola, including reduction of the areolar circumference, increase the likelihood that the critical fourth intercostal nerve will be damaged, even though the areola is not moved. Also, the likelihood of removal of glandular tissue is increased because this surgery is only appropriate for women who have moderately large breasts, which contain less fat than larger breasts. Therefore, less fat is available to remove, making removal of lactation tissue more likely.

It can be expected that lactation will be impacted somewhat, however, it is possible that only minimal supplementation may be necessary. The impact of recanalization and reinnervation may further eliminate the need for supplementation for subsequent children.


**Superior Pedicle (Medial) Reduction Mammoplasty**

The Superior Pedicle (Medial) reduction mammoplasty technique was first performed in the early 1960s by Drs. Lassus and Lejour in France. The primary goal of this surgery is to minimize vascular damage to the areola-nipple complex so as to reduce the risk of infection and nipple loss. This surgical technique also seeks to minimize visible scarring by allowing only a scar around the areola, in addition to a vertical scar from the bottom of the areola to the inframammary fold. There is no horizontal scar along the inframammary fold. The nipple and areola are moved to a new, higher position, but not severed.

**Surgical Technique**

A football-shaped incision, with a rounded top to create the space for the new nipple-areola position, is made from the base of the breast to the new nipple-areola position. This surgery is a superior-based pedicle technique because the nipple-areola complex remains attached to the breast by a flap of breast tissue above the areola as it is moved into the new position. The size of the areola is reduced to a proportional circumference by cutting away the outer portion of the areola. The nipple-areolar connection to the fourth intercostal nerve is preserved. When the nipple-areola is relocated, a wedge of breast tissue between the open edges of the incision is removed. The edges of the incision are then brought together and sutured. Once the initial suturing has been performed, the resulting breast shape is evaluated. If it is not in the desired form, the sutures are then separated and remedial excisions of tissue are performed. This process is repeated until the desired shape is achieved.

**Implications for Lactation**

Although this technique does not sever the nipple-areola complex from the breast and does not impact the blood supply to the breast, it does greatly impact the nerves and ducts connected to the areola and nipple, and indiscriminately removes a significant amount of breast tissue in the area most likely to contain lactation tissue. It is amazing that lactation is at all possible with this technique, although it has been known to occur to a limited degree. Nonetheless, if lactation does occur, a high proportion of supplementation will almost invariably be necessary for women who have received this technique.

**Vertical and Short Horizontal Scar Reduction Mammaryoplasty**

The Vertical and Short Horizontal Scar reduction procedure was first performed in 1977 in France and is characterized by a scar around the perimeter of the areola, in addition to a horizontal scar radiating from the base of the areola to a space above inframammary fold, where it connects to a short horizontal scar. The technique is performed in a similar manner to the Vertical Scar technique, however, with the allowance of a short horizontal scar, this technique yields an attractive result without the necessity for repeated suturing.

**Implications for Lactation**

Because this technique yields a similar result to the Vertical Scar superior-pedicle technique, the lactation prognosis is the same. A great deal of critical lactation tissue is removed, which necessarily results in loss of lactation tissue. Nonetheless, some lactation is certainly possible.

**Free Nipple Graft Reduction Mammoplasty**

The Free Nipple Graft reduction mammoplasty technique is an appropriate surgery only for women who do not anticipate future lactation, as nipple innervation is likely to be significantly compromised. It may be appropriate for women in whom the presence of excess tissue beneath and over a long pedicle may cause nipple-areolar complex necrosis. This technique is accomplished by complete removal of the nipple from the breast, followed by grafting it to a new location on the breast. As a result, extensive damage is done to the lactation tissue (Aiden, 2002). The medial pedicle reduction mammoplasty technique may be an alternative in cases of severe hypertrophy (Nahabedian et al, 2000).

**Surgical Technique**

The Free Nipple Graft technique is begun by determining the new location of the areola-nipple complex using numerical and subjective estimates. The areola and nipple are excised, removed from the breast, and placed in a moist saline sponge. The new location for the areola-nipple complex is prepared by removing the skin. Incisions are made vertically from this point to the site of the new inframammary fold. A horizontal incision is made along the line of the new inframammary fold. Skin and tissue inside of the vertical and horizontal incision lines is removed. The nipple-areola complex is grafted onto the new site and sutured in place. The remaining incisions are sutured. The scars are identical to the superior and inferior pedicle techniques (Spear, 2005).

**Implications for Lactation**

This surgical technique yields the least lactation potential of all reduction mammoplasty techniques because the nerves and ducts of the nipple and areola complex are severed. Although recanalization and reinnervation are certainly possible, even moderate lactation is not likely. It is also likely that significant damage was done to the interior lobes of the mammary system, so that even if recanalization and reinnervation occur to any degree, the available lactation tissue will still be largely insufficient.
Appearance of the Surgically Reduced Breast

Women who have undergone breast reduction surgery have a smaller areola circumference and, of course, smaller breast size. Scars differ widely according to the technique that was used, but in general can include a scar around the areola, a scar in a vertical line from the areola to the inframammary fold, a very small half-inch horizontal scar at the base of the breast, a short horizontal scar of about two inches somewhat above the inframammary fold, or a long horizontal scar along the inframammary fold. Some scars resemble an inverted T and others resemble an anchor.

Milk Storage Capacity of the Surgically Reduced Breast

For mothers who have had breast reduction surgery, the research findings about variable milk storage capacities contribute an added dimension to the question of lactation capability and explain an anecdotal finding. It has been anecdotally observed that mothers who have had breast reduction surgery tend to produce higher fat milk. It is also a logical conclusion that most of them will have a smaller areola circumference and, of course, smaller breast size. Scars differ widely according to the technique that was used, but in general can include a scar around the areola, a scar in a vertical line from the areola to the inframammary fold, a very small half-inch horizontal scar at the base of the breast, a short horizontal scar of about two inches somewhat above the inframammary fold, or a long horizontal scar along the inframammary fold. Some scars resemble an inverted T and others resemble an anchor.

Structural Changes in the Surgically Reduced Breast

By the time a woman who has had a breast reduction is considering breastfeeding, most post-surgical areolas and breasts are no longer as perfect as they were post-surgically. Weight gain, gravity, and especially pregnancy can cause areolas to stretch and breasts to enlarge and sag. Many post-surgical women find that their areolas stay in the new position, but the majority of their breast tissue drops to the pendulous, sagging portion of the breast.

With these dramatic changes, scars can be also altered. Many vertical and horizontal scars spread and dramatically lighten. Areolar scars tend to remain the same or lighten to become almost unnoticeable, although some women report that this areolar tissue becomes a shade of pink unlike the normal breast skin or the areolar skin. Scar tissue on the interior of the breast can feel distinctly thick.

Fair-skinned women often find that pregnancy brings many more prominent blue veins to the surface. Most fair-skinned women experience this phenomenon during and after pregnancy. Women who have had breast surgery may be more aware of it, however, as they tend to notice breast changes more readily.

Some mothers find that a portion of the darker pigmented, previously areolar, skin is now located in the lower scar line. It may not have been noticeable before pregnancy, however the hormones that darken the areola also darken this areolar skin so that it becomes more pronounced during pregnancy. The reason extraneous areolar skin remains is that during the reduction surgery, when the areolar pedicle is cut, the skin blanches, making it difficult to differentiate the areola boundaries. The tissue remains blanched when it is being sutured, so that it cannot be identified.

Of course, time can be kind, as well. Most scars lighten considerably over the years and nerves regenerate so that sensation is regained in all regions of the breast. Occasionally, the sensation that develops is more acute than it was previously when the breasts were so large.

Some women who have had breast reductions find that they have developed “dog ears” as their breasts changed since the surgery. A “dog ear” is the term describing the phenomenon of the horizontal scar that extends from under the breast that spreads at the outer edge under the arm, folding on to itself, with a pucker at the base, resembling a dog’s ear. Most plastic surgeons can easily modify the scar during an office visit. As it is a common occurrence, it may also be included in post-surgical care.

Rarely, some women who have had breast reduction surgery find that small “holes” exist in the scar tissue. These may originate from poor healing around sutures. Such holes can be troublesome, however, as they tend to collect dirt, oil, and debris, and can sometimes become infected. If they become troublesome, it may be prudent to bring them to the attention of the plastic surgeon so that they can be removed.

Regaining or Exceeding Original Breast Size

Many mothers who have had breast reduction surgery lament the fact that during pregnancy their breasts are once again the size they were before the surgery (or even larger). It is important to consider that they had the surgery because they have a tendency to grow large breasts. A small proportion of women who choose to undergo reduction mammoplasty in adolescence may have juvenile gigantomastia, a benign disorder of the breast in which one or both of the breasts undergo a massive increase in size during adolescence. A study in 2001 by Baker, Burkey, Thornton, and LaRossa examined juvenile gigantomastia and noted a high incidence of repeat reduction mammoplasty as the breast tissue...
continued to grow in significant proportions even after the first surgery. “The authors’ experience has been that juvenile gigantomastia in young patients is prone to recurrence, and is in agreement with previous studies that subcutaneous mastectomy provides definitive treatment. However, tamoxifen may be a useful adjunct and may allow stable results when combined with reduction mammoplasty. If successful, the use of tamoxifen would eliminate the potential complications of breast prostheses” (Baker et al, 2001).

An important consideration that may consoling for any post-reduction surgery mother who experienced breast growth after pregnancy is that if she had they not had the surgery, the increased breast growth normal to pregnancy would have occurred in addition to her original breast size, rather than from the reduced size, so that she would be much larger and more uncomfortable than she is currently.

**MASTOPEXY**

Mastopexy is surgery to lift and reposition the breasts to reduce ptosis, without reducing volume. This surgical technique reshapes and repositions the breasts, resulting in fuller, rounder, and higher breasts. Augmentation surgery with a prosthetic implant may be performed at the same time to further increase the fullness of the breasts.

There are two types of mastopexy techniques: the Periareolar mastopexy technique and the Inverted T or Vertical Scar technique. The determining criterion for the type of technique used is the degree of nipple ptosis. When the nipple is at or above the inframammary fold, the Periareolar technique is commonly employed. When the nipple is below the inframammary fold, an Inverted T or Vertical Scar technique is typically appropriate. Although the nipple is repositioned, the nipple/areolar pedicle is not usually separated from the parenchyma and, therefore, the fourth intercostal nerve remains intact, preserving lactation functionality.

In both types of mastopexy techniques, the impact upon lactation is usually quite minimal as no parenchyma is excised. The only threat to lactation functionality is the extent of the damage to the innervation of the nipple/areolar complex or compression of glandular tissue if an implant is placed above the muscle, constricting glandular tissue.

**Periareolar Mastopexy**

The Periareolar mastopexy technique is identical to the “Round Block” reduction mammoplasty described above, with the exception that the mastopexy technique primarily excises epidermal layers and removes no parenchyma or stroma.

**Inverted T or Vertical Scar Mastopexy**

The Inverted T or Vertical Scar mastopexy repositions the nipple and removes skin from the lower part of the breast, with a periareolar incision and an epidermal incision from the base of the areola to the inframammary fold. In the Inverted T technique, there is also an incision along the line of the inframammary fold. Tissue removal is limited to epidermal layers; no parenchyma or stroma is excised.

**NIPPLE REDUCTION SURGERY**

Nipple reduction surgery is performed for women who have nipples with long shank lengths on one or both breasts and desire to have them reduced in length. The surgery is primarily cosmetic and not performed to reduce pain or increase functionality. There are many nipple reduction surgical techniques, ranging from amputation of the top of the nipple to a procedure that removes a cylinder of skin around the neck of the nipple in order to insert the nipple more deeply into the breast. In most cases, lactation is not affected as neither the fourth intercostal nerve or the ducts within the nipple are severed. The surgery may be combined with reduction or augmentation mammoplasties. In such cases, diminishment of lactation functionality will be related to the mammoplasty and not the nipple reduction.

**NIPPLE ENLARGEMENT SURGERY**

Nipple enlargement surgery is performed for a woman who has nipples that are normal in projection and shape, but who desire them to be larger. There are several techniques to enlarge nipples, usually incorporating tissue grafts. There is a minute risk of scaring that can reverse the enlargement, resulting in a nipple that is reduced beyond the original size, which can negatively affect latching. In most cases, nipple and lactation functionality are unaffected.

**INVERTED NIPPLE RELEASE SURGERY**

Nipple inversion may be congenital or acquired as a result of nipple or ductal trauma or previous breast surgery. Congenital inversion is thought to be due to either exceptionally short ducts or fibrous adhesions that constrict the nipple, drawing it inward. Kehrer performed the first surgical correction of inverted nipples in 1879 (Huang, 2003). Surgeons use the Han and Hong Nipple Inversion Grading System to quantify the degree of inversion (Han and Hong, 1999):

- **Grade 1:** The nipple can easily be pulled out easily and maintains projection. The nipples have minimal fibrosis beneath the nipple. Manual manipulation or a simple buried
purse-string suture is adequate to achieve protrusion. Lactation is not impacted.

- **Grade II:** The nipple can be pulled out with moderate difficulty, but does not maintain projection, retracting back into the breast. The majority of inverted nipples fall into this classification. These nipples have moderate fibrosis beneath the nipple. Surgical treatment involves dissection of the nipple to release fibrotic bands. Lactiferous ducts are preserved. Lactation is not impacted.

- **Grade III:** It is difficult or impossible to evert the nipple manually. The least proportion of nipples is this severely inverted. There is severe fibrosis at the base of the nipple so that it is impossible to sever all the fibrotic bands without also severing ducts, particularly in the central portion of the nipple. Lactation is significantly impacted. With time, recanalization of the ducts can regain partial or full functionality.

As the Han and Hong Nipple Inversion Grading System demonstrates, surgery to correct congenital or acquired nipple inversion can impair lactation functionality, depending upon the degree of inversion and the type of technique used. Although there are over 20 identified surgical techniques correct nipple inversion, there are two main types of nipple inversion release surgical techniques, differentiated by preservation or severance of the ducts.

**Inverted Nipple Release Surgery with Preservation of Ducts (Grades I and II)**

An incision is made around the base of the nipple. Fibrous adhesions are severed. The nipple and areola tissue is lifted and stitched into a new, projecting shape, utilizing a “purse-string” style of suturing. Scar contracture around the circular shape of the nipple further increases nipple projection (el Sharkawy, 1995).

**Inverted Nipple Release Surgery with Severance of Ducts (Grade III)**

An incision is made around the base of the nipple. Fibrous adhesions and milk ducts are severed. The nipple and areola tissue is then lifted and sutured, creating normal projection of the nipple. Scar contracture around the circular shape of the nipple further increases nipple projection (el Sharkawy, 1995).

**LACTATION MANAGEMENT IN THE POST-BREAST OR POST-NIPPLE SURGICAL MOTHER**

**Lactogenesis II and Engorgement**

Engorgement during Lactogenesis II can be a significant first hurdle when breastfeeding after breast surgery. Despite the cause or the extent of the engorgement and no matter when it is experienced, it is important to relieve the engorgement in a timely manner so as to avoid damage to functional alveoli, which can permanently reduce lactation capability.

Most mothers with surviving lactation tissue will experience some degree of engorgement following delivery of their first babies. It is often after delivery of the second baby, though, that engorgement becomes pronounced enough to cause serious discomfort and interfere with breastfeeding. This is because the first lactation experience prompted the recanalization and growth of additional lactation tissue, which is then subject to engorgement.

The extent of recanalization bears a direct correlation between the degree of the first and subsequent engorgement episodes. Mothers who have lactated longer with the first child will usually experience more engorgement following the next delivery as a result of recanalization than those mothers who lactated for only a short time. Engorgement following the third and subsequent births tends to be at least as pronounced as it was the previous time, and may even be more extensive as a result of further recanalization.

Apart from the pain and discomfort of engorgement, many mothers find that the engorgement experience is made more difficult by healthcare professionals who tend to refer to the swelling as an inevitable result of severed ducts rather than as proof of functional lactation tissue. Instead of being reassured by the evidence of recanalization, the mother is incorrectly warned about a risk of breast infection due to the mistaken belief that the engorgement will take longer than normal to resolve since the “milk has nowhere to go” and can become infectious. This is incorrect from the standpoint of both general lactation principles and post-surgical physiology. From the general lactation perspective, engorgement is not a result of a large volume of milk so much as it is swelling of the tissues that surround the glands and ducts in response to a rapid influx of mature milk. Thus, the presence of milk in severed ducts is not responsible for the majority of the engorgement, and so will not have a bearing upon its progress. When the milk is not removed, the severed ducts atrophy rapidly, so they do not become distended with “backed up” milk and do not progress to infection or abscesses.

If a mother does not experience any fullness at all during Lactogenesis II, this can indicate that her prolactin levels are too low or the prolactin has not been able to affect milk production. Or, it may mean that she did not have many viable, intact lobes to produce milk. Occasionally, some mothers experience unequal engorgement between their breasts, again indicating that the viable lactation tissue is present in greater quantities in one breast than the other. Less frequently, some mothers find that they have engorgement only on portions of one or both breasts, but that other areas of the breast remain soft. This is further evidence that little or no viable lactation tissue exists in the non-engorged areas.
The critical component of managing Lactogenesis II in the post-surgical mother is maximizing milk removal to ensure maximum milk production. This may necessitate confirmation that baby is able to remove milk adequately and/or addition of a pumping regime subsequent to each breastfeeding.

**Milk Ejection**

In mothers who have had breast reduction surgery, initiation of milk ejection is more dependent upon the state of the neural pathways than it is upon the capacity of the mammary gland itself. Of course, even with an excellent milk ejection, the ducts that are not connected cannot express milk and will eventually atrophy. If the nerves of the nipple and areola have been completely severed, particularly the fourth intercostal nerve, assuming reinnervation has not occurred, then let-down cannot happen, except as a psychological response or as a result of ingestion or inhalation of synthetic oxytocin. A loss of sensation in either nipple/areolar region indicates the presence of nerve impairment that will negatively impact milk production.

**Surgical Adhesions**

Adhesions formed after breast surgery are frequently discussed in the medical literature and are often attributed as the cause of breast pain in mothers who have had reduction mammoplasty. The observed prevalence of adhesions, however, as a significant cause of post-surgical complications in these mothers is fairly low.

Nonetheless, some breast pain felt by post-surgical mothers, especially during their first lactation experience, can be attributed to adhesions. Adhesions are comprised of scar tissue that forms connections between layers of tissue after surgery. The binding together of the tissue layers that would normally move independently is painful. The adhesions can vary in severity, from thin, filmy adhesions, to thick, vascular adhesions, to dense cohesive adhesions. The thinner the adhesion, of course, the less pain it causes and the easier it is to break by exterior or surgical methods. Over time, adhesions shorten, and depending on the type of adhesion, can introduce pain that did not previously exist. This pain can significantly inhibit milk ejection, and thus reduce milk production.

When an adhesion is suspected, the first remedy is to try to move the layers of tissue by frequent, gentle massage, which will break the adhesions if they are not too dense. In the case of nipple adhesions, the nipples can be gently pulled outward. With time and active use of the breast, the adhesions will usually diminish in severity.

Unfortunately, when mothers have a sharp, stabbing breast pain, it is very common for their physicians to mistakenly attribute the cause of the pain to adhesions. The mothers are frequently told there is nothing that can be done about it and the pain is something to be suffered through. In fact, however, in many cases the actual cause of this type of pain is either shallow latching or a *Candida* infection, which is treatable. Therefore, it is important to rule out the more common causes of breast pain in lactating women before attributing it conclusively to adhesions.

**Nipple Blanching**

It seems to be common for post-surgical mothers to experience a phenomenon that is otherwise rare among breastfeeding mothers, called *blanching or nipple vasospasm*. Blanching occurs when either the tip of the nipple or the entire nipple becomes rigid, squeezing out all blood and turning completely white. After some time, it may turn blue, and then the nipple will relax and a deep purple-red color will flush the entire nipple as the blood returns. It is very painful, often including numbness, burning, and tingling. It can last several minutes and occur frequently, even in between feedings.

It is not known why post-surgical mothers experience blanching so commonly. It may be a result of blood supply disruption or nerve trauma to the nipple/areola complex during the surgery.

Blanching can also be caused by many factors, however, that are unrelated to surgical trauma. At one time, it was thought that the phenomenon was a psychosomatic disorder (a manifestation of psychological disturbance) (Gunther, 1970). It is now a well-known medical disorder, and is believed to be caused by physical factors, as well as external physical or chemical causes (Coates, 1992).

Some cases of nipple blanching have been identified by numerous clinical studies as a manifestation of Raynaud’s Syndrome, a disorder that causes blanching in the extremities (Lawlor-Smith et al, 1997). Raynaud’s Syndrome usually affects extremities such as fingers and toes in persons who are not lactating, but it can also affect coronary, pulmonary, ocular, gastrointestinal, penile, placental, and cerebral blood vessels. In nursing mothers, though, it seems to affect the nipples. Mothers who experience true Raynaud’s Syndrome have experienced this disorder before breastfeeding as blanching in other parts of the body. They may have Primary Raynaud’s Syndrome with no other symptoms or Secondary Raynaud’s Syndrome, which is caused by an underlying autoimmune or connective tissue disorder.

In mothers who do not have Raynaud’s Syndrome, blanching may be caused by either external physical or chemical factors. A vigorous sucking technique, with a tight jaw and clamping, can precipitate blanching, as can poor latching and positioning techniques. Exposure to cold can also precipitate nipple blanching. Some drugs, such as terphylline, terbutaline, epinephrine, norepinephrine, serotonin, nicotine,
and caffeine are known to cause vasoconstriction, which can manifest in the nipple (Lawrence and Lawrence, 1999).

The treatment of nipple blanching depends on the cause of the blanching. When it is caused by Raynaud’s Syndrome, blanching can be improved by the use of food supplements such as calcium and magnesium, as well as evening primrose oil (gamma linoleic acid), and fish oil (eicosapentanoic acid and docosahexanoic acid) eicosapentanoic acid and docosahexanoic acid). Unfortunately, it can take up to six weeks to see improvement with these supplements.

When the discomfort from nipple blanching is severe, a prescription medication may be warranted, despite the original cause of the blanching. The most commonly prescribed drug for the treatment of nipple blanching is nifedipine, which is a calcium channel blocker. It has been shown to be clinically effective in reducing nipple blanching fifty to ninety-one percent of the time. It passes into the milk at a rate of under five percent, which presents virtually no risk to the nursing child. The side effects that are most commonly seen from use of this drug are headache, flushing, dizziness, rapid heartbeat, and edema in the extremities (Hale, 2005; Riordan, 2004).

Nipple blanching that is caused by poor positioning, latching, or suckling techniques is resolved by improvements to those techniques. Nipple blanching caused by exposure to cold can be prevented by keeping the entire body warm at all times as it is not enough to keep just the nipples warm. When it has already occurred, however, applying warm compresses to the nipple and gently squeezing blood back into the nipple can relax the spasm enough to stop the blanching.

**ASSESSING MILK PRODUCTION AFTER BREAST OR NIPPLE SURGERY**

The prevalent advice for women who have had breast surgery is to “wait and see what their lactation capability is when their babies are born.” This is somewhat of an oversimplification in that it is predicated upon the assumption that milk production can be easily estimated, that it does not fluctuate, and that it cannot be altered. In actuality, milk production is often inaccurately estimated from unreliable criteria; it fluctuates according to hormonal influences and milk removal; and it can be altered by galactagenic medications and increased milk removal.

It is usually in the first few weeks postpartum that mothers determine if there is a requirement for supplementation. Supplementation is not inevitable after breast or nipple surgeries; a significant number of mothers do not need to supplement at all. But for a great many others, it is a necessary component of breastfeeding.

Unless the ducts within the nipple/areola complex were completely severed during the surgery, the chances are good that a mother will be able to produce at least some colostrum. Her baby should have the maximum opportunity to receive as much of this precious substance as possible. Nursing as often as possible will also allow her breasts to create as many prolactin receptors as possible, ensuring that her milk supply is maximized to its complete potential. In order to assess the baby’s milk intake, it will be necessary for the parents to be vigilant in tracking their baby’s progress. They can do this most efficiently by recording diaper output and monitoring weight.

Should clear evidence of insufficient stooling or rapid weight loss be present, immediate supplementation is warranted. Once the baby has had his immediate nutritional needs met, it is important to rule out mechanical breastfeeding problems as the cause of inadequate milk production. Apart from slight tenderness in the first few days, breastfeeding should never hurt. If it does, it means that there is a problem with the way the baby is positioned, latched, or how he suckles the breast. Many mothers find they have poor milk production early on because of positioning, latching, or sucking problems related to alterations in breast structure resulting from their surgeries. The challenge for the lactation consultant will be devising creative strategies to compensate for the inadequacies.

The timing of supplementation depends upon the baby’s degree of weight loss. The greater the degree of weight loss, the more critical it is to begin immediate supplementation. Conversely, the less the weight loss, the more room there is to determine if, when, and how much supplementation may be necessary.

**Delayed Insufficient Production**

Some post-surgical mothers find that their babies gain adequately and they are able to entirely avoid supplementation in the first few days. After that time, though, their babies’ rate of growth slows down and they are forced to reevaluate the necessity of supplementation. A need for late supplementation may be caused by the transition from the endocrine-stimulated lactation system to the autocrine-stimulated lactation system over the first few weeks. A mother can have initially adequate milk production because her milk is being created more from the hormones her body is generating than from the demand that is placed upon it. When the body slowly stops creating hormones automatically, though, the lactation system becomes more and more dependent upon nerve stimulation. At this point, milk production can decrease if the stimulation is not adequate to sustain it. The inadequate stimulation is usually not because the mother is not breastfeeding enough, but is rather because the nerves in her nipple/areola complex were damaged during her surgery and cannot relay the proper stimulation messages to the lactation system.
When this is the case, most mothers find that herbal or prescription galactagogues have a dramatic impact on milk production because they bridge the gap between the nerve stimulation and prolactin production. Some galactagogues also greatly facilitate milk ejection.

SUPPLEMENTATION

The objective in supplementation is augmenting as conservatively as possible to permit the mammary system to produce milk to its fullest capacity, while still assuring that the baby is provided sufficient nutrition and hydration to gain well. It is important for the lactation consultant to be sensitive to the likelihood that learning supplementation is necessary will be disappointing to mothers who had been hopeful that they would have a full milk supply.

Supplementation Methods

Supplementation options are comprised of combinations of variables of two factors: lactation capability and feeding method. A mother’s lactation capability will fall somewhere on a continuum of a full milk supply, a partial milk supply, or no milk supply at all. Feeding method options encompass feeding at the breast, feeding at the breast with an at-breast supplementer, and feeding with artificial feeding devices. The method by chosen to feed the baby will depend upon the mother’s milk production, the feeding method most appealing to her in terms of comfort and convenience, and her baby’s preferences.

At-Breast Supplementation

Mothers who have had breast surgery and who have an incomplete milk supply may choose to supplement at the breast in order to maintain the maximum sucking stimulation and enhance milk production. Feeding the baby at the breast with an at-breast supplementer conveys the greatest benefit to the baby, as well as the mother, and allows them to enjoy the harmonious quality of breastfeeding. This type of supplementer employs a plastic bag or bottle that hangs around the neck by a cord. Extending from the bag or bottle is a tube that is placed on top of the nipple and possibly taped in place. As the baby nurses from the breast, supplement is delivered through the tube.

Supplementing a baby’s complete nutritional requirement at the breast requires more effort in some ways than bottle-feeding, but it is often more rewarding. Of course, if the mother has no milk at all, the baby does not receive the benefits of human milk. However, he does receive the advantage of better oral and facial development as a result of the sucking motions unique to breastfeeding, as well as better hand-eye coordination as a result of switching from side to side during feedings. Most importantly, though, the baby who is supplemented completely at the breast is able to enjoy all the benefits of the intimate, deeply satisfying emotional bond that comes naturally to the breastfeeding couple. And even though little or no milk is present, these babies are usually willing to nurse without the supplementer for comfort.

Using an at-breast supplementer can be overwhelming to some mothers. If the mother is feeding her baby exclusively at the breast, for the most part, she will be the only one who can feed the baby, both day and night, which is comforting for some women, and confining for others. The at-breast supplementer also must be cleaned, prepared, and filled before each feeding. Using it is a learned skill for both mother and baby, and not all mothers and babies find that it works well for them. An at-breast supplementer is contraindicated when baby cannot latch well. It is sometimes more difficult to use an at-breast supplementer at night, although many mothers find they do not need to supplement at night because their milk production is higher then.

Combined Supplementation Methods

Some mothers who have compromised milk production find that they are not comfortable using an at-breast supplementer. They may have tried it and not liked it, or they may never have used it at all. Instead of supplementing at the breast, these mothers nurse their babies at the breast, but also supplement the feeding with a bottle or alternative feeding device, either before or after breastfeeding.

Even among those mothers who find at-breast supplementers to work well for them, there may be times when using a bottle or alternative feeding device is more convenient than using the at-breast supplementer. Some mothers who use an at-breast supplementer in conjunction with bottles find it more comfortable to feed the baby at the breast when they are at home and feed the baby with a bottle when out in public due to the cumbersome nature of preparing the at-breast supplementer prior to feeding. As long as the baby is adept at using both the human and the artificial nipple, this combined feeding method can work well.

Bottles

Mothers who have little or no milk production, but find that their babies have no trouble switching between a human and artificial nipple, sometimes discover that they can develop a comforting nursing relationship by nursing the child at the breast for comfort and feeding him his nutritional requirements by bottle. When both the mother and the baby are comfortable with this arrangement, it can work well. However, switching from breast to bottle is only possible when the baby is able to easily manage both kinds of nipples. Some babies cannot go back and forth and come to strongly prefer either the breast or the bottle.
Used with a bit of expertise, knowledge of feeding mechanics and risk factors, and empathy for the baby, bottles can be used successfully as a means of supplementation for the breastfed baby (Kassing, 2002).

Increase Milk Production if Necessary

Many mothers who have had breast or nipple surgery increase their inherent milk production capabilities by strategies that involve increased milk removal and/or taking galactagogues (herbal and prescription medications that increase milk production). Increased milk removal is accomplished by methods such as frequent feedings, pumping with a hospital-grade electric pump after feedings, and breast compressions while pumping and nursing. There are many herbal galactagogues that are effective in increasing milk production to varying degrees. Goat’s rue, fennel, fenugreek, nettle, alfalfa in particular are reputed to be effective for many post-surgical mothers, particularly when taken in tincture form, which is generally more potent than dried herbs taken in capsule form.

Prescription galactagogues such as domperidone (Motilium®) and metoclopramide (Reglan®) have the ability to increase prolactin and usually result in a more dramatic increase in milk production than herbs. Metoclopramide has a long history of effectiveness in increasing milk production with adequate dosages (up to 15mg tid) (Hale, 2006; Budd et al, 1993; Ehrenkranz et al, 1986; Gupta, 1985; De Gezelle, 1983; Kauppila, 1981). However, it crosses the blood-brain barrier and can affect the central nervous system, causing symptoms of depression or dyskinesia (Gabay, 2002). Postpartum women are at particular risk for these side effects (Rogers, 1992). For this reason, it is not recommended that metoclopramide be taken for longer than three weeks (Hale, 2006).

Domperidone, by contrast, has been demonstrated by many research studies and many hundreds of thousands of lactating women worldwide to be both safe and effective in increasing milk production and can be taken long-term (Gabay, 2002; da Salva, 2001; Brown, 2000; Cheales-Siebenaler, 1999; Prakash, 1998; Soykan, 1997; Petraglia, 1985; Madern, 1983; Cann, 1983; Holfmeyr, 1983). The usual dose to increase milk production is 80-120 mg/day taken 20mg QID or 30mg TID. Unlike metoclopramide, it does not cross the blood-brain barrier and so is unlikely to cause central nervous system symptoms (Gabay, 2002).

Increases in milk production from the use of galactagogues usually occur within four to seven days, although some women see an increase as soon as two days. Because prolactin levels are already high in the very early postpartum period, galactagogues that increase prolactin are likely to be ineffective before the Lactogenesis II (Hansen et al, 2005). When discontinuing prescription galactagogues, it is important to reduce the dosage in gradual increments by no more than 25 percent every 14 days.

EFFECTIVE COUNSELING OF MOTHERS WHO HAVE EXPERIENCED BREAST OR NIPPLE SURGERY

Mothers with impaired milk production are particularly in need of reassurance by means of an explicit comment from their healthcare professional that assert awareness of the superiority of breastfeeding and commitment to helping them successfully reach their breastfeeding goals. In discussing breastfeeding with a mother who has had breast or nipple surgery, it is important to be neither overly optimistic about the chance of exclusive breastfeeding nor pessimistic regarding the mother’s likelihood of breastfeeding at all. Mothers should be encouraged to celebrate even the smallest milestones. A healthcare professional has a unique opportunity by virtue of the authority of his or her credentials to encourage mothers to understand that while it may not always be possible to breastfeed exclusively after breast or nipple surgery, most mothers can have a satisfying breastfeeding relationship even with supplementation. It is also important for mothers to understand that it is normal to have mixed feelings about using an at-breast supplementer or breast pump. She should be encouraged to nurse without the supplementer in between feeding to comfort the child so that she has the full experience of nursing her baby without apparatus.

The following recommendations are also effective in counseling mothers who wish to breastfeed after breast surgery.

Note Prenatal Breast Changes to Predict Lactation Outcome

In recording a history during a patient consultation, it is important to note the presence or absence of breast changes during pregnancy (enlargement, tenderness, areola darkening) as breast growth and development during pregnancy is correlated with maturation of lactation tissue (Neifert, 1990).

Facilitate Identification of Breastfeeding Goals

For many mothers who have had breast or nipple surgery, embarking upon the breastfeeding journey is a decision that is made without a great deal of information about what it entails, primarily because there are few sources for information about breastfeeding after breast or nipple surgery. As she progresses through the stages of lactation, encountering difficulties that she did not know to anticipate, it can be very difficult for her to maintain her motivation.
One of the most important services a healthcare professional can provide to a mother who is breastfeeding after breast or nipple surgery, then, is to help her understand and identify her breastfeeding goals. Taking the time to consider alternatives and decide what is important to her may be very enlightening. She may find that she has an unsuspected passion for breastfeeding, or she may find that deep in her heart she does not truly want to breastfeed. You may also be able to help her realize that breastfeeding is not “all or nothing” and that she can adjust the elements of breastfeeding so that it is reasonable for her. Becoming attuned to her own values will give her an outcome to work toward that is perfectly suited to her needs. Having the insight of the mother’s values will also help you know how to tailor your lactation consulting perspective to most effectively help her meet her goals.

Facilitate Education about Normal Breastfeeding

It will be essential for post-surgical mothers to learn all that they can about the normal course of breastfeeding. There are many reliable resources for breastfeeding information; books such as Breastfeeding Made Simple: Seven Natural Laws for Nursing Mothers (Mohrbacher and Kendall-Tackett, New Harbinger, 2005); mother-to-mother support groups; local classes offered by healthcare providers; and support from the experienced breastfeeding mothers among friends and family. Becoming knowledgeable about the “normal” breastfeeding process and issues will help mothers in their experience of breastfeeding after breast and nipple surgeries. They will require a thorough understanding of proper positioning and deep latch techniques, including different ways to position their babies at the breast.

Encourage Mothers to Employ Breastfeeding-Friendly and Breastfeeding Knowledgeable Health Care Professionals

It is important for mothers to identify and employ breastfeeding friendly and knowledgeable professionals before they need them. The prenatal time is ideal to make calls or ask breastfeeding friends for names of lactation consultants, obstetricians, midwives, and pediatricians. In breastfeeding after breast or nipple surgery, it will be important to work with professionals who have a sound knowledge of and experience in lactation. Professionals who believe that formula is “just as good” as human milk and breastfeeding may not help mothers to work through the issues they will face and can actually undermine their efforts with incorrect advice. On the other hand, as mothers who have had breast or nipple surgery, they must be open to the possibility of supplementation and the professionals they consult must be able to determine when this is truly necessary.

One suggestion some mothers have for determining whether a physician is supportive of breastfeeding is to not tell them of their convictions, but to rather ask the following question, “I’m trying to decide whether to breastfeed. Can you tell me what you think of it so that I can make my decision?” This way, the doctor will tell what he or she really believes, and not what he or she thinks the mother wants to hear.

Use a Breastfeeding Friendly and Breastfeeding Knowledgeable Health Care Facility

Finding a breastfeeding-friendly hospital or birthing center is also critically important to breastfeeding success. The length of a mother’s stay in the hospital or birthing center should be as short as possible so that she can minimize separations from her baby, as well as unnecessary interventions. Although she may feel that she needs to rest and recuperate from the birth, it is crucial that she keep her baby with her so that she can nurse frequently and on demand and prevent the use of artificial nipples or pacifiers, which can interfere with the development of her baby’s sucking skills. Rooming-in can actually result in better rest for both the mother and the baby by reducing her stress level and encouraging harmonious nursing patterns. (Yamauchi and Yamanouchi, 1990) Provided they have been taught the correct means of use of artificial nipples or pacifiers, which can interfere with the development of her baby’s sucking skills. Rooming-in can actually result in better rest for both the mother and the baby by reducing her stress level and encouraging harmonious nursing patterns. (Yamauchi and Yamanouchi, 1990) Provided they have been taught the correct means of

Document Subjective Information during Diagnosis and Treatment

In conjunction with objective, quantitative data, many healthcare professionals have found that it is beneficial in the process of diagnosis and treatment to include subjective or other qualitative factors, such as the mother’s impressions, opinions, and insights, as this subjective information often provides insights that are critical to successful management of her case.

Facilitate Affordable Alternatives

Breastfeeding after breast or nipple surgery can be very expensive at a time when new families are already experiencing the harsh realization that the costs of having a new baby can quickly mount. There may be ways that you can help families find affordable alternatives for the breastfeeding aids they require that may very well enable them to continue breastfeeding when they might not have been able to otherwise. Even something as simple as writing a letter to help her obtain insurance reimbursement for your services or supplies may make a tremendous difference in the budget of a new family.

Facilitate Appreciation of the Milk Produced

For many mothers who wish to breastfeed after breast or nipple surgery, breastfeeding begins with an expectation that either she will produce a full milk supply or she will bottle-feed. It can be very discouraging, then, when she discovers
that she does have milk, but not a full supply. Helping her accept that supplementation is positive because it allows her to continue breastfeeding will be difficult until she understands that every drop of her milk and every moment spent at the breast are of unequaled value to her baby. Developing a profound appreciation for the superiority of her milk and breastfeeding in any amount is essential for her ability to maintain a sufficient level of motivation to persevere in breastfeeding. Educating the mother about ways to maximize her own production also will empower her to gain some control over her unique breastfeeding situation, thereby decreasing her level of anxiety and fear.

**Discuss Birthing Methods that Minimize Interventions**

Many studies have shown that medications, *including epidurals*, especially epidurals containing bupivacaine, during childbirth can significantly inhibit the sucking abilities of newborns by causing the baby to be sleepy and somewhat uncoordinated for a significant period after birth (Mohrbacher, 2004). This very period after birth, however, is a critical window of time to begin breastfeeding which, of course, cannot begin until baby is alert and able to latch on properly. This is not to say that there are never circumstances that warrant the use of drugs during birth, but rather that whenever possible, avoiding or minimizing their use will maximize the baby’s initial sucking abilities, which are so important for establishing the milk supply. Of course, if an epidural is used during labor, it certainly will not make breastfeeding impossible, but will only mean that it may be necessary to pay closer attention to any latching problems that are experienced and seek help to remedy them.

Preparing for the birth by attending classes in birthing methods that focus on avoiding the use of medications during labor can enhance a mother’s chances of having a drug-free birth.

**Share Resources about Breastfeeding after Breast and Nipple Surgery**

Mothers who are breastfeeding after breast or nipple surgery often are not aware of the many resources for information and support that are available to them. The healthcare professional is in an excellent position to share resources that will facilitate the experience of breastfeeding after breast surgery. Help her explore the many options that are available to make breastfeeding possible. These resources may include a recommendation to read relevant books, such as “DEFINING YOUR OWN SUCCESS: BREASTFEEDING AFTER BREAST REDUCTION SURGERY," or "MAKING MORE MILK: A NURSING MOTHER’S GUIDE TO MILK SUPPLY,” sharing website addresses such as the Breastfeeding After Breast Reduction website (http://www.bfar.org) and Low Milk Production website (http://www.lowmilksupply.org), or referral to a knowledgeable healthcare professional.

Mothers should also be encouraged to attend mother-to-mother support meetings even if they are supplementing with bottles. The support and encouragement at such meetings can be instrumental in maintaining motivation and identification as a breastfeeding mother.

**SUMMARY**

Any breast or nipple surgery can significantly impair lactation functionality, depending upon the location, number, and orientation of the incisions, the degree of destruction of parenchyma, and the extent of damage to nerves critical to lactation. It is also affected by the functionality of the parenchyma prior to surgery, the post-operative course, the time interval between the surgery and the lactation event, other lactation experiences between the surgery and this lactation event, breastfeeding management, as well as the mother’s attitude toward breastfeeding. It is likely that milk production will be reduced more significantly for the first lactation event after the surgery, but production can be increased by many psychological, mechanical, and chemical devices. When milk production cannot be increased to the point of full lactation, many mothers find that they can still have very satisfying breastfeeding relationships by supplementing in ways that maximize milk production and the time the baby spends at the breast.

**RESOURCES**

**Books**

*Defining Your Own Success: Breastfeeding After Breast Reduction Surgery* by Diana West (La Leche League International, 2001)

*Making More Milk: A Nursing Mother’s Guide to Milk Production* by Diana West and Lisa Marasco (publication TBA)

*Breastfeeding Made Simple: Seven Natural Laws for Nursing Mothers* by Nancy Mohrbacher and Kathleen Kendall-Tackett (New Harbinger, 2005)


**Websites**

Breastfeeding After Reduction
Capsulotomy – Surgical scoring or cutting of the capsule of scar tissue in order to release its pressure upon the breast implant.

Colostrum – The first clear, yellowish milk produced by the breasts after birth.

Cooper’s Ligaments – A type of connective tissue that figures prominently in the support structure of the breast.

Diagnostic Surgery – Surgery to determine the nature of the physiological dysfunction.

Ducts – Conduits that convey milk through the breast from the milk-producing portions of the gland.

Ductules – Smaller branches of the ductal network.

Endocrine Milk Production – The initial postpartum lactation process that relies upon hormonal stimulation rather than milk removal for milk production.

Engorgement – The normal postpartum process whereby the mature milk appears suddenly and copiously in the first few days after birth, resulting in tremendous swelling in the breasts. Engorgement can also occur at any time during lactation when a larger amount of milk is produced than removed.

Fasciculi – The branches of the fourth intercostal nerve.

Foremilk – The milk the baby receives when he begins suckling. Thin and usually bluish, it is the milk that has accumulated since the last nursing and has a higher protein, but lower fat content than hindmilk.

Galactagogue – A substance that increases the milk supply.

Galactogenic – The ability of a substance to increase the milk supply.

Galactorrhea – Spontaneous milk production.

Hindmilk – The milk actively produced during the feeding after most of the foremilk has been removed. Hindmilk is much higher in fat, which results in a thick, white appearance.

Hypoplasia – Insufficient lactation glandular tissue.

Innervation – The conduction of nerve impulses through the neural network.

Intercostal Spaces – The regions between the ribs.

Inframammary Fold – The line at the base of the breast where the breast meets the chest wall.

Lactogenesis II – Transition from the colostrum stage of lactation to mature milk.

Lactogenesis III – Weaning.

Lobuli – Clusters of alveoli.

Mammaplasty – Surgery of the breast (see also reduction mammaplasty and augmentation mammaplasty).

Mastectomy – Surgical removal of the breasts and lactation tissue.

Mastopexy – Breast lift without removal of breast tissue.

Mature Milk – Milk that has fully transitioned from colostrum.

Milk Ejection Reflex (MER) – The process by which milk is forcibly expelled from the milk-producing glands, through the ducts, and from the breast.

Myoepithelial Cells – Minute muscles that squeeze milk from the alveoli cells.
Neural Pathways – The interlacing network of nerves fibers that allows a nerve impulse to follow a myriad number of pathways.

Nipple/Areolar Complex – The combined anatomical structures of the nipple and areola.

Oncology – The medical specialization of cancer diagnosis and treatment.

Oxytocin – A hormone produced by the pituitary gland that stimulates uterine and lactiferous muscle contractions.

Parenchyma -- The elements of the mammary system within the breast.

Periareolar – Around the circumference of the areola.

Pituitary Gland – The endocrine gland that produces prolactin and oxytocin.

Prolactin – A hormone produced by the pituitary gland that influences and promotes lactation.

Ptosis – Sagging.

Reduction Mammooplasty – Breast reduction surgery.

Reinnervation – The process by which nerve segments are regrown between or around severed nerves.

Sebaceous Glands -- Glands that produce fatty substances known as sebum.

Soporific – Sleepy, lethargic.

Stroma -- Tissue that provides a formative structure to the breast.

Transition Milk – The yellowish breastmilk that is in the process of transitioning from colostrum into mature milk.

Vascularization – The establishment of the network of blood veins and arteries.

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