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Pedicles for Reduction Mammaplasty

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Abstract:

Reduction mammoplasty can be performed in several different techniques. They all have their own characteristics and outcomes. Different methods may be more optimal for certain patients and thus a pedicle selection and skin excision pattern should be always considered independently. Understanding the complication profile and risk factors in different reduction methods can help in choosing a technique, which serves the patient best.

Keywords: Reduction mammoplasty, superomedial pedicle, inferior pedicle.

Introduction:

Breast reduction surgery usually combines a skin and parenchymal resection with a pedicle to maintain blood supply to the nipple-areola complex. This pedicle should allow adequate movement of the nipple to its new, more elevated position **(1).**

In all cases of breast reduction de-epithelization has to be done along the pedicle and around the areola leaving identical layer thickness of the dermis.It is the key to preserve blood supply to the nipple areola complex; however, it is also important to preserve sensation and breastfeeding potential. A dermal pedicle alone may have adequate circulation, but it is less likely to provide sensation and is unlikely to have any breastfeeding potential. It may appear that a full-thickness dermo-glandular pedicle would be the ideal option; however, there can occasionally be difficulties with inset, resulting in compression and torsion of the pedicle such that the blood supply is compromised **(1).**

1- The Bipedicle technique:

The horizontal bipedicle flap as described by ***Strombeck*** in 1960 **(2),** was the first technique that allowed for safe reproducible one stage reduction mammaplasty procedures. The benefit of ***Strombeck's*** technique was that it included perforators from the medial and lateral segments of the breast, thus preserving the vascularity. The reason this procedure lost favor was that if the pedicle was long the parenchyma would 'bottom out' or drop and assume an inferior position as time passed. If the pedicle was too short, it was difficult to maneuver the NAC into position in the keyhole. There was also a tendency for loss of nipple projection **(3).**

In 1976**,** ***McKissock (4)*** adapted the bipedicle principle and rotated the orientation of the pedicle 90°, to the superior/inferior direction producing the vertical bipedicle flap. This procedure has remained popular and has stood the test of time. The impetus for ***McKissock's*** technique was that many of the previous techniques were plagued by skin or nipple areolar necrosis, loss of sensation, and irregular contour. The vertically oriented bipedicle flap was thought to minimize some of these shortcomings. Thus, with our improved understanding of the vascularity and innervation of the breast these bipedicle techniques have largely been replaced by the uni-pedicle techniques **(5).**

Inferior pedicle:

As described by ***Ribeiro*** (6) followed by ***Robbins*** (7) , the inferior pedicle technique for nipple areolar transposition with the inverted-T skin pattern was one of the first techniques described in the modern era of

reduction mammoplasty. An important consideration with the inferior pedicle technique is the length to width ratio of the pedicle. This may range from as low as 1.5:1 and as high as 4:1 **(8).**

The pedicle receives a normal and reliable vascular supply from the fourth, fifth, and sixth intercostal perforating vessels of the internal mammary arteries. Sensation to the NAC is usually preserved as long as there is some preservation of the tissue over the pectoralis fascia lateral to the pedicle as a major branch of the fourth intercostal nerve travels just above the pectoralis fascia until the breast meridian, where it turns and passes upward toward the NAC.[fig (1)] **(9).**

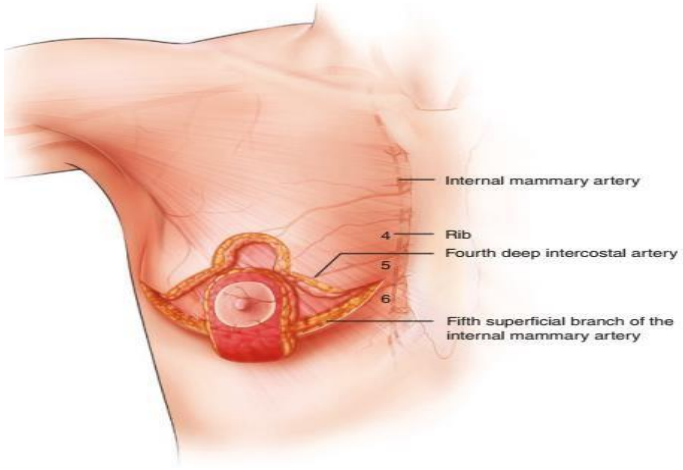


Fig (1): *Blood supply of the inferior pedicle* **(10)**

3-Superomedial Pedicle:

The superomedial pedicle is robust and supplied by a large descending artery from the second or third interspace from the internal mammary system. This artery is about one centimeter deep to the skin surface and usually just medial to breast meridian. A truly medial pedicle will miss incorporating this artery, but it is supplied by other medial vessels from the internal mammary system. Maintaining a full thickness superomedial pedicle will preserve the deep lateral branch of the 4th intercostal nerve although the superficial lateral branch will be sacrificed. Superior and medial nerve branches will also be preserved [Fig(2)] **(11).**

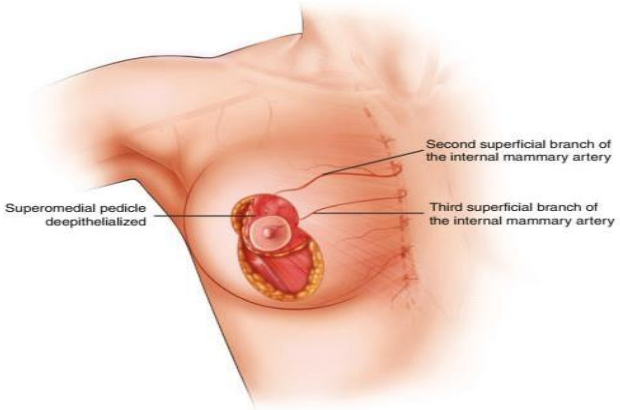


Fig (2): *The dual blood supply of the superomedial pedicle* **(10).**

4- Medial pedicle:

The blood supply to the medial pedicle is provided by several smaller branches from the internal mammary system (third to sixth intercostal spaces). Since these vessels enter the breast at a superficial level, the pedicle can be either dermal or thickness dermo- glandular. A full-thickness dermo-glandular pedicle is more likely to preserve sensation since the deep branch of the fourth intercostal nerve, which travels just above the pectoralis major muscle, can be preserved **(1)**

5-Superior Pedicle:

The superior pedicle may be either dermal or full thickness dermoglandular. The full- thickness pedicle is more difficult to inset but is more likely to preserve breastfeeding potential. The arterial blood supply is relatively constant with a major vessel from the internal mammary system, mostly originates from the second or third interspace. Innervation is superficial and comes down from the clavicular area. Sensation is therefore preserved with both types of superior pedicle **(1).**

6-Lateral Pedicle:

The lateral thoracic vessels descend at an oblique angle and enter the breast superficially. This means that both dermal and dermoglandular pedicles will have adequate arterial input and venous drainage. Since the fourth lateral intercostal nerve has both a deep and a superficial branch, sensation is well preserved with either a thick or a thin. A full- thickness laterally based pedicle is more likely than a dermal pedicle to preserve ductal tissue**(1).**

The lateral pedicle is relatively easy to rotate into position. The main drawback of the lateral pedicle is the resultant lateral fullness of the breast if the pedicle is left too full **(1).**

Skin Resection Patterns for Reduction Mammaplasty

1- Inverted-T/Wise Pattern:

As 1st described by ***Wise (12)***, the classic inverted-T pattern had vertical and horizontal limbs with a keyhole pattern at the upper apex for insetting of the nipple areolar complex. The vertical limbs of the inverted-T pattern are delineated with a length that ranges from 8 to 9 cm. This will vary based on the volume of the breast. The angle of the apex is usually 60° and can be narrowed or widened based on the base width of the breast. The horizontal component of the inverted-T pattern is then marked and extends from the inferior point of both vertical limbs to the lateral and medial limits of the IMF. The horizontal incision should never cross the sternal midline and should be tailored laterally to eliminate any dog-ear and to follow the desired lateral mammary fold to optimize contouring and appearance **[Fig(3)] (13).**

The primary reasons for using the inverted-T technique are numerous. The resections are accurate because the incisions permit wide exposure of the parenchyma with precise resection of glandular tissue. The technique has proven useful for breasts of all sizes; however, it is especially useful for breasts that will require more than 300 g resections. The naturally ptotic breast almost always conceals the horizontal scar. Finally, the breast appearance upon completion of the operation is usually excellent**(13).**

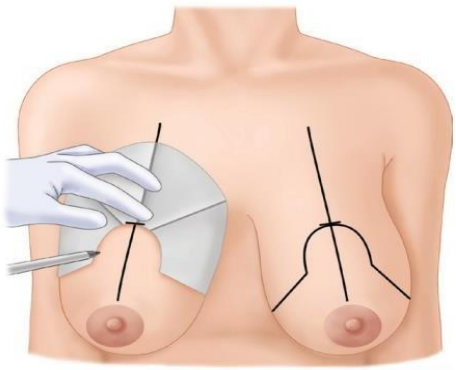


Fig (3): *Wise Pattern markings with Inverted-T approach* **(14).**

2- Short Scar Techniques:

Short scar reduction mammaplasty techniques were developed to improve long-term projection of the breasts while minimizing the scar burden associated with other breast reduction techniques. In recent years, short scar reduction techniques have become increasingly popular.

A-Vertical Scar:

Reduction mammaplasty finishing with a vertical scar was first described by ***Arie*** in 1957 15.However, this technique did not gain popularity because the vertical scar often extended below the inframammary crease leaving an unsightly scar on the chest wall**(16).**

In 1969, ***Lassus (17)*** renewed interest in vertical scar reduction mammaplasty by developing a technique using a superior dermo glandular pedicle for transposition of the nipple-areola complex; a central excision en bloc of skin, fat, and gland; no undermining; and a vertical scar to finish**(16).**

In 1990, ***Lejour (18)*** described a modification of ***Lassus'*** technique. Liposuction was used preexcision to eliminate fat contributing to breast volume, the skin surrounding the excised area was undermined, the superior dermo glandular pedicle was sutured to the pectoralis fascia, sutures were used in the breast parenchyma to reapproximate the pillars producing a more durable breast shape, and gathering of the skin of the vertical wound was used to keep the scar above the inframammary crease. **(16).**

In 2006, ***Lista & Ahmed*** described another modifiction which uses a mosque dome skin marking pattern; transposition of the NAC on a superior or medial dermoglandular pedicle, the flap is maintained at a thickness of 2.5 cm throughout its length, an excision en bloc of skin, fat, and gland, postexcision liposuction if required, and wound closure in two planes, with gathering of the skin of the vertical wound **(16).**

A mosque dome pattern, as described by ***Lejour, (18)*** *is* marked onto the breast. One hand is inserted behind the breast to the level of the inframammary crease, and this point is projected anteriorly onto the breast and marked (point A). Point A represents the superior border of the new NAC. This point is transposed onto the contralateral breast. The inferior limit of the planned skin excision is marked (point B) 2–4 cm above the inframammary crease, depending on the size of the reduction. A mosque dome pattern is used in this technique. The roof of the mosque dome is drawn by extending curved lines from point A to points C and D, which form the border of the new NAC. The roof is drawn such that when points C and D are brought together and the breast is coned, the roof will form a circle ***[Fig (4)]*** **(16).**

The vertical limbs of the mosque dome pattern are drawn by extending curved lines from point B to points C and D, thus forming the margins of the planned skin excision. Blocking triangles should be drawn at points C and D, toward the central axis of the breast, to prevent a teardrop deformity of the areola. The inferior extent of the skin resection is marked in the shape of a 'V' for easier skin closure **(16).**

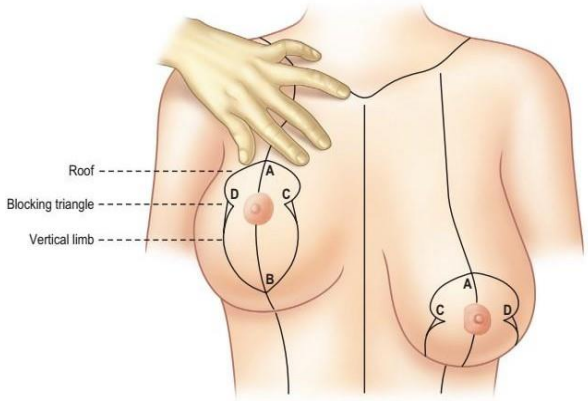


Fig (4): *Mosque dome skin marking pattern. Point A is at the level of the anterior projection of the inframammary crease on the breast. Point B is the inferior limit of the skin excision.*

*Blocking triangles are extended from points C and D***(16).**

B- Periareolar scar:

Searching for a way to perform a reduction mammaplasty without the introduction of visible scars onto the skin of the breast, ***Andrews (19)*** first described a technique that camouflaged the incision at the junction of the breast skin and pigmented areola. Unfortunately, one of the major problems associated with periareolar scar

reduction techniques remained the tendency for the areola to widen postoperatively. In response, ***Peled (20)*** described a purse-string suture for closure of the areola, which was quickly followed by ***Benelli***'s "round-block" technique, which utilized a running non-absorbable suture around the areola to create a dense scar layer and thus prevent areolar widening **(21).**

The Benelli periareloar technique extends the periareolar approach to the breast to include a limited reduction of the breast gland. Removal of central and inferior glandular tissue followed by 'reconization' parenchymal rearrangement is accomplished through a periareolar incision. A decreased base diameter of the breast results and pushes the areola superiorly supported by breast parenchyma **[Fig (5) & (6)] (22).**

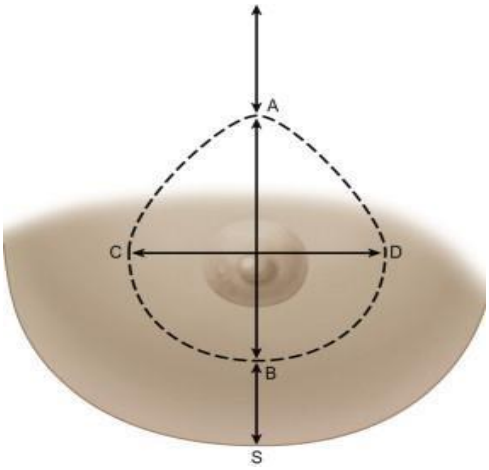


Fig (5): Marking for Benelli peri areolar mammaplasty. Point A marks the new superior areolar position. Point B is the inferior extent of excision. Points C and D mark the medial and lateral limits of excision. Point S marks the midline of the inframammary fold (22).

Fig (6): A permanent suture on a straight needle is passed through the same incision as a purse-string cerclage 'round-block' in the breast skin dermis and cinched down **(22).**

C- No vertical (horizontal only) scar:

The no vertical scar technique was first described by ***Passot (23)***, though, in subsequent years, several authors described a similar approach with the use of a free nipple graft. ***Ribeiro*** was the first to describe transposition of the NAC on a dermoglandular pedicle in association with the no vertical scar technique. The most important factor in patient selection for the no vertical scar technique is that the ideal patient is one who has 5 cm or more skin between the areola and the new areolar site. In other words, this is a good technique for a patient who has a lot of ptosis and excess skin **[Fig (7)]**. **(24).**

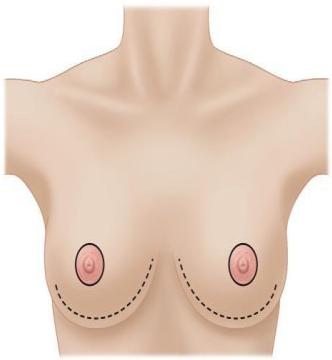


Fig (7):*The no-vertical scar breast reduction has a periareolar scar and a hidden inframammary scar* **(24).**

D- Regnault B Scar:

The original technique as outlined by ***Regnault*** can be used for both mastopexy and reduction. It can also be done with simultaneous augmentation. The technique involves two stages of marking. Three basic markings are made preoperatively as patient is sitting on the edge of the bed with shoulders in upright and level position. Upper limit of skin excision is marked from the sternal notch to the new upper limit of the areola. This is line marked SV. Vertical and horizontal axes of the areola are marked in the sitting position to ensure proper orientation and tension of the areola at time of closure. Vertical midline of chest from sternal notch to xyphoid process is also marked **(25).**

Remaining markings are then done in supine position. New medial limit of the areola is marked from midline (X) to a point M, which lies on the horizontal axis perpendicular to vertical midline. A new periareolar oval is drawn, using points V and M as landmarks for a gentle curve. This oval extends to about 1 cm below current areola. New IMF is marked, which should lie about 1–4 cm above current IMF, depending on amount of reduction to be done. A curve is drawn to create lower portion of the "B," connecting the periareolar oval and the sub mammary fold in a gentle curve. Upper and lower curves should intersect at a 90° angle, leaving a triangular flap that is about 1 cm in length. This triangular flap is labeled T **[Fig (8)] (25).**

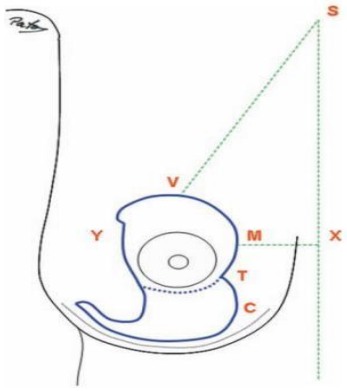
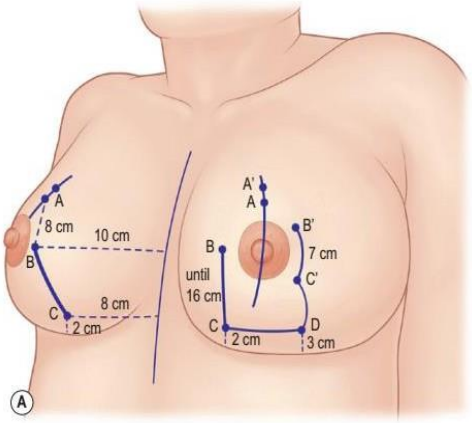


Fig (8): *Preoperative markings for Regnault B technique.* **(25).**

E- L-Short Scar:

As described by ***Meyer & Kesselring***, **(26)** the L short-scar mammaplasty is a reduced scar technique, which seeks to maximize the utilization of the principle that what is most important is what remains, not what is removed. With the patient standing, the mid- mammary and midsternal lines are marked. Point A is marked on the projection of the sub-mammary sulcus, on the midmammary line, and point A′ is marked 2 cm above it. Afterwards, the patient is set in dorsal decubitus. Point C is marked 8 cm from the midsternal line and 2 cm (for larger breasts) from the sub-mammary sulcus. Point B is marked 10 cm from the midsternal line and 8 cm from point A. Point B′ is marked between the nipple and point A. Point C′ is marked 7 cm from point B′, forming line B′C′C, with breast skin stretched medially and upwards. Point D is marked 3.0 cm from the sub-mammary sulcus,

at the end of the skin fold that is formed by the union of lines BC and B′C′, by the use of bidigital maneuvers **[Fig(9)]. (26).**



Fig(9): *Preoperative markings for L- Short Scar Technique* **(26).**

Inferior Pedicle with Inverted T (Wise) Pattern Breast Reduction:

This technique bases the blood supply to the NAC on an inferior pedicle, resects tissue from around the periphery of the pedicle and uses a tapered wedge pattern to resect skin from around the inferior pole of the breast with a central superior extension that results in a scar along the IMF with a central extension up to and around the NAC, hence the name the inverted T.**Markings:**

The markings are performed with the patient in the standing position. A line is drawn in the midline of the chest and each vertical chest wall meridian is marked, with extension from the mid-clavicle to the IMF. This line may not intersect the nipple. The new nipple position is determined by one of three ways, depending on the size of the breasts: at the level of the IMF, 21–23 cm from the suprasternal notch, or at the level of the mid-humerus. In larger breasts, however, the nipple position may need to be lower. An inverted-T pattern is delineated and based on the location of the desired nipple areolar complex. A pinch test is performed between the limbs to ensure that the planned skin resection is not overly aggressive. Symmetry of the markings should be checked by measuring the suprasternal notch-to new nipple distance, as well as the inframammary fold-to-nipple distance, bilaterally **(27).**

The inferior pedicle is delineated in the operating room with the patient in the supine position. The base of the inferior pedicle typically ranges from 6 to 10 cm and is dependent upon the base diameter of the breast. The inferior pedicle is usually centered along the inferior breast meridian and always includes a cuff of tissue measuring 1 cm around the areola to preserve the vascular plexus supplying the nipple areolar plexus. **(27).**

Operative technique:

The patient is transported to the operating room, placed in the supine position, usually under general endotracheal anesthesia. The arms are usually positioned at approximately 60° of abduction, although they may be placed along the trunk as well. Pneumatic compression devices are applied. The preoperative markings are delineated then the nipple areolar complex is inscribed with a 42- or 45-mm cookie-cutter under maximal tension **(13)**

The incisions are then made through the dermis and into the subcutaneous tissue around the entire periphery of the pattern. However, the base of the inferior pedicle is left undisturbed. The pedicle is de-epithelialized according to ***Schwartzmann maneuver*** leaving a 1 cm ring of tissue around the new areolar circumference. The advantages of de-epithelialization include safety in blood supply, better contour, less slippery pedicle, and better strength to hold sutures at the "T" junction**(13).**

The superiorly based flaps are then dissected free from the remainder of the breast mound. The inferior pedicle is then skeletonized with care being taken not to undermine the pedicle and potentially interrupt the vessels

in the breast septum. Also, dissection proceeds carefully in the region of the IMF on either side of the pedicle to avoid opening up the loose sub-scarpal space, which could potentially lead to inferior migration of the breast parenchyma and the classic complication of bottoming out. The flaps are then approximated along the IMF and up along the vertical incision. The patient is then placed in the upright position and a circular defect is created in the midline at the apex of the breast **[Fig (10) & Fig (11)] (13).**

The pedicle is oriented such that the nipple areolar complex is at the apex of the vertical limbs. A closed suction drain is placed through the lateral incision and secured. Layered skin closure is completed using absorbable monofilament sutures. Following the incision, the nipple areolar complex is exteriorized and sutured. Dressing applied followed by soft compression bra **(13).**

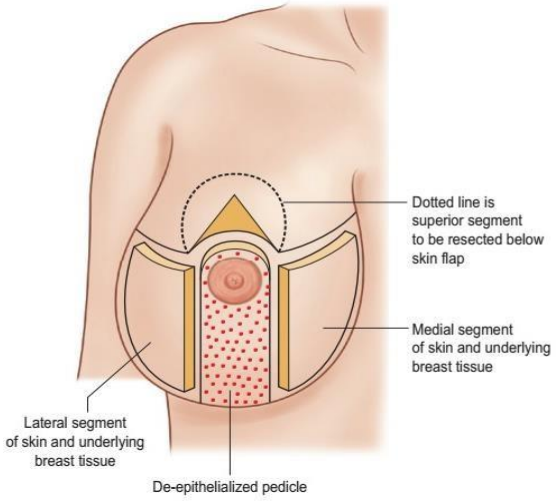


Fig (10): *The inferior pedicle has been de-epithelialized. Outline of the three segments to be resected the medial, lateral and superior* **(13).**

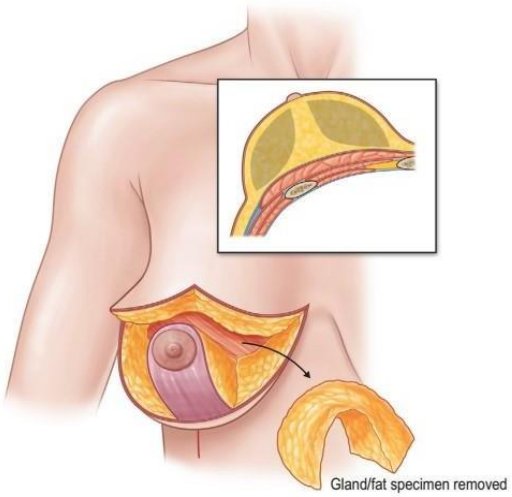


Fig (11): *Inferior pedicle technique with Wise-pattern skin excision* **(13).**

Superomedial Pedicle Breast reduction

Markings

With the patient is standing the midline and the breast meridian are drawn. The new nipple position is marked 1 cm below the IMF. A Circle is drawn opening at the inferior pole with a superior margin placed 1.5–2 cm higher than the position of the neo-nipple along the previously drawn breast meridian. The breast is rotated superomedially, and a 6–7 cm line is drawn from the inferior portion of the circumference along the breast meridian. The same maneuver is repeated rotating the breast superolaterally. The two lines B–D and C–E will form the pillars of the breast should have a 5–7 cm length. The angle between these two lines can be increased or reduced according to the size of the areola and to the quantity of tissue to be removed. The following step consists of drawing the pedicle and the portion of the areola and nipple to be transposed **[Fig (12)] (28).**

During the operation, the areola is not entirely transposed but only a part of it with the nipple in the center. In order to improve the final aesthetic outcome, it is therefore preferred to draw around the nipple a circle with a 4–4.5 cm diameter that will be the neo-NAC to be transposed. The neo-areola is drawn by hand or by using a template while the assistant keeps the skin of the breast moderately stretched. The diameter of the neo-areola, as previously mentioned, should not measure more than 4–4.5 cm. (Pascone et al, 2016)

The pedicle should have a superior base of at least 5–6 cm and should include a portion of tissue of at least 2 cm around the neo-NAC in order to guarantee an adequate blood supply and a sufficient venous drainage **(28).**

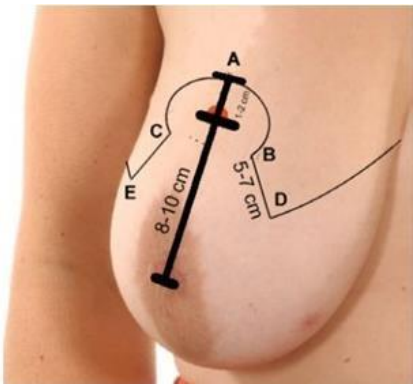


Fig (12): Detail of the measures of the keyhole. Line A is the superior portion of the new nipple/areola complex, Lines B-D and C-E represent the medial and lateral Pillars **(29).**

Operative technique:

The first step of the operation consists of the de-epithelialization of the pedicle leaving a 1–2 cm ring of tissue around the areola in order to assure an adequate blood supply. Then removal of the glandular and cutaneous tissue from around the pedicle en bloc. The following step consists of the incision of the pedicle along the borders of the de-epithelialized area. In case the glandular and cutaneous resection is adequate, suturing the two pillars by single interrupted sutures, should be started from the deep planes and trying to obtain a good facing in order not to leave empty spaces in the lower pole, to prevent the diastasis of the pillars, and to give an adequate support to the breast as well as an adequate projection **(29).**

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