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## **Središnja medicinska knjižnica**

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# The "dermal cage": a modification of the inferior pedicle breast reduction

Rado Žic, Zlatko Vlajčić, Daemon Dewing, Mario Zambelli, Zdenko Stanec

## **Abstract:**

In spite of more recent techniques for breast reduction, the inferior pedicle technique has proven to be enduring being a still a very popular option in the plastic surgeons armamentarium despite certain shortcomings. This utility is especially so for the treatment of large breasts with a long sternal notch to nipple distance. The modifications we describe in this article, overcome some of the main drawbacks of the standard inferior pedicle technique, and is particularly effective when used with appropriately selected patients. This is achieved principally by the making of a strong, durable and internalized "dermal cage" that remains fixed to the chest wall in the upper part, as well as on both sides, to support the majority of the remaining breast tissue. This serves several purposes, including the narrowing of the breast, thereby giving good projection and reduction of the N-IMF length of the inferior pedicle. Through suspension and fixation of the inferior pedicle to the chest wall, one can obtain mitigation of the effects of gravity on the inferior pedicle. The benefits include reduced tension on the T junction, thereby reducing the incidence of wound dehiscence in the immediate post-operative phase; whilst reduction of tension on the NAC reduces "bottoming" out over the longer-term. This process has been the main short coming of the inferior pedicle technique to date.

The technique was used for 26 patients over a 7 year period with a mean long term follow up of 41 months. The results demonstrate the short and long time effectiveness of our own particular combination of modifications to previously described techniques and modifications of the inferior pedicle breast reduction.

EBM level: V

## Introduction

The inferior pedicle technique of reduction mammoplasty was originally described by Ribeiro [1] and later by Courtiss & Goldwyn [2], Robbins [3], Georgiade et al [4], and Reich [5]. Despite newer techniques of breast reduction, it remains a popular option. When asked by questionnaire, more than a half of the members of the American Society for Aesthetic Plastic Surgery stated they use only the inferior pedicle and Wise pattern techniques [6]. The reasons for this enduring appeal are the preservation of both excellent sensibility and vascularity of the nipple when compared to other techniques even in these cases of long sternal notch to nipple distance. Additionally, the technique can be acquired with relative ease by the junior surgeon, with a straightforward learning and performance curve. Finally the technique is highly versatile with applicability to almost all breast sizes and sternal notch to nipple distances. The main drawback of this technique, apart from time-consuming deepithelialisation, is tension at the inverted T junction point. This commonly results in wound dehiscence in the early post operative phase; and significant descent of the breast tissue over the longer term with a cosmetically unattractive ‘bottoming out’. In comparison with the vertical techniques of breast reduction, the standard inferior pedicle technique results in a lack of narrowing of the breast tissue and poor projection.

Due to its enduring popularity, many modifications have been described in the literature during the last two decades that attempt to overcome the shortcomings of this technique. Most techniques developed different approaches for achieving horizontal dermal suspension, as a modification to reduce both the descent of the breast tissue, and tension at the inverted T junction point. These techniques however did not resolve the problem of poor glandular projection. The authors of this paper had the idea to create a “dermal cage” on the thoracic wall that would achieve stability of the inferior pedicle in multiple directions. In this way we aimed at stabilizing the breast tissue vertically (media-laterally) and antero-posteriorly with narrowing of the breast and better projection. We first presented our own “dermal cage” modification in 2008 [7], and are publishing our results after an appropriate follow up period. Our long-term results give us confidence in the durability of our method.

In this article we present our technique explaining differences between previously published modifications of the inferior pedicle and our own “dermal cage” modification.

## **Patients and Methods**

### **Patients**

From March 2005 to December 2011, 26 patients were treated with the “dermal cage” modification to the inferior pedicle breast reduction. Our selection criteria specified that only patients with sternal notch to nipple distance greater than 31 cm and requiring skin resection that would likely result in an inverted T scar were appropriate for treatment with this technique. Patients with volumetrically smaller and less ptotic breasts, or with good skin and tissue quality are routinely treated with the vertical scar technique. The lateral or medial septum based technique published by Hamdi et al [8] is the technique most favored by the authors in their practice. The youngest patient was 23 and the oldest was 67 years old. The mean age was 50.4 years. The sternal notch to nipple distance ranged from 31 to 42 cm with a mean value of 36.3 cm. The BMI of the patients ranged from 23.1 to 33.3 with a mean value of 28.7 placing the majority of patients in the overweight category.

### **Preoperative investigations**

Preoperative exams and tests are performed in accordance with patient age and medical history. Mammography for patients over 35 years of age and ultrasound of the breast for patients younger than 35 are obtained as part of standard pre-operative work-up. Further investigations of the breast are performed only in cases where abnormal or suspect findings on mammograms or USS are detected.

### **Preoperative markings**

The preoperative markings must be made with the patient sitting on the edge of the examination table with arms at the sides and back straight.

The sternal notch, xiphoid, sternal midline and breast meridians should then be marked and the breast footprint marked on both sides checking for symmetry.

Depending on the patient and breast size, location of the breast footprint and sternal notch to nipple distance, the new position of the nipple should be marked on the breast meridian from 20 to 24 cm from the sternal notch. The central point of the inferior pedicle should be marked as the continuation of the breast meridian on the inframammary fold. The symmetry must be checked by measuring the distance of this point to the sternal midline on both sides. The width of the lower pedicle chosen should range between 6-8 cm and be marked on the inframammary fold depending on breast size, proposed distance of nipple advancement and desired reduction. The breast is then rotated medially and a line is drawn from the new nipple position to the central point of the inferior pedicle, then the breast is rotated laterally and a line made from the new nipple position to the central point of the inferior pedicle. A distance ranging 7-9 cm should be marked on the lateral and medial line from the new nipple location in a triangular shape, that will represent the new nipple to inframammary fold (N-IMF) distance. The new inframammary fold must then be marked 2-4 cm higher than the original one. The medial and lateral end points of the inframammary incisions are marked along the projection of the new inframammary fold, and care should be taken to keep them as short as possible using an M-plasty at the end points. This reduces the visibility of the scar in the final result. The Wise pattern skin incision is then completed by drawing a connecting line between the medial and lateral ends of the new inframammary fold, and medial and lateral ends of the previously marked triangle in an S shape to reduce tension at the T-junction. We have concluded by experience that in large breast reductions, the scar needs to be brought onto the lateral side of the breast up to 2-3 cm above the new inframammary fold for the best results. Patient preference over areola size should be discussed pre-operatively, and usually ranges from 38-45 mm. The inferior portion of the inferior pedicle is optimally marked for plication with the bottom part of the plication marked at 10 mm above the new inframammary fold. The upper margin of this plicatory border is 2-4 cm above this line depending on the lower pedicle length and forms the lower border of the dermal wings. The upper borders of the dermal wings are then brought into line with the lower border of the planned areola in order to ensure an unrestrained nipple position at the end of the operation. The dermal wings that will be used to form the lateral and superior part of the dermal cage are marked from this base laterally as a triangle. By marking the dermal wings pre-operatively we reduce the area of skin that needs to be deepithelialised during the operation.

### **Surgical technique:**

Perioperatively the patient receives three doses of i.v antibiotics for prophylaxis. For patients at increased risk of DVT, thromboprophylaxis is also given as standard practice. The central point of the inferior pedicle at the new inframammary fold should be additionally landmarked with a staple (T-junction key suture point) preventing loss of the surgical marking of this important landmark during the procedure.

Using a blunt cannula the incision lines and medial and lateral part of the breast are infiltrated with normal saline containing 1 ml of epinephrine and 50 ml of 0.5% bupivacaine in 500 ml of saline. The operation is performed using a 10 blade scalpel and pinpoint coagulation of bleeders with monopolar and bipolar electro cautery. The surgery begins by placement of a tourniquet at the base of the breast to facilitate skin tension for easy deepithelialisation. Deepithelialisation of the lower pedicle is performed and includes the dermal wings medially and laterally. The tourniquet is then removed, and incisions on the lower and upper border of the dermal wings are performed on the breast tissue. Elevation of the dermal wings is started at the tip and thickness is varied according to the desired fullness in the medial or lateral part of the breast, but practically usually ranges from 1-2 cm. Once both wings are raised, they are fixed in the middle of the pedicle by a suture, to prevent obstruction during glandular resection. The lower pedicle is formed next. Care is taken to ensure the uniform thickness of the lower pedicle from the dermis to the pectoral fascia. The thin layer of soft fat usually found between the pectoral fascia and the breast tissue is retained. On the lateral aspect the lower pedicle is beveled laterally to ensure preservation of the lateral part of the breast septum with its blood vessels and nerves supplying the nipple areola complex (NAC). Then the incision above the nipple is performed leaving 1 cm of deepithelialised dermis, before being carried down to the pectoral fascia. This step marks completion of the formation of the inferior pedicle with the dermal wings.

Following this, a keel shaped resection of the upper part of the breast tissues is then performed. On the lateral and medial side, the upper dermoglandular flap is thinned in a beveled fashion with more thickness at the base and less at the distal edge of the flaps. The thickness of the edge of the upper dermoglandular flap is kept uniform whilst the thickness in the middle and upper third can be tailored to fit the specific breast and desired shape and fullness. The upper dermoglandular flap is thinned more

in the middle to ensure an unrestrained nipple positioning. At this point, symmetry of the resected flaps and pedicle should be checked by inspection and palpation on both sides. The weight of the resected tissues will give the operator an idea of the amount removed but without information of distribution of the remaining tissues. Haemostasis should also be checked at this point. The plication of the lower part of the inferior pedicle is performed next using interrupted 4/0 PDS or Vicryl sutures. The amount of plication required depends on pedicle length. The longer the pedicle, the wider is the area that is plicated. This provides for better projection and positioning of the NAC. The medial dermal wing is brought up to the level of the 2<sup>nd</sup> or 3<sup>rd</sup> rib and is fixed to the pectoral fascia 2 to 4 cm from the midsternal line using a 2/0 or 0 PDS suture. Fixation is performed by folding the tips of the wings so that dermis is in contact with fascia. Suturing of dermis to fascia ensures strong adherence and fibrous healing. In cases where the fascia is thin, a dermal sling can be created by passing the tip of the wing under a slip of the pectoral muscle. The lateral wing is then rotated laterally and sutured at a distance of 0.5-3 cm from the medial wing. Following this step, the superior dermoglandular flap should temporarily be re-draped around the inferior pedicle, and corrective checks to breast shape made. The shape can be modified by fixing the lower parts of the medial and lateral wings to the chest wall more medially or laterally as needed. Once satisfactory positioning and symmetry is achieved, the lower border of the medial and lateral wings are sutured to the pectoral fascia using interrupted sutures with especial attention not to include the blood vessels and nerves in the lateral part of the breast septum. In this manner, formation of the dermal cage enclosing the inferior pedicle has been executed. The 'lid' of the cage is provided by the dermal part of the inferior pedicle and the NAC when it is fixed to its new position. Hemostasis is rechecked and a redivac drain is placed. The superior dermoglandular flaps are redraped and temporarily fixed with a key suture. As the superior flaps are thinned and there is an inferior pedicle in the middle, there are not the medial and lateral glandular pillars, as in the superior pedicle techniques, that are used to close and maintain glandular shape. Nevertheless the dermal cage gives the necessary firmness to hold the breast tissue in the central part. The plication of the inferior pedicle, and tension of the dermal wings at the sides of the inferior pedicle, provide a stable support to the remaining breast tissue, also reducing the tension at the T junction.



This is an improvement to the standard technique where the remaining breast tissue in the inferior pedicle is freely mobile allowing gravity to displace it inferiorly.

Commonly this exerts pressure on the T junction that commonly leads to healing problems initially and bottoming out in the long run.

After placing the patient upright, the exact position of the new nipple is marked according to preoperative measurements and modified to the highest projection point on the new breast mound. In cases of asymmetry or unacceptable breast shape there should be no hesitation to remove the key suture in order to make additional refinements. With a satisfactory result, the following step is NAC fixation. The circle, (one size smaller than the size used to create the NAC on the pedicle) is deepithelialised and dermis incised in a cross pattern. The NAC is brought to the surface and fixed with eight vycril 4/0 sutures placed around the circumference of the areola. If there is tension on the NAC at this point, further resection of glandular tissue from the edge can be performed to relieve tension. The remaining spaces are sutured with 5/0 Vicryl and the skin is closed with 5/0 PDS intradermally. The vertical and T scar are closed with 4/0 vicryl subcuticularly with 4/0 PDS intradermally for the skin. Care is taken to shorten the horizontal scar and bring any excess skin to the middle where it can be either repositioned or resected. Steristrips are applied to the wound edges with gauze and medpore tape used to cover and support the breast in the shape of a bra.

### **Postoperative management:**

The patient receives analgesia as required, with dressing changes the next day. The redivac drains are removed when 24 hour drainage is 30 ml or less, usually at day two or three post-op. The skin sutures are removed 11-14 days post-operatively. The patient is instructed to wear a medical grade supportive bra for four to six weeks.

### **Results and follow up**

Tissue resection volumes ranged 750 to 1400 g with a mean of 975g. The follow up range was from two months to seven years. The mean follow up period was 41 months. The most consistent technical post operative problem with our technique was an early W - shaped retraction of skin at the points where the dermal wings apply traction on the new inframammary crease. This was noted in 20 patients but settled

without intervention by the third month of follow up in 18 cases. Of the remaining two patients, one was not concerned as the puckering was under the new breast. The other had percutaneous needle release of scar and lipofilling performed six months after the operation that corrected the problem. No patients had full nipple necrosis, although partial necrosis in the form of epidermolysis of a part of the NAC occurred in two patients. These healed spontaneously on dressing with hydrocolloids, and required no further surgical treatment. In two patients, a small T- junction dehiscence under 1 cm<sup>2</sup> occurred, but healed spontaneously with dressing changes requiring no further surgical intervention.

3 cases presented with superficial soft tissue infection that resolved with antibiotic therapy. One patient had keloid scarring on the lateral part of the breast bilaterally that did not respond successfully to treatment with resection and corticosteroids.

Concerning long term follow up: 8 patients had slight asymmetry, of which all were satisfied with the cosmetic outcome, and requested no further correction. On review of the patient data most of these patients were done in the early part of the series, and the asymmetries were probably the result of the authors learning curve. One patient demonstrated “bottoming out” three years after the operation. In all other cases presenting for long term follow up, no such phenomenon was observed.

The NAC sensation was present immediately after the operation in all but two patients. These had loss of sensibility in one breast, but both recovered spontaneously over the post operative follow up period.

The overall patient satisfaction with the operation was high and the patients expressed high levels of satisfaction with the outcome. Only one patient expressed dissatisfaction and this was with keloid scarring on the lateral breast that was refractory to treatment, not her post operative breast shape or volume.

## **Discussion**

Despite more recently popularized techniques of breast reduction as described by Hamdi [8], Lejour [9], Hall-Findlay [10], Benelli [11], Goes [12], Graf [13] and the inferior pedicle reduction mammoplasty is still very popular because of its well recognized advantages. Firstly, this technique can be utilized with almost all breast sizes (more than 2000 g per breast) and even in cases of gigantomastia it is possible to avoid free nipple grafts [14]. Secondly, it retains superior vascularity [15] and sensibility [16] in the NAC when compared to other techniques.

Finally because of the relative ease with which the technique can be learnt and performed successfully, it is suitable for junior trainees.

In the history of breast reduction techniques we have seen first generation “cut and drape” techniques that retained breast weight with breast skin; second generation self-bearing glandular tissue cones and finally techniques of breast tissue suspension with suture, plication, mesh or muscle sling.

We agree that optimal projection of the breast can be achieved by the vertical technique described by Lassus and modified by Lejour, Hall-Findlay, Hamdi and Graf, because of narrowing of the breast. However for huge volume breast reduction with long sternal notch-nipple distances, the inferior pedicle could still be the most suitable option, especially for younger surgeons.

The idea of this modification was to elevate the inferior pedicle from a “first generation” to “third generation” technique by incorporating the benefits of “third generation” concepts – real “high” suspension and “internal bra” support.

The main drawback of inferior pedicle technique is pseudoptosis or “bottoming out” caused by descent of the breast tissue over the time. Other technical disadvantages include time-consuming deepithelialisation, poor projection, and tension at the inverted T-junction point known for all Wise pattern [17] techniques and even the short T-conversion of the vertical mammoplasty [18].

In trying to resolve the main problem of the inferior pedicle technique namely pseudoptosis, Robbins added pedicle plication and suspension, later modified by Pennington [19]. This modification fixed only the lower and central parts of the breast with the plicated pedicle at the inframammary level, but did not address the medial and lateral parts of the breast. Furthermore the technique lacked real “high” suspension. Further modifications of internal dermal suspension had been published by Frey[20], Echo[21], Baumeister[22], Aydin[23] and Rubin [24] for mastopexy after massive weight loss.

The author’s stated intention in this article, is to improve the inferior pedicle technique by combining pedicle plication, high suspension of glandular tissue and simultaneously utilizing the fixation of the medial and lateral lower parts of the dermal wings to create a fixed “dermal cage” on the thoracic wall. In the authors experience, this serves to narrow the breast and give it good projection. It also allows for parenchymal rotation with the fixation level of the medial and lateral dermal wings on the pectoral fascia.

Concerning tension at the inverted T-junction point, the authors would strongly emphasise the benefits of redistribution of glandular tissue weight along the chest wall when using the “dermal cage”. This reduces glandular weight at the T-junction, and therefore decreases point tension and problems associated with wound dehiscence post-operatively.

The drawback of this technique is a moderately longer operating time compared to the standard inferior pedicle technique with the increased time penalty incurred by deepithelialisation of the dermal wings and suture to the chest wall. This time-consuming deepithelialisation is reduced by narrowing the dermal wings, using only part of the lower pole of the breast in contrast to the technique published by Echo [21] et al. With suturing along the outer border of the suspended dermal wings, the breast tissue is gathered into the “dermal cage” narrowing the breast further, and enhancing the projection of the breast. The multiple sutures along the lower part of the dermal wings reduce the tension on the tip of the wings thus increasing the primary and long term stability of the suspension.

In the author’s opinion, these several factors are the main contributors of importance in respect of this techniques effectiveness, when compared to other published modifications of the inferior pedicle technique that use a horizontal dermal suspension. Last but not least, the inframammary scar is surprisingly well tolerated by patients. This is confirmed in a study of cosmetic evaluation between the Lejour and Wise pattern groups [25].

## **Conclusions**

To summarize, the difference in this surgical technique compared to the standard method is preservation of dermis to fashion dermal wings, from the area of skin and breast tissue normally resected during the fashioning of the standard inferior pedicle; and the fixation of these wings to the pectoral fascia above and laterally. The inferior dermal pedicle is shortened by plication just above the new inframammary fold and this improves projection and NAC positioning. In combination, these maneuvers form a stable “dermal cage” securing the residual breast tissue in the desired shape and position. This prevents medial, lateral and inferior displacement - not just ‘bottoming out’. It also reduces the pull of the inferior breast tissue on the nipple from inside. This gives superior breast projection with narrowing of the breast successfully

addressing the last fundamental weak points of the standard inferior pedicle technique whilst retaining its key benefits.

#### ACKNOWLEDGMENT:

The authors declare that they have no conflicts of interest to disclose.

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Figure 1 A. Front view of preoperative markings.

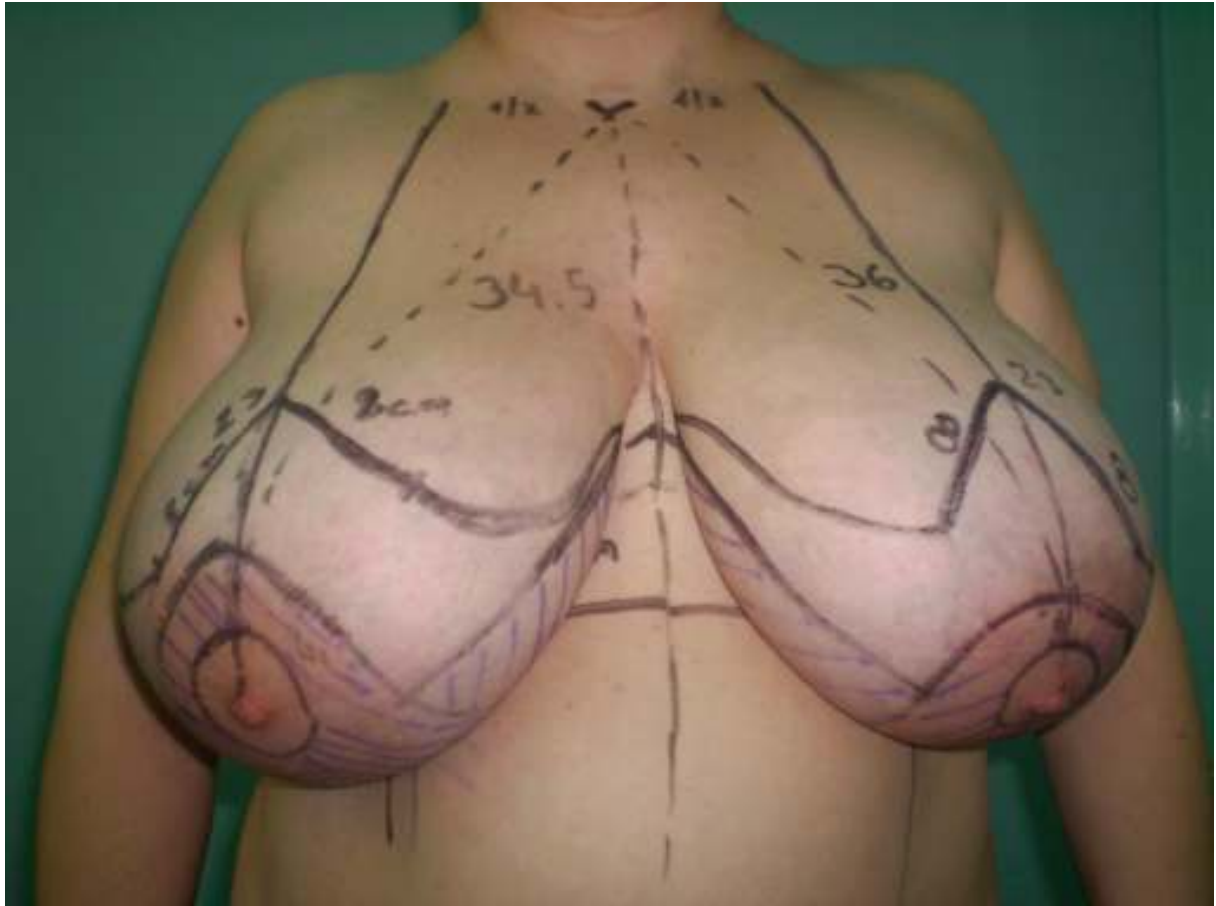


Figure 1.B. View from below of the preoperatively marked breast, where elevation of the inframammary fold and area of inferior pedicle with wings on the side (marked with blue marker) can be seen.





Figure 1.C. Oblique view of both breasts where the lateral wing can be seen on the right breast and medial on the left (marked with blue marker).



Figure 2.A Schematic presentation of deepithelialised area.

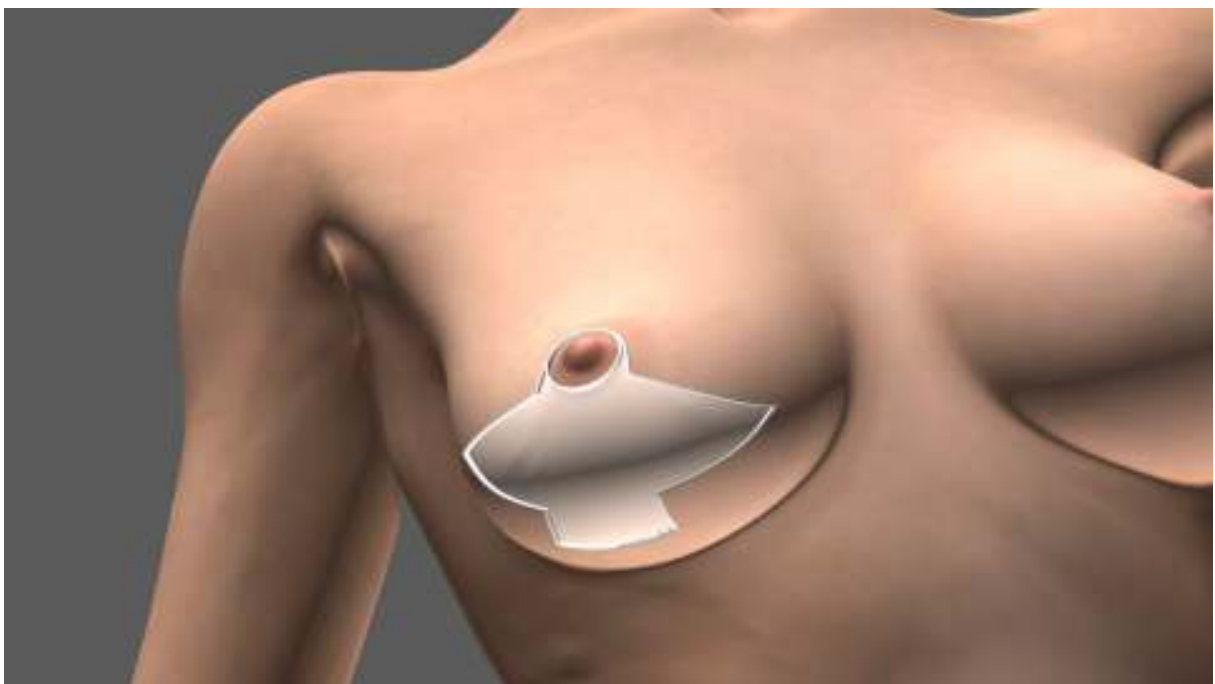


Figure 3.A. Schematic presentation of elevation of the deepithelialised dermal wings with the inferior pedicle.

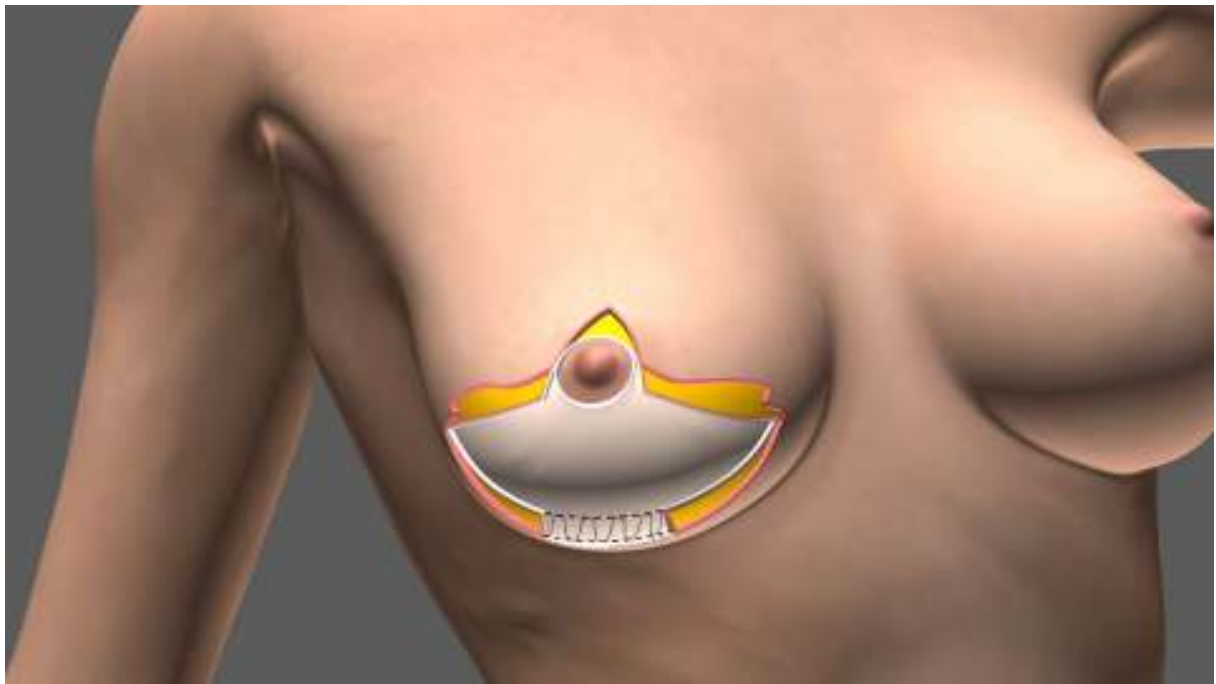


Figure 3.B Intraoperative view of the raised dermal wings attached to the inferior pedicle.

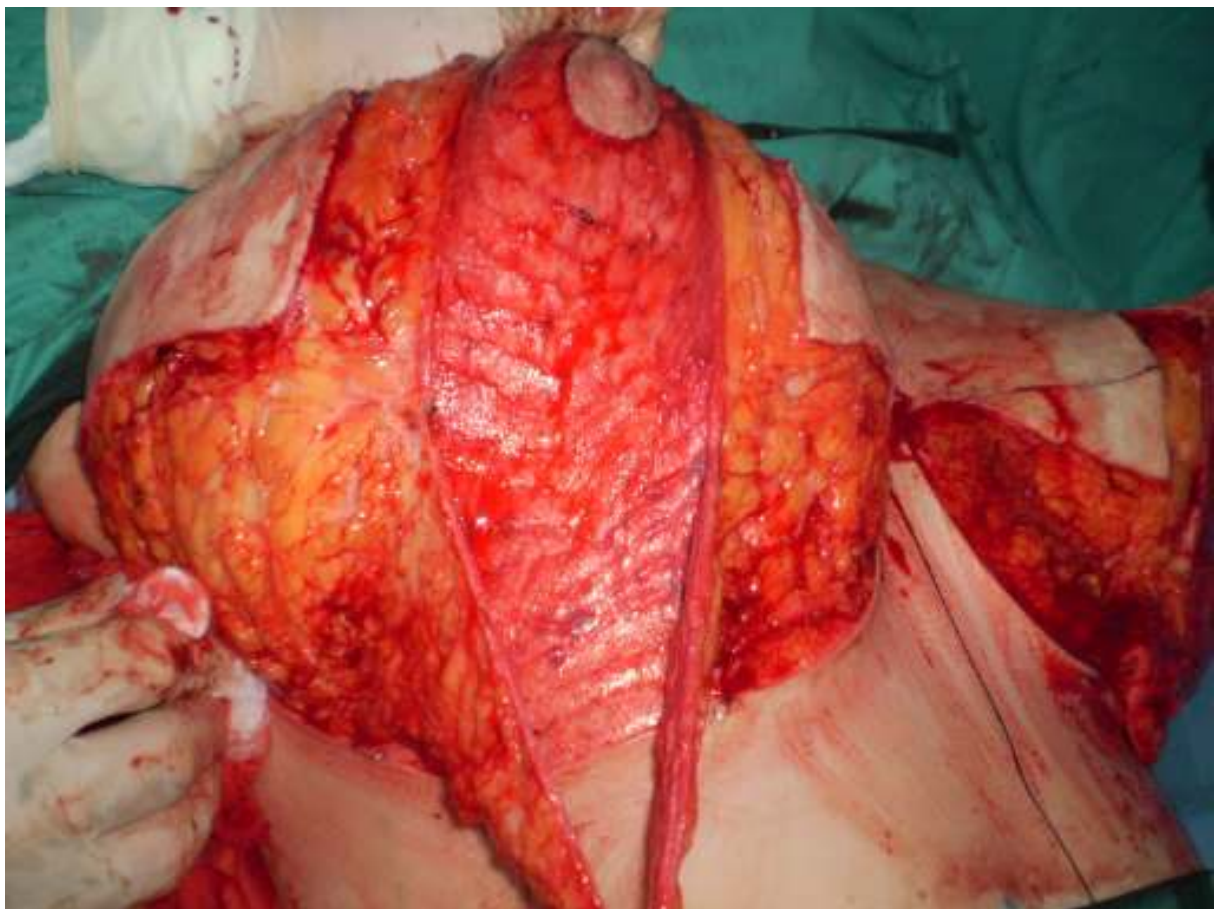


Figure 4.A. Schematic presentation of dermal wings fixed to the second rib superiorly and to the pectoral fascia on the sides forming the dermal cage.

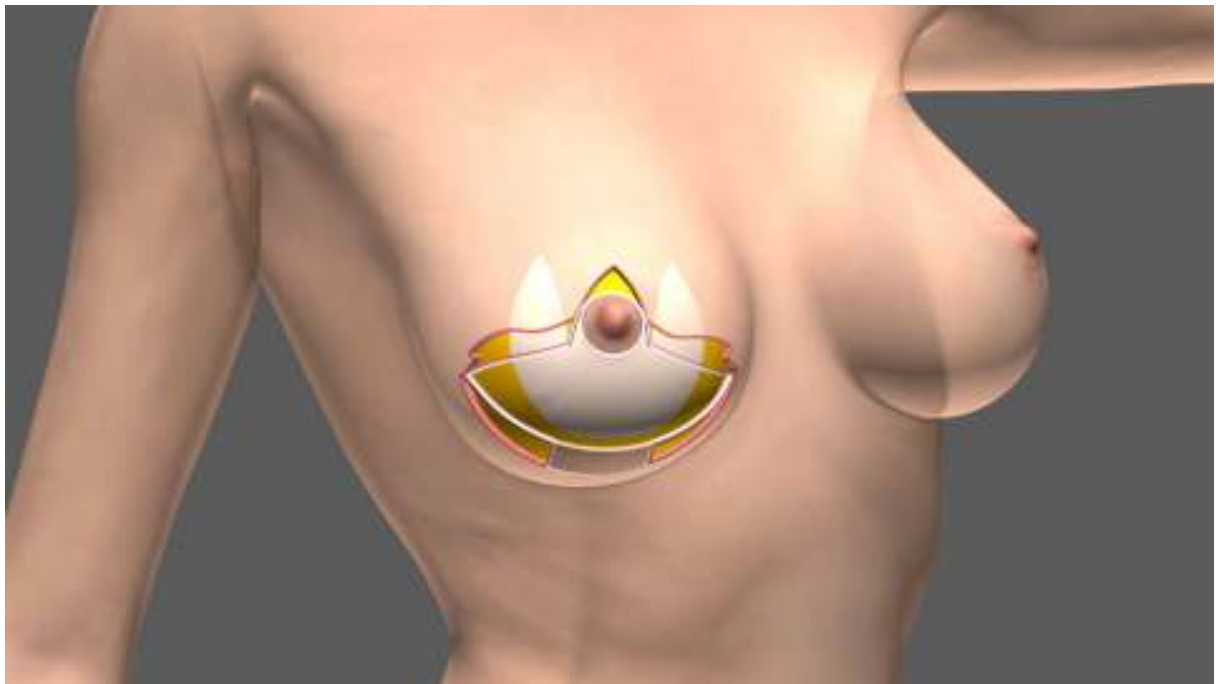


Figure 4.B. Intraoperative picture of the formed 'dermal cage' where it can be clearly seen that the inferior pedicle is encased inside the dermal wings.

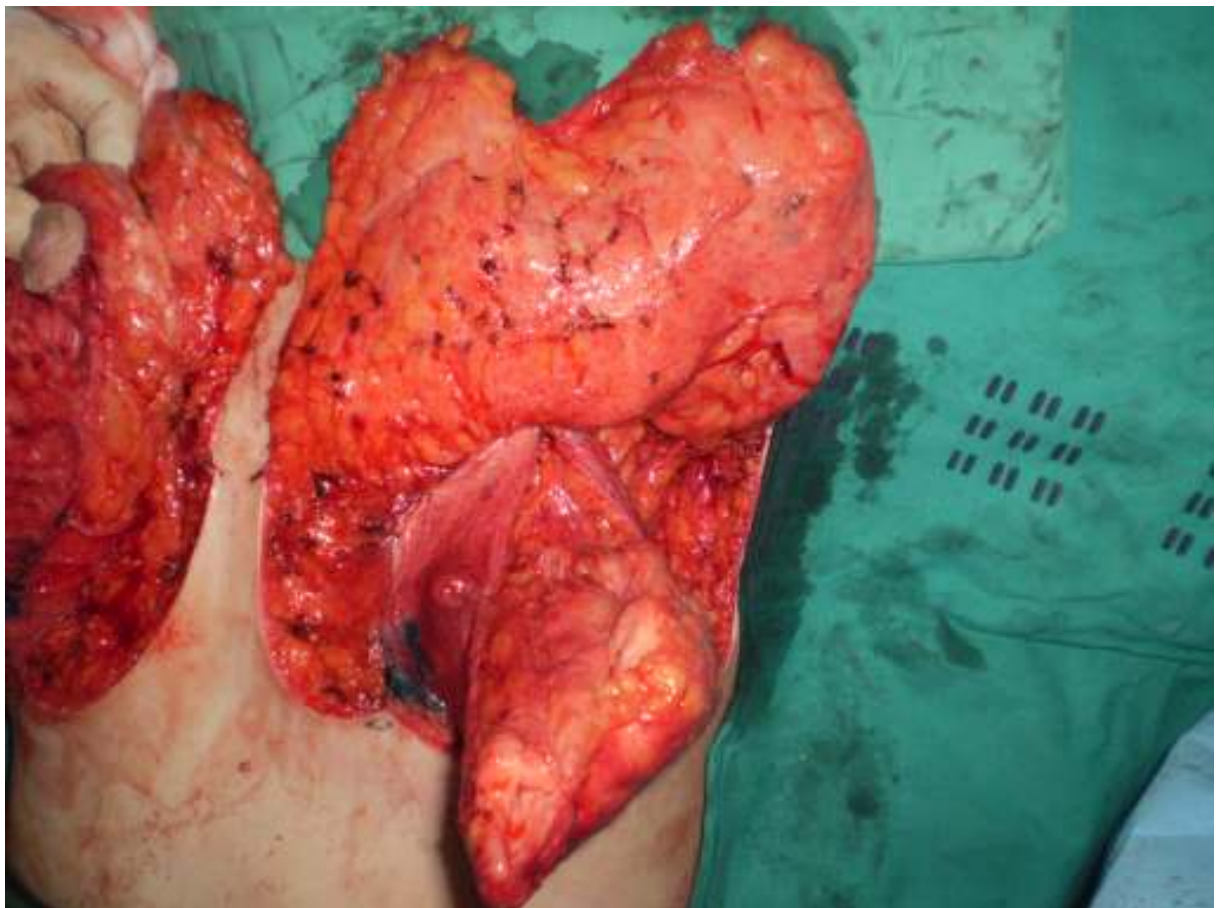




Figure 5.A Bottoming out of the right breast 3 years post operatively (front view).



Figure 5.B Bottoming out of the right breast 3 years post operatively. Left oblique view showing the descent of the tissues below the right NAC.



Figure 6.A-F Results of a middle aged patient, 2 years post operatively.



Figure 7.A-F Results of an older patient, 3 years post operatively.



Figure 8.A-F Results of a younger patient, 10 months post operatively.



Figure 9. 3D Animation of the “Dermal Cage” technique (need XVID CODEC-[www.xvid.org](http://www.xvid.org) )