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Reduction mammaplasty with the inferior pedicle technique: early and late complications in 371 patients

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SUMMARY. A review of reduction mammaplasties with the inferior pedicle technique in 371 patients over 10 years is presented and the complications associated with this particular technique are discussed. The mean age was 33.1 years (range 15–67), the average preoperative sternal notch to nipple distance was 30.4 cm (range 21–43), the mean breast tissue resected was 870 g per breast (range 250–1960) and the mean operating time was 3.1 hours (range 2.5–4). The overall complication rate was 11.4%. The incidence of specific complications in our series was: haematoma 0.3%, nipple and/or pedicle necrosis 0.8%, wound dehiscence 4.6%, fat necrosis 0.8%, carcinoma 0.5%, loss of sensitivity of the nipple 1.3%, hypertrophic scars 3.3%, dermoid cysts 0.3% and marked lower fullness 0.3%. 72% of the patients that became pregnant were able to lactate.

The problem of macromastia has been the object of the efforts of many plastic surgeons ever since the late 19th century. In the United States alone nearly 40 000 women undergo breast reduction surgery each year.[1] A multitude of techniques has been proposed and each one has its advantages and disadvantages. One of the most popular methods of reduction mammaplasty is the inferior pedicle technique and its variants.[1] The inferior pedicle technique was introduced in 1975–1977 by Ribeiro,[2] Robbins[3] and Courtiss and Goldwyn[4] who, working independently of each other, came to the same conclusions and published their descriptions of a new technique based on an inferiorly based dermal pedicle bearing the nipple-areola complex. The inferior pedicle technique uses the popular keyhole pattern and results in an inverted-T scar.

We have used this technique since 1984, incorporating some useful modifications over the years.

Patients and methods

Patients

In this retrospective study, we reviewed 380 patients who underwent reduction mammaplasty with the inferior pedicle technique from September 1984 until November 1994. All patients were treated at the Plastic Surgery Centre of Athens or at the Plastic Surgery Unit of the Naval and Veterans Hospital of Athens by the senior author (ADM). Nine of the patients had a unilateral breast reduction, while the remaining 371 patients had bilateral breast reductions. The nine patients who underwent unilateral breast reduction, either to obtain breast symmetry after breast reconstruction or as a result of a congenital anomaly, were excluded from all further analysis. All patients had surgery under general anaesthesia, using the inferior pedicle technique. Two of the patients had already undergone breast

reduction using some other (unknown to us) technique in the past and came to our clinic for secondary corrective surgery. During the last 3 years, we used liposuction of the breasts in 24 selected cases, as an adjunct at the beginning of surgery, to make the breast smaller as well as to reduce lateral breast fullness.[5,6]

The average age of the patients was 33.1 years (range 15–67 years) and the average sternal notch to nipple distance was 30.4 cm (range 21–43 cm).

All tissue removed was sent to the pathology department, all patients received antibiotics perioperatively, had suction drains and were discharged after 12–24 hours.

Technique

We used the inferior pedicle technique described by Ribeiro,[2] Robbins,[3] Courtiss and Goldwyn[4] and Georgiade et al.[7] with some modifications introduced over the years. Skin markings were made using a flexible keyhole pattern (made of film) resembling Wise's and McKissock's patterns, with the patient standing, and a correction of the skin markings was done with the patient supine, especially at the sternal area to minimise the extent of the incisions. The vertical length of the flap edges was set to 8.5–10 cm (4.5–5 cm nipple diameter + 4–5 cm for the remaining length of the flaps). The angle of the medial edges of the lateral flaps is usually set around 90° but when we feel that there might be a problem we make this angle narrower.

Surgery begins at 7.30 am. After the induction of anaesthesia and about 15 minutes before starting the operation, we infiltrate the skin and subcutaneous tissue of the breast along the marked sites of incision and then the breast tissue itself, with 60 ml of 0.5% lignocaine solution with 1:400 000 epinephrine using a 25G spinal puncture needle, to minimise blood

loss.[8-11] The inclusion of lignocaine in the solution allows for a more superficial general anaesthesia.

In the cases where we have decided to use liposuction instead of the above described procedure we use the tumescent technique[12] and then proceed with the liposuction using a small incision at the lateral aspect of the inframammary fold.[5,6]

We then proceed with the technique de-epithelialising the skin over the pedicle. The pedicle itself is designed as a pyramidal segment of tissue. The width of its base is 7–8 cm and its thickness 5–6 cm; the width of the superior edge of the pedicle bearing the nipple-areola complex is 4–5 cm and its thickness 2–3 cm.

According to Craig and Sykes[13] as well as others,[14] the nerve supply to the nipple is derived from perforating branches that penetrate the pectoralis major muscle and course along the muscle surface before entering the gland. The nerves tend to stay close to the layer of the deep fascia on the anterior surface of the pectoralis major muscle passing at first through the deepest part of the subcutaneous tissue and then into the base of the breast. Craig and Sykes reported that the nerves only incline superficially towards the nipple as they approach their destination. On the basis of these findings, we leave 0.5–1 cm of fat and breast tissue on the pectoralis major starting from the base of the pedicle and extending upwards along the whole length of the muscle and laterally until we reach the lateral flaps.

Because the area of maximal tension when closing the breast wounds is at the T-junction, we leave a small triangle of skin with its base on the inframammary fold which we do not de-epithelialise, to relieve tension. The height of the triangle is very short (<0.5 cm), and it has an angle of 110–120°. Its base is situated on the inframammary fold and its sides are about 1 cm in length. We try to keep the height of the triangle as short as possible to avoid displacing the nipple upwards.

The new nipple site is cut with the aid of a nipple marker designed by us, 4.5–5 cm in diameter, after we have closed the breast wound in both breasts.

A pressure dressing is applied using one of the patient's old brassieres covering the gauzes.

If recovery is uneventful, suction drains are removed at 8–9 pm. and if the patient lives in the greater Athens area she is discharged to her home; otherwise she stays overnight and is discharged in the morning.

In either case, the following day the dressings are removed and the patient can have a shower. For the following 4 weeks, the patient wears a brassiere to support the breasts.

Results

371 patients were included in our study. The mean breast tissue resected was 870 g per breast (range 250–1960 g) (the weight includes adipose tissue removed by liposuction in selected cases), the mean volume of liposuction tissue removed was 160 cc

Table 1 Results

	Patients
Early complications	21 (5.7%)
Haematoma	1 (0.3%)
Nipple and/or pedicle necrosis	3 (0.8%)
Wound dehiscence	17 (4.6%)
Late complications	21 (5.7%)
Fat necrosis	3 (0.8%)
Carcinoma	2 (0.5%)
Loss of sensitivity and erectility of the nipple	2 + 3* (0.5 + 0.8%)
Hypertrophic scars	12 (3.3%)
Dermoid cyst	1 (0.3%)
Marked fullness requiring secondary surgery	1 (0.3%)
Total complications	42 (11.4%)
No complications	329 (88.6%)
Total patients	371

A total of 42 patients developed 42 complications. None of the patients developed more than one complication.
* The three patients with nipple necrosis.

(range 100–400 cc) and the mean operating time was 3.1 hours (range 2.5–4 hours).

The early and late complications are presented in Table 1.

Early complications

Haematoma. One patient (0.3%) developed a haematoma in her right breast, which subsided by itself without further treatment. The patient was 19 years old and we removed 1300 g of breast tissue from each breast. No liposuction was performed.

Nipple necrosis. Of the three patients (0.8%) who developed nipple and/or pedicle necrosis, one patient developed necrosis of the left pedicle and nipple-areola complex which was attributed to previous surgery for breast reduction with a technique not known to us (we were not able to obtain the patient's file). The patient was 45 years old, the breast tissue resected was 450 g from the right and 550 g from the left breast and no liposuction was performed. Another patient, 24 years old, developed superficial necrosis of the right nipple-areola complex (due to venous congestion) following resection of 800 g from each breast. Again no liposuction was performed. The third patient (60 years old) developed full thickness necrosis of the upper half of both areolas due to the large length of the pedicles (sternal notch to nipple distance was 42 cm, pedicle length 27 cm). The weight of tissue removed in this patient was 1200 g from each breast and no liposuction was performed.

All cases healed conservatively, by secondary intention, and revision was done 6 months after the first operation.

Wound dehiscence. In 17 cases (4.6%) there was skin dehiscence at the T-junction which was left to heal by secondary intention. The age of the patients was 16–56 years (mean 29 years) and the weight of breast

tissue resected was 270–1500 g for each breast (mean 790 g).

Late complications

Fat necrosis. Three of the patients (0.8%) developed fat necrosis in one of their breasts, which was clinically indistinguishable from carcinoma. The first patient was a 31-year-old lady who had undergone reduction mammaplasty by another surgeon 6 months previously and came to us for revision of the shape and scars. A lump was found in her right breast which was excised and biopsy identified it as fat necrosis. The second patient was a 40-year-old lady in whom we excised 600 g of tissue from each breast and no liposuction was performed. Excision biopsy was performed 6 months postoperatively and revealed fat necrosis. Finally, the third patient was a 62-year-old lady with 650 g of tissue resected from each breast and no liposuction. Excision biopsy was performed one year postoperatively.

Carcinoma. In two of the patients (0.5%) the pathology examination reported the existence of breast carcinoma in one of their breasts. The patients were 45 and 54 years old and pathology revealed the existence of lobular carcinoma in situ in their left and right breast respectively. Neither of the patients had a history of breast symptoms, nor a family history of breast carcinoma, and their physical examination was normal. Both patients were referred to a breast surgeon for evaluation.

Nipple sensation. Evaluation of nipple sensation was performed for all patients at 6 months and 1 year postoperatively using the cotton wool test. Only 5 patients complained of loss of sensitivity and erectility of the nipple including the three patients who developed nipple and/or pedicle necrosis. The two patients not already mentioned were 40 and 30 years old respectively. In the first patient, 750 g of tissue were resected from each breast and 300 g were removed from each breast by liposuction. In the second patient, 800 g of breast tissue were resected from each breast and no liposuction was performed.

Hypertrophic scars. 12 patients (3.3%) developed hypertrophic scars, and in half of these patients we were able to perform secondary surgery 6 months to 1 year postoperatively to improve the scars (under local anaesthesia). The patients' age was 17–37 years (mean 23 years) and the weight of breast tissue resected was 250–1100 g for each breast (mean 750 g).

Dermoid cyst. One patient (0.3%) developed a dermoid cyst due to incomplete de-epithelialisation of the pedicle. The patient was 17 years old, the weight of tissue resected was 1200 g from each breast and no liposuction was performed. The cyst was surgically removed under local anaesthesia one year postoperatively.

Lower breast fullness. One patient (0.3%), had secondary surgery to correct progressing ptosis of the pedicle resulting in significant lower fullness of both her breasts. The patient had her first operation in 1986, at the age of 17 years, and 1000 g of tissue were removed from each breast (no liposuction was performed). Secondary operation was performed four years later.

Lactation

Of the 371 patients, 18 gave birth after the operation. Only 13 of these patients were able to breast feed (72%), with decreased capacity. The other 6 patients developed problems during breast feeding (milk insufficiency, mastodynia) and lactation was pharmaceutically suppressed.

Blood loss

None of the patients required blood transfusion (autologous or heterologous). Furthermore, none of our patients developed large haematomas requiring drainage, and the amount of blood in the suction drains never exceeded a volume of 50 ml.

Discussion

Macromastia is a condition causing psychological and physical problems. In particular, it has been consistently shown that, besides psychological considerations regarding self-esteem and aestheticality,[15,16] macromastia is responsible for a number of complaints relating to the skeletal system.[17,18] These complaints include neck pain, back pain, headache and shoulder pain. Furthermore, other complaints reported by patients suffering from macromastia include paresthesiae of the little fingers, bra strap groove pain and breathing and sleeping problems.

Several studies have shown that patient satisfaction following reduction mammaplasty in general, and with the inferior pedicle technique in particular, is very high (86–95%).[19–21]

Davis et al.[19] reported an overall patient satisfaction of 87%, Dabbah et al.[20] 95% and Serletti et al.[21] 86%. Our complication rate was 11.4%, comparable to that of Bolger et al.[19] (13.6%) but rather low compared with that of Davis et al. (50%) and Dabbah et al. (45%), although the latter two used other procedures besides the inferior pedicle technique.

It should be noted, however, that the maximum amount of breast tissue resected by us was 1960 g for each breast, rather small compared to 4200 g and 3717 g by Davis et al. and Dabbah et al. respectively, which supports the observation of Dabbah et al. that there is a considerable increase in the complication rate when more than 1000 g of tissue are removed from each breast.

Our very low haematoma rate 0.3% (comparable to 2% and 1.17% by Dabbah et al. and Bolger et al. respectively) and the lack of need for blood transfusion confirms the value of routine infiltration with adrenaline.[8–11] We have found that the use of adrenaline aids in the rapid recuperation and brief hospitalisation of the patients (patients are discharged

after 12–24 hours), drastically reducing cost as well as patient discomfort.

Three of our patients suffered from nipple and/or pedicle necrosis (0.8% versus 6% and 4% by Davis et al. and Dabbah et al. respectively). On reviewing these cases in retrospect, we realised that in all three cases the fault was ours: the blood supply was impaired due to previous surgery or the pedicle was either too long (27 cm) or was buried under considerable tension, causing venous congestion. The case of the patient with previous surgery who developed necrosis of the left pedicle and nipple-areola complex emphasises the importance of establishing the previous technique used and poses the question whether other techniques such as free nipple grafting would be safer in cases having secondary surgery.

One of the most common complications of this technique is wound dehiscence at the T-junction. We experienced this complication in 17 patients (4.6%), which is quite low compared to other series;[9,20] we attribute this low incidence to the retaining of a small triangle of skin on the inframammary flap to reduce tension, as discussed in detail earlier.

Many authors believe that de-epithelialising the skin offers no advantage over removing it, since nipple survival and sensation is not affected whether the skin removed is split-thickness or full-thickness,[14] and furthermore slows down the operation considerably.[9] We do not agree with the latter since, at least in our experience, de-epithelialisation does not significantly slow down our procedure, and with regard to the former, de-epithelialisation makes suturing around the areola easier and, in the event of breakdown at the T-junction, the de-epithelialised skin acts like a skin graft donor site and re-epithelialises to the edges of the defect,[8] producing a most pleasing final result.

One other interesting complication is fat necrosis, which developed in three of our patients.[22] The incidence of fat necrosis in our series was 0.8%, which is quite low compared with the 16% incidence reported by Strömbeck,[23] although Strömbeck calculated this percentage for patients having a resection of more than 1000 g, and 22% reported by Dabbah et al.,[20] although they used a variety of procedures in their series and they included infection in this percentage. The development of fat necrosis might be associated with the use of the electrocautery,[22] although Goldwyn attributes it to nipple-areola necrosis and subsequent insufficient debridement;[23] however none of our three cases were associated with nipple and/or pedicle necrosis. All three cases were clinically indistinguishable from carcinoma and only excision biopsy established the diagnosis. We would therefore like to stress the fact that, no matter how strong the clinical suspicion of fat necrosis is, an excision biopsy is necessary for confirmation of the diagnosis.

In two of our patients histology of the breast tissue revealed the existence of lobular carcinoma in situ (LCIS). The incidence of carcinoma in our series was 0.5% versus 1.5% reported by Davis et al.,[19] 0.4% by Snyderman,[24] 1.57% by Pitanguy and Torres[24] and 0.96% by Geary and Batchelor,[24] while the reported incidence of lobular carcinoma in situ alone is 2.5%.[24] According to Geary and Batchelor, preoperative mammography is expensive, exposes patients to unnecessary irradiation and discomfort and is often unhelpful in cases of LCIS. According to them, far more valuable in cases of LCIS is the documentation of a family history and we agree with this.

Only five patients complained of loss of sensitivity and erectility of the nipples, including the three patients with nipple and/or pedicle necrosis (1.3%), comparable with the 1.94% reported by Bolger et al.[9] as opposed to an incidence of loss or alteration of nipple sensitivity in 25% of the patients reported by Davis et al.[19] We have attributed this very low incidence of loss of nipple sensitivity to the retaining of 0.5–1 cm of fat and breast tissue on the pectoralis major, thus sparing the perforating branches of the 3rd–5th intercostal nerves that course along the muscle surface before entering the gland, as discussed earlier in the technique section. This was based on the work of Craig and Sykes[13] and others.[14] Sarhadi et al.[25] have recently reported additional findings in an anatomical study.

It should be noted, however, that nipple sensation is often diminished in patients with macromastia and that nipple erectility is more dependent on an intact blood supply to the nipple and intact smooth muscles of the nipple than on innervation.[13] Furthermore, there are reports stating that nipple sensation is present even after free nipple grafting[26] in as high as 82% of patients, while Craig and Sykes[13] found that nipple sensitivity is retained in over 80% of cases where the nipple is left in continuity with the gland contrary to less than 50% of cases following free transplantation of the nipples, raising the question of how precise the assessment of nipple sensation is.

With regard to lactation potential, 18 patients gave birth after the operation and 13 (72%) of these patients were able to breast feed, with decreased capacity. Our results are in accordance with those of Marshall et al.,[27] Davis et al.,[19] Serletti et al.[21] and Harris et al.,[28] 73%, 68%, 70% and 80% respectively. This high percentage is attributed to the preservation of the continuity of the lactiferous ducts with the nipple by the inferior pedicle technique, although the adequacy of milk production is determined by the percentage of breast tissue left attached.[27]

Besides the above mentioned complications, the inferior pedicle technique has the following disadvantages:

1. The technique results in a conspicuous scar in the inframammary fold, which is longer than in other techniques. However, in general, shorter scar procedures are more suitable for smaller breasts, while the inferior pedicle technique, despite this drawback, has the versatility of reducing breasts with sizes ranging from comparatively small to spectacularly large.[1] Furthermore, we have found that patient satisfaction is excellent and that patients are more concerned with breast volume and contour than with an inframammary scar that in any case is hidden under the breast in the standing position.

2. This technique is more time-consuming than others.[9] Our mean operating time was 3.1 hours (range 2.5–4 hours), including de-epithelialisation of the two pedicles.

3. One of the most annoying aesthetic disadvantages of the inferior pedicle technique is gradual fullness of the lower part of the breast because of the weight of the large pedicles. We have overcome this problem by trimming the pedicle as much as possible, thus minimising its weight, and leaving more breast tissue on the lateral flaps.

4. It has been reported, and indeed it has been observed by us as well, that there is a gradual increase in the distance from the inframammary fold to the areola, due to a descent of the breast parenchyma because of gravity, along with a displacement of the nipple-areola complex superiorly.[1,9] We have overcome this problem by situating the nipple-areola complex one or two centimetres below the expected position.

In comparison to other reduction mammaplasty techniques, the inferior pedicle technique has been characterised as the most versatile technique that has consistently produced the most satisfactory results.[11] In particular, breast contour and volume, nipple projection, nipple sensation and the potential for lactation are comparable to or better than other techniques, many of which produce better scars.

In conclusion, reduction mammaplasty with the inferior pedicle technique is an established technique, applicable in a wide range of breast sizes. The complication rate is rather low, and nipple sensation and lactation potential are preserved.

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