

## “Triple Ellipse” Brachioplasty: A Novel Modification for a Safe and Successful Brachioplasty

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### ABSTRACT

**Background:** One of the most important factors in achieving a good result after brachioplasty is the balanced amount of skin resection. A double ellipse technique was described to avoid over resection and leave adequate skin for closure.

**Patients and Methods:** This study was done on 30 patients with grade 3 and 4 arm deformity. The evaluation questionnaire and rate of complications were used to assess the aesthetic outcome.

**Results:** All patients who underwent the "triple ellipse" technique were free of post-operative arm contour deformity. The wounds healed without complications.

**Conclusion:** The current modification prevents tension on the wound as well as permits achieving a balanced skin resection.

**Key Words:** *Brachioplasty – Modification – Double ellipse.*

### INTRODUCTION

The demand of the upper limb recontouring surgeries has increased because of the increasing number of patients who have developed post massive weight loss deformities [1,2]. So, there is a constant search to improve aesthetic outcome using new techniques [3].

The idea of double ellipse technique is avoiding over resection of skin. The outer ellipse is based on the extent of the deformity of the upper limb extending from the axilla to the elbow. The inner ellipse is based on the outer ellipse, but it is adjusted to allow closure over a hard non-compressible cylindrical structure of the upper limb. Relying only on the pinch technique in excision in a cylindrical structure like the arm will end up with over resection because the distance between the fingers of the surgeon is not accounted for during skin closure [2].

### MATERIAL AND METHODS

In the current study the authors' aim is to modify the skin resection pattern to achieve balanced skin resection and minimize intraoperative modifications.

**Surgical technique:**

**Marking:**

The markings of the triple ellipse technique is shown in Fig. (1). The patient is standing, the shoulder is abducted to 90 degree and the elbow is flexed to 90 degree. The original double ellipse is drawn as originally described by Al Aly. Marking of the outer ellipse is done by starting at the axillary crease; pinch the excess just inferior to the musculoskeletal mass; and mark the skin both anteriorly and posteriorly. Then repeat this step distally to include all redundant skin.

The inner ellipse is then drawn by determining the distance between the pinched fingers. This distance is divided by two and the marking is moved anteriorly and posteriorly to a distance that equal to half the distance between pinched fingers. In original technique the new marks of inner ellipse represents the actual resection.

In our modification there is addition of other marks. First of them are two lines drawn proximal and distal to the belly of biceps to divide the arm into three equal distances. A third ellipse is drawn. The distance between the third and second ellipse is equal to the distance between the first and second one.

**Procedure:**

Infiltration within the third ellipse is performed using normal saline with 1:1000000 epinephrine concentrations. Liposuction is done first confined

to the limits of the third ellipse. Superficial liposuction is done to facilitate the inversion of the planned area of resection as well as to facilitate the dissection.

A continuous running 0 silk suture is taken inverting the part of skin that will be resected

inward, starting from distal to proximal Fig. (2). The rule of this continuous suture is to precisely determine the amount of the skin that will be removed without producing constriction rings denoting an exaggerated plan of resection. Then the suture is removed and the excision is started.

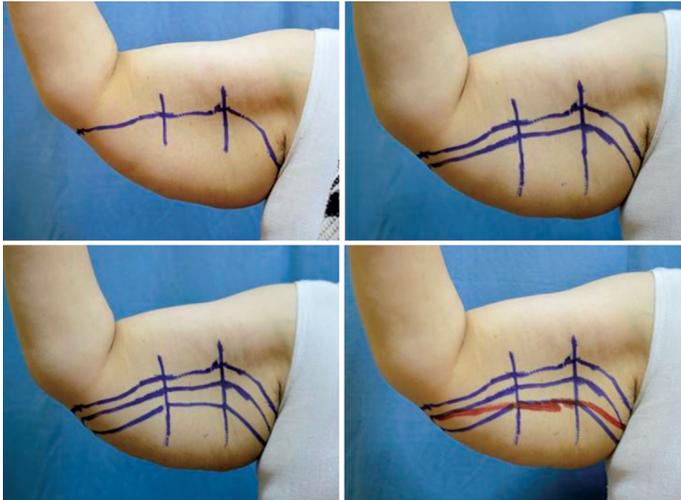


Fig. (1): The triple ellipse technique markings. (a) The first ellipse was drawn by pinching. (b) Second ellipse to compensate the distance between fingers during pinch. (c) Third ellipse 'our modification'. (d) Red line indicates the line of excision.



Fig. (2): Operative technique: (a & b) Continuous running silk suture to assess extent of resection. (c) Incision between entry and exit points of the silk suture. (d) Plane of excision facilitated by liposuction. (e) Excised ellipse. (f) Resulting defect. (g) Following fascial closure and insertion of the drain. (h) Following subdermal closure.

The line of excision should be centered between the needle entry and exit marks. The line of excision starts from distal to proximal. In the distal third of the arm the line of excision should follow the mark of the second ellipse. When approaching the middle third of the arm the amount of skin excision should be less by following the marks of the third (innermost) ellipse.

The transition between second and third ellipse will take the form of smooth curve. After skin excision of the middle third of the arm the line of excision will follow the second ellipse, again the transition between the third and second ellipse will take a smooth curve.

As in original technique described by Al Aly, segmental resection and closure will be done to avoid intraoperative arm edema [4]. A suction drain is inserted and the point of exit is at the posterior axillary fold in order to prevent limitation of the patient's activity.

After completion of excision and temporary closure, the temporary stitches are removed individually and replaced by 2-0 PDS sutures to approximate the superficial fascia. Then a layer of continuous subdermal 3-0 PDS sutures is placed. The skin is closed with running subcuticular 2-0 prolene sutures. Compression garment is applied at the end of the procedure.

The post-operative care of the patient includes; removal of the drain 3-5 days post-operative according to its daily output. The sutures are removed 2 weeks post-operatively. Compression garment is used for three weeks.

**RESULTS**

The study includes 30 patients (25 females & 5 males) with average age 33 years. All have stage 3 and 4 arm contour deformity. The etiology of the arm deformity was weight loss either following bariatric surgery or following weight loss by diet. Patients with unstable weight, previous arm contouring surgery, or stage 1 & 2 deformity were excluded.

With average six months follow-up period, the patients achieved long lasting satisfactory results without recurrence of skin laxity.

The patients' postoperative aesthetic satisfaction rate was measured using a 5-point self-evaluation scale.

The results were rated "excellent" in 25 patients and "good" in the remaining 5 patients.

Two independent plastic surgeons reviewed and assessed the pre and postoperative patients' photographs. Their assessment depends on rating the aesthetic results on a visual analog scale of 1 (poor) to 10 (excellent). The mean postoperative aesthetic result was 9.1±0.3.

Table (1): The percentage of early post-operative complications.

Early postoperative complications	Number	Percentage
Seroma	3 patient	10
Hematoma	-	0
Surgical site infection	-	0
Wound dehiscence	-	0

Table (2): The percentage of late post-operative complications.

Late postoperative complications	Number	Percentage
Scar widening	1	3
Hypertrophic scar/Keloid	1	2
Under resection	-	0
Over resection with constricting bands	-	0

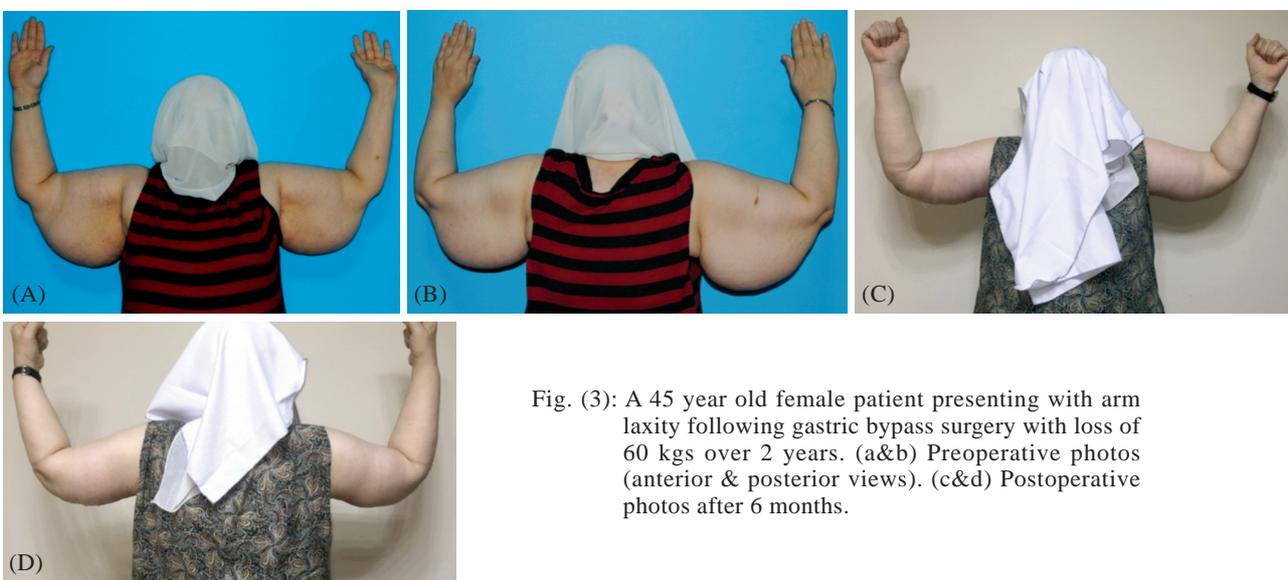


Fig. (3): A 45 year old female patient presenting with arm laxity following gastric bypass surgery with loss of 60 kgs over 2 years. (a&b) Preoperative photos (anterior & posterior views). (c&d) Postoperative photos after 6 months.



Fig. (4): A 23 year old female patient presenting with arm laxity following sleeve gastrectomy with loss of 40 kgs over 2 years. (a&b) Preoperative photos (anterior & posterior views). (c) Postoperative photo after 2 months. (d) Posterior view of left arm. (e) Posterior view of right arm.

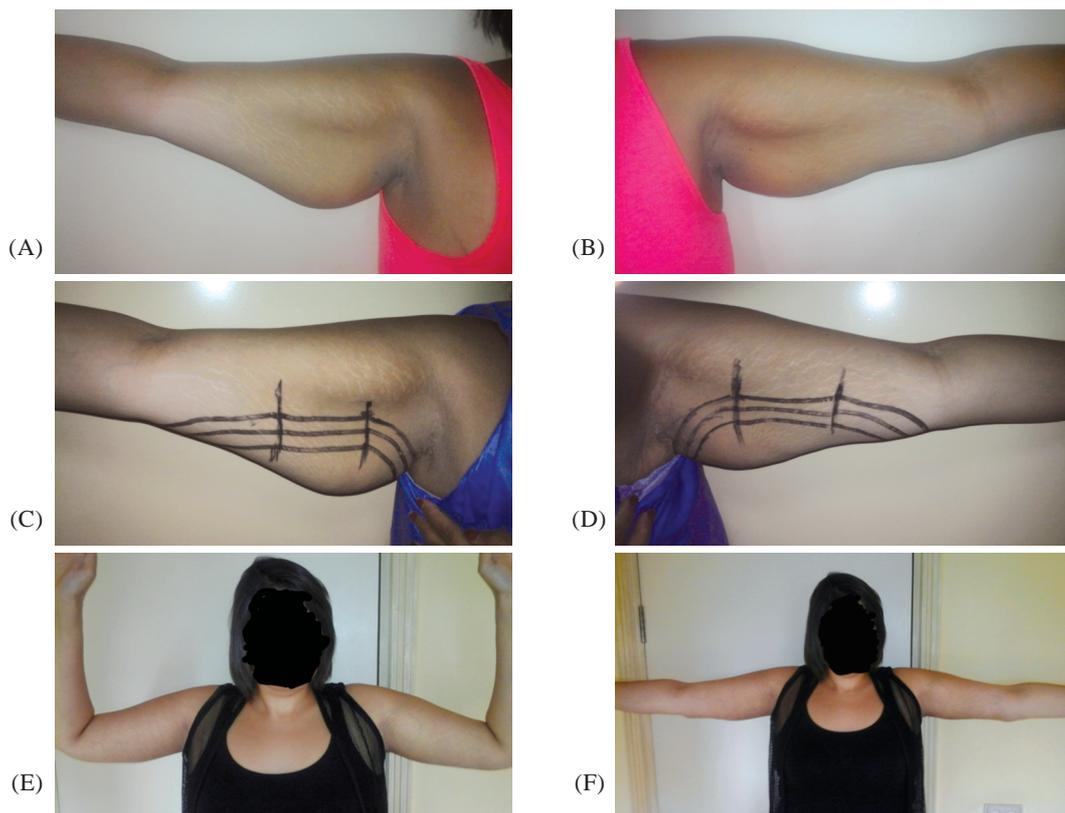


Fig. (5): A 26 year old female patient presenting with arm laxity following sleeve gastrectomy with loss of 50 kgs over 2 years. (a&b) Preoperative photos. (c&d) Preoperative markings. (e&f) Postoperative photos after 6 months.

## DISCUSSION

Upper arm deformities that develop after weight loss or as a result of aging led to increased demand of arm contouring operations such as brachioplasty [4]. Brachioplasty procedure involves removal of excess skin. Many approaches are described aiming to improve the arm contour with adequate wound healing and concealed scars. One of the difficulties encountered during the design of the operation is determining the amount of the skin that will be removed as there is a lack of an objective method to determine the amount of skin to be excised [5].

Removing appropriate amount of skin in those patients is a key to a successful satisfactory operation. It should be balanced to avoid over resection sequelae as, compression of neurovascular structures of the arm, distal edema and wound dehiscence or scar widening. It should also avoid under-resection that may produce unsightly appearance [6].

The quantity of the skin that will be removed should lead to arm circumference that is proportionate to the forearm to avoid changing of the anthropometry of the upper extremity.

Our aim was to modify the original technique that was described by Aly AS “the double ellipse technique” by addition of a third ellipse. A third ellipse was added in the middle third of the arm aiming to avoid over resection in this critical area with the widest muscular circumference produced by the fleshy bellies of the biceps and triceps muscles. An appropriate amount of skin excision will abolish the tension on the scar and thereby the wound will heal by fine linear scar.

In the traditional brachioplasty techniques, one side of the resection was done first and tissues are overlapped and tailored. This allows the surgeon to adjust the resection to avoid over resection however scar migration is a possibility.

Limiting the liposuction within the third ellipse and to the most superficial fat preserved most of the lymphatics and the veins of the upper extremity minimizing the possibility of developing postoperative arm edema. It also permits an “adequate” fascial edge for fascial closure which is a step of paramount importance to obviate any tension on the wound.

Application of the continuous running silk suture before skin incision is extremely important to simulate the result & confirm the efficacy and safety of the markings.

In our modification to double ellipse technique we tried to minimize the intraoperative modification of the preoperative markings. So, the procedure will be simplified especially for younger surgeons. It will increase the surgeons’ confidence and abolish fear of over or under resection. Another advantage of minimizing intraoperative modification is decreasing the operative time. Another important advantage is absence of scar migration anteriorly or posteriorly as there is no elevation of skin flaps. This ends by a properly hidden scar in the posteromedial aspect of the arm.

The most common complications following the brachioplasty procedure are: Wound dehiscence, hypertrophic scar, seroma, wound infection, sensory loss, neuroma formation, revision surgery [7-9]. The complication rate is minimal in this study thanks to this modification that enabled us to reach the “cutting edge” between “over excision” & “under excision”.

### Conclusion:

To balance the amount of skin resection in brachioplasty we add a third ellipse as a modification of the previously described double ellipse technique. Segmental resection and closure was done as previously described. It was found that this modification will facilitate the procedure, avoiding over resection, and minimize any intraoperative need of modification of the preoperative markings.

### Conflict of interest:

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

## REFERENCES

- 1- Aly A., Pace D. and Cram A.: Brachioplasty in the patient with massive weight loss. *Aesthetic Surg. J.*, 26: 76-84, 2006.
- 2- Aly A.S. and Cram A.E.: Brachioplasty. In Aly A.S., editor. *Body Contouring After Massive Weight Loss*. St Louis: Quality Medical Publishing, pp 303-333, 2006.
- 3- Elkhatib H.: Posterior scar brachioplasty with fascial suspension: A long-term follow-up of a modified technique. *Plast. Reconstr. Surg. Glob Open*, 7; 1, 2013.
- 4- Aly A., Soliman S. and Cram A.E.: Brachioplasty in massive weight loss patients. *Clin. Plastic Surg.*, 35: 141-147, 2008.
- 5- Fantozzi F.: Brachial lifting using the balanced triple-vector (BTV) technique with dual opposing flaps. *Eur. J. Plastic Surg.*, 37 (2): 95-102, 2014.
- 6- Egrari S.: Brachioplasty: A personal approach. *Aesthetic Surgery Journal*, 1-11, 2015.

- 7- Zomerlei T.A., Neaman K.C., Armstrong S.D., Aitken M.E., et al.: Brachioplasty outcomes: A review of a multipractice cohort. *Plast. Reconstr. Surg.*, 131 (4): 883-9, 2013.
- 8- Nguyen L., Gupta V., Afshari A., Shack R.B., et al.: Incidence and risk factors of major complications in brachioplasty; Analysis of 2,294 patients. *Aesthetic Surg. J.*, 36 (7): 792-803, 2016.
- 9- Hurwitz D.: Brachioplasty. *Clin. Plast. Surg.*, 41 (4): 745-51, 2014.