CASE REPORT

Anthropometrically correct traditional brachioplasty in females: a novel technique

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Background: Brachioplasty is a popular plastic surgery procedure. Current and common various techniques are based on either surgeon's sense preoperatively, or tailor tacked design intraoperatively. A method is needed to define how much skin and soft tissue should be excised precisely, or what can be a reference point to use to design a brachioplasty mathematically.

Aim: Anthropometry as a science can help design what can be called an 'Anthropometrically Correct Traditional Brachioplasty' or (ACTB). Anthropometry, classically, could bind the upper arm/biceps circumference with forearm circumference to make postoperative results more harmonious and natural.

Methods: To find out the anthropometrically correct ratio between forearm circumference and upper arm/biceps circumference, Anthropometric studies addressing live or cadaveric adult female human beings body measurements and circumferences in different times and races were reviewed with normal BMI. Chosen studies must include forearm circumference and (mid-) upper arm circumference measurements. As a result, the postoperative correct mid-arm circumference can be calculated preoperatively.

Results: 85% as an average ratio of forearm circumference to upper arm/biceps circumference could be calculated by reviewing several anthropometric studies.

Conclusion: Postoperative anthropometrically correct mid-arm circumference can be calculated and the to-be-excised arm skin is marked preoperatively by measuring the forearm circumference and multiplying it with 100/85. The excess skin is marked in a way that makes the skin left enough to make the arm in its preoperatively calculated anthropometrically correct circumference.

Keywords: Brachioplasty; anthropometry; anthropometrically correct traditional brachioplasty

INTRODUCTION

Brachioplasty is a popular plastic surgery procedure. According to the American Society of Plastic Surgeons, more than 18000 Brachioplasty were done in the US in 2017 [1].

Traditional/simple/wedge excision Brachioplasty will be the target of our novel technique. Literature is relatively unsatisfying dealing with traditional Brachioplasty numerical marking and design. Current and common various techniques are based on either surgeon's sense preoperatively, or tailor tacked design intraoperatively that cuts the excessive flap into pieces. No method could define how much skin and soft tissue should be excised precisely, or what can be a reference point to use to design a Brachioplasty mathematically. Successful Brachioplasty is all about how much you should excise not how much you can excise.

Anthropometry as a science can help design what can be called an 'Anthropometrically Correct Traditional Brachioplasty' or (ACTB). Anthropometry, classically, could bind the upper arm/biceps circumference with different reference points within the arm like Triceps Skin Fold (TSF) and Mid-Upper Arm Muscle Circumference (MUAMC), and other points outside the arm region like weight and forearm circumference [2-8].

METHODOLOGY

Plastic surgery-wise, forearm circumference should be the reference point as other reference points cannot be dependable in cases of weight variations and skin laxity post massive weight loss. The anesthetic arm is an arm that looks harmonious and compatible next to the forearm (Figures 1-10).

Inclusion criteria of studies

Anthropometric studies addressing live or cadaveric adult female human beings body measurements and circumferences at different times and races were reviewed with normal BMI. Chosen studies must include forearm circumference and (mid-) upper arm circumference measurement methods that don't oppose the following:

Arm (relaxed):

1. First mark the site to be measured

2. The measurement is taken at the mid-point between the acromion and the olecranon processes

3. When recording, make sure the tape is lying flat on the skin, with the tape perpendicular to the bone of the upper arm

Forearm:

1. The subject holds the arm out with the palm facing upwards. The measurement is taken along the forearm at the point of the largest circumference. The maximal girth is not always obvious. The tape may need to be moved up and down to find the point of maximum circumference, which will usually be found closer to the elbow

2. When recording, make sure the tape is lying flat on the skin, with the tape perpendicular to the bones of the forearm [9]

Exclusion criteria of studies

Studies addressing males, athletes, samples with present morbidities and extreme BMI groups were excluded.

RESULTS

Three studies were found fulfilling the above criteria. Mean values of Forearm circumference (A) and (mid-) upper arm circumference (B) were compared and A/B ratio was produced in the following table.

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Table 1: Three studies were found fulfilling the above criteria. Mean values of forearm circumference (A): and (mid-) upper arm circumference; (B): were compared and A/B ratio was produced.

Study	A: forearm circumference (in inch)	B: (mid-) upper arm circumference (in inch)	A/B ratio
MSIS [10]	8.7	10.1	0.861386
Drinkwater DT [11]	9.1535	10.7322	0.8529
Drinkwater DT [11]	9.4842	11.0472	0.858516
Polymeris A et al. [12]	9.0944	9.37	0.970588

Application

1. 85% as an approximate ratio was chosen to be applied for the following reasons:

2. Easy to remember and use

3. Matches results of most of the studies found; two out of three

4. Applying the ratio of 85% in actual surgeries was complication-free and achieved harmony with the forearm [10-14]

Design (Figure 1):

1. With the upper limb in 90 abducted and supinated, measure forearm circumference (A) as shown above

2. Multiply forearm circumference (A) by 100/85 to get the ideal (mid-) upper arm circumference (B')

3. Draw a line (L) starting from the most dependent point of the redundancy proximally near axilla, following the base/lowest point of the redundancy till the elbow

4. Draw six to ten circumferential lines around arm (B1, B2, B3, ...) perpendicular to the long axis of the arm

5. Calculate the difference (D) between each current (mid-) upper arm circumference (B) and ideal (mid-) upper arm circumference (B')

6. Divide (D) by 2 (D/2)

7. Mark the circumferential lines by the distance (D/2) anterior and posterior to the line (L)

8. Connect anterior marks together and posterior marks together to define the excisable excessive tissues

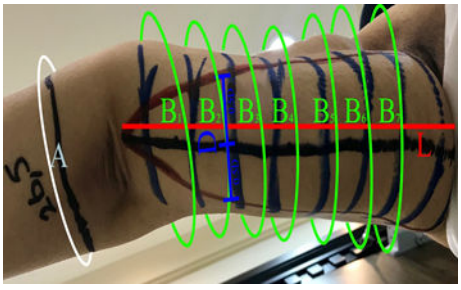

Figure 1: Illustration of Anthropometrically Correct Traditional Brachioplasty (ACTB); A: Forearm circumference; L: A line starting from the most dependent point of the redundancy proximally near axilla, following the base/lowest point of the redundancy till the elbow; B1, B2, B3, ...: circumferential lines around arm; D: difference between each current arm circumference (B) and ideal (mid-) upper arm circumference.

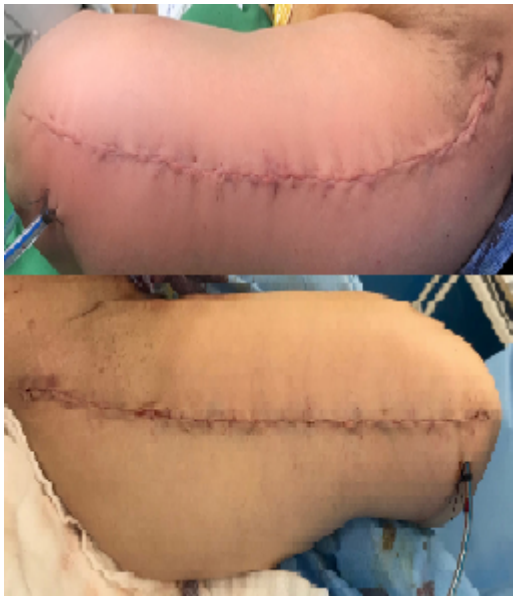

Figure 2: Intraoperative view of the closed wound.

Figure 3: Case 1 (right side), Surgery is done using ACTB principle. The postoperative photo was taken immediately after surgery.

Figure 4: Case 2 (left side), Surgery is done using ACTB principle. The postoperative photo was taken 14 days after surgery.

Figure 5: Case 3 (right side), Surgery is done using ACTB principle. The postoperative photo was taken immediately after surgery.

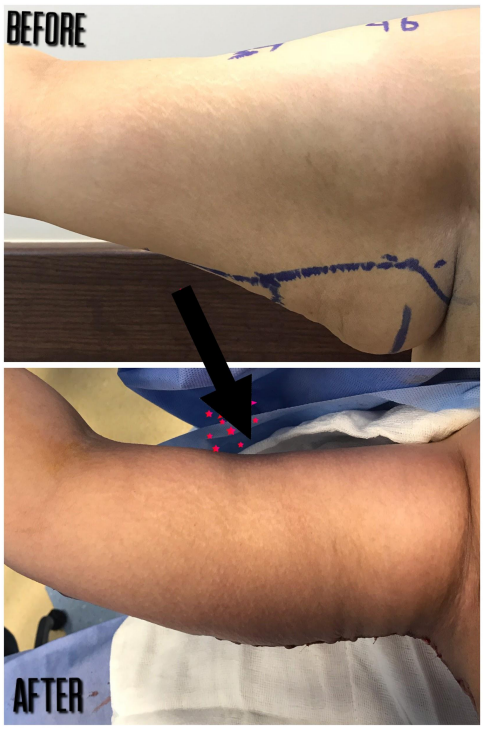

Figure 6: Case 4 (right side), Surgery is done using ACTB principle. The postoperative photo was taken immediately after surgery.

Figure 7: Case 4 (left side), Surgery is done using ACTB principle. The postoperative photo was taken immediately after surgery.

Figure 8: Case 5 (right side), Surgery is done using ACTB principle. Brachioplasty photo was taken 53 days after surgery.

Figure 9: Case 5 (left side), Surgery is done using ACTB principle. The postoperative photo was taken 53 days after surgery.

Figure 10: Case 6 (right side), Surgery is done using ACTB principle. The postoperative photo was taken 44 days after surgery.

CONCLUSION

85% as an average ratio of forearm circumference to upper arm/biceps circumference could be calculated by reviewing several anthropometric studies. The excess skin is marked in a way that makes the skin left enough to make the arm in its preoperatively calculated anthropometrically correct circumference.

The study/innovation is simple with a small sample of patients. However, it can be expanded to serve the following expectations:

1. The reviewed studies only contained female samples. Another study addressing male samples that should take the arm muscle mass and measurements in consideration as a significant factor can be interesting

2. Another study related to thigh lift using the same principle can be interesting

3. More interest should be given to the ideal place of the brachioplasty scar considering:

- Vital structures threatened
- Skin thickness variation and relation to scarring (Literature wasn't satisfying regarding that point)
- Position of the scar and if there is a variation in impact on brachial lymphatic circulation
- More accurate technology to define the site of the least noticeable Brachioplasty scar using advanced videography techniques

4. Combining the current study with the previous point results can lead to a perfect Brachioplasty technique

5. The study leads to a better understanding of the arm aesthetics and can lead to more accurate algorithm of Brachioplasty procedures containing options more than liposuction and skin excision

CONFLICT OF INTEREST

None

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