

Applying Average Anthropometric Reference Measurements to Thigh Lift Surgical Design in Females: A Novel Technique

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Abstract

Background: Thigh lift is a common procedure in plastic surgery. Surgeon's sense or tailor tacdundancy to bek is mainly the methods used for designing thigh lift currently. This article is an attempt to find a method/a reference point to define the exact amount of re excised. **Introduction:** Anthropometry reference measurements can be applied in designing thigh lift surgery. Classically, anthropometry binds the calf circumference with mid-thigh circumference and upper thigh (gluteal) circumference to make postoperative results more harmonious and natural. **Method:** To find out the anthropometrically referenced ratio of the calf circumference with mid-thigh circumference and upper thigh (gluteal) circumference, anthropometric databases and studies done on females addressing different ages, countries and races with average BMI (body mass index) were reviewed. Chosen studies should include the calf circumference, mid-thigh circumference and/or upper thigh (gluteal) circumference. Anthropometrically referenced upper and mid-thigh circumferences can be calculated preoperatively. **Result:** 64:92:100 was concluded as a pooled mean ratio out of nine different studies addressing the ratio of the calf circumference:mid-thigh circumference:upper thigh (gluteal) circumference. **Conclusion:** Postoperative anthropometrically referenced mid and upper thigh circumferences can be calculated by measuring the calf circumference and applying the 64:92:100 ratio. Markings are done intraoperatively using my innovated "Stab-Push-Pinch-Mark" or SPPM technique for drawing a rough surgical design, then tweaked using the anthropometrically referenced 64:92:100 ratio results.

Keywords

Anthropometry, Anthropometric Ratio, Thigh Lift, Calf Circumference, Mid-Thigh Circumference, Upper Thigh Circumference, Gluteal Circumference

1. Introduction

Thigh lift is a common procedure in plastic surgery. More than 10,100 thigh lift procedures were done in the United States in 2018 [1].

Thigh lift is a common procedure in plastic surgery. Surgeon's sense or tailor tack is mainly the methods used for designing thigh lift currently. This article is an attempt to find a method/a reference point to define the exact amount of redundancy needed to be excised.

Previously, I had an early attempt to apply the average anthropometric measures in brachioplasty in females. 85:100 is the forearm circumference to mid-arm circumference ratio that I have been using [2]. Thigh has a different structure from arm. In anthropometry, thigh is measured at different circumferences e.g. knee, mid-thigh and upper thigh or gluteal circumferences. Such differences have to be considered.

2. Background

Anthropometry reference measurements can be applied in designing thigh lift surgery. Classically, anthropometry binds lower limb various circumferences with muscle mass, weight and incidence of some diseases e.g. diabetes mellitus, cardiac diseases [3] [4] [5].

Calf circumference can be used as the reference point. Aesthetic thigh is not just about being tight without redundancies, but to look compatible with the calf.

3. Method

Inclusion criteria of studies:

Anthropometric databases and studies done on females addressing different ages, countries and races with average BMI (body mass index) were reviewed. Chosen studies have to include calf circumference, mid-thigh circumference and/or upper thigh (gluteal) circumference measurement methods that follow the next measures:

Calf:

- 1) The subject stands erect with their weight evenly distributed on both feet and legs slightly apart.
- 2) The measurement is taken at the level of the largest circumference of the calf. The maximal girth is not always obvious, and the tape may need to be moved up and down to find the point of maximum circumference [6].

Mid-thigh

- 1) The subject stands erect with the measured limb laterally elevated, on a chair or a table, in 90° abduction to avoid mistaken measurements by the redundant skin that will migrate downwards with gravity if the thigh is measured in a vertical position (**Figure 1**).
- 2) The circumference measure is taken at the level of the mid-point on the lateral (outer side) surface of the thigh, midway between the greater trochanter of the femur and lateral condyle of the tibia [6].

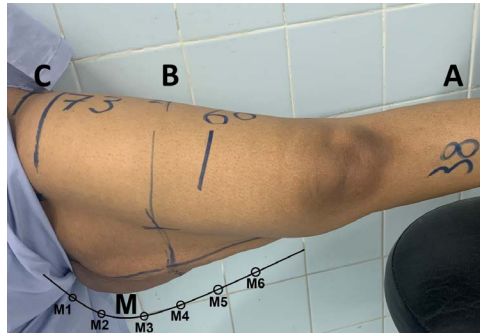


Figure 1. Subject stands erect with the measured limb laterally elevated, on a chair or a table, in 90° abduction.

Upper thigh

1) The subject stands erect with the measured limb laterally elevated, on a chair or a table, in 90° abduction to avoid mistaken measurements by the redundant skin that will migrate downwards with gravity if the thigh is measured in a vertical position (**Figure 1**).

2) The circumference measure is taken 1 cm below the gluteal line or fold (buttock crease) [6].

When recording, you need to make sure the tape is not too tight or too loose, is lying flat on the skin, and the tape held horizontal [6].

Exclusion criteria of studies

- 1) Male or mixed gender, statistics
- 2) Athletes
- 3) Current morbidities
- 4) Abnormal BMI groups
- 5) Different methods of measurement

4. Result

Nine studies were found fulfilling the above criteria. Mean values of calf circumference (A), mid-thigh circumference (B), upper thigh circumference (C) were compared and A:B:C ratio was produced, when possible, in **Table 1**.

Application

1) Pooled mean was calculated for each variable (A, B, C) to put variation in sample sizes in consideration.

2) Results were as following:

Pooled mean of calf circumference (A) = 36.96 cm

Pooled mean of mid-thigh circumference (B) = 53.06 cm

Pooled mean of upper thigh circumference (C) = 57.69 cm

3) A:B:C = 64.04:91.97:100 ≈ 64:92:100

Design

1) The subject stands erect with the measured limb laterally elevated, on a chair or a table, in 90° abduction to avoid mistaken measurements by the redundant skin that will migrate downwards with gravity if the thigh is measured in a vertical position (**Figure 1**).

Table 1. Nine studies were found fulfilling the above criteria. Mean values of calf circumference (A), mid-thigh circumference (B), upper thigh circumference (C) were compared.

Study	Sample size	A: calf circ (in cm)	B: mid-thigh circ (in cm)	C: Upper thigh Circ (in cm)
MSIS [7] (50th percentile)	26	34.10	-	51.60
Drinkwater DT [8]				
<i>Embaled (left)</i>	13	30.43	39.13	48.81
<i>Embaled (right)</i>	13	30.74	40.21	49.07
<i>Unembaled (left)</i>	13	30.99	43.18	51.43
<i>Unembaled (right)</i>	13	29.57	42.73	51.47
<i>Both groups (left)</i>	13	30.73	41.31	50.22
<i>Both groups (right)</i>	13	30.11	41.57	50.36
ANSUR [9] (Mean calculated)	2208	35.23	-	58.02
ANSUR II [10] (Mean calculated)	1986	37.32	-	61.61
Liu <i>et al.</i> [11]	128	35.00	47.00	54.00
Dessalew <i>et al.</i> [12]	16	23.30	-	36.90
Churchill <i>et al.</i> [13]				
<i>White</i>	1742	33.50	-	54.60
<i>Black</i>	146	34.20	-	55.20
<i>Asian</i>	17	33.30	-	51.50
McDowell <i>et al.</i> [14]	A	B		
<i>All races</i>	4133	4065	38.40	52.90
<i>Non-Hispanic white</i>	2124	2093	38.40	52.50
<i>Non-Hispanic black</i>	612	888	39.60	58.00
<i>Mexican American</i>	789	776	37.30	52.00
Stirling [15]	153	36.88	-	59.27

2) Measure and record the maximum circumference of the calf (A), mid-thigh circumference (B), upper thigh circumference (C). Mark the three levels circumferentially (**Figure 1**).

3) Calculate the (64:92:100) ratio using the maximum circumference of the calf (A) as a reference value. Results will be taken as reference points to modify the final surgery design.

4) Mark the most medial line of the thigh (M) *i.e.* the lowest line of the redundancy in the 90° abduction position. It is supposed to start from the adductor longus tendon by its origin till the medial aspect of the knee (**Figure 1**). Mark several points on the line (M) with around 10 cm in between. Points will be M1, M2, M3, etc. (**Figure 1 & Figure 2**).

5) Start the surgery in lithotomy position. At each point on the line (M), start the (Stab-Push-Pinch-Mark) or SPPM technique to mark the maximum skin closure limits (**Figure 3**).

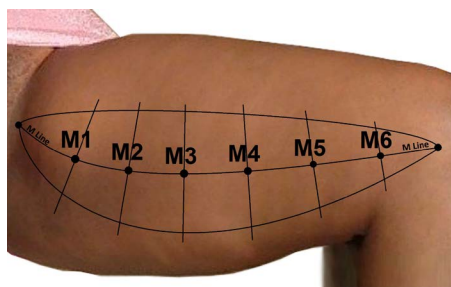


Figure 2. “Anthropometrically referenced Thigh Lift” or (ACTL) final surgical design. I do (Stab-Push-Pinch-Mark) or SPPM technique on each point from M1 to M6 along the M-Line, the most medial line of the thigh, to mark the maximum skin closure limits, then connect the points and draw a surgical design.

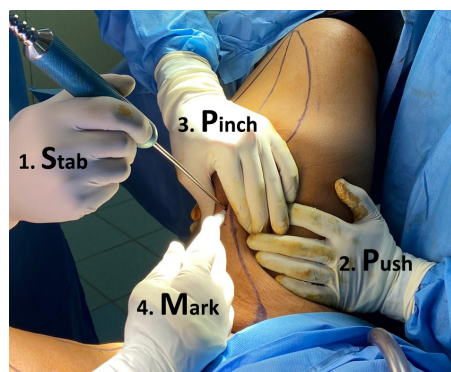


Figure 3. (Stab-Push-Pinch-Mark) or SPPM technique to mark the maximum skin closure limits. Head surgeon (one hand): Push a liposuction cannula or a graded blunt rod perpendicularly against the skin like a stab on one of the (M) points. Assistant 1 (both hands): Push the thigh tissues in a parallel and opposite direction to the cannula. Head surgeon (the other hand): Pinch the skin above and below the cannula to get the maximum capacity of skin closure. Assistant 2 (one hand): Mark the pinched points anterior and posterior to the cannula. Repeat the steps on each M point from M1 to M6.

6) Connect the points and draw a rough surgical design. Slightly, curve the design out distally to be more convex at the distal end to avoid dog ear by the knee side (**Figure 2**).

7) Compare “Anthropometrically referenced Thigh Lift” or (ACTL) to (Stab-Push-Pinch-Mark) or SPPM technique results. Apply “Anthropometrically referenced Thigh Lift” or (ACTL) results to modify the surgical design, then check symmetry.

8) Within the marked, to-be-excised, area, inject tumescent and start extensive liposuction, leaving thin skin.

9) Peel the skin by diathermy very superficially to spare lymphatics. However, I prefer going slightly deeper by the far distal end of the wound to avoid dog ear formation by the knee side, then close the wound and check symmetry.

10) Push the wound line proximally, with a medium strength, towards the origin of adductor longus. Mark the point where the wound line will meet the beginning of the adductor longus tendon (**Figure 4**).



Figure 4. Push the wound line proximally, with a medium strength, towards the origin of adductor longus. Mark the point where the wound line will meet the beginning of the adductor longus tendon. Design a diamond shape (shaded in green) that will be closed to form the new inner crotch line to defy vertical redundancy.



Figure 5. Intraoperative results.



Figure 6. Results 14 days after surgery.

11) Design a diamond shape that will be closed to form the new inner crotch line to defy postoperative vertical redundancy. Anchor the flaps to one stationary point or more e.g. pubic bone, inguinal ligament or adductor longus tendon to distribute the main weight and avoid secondary descent of the scars, and divarication of the labia majora (**Figure 4**).

5. Conclusion

Postoperative anthropometrically referenced mid and upper thigh circumferences can be calculated by measuring the calf circumference and applying the 64:92:100 ratio. Markings are done intraoperatively using my innovated “Stab-Push-Pinch-Mark” or SPPM technique for drawing a rough surgical design, then tweaked using the anthropometrically referenced 64:92:100 ratio results to make an anthropometrically correct thigh lift (**Figure 5, Figure 6**).

Data Availability

The author confirms that the data supporting the findings of this study are available within the article.

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Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this paper.

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