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Gluteal Region Morphology: The Effect of the Weight Gain and Aging

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Abstract. The gluteal region is an important secondary sexual character itself and it has its place in the concept of the beauty in all communities. Interestingly, as far as we know, there is not any previous study addressing gluteal region morphology in an objective way in the aesthetic surgery literature. The aim of this study was to define the changes of the gluteal region morphology with aging and weight gain.

Beside body weight, a total of five distances between predetermined anatomic points in gluteal region were measured on randomly selected 115 female volunteers, with their age ranging from 17 to 48 years (mean 22.7). All the records were analyzed by a correlation matrix using computer-based SPSS 7.5 program.

As women grow older, the width of the gluteal region decreases and the gluteal sulcus elongates laterally and inferiorly. Contrary to aging, with weight gain the gluteal region becomes wider as the gluteal sulcus gets shorter.

Although the subject does not sound new, our study is the first, documenting the changes in morphology of the gluteal region in relation to weight gain and aging in an objective way.

Key words: Gluteal region morphology—Anthropometrics—Body sculpturing

The gluteal region, which is formed mainly by the gluteal muscles on each side, lies behind the pelvis, and extends from the iliac crest, superiorly, to the gluteal fold, inferiorly [10]. The gluteal groove or crease, located inferior to the gluteal fold, draws the inferior border of the gluteus maximus muscle. The gluteus medius muscle forms the superolateral part of the gluteal region [5].

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On the other hand, the gluteal region, commonly known as buttocks, mean more than this anatomical description. Its shape and dimensions dictate whether the person rising above this part is sexy, attractive, good-looking, or not. The pattern of fat distribution in gluteal region was studied intensively by various methods such as ultrasound [6,7], computed tomography [8], MRI [1], waist-to-hip ratio [9], and direct skin fold thickness measurements [4]. From the aesthetic surgery point of view, the reflections of the weight gain and aging on gluteal region morphology remained untouched, since the change in the shape of the buttocks is not a consequence of the fat accumulation alone. The aim of this study was to evaluate the metamorphosis in the gluteal region with aging and weight gain. To the best of our knowledge, there is not any previous study addressing this subject.

Material and Methods

All measurements were performed by the same senior anatomist (RG) on 115 randomly selected female volunteers, ranging in age from 17 to 48 years (mean 26.4), in a comfortable room with daylight. Subjects were totally naked and stood barefoot on an anatomical position. The criteria to exclude the subjects included obesity (Body Mass Index >30%), emaciation (Body Mass Index <18%), a history of congenital hip dislocation, major trauma to and operation of the gluteal region, and pregnancy. The weight and height of the patients were recorded routinely.

In this study, beside the basic anatomical reference points such as posterior superior iliac spine (PSIS) and greater trochanter, new but reliable points namely most lateral end of the gluteal sulcus and cephalic end of the intergluteal sulcus were used (Table 1, Fig. 1). The distance between two horizontal lines; the line connecting right and left PSIS (AA) and the line passing through

Table 1. The description of anatomical landmarks, which were taken as reference points in the gluteal region. These points are easily identifiable, reliable, and objective

Point A	Posterior-Superior Iliac Spine (PSIS)
Point B	Lateral end-point of the greater trochanter
Point C	The most caudal point of the gluteal sulcus
Point D	The most cephalic point of the intergluteal sulcus
Point E	The most caudal point of the intergluteal sulcus
Point F	Lateral end-point of the gluteal sulcus

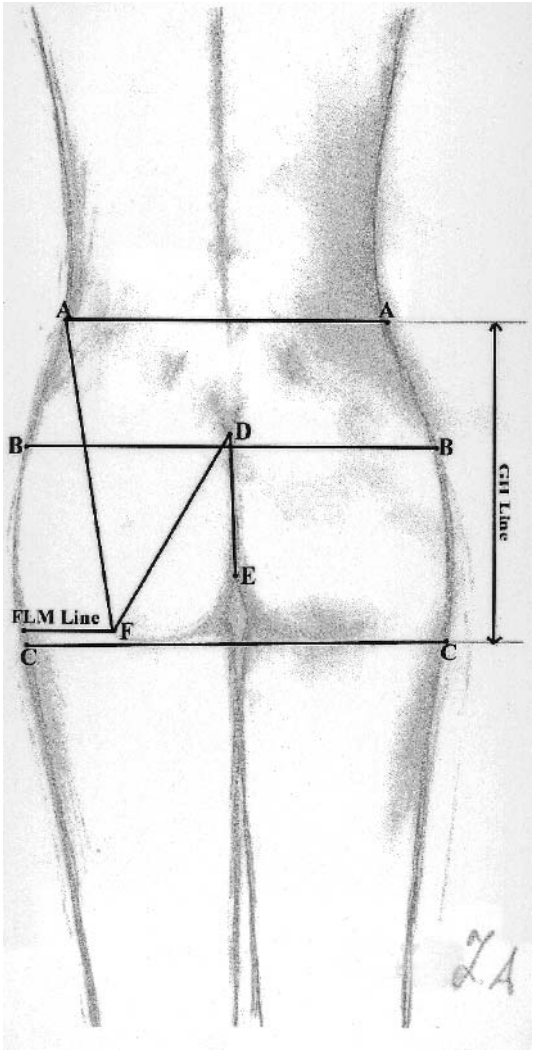

Fig. 1. Schematic presentation of anatomical landmarks.

most caudal points (CC) of the both gluteal sulcus was accepted as the height of the gluteal region (Table 2, Fig. 1). In the same way, BB line connecting two trochanters, gave the width of the same area. To figure out lateral extension of the gluteal sulcus, the distance from the most lateral point of the gluteal sulcus (point F) to mid-axillary line (FML) was recorded. Down sloping of the gluteal sulcus was estimated by recording distance from point F to the most cephalic part of the intergluteal sulcus

Table 2. Definitions of the lines drawn between reference points

AA line	The line drawn between right and left PSIS*
BB line	The line drawn between greater trochanters
DE line	The line drawn between most cephalic and caudal points of the intergluteal sulcus
GH line	The line intersecting AA and CC lines in a right angle
FLM line	The line drawn from most lateral point of gluteal sulcus (point F) to mid-axillary line
AF line	The line drawn from PSIS* (point A) to the most lateral point of gluteal sulcus (point F)
DF line	The line drawn from the most cephalic point of the intergluteal sulcus (point D to the most lateral point of gluteal sulcus (point F)

* Posterior Superior Iliac Spine.

(point D) and ipsilateral PSIS (point A), respectively (Table 2, Fig. 1). All records were analyzed by correlation matrix using computer based SPSS 7.5 program. Statistical significance was presumed at $p < 0.05$.

Results

One hundred-fifteen women with a mean age of 26.4 years (17–48) were evaluated. The average height and weight were 163.1 cm (154–175 cm) and 55 kg (40–85 kg), respectively.

Weight. (Table 3, Fig.): Overall, weight was in significant correlation with all parameters listed in Table 2. Increments of weight have led to the widening of the gluteal region (BB: distance between greater trochanters), and to an increase in the gluteal height (GH: the distance between two horizontal lines passing through two PSIS and C-points, respectively) ($p < 0.01$). The effect of weight gain on the gluteal sulcus was significant ($p < 0.01$). The distances from PSIS (A point) and most cephalic point of the intergluteal sulcus (D point) to most lateral point of the gluteal sulcus (F point), representing downward displacement of the sulcus, increased as the weight records increased. Intergluteal sulcus was also lengthened with weight gain ($p < 0.01$). FLM distance, which was inversely correlated with lateral extension of gluteal sulcus, has increased as the weight of the subjects increased ($p < 0.01$).

Age. (Table 3, Fig. 1): Another major determinant of the morphology of gluteal region was age. As subjects got older, the height of gluteal region (GH), and of intergluteal sulcus (DE) increased, correspondingly ($p < 0.05$). Aging, as weight gain did, caused down sloping of gluteal sulcus as DF and AF distances were lengthened ($p < 0.05$). Contrary to weight gain, with aging the width of the gluteal region had tendency to get narrower ($p < 0.05$) while gluteal sulcus extended laterally (decreased FLM distance) ($p < 0.05$). There was no significant cor-

Table 3. There was a significant correlation between age and weight of subjects and parameters of the gluteal region morphology. The arrowheads show whether measured distance increase or decrease as the weight or age records change

	BB	GH	DE	DF	AF	FLM
Weight	▲*	▲*	▲*	▲*	▲*	▲*
Age	▼#	▲#	▲#	▲#	▲#	▼#

▼, decrease; ▲, increase; #, $p < 0.05$; *, $p < 0.01$.
BB: The distance between greater trochanters; DE: The distance between most cephalic (point D) and caudal points of the intergluteal sulcus (point E); GH: Distance between AA line and CC line; DF: Distance from most cephalic point of the intergluteal sulcus (point D) to the most lateral point of gluteal sulcus (point F); AF: Distance from PSIS (point A) to the most lateral point of gluteal sulcus (point F); FLM: Distance from most lateral point of gluteal sulcus (point F) to mid-axillary line.

relation between subject's height and gluteal region parameters.

Discussion

As in the shape of breasts [11], eyelids [12], and ears [2], there is a common sense about how the shape of attractive female buttocks should be in the current western culture. This form is deformed mainly by aging and weight gain. In this study, we attempted to document the effect of these two factors on the gluteal morphology in a consistent and reproducible manner.

Weight gain had significant correlation with consistently all measurements of the gluteal region (Table 3, Fig. 1). Height and intertrochanteric distance (width) of the gluteal region, and intergluteal sulcus elongated noticeably as the patient gains weight ($p < 0.01$). Surprisingly, length of the gluteal sulcus had inverse correlation with weight, in other words; this anatomical formation became shorter as the weight of the subjects was increased, contradicting common expectation ($p < 0.01$). There may be two explanations for this finding; firstly, the expanding nature of the fat accumulation may cause vanishing of distal part of the sulcus, or secondly (and more probably), fat accumulation over the lateral part of the upper limb in the case of the female type weight gain may increase the FLM distance.

As women grow older, our measurements show that the height of the gluteal region increased significantly ($p < 0.05$) and gluteal sulcus lengthened laterally and inferiorly ($p < 0.05$) (Table 3, Fig. 1). At the first glance, it would be difficult to explain the decrease in gluteal width (intertrochanteric distance–BB) with aging when we consider the reports of Murakami [6,7]. In his studies, he has demonstrated an increase in the subcutaneous fat tissue volume, especially located in the lower part of the body, including gluteal region, with aging. The width of the gluteal area should have widened with aging when Murakami's results were taken into account, but it was just contrary in our study. The reason for this discrepancy might be the measurement methods. In this study, all the measurements were taken using predetermined and consistent anatomical landmarks. Naturally, with aging, skin and other supporting structures lose their elasticity and resistance to gravity. Therefore, it would be possible to consider inferior displacement of the whole gluteal mass with aging, leading the widest part of the gluteal region moved inferiorly so that while buttocks keep getting wide, intertrochanteric distance decreases.

In this respect, what kind of approach in the body sculpturing operation would make the gluteal region slimmer and younger looking? Basically, when we consider the results of this study, the answer is shortening of the gluteal sulcus as much as possible, lifting gluteal mass (decreasing of the gluteal region vertical height), and giving volume and smooth curvature to the lateral sides of the gluteal region.

Conclusion

As advocated by Illouz [3], the gluteal region reshaping is not only a reduction procedure; rather it is a combination of both reduction and augmentation. If the harmony between proportions were ignored to obtain just a slimmer gluteal region, the results would be poorer than would be expected. The aim should be harmony, even in the price of relatively increased body size.

Like the concept of beauty, the ideal gluteal shape has been changing through decades and cultures. For this reason, the aim of this study was not to dictate the ideal shape of this region but to appraise the relations of the proportions of the gluteal region with each other, with aging and weight gain in an objective way.

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