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ARTICLE

Anthropometric breast measurements of young women with no history of pregnancy or surgery in Turkey

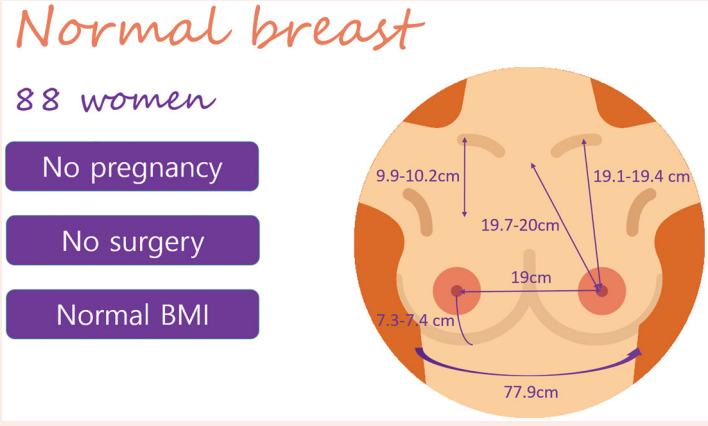
Anıl Demiröz[a], Arif Türkmen[a], Tuğba Feryal Yıldız[b] and Başak Dağhan[a]

[a]Department of Plastic, Reconstructive and Aesthetic Surgery, Cerrahpasa Faculty of Medicine, Istanbul University-Cerrahpasa, Istanbul, Turkey; [b]Department of Plastic, Reconstructive and Aesthetic Surgery, Bakırköy Sadi Konuk Training and Research Hospital, Health Sciences University, Istanbul, Turkey

ABSTRACT

Anthropometric measurements of the breast play a guiding role in surgical planning. In our study, it was aimed to determine the normal shape and size of the breast by taking measurements in young women who did not experience pregnancy or surgery and comparing them with the results of other studies. The breast parameters of 88 women aged between 18 to 30 years old, with a normal body mass index, with no history of previous pregnancy, surgery or rapid weight gain were measured. The measured parameters were age, body mass index, cup size, distance between nipple and suprasternal notch, distance between both nipples, distance between midclavicular point and nipple, distance between midclavicular point and upper border of the breast, the distance between the midaxillary line and nipple, the distance between the nipple and inframammarian fold, the projection of the breast, the projection of the nipple and the chest circumference under the breast. The mean values were determined and the correlation between the parameters was evaluated statistically. A significant correlation was found between cup size and all parameters except for the chest circumference and nipple projection. The distance between the midclavicular point and upper border of the breast was found correlated with the cup size. In addition, a significant correlation was found between body mass index and all other parameters. This study revealed the average breast size and measurements of women in Turkey. It can be useful to guide for both reconstructive and aesthetic procedures of the breast.

GRAPHICAL ABSTRACT



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Introduction

Breast is an important organ that affects women's sexual identity. Therefore, it is targeted both by aesthetic and reconstructive surgery. Although several techniques have been defined for the planning of breast operations, a standard measurement protocol is not yet available. Anthropometric studies about ideal breast shape, size, and location are few in number and usually have been conducted on subjects with breasts often described as 'perfect' [1,2] instead of concentrating on the normal values of the population [3].

Although aesthetically good looking breast has been defined as the breast with a size and volume proportional to the rest of the body, which is conical or tear-shaped, showing minimal ptosis and the nipple located at the most anterior location [2]; the ideal and normal size, shape and location may vary in between different races.

CONTACT Anıl Demiröz anil.demiroz@istanbul.edu.tr Department of Plastic, Reconstructive and Aesthetic Surgery, Istanbul University-Cerrahpasa, Cerrahpasa Faculty of Medicine, Cerrahpaşa Tıp Fakültesi Plastik Cerrahi Anabilim Dalı, Fatih, Istanbul, 34098, Turkey
This study was presented at 39th Turkish National Congress of Plastic, Reconstructive and Aesthetic Surgery, Antalya, Turkey in 2017 as an oral presentation.

The aim of this study was to determine the normal breast size and location in young women who had no previous pregnancy or breast surgery and had normal body mass index (BMI) (18.5–25). We think that the obtained data may guide in the planning process of surgical procedures of the breast.

Materials and methods

The study was conducted between November 2016 and May 2017 after the approval of the Local Clinical Ethics Committee. All participants were given and signed an informed consent form. Measurements were performed in 100 randomly selected women between 18–30 years of age, who had never given birth, had no breast surgery, and had no history of rapid weight gain. Low-weight participants with a BMI of less than 18.5 ($n = 2$) and overweight participants with a BMI of more than 25 ($n = 10$) were excluded from the study.

All measurements were performed by the same plastic surgeon with the patient in the anatomical position; the participant was held in standing position, arms on both sides, palms facing anteriorly. 11 different parameters were defined in order to evaluate the breast placement, anatomical shape and overall body structure; (1) body mass index (BMI), (2) suprasternal notch to nipple distance (SNL), (3) distance between two nipples (NNL), (4) distance between midclavicular point and nipple (CNL), (5) distance between midclavicular point and upper border of the breast (CSL), (6) mid-axillary line to nipple distance (MNL), (7) inframammarian fold to nipple distance (IR), (8) breast projection (BP), (9) nipple projection (NP), (10) inframammarian chest circumference (CC), (11) cup size (Figures 1 and 2). Cup measurement was performed using the method previously described by Pechter [4].

Statistical analysis: For the descriptive statistics of the data, mean, standard deviation, median lowest, highest, frequency and ratio values were used. Distribution of variables was measured by Kolmogorov Simirnov test. Wilcoxon test was used for the analysis of dependent quantitative data. Spearman Correlation Analysis was used for correlation analysis. IBM SPSS Statistics for Windows, Version 22.0 *(Armonk, NY: IBM Corp.)* was used for analysis.

Results

The mean age was 25.1 (18–30) years. The mean body mass index was determined as 21.1 (18.5–25). The mean SNL was 20 (15–31.5) cm on the right, 19.7 (15.5–31) cm on the left, the mean NNL was 19 (14–27) cm, the mean CNL was 19.1 (15–30) cm on the right, 19.4 (14.5–32) cm on the left, the mean CSL was 10.2 (6–16) cm on the right, 9.9 (6.5–15) cm on the left, the mean MNL was 13.6 (10.5–19) cm on the right, 13.8 (10–20) cm on the left, the IR was 7.3 (5–14) cm on the right, 7.4 (4–16) cm on the left, the mean BP was 10.9 (7–19) cm on the right, 11 (7–20) cm on the left, the mean NP was 4 (1–9) mm on the right, 3.9 (1–10) mm left, the mean CC was measured as 77.9 (65–94) cm (Table 1). Cup sizes were A in 26 women, B in 21 women, C in 19 women, D in 10 women, DD in 3 women, E in 5 women, and F in 4 women.

There was no significant correlation between age and SNL, CNL, NNL, CSL, MNL, IR, CC, BP measurements ($p > 0.05$). There was a significant positive correlation between BMI and SNL, CNL, NNL, CSL, MNL, IR, CC, BP, NP ($p < 0.05$) (Table 2).

The SNL value on the right side was significantly higher than the left side ($p < 0.05$). The CNL value on the left side was significantly higher than the right side ($p < 0.05$). CSL on the right side was significantly higher than the left side ($p < 0.05$). MNL, IR, BP and NP values did not differ significantly between the right and left sides ($p > 0.05$) (Table 1).

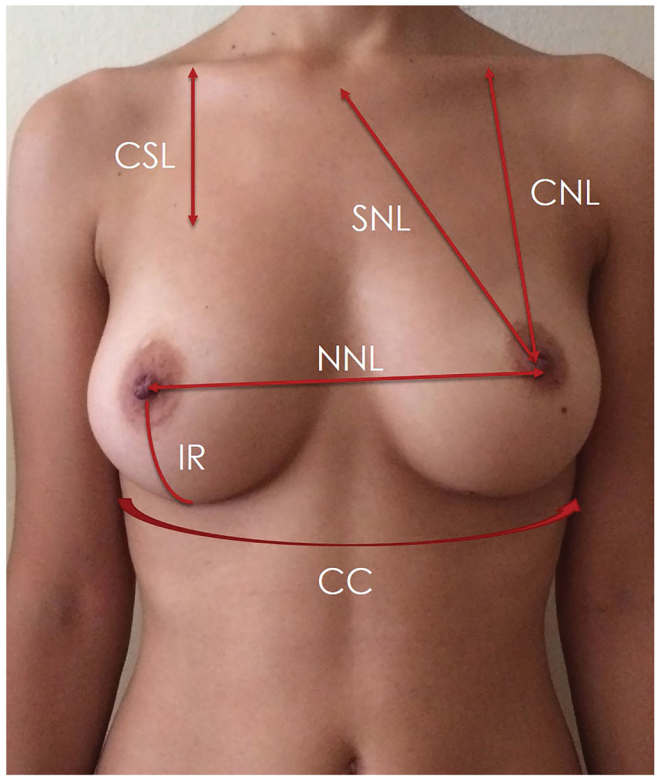

Figure 1. Breast measurement points on the anterior view. SNL: suprasternal notch to nipple distance; NNL: distance between two nipples; CNL: distance between midclavicular point and nipple; CSL: distance between midclavicular point and upper border of the breast; IR: inframammarian fold to nipple distance; CC: inframammarian chest circumference.

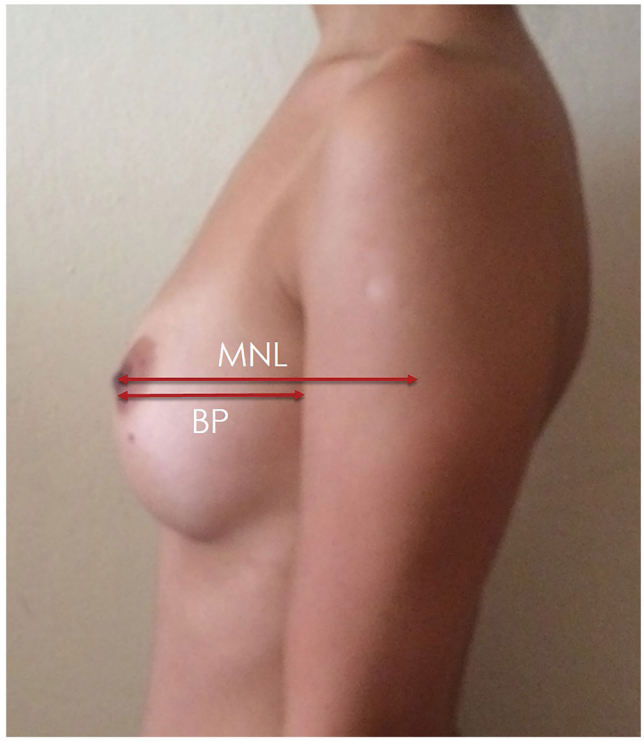

Figure 2. Breast measurement points on the lateral view. MNL: mid-axillary line to nipple distance; BP: breast projection.

Table 1. Mean, standard deviation, median, minimum and maximum values.

	Min-Max	Median	Mean ± S. D.	*p*
SNL				
Right	15.0–31.5	19.3	20.0 ± 3.1	***0.009***[w]
Left	15.5–31.0	19.0	19.7 ± 2.9	
Difference	−1.0–2.0	0.5	0.3 ± 0.9	
CNL				
Right	15.0–30.0	19.0	19.1 ± 2.5	***0.021***[w]
Left	14.5–32.0	19.0	19.4 ± 2.9	
Difference	−3.0–1.5	0.0	−0.3 ± 0.9	
CSL				
Right	6.0–16.0	10.0	10.2 ± 2.2	***0.003***[w]
Left	6.5–15.0	10.0	9.9 ± 2.2	
Difference	−2.0–2.0	0.0	0.2 ± 0.8	
MNL				
Right	10.5–19.0	13.0	13.6 ± 1.9	0.062[w]
Left	10.0–20.0	13.5	13.8 ± 1.9	
Difference	−2.0–2.0	0.0	−0.2 ± 0.8	
IR				
Right	5.0–14.0	7.0	7.3 ± 1.6	0.949[w]
Left	4.0–16.0	7.0	7.4 ± 2.0	
Difference	−2.0–2.0	0.0	0.0 ± 0.8	
BP				
Right	7.0–19.0	11.0	10.9 ± 2.6	0.298[w]
Left	7.0–20.0	11.0	11.0 ± 2.9	
Difference	−3.5–2.0	0.0	−0.1 ± 0.9	
NP				
Right	1.0–9.0	4.0	4.0 ± 1.8	0.140[w]
Left	1.0–10.0	4.0	3.9 ± 1.8	
Difference	−2.0 − 3.0	0.0	0.1 ± 0.8	

[w]*Wilcoxon test*.
SNL: suprasternal notch to nipple distance; CNL: distance between midclavicular point and nipple; CSL: distance between midclavicular point and upper border of the breast; MNL: mid-axillary line to nipple distance; IR: inframammarian fold to nipple distance; BP: breast projection; NP: nipple projection.
Significant differences in left and right values ($p < .05$) are marked in bold italic text.

Table 2. Correlation analysis of breast measurement values with age, BMI and cup size.

	SNL	NNL	CNL	CSL	MNL	IR	CC	BP	NP
Age									
r	0.104	−0.019	0.206	−0.003	−0.003	0.066	−0.062	0.134	0.254
p	0.334	0.860	0.055	0.974	0.977	0.544	0.565	0.213	***0.017***
BMI									
r	0.611	0.303	0.493	0.414	0.220	0.427	0.216	0.530	0.283
p	***0.000***	***0.004***	***0.000***	***0.000***	***0.039***	***0.000***	***0.043***	***0.000***	***0.007***
Cup size									
r	0.658	0.339	0.614	0.489	0.304	0.591	−0.117	0.975	0.159
p	***0.000***	***0.001***	***0.000***	***0.000***	***0.004***	***0.000***	0.279	***0.000***	0.140

Spearman Correlation Analysis.
BMI: Body mass index; SNL: suprasternal notch to nipple distance; NNL: distance between two nipples; CNL: distance between midclavicular point and nipple; CSL: distance between midclavicular point and upper border of the breast; MNL: mid-axillary line to nipple distance; IR: inframammarian fold to nipple distance; CC: inframammarian chest circumference; BP: breast projection; NP: nipple projection.
Significant correlation was accepted as $p < .05$ and marked by bold italic text.

SNL values were positively correlated with all other parameters except for the CC ($p < 0.05$). There was a significant positive correlation of CNL with SNL and NNL values ($p < 0.05$). CSL values were found to be significantly correlated with SNL and CNL values ($p < 0.05$). IR was found to be positively correlated with SNL, NNL, CNL, CSL, MNL values ($p < 0.05$). There was no significant correlation between CC and other parameters ($p > 0.05$) (Table 3).

Cup size was found to be positively correlated with SNL, NNL, CNL, CSL, MNL, IR, BP values but not with CC and NP values (Table 2).

Table 3. Correlation analysis in between breast measurement values.

	SNL	NNL	CNL	CSL	MNL	IR	CC	BP
NNL								
r	0.385							
p	***0.000***							
CNL								
r	0.748	0.274						
p	***0.000***	***0.010***						
CSL								
r	0.446	0.119	0.421					
p	***0.000***	0.270	***0.000***					
MNL								
r	0.437	0.146	0.297	0.190				
p	***0.000***	0.175	***0.005***	0.077				
IR								
r	0.461	0.270	0.246	0.403	0.220			
p	***0.000***	***0.011***	***0.021***	***0.000***	***0.040***			
CC								
r	0.171	0.189	−0.088	−0.148	0.206	0.009		
p	0.111	0.078	0.415	0.169	0.054	0.935		
BP								
r	0.646	0.329	0.629	0.451	0.310	0.572	−0.171	
p	***0.000***	***0.002***	***0.000***	***0.000***	***0.003***	***0.000***	0.112	
NP								
r	0.279	0.328	0.358	0.085	0.060	0.134	0.042	0.181
p	***0.008***	***0.002***	***0.001***	0.430	0.577	0.213	0.695	0.092

Spearman Correlation Analysis.
SNL: suprasternal notch to nipple distance; NNL: distance between two nipples; CNL: distance between midclavicular point and nipple; CSL: distance between midclavicular point and upper border of the breast; MNL: mid-axillary line to nipple distance; IR: inframammarian fold to nipple distance; CC: inframammarian chest circumference; BP: breast projection; NP: nipple projection. Significant correlation was accepted as $p<.05$ and marked by bold italic text.

Discussion

Both aesthetic and reconstructive surgical procedures are commonly performed in the breast. Nevertheless, the number of studies regarding the normal size and placement of the breast is limited. Breast is an organ with a wide variety in shape, size and location. Racial characteristics also play a role in this diversity.

The first report on this subject can be found in Penn's 1955 article [1]. After measurements were made on 150 women, 20 of them were evaluated as 'perfect breast' by the author and only the results of this sample group were reported.

In 1986, Smith published a larger series of measurements on 55 women [5]. Although including the subjects with 'perfect breasts' was aimed in this study; the sample group was composed of women who responded to a newspaper ad; therefore, the study remained weak to reflect the 'normal' values. In his 1997 study, Westreich focused again on the concept of 'perfect breast' making the measurements on 50 women with no ptosis and no need for surgery and comparing the results with the two previous studies [2].

In 1999, Brown performed the first study that concentrated on the concept of average measurements of normal breasts instead of the ideal [3]. In this study, measurements of 60 women who had no history and no request of breast surgery were made and compared with those of 25 women who applied for enlargement or reduction mammoplasty.

In the 2002 study of Vandeput, measurements were made in 973 women for breasts defined as 'aesthetically near perfect' [6]. However, it is stated that the majority of these women have applied for augmentation mammoplasty operation. Despite the large size of the series, this patient group with the desire of breast surgery was insufficient to reflect the normal breast values.

Avsar in 2010, similar to our study, has revealed normal breast parameters for Turkey taking the measurements of 385 college students with normal BMI and no history of pregnancy [7]. A similar regional study was conducted by Qiao to evaluate the mean breast values of Chinese women [8].

In his 2013 study which aimed to define a predictive formula for breast assessment, Longo had researched the correlation between anthropometric values and breast volume in woman who underwent modified radical mastectomy [9]. Although there were no age or weight limitations in this study, using the direct weight of the mastectomy material gave countable results for volume determination. In addition to describing to formula, a useful app to be used on mobile phones and tablets was also created as a result of this study.

The age group in our study was restricted to 18 to 30 years old, which could be described as young. While no such restriction was made in many studies, only Avşar's 2010 study conducted measurements on university students aged 18–26 [7]. The mean age in this study was reported to be 19.6. This study was conducted on a relatively young group. We think that the average age of 25.1 in our study may be more decisive in reflecting the information about young women. Moreover, in any study other than Avşar's article, it was not mentioned if the women in the sample groups had previous pregnancy or surgery. Since previous pregnancy and surgical procedures may change breast size and shape, we excluded these patients in our study.

Although it has been shown that as the age increases, all the breast marking points are displaced towards the inferior [3]; we did not observe such a relationship in our sample group. It may be due to the age restriction in our study. On the other hand, although we limited our sample group to women with BMI within normal limits, we observed an increase in all measurement parameters with the increase in BMI. It has been shown in previous studies that the increase in body weight also causes an increase in breast volume due to fat content [2].

In our study, the cup size was significantly correlated with all parameters except CC. This information is consistent with the results of previous studies [6]. It was concluded that all these parameters should be taken into consideration when planning aesthetic or reconstructive breast shaping operations.

It should be noted that the distance between the midclavicular point and the upper breast border (CSL), which was not evaluated in previous studies, is also included in these parameters and has an important place in planning. In low-seated breasts where this distance is long; it is thought that distances such as SNL and CNL should be kept proportionally long.

Mean SNL distance was similar to other studies. The mean SNL value of Qiao was 19.05 cm and Avşar was 19.6 cm, which was 19.85 cm in our study. The mean SNL distance was 20 cm on the right and 19.7 cm on the left. In Longo's study, assessment of a remarkably older patient group revealed a higher SNL distance of 24.73 cm.

IR distance was reported as 6.74 cm in Penn's study, 6.46 cm in Smith's study, 6.95 cm in Westreich's study and 6.94 cm in Vandeput's study. In Avşar's study, the mean IR distance was found the longest; 8.3 cm. In our study, we determined the IR distance to be 7.3 cm on the right and 7.4 cm on the left. The fact that the IR distance was longer in these two studies compared to other studies could be interpreted as a racial feature. However, unlike the other studies, Avşar's and our study evaluated the average women, not the samples with the 'ideal breasts'. This difference in the IR distance may be due to the higher ptosis rate in average women compared to the 'ideal' group. Longo's study with the oldest sample group and the longest IR distance of 9.26 cm also supports this opinion.

The effect of chest circumference on breast size is controversial. Although Qiao suggested that the chest circumference was directly proportional to the breast volume [8], Vandeput concluded that the chest circumference and the cup size were independent [6]. In our study, chest circumference was found to be unrelated to all parameters including cup size.

The relatively small size of the sample group compared to other studies was a limitation of our study [6,7]. The main reason for this was thought to be the conservative structure of the society. Many women refused to provide data for the study because of embarrassment. However, based on the results of statistical analysis; we believe that our randomly selected sample group was adequate to provide data.

In our study, the normal values and correlation of breast measurement parameters in young women with no history of surgery or pregnancy were investigated. The distances affecting the cup size were evaluated. The distance between the midclavicular point and the upper border of the breast (CSL), which was not mentioned in the previous studies, was found to be correlated with other parameters. We think this study along with other similar anthropometric studies will guide in the planning of aesthetic and reconstructive surgical procedures of the breast.

Disclosure statement

The authors have no conflicts of interest to declare.

ORCID

Anıl Demiröz http://orcid.org/0000-0001-6182-6939
Arif Türkmen http://orcid.org/0000-0001-8774-830X
Tuğba Feryal Yıldız http://orcid.org/0000-0002-8531-1515
Başak Dağhan http://orcid.org/0000-0002-7268-8989

References

[1] Penn J. Breast reduction. Br J Plast Surg. 1954;7:357–371.
[2] Westreich M. Anthropomorphic breast measurement: protocol and results in 50 women with aesthetically perfect breasts and clinical application. Plast Reconstr Surg. 1997; 100(2):468–479.
[3] Brown TP, Ringrose C, Hyland RE, et al. A method of assessing female breast morphometry and its clinical application. Br J Plast Surg. 1999;52(5):355–359.
[4] Pechter EA. A new method for determining bra size and predicting postaugmentation breast size. Plast Reconstr Surg. 1998;102(4):1259–1265.
[5] Smith DJ Jr, Palin WE Jr, Katch VL, et al. Breast volume and anthropomorphic measurements: normal values. Plast Reconstr Surg. 1986;78(3):331–335.
[6] Vandeput JJ, Nelissen M. Considerations on anthropometric measurements of the female breast. Aesthetic Plast Surg. 2002;26(5):348–355.
[7] Avşar DK, Aygit AC, Benlier E, et al. Anthropometric breast measurement: a study of 385 Turkish female students. Aesthet Surg J. 2010;30(1):44–50.
[8] Qiao Q, Zhou G, Ling Y. Breast volume measurement in young Chinese women and clinical applications. Aesthetic Plast Surg. 1997;21(5):362–368.
[9] Longo B, Farcomeni A, Ferri G, et al. The BREAST-V: a unifying predictive formula for volume assessment in small, medium, and large breasts. Plast Reconstr Surg. 2013; 132(1):1e–7e.