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Breast Morphometry in Senegalese Women: Study on a Sample of 118 Subjects

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Abstract

Nowadays, women are more and more resorting to breast surgery for the purposes of isolated esthetics or within the framework of a mammectomy for tumor with its cohort of psychological problems post mutilation often requiring reconstruction. In context of breast cancer increase in Senegal, we have carried out breast morphology in female subjects of the Sahelian type in order to contribute to the development of a morphological database for reconstruction, reduction or breast augmentation. It was a prospective study on 118 female subjects received at Cancer Institute for screening. They were divided into two groups (age ≤ 40 years and age > 40 years). Subjects' morphometric variables were collected in anatomical position and correlated with age, parity, obesity and genital activity using. Fifty six subjects (47.5%) were over 40 years of age. There were 40 multiparous (33.9%). Fifteen subjects (12.7%) and six subjects (5%) were obese and morbidly obese, respectively. Subjects in genital activity were 34 (29%). The overall average size of the areola was 4.3 ± 1.5 cm. The nipple was low located with an average of 7.2 ± 3.5 cm. The diameters mentioned above increased significantly with age and body mass index, for p-values < 0.05, with the exception of the vertical diameter. Breast diameters were greater in postmenopausal women. Morphometry of Sahelian-type women's breast is strongly influenced by socio-demographic data, hence the need to take it into account during reconstruction, reduction or breast augmentation surgeries in Senegal.

Keywords

Breasts, Morphometry, Surgery, Sahelian Woman

1. Introduction

Breast represents a cardinal symbol of beauty, sensuality and sexuality of a woman. Its morphology is subject to great variability in its dimensions, especially after puberty. This morphology also depends on family, racial and ethnic specificities [1] [2] [3] [4]. Note also that women are increasingly resorting to breast surgery for isolated aesthetical or as part of therapy with his cohort of post-mutilation psychological problems, especially in the context of a resurgence of breast cancer in Senegal (the number of cases increased from 749 in 2010 to 3826 in 2017 according to data from the Registry of the Institute of Cancer DAKAR). The efficiency of breast plastic surgery worldwide is fueled by studies on morphometry [5] [6] [7]. With the rise of plastic surgery in Senegal, it became necessary to focus on the study of breast morphology in women. The aim of this work was to specify the morphometric variations of the breast as a function of socio-demographic data in 118 Senegalese female subjects to propose a morphological database for breast reconstruction, reduction or augmentation.

2. Subjects and Method

2.1. Subjects

They were 118 Senegalese melanoderm women who consulted at the Cancer Institute for mastodynia or came to do a screening mammography at the Radiology Department of Aristide Le Dantec Hospital from the beginning of January 2013 till the end of September 2013. Were not included, all women with breast disease, breast surgery and pregnant or lactating women.

2.2. Method

After her free consent, the subject was stripped to the waist and the measurements were taken in an anatomical position. Thus for each subject, we noted on sheet, socio-demographic and morphometric data:

Age, parity (the number of pregnancies completed), genital activity (menopausal or premenopausal), weight in kg (using a scale), size in cm (using a height rod), the body mass index (BMI) in kg/m^2 (normal: BMI 18 to 24.9; overweight: BMI 25 to 29.9; obesity: BMI 30 to 39.9; morbid obesity: BMI from 40).

For each breast, the following measurements were made: largest horizontal diameter in cm (**Figure 1**), vertical diameter: distance from the lower breast to the

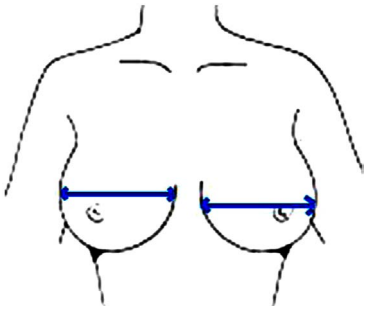

Figure 1. Horizontal diameter measurement.

upper breast determined by the slight upward pushing of the breast in cm (Figure 2), areola size in cm (largest diameter of the areola) (Figure 3), position of the nipple determined by its relative location to the median of the vertical line connecting the acromion to the lateral epicondyle. The nipple is said to be high located when it is above the median and low when it is below the latter (Figure 4). All data was entered into an Excel file and the statistical analyzes made using the Epi info 7 software.

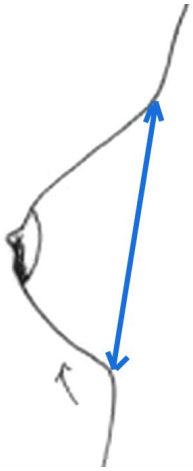

Figure 2. Vertical diameter measurement.

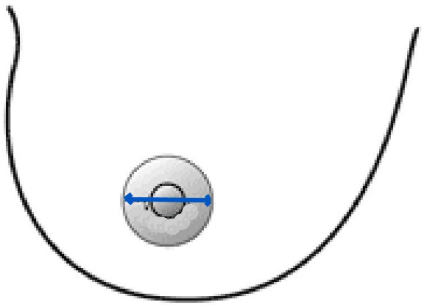

Figure 3. Largest diameter of the areola measurement.

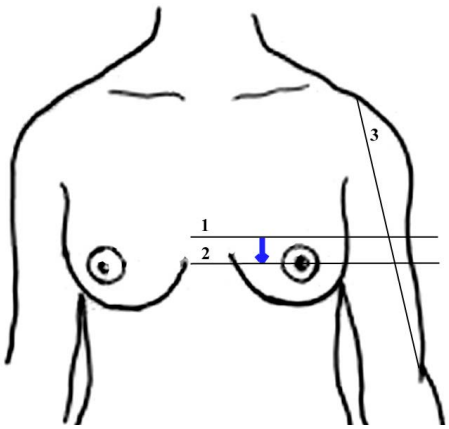

Figure 4. Position of the nipple measurement.

2.3. Statistical Analyzes

Two age groups were established for the purposes of statistical correlation: group 1 (age ≤ 40 years) and group 2 (age > 40 years).

Qualitative variables were expressed in proportions and the quantitative ones, on average with standard deviation. According to the validity conditions, the chi-square test was used to study the association between two qualitative variables. For the comparison of means or quantitative variables, Student and the ANOVA tests were respectively used to compare two means or more than two means.

All the statistical calculations were carried out using a confidence level of 95% and a threshold value of P equal to 0.05. At the 95% confidence level, the test was statistically significant if the threshold value of P was less than 0.05.

3. Results

3.1. Socio-Demographic Data

Table 1 below summarizes the socio-demographic data expressed as a percentage. The population aged under 40 was larger with a percentage of 52.5%.

3.2. Breast Morphometric Data

Table 2 highlights the averages of the breast morphometric data.

3.3. Correlation Tests

Table 3 illustrates the variations of the different diameters of the breasts depending on the age.

There is an increase in the average horizontal diameter as a function of age.

The breast diameters measured (vertical, horizontal and areolar) increased statistically significantly with BMI except the vertical diameter of the right breast (Table 4).

Table 1. Sociodemographic data expressed as a percentage.

		Numbers	Percentages (%)
Groups	1	62	52.5
	2	56	47.5
Genital activity	postmenopausal	34	29
	Not menopausal	84	71
BMI	Normal	65	55
	Overweight	32	27.2
	Obesity	15	12.7
	Morbid obesity	6	5
Parity	Nulliparous	26	22.03
	pauciparous	52	44.07
	Multiparous	40	33.9

Table 2. Breast morphometric data.

			Averages ± standard deviation	Averages ± standard deviation
Horizontal diameter (cm)		Right breast	16.6 ± 4.1	16.9 ± 4.1
		Left breast	17.3 ± 4.1	
Vertical diameter (cm)		Right breast	7.7 ± 2.1	7.9 ± 2.1
		Left breast	8 ± 2.1	
Areola size (cm)		Right breast	4.1 ± 1.5	4.3 ± 1.5
		Left breast	4.4 ± 1.6	
Nipple position	high	Right breast	2.8 ± 0.5	3.2 ± 0.5
		Left breast	3.6 ± 0.5	
	low	Right breast	8.9 ± 3.5	9.5 ± 3.5
		Left breast	9.2 ± 3.5	

Table 3. Variation of the means of the different diameters according to age.

		Groups		p value
		1	2	
Average horizontal diameter (cm)	Right breast	15	18	0.0016
	Left breast	16.1	18.5	0.002
Average vertical diameter (cm)	Right breast	7.6	8	0.37
	Left breast	7.9	8.1	0.6
Areola size (cm)	Right breast	3.8	4.5	0.001
	Left breast	3.98	4.91	0.014

Table 4. Variation in average diameters according to BMI.

		BMI				p
		Normal	overweight	Obesity	Morbid obesity	
Average horizontal diameter (cm)	Right breast	14.8	20.4	20.8	17.6	0.01
	Left breast	15.6	21	20.4	18	0.01
Average vertical diameter (cm)	Right breast	7.3	8.8	7.8	8.1	0.06
	Left breast	7.6	9.3	8.0	8.3	0.03
Areola size (cm)	Right breast	3.8	5.1	4.6	4.2	0.04
	Left breast	4.0	5.5	5.0	4.4	0.008

In Table 5, the entire breast diameters measured in this study increased statistically significantly with menopause except for the vertical diameter.

Table 6 illustrates the variations in average diameters as a function of parity. We noted an increase in the mean horizontal diameter as a function of parity.

Table 5. Variation in mean diameters as a function of genital activity.

		Genital activity		p
		Not menopausal	Postmenopausal	
Average horizontal diameter (cm)	Right breast	16	18.2	0.0110
	Left breast	16.5	19.5	0.0007
Average vertical diameter (cm)	Right breast	7.7	7.8	0.6
	Left breast	8	8.2	0.8
Areola size (cm)	Right breast	3.9	4.8	0.004
	Left breast	3.9	4.8	0.004

Table 6. Variations in average diameters as a function of parity.

		Parity			p
		Nulliparous	Few previous deliveries	Multiparous	
Average horizontal diameter (cm)	Right breast	15.12	16.1	18.28	0.003
	Left breast	15.7	16.61	19.35	0.003
Average vertical diameter (cm)	Right breast	7.55	7.79	7.7	0.6
	Left breast	7.74	8.04	8.20	0.5
Areola size (cm)	Right breast	3.59	3.95	4.9	0.001
	Left breast	3.8	4.09	5.4	0.008

4. Discussion

Comparison of the two age groups 1 and 2 showed an increase in all breast diameters with age, except for vertical diameter. Brown *et al.* [2] had similar results with a smaller sample of 60 patients. It was the same for Kim *et al.* [8] who worked on the volume of the breasts. This increase in breast diameter with age is explained by the flattening, pediculization of the breast and physiological ptosis related to the morphological changes that occur with aging.

In our study, the analysis of the average BMI which was normal in the majority of our patients allowed us to note an increase in the different diameters of the breasts with weight gain. This fact was reported by several authors including Kim *et al.* [8], Brown *et al.* [2]. This increase presents a considerable peak in favor of overweight. If this increase could not be as clear in the case of obesity and morbid obesity this could be explained by the relatively low percentage of these latter groups in our sample. This could constitute a limit to our work.

The horizontal diameters and the size of the areola did not increase significantly depending on the genital activity. These results based on genital activity were found by Brown *et al.* [2] in 2012 who studied a sample of 89 women. In contrast, Sanuki *et al.* who associated measurements with the study of breast volume, found a horizontal diameter which increased significantly from 17.23 cm in premenopausal women to 19.08 cm in postmenopausal women [9]. The latter did their study on the Caucasian type. This could explain the difference between their result and ours.

Our study found an increase in breast and areola diameters with parity. In fact, a 77.11 percentage of our patients had already had at least one child and had lower measurements than those who had at least 4 (44%, few previous deliveries). This observation is shared by several authors, including Sanuki *et al.* [9]. These results are explained by the cyclical and repetitive changes depending on the parity and consequently breastfeeding. Indeed, during breastfeeding, the breast volume increases due to the increase in blood volume, secretion and development of glandular tissue. When lactation stops, the alveoli involute, the glandular tissue atrophies and is replaced by connective tissue. However, some alveoli persist.

Regarding symmetry, the average horizontal diameters of the right and left breasts are comparable, which is not the case for vertical diameters. Thus the mean horizontal diameters were 17.3 ± 4.1 cm for the left breast and 16.6 ± 4.1 cm for the right breast, while the mean vertical diameter of the left breast was larger than that of the right breast with 8 ± 2.1 cm for the left breast and 7.7 ± 2.1 cm for the right breast. This lack of symmetry in vertical breast measurements could be correlated with the socio-demographic data studied.

This asymmetry of breast measurements has been noted by Brown *et al.* [2] in 2012 but also by Smith *et al.* who also did not find any significant difference in terms of volume. On the other hand, other authors have found perfect symmetry or non-significant asymmetry concerning this vertical mean diameter [10]. Regarding the difference in measurements of the size of the areola between the right and left breasts, it is contradictory to a study to another [2] [9]. Thus Sanuki noted that the average size of the areolas of the left breast was 4.4 ± 1.6 cm while that of the right breast was 4.1 ± 1.5 cm. These values are lower than those found by Brown *et al.*, namely 4.9 and 5 cm respectively for the left and right breasts [2]. Our study reveals a larger diameter for the left breast, while the opposite is found by Brown *et al.* in 1999. This difference could be related to the race of the patients. Indeed, Brown *et al* made measurements on the Caucasian type, while our measurements are made on the African type.

The average position of the nipple was 9.2 ± 3.5 cm for the left breast versus 8.9 ± 3.5 cm for the right breast below the horizontal passing through the middle of the lateral acromion-epicondyle line. This shows an asymmetry of position between the left and right breasts, noted by Katch *et al.* [7] who found similar results when working on the volume. Thus De Mey *et al.* [4] used a surgical technique limiting the scar in the ptoses which influence the position of the nipple. This variation in the position of the nipple could be explained by the particular distribution of fatty mass or adipose tissue in women with an excess of fat which is localized especially in the breasts, lower abdomen, hips, buttocks and thighs; one speaks of gynoid type distribution of fat [11].

5. Conclusion

Our results showed important influence of socio-demographic data on breast morphometry in Senegal. Taking this into account will allow better management of

breast reduction or breast augmentation in Senegal but above all reconstruction in context of cancer resurgence in our country. In short, this work has made possible to have a two-dimensional database which will be completed by a later study based on volume.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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