Archives Of
Breast
Cancer

A Study on Factors Predisposing to Breast Ptosis

Saeed Arefanian[a], Shahrzad Azizaddini[b], Mohammad Reza Neishaboury[c], Sanaz Zand[c], Soheil Saadat[d],

Ahmad Kaviani*[c,d]

[a] Department of Surgery, Washington University School of Medicine, Saint Louis, Missouri, USA
[b] Mallinckrodt Institute of Radiology, Department of Radiology, Washington University School of Medicine, Saint Louis, Missouri, USA
[c] Department of Research, Kaviani Breast Diseases Institute (KBDI), Tehran, Iran
[d] Sina Trauma and Surgery Research Center, Tehran University of Medical Sciences, Tehran, Iran
[e] Department of Surgery, Tehran University of Medical Science, Tehran, Iran

ABSTRACT

Background: Despite being a frequent plastic surgery complaint, the causes and predisposing factors for breast ptosis have not been studied profoundly. Studying ptosis causative factors will improve prevention, patient select and education, surgical outcome, and patient education. The present study aims to demonstrate the potential predisposing factors for breast ptosis.

Methods: In a 6-month study was conducted at the research department of Kaviani Breast Diseases Institute, Tehran, Iran, all female patients referring to the breast clinic were assessed. Patients with a background of severe comorbidities, history of breast surgery, and breast cancer were excluded. Data on demographic characteristics, current and past medical history, physical examination, and ptosis presence grade were collected.

Results: A total number of 141 patients, with the mean age of 35.8 years, were included. About 72% of the patients had varying grades of breast ptosis. Patients with ptosis tended to be of older age, weight, BMI, and brassiere size, were more likely to be menopausal, and had begun wearing brassiere at younger ages. The ordinal model revealed an association between ptosis and age, age at wearing brassiere, current breast size, and smaller cup size in patients.

Conclusion: We suggest age and breast size as the predisposing factors for breast ptosis. In our study, there was no relation between breast ptosis and history of lactation or the number of pregnancies. The effects of hormonal and menstrual status, as well as drinking and smoking habits, need to be investigated further.

Introduction

Breast ptosis is a common complaint among plastic surgery patients. Mastopexy is a common cosmetic surgery for improving the shape of the ptotic breast, which is preformed either alone as breast lift surgery, or in combination with reduction mammoplasty or breast augmentation.[1] Despite the high prevalence of breast ptosis, only a small number of studies have demonstrated its causes and risk factors in a research-based method, and most of the suggested risk factors are based on experience.[2] Ptosis is not only a cosmetic issue of the breast, but also an important factor in therapeutic breast surgeries for breast cancer. Ptosis can affect technique selection in both oncoplastic and reconstructive breast surgeries for breast cancer patients.[3,4]

Breast ptosis can be a consequence of parenchymal maldistribution as well as connective tissue and skin dysfunction. Aging, weight change, pregnancy, menopause, and lactation are among the events in a woman's life that can affect the breasts through alterations in hormonal and structural components of

Address for correspondence:
Ahmad Kaviani, M. D.
Address: No. 3, Tavaneer Sq., 1434888413, Tehran, Iran
Tel: +9821 88663937
Fax: +9821 88871698
Email: akaviani@tums.ac.ir

the female body and physiology.[5,6] To the best of our knowledge, very few studies have assessed the etiologic factors of breast ptosis or have addressed the present controversies regarding the probable causes, and most were focused on lactation from a maternity rather than plastic surgery aspect. The importance and need for such studies will be prominent when one considers that knowing the risk factors not only can improve the efficacy of prevention, patient selection for surgical corrections, and the clinical outcome of such interventions, but also helps to educate patients and clarify some cultural notions. For instance, the low rates of breast-feeding in both developed and developing countries have not changed after several years of education for fear of adverse effects on breast shape and cosmetics as one of the main mentioned causes.[7,8] Surprisingly, this wrong notion does not seem to be restricted to specific cultural or geographical distribution.[9-12] One can assume that understanding the actual predisposing factors will address the aforementioned advantages in plastic surgery. Considering these facts, we designed the present study to demonstrate and determine the probable risk factors for breast ptosis.

Methods

Study Design and Participants

Female patients referring to Kaviani Breast Diseases Institute in Tehran, Iran, between January and June 2013 were assessed for the presence of ptosis and its grade. We used the classification introduced by Regnault in 1976 for grading of ptosis. This classification is based on the position of the nipple: Grade I ptosis is described as the nipple being located at or up to 1 cm below the inframammary fold (IMF); in grade II, the nipple is located at a level 1 to 3 cm below IMF; and grade III ptosis is defined as the nipple being located more than 3 cm below IMF or at the inferior pole of the breast.[13]

Patients with a history of breast surgery, breast cancer, or severe underlying medical conditions causing weight change in a short period (at least a month), including Cushing's syndrome, Addison's disease, severe thyroid diseases, and metabolic syndrome, and all patients requesting cosmetic breast surgeries were excluded from the study. All the questionnaires were anonymous, and patients' data were kept confidential during the study. The study protocol was approved by the Tehran University of Medical Sciences Ethics Committee, and the informed consent was taken from patients after explaining the study and emphasizing on the confidentiality of the collected data.

Definition of Variables

The data regarding patients' demographics and history, such as age, age at menarche, menopause age, age at beginning to wear brassiere, weight, BMI, education level, number of pregnancies, total number of lactating months, brassieres size before pregnancy and its changes, weight gain after each pregnancy were gathered through a structured interview (all the data were self-reported except for weight and height, which were measured by the same devices). In regard to smoking, patients were categorized into two groups of smokers/ex-smokers and nonsmokers. The same stratification was applied to alcohol consumption. Current brassiere and cup sizes were determined by a surgeon, using the underbust girth for the brassiere size according to the EN 13402 dress-size standard, and the alphabetic method for cup size, both of which are the current measuring systems in Iran as well.[14-17]

Statistical Analysis

SPSS v. 19 (IBM Inc.) was used for data analysis. Data are presented as number (percent) or mean ± standard deviation. The means were compared using the student t test. Analysis of variance (ANOVA) was employed to compare the different grades of ptosis with interested risk factors. Factors showing significant association with ptosis in univariate analyses were put in a multivariate analysis to identify the independent associations between the potential risk factors of breast ptosis. A P value of 0.05 was considered the cut point for significant statistical difference.

Results

A total of 141 patients were included in the study. The patients' mean age was 35.92 ± 9.42 years (ranging from 17 to 62 years). The mean age of menarche was 13.45 ± 1.58 years. The mean duration of lactation was 32.10 ± 18.70 months. Table 1 presents the detailed demographic specifications of the study population. A total number of 102 cases (72.3%) were diagnosed with varying grades of breast ptosis, while 37 (26.2%) did not have ptosis and 2 (1.5%) had pseudo-ptosis. The patients with pseudo-ptosis in the examination were assigned to the no-ptosis group. Moreover, we classified breast ptosis into two groups: minor ptosis (grade 1) and moderate to major ptosis (grades 2 and 3).

Patients with higher grades of breast ptosis tended to be of older age, higher weight, and BMI and were more likely to be menopausal. No significant differences were observed between the groups in the other variables (Table 2).

Variables showing significant difference among the three groups in univariate analyses were put in an ordinal model to investigate the independent role of each one. As shown in Table 3, older patients were more commonly diagnosed with breast ptosis (95% CI: 0.020 to 0.109, P = 0.005). The younger age at wearing brassiere was associated with higher grades of breast ptosis (95% CI: -0.533 to -0.084, P = 0.007).

Current brassiere and cup sizes were also

Table1. Demographic characteristics of the study population

Variables	Categories	Mean ± SD or N (%)
Age		35.83 ± 9.42
Weight (kg)		65.85 ± 11.07
Height (cm)		162.12 ± 5.85
BMI (kg/m2)		24.48 ± 4.54
Age at menarche		13.46 ± 1.57
Menopause age (N = 12)		45.91 ± 5.59
Number of pregnancies (N = 95)		2.27 ± 1.36
Total months of lactation (N = 86)		31.86 ± 18.54
Weight gain after each pregnancy (N = 91)		7.86 ± 4.53
Age at beginning to wear brassiere		14.28 ± 1.88
Current or past smoker	No	136 (96.5 %)
	Yes	5 (3.5 %)
Current or past alcohol consumption	No	133 (94.3%)
	Yes	8 (5.7%)

Table 2. Comparison of the variables between ptotic and non-ptotic patients

Variables		No ptosis	Minor Ptosis	Moderate-Major Ptosis	P value
Age		30.05 ± 7.64	38.11 ± 9.77	38.24 ± 8.29	**< 0.001**
Age at menarche		13.74 ± 1.73	13.48 ± 1.52	13.18 ± 1.52	0.227
Age at beginning to wear brassiere		14.97 ± 2.46	14.18 ± 1.82	13.89 ± 1.17	**0.025**
Age at first pregnancy		24.80 ± 4.56	23.65 ± 4.73	22.89 ± 5.28	0.529
Weight		58.71 ± 7.76	65.01 ± 9.63	72.26 ± 11.11	**<0.001**
BMI		22.13 ± 3.04	24.54 ± 4.25	28.88 ± 4.32	**<0.001**
Number of pregnancies		2.00 ± 1.26	2.20 ± 1.39	2.42 ± 1.36	0.610
Lactation duration (month)		36.11 ± 13.10	28.58 ± 15.65	35.09 ± 22.45	0.258
Number of breast-feedings	0	1 (10%)	1 (2.4%)	1 (2.8%)	0.437
	1	2 (20%)	17 (40.5%)	14 (38.9%)	
	2	6 (60%)	20 (47.6%)	13 (36.1%)	
	≥ 3	1 (10%)	4 (9.5%)	8 (22.2%)	
Weight gain after each pregnancy (kg)		7.40 ± 3.16	7.24 ± 4.58	8.81 ± 4.78	0.290
Current or ex-smoker	No	37 (94.9%)	54 (96.4%)	45 (97.8%)	0.764
	Yes	2 (5.1%)	2 (3.6%)	1 (2.2%)	
Current or past alcohol consumption	No	35 (89.7%)	54 (96.4%)	44 (95.7%)	0.342
	Yes	4 (10.3%)	2 (3.6%)	2 (3.9%)	
Menstrual status	Menstruation	39 (100%)	48 (85.7%)	42 (91.3%)	0.049
	Menopause	0	8 (14.3%)	4 (8.7%)	
Current brassiere size (cm)		72.31 ± 5.71	78.21 ± 4.99	81.52 ± 13.77	**<0.001**
Current cup size	A	18 (46.2%)	15 (26.8%)	3 (6.7%)	**<0.001**
	B	12 (30.8%)	29 (51.8%)	13 (28.9%)	
	C	9 (23.1%)	10 (17.9%)	23 (51.1%)	
	D	0	2 (3.6%)	6 (13.3%)	

Table 3. Multivariate analysis of factors with association with breast ptosis

	P value	95% CI	
		Lower	Upper
Age	**0.005**	0.020	0.109
Age at beginning to wear brassiere	**0.006**	-0.533	-0.084
Current brassier size	**<0.001**	0.117	0.268
Current cup size	**<0.001**	0.489	1.461

Nagelkerke = 58.8%

independently associated with ptosis (95% CI: 0.117 to 0.268, P < 0.001 and 95% CI: 0.489 to 1.461, P < 0.001).

The relationships between ptosis grade and different factors were investigated. The mean weight of patients was observed to be different for different grades of ptosis based on the ANOVA test (P < 0.001)

Discussion

Despite being one of the most common cosmetic problems for women,[1] only a few studies have evaluated the impact of possible risk factors on breast ptosis, and most of the studies about breast ptosis have referred to surgical techniques for solving the problem. As it can be assumed, breast

ptosis etiology has a multi-factorial nature and can be affected by dependent and independent factors such as race, culture, body composition, and age as well as hormonal changes. Regression of the glandular tissue due to hormonal changes after menopause or pregnancy, weight loss, skin pathologies, and previous surgery have been mentioned as potential causes of breast ptosis.[2, 5] All of the 12 menopausal patients in the present study had some degrees of ptosis, providing evidence for the aforementioned effect of menopause. None of the patients in this study had a history of breast surgery or dermatochalasis.

We observed an association between the cup size and ptosis grade. Patients with no ptosis were mostly size A, while patients with minor ptosis were size B, and more than half of the patients with moderate to major ptosis had a C cup size. In this study, we inquired the weight gain after the pregnancy to evaluate its effect. The mean weight gain after the pregnancy did not show statistically significant difference between the ptosis and no-ptosis groups. Unfortunately, we did not inquire the history of weight loss and were not able to evaluate its effect on breast ptosis.

The weight of the breast itself and the laxity degree of the breast-supporting ligaments are other proposed causative factors for breast ptosis. In the present study, we considered the breast cup size as a measure of the breast volume and mass. Although the cup size is not a perfect indicator of the breast weight due to variation in breast density and the several factors affecting it, the current cup size of the patients at the study time was higher in the ptosis group compared with the no-ptosis group. Meanwhile, as the mean weight of the ptotic patients was greater, the breast cup size and breast weight might have increased as a consequence of weight and body fat distribution. However, both factors lost their significant association with ptosis in multivariate analysis. Accordingly, the causative effect of the breast volume and weight need to be assessed in a more detailed study to check whether breast volume is an independent breast ptosis risk factor, or it is merely a manifestation of higher weight and BMI as main risk factors.

Laxity of the Cooper's ligaments as another potential cause for ptosis, which is suggested mostly based on the individual observations, needs to be proved through scientific, experimental methods. As suggested by previous studies[18,19], smoking is a cause for abnormal elastic characteristics of the skin, was studied in our patients along with drinking history. There were some limitations in our study to assess the effect of cigarette smoking or alcohol consumption on the development of breast ptosis. Considering a negative attitude towards female smokers in the society, we can assume that this fact might have influenced the overall prevalence of the smoking cases in our study through patients' disclosure of their smoking status to the study team. Religious considerations can be applied to alcohol consumption besides the overall lower consumption of alcohol in the Iranian population, especially in females (relative frequency in total population = 2.31%, females = 0.56%).[20]

None of the patients in the non-ptosis group were in the menopause phase of the reproductive physiology, while 11% (12 patients) of the ptotitc patients were in this phase. This may be indicative of a protective effect of the female reproductive hormones, or it can just be a manifestation of the age factor. Our study not only confirms the previous finding that lactation has no effect on the development of breast ptosis, but adds to the literature by providing evidence for the lack of association between the number of pregnancies and breast ptosis.

Considering the available data, we suggest age and breast size as risk factors for breast ptosis. In addition, the age at beginning to wear brassiere was associated with having ptosis in our study, although it was not clear whether the patients began to wear brassiere at younger ages because of earlier onset of puberty or other considerations such as cultural issues. Obviously, further studies are needed to clarify the highly probable effects of female hormones as well as menstrual status on development of breast ptosis. The effects of smoking and alcohol consumption also need to be investigated in studies with greater sample sizes. In our study, there was no relationship between breast ptosis and breast-feeding, number of pregnancies, duration of lactation, or weight gain after pregnancy, a finding that can relieve the future mothers of the stress of developing breast ptosis following childbirth or lactation. Moreover, we suggest studies to demonstrate patients before pregnancy, during pregnancy, during lactation, and after weaning and compare with a control group. Also, another limitation of our study was generalizability of results as the included subjects were those referring to a private clinic..

Conflict of Interest
All the authors declare that they have nothing to disclose.

References
1. Ibrahim AM, Sinno HH, Izadpanah A, Vorstenbosch J, Dionisopoulos T, Markarian MK, et al. Mastopexy for breast ptosis: Utility outcomes of population preferences. Plast Surg (Oakv). 2015;23(2):103-7.
2. Rinker B, Veneracion M, Walsh CP. Breast ptosis: causes and cure. Ann Plast Surg. 2010;64(5):579-84.
3. Kaviani A, Safavi A, Mohammadzadeh N, Jamei K, Ansari-Damavandi M, Salmon RJ.

Oncoplastic surgery in breast conservation: a prospective evaluation of the patients, techniques, and oncologic outcomes. Am J Surg. 2014;208(5):727-34.

4. Najafi M, Salmon R, Kaviani Oncological Outcome of Oncoplastic Breast Surgery: A Review of the Literature. Archives of Breast Cancer. 2015;2(1):5-14.

5. Higdon KK, Grotting JC. Mastopexy. Plastic Surgery: Breast. 5. 3rd ed: Elsevier Health Sciences; 2013. p. 119-51.

6. Nahai F, Boehm KA. CHAPTER 30 - Superior Pedicle Extension Mastopexy A2 - Hall-Findlay, Elizabeth J. In: Evans GRD, editor. Aesthetic and Reconstructive Surgery of the Breast. Edinburgh: W.B. Saunders; 2010. p. 475-82.

7. Gartner LM, Morton J, Lawrence RA, Naylor AJ, O'Hare D, Schanler RJ, et al. Breastfeeding and the use of human milk. Pediatrics. 2005;115(2):496-506.

8. Ryan AS, Zhou W, Arensberg MB. The effect of employment status on breastfeeding in the United States. Womens Health Issues. 2006;16(5):243-51.

9. Weichert C. Breast-feeding: First thoughts. Pediatrics. 1975;56(6):987-90.

10. Foster SF, Slade P, Wilson K. Body image, maternal fetal attachment, and breast feeding. J Psychosom Res. 1996;41(2):181-4.

11. McLennan JD. Early termination of breast-feeding in periurban Santo Domingo, Dominican Republic: mothers' community perceptions and personal practices. Rev Panam Salud Publica. 2001;9(6):362-7.

12. Pisacane A, Continisio P, Italian Work Group on B. Breastfeeding and perceived changes in the appearance of the breasts: a retrospective study. Acta Paediatr. 2004;93(10):1346-8.

13. Regnault P. Breast ptosis. Definition and treatment. Clin Plast Surg. 1976;3(2):193-203.

14. BSI. Size Designation of Clothes – Part 1: Terms, Definitions and Body Measurement Procedure. . Milton Keynes: British Standards Institute; 2001. p. BS EN 13402-1

15. BSI. Size Designation of Clothes - Part 2: Primary and secondary dimensions. London: BSI Standards; 2002. p. BS EN 13402-2

16. BSI. Size Designation of Clothes - Part 3: Measurements and Intervals.: BSI Standards; 2004. p. BS EN 13402-3

17. Magee J, McClelland B, Winder J. Current issues with standards in the measurement and documentation of human skeletal anatomy. J Anat. 2012;221(3):240-51.

18. Daniell HW. Smoker's wrinkles. A study in the epidemiology of "crow's feet". Ann Intern Med. 1971;75(6):873-80.

19. Boyd AS, Stasko T, King LE, Jr., Cameron GS, Pearse AD, Gaskell SA. Cigarette smoking-associated elastotic changes in the skin. J Am Acad Dermatol. 1999;41(1):23-6.

20. Nikfarjam A, Hajimaghsoudi S, Rastegari A, Haghdoost AA, Nasehi AA, Memaryan N, et al. The Frequency of Alcohol Use in Iranian Urban Population: The Results of a National NetworkScale Up Survey. Int J Health Policy Manag. 2016;6(2):97-102.