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# Breast Deformities after Massive Weight Loss: Statistical Analysis and Clinical Application

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## ABSTRACT

*Background:* The breast is one of the organs that are affected by changes in the patient weight. The obesity affects the breast shape, degree of ptosis and symmetry. Massive weight loss also affects the breast by wide spectrum of deformities.

*Methods:* This study includes review of the literatures that addresses the effect of the obesity and the massive weight loss on the female breast. As well as addressing clinically the deformities that affect thirty female patients presented after massive weight loss. With statistical evaluation of breast changes.

*Results:* The patients are evaluated clinically regarding the breast volume, ptosis, and quality of the skin. Statistical evaluation of these changes was done to determine factors that affect these changes.

*Conclusion:* Addressing the wide spectrum of deformities that affects the female breast after massive weight loss is important to facilitate communication with other plastic surgeons. It is also important in designing a plan to correct these deformities to achieve better aesthetic results. There are many classification systems that address these deformities but yet none of them can cover all these deformities.

***Key Words:*** *Breast – Obesity – Weight loss – Breast volume – Ptosis.*

## INTRODUCTION

*Effects of obesity on the breast:*

Obesity affects the breast in different ways. It leads to breast hypertrophy that includes both the fat and the glandular components **[1]**. The Fat component of the breast is influenced by the hormonal factors as well as the percentage of the body fat **[2]**. There is a strong positive correlation between breast fat and total body fat **[3]**. High BMI is associated with an increased level of serum leptin. There is also an increased level of estrogen as fat cells in obese patients are a major source of it **[4]**. Both lead to increase in the glandular component of the breast as well as breast density. Adjustment of BMI will eliminate this effect **[5]**.

Fixation of the breast is provided by the skin through multiple fibrous prolongations (Cooper's Ligament) passing into the gland and by the retromammary fascia which provides a suspensory ligament attached to the clavicle. A marked increase in the weight of the breast, from any cause, overtaxes this apparatus and produces ptosis **[6]**. Weight gain not only produces stretching of supporting ligaments but also lead to stretching of the skin, and glandular element **[7]**. The greater the breast mass the greater the degree of inferior migration of the nipple. So, the degree of ptosis correlates with the breast mass **[3]**.

Natural breast asymmetry exists in almost all women, and it is important to know the baseline differences in symmetry prior to any aesthetic breast surgery. An attempt was made to predict which factors contribute to the degree of natural breast asymmetry. It was found that increased BMI, chest-wall circumference, and cup size are all directly affecting the degree of breast asymmetry. There were no predictable patterns of asymmetry. However, the most common pattern was larger laterally and smaller medially **[8]**. The dimension and mass of the female breast can vary substantially between individuals. The composition of the breast comprising fat, skin, and glandular and connective tissue also varies among individuals with these differences often attributed to variations in adipose tissue. BMI is one of the important factors that determine the breast size. Brown et al., 2012 found that there is a significant correlation between anthropometric variables and breast mass, particularly body mass and BMI. They also found that there is a relation between the breast size and the distance between the suprasternal notch to nipple i.e; women with large breast have a significantly greater suprasternal notch to nipple distance **[3]**.

*Breast changes after massive weight loss:*

Breast size and shape often change significantly following weight loss. The effects of aging and gravity cause the breasts to sag with time. Massive weight loss greatly accelerates this process.

A change in fat component of the breast after weight loss varies according to age, familial and gender-specific fat depositions. With reduced fat, the organ feels firm and gritty **[9]**. During weight loss, the ability or capacity for adipogenesis may be decreased, and number of fat cells also decreases **[10]**.

This can be explained by the ability of adipocytes to affect the process of adipogensis through both direct and indirect factors **[10]**. When patients lose weight loss of the superficial fascial system occurs. The fat lobules become loose and ill-defined in poorly delimitated spaces with absence of fibrous septa and loss of the connections to the deep dermal layer **[11]**. Histological analysis was done by Miglio-ri et al., revealed the following changes in the fat tissue; collapsed adipocytes, cytoplasmatic membrane thickening, visible nucleus, and fibrous septum thickening. In this study the specimens was retrieved from abdominal wall **[12]**.

The effect of weight loss on the glandular component of the breast is varied according to the age of the patient. The glandular tissue is more firm than fat. Women who sustain significant weight loss in the fourth and fifth decades of life can have a marked change in breast size and shape than in younger patients. As in this age, a significant portion of the breast glandular tissue has been replaced with fat and therefore marked weight loss will lead to a rapid decrease in the amount of breast tissue **[13]**.

The skin becomes too loose with loss of tension and elasticity. The skin laxity is related to the rapidity of reduction, absolute change and the final BMI **[14]**. The skin is unable to retract completely producing a severely ptotic (sagging) breasts and overlapping skin folds. The overlapping skin traps moisture, with increased bacterial counts. Skin irritation begins from intertrigo to abscesses. Broad areas of dermal striae are common **[9]**. A histomorphologic analysis of the skin in massive weight loss patient has been addressed in multiple studies and revealed the following changes: Mild to moderate degrees of inflammation, changes in elastin fibers quantity but no change in its quality, no changes in collagen morphology but there's a variable degree of fibrosis **[14]**.

Although there definitive histomorphologic changes in skin after massive weight loss but none of these changes exhibit a strong relationship to postoperative wound complications **[14]**.

Several factors like metabolic disorders may affect the physiological skin restoration, resulting in insufficient healing and delayed scar formation. **[11]**.

*Clinical application:*

MWL leaves a spectrum of body deformity that will affect the breast as well as other areas of the body. The breast and thoracic deformities that develop after massive weight loss are fairly complex. They are variable and related to the amount of weight lost, the fat deposition pattern, and the quality of the skin-fat envelope **[15]**.

Rubin summarizes the various deformities that occur in the breast after massive weight in four features that manifest in various combinations which give the breast its characteristic shape: 1- Significant and sometimes asymmetric breast volume loss, with a deflated and flattened appearance; 2- Dramatic loss of skin elasticity, as well as tremendous skin excess relative to the parenchymal volume; 3- Nipple position that is overly-medial; and 4- A prominent axillary skin fold that blurs the border between the lateral breast and chest wall.

Table (1): Pittsburgh Rating Scale **[16]**.

| Scale | Deformity | Procedure |
|---|---|---|
| 0 | Normal | None |
| 1 | Ptosis grade I/II or severe macromastia | Traditional mastopexy, reduction, or augmentation techniques |
| 2 | Ptosis grade III or Moderate volume loss or Constricted breast | Traditional mastopexy +/– augmentation |
| 3 | Severe lateral roll and/or Severe volume loss with loose skin | Parynchemal reshaping techniques with dermal suspension, consider autoaugmentation |

One of the classification systems of contour deformities is The Pittsburgh Rating Scale which is succinct and structured and easily applied. The scale both categorizes preoperative appearance and helps formulate appropriate treatment. According to Pittsburgh Rating Scale the breast deformity is classified as following **[16]**.

## PATIENTS AND METHODS

These study incudes 30 patients (60 breasts) all of them presented after massive weight loss either after regulation of diet and exercise or after bariatric surgery. They all underwent clinical assessment of their breast deformities. The points of assessment of them were the residual breast volume, the degree of ptosis, the quality of the skin.

The assessment of breast volume was subjective. The breast volume was classified to be sufficient/moderate loss, insufficient/atrophy, or excess/hypertrophy. The results revealed that 12 out of 30 have insufficient residual breast volume.10 out of 30 have moderate loss of the breast volume. And 7 out of 30 have excess breast volume.

Degree of breast ptosis was classified either to be class I, II, or III according to the relation between nipple areola complex and inframmamary fold. 2 patients have grade I ptosis, 14 patient have grade II ptosis and 14 patients have grade III ptosis.

The quality of the skin was described either to be good or poor according to the dermal thickness, presence of stria or stretch marks. 12 patients have poor skin quality. And 18 have good skin quality.

Clinical classification of patient was done using Pittsburgh rating scale. It was difficult to apply it to all the patients due to variability in the deformities that affect the breast.

## RESULTS

We stratified our subjects into 3 age groups; group 1 consisted of 9 cases aged from 20 to 30 years, group 2 consisted of 16 cases aged from 30 to 40 years and group 3 consisted of 5 cases aged above 40 years.

We stratified our subjects into 3 groups according to their BMI; 10 cases were of normal BMI, 13 cases were overweight and 7 cases were obese.

Regarding the breast volume, we found that up to 60% of cases above 40 had excess breast volume while most of cases aged from 20 to 30 had insufficient breast volume, however, there was no significant difference between the different age groups ($p$=158).

Table (2): Relation between breast volume and age.

| Age group | Breast volume | | | $p$ value |
|---|---|---|---|---|
| | Insufficient (12/30) | Sufficient (10/30) | Excess (7/30) | |
| 20-30 year | 5 (62.5%) | 3 (37.5%) | 0 | 0.158 |
| 31-40 year | 5 (33%) | 6 (40%) | 4 (27%) | |
| Above 40 year | 1 (20%) | 1 (20%) | 3 (60%) | |

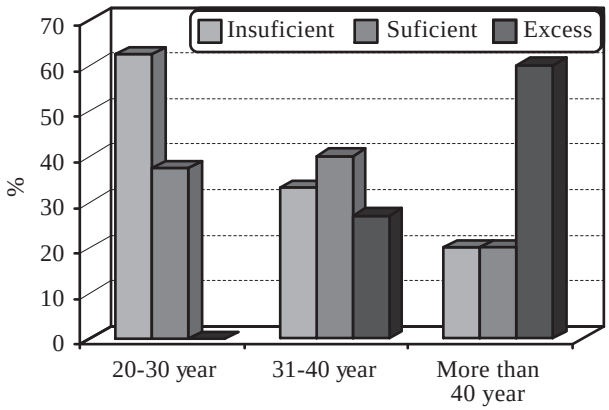


Fig. (1): Relation between breast volume and age.

Most with BMI 20 to 25 had insufficient breast volume while most of females with BMI above 30 had excess breast volume, and the difference was statistically significant ($p$<0.05); this means that the breast volume is related to BMI.

Table (3): Relation between breast volume and BMI.

| BMI | Breast volume | | | $p$ value |
|---|---|---|---|---|
| | Insufficient | Sufficient | Excess | |
| 20-25 | 8 (89%) | 1 (11%) | – | <0.001* |
| 26-30 | 3 (27%) | 8 (73%) | – | |
| More than 30 | 1 (11%) | 1 (11%) | 7 (78%) | |

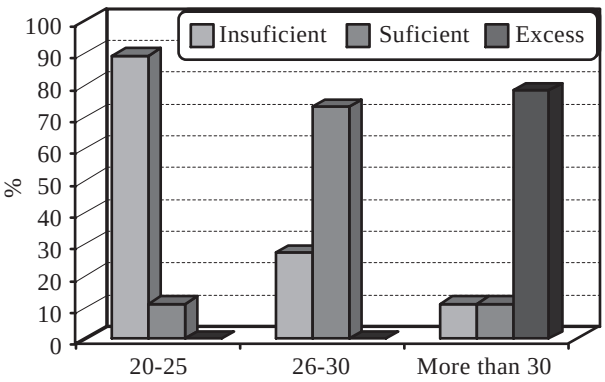


Fig. (2): Relation between breast volume and the BMI.

Most cases above 40 years had grade III ptosis while most of cases aged from 20 to 30 were of grade I or II, however, there was no significant difference in the grade of breast ptosis among the different age groups ($p$=145); this means that the grade of ptosis is not related to age.

Table (4): Relation between grade of ptosis and age.

| Age | Grade I, II (Total; 15) Ptosis | Grade III (Total; 15) Ptosis | $p$ value |
|---|---|---|---|
| 20: 30 year | 6 (75%) | 2 (25%) | 0.145 |
| 30: 40 year | 8 (47%) | 9 (53%) | |
| Above 40 | 1 (20%) | 4 (80%) | |

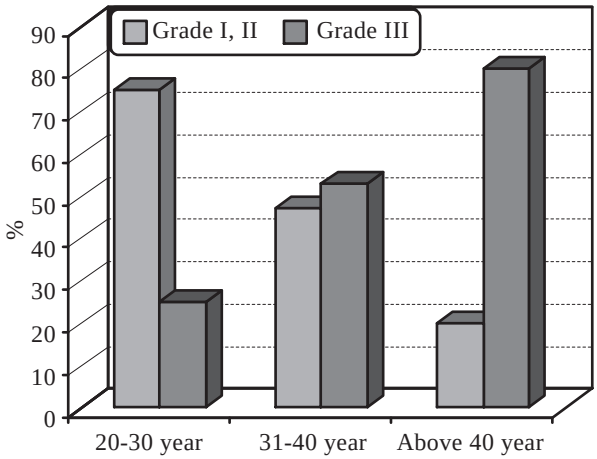


Fig. (3): Relation between grade of ptosis and age.

Most cases of grade I, II ptosis were aged 20 to 25, while most of cases with grade III aged above 25, but the difference was not significant ($p$=0.054); this means that the grade of ptosis is not related to BMI.

Table (5): Relation between grade of ptosis and BMI.

| BMI | Grade I, II (Total; 15) Ptosis | Grade III (Total; 15) Ptosis | $p$ value |
|---|---|---|---|
| 20: 25 | 8 (53%) | 3 (20%) | 0.054 |
| 26: 30 | 6 (40%) | 6 (40%) | |
| Above 30 | 1 (7%) | 6 (40%) | |

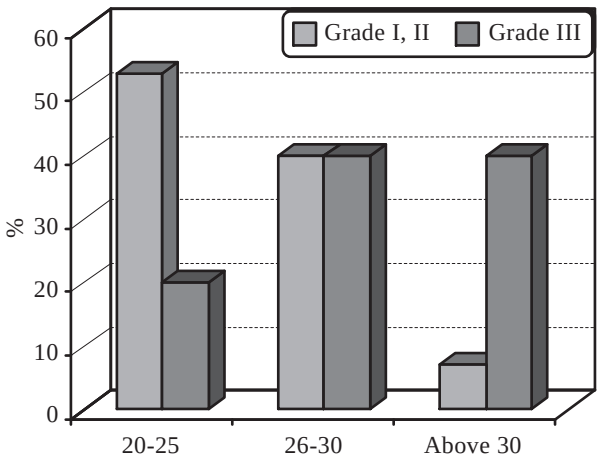


Fig. (4): Relation between grade of ptosis and BMI.

Regarding the quality of the skin we found that most of patient aged from 20-30 year has good skin quality. While poor skin quality is evenly distributed between the three age groups. There is no significant relation between the age of the patient and quality of the skin.

Table (6): Relation between the quality of the skin and the patient's age.

| Age | Good (Total; 18) | Poor (Total; 12) |
|---|---|---|
| 20: 30 year | 6 (75%) | 2 (25%) |
| 31: 40 year | 9 (53%) | 8 (47%) |
| Above 40 | 3 (60%) | 2 (40%) |

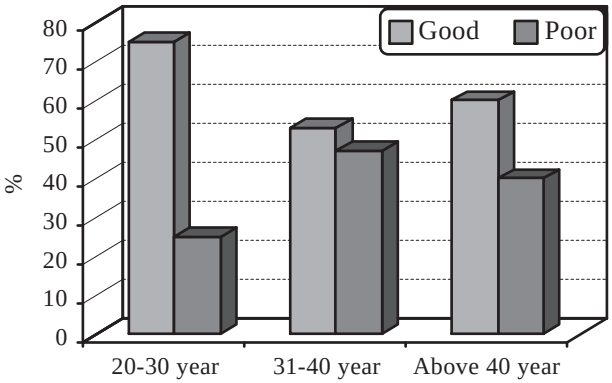


Fig. (5): Relation between the quality of the skin and the patient's age.

Regarding the relation between the quality of the skin and the BMI of the patient we found that most of cases with BMI above 30 have good skin while patient with poor skin quality mostly with BMI from 26-30.

Table (7): Relation between quality of the skin and BMI.

| BMI | Good (Total; 18) | Poor (Total; 12) |
|---|---|---|
| 20: 25 | 5 (50%) | 5 (50%) |
| 26: 30 | 6 (46%) | 7 (53%) |
| Above 30 | 7 (100%) | – |

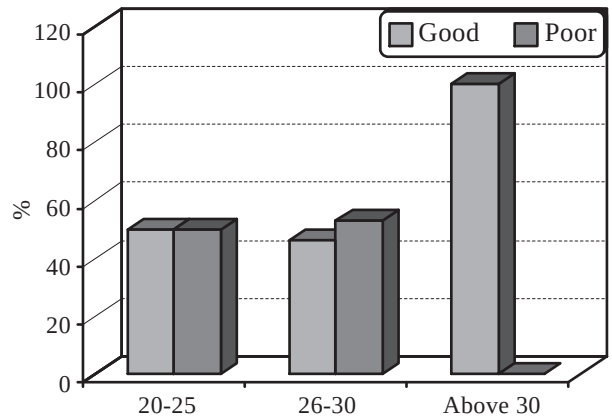


Fig. (6): Relation between quality of the skin and BMI.

Regarding classification of patients according to the Pittsburgh scale system some of them fit the criteria of this classification as shown in the following Figures. Other patients need modification of the recommended procedure to achieve maximum aesthetic results.

Fig. (7): Patient with macromastia grade III ptosis, classified as scale 1 recommended procedure is traditional reduction.

Fig. (8): Patient with moderate volume loss, grade III ptosis, classified as scale 2, recommended procedure is parenchymal redistribution to enhance upper pole fullness.

Fig. (9): Patient classified as scale 3, recommended procedure is parenchymal reshaping (autoaugmentation).

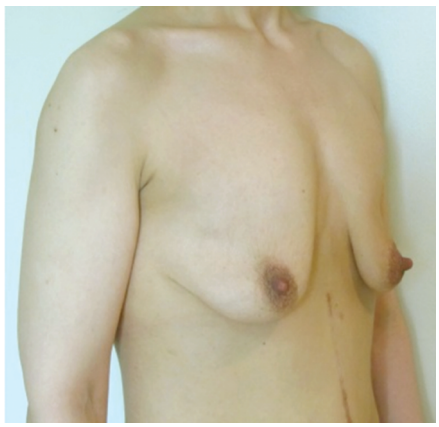

Fig. (10): Patient classified as scale 3, augmentation mastopexy is recommended procedure.

## DISCUSSION

The aim of our study is to address the changes that occur in the breast after massive weight loss regarding the volume, grade of ptosis, and quality of the skin. There are many articles that address the same subject. One of them was Gunesof et al., 2005 **[13]**. In their study they address the effect of loss of weight on the breast volume. They stated that the effect of weight loss on the breast is varied according to the age of the patient. Women who sustain significant weight loss in the fourth and fifth decades of life can have a marked change in breast size and shape than in younger patients. As in this age, a significant portion of the breast glandular tissue has been replaced with fat and therefore marked weight loss will lead to a rapid decrease in the amount of breast tissue. In our study when we addressed the breast volume it was found that up to 60% of cases above 40 had excess breast volume while most of cases aged from 20 to 30 had insufficient breast volume, however, there was no significant difference between the different age groups ($p$=0.158).

BMI is one of the important factors that determine the breast size. Brown et al., 2012 found that there is a significant correlation between anthropometric variables and breast mass, particularly body mass and BMI **[3]**. In our study most of the patients presented with BMI 20 to 25 had insufficient breast volume while most of females with BMI above 30 had excess breast volume, and the difference was statistically significant ($p$<0.05).

The fixation of the breast is provided by the skin and the cooper's ligament. The degree of the breast ptosis related to the breast mass so, weight gain not only produces stretching of supporting ligaments but also lead to stretching of the skin, and glandular element **[7]**. The greater the breast mass the greater the degree of ptosis. When we addressed the effect of weight loss on the degree of breast ptosis we focus on finding the relation

between the age of the patient, the BMI, and the degree of ptosis. In our study most cases of grade I, II ptosis were aged 20 to 25, while most of cases with grade III aged above 25, but the difference was not significant ($p$=0.054). The other known factor that affects the breast ptosis is the age. As age, fluctuation of weight, and pregnancy all accelerate the process of ptosis. In our study we address the effect of age on the degree of ptosis. It was found that most cases above 40 years had grade III ptosis while most of cases aged from 20 to 30 were of grade I or II, however, there was no significant difference in the grade of breast ptosis among the different age groups ($p$=145).

Regarding the quality of the skin there were no significant relation between the age of the patient and loss of skin elasticity. But most of patient with high BMI have good skin quality.

In our study it was difficult to classify our patient according to the Pittsburgh scale. This scale depends on classifying the patient according to more than one variable. Volume of the breast either to be hypertrophy, moderate loss, or severe volume loss. The second variable is the grade of ptosis. Grade I and II ptosis consider as class 1. While class III ptosis considered as class 3. There was wide spectrum of the breast deformities that affect the breast with combination of more than one variable in our patients. For example some patients have breast hypertrophy with grade III ptosis and excess lateral roll. Others have severe volume loss with grade II ptosis. In Pittsburgh scale this variables present in more than one class. This makes it difficult to apply it on many patients. As well as many patients need modification in the recommended procedure of this scale to achieve better aesthetic results. We recommend either thinking in modification of this scale or to create an algorithm for management of these patients.

*Conclusion:*

Proper assessment and classification of the breast deformities after massive loss is of utmost importance in starting putting a plan for correction of this wide spectrum of deformities. Although there is more than one classification system to address these changes yet there are many patients that didn't totally fit the described scaling systems.

## REFERENCES

1- Hestrens D. and Vandeweyer E.: Quantification of glands and fats in breast tissue. Annals of Anatomy. Mar., 184 (2): pp. 181-184, 2002.

2- Hanna K. and Nahai H.: Applied anatomy of the breast. In: Nahai F. the art of aesthetic surgery principles and techniques. Quality Medical Publishing, Vol. 6, Ch. 48, pp. 1800-1802, 2005.

3- Brown N., White J., Milligan A., Risuis D., Ayres B., Wendy H. and Scurr j.:. The relationship between breast size and anthropometric characteristics. American Journal of Human Biology, 24: 158-164, 2012.

4- Eliassen H., Colditz G., Rosner B., Wilelett W. and Hankinson S.: Adult weight change and risk of postmenopausal breast cancer. JAMA, (2): 193-201, 2006.

5- Maskarinec G., Woolcott C., Steude J. and Franke A.: The relation of leptin and adiponectin with breast density among premenopausl women. European Journal of Cancer Prevention, 19: 55-60, 2010.

6- Maliniac J.: Breast deformities: Anatomical and physiological considerations in plastic repair. The American Journal of Surgery, 39 (1): 54-61, 1938.

7- Grotting J. and Chen S.: Control and precision in mastopexy. In Nahai F. the art of aesthetic surgery principles and technique. Quality Medical Publishing, Vol. 5, Ch. 51, pp. 1909, 2005.

8- Losken A., Fishman I., Denson D., Moyer H. and Carlson G.: An objective evaluation of breast symmetry and shape differences using the 3 dimensional images. Lippincott Williams & Wilkins Ann. plas. Surg., 55: 571-575, 2005.

9- Huwitz D.: Strategies in breast reduction and mastopexy after massive weight loss. In Spear, S. surgery of the breast principles and arts Lippincott Williams and Wilkins, Ch. 103, pp. 1185-1203, 2011.

10- Levy S., Gomes F. and Sterodimas A.: Macroscopic anatomic changes of subcutaneous fat tissue in massive weight loss patients. Aesth. Plas. Surg. Springer April, 35: 814-819, 2011.

11- D'Ettorre M., Giniuli D., Bracaglia R., Tambasco D., Mingrone G., Gentileschi S. and Massi G.: Wound healing process in postbariatric patients: an expremintal evaluation, Obes. Surg. Springer Nov., 20 (11) 1552-8, 2012.

12- Migliori F., Robello G. and Ravetti J.: Histologic alterations following bariatric surgery: Pilot study Obes. Surg. Springer, 18: 1305-1307, 2008.

13- Gusenoff J., Coom D. and Rubin P.: Implication of weight method in body contouring outcomes Plast. Reconst. Surg. Jan., 123 (1): 373-376, 2009.

14- Fearmonti R., Blanton M., Bond J., Pestana I., Selim M. and Edrmann D.: Changes in dermal histomorphology following surgical weight loss versus diet induced weight loss in morbidly obese patients. Anns. Plast. Surg., 68: 507-512, 2012.

15- Aly A.: Upper body lift. In: Aly A. Body contouring after massive weight loss. Qulaity Medical Publisher, pp. 335-360, 2005.

16- Song A., O'Toole J., Jean R. and Rubin P.: Classification of contour deformities after massive weight loss: Application of Pitsburgh Rating scale. Seminars in plastic surgery. Thieme Medical Publishers. Feb., 20, pp. 24-25, 2005.