

# Ultrasonographic findings in young men with breast masses: Changes in adolescence and young adulthood\*

## *Meme kitlesi olan genç erkeklerde ultrasonografi bulguları: Adolesans ve sonrasında görülen değişiklikler*

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### ABSTRACT

**Aim:** Gynecomastia is defined as an increase in the stromal and ductal components of the male breast due to an imbalance between the effects of free estrogen and testosterone which affects adolescents commonly. The aim of this study is to determine the causes of breast masses in young males and adolescents and to test the hypothesis that gynecomastia will be smaller and less frequent in adult males than adolescents due to the regulation of hormone levels after adolescence.

**Methods:** Breast ultrasound imaging studies between January 2014 and October 2019 were reviewed and a total of 345 male patients between 9-20 and 21-35 years of age were included in the study. Lesions were classified as normal male breast appearance, unilateral gynecomastia, bilateral gynecomastia, increased subcutaneous-adipose tissue (pseudogynecomastia), lipoma, suspicious lesion, and other benign findings as infection. Sizes of fibroglandular tissue were reported and compared between age groups. Statistical analysis of lesion types and patient groups was performed by the Chi-square test. Patient age and gynecomastia status were analyzed by Student's t-test. Patient age and size of gynecomastia were compared by the Spearman correlation test.

**Results:** Two hundred and eight young males and 137 adolescents formed the study group. Sixty percent of the adults and 77.6% of the adolescents had gynecomastia. The second most common pathology was pseudogynecomastia in 17% of the young adults and, 12% of the adolescents. One suspicious lesion was found in the adult group and the pathology revealed gynecomastia. Gynecomastia was found to be more common in the adolescent group ( $P<0.01$ ). the sizes of the glandular tissues were not significantly different between adolescents and young adults and according to age.

**Conclusion:** Gynecomastia is more common in adolescents, mostly bilateral, than in young adults. However, the size of the glandular tissue does not differ between age groups. We cannot conclude that gynecomastia in adults is prone to be smaller than in adolescents due to the regulation of hormones after adolescence.

**Keywords:** Adolescence, breast ultrasound, gynecomastia, male breast

### ÖZ

**Amaç:** Jinekomastr, serbest östrojen ve testosteron etkileri arasındaki dengesizlikten kaynaklanan erkek meme dokusundaki stromal ve duktal bileşenlerinde artış olarak tanımlanır. Ergenlik, vücutta farklı endokrinolojik değişikliklerin olduğu bir dönemdir. Bu çalışmanın amacı, genç erkekler ve ergenlerde meme kitlelerinin nedenlerini araştırmak ve erken gençlik döneminde jinekomastrinin ergenlere daha küçük ve daha az sıklıkta olacağı hipotezini araştırmaktır.

**Yöntem:** Ocak 2014-Ekim 2019 arasındaki meme ultrason görüntülemeleri gözden geçirildi ve 9-20 yaşları arasında ve 21-35 yaşları arasında toplam 345 erkek hasta kaydedildi. Tüm lezyonlar normal erkek meme görünümü, tek taraflı jinekomastr, bilateral jinekomastr, ciltaltı yağ dokusu artışı (psödo jinekomastr), lipomlar, şüpheli lezyon, enfeksiyon ve diğer benign bulgular olarak sınıflandırıldı. Jinekomastrinin fibroglandüler dokusunun boyutları rapor edildi ve yaş grupları arasında karşılaştırıldı. Lezyon tipleri ve

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hasta gruplarının istatistiksel analizi ki-kare testi ile yapıldı. Hastanın yaşı ve jinekomasti durumu Student-t testi ile analiz edildi. Hasta yaşı ve jinekomasti boyutları Spearman korrelasyon testi ile karşılaştırıldı.

**Bulgular:** Çalışma grubunu 208 genç erkek ve 137 ergen oluşturdu. Genç erişkinlerin %60'ında, adolesanların %77,6'sında jinekomasti vardı. En sık ikinci patoloji, yağ dokusu artışı ile birlikte psödo-jinekomastiydi ve yetişkinlerde %17, ergenlerde %12 oranında görüldü. Erişkin grupta bir lezyon şüpheli bulundu ancak histopatolojik tanısı jinekomasti idi. Chi-kare testi ile değerlendirildiğinde jinekomasti ergen grupta istatistiksel olarak anlamlı şekilde daha sık bulundu ( $P<0,01$ ). Glandüler dokunun ultrasonografide ölçülen derinlik ve transvers boyutları, ergenler ve erişkinler arasında ve yaşlara göre anlamlı ölçüde farklı değildi.

**Sonuç:** Jinekomasti sıklığı ergenlikten sonra azalmaktadır ancak jinekomastisi olan yetişkinlerde meme glandüler doku boyutlarının, ergenlik sonrası hormonların düzenlenmesine bağlı olarak fark göstermediği görülmektedir. Adölesans döneminde görülen jinekomastinin regrese olmaması halinde yetişkinliğe geçildiğinde de küçülmediği anlaşılmaktadır.

**Anahtar kelimeler:** Ergenlik, erkek memesi, jinekomasti, meme ultrasonu

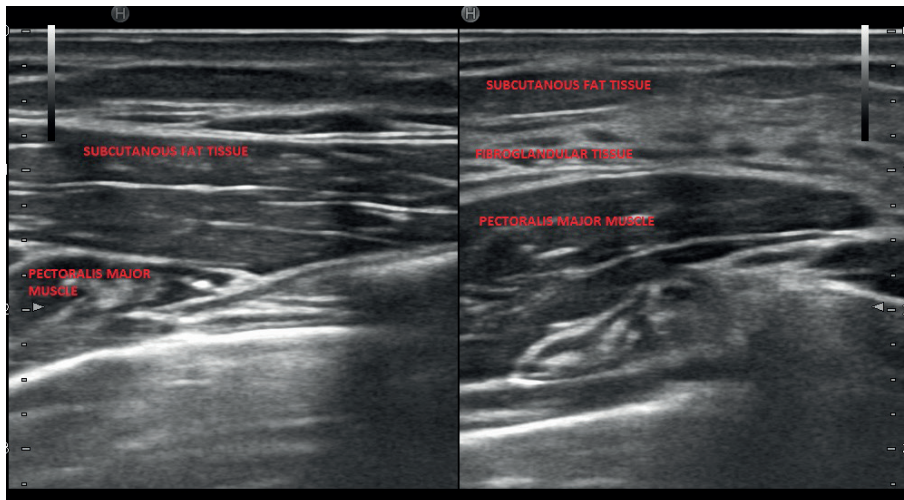
## INTRODUCTION

Gynecomastia is defined as an increase in the stromal and ductal components of the male breast and is a common breast problem in adolescent patients (1-3). Pseudogynecomastia is an increase in adipose tissue that cause breast enlargement (4,5) (Figures 1a and 1b). Both can cause breast enlargement and symptoms in males.

The etiology of gynecomastia is due to an imbalance between free estrogen and testosterone effects in breast tissue, and its incidence has dramatically increased in the last 20 years (6). Newborns, adolescents, and elderly men can have physiological gynecomastia because of hormonal changes. Functional tumors of the adrenal cortex or testis, chronic renal, hepatic, or pulmonary diseases, and hepatocellular carcinoma can also

cause gynecomastia. It is also commonly seen as a side effect of drugs (7).

Adolescence is a period of human life with different endocrinological changes in the body. First, an increase in estrogen and then in testosterone levels result in a temporary increase in the glandular stroma and ducts, and after adolescence, regression of the ducts is seen. Histopathologically, gynecomastia is classified into fibrous and florid types. In the florid type, which is a form of early-onset gynecomastia (less than 6 months), there is ductal hyperplasia with accompanying periductal inflammatory cells and edema. During this period, the gynecomastia is painful and may be reversible. The fibrous pattern is mostly observed after 6 months and the glandular tissue regresses. Instead, during this period, the connective fibrous tissue is more predominant and characterized by ductal



**Figure 1.** 1a Ultrasound image of pseudogynecomastia on the left with increased subcutaneous fatty tissue. 1b. Ultrasound image of gynecomastia on the right with glandular tissue development.

dilatation and fibrosis, hyalinization, and increased adipose tissue. After this period, gynecomastia is considered irreversible due to chronic changes (8,9). Since progesterone is missing, terminal ductolobular units do not develop in males (2,10). As a result, lobular pathologies are unusual in male breasts (9).

Male breast diseases are not as widely evaluated in the literature as female breast diseases. In addition, since malignancy is not a common pathology, breast imaging findings in young men are not commonly analyzed in the literature. However, males do apply to radiology departments, though not as frequently as women. The most common symptoms of male breast lesions are increased breast size, a palpable nodule, or pain<sup>2,11</sup>; aesthetic concerns may also be another reason for seeking medical attention.

Although breast lumps are common in adolescents, radiological imaging is not routinely required for young males. According to the American Society of Andrology and the European Academy of Andrology, breast imaging may offer assistance where the clinical examination is equivocal (11).

The radiological differentials of gynecomastia are mainly benign diseases of the breast, subcutaneous adipose tissue, and skin (12). Benign breast cysts are rare and mostly due to ductal dilatation. Fibroadenomas are also very rare in men due to the absence of glandular lobules (13). Breast cancer is a very rare entity in men, and it is a disease in elderly patients (14). Lipoma may be the cause of palpable lesions of the breast as well as any other part of the body. Seat belt injuries can also cause fat necrosis in men (14). Pseudogynecomastia is a disproportionate increase in subcutaneous adipose tissue behind and around the areola. Although not common, mastitis can also be seen in male patients. It is seen in the retroareolar region and results in abscess formation. An abscess can require differentiation from a malignancy in elderly patients (13). Skin lesions (such as sebaceous cysts) are as common

in women and can be easily differentiated by their location on both physical examination and ultrasound (14).

The study aims to investigate the sonographic findings of young males with breast lumps and the differences between young adulthood and adolescence.

## MATERIAL AND METHODS

Male patients between 9-35 years of age with a breast lump or pain who had breast ultrasound evaluation formed the study group. Breast ultrasound imaging studies between January 2014 and October 2019 were reviewed, and 345 male patients were found to have undergone ultrasonographic evaluation. The patients were divided into two groups according to their age. Male patients between the age of 9-20 years (early, middle, and late adolescents) and between the ages of 21-35 years (young adults) were included (15). Two hundred and eight young males and 137 adolescents formed the study group. The adolescent group was formed between precocious puberty and late adolescence period (16,17).

Patients were classified as having normal male breast appearance, unilateral gynecomastia, bilateral gynecomastia, increased subcutaneous adipose tissue (pseudogynecomastia), lipomas, suspicious lesion, and other benign findings such as infection.

Also, the sizes of the glandular tissue, such as the radius and depth of the tissue, were recorded according to the ultrasonographic evaluations.

The study has been approved by the ethics committee (date: 14-02-2018 no: 2012-KAEK-15/1605) and Helsinki ethical principles were followed.

### Statistical analysis

Normal breast ultrasound, pseudogynecomastia, and gynecomastia according to age groups were

analyzed with a chi-square test. Patient age and gynecomastia status were analyzed by Student's t-test. Patient age and gynecomastia sizes were compared by the Spearman correlation test.

**RESULTS**

One hundred twenty-five of the 208 patients (60%; 41.8% bilateral, 18.2% unilateral) in the young adults and 105 of the 137 (77.6%; 50.3% bilateral, 26.3% unilateral) of the adolescents who underwent ultrasonographic evaluation had gynecomastia (Table 1). The second most common pathology was pseudogynecomastia with increased adipose tissue; in 17% of young adults and, 12% of adolescents. The Chi-square test demonstrated the relationship of age

groups with normal, pseudogynecomastia, and gynecomastia groups; gynecomastia was more common in adolescents and pseudogynecomastia incidence was higher in adults. (P=0.002; Graphs 1 and 2).

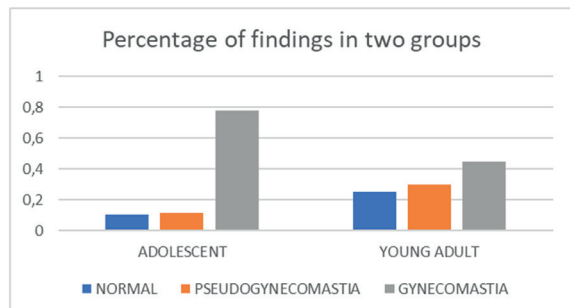
Lipoma was the cause of the lump in three patients in young adults, whereas we didn't see lipoma as the cause of the lump in adolescents.

One skin lesion and one cyst were seen in adolescents; infectious findings were seen in one patient. One cyst and one solid benign lesion were seen in one patient in the young adult group. One lesion was found suspicious in the adult group and the pathology revealed gynecomastia in this patient.

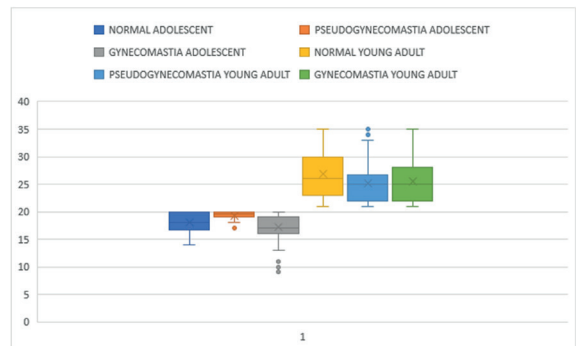
**Table 1. Lesions according to patient groups.**

	Adolescent	Young Adult	Total
SOLID LESION	0	1	1
NORMAL	14	41	55
PSEUDOGYNECOMASTIA	16	35	51
LEFT GYNECOMASTIA	21	19	40
RIGHT GYNECOMASTIA	15	17	32
BILATERAL GYNECOMASTIA	69	86	155
SUSPICIOUS LESION	0	1	1
INFECTION	0	1	1
FRONCULE	1	0	1
CYST	1	1	2
LIPOMA	0	5	5
EDEMA	0	1	1
Total	137	208	345

All lesions in each group.



**Graph 1. Normal, Pseudogynecomastia and gynecomastia percentages of the patients according to age group (excluding other focal lesions).**



**Graph 2. The mean ages of normal adolescents 18.1, adolescents with pseudogynecomastia 19.3, adolescents with gynecomastia 17.1, young adults with normal ultrasound 26.9, young adults with increased subcutaneous fatty tissue 25.2, young adults with gynecomastia 25.6.**

The mean transverse diameter of the fibroglandular tissue was 20.6 mm (minimum 3.6 and maximum 110 mm) in adolescents and 22.4 mm (minimum 2.7 and maximum 130 mm) in young adults.

The mean depth of the fibroglandular tissue in adolescents was 5.7 mm (minimum 1.2 and maximum 50 mm) and the mean depth of gynecomastia in young adults was 6.8 mm (minimum 2 and maximum 40 mm). When the transverse dimension and depth of the gynecomastia were compared with patient age and adult-adolescent groups, there was no statistical difference between young and adult patients ( $P>0.05$ ).

## DISCUSSION

Breast enlargement is a common complaint among young males with a prevalence varying between 22 and 69% (11). However, due to hormonal changes after adolescence, the reason for breast masses would differ among different age groups. In this study, it is hypothesized that since the adolescence period is the period of transient gynecomastia, gynecomastia would be more frequent in adolescents than in young adults. Accordingly, this study revealed that true gynecomastia is more common than it is predicted in boys.

Pubertal gynecomastia is a physiological phenomenon that occurs in medically healthy boys. It is mostly seen in mid-puberty. An imbalance in the ratio of free androgen to free estrogen that results in greater physiological estrogen effects on breast tissue during puberty has been suggested as the cause. After adolescence, circulating androgen levels rise closer to adult levels, and a higher androgen-to-estrogen ratio is expected. Within 1–3 years, almost 90% of boys will have regression of their breast enlargement. There is also a growing body of evidence that leptin can influence pubertal gynecomastia (18). There are cross-sectional national-based studies showing

that 2.8% of 19-year-old boys have persistent gynecomastia (11). This is concordant with our study group, which includes males up to 20 years old in the adolescent group, so we can see the changes that will occur after early adolescence. And the consistent findings in the young adult group will be classified in the latter group.

We were expecting to see larger fibroglandular tissue size in adolescents and smaller fibroglandular tissue in young adults. However, the study showed that the size of the stromal tissue was not different between the two age groups. Reinehr and friends showed that 29% of the boys had smaller-size gynecomastia in their 2-year follow-up study with 31 patients. In this cross-sectional study, we did not see any difference in size between boys and young adults. The difference between these two results can be due to the age groups involved; they only included 11-16-year-old boys, and we used a wider age range and a larger number of patients for the study (4).

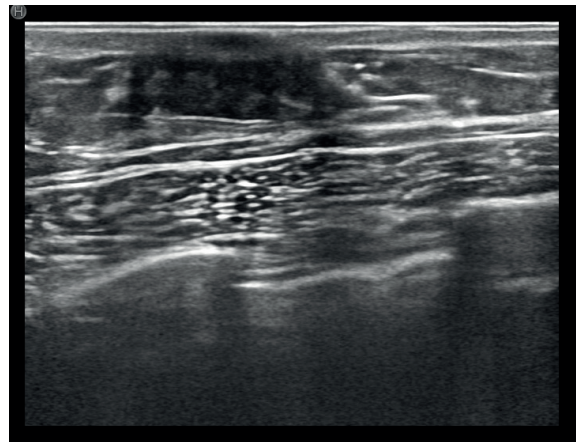
Having similar sonographic measurements of glandular tissue size in boys and young adults could be a sign that if gynecomastia is present throughout adolescence, these patients are those who have regression of stromal tissue and have breast tissue similar to that of adolescents. Also, late-onset gynecomastia patients are in this group and their presence did not change the size of the gynecomastia between the groups. As a result, we wouldn't see a difference in the appearance of gynecomastia between the two age groups.

Gynecomastia was also the most common cause of breast lumps seen on the ultrasound in young adults. Thickening of the subcutaneous adipose tissue -pseudogynecomastia- seen on ultrasound was another common cause of breast masses in adults, which is less common in boys. An increase in the incidence of pseudogynecomastia after adolescence was concordant with the literature (13). Reinehr et al.<sup>4</sup> showed that 65% of the pubertal boys had fatty thickening (pseudogynecomastia) of the breast at two-year follow-up.

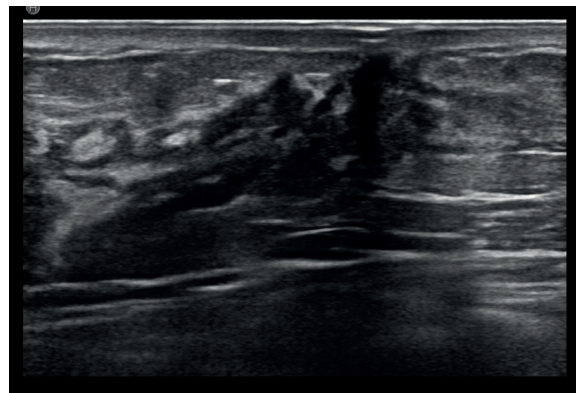
The composition of the breast lump on ultrasound is important for the surgeon to decide on the surgical technique. Breast lumps mostly composed of large fibroglandular tissue may require excisional surgery, whereas if the lesion is due to pseudogynecomastia and is composed of adipose tissue, the operation can be performed with liposuction (19,20). Most of our patients had unilateral or bilateral true gynecomastia (235 out of 345 total patients).

In the review of the ultrasound images, it was seen that there are cases overlapping of minimal gynecomastia and accompanying increased fatty tissue (2). This can be an issue especially when the developing stromal tissue is limited to the retro areolar region since the artifacts of the areola always make it difficult to see the ducts, glandular tissue, and lesions below the areola even in female patients. Applying adequate compression and using large amounts of gel will help visualization of this area. Gel pads can also be helpful in the evaluation (14).

Gynecomastia is radiologically classified as nodular, dendritic, and glandular on mammography. The nodular type is generally newly developing fibroglandular tissue (Figure 2). The dendritic type is seen in more chronic processes and has fibrous components (Figure 3). The glandular type is generally associated with external hormonal intake and causes large breast masses similar to those of young females. Gynecomastia usually begins centrally as a hypoechoic nodule and turns into a dendritic pattern with more complex, heterogenous hypo-hyperechoic fibroglandular tissues on ultrasound in adults (2). In adult cases with a nodular lesion, malign lesions should always be considered in the differential diagnosis. In case of any suspicion, mammography should be included in the diagnostic work-up (21). In this study, one nodular lesion was found suspicious in the adult male group and was biopsied and confirmed to be fibroglandular tissue. Although mammography is considered the first-line radiological evaluation in male breast



**Figure 2. Nodular gynecomastia is generally the early appearance of gynecomastia.**



**Figure 3. Dendritic gynecomastia is a more structured form and has fibrotic components.**

pathologies, especially for microcalcifications, young populations with a low risk of malignancy can be evaluated by ultrasound (13,22).

Focal breast lesions in males are very rare, and it's seen that their frequency increases after adolescence. Among the focal breast lesions, lipoma was the most common one. Lipoma is a nodular hyperechoic solid lesion on ultrasound imaging, and it is not specific to breast tissue and can be seen on different sides of the body (14). In our study, there were three adult patients with lipoma.

Inflammatory lesions of the male breast and skin in this region were another rare causes of ultrasound use. We had one patient with inflammatory findings. In that case, edematous adipose tissue changes-hyperechoic adipose

tissue, fine collections around fat lobules- and skin thickening were the radiological findings. In this study, abscess formation was not seen during the study period.

The limitations of this study are that it was not prospective and evaluated the same patients in different periods of time.

Another limitation is that the lesions were evaluated according to their sizes. Nodular-dendritic typing would be more accurate if it was supported by mammographic evaluation. However, since there was no suspicion of malignancy in this group of young males, we did not get mammograms from most of the patients. This study aimed to evaluate the value of ultrasound without the usage of mammography in young male patients.

## CONCLUSION

Gynecomastia is the most common reason for radiological imaging in young male patients. After adolescence, the incidence of pseudogynecomastia increases. However, the size of the glandular tissue does not differ between age groups. We cannot conclude that gynecomastia is prone to be smaller in adults than in adolescents, but the incidence of gynecomastia decreases after adolescence as a result of hormonal regulation.

Although male patients do not apply at the breast imaging sections of radiology departments as often as women, getting used to young male breast ultrasound imaging is important for evaluating this group of patients.

**Ethics Committee Approval:** The study protocol was approved by the Ankara Keçiören Training and Research Hospital Clinical Research Ethics Committee (14.02.2018 / 2012-KAEK-15/1605).

**Conflict of Interest:** The authors have declared that they have no conflict of interest.

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