Topics in plastic surgery of the breast
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OVERUSE OF IMAGING OF THE MALE BREAST – FINDINGS IN 557 PATIENTS
ABSTRACT

Background: Gynecomastia is the most common abnormality of the male breast. However, breast cancer may occur, albeit with a significantly lower incidence than in females. Imaging is often used as part of the diagnostic workup. The aim of this study was to assess the utilization and outcome of imaging with mammography or ultrasound of the male breast in a university hospital’s department of radiology.

Method: A retrospective study assessing the imaging of the male breast in 557 patients over a 10-year period.

Results: Referral was done mainly by general surgeons and general practitioners. The most common indication was enlargement of the breast, described as gynecomastia or swelling in 74% of patients, followed by pain in 24% and “lumps” in 10%. The modalities used were mammography in 65%, ultrasound in 51% and both in 26%. Most examinations, 519, had a BI-RADS score of 1 or 2, and 38 had a score of 3 or higher. Altogether 160 patients had additional fine needle aspiration or biopsy.

Malignancies were diagnosed in 5 patients (0.89%). Imaging had a sensitivity of 80% and a specificity of 99%. The positive predictive value was 44% and the negative predictive value 99.8%.

Conclusion: Malignancies are rare in the male breast. The probability of finding cancer when performing imaging of clinically benign findings in the male breast is negligible. Imaging is not warranted unless there are obvious abnormalities. Routine imaging of gynecomastia should be discouraged.
INTRODUCTION

The male breast is an embryological remnant; it has no physiological function. Nevertheless, the nipples and breast tissue form part of the normal male anatomy and are important for the body self-image.

During the embryonal period the development is identical in both males and females, with similar nipples present at birth. Until puberty the breasts remain similar in both sexes. In females growth and differentiation will occur during puberty, under hormonal influence, and such changes may be seen to a lesser extent in male breasts during the same period.

The most common anomalous finding in the male breast is gynecomastia – excessive enlargement of the breast, seen in up to 64% of adolescents and up to 72% of hospitalized patients [1, 2]. The etiology is attributed to hormonal imbalance which in most cases is idiopathic but may also be caused by systemic diseases and medicine use [3].

The possibility of breast cancer should not be overlooked, although the incidence in men is low, being less than 1% of that seen in women. Lipomas and infectious processes may also be seen [4].

As in diagnostics of the female breast, the first step is taking a detailed history and performing a thorough physical examination. This can be followed, if necessary, by imaging and biopsies.

Mammography and ultrasound (US) are as effective for evaluating the male patient as for the female patient [5]. Similarly, the Breast Imaging-Reporting and Data System (BI-RADS) is applicable to reporting the findings [6]. The imaging characteristics of the different lesions are fully comparable and have been previously described [5].

Imaging is often used by clinicians to confirm the clinical diagnosis of gynecomastia or to evaluate the nature of clinical findings in the breast and, in elderly men, to exclude the small risk of malignancy.

In men under the age of 30, US is considered the imaging method of choice. In addition, it has the advantage of avoiding radiation. In elderly men mammography is considered the method of choice because malignancy can be depicted with higher accuracy than on US. Additional US is, of course, always indicated if the mammogram does not provide satisfactory information with regard to the patient’s symptoms [7].

The aim of this study was to assess the utilization and outcome of imaging of the male breast in a university hospital’s department of radiology.

METHODS

Setting: a university teaching hospital. Design: a retrospective study assessing all imaging of the male breast over a 10-year period.

Using the database of the Academic Medical Center’s Department of Radiology, imaging reports of the male breast were retrieved for the period between 1 January 2001 and 31 December 2010. A total of 634 patients were identified. The available data
retrieved included: patient demographics, a transcription of the imaging request form, the imaging performed and its results. In cases where a biopsy was also performed, the histopathological result was retrieved. Examinations were excluded if they were considered to be irrelevant, i.e. non-breast-related. We defined an examination as secondary if it took place within 2 years of a previous examination. If an examination occurred more than 2 years after the first one, it was considered a primary examination.

The patient data were entered in a database (Microsoft Access 2010). Descriptive statistics were used.

Querying the database returned 660 imaging examinations. We excluded 34 of these, namely 13 tissue specimens, 12 examinations of the axilla, 8 non-breast-related chest wall pathologies, and 2 examinations in a transsexual patient.

We identified 557 primary examinations. The average age of the patients at the first examination was 45.7±18.5 years, with a range between 5 and 89.

RESULTS

Patients were referred for examination mainly by general surgeons (34.7%) and general practitioners (34.5%), followed by internal medicine specialists (16%), pediatricians (5%), endocrinologists (2.7%), radiotherapists (1.8%), and plastic surgeons (1.8%). The rest of the patients were referred by other disciplines.

The most common indications for examinations as defined by the referring physicians were enlargement of the breast, described as gynecomastia or swelling in 74.24% of patients, followed by pain in 24.33% of patients, and a lump in 10%. There was an overlap of complaints. These data are set out in Figure 1.

![Figure 1. Indications for imaging](image-url)
The affected side was reported to be the left in 263 cases, the right in 173 and bilateral in 67; in 54 cases this was not clearly stated in the report.

**Imaging diagnosis**
The imaging modalities used were mammography in 65% and US in 51%. In 26% of the examinations both modalities were used. There was an increased use of mammography with increase in patient age, concordant with the imaging protocols shown in Figure 2.

![Graph](image_url)

Figure 2. Imaging modalities used

Most examinations, 518 (93%), were assigned a BI-RADS score of 1 or 2. One examination was wrongly assigned a BI-RADS of 0; however, after revision it was included in the BI-RADS 1 and 2 cohort. Thirty-eight examinations were assigned a BI-RADS score of 3 or higher. The distribution of the BI-RADS scores and pathological examination in our patient group is presented in Table 1.

Gynecomastia was the most common diagnosis, being diagnosed in 477 patients (85.3%). Lipomas were diagnosed in 4.3% of the cases and infections occurred in 2.5% of cases. Malignancies were diagnosed in 5 patients (0.89%). The remaining cases included benign findings such as post-operative changes, fat necrosis and epidermal cysts.
Pathological diagnosis

Fine needle aspiration (FNA) was used in 160 patients. In the first half of the study decade our protocol called for the use of FNA to establish the diagnosis of gynecomastia. This practice was later abandoned because of the high negative predictive value of benign clinical and radiological findings. FNA was performed in 134 cases with BI-RADS of 1 and 2. Malignancy was excluded in 112 cases and in 22 cases the results were inconclusive.

Additional biopsies were performed in 8 cases and confirmed the diagnosis of gynecomastia. Two patients underwent surgical excision, confirming gynecomastia. In the other cases only follow-up was performed.

FNA was performed in 20 cases with a BI-RADS score of 3. In 19 patients the diagnosis was benign. In one it was inconclusive and this was followed by additional excision which showed gynecomastia.

One of the 19 patients presented with bloody nipple discharge. Imaging showed a 6 mm rounded complex cyst, probably a papilloma, assigned a BI-RADS of 3. FNA demonstrated blood and no evidence of a tumor. Because of the persistence of symptoms in this patient, imaging was repeated and now a BI-RADS of 4 was assigned because of new microcalcifications. Excision subsequently revealed invasive carcinoma.

FNA was performed in 5 cases with BI-RADS scores of 4. In 2 cases the diagnosis was benign, in 1 case the diagnosis was malignant and in 2 cases the results were inconclusive. Additional biopsies were all benign. In the 2 patients with BI-RADS scores of 5 the diagnosis of malignancy was confirmed in 1 patient by FNA and in the other by biopsy.
**Final diagnosis**

All 5 patients diagnosed with a malignancy had signs and symptoms: they all had a unilateral, painless palpable mass, 2 also had an inverted nipple and 1 had bloody nipple discharge. The imaging of the latter patient was in the first instance false-negatively assigned a BI-RADS of 3. After 3 months this was upgraded to a BI-RADS of 4.

The other 4 malignancies were true-positively assigned a BI-RADS of 4 or 5.

One patient with a known metastatic lymphoma was diagnosed by radiology as having a metastatic infiltration in his breast, but it was decided not to confirm this by pathological examination.

Apart from the abovementioned false-negative result, no other false-negative results turned up during the period of the study.

Using BI-RADS scores of 4 and 5 as positive examinations and BI-RADS of 1-3 as negative, we found that radiological examination had a sensitivity of 80% and a specificity of 99%. The positive predictive value was 44% and the negative predictive value was 99.8% (see Table 2).

**DISCUSSION**

In our series the most common finding on imaging of the male breast was gynecomastia, followed by other benign findings. There were only 5 malignancies in our series, representing no more than 0.89% of the examinations. This reflects the high prevalence of gynecomastia and the low prevalence of carcinoma of the breast in males. The imaging performed in our institution had a low yield; many of the examinations were performed to confirm benign clinical diagnoses and did not add significant information to the clinical diagnosis. In fact, there was almost complete agreement between the clinical and radiological diagnoses. The malignancies were observed only in patients in whom there was clinical suspicion and a BI-RADS score of 3 or higher. The standard use of biopsies in the first half of the study decade did

<table>
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<th>Malignant</th>
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<tr>
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<td>4</td>
<td>5</td>
<td>9</td>
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<tr>
<td>BI-RADS 4 &amp; 5</td>
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<tr>
<td>Test negative</td>
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<td>547</td>
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</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>552</td>
<td>557</td>
</tr>
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Sensitivity = 4/5 x 100% = 80%
Specificity = 547/552 x 100% = 99%
Positive predictive value = 4/9 x 100% = 44%
Negative predictive value = 547/548 x 100% = 99.8%
not add to the diagnosis. Moreover, inconclusive FNA results led to uncertainty for the patients and to unnecessary additional biopsies. Since breast cancer in men is rare, the incidence being less than 1% of that seen in women [8], it is expected that this difference should also be reflected in the results of imaging of the male breast. Gynecomastia is the most common pathology of the male breast and is a benign finding only rarely associated with malignancy [9]. It is therefore probably not necessary to perform imaging unless there are suspicious clinical findings [10, 11]. As opposed to the practice in women, population screening is not practiced in men, even in patients with an increased relative risk, due to the fact that the incidence of tumors remains too low to warrant such screening.

The incidence of tumors that we observed is lower than that described in other publications, and is probably influenced by the referral pattern. Gunhan-Bilgen et al. presented a series of 236 male patients, among whom they diagnosed a carcinoma in 6% [5]. Dershaw observed a similar carcinoma incidence of 6% in the 94 patients he examined [12]. Munoz Carrasco et al. reported an incidence of 3% in 628 patients [13]. Hines et al. reported on 198 patients and described a carcinoma incidence of 1%. They concluded that because most male breast cancers are obvious, mammography is not always required [14]. We only partially agree with the conclusion of Hines et al. In our series a significant number of the examinations were performed for unnecessary confirmation of long-lasting swelling of the breasts, without actual suspicion of malignancy, the referring physicians already stating that the patients had gynecomastia.

However, imaging is very effective in inconclusive clinical findings. Imaging is also indicated in the case of high suspicion of malignancy, [11, 15-17]. Treatment is better ensured by complete information about the extent of the disease. This has become even more relevant considering the fact that advanced surgical procedures nowadays also include breast-conserving therapy in men [18].

In our healthcare system medical insurers require radiological confirmation of the presence of breast tissue before coverage is given for the surgical excision of gynecomastia, but imaging is usually not needed for the planning of a surgical procedure. This represents an unnecessary burden on healthcare resources.

Although it may be claimed that we observed a low incidence of malignancy because lesions may have been missed, our negative predictive value of the imaging results was very high, i.e. 99.8%, which is in concordance with the literature findings [13, 16, 19-22].

A weakness of our study is the retrospective design since we do not know how many of all male patients presenting to their physicians with complaints or symptoms were referred for breast imaging. Nevertheless, most imaging was not necessary; the same applies to FNA and puncture procedures. Imaging of the male breast should be performed when there is a strong clinical indication and a true suspicion of a
pathological process and additional puncture should be undertaken according to the BI-RADS score [22].

CONCLUSION

Pathological findings other than gynecomastia are very rare in the male breast. Therefore the probability of finding cancer when performing imaging of clinically benign findings in the male breast is negligible. Imaging of male breasts is not warranted unless there are obvious abnormalities.

Routine imaging of gynecomastia should be discouraged and we must strengthen our efforts to improve the education in clinical skills of residents and practitioners who will treat male patients with breast complaints.

REFERENCES

7. [http://www.oncoline.nl/breastcancer]