Original Article

Sonographic Ultrasound Evaluation of Mastalgia and to Determine the Relationship between Breast Duct Diameter and Severity of Mastalgia

Sundus Aziz[1*], Amjad Sattar[1], Ayesha Walid[1], Anila Rahim[1], Nasreen Naz[1], Husson Ara[1]

ABSTRACT

OBJECTIVE: To determine the breast ultrasound findings in patients with Mastalgia and the relationship between breast duct diameter and severity of Mastalgia.

METHODOLOGY: A prospective cross-sectional study carried out at Dow Institute of Radiology, Dow University of Health Sciences from June-December 2021. Female patients, irrespective of age, presenting with Mastalgia without any prominent finding on clinical examination were included. A fellowship-trained radiologist performed an ultrasound. Data analysis was performed on SPSS 22.0

RESULTS: Total 380 patients were included. The mean age of the patients was 36.3±11.5 years, and the mean VAS score was 3.2±1.2. A total of 234(61.6%) had mild pain, 139(36.6%) had moderate pain and 7 (1.8%) had severe pain. The mean duct diameter in patients with Mastalgia was 2.9±3.7 mm, with 220 (57.9%) patients having a diameter <2.0 mm and 160(42.1%) having a diameter >2.0 mm. Duct ectasia was found in 161(42.4%). Mastalgia was significantly higher in patients with duct ectasia (p-value <0.001) and in patients with fibrocystic change (p-value <0.001).

CONCLUSION: Duct ectasia, fibrocystic changes, infective/inflammatory changes, and axillary lymphadenopathy were sonographic features of Mastalgia. Mastalgia was significantly higher in patients with duct ectasia, duct diameter >2.0 mm and in patients with fibrocystic changes.

KEYWORDS: Mastalgia, Duct ectasia, fibrocystic changes, breast pain.

INTRODUCTION

Breast pain, often termed medically as Mastalgia, is a common condition among females. Women usually describe it as a dull ache. However, some females may have breast heaviness, numbness, tightness, or discomfort. Pain severity may be variable, ranging from mild to severe. Moreover, its nature may be intermittent or continuous. In extreme cases, it may hamper the quality of life[1,2]. Mastalgia may be cyclic or non-cyclic. Cyclic pain is usually due to hormonal variation during the menstrual cycle, often described as severe one to two weeks before the start of periods and declining on the day of bleeding, subsiding in the next few days. It improves during pregnancy or lactation or in menopause[3]. Non-cyclic pain is usually unrelated to the menstrual cycle and may be related to injury, surgery, infection or intrinsic breast diseases such as cysts or neoplasm[4].

According to a study, Mastalgia is present in 51.5% of the population[5]. Moreover, it was frequent in older patients and less active patients. 35% of the patients reported sleep disturbance due to Mastalgia.[5] Mastalgia has also been linked to ingestion of a high-fat diet, intake of high-caffeine drinks, smoking, and use of some antidepressants, antibiotics or hormonal treatment. However, the mechanism is not well understood[6].

Commonly used imaging modalities for breast pain evaluation include mammography and ultrasonography. Ultrasound employs sound waves, predominantly in females under 35 years and those with dense breasts[7]. Females with Mastalgia may have a normal ultrasound or fibrocystic disease, duct ectasia, mastitis and fibroadenoma in 32.3%, 8.8%, 0.6% and 6.1% of the cases respectively[8]. It is essential to exclude any serious underlying disease process in patients presenting with Mastalgia. According to Breast Imaging Reporting and Data System (BI-RADS)[9], a previous local study has focused on findings. However, no relationship between Mastalgia and its severity has been made with the breast duct diameter in our population. Moreover, a study reported a higher duct diameter in patients with painful breasts than in non-painful breasts[10]. Therefore, this study aimed to determine the breast ultrasound findings in patients with Mastalgia and the relationship between breast duct diameter and severity of Mastalgia.

METHODOLOGY

A prospective cross-sectional study was undertaken at Dow Institute of Radiology, Dow University of Health Sciences, Ojha campus, from June - December 2021.

[1]*Dow Institute of Radiology, Dow University of Health Sciences, Karachi, Sindh-Pakistan*
***Correspondence:** sundus.azizshaikh@gmail.com*
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The sample size was calculated using an Openepi calculator, taking the frequency of duct ectasia in mastitis as 8.8% [8], the confidence interval (CI) as 95%, and the margin of error as 3%. The total sample size came out to be 342. Non-probability consecutive sampling technique was used. Female patients of either age presenting with Mastalgia without any prominent finding on clinical examination were included as described in the operational definition and prescribed ultrasound by their primary physician. Patients with a positive physical examination, including palpable breast mass, skin thickening, ulceration, nipple discharge, nipple retraction, known breast carcinoma, post-breast surgery, lactation, or already diagnosed with duct ectasia/follow-up patients. In included patients, Mastalgia was defined as breast pain for one day or more without any prominent finding on clinical examination. Its severity will be labelled on a visual analogue scale (VAS)[11]: VAS 1-3 was considered mild pain, VAS 4-6 was moderate pain, and VAS 7-10 was severe pain. Among sonographic findings of Mastalgia, duct ectasia was regarded as the abnormal widening of one or more breast ducts (tubular branching structures) to greater than 2 mm diameter, or 3 mm at the ampulla[12,13]. On ultrasound, fibrocystic change was defined as prominent fibro glandular tissue without any palpable mass, which may include cysts and areas of fibrosis.

Patients presenting with Mastalgia for ultrasound breast were initially to grade their pain on the visual analogue scale (VAS). The patient signed a written consent form before the procedure. Following pain grading, an ultrasound breast was performed by the principal investigator and also by a consultant radiologist with more than three years of experience post-fellowship in female imaging. Ultrasound was performed on Toshiba Aplio 300 ultrasound system machine. All four quadrants of the breast and retroareolar region were scanned systematically. Patients were again asked to pinpoint the exact location of the pain to re-look that area again for any abnormality. Patient demographics, pain score, severity, and ultrasound findings were recorded.

Statistical package for social sciences version 22.0 was used for data entry and analysis. Mean and standard deviation (SD) was calculated for quantitative variables such as age, weight, height, BMI, VAS score and duct diameter. Frequency and percentages were computed for qualitative variables such as pain severity (mild, moderate or severe), duration of pain, cyclical variation (cyclic or non-cyclic), marital status (unmarried or unmarried), menstrual status (normal cycle, premenopausal or menopause), co-morbidities (hypertension, diabetes, nil), drug history (hormone therapy, antidepressants antibiotics), occupation, and residence. Effect modifiers such as age, duct diameter, cyclical variation, marital status and menstrual status were stratified to see their effect on pain severity. Post-stratification, the chi-square test was applied, and a p-value of less than or equal to 0.05 will be taken as significant.

RESULTS

A total of 380 patients were included in this study. The mean age of the patients was 36.3±11.5 years. The

Table I: Baseline characteristics of the patients with Mastalgia (n=380)

	n	%
Age (years)	36.3±11.5*	
≤40	259	68.2
>40	121	31.8
Height (cm)	164.3±5.5*	
Weight (kg)	67.7±9.32*	
BMI (kg/m^2)	25.0±3.1*	
Duct diameter (mm)	2.9±3.7*	
≤2.0	220	57.9
>2.0	160	42.1
VAS score	3.2±1.2*	
Pain severity		
Mild	234	61.6
Moderate	139	36.6
Severe	7	1.8
Duration of pain (months)	3.4±1.4*	
Cyclic variation		
Cyclic	54	14.2
Non-cyclic	326	85.8
Marital status		
Married	273	71.8
Unmarried	107	28.2
Menstrual status		
Normal cycle	272	71.6
Peri-menopausal	41	10.8
Menopause	67	17.6
Diabetes Mellitus		
Present	42	11.1
Absent	338	88.9
Hypertension		
Present	66	17.4
Absent	314	88.9
Medication use for co-morbid conditions		
Present	57	15.0
Absent	323	85.0

**Mean±SD*

Table II: Ultrasound features in patients with Mastalgia (n=380)

	n	%
Duct ectasia		
Present	161	42.4
Absent	219	57.6
Fibrocystic changes		
Present	66	17.4
Absent	314	82.6
Infective/inflammatory changes		
Present	56	14.7
Absent	324	85.3
Axillary lymphadenopathy		
Present	12	3.2
Absent	368	96.8

mean duration of symptoms was 3.4±1.4 months. Mean height, weight and BMI were 164.3±5.5 cm, 67.7±9.32 kg and 25.0±3.1 kg/m^2, respectively. The mean VAS score was 3.2±1.2. A total of 234 (61.6%) had mild pain, 139 (36.6%) had moderate pain and 7 (1.8%) had severe pain. 326 (85.8%) had non-cyclic Mastalgia, and 54 (14.2%) had cyclic Mastalgia. Out of 380 patients, 273 (71.8%) were married. Multiple findings in mastalgia patients were found in 69 (18.2%), and a single result was found in 311 (81.8%). A total of 272 (71.6%) had normal menstrual cycles. The mean duct diameter in patients with Mastalgia was 2.9±3.7 mm, with 220 (57.9%) patients having a diameter <2.0 mm and 160 (42.1%) having a diameter >2.0 mm. The baseline characteristics of the patients are summarized (**Table I**).

Table III: Comparison of mastalgia severity with patient characteristics

	Mastalgia severity			Total	P value
	Mild	Moderate	Severe		
Age					
≤40 years	186 (48.9%)	70 (18.4%)	3 (0.8%)	259 (68.2%)	<0.001*
>40 years	48 (12.6%)	69 (18.2%)	4 (1.1%)	121 (31.8%)	
Cyclic variation					
Cyclic	44 (11.6%)	10 (2.6%)	0 (0.0%)	54 (14.2%)	0.004*
Non-cyclic	190 (50.0%)	129 (33.9%)	7 (1.8%)	326 (85.8%)	
Marital status					
Married	152 (40.0%)	114 (30.0%)	7 (1.8%)	273 (71.8%)	<0.001*
Unmarried	82 (21.6%)	25 (6.6%)	0 (0.0%)	107 (28.2%)	
Menstrual status					
Normal cycle	191 (50.3%)	78 (20.5%)	3 (0.8%)	272 (71.6%)	<0.001*
Peri-menopausal	12 (3.2%)	25 (6.6%)	4 (1.1%)	41 (10.8%)	
Menopause	31 (8.2%)	36 (9.5%)	0 (0.0%)	67 (17.6%)	

**Chi-square test applied*

Table IV: Comparison of mastalgia severity with duct diameter, duct ectasia and other ultrasound findings

	Mastalgia severity			Total	P-value
	Mild	Moderate	Severe		
Duct diameter					
≤ 2.0 mm	187 (49.2%)	33 (8.7%)	0 (0.0%)	220 (57.9%)	<0.001*
>2.0 mm	47 (12.4%)	106 (27.9%)	7 (1.8%)	160 (42.1%)	
Duct ectasia					
Present	47 (12.4%)	107 (28.2%)	7 (1.8%)	161 (42.4%)	<0.001*
Absent	187 (49.2%)	32 (8.4%)	0 (0.0%)	219 (57.6%)	
Fibrocystic changes					
Present	30 (7.9%)	32 (8.4%)	4 (1.1%)	66 (17.4%)	0.001*
Absent	204 (53.7%)	107 (28.2%)	3 (0.8%)	314 (82.6%)	
Infective / Inflammatory changes					
Present	14 (3.7%)	36 (9.5%)	6 (1.6%)	56 (14.7%)	<0.001*
Absent	220 (57.9%)	103 (27.1%)	1 (0.3%)	324 (85.3%)	
Axillary lymphadenopathy					
Present	2 (0.5%)	6 (1.6%)	4 (1.1%)	12 (3.2%)	<0.001*
Absent	232 (61.1%)	133 (35.0%)	3 (0.8%)	368 (96.8%)	

**Chi-square test applied*

Among ultrasound features of Mastalgia, duct ectasia was found in 161 (42.4%), fibrocystic changes were found in 66 (17.4%), infective/inflammatory changes in 56 (14.7%) and axillary lymphadenopathy in 12 (3.2%) (**Table II**).

A total of 65(19.0%) patients had isolated duct ectasia. 34(9.9%) patients had duct ectasia together with fibrocystic changes. 51(14.9%) patients had duct ectasia together with inflammation. A total of 11(3.2%) patients had duct ectasia and axillary lymphadenopathy.

Mastalgia was significantly higher in patients aged ≤40 years age (p-value <0.001), in patients with non-cyclic variation (p-value of 0.004), married patients (p-value <0.001) and patients with normal cycles (p-value <0.001) (**Table III**).

Mastalgia was significantly higher in patients with duct ectasia (p-value <0.001) and in patients with fibrocystic change (p-value <0.001) (**Table IV**).

DISCUSSION

Mastalgia, commonly referred to as breast pain, is also described by some females as aching, dull pain or by some females as discomfort, breast heaviness or tightness. It usually ranges from mild to severe and may affect the quality of life[1]. It may be related or unrelated to the menstrual cycle. Hormone-related changes may be responsible for cyclic mastalgia[3]. Whereas vascular, inflammatory, infective, or neoplastic may result in non-cyclic Mastalgia. Ultrasound and mammogram are the modalities to evaluate for mastalgia[7,14].

In our study population, most females experiencing Mastalgia were less than 40 years. Another study showed that Mastalgia was common in young patients[15]. Our study further showed that mild Mastalgia was more common than in the previous study[15], leading to moderate to severe Mastalgia in younger patients; this could be attributed to hormonal changes in younger age.

In our study, non-cyclic Mastalgia was more common than cyclic Mastalgia. Another study showed a higher prevalence of non-cyclic mastalgia[16,17]. However, another study showed a high prevalence of cyclic Mastalgia.[15] It can be theorized that hormonal changes could result in Mastalgia during the menstrual cycle. In contrast, other causes such as neoplasm, trauma or other non-specific causes can result in non-cyclic Mastalgia.

Mammary duct ectasia is one of the common benign breast diseases. It is an underestimated disease, and confusion about its overlap with plasma cell mastitis still exists presently[18]. Our study showed a high prevalence of duct ectasia in patients with Mastalgia, and a higher diameter was observed in patients with moderate and severe Mastalgia. Another study showed a significant association of Mastalgia with breast pain.[19] This previous study also showed nipple discharge as another presenting symptom in duct ectasia[19]. Another study showed a very low prevalence of breast duct ectasia in patients with mastalgia[20]; this could be attributed to the small sample size of that study.

Fibrocystic breast disease, now more commonly termed fibrocystic breasts, is a common benign breast disease. Our study also observed a high prevalence of fibrocystic disease in patients with Mastalgia. Another study showed that almost 50% of patients had fibrocystic breast disease with mastalgia[21]. Pain, discomfort and tenderness are common symptoms of this condition, and some women also experience nodularity. It can be assumed that Mastalgia may result in changes leading to fibrocystic breast development.

A high prevalence of infective/inflammatory changes was reported in our study in patients presenting with Mastalgia. However, another study reported a relatively lower prevalence of infective diseases such as mastitis and abscess in such patients[22]. This reported difference could be related to a difference in sample size. Our study had a high sample size, whereas a smaller sample size was present in the previous study.

Our study reported the presence of axillary lymphadenopathy in a few patients with Mastalgia. Isolated axillary lymphadenopathy in Mastalgia is usually rare. However, we believe that axillary lymphadenopathy may be present in cases of mastitis if ancillary findings in ultrasound breast are observed, such as mastitis, abscess or any neoplastic cause. Therefore, adequate history followed by a detailed physical examination of all four quadrants, regional lymph node areas, and axilla, such as supraclavicular and infraclavicular regions, should be adequately and thoroughly examined.

Our study was not without certain limitations. The first limitation was that it was a single-centre study, and another limitation was that its relationship with nipple discharge was not observed in our population. A previous study showed a significant correlation of duct ectasia with nipple discharge[19]. Another limitation was that the association with the use of lactation was not evaluated. Lactation has also demonstrated a strong association with duct ectasia and mastalgia[19]. Our study assessed the use of co-morbid medications; however, the association between oral contraceptive medications and mastalgia or duct ectasia was not evaluated.

Despite these limitations, we believe that the prospective nature of the study is its strength, and another strength is its large sample size. It is recommended that further multicentric studies incorporating various other symptoms such as lump and nipple discharge and other variables such as smoking should be carried out to obtain additional insights regarding mastalgia and duct ectasia.

CONCLUSION

Duct ectasia, fibrocystic changes, infective/ inflammatory changes and axillary lymphadenopathy

were sonographic features of Mastalgia. Mastalgia was significantly higher in patients with duct ectasia, duct diameter >2.0 mm and in patients with fibrocystic changes.

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Data Sharing Statement: The corresponding author can provide the data proving the findings of this study on request. Privacy or ethical restrictions bound us from sharing the data publically.

AUTHOR CONTRIBUTIONS

Aziz S: Concept, Final approval of the manuscript
Sattar A: Literature review
Walid A: Proofreading, literature review
Rahim A: Final draft of the manuscript
Naz N: Data interpretation, analysis
Ara H: Supervision and proofread of final manuscript draft

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