Scientific Research Publishing

Open Journal of Radiology, 2023, 13, 218-231
https://www.scirp.org/journal/ojrad
ISSN Online: 2164-3032
ISSN Print: 2164-3024

Histopathological and Ultrasound Correlation in Women Presenting with Breast Lumps in Yaoundé, Cameroon

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How to cite this paper: Eng, Y.C.M., Engoumou, A.M.S., Awana, A.P., Onembele, S.P.N., Ntsama, J.A.M. and Zeh, O.F. (2023) Histopathological and Ultrasound Correlation in Women Presenting with Breast Lumps in Yaoundé, Cameroon. *Open Journal of Radiology*, **13**, 218-231.
https://doi.org/10.4236/ojrad.2023.134023

Received: October 27, 2023
Accepted: December 19, 2023
Published: December 22, 2023

Abstract

Context: Breast cancer is very deadly among women with higher rates in the developing world. Imaging tools such as ultrasound, can be used to differentiate between the types of breast lumps. This study aimed to determine the value of ultrasound as a first-line examination in the diagnosis of breast masses. **Methods:** This was a retrospective cross-sectional study of women presenting with breast lumps from November 2022 to June 2023 at the Yaounde General Hospital, which lasted seven months, from November 2022 to June 2023. The sampling was exhaustive and consecutive. Association between variables was studied using the x^2 test and concordance between ultrasound and histopathological findings was assessed using the Kappa correlation coefficient. **Results:** 234 women were included in the study. Their mean age was 46.3 ± 11.4 years. Overall, 15 (6.4%) lumps were benign while 219 (93.6%) were malignant. Triple negative (5.6%) was the most recurrent genomic classification. The correlation between the ultrasound and histopathological findings was significant, with an observed concordance rate at 85.1%, kappa = 0.322 and a p-value < 0.001. **Conclusion:** The performance of ultrasound in differentiating benign and malignant lesion was high. However, the discordant cases highlight the need for a diagnosis system which blends histopathological and radiological findings for an improved management of patients with breast lumps.

Keywords

Ultrasound, Histopathological Diagnosis, Breast Lumps, Yaoundé

1. Introduction

Breast cancer is one of the deadliest cancers among women, with the lowest survival rates observed in the developing world. The mortality of this disease increased from 458,000 deaths to 684,996 deaths between 2008 and 2020 respectively, year in which the global incidence was about 2.26 million cases. In 2018, breast cancer contributed to 18.3% of mortality related to cancer and 16% of cancer incidence in Africa. In Cameroon, it ranked as the most common cancer in 2018 with 3,273 new cases diagnosed and 4170 new cases recorded in 2020, with a total of 2108 deaths. With an overall 5-year survival ranging from 30% - 62%, breast cancer continues being a burden despite the efforts mobilised by the state of Cameroon [1] [2] [3].

Breast lumps can be gauged according to different criteria. According to their shape, they can be irregular, oval, round or even lobulated while their margins can be spiculated, obscured, smooth or indistinct. There are two main types of breast lesions: malignant and benign lesions. Malignant lesions which can be lobular or ductal, are likely to be irregularly shaped with obscured margins while benign lesions which are likely to be oval or round with well-defined margins, include types such as galactocele, fibroadenoma, abscess and cyst [4]. Early detection and precise assessment of lesions improve the prognosis of breast cancer cases and are best achieved through screening programmes. A triple assessment including physical examination, biopsy and imaging (mammography or ultrasound) is often necessary in order to exclude breast cancer definitively [5].

Imaging tools, for instance, Ultrasound (US), Magnetic Resonance Imaging (MRI) and mammography are used to differentiate between the types of tumours with some level of confidence. This is reinforced by a standardized system of classification called Breast Imaging-reporting and Data System (BI-RADS). Made up of categories from 0 - 6, this system ensures that imaging reports give a detailed account of all what makes up the breast under analysis, be it normal or abnormal [6] [7]. Even though the malignancy of suspicious lesions is evaluated using image-guided breast biopsy, definitive diagnosis can only be established using histopathological examination [8]. However, the latter is not always available in developing countries, especially in rural areas where technical resources are quite limited. Conversely, ultrasound could be more accessible and could potentially identify suspected cases of malignant lesions before referring them to higher-level hospitals. Data on the performance of ultrasound remains limited in our context. The present study was carried out to determine the value of ultrasound as a first-line imaging modality in the diagnosis of breast lumps.

2. Methods

2.1. Study Design and Timeline

This was a retrospective cross-sectional study of women presenting with breast lumps over five consecutive years at the Yaounde General Hospital, a first category hospital found in the Central region of Cameroon. The study lasted seven

months, from November 2022 to June 2023.

2.2. Selection Criteria and Enrolment of Participants

This study targeted the files of women presenting with breast lumps who had undergone ultrasound and histopathology examinations at the Yaounde General Hospital within the study period. After identifying the files from the archives of the hospital, sampling was consecutive and exhaustive. The files were checked for completeness and only those with exploitable information were included in the study.

2.3. Data Collection & Tools

Data collection began once the various authorizations (the ethical clearance and the hospital's administrative authorization) were obtained and was carried out using a questionnaire designed from literature review. The data was exclusively collected in the Archives department and the questionnaire was conceived with three (3) main parts: sociodemographic, clinical and paraclinical data.

2.4. Statistical Analysis

The database was created using Census and Survey Processing System (CSPro) software version 6.2 and Statistical Package for the Social Sciences (SPSS) version 23 was used for the analysis. Association between variables was studied using the x^2 test and concordance between ultrasound and histopathological findings was assessed using the Kappa correlation coefficient.

2.5. Ethical Consideration

We obtained ethical approval and research authorization from the Ethics Committee of the Faculty of Medicine and Biomedical Sciences of the University of Yaoundé I and the administration of the Yaoundé General Hospital respectively. Informed consent was not necessary as this was a retrospective work. All the data collected was anonymized and treated confidentially.

3. Results

3.1. Description of Study Participants

A total of 1073 women presented with breast lumps over the study period, among which 234 were included in the study (**Figure 1**). The age range of the study participants was 22 - 91 years with the mean age being 46.3 ± 11.4 years. As described by **Table 1**, most of the participants were married (47.4%), had a secondary level of education (51.3%) and were housewives (50.9%).

3.2. General Features of the Breast Lumps within the Study Population

The ultrasound records showed that 42 (17.9%) of the lumps were benign, the most common type being cysts (3.8%), while 192 (82.1%) were malignant, with

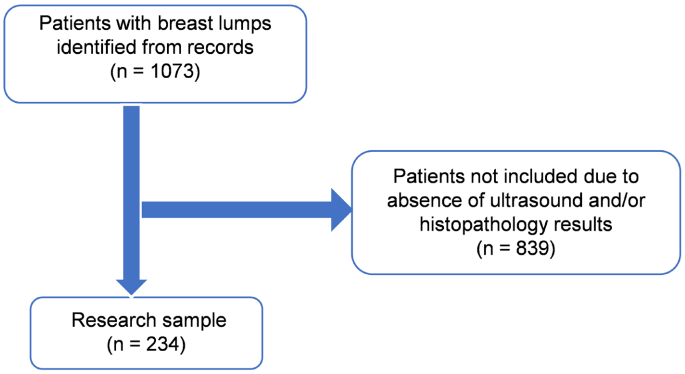

Figure 1. Flow chart of the study's recruitment process.

Table 1. Sociodemographic characteristics of the participants.

Variables	Numbers (N = 234)	Frequency (%)
Age (in years)		
20 - 30	15	6.4
30 - 40	57	24.4
40 - 50	77	32.9
50 - 60	54	23.1
≥60	31	13.2
Marital status		
Married	111	47.4
Single	101	43.2
Widow	22	9.4
Study level		
Illiterate	02	0.9
Primary	61	26.1
Secondary	120	51.3
Superior	51	21.8
Occupation		
Housewife	119	50.9
Informal sector	35	15.0
Public sector	32	13.7
Private sector	31	13.2
Pupil/Student	14	6.0
Retired	03	1.3
Region of origin		
West	109	46.6
Centre	68	29.1
Great North	27	11.5
South	08	3.4
Littoral	07	3.0
East	07	3.0
North West	04	1.7
South West	04	1.7

ductal carcinoma representing 81.6%. BI-RADS 4 was the leading class of lesion with 122 (52.1%) cases, followed by BIRADS 5 with 61 (26.1%) cases. However, histopathological findings revealed that 219 (93.6%) of the cases had malignant lesions with needle biopsy (95.3%) being the most common sampling method. The lumps detected within the study population were also oval in shape (88.9%), unique (92.7%) and had irregular margins in most of the cases (83.8%). See Table 2 for more details.

Table 2. Distribution of the breast lump features within the study population.

Variables	Numbers (N = 234)	Frequency (%)
Type of tumour		
Adenofibroma	05	2.1
Cyst	09	3.8
Papilloma	01	0.4
Ductal carcinoma	191	81.6
Glandular carcinoma	13	5.6
Carcinomatous mastitis	06	2.6
Mucinous carcinoma	05	2.1
Ductal adenocarcinoma	02	0.9
Tubulous carcinoma	01	0.4
Lobular adenocarcinoma	01	0.4
Laterality		
Unilateral	229	97.9
Bilateral	05	2.1
Number of lesions		
Unique	217	92.7
Multiple	17	7.3
Shape		
Oval	208	88.9
Round	16	6.8
Dysmorphic	10	4.3
Outlines		
Regular	38	16.2
Irregular	196	83.8
BI-RADS classification		
BI-RADS 1	01	0.4
BI-RADS 2	19	8.1
BI-RADS 3	22	9.4
BI-RADS 4	122	52.1
BI-RADS 5	61	26.1
BI-RADS 6	09	3.8

Continued

Type of lesion on ultrasound		
Suspected benign lesion	42	17.9
Suspected malignant lesion	192	82.1
Sampling method		
Needle biopsy	223	95.3
Surgical excision	11	4.7
Type of lesion on histopathology		
Benign	15	6.4
Malignant	219	93.6

Out of the 219 women who had malignant tumours, immunohistochemistry analysis was performed for 32 (14.6%) and the samples were tested for the presence of different proteins. As such, oestrogen receptor, HER2, progesterone receptor and Ki67 turned out to be present in 40.6%, 37.5%, 40.6% and 34.4% of the cases respectively. Triple negative was the most recurrent genomictype (5.6%) followed by Luminal A (3.0%) and HER2 (3.0%) as shown in Table 3.

3.3. Correlation between Ultrasound and Histopathology Results

Histopathologic examination confirmed 188 (80.3%) cases among the 192 suspected as malignant by ultrasound and 11 (4.7%) cases among the 42 suspected as benign. Hence, the observed concordance rate was 85.1% with a p-value < 0.001, and kappa = 0.332. When considering the histopathology as reference and ultrasound as evaluated test for the diagnosis of malignant lesion, the sensitivity, specificity, positive and negative predictive values were respectively 85.8%, 73.3%, 97.9% and 26.2%. The global correlation between these two methods is described in Table 4.

4. Discussion

The present study aimed to determine the diagnostic value of ultrasound in the diagnosis of breast lumps among women attending the Yaoundé General Hospital over a period of five (5) consecutive years.

The age range of the participants in our study was 22 - 91 years with the mean age being 46.3 ± 11.4 years. This is similar to the values obtained in a study conducted by Akinnibosun-Raji *et al.* in 2022 where the age of the patients ranged between 16 and 75 years, with a mean of 33.03 ± 12.32 years and another conducted by Bello *et al.* the same year, where the age range was 18 - 69 years with a mean age of 34.66 ± 13.99. The premenopausal and young population bear a greater risk of non-proliferative diseases. This could explain why the mean ages for women presenting palpable lumps in all of these studies were below 65 years [4] [9].

Table 3. Molecular classification of the breast lumps.

Variables	Numbers (N = 234)	Frequency (%)
Oestrogen receptor		
Yes	13	40.6
No	19	59.4
HER2 status		
Yes	12	37.5
No	20	62.5
Progesterone receptor		
Yes	13	40.6
No	19	59.4
Ki67 protein		
Yes	11	34.4
No	12	37.5
Molecular classification		
Greater than 80%	03	9.4
Less than 5%	01	3.1
Luminal A	07	21.9
Luminal B	05	15.6
Her2	07	21.9
Triple negative	13	40.6

Table 4. Correlation of ultrasound findings and histopathological diagnoses.

		Histopathological results	
		Benign Lesion	Malignant Lesion
Ultrasound diagnosis	Suspected benign lesion	11 (4.7)	31 (13.2)
	Suspected malignant lesion	04 (1.7)	188 (80.3)

A study conducted by Amritha *et al.* revealed that 76.7% of the cases were benign, the most reported being fibroadenoma (48.3%) whereas ductal carcinoma (75%) was the most reported type of malignant lesions. This predominance of benign cases was also demonstrated by the studies conducted by Jahan *et al*, Kapoor *et al.* and Sarangan *et al.* in 2017, 2020 and 2022 respectively [10] [11] [12]. This differs from our study which revealedthat6.4% of the lumps were benign, the most common type being cysts (3.8%) and ductal carcinoma (81.6%) was the dominant type of malignant lesion. The high prevalence of malignancy observed in our study could be due to the fact the study site is one of the reference health structures in the country where patients suffering from cancer receive interdisciplinary treatment [13].

The descriptive characteristics which stood out in our study population were

unique (92.7%), oval in shape (88.9%), firm in consistency (78.6%), mobile (74.4%) and presence of irregular margins (83.8%). A study conducted by Roostaee *et al.* in Iran showed that 88.8% of the tumours were oval, 72.5% had circumscribed margins and 82.5% were solid in nature. Another study carried out in Zaria in 2023 showed that the lumps were oval (71%), had circumscribed margins (72%) and had abrupt boundaries (92%). Features such as margins and shapes are associated to image interpretation while others such as orientation are associated to ultrasound. This makes the use of all the morphological features of an image difficult, thus, the variations perceived in these studies [9] [14] [15].

The immunohistochemical study of breast lumps demonstrated that Triple negative was the most recurrent genomic classification followed by Luminal A and HER2. Also, the class of breast mass with the highest frequency was BI-RADS 4 (52.1%), followed by BI-RADS 5 (26.1%). This trend is consistent with studies conducted by Eren *et al.* in Turkey, Aziz *et al.* in Malaysia, as well as numerous others studies [7] [8] [16] [17] [18] [19]. Anatomopathological analysis was performed spontaneously for prospective studies while the bulk of anatomopathological analysis for this research work was performed only under the condition that an ultrasound result had a BI-RADS classification superior or equal to 4. This could account for the disparities observed between the mentioned studies.

The overall ability for ultrasound to differentiate between malignant and benign lesions in our study was marred by the negative predictive value (NPV) for malignant lesions and the positive predictive value (PPV) for benign lesions which were both equal to 26.2%. The PPV (48%) and NPV (42.8%) of are trospective study among 40 women were alike to our findings whilst PPV and NPV of ultrasound in a prospective study among 59 women were significantly higher, 76.47% and 93.33% respectively. Numerous studies aligned with this tendency for high values [20]-[25]. Differences in inclusion criteria and disease prevalence among the study participants could account for the wide range of values recorded.

The correlation coefficients between histopathology and different diagnostic procedures have been estimated to range from 0.47 to 0.92 for ultrasound, 0.68 to 0.79 for physical examination, and 0.48 for mammography. Ghafoor *et al.* revealed a statistically significant ($p < 0.01$) concordance rate of 33.3% between radiology and histopathology. This is far below the values obtained by Humayun *et al.* and our study, which showed concordance rates of 81.2% and 85.1% respectively [26] [27] [28]. Inappropriate sampling and targeting of lesions account for most cases of discordance between imaging and histopathology findings.

5. Study Limitations

The statistical power of the present study was reduced by the fact that it was performed on a single site and only a small proportion of the files satisfied the

inclusion criteria. The retrospective design also made it possible for selection bias since there were no defined criteria for the management of patients with palpable concerns.

6. Conclusion

The overall performance of breast ultrasound in differentiating between breast lumps was satisfying but the proportion of discordant cases highlights the need of a diagnosis system which blends histopathological and radiological findings for an improved management of patients with breast lumps.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix: Questionnaire

File number: ……..
Patient's initials ……..
Date of collection …….

Part I: Sociodemographic Data

1. Age at diagnosis (in year): ……
2. Marital status| |: 1 = Single; 2 = Married; 3 = Divorced; 4 = Widowed
3. Level of study| |: 1 = Not in school; 2 = Primary; 3 = Secondary; 4 = Higher education
4. Profession/Occupation| |: 1 = Public sector employee; 2 = Private sector employee; 3 = Actor in the informal sector; 4 = Pupil/Student; 5 = Unemployed/Housewife; 6 = Retired; 7 = Others
5. Region of origin| |: 1 = Far North; 2 = North; 3 = Adamaoua; 4 = West; 5 = Northwest; 6 = South; 7 = Southwest; 8 = Centre; 9 = Littoral; 10 = East

Part II: Clinical Data

I. Reproductive Variables

6. Gravidity: ……
7. Number of children born full term: ……..
8. Number of children born prematurely: ……
9. Age of first period (in year): ……
10. Dysmenorrhea| |: 1 = None; 2 = Primary; 3 = Secondary
11. Breastfeeding history| |: 1 = Yes; 2 = No
12. Duration of menstrual cycle (in days): ……..
13. Duration of menses (in days): ……
14. Concept of hormonal contraception | |: 1 = Yes; 2 = No
15. Others:……

II. Comorbidities

16. None | |: 1 = Yes; 2 = No
17. Hypertension | |: 1 = Yes; 2 = No
18. Diabetes | |: 1 = Yes; 2 = No
19. Obesity/overweight | |: 1 = Yes; 2 = No
20. HIV infection | |: 1 = Yes; 2 = No
21. Others: …….

III. Toxicology

22. Smoking| |: 1 = Yes; 2 = No
23. Alcohol| |: 1 = Yes; 2 = No

IV. Family history

24. History of breast cancer? | |: 1 = Yes; 2 = No

If yes, degree of relationship | |: 1 = 1st degree; 2 = 2nd degree; 3 = 3rd degree

V. Reasons for consultation

- Breast lump or swelling | |: 1) Yes; 2) No

- Nipple discharge | | : 1) Yes; 2) No
- Breast pain | | : 1) Yes; 2) No
- Abnormality of the skin or nipple | | : 1) Yes; 2) No
- Axillary nodule | | : 1) Yes; 2) No
- Others……

VI. Physical signs

25. Affected breast(s)| | : 1 = Left breast; 2 = Right breast; 3 = Bilateral
26. Location of the tumour:

- Upper Outer Quadrant | | : 1) Yes; 2) No
- Upper-Inner Quadrant | | : 1) Yes; 2) No
- Infero-outer quadrant | | : 1) Yes; 2) No
- Infero-Internal Quadrant | | : 1) Yes; 2) No
- Nipple | | : 1) Yes; 2) No
- Others ……

27. Number of masses or nodules: …….
28. Consistency

- Soft| | : 1) Yes; 2) No
- Farm| | : 1) Yes; 2) No
- Hard| | : 1) Yes; 2) No

29. Mobility relative to the deep plane| | : 1) Yes; 2) No
30. Pain on palpation| | : 1) Yes; 2) No
31. Skin signs

- No signs | | : 1) Yes; 2) No
- Swelling | | : 1) Yes; 2) No
- Orange peel | | : 1) Yes; 2) No
- Ulceration | | : 1) Yes; 2) No
- Retraction | | : 1) Yes; 2) No
- Other skin signs (to be specified)

Part III: Paraclinical Data

I. Ultrasound

32. Ultrasound laterality of the tumour | | : 1 = Left breast; 2 = Right breast; 3 = Bilateral
33. Ultrasound location of the tumour

- Upper Outer Quadrant | | : 1) Yes; 2) No
- Upper-Inner Quadrant | | : 1) Yes; 2) No
- Infero-Internal Quadrant | | : 1) Yes; 2) No
- Infero-outer quadrant | | : 1) Yes; 2) No
- Nipple | | : 1) Yes; 2) No
- Others

34. Number: ……..
35. Shape

- Oval | | : 1) Yes; 2) No

- Round | | : 1) Yes; 2) No

36. Outlines

- Regular | | : 1) Yes; 2) No
- Irregular || : 1) Yes; 2) No

37. Margins

- Well circumscribed | | : 1) Yes; 2) No
- Poorly circumscribed | | : 1) Yes; 2) No

38. BI-RADS evaluation

a- Benign (BI-RADS 2) | | : 1) Yes; 2) No

b- Probably benign (BI-RADS 3) | | : 1) Yes; 2) No

c- Suspected of malignancy (BI-RADS 4) | | : 1) Yes; 2) No

d- Highly suggestive of malignancy (BI-RADS 5) | | : 1) Yes; 2) No

e- Malignant (BI-RADS 6) | | : 1) Yes; 2) No

39. Ultrasound diagnosis | |: 1 = Suspected benign lesion; 2 = Suspected malignant lesion

II. Histopathology

40. Nature of the sample| | : 1 = Cytology by fine needle aspiration; 2 = Fine needle biopsy; 3 = Central needle biopsy; 4 = Open surgical excision

41. Histological result | |: 1 = Benign lesion; 2 = Malignant lesion

42. Type of benign lesion: ……

43. Type of malignant lesion: ……

44. Immunohistochemistry test

- Oestrogen receptor| | : 1) Yes; 2) No
- HER2 status | | : 1) Yes; 2) No
- Progesterone receptor | | : 1) Yes; 2) No
- Ki67 protein | | : 1) Yes; 2) No

45. Molecular classification | | : 1) Luminal A; 2) Luminal B; 3) HER2; 4) Triple negative