Role of Breast Ultrasonography in Adding Diagnostic Value in Case of Dense Breasts Detected by Mammography

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ABSTRACT

Introduction: Mammography is a simple and effective tool in early detection of breast lesions. However its sensitivity is less in dense breast. The aim of the study is to see whether addition of ultrasonography adds on to the diagnostic value by finding more breast lesions in evaluation of mammographic dense breasts or not.

Methods: The hospital data of all the patients who underwent mammography in the Department of Radiology of Shree Birendra Hospital, Kathmandu over a period of two and a half years from November 2017 to April 2020 were retrieved and retrospectively analyzed. The mammographic findings of patients with dense breast were compared with the corroborative ultrasonographic findings. Discrepancy in positive findings between the two imaging modalities was studied.

Results: Out of 536 patients studied, 238 patients had mammographic dense breast. Comparative study showed 82 cases with positive findings on mammography alone, compared to 114 cases with positive findings on combined mammography and ultrasonography with p-value < 0.05 which is statistically significant.

Conclusions: Ultrasonography is a useful additional imaging modality in evaluation of mammographic dense breast by finding more breast lesions compared to Mammography alone.

Key words: Mammography; Mammographic dense breast; Ultrasonography

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INTRODUCTION

Mammography is a simple and effective tool in early detection of breast lesions. However its sensitivity is reduced in dense breasts. Overall, the sensitivity of mammography for the detection of breast cancer is 77.6%; however, the sensitivity of mammography is reduced to 48% in the densest breast.[1] Moreover, mammographic density is a strong risk factor for breast cancer, risk being four to five times greater in women with dense breast.[2] Dense breast has been accounted for a 50% of cancers detected in less than 12 months after a negative screening examination. This is probably due to cancers that were present at the time of screening and were not detected because of masking by dense breast tissue.[3] Breast density as an important risk factor for development of breast cancer has been shown in several other studies.[4,5]

Ultrasonography is yet another simple and easily accessible investigation used to evaluate breast lesions. This has been widely used in our country for decades. Many studies have shown ultrasonography to be an effective second line screening tool in evaluation of women with dense breast on mammography by detection of otherwise occult small breast cancers.[1,6-8] The aim of this study is to assess the role of ultrasonography as a supplemental imaging modality in adding diagnostic value in evaluation of patients with dense breasts on mammography by comparing the findings of Mammography alone with combined mammo-ultrasonography.

METHODS

This is a retrospective study carried out at the Department of Radiology, Shree Birendra Hospital , Chhauni, Kathmandu over a period of two and a half years, from November 2017 to April 2020. All the mammographic studies performed during that period were retrieved and reviewed. Breast composition was assessed and the density of the breast was categorised according to the American College of Radiology (ACR) classification.[9] Category C and D were considered as dense breasts. Ethical approval was taken from IRB of the institute.

Out of 536 mammographies performed during that period, only 238 studies showed dense breast composition and were included in the study. Mammographic findings of each case were reviewed in terms of morphological characters like, mass, asymmetry, architectural distortion, calcification and assigned a BIRADS scoring system.[9] All category D cases were assigned BIRADS 0, irrespective of any findings seen on mammography or not. Each case was further compared with the corroborative ultrasonographic findings retrieved from the database and final BIRADS system assigned. Discrepancy in positive findings between the two imaging modalities was studied. Chi-square test was used for comparison of positive findings between two groups. A 'p' value < 0.05 was considered statistically significant.

RESULTS

During the study period of two and a half years, 238 cases with dense breast composition were enrolled in the study. Majority of the patients were in the age group of 40 to 49 years. Primary indication was mastalgia (35.2 %), followed by palpable lump (12.6 %). 51 cases (21.4 %) were asymptomatic and came for routine screening. 0.8% cases were known cases of carcinoma breast on follow up (Table 1).

Among the 238 cases of dense breast composition reviewed on mammogram, 188 cases (78.9 %) were of category C and 50 cases (21%) were of category D (Table 2).

Mammographic evaluation was indeterminate in 39 cases (16.3%) cases, requiring additional imaging. 117 cases (49.1 %) were normal. 82 cases (34.4%) had positive findings, out of which calcification was most common finding (42.6%). Final combined mammographic plus ultrasonographic evaluation showed normal findings in 124 cases (52.1%) and positive findings in 114 cases (47.8%). (Table 3, Chart 1).

Mammographic evaluation revealed 53 cases (22.2%) of BIRADS II lesions which increased to 77 cases (32.3%) on final scoring after corroboration with ultrasonography findings (Table 4).

Comparative study showed 82 cases with positive findings on mammogram, compared to 114 cases with positive findings on combined mammogram

Table 1. Indications for mammography

Indication for Mammograpy	Frequency	%
Mastalgia	84	35.2
Screening	51	21.4
Lump	30	12.6
Discharge	10	4.2
Miscellaneous (Retraction of nipple, rash, erythema etc)	13	5.4
Combination of symptoms	48	20.1
Follow up	2	0.8

and sonogram. A chi-square test of independence was performed, which showed the increase in number of positive findings was significant with p-value < 0.05 (Table 5).

DISCUSSION

The study group comprised women of mostly 40-49 years of age. Commonest indication was mastalgia followed by screening and palpable breast lump. Large number of cases had evidence of dense breast (ACR catergory C and D) which is comparable to a cohort study conducted by Kerlikowse et al. which showed approximately 47% of women undergoing screening mammography to have mammographically dense breasts.[10] Majority of dense breasts were of ACR category C, consisting of heterogeneously dense breasts.

Extensive mammographic breast density is one of the factors that may lower the sensitivity of mammography. And, at the same time, mammographic density is a strong risk for breast cancer.[11] The fact that mammographic density is also an important risk factor for breast cancer was first recognised by Wolfe in the 1970s.[12] This observation has since been confirmed in more than 40 studies, the vast majority of which have shown

Table 3. Findings

Findings	Mammography alone		Combined Imaging	
	Frequency	%	Frequency	%
Indeterminate	39	16.3	0	0
Normal	117	49.1	124	52.1
Positive	82	34.4	114	47.8

Table 2. Breast composition

Breast composition	Frequency	%
Category C	188	78.9
Category D	50	21

an association between increased mammographic density and the risk of breast cancer. McCormack VA and colleagues in 2006 showed evidence that increasing breast density is associated with an increased risk of breast cancer and that the magnitude of this association is 4.64 fold for the most dense (≥ 75%) compared with the least dense category (< 5%).[13] Byrne and colleagues also reported that 28% of cancers were attributable to having 50% or greater breast density.[14] Hence, it becomes imperative to further evaluate the patients with mammographic dense breast with additional imaging modality.

In our study, we added ultrasonography as a supplemental imaging modality in evaluation of dense breasts and found that ultrasonography reported more solid and cystic lesions compared to mammography alone. Not only was there increase in total number of findings, there was also increase in number of BIRADS IV and BIRADS V lesions. There was also improved detection of cysts and dilated ducts. Also, statistically significant difference was seen between the normal findings and positive findings detected on mammography

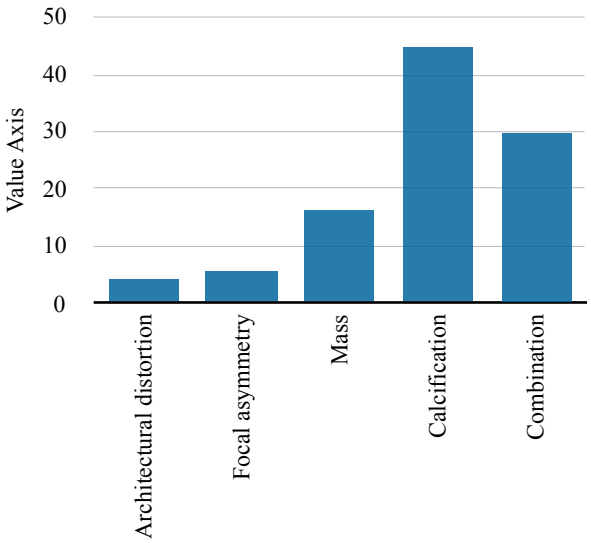

Figure 1. Positive Mammographic findings

Table 4. BIRADS Category

BIRADS Category	Mammography alone		Combined Imaging	
	Frequency	%	Frequency	%
O	39	16.3	0	0
I	117	49.1	124	52.1
II	53	22.2	77	32.3
III	16	6.7	20	8.4
IV	8	3.3	11	4.6
V	3	1.2	4	1.6
VI	2	0.8	2	0.8

alone versus combined mammography and ultrasonography.

The low sensitivity of mammogram is due to the fact that dense breast tissue appears white, as do breast cancer and other solid lesions, which is why dense tissue can sometimes obscure a cancer. In contrast, dense tissue is echogenic on ultrasound, while breast cancer is hypoechoic. Ultrasound leverages the differences in tissue characteristics to improve cancer detection in women with dense breasts.[15] Similar is the case with cystic lesions. Ultrasonography has the advantage of not only picking up smaller lesions and differentiating solid from cyst, but it also helps in further characterizing different types of solid lesions like lipoma, fibroadenoma, intramammary lymph nodes etc. Another important added advantage of ultrasonography is direct visualization of the mammary ducts which is not possible with mammography. These factors also led to change in the final combined BIRADS category compared to the mammographic BIRADS alone, with increased detection of benign as well a malignant lesions.

Benefit of adding ultrasonography has been described in many studies.[16,22] Kaplan and colleagues evaluated the performance of screening ultrasound in patients with dense breast and negative findings at clinical examination and mammography and found a diagnostic yield of three additional cancers per 1000 women.[23] In 2003, Leconte et al. compared the sensitivities of

Table 5. Comparison between findings of mammography alone and combined mammo-ultrasonography

	Positive findings	Normal / Indeterminate	p-value
Mammography alone	82	156	0.0028
Combined mammo-ultrasonography	114	124	

mammography with subsequent ultrasonography and found that the result was not statistically significant in patients with non-dense tissue, however, in patients with dense breast tissue, the sensitivities were 56% for mammography and 88% for mammography plus ultrasonography, a statistically significant finding.[6] In 2012, Berg and colleagues also reported the sensitivity of mammography combined with ultrasonography was higher than that for mammography alone (77.5% vs. 50%).[24] This study shows that in mammographic dense breast, addition of ultrasonography can lead to detection of more number of solid as well as cystic lesions compared to mammography alone.

This study has been limited by the fact that it is a single centric study with limited number of cases. Since our centre is located in central Nepal, our study might not reflect the picture of the entire country. However, it is recommended that our results should be validated with further multi centric and more extensive research in the days ahead.

CONCLUSIONS

Mammography is extremely helpful in detecting breast lesions, however; its sensitivity decreases in dense breasts, requiring additional imaging. Ultrasonography being readily available in most parts of our country can be combined with mammography in evaluation of dense breast for early identification of benign as well as malignant lesions.

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REFERENCES

1. Kolb TM, Lichy J, Newhouse JH. Comparision of the performance of screening Mammography, physical examination and breast US and evaluation of factors that influence them: an analysis of 27,825 patient evaluations. Radiology. 2002;225(1):165-75.https://doi.org/10.1148/radiol.2251011667
2. Boyd NF, Rommens JM, Vogt K, Lee V, Hopper JL, Yaffe MJ et al.Mammographic breast density as an intermediate phenotype for breast cancer. Lancet Oncol. 2005; 6(10):798-808. DOI: 10.1016/S1470-2045(05)70390-9
3. Boyd NF, Guo H, Martin LJ, Sun L, Stone J, Fishel E et al. Mammographic density and the risk and detection of breast cancer. N Engl J Med. 2007;356:227-36. DOI: 10 1056/NEjMoa062790
4. Vachon CM, Gils CHV, Sellers TA, Ghosh K, Pruthi S, Brandt KR, et al.Mammographic density, breast cancer risk and risk prediction. Breast Cancer Res. 200;9(6):217. DOI: 10.1186/bcr1829
5. Pankow JS, Vachon CM, Kuni CC, King RA, Arnett DK, Grabrick DM et al.Genetic analysis of mammographic breast density in adult women : evidence of a gene effect. J Nati Cancer Inst. 1997;89(8):549-56. DOI: 10.1093/jnci/89.8.549
6. Leconte I, Feger C, Galant C, Berliere M, Berg BV, D'Hoore W, et al. Mammography and subsequent whole-breast sonography of non palpable breast cancers: The importance of radiologic breast density. AJR Am. J. Roentgenol. 2003;180:1675-9. DOI:10.2214/ajr.180.6.1801675
7. Crystal P, Strano SD, Shcharynski S, Koretz MJ. Using Sonography to screen women with Mammographically dense breasts. AJR Am. J. Roentgenol. 2003;181:177-82. DOI :10.2214/ajr.181.1.1810177
8. Hooley RJ, Greenberg KL, Stackhouse RM, Geisel JL, Butler RS, Philpotts LE.Screening US in patients with mammographically dense breasts: inital experience with connecticut public act 09-41. Radiology. 2012;265(1):59-69. DOI:10.1148/radiol.12120621
9. D'Orsi CJ, Sickles EA, Mendelson EB, Morris.ACR BI-RADS Atlas, Breast Imaging Reporting and Data System, Reston, VA: American College of Radiology.Reston. 2013.
10. Kerlikowske K, Hubbard RA, Miglioretti DL, Geller BM, Yankaskas BC, Lehman CD, et al. Breast Cancer Surveillance Consortium. Comparative effectiveness of digital versus film-screen mammography in community practice in the United States: a cohort study. Ann Intern Med. 2011;155(8):493-502. DOI: 10.7326/0003-4819-155-8-201110180-00005.
11. Mandelson MT, Oestreicher N, Porter PL, White D, Finder CA, Taplin SH, et al. Breast density as a predictor of Mammographic detection: Comparision of interval-and screen – detected cancers. JNCI. 2000;92(13):1081-7. DOI: https://doi.org/101.1093/jnci/92.13.1081
12. Kerlikowske K. The mammogram that cried Wolfe. N Engl J Med. 2007;356:297–300. DOI: 10.1056/NEJMe068244
13. McCormack VA, Silva IDS. Breast density and parenchymal patterns as markers of Breast Cancer risk: A meta-analysis. Cancer Epidemiol Biomarkers. 2006;15(6):1159-69. DOI:10.1158/1055-9985.EPI-06-0034
14. Byrne C, Schairer C, Wolfe J, Parekh N, Salane M, Brinton LA, et al. Mammographic features and breast cancer risk: effects with time, age and menopause status. J Natl Cancer Inst. 1995;87(21):1622-9. DOI:10.1093/jnci/87.21.1622
15. Thigpen D, Kappler A, Brem R. The role of Ultrasound in screening dense breasts- A review of the literature and practical solutions for implementation. Diagnostics. 2018;8(1):20. DOI:10.3390/diagnostics8010020
16. Scheel JR, Lee JM, Sprague BL, Lee CI, Lehman CD. Screening ultrasound as an adjunct to mammography in women with mammographically dense breasts. Am J Obstet Gynecol. 2015;212(1):9-17. DOI: 10.1016/j.ajog.2014.06.048. Epub 2014 Jun 21. PMID: 24959654
17. Tagliafico AS, Calabrese M, Mariscotti G, DurandoM, Tosto S, Monetti F, et al. Adjunct screening with tomosynthesis or ultrasound in women with Mammography-negative dense breasts: Interim report of a prospective comparative trial. J Clin Oncol. 2016;34:1882-8. DOI: 10.1200/JCO.2015.63.4147
18. Destounis S, Arieno A, Morgan R.New York State breast density mandate: Follow up data with screening Sonography. J Ultrasound Med. 2017;36(12):2511-7. DOI: https://doi.org/10.1002/jum.14294
19. Ohuchi N, Suzuki A, Sobue T, Kawai M, Yamamoto S, Zheng YF et al.Sensitivity and specificity of mammography and adjunctive ultrasonography to screen for breast cancer in the Japan Strategic anti cancer randomised trial. Lancet. 2016;387(10016):341-8. DOI: 10.1016/SO140-6736(15)00774-6

20.Brem RF, Tabar L, Duffy SW, Inciardi MF, Guingrich JA, Hashimoto BE, et al.Assessing improvement in detection of breast cancer with three dimensional automated breast US in women with dense breast tissue. Radiology. 2017;285(1):36-43. DOI: https://doi.org/10.1148/radiol.14132832

21.Berg WA, Zhang Z, Lehrer D, Jong RA, Pisano ED, Barr RG et al.Detection of breast cancer with addition of annual screening ultrasound or a single screening MRI to mammography in women with elevated breast cancer risk. JAMA. 2012;307(13):1394-1404. DOI: 10.1001/jama.2012.388

22.Corsetti V, Houssami N, Ghirardi M, Ferrari A, Speziani M, Bellarosa S, et al. Evidence of the effect of adjunct ultrasound screening in women with mammography-negative dense breasts: interval breast cancers at 1 year follow-up. Eur J Cancer. 2011;15:1021-6. DOI: 10.1016/j.ejca.2010.12.002.

23.Kaplan SS. Clinical utility of bilateral whole breast US in the evaluation of women with dense breast tissue. Radiology. 2001;221:641-9. DOI: https://doi.org/10.1148/radiol.2213010364

24.Berg WA, Blume JD, Cormack JB, Mendelson EB, Lehrer D, Bohmvelez M, et al. Combined screening with ultrasound and mammography compared to mammography alone in women at elevated risk of breast cancer, JAMA. 2008;299:2151-63. DOI: 10.1001/jama.299.18.2151