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Original Research Article

Vascular calcifications in mammogram and correlate them with coronary artery diseases: a retrospective study

Attili V. S. Suresh[1]*, Rakesh Sharma[2], Praveen K. Dadireddy[3], Rajkumar Bunga[4], Krishna M. Lalukota[5], Pradeep K. Reddy[1], Guru N. Reddy[6]

[1]Department of Medical Oncology, [3]Department of Surgical Oncology, [4]Department of Radiology, [5]Department of Cardiology, [6]Department of Preventive Medicine, Continental Hospitals, Hyderabad, Telangana, India
[2]National Board of Examinations, Medical Sciences, Delhi, India

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***Correspondence:**
Dr. A. V. S. Suresh,
E-mail: attilivss@gmail.com

ABSTRACT

Background: The aim was to evaluate the incidental findings of vascular calcifications in mammogram and correlate them with coronary artery diseases clinically and radiologically in retrospective manner from multiple institutes.
Methods: It was a retrospective analysis of all mammograms done in past one year for routine screening from three institutes during 2020-2021. Those with positive calcifications were interviewed and for the willing population we evaluated the coronary artery disease status clinically and radiologically.
Results: There were 335 subjects whose complete case records were available. Out of these patients 38 had some form of calcifications found on mammograms with varying severity. Out of the 38 subjects 31 had coronary angiogram testing (either conventional or CT). We could observe 26 of them harbouring moderate to severe atherosclerotic changes and varying degree of coronary artery stenosis.
Conclusions: Observation of calcifications on mammogram should prompt the screening physician to encourage the patients for their cardiac risk assessment.

Keywords: Calcification, Cardiac risk assessment, Severe atherosclerotic, Mammograms

INTRODUCTION

Due to lack of structured screening system, we have good number of patients presenting in advanced stages with breast cancer in India. Attempts are made for the early detection using an array of methods from awareness programs, augmented breast screening examinations to mammogram with varying success and detection rates.[1] We are still lacking significantly in terms of mass screening for the coronary artery disease, which contributes to the top 10 reasons for morbidity and mortality across all sections in India. It is a well-known factor that the cardiac risk could be assessed through multiple indirect parameters like carotid Doppler etc. Though some literature exists in finding the correlation between the vascular calcifications in mammogram and coronary artery diseases, the same is sparely available from India.[2] In view of the inherent variability of the genetic and lifestyle parameters we thought of doing this explorative, retrospective analysis and assess the correlation if any.

METHODS

It was a retrospective analysis of all mammograms done in past one year for routine screening from three institutes during 2020-2021. Those with positive calcifications were interviewed and for the willing population we evaluated the coronary artery disease status clinically and

radiologically. Institutional ethics committee permission was sought before the start of the therapy.

The demographics, clinical characters and the mammogram features were captured in case report form and the descriptive statistics were used for the representation of the same. The mammogram calcifications were classified into mild, moderate, and severe as per the literature, so as the findings of the coronary angiogram. The incidence of the calcifications and the presence of CAD in the population was presented as percentages. Medcalc software version 10.1 was used for the analysis.

RESULTS

There are 335 subjects whose complete case records besides the mammograms available. Out of these patients 38 had some form of calcifications found on mammograms with varying severity. Out of the 38 subjects 31 had coronary angiogram testing (either conventional or CT). We could observe 26 of them harbouring moderate to severe atherosclerotic changes and varying degree of coronary artery stenosis. The selection of the cases and workflow are as mentioned in (Figure 1). The demographics of the patients with and without calcification were represented in (Table 1).

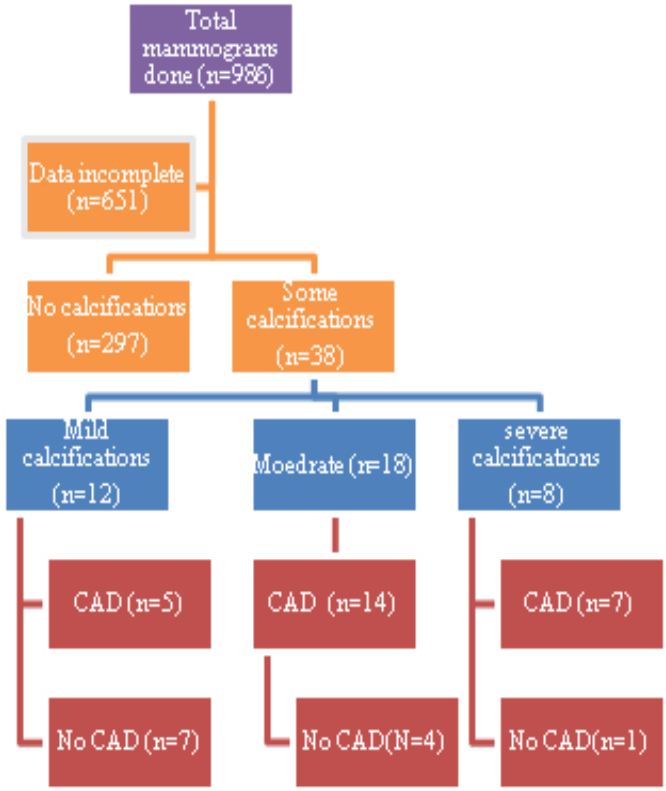

Figure 1: Selection of patients and the stratifications.

Table 1: Patient characteristics.

Patient characteristics		No calcifications	Mild	Moderate	Severe
Total breast arterial calcification score		0	1	2	>3
Patients N (%)		297 (88.6)	12 (3.6)	18 (5.4)	8 (2.4)
Age (years)		47±12	51±9	54±10	58±7
Body mass index (kg/m^2)		28±4	31±3	32±5	33±8
Previous vascular disease (CVA/CAD) (out of the subset) N (%)		20 (7)	0	3 (17)	2 (25)
Smoking status N (%)	Current	20 (7)	0	1 (3)	0
	Ex-smoker	47 (16)	0 (0)	0 (28)	0 (10)
	Non-smoker	230 (77)	18 (60)	17(97)	8 (100)
Hypertension N (%)		106 (34)	10 (82)	16 (89)	8 (100)
Diabetes N (%)		24 (8)	5 (41)	7 (39)	8 (100)
Family history N (%)		150 (51)	10 (82)	16 (89)	7 (88)
Any coronary artery disease on CCTA N (%)		12 (4)	5 (41)	14 (78)	7 (88)

DISCUSSION

Effective, efficient, and broad-reaching screening strategies are difficult to implement in large nations like India. However, if one of the testing modalities could contribute for, the prediction of other diseases, it shall solve two purposes.[3] Current guidelines recommend the use of risk-factor based algorithms to estimate the 10-year risk of atherosclerotic cardiovascular disease (ASCVD) and to identify high-risk individuals for more aggressive prevention strategies.[4] The patterns of calcification detected in the breast parenchyma on mammogram often are interpreted as benign to malignant based on the BIRAD score.[5] Besides the same we could often see a linear calcification within beast arteries resembling a railroad track, referred to as breast arterial calcification. The prevalence of detected BAC has increased over time with technical advancements in mammography.

Recent estimates are that 12.7% of women undergoing breast cancer screening have some degree of BAC.[6] The recent review suggested that factors associated with a higher prevalence of BAC, apart from age, include diabetes mellitus, parity, chronic kidney disease, and personal history of coronary artery disease or risk equivalents.[3,6] Prevalence also varies significantly by race and ethnicity. One cross sectional study of 1905 women found that BAC prevalence was highest in Hispanics (35%), followed by African Americans (25%), Caucasians (24%), and Asians (7%).[7] The recent publications by Quan et al who reviewed all the major 15 studies in this regard are of the opinion that “the association of BAC with prevalent and incident CVD is apparent from the studies above.

However, questions surround BAC regarding current clinical application, lack of prospective/outcomes studies, and technological challenges. Overall, the results indicate that the incidence of calcifications among the randomly picked up mammograms is 11.3%, which was similar in line with that of reported literature, where the review by Quan et al, found that it may range from 3-16% based on the race, lifestyle, and selection methodology.[3-8]

Out of the various types of calcifications, we found in our study, majority of these are of moderate to severe in nature. As expected through the pathophysiology we could found that those without breast arterial calcifications have least risk of CAD (4%) followed by mild BAC (41%) moderate (78%) and severe (88%) in increasing order. These results indicated a relatively higher incidence of CAD compared to the other studies, where in the highest incidence was close to 50% by Oliviera et al.[8] This could probably was due to the smaller size of the sample in the present study, never the less the trend was quite alarmingly high. The results hence strongly advocated the radiologists to report the same and should prompt the screening physician to encourage the patients for their cardiac risk assessment.

In this multi-centre study patients with suspected coronary artery disease, our timely intervention changed the diagnosis and management of patients, who underwent mammogram, but were unaware of the coronary disease, which led to improved outcomes on cardiac aspects, very similar to the lines of the Scottish study.[9]

CONCLUSION

Observation of calcifications on mammogram should prompt the screening physician to encourage the patients for their cardiac risk assessment.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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