

## Mammographic and MR density in Dense Breasts: Is there a Correlation?

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**Background:** There is a well-described correlation between mammographic density and breast cancer risk. Chinese women in Hong Kong (HK) have been shown to have dense breasts on mammography. However, if MRI were used as a tool to measure breast density, it would eliminate the radiation dose, and provide 3D and structural information. This study compares MRI 3D density to 2D mammogram density in HK Chinese women to determine if MRI can be used as a tool to assess density and cancer risk.

**Purpose:** To investigate mammographic density and MR density in a cohort of HK Chinese women.

**Materials and Methods:** Two mammographers rated breast density on mammograms using BIRADS, Wolfe and Tabar methods(1-3) in 23 HK Chinese women (age 28-57 years old). MR breast density, defined as the ratio of breast fibroglandular tissue over the total volume of the breast, was measured by a previously validated technique (4) using a semiautomatic 3D fuzzy C-means segmentation technique to quantify breast tissue and total breast volume from the patients' MRIs. We then compared mammogram and MR densities.

**Results:** BIRADS data showed 16/23 (69.6%) women were dense (>75% breast tissue), 5/23 (21.7%) were heterogeneously dense (50-75% breast tissue) and 2/23 (8.7%) had scattered density (25-50% breast tissue). Wolfe criteria found mostly dense breast patterns, with 13/23 DY (56.5%) and 10/23 P2 (43.4%) patterns. Tabar criteria showed mostly dense pattern 5 (12/23, 52.1%), with some dense pattern 4 (8/23, 34.7%), and less dense pattern 3 (2/23, 8.7%) and pattern 1 (1/23, 4.3%). Mammographic density in these women with predominantly dense breasts consistently overestimated the values of volumetric breast density measured on MRI.

**Conclusion:** MR breast density calculations may be inherently more accurate than mammography due to higher MRI contrast resolution and 3D representation of internal structures. Our work shows that 2D mammography predicted breast density at least twice greater than that measured by MR quantitative methods. These 2D and 3D measurement techniques may differ due to overlap of breast tissue patterns on the 2D projections. Mammography is less sensitive for cancer in women with dense breasts. Our results show that mammography also overestimates the amount of dense tissue present in the breast volume. Therefore, MRI may be more accurate than mammography in calculating the percent of actual fibroglandular tissue relative to the total breast volume in women with dense breasts.

| # BIRADS | % Density on MRI |        |        |        |        |        |        |        | TOTAL |
|----------|------------------|--------|--------|--------|--------|--------|--------|--------|-------|
|          | 0-9%             | 10-19% | 20-29% | 30-39% | 40-49% | 50-59% | 60-69% | 70-79% |       |
| 4        |                  | 3      | 7      | 1      | 1      | 1      | 1      | 2      | 16    |
| 3        | 3                | 2      |        |        |        |        |        |        | 5     |
| 2        | 2                |        |        |        |        |        |        |        | 2     |
| TOTAL    | 5                | 5      | 7      | 1      | 1      | 1      | 1      | 2      | 23    |

| Tabar Patterns | % Density on MRI |        |        |        |        |        |        |        | TOTAL |
|----------------|------------------|--------|--------|--------|--------|--------|--------|--------|-------|
|                | 0-9%             | 10-19% | 20-29% | 30-39% | 40-49% | 50-59% | 60-69% | 70-79% |       |
| V              |                  | 2      | 5      | 1      | 1      |        | 1      | 2      | 12    |
| IV             | 3                | 2      | 2      |        |        | 1      |        |        | 8     |
| III            | 1                | 1      |        |        |        |        |        |        | 2     |
| II             |                  |        |        |        |        |        |        |        | 0     |
| I              | 1                |        |        |        |        |        |        |        | 1     |
| TOTAL          | 5                | 5      | 7      | 1      | 1      | 1      | 1      | 2      | 23    |

| Wolfe Patterns | % Density on MRI |        |        |        |        |        |        |        | TOTAL |
|----------------|------------------|--------|--------|--------|--------|--------|--------|--------|-------|
|                | 0-9%             | 10-19% | 20-29% | 30-39% | 40-49% | 50-59% | 60-69% | 70-79% |       |
| DY             |                  | 3      | 5      | 1      | 1      |        | 1      | 2      | 13    |
| P2             | 5                | 2      | 2      |        |        | 1      |        |        | 10    |
| TOTAL          | 5                | 5      | 7      | 1      | 1      | 1      | 1      | 2      | 23    |

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