



Original Article

Breast cancer screening with digital breast tomosynthesis - 4 year experience and comparison with national data

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Abstract

Background: To determine if mammography combined with tomosynthesis (DBT) leads to superior performance in screening for breast cancer compared to digital mammography alone.

Methods: We retrospectively collected data from A) the results of population-based mammography-screening provided by the National Cancer Registry in Taiwan, and B) the results from all screening mammography performed with DBT from 2012 through 2015 at Veterans General Hospital Kaohsiung (VGHKS) since the institution of DBT at the end of 2011. This was compared data from 3 years with Digital Mammography (DM) performed prior to DBT implementation. We calculated the results of medical audit of VGHKS and compared this with national data. Fisher's exact test is applied.

Results: VGHKS data demonstrated a higher cancer detection rate (CDR) and Positive Predictive Value 1 (PPV1) than the national average. Most prominently in the year 2014, our CDR was 120% better than that of the national average. CDR ranged from 6.3 to 8.1‰ prior to the introduction of DBT, and following DBT implementation this improved to 8.5–11.4‰, reflecting a mean increase of 32.2%. Early cancer detection was 50% higher and node negative rate was 25% higher than the national average of latest year. A 17.8% reduction in recall rate (RR) was achieved due to a decrease in unnecessary recall.

Conclusion: There was a 32.2% increase in CDR and a 17.8% decrease in RR when DBT was used as an adjunct to DM, as compared to DM alone. CDRs were approximately twofold better than national average data. DBT was more effective at detecting cancer in DCIS and stage 1. Copyright © 2017, the Chinese Medical Association. Published by Elsevier Taiwan LLC. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Keywords: Asia; Mammography-screening; Taiwan; Tomosynthesis (DBT)

1. Introduction

Early diagnosis translates into better outcomes. Mammography is a proven screening tool for reducing the

risk of death from breast cancer.^{1,2} Compared with annual clinical breast examination, universal biennial mammography in Taiwan was associated with a 41% mortality reduction.³ The major limitation to the sensitivity of screening mammography is the density of breast tissue, with cancer being obscured by overlapping structures. Breast cancer screening with full-field digital mammography (DM) fails to detect 15–30% of cancers.⁴ The myriad potential harms frequently associated with screening mammography highlight the need for improved imaging technologies. One such

Conflicts of interest: The authors declare that they have no conflicts of interest related to the subject matter or materials discussed in this article.

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Table 1

The result of medical audit in VGHKS compared with that of national screening. (ACR* recommendations are listed for reference): In 2011 and years prior, the outcomes of VGHKS were screened with digital mammography. DBT was implemented after 2012. As a medical center, VGHKS shows a better CDR than national average. The range was 6.3‰–8.1‰ before DBT being applied and 8.5–11.4‰ after DBT being implemented, that means about 32.2% increase in CDR. The recall rates were significantly diminished after DBT implementation, with the range between 11.4 and 12.2% reduced to the range between 9.0 and 10.1%, and the mean about 17.8% reduction.

| Taiwan/VGHKS | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | ACR* recommendations |
|---|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|----------------------|
| PPV1 | 4.10/5.3 | 4.88/6.6 | 5.00/6.6 | 5.21/9.4 | 5.36/10.0 | 5.81/11.4 | 5.72/9.6 | 5–10% |
| PPV2 | 26.50/30.8 | 25.82/31.5 | 26.12/30.7 | 26.22/36.1 | 30.82/34.6 | 28.21/34.6 | 31.54/27.8 | 25–40% |
| PPV3 | 43.32/35.3 | 38.54/40.5 | 39.12/39.8 | 37.49/43.0 | 36.97/40.6 | 38.03/38.8 | 36.99/31.5 | 25–40% |
| Cancer detection rate | 3.94/6.3 | 4.71/8.1 | 5.04/7.5 | 5.02/8.5 | 4.75/10.1 | 4.92/11.4 | 4.77/8.7 | 2–10‰ |
| Early cancer rate (DCIS & <1 cm IDC) | 36.42/27.3 | 41.69/48.9 | 39.74/52.4 | 39.65/35.3 | 39.05/50.0 | 39.13/31.3 | 40.72/61.2 | >30% |
| Node negative rate | 64.23/62.5 | 62.00/64.3 | 63.06/53.3 | 63.83/59.5 | 67.28/64.9 | 61.39/64.3 | 65.80/82.1 | >75% |
| Recall rate | 9.61/11.9 | 9.66/12.2 | 10.08/11.4 | 9.62/9.1 | 8.85/10.1 | 8.46/10.0 | 8.34/9.0 | <10% |
| Screened no. | 247,022 (1905) | 528,401 (5838) | 558,804 (5767) | 670,530 (6101) | 694,197 (5365) | 735,720 (5773) | 769,532 (6568) | |

technology is digital breast tomosynthesis (DBT), also known as 3D mammography, which the U.S. Food and Drug Administration first approved in 2011 as a modality to be used in combination with DM. DBT reduces the challenges of interpretation due to overlapping structures in breast tissue,⁵

and the implementation of DBT in breast imaging is rapidly increasing world-wide.⁶ It has been approved for use as a screening tool in several countries. The prospective,^{7–9} retrospective screening^{10,11} and systematic review¹² studies comparing DM and DBT have all demonstrated that DBT has

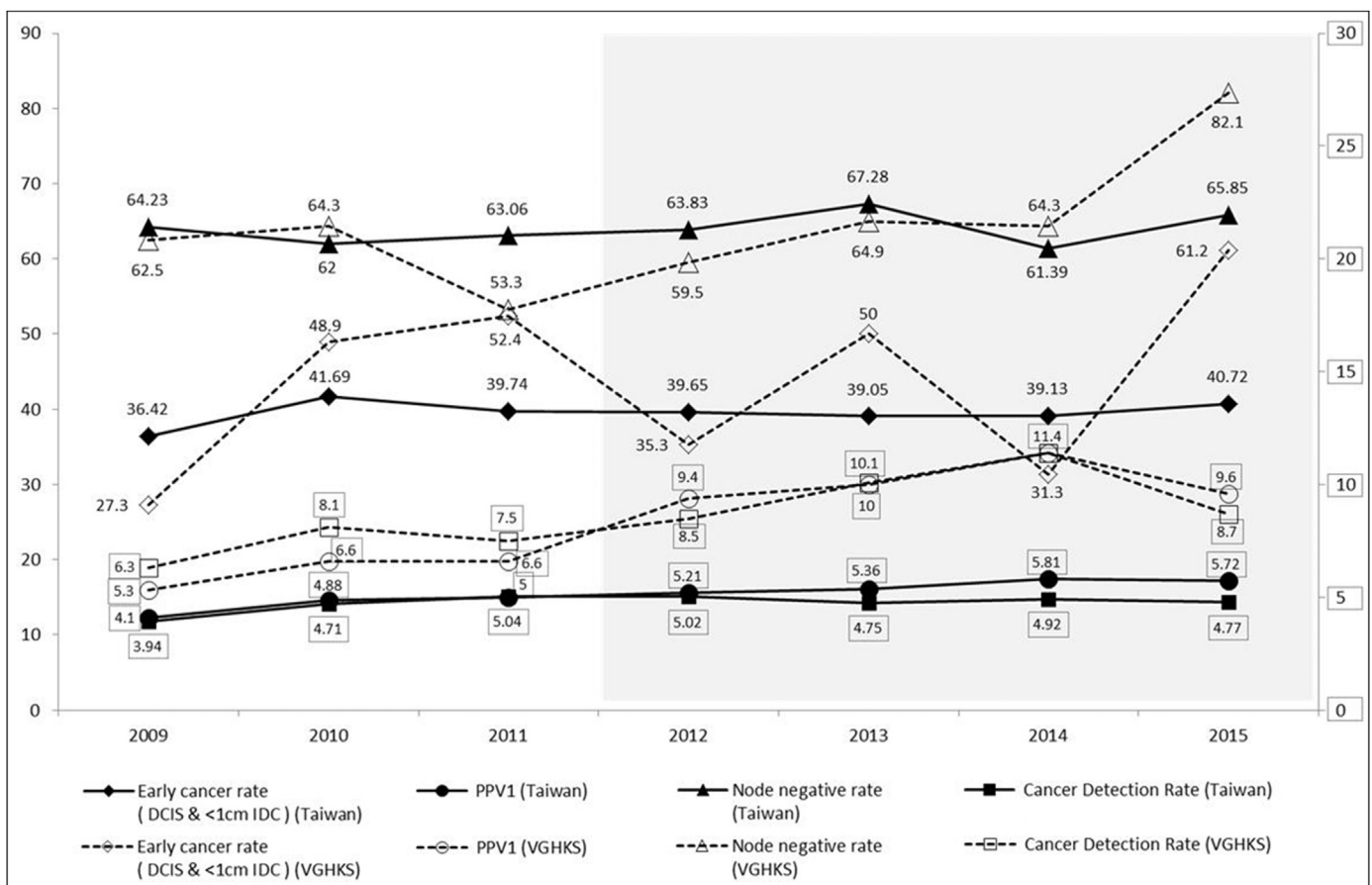


Fig. 1. The distribution of medical audit related to screened cancers before and after DBT applied: CDRs and PPV1 were significantly higher than the national average, even higher than the upper bound of ACR recommendation. In spite of significant CDR increase, the early cancer detection rates fluctuated, due to more invasive cancer detected of size 1 cm–2 cm. The node negative rate remained relatively stable throughout the screening years. The reduction of CDR in latest year is due to limited incidence of cancer. The first-time screened women were about 1.2 times higher in year 2013 when compared with 2014 and 2015, this is a limitation of screening in a fixed geographical location.

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