Predicting the Risk of Invasive Versus In Situ Breast Cancer to Aid Clinical Management

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INTRODUCTION

1. Mammography is a non-invasive method that can be used for early detection and diagnosis of breast cancer.

2. Predicting the risk of DCIS versus invasive cancer can aid clinical management.

3. We used 146,972 mammograms interpreted between 1997 and 2007 to build our Mammography Bayesian Network (MBN).

4. The MBN was trained on 2,211 independent biopsy records.

5. We used 10-fold cross-validation to train and test the MBN.

6. The area under the PR Curve of MBN (P=0.038) was significantly higher than that of the TAN algorithm.

THE MBN

We used the TAN algorithm to learn the structure of our model.

THE MBN structure consists of the following factors:

1. Mass size (MaSz)
2. Mass margins (MaMg)
3. Mass shape (MaSh)
4. Calcification milk (CaMi)
5. Calcification round (CaRo)
6. Calcification finelinear (CaFi)
7. Calcification punctate (CaPu)
8. Calcification pleomorphic (CaPl)
9. Calcification distribution (CaDt)
10. If abnormal, principal mammographic finding (PMF)
11. Breast density (BrDn)
12. Interpreting radiologist (Rad)
13. Indication for exam, if diagnostic examination (ExId)
14. Palpable lump (Palp)
15. Prior surgery (PrSr)
16. Personal history (PrHx)
17. Mass angularity (Ang)
18. Mass spiculation (Spic)
19. BI-RADS codes (BRDS)

RESULTS

1. The PR Curve of MBN was significantly higher than that of the TAN algorithm.

2. The area under the ROC Curve of MBN (AUC=0.896) was significantly higher than that of the TAN algorithm.

3. The PR Curve of MBN (P=0.038) was significantly higher than that of the TAN algorithm.

CONCLUSIONS

1. Our MBN model is the first to predict the risk of DCIS versus invasive cancer.

2. Our MBN model has the potential to aid in the clinical management of breast cancer.

3. Our MBN model can be used to predict the risk of DCIS versus invasive cancer in clinical practice.

4. Our MBN model is the first to use machine learning to predict the risk of DCIS versus invasive cancer.