Discordance in Breast Biopsies: An Analysis of Contributing Variables

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Introduction

Image-guided core needle biopsy is a less invasive method than excisional biopsy. However, sampling error can occur yielding benign results that do not coincide with what was identified in prior breast imaging. In these discordant cases where there is concern for missed malignancy, additional evaluation such as imaging, repeat biopsy, or excisional biopsy is performed. These additional procedures to confirm malignancy may cause patient anxiety or financial burden.

Objective

To determine the factors that influence whether the discordant results, upon further evaluation, are malignant or benign.

- True discordance: additional evaluations that yield a final diagnosis of malignancy
- False discordance: additional evaluations that yield a final diagnosis of benign pathology

Data and Analysis

Our institutional database was searched for records of biopsies performed that yielded discordant results between 2016-2021. Patient demographics, imaging features, biopsy method, and pathology findings were recorded.

Statistical analysis was performed using R statistical software to assess statistical significance between the true and false discordance groups.

- For categorical variables such as presence of axillary lymphadenopathy (LAD) found in the imaging features, a Pearson's chi-squared test was performed.
- For continuous variables such as size (mm) of the lesion noted on imaging, an independent-samples t-test was performed.
- A logistic regression model was developed to compare predicted probabilities of true and false discordance against the data.

Results

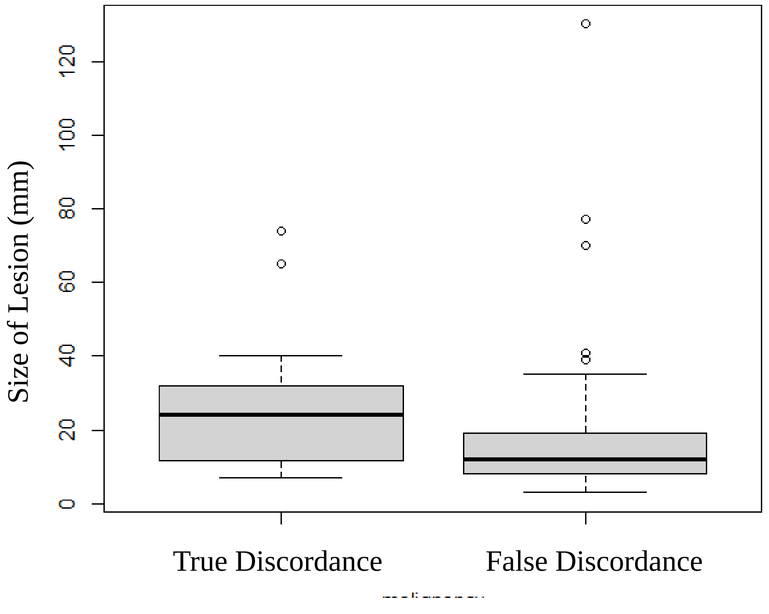
A total of 7635 biopsies were performed, of which 155 discordant lesions were identified (2%). 33 patients were lost to follow-up. Of the 122 patients who underwent additional biopsy evaluation, 30 were true discordant (24.6%) and 92 were false discordant (75.4%). Of the biopsies that led to a discordant finding, 61 were stereotactic (50%), 57 were ultrasound-guided (46.7%), and 4 were MRI-guided (3.3%).

Against true and false discordance, the significantly correlated variables are lesion size (mm) (p=0.099), BI-RADS score (p=0.006), LAD (p=0.015), lesion type (p=0.035), biopsy method (p=0.037), history of atypia (p=0.049).

Age, family history of breast cancer, IBIS score, prior breast procedure, breast density were not significant variables.

Between the stereotactic and US guided core biopsies that produced discordant results (n=118), there was a higher rate of true discordance in US guided core biopsy (35%, n=20) compared to stereotactic-guided biopsies (15%, n=9) (p=0.018). This can be explained by US-guided biopsies using smaller needle sizes and being more challenging to perform.

Lesion Size (mm) vs. Malignancy (p=0.042)



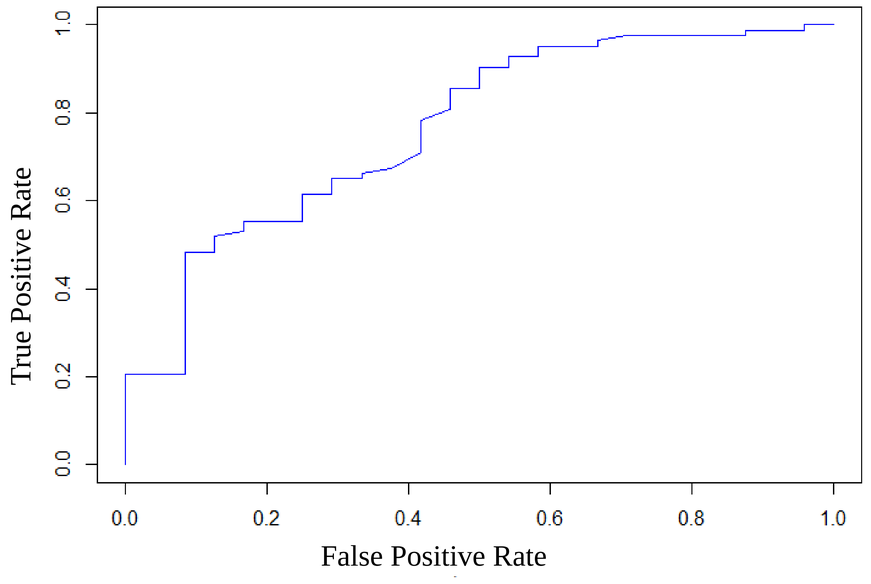
Logistic Regression

Models are still being evaluated. The current model presented is constructed with the statistically significant variables: lesion size (mm), BI-RADS score, LAD, and history of atypia against true and false discordance.

Predictive performance of the model was evaluated using a 10-fold validation technique. The dataset was divided into ten independent subsets. Nine of the ten subsets were used to train the model to be tested against the tenth subset. This was iterated ten times.

Model Performance

The model had a sensitivity of 37% and a specificity of 96%, with a predictive accuracy of 81% (95% CI : (0.73, 0.88)). An ROC curve has been constructed from the output probability of the model with an AUROC = 77.4%. Removing any variable reduces the AUROC.



Conclusion

Our institutional discordance rate was 2% with a true discordance rate of 24.6%. Among the variables tested, lesion size (mm), BI-RADS, LAD, lesion type, history of atypia, and biopsy method are each significantly correlated with a true discordant lesion. Logistic regression models are still being tested to see if other variables may contribute to its predictive power.