THE QUANTIFICATION OF PHOSPHATIDYLSERINE POSITIVE (PS+) LIVE SPERM IN COMBINATION WITH THE CONVENTIONAL SEMEN ANALYSIS GIVES A BETTER INDICATION OF MALE FERTILITY

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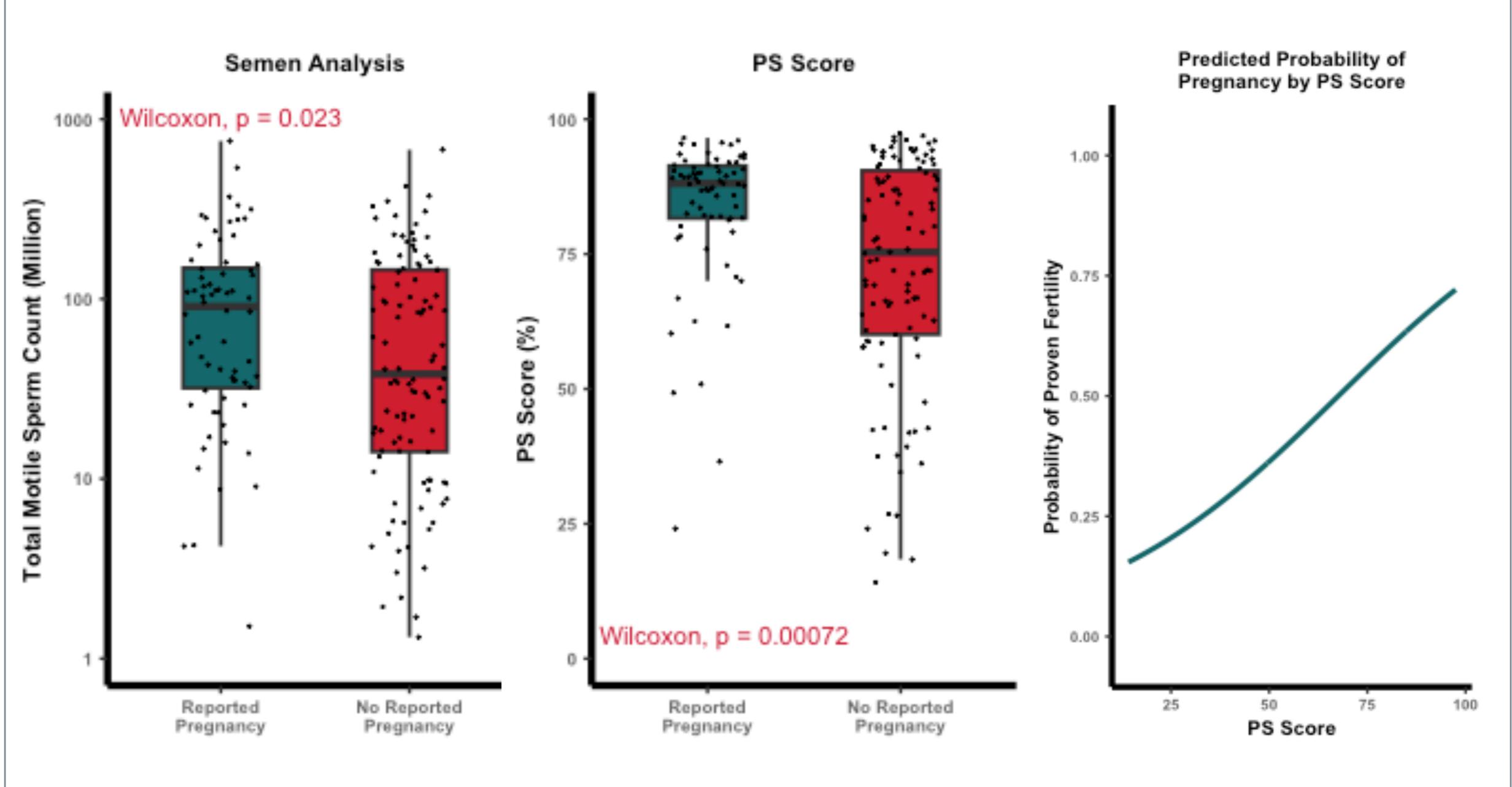
PURPOSE & OBJECTIVES

Infertility affects about 1 in 6 couples of reproductive age, with male factors accounting for 50% of these cases. The semen analysis (SA) serves as the primary tool in the initial evaluation of male fertility. Although the SA is informative in some ways, it is an imperfect assessment of male fertility as 12% of males with normal semen parameters still encounter infertility and 40% of fertile men can demonstrate abnormal semen parameters. Therefore, there is a critical need for more quantitative approaches to diagnose male infertility. Phosphatidylserine (PS) exposed on live sperm is necessary for sperm:egg fusion and may be a biomarker for fertilization competent sperm. The aims of this study were to: 1) quantify the PS+ live sperm (PS Score) in individuals with reported pregnancy compared to those seeking fertility treatment, and 2) build a computational model using SA and PS Score that accurately predicts fertility status.

MATERIAL & METHODS

Semen samples from pregnancy proven donors (cryo-banked and fresh) and from men seeking infertility treatment were analyzed. Conventional SA was performed followed by screening for PS+ live sperm by analyzing fluorescently tagged Annexin (PS+) and 7AAD (dead) by flow cytometry. Logistic regression models were fit using a cross-validation strategy, where fertility status was predicted as a function of SA parameters and PS Score. The performance of each model was characterized by examining the area under the receiver operator characteristic (ROC) curve. The optimal decision boundary was chosen as the value that maximized both sensitivity and specificity across the models. Overall performance was quantified by accuracy and F-scores at this decision boundary.

RESULTS

Semen samples from individuals who were able to achieve pregnancy (n=148) had a mean PS Score of 85.29% (sem±0.09). PS Scores of patients seeking infertility treatment (n=107) varied greatly with a mean of 72.05% (sem±0.2), which was significantly lower according to a Wilcoxon rank sum test (p<0.05). Cross validated logistic regression models fit using the PS Score as the sole predictor had an average AUC of 0.7. This shows that PS Score is a useful parameter for predicting fertility and has the potential to be combined with traditional SA parameters to provide a more comprehensive view of fertility status.

CONCLUSIONS

These results suggest that the percentage of PS+live sperm, PS Score, in an ejaculate is an indicator of male fertility. Statistical classification methods suggest that PS Score is a useful addition to the conventional SA in determining if an individual is infertile.

REFERENCES

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- The percentage of PS+ live sperm is an indicator of male fertility

- The predicted probability of pregnancy increases as PS Score increases

- PS Score would be a useful addition to the conventional SA