

Can Artificial Intelligence Predict Good Eggs From Bad? Comparing Oocyte Assessment Tool Violet To Current Egg Freezing Predictors

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Abstract

BACKGROUND: Future Fertility's Violet is an artificial intelligence image analysis egg assessment tool for patients seeking elective oocyte preservation. The technology is used to identify the relative viability of mature eggs to tailor a personalized treatment plan for each patient. The software detects patterns in oocytes in order to better understand egg quality. It may be particularly impactful for older patients who are known to have problems related to egg quality, especially given the fact that they may have less opportunities to undergo multiple cycles. While we currently have methods for assessing sperm quality and embryo quality, there are very limited guidelines for determining successful oocytes. Violet is currently the only objective assessment tool for predicting egg quality. Current research suggests Violet is superior to trained embryologists by more than 20%, with 100% reproducibility¹. More data is needed to assess the viability of Violet to better assess the value it provides in improving IVF outcomes.

OBJECTIVE: We sought to compare predictions of live birth rate between Violet and a currently utilized egg freezing predictor, which takes into account age and number of mature oocytes.

MATERIALS & METHODS: A retrospective chart review was performed at a private multi-site infertility center from March 2020 to April 2022. All patients undergoing elective egg vitrification who opted to get oocyte assessment results from Violet were included, for a total of 154 patients. Patients under the age of 24 or over the age of 44 were excluded as the calculator is not recommended in those age groups. All patients underwent controlled ovarian stimulation and subsequent retrieval and mature oocyte vitrification. Likelihood of one live birth was given as a percentage by the Violet report. These results were compared to the Brigham & Women's Hospital Egg Freezing Counseling Tool (BWH EGCT) calculator per MDCalc. An unpaired t-test was performed to compare the mean percentages. Given differences in egg quality with relation to age, we also sought to determine if there was a difference in results by age (age groups: 27-32, 33-38, and 39-44 years old).

RESULTS: The probability of one live birth was assessed using Violet as well as the BWH EGCT for 154 patients. Mean AMH of patients included was 2.42. Mean age at retrieval was 36, with a range of 27-44. The mean likelihood of one live birth rate using Violet as an assessment tool was 47.60%, while the conventional method gave a mean likelihood of

one live birth of 49.14% ($p=0.6079$). There was no significant difference in predictions by Violet versus the conventional method by age, though the results did approach significance ($p=.12$ for 27-32, $p=.24$ for 33-38, and $p=.13$ for 39-44).

CONCLUSIONS: This is the largest study to our knowledge assessing the viability of Violet compared to conventional methods for assessing egg quality. Our results suggest there is no significant difference between the AI oocyte assessment tool Violet and conventional methods for prediction using age and number of mature oocytes. Additionally, there is no significant difference when comparing results by age group. This suggests that Violet is able to individually visually assess oocytes for quality and likelihood of success. Violet provides a non-invasive approach and a comprehensive breakdown of the quality of each oocyte. Though these results suggest Violet is similar to existing predictors, it adds value by determining the individual quality of each oocyte. This allows for stratification that can guide fertility decision-making. A limitation of the study is the fairly low number of patients given this is a new technology. As more patients utilize the Violet assessment tool, there will be greater numbers of oocytes that undergo thaw, insemination, and transfer. This will provide greater data regarding fertilization, blastocyst development, and ultimately live birth rate. Though this technology is still in its relative infancy, there is an exciting future ahead for artificial intelligence in assessing oocyte quality and predicting IVF success.

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