Novel Oocyte Grading Method Utilizing Viscoelasticity Properties

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Background and Aims

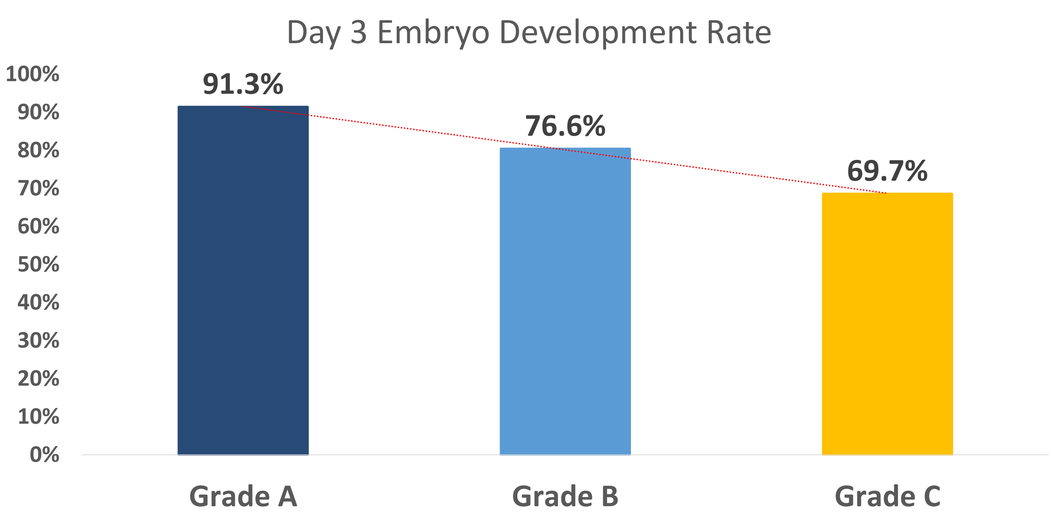
Currently, oocyte selection relies on subjective morphological assessments, lacking accuracy and standardized guidelines in selecting oocytes with optimal developmental potential. This study aimed to utilize a novel grading device to investigate the correlation between biomechanical properties of mature oocytes and subsequent embryo development. The safety of the aspiration measurement procedure for oocyte quality assessment was also validated.

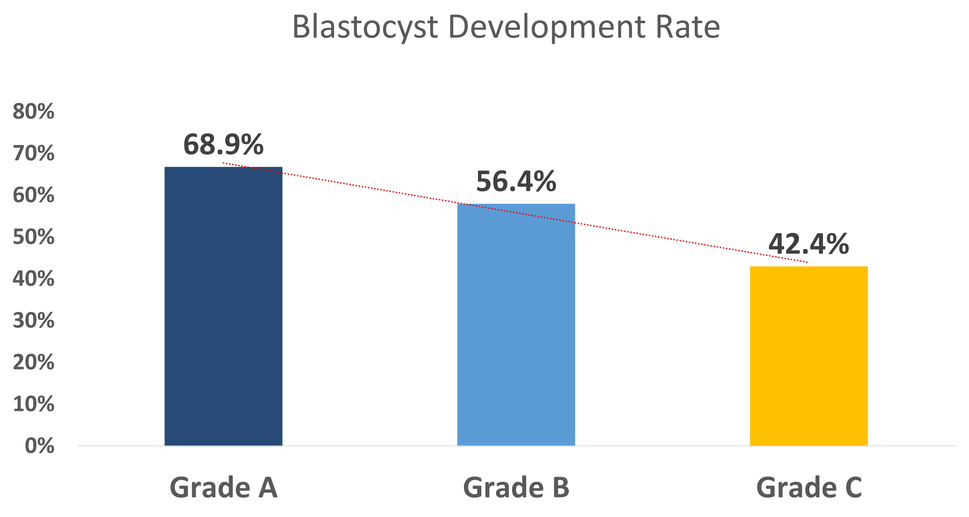
Methods

A total of 279 oocytes from patients undergoing in vitro fertilization were evaluated and graded by the device into three categories: A, B, C. Fertilization rates, day 3 embryo development rates (≥7CB), and day 5/6 blastocyst development rates were compared across the grading groups. Additionally, the device's oocyte grading (A, B, C) was analyzed in relation to the time-lapse scoring system (KIDScore: good, fair, poor) to explore potential correlations.

Results

The measurement of biomechanical properties was suggested not to adversely affect the rates of fertilization (82.4%), day 3 embryo development (82.2%), or blastocyst development (60%), all of which aligned with the key performance indicators. Oocytes graded as A, B, and C achieved day 3 embryo development rates of 91.3%, 76.6%, and 69.7% ($p < 0.05$) and blastocyst development rates of 68.9%, 56.4%, and 42.4%, respectively ($p < 0.05$). A correlation between oocyte grading and the KIDScore was observed ($p < 0.05$). Notably, patients with higher graded oocytes achieved higher successful pregnancy rates (66.7%) following single blastocyst transfers.





Conclusion

This study introduces a novel approach in assessing oocytes quality based on biomechanical properties and related characteristics. Higher-grade oocytes detected by the device were associated with improved embryo quality, higher blastocyst formation rates, and higher reproductive outcomes. The device's aspiration measurement had no adverse effects on embryo culture outcomes. While further studies are warranted, this research highlights the potential of using biomechanical properties to predict oocyte quality and optimize embryo selection.