



Irregular cleavage in early embryogenesis does not reduce the euploidy after reaching the blastocyst

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Purpose

In recent years, there have been many reports in which viability was estimated by analyzing morphokinetics of embryos using a time-lapse monitoring system.

Among them, the dynamics of early cleavage have been studied extensively, and it has been reported that embryos with irregular cleavage have a reduced early embryo transfer pregnancy rate or a reduced blastocyst development rate, but there is ongoing debate about fertility and euploidy when such embryos reach the blastocyst.

In this retrospective study, PGT-A was performed on embryos that showed irregular cleavage but became blastocysts, and their euploid rates were compared with those of blastocysts that showed normal cleavage.

Materials and methods

96 embryos that were egg-collected in 2013-2018, reached the blastocyst, were vitrified, and were discarded at the request of the patient were included in the study.

They were cultured on a time-lapse monitoring system (EmbryoScope, Vitrolife), and were classified by time-lapse videos, those with 2 cells in the first cleavage and 4 cells in the second cleavage are the good cleavage groups (Fig.1), those with 3 or more cells in the first cleavage, or those with 5 cells or more in the second cleavage are the irregular cleavage groups (Fig. 2).

Before vitrifying, several cells of trophoctoderm were biopsied from the blastocysts, and the samples were analyzed by next-generation sequencing at Institute for Comprehensive Medical Science, Fujita Health University, Toyoake, Japan.

Embryos were classified into euploid, aneuploid, and mosaic according to the analysis.

Fig.1 Good cleavage group (embryos with 2 cells in the first cleavage and 4 cells in the second cleavage)

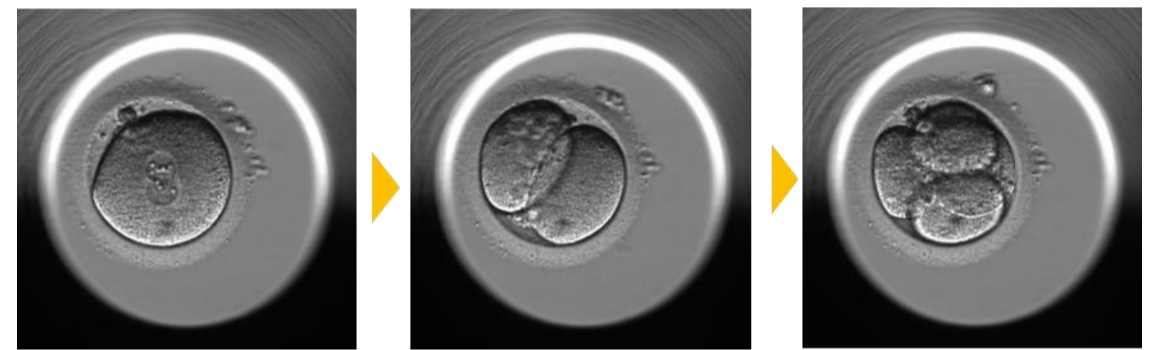
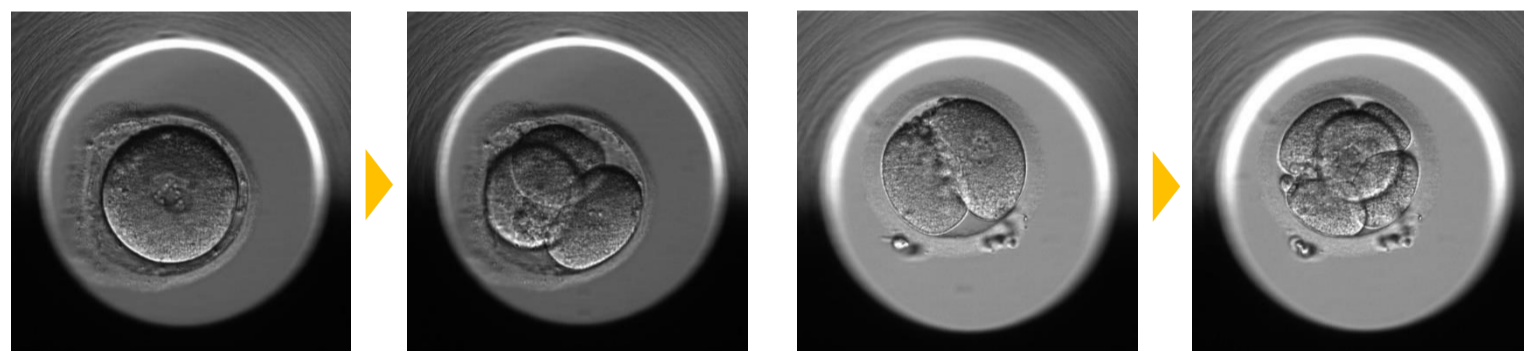


Fig.2 Irregular cleavage group (embryos with 3 or more cells in the first cleavage, or those with 5 cells or more in the second cleavage)



Results

As a result of image analysis by time-lapse monitoring, there were 53 good cleavage groups and 43 irregular cleavage groups.

The proportions of euploid embryos, aneuploid embryos and mosaic embryos were 43.4% (23), 45.3% (24) and 11.3% (6) in the good cleavage group, 41.9% (18), 46.5% (20), and 11.6% (5) in the irregular cleavage group (Table 1), there was no significant difference in euploid rate between the two groups.

(The odds ratio of the euploid rate of the irregular cleavage group to the good cleavage group was 0.94)

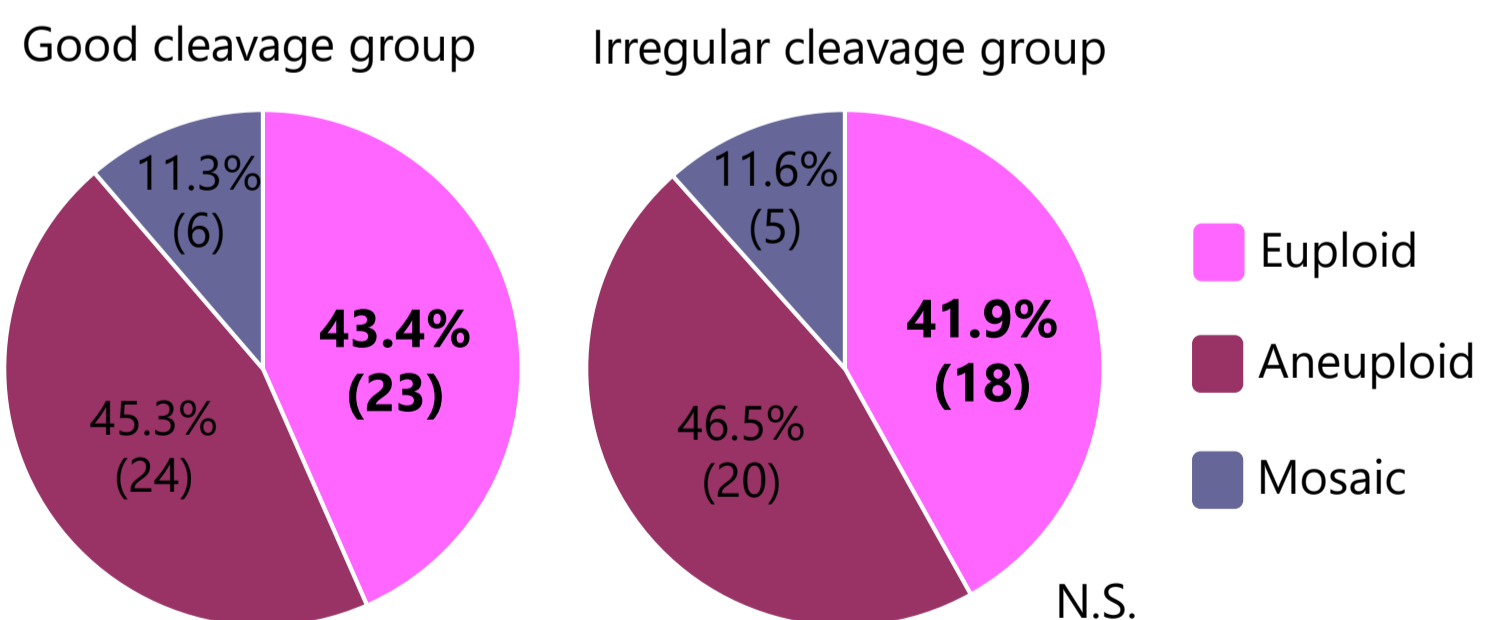


Table 1 Euploid rate of the both groups.

Conclusions

This study showed that Irregular cleavage in early embryogenesis did not reduce the euploid rate after reaching the blastocyst. It has thought that irregular cleavage cause chromosomal abnormalities. However, it has been reported that chromosomal abnormalities may be corrected during the developmental process in embryos that have become blastocysts with abnormal initial cleavage (Zhan *et al.* 2016, Lagalla *et al.* 2017).

In conclusion, irregular cleavage embryos that have reached the blastocyst need not be excluded from transfer.

References

- Zhan Q, Ye Z, Clarke R, Rosenwaks Z, Zaninovic N. Direct unequal cleavages: embryo developmental competence, genetic constitution and clinical outcome. *PLoS One*. 2016; 11: e0166398.
- Lagalla C, Tarozzi N, Sciajno R, Wells D, Di Santo M, Nadalini M, Distratis V, Borini A. Embryos with morphokinetic abnormalities may develop into euploid blastocysts. *Reprod Biomed Online*. 2017; 34: 137-46