EMBRYO CLEAVAGE BEHAVIOUR IN INITIAL THREE CELL CYCLES PREDICTS DEVELOPMENTAL POTENTIAL AND PLOIDY STATUS
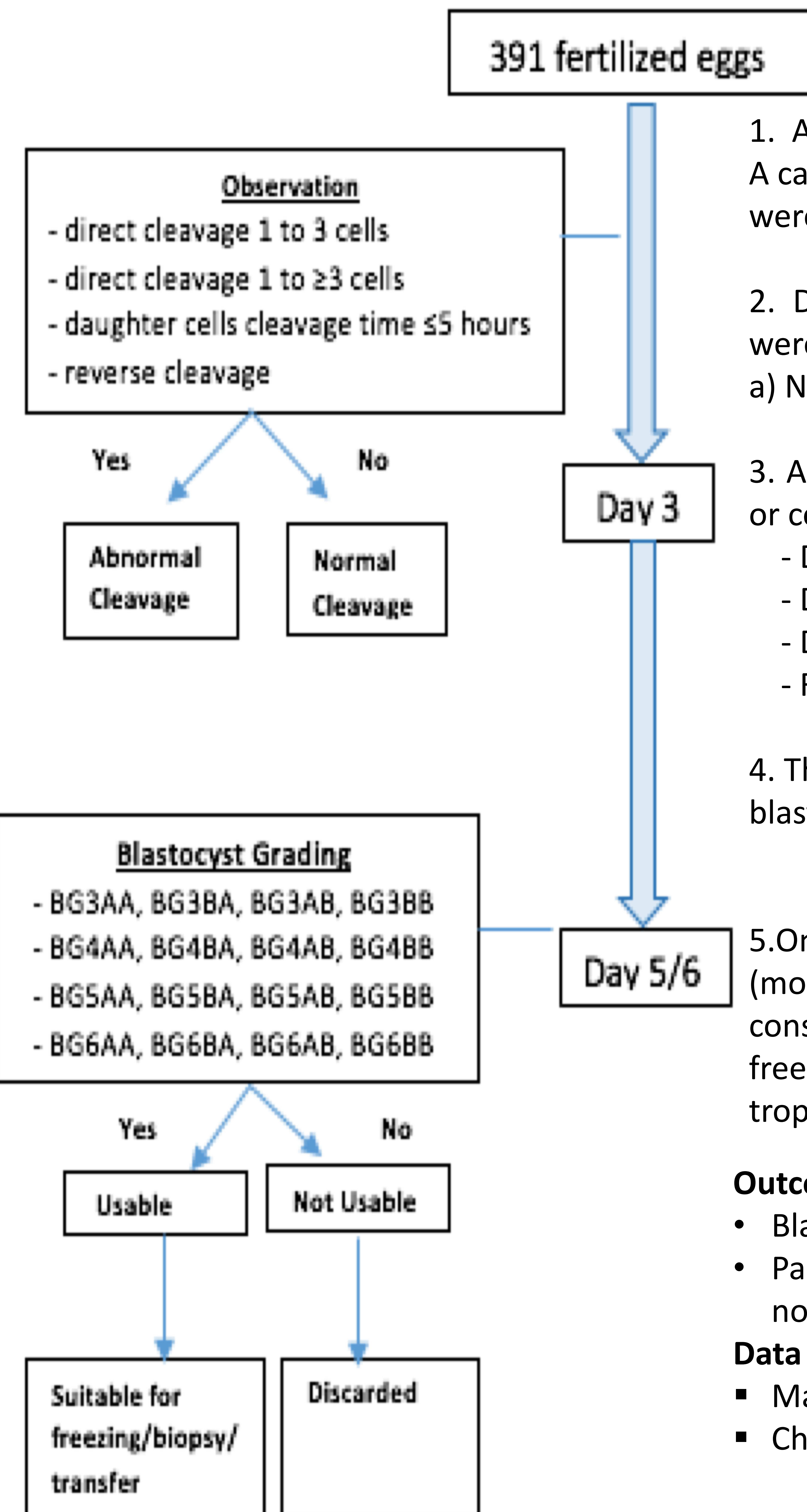
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INTRODUCTION

Some studies have demonstrated embryos resulting from abnormal cleavage during early development can result in aneuploidy and failed to develop to blastocysts. Our aim is to determine whether embryos display abnormal division pattern during early development (initial three cell cycles) affects their ability to form blastocyst and ploidy status.

MATERIAL &METDOLOGY

391 fertilized eggs

Observation
- direct cleavage 1 to 3 cells
- direct cleavage 1 to ≥3 cells
- daughter cells cleavage time ≤5 hours
- reverse cleavage

Yes → Abnormal Cleavage
No → Normal Cleavage

Day 3

Blastocyst Grading
- BG3AA, BG3BA, BG3AB, BG3BB
- BG4AA, BG4BA, BG4AB, BG4BB
- BG5AA, BG5BA, BG5AB, BG5BB
- BG6AA, BG6BA, BG6AB, BG6BB

Yes → Usable
No → Not Usable

Usable → Suitable for freezing/biopsy/transfer
Not Usable → Discarded

Day 5/6

1. A total of 391 fertilized zygotes from 59 PGT-A cases were reviewed retrospectively. Embryo were cultured for 6 days using embryoscope.

2. Division patterns in initial three cell cycles were registered and divided into 2 groups:
a) Normal cleavage b) Abnormal cleavage.

3. Abnormal division was defined as having one or combination of these cleavage irregularities:
- Direct cleavage from 1 to 3 cells
- Direct cleavage from 1 to ≥3 cells
- Daughter cells cleavage time <5h
- Reverse cleavage

4. The embryos were continued to culture until blastocysts stage.

5. On day 5/6, (BG3-6) AA/AB/BA/BB blastocysts (modified gardner grading system) were considered usable, and qualify for biopsy and freezing. Blastocysts with 25-80% aneuploidy in trophectoderm cells were reported as mosaic.

Outcome measures
- Blastocyst formation and utilization rate
- Parallel comparison of ploidy status between normal and abnormal cleavage group.

Data Analysis
- Mann-Whitney U test[a]
- Chi Square[b]

P value significant at <0.05

RESULTS

	Normal Cleavage (n=200)	Abnormal Cleavage (n=191)	P value
Maternal age (mean±SD)	36.3±4.7	36.6±4.8	NS[a]
Timing of 1st cleavage	25.98 ± 2.9	28.25±4.95	0.00001[a]
Blastocyst formation, n (%)	191(95.5)	116(60.7)	0.00001[b]
Utilization, n (%)	154(77)	65(34)	0.00001[b]

Table 1 Comparison of maternal age, timing of first cleavage, blastocysts formation and utilization rates between normal cleavage group & abnormal cleavage group.

Note: Mann-Whitney U test[a], Chi Square[b]

	Normal Cleavage	Abnormal Cleavage	P value
Total number for biopsy	154	65	
Euploid, n (%)	66(42.9)	17(26.2)	0.02[b]
Aneuploid, n (%)	65(42.2)	32(49.2)	NS[b]
Mosaic, n (%)	23(14.9)	16(24.6)	NS[b]

Table 2. Parallel comparison of ploidy status between normal cleavage group & abnormal cleavage group.

Note: Chi Square[b]

CONCLUSION

Embryo showed abnormal cleavage behaviour during initial three cell cycles is associated with negative outcomes in terms of blastocysts formation and utilization rates, while embryos showed normal division is more likely to be euploid if they are able to form usable grade blastocysts (BG3-6, AA-BB). It is suggested embryo division patterns could be a useful measure in predicting blastocyst development potential and provide additional information on deciding which embryos to choose for transfer.

REFERENCES

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CONTACT