PRIMARY INFERTILITY RESULTING FROM OOCYTE MATURATION ARREST: A CASE REPORT

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BACKGROUND

Oocyte maturation arrest (OMA), characterized by abnormal meiosis and failure of polar body formation, was first linked to infertility in 1990 during in-vitro-fertilization (IVF) [1]. Most cases remain unsolved, though scare literature includes rare pathogenic variants in *TRIP13* and mechanisms that may contribute to its etiology [2-4].

OBJECTIVE

To present a case of primary infertility with repeated M1 oocyte arrest and use of experimental in-vitro maturation (IVM) culture media to mature oocytes in-vitro.

MATERIALS AND METHODS

A 39 year old G0 Libyan female with regular menses and 14 years of infertility with her current partner presented after two previous IVF cycles at different IVF centers with OMA. In her first IVF cycle in 2013 (age 28, Georgia, USA) Long Lupron protocol with Menopur 75 IU / Follistim 200 IU was used. On cycle day 11, E2 was 7850 pg/mL, with 20mm leading follicles, followed by an hCG trigger. 12 oocytes were retrieved 36 hours later, all arrested in MI. 8 oocytes were incubated with sperm and 4 had ICSI attempted, however all 12 remained arrested in M1 and none matured or fertilized. Her second IVF cycle was performed in Jordan in 2016 at age 31 with an AMH of 4.8 ng/mL. An antagonist protocol was used with follicles reaching 20-21mm followed by 10,000 units of hCG. Transvaginal oocyte retrieval 36 hours later resulted in 22 oocytes: 19 M1, 2 GV, and 1FZ. Upon arriving to our clinic in 2023, she was counseled on the high likelihood of the same outcome, however elected to proceed with a third IVF cycle. Changes discussed included a microdose Lupron protocol, Ovidrel trigger, prolonging stimulation to a 23-24mm lead follicle, and experimental IVM culture media. Prior to stimulation, she was age 39, AMH of 1.6 ng/mL and tested negative for *TRIP13,* the most common gene associated with MI arrest [2, 4]. Microdose Lupron protocol was used with Follistim 375 IU / Menopur 150 IU. Stimulation lasted 14 days, reaching a 23-24mm follicle size with peak E2 of 4076 pg/mL, followed by an Ovidrel trigger. Oocyte retrieval 36 hours later yielded 11 oocytes (9M1, 1GV, 1FZ). The Medicult IVM System was used experimentally for oocyte maturation. Culture media was prepared a day before retrieval. 3mL of LAG Medium (Vial 1) and 10mL of IVM Medium (Vial 2) were pre-equilibrated in CO_2 at 37^0C for at least 12 hours. Retrieved oocytes were stored in LAG Medium for 2-3 hours before transfer to IVM Maturation medium containing 9mL IVM Medium, 1mL of patient's serum, 10µL of hCG solution, and 100µL of FSH. Oocytes were incubated in IVM medium for 48 hours.

RESULTS

Oocytes were incubated in IVM medium and evaluated at 24, 28, and 48 hours in culture, but none matured.

CONCLUSION

Despite 14 years of infertility, 3 IVF cycles, no *TRIP13* pathogenic variant, and a trial of IVM, the patient has primary infertility due to abnormal meiosis causing oocyte maturation arrest. We suspect an unidentified genetic component causing this deficiency and are performing genome sequencing to further understand the pathogenesis of oocyte maturation.

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REFERENCES

1. Rudak, E., et al., *Anomalies of human oocytes from infertile women undergoing treatment by in vitro fertilization.* Fertil Steril, 1990. **54**(2): p. 292-6.
2. Mrazek, M. and J. Fulka, Jr., *Failure of oocyte maturation: possible mechanisms for oocyte maturation arrest.* Hum Reprod, 2003. **18**(11): p. 2249-52.
3. Chen, J., et al., *Identification of a novel splicing variant of thyroid hormone receptor interaction protein 13 (TRIP13) in female infertility characterized by oocyte maturation arrest.* J Assist Reprod Genet, 2024.
4. Fei, C.F. and L.Q. Zhou, *Gene mutations impede oocyte maturation, fertilization, and early embryonic development.* Bioessays, 2022. **44**(10): p. e2200007.