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Research Article

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No Evidence that a Single Injection of Granulocyte Colony Stimulating Factor in the Late Follicular Phase Improves Fecundity with in Vitro Fertilization-Embryo Transfer in Women of Advanced Age with Diminished Oocyte Reserve

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ABSTRACT

A woman with primary infertility and diminished oocyte reserve (DOR) had the luteinized unruptured follicle (LUF) syndrome. Egg release from the follicle was finally achieved using an experimental treatment of a single injection at the time of peak follicular maturation of granulocyte colony stimulating factor (G-CSF). Not only did she conceive at the age of 42 and deliver a healthy full-term baby, but she also conceived at age 46.5 and delivered a full-time baby when she released her egg on the first cycle with G-CSF followed by 10,000 IU of human chorionic gonadotropins. Complicating the advanced reproductive age was the fact that she was in overt menopause, but was able to mature a follicle by lowering the very high serum FSH with ethinyl estradiol thus up regulating down regulated FSH receptors and making her follicle sensitive again to endogenous gonadotropins. The odds of 2 out of 2 successful pregnancies despite these clinical circumstances, we have to wonder was the G-CSF injection that somehow so it reads injection somehow the cause of marked reduced fecundity with advancing age?

Thus, patients with marked DOR needing or wanting to do in vitro fertilization embryo transfer (IVF-ET) were given the option of adding G-CSF to their FSH receptor up-regulation follicle stimulation protocol. The 8.3% live delivered pregnancy rate (LDPR) in the 24 women who had an embryo transferred was not higher than the expected LDPR for similar type patients at our infertility center. Thus, we did not begin to undergo controlled trials with G-CSF based on the results of the pilot study.

Keywords: Advanced Age, Diminished Ovarian Reserve, Luteinized Unruptured Follicle Syndrome, Granulocyte Colony Stimulating Factor

Introduction

A case was reported in which a 42-year-old woman with primary infertility of 3.5 years duration was found to have diminished egg reserve with a day three serum FSH of 47 mIU/ml indicating diminished oocyte reserve (DOR). She was also found to have also the luteinized unruptured follicle (LUF) syndrome [1,2]. Three different medical treatments for LUF were rendered after demonstrating LUF in the 1st natural cycle, but they failed to result in oocyte release [3-5].

We advised in vitro fertilization embryo transfer (IVF-ET). However, she could not afford the procedure and the expense of gonadotropins. She asked if she could be part of a research project. She was informed that based on observed significant increase in the cytokine granulocyte colony stimulating factor (G-CSF) in the follicular fluid prior to the LH surge, we were going to see if perhaps G-CSF may play a role in egg release. Possibly deficiency of G-CSF could lead to LUF and supplementing it at the right time could enhance egg release.

She was injected with 300 µg of G-CSF at the time of peak follicular maturation followed the next day with an injection of 10,000 IU human chorionic gonadotropin (hCG). She released her egg by transvaginal sonography. We supplemented her with

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vaginal progesterone (P) suppositories 400mg morning and night in the luteal phase. She was also taking dextroamphetamine sulfate [6]. She conceived that cycle and delivered a healthy full-term baby [1]. We subsequently evaluated a short series of patients with LUF failing to conceive to release with hCG or leuprolide acetate. We confirmed that a one-time injection of G-CSF can help to enable egg release [7].

She had stated that she only wanted 1 child. However, she changed her mind and consulted with our group again at age 46.5 but now in overt menopause. Her serum E2 was less than 15 pg/nl, her serum FSH was 117 mIU/ ml and her serum anti-mullerian hormone level was <0.09ng/ml. She formed a mature follicle on day 44 by just lowering her serum FSH with ethinyl estradiol. Again, 300 mg of G-CSF was given followed by hCG. She released her egg and had another full-term baby [1,8-12].

The question with successful pregnancies at age 42 with DOR and 46.5 with POF in just one cycle each time once egg release was achieved is whether this was merely fortuitous (with odds similar to winning the lottery), or for some reason does she have genes that make eggs with a quality similar to a 15-year-old? However, another question is doing should be giving and do should be does G-CSF do something to correct diminished mitochondrial DNA seen with aging thus allowing her to have these miraculous babies.

We thus decided to evaluate the efficacy of G-CSF should be on fecundity. We conducted a patient option study determining if G-CSF could embrace the rate of conception in patients highly unlikely to conceive. We chose first to evaluate IVF-ET cycles.

Materials and Methods

G-CSF 300mg was given one time at follicular maturation at a dosage of 300mg with hCG 10,000 IU given the next day. Oocyte retrieval was generally 32 hours from the hCG injection. Embryos were transferred fresh on day 3 from egg retrieval.

Results

The average age for the 44 women having egg retrievals was 44. The average serum AMH was 0.32ng/ml and the average age was 42.9 for the women actually getting to embryo transfer.

There were 38 of the 44 women (86%) that had at least 1 egg retrieved. This led to 24-day 3 embryo transfers. There were 2 live deliveries of the 24 transfers (8.3%) per transfer and 4.7% per retrieval. The 2 women who delivered were 39 years old at the time of egg retrieval.

Discussion

The live delivered pregnancy rates were no higher than our usual success rate in this difficult group of patients. Thus, we no longer offer G-CSF as a treatment option for patients with poor prognosis. This was a pilot study; thus based on these results we decided not to proceed with a randomized controlled trial.

References

1. Check JH, Check DL, Richardson K. Live delivery in a 46.5-year-old woman in overt menopause by restoring follicular sensitivity to follicle stimulation (FSH). Gynecol Reprod Health. 2022. 6: 1-3.
2. Check JH, Adelson HG, Dietterich C, Stern J. Pelvic sonography can predict ovum release in gonadotropin-treated patients as determined by pregnancy rate. Human Reproduction. 1990. 5: 234236.
3. Check JH, Dietterich C, Nowroozi K, Wu CH. Comparison of various therapies for the luteinized unruptured follicle (LUF) syndrome. Int. J. Fertil. 1992. 37: 33-40.
4. Check JH, Nazari A, Barnea ER, Weiss W, Vetter BH. The efficacy of short-term gonadotrophin-releasing hormone agonists versus human chorionic gonadotrophin to enable oocyte release in gonadotrophin stimulated cycles. Hum Reprod. 1993. 8: 568-571.
5. Check JH, Vetter BH, Weiss W. Comparison of hCG versus GnRH analog for releasing oocytes following ultra-low-dose gonadotropin stimulation. Gynecological Endocrinology. 1993. 7: 115-122.
6. Check JH, Neulander M, Check DL, O'Neil MM, Wilson CBS. The relationship between diminished ovarian reserve and the increased cellular permeability syndrome. Int J Clin Med Case Stud. 2025. 2: 1017.
7. Check JH, Vaniver J, Senft D, DiAntonio G, Summers D. The use of granulocyte colony stimulating factor to enhance oocyte release in women with the luteinized unruptured follicle syndrome. Clin Exp Obstet Gynecol. 2016. 43: 178-180.
8. Check JH, Nowroozi K, Chase JS, Nazari A, Shapse D. Ovulation induction and pregnancies in 100 consecutive women with hypergonadotropic amenorrhea. Fertil Steril. 1990. 53: 811-816.
9. Check ML, Check JH, Choe JK, Berger GS. Successful pregnancy in a 42-year-old woman with imminent ovarian failure following ovulation induction with ethinyl estradiol without gonadotropins and in vitro fertilization. Clin Exp Obstet Gynecol. 2002. 29: 11-14.
10. Check JH, Gampo NN. The role of membrane progesterone receptor associated proteins in gynecological and reproductive disorders, and cancers: an editor's historical perspective: Part 2: Clinical benefits of P supplementation post-ovulation. J Sex Health Reprod Med. 2026. 2: 1-8.
11. Check JH. The multiple uses of ethinyl estradiol for treating infertility. Clin Exp Obstet Gynecol. 2010. 37: 249-251.
12. Check JH, Covolesky S, DiAntonio A. A Detailed Description of the FSH Receptor up Regulation Technique Employed to Develop Metaphase II Oocytes for in Vitro Fertilization Embryo Transfer in Women with Extremely Low Egg Reserve who had Successful Pregnancies. J Sex Health Reprod Med. 2026. 2: 1-7.