

Title:

Comparing Pregnancy Outcomes Between Natural Cycles and Artificial Cycles Following Frozen-Thaw Embryo Transfers

Running Title:

A retrospective cohort analysis

Cassandra PAKES¹

Michelle VOLOVSKY¹

Genia ROZEN^{1, 2, 3}

Franca AGRESTA²

David K. GARDNER²

Alex POLYAKOV^{1, 2, 3}

¹ Royal Women's Hospital, Parkville, Victoria, Australia

² Melbourne IVF, East Melbourne, Victoria 3002, Australia

³ Department of Obstetrics and Gynaecology, University of Melbourne

Author Addresses:

Cassandra PAKES

ORCID - <https://orcid.org/0000-0003-2916-1556>

Registrar, Royal Women's Hospital

20 Flemington Rd, Parkville, Victoria 3052, Australia

Email: cassandrapakes@gmail.com

Michelle VOLOVSKY

Registrar, Royal Women's Hospital

20 Flemington Rd, Parkville, Victoria 3052, Australia

Email: michelle.volovsky@gmail.com

Genia ROZEN

Consultant, Melbourne IVF and Royal Women's Hospital

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the [Version of Record](#). Please cite this article as [doi: 10.1111/AJO.13213](https://doi.org/10.1111/AJO.13213)

This article is protected by copyright. All rights reserved

PhD scholar, Gynaecology research centre, University of Melbourne
Suite 4, 320 Victoria Parade, East Melbourne, Victoria 3002 Australia
Email: genia.rozen@mivf.com.au

Franca AGRESTA
Clinical Research Manager, Melbourne IVF
344 Victoria Parade, East Melbourne, Victoria 3002 Australia
Email: franca.agresta@mivf.com.au

David K. GARDNER
Scientific Director, Melbourne IVF
344 Victoria Parade, East Melbourne, Victoria 3002 Australia
Email: David.Gardner@mivf.com.au

Alex POLYAKOV (corresponding author)

ORCID - <https://orcid.org/0000-0002-4535-1854>
Clinical Director, Melbourne IVF
Clinical Senior Lecturer, Department of Obstetrics and Gynaecology, University of Melbourne
Suite 4, 320 Victoria Parade, East Melbourne, Victoria 3002 Australia
Phone +61 394860677
Fax +61 394869161
Email: alex.polyakov@mivf.com.au

Article type: Original manuscript

Body word count: 1985/2,500 (excluding tables and figures, abstract and references)

Authors' roles: All authors contributed to the conception and design of the study, acquisition of data, or the analysis and interpretation of data. All authors were also involved in the drafting of the manuscript or revising it critically for important intellectual content.

This article is protected by copyright. All rights reserved

Acknowledgements: The authors would like to thank Melbourne IVF Clinics, Staff, and Claire Garrett.

Funding: This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

Conflicts of Interest: the authors declare no conflicts of interest with respect to this study.

MeSH Keywords: Embryo Transfer, Pregnancy Outcomes, Abortion Spontaneous, Live Birth, Fertilization in Vitro

Author Manuscript

DR. GENIA ROZEN (Orcid ID : 0000-0003-1210-1645)

DR. ALEX POLYAKOV (Orcid ID : 0000-0002-4535-1854)

Article type : Original Manuscript

Title:

Comparing Pregnancy Outcomes Between Natural Cycles and Artificial Cycles Following Frozen-Thaw Embryo Transfers

Running Title:

A retrospective cohort analysis

MeSH Keywords:

Embryo Transfer, Pregnancy Outcomes, Abortion Spontaneous, Live Birth, Fertilization in Vitro

Manuscript word count:1984

Abstract word count: 246

Figure count: 2

Table count: 2

Abstract:**Background:**

Frozen embryo transfer (FET) is increasing in prevalence. In contrast to the amount of research performed on the actual cryopreservation procedure, there are limited data with respect to optimal endometrial preparation in FET cycles. Increasingly artificial cycle (AC) preparation is being adopted over the natural cycle (NC) to facilitate greater access to FET. However, there remains a paucity of data comparing pregnancy outcomes between these two commonly used cycle types.

Aims:

To examine the efficacy of AC vs NC following FET, by comparing pregnancy outcomes including biochemical, clinical and live birth rates, along with miscarriage rates.

Materials and Method:

This is a large single-centre retrospective analysis, examining a standardised data set from January 2015 to July 2018. It included 3030 cycles (NC=2033, AC=997). Main outcomes were biochemical pregnancy (beta-hCG >5IU), ultrasound-diagnosed clinical pregnancy, and live births. Using the chi-squared test, the above pregnancy outcomes were compared between AC and NC. A multivariate logistic regression, controlling for factors such as age, embryo quality, and day of blastocyst freeze was further utilised to assess for confounding variables.

Results:

No difference was observed between biochemical pregnancy rates (NC=39.45% vs AC=37.71%, P=0.357), statistically significant differences were observed between clinical pregnancy (30.84% vs 26.08%, P=0.007), and live birth rates (24.40% vs 18.86% P=0.001). Multivariate analysis confirmed that NC produces superior pregnancy outcomes when controlling for confounding variables.

Conclusion:

This analysis demonstrates the non-inferiority of NC than compared to AC, on continuing pregnancy rates. Taken together with patient acceptability and possibly increased obstetric risks with AC, these findings support the use of NC when medically possible.

INTRODUCTION

The use of Frozen Embryo Transfer (FET) in assisted reproductive technique (ART) centres is increasing in frequency, partially driven by the increase in pre-implantation genetic testing (PGT)¹ and also by the desire to move away from the transfer of embryos to the uterus in the same stimulation cycle². Modern vitrification methods have allowed safe and efficient cryopreservation, storage and warming of embryos, with increased utilization of freeze-all cycles. Current evidence suggests that freeze all cycles produce similar ongoing pregnancy rates to fresh cycles^{3,4}. A practical advantage of FET is its convenience, enabling clinics with scheduling limitations to have greater control over cycle timing, and there are potential benefits to patients, who have lower rates of complications such as OHSS as a result of FET. In spite of this, a consensus has still not been reached regarding the optimal method of endometrial preparation prior to FET⁵.

There are several methods used for endometrial preparation prior to FET, the most common of which remains the natural cycle (NC). In a natural cycle, FET success is dependent on a patient's endogenous cycle and the corpus luteum to maintain the normal hormonal milieu of early pregnancy. As such, FET must coincide with a woman's natural cycle and ovulation.

Alternatively, in artificial cycles (AC), this physiological process is overridden through the administration of exogenous oestrogen (E2) and progesterone (P4). E2 is used to prime the endometrium, while P4 is supplemented to complete endometrial maturation, and support the presumptive new pregnancy through to the end of the first trimester⁶.

In certain clinical situations, such as anovulatory women, NC may not be possible. Hence, alternative methods such as AC are sometimes necessary. Additionally, AC is increasingly adopted over NC for practical purposes, even in normo-ovulatory women, in order to facilitate greater control over FET timing and improve access to treatment. However, questions remain regarding whether AC can produce equivalent pregnancy outcomes to NC^{5,7-11}, and whether this increased patients' and clinicians' convenience comes at the cost of more favourable pregnancy outcomes. Furthermore, several recent publications have questioned whether obstetric complications, such as hypertensive disorders of pregnancy, may be increased in the absence of a corpus luteum^{4,12,13}.

Consequently, we sought to examine the efficacy of AC vs NC, comparing pregnancy outcomes including biochemical, clinical and live birth rates, along with miscarriage rates, following each cycle type.

MATERIALS AND METHODS

This was a large single-centre retrospective analysis of prospectively collected data, examining a standardised data set from January 2015 to July 2018. It included 3030 first thaw cycles (NC=2033, AC=997) performed at a single site utilising the same laboratory. We specifically excluded ovulation induction (OI) cycles, as well as cycles which involved trophoctoderm biopsy, and donor egg cycles. The main outcomes of interest were biochemical pregnancy (beta-hCG >5IU), ultrasound-diagnosed clinical pregnancy (gestational sac seen on ultrasound), miscarriage rate, and live birth. Patient characteristics were prospectively recorded in the clinic database and were extracted for analysis.

The protocol for natural cycles was USS on Day eight to measure endometrial thickness, then monitoring for ovulation with urinary home test or LH/P4 bloods until ovulation confirmed. FET was subsequently undertaken five days later, as previously described¹⁴. Additionally, most patients commenced P4 supplementation on two days following ovulation. Beta-HCG samples were obtained ten days following FET.

The hormonal replacement protocol for AC FETs included oestradiol 2mg BD from day five of the cycle, as previously described¹⁵. This was adjusted as required to achieve a transvaginal ultrasound measurement of endometrial thickness of ≥ 8 mm. Progesterone supplementation was then commenced PV 200mg eight-hourly. After five full days of P4 replacement, embryo transfer occurred. Both E2 and P4 were continued until pregnancy testing, with beta-HCG samples taken ten days following FET. If positive, both were continued until twelve weeks gestation, if negative or in the event of miscarriage, all medications were ceased. Serum P4 was measured on the day of FET and if levels were less than 25mmol/L, then P4 replacement was increased at the discretion of the treating clinician.

Embryos were derived from in vitro fertilisation (IVF) or intracytoplasmic sperm injection (ICSI) cycles. The vitrification and warming protocols on either day 5 (D5) or day 6 (D6) were performed using the Rapid-I¹⁶ (Vitrolife AB, Sweden), and the RapidVit Blast and RapidWarm Blast kits (Vitrolife). The quality of each blastocyst was recorded on day of cryopreservation as per the Gardner classification^{17,18}. A 'Good quality' embryo transfer was considered to occur where a blastocyst had an expansion grade of three or higher (full blastocyst to hatched blastocyst), an inner cell mass grade of A or B, and a Trophectoderm grade of A or B, i.e. 3BB or superior. All embryo transfers were performed as recommended by the American Society for Reproductive Medicine¹⁹ using Guardia AccessET Embryo Transfer Catheter Set (Cook Medical, USA) by experienced clinicians who have performed at least 100 embryo transfer procedures prior to the index transfer.

The main outcomes measured were biochemical pregnancy (beta human chorionic gonadotropin ≥ 5), ultrasound-diagnosed clinical pregnancy, and miscarriage and live birth rates.

Univariate analyses for patient characteristics and pregnancy outcomes were compared between these cohorts using the Chi squared test, or the student t-test for continuous variables. A multivariate logistic regression, controlling for factors including patient age, D5 or D6 blastocyst, and blastocyst quality at freeze was utilised to assess for confounding variables.

This study was approved by Melbourne IVF Human Research Ethics Committee, ID 71/19-MIVF.

RESULTS

A total of 3030 FET cycles were included in the data set. The characteristics of patients were compared between the two cohorts of those that underwent NC vs those undergoing AC. Some heterogeneity was observed between the two cohorts, particularly with respect to age and embryo quality (Table 1).

Whilst no difference was observed between biochemical pregnancy rates for the two cycle types (NC vs. AC, 39.45% vs. 37.71%, $P = 0.357$), statistically significant differences were observed with respect to clinical pregnancy (30.84% vs. 26.08%, $P = 0.007$), and live birth rates (24.40% and 18.86% $P = 0.001$) (Figure 1).

A multivariate logistic regression was performed, again demonstrating that NC produces superior pregnancy outcomes when controlling for the afore-mentioned factors (Table 2). Logistic regression was adjusted for fertilisation method, age of blastocyst (D5 vs. D6), and maternal age at embryo creation. These factors had statistical significance in predicting biochemical pregnancy ($P < 0.1$) and therefore were included. When controlling for these variables, a trend towards NC was observed, that became increasingly more significant as pregnancy progressed. Interestingly, when examining biochemical pregnancy rates in the multivariate analysis, a statistically significant difference between AC and NC was observed for the first time (OR 0.79, $P = 0.005$).

Miscarriage rates were further examined in greater detail. Given the lack of significant observed difference between biochemical pregnancy rates following the two cycle types, we examined the pregnancy rates further to determine at what point AC pregnancy outcomes began to deteriorate. As demonstrated in Figure 2, the miscarriage rate rose significantly in the AC cohort as the pregnancy progressed further. As such, even though the biochemical pregnancy rates between NC and AC cohorts were similar, 30.85% of these failed before an ultrasound diagnosis of pregnancy could be made in the AC cohort, compared to 21.82% in the NC cohort. By the time live births could be reached, 50% of pregnancies resulting from AC FETs had failed, compared to 38% in the NC cohort ($P < 0.001$).

DISCUSSION

This analysis has revealed that while there was no difference in biochemical pregnancy rates, the increased pregnancy loss associated with AC lead to a statistically significant decline in clinical pregnancy and live birth rates compared to NC in the univariate analysis. The multivariate analysis additionally demonstrated that AC is associated with lower continuing pregnancy rates when compared with NC. Interestingly, this also demonstrated a trend towards improved biochemical rates suggesting that NC may facilitate a superior implantation rate.

Previous reports have considered whether AC is comparable to NC in terms of efficacy but have failed to reach a consensus. The 2017 Cochrane review was unable to determine the comparability of NC and AC with respect to pregnancy outcomes including pregnancy rate and live birth rate. Furthermore, when examining other methods of endometrial preparation such as ovulation induction, modified natural cycle (where ovulation is triggered pharmacologically) and artificial cycles with GnRH analogue, no single cycle type proved most efficacious⁵. Several smaller, retrospective studies have also been inconclusive; while some found no difference between pregnancy outcomes in NC vs AC^{9,10}, another larger study did demonstrate an improved clinical pregnancy rate following NC compared to AC⁸. A small prospective study demonstrated a similar trend toward increased miscarriage following AC as opposed to NC (although didn't find a statistically significant difference in clinical pregnancy or ongoing pregnancy rates)¹¹. A second small prospective study was published earlier this year but did not demonstrate a significant difference between the two cycles when considering pregnancy outcomes such as biochemical or clinical pregnancy rates, or livebirth⁷.

The question of the safety of AC has also recently been examined. A population-wide analysis of pregnancy outcomes following ART was published from Sweden this year, in which higher rates of hypertensive disease of pregnancy, post-partum haemorrhage, postdates pregnancy deliver and macrosomia were demonstrated following AC compared to NC⁴. What this and other studies indicate, is that the presence of a corpus luteum (CL) may play a significant endocrine role during the preimplantation/implantation period, and that a failure to support optimal events at implantation (such as the absence of a CL) has consequences later in the pregnancy, including development of preeclampsia^{8,11}.

In considering a physiological process to explain our findings, we propose two potential factors contributing towards the inferiority of AC as a method of endometrial preparation and luteal phase support. Firstly, the AC regime is limited to the replacement of those two

hormones considered to be essential for implantation and pregnancy maintenance, E2 and P4. However, the regime is an over-simplified replica of the complex hormonal and biochemical processes present throughout ovulation, implantation and early pregnancy. Other steroidal hormones such as testosterone vary in concentration in the presence of the corpus luteum²⁰; hence, in NC, conception and pregnancy may be aided by biochemical mechanisms that we do not yet fully understand. Secondly, in AC cycles, P4 replacement regimes may deliver suboptimal luteal phase support. It is very difficult to determine what comprises adequate luteal phase support in AC. There are data to suggest that serum P4 may have utility in guiding P4 administration²¹⁻²³, but there is also evidence that peripheral P4 levels do not correlate well with uterine P4 levels, particularly in the case of PV administration^{24,25} as a result of the uterine first pass effect²⁶. Additionally, there is a great deal of inter-individual variation in P4 serum concentrations following PV P4 administration^{27,28}, so there may not be a uniform 'adequate' P4 level that can be used to guide administration. Thus, we may be failing to replicate the natural hormonal environment needed to support pregnancy in AC.

We acknowledge the shortcomings of our study design, and the possibility that they may have contributed to our findings. This study was limited by its retrospective nature with the inherent possibility that the two groups are different in unidentifiable ways. The choice of thaw cycle was at clinicians' discretion, and while some use AC for most patients others use NC, with AC reserved for those where natural ovulation is sporadic or absent. Also, clinician preference is dynamic and practices have changed over time. Furthermore, there was identified heterogeneity in the patient characteristics between the two groups, with patients in the AC group being significantly younger and with more good quality blastocysts on day 5, both with a known association with improved pregnancy outcomes. In spite of this, the NC outcomes were significantly better post transfer. Additionally, without specifically examining individual infertility causes, we were unable to determine the proportion of anovulatory cycles in the AC cohort; there is low level evidence that certain anovulatory conditions such as PCOS are associated with miscarriage²⁹; this may have had some unrecognised contribution towards our findings. Importantly, we are not aware of any particular cause of infertility, whose disproportionate presence in the AC group, would explain the higher rate of miscarriage.

This cohort included patients first thaw cycle at our centre, as previously mentioned, but there is a possibility that, unknown to us, some may have had prior treatment elsewhere. Nevertheless, we would expect that this small number of patients would be randomly, not

unequally, distributed between the two groups and therefore not bias the results in favour of NC.

Despite the aforementioned limitations it is reasonable to conclude that NC is at least not inferior, in terms of live birth compared to AC. Taken together with recent evidence of higher obstetric complications in AC compared to NC cycles, as well as better patient tolerability, these findings suggest that

NC should be the cycle of choice, when medically possible. We highlight the need for randomised control trials to further evaluate this question and to examine whether intermediary options such as ovulation induction cycles may provide to be a viable alternative to artificial cycles in smaller centres, allowing improved FET scheduling and accessibility, without compromising cycle efficacy and safety.

Figure 1

Pregnancy Outcomes by Cycle Type

Figure 2

A Schematic Representation of Miscarriage Rates by Cycle Type

REFERENCES

1. Schoolcraft, W.B. and M.G. Katz-Jaffe, *Comprehensive chromosome screening of trophoctoderm with vitrification facilitates elective single-embryo transfer for infertile women with advanced maternal age*. Fertil Steril, 2013. **100**(3): p. 615-9.
2. Shapiro, B.S., et al., *Clinical rationale for cryopreservation of entire embryo cohorts in lieu of fresh transfer*. Fertil Steril, 2014. **102**(1): p. 3-9.
3. Wong, K.M., et al., *Fresh versus frozen embryo transfers in assisted reproduction*. Cochrane Database Syst Rev, 2017. **3**: p. Cd011184.
4. Ginstrom Ernstad, E., et al., *Neonatal and maternal outcome after frozen embryo transfer: Increased risks in programmed cycles*. Am J Obstet Gynecol, 2019. **221**(2): p. 126.e1-126.e18.
5. Ghobara, T., T.A. Gelbaya, and R.O. Ayeleke, *Cycle regimens for frozen-thawed embryo transfer*. The Cochrane database of systematic reviews, 2017. **7**(7): p. CD003414-CD003414.
6. Taraborrelli, S., *Physiology, production and action of progesterone*. Acta Obstet Gynecol Scand, 2015. **94**: p. 8-16.
7. Madani, T., et al., *Live birth rates after different endometrial preparation methods in frozen cleavage-stage embryo transfer cycles: a randomized controlled trial*. Arch Gynecol Obstet, 2019. **299**(4): p. 1185-1191.
8. Levron, J., et al., *Comparison between two protocols for thawed embryo transfer: natural cycle versus exogenous hormone replacement*. Gynecol Endocrinol, 2014. **30**(7): p. 494-7.
9. Orvieto, R., et al., *Natural cycle frozen-thawed embryo transfer-can we improve cycle outcome?* J Assist Reprod Genet, 2016. **33**(5): p. 611-615.
10. Morozov, V., et al., *Natural cycle cryo-thaw transfer may improve pregnancy outcome*. J Assist Reprod Genet, 2007. **24**(4): p. 119-23.
11. Cerrillo, M., et al., *Impact of Endometrial Preparation Protocols for Frozen Embryo Transfer on Live Birth Rates*. Rambam Maimonides Med J, 2017. **8**(2).
12. von Versen-Hoynck, F., et al., *Increased Preeclampsia Risk and Reduced Aortic Compliance With In Vitro Fertilization Cycles in the Absence of a Corpus Luteum*. Hypertension, 2019. **73**(3): p. 640-649.
13. von Versen-Hoynck, F., et al., *Absent or Excessive Corpus Luteum Number Is Associated with Altered Maternal Vascular Health in Early Pregnancy*. Hypertension, 2019. **73**(3): p. 680-690.

14. Fatemi, H.M., et al. *Cryopreserved-thawed human embryo transfer: spontaneous natural cycle is superior to human chorionic gonadotropin-induced natural cycle*. Fertility and Sterility, 2010. **94**(6): p. 2054-8.
15. Mounce, G., et al. *Randomized, controlled pilot trial of natural versus hormone replacement therapy cycles in frozen embryo replacement in vitro fertilization*. Fertility and Sterility, 2015. **104**(4): p. 915-20.
16. Larman, M.G. and D.K. Gardner, *Vitrification of mouse embryos with super-cooled air*. Fertil Steril, 2011. **95**(4): p. 1462-6.
17. Gardner, D. and W. Schoolcraft, *In vitro culture of human blastocyst*, in *Towards Reproductive Certainty: Fertility and Genetics Beyond 1999*, J. R and M. D, Editors. 1999, Parthenon Publishing Carnforth: UK. p. 378–388.
18. Gardner, D.K., et al., *Blastocyst score affects implantation and pregnancy outcome: towards a single blastocyst transfer*. Fertil Steril, 2000. **73**(6): p. 1155-8.
19. Penzias, A., et al., *Performing the embryo transfer: a guideline*. Fertility and Sterility, 2017. **107**(4): p. 882 - 896
20. Kor, N.M., *The effect of corpus luteum on hormonal composition of follicular fluid from different sized follicles and their relationship to serum concentrations in dairy cows*. Asian Pac J Trop Med, 2014. **7s1**: p. S282-8.
21. Cedrin-Durnerin, I., et al., *Serum progesterone concentration and live birth rate in frozen-thawed embryo transfers with hormonally prepared endometrium*. Reprod Biomed Online, 2019. **38**(3): p. 472-480.
22. Labarta, E., et al., *Low serum progesterone on the day of embryo transfer is associated with a diminished ongoing pregnancy rate in oocyte donation cycles after artificial endometrial preparation: a prospective study*. Hum Reprod, 2017. **32**(12): p. 2437-2442.
23. Tihomirova, T., et al., *Measurement of serum progesterone levels on the day of embryo transfer is a useful tool in prediction of successful pregnancy*. Annuaire de l'Afrique du Nord, 2018. **103**: p. 53-59.
24. Miles, R.A., et al., *Pharmacokinetics and endometrial tissue levels of progesterone after administration by intramuscular and vaginal routes: a comparative study*. Fertil Steril, 1994. **62**(3): p. 485-90.
25. Paulson, R.J., M.G. Collins, and V.I. Yankov, *Progesterone pharmacokinetics and pharmacodynamics with 3 dosages and 2 regimens of an effervescent micronized progesterone vaginal insert*. J Clin Endocrinol Metab, 2014. **99**(11): p. 4241-9.
26. De Ziegler, D., et al., *The first uterine pass effect*. Ann N Y Acad Sci, 1997. **828**: p. 291-9.

27. Nahoul, K., et al., *Profiles of plasma estrogens, progesterone and their metabolites after oral or vaginal administration of estradiol or progesterone*. *Maturitas*, 1993. **16**(3): p. 185-202.
28. Archer, D.F., et al., *Initial and steady-state pharmacokinetics of a vaginally administered formulation of progesterone*. *Am J Obstet Gynecol*, 1995. **173**(2): p. 471-7; discussion 477-8.
29. Luo, L., et al., *Early miscarriage rate in lean polycystic ovary syndrome women after euploid embryo transfer - a matched-pair study*. *Reprod Biomed Online*, 2017. **35**(5): p. 576-582.

Author Manuscript

Table 1 – Patient Characteristics

	NC, N = 2033, 67.10%	AC, N = 997, 32.9%	P Value
No. Embryos transferred			<i>0.21</i>
1	90.61%	89.17%	
2	9.39%	10.83%	
Age at embryo creation (mean +/- SD)	35.56 ± 0.89	33.79 ± 0.14	<0.01
IVF vs. ICSI			<i>0.2</i>
IVF	29.71%	30.49%	
ICSI	70.29%	69.51%	
Day 5 vs. Day 6 blast			0.01
D5	56.42%	61.28%	
D6	43.58%	38.72%	
Good quality† embryo transfer – D5 Blastocysts	42.35%	47.64%	0.01
Good quality† embryo transfer – D6 Blastocysts	29.56%	25.48%	0.02

†Good quality, denoted by Gardner classification system. Expansion grade 3 or higher. ICM A or B, TE A or B

Table 2 – Multivariate logistic regression analysis of factors related to pregnancy outcomes

	Adjusted OR (95% CI)	P Value
Biochemical Pregnancy		
AC vs. NC	0.79 (0.67; 0.93)	<0.01
ICSI vs. IVF	0.83 (0.71; 0.98)	0.02
D5 vs. D6	1.46 (1.25; 1.70)	<0.01
Age at embryo creation	0.93 (0.91; 0.95)	<0.01
Clinical Pregnancy		
AC vs. NC	0.67 (0.56; 0.80)	<0.01
ICSI vs. IVF	0.91 (0.76; 1.08)	0.26
D5 vs. D6	1.55 (1.31; 1.82)	<0.01
Age at embryo creation	0.93 (0.91; 0.95)	<0.01
Live birth		
AC vs. NC	0.57 (0.47; 0.70)	<0.01
ICSI vs. IVF	0.81 (0.67; 0.97)	0.02
D5 vs. D6	1.50 (1.25; 1.80)	<0.01

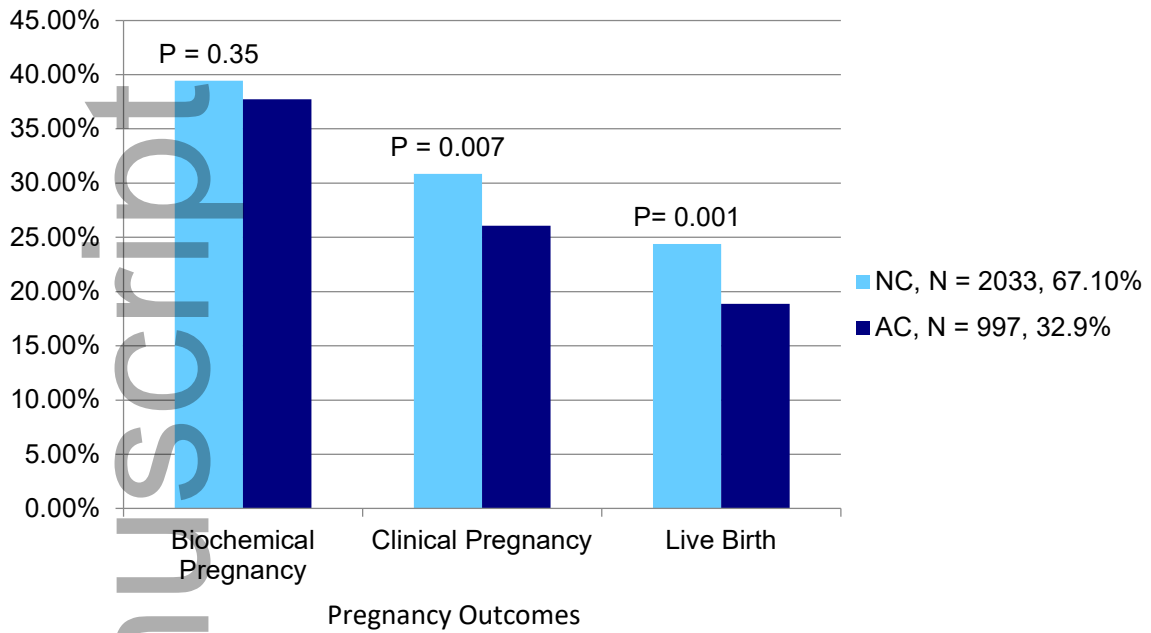
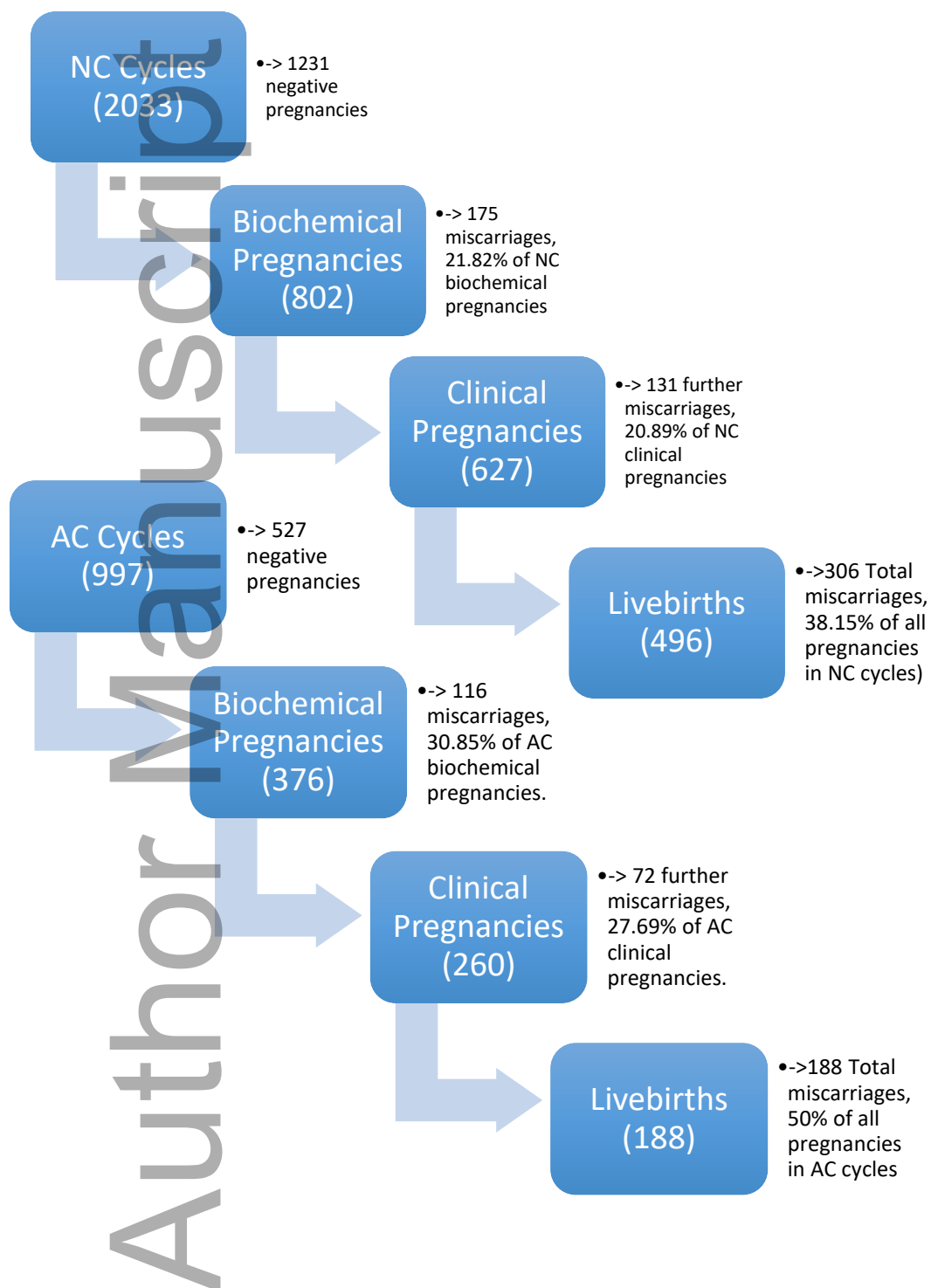
Figure 1. Pregnancy Outcomes by Cycle Type

Figure 2 – A Schematic Representation of Miscarriage Rates by Cycle Type





Minerva Access is the Institutional Repository of The University of Melbourne

Author/s:

Pakes, C;Volovsky, M;Rozen, G;Agresta, F;Gardner, DK;Polyakov, A

Title:

Comparing pregnancy outcomes between natural cycles and artificial cycles following frozen-thaw embryo transfers

Date:

2020-10

Citation:

Pakes, C., Volovsky, M., Rozen, G., Agresta, F., Gardner, D. K. & Polyakov, A. (2020). Comparing pregnancy outcomes between natural cycles and artificial cycles following frozen-thaw embryo transfers. *Australian and New Zealand Journal of Obstetrics and Gynaecology*, 60 (5), pp.804-809. <https://doi.org/10.1111/ajo.13213>.

Persistent Link:

<http://hdl.handle.net/11343/276029>