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The optimal timing of frozen-thawed embryo transfer: delayed or not delayed? A systematic review and meta-analysis

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Background: The use of frozen embryo transfer (FET) has grown exponentially over the past few years. However, in clinical practice, there are no specific criteria as to whether a delay of at least one menstrual cycle is required for an FET after a failed fresh ET or a freeze-all cycle.

Objective: Through the effects on live birth rate (LBR), clinical pregnancy rate (CPR) and pregnancy loss rate (PLR), to determine whether FET requires a delay of at least one menstrual cycle after fresh ET failure or a freeze-all cycle.

Methods: The search was conducted through PubMed, Web of Science, CNKI, and Wanfang databases for terms related to FET timing as of April 2023. There are no restrictions on the year of publication or follow-up time. Women aged 20 to 46 with any indication for *in vitro* fertilization and embryo transfer (IVF-ET) treatment are eligible for inclusion. Oocyte donation studies are excluded. Except for the case report, study protocol, and abstract, all original studies are included.

Results: In 4,124 search results, 19 studies were included in the review. The meta-analysis includes studies on the adjusted odds ratio (OR) and 95% confidence interval (CI) of reported live birth rate (LBR), clinical pregnancy rate (CPR), and pregnancy loss rate (PLR), 17 studies were retrospective cohort study, and 2 studies were randomized controlled trial, a total of 6,917 immediate FET cycles and 16,105 delayed FET cycles were involved. In this meta-analysis, the combined OR of LBR was [OR = 1.09, 95% CI (0.93–1.28)], the combined OR of CPR was [OR = 1.05, 95% CI (0.92–1.20)], and the combined OR of PLR was (OR = 0.96, 95% CI 0.75–1.22). There was no statistical significance between the two groups.

Conclusion: Overall, delaying FET by at least one menstrual cycle has no advantage in LBR, CPR, or PLR. So, flexible scheduling of FETs is available to both doctors and patients.

Systematic review registration: https://www.crd.york.ac.uk/PROSPERO/, identifier CRD42020161648.

KEYWORDS

in vitro fertilization, frozen-thawed embryo transfer, immediate, delayed, live birth

Introduction

The number of FET cycles in assisted reproductive technology (ART) has been increasing yearly, and it is estimated that in 2014, FET accounted for approximately 40% of the approximately 2 million ART treatment cycles per year worldwide (1). In fact, with the advancement and improvement of freezing, thawing, and resuscitation techniques, frozen embryos are almost indistinguishable from fresh embryos in terms of quality and implantation potential (2, 3). In cases where fresh embryo transfers fail or in cases where fresh embryos fail to transfer for various reasons, patients choose FET.

After determining to adopt FET, how far apart does FET need to be performed for optimal clinical outcomes? The use of controlled ovarian stimulation (COS) before IVF is mostly aimed at obtaining more embryos and, consequently, increasing the success rate of the procedure. Nevertheless, concerns have been raised about the adverse effects of supraphysiological hormones used in COS, including embryo-endometrial asymmetry (4) and alteration of the endometrium's immune system (5), which may adversely affect the pregnancy outcome of subsequent embryo transfers. There are also multiple luteal or luteal cysts after oocyte retrieval and functional cysts may lead to ovulation disorders and increase the cancellation rate of the FET cycle. If immediate FET fails, the pressure and economic burden on patients will be increased. Therefore, in current clinical practice, most ET procedures are delayed, a practice that aims to minimize the possible residual negative effects of COS on the recovery to normal ovulatory cycles and endometrial receptivity.

However, it has not yet been determined whether delaying FET leads to a better outcome. As a social issue, infertility is a major problem that cannot be ignored, and it also causes heavy psychological stress to patients. In addition, negative emotions such as excessive anxiety and depression can have a negative impact on pregnancy outcomes (6, 7). For infertile couples, delayed ET is a challenge and should be further explored to minimize interruptions in treatment. Therefore, the purpose of this study is to determine whether FET should be delayed for at least one menstrual cycle following a failed fresh ET or following a freeze-all cycle.

Materials and methods

Inclusion criteria and exclusion criteria

Inclusion criteria

- (1) Study design: randomized controlled trial or cohort study.
- (2) Participants: women who underwent their first FET following failed fresh ET or freeze-all cycle.
- (3) Outcome measures: CPR, LBR, and PLR are the primary outcomes of interest.

Exclusion criteria

- Those who have undergone preimplantation genetic diagnosis and screening (PGD/PGS).
- (2) Patients who have not undergone an ovarian stimulation cycle.
- (3) Repeated publication, incomplete data, unable to obtain the full text.
- (4) Studies on oocyte donation.

Search strategy

We searched PubMed, Web of Science, CNKI, Wanfang, and other databases for medical subject titles as of April 2023, as well as text words related to FET timing. In addition, the references of the included literature were searched to supplement the acquisition of relevant information. The search method is a combination of free words and subject words. The search terms included "freeze all," "fresh embryo transfer," "infertility," "frozen embryo transfer" or "frozenthawed embryo transfer" or "cryopreserved embryo transfer," "immediate" or "delayed" or "postpone," "timing" or "time" or "time interval," "oocyte retrieval" or "ovum pick-up," "ovarian stimulation," "IVF" or "Fertilization *in Vitro*" or "OPU" etc.

Data extraction

For data extraction, the two researchers independently read the literature based on the unified inclusion and exclusion criteria. In case of disagreement, the third researcher will participate in the discussion and decide. Information extracted included first author's name, year of publication, country of origin, study design, population characteristics, definition of immediate/delayed FET, ovarian stimulation protocol, trigger agent, endometrial preparation protocol, embryonic development stage, and outcome parameters.

Risk of bias evaluation

The Newcastle–Ottawa scale (NOS) was used to evaluate the methodological quality of the eligible studies. The scale assigns a maximum of 9 points to each study based on three broad dimensions: subject selection and exposure assessment (4 points), comparability of study groups (2 points), and adequacy of outcome ascertainment and follow-up (3 points). studies with a score of 7–9 are of high quality and low risk of bias. The investigators scored each study independently, and discrepancies were resolved by consensus with the third investigator. The Cochrane Handbook was used to evaluate the methodological quality of the eligible studies. The evaluation content consists of 7 items. Each entry was rated as "low risk," "unknown," and "high risk."

Statistical methods

Using RevMan 5.4 statistical software. Relative risk (RR) and 95% CI were selected as the statistical variables of binary classification. Mean difference (MD) and its 95% CI were selected as statistical variables for continuity variables. The statistical heterogeneity of the included studies was analyzed and judged by *p*-value and *I*². When p > 0.1 and $I^2 \le 50\%$, the heterogeneity among the studies was small, and the fixed-effect model was used for meta-analysis. When $p \le 0.1$ or $I^2 > 50\%$, it indicates that there is a large heterogeneity among studies, and a random effects model is used. When the heterogeneity was large, sensitivity analysis was carried out by eliminating each study one by one to check whether the results were stable, and descriptive analysis was carried out to explore the possible sources of heterogeneity. Test level $\alpha = 0.05$.

Result

A total of 19 studies were included in this systematic review (8–26). All 17 studies were retrospective cohort studies and 2 were randomized controlled trials. The studies included a total of 23,111 cycles, of which 6,842 immediate FETs and 16,269 delayed FETs were involved. The flow chart of literature retrieval is shown in Figure 1, and the general information and quality evaluation results of the included literature are shown in Tables 1-3.

Meta-analysis of CPR

A total of 19 literatures with CPRs supported by original data were included. The combined results of these studies showed that there was no statistical significance in CPR between the immediate FET group and the delayed FET group [OR=1.05, 95% CI (0.92-1.20), p > 0.05](Figure 2). We believe that immediate FET is not superior to delayed FET in CPR. In addition, the included studies are highly heterogeneous. To determine the source of heterogeneity, we conducted multi-group subgroup analysis. The subgroup analysis of type of triggering (OR 0.97, 95% CI 0.81-1.15), embryo stage at transfer (OR 1.03, 95% CI 0.80-1.32), endometrial preparation (OR 1.04, 95% CI 0.82-1.31), and FET cycle following a freeze-all cycle or fresh ET failure (OR 1.02, 95% CI 0.88-1.19), did not reveal any statistical significance in CPR between the two groups (Figure 3).

Meta-analysis of LBR

A total of 16 publications with original data were included. According to Figure 4, there was no statistically significant



TABLE 1 The basic information of included studies.

Study	Country	Publication date	Study design	Definition of immediate/ delayed FET	Population	Embryonic development stage	Trigger agent	Ovarian stimulation protocol	Endometrial preparation	Outcome
Lattes 2016	Spain	2016	Retrospective cohort study	<1 cycle/≥ 2 cycles from oocyte retrieval to the start of FET	Freeze-all	Cleavage stage	GnRHa /dual trigger	GnRH-ant protocol/ long GnRH agonist protocol	HRT	LBR, CPR, PLR
Chen 2019	China	2019	Retrospective cohort study	<1 cycle/≥ 2 cycles from oocyte retrieval to the start of FET	Freeze-all	1	hCG	Super long protocol/ long GnRHa protocol/ short GnRHa protocol/ GnRH-ant protocol	HRT	LBR
He 2020	China	2020	Retrospective cohort study	<1 cycle/≥ 2 cycles from oocyte retrieval to the start of FET	Freeze-all	Cleavage and blastocyst stage	hCG	GnRH-ant protocol/ GnRHa pituitary down- regulation protocol	HRT/NC	LBR, CPR
Higgins 2017	Australia	2017	Retrospective cohort study	25–35/50– 70 days cycles from oocyte retrieval to the start of FET	Freeze-all	Blastocyst stage	hCG	GnRH-ant protocol/ GnRHa pituitary down- regulation protocol/ GnRHa protocol	HRT/NC	CPR, LBR, PLR
Horowitz 2019	Israel	2019	Retrospective cohort study	<22/≥ 22 days from failed IVF-ET cycle to FET	Failed fresh ET	Cleavage and blastocyst stage	hCG	GnRH-ant protocol/ GnRHa protocol	NC	CPR, LBR
Hu 2020	China	2020	Retrospective cohort study	\leq 40/> 40 days from oocyte retrieval to the start of FET	Freeze-all	Blastocyst stage	hCG	GnRH-ant protocol/ GnRHa protocol	HRT	CPR, LBR, PLR
Huang 2019	China	2019	Retrospective cohort study	$<1 \text{ cycle} \ge 2 \text{ cycles}$ from oocyte retrieval to the start of FET	Freeze-all	Cleavage and blastocyst stage	hCG/GnRHa agonist/dual trigger	Progestin primed ovarian stimulation protocol, short GnRHa protocol	HRT + NC	CPR, LBR
Kaye 2017	United States	2017	Retrospective cohort study	<1 cycle/≥ 2 cycles from oocyte retrieval to the start of FET	Freeze-all	Blastocyst stage	hCG/GnRHa agonist/Dual trigger	GnRH-ant protocol/ GnRHa protocol	HRT + NC	CPR, LBR
Yildiz 2021	Turkey	2021	Retrospective cohort study	≤30/> 30 days from oocyte retrieval to the start of FET	Freeze-all	Blastocyst stage	hCG/GnRHa agonist/Dual trigger	Progestin primed ovarian stimulation protocol, short GnRHa protocol	HRT	LBR
Li 2021	China	2021	Randomised controlled trial	<1 cycle/ \geq 2 cycles from oocyte retrieval to the start of FET	Failed fresh ET and freeze-all cycle	Cleavage and blastocyst stage	hCG/GnRHa agonist/dual trigger	Long GnRHa protocol/ GnRH-ant protocol	HRT	LBR, CPR

(Continued)

TABLE 1 (Continue	ed)
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Study	Country	Publication date	Study design	Definition of immediate/ delayed FET	Population	Embryonic development stage	Trigger agent	Ovarian stimulation protocol	Endometrial preparation	Outcome
Liang 2017	China	2017	Retrospective cohort study	\leq 45/> 45 days from oocyte retrieval to the start of FET	Freeze-all	Cleavage and blastocyst stage	hCG	GnRH-ant protocol/ GnRHa protocol	HRT/NC	CPR, LBR
Peng 2019	China	2019	Retrospective cohort study	<1 cycle/≥2 cycles from oocyte retrieval to the start/failed IVF-ET cycle of FET	Failed fresh ET and freeze-all cycle	Cleavage and blastocyst stage	hCG	GnRHa pituitary down- regulation protocol	HRT/NC	CPR
Samuel Santos- Ribeiro 2016 (1)	Brussel	2016	Retrospective cohort study	≤22/> 22 days from failed IVF-ET cycle to FET	Failed fresh ET	Cleavage and blastocyst stage	HCG	GnRH-ant protocol	HRT/NC	CPR, LBR
Samuel Santos- Ribeiro 2016 (2)	Brussel	2016	Retrospective cohort study	<1 cycle/≥ 2 cycles from oocyte retrieval to the start of FET	Freeze-all	Cleavage and blastocyst stage	hCG	GnRH-ant protocol	HRT	CPR
Song 2019	China	2019	Retrospective cohort study	<1 cycle/≥ 2 cycles from oocyte retrieval to the start of FET	Freeze-all	Cleavage stage	hCG/GnRHa agonist/dual trigger	GnRH-ant protocol/ GnRHa protocol/mini- stimulation protocol/ GnRHa pituitary down- regulation protocol	HRT/NC	LBR
Song 2021	China	2021	Randomised controlled trial	<1 cycle/≥ 2 cycles from failed IVF-ET cycle to FET	Failed fresh ET	Cleavage stage	hCG	GnRH-ant protocol	HRT	CPR, PLR, LBR
Tian 2021	China	2020	Retrospective cohort study	<90/≥ 90 days from failed IVF-ET cycle to FET	Failed fresh ET	Cleavage and blastocyst stage	hCG	GnRH-ant protocol/ GnRHa protocol	HRT/NC	CPR
Volodarsky- Perel 2016	Israel	2020	Retrospective cohort study	<50/≥ 50< 120 days from failed IVF-ET cycle to FET	Failed fresh ET	Cleavage and blastocyst stage	hCG	Long GnRH-agonist protocol	HRT	CPR, LBR
Xu 2021	China	2020	Retrospective cohort study	≤1 cycle/> 2 cycles/> 3 cycles from oocyte retrieval to the start of FET	Failed fresh ET	Cleavage stage	hCG	CC+hMG ovulation induction protocol	HRT	CPR, LBR

FET, frozen embryo transfer; ET, embryo transfer; LBR, live birth rate; CPR, clinical pregnancy rate; PLR, pregnancy loss rate; HRT, hormone replacement therapy; NC, natural cycle; GnRH, gonadotropin releasing hormone; hCG, human chorionic gonadotrophin; CC, clomiphene citrate; hMG, human menopausal gonadotropin.

Study		Sele	ction		Comparability		Outcomes		Quality
	Representativeness of the exposed cohort	Selection of the non- exposed cohort	Ascertainment of exposure	Demonstration that outcome of interest was not present at start of study	Comparability of cohorts on the basis of the design or analysis	Assessment of outcome	Was follow- up long enough for outcomes to occur	Adequacy of follow up of cohorts	Score
Lattes 2016	1	1	0	0	2	0	1	1	6
Chen 2019	1	1	0	0	2	0	1	1	6
He 2020	1	1	1	0	2	1	1	1	8
Higgins 2017	1	0	1	0	2	1	1	1	7
Horowitz 2019	1	1	0	0	2	0	1	1	6
Hu 2020	1	1	0	0	2	0	1	1	6
Huang 2019	1	1	0	0	2	0	1	1	6
Kaye 2017	1	1	1	0	2	0	1	1	7
Yildiz 2021	1	1	1	0	2	1	1	1	8
Li 2021	1	1	0	1	2	1	1	1	8
Liang 2017	1	1	0	0	2	0	1	1	6
Peng 2019	1	1	0	0	2	0	1	1	6
Samuel Santos- Ribeiro2016 (1)	1	1	0	0	2	0	1	1	6
Samuel Santos- Ribeiro2016 (2)	1	1	0	0	2	0	1	1	6
Song 2019	1	1	1	0	2	1	1	1	8
Song 2021	1	1	0	2	2	1	1	1	9
Tian 2021	1	1	1	0	2	1	1	1	8
Volodarsky- Perel 2016	1	1	1	0	2	1	1	1	8
Xu 2021	1	1	1	0	2	1	1	1	8

TABLE 3 Cochrane for assessing the quality of studies in meta-analysis.

Study (randomized	Select	ion bias	Performance bias	Detection bias	Attrition bias	Reporting bias	Other bias
controlled trial)	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Other bias
Li 2021	Low risk of bias	Low risk of bias	High risk of bias	High risk of bias	Low risk of bias	Low risk of bias	Low risk of bias
Song 2021	Low risk of bias	Low risk of bias	High risk of bias	Low risk of bias	Low risk of bias	Low risk of bias	Low risk of bias



difference between the immediate and delayed FET groups on LBR [OR = 1.09, 95% CI (0.93–1.28), p = 0.31], suggesting that the immediate FET was not superior to the delayed FET in LBR. Considering the high heterogeneity, multi-group subgroup analysis was performed, and the combined result remained unchanged when subgroup analysis was performed for FET cycles following fresh ET failure and for FET cycles following freeze-all (OR 1.05, 95% CI 0.99–1.25). Similarly, subgroup analyses of type of trigger (RR 0.96, 95% CI 0.73–1.29), and embryo stage (RR 1.12, 95% CI 0.86–1.46) did not reveal any differences (Figure 5).

Meta-analysis of PLR

A total of 12 literatures were included, as shown in the forest diagram in Figure 6. The results of meta-analysis showed that there was no statistical significance (OR=0.96, 95% CI 0.75–1.22) between immediate FET and delayed FET groups on PLR. To identify the source of heterogeneity, a multi-group subgroup analysis was performed. Type of triggering (OR 0.95, 95% CI 0.74–1.22), endometrial preparation (OR 0.90, 95% CI 0.60–1.35), and embryo stage (RR 0.96, 95% CI 0.67–1.33) were evaluated (Figure 7). However,

in the subgroup analysis, after fresh ET failure, delayed FET had a higher rate of pregnancy loss than immediate FET (OR 0.62, 95% CI 0.44–0.87, see Figure 7).

Discussion

In this systematic review and meta-analysis, the effects of FET timing on LBR, CPR, and PLR were summarized. In general, the timing of FET, that is, whether it is performed immediately after fresh ET failure or delayed after freeze-all cycles, LBR, CPR, and PLR was not superior to immediate FET. However, in the FET cycle after fresh ET failure, the PLR with immediate FET is lower than that with delayed FET.

Out of 19 studies, our conclusions are consistent with those of 7 studies (9, 14, 15, 17, 19, 24, 25), regardless of which COS protocol is adopted. While FET is not necessary to delay a menstrual cycle after a freeze-all cycle, Yildiz et al. (24) and Hu et al. (12) both suggest delayed FET may result in a higher birth weight, preeclampsia, and macroia, which may result from the loss of corpus luteum during an artificial cycle and an extended period of isolation and freezing of embryos. On the other hand, the results of He's et al. (9) study showed that there were no significant differences between immediate and delayed FET cycles in terms of preterm birth, gestational age, birth weight, congenital

Type of triggering Study or Subgroup	Immediate FET Events Tota	Delayed FET I Events Total	Weight	Odds Ratio M-H, Random, 95% Cl	Odds Ratio M-H, Random, 95% Cl
2.2.1 hCG					
Chen2019 He2020	331 52 1445 236			1.07 [0.82, 1.38] 1.04 [0.92, 1.17]	
Higgins2017	211 63	5 273 965	11.0%	1.26 [1.02, 1.57]	
Horowitz2019 Hu2020	30 11 129 20			1.02 [0.53, 1.97] 1.08 [0.79, 1.48]	
Liang2017	41 7			1.16 [0.70, 1.91]	
Peng2019 Samuel Santos-Ribeiro, M.D2018	82 12 6 64 19			1.21 [0.78, 1.88]	
Song2021	137 36			1.03 [0.75, 1.43] 1.37 [1.01, 1.87]	
Tian2020	23 8	6 79 207	5.8%	0.59 [0.34, 1.03]	· · · · · · · · · · · · · · · · · · ·
Volodarsky-Perel2016 Xu2021	12 6 116 35			0.30 [0.14, 0.67] 0.55 [0.42, 0.71]	
Subtotal (95% CI)	512	7 7241		0.97 [0.81, 1.16]	-
Total events Heterogeneity: Tau ² = 0.06; Chi ² = Test for overall effect: Z = 0.36 (P		3455 0.0001); I² = 74%			
Total (95% CI)	512	7 7241	100.0%	0.97 [0.81, 1.16]	
Total events	2621	3455			
Heterogeneity: Tau ² = 0.06; Chi ² = Test for overall effect: Z = 0.36 (P		J.0001); I² = 74%			0.5 0.7 1 1.5 2
Test for subaroup differences: No					Delayed FET Immediate FET
Endometrial prepara	tion				
	Immediate FET D	elayed FET		Odds Ratio	Odds Ratio
Study or Subgroup 2.4.2 Programmed	Events Total Ev	ents Total We	agnt M-H,	Random, 95% Cl	M-H, Random, 95% Cl
Chen2019	331 526		.6%	1.07 [0.82, 1.38]	
Hu2020 Lattes2016	129 207 116 263		1.9% 1.3%	1.08 [0.79, 1.48] 1.39 [0.98, 1.99]	
Li2021	197 345	178 342 11	.1%	1.23 [0.91, 1.66]	+
Samuel Santos-Ribeiro2016 Song2019	110 208 179 385		1.0% 1.0%	1.58 [1.01, 2.47] 1.01 [0.80, 1.28]	
Song2021	137 366	111 366 11	.0%	1.37 [1.01, 1.87]	
Volodarsky-Perel2016 Xu2021	12 67 116 355		i.2% .5%	0.30 [0.14, 0.67]	
Yildiz2021	60 119	35 79 7	.5%	0.55 [0.42, 0.71]	
Subtotal (95% CI) Total events	2841 1387	4374 100 2139	0.0%	1.04 [0.82, 1.31]	-
Heterogeneity: Tau ² = 0.10; Chi ² =	= 42.56, df = 9 (P < 0.				
Test for overall effect: Z = 0.31 (P	= 0.76)				
Total (95% CI)	2841	4374 100	0.0%	1.04 [0.82, 1.31]	-
Total events Heterogeneity: Tau ² = 0.10; Chi ² =		2139 00001): IP = 79%			<u> </u>
Test for overall effect: Z = 0.31 (P	= 0.76)	00001),1 = 10 %			0.5 0.7 1 1.5 2 Delayed FET Immediate FET
Test for subaroup differences: No	ut applicable				
Embryo stage					
Immediate			Odds Rat		Odds Ratio
Study or Subgroup Events 2.3.1 Cleavage	Total Events To	otal Weight M-H	i, Karidom	95% CI	M-H, Random, 95% Cl
Lattes2016 116		249 12.4%	1.39 [0.9		
Song2019 179 Song2021 137		155 14.5% 366 13.2%	1.01 [0.8		
Xu2021 116	355 342	727 13.9%	0.55 [0.4	2, 0.71]	_
Subtotal (95% CI) Total events 548	1369 24 1076	497 54.1%	1.01 [0.6	6, 1.54]	
Heterogeneity: Tau ² = 0.17; Chi ² =	= 27.02, df = 3 (P < 0.	00001); I² = 89%			
Test for overall effect: Z = 0.03 (P	= 0.98)				
2.3.2 Blastolyst					
Higgins2017 211 Hu2020 129		965 14.7% 818 13.1%	1.26 [1.0		
Kaye2017 54	80 202	264 9.2%	0.64 [0.3	7, 1.10]	
Yildiz2021 60 Subtotal (95% Cl)	119 35 1041 2	79 8.9% 126 45.9%	1.28 [0.7 1.09 [0.8		
Total events 454	1005		[0.0	_,1	
Heterogeneity: Tau ² = 0.03; Chi ² = Test for overall effect: Z = 0.65 (P		4); I ² = 45%			
Total (95% CI) Total events 1002	2410 44 2081	523 100.0%	1.03 [0.8	0, 1.32]	
Heterogeneity: Tau ² = 0.10; Chi ² =	= 35.08, df = 7 (P < 0.	0001); I² = 80%			17 1 15 2
Test for overall effect Z = 0.20 (P	= 0.84)				0.7 1 1.5 2 layed FET Immediate FET
Test for subaroup differences: Ch	n – 0.09. dt = 1 (P =	0.70). ("= 0%)			
After freeze-all proto					
	Immediate FET Events Tota		Wointet	Odds Ratio M-H, Random, 95% Cl	Odds Ratio M-H, Random, 95% Cl
Study or Subgroup					man, ruinuoni, 33 n G
2.5.1 Freeze-all				1.07 [0.82, 1.38]	
2.5.1 Freeze-all Chen2019	331 52		9.4%	1.04 [0.92, 1.17]	
2.5.1 Freeze-all Chen2019 He2020	331 52 1445 236 211 63		8.3%	1.26 [1.02, 1.57]	
2.5.1 Freeze-all Chen2019 He2020 Higgins2017 Hu2020	1445 236 211 63 129 20	5 273 965 7 495 818	7.0%	1.08 [0.79, 1.48]	
2.5.1 Freeze-all Chen2019 He2020 Higgins2017 Hu2020 Huang2019	1445 236 211 63 129 20 176 28	5 273 965 7 495 818 0 150 280	7.0% 6.7%	1.08 [0.79, 1.48] 1.47 [1.05, 2.06]	
2.5.1 Freeze-all Chen2019 He2020 Higgins2017 Hu2020 Huang2019 Kaye2017 Lattes2016	1445 236 211 63 129 20 176 28 54 8 116 26	5 273 965 7 495 818 0 150 280 0 202 264 3 90 249	7.0% 6.7% 4.4% 6.5%	1.08 [0.79, 1.48] 1.47 [1.05, 2.06] 0.64 [0.37, 1.10] 1.39 [0.98, 1.99]	
2.5.1 freeze-all Chen2019 He2020 Hugoins2017 Hu2020 Huang2019 Kaye2017 Lattes2016 Samuel Samtos-Ribeiro2016	1445 236 211 63 129 20 176 28 54 8 116 26 110 20	5 273 965 7 495 818 0 150 280 0 202 264 3 90 249 8 52 125	7.0% 6.7% 4.4% 6.5% 5.4%	1.08 [0.79, 1.48] 1.47 [1.05, 2.06] 0.64 [0.37, 1.10] 1.39 [0.98, 1.99] 1.58 [1.01, 2.47]	
2.5.1 freeze-all Chen2019 He2020 Huggins2017 Hu2020 Huang2019 Kaye2016 Samuel Santos-Ribeiro2016 Song2019 Tian2020	1445 236 211 63 129 20 176 28 54 8 116 26 110 20 179 38 23 8	5 273 965 7 495 818 0 150 280 0 202 264 3 90 249 8 52 125 5 533 1155 6 79 207	7.0% 6.7% 4.4% 6.5% 5.4% 8.1% 4.3%	1.08 [0.79, 1.48] 1.47 [1.05, 2.06] 0.64 [0.37, 1.10] 1.39 [0.98, 1.99] 1.58 [1.01, 2.47] 1.01 [0.80, 1.28] 0.59 [0.34, 1.03]	
2.5.1 Freeze-all Chen2019 He2020 Hu2020 Hu2020 Hu2020 Lu2020 Lattes2016 Samuel Santos-Ribeiro2016 Song2019 Tian2020 Yildiz2021	1445 236 211 63 129 20 54 8 116 26 110 20 179 38 23 8 60 11	5 273 965 7 495 818 0 150 280 0 202 264 3 90 249 8 52 125 5 533 1155 6 79 207 9 35 79	7.0% 6.7% 4.4% 6.5% 5.4% 8.1% 4.3% 4.2%	1.08 [0.79, 1.48] 1.47 [1.05, 2.06] 0.64 [0.37, 1.10] 1.39 [0.98, 1.99] 1.58 [1.01, 2.47] 1.01 [0.80, 1.28] 0.59 [0.34, 1.03] 1.28 [0.72, 2.26]	
Study of Subgroup 2.5.1 Freeze-all Chen2019 Hagoins 2017 Hu2020 Huang2019 Kaye2017 Lattes 2016 Samuel Santos-Ribeiro2016 Sangu219 Tian202021 Vidz2021 Vidz2021 Total events	1445 236 211 63 129 20 176 28 54 8 116 26 110 20 179 38 23 8 60 11 515 2834	5 273 965 7 495 818 0 150 280 0 202 264 3 90 249 8 52 125 5 533 1155 6 79 207 9 35 79 2 6634 3416	7.0% 6.7% 4.4% 6.5% 5.4% 8.1% 4.3% 4.2%	1.08 [0.79, 1.48] 1.47 [1.05, 2.06] 0.64 [0.37, 1.10] 1.39 [0.98, 1.99] 1.58 [1.01, 2.47] 1.01 [0.80, 1.28] 0.59 [0.34, 1.03]	
2.5.1 Freeze-all Chen2019 He2020 Huggins2017 Huggins2017 Kaye2017 Lattles2017 Samuel Santos-Ribeiro2016 Song2019 Tian2020 Yildiz2021 Subtotal (95% C) Total events Heterogenetik, Tau* = 0.02; Chi*	1445 236 211 63 129 20 176 28 54 8 116 26 110 20 179 38 23 8 60 11 515 2834 = 18.84, df = 10 (P = 1	5 273 965 7 495 818 0 150 280 0 202 264 3 90 249 8 52 125 5 533 1155 6 79 207 9 35 79 2 6634 3416	7.0% 6.7% 4.4% 6.5% 5.4% 8.1% 4.3% 4.2%	1.08 [0.79, 1.48] 1.47 [1.05, 2.06] 0.64 [0.37, 1.10] 1.39 [0.98, 1.99] 1.58 [1.01, 2.47] 1.01 [0.80, 1.28] 0.59 [0.34, 1.03] 1.28 [0.72, 2.26]	
2.5.1 Freeze-all Chenz019 He2020 Hug0rs2017 Hu302019 Kaye2017 Lattes2019 Samuel Santos-Ribeiro2016 Somg2019 Tian2020 Yildiz2021 Subtofa1 (9% C) Total events Heterogeneity. Tau [≠] = 0.02; Chi [≠] Test for overail effect Z = 1.71 (P	1445 236 211 63 129 20 176 28 54 8 116 26 110 20 179 38 23 8 60 11 515 2834 = 18.84, df = 10 (P = 1	5 273 965 7 495 818 0 150 280 0 202 264 3 90 249 8 52 125 5 533 1155 6 79 207 9 35 79 2 6634 3416	7.0% 6.7% 4.4% 6.5% 5.4% 8.1% 4.3% 4.2%	1.08 [0.79, 1.48] 1.47 [1.05, 2.06] 0.64 [0.37, 1.10] 1.39 [0.98, 1.99] 1.58 [1.01, 2.47] 1.01 [0.80, 1.28] 0.59 [0.34, 1.03] 1.28 [0.72, 2.26]	
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2.5.1 Freeze-all Chen2019 He2020 Higgins2017 Hu2020 Hu2020 Hu202019 Samuel Santos-Ribeiro2016 Song2019 Tian2020 Yildiz2021 Subtota1 (9% C1) Total events Helerogeneity: Tau*= 0.02; Chi*= Test for overall effect Z = 1.71 (P 2.5.2 failed fresh ET HorowIC2019 Samuel Santos-Ribeiro, M.D2011	1445 236 211 63 119 20 176 28 54 8 116 26 110 20 179 38 60 11 515 233 8 60 11 515 233 8 60 11 515 233 8 60 11 515 10 (P = 1 = 0.09)	5 273 965 7 495 818 0 150 280 0 202 264 8 52 125 5 533 1155 6 79 207 2 6634 3416 0.04); F=47% 8 20 80 7 313 966	7.0% 6.7% 4.4% 6.5% 8.1% 4.3% 4.2% 72.1%	1.08 [0.79, 1.46] 1.47 [105, 2.06] 0.64 [0.37, 1.10] 1.39 [0.86, 1.99] 1.58 [101, 2.47] 1.01 [0.80, 1.28] 0.59 [0.34, 1.03] 1.28 [0.72, 2.26] 1.11 [0.98, 1.26] 1.02 [0.53, 1.97] 1.03 [0.75, 1.43]	
2.5.1 Freeze-all Chenz2019 He2020 Hug0rs2017 Hug0rs2017 Hug0rs2017 Lattes2016 Samuel Santos-Ribeiro2016 Song2019 Tina2020 Samuel Santos-Ribeiro2016 Satudtat (95% CI) Total events Heterogenetic, Tau ² = 0.02; Ch ² = Test for overall effect Z = 1.71 (P 2.5.2 failed fresh ET Horowt22019 Samuel Santos-Ribeiro, M.D2011 Song2021	1445 236 211 63 129 20 176 29 54 8 116 26 179 20 179 20 54 8 8 0 19 20 20 9 8 0 11 2834 515 2834 10 (P = I 0.09) 30 11 6 64 19 137 36	5 273 965 7 495 818 0 150 280 0 202 264 8 52 125 5 533 1155 5 739 207 9 35 79 2 6634 3416 0.04); #=47% 8 20 90 7 313 986 6 111 366	7.0% 6.7% 4.4% 6.5% 5.4% 8.1% 4.3% 4.2% 72.1%	1.08 [0.79, 1.49] 1.47 [105, 2.06] 0.64 [0.37, 1.10] 1.39 [0.48, 1.99] 1.58 [1.01, 2.47] 1.01 [0.40, 1.28] 0.59 [0.34, 1.03] 1.28 [0.72, 2.26] 1.11 [0.96, 1.28] 1.02 [0.53, 1.97] 1.03 [0.75, 1.43] 1.37 [1.01, 1.87]	
2.5.1 Freeze-all Chenz2019 He2020 Hug0rs2017 Hu2020 Huang2019 Karys2017 Lattes2016 Samuel Santos-Ribeiro2016 Song2019 Tial2020 Subtotal (95% CI) Total events Heterogenetic, Tau" = 0.02; Chi" = Test for overall effect Z = 1.71 (P 2.5.2 failed fresh ET HorowtE2019 Samuel Santos-Ribeiro, M D2011 Song2021 Voldarsky-Perel2016 Xu2021	1445 236 211 63 119 20 176 28 54 8 116 26 110 20 179 38 60 11 515 233 8 60 11 515 233 8 60 11 515 233 8 60 11 515 10 (P = 1 = 0.09)	5 273 965 7 495 818 0 150 280 0 202 264 8 52 125 5 533 1155 6 79 207 9 35 79 2 6634 3416 0.04); /= 47% 8 20 90 7 313 966 6 111 366 6 111 366	7.0% 6.7% 4.4% 6.5% 8.1% 4.2% 72.1% 3.5% 6.9% 7.1% 2.7%	1.08 [0.79, 1.46] 1.47 [105, 2.06] 0.64 [0.37, 1.10] 1.39 [0.86, 1.99] 1.58 [101, 2.47] 1.01 [0.80, 1.28] 0.59 [0.34, 1.03] 1.28 [0.72, 2.26] 1.11 [0.98, 1.26] 1.02 [0.53, 1.97] 1.03 [0.75, 1.43]	
2.5.1 Freeze-all Chen2019 He2020 Hugginz2017 Hu2020 Huang2019 Kay2017 Lattes2016 Somuel Santos-Ribeiro2016 Somuel Santos-Ribeiro2016 Somuel Santos-Ribeiro2016 Subtota1 (95° CI) Total events Heterogeneity-Tau* = 0.02; Chi*- Test for overall effect Z = 1.71 (P 2.5.2 failed fresh ET Horowitz2019 Samuel Santos-Ribeiro, M.D2011 Song2021 Voidarsky-Perie2016 Xu2021	1445 226 211 63 212 9 20 176 29 54 8 116 26 110 20 179 38 23 8 60 11 2334 = 1884, dr = 10 (P = 1 = 0.09) 30 11 6 64 19 137 36 6 116 35 12 6 116 35 12 6 116 35	5 273 965 7 495 818 0 150 280 0 202 264 8 52 125 5 533 1155 6 79 207 9 35 79 2 6634 0.04); F=47% 8 20 80 7 313 966 6 7 26 5 342 727 7 26 62 5 342 727	7.0% 6.7% 4.4% 5.5% 5.4% 8.1% 4.3% 72.1% 3.5% 6.9% 7.1% 2.7%	1.09 (7, 9, 1.49) 1.47 (10 5, 2.06) 0.44 (0.37, 1.10) 1.39 (0.98, 1.99) 1.58 (1 (11, 2.47) 1.01 (0.80, 1.28) 0.59 (0.34, 1.03) 1.28 (0.72, 2.26) 1.11 (0.98, 1.26) 1.02 (0.53, 1.97) 1.03 (0.75, 1.43) 1.37 (1.01, 187) 3.09 (1.44, 0.67)	
2.5.1 Freeze-all Chenz2019 He2020 Hu2020 Hu202017 Hu202019 Lattes2019 Samuel Santos-Ribeiro2016 Song2010 Tin20200 Yildiz2021 Satutotal (95% CI) Stutotal (95% CI) Satutotal Santos-Ribeiro, M.D2011 Song2021 Lorowt22019 Satutotal (95% CL) Yoldarsky-Perei2016 Xu2021 Stutotal (95% CL) Total events	1445 236 211 63 2129 20 176 22 54 8 110 20 179 20 176 22 54 8 20 20 179 20 2	5 273 965 7 495 818 0 150 280 0 202 284 3 90 249 8 52 125 6 79 207 9 35 679 2 6633 1155 6 79 207 3416 0.04); P=47% 8 20 90 7 313 966 6 111 366 7 26 62 5 342 727 3 2221 812	7.0% 6.7% 4.4% 5.5% 5.4% 8.1% 4.3% 72.1% 3.5% 6.9% 7.1% 2.7%	$\begin{array}{c} 1.0 \pm 0.72, 1.48 \\ 1.47 (10.52, 2.06 \\ 0.94 (10.7, 1.10, 9.4, 10.94 \\ 1.39 (10.94, 1.99 \\ 1.98 (10.94, 1.97 \\ 1.91 (10.94, 1.28 \\ 0.59 (10.24, 1.03 \\ 1.28 (10.72, 2.26 \\ 1.11 (10.96, 1.26 \\ 1.03 (10.53, 1.97 \\ 1.03 (10.53, 1.97 \\ 1.03 (10.53, 1.97 \\ 1.03 (10.53, 1.97 \\ 1.03 (10.53, 1.97 \\ 1.03 (10.53, 1.97 \\ 1.03 (10.53, 1.97 \\ 1.03 (10.53, 1.97 \\ 1.03 (10.54, 1.05 \\ 1.05 (10.54, 1.05 \\ 1.05 (10.55, 1.97 \\ 1.05 (10.44, 0.71 \\ 1.05 (10.$	
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2.5.1 Freeze-all Chen2019 He2020 Hugginz017 Hugginz017 Hu2020 Huang2019 Kaye2017 Lattes2016 Samuel Santos-Ribeiro2016 Samuel Santos-Ribeiro2016 Subtota1 (95% C) Total events Heterogeneity-Tau" = 0.02; Chi ² - Test for overall effect Z = 1.71 (P 2.5.2 failed fresh ET Horowte2019 Samuel Santos-Ribeiro, M.D2011 Song2021 Voidarsky-Preiz016 Xu2021 Voidarsky-Preiz016 Subtota1 (95% C) Total events Heterogeneity. Tau" = 0.23; Chi ² = Test for overall effect Z = 0.36 (P	1445 236 211 63 179 20 179 20 178 29 54 8 116 26 51 8 60 11 2334 23 8 60 11 545 2334 = 18.84, df = 10 (P = 1 = 0.09) 30 11 6 64 19 137 36 64 19 137 36 116 35 359 359 = 28.0, df = 4 (P < 0. = 0.34)	5 273 965 7 495 818 0 150 280 0 202 284 3 90 249 8 52 125 5 533 1155 6 634 3416 6634 3416 6634 0.04), P = 47% 8 20 80 7 313 986 6 111 362 7 26 62 5 342 727 3 2228 812 0001), P = 86%	7.0% 6.7% 4.4% 5.5% 5.4% 4.3% 4.3% 4.2% 72.1% 3.5% 6.9% 7.1% 2.7% 2.7%	109 (72, 148) 147 (105, 206) 0.54 (103, 110) 158 (103, 208), 199 158 (101, 247) 101 (1020, 128) 158 (101, 247) 102 (1020, 128) 158 (101, 247) 158 (1020, 244, 103) 158 (1020, 244, 103) 158 (1072, 226) 1.11 (1098, 126) 1.02 (1053, 197) 1.03 (1075, 143) 1.37 (101, 187) 0.36 (104, 067) 0.36 (104, 067) 0.56 (142, 071) 0.79 (0.50, 127)	
2.5.1 Freeze-all Chen2019 He2020 Hugginz2017 Hu2020 Huang2019 Kay2017 Lattes2018 Samuel Santos-Ribeiro2016 Song2019 Tian2020 Vildiz2021 Subtota1 (95° CI) Total events Heterogeneity-Tau* = 0.02; Chi*- Test for overall effect Z = 1.71 (P 2.5.2 failed fresh ET Horowtt2019 Samuel Santos-Ribeiro, M.D2011 Song2021 Voidarsky-Preiz016 Xu2021 Subtota1 (95° CI) Total events Heterogeneity-Tau* = 0.23; Chi*-	1445 226 211 63 212 9 20 176 29 54 8 116 26 61 18 23 8 60 11 2234 = 18.84, df = 10 (P = 1 = 0.09) 30 11 6 64 19 137 36 116 35 116 35 116 35 116 35 12 6 116 35 19 137 35 19 137 35 10 139 40 137 35 116 35 116 35 117 5 118 35 119 11 118 35 119 11 118 35 119 11 119 119	5 273 965 7 495 818 0 150 280 0 202 284 3 90 249 8 52 125 5 533 1155 6 634 3416 6634 0.04); P= 47% 8 20 80 7 313 986 6 111 362 7 26 62 5 8855 5 8855 4228	7.0% 6.7% 4.4% 6.5% 5.4% 8.1% 4.3% 4.2% 72.1% 3.5% 6.9% 7.1% 2.7% 7.7% 2.7% 7.7%	$\begin{array}{c} 1.0 \pm 0.72, 1.48 \\ 1.47 (10.52, 2.06 \\ 0.94 (10.7, 1.10, 9.4, 10.94 \\ 1.39 (10.94, 1.99 \\ 1.98 (10.94, 1.97 \\ 1.91 (10.94, 1.28 \\ 0.59 (10.24, 1.03 \\ 1.28 (10.72, 2.26 \\ 1.11 (10.96, 1.26 \\ 1.03 (10.53, 1.97 \\ 1.03 (10.53, 1.97 \\ 1.03 (10.53, 1.97 \\ 1.03 (10.53, 1.97 \\ 1.03 (10.53, 1.97 \\ 1.03 (10.53, 1.97 \\ 1.03 (10.53, 1.97 \\ 1.03 (10.53, 1.97 \\ 1.03 (10.54, 1.05 \\ 1.05 (10.54, 1.05 \\ 1.05 (10.55, 1.97 \\ 1.05 (10.44, 0.71 \\ 1.05 (10.$	

FIGURE 3

Subgroup analysis of clinical pregnancy rate.

	Immediat	e FET	Delayed	FET		Odds Ratio	Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI	M-H, Random, 95% Cl
Chen2019	90	526	95	451	7.0%	0.77 [0.56, 1.07]	
He2020	1169	2363	1007	2041	9.2%	1.01 [0.89, 1.13]	+
Higgins2017	175	635	213	965	8.0%	1.34 [1.07, 1.69]	
Horowitz2019	25	118	16	80	3.4%	1.08 [0.53, 2.17]	
Hu2020	104	207	403	818	7.1%	1.04 [0.77, 1.41]	
Huang2019	156	280	123	280	6.8%	1.61 [1.15, 2.24]	
Kaye2017	34	80	118	264	4.9%	0.91 [0.55, 1.52]	
Lattes2016	99	263	68	249	6.3%	1.61 [1.11, 2.34]	· · · · · · · · · · · · · · · · · · ·
Li2021	163	345	129	342	7.2%	1.48 [1.09, 2.00]	
Liang2017	34	79	106	276	4.9%	1.21 [0.73, 2.01]	
Samuel Santos-Ribeiro, M.D2016	48	197	238	986	6.5%	1.01 [0.71, 1.45]	
Song2019	122	385	379	1155	7.8%	0.95 [0.74, 1.22]	
Song2021	120	366	96	366	7.0%	1.37 [1.00, 1.89]	· · ·
Volodarsky-Perel2016	9	67	20	62	2.5%	0.33 [0.13, 0.79]	
Xu2021	94	355	284	727	7.5%	0.56 [0.43, 0.74]	
Yildiz2021	51	119	21	79	4.0%	2.07 [1.12, 3.84]	
Total (95% CI)		6385		9141	100.0%	1.09 [0.93, 1.28]	•
Total events	2493		3316				
Heterogeneity: Tau ² = 0.07; Chi ² = 5	59.08, df = 1	5 (P < 0.	00001); l ²	= 75%			
Test for overall effect: Z = 1.02 (P =	0.31)						Delayed FET Immediate FET
RE 4 est plots of the association betwe							

malformations and sex ratio, and that immediate FET did not improve neonatal risk, which needs more research to be confirmed.

Huang et al. (13) and Higgins et al. (10) have different conclusions with us. In their study, they found that immediate FET has a higher LBR than delayed FET. Most of the patients included in Huang's study underwent COS with exogenous gonadotrophins by using progestinprimed ovarian stimulation (PPOS) or gonadotropin-releasing hormone agonist (GnRH-a) short protocol, and in the author's opinion, many luteal products after COS can restore the endometrial blood vessels and improve pregnancy outcomes (13). Nevertheless, Kaye et al. (14) suggests delaying one cycle, as immediate FET cycles can indicate a dysfunctional menstrual cycle.

The optimal timing of FET after a failed fresh ET cycle is a common problem, and after subgroup studies, we found that the PLR of immediate FET after fresh ET failure was lower than that of delayed FET. A large number of follicles develop in COS, and the influence of ovarian superphysiological doses of hormones on endometrial receptivity, resulting in embryo-endometrial dissynchrony (27) may make clinicians more inclined to delay FET after fresh ET failure. However, the study by Horowitz et al. (11), Santos-Ribeiro et al. (18), Song et al. (20), Tian et al. (21), and Peng et al. (26) showed that pregnancy outcomes after fresh ET were better than those after delayed FET, whether in the modified natural cycle or hormone replacement cycle. In Song's et al. (20) study, the frequency of moderate-to-severe depression and high stress level before FET was significantly higher in the delayed FET group than in the immediate FET group, and high stress level and high stress level had adverse effects on continued pregnancy and live birth rate (28).

In contrast, research by Volodarsky-Perel et al. (22) and Xu et al. (23) found a positive effect of delaying FETs. A long GnRH-a regimen was used by Volodarsky-Perel et al. (22), and the effects of GnRH-a on the endometrium in the ovarian hyperstimulation cycle were found to persist into adjacent menstrual cycles. There are studies showing that, after the full dose of GnRH-a is injected, the effect on the menstrual cycle can last for 11-13 weeks (29). Nevertheless, some studies have evaluated the clinical efficacy of long-acting GnRH agonists in general populations, and have identified a variety of proteins that facilitate embryo implantation in the endometrium, suggesting that long-acting agonists may enhance endometrial receptivity (30). In addition, another study showed that increased levels of GnRH-a directly modulate the expression of enzymes and cytokines and increase the expression of endometrial tolerance markers such as integrin b3 and leukaemia inhibitory factor, improving endometrial tolerance and clinical outcome in patients with intermediate and very thin endometrium (31). Xu's et al. (23) study used clomiphene citrate (CC) + human menopausal gonadotrophin (HMG) protocol for COS. In clinical practice, CC is widely used as a first-line ovulation-promoting drug. However, due to its anti-estrogen effect, CC occupies endometrial estrogen receptors, inhibits endometrial proliferation, promotes endometrial cell apoptosis, and affects endometrial receptivity through various ways. For example, the study compared the expression of key molecules in the Wnt/βcatenin signaling pathway during the CC expulsion cycle, and CC significantly down-regulated Wnt signaling, which led to thinning of the endometrium (32). Furthermore, due to the prolonged use time of CC during the ovulation induction process, it may take longer for metabolism clearance to be completed (33). Furthermore, this study indicates that embryo implantation rates, CPRs and LBRs during the first menstrual cycle after oocyte retrieval are significantly less than those in other groups (23).

In the selected studies, ovarian hyperstimulation syndrome (OHSS) is a common and potentially risky iatrogenic complication. Especially for women with high ovarian response, the risk of acquiring OHSS is higher, and FET after embryo freezing is the most meaningful strategy for these women (34). A study of 2,060 cases found that delaying the FET cycle did not improve live birth rates in patients who cancelled ET because of high risk of OHSS (35). Patients who opt for a freeze-all policy

Study or Subgroup	Immediate Events		elayed FET vents To		Odds Ratio M-H, Random, 95% Cl	Odds Ratio M-H, Random, 95% Cl
2.2.1 hCG						
Chen2019 He2020	331 1445	526 2363	277 4 1230 20	51 10.3% 41 12.4%	1.07 [0.82, 1.38] 1.04 [0.92, 1.17]	
Higgins2017	211	635		65 11.0% 80 4.8%	1.26 [1.02, 1.57]	
Horowitz2019 Hu2020	30 129	118 207		80 4.8%	1.02 [0.53, 1.97] 1.08 [0.79, 1.48]	
Liang2017	41	79		76 6.5%	1.16 [0.70, 1.91]	
Peng2019 Samuel Santos-Ribeiro, M.D2016	82 64	128 197		62 7.4%	1.21 [0.78, 1.88] 1.03 [0.75, 1.43]	
Song2021	137	366	111 3	66 9.5%	1.37 [1.01, 1.87]	
Tian2020 Volodarsky-Perel2016	23 12	86 67		07 5.8% 62 3.6%	0.59 [0.34, 1.03] 0.30 [0.14, 0.67]	
Xu2021 Subtotal (95% CI)	116	355	342 7	27 10.2%	0.55 [0.42, 0.71]	
Total events	2621		72 3455		0.97 [0.81, 1.16]	
Heterogeneity: Tau ² = 0.06; Chi ² = Test for overall effect: Z = 0.36 (P =		(P < 0.000	01); I ² = 749	%		
Total (95% CI) Total events	2621	5127	72 3455	41 100.0%	0.97 [0.81, 1.16]	
Heterogeneity: Tau ² = 0.06; Chi ² =	42.28, df = 11			%		0.5 0.7 1 1.5 2
Test for overall effect: Z = 0.36 (P = Test for subgroup differences: Not						Delayed FET Immediate FET
Endometrial prepara						
	nmediate FET	Delaye	d FET		Odds Ratio	Odds Ratio
	Events Tota				Random, 95% Cl	M-H, Random, 95% Cl
Chen2019	331 526			11.6%	1.07 [0.82, 1.38]	
Hu2020	129 203			10.9% 10.3%	1.08 [0.79, 1.48]	
Lattes2016 Li2021	116 263 197 345	5 178	342	11.1%	1.39 [0.98, 1.99] 1.23 [0.91, 1.66]	
Samuel Santos-Ribeiro2016 Song2019	110 208 179 385			9.0% 12.0%	1.58 [1.01, 2.47] 1.01 [0.80, 1.28]	
Song2021	137 366	6 111	366	11.0%	1.37 [1.01, 1.87]	
Volodarsky-Perel2016 Xu2021	12 67 116 355			5.2% 11.5%	0.30 [0.14, 0.67] + 0.55 [0.42, 0.71] -	
Yildiz2021	60 119	9 35	79	7.5%	1.28 [0.72, 2.26]	
Subtotal (95% CI) Total events	2841 1387	1 2139		100.0%	1.04 [0.82, 1.31]	
Heterogeneity: Tau ² = 0.10; Chi ² = Test for overall effect: Z = 0.31 (P =	42.56, df = 9 (F			%		
Total (95% CI) Total events	2841 1387	1 2139	4374	100.0%	1.04 [0.82, 1.31]	
Heterogeneity: Tau ² = 0.10; Chi ² =	42.56, df = 9 (F	> < 0.0000	01); I² = 799	%		0.5 0.7 1 1.5 2
Test for overall effect: Z = 0.31 (P = Test for subgroup differences: Not						Delayed FET Immediate FET
Embryo stage						
Immediate	FET Delaye	d FET		Odds Rat	io	Odds Ratio
Study or Subgroup Events 2.3.1 Cleavage	Total Events	Total	Weight N	II-H, Random	.95% CI	M-H, Random, 95% Cl
Lattes2016 116	263 90		12.4%	1.39 [0.9		
Song2019 179 Song2021 137	385 533 366 111		14.5% 13.2%	1.01 [0.8 1.37 [1.0		
Xu2021 116	355 342	727	13.9%	0.55 [0.4	2, 0.71]	_
Subtotal (95% CI) Total events 548	1369 1076	2497	54.1%	1.01 [0.6	6, 1.54]	
Heterogeneity: Tau ² = 0.17; Chi ² = Test for overall effect: Z = 0.03 (P =		[,] < 0.0000	01); I ^z = 899	%		
	. 0.30)					
2.3.2 Blastolyst Higgins2017 211	635 273	965	14.7%	1.26 [1.0	2. 1.571	
Hu2020 129	207 495	818	13.1%	1.08 [0.7	9, 1.48]	
Kaye2017 54 Yildiz2021 60	80 202 119 35		9.2% 8.9%	0.64 [0.3		
	1041	2126	45.9%	1.09 [0.8	5, 1.39]	
Subtotal (95% CI)						
Subtotal (95% CI) Total events 454 Heterogeneity: Tau ² = 0.03; Chi ² =	1005 5.44, df = 3 (P		= 45%			
Subtotal (95% CI)	5.44, df = 3 (P :		= 45%			
Subtotal (95% Cl) Total events 454 Heterogeneity: Tau ² = 0.03; Chi ² = Test for overall effect: Z = 0.65 (P = Total (95% Cl)	5.44, df = 3 (P = 0.52) 2410	= 0.14); l² 4623	= 45% 100.0%	1.03 [0.8	0, 1.32]	
Subtotal (95% CI) 454 Total events 454 Heterogeneity: Tau" = 0.03; Chi" = 7 Test for overall effect: Z = 0.65 (P = 7 Total (95% CI) 1002 Heterogeneity: Tau" = 0.10; Chi" = 1002	5.44, df = 3 (P = = 0.52) 2410 2081 35.08, df = 7 (F	= 0.14); I ² 4623	100.0%			
Subtotal (95% CI) Total events 454 Heterogeneity, Tau" = 0.03, Chi" = Test for overall effect: Z = 0.65 (P = Total (95% CI) Total events 1002 Heterogeneity, Tau" = 0.10, Chi" = Test for overall effect: Z = 0.60, Chi" =	5.44, df = 3 (P = = 0.52) 2410 2081 35.08, df = 7 (F = 0.84)	= 0.14); I ² 4623 P < 0.0001	100.0% I); I ² = 80%		0.5	0.7 1 1.5 2 layed FET Immediate FET
Subtoriar (95% CI) 454 Total events 454 Heterogeneity: Tau" = 0.03; Chi" = Test for overall effect Z = 0.85 (P = Total (95% CI) 1002 Total events 1002 Heterogeneity: Tau" = 0.10; Chi" = Test for overall effect Z = 0.85 (P = Total events 1002 Heterogeneity: Tau" = 0.10; Chi" = Test for overall effect Z = 0.20 (P = Test for overall effect Z = 0.20; Chi" = Test for subarous differences: Chi	5.44, df = 3 (P = = 0.52) 2410 2081 35.08, df = 7 (P = 0.84) i ² = 0.09. df = 1	= 0.14); ² 4623 P < 0.0001 (P = 0.76)	100.0% I); I [#] = 80%). I [#] = 0%		0.5	
Subtotal (95% Cl) Total events 454 Heterogeneity, Tau" = 0.03, Chi" = Test for overall effect. Z = 0.65 (P = Total events 1002 Heterogeneity, Tau" = 0.10, Chi" = Test for overall effect. Z = 0.20 (P =	5.44, df = 3 (P = = 0.52) 2410 2081 35.08, df = 7 (F = 0.84) F = 0.09, df = 1 col or fre	= 0.14); ² 4623 P < 0.0001 (P = 0.76) sh ET 1	100.0%); ² = 80%). ² = 0% failure		0.5 De	Played FET Immediate FET
Subtorial (95% CI) 454 Total events 454 Heterogeneity: Tau* = 0.03; Ch* = Test for overall effect Z = 0.85 (P = Total (95% CI) 1002 Heterogeneity: Tau* = 0.10; Ch* = 102 Heterogeneity: Tau* = 0.10; Ch* = 102 Heterogeneith: Tau* = 0.20; P = Test for overall effect Z = 0.20; P = Test for overall effect Z = 0.20; P = Test for subaroup differences: Ch	5.44, df = 3 (P = = 0.52) 2410 2081 35.08, df = 7 (F = 0.84) PCOI or fre Immediate	= 0.14); ² 4623 P < 0.0001 (P = 0.76) sh ET f FET D	100.0%); ² = 80%). ² = 0% failure elayed FET	ſ	0.5	Nayed FET Immediate FET Odds Ratio
Subtorial (95% CI) Total events 454 Helerogeneiky, Tau" = 0.03; Ch" = Test for overall effect Z = 0.65 (P = Total (95% C) Total events Helerogeneiky, Tau" = 0.10; Ch" = Test for overall effect Z = 0.20 (P Test for subaroup differences: Ch After freeze-all proto Study or Subgroup 2.5. Freeze-all	5.44, df = 3 (P : = 0.52) 2410 2081 35.08, df = 7 (P = 0.084) F = 0.09. df = 1 PCOI Or free Immediate Events	4623 4623 < 0.0001 (P = 0.76) sh ET FET D Total Ev	100.0% 1); ² = 80%). ² = 0% failure elayed FET <u>rents To</u>	tal Weight	Odds Ratio M-H, Random, 95% CI	Nayed FET Immediate FET Odds Ratio
Subtorial (95% CI) Total events 454 Heterogeneity, Tau* = 0.03, Chi* = Test for overall effect Z = 0.65 (P = Total events 1002 Heterogeneity, Tau* = 0.10, Chi* = Test for overall effect Z = 0.20 (P = Test for overall effect Z = 0.20 (P = Test for overall effect Z = 0.20 (P = Test for overall effect Z = 0.20 (P = Study or Subaroup 2.5.1 Freeze-all Chen2019 He2020	5.44, df = 3 (P : = 0.52) 2410 2081 35.08, df = 7 (P = 0.84) F = 0.09. df = 1 cool or free Events 331 1445	4623 4623 P < 0.0001 (P = 0.76) sh ET FET D Total Ex 526 2363	100.0% 1); I ² = 80%). I ² = 0% failure elayed FET vents To 277 4 1230 20	tal Weight 51 7.8% 141 9.4%	0.5 De Odds Ratio M-H. Random, 95% CI 1.07 [0.82, 1.38] 1.04 [0.92, 1.17]	Nayed FET Immediate FET Odds Ratio
Subtoral (95% CI) Total events 454 Heterogeneiky, Tau" = 0.03; Chi" = Test for overall effect Z = 0.65 (P = Total (95% CI) Total events Total events Test for overall effect Z = 0.20 (P = Test for overall effect Z = 0.20 (P = Test for subarroup Z.5.1 Freeze-all Chen2019 He2020 Hegon2017	5.44, df = 3 (P = = 0.52) 2410 2081 35.08, df = 7 (F = 0.84) P = 0.09. df = 1 bcol or free Immediate Events 331 1445 211	4623 4623 < 0.0001 (P = 0.76) sh ET FET D Total Ex 526 2363 635	100.0% (); ² = 80%). ² = 0% failure elayed FET vents To 277 4 1230 20 273 9	t <mark>al Weight</mark> 51 7.8% 41 9.4% 65 8.3%	0.5 De 0.5 De 0.6 De 0.6 De 0.6 De 0.7 (0.82, 1.38) 1.04 (0.92, 1.17) 1.26 (1.02, 1.57) 1.26 (1.02, 1.57)	Nayed FET Immediate FET Odds Ratio
Subtorial (95% CI) Total events 454 Heterogeneiky, Tau" = 0.03; Chi" = Test for overall effect Z = 0.85 (P = Total (95% CI) Total events Total events Test for overall effect Z = 0.20 (P = Test for serial effect Z = 0.20 (P = Test for serial effect Z = 0.20 (P = Test for subarroup differences: Ch After freeze-all Chen2019 He2020 Hugoin2017 Hu2020 Huang2019	5.44, df = 3 (P = 0.52) 2410 2081 35.08, df = 7 (F = 0.84) P = 0.09, df = 1 pcol or free Immediate Events 331 1445 211 129 176	= 0.14); ² 4623 4623 Constant of the second s	100.0%); ² = 80%); ² = 0% failure elayed FET vents To 277 4 1230 20 273 9 495 8 150 2	tal Weight 51 7.8% 41 9.4% 65 8.3% 18 7.0% 80 6.7%	0.5 1 0.5 1 0.5 1 0.6 0.5 1 0.5 1 0.5 1 0.2, 1.7 1.26 (1.02, 1.57) 1.08 (0.79, 1.48) 1.47 (1.05, 2.06)	Odds Ratio M-H, Random, 95% Cl
Subtoil (95% CI) Total events 454 Heterogeneity, Tau* = 0.03, Chi* = Test for overall effect Z = 0.65 (P = Total events 1002 Heterogeneity, Tau* = 0.10, Chi* = Test for overall effect Z = 0.20 (P = Test for overall effect Z = 0.20 (P = Test for overall effect Z = 0.20 (P = Test for overall effect Z = 0.20 (P = Test for overall effect Z = 0.20 (P = Study or Subgroup 2.5.1 Freeze-all Chen2019 He2020 Huag2017 Huag2019 Kaye2017 Stay	5.44, df = 3 (P : = 0.52) 2410 2081 35.08, df = 7 (F = 0.84) P = 0.09, df = 1 procol or free Immediate Events 331 1445 211 129 176 54	= 0.14); ² 4623 ² < 0.0001 (P = 0.76) sh ET FET D Total Ex 526 2363 635 207 280 80	100.0%); ² = 80%). ² = 0% failure elayed FET vents To 277 4 1230 20 273 9 495 8 150 2 202 2	tal Weight 51 7.8% 41 9.4% 65 8.3% 118 7.0% 80 6.7% 64 4.4%	0.5 1 0.5 De 0.6 0.5 De 0.6 0.6 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	Odds Ratio M-H, Random, 95% Cl
Subtoil (95% CI) Total events 454 Heterogeneity, Tau* = 0.03, Chi* = Test for overall effect Z = 0.65 (P = Total events 1002 Heterogeneity, Tau* = 0.10, Chi* = Test for overall effect Z = 0.20 (P - Test for overall effect Z = 0.20 (P - Test for overall effect Z = 0.20 (P - Test for overall effect Z = 0.20 (P - Study or Subgroup 2.5.1 Freeze-all Chen2019 He2020 Hu2020 Hu305.2017 Hu2020 Lates 2016 Samuel Santos-Ribeiro2016	5.44, df = 3 (P: 0.52) 2410 2081 35.08, df = 7 (F 0.84) pr = 0.09. df = 1 cool or free Immediate Events 331 1445 2211 129 176 54 116 110	= 0.14); * 4623 * < 0.0001 (P = 0.76' sh ET FET D Total Ex 526 2363 635 207 280 80 263 208	100.0% (); ² = 80%). ² = 0% failure elayed FET cents To 277 4 1230 20 273 9 495 88 150 2 202 2 90 2 52 11	Tal Weight 51 7.8% 41 9.4% 65 8.3% 18 7.0% 80 6.7% 64 4.4% 49 6.5% 25 5.4%	0.5 Def 0.6 Def 0.6 Def 0.7 (0.82, 1.38) 1.07 (0.82, 1.38) 1.04 (0.92, 117) 1.26 (102, 157) 1.08 (0.79, 1.48) 1.47 (10.5, 2.06) 0.64 (10.37, 1.10) 1.58 (10.1), 2.47]	Odds Ratio M-H, Random, 95% Cl
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Subtoil (95% CI) Total events 454 Heterogoneik, Tau'= 0.03; Chi'= Test for overall effect Z = 0.65 (P = Test for overall effect Z = 0.65 (P = Test for overall effect Z = 0.20 (P = Test	5.44, df= 3 (P: e 0.52) 2410 2081 35.08, df= 7 (F 0.084) P= 0.09, df= 1 tocol or free Immediate Events 331 1445 211 129 176 54 116 110 179 23 60	= 0.14); P 4623 4623 4623 P < 0.0001 (P = 0.76) sh ET 526 2363 635 207 280 80 208 385 86 119	100.0%); ^P = 80%); ^P = 0% failure elayed FET yents To 277 4 1230 20 273 9 495 8 150 2 202 2 90 2 52 1 533 11 79 2 35	tal Weight 51 7,8% 41 9,4% 65 8,3% 118 7,0% 80 6,7% 55 8,1% 007 4,3% 79 4,2%	0.5 Def Ratio M.H. Random, 95% CI 1.07 (0.62, 1.38) 1.04 (0.32, 1.17) 1.28 (10.24, 1.57) 1.08 (0.79, 1.48) 1.47 (10.52, 2.06) 0.64 (0.37, 1.10) 1.39 (0.86, 1.99) 1.58 (10.1, 2.47) 1.01 (0.60, 1.28) 0.59 (0.34, 1.03) 1.28 (0.72, 2.28)	Odds Ratio M-H, Random, 95% CI
Subtol (95% CI) Subtol (95% CI) Total events 454 Helerogeneily, Tau" = 0.03, Ch" = Test for overall effect, Z = 0.86 (P = Test for overall effect, Z = 0.86 (P = Test for overall effect, Z = 0.20 (P = Test for o	5.44, df = 3 (P; = e.0.52) 2410 2081 2508, df = 7 (F e.0.84) df = 0.09, df = 1 coll of free Events 3311 1445 211 129 1766 54 1116 1110 1799 2336 00 2834	= 0.14); P 4623 4623 4623 4623 6 0.0001 (P = 0.76) sh ET FET D Total Ex 526 280 80 263 208 385 86 119 5152	100.0% (); ² = 80% (); ² = 0% failure elayed FET cents To 2777 4 1230 20 273 9 495 8 1530 20 202 2 90 2 52 1 1533 11 79 2 35 66 3416	tal Weight 51 7,8% 41 9,4% 65 8,3% 118 7,0% 80 6,7% 55 8,1% 007 4,3% 79 4,2%	Odds Ratio MH. Random, 95% CI 1.07 (0.82, 1.38) 1.04 (0.22, 1.17) 1.26 (10.21, 157) 1.26 (10.21, 157) 1.08 (0.79, 1.48) 1.47 (10.5, 2.06) 0.54 (0.37, 1.10) 1.58 (10.11, 2.47) 1.58 (10.11, 2.47) 1.58 (10.11, 2.47) 0.59 (0.34, 1.03) 0.59 (0.34, 1.03)	Odds Ratio M-H, Random, 95% CI
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Subtoil (95% CI) Total events 454 Heterogeneity, Tau" = 0.03; Chi"= Test for overall effect Z = 0.66 (P= Test for overall effect Z = 0.66 (P= Test for evental effect Z = 0.20 (P= Test for evental effect Z = 0.20 (P= Test for subarroup differences: Ch After freeze-all proto Study or Subarroup 2.5.1 Freeze-all Chen2019 He2020 He202	5.44, df = 3 (P; = 0.52) 2410 2081 3508, df = 7 (F 0.9.44) F ² = 0.99, df = 1 ccol or fre Immediate Events 331 1445 271 129 176 54 110 1179 2834 18.84, df = 10 (- 0.09)	4623 2 < 0.0001 (P = 0.76' 526 2363 635 635 635 207 200 263 207 200 263 207 207 207 207 207 207 207 207	100.0%); ² = 80%). ² = 0% failure elayed FET eents To 277 4 1230 20 273 9 495 8 150 2 202 2 90 2 52 1 533 11 533 11 79 2 35 66 3416 ; ² = 47%	tal Weight 51 7.8% 41 9.4% 65 8.3% 118 7.0% 800 6.7% 64 4.4% 45 5.4% 52 5.4% 55 8.1% 79 4.2% 34 72.1%	0.5 0.6 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	Odds Ratio M-H, Random, 95% CI
Subtoil (95% CI) Total events 454 Heterogeneily, Tau* = 0.03, Ch# = Test for overall effect Z = 0.66 (P = Test for overall effect Z = 0.06 (Ch# Heterogeneily, Tau* = 0.10, Ch# = Test for verall effect Z = 0.20 (P = Test for verall effect Z = 0.20 (P = Test for verall effect Z = 0.20 (P = Test for verall effect Z = 0.20 (P = Test for verall effect Z = 0.20 (P = Test for verall effect Z = 0.20 (P = Test for verall effect Z = 0.20 (P = Test for verall effect Z = 0.20 (P = Test for verall effect Z = 0.20 (P = Test for verall effect Z = 0.20 (P = Test for verall effect Z = 0.20 (P = Test for verall effect Z = 0.20 (P = Test for verall effect Z = 0.20 (P = Test for verall effect Z = 0.20 (Ch# = Test for verall effect Z = 1.71 (P = Test for verall	5.44, df = 3 (P; = e. 0.52) 2410 2081 35.08, df = 7 (F e 0.84) i [#] = 0.09, df = 1 tecol or free Immediate Events 331 1445 211 129 176 54 116 110 179 23 2834 18.84, df = 10 e 0.09)	= 0.14); P 4623 4623 4623 4623 6 0.0001 (P = 0.76) sh ET FET D Total Ex 526 280 80 263 208 385 86 119 5152	100.0%); ² = 80%); ² = 0% failure elayed FET events To 277 4 1230 20 273 9 495 8 150 2 202 2 90 2 52 1 533 11 79 2 35 66 3416 ; ² = 47%	tal Weight 51 7,8% 41 9,4% 65 8,3% 118 7,0% 80 6,7% 55 8,1% 007 4,3% 79 4,2%	0.5 Def Ratio M.H. Random, 95% CI 1.07 (0.62, 1.38) 1.04 (0.32, 1.17) 1.28 (10.24, 1.57) 1.08 (0.79, 1.48) 1.47 (10.52, 2.06) 0.64 (0.37, 1.10) 1.39 (0.86, 1.99) 1.58 (10.1, 2.47) 1.01 (0.60, 1.28) 0.59 (0.34, 1.03) 1.28 (0.72, 2.28)	Odds Ratio M-H, Random, 95% CI
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Subgroup analysis of live birth rate.

FIGURE 5

	Experim		Contr			Odds Ratio	Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% Cl	M-H, Random, 95% Cl
Chen2019	41	526	23	451	8.3%	1.57 [0.93, 2.66]	
He2020	236	2363	183	2041	12.5%	1.13 [0.92, 1.38]	
Higgins2017	36	635	60	965	9.6%	0.91 [0.59, 1.39]	
Hu2020	25	207	92	818	9.0%	1.08 [0.68, 1.74]	
Kaye2017	17	80	52	264	7.3%	1.10 [0.59, 2.04]	
Lattes2016	31	263	40	249	8.6%	0.70 [0.42, 1.16]	· · · · · · · · · · · · · · · · · · ·
Li2021	26	345	43	342	8.5%	0.57 [0.34, 0.95]	•
Liang2017	14	79	50	276	6.8%	0.97 [0.51, 1.87]	
Song2019	41	285	89	1155	10.0%	2.01 [1.36, 2.99]	
Song2021	33	366	61	366	9.3%	0.50 [0.32, 0.78]	← -
Volodarsky-Perel2016	3	67	6	62	2.4%	0.44 [0.10, 1.83]	· · · · · · · · · · · · · · · · · · ·
Xu2021	18	355	39	727	7.7%	0.94 [0.53, 1.67]	
Total (95% CI)		5571		7716	100.0%	0.96 [0.75, 1.22]	
Total events	521		738				
Heterogeneity: Tau ² = 0.	11; Chi ² = 3	33.83, d	f = 11 (P	= 0.000)4); l ² = 67	%	
Test for overall effect: Z	= 0.35 (P =	0.73)					0.5 0.7 1 1.5 2
		1					Delayed FET Immediate FET
RE 6							
	n hotwoon	immed	iato EET -	and del	avod EET	and pregnancy loss rate.	

due to OHSS may have relatively good ovarian reserve function, which may optimize the results of an immediate FET. In addition, differences in embryo quality may be a confounding factor in the comparison of clinical outcomes between the two groups, as embryos with the highest implantation potential are usually transferred first according to morphodynamic criteria, so embryos transferred mid-cycle in the delayed FET group may be of poorer quality than those in the immediate FET group.

Additionally, differences in endometrial preparation protocols between included studies, such as programmed cycle (PC) and natural cycle (NC), may have increased the risk of selection bias. To eliminate potential bias based on the type of endometrial preparation protocol for FETs, we performed a subgroup analysis of PC-FETs, but because most studies in this review were a combination of PC-FETs and NC-FETs, or PC-FETs alone, a subgroup analysis of NC-FETs was not possible. Subgroup analyses of endometrial preparation protocols revealed no significant differences between immediate and delayed PC-FET groups in LBR, CPR, and PRL. PC-FET is a better option for patients with irregular periods, amenorrhoea or poor response to ovulation induction, prolonged persistent anovulation, and recalcitrant polycystic ovary syndrome (PCOS), and PC-FET requires luteal support in the later stage and has strong operability, and patients do not need to be hospitalized for multiple monitoring. NC-FET is a safer and more natural endometrial preparation protocol, in which the timing of embryo transfer is determined by the increased production of luteinizing hormone (LH) or human chorionic gonadotropin (hCG), which induces ovulation. However, women with NC for endometrial preparation must monitor ovulation frequently, and there is a high probability of cycle cancellation, which increases the mental stress and financial costs of the patient. Despite this, studies indicate that NC-FET suffers less complications than PC protocol due to the lack of luteum (36). PC-FET significantly increases the risk of pregnancy-induced hypertension and placental implantation compared to NC-FET. In 2020, Singh et al. (37), summarized recent research on the impact of luteum on FET obstetric outcomes, highlighting the risk for preeclampsia, postpartum hemorrhage, macroia, and overdue labor associated with PC-FET without luteum production, and stating that the luteum plays a crucial role in preventing obstetric complications. In addition to luteal deficiency, Zong's et al. (38) study found that elevated estrogen levels not only significantly suppressed vascular invasion, but also impaired trophoblast invasion and may be associated with poor maternal and neonatal outcomes. As of now, however, there is no strong evidence supporting which endometrial preparation regimen is more advantageous for women with regular menstrual cycles.

Following fresh ET failure or freeze-all cycles, it may be cumbersome and outdated to delay FET for at least one menstrual cycle in order to minimize the potential negative effects of ovarian stimulation and multiple luteum on the restoration of normal ovulation cycles and the receptive endometrium. Nevertheless, the selected literature does not provide a specific explanation for canceling fresh ET, nor does it provide any explanation for selecting immediate or delayed FET criteria, therefore, in clinical practice, it is imperative that a strict set of delayed FET criteria be established based upon the adverse conditions for immediate FET.

After the development of ART, several studies have demonstrated that the timing of FET following the cancellation of fresh ET does not have a significant impact on pregnancy outcomes. With the advancement in freeze-thaw and resuscitation technology, embryos can be preserved to the maximum extent possible and the quality of freezing and thawing can be improved. In this way, the timing of FET after fresh ET failure or the freeze-all policy has little impact on pregnancy outcomes.

In the present study, it appears that delayed FET may be unnecessary, but caution should be exercised in its interpretation. Important limitations of this review are the retrospective design, including the heterogeneity of the studies. In addition, in some studies, the existence of selection bias is obvious. No article in this systematic review specifically explained the reasons for choosing freeze-all policy instead of fresh ET, the reasons for choosing immediate FET or delayed FET, and the length of time for delayed FET. Therefore, the risk of selection bias is obvious, and the quality of studies is uneven. The results measured in this study included clinical pregnancy, live birth, and preclinical pregnancy loss. Other outcomes, such as preterm birth, birth weight, and fetal development, are not

3.2.1.0.G Central 19 41 528 21 451 12.1% 157 (0.9.2.7.86 Helpson 2017 326 223 69 045 14.1% 157 (0.9.2.7.86 Helpson 2017 326 223 69 045 14.1% 157 (0.9.2.7.86 Helpson 2017 326 223 69 045 14.1% 050 02.50 (0.9.1.87 Helpson 2017 326 227 21.0% 045 (0.9.1.97 Helpson 2017 14 17 95 05 272 11.0% 045 (0.5.1.97 Helpson 2017 14 17 95 05 272 11.0% 045 (0.5.1.97 Helpson 2017 14 19 255 39 272 11.0% 045 (0.5.1.97 Helpson 2017 14 19 255 39 272 11.0% 045 (0.5.1.97 Helpson 2017 14 19 255 39 272 11.0% 045 (0.5.1.97 Helpson 2017 14 19 255 39 272 11.0% 045 (0.5.1.97 Helpson 2017 14 19 255 39 272 11.0% 045 (0.5.1.97 Helpson 2017 14 19 255 39 272 11.0% 045 (0.5.1.97 Helpson 2017 14 19 255 39 272 11.0% 045 (0.5.1.97 Helpson 2017 14 19 255 39 272 11.0% 045 (0.5.1.97 Helpson 2017 14 19 255 39 272 11.0% 045 (0.5.1.97 Helpson 2017 14 19 255 39 272 11.0% 045 (0.5.1.97 Helpson 2017 14 19 255 22 34 11.3% 157 (0.5.2.96 Helpson 2017 14 12 25 0.22 34 11.3% 157 (0.5.2.96 Helpson 2017 14 12 25 0.22 34 11.3% 157 (0.5.2.96 Helpson 2017 14 12 25 0.22 34 11.3% 157 (0.5.2.96 Helpson 2017 14 12 25 0.22 34 11.3% 157 (0.5.2.96 Helpson 2017 14 12 25 0.21 34 12 27 (2.5% 044 (0.5.1.57) Helpson 2017 14 12 25 0.21 47 (7.9.0.00); <i>p</i> = 73% Helpson 2017 14 12 25 0.22 44 12.4% 0.70 (0.4.1.54) Helpson 2017 14 22 54 01 27 (2.0.00); <i>p</i> = 73% Helpson 2017 14 22 56 01 155 14.5% 22 10 (1.5.2.96) Helpson 2017 14 22 56 01 155 14.5% 22 10 (1.5.2.96) Helpson 2017 14 225 01 22 27 (2.5% 044 (0.5.1.57) Helpson 2017 14 22 26 04 07 (0.20); <i>p</i> = 73% Helpson 2017 14 22 26 04 07 (0.20); <i>p</i> = 73% Helpson 2017 14 22 26 04 07 (0.20); <i>p</i> = 73% Helpson 2017 14 22 26 04 07 (0.20); <i>p</i> = 73% Helpson 2017 14 22 26 04 07 (0.20); <i>p</i> = 75% Helpson 2017 14 22 26 04 07 (0.20); <i>p</i> = 275; Helpson 2017 14 25 04 07 (0.20); <i>p</i> = 275; Helpson 2017 14 25 04 07 (0.20); <i>p</i> = 275; Helpson 2017 14 25 04 07 (0.20); <i>p</i> = 275; Helpson 2017 14 25 04 07 (0.20); <i>p</i> = 275; Helpson 2017 14 25 04 07 (0.20); <i>p</i> = 275; Helpson 2017 14 20 05; <i>c</i> = 227; <i>q</i> = 070 1	Study or Subgroup	Experime Events		Control Events To		Weight M	Odds Ratio M-H, Random, 95% Cl	Odds Ratio M-H, Random, 95% Cl	
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Hu2020 Hu2020	He2020	236	2363	183 2	041	22.4%	1.13 [0.92, 1.38]	1	
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$\begin{aligned} detergomenty: Tar = 0.06, CM = 15.11, dr = 7 (P = 0.03); P = 54.9; \\ \text{test for versal differences: Not accilicates the second $	Subtotal (95% CI)			5					
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Heterogeneity: Tau ² = 0	0.06; Chi ² = 1			03); P	* = 54%			
Total events 400 514 Heterogeneity Tarel 20 60, Pt = 511, Here 7(P = 0.03), P = 54% Test for variable 000, Pt = 754 Enterogeneity Tarel 20 60, Pt = 511, Here 7(P = 0.03), P = 54% Test for variable and there rest in another the formation of		.= 0.42 (F =		5	706	100.0%	0.95 (0.74, 1.22)		
Test for value of differences: Hot and official set of the set of	Total events			514			oloo [oli i, hee]		
Testor Experimental Experimental Suburo Suburous 3.4.2 Programmed Chen2019 Odds Ratio 2.5 (27) Odds Ratio 3.4.2 Programmed Chen2019 Odds Ratio 4.1 (22) Odds Ratio 3.4.2 Programmed Chen2019 MH, Random, 95% (2) 4.1 (22) 5.002017 3.1 (25) 3.1 (25) 3.1 (25) 3.1 (25) 3.1 (25) 5.002021 3.3 (26) 4.1 (24) 3.1 (25) 3.1 (25) 3.1 (25) 5.002021 3.3 (26) 1.3 (25) 3.1 (25) 3.1 (25) 3.1 (25) 5.002021 3.3 (26) 1.0 (25) 1.0 (25) 3.1 (25) 3.1 (25) 3.1 (25) 5.002021 3.3 (26) 1.0 (25) 1.0 (25) 1.0 (25) 1.0 (25) 1.0 (25) 5.002021 3.3 (26) 1.0 (25) 0.20 (0.60, 1.35) 0.5 (0.7 (10) 0.20 (0.60, 1.35) 5.001 2.21 (0.4 (25) 0.21 (0.4 (25) 0.20 (0.60, 1.35) 0.5 (0.7 (10) 0.5 (0.7 (10) 5.002 2.01 (0.6 (1.3 (25)) 0.05 (0.7 (10) 0.05 (0.5 (1.5 (10)) 0.05 (0.5 (1.5 (10)) 0.05 (0.5 (1.5 (10)) 5.002 1.0 (25) 1.0 (25) 0.0 (25) 0.0 (25) 0.0 (25) 0.0 (25) 0.0 (25) 0.0 (25) 0.0 (Test for overall effect: Z	= 0.42 (P =	0.68)		03); F	* = 54%			
Descrimental Control Odds Ratio Odds Ratio 3.4.2 Programmed Forms Total Persits MAH Random, 95% CI Hu2020 25 207 9.2 818 1.57 (0.3), 2.68 [] Hu2020 21 34.2 90.2 91.8 1.07 (0.3), 2.68 [] 9.4 Labe2016 31 23.4 0.240 [1.34, 0.07 (0.3), 2.68 [] 9.4 9.4 Song2021 31.356 [1.35 [3.67 [1.6.9], 2.44, 118 [] 0.57 [0.3], 0.92 [0.58 [] 9.4 9.4 Subtoal (95% C) 2414 4170 [0.00%] 0.90 [0.66, 1.35 [] 0.5 [0.7 - 1.5 - 2] Total events 21.8 [-3.24 [.4.7 (7.9 - 0.0001); P = 78% [-3.27 (7.8 [.4.7 (7.9 - 0.001); P = 78% [-3.27 (7.8 [.4.7 (7.9 - 0.001); P = 78% [-3.27 (7.8 [.4.7 (7.9 - 0.001); P = 78% [-3.27 (7.8 [.4.7 (7.9 (.4.9 (1.4.7 (7.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.1 (1.4.9 (.4.9 (.4.1 (1.4.9 (.4.1 (1.4.9 (.4.1 (1.4.9 (.4.1 (1.4.9 (.4.1 (1.4.9 (.4.1 (1.4.9 (.4.1 (1.4.9 (.4.1 (1.4.9 (.4.1 (1.4.9 (.4.1				le					
Study or Subarous Fords Total Weint Mith. Random. 95% CI Mith. Random. 95% CI Ohen 2019 41 526 23 451 13.1% 1.57 (0.3), 2.68 Vid200 25 207 22 81.9 13.7% 1.000 (0.61, 7.4) Late 2016 31 203 4.0 21.33% 0.57 (0.3), 2.68 Song 2017 43 33.63 61.165 1.43% 0.90 (0.60, 1.35) Voldarsky Perei2016 3 67 6 5.5 4.4% 0.44 (0.11, 183) Vuldarsky Perei2016 3 67 6 5.5 4.4% 0.44 (0.11, 183) Vuldarsky Perei2016 3 67 6 5.04 0.30 (0.60, 1.35) Total (95% CD 22 41.4 4170 100.0% 0.90 (0.60, 1.35) 0.5 0.7 1.01 (0.60, 1.35) Total (95% CD 23.1 (Demost and demost and and the case) Mith. Random. 25% CI Mith. Random. 25% CI Mith. Random. 25% CI 3.3.1 (Demost and demost and and the case) Data or 31.65 (0.0001); #= 75% Test or vorail affect Z = 0.24 (0.7 * 0.0001); #= 75	Endometrial p			Control			Odds Ratio	Odds Batio	
Chen2019 41 526 23 451 131% 157 [03.2.66] 142020 25 207 92 818 137% 1057 [03.2.67] 142021 26 33 46 43 342 13.3% 057 [03.4.05] Song201 41 285 44 33 40 249 13.4% 0.70 [04.1.16] Song201 33 66 61 366 14.0% 0.60 [0.20,7.13] Song201 41 285 93 777 25% 0.60 [0.20,7.13] Song201 41 285 93 777 25% 0.60 [0.20,7.13] Total events 218 353 34 Heterogenety: Tau" 2.05, Ch ² - 32.19, df = 7 (P < 0.0001); P = 78% Test for overall effect Z = 0.49 (P = 0.62) Total events 12 2.0 49 (P = 0.62) Total events 12 2.0 49 (P = 0.62) Total events 201 13 35 34 0249 14.1% 0.70 [0.2, 0.70 Total events 202 Ch ² = 32.19, df = 7 (P < 0.0001); P = 78% Test for overall effect Z = 0.49 (P = 0.62) Test for overall effect Z = 0.49 (P = 0.62) Test for overall effect Z = 0.49 (P = 0.62) Test for overall effect Z = 0.49 (P = 0.62) Test for overall effect Z = 0.49 (P = 0.62) Test for overall effect Z = 0.49 (P = 0.62) Test for overall effect Z = 0.49 (P = 0.62) Test for overall effect Z = 0.49 (P = 0.62) Test for overall effect Z = 0.49 (P = 0.62) Test for overall effect Z = 0.49 (P = 0.62) Test for overall effect Z = 0.49 (P = 0.62) Test for overall effect Z = 0.49 (P = 0.62) Test for overall effect Z = 0.49 (P = 0.62) Test for overall effect Z = 0.49 (P = 0.62) Test for overall effect Z = 0.49 (P = 0.62) Test for overall effect Z = 0.49 (P = 0.77) 3.3.4 Clearage Heterogenety: Tau" = 0.00, Ch ² = 2.41 (P = 0.77) 3.3.2 Blastolyst Higging 2017 127 20 6 22 2047 57.75; 0.31 [0.47, 1.76] Total events 123 2.29 (P = 0.77) Total events 70 2.21 (P = 0.70) Total events 70 2.21 (P = 0.70); P = 0%; Test for overall effect Z = 0.49 (P = 0.000); P = 75% Test for overall effect Z = 0.49 (P = 0.000); P = 75% Test for overall effect Z = 0.47 (P = 0.20); P = 0%; Test for overall effect Z = 0.47 (P = 0.20); P = 0%; Test for overall effect Z = 0.47 (P = 0.20); P = 0%; Test for overall effect Z = 0.47 (P = 0.20); P = 58% Total events Tau" = 0.00, Ch ² = 0.41, df = 2 (P = 0.20); P = 58% Total (95% Ch) 2.25 (P = 0.20); P = 58% T						Weight M			
$\begin{aligned} \frac{1}{122020} & \frac{2}{25} & \frac{207}{20} & \frac{9}{20} & \frac{10}{10} & \frac{10}{20} & $		41	626	22	451	12.10	1 67 10 00 0 66		
Lu221 2 28 345 4 3 342 13.3% 0.57 [0.34, 0.65] Song2019 41 226 89 1155 14.5% 0.59 [0.32, 0.76] Voldarsky-Peril2016 3 67 6 62 54% 0.048 [0.0, 1.35] Total events 210 435 39 727 12.0% 0.94 [0.3, 1.57] Total events 210 49 (P = 0.62) Total events 211 44 4170 100.0% 0.90 [0.60, 1.35] Total events 212 414 4170 100.0% 0.90 [0.60, 1.35] Total events 212 414 4170 100.0% 0.90 [0.60, 1.35] Total events 22.0 (AP = 2.19, df = 7 (P < 0.0001); P = 78% Test for overall effect Z = 0.49 (P = 0.62) Total events 22.0 (AP = 2.13, df = 7 (P < 0.0001); P = 78% Test for overall effect Z = 0.49 (P = 0.62) Total events 22.0 (AP = 2.13, df = 7 (P < 0.0001); P = 78% Test for overall effect Z = 0.49 (P = 0.62) Total events 22.0 (AP = 2.13, df = 7 (P < 0.0001); P = 78% Test for overall effect Z = 0.49 (P = 0.62) Total events 20.0 (AP = 2.33, df = 3.33) Song2019 41 22.5 (AP = 2.21, 3 df = 7 (P < 0.0001); P = 78% Song2011 13 2.398 Song2012 11 83 298 Song2012 11 83 298 Song2012 11 83 2.98 Song2012 11 83 2.98 Subtoat (p5% Ct) 22.5 (AP = 2.37, df = 6 0 = 0.0000); P = 67% Test for overall effect Z = 0.41, df = 2 (P = 0.62); P = 0% Test for overall effect Z = 0.41, df = 2 (P = 0.62); P = 0% Test for overall effect Z = 0.41, df = 2 (P = 0.62); P = 0% Test for overall effect Z = 0.41, df = 2 (P = 0.62); P = 0% Test for overall effect Z = 0.42, df = 1.10 (D, 59, 2.04] Heterogeneity: Tau* = 0.00; Ch* = 0.31, df = 0.90; P = 75% Test for overall effect Z = 0.42, df = 0.90; P = 0.30; P = 55% Test for overall effect Z = 0.42, df = 0.41, df = 2 (P = 0.03); P = 55% Test for overall effect Z = 0.42, df = 0.63; J = 1.38, 0.000; J = 0.57, 0.41, 1.61, 0.41, 1.48, 0.41									
Song2019 41 225 89 1155 14.5% 2.01 [1.8, 2.99] Song2021 33 386 61 386 14.0% 0.50 [0.2, 0.78] Volodarsky-Perei2016 3 67 6 62 5.4% 0.44 [0.1, 1.83] Volodarsky-Perei2016 3 67 2 5.2% 0.44 [0.1, 1.83] Volodarsky-Perei2016 3 67 2 5.2% 0.44 [0.1, 1.83] Volodarsky-Perei2016 2 14 4170 100.0% 0.90 [0.60, 1.35] Total events 218 393 Heterogenety: Tau* 0.05, ChF = 32.19, dF = 7 (P < 0.0001); F = 78% Test for overall effect Z = 0.49 (P < 0.0001); F = 78% Test for overall effect Z = 0.49 (P < 0.0001); F = 78% Test for overall effect Z = 0.49 (P < 0.0001); F = 78% Test for overall effect Z = 0.49 (P < 0.0001); F = 78% Test for overall effect Z = 0.49 (P < 0.0001); F = 78% Test for overall effect Z = 0.49 (P < 0.0001); F = 78% Test for overall effect Z = 0.49 (P < 0.0001); F = 78% Test for overall effect Z = 0.49 (P < 0.0001); F = 78% Test for overall effect Z = 0.49 (P < 0.0001); F = 78% Total events 1 23 229 Heterogenety: Tau* 0.15, ChF = 32.19, dF = 7 (P < 0.0001); F = 67% Total events 1 23 229 Heterogenety: Tau* 0.15, ChF = 23.38, dF = 3 (P < 0.0001); F = 67% Total events 1 23 229 Heterogenety: Tau* 0.18, ChF = 23.38, dF = 3 (P < 0.0001); F = 67% Total events 201 42, SM = 10, 59, 1.39] Hu2020 2 25 207 92 218 14.5% 1.09 (0.58, 1.57] Hu2020 2 25 207 92 218 14.5% 1.09 (0.58, 1.57] Hu2020 2 25 207 92 218 14.5% 1.09 (0.58, 1.57] Hu2020 2 25 207 92 218 14.5% 1.09 (0.58, 1.57] Hu2020 2 25 207 92 218 14.5% 1.09 (0.58, 1.57] Hu2020 2 25 207 92 218 14.5% 1.09 (0.58, 1.57] Hu2020 2 25 207 92 218 14.5% 1.09 (0.58, 1.57] Hu2020 2 25 207 92 218 14.5% 1.09 (0.58, 1.57] Hu2020 2 25 207 92 218 14.5% 1.09 (0.58, 1.57] Hu2020 2 25 207 92 218 14.5% 1.09 (0.58, 1.74] Hu2020 2 25 207 92 218 14.5% 1.09 (0.58, 1.74] Hu2020 126 2.207 92 218 14.5% 1.09 (0.58, 1.74] Hu2020 126 2.207 92 218 14.5% 1.09 (0.58, 1.74] Hu2020 126 2.207 92 28 113 14.5% 1.09 (0.58, 1.74] Hu2020 126 2.207 92 28 113 14.5% 1.09 (0.58, 1.74] Hu2020 126 2.207 92 28 113 14.5% 1.09 (0.58, 1.74] Hu2020 126 2.207 92 28 113 14.5% 1.09 (0.58, 1.7									
Song2021 33 366 61 366 14 36, 0 59 (0 32, 0.78) Voldorates/Pereitol 3 67 6 62 54%, 0 44 (0 5, 1, 38) Voldorates/Pereitol 3 367 6 62 54%, 0 44 (0 5, 1, 38) Voldorates/Pereitol 3 39 727 12.8%, 0 94 (0 5, 1, 35) Total events 218 393 Heterogenety, Tau* = 0.25, Ch* = 20, 8(+ 2 / 0 + 0.001); # = 78% Test for vorail effect 2 = 0.49 (P = 0.62) Test for suborous differences: Not acoil cable Embry 0 stage Study or suborous differences: Not acoil cable Study or suborous differences: Not acoil cable Embry 0 stage Study or suborous differences: Not acoil cable Embry 0 stage Study or suborous differences: Not acoil cable Study or suborous differences: Chr = 0.006, r = 75% Test for suborous differences: Chr = 0.006, r = 0.0006); # = 75% Test for suborous differences: Chr = 0.006, dr = 1 (P = 0.70); # 0 dds Ratio Study or suborous differences: Chr = 0.006, r = 0.0006; F = 75% Test for suborous differences: Chr = 0.006, dr = 1 (P = 0.70); # 0 dds Ratio Study or suborous differences: Chr = 0.006; H = 0.006; F = 75% Test for suborous differences: Chr = 0.006, dr = 1 (P = 0.70); # 0 dds Ratio Study or suborous differences: Chr = 0.006; H = 0.006; F = 75% Test for suborous differences: Chr = 0.006; H = 0.000; F = 75% Test for suborous differences: Chr = 0.006; H = 0.000; F = 75% Test for suborous differences:									
$\begin{aligned} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c}$	Song2021	33	366	61	366	14.0%	0.50 [0.32, 0.78]	·	
Subtoal (6% C) 2414 4170 100.0% 0.90 [0.60, 1.35] Heterogeneik, Tau ² = 0.25 (Ch ² = 32.19, df = 7 ($P < 0.001$), $P = 78\%$ Total events 216 393 Heterogeneik, Tau ² = 0.25 (Ch ² = 32.19, df = 7 ($P < 0.001$), $P = 78\%$ Test for overall effect Z = 0.49 ($P = 0.62$) Total events 216 49 ($P = 0.62$) Total events 219, df = 7 ($P < 0.001$), $P = 78\%$ Test for overall effect Z = 0.49 ($P = 0.62$) Experimental Control Odds Ratio Odds Ratio Study or Subarcon Events Total Events Total Weight MH, Random, 95% Cl MH, Random, 95% Cl 33.1 Cleavage Lates 2016 31 263 40 249 14.1% 0.70 04.2, 1.16] Song 2019 41 265 89 155 15.7% 0.91 (10.47, 1.76] Song 2019 41 265 89 155 15.7% 0.91 (10.47, 1.76] Subtoal (95% Ci) 1269 2497 57.7% 0.91 (10.47, 1.76] Subtoal (95% Ci) 1269 2497 57.7% 0.91 (10.47, 1.76] Total events 123 229 Heterogeneity, Tau ² = 0.40, Ch ² = 23.9%, df = 3 ($P < 0.000$); $P = 67\%$ Test for overall effect Z = 0.29 ($P = 0.77$) 3.3.2 Elastolyst Higging 2017 36 635 60 965 15.3% 0.91 (10.59, 1.39] Heterogeneity, Tau ² = 0.40, Ch ² = 23.76, df = 3 ($P < 0.0000$); $P = 67\%$ Test for overall effect Z = 0.24 ($P = 0.81$); $P = 0\%$ Total events 78 Experimediate fET Taile Uncerts Total Weight MH, Random, 95% Cl After freeze-all cycle or fresh ET failure Delayed FET Immediate FET Subto or Subrocu Offerences: Charle 2.04 ($P = 0.07$) Total events 78 Experimediate feet T = 0.24 ($P = 0.81$); $P = 75\%$ Test for overall effect Z = 0.24 ($P = 0.81$); $P = 75\%$ Test for overall effect Z = 0.24 ($P = 0.81$); $P = 75\%$ Test for overall effect Z = 0.24 ($P = 0.81$); $P = 0\%$; $P = 0.0000$; $P = 75\%$ Total events 13 263 180 2041 225\% 113 (0.92, 1.81] 0.5 0.7 1 1.5 2 Delayed FET Immediate FET Odds Ratio MH, Random, 95\% Cl Heterogeneity, Tau ² = 0.06; Ch ² = 0.03; $P = 60\%$ Total events Total Events Total Weight MH, Random, 95\% Cl Heterogeneity, Tau ² = 0.06; Ch ² = 0.03; $P = 60\%$ Total events Total Eve									
Total events 218 393 Heterogenety, Tau" = 0.25; Ch" = 2.19, dfr = 7 ($P < 0.001$); P = 78% Test for overall effect Z = 0.49 ($P = 0.62$) Total events 218 393 Heterogenety, Tau" = 0.25; Ch" = 2.219, dfr = 7 ($P < 0.001$); P = 78% Test for overall effect Z = 0.49 ($P = 0.62$) Test for subarrou filterences: Not acolicable Embryo stage Experimental Control Odds Ratio Stude or Subarrou Events Total Events Total Weight MH, Random, 95% Cl 3.3.1 Clearents Stude or Subarrou Filter Overall effect Z = 0.49 ($P = 0.62$) Test for subarrou filterences: Not acolicable Embryo stage Experimental Control Odds Ratio Stude or Subarrou Filter Overall effect Z = 0.49 ($P = 0.62$) Test for subarrou filterences: Not acolicable Experimental Control Odds Ratio Stude or Subarrou Filter Overall effect Z = 0.49 ($P = 0.62$) Test for subarrou filterences: Not acolicable Experimental Control Odds Ratio Stude of Subarrou Filter Overall effect Z = 0.29 ($P = 0.52$) Total events 123 223 Heterogenety, Tau" = 0.00; Ch" = 2.39, df = 3 ($P < 0.0001$); $P = 87\%$ Total events 123 223 Heterogenety, Tau" = 0.00; Ch" = 2.39, df = 3 ($P < 0.0001$); $P = 87\%$ Total events 78 204 Heterogenety, Tau" = 0.00; Ch" = 2.04 ($P = 0.020$; $P = 0.0\%$ Total events 78 204 Heterogenety, Tau" = 0.02 ($Ch" = 2.04 (P = 0.020$; $P = 0.0\%$ Total events 78 204 Heterogenety, Tau" = 0.02 ($Ch" = 2.02 (P = 0.020$; $P = 0.0\%$ Total events 78 204 Heterogenety, Tau" = 0.02 ($Ch" = 2.02 (P = 0.020$; $P = 0.0\%$ Total events 78 204 Heterogenety, Tau" = 0.02 ($Ch" = 2.02 (P = 0.020$; $P = 0.0\%$ Total events 78 204 Heterogenety, Tau" = 0.02 ($Ch" = 2.02 (P = 0.020$; $P = 0.0\%$ Total events 78 204 Heterogenety, Tau" = 0.02 ($Ch" = 2.02 (P = 0.020$; $P = 0.0\%$ Total events 78 204 Heterogenety, Tau" = 0.02 ($Ch" = 0.020$; $P = 0.030$; $P = 0.0\%$ Total events 76 204 ($P = 0.030$) Total events 76 204 ($P = 0.030$; $P = 0.0\%$, 110, 59, 204 Heterogenety, Tau" = 0.02 ($Ch" = 0.020$; $P = 0.030$; $P = 0.0\%$ Total (PSW Cl) 4359 59 5943 10.000, 1		10							
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considered, which may also be affected by ovarian stimulation, and therefore by FET timing, and should therefore be considered when applying these results to clinical practice.

Conclusion

Overall, FET immediately or subsequently after fresh ET failure or freeze-all policy had no adverse effects on pregnancy outcomes. Due to the limited number of retrospective cohort studies evaluated, selection bias was evident, and the overall quality of the evidence was low. Therefore, delaying FET may unnecessarily delay pregnancy. Clinical decisionmakers can consider patient preferences when selecting an appropriate time for FET after canceling fresh ET and menstruation. However, more future research is needed to confirm this finding.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding authors.

Author contributions

Y-QG: Writing – original draft. J-YS: Conceptualization, Formal analysis, Writing – review & editing. Z-GS: Funding acquisition, Supervision, Writing – review & editing.

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Conflict of interest

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fmed.2023.1335139/ full#supplementary-material

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