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Effect of Intrauterine Autologous Platelet-Rich Plasma on Pregnancy outcomes in Women with Repeated Implantation Failure Undergoing Assisted Reproductive Technology at a Fertility Centre in Sub-Saharan Africa: A Randomized Control Trial.

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ABSTRACT

Background: Repeated Implantation Failure (RIF) is generally defined as the failure to achieve a clinical pregnancy after the transfer of multiple, high-quality embryos across a minimum of three fresh or frozen in vitro fertilization (IVF) cycles. RIF remains a challenging problem in IVF particularly among women who have experienced transfer of embryos (fresh or frozen) considered to have reasonable implantation potential without achieving a pregnancy, **AIM**: This study aimed to determine the impact of intrauterine infusion of platelet-rich plasma (PRP) in improvement of pregnancy outcomes in RIF patients undergoing frozen embryo transfer (FET) **METHODS:** Patients with a history of RIF undergoing FET were assessed for eligibility. A total of 100 eligible patients were recruited and randomized into 2 groups: control group (embryo transfer with standard endometrial preparation with oestradiol and adjuvant therapy other than PRP) and intervention group (embryo transfer with standard endometrial preparation with oestradiol, adjuvant therapy and PRP infusion). The intervention group received an intrauterine infusion of 0.4 ml of PRP on day 7th and day 12th of oestradiol valerate administration and on the day of progesterone supplementation. **RESULTS:** There were no statistically significant differences in socio-demographic variables between the groups. There was statistically significant difference in mean endometrial thickness at embryo transfer between the groups. (8.29 ± 0.87 vs 6.70 ± 0.51). The differences in chemical pregnancy rates (62% vs 30%) and clinical pregnancy rates (48% vs 20%) were statistically significant between the groups. However, the difference in the miscarriage rates were not statistically significant in the groups. There were no side effects recorded. **CONCLUSION:** Our findings demonstrate the effectiveness and safety of intrauterine infusion of PRP in improving pregnancy outcomes in RIF patients undergoing FET.

Keywords: Repeated Implantation Failure, Platelet-rich plasma, Chemical pregnancy rate, Clinical pregnancy rate,

INTRODUCTION

Recurrent implantation failure remains one of the major challenges in the field of reproductive medicine, because it is associated with prolonged physical, emotional, and financial burdens for the patients.[1] RIF is defined as the implantation failure of at least three successive in vitro fertilization (IVF) treatments with good quality embryos.[2] Thus, it is essential to find an effective treatment that can improve pregnancy outcomes.

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Implantation is the critical determinant for the establishment of a successful pregnancy.[3] Implantation requires a receptive endometrium, a viable embryo, and synchronized embryo-endometrium interaction.[3] Despite advances in assisted reproductive technology (ART) that have improved pregnancy rates, implantation failure remained unresolved. Approximately one-third of failures are embryo-related, while impaired endometrial receptivity and deficient embryo-endometrium communication account for the rest.[3]

Although embryo selection and quality have advanced, repeated implantation failure (RIF) due to refractory endometrium persists. Poor endometrial receptivity is now a critical barrier in ART, with the absence of evidence-based therapies underscoring the challenges.[3]

Several methods have been explored to enhance pregnancy rates for women with RIF. These include treatments such as the use of extended oestrogen therapy, exogenous granulocyte-colony stimulating factor (GCSF), intra-uterine human chorionic gonadotropins, low-dose acetylsalicylic acid, vaginal sildenafil, and intra-uterine platelet rich plasma (PRP).[2,4] Undoubtedly, many women with refractory endometrium do not respond to these therapies. However, platelet-rich plasma (PRP) was the most effective among women with 2 or more implantation failures.[5]

PRP is plasma derived from centrifuged whole blood with a platelet concentration above baseline. [6, 7] Intrauterine autologous PRP infusion releases proteins, growth factors (GFs), and cytokines that enhance endometrial proliferation, stimulate angiogenesis, and exert anti-inflammatory effects, thereby promoting implantation. [6] PRP is increasingly investigated due to its advantages as an autologous material, which reduces immune and infectious risks, [8] and its minimally invasive preparation from peripheral blood. [9]

The role of PRP in sub fertile women was first investigated by Chang et al.[10] They found that PRP improved endometrial thickness and pregnancy outcomes. Subsequently, several studies investigated the efficacy of PRP. However, they came with conflicting results. Some studies [11,13] demonstrated that PRP infusion had insignificant effect on clinical pregnancy rate while others [14-16] showed that PRP improved it significantly. Since the studies had inconsistent results, coupled with the fact they were conducted outside the shore of our continent. We seek to determine the impact of intrauterine infusion of platelet-rich Plasma (PRP) on pregnancy outcomes in RIF patients undergoing frozen embryo transfer (FET) in our environment.

MATERIALS AND METHODS

This is a double-blinded randomized controlled interventional study of eligible infertile women with RIF undergoing ART between 1st January 2025 and 30th June, 2026 at Medclev Multispecialist Hospital, Ilorin, Kwara state. The subjects were randomized into the study and control arm using simple randomization through the use of lottery / balloting method. To ensure allocation concealment, opaque envelopes were used. Contained in the opaque envelope were the different allocation groups marked as either study group or Control group. These labelling and concealment were performed by an independent person. The number of these allocations corresponds to the numerical equivalence of the determined sample size per group.

Thus, once a subject is deemed eligible and gives informed consent, she was allocated to a group after balloting. As the eligible subjects were enrolled, each of them balloted from the opaque envelopes bearing the allocations. This was opened to identify the allocation for the participant. This process continued until the required number of participants were recruited. The participants were blinded to the allocation, and the ballots were shuffled after each balloting process.

The control group are patients with RIF who had good quality blastocyst transfer under standard endometrial preparation protocol with oestradiol and with adjuvant therapy (such as aspirin, vitamin C, and vitamin E) other than PRP. While the intervention group are patients with RIF who had the embryo transfer performed under the same standard endometrial preparation with oestradiol

preparation protocol, adjuvant therapy, and intrauterine PRP infusion on menstrual day 7, 12, and on the day of commencement of progesterone for luteal phase support. Endometrial thickness was measured at its thickest part in the longitudinal axis of the uterus with an ultrasound transvaginal probe of 5 to 9 MHz (Sonoscape S11 Plus, Guangdong, China).

Long- agonist stimulation protocol was adopted in this study. All sperm preparation was by Density gradient centrifugation and insemination was by Intracytoplasmic Sperm Injection (ICSI) of frozen thaw quality eggs with the aim of achieving high-quality blastocysts for transfer.

Sample Size Determination [17]

$$n = \frac{(Z\alpha+Z\beta)2\,(\sigma12+\sigma02)}{(\mu1-\mu0)2}$$

n= Minimum sample size per group

Zβ = Standard normal deviate corresponding to the probability β at power of 80%, Z= 0.84

Zα = Standard normal deviate corresponding to the probability α at 95% confidence level= 1.96

σ1= Standard deviation of mean endometrial thickness after PRP in the study group=0.64

σ0= Standard deviation of mean endometrial thickness in the control group (No PRP) = 0.27

μ1= Mean endometrial thickness after PRP in the study group= 8.67

μ0= Mean endometrial thickness in the control group (No PRP) = 8.04

n= (1.96+0.84)2 (0.64+0.27)

(8.67-8.04)2

= 7.84 x 0.91 = 7.1344 ÷ 0.3969

n= 17.97

n= 20 (approximately)

Attrition:

For the purpose of attrition, 10% rate will be used:

Attrition= n/0.9= 20/0.9= 22.2

However, 25 subjects will be recruited per arm of the study.

The minimum sample size for the study will be 50 subjects for both the study and control groups. However, in order to improve the power of this study, the sample size of 100 subjects will be used for both study and control groups.

Endometrial preparation

On the second day of the menstrual cycle after a transvaginal ultrasound evaluation and precervical assessment (dummy transfer), patients commenced 4 mg dose of oestradiol valerate (OESTRAFERT® 2mg, West-Coast, Pharmaceutical Works; Gujurat; India) three times daily. After 7 days, another ultrasound evaluation for the endometrial thickness was carried out. The first uterine PRP infusion was performed under ultrasound guidance on the 7th day of endometrial preparation. After 2–3 days, the endometrial thickness was evaluated. The second PRP intrauterine infusion was performed on the 12th day of oestradiol valerate administration, and the third PRP infusion was performed on the day of progesterone supplementation.

On the day of progesterone supplementation, the level of progesterone was expected to be less than 1 ng/mL The progesterone dosage was 800 mg daily intravaginal administration (UNOPROG® 200mg, Akums Drugs and Pharmaceutical Ltd, Ranipur; India) and 10mg oral daily (DUPHASTON® 10mg, Abbott Laboratories; Netherland). On the day of embryo transfer, the progesterone level was checked and a value over 8 ng/mL was adjudged adequate. The embryo transfer was performed under ultrasound guidance (trans-abdominally) with a WALLACE® SURE PRO® Cooper Surgical, San Ramon, California, USA.

After 14 days of embryo transfer, beta human chorionic gonadotropin (HCG) was identified in maternal serum for confirmation of chemical pregnancy and the medications was continued and transvaginal ultrasound scan was carried out 2 weeks later for clinical pregnancy confirmation.

PRP Preparation

Twenty (20) ml of venous blood was drawn from all the

patients enrolled in the study and blood was divided equally into four test tubes for PRP preparation. These test tubes were pre-treated with 0.5 ml of Sodium Acetate as the anticoagulant. Blood was mixed well and kept in a centrifuge machine. The samples were then be centrifuged at 1200 rpm for 12 minutes. [18] Following the centrifugation, the buffy coat and the plasma (supernatant) were taken off the test tubes and added to a single test tube followed by another centrifugation of 2500 rpm for 15 minutes. The supernatant was discarded, and only 0.4 ml of plasma platelet pellet was kept. The plasma was activated by adding 0.02 mL/mL of calcium chloride. The activated plasma was incubated at 37^0 C for 20-40 min before administration into the uterus. [18]

PRP Intrauterine Infusion

Patients were asked to drink water to make the bladder partially full, under all aseptic precautions in lithotomy position, per speculum examination was done to see the direction of the cervix and then the external os was cleansed with a normal saline swab. An insulin syringe containing 0.1 ml of air was attached to an IUI catheter before 0.4 ml of PRP solution was drawn into the syringe. Under Trans-abdominal 2D ultrasound guidance IUI catheter was introduced just beyond internal os and instillation of PRP was done. Ultrasound guidance was used to avoid wrong passage, inadvertent damage to the endometrial lining, and accidental touching of the fundus of the uterus. After instillation patients was asked to remain on the table for 10 minutes.

Data analysis

Statistical analysis was performed using SPSS software (version 26.0). Continuous variables will be tested for normality using the Shapiro–Wilk test. Normally distributed data will be expressed as mean ± standard deviation ($\bar{x} \pm s$) and compared between groups using the independent samples t-test. Non-normally distributed data will be expressed as median (interquartile range, IQR; P25, P75) and compared using the Mann–Whitney U test. Categorical data will be expressed as frequency [percentage, n (%)] and analyzed using the Chi-square test or Fisher's exact test. A P-value < 0.05 will be considered statistically significant.

Ethical approval was obtained from the Institutional Review Board of the Kwara State Ministry of Health, Ilorin.

RESULTS

A total of 100 patients were recruited for the study after meeting the designated inclusion and exclusion criteria. The patients' ages ranged between 18 and 45 years, with most (56%) falling within the 35-45 years age group. The median age for both groups was 36.81 ± 8.52 years. Less than half (43%) have a BMI of 30 and above. Their mean duration of infertility was = 8.35 ± 4.32 years, with most (65%) falling within 1-9 years. Also, less than one-third (31%) belong to the lower social class. More than half (53%) of the spouses of the patients have normozoospermia, while 47% have oligozoospermia. Male factor infertility (48%), female factor infertility (34%), and more than one-third (39%) accounted for unexplained infertility, respectively. A positive serum β-HCG (chemical pregnancy) was recorded in 46 (46%), clinical pregnancy in 34 (34%), and spontaneous miscarriage in 12 (12%) of the patients, respectively. Table 1

Table 1: Sociodemographic characteristics and clinical variables

Variable	Frequency (N=100)	Percentage (100%)
Age in years		
18 - 25	7	7
26 - 34	37	37
35 - 45	56	56
Mean ±SD = 36.81±8.52 (20-55)		
BMI		
19.0 - 24.99	23	23
25.0 – 29.99	34	34
≥30.0	43	43
Mean ± SD = 28.96±5.48 (19-42)		
Socio-economic status		
Lower	31	31
Middle	43	43
Upper	26	26
Duration Infertility		
1 - 9	65	65
10 - 19	33	33
20 - 29	2	2
Mean ± SD = 8.35 ±4.32 (2 - 20)		
BHCG positive		
No	54	54
Yes	46	46
Semen analysis		
Normozoospermia	53	53
Oligozoo spermia	47	47
Male factor		
No	52	52
Yes	48	48
Female factor		
No	66	66
Yes	34	34
Unexplained		
No	61	61
Yes	39	39
Clinical Pregnancy		
No	66	66
Yes	34	34
Spontaneous miscarriage		
No	88	88
Yes	1 2	1 2

Table 2 shows the relationship between the socio-demographic characteristics of the study and the control groups. Four (8%) patients from the study group fall within the age range of 18-25, 19 (38%) 26-34 years, while 27 (54%) fall within the age range of 35- 45 years. On the contrary, 3 (6%) from the control group fall within the age range of 18-25, 18 (36%) 26-34, and 29 (58%) 35-45 years, respectively; the age differences were not statistically significant between the two groups (p=0.0906). Also, less than one-third of the patients' BMI in the study group and control group fall within the age range of 18-25 years. The difference in BMI was not statistically significant between the two groups (p=0.967). Similarly, the differences in social class and duration of infertility were not statistically significant in both arms of the study groups (p= 0.167 and 0.814, respectively).

Table 2: Sociodemographic Characteristics of Participants

Variables	Group			χ^2	p-value
	Study	Control	Total		
	n=50(100%)	n=50(100%)	N=100(%)		
Age				0.241	*0.906
18 - 25	04 (08.00)	03 (06.00)	07 (07.00)		
26 -34	19 (38.00)	18 (36.00)	37 (37.00)		
35 -45	27 (54.00)	29 (58.00)	56 (56.00)		
Mean ±SD					
BMI				0.067	0.967
19.0 - 24.99	11 (22.00)	12 (24,00)	23 (23.00)		
25.0 – 29.99	17 (34.00)	17 (34.00)	34 (34.00)		
≥30.0	22 (44.00)	21 (42.00)	43 (43.00)		
Mean ±SD					
Socio -economic status				3.559	0.169
Upper	14 (28.00)	17 (34.00)	31 (31.00)		
Middle	26 (52.00)	17 (34.00)	43 (43.00)		
Lower	10 (20.00)	16 (32.00)	26 (26.00)		
Duration of Infertility				0.411	0.814
1-9	34 (68.00)	31 (62.00)	65 (65.00)		
10-19	15 (30.00)	18 (36.00)	33 (33.00)		
20-29	01 (02.00)	01 (02.00)	02 (02.00)		
Mean+SD					

Twenty-seven (54%) in the study group have normozoospermia, twenty-six (52%) in the control group have normozoospermia, while 23 (46%) in the study and 24 (48%) in the control group have oligozoospermia. The difference in the semen parameters between the two groups was not statistically significant. Correspondingly, there was no significant difference in male factor, female factor, unexplained infertility, and spontaneous miscarriage between the two groups (p> 0.05). Table 3.

Table 3: Male and female factor infertility among the participants

Variables	Group			χ^2	p-value
	Study	Control	Total		
	n=50(100%)	n=50(100%)	N=100(%)		
Semen				0.040	0.841
Normozoospermia	27 (54.00)	26 (52.00)	53 (53.00)		
Oligo zoo spermia	23 (46.00)	24 (48.00)	47 (47.00)		
Unexp lained				0.042	0.838
No	30 (60.00)	31 (62.00)	61 (61.00)		
Yes	20 (40.00)	19 (38.00)	39 (39.00)		
Male factor				0.000	1.000
No	26 (52.00)	26 (52.00)	52 (52.00)		
Yes	24 (48.00)	24 (48.00)	48 (48.00)		
Female factor				0.178	0.673
No	34 (68.00)	32 (64.00)	66 (66.00)		
Yes	16 (32.00)	18 (36.00)	34 (34.00)		
Spontaneous miscarriage				0.000	1.000
No	43 (86.00)	45 (90.00)	88 (88.00)		
Yes	07 (14.00)	05 (10.00)	12 (12.00)		

The comparison of biochemical variables of the groups is shown in Table 4. The serum progesterone at commencement of progesterone were with normal range for both groups, likewise serum progesterone and serum prolactin at embryo transfer. However, the differences were not statistically significant between the two groups (p>0.05).

Table 4: Biochemical Parameters of Study Participants

Variables	Group			χ^2	p-value
	Study n=50(100%)	Control n=50(100%)	Total N=100(%)		
Serum Progesterone at Commencement of Progesterone (PATP)					
0-0.4				1.084	0.298
0.5-0.9	11 (22.00)	07 (14.00)	18 (18.00)		
Mean±SD	39 (78.00)	43 (86.00)	82 (82.00)		
Serum Progesterone at Embryo Transfer (PATET)				4.345	*0.227
1-4	-	-	-		
5-9	07 (14.00)	04 (08.00)	11 (11.00)		
10-14	25 (50.00)	32 (64.00)	57 (57.00)		
15-19	13 (26.00)	13 (26.00)	26 (26.00)		
20-25	05 (10.00)	01 (02.00)	06 (06.00)		
Mean+SD					
Serum Prolactin at Embryo transfer (PRATET)				4.085	*0.398
1-4	06 (12.00)	12 (24.00)	18 (18.00)		
5-9	14 (28.00)	14 (28.00)	28 (28.00)		
10-14	16 (32.00)	10 (20.00)	26 (26.00)		
15-19	09 (18.00)	11 (22.00)	20 (20.00)		
20-24	05 (10.00)	03 (06.00)	08 (08.00)		
Mean±SD	-	-	-		

The mean differences between the ages, BMI, duration of infertility, number of embryos transferred, serum progesterone at commencement of progesterone, serum prolactin at embryo transfer, and serum progesterone at embryo transfer were not statistically significant between the two groups (Table 5).

Table 5: The Mean of Variables between study and control groups

Mean of Variables	Group			test	p-value
	Study n=50(100%)	Control n=50(100%)	Total N=100(%)		
Age	36.80±8.71	36.82±8.41	36.81±8.52	-0.012	0.991
BMI	29.22±5.69	28.70±5.30	28.96±5.48	0.473	0.637
Duration of infertility	8.10±4.31	8.60±4.36	8.35±4.32	-0.577	0.566
EMBB - No of Embryo transfer	3.50±0.51	3.52±0.50	3.510±0.50	-0.198	0.843
END PRO - Endometrial thickness after PRP use	8.29±0.87	6.70±0.51	7.496±1.06	11.179	**0.000**
PRATET - Serum Prolactin at embryo transfer	11.16±5.32	9.94±6.09	10.55±5.72	1.067	0.289
PATP - Serum progesterone at commencement of progest	0.48±0.19	0.51±0.19	0.49±0.19	-0.885	0.379
P AT ET - Serum progesterone at Embryo transfer	13.46±3.50	13±2.76	13.23±3.15	0.729	0.468

The positive serum β-HCG (chemical pregnancy) was in 31(62%), and negative serum β-HCG in 19 (38%), and positive serum β-HCG of 15 (30%) and negative serum β-HCG of 35 (70%) were obtained in the study and control group, respectively. However, the difference was statistically significant (p=0.001). The clinical pregnancy rate in the study group was 24 (48%), while the rate was 10 (20%) in the control group. The difference in clinical pregnancy rate was statistically significant between the groups (p=0.003). On the other hand, the miscarriage rate per chemical pregnancy of 7 (22.6%) in the study group and 5 (33.3%) in the control group. The difference was not statistically significant (p= 1.00). Table 6.

Table 6: Comparison of Pregnancy Outcomes between the Groups of Study Participants

Variables	Group			χ^2	p-value
	Study n=50(100%)	Control n=50(100%)	Total N=100(%)		
Serum β -hCG (Chemical Pregnancy)					
Negative	19 (38.00)	35 (70.00)	54 (54.00)	10.31	**0.001**
Positive	31 (62.00)	15 (30.00)	46 (46.00)		
Clinical Pregnancy					
No	26 (52.00)	40 (80.00)	66 (66.00)	8.734	**0.003**
Yes	24 (**48.** 00)	10 (**20.** 00)	34 (**34** .00)		
Miscarriage					
No	43 (86.00)	45 (90.00)	88 (88.00)	0.000	1.000
Yes	07 (14.00)	05 (10.00)	12 (12.00)		
Clinical pregnancy rate/transfer cycle	24/50 *100 = 48%	10/50*100=20%	34/100*100=34%		
Miscarriage rate/clinical pregnancy	7/24 *100=2 9.2%	5/10*100=50%	12/34*100= 35.3%		
Miscarriage rate /chemical pregnancy	7/31 *100= 22.6%	5/15*100=33.3%	12/46*100=26.1%		

DISCUSSION

PRP is an autologous blood plasma enriched with four- to fivefold higher levels of platelets than those in circulating blood. PRP stimulates proliferation and regeneration through a large quantity of growth factors and cytokines, including PDGF, TGF, VEGF, EGF, fibroblast growth factor (FGF), insulin-like growth factor I and II (IGF I, II), interleukin 8 (IL-8), and connective tissue growth factor (CTGF). [19-25] This study aims to determine the impact of PRP intrauterine infusion on pregnancy outcomes among patients with RIF.

The median age of the study participants was 36.81 ± 8.52 years. This is slightly lower than the 38.4 years and 38.23 ± 4.42 years reported by Kim et al. [26] and Huniadi et al [27] respectively, but higher than the 33.4 ± 5.7 years reported in a similar study.[17] This, however, resulted from varied sample sizes across these studies. Also, the mean BMI of 28.96 ± 5.48 kg/m^2 and the duration of infertility of 8.35 ± 4.32 years obtained in this study are closely related to 26.3 ± 3.6 kg/m^2,[57] but higher than the 5.7 years, [26] and 5.8 ± 2.7 years [27] documented in previous studies. [17,26,27] This could be due to differences in sample size and study methodologies.

Our findings revealed no statistically significant differences in age, BMI, duration of infertility, causes of infertility, semen parameters, or social class between the study and control groups. This aligns with results from Yazd, Iran, [28], and Tehran, Iran,[29,] respectively. This underscores our due diligence in patient recruitment for this study, aimed at eliminating confounding variables, ensuring group equivalence, and improving the internal validity of the research.

Similarly, there were no statistically significant differences in biochemical parameters between the two groups, namely: serum progesterone at the start of progesterone supplementation for luteal phase support, serum progesterone, and prolactin at embryo transfer. Ideally, serum progesterone should be below 1ng/ml at the start of progesterone supplementation in IVF and above 8ng/ml at embryo transfer, with normal serum prolactin (2-25ng/ml) for successful outcomes.[27] This was replicated in this study. This was imperative to further eliminate confounding variables that might impact the validity of this study.

In this study, the mean number of embryo transfers was 3.51 ± 0.5, and there was no statistically significant difference in the number of embryo transfers between the groups. This aligns with the methodology of Eftekhar et al. [28] and Nazari et al. [17] This approach aims to remove embryo number as a confounding variable that might affect the validity of our results, given the limited sample size used in this study.

The chemical pregnancy (positive serum β hCG) rate in this study was 31/50 (62%) for the study group and 15/50 (30%) for the control group. This is closely related to 14/40 (42.4%) vs 14/40 (35%), 12/40 (40%) vs 10/40 (33.3%) for the study and the control group reported in

previous studies,[17,28] but comparable to 12/24 (50%) documented for the study group in another related study. [30] The differences between the chemical pregnancy rate in the study group and the control group were found to be statistically significant in all the studies.[17,28] This agrees with the finding from this study.

Furthermore, the clinical pregnancy rate in our series for the study group was 24/50 (48%), while the rate was 10 (20%) in the control group. This is similar to the findings of Nazari et al[17] and Zamaniyan et al[31] that reported the clinical pregnancy rates of 44.9% vs 16.7% and 48.3% vs 23.3% in the study group and the control group. The differences between the clinical pregnancy rate in the study group and the control were found to be statistically significant in this study. This has been documented in earlier studies. [17,31] In contrast, Ershadi et al. and Tehraninejad et al reported no significant differences between PRP and control groups in biochemical, clinical, or ongoing pregnancy rates. [11,13]

Also, the miscarriage rate per clinical pregnancy of 7/24 (29.2%) in the study group and 5/10 (50%) in the control group is far higher than 9% vs 6% and 6.3% vs 17.6% reported by Eftekhar et al [28] and Yahyaei et al. [32], respectively. The differences might be due to variations in patient selection protocols and sample sizes used in these studies.

In this study, we recorded two (2) triplets and five (5) twins gestational sacs from the study group and five (5) twins gestational sacs from the control group. The difference in multiple gestational sacs development was not statistically significant between the groups. On the contrary the difference was found to be statistically significant in a similar study. [33] Platelet-rich plasma (PRP) therapy does not directly cause or specifically target multiple gestations; multiple gestations typically result from transferring more than one embryo in assisted reproduction technology. In this study, the mean number of embryo transfers was 3.51 ± 0.5, and there was no statistically significant difference in the number of embryo transfers between the groups.

There were no adverse side effects recorded among the participants in the study group who received intrauterine PRP. This finding conforms with the findings of Zhu et. al [34] and Kim et. al [26] that reported no adverse side effects in women who received PRP in their series. Our aseptic technique on PRP preparation could be responsible for this finding, more so. PRP is an autologous product from the patient's own blood, least immunogenic. On the contrary, Liu et al [35] documented fewer side effects in their series, namely, vaginal bleeding, lower abdominal pain, fever, and allergy.

Limitation and Recommendation: The study being a single centered limit its generalization, hence a multicentered study is suggested to improve the strength of this study.

Conclusion: Intrauterine infusion of PRP showed significant improvements in chemical and clinical pregnancy rates in patients with RIF in assisted reproduction. However, more research with larger sample sizes and comprehensive data on pregnancy outcomes is needed to draw definitive conclusions about the effectiveness of PRP in assisted reproduction.

REFERENCES

1. Bakhsh AS, Maleki N, Sadeghi MR, SadeghiTabar A, Tavakoli M, Zafardoust S. et., al. Effects of Autologous Platelet-Rich Plasma in women with repeated implantation failure undergoing assisted reproduction. JBRA Assist Reprod. 2022. 17; 26 (1): 84-87.
2. Shalma NM, Salamah HM, Alsawareah A, Shaarawy AS, Mohamed MR, Manirambona E, et al. The efficacy of intrauterine infusion of platelet rich plasma in women undergoing assisted reproduction: a systematic review and meta-analysis. BMC Pregnancy Childbirth. 2023. 8; 23 (1): 843.
3. Craciunas L, Gallos I, Chu J, Bourne T, Quenby S, Brosens JJ et al. Conventional and modern markers of endometrial receptivity: a systematic review and meta-analysis. Hum Reprod Update. 2019; 1;25(2):202-223.
4. Chatterjee P, Ghosh S, Mahajan S. Evaluating the Effectiveness of Platelet Rich Plasma Therapy in Enhancing Endometrial Receptivity for Women with Infertility: A Narrative Review. J Pharm

Bioallied Sci. 2025;17(Suppl 1):S137-S140.

5. Jin XH, Li Y, Li D. Intrauterine interventions for women with two or more implantation failures: A systematic review and network meta-analysis. Front Endocrinol. 2022;13:959121.
6. Bos-Mikich A, de Oliveira R, Frantz N. Platelet-rich plasma therapy and reproductive medicine. J Assist Reprod Genet. 2018 May;35(5):753-756.
7. Bos-Mikich A, Ferreira MO, de Oliveira R, Frantz N. Platelet-rich plasma or blood-derived products to improve endometrial receptivity? J Assist Reprod Genet. 2019 Apr;36(4):613-620.
8. Marques LF, Stessuk T, Camargo IC, Sabeh Junior N, dos Santos L, Ribeiro-Paes JT. Platelet-rich plasma (PRP): methodological aspects and clinical applications. Platelets. 2015;26(2):101-13.
9. Kim JH, Park M, Paek JY, Lee WS, Song H, Lyu SW. Intrauterine Infusion of Human Platelet-Rich Plasma Improves Endometrial Regeneration and Pregnancy Outcomes in a Murine Model of Asherman's Syndrome. Front Physiol. 2020 Feb 14;11:105.
10. Chang Y, Li J, Chen Y, Wei L, Yang X, Shi Y, et al. Autologous platelet-rich plasma promotes endometrial growth and improves pregnancy outcome during in vitro fertilization. Int J Clin Exp Med. 2015;8(1):1286–1290
11. Ershadi S, Noori N, Dashipoor A, Ghasemi M, Shamsa N. Evaluation of the effect of intrauterine injection of platelet-rich plasma on the pregnancy rate of patients with a history of implantation failure in the in vitro fertilization cycle. J Family Med Prim Care. 2022;11(5):2162–2166
12. Allahveisi A, Seyedoshohadaei F, Rezaei M, Bazrafshan N, Rahimi K. The effect of platelet-rich plasma on the achievement of pregnancy during frozen embryo transfer in women with a history of failed implantation. Heliyon. 2020;6(3):e03577.
13. Tehraninejad ES, Kashani NG, Hosseini A, Tarafdari A. Autologous platelet-rich plasma infusion does not improve pregnancy outcomes in frozen embryo transfer cycles in women with history of repeated implantation failure without thin endometrium. J Obstet Gynaecol Res. 2021;47(1):147-151.
14. Nazari L, Salehpour S, Hosseini S, Sheibani S, Hosseinirad H. The Effects of Autologous Platelet-Rich Plasma on Pregnancy Outcomes in Repeated Implantation Failure Patients Undergoing Frozen Embryo Transfer: a Randomized Controlled Trial. Reprod Sci. 2021 ;(3):993–1000.
15. HA Coksuer Y, Barut M. Improved in vitro fertilization success and pregnancy outcome with autologous platelet-rich plasma treatment in unexplained infertility patients that had repeated implantation failure history. Gynecol Endocrinol. 2019;35(9):815–8.
16. Zamaniyan MP S, Heidaryan Gorji H, Moradi S, Jamal J, Yahya Poor Aghmashhadi J, H et al. Effect of platelet-rich plasma on pregnancy outcomes in infertile women with recurrent implantation failure: a randomized controlled trial. Gynecol Endocrinol. 2021;37(2):141–5
17. Nazari L, Salehpour S, Hoseini S, Zadehmodarres S, Ajori L. Effects of autologous platelet-rich plasma on implantation and pregnancy in repeated implantation failure: A pilot study. Int J Reprod Biomed. 2016; (10):625-628.
18. Desai K, Desai F, Sharma H, Bambhaniya H, Sharma S. Effect of intrauterine instillation of autologous platelet-rich plasma on endometrial thickness and pregnancy outcome. Indian J Obstet Gynecol Res. 2023; 10 (1): 36-41.
19. Dohan Ehrenfest DM, Rasmusson L, Albrektsson T. Classification of platelet concentrates: from pure platelet-rich plasma (P-PRP) to leucocyte- and platelet-rich fibrin (L-PRF). Trends Biotechnol. 2009; (3):158-67.
20. DeLong JM, Russell RP, Mazzocca AD. Platelet-rich plasma: the PAW classification system. Arthroscopy. 2012;(7):998-1009.
21. Lin Y, Qi J, Sun Y. Platelet-Rich Plasma as a

Potential New Strategy in the Endometrium Treatment in Assisted Reproductive Technology. Front Endocrinol (Lausanne). 2021;12:707584.

22. Maleki-Hajiagha A, Razavi M, Rouholamin S, Rezaeinejad M, Maroufizadeh S, Sepidarkish M. Intrauterine infusion of autologous platelet-rich plasma in women undergoing assisted reproduction: A systematic review and meta-analysis. J Reprod Immunol. 2020; 137:103078.
23. Aghajanova L, Houshdaran S, Balayan S, Manvelyan E, Irwin JC, Huddleston HG, Giudice LC. In vitro evidence that platelet-rich plasma stimulates cellular processes involved in endometrial regeneration. J Assist Reprod Genet. 2018; 35(5):757-770.
24. Marini MG, Perrini C, Esposti P, Corradetti B, Bizzaro D, Riccaboni P, et al. Effects of platelet-rich plasma in a model of bovine endometrial inflammation in vitro. Reprod Biol Endocrinol. 2016; 14(1):58.
25. de Miguel-Gómez L, López-Martínez S, Campo H, Francés-Herrero E, Faus A, Díaz A, Pellicer A, Domínguez F, Cervelló I. Comparison of different sources of platelet-rich plasma as treatment option for infertility-causing endometrial pathologies. Fertil Steril. 2021; 115(2):490-500.
26. Kim H, Shin JE, Koo HS, Kwon H, Choi DH, Kim JH. Effect of Autologous Platelet-Rich Plasma Treatment on Refractory Thin Endometrium During the Frozen Embryo Transfer Cycle: A Pilot Study. Front Endocrinol (Lausanne). 2019; 10:61.
27. Huniadi A, Zaha IA, Naghi P, Stefan L, Sachelarie L, Bodog A, Szuhai-Bimbo E, Macovei C, Sandor M. Autologous Platelet-Rich Plasma (PRP) Efficacy on Endometrial Thickness and Infertility: A Single-Centre Experience from Romania. Medicina (Kaunas). 2023; 59(9):1532.
28. Eftekhar M, Neghab N, Naghshineh E, Khani P. Can autologous platelet rich plasma expand endometrial thickness and improve pregnancy rate during frozen-thawed embryo transfer cycle? A randomized clinical trial. Taiwan J Obstet Gynecol. 2018; 57(6):810-813.
29. Nazari L, Salehpour S, Hoseini S, Zadehmodarres S, Azargashb E. Effects of autologous platelet-rich plasma on endometrial expansion in patients undergoing frozen-thawed embryo transfer: A double-blind RCT. Int J Reprod Biomed. 2019 29;17(6):443-448.
30. Agarwal M, Mettler L, Jain S, Meshram S, Günther V, Alkatout I. Management of a Thin Endometrium by Hysteroscopic Instillation of Platelet-Rich Plasma Into The Endomyometrial Junction: A Pilot Study. J Clin Med. 2020 30;9(9):2795.
31. Zamaniyan M, Peyvandi S, Heidaryan Gorji H, Moradi S, Jamal J, Yahya Poor Aghmashhadi F, Hossein Mohammadi M. Effect of platelet-rich plasma on pregnancy outcomes in infertile women with recurrent implantation failure: a randomized controlled trial. Gynecol Endocrinol. 2021; 37(2):141-145.
32. Yahyaei A, Madani T, Vesali S, Mashayekhi M. Intrauterine infusion of autologous platelet rich plasma can be an efficient treatment for patients with unexplained recurrent implantation failure. Sci Rep. 2024;14(1):26009.
33. Soliman A, Elsonbaty S, Saleh Y, Hegazy D, Faragallah HM. How autologous platelet-rich plasma affects pregnancy and birth outcomes in women with repeated embryo implantation failure: A prisma-compliant meta-analysis. Turk J Obstet Gynecol. 2023; 20(2):154-163. d
34. Zhu X, Deng X, Li L, Zhao X, Guo Y. Intrauterine platelet-rich plasma infusion with hormone replacement therapy improves menstrual and pregnancy outcomes in thin endometrium patients undergoing frozen-thawed embryo transfer. Gynecol Endocrinol. 2026; 42(1):2610084.
35. Liu, Xiao-Hui & He, Li-Xia & Li, Man & Tian, Zheng-Ping & Qin, An-Qi & Yao, Jun. Effects of autologous platelet-rich plasma intrauterine perfusion on clinical outcomes in recurrent implantation failure patients with non-thin endometrium undergoing frozen-thawed embryo transfer. Archives of Gynecology and Obstetrics. 2025; 311. 1423-1433.