Review article

Contribution of platelet-rich plasma therapy in reproductive health science: A narrative review

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ABSTRACT

Platelet-rich plasma therapy, also truncated as PRP, has been remarkably utilized for quite long in the domains of cardiovascular surgery, orthopaedic treatments, sports medicines etc. Being in the limelight for its remarkable wound healing and cell proliferating activities, it has caught the interest of researchers in the field of reproductive sciences. The chief domain of research has revolved around thin endometrial lining, diminished ovarian content, recurrent implantation failure ailments etc. This article has focused on reviewing existing articles till now on the aetiology of PRP along with methodologies and results in reproductive aberrational conditions. Restrictive research is conducted from Scopus and Web of Science indexed journals, PubMed focusing on the deployment of PRP in infertility science and categorized the result under 3 genres: PRP in refractory attenuated endometrium, PRP in female gonadal abnormalities and PRP in Asherman's syndrome. Most literature has shown promising results in improvement of thin endometrium, along with increase in AMH (Anti-Mullerian Hormone) level along with decrement of FSH (Follicle Stimulating Hormone) level, thereby improving ovarian reserve. It also showed reduced adhesion in the uterus after hysteroscopy, along with improvement in the menstrual cycle in case of Asherman's syndrome, thereby increasing chances of clinical pregnancy. However, lack of standardized protocol is a major con in variation of results. Thus, until conclusive RCTs with larger sample size are conducted, PRP should be restricted to the experimental stage for now.

Keywords: Thin endometrium; Asherman's syndrome; diminished ovarian reserve; FSH; clinical pregnancy.

INTRODUCTION

Infertility, as per WHO, is elucidated as the incompetence of a couple to culminate their genes into offspring despite repetitive sexual encounters. It has been estimated that one in every four couples contributes to the total infertility rate around the globe (1). The majority of the researchers have pointed out that the failure of a couple to lead to a healthy conceptus lies in the procedure of implantation. It has been evidenced that despite the advancement in the field of ART, 70 to 80% of the assisted transferred embryos are not proficient enough to culminate into healthy conception due to failure in implantation (2). Uterine receptivity, endometrial thickness, endometrial vascularity and embryo quality play a determining part in the triumph of the implantation of embryos. Among all the determining factors, it has been reportedly found that endometrial thickness plays the first line of determining factors for resulting in healthy implantation (2). Most researchers have predicted that an endometrial thickness of more than 7 mm is necessary for successful installation of embryos. Hence, to combat the suboptimal thickness of endometrium that has caused hindrance positive pregnancy outcomes, several studies have started experiments on the same. Several different methodologies are being used to improve the chances of conceptus through positive implantation, like elevated estrogen therapy, stem cell therapy, alpha-tocopherol etc., but most of the experiments have failed to produce the expected results in thin or damaged endometrial patients (3).

Platelet-rich plasma therapy, also abbreviated to PRP, owing to being in the limelight for its remarkable angiogenic, mitogenic and chemotactic effects, caught the eyes of reproductive medicine researchers and, thus, started experiments on various parameters of reproductive science and analysing results of it (3, 4). Major studies have suggested that utilisation of PRP has led to a favourable outcome in pregnancy rate in women with different implantation abnormalities. This article has been written with the purpose of reviewing the prevailing literature and the intent to impart a broad overview of the advancement that has been done to date upon the employment of platelet-rich plasma in women with embryo installation failure due to uterine and ovarian aberrations.

METHODS

This narrative review has been composed based on literature search on electronic bibliographies such as PubMed, MEDLINE, Google Scholar, Scopus, Web of Science etc., with emphasis on the use of PRP in progenitive science without publication date restraints. The search words that were used either individually or in combinations to scan for articles were "PRP in IVF", "PRP extraction", "PRP for thin endometrium", "PRP for endometrial vascularity", "PRP in

reproductive science", "PRP in Asherman's Syndrome", "PRP in diminished ovarian insufficiency", "PCOS", "Endometritis", "Tuberculosis". The abstract of the article has also been used for screening pertinent literature, and ineligible articles were eliminated.

Definition

PRP is explicated as an autologous blood product which comprises a snippet of plasma along with an elevated concentration of platelets 3 to 5 times more than the normal baseline in human blood. It is also enriched in different growth factors, chemokines (D40L,CD40 ligand (CD154); RANTES, MIP-1α, 1α; interleukin-8, platelet factor 4), cytokines and other plasma proteins (5,6). It is basically formulated from fresh whole blood withdrawn from the peripheral blood vessels of patients and subjected to double centrifugation. Based on the method of centrifugation, many researchers have attempted to classify platelet-rich plasma. Enherfest *et al.,* (Table 1) derived a classification system on the basis of 2 factors: cellular component with a main focus on leukocytes and fibrin content. Based on these factors, PRP could be grouped under 4 disparate types. A combination of the absence of leukocytes along with the presence of low-density fibrin content is termed as Pure PRP, abbreviated as P-PRP. The second variety contains a combination of a higher congregation of leucocytes along with platelets accompanied by a low-density fibrin network. This is termed as Leukocyte-rich PRP (LR-PRP). The third category is termed as Pure platelet-rich fibrin (P-PRF). It is mainly a composition of high-density fibrin substance only and is free of white blood cells. The last category is known as Leukocyte-rich and Platelet-rich Fibrin (LR-PRF). It is basically a combination of higher concentrations of leukocytes and platelets along with an increased concentration of high-density fibrin content (7).

Table 1: Gradation of PRP

Classification of Platelet-rich Plasma	Presence of White Blood Cells (WBC)	Fibrin Texture Quality
P-PRP	No	LD
LR-PRP	Yes	LD
P-PRF	No	HD
LR-PRF	Yes	HD

P-PRP: Pure Platelet-rich Plasma; LR-PRP: Leucocytes-rich and Platelet-rich Plasma; P-PRF: Pure Platelet-rich Fibrin; LR-PRF: Leucocytes-rich and Platelet-rich Fibrin; LD: Low Density; HD: High Density.

Mechanism of action

The main actionable product in PRP is platelets. Platelets are made up of 3 granules: α, δ and λ, out of which α is the most abundant granule found. There are around 50 to 80 granules present per platelet's intracellular matrix. These granules contain membrane-bound protein, which is very heterogeneous and involved in various activities like clotting, cell proliferation, wound healing etc., (8, 9). It also includes 6 main proteins, namely (Table 2):

Table 2: Types of proteins and their functions in platelet granules

Proteins	Functions
PDGF	Angiogenesis, Mitogenesis, Macrophage activation
TGF-β	Prolonged healing, Bone regeneration & modelling, Inflammatory regulation processes
VEGF	Angiogenesis, Vasculogenesis
EGF	Cell growth, proliferation, differentiation
IGF	Cell growth, differentiation, mitogenesis
FGF	Bone cells proliferation, Angiogenesis

PDGF: platelet-derived growth factor; TGF-β: transforming growth factor-β; VEGF: vascular endothelial growth factor; EGF: epidermal growth factor; IGF: Insulin-like growth factor; FGF: fibroblast growth factor

It has been reported that these proteins help in angiogenic, mitogenic and chemotactic effects, following Wnt/β-catenin, ERK, and Akt signalling pathways (10).

Platelet-rich plasma concoction

Various modus operandi was employed for the preparation of PRP from the whole blood collected from the peripheral blood vessels of patients. Marketed PRP kits have provided miscellaneous results which greatly affect the concentration of platelets in the specimen. Hence, the paucity of a standard protocol for the extraction of PRP can possibly affect the outcome and credibility of an examination.

P-PRP: Upon reviewing various literature, we have found that major studies have opted for the differential centrifugation technique, which includes the first round of soft spin of peripheral blood (175-300 x g for 5-15 minutes at 12 to 16℃) followed by separation of upper coat and buffy layer and providing a hard spin (600-1300 x g for 6-20 minutes). The upper layer is pipetted, and 0.5 to 2 ml is used for inundation (6, 11-13).

LR-PRP: For the preparation of L-PRP, major articles suggest density gradient centrifugation. The first spin of peripheral blood varies around 800 to 3200 x g for 5 to 15 minutes, accompanied by collecting the apical layer (Platelet-poor Plasma) along with BC (Buffy Coat) to another conical tube and providing a second hard spin of 400 to 1500 x g for 10 to 17 minutes. The superior film is discarded, and LR-PRP is ready to use (6, 14-16).

P-PRF: Evaluation of the literature reveals a lot of centrifugation measurements for the preparation of P-PRF, which is an advanced form of P-PRP. It was first studied by Dr. Joseph Choukroun. Major literature

reveals that a spin of 400 to 700 x g for 8-12 minutes of 9 ml whole blood yields the highest quality of fibrin. Upon centrifugation, the middle layer is extracted two cm below the lower diving line of RBCs (5, 6, 17, 18).

LR-PRF: This type of PRF is a revised version of P-PRF. It is prepared following Choukroun's protocol. 9 ml of peripheral blood is taken into a conical tube filled with an anticoagulant such as EDTA. Centrifugation is done at 2700 rpm or 408 g for at least 12 minutes at room temperature. Post-centrifugation, a surgical tweezer is used to extract the LR-PRF clot from the middle layer (6).

To date, it has been found that majorly P-PRP is used for reproductive science for the treatment of uterine and ovarian-related infertility.

PRP in women with refractory attenuated endometrium (Table 3)

Chang *et al.,* have been the torchbearer in the utilization of PRP for the first time in the hope of improvement of endometrial thickness. He elected 5 women on the basis of their history of implantation failure due to thinness of endometrium (<7 mm) despite the use of standard hormonal therapy. All the patients were infused with intrauterine autologous PRP, and the endometrial lining was recorded after 48-72 hours. 2 out of the 5 patients underwent the infusion twice. All the patients successfully conceived with an increment in the endometrial lining (>7 mm). All the patients carried full-term with 2 twin pregnancies. One of the participants had an abortion at 9 weeks due to chromosomal aberrations (XO; 19).

Nazari *et al.,* organised a double-blinded, randomized controlled trial on 60 participants with a chronicle of implantation failure due to lean endometrium (<7 mm). Hormone replacement therapy was administered to all the participants. The group was bisected into two sets. (i) PRP group (ii) sham-catheter group. On Day 11 and 12, the PRP group underwent an infusion of PRP for endometrial expansion. The length of endometrial was assessed after 48 hrs of the first intervention. Due to insignificant differences in length, all the participants of the PRP group underwent a second infusion of PRP. The endometrial thickness was reported to be 7.21±0.18 mm in the PRP group and 5.76±0.97 mm in the sham-catheter group. A noteworthy difference ($p<0.001$) was recorded. Hence, endometrial expansion was observed upon administration of PRP in thin endometrium (20).

Kim *et al.,* did a prospective interventional study on 24 women with a history of IVF Cycle failure more than two times and had endometrial thickness below 7 mm. The average increase in endometrium was reported to be 0.6 mm. The implantation and clinical pregnancy rate also increased remarkably (21).

Dogra *et al.,* analysed 22 infertile participants due to suboptimal endometrium in their prospective interventional study and evaluated the effect of PRP on their endometrial lining improvement as well as live birth rate. The noteworthy point here was that patients were also suffering from tuberculosis and polycystic ovarian syndrome (PCOS). 26 PRP cycles were conducted on 20 patients. Mean increment in EMT was reported to be 1.07 mm and 0.83 mm after the application of the first infusion of PRP in patients undertaking fresh in-vitro fertilisation and frozen embryo transfer, respectively (11).

Russell *et al.,* also in line with others, conducted a retrospective study on an aggregate of 85 participants, out of which 23 patients were suffering from thin endometrium. Majority of them were infused with a singular dosage of PRP. A notable difference of 1.0 mm has been observed post-application of PRP as juxtaposed to the cycles without the application of PRP (22).

Most recently, Efendieva *et al.,* directed a randomized pilot research on 115 willing participants with compromised endometrial size (<7 mm). They divided the patients into sub-groups: group 1(n=30) received conventional treatment, group 2(n=42) received intraendometrial PRP injections, and group 3(n=38) received both conventional and PRP for the study. A single injection volume constituted around 0.6 to 0.7 x 10^{11} of platelets. The study showed considerable enhancement in the endometrial layer post-application of autologous PRP (23). Thus, on the basis of the above research, it is quite perceptible that the use of autologous PRP on endometrium seems promising. It can serve as a good alternative to those suffering from infertility due to thin endometrium. However, large controlled trials are required to make PRP a commercial protocol.

Effect of PRP on female gonadal abnormalities (Table 4)

Sills *et al.,* were the pioneer researchers to utilise intraovarian PRP for the increment in oocyte development and extraction, thereby increasing the chances of pregnancy. They had enrolled 4 participants in the study with a history of diminished ovarian reserve, which had led to IVF failure, despite the use of conventional techniques. Upon application of PRP, all patients yielded 4 to 7 eggs each and had undergone positive clinical pregnancy (27).

Table 3: Study of PRP on refractory attenuated endometrium

Author/Year	Study Design	Population Size	Population Medical History	EMT Before PRP (mm)	EMT After PRP (mm)	Result
Chang *et al.*, (2015;19)	Cohort	5	Suboptimal EMT (<7 mm) due to which embryo transfer was cancelled	5.9-6.6	>7	EMT was achieved, followed by positive pregnancy in 4 patients.
Zadehmodarres *et al.*, (2017; 24)	Cohort	10	Suboptimal EMT (<7 mm) resulting in cancelled FET	4-6	7.1-7.5	EMT was achieved in all patients, followed by positive pregnancy in all patients.
Eftekhar *et al.*, 2018; (25)	RCT	40 (PRP); 43 (HRT)	Poor endometrial response post HRT on 13th day of IVF cycle	6.09±0.47	8.67±0.64	EMT(p=0.001); IR (p=0.002); PR(p=0.044)
Nazari *et al.*, 2019; (20)	Double-blind RCT	30 (PRP); 30 (Sham-catheter)	Cancelled FET due to thin EMT (<7 mm)	4.92±0.67	7.21±0.18	EMT(p<0.001); PR(p=0.048)
Kim *et al.*, 2019; (21)	Prospective Interventional	24	≥2 IVF failure due to thin EMT (<7 mm)	4-6.8	4.2-9.1	EMT improved; IR (12.7%); PR (30%); LBR (20%)
Agarwal *et al.*, 2020; (26)	Cross-sectional	32 but 24 (PRP)	1° & 2° infertility; IVF failure due to thin EMT (<7 mm)	<7	>7	EMT improved (50%); PR (41.6%); BCP (8.3%); LBR (20.83%)
Dogra *et al.*, 2022; (11)	Prospective Interventional	20	Thin EMT despite HRT	5.83±0.81 (fresh IVF); 5.52±0.89 (FET)	7.14±0.54(Fresh IVF); 7.14±0.68(FET)	EMT(p<0.001); PR (p=0.59); IR (p=0.355); LBR(p=0.317)
Russell *et al.*, 2022; (22)	Retrospe-ctive cohort	85	IVF failure due to thin EMT	6.7±0.17	7.8±1.0	EMT(p<0.0001); PR (29%); BCP (51.6%); LBR (16.1%)
Efendieva *et al.*, 2023; (23)	Randomized pilot	115	Implantation failure due to thin endometrium (<7 mm)	G1:5.9 ± 1.2 G2:5.3 ± 1.5 G3:5.4 ± 1.4	G1:7.4 ± 1.2 G2:7.4 ± 1.8 G3:7.9 ± 1.6	EMT (p<0.00001) in all groups

EMT: Endometrial Thickness; FET: Frozen Embryo Transfer; PRP: Platelet-Rich Plasma; HRT: Hormone Replacement Therapy; IR: Implantation Rate; PR: Pregnancy Rate; IVF: In-Vitro Fertilization; BCP: Biochemical Pregnancy; LBR: Live Birth Rate; RCT: Randomized Clinical Trial.

Pantos *et al.*, were the first to report on improved ovarian reserve upon the use of intraovarian PRP on post-menopausal participants in 2016. Thereafter, he studied a pregnancy outcome report on 3 women aged 27, 40 and 46. The former 2 women suffered from primary ovarian insufficiency (POI), and the latter was in her postmenopausal phase. Following a month of intraovarian PRP, all women got their menstrual cycle restored and opted for natural pregnancy. All the patients underwent successful clinical pregnancy on a natural attempt (28).

Farimani *et al.*, in a parallel study, also reported three live births in patients with poor ovarian insufficiency following the instillation of intraovarian PRP on them. 19 women with a record of diminished ovarian response were enrolled in their study. They at first underwent follicular puncture followed by PRP according to Shanghai protocol and then a second ovarian stimulation. All reported healthy responses post-application of PRP, and 3 live births were reported in their study (29). Followed by the result of the case report, in 2021, they published a retrospective study on 96 women that underwent intraovarian PRP. MII oocytes notably increased post-PRP, and 14.6% reported clinical pregnancy using Assisted Reproductive Techniques (30).

Hsu *et al*., reported a case of live birth following the application of intraovarian PRP on a 37-year-old woman suffering from diminished ovarian reserve along with secondary amenorrhea for 6 months (31). Parikh *et al.*, did a prospective cohort study where 45 women consented to the use of intraovarian

PRP(IOPRP). Three cycles of IOPRP were performed on the participants. Laboratory variables (AMH, AFC) were compared, and they showed promising improvement post-utilization of IOPRP. The clinical pregnancy was reported to be 46.88% (32).

Rezk *et al.,* orchestrated a prospective controlled study on 50 infertile patients having diminished ovarian reserve along with a history of at least one IVF cycle failure and amenorrhea for 3 months. Post-instillation of intraovarian PRP, laboratory variables and follicles were measured every month for 3 months. The study showed an increase in follicular count on utilisation of IOPRP in POI patients (33).

Most recently, Hosseinisadat *et al.,* conducted a before and after study on 22 infertile women with a history of failed IVF using GnRH antagonist protocol and who also have diminished ovarian reserve. Intraovarian PRP was administered, and AMH and AFC values were analysed after 3 months of the administration. Increased AMH level was reported in the study, thereby hinting towards improvement in chances of fertility in women post administration of IOPRP (33). On the basis of the above studies, it can be evidenced that intraovarian PRP seems to provide noteworthy results in increasing oocyte retrieval, thereby improving the chances of pregnancy in ART.

Table 4: Study of PRP on female gonadal abnormalities

Author/Year	Study Design	Sample Size	Population Medical History	AMH (*Before/ After*)	FSH (*Before/ After*)	AFC	Menstrual Resto-ration	MII Oocyte Retrieved	Outcome
Pantos *et al.,* (2016)	Cohort	8	Peri-menopausal with amenorrhea for 4.88± 1.13 months	-	-	2.50±0.71	Yes	1.50±0.71	Menstruation was restored post-1-3 months of PRP
Sills *et al.,* 2018; (27)	Cohort	4	DOR with ≥1 IVF failure, amenorrhea ≥1 year	*P*=0.17	*p*=<0.1	-	-	5.3±1.3	Improved ovarian function was noted with at least 1 blastocyst for cryopreservation.
Pantos *et al.,* 2019; (28)	Case Report	3	menopausal with amenorrhea≥1 year	Pt1:0.16/0.22 Pt2:0.06/0.20 Pt3:0.17/0.30	Pt1:119/27 Pt2:65/10 Pt3:46.5/15.05	4-Pt1) 1-Pt2, Pt3)	Yes	-	Improved ovarian function; Restored menstruation in menopausal Pt; +ve CP
Sfakianoudis *et al.,* 2018; (35)	Case Report	3	Poor Ovarian Response; Failed IVF; Poor Oocyte	0.03-0.78/0.03-0.92	10.8-14.9/3.3-11.8	-	-	3/2/3	Improved oocyte quality with uncomplicated pregnancy & live birth reported
Farimani *et al.,* 2019; (29)	Case Report	19	Poor Ovarian Response	-	-	-	-	2±0.1	Spontaneous conception with an improved number of oocytes
Hsu *et al.,* 2020; (31)	Case Report	1	DOR; 2° amenorrhea for 6 months	0.23/-	63.65/17.84	6	Yes	3	Improved ovarian function with live birth of pre-term twins
Farimani *et al.,* 2021; (30)	Retrospective	96	Poor Ovarian Response	*P*<0.001	*P*=0.054/0.028	*P*<0.001	Yes	0.052/0.001	PR(*P*=0.002),Fetus(*P*=0.005)
Parvanov *et al.,* 2022; (36)	Prospective	66	Poor Ovarian Response; ≥1 ICSI cycle failure	0.63 ± 0.62/ 0.89 ± 0.79	11.89 ± 6.54/ 11.73 ± 5.82	3.18 ± 2.14	Yes	2.31±0.63	Improved oocyte and embryo quality
Merhi *et al.,* 2022; (37)	Pilot	12	Poor Ovarian Response; ≥1 IVF failure	-	7.98±1.01/8.45±1.55	11.09±1.82/ 12.36±2.36	Yes	6.18±1.6/ 7.27±1.68	Improved oocyte and blastocyst quality with 3 clinical pregnancies.
Rezk *et al.,* 2022; (33)	PCT	50	DOR with ≥1 IVF failure, amenorrhea for 3 months	0.39±0.09/0.8±0.11	48.51±15.61/ 34.06±15.74	1±0.06/ 2.5± 0.4	Yes	-	Improved ovarian parameter
Parikh *et al.,* 2022; (32)	Prospective Cohort	45	DOR; low AFC, AMH; failed IVF	0.85±0.44/0.94±0.53	-	3.44±2.35 / 4.95±2.84	Yes	P=0.0125	Ovarian rejuvenation; improve AFC without significantly altering AMH levels
Hosseinisadat *et al.,* 2023; (34)	Prospective	22	DOR; Failed IVF using GnRH	*P*<0.001	-	*P*=0.140	-	-	Increase in AMH, but no change in AFC reported

AMH: Anti-Mullerian Hormone; FSH: Follicle Stimulating Hormone; AFC: Antral Follicle Count; DOR: Diminished Ovarian Reserve; IVF: *In Vitro* Fertilisation; PCT: Prospective Controlled Study; CP: Clinical Pregnancy; PR: Pregnancy Rate; Pt: Patient; ICSI: Intracytoplasmic sperm injection; GnRH: Gonadotropin Releasing Hormone.

Effect of PRP on Asherman's syndrome (Table 5)

Aghajanova *et al.,* were the primary researchers to study the effect of PRP on Asherman's syndrome (AS). They did a case report on two women. The first woman was 34 years with a history of secondary amenorrhea and three episodes of dilation and curettage (D & C) to handle her miscarriages, resulting in uterine scarring and adhesions. To address AS, the patient also underwent hysteroscopy for adhesion lysis and hormonal treatment. Despite conventional treatment, the patient failed to have a successful pregnancy four times. The other patient, aged 40 years suffering from AS with a medical history of hysteroscopic polypectomy, irritable bowel syndrome and pelvic pain and D & C for miscarriages. Application of PRP during the last hysteroscopy resulted in improvement in endometrial thickness and successful pregnancy in both patients (38).

Amer *et al.*, regulated the first randomized controlled trial with 40 patients with a history of primary or secondary infertility along with severe intrauterine adhesion (AS). The participants were divided into two groups- one who received PRP and the other who received IU Balloons. The study shows considerable improvement in menses and reduced adhesion post-operatively, thus improving the chances of a successful pregnancy (39).

Gonzalo *et al.,* in their publication on intrauterine installation of PRP for severe AS, reported that the therapy has shown considerable improvement in the regeneration of endometrial thickness along with restoration of endometrial functions, thereby improving the chances of a successful pregnancy (40). Albazee *et al.*, in their meta-analysis of randomized controlled trials on the utilization of PRP for the management of AS, reported that the use of PRP after hysteroscopic adhesiolysis is a noteworthy way of improving the endometrial quality and decreasing the adhesion in the uterus, thereby promoting the chances of successful implantation leading to pregnancy (41).

Most recently, Naghshineh *et al.,* conducted a randomized controlled trial contrasting the utilisation of PRP and hormonal therapy on 60 women with Asherman's syndrome in two groups. The therapies were performed, and intrauterine adhesion was measured 6 to 8 weeks post-application. The frequency distribution of the IUA stage was slightly more in the PRP group than in the hormonal group alone (42).

Table 5: Study of PRP on Asherman's syndrome

Author/Year	Study Design	Sample Size	Population Medical History	Menstrual Improvement	EMT Improvement	IUA decreased	Outcome
Aghajanova *et al.,* 2018; (38)	Case Report	2	2° amenorrhea; AS; D&C	Yes	Yes	Yes	Both patients conceived successfully
Gonzalo *et al.,* 2020; 40)	Review	-	Severe AS	-	Yes	-	Successful pregnancy reported upon restoration of EMT.
Javaheri *et al.,* 2020; (43)	RCT	30 (15-PRP; 15-Control)	AS	No such changes	-	No such changes	No significant difference
Amer *et al.,* 2020, (39)	RCT	40 (20-PRP; 20-IU Balloon	1° & 2° infertility with severe intrauterine adhesions	Yes(3.0±1.1mm)	-	Yes	menses duration, amount and adhesion score improved
Aghajanova *et al.,* 2021 (44)	RCT	30 (15-PRP; 15-Saline)	Moderate to Severe AS	-	No (p=0.78)	-	No effect on EMT & pregnancy rate
Naghshineh *et al.,* 2023 (42)	RCT	60 (30-PRP; 30-Hormonal therapy)	AS	No(p>0.05)	-	No (p=0.22)	Insignificant improvement in menses, IUA

EMT: Endometrial Thickness; IUA: Intrauterine Adhesion; AS: Asherman's syndrome; RCT: Randomized Controlled Trial; D & C: Dilatation & Curettage; PRP: Platelet-rich Plasma

CONCLUSION

Platelet-rich plasma therapy seems to promise an alternative outlook in the field of reproductive science for the treatment of certain infertility conditions like thin endometrium, poor ovarian reserve, intrauterine adhesion, and recurrent implantation failure. It is a cost and time-effective method and can be easily elected by patients for therapeutic purposes. Studies

seem to provide a promising inference that PRP may improve endometrial thickness, restore menstruation in diminished ovarian reserve and menopausal patients, and increment endometrial vascularity, thereby leading to improvement in chances of pregnancy and live births. But more random controlled trials on a large sampling size is a prerequisite for validation of its result on a major mass population. Also, a standardized protocol for PRP is of utmost importance for even outcomes of future studies, thereby aiming towards a one-way result on population.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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