

## Platelet – Rich Plasma: A Novel Therapy To Treat Thin Endometrium

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### ABSTRACT:

**BACKGROUND:** Endometrium is one of the key components of pregnancy. For women with infertility, endometrial thickness has been found to be a predictor of conception rate. Female infertility is frequently caused by a thin endometrium, some cycles are terminated during treatments using assisted reproductive technology because of insufficient endometrial development. Thin endometrium is defined as <7mm. A new therapeutic option for thin endometrium is platelet rich plasma (PRP) Therapy.<sup>4</sup> Adjuvant strategies for enhancing endometrial thickness remain a popular topic. This article seeks to analyse body of research regarding the effects of autologous PRP in reproductive medicine, and summarizing the recent findings<sup>1</sup>.

**CONCLUSION:** The use of PRP in intrauterine injections may provide an innovative option for endometrial thickness. PRP effectively promotes endometrial development in the individuals with thin endometrium/reduced endometrial thickness<sup>4</sup>

**KEY WORDS:** Endometrial thickness, Infertility, Reproductive medicine, assisted reproductive technology, autologous platelet concentration/Platelet rich plasma (PRP).

### INTRODUCTION:

The endometrium is a crucial element for implantation and pregnancy. As the endometrial thickness increases does the pregnancy rate. Several studies suggest that a 7mm endometrial thickness is a minimum threshold for embryo transfer. In frozen-thawed embryo transfer (FET) cycles, several strategies are used there is little agreement on the most effective route.<sup>5</sup> numerous treatments, including oestrogen therapy, low-dose aspirin, vitamin-E, vaginal sildenafil, pentoxifylline, stem- cell therapy, are currently being utilized to increase the likelihood of implantation. Many women, who have thin or impaired endometrial linings, however failed to react to this treatments.<sup>2</sup>

Endometrial receptivity or the period during which the endometrium epithelium becomes receptive to blastocyst implantation is an important aspect in a healthy pregnancy. Women's implantation window normally occurs between days 20 and 24 of their menstrual cycle. Endometrial receptivity is important in implantation during ART because it indicates the uterine lining's ability to be ideally prepared for embryo attachment and development, which eventually leads to pregnancy. This process coordinates embryo development and endometrial preparation, which is critical for successful implantation. The endometrium is most receptive to embryo implantation during the implantation window, which normally lasts from days 20 to 24 of a 28-day cycle

Autologous platelet concentration (APC) application has been enhanced in a variety of scientific domains, including ART. Research has shown that it improves live birth rates and pregnancy outcomes in women who experience recurrent implantation failure (RIF) during in vitro fertilisation (IVF). APC has been studied in combination with ART for its ability to treat vitiligo and tendinopathies. The use of APC in ART represents a significant advancement in the profession, ushering in a new era of regenerative medicine in fertility. This

wide mechanism tackles not only RIF, but also has the ability to treat unexplained infertility by providing a tailored therapy strategy based on the particular needs of patients

Intrauterine infusion of APC is an innovative way to treat thin endometrium. APC is blood plasma made from fresh blood centrifuging the sample once to isolate and discard red blood cells, then centrifuging the platelets again to concentrate them and finally adding a platelet activator to stimulate the sample.<sup>11</sup> Blood is extracted from peripheral veins and comprise a variety of growth factors, including vascular endothelial growth factors (VEGF), epidermal growth factor (EGF), platelet-derived growth (PDGF), transforming growth factor (TGF), and other cytokines that promote proliferation and growth. APC with an elevated thrombocyte count is capable to give supra-physiologic levels of critical growth factors, providing a restoration prompt for boosting tissue regeneration in impaired healing.<sup>5</sup>

The introduction of APC in ART is a huge change in the profession, leading in a new phase of regenerative medicine in fertility. The intricate interaction of growth factors and bioactive proteins in PRP emphasises its critical role in improving reproductive outcomes. Strong interaction between uterine tissue and APC gained significant interest because of their potential to improve reproductive outcomes and increase endometrial receptivity. APC is remarkable medical technique used in the field of assisted reproductive technology (ART), primarily for the management of foetal conditions. Uterine thickness is an important predictor of pregnancy outcomes in infertility. PRP's immunomodulatory properties are critical in creating an environment conducive to embryo implantation, decreasing inflammation, and encourage tissue repair within the reproductive canal. The synergistic potential of APC in combination with current ART treatment emphasises its adaptability as a supplementary intervention, raising treatment effectiveness and opening the way for individualised strategies in improving reproductive outcomes.

Low vascular endothelial growth factor and poor epithelial development are caused by the high impedance blood supply to the uterine vasculature's radial arteries, which ultimately guides to implantation failure. Persistence implantation failure occurs when there is no gestational sac visible on ultrasound at least five weeks after a FET, either after 3 FET with increased quality embryos or after ten or more embryos have been transferred in multiple transfers. A significant problem in reproductive medicine is recurrent implantation failure, and despite numerous advancement, there is no unanimous agreement

APC is made from a significant amount of active platelet that have been centrifuged or otherwise processed to release their internal growth factors and cytokines, platelet activation, a vital first step, allows for the release of bioactive proteins known as growth factor in APC following centrifugation, the activation process starts, which causes platelets to degranulate and release growth factors essential for cell mitosis, angiogenesis, chondrogenesis, and chemotaxis. These growth factors are crucial for the therapeutic effects of APC because they start the healing cascade in injured tissues. There are a number of ways to activate APC, such as using calcium chloride, fibrin, or thrombin. Platelet activation, a crucial stage of APC, causes the release of growth factors essential for tissue repair and regeneration. Effective activation techniques, including calcium chloride, fibrin or thrombin are essential for optimising the advantage of platelet-derived therapy in a range of therapeutic settings

The advantages of autologous APC in reproductive medicine have increasingly grown. Research on autologous APC has indicated encouraging outcomes for women with a thin endometrial lining, reduced ovarian reserve or repeated implantation failure, which could lead to better results.<sup>11</sup>

## METHODS:

A literature search was conducted to find a paper concentrating on the application of platelet – rich plasma in reproductive medicine. The search engines utilized were Pub MED, BMJ, MDPI, MEDICINA, and JBRA. “APC and fertility”, “APC and infertility”, “PRP and thin endometrial lining” were the search terms. A total of 30 articles were utilized from Pub Med to employ acceptable terms appropriate for the description. Randomized clinical trials, case series, case reports, reviews and pilot studies were examined.

## DISCUSSION:

The human endometrium is essential to the process of implantation of embryos. In clinical practice, the endometrial thickness measurement is the most widely utilized method. For doctors, addressing issues related to thin endometrium in patients remains a significant hurdle. The bone marrow generates platelets, which are well recognized for their capacity to coagulate blood. Platelet rich plasma basically comprised of the platelets and plasma. Additionally, endocrine and paracrine signalling molecules are highly concentrated in platelets. Due to the increased activity of the signalling molecules effective implantation and pregnancy preservation can be possible. Platelet rich-plasma injections intrauterine considerably improved endometrial receptivity, thickened the endometrium and raised the frequency of biochemical pregnancy, clinical pregnancy, live birth, and implication.<sup>1</sup>the tubal factor group is more likely to experience ectopic pregnancy and have a thin endometrium. It may be possible to conduct additional research and determine the implications in this additional therapy in assisted reproduction by standardizing the APC preparation method.<sup>2</sup>.

APC is derived the patient's own blood utilizing a two – step centrifuge procedure. The blood is process done the ninth or tenth day of the menstrual cycles. 5ml of peripheral circulation blood are extracted using an injection apparatus that holds 2.5 millimetres of acid citrate. To segregate the RBC, blood is centrifuged right away at 1200 rotation per minute for 12 minutes using an anti coagulant solution (ACD-A). To extract the APC, the plasma is centrifuged once more for 7 minutes at 3300 rpm. The IUI catheter is then used to inject 0.5ml of APC into the uterus. Endometrial thickening, increased implantation rates and clinical pregnancies are the outcomes of this therapy. Compared to other therapies for promoting endometrial growth, like G-CSF (granulocyte – stimulating factor), intrauterine APC infusion are more easily obtainable.<sup>9</sup>

Firstly, the intrauterine platelet rich-plasma injections, where they stimulate the proliferation of endometrial cell and enhance their tissue regenerative ability. Secondly, APC encourages neovascularisation by enhancing the endometrium's blood flow condition. Nonetheless, it is demonstrated that PRP/APC is effective in endometrial regeneration by showing a notable raise in endometrial thickness in the APC group. Therefore, a thorough analysis of APC's effectiveness and safety in treating thin endometrium is required.<sup>2</sup>

## CONCLUSION:

Intrauterine administration of PRP/APC may provide a innovative treatment strategy for enhancing endometrial thickness .This therapy not only promotes endometrial growth in women with thin lining, but also improves pregnancy success rate with proven safety and no harmful effects.<sup>2</sup>for the women with thin endometrium, APC improves the rate of embryo implantation, endometrial growth and clinical pregnancy. Intrauterine APC infusion is a non-invasive front line therapy for enhancing endometrial thickness and implantation. Further extensive, multi-centre, and meticulously planned research is necessary for additional validation.

It is one of the useful approach in developing successful individualised treatment which are used to address the problems such as, Endometrial thinning, Repeated implantation failure RIF, and other uterine pathologies. This could aid in enhancing the endometrial receptivity and health in feature. These patients with or prognoses show a significant considerable growth in pregnancy outcomes, with clinical pregnancy and live birth rate (LBR) reaching up to 20% and 25% respectively. As a result the current study supports the application of APC in women who are unable to undergo fresh ET or have had many cycle cancellations during FET due to refractory thin endometrium.

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