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Regenerative Gynecology Redefined: Platelet-Rich Plasma in Vaginal Rejuvenation: THE REVIEW

Dr. Patel Mit Alpeshkumar[1], Dr. Prof Madhu Jain[2], Dr. Vibha Mishra[3], Dr. Deepak Jadaun[4], Dr. Shubhi Vaishya[5], Dr. Patel Shail Alpeshkumar[6]

[1] MBBS, MS OBGYN (PG Resident), Department of Obstetrics and Gynecology, Heritage Institute of Medical Sciences, Varanasi (U.P)
[2] MBBS, MD, Professor and Head, Department of Obstetrics and Gynecology, Heritage Institute of Medical Sciences, Varanasi (U.P)
[3] MBBS, DGO, DNB, FIAGE, Fellowship In Gynae Oncology, Assistant Professor, Department of Obstetrics and Gynecology, Heritage Institute of Medical Sciences, Varanasi (U.P)
[4] MBBS, MS OBGYN (PG Resident), Department of Obstetrics and Gynecology, Heritage Institute of Medical Sciences, Varanasi (U.P)
[5] MBBS, MS OBGYN (PG Resident), Department of Obstetrics and Gynecology, Heritage Institute of Medical Sciences, Varanasi (U.P)
[6] MBBS, GMERS Medical College, Gotri, Baroda (Gujarat).

Corresponding Author

Dr. Patel Mit Alpeshkumar

MBBS, MS OBGYN (PG Resident), Department of Obstetrics and Gynecology, Heritage Institute of Medical Sciences, Varanasi (U.P)

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Abstract

Exciting new developments in tissue engineering and molecular biology have created regenerative medicine, a discipline that aids in the body's inherent capacity to repair damaged cells, tissues, and organs. Among the many regenerative medicine preparations, platelet rich plasma stands out due to its abundance of growth factors derived from platelet granules. Increasing numbers of medical fields are using this treatment into their routine treatments. Recently, researchers have begun testing the efficacy of platelet-derived products in treating pelvic floor disorders (PFDs) and pelvic organ prolapse (POP). Some women may find that getting older or going through postpartum depression affects their sexual lives. By utilizing lipofilling, the posterior vaginal wall can be restored in a way that avoids the vascular axes during the surgical operation. Not only are these methods suitable for use in private clinics as part of a standard outpatient routine, but they are also easy to apply and have no known risks. The release of growth factors by platelet alpha granules during platelet-rich plasma (PRP) therapy encourages the production of new collagen and blood vessels. Additional research is necessary to fully evaluate the procedure's safety, efficacy, and effects in the medium and long term.

KEYWORDS: *Vascular rejuvenation, sexual vigour, and platelet-rich plasma's positive effects on regenerative medicine.*

INTRODUCTION

The fields of molecular biology and tissue engineering are foundational to regenerative medicine. Medications carried by platelet granules hasten the process of cellular, tissue, and organ regeneration and healing [1]. Making these strategies more resilient is the goal here. The use of platelet-rich plasma (PRP) as a therapeutic alternative has only just become commonplace in the field of tissue regeneration [2]. The concentration of thrombocytes was determined in 1954 by Kingsley and colleagues through a haematological study of blood coagulation. First, the researchers described platelet-rich human plasma [3]. Autologous transfusions, like platelet-rich plasma (PRP), were first used in cardiac surgeries in the 1980s [3,4]. Different from other types of plasma, platelet rich plasma contains a large quantity of platelets together with other cytokines and growth

factors. In light of the findings, this unusual combination may have several beneficial effects. Growth factors such as platelet-derived growth factor, vascular endothelial growth factor, and transforming growth factor-β can be found in activated plasma with a high concentration of platelets. Cytokines such as interleukin-1, interleukin-6, interleukin-8, matrix metalloproteinase-9, tumour necrosis factor-a, and interferon-a can also be incorporated [5]. Concerns about trophicity can cause a variety of symptoms, including dyspareunia and vaginal laxity. Some possible reasons for these difficulties include getting older and experiencing obstetric perineal trauma. For this and many other therapeutic purposes, platelet-rich plasma can be useful, as platelets contain growth factors that aid in tissue regeneration [6]. If you're experiencing any of the following following giving birth, you might find it more difficult to have pleasurable sexual relationships. A woman's level of comfort and ease during sexual encounters may be significantly affected by this widespread problem [7]. In the absence of perineal therapy, women's vaginas tend to be more voluptuous. Getting started on perineal rehabilitation as soon as possible following a vaginal delivery can help with these symptoms [8]. Orthopedic, gynecological, and oral surgeons are just a few of the modern surgical specialties that have embraced platelet-rich plasma (PRP) for its innovative therapeutic potential. As a result of its potential to facilitate the regeneration and repair of damaged tissues, it has garnered considerable attention during the 1980s and 1990s [9,10]. This technique is famous in the vaginal rejuvenation industry for being a less invasive, natural, easy, inexpensive, and risk-free alternative to other methods. If this is the simplest explanation possible, platelet-rich plasma is just whole blood with a higher concentration of platelets. A patient's blood sample must be drawn and the red blood cells separated by centrifugation before autologous platelet-rich plasma (PRP) may be obtained.

It is possible that platelets can aid in certain physiological functions. The human body is an inherent source of growth factors, making it an obvious place to find them [11].The first patients to receive platelet-rich plasma (PRP) were those with very low platelet counts [12]. Additional study led to the investigation of its possible uses in many domains, one of which being surgery [13]. This medication is currently being used in many different medical contexts, and it's helping both people and animals [14]. This paper gives a thorough review of the most recent studies in obstetrics and gynecology.

Table 1: Overview of previous studies in PRP preparation

Patients Number (*n*)	Amount Given (ml)	Indication	Kit Used	References
6	1	Asherman's syndrome	Magellan Autologous Platelet Separator System	[15]
19	2	Poor ovarian response	Not specified	[16]
29	5	Lichen sclerosis	Magellan Autologous Platelet Separator System	[17]
19	10	Bladder pain syndrome	Not specified	[18]
20	5	Stress urinary incontinence	RegenKit	[19]
16	4.0–6.0	Vesicovaginal fistula	Arthrex Angel System	[20]
32	11	Female sexuality	Not specified	[21]
42	1	Refractory endometrium	Not specified/ double centrifugation	[22]

Fixing platelet-rich plasma necessitates the use of artificial scaffolding materials or surgical meshes. In addition to providing mechanical and load-bearing support, these materials are designed to mimic the properties of natural tissues. Unfortunately, the assumption that polymers should be inert is the foundation of the existing technologies. As a result, they must be non-reactive, non-carcinogenic, and non-harmful to any soft tissues they come into touch with. The behaviour of urogynecologic polypropylene meshes is similar to that of other materials. A biomechanical imbalance occurs when mesh devices are employed in the vaginal

tissue. A negative impact on the patient's health could result from this imbalance. Mesh geometries are unstable under tension, which could explain why the pores collapse and the device looks wrinkled. Consequently, this causes the vaginal region to experience uneven stress distributions. New research shows that myofibroblasts are more abundant in areas that are highly stressed, which can lead to fibrosis, discomfort, and scarring. But in low-stress areas, as under a wrinkle, macrophages usually take the lead. They cause tissues to weaken and break down, which could increase the likelihood of mesh exposure [23].

Synthetic scaffolding is gaining attention in regenerative medicine because it is better able to integrate with damaged tissues and encourage a positive immune response. The use of artificial scaffolding is growing in significance within this field. One novel approach to engineering makes use of elastomeric meshes, which are softer but may nevertheless retain their stability under loading [24]. One unique property of auxetic materials is the idea of a negative Poisson ratio. Due to this property, the material can swell instead of shrinkage when loaded with large objects.

Bio scaffolds

In the realm of regenerative medicine, the cell-free technology that was developed from pigs is a strong instrument that represents a significant advancement. The formation of the extracellular matrix, which serves the functions of tissue anchoring, cell adhesion, communication, and migration, occurs when the secretions of cells come together to form a three-dimensional structure. These processes are supported by this structure, which gives support. One of the advantages of employing extracellular matrix as a template for tissue regeneration is that it can reproduce the natural cellular environment of native tissue.

Altering the composition of the extracellular matrix during the process of wound healing has the potential to increase tissue regeneration in adult tissue [25]. This is because the extracellular matrix is composed of cells. It is possible to achieve this goal by directing the natural reaction of the host towards a system of healing that is constructive and lowers inflammation. Tissues can have their extracellular matrix removed by a procedure called decellularization. With this method, DNA and RNA can be effectively extracted while leaving the extracellular matrix intact. It appears that this substance is truly producible, since a hydrogel may be produced by digesting and rehydrating an extracellular matrix. Multiple complications, such as weak pelvic muscles, scarring, tissue buildup, and persistent inflammation, put babies born with birth abnormalities at a higher risk for pelvic organ prolapse (POP). In a rat model of the disease, the researchers discovered that injecting a specific hydrogel made from decellularized pig skeletal muscle encouraged regeneration of pelvic floor muscles. This finding has fascinating implications for the management of birth injuries. Hydrogel injections into muscles have several beneficial effects, including promoting muscle regeneration, halting atrophy, and decreasing gene expression associated with fibrosis [26].By capitalising on the extracellular matrix's natural characteristics, hydrogels create an optimal milieu for tissue restoration.

Platelet-rich plasma: Cell based therapy

One of the most important things that α-granules in platelets do is create growth factors, which are vital for wound healing. The platelet-rich plasma not only helps the body make new blood vessels, but it also includes several chemicals that stimulate cell division and wound healing. [27]. Autologous platelet-rich plasma has no impact on the host immune system and does not transmit any germs from the donor. Gynecologic regenerative medicine utilizes platelet-rich plasma to address a range of conditions including Asherman syndrome, genitourinary fistula, lichen sclerosis, premature ovarian failure, stress urine incontinence, and thinning endometrium[20]. A 20 percent increase in endometrial thickness was observed after intrauterine infusion of platelet-rich plasma, as compared to a control group reported by the researchers [28]. Although there is evidence that platelet-rich plasma treatment has the potential to stimulate tissue biostimulation, there are a number of restrictions that should be taken into consideration. Both the absence of definitive advantages from prospective randomised clinical studies and the absence of uniform preparation processes are examples of

these issues. Ascertaining whether or not the characteristics of particular patients have an effect on the quality, content, and overall efficacy of platelet-rich plasma requires additional studies to be conducted.

Figure 1: Cutting of Labia minora/Clitoris scarring [29].

Figure 2: After the excision of the cutaneous scar, photograph and visualization of clitoral tissue [29].

Figure 3: Unaltered anatomical clitoris: Positioned level of Neo-clitoris [29].

Figure 4: Injecting PRP into clitoris [29].

Figure 5: Photograph of reconstructed clitoris and vulva taken during menstruation after two months of PRP procedure [29].

DISCUSSION

Platelet-rich plasma is a source of a wide range of growth factors, each of which contributes to the process of ligament rebuilding. Several growth factors are included in this category. These include FGF, HGF, PDGF, VEGF, and IGF-I. In light of these findings, a pilot study was carried out with the purpose of determining whether or not PRP can result in the resolution of SUI. PRP was applied to the anterior vaginal mucosa, which is located close to the mid-urethra, in twenty different women. Nevertheless, this innovative strategy has the potential to serve as an alternate therapy option for the treatment of SUI [28]. After providing platelet-rich plasma injections twice to twenty women at intervals of four to six weeks, the results of a separate pilot trial demonstrated a significant reduction in the symptoms of spontaneous urogenital infection (SUI). It was found that there was an improvement three months following treatment, and it continued to demonstrate significant development at the six-month point. A decrease in urine loss of around 50.2% was seen during the pad test that lasted for one hour. Following a period of six months, a sizeable majority of women declared that they had seen improvement. None of the team's members are aware of any unfavourable results. At least for the time being, the data points to platelet-rich plasma injections as a potentially viable and safe alternative. A

different kind of treatment for younger women with stress-related pee incontinence could be this outpatient operation [30].

CONCLUSION

Finally, a newer method of regenerative medicine that focuses on the vaginal region is platelet-rich plasma, or PRP. Growth factors are a part of platelet-rich plasma (PRP) that help injured tissues recover and regenerate. Gynecologists and other medical professionals have recommended it for the treatment of erectile dysfunction, pelvic organ prolapse, and abnormalities of the pelvic floor. Positive outcomes have been observed in studies utilizing platelet-rich plasma (PRP) as a treatment for stress urine incontinence, erectile dysfunction (ED), and endometrial thickening. This operation is available as an outpatient at private clinics, and it's a safe and affordable option. Further investigation into the safety and efficacy of platelet-rich plasma (PRP) is required, however it shows promise as a vaginal rejuvenation treatment. When extracellular matrix bioscaffolds and platelet-rich plasma (PRP) are administered together, there is a chance that tissues can regenerate in the setting of pelvic organ prolapse. One potential advantage of platelet-rich plasma is an enhancement to a woman's sexual life. Patients have mentioned an increase in self-assurance in the vaginal rejuvenation area following this operation.

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