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Evaluation of the Use of Platelet-Rich Plasma as Therapy for Stress Urinary Incontinence in Women. Comparative Analysis. Literature Review

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Abstract: To review the existing literature on the potential role of platelet-rich plasma (PRP) as a therapeutic adjuvant for female patients with stress urinary incontinence (SUI) who have not responded to conventional non-surgical or surgical treatments. Materials and Methods. A comprehensive review of English-language literature was conducted using PubMed, Google Scholar, and Scopus to evaluate the efficacy of PRP in SUI therapy. Studies focusing on PRP therapy have demonstrated effective and safe outcomes as a treatment for SUI in women. PRP injections, utilized either as monotherapy or in combination with other treatment modalities, have shown significant improvements in SUI symptoms. Furthermore, these studies indicate that PRP injections offer a less invasive and minimally risky alternative to surgical procedures for managing SUI, potentially leading to accelerated rehabilitation. The efficacy of PRP therapy is supported by a significant reduction in the severity of SUI symptoms and an improvement in bladder function variables, with no reports of significant adverse events. However, further research is needed to establish the long-term efficacy and safety of PRP therapy in managing SUI across diverse patient populations.

Keywords: Stress urinary incontinence, Platelet-rich plasma, Female, Regenerative medicine

Introduction

Stress urinary incontinence (SUI) is a pressing medical and social issue that significantly reduces the quality of life for women worldwide. This condition is characterized by an involuntary loss of urine that occurs with an increase in intra-abdominal pressure, such as during coughing, laughing, sneezing, or various levels of physical exertion. Despite the variety of available conservative and surgical treatment methods, a significant cohort of patients continues to face persistent or recurrent symptoms, which necessitates further therapeutic interventions [1].

The objective of this study is to conduct a review of the advanced literature on the potential role of platelet-rich plasma (PRP) as a therapeutic adjuvant for female patients with stress urinary incontinence (SUI) that is unresponsive to conventional non-surgical or surgical treatments.

According to modern clinical guidelines developed by the American Urological Association in partnership with the Society of Urodynamics, Female Pelvic Medicine & Urogenital Reconstruction (AUA/SUFU) and the European Association of Urology (EAU), mid-urethral sling procedures are considered the "gold standard" for the treatment of SUI [10, 12]. Nevertheless, in recent years, there has been active discussion regarding potential long-term complications associated with these procedures, including the development of chronic pain syndrome and erosions caused by the implantation of a non-biodegradable polypropylene mesh. In the context of the aforementioned clinical challenges, platelet-rich plasma (PRP) therapy is being considered a promising adjuvant or alternative method for treating SUI that is refractory to traditional approaches [3, 6, 12, 14].

Platelet-rich plasma (PRP) is a concentrated suspension of autologous human platelets in a small volume of plasma. The advantage of PRP lies in its higher concentration of platelets, which is 3–5 times greater than the basal level in peripheral blood [7, 8, 14]. Among the effective properties of PRP application, it is important to note its significant regenerative potential and its ability to promote tissue repair and regeneration [5, 14].

The preparation of platelet-rich plasma (PRP) involves a two-step process. The first step consists of drawing a sample of the patient's whole venous blood. The second step is a two-stage centrifugation to separate the blood components into fractions based on their density: the erythrocyte layer, the "buffy coat" layer, plasma, and the platelet layer. In this plasma, a significantly high concentration of platelets is formed compared to baseline levels [5].

1. First centrifugation (soft spin): At this stage, erythrocytes, which have a high density, settle to the bottom of the tube. The plasma, containing platelets and leukocytes, remains in the upper layer. A thin layer known as the "buffy coat" forms between these two layers. This leukocyte-platelet film contains the majority of the leukocytes. The highest concentration of platelets is found in the plasma immediately adjacent to the buffy coat.
2. Second centrifugation (hard spin): The buffy coat and the adjacent plasma (which has a high platelet content) are subjected to a second centrifugation at a higher force. This results in the formation of a loose pellet of platelets and leukocytes at the bottom of the tube. The upper layer, which is platelet-poor plasma (PPP), is removed. The remaining platelet pellet is then resuspended in a small volume of the remaining plasma, forming the final product—PRP.

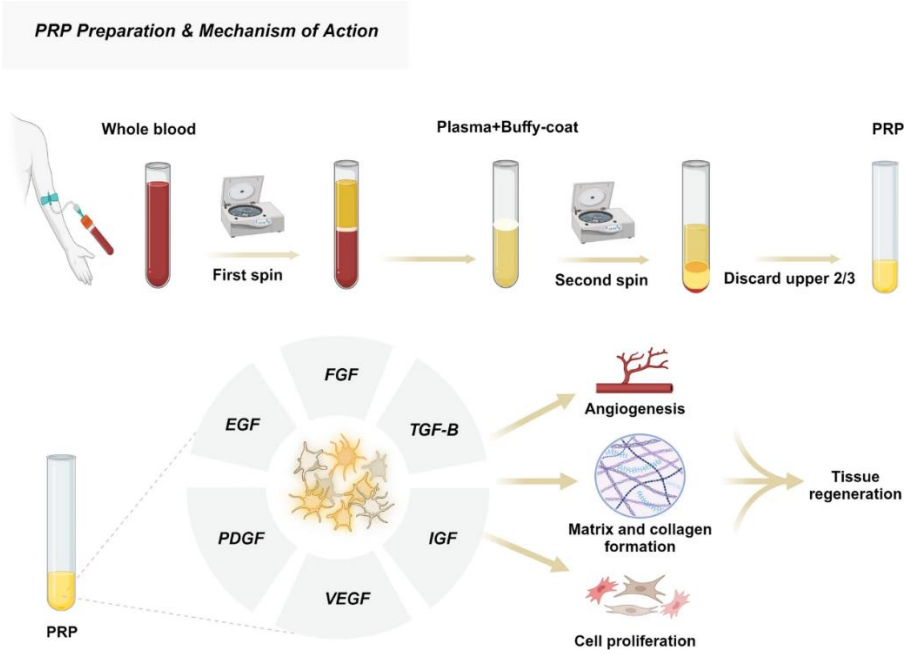

Fig. 1. PRP preparation and mechanisms of action [5]

It is important to note that the final platelet concentration in PRP is not fixed and depends on the chosen preparation method, as well as on individual patient factors such as age, comorbidities, and the state of the vascular system [7, 5].

Platelets, concentrated in PRP, are often activated by the addition of thrombin and calcium chloride, which induces the release of these factors from alpha-granules [3, 14]. Platelets, which originate from bone marrow megakaryocytes, contain over 30 bioactive proteins, many of which are critically important for hemostasis and tissue regeneration processes. Additionally, PRP includes three key blood adhesive proteins: fibrin, fibronectin, and vitronectin [6].

The therapeutic rationale for using PRP in urogynecology is based on its rich content of growth factors, cytokines, and chemokines. Moreover, because PRP is derived from the patient's own (autologous) blood, it's associated with a reduced risk of immunogenic reactions and infectious agent transmission. This is a significant advantage over synthetic alternatives. The use of PRP also proves to be cost-effective and minimizes the risk of a foreign body reaction [3, 14].

Materials and Methods

This review was conducted by searching for published scientific articles in three relevant electronic databases: Google Scholar, Scopus, and PubMed. The search was performed using the keywords: "platelet-rich plasma," "stress urinary incontinence," as well as their combinations and in works dedicated to the use of PRP in the treatment of SUI in women.

The search for published articles and scientific works was conducted using both Russian and American sources. No restrictions were set on the year of publication; however, it was determined that publication activity in these databases only began in 2010, with the presentation of research results dating back to 2006. Additionally, a manual search was conducted through the reference lists of the included articles to identify relevant sources.

During the writing of this article, seven clinical studies were reviewed. The total sample size of the included studies was 231 patients. I have translated the provided text. The translation maintains a scientific tone and uses appropriate medical and research terminology.

In the research by Grigoriadis et al., (2024), a cohort of 50 women with confirmed SUI was randomized into two groups. The treatment group received two PRP injections into three urethral sites at 4–6-week intervals, while the control group received injections of a 0.9% NaCl solution. The initial evaluation included urodynamic studies, a 1-hour pad weight test (PWT), and questionnaire completion. Subsequent evaluations were performed at 1-, 3-, and 6-months post-intervention and included a repeat of the PWT and the “King’s Health Questionnaire and ICIQ-FLUTS” questionnaires. The PRP group demonstrated a significantly higher rate of subjective cure. A statistically significant reduction in urine loss, as measured by the PWT, was also noted in the PRP group after 6 months [9].

In the research by Saraluck et al., (2024), the efficacy of autologous platelet-rich plasma (A-PRP) combined with pelvic floor muscle training (PFMT) was evaluated against PFMT alone in women with SUI. The frequency of adverse reactions after A-PRP injections was also assessed. The research included 60 women with no prior treatment for urinary incontinence; the combined treatment group (A-PRP + PFMT) consisted of 31 patients, while the PFMT monotherapy group included 29 women. After 5 months of follow-up, a significant reduction in 1-hour PWT results was recorded in the A-PRP + PFMT group, in contrast to a minor reduction in the PFMT group. Furthermore, a substantial difference in the severity of incontinence symptoms, as quantitatively assessed by questionnaire results, was observed, indicating a superior improvement in the A-PRP + PFMT group compared to the PFMT-only group at both 2- and 6-months post-therapy. In conclusion, the integration of A-PRP with PFMT may be a promising therapeutic approach for women with SUI [13].

Chiang et al., (2022) evaluated the effects of autologous platelet-rich plasma injections as a treatment for SUI caused by intrinsic sphincter deficiency (ISD) in women who were resistant to standard therapy. The prospective research included 26 women with urodynamically confirmed ISD, with a mean age of 61.7±15.3 years. Participants received four monthly treatment courses, each involving an injection of 5 ml of PRP into the urethral sphincter at five different points. The results showed a success rate of 50%. Twelve patients (46.2%) achieved complete dryness immediately after therapy, and 7 (26.9%) maintained complete continence for 12 months. Thus, repeated PRP injections into the urethral sphincter are a safe intervention that reduces the severity of SUI in women with stable medium-term results. The presented data demonstrate the efficacy of PRP injections in enhancing urethral sphincter resistance in the treatment of SUI [3].

In the research by Cheng Yu Long et al., (2021), seeking to evaluate therapeutic efficacy, 20 women with SUI received A-PRP injections into the anterior vaginal wall adjacent to the mid-urethra. The mean age of the participants was 44.5±9.1 years. Symptom severity was assessed before treatment, and at 1 and 6 months after treatment using self-report questionnaires. The results demonstrated the effectiveness of A-PRP injections in reducing SUI symptoms at both one- and six-months post-intervention, with no significant side effects reported [12].

The research by Athanasiou et al., (2021) showed a 50.2% reduction in urine loss among 20 women who received two PRP injections into the lower third of the anterior vaginal wall at 4–6-week intervals. Furthermore, at the 6-month follow-up, 80% of patients reported at least some degree of symptomatic improvement. The research reported no adverse reactions [2].

Daneshpajooh et al., (2021) conducted a comparative analysis of periurethral PRP injection in 10 patients (experimental group), while a control group of 10 patients underwent a mid-urethral sling procedure, which is a widely accepted standard of care for SUI. The mean age for the PRP injection group and the mid-urethral sling group was 50.9±8.74 and 45.7±6.3 years, respectively. Evaluations were performed at 1 and 3 months. In the experimental group, 70% of patients showed relative symptomatic recovery after the injection. At the same time, 80% of patients in the control group reported a complete cure after the procedure. Data from the pre- and post-treatment questionnaires indicated the efficacy of both interventions. Nevertheless, the mid-urethral sling procedure was found to be more effective than PRP injection in terms of patient subjective response. The authors suggest that more convincing results may be achieved with subsequent P-PRP administrations [4].

The objective of the research by Jiang et al., (2021) was to evaluate the efficacy of autologous platelet-rich plasma in the treatment of urinary incontinence caused by intrinsic sphincter deficiency (ISD). The prospective research included 35 patients with ISD-related SUI, with a mean age of 68.7±12 years. 5 ml of PRP was injected into the external sphincter at 5 points; all patients received 4 injections at monthly intervals. Complete dryness was achieved in 20.0% of patients, and moderate improvement was observed in 40.0%. The mean score on the visual analog scale (VAS) for assessing urinary incontinence significantly decreased after treatment. The abdominal leak point pressure (ALPP) significantly increased. The authors also noted no increase in ALPP in neurogenic SUI and a smaller increase in ALPP in patients with failed treatment outcomes [11].

Efficacy and Safety

PRP therapy demonstrates advantages in efficacy and safety compared to some traditional treatment methods [5]. While mid-urethral sling procedures, which are a standard intervention for SUI, can be associated with various complications, PRP therapy is characterized by a favorable safety profile. Its less invasive nature is a notable advantage over traditional surgical methods for treating SUI [5, 7, 8].

Duration of Effect

The therapeutic effects of PRP injections for SUI show durability, lasting up to 12 months post-treatment in most patients who respond to the therapy. The duration of response to traditional SUI treatments can vary significantly: surgical methods often provide lasting results, while non-surgical approaches may require continuous or repeated treatment [7].

Safety, Side Effects, and Limitations of PRP use

To form well-reasoned conclusions on the use of PRP, a number of existing limitations must be considered. PRP therapy offers a solution that eliminates the need for immunosuppression and addresses concerns related to the rejection of autologous material [8].

However, it is critically important to account for the high degree of variability in preparation protocols, as well as in the duration of treatment, frequency, and location of injections, which is characteristic of most published research on PRP. This problem is primarily due to small sample sizes, suboptimal methods for reporting randomization, relatively short follow-up periods, a limited number of recorded adverse events, and an uncertain scope of clinical implementation [4, 7].

Heavy systemic reactions from PRP use in various clinical applications are extremely rare to date. Nevertheless, local reactions such as minimal pain and a burning sensation at the injection site have been reported. The most important contraindications to PRP therapy include platelet function disorders, thrombocytopenia, current use of non-steroidal anti-inflammatory drugs, corticosteroids, or anticoagulants, as well as the presence of a local infection in the injection area [3, 4, 6].

Conclusion

The results of the studies presented in this article convincingly demonstrate that PRP therapy is a promising, effective, and safe treatment for SUI in women. When used as both a monotherapy and in combination with pelvic floor muscle training or other interventions, PRP injections led to a noticeable and statistically significant improvement in SUI symptoms, including a reduction in urine loss and an increase in urethral resistance.

It is critically important to reach a consensus on the optimal frequency and quantity of PRP administrations. Moreover, continued evaluation of PRP therapy in combination with other interventions will be essential for optimizing clinical treatment outcomes and expanding the potential areas of PRP application in urogynecology.

References

1. Ashok K, Wang A (2010) Recurrent urinary stress incontinence: an overview. J Obstet Gyneclogy 36(3): 467–473
2. Athanasiou S, Kalantzis C, Zacharakis D, Kathopoulis N, Pontikaki A, Grigoriadis T (2021) The use of platelet-rich plasma as a novel nonsurgical treatment of the female stress urinary incontinence: a prospective pilot study. Female Pelvic Med Reconstr Surg 27(11): e668–e672
3. Chiang C-H, Kuo H-C (2022) The efcacy and mid-term durability of urethral sphincter injections of platelet-rich plasma in treatment of female stress urinary incontinence. Front Pharmacol 13:847520
4. Daneshpajooh A, Mirzaei M, Farsinejad A, Naghibzadeh-Tahami A, Eslami A (2021) The efect of periurethral injection of pure platelet-rich plasma in the treatment of urinary incontinence in female patients: a randomized clinical trial. J Kerman Univ Med Sci 28(4):330–337
5. Dankova I, Pyrgidis N, Tishukov M, Georgiadou E, Nigdelis MP, Solomayer E-F et al (2023) Efcacy and safety of platelet-rich plasma injections for the treatment of female sexual dysfunction and stress urinary incontinence: a systematic review. Biomedicines 11(11):2919
6. Dhillon RS, Schwarz EM, Maloney MD (2012) Platelet-rich plasma therapy—future or trend? Arthritis Res Ther 14(4):219\
7. Dhurat R, Sukesh M (2014) Principles and methods of preparation of platelet-rich plasma: a review and author's perspective. J Cutan Aesthet Surg 7(4):189–197
8. Dos Santos RG, Santos GS, Alkass N, Chiesa TL, Azzini GO, da Fonseca LF et al (2021) The regenerative mechanisms of plateletrich plasma: a review. Cytokine 144:155560
9. Grigoriadis T, Kalantzis C, Zacharakis D, Kathopoulis N, Prodromidou A, Xadzilia S et al (2024) Platelet-rich plasma for the treatment of stress urinary incontinence-a randomized trial. Urogynecology 30(1):42–49
10. Harding C, Lapitan M, Arlandis S, Bø K, Cobussen-Boekhorst H, Costantini E, et al. (2024) Non-neurogenic female LUTS [Internet]. EAU Guidelines Ofce, Arnhem. accessed September 13, 2024. https://uroweb.org/guidelines/non-neurogenic-female-luts/chapter/introduction. Accessed 13 Sep 2024
11. Jiang Y-H, Lee P-J, Kuo H-C (2021) Therapeutic efcacy of urethral sphincter injections of platelet-rich plasma for the treatment of stress urinary incontinence due to intrinsic sphincter defciency: a proof-of-concept clinical trial. Int Neurourol J 25(1):51–58
12. Kobashi KC, Vasavada S, Bloschichak A, Hermanson L, Kaczmarek J, Kim SK et al (2023) Updates to surgical treatment of female stress urinary incontinence (SUI): AUA/SUFU guideline (2023). J Urol 209(6):1091–1098

13. Long C-Y, Lin K-L, Shen C-R, Ker C-R, Liu Y-Y, Loo Z-X et al (2021) A pilot study: efectiveness of local injection of autologous platelet-rich plasma in treating women with stress urinary incontinence. Sci Rep 11(1):1584

14. Saraluck A, Chinthakanan O, Kijmanawat A, Aimjirakul K, Wattanayingcharoenchai R, Manonai J (2024) Autologous platelet rich plasma (A-PRP) combined with pelvic foor muscle training for the treatment of female stress urinary incontinence (SUI): a randomized control clinical trial. Neurourol Urodyn 43(2):342–353

15. Tahoon AS, Salem HE-DH, Mousa AAA (2022) The role of platelet rich plasma injections in cases of stress incontinence. Qeios. https://doi.org/10.32388/KG77ZQ.2