PRP loaded hydrogels for female reproductive tissues regeneration

female reproductive system is anatomically divided into vagina, cervix, fallopian tubes, uterus and ovaries. Platelet-rich plasma (PRP) as a rich source of plasma proteins and platelets, has become an attractive therapeutic approach for reproductive tissue regeneration. In recent years, researchers have used PRP encapsulation in biomaterials and hydrogels to address these challenges. PRP loaded hydrogels by gradually biodegradation in body environment allow for sustain release of PRP.

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Aim: This systematic review highlighted the use of PRP loaded hydrogels in reproductive system tissues regeneration. This study investigated the role of hydrogels and biomaterials in improving the effectiveness PRP therapy for reproductive system related diseases.

Background: In recent years, researchers have used PRP encapsulation in biomaterials and hydrogels to address these challenges. PRP loaded hydrogels by gradually biodegradation in body environment allow for sustain release of PRP.

Methods: This systematic review and meta-analysis followed the PRISMA guidelines and searched multiple databases, including PubMed, Scopus, Web of Science, and Cochrane until January 2025. To evaluate the studies, the review used the SYRCLE's tool to assess risk of bias, and the GRADE method to determine the certainty of evidence for each outcome. A random-effects meta-analysis was performed, and heterogeneity was evaluated.

Results: Overall, 7 studies included in this systematic review and meta-analysis. The meta-analysis demonstrated that combining platelet-rich plasma (PRP) with hydrogel scaffolds significantly enhanced endometrial regeneration compared to untreated intrauterine adhesions (IUAs).

Conclusions: In conclusion, PRP/hydrogel synergistically enhances endometrial regeneration by combining sustained growth factor delivery with scaffold-mediated structural support, offering a promising therapeutic strategy for IUAs. Standardization of protocols is needed to optimize clinical translation.

Keywords: PRP, Hydrogel, Sustain release

Strengths and limitations:

Although PRP encapsulation has received much attention in recent years to improve its regenerative performance, achieving the ideal biomaterial faces various challenges and requires more comprehensive studies.