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LETTER

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Contemporary application and prospects of mesenchymal stem cell therapies in gynecology and gynecologic oncology

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Dear Editor,

Mesenchymal stem cells (MSCs) have garnered increasing interest because to their multidirectional differentiation potential, immunomodulatory capabilities, and self-renewal capacity. Being able to comprehend the multi-omics molecular background of stem cells has the potential to offer us with important information on the treatment of diseases, including gynecological disorders, as well as the synthesis of healthy cells for use in regenerative medicine. Due to the fact that they encourage immunoregulatory, anti-inflammatory, anti-apoptotic, and anti-oxidative activities, MSCs have been proven to possess paracrine capabilities. This gives them the status of agents that are tolerant of the immune system. In addition, they possess both pain-relieving and angiogenic actions (1).

A significant number of findings concerning mesenchymal stem cells have been made in a variety of medical fields, and a great deal of research has been published on the therapeutic potential of these cells. For instance, in specialties of medicine such as psychiatry and general surgery, their efficiency in the treatment of disorders is becoming more and more evident (2-4). This letter is written with the intention of bringing attention to the vast number of studies that have been conducted in aspects of gynecology, and gynecologic oncology, as well as the utilization of mesenchymal stem cells in these areas (5-7).

Premature ovarian failure

It is possible that ovarian function might improve if exosomes that are extracted from mesenchymal stem cells of the human umbilical cord were injected directly into the ovaries (8). Mesenchymal stem cells injected to mice model had been improved ovarian function. Following the infusion of mesenchymal stem cells, there was a considerable increase in serum levels of both AMH and estradiol, suggesting that this treatment could be beneficial for patients with premature ovarian failure (POF). The inhibition of apoptosis was the mechanism by which the function of the ovaries was improved. Following the completion of treatment, the outcomes of the study revealed that the number of follicles had grown (9). It has been shown that in cases of ovarian failure due to chemotherapy or radiotherapy, ovarian functions are restored, serum hormone levels improve, and even pregnancies can occur by administering MSCs and MSC-derived exosomes (10,11).

Polycystic ovary syndrome

Women who have hyperandrogenemia, ovulation failure, and insulin resistance are at risk of developing polycystic ovarian syndrome (PCOS), a condition that results from abnormalities in the endocrine and

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metabolic functions of the body (6). A research that used a rat model of polycystic ovary syndrome (PCOS) found that adipose-derived mesenchymal stem cells (ADMSCs) had the potential to restore the structure of the ovaries, increase the number of oocytes and corpora lutea, and decrease the number of abnormal cystic follicles (12). Additionally, MSCs and the substances they secrete have the ability to reduce testosterone levels, improve insulin sensitivity, and reduce the amount of proinflammatory chemicals that are present. In this way, exosomes that are produced from MSCs have the potential to be used in the treatment of PCOS (13).

Infertility

Endometrial MSCs are one of the types of MSCs that can be utilized in the treatment of infertility. The endometrium is a component of the reproductive system that is responsible for the production of SCs. These are especially significant to the reproductive lives of women. The thickness of the endometrium can be dramatically increased with subendometrial transplantation of eMSCs, which also has the potential to improve outcomes for in vitro fertilization (1). Furthermore, mesenchymal stem cells (MSCs) are able to successfully initiate the decidualization process and can be employed to increase the quality of oocytes (14,15).

Uterine leiomyoma

Leiomyomas of the uterus are tumors of the smooth muscle that are not cancerous. They are the most prevalent form of benign gynecological tumor found in women who are of reproductive age, and it is believed that they impact seventy percent of women. The use of magnetic nanoparticles complexed to adenovirus to target tumor-initiating leiomyoma stem cells for gene therapy has resulted in apoptosis and reduced proliferation. Furthermore, stem cells are regulated by Simvastatin, which is known to have anti-leiomyoma characteristics (16).

Stress urinary incontinence

Stem cell research for the treatment of stress urinary incontinence (SUI) is quickly developing, with the outcomes of the research being favorable generally. The manner of cell transplantation has included intraurethral, periurethral, and intravenous routes of administration. Here are studies showing improvement in SUI after periurethral and urethral MSC injections (1,4,17).

Endometriosis

Endometriosis is a medical disorder in which endometrial tissue development is found to occur outside of the uterine cavity. It has been demonstrated that exosomes released by MSCs in cases of endometriosis are effective in considerably reducing the amounts of improperly expressed angiogenic markers and inflammatory factors. Endometriosis is a condition that can be treated with medication, but the effectiveness of such treatments is dependent on how well the medication is delivered to the endometriotic lesions. Human endometrial mesenchymal stem cells (hEMSCs) have showed tropism toward endometriotic lesions, indicating that hEMSCs may be viable drug delivery systems for treating endometriosis (6). Following the transplantation of mesenchymal stem cells (MSCs) into a mouse model of endometriosis, a study found that the expression of tumor necrosis factor alpha (TNF-α) in the bone marrow of the mice decreased. The development of endometriotic lesions had been prevented by the remodeling of bone marrow, which results in a seven-fold reduction in the volume of the lesions (18).

Gynecologic cancers

Despite the progress that has been made in the medical field, cervical, ovarian, and endometrial cancers are still the most common and deadly diseases affecting women all over the world. Cell-based therapies, such as MSCs, are currently becoming more and more popular in clinical settings as a treatment for cancer.

Cervical cancer

The anticancer effects of exosomes produced from MSc were confirmed in vivo using either intra-tumoral or intravenous injection in cervical cancer xenograft animal models. MSC-derived exosomes strongly trigger apoptosis and reduce proliferation and epithelial-mesenchymal transition in a dose-dependent manner (19).

Endometrial cancer

Research indicates the impact of MSCs on the management of endometrial cancer. The research by Pan et al. emphasizes that increased levels of hUMSCs-derived exosomal miR-503-3p or reduced mesoderm-specific transcript impede the progression of human endometrial cancer, hence enhancing the treatment of endometrial cancer (20). Exosomes released by MSCs can effectively treat endometrial malignancies through the targeted administration of anticancer miRNAs or pharmaceuticals (19).

Ovarian cancer

Liu et al. found that adipose-derived MSCs promote epithelial-mesenchymal transition (EMT) in ovarian cancer cells and activate the TGF-β signaling system, hence augmenting ovarian cancer proliferation and metastasis, a result reversible by the TGF-β inhibitor SB431542. This indicates that inhibiting TGF-β in adipose-derived MSCs may have therapeutic promise in preventing ovarian cancer progression (21). Aziz et al. demonstrated that hAFMSCs have inherent tumor tropism and can secrete soluble substances in cell culture, resulting in an effective anticancer impact (22).

Perspective

Research on the application of mesenchymal stem cells (MSCs) for disease management in gynecology and gynecologic oncology is on the rise. A transition from in vitro to in vivo studies is apparent. Mesenchymal stem cells (MSCs) are gaining recognition as a biologically valid and progressively substantiated methodology. There are noted contradictions regarding the capacity of MSCs to either promote or inhibit carcinogenesis. These inconsistencies arise from variations in experimental parameters, including animal models, cell lines, dosages, and treatment periods. Consequently, the classification of MSCs as either anticancer agents or therapeutic targets in cancer treatment continues to be a subject of contention. Questions of this nature must be elucidated prior to the implementation of MSC-based cancer therapy in clinical environments.

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References

1. Erceg Ivkošiæ I, Fureš R, Æosiæ V, Mikelin N, Buliæ L, Dobraniæ D, et al. Unlocking the potential of mesenchymal stem cells in gynecology: where are we now? J Pers Med. 2023;13(8):1253.
2. Azizoglu SI. The pathophysiology of psychiatric disorders and the therapeutic potential of mesenchymal stem cells. Psychiatry Investig. 2025;22(9):961.
3. Gul MC. The pathophysiology of abdominal surgical diseases and the therapeutic potential of mesenchymal stem cells. J Clin Trials Exp Investig. 2025;4(2):59-61.
4. Azizoglu M, Zorba-Yildiz AP, Yilmaz H, Yurtbay G, Catli G, Yavuz G, et al. Regenerative medicine in surgery: stem cells and exosome applications. Cir Cir. 2025;93(1):86-104.
5. Kurniadi A, Zucha MA, Kusumanto A, Salima S, Harsono AB. Application of adult stem cells in obstetrics and gynecology: a scoping review. Eur J Obstet Gynecol Reprod Biol X. 2025;25:100367.
6. Gao G, Li L, Li C, Liu D, Wang Y, Li C. Mesenchymal stem cells: guardians of women's health. Regen Ther. 2024;26:1087-98.
7. Zhao YX, Chen SR, Su PP, Huang FH, Shi YC, Shi QY, et al. Using mesenchymal stem cells to treat female infertility: an update on female reproductive diseases. Stem Cells Int. 2019;2019:9071720.
8. Dai F, Liu H, He J, Wu J, Yuan C, Wang R, et al. Model construction and drug therapy of primary ovarian insufficiency by ultrasound-guided injection. Stem Cell Res Ther. 2024;15(1):49.
9. Un B, Cetinkaya-Un B, Akpolat M, Andic F, Yazir Y. The effects of human amnion membrane-derived mesenchymal stem cells conditioned medium on ionizing radiation-induced premature ovarian failure

and endoplasmic reticulum stress-related apoptosis mechanism. Eur J Obstet Gynecol Reprod Biol. 2023;288:191-7.

10. Li J, Fan H, Liu W, Zhang J, Xiao Y, Peng Y, et al. Mesenchymal stem cells promote ovarian reconstruction in mice. Stem Cell Res Ther. 2024;15(1):115.

11. Park HS, Chugh RM, Seok J, Cetin E, Mohammed H, Siblini H, et al. Comparison of the therapeutic effects between stem cells and exosomes in primary ovarian insufficiency: as promising as cells but different persistency and dosage. Stem Cell Res Ther. 2023;14(1):165.

12. Nejabati HR, Nikzad S, Roshangar L. Therapeutic potential of mesenchymal stem cells in PCOS. Curr Stem Cell Res Ther. 2024;19(2):134-44.

13. Prayitno GD, Lestari K, Sartika CR, Djuwantono T, Widjaya A, Muharam R, et al. Potential of mesenchymal stem cells and their secretomes in decreasing inflammation markers in polycystic ovary syndrome treatment: a systematic review. Medicines (Basel). 2022;10(1):3.

14. de Miguel-Gómez L, López-Martínez S, Francés-Herrero E, Rodríguez-Eguren A, Pellicer A, Cervello I. Stem cells and the endometrium: from the discovery of adult stem cells to pre-clinical models. Cells. 2021;10(3):595.

15. Kaupinis A, Valius M, Ramağauskaitė D, Navakauskienė R. Menstrual blood-derived endometrial stem cells' impact for the treatment perspective of female infertility. Int J Mol Sci. 2021;22(13):6774.

16. El Sabeh M, Afrin S, Singh B, Miyashita-Ishiwata M, Borahay MA, Segars JH, et al. Uterine stem cells and benign gynecological disorders: role in pathobiology and therapeutic implications. Stem Cell Rev Rep. 2021;17:803-20.

17. Lane FL, Jacobs S. Stem cells in gynecology. Am J Obstet Gynecol. 2012;207(3):149-56.

18. Habata S, Mamillapalli R, Ucar A, Taylor HS. Donor mesenchymal stem cells program bone marrow, altering macrophages, and suppressing endometriosis in mice. Stem Cells Int. 2023;2023:1598127.

19. Song Y, Liu H, Pan S, Wang X, Ma Y, Zhou J, et al. Emerging role of mesenchymal stromal cells in gynecologic cancer therapy. Stem Cell Res Ther. 2023;14:347.

20. Pan Y, Wang X, Li Y, Zhang J, Liu D, Chen X, et al. Human umbilical cord blood mesenchymal stem cells-derived exosomal microRNA-503-3p inhibits progression of human endometrial cancer cells through downregulating MEST. Cancer Gene Ther. 2022;29(6):1130-9.

21. Liu X, Zhao G, Huo X, Zhang J, Li Y, Xu B, et al. Adipose-derived stem cells facilitate ovarian tumor growth and metastasis by promoting epithelial to mesenchymal transition through activating the TGF-β pathway. Front Oncol. 2021;11:756011.

22. Gholizadeh-Ghaleh Aziz S, Fardyazar Z, Pashaiasl M. The human amniotic fluid mesenchymal stem cells therapy on SKOV3 ovarian cancer cell line. Mol Genet Genomic Med. 2019;7(7):e00726.