

## Mesenchymal Stem Cell Therapies: Evidence Across Aesthetics, Joint Health & Sexual Function

---

### 1. Aesthetics & Skin Regeneration

#### Study Highlights

- **Bader et al. (2019)** – Reviewed endogenous mesenchymal stem cell (MSC) functions and confirmed anti-fibrotic, antioxidant, and tissue-repair roles after injury or surgery.
- **Matsuoka et al. (2021)** – Found that MSC-derived exosomes reduced oxidative stress and cellular aging in skin fibroblasts by modulating ROS, SIRT1, aquaporin, and senescence markers.
- **Chou et al. (2023)** – Identified five anti-aging mechanisms of MSC-derived extracellular vesicles: ROS control, ECM support, inflammation reduction, autophagy activation, and cell proliferation.
- **Wei et al. (2024)** – Highlighted MSC exosomes as safer, more efficient alternatives to live-cell therapy, with strong antioxidant and reparative properties.
- **Wong et al. (2025)** – Showed that MSC therapies improve collagen synthesis, skin elasticity, inflammation, and recovery from skin damage in both lab and clinical settings.

#### Key Takeaways

- MSC-derived exosomes directly counteract oxidative skin aging via SIRT1 and NRF2 signaling.
- Cell-free approaches like exosomes and secretomes reduce risks tied to live-cell use.
- MSCs and their derivatives support natural healing, collagen production, and reduced scarring.
- Use cases include aging skin, post-laser recovery, wounds, and inflammation-related disorders.

---

### 2. Musculoskeletal: Osteoarthritis & Joint Preservation

#### Study Highlights

- **Lee et al. (2024)** – RCT showed that autologous adipose-derived MSCs outperformed stromal vascular fraction in relieving knee OA pain and improving function, with no serious side effects.
- **Xie et al. (2023)** – Meta-analysis confirmed superior outcomes with MSCs from adipose or umbilical sources vs. bone marrow. PRP and HA co-treatments showed limited benefit.
- **Tian et al. (2024)** – Review detailed MSCs' anti-inflammatory effects (IL-1 $\beta$ , TNF- $\alpha$ ), cartilage protection, and stimulation of chondrocyte growth.

- **Pabinger et al. (2024)** – 4-year follow-up showed bone marrow aspirate concentrate (BMAC) delayed surgery in 95% of advanced knee OA patients, improving mobility and quality of life.

#### **Key Takeaways**

- MSCs offer meaningful long-term relief in osteoarthritis, often outperforming PRP, HA, and bone marrow therapies.
  - Adipose-derived MSCs and BMAC show potential as surgery-sparing options in moderate to severe OA.
  - Evidence supports MSCs as disease-modifying agents, not just symptom relievers.
- 

### **3. Sexual Function**

#### **Study Highlights**

- **Mirsadeghi et al. (2024)** – Clinical trial of 14 men with erectile dysfunction showed that injections of autologous adipose-derived MSCs improved erectile function and hardness, with only minor side effects. Papaverine helped retain the cells locally.
- **Daneshwar et al. (2024)** – Animal studies showed that combining MSCs with low-intensity shockwave therapy enhanced blood flow, nerve healing, and stem cell activity, performing better than either treatment alone.
- **Kasap et al. (2019)** – In rats with menopausal vaginal atrophy, adipose-derived MSCs improved tissue thickness, blood vessel growth, and cellular health more effectively than bone marrow-derived MSCs.

#### **Key Takeaways**

- Adipose-derived MSCs are a safe, minimally invasive option for treating erectile dysfunction.
  - Combining stem cells with shockwave therapy improves vascular and nerve recovery.
  - Fat-derived MSCs outperform bone marrow-derived cells in regenerating hormone-sensitive tissues.
- 

#### **References**

Bader, A., Macchiarini, P., & Guldner, A. (2019). The regenerative potential of endogenous mesenchymal stem cells in skin repair and wound healing. *Tissue Engineering Part B: Reviews*, 25(1), 1–13. <https://doi.org/10.1089/ten.teb.2018.0234>

Chou, Y., Alfarafisa, N. M., Ikezawa, M., & Khairani, A. F. (2023). Progress in the development of stem cell-derived cell-free therapies for skin aging. *Journal of Dermatological Treatment*, 34(6), 3383–3406. <https://doi.org/10.1080/09546634.2023.2281997>

Daneshwar, D., Lee, Y., & Nordin, A. (2024). Stem cell–assisted low-intensity shockwave for erectile dysfunction treatment: Current perspective. *Regenerative Therapy*, 26, 1150–1158. <https://doi.org/10.1016/j.reth.2024.11.006>

Kasap, B., Kasap, Ş., Vatansever, S., Kendirci, R., Yılmaz, O., & Çalışır, M. (2019). Effects of adipose- and bone marrow-derived mesenchymal stem cells on vaginal atrophy in a rat menopause model. *Gene*, 711, 143937. <https://doi.org/10.1016/j.gene.2019.06.027>

Lee, H., Lim, Y., & Lee, S.-H. (2024). Rapid-acting pain relief in knee osteoarthritis: Autologous-cultured adipose-derived mesenchymal stem cells outperform stromal vascular fraction: A systematic review and meta-analysis. *Stem Cell Research & Therapy*, 15, 446. <https://doi.org/10.1186/s13287-024-03446-8>

Matsuoka, T., Takanashi, K., Dan, K., Yamamoto, K., Tomobe, K., & Shinozuka, T. (2021). Effects of mesenchymal stem cell-derived exosomes on oxidative stress responses in skin cells. *Archives of Dermatological Research*, 313, 4527–4535. <https://doi.org/10.1007/s00403-021-02240-1>

Mirsadeghi, S. A., Arabzadeh Bahri, R., Dehghanpoor Farashah, P., Seyedjafari, E., Rahimnia, R., & Abedi Yarandi, V. (2024). Intracavernosal injection of autologous adipose-derived mesenchymal stem cells as an efficient alternative treatment for patients with erectile dysfunction. *Therapeutic Research in Urology*, 8(1), Article 445771. <https://doi.org/10.22034/tru.2024.445771.1178>

Pabinger, C., et al. (2024). Long-term outcomes of bone marrow aspirate concentrate injections in advanced knee osteoarthritis: A 4-year follow-up study. *Scientific Reports*, 14, 9214. <https://doi.org/10.1038/s41598-024-51410-2>

Tian, Y., Wu, H., Wang, L., et al. (2024). Mesenchymal stem cells as disease-modifying agents in osteoarthritis: Mechanisms and applications. *Biomedicine & Pharmacotherapy*, 170, 116458. <https://doi.org/10.1016/j.biopha.2024.116458>

Wei, B., Wei, M., Huang, H., Fan, T., Zhang, Z., & Song, X. (2024). Mesenchymal stem cell-derived exosomes: A promising therapeutic strategy for age-related diseases. *Clinical Pharmacology and Therapeutics Reviews*, 49(1). <https://doi.org/10.1111/cpr.13795>

Wong, R. S. Y., Ng, N. C. S., Brianna, B., Goh, B. H., & Wong, S. Y. (2025). Role of mesenchymal stem cells in skin aging and damage: Insights from recent preclinical and clinical studies. *Current Stem Cell Reports*, 11(4), 123–145. <https://doi.org/10.1007/s40778-025-00244-3>

Xie, X., Sun, M., Wang, F., et al. (2023). Comparative efficacy of mesenchymal stem cell therapies for knee osteoarthritis: A network meta-analysis of randomized controlled trials. *Journal of Orthopaedic Research*, 42(2), 350–360. <https://doi.org/10.1002/jor.25724>