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Systematic review

Role of stem cells in stress urinary incontinence: a systematic review

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Abstract

Background: Stress urinary incontinence (SUI) results from urethral support failure, intrinsic sphincter deficiency, or both, and affected patients seek less invasive options than repeat surgery. Stem-cell therapy restore urethral sphincter structure through myogenic replacement, stromal support, angiogenesis, and paracrine modulation. **Objective:** This systematic review evaluated studies on stem-cell and cell-based therapy for SUI, focusing on efficacy, safety, cell source, delivery route, and methodological quality. **Methods:** We searched PubMed/MEDLINE, Scopus, Web of Science, and Cochrane Library from inception to Jan 2026. Eligible studies enrolled humans with SUI or stress-predominant mixed urinary incontinence and reported original clinical outcomes after periurethral, transurethral, or intrasphincteric administration of stem-cell-derived or regenerative cell products. **Results:** Ten studies were included. Most studies used autologous muscle-derived cells or myoblasts; fewer used adipose-derived stem cells or cord blood cells. Reported outcomes included weight, cough or stress tests, leakage diaries, quality-of-life scales, urodynamics, and adverse events. Safety was good, with transient local symptoms and no consistent severe treatment-related signal. Efficacy ranged from modest subjective improvement to complete dryness in a subset of patients, with stronger signals in higher-dose muscle-derived protocols. **Conclusion:** Our included studies supports feasibility and early safety, while clinical efficacy still heterogeneous and insufficient for routine adoption outside regulated research settings.

Keywords: stress urinary incontinence; stem cells; muscle-derived cells; myoblasts; adipose-derived stem cells; regenerative medicine; urethral sphincter; systematic review.

Introduction

Stress urinary incontinence is an involuntary urine leakage during effort, exertion, sneezing, or coughing, and it is a major female pelvic floor disorder with functional, psychological, and social consequences (1). SUI forms a frequent clinical subtype that affects daily activity, intimate life, and health-related quality of life (2). Continence depends on coordinated urethral closure pressure, pelvic floor muscle integrity, connective-tissue support, neural control, and vascular supply around the urethra and bladder neck (3).

Conservative management, injectable bulking agents, and surgery form the traditional treatment spectrum for women with SUI, with procedure choice guided by symptom severity, urethral mobility, intrinsic sphincter deficiency, prior surgery, and patient preference (4). Pelvic floor muscle training improves continence outcomes compared with no active treatment, especially in motivated patients with mild to moderate symptoms (5). Mid-urethral sling procedures provide stronger objective cure rates than

conservative treatment, and mesh-related concerns, recurrence, pain, voiding dysfunction, and reoperation risk maintain interest in less invasive regenerative strategies (6). Urethral injection therapy offers a minimally invasive route, although durability and comparative effectiveness is limited compared with established surgical procedures (7).

Stem-cell therapy has been proposed for SUI because sphincter deficiency includes muscular, neural, stromal, and vascular components rather than a single mechanical defect (8). Muscle-derived cells, myoblasts, mesenchymal stromal cells, adipose-derived cells, and cord blood cells have been studied because they provide myogenic potential, trophic signaling, matrix remodeling, and local tissue support (9). Clinical reviews describe early feasibility signals in small studies, with wide variation in cell source, culture technique, injection route, dose, follow-up, and outcome definitions (10). Recent systematic review report encouraging safety and improvement rates (11). Meta-analytic study found pooled improvement in leakage and quality-of-life measures, although clinical

translation requires stricter randomized evidence and standardized outcome reporting (12). A clinical-trial review also highlights the need to avoid retracted studies and to interpret early positive reports with caution because regulatory, methodological, and reproducibility issues affected parts of the early evidence base (13). This systematic review aimed to evaluate the clinical role of stem-cell-based therapy in the treatment of stress urinary incontinence, and we focus on its efficacy, safety, cell sources, delivery methods, patient outcomes, and limitations of the current human evidence.

Methods

This systematic review was conducted according to the PRISMA 2020 principles. The review question followed the PICOS structure: participants were humans with SUI or stress-predominant mixed urinary incontinence. The intervention was any stem-cell or regenerative cell injection; comparators included placebo, standard care, or no comparator. Outcomes included continence, pad weight, leakage diary, stress test, quality-of-life scores, urodynamics, and adverse events; and eligible study designs included randomized trials, prospective cohorts, pilot studies, dose-ranging studies, and single-arm clinical studies.

PubMed/MEDLINE, Scopus, Web of Science Core Collection, and Cochrane Library were searched from database inception to Jan 2026 (Fig 1). The search combined terms for the condition and intervention: “stress urinary incontinence”, “SUI”, “intrinsic sphincter deficiency”, “stem cell”, “cell therapy”, “muscle-derived cell”, “myoblast”, “adipose-derived stem cell”, “mesenchymal stromal cell”, “cord blood”, “regenerative cell”, and “periurethral injection”. Reference lists of relevant reviews and eligible studies were checked for additional original reports.

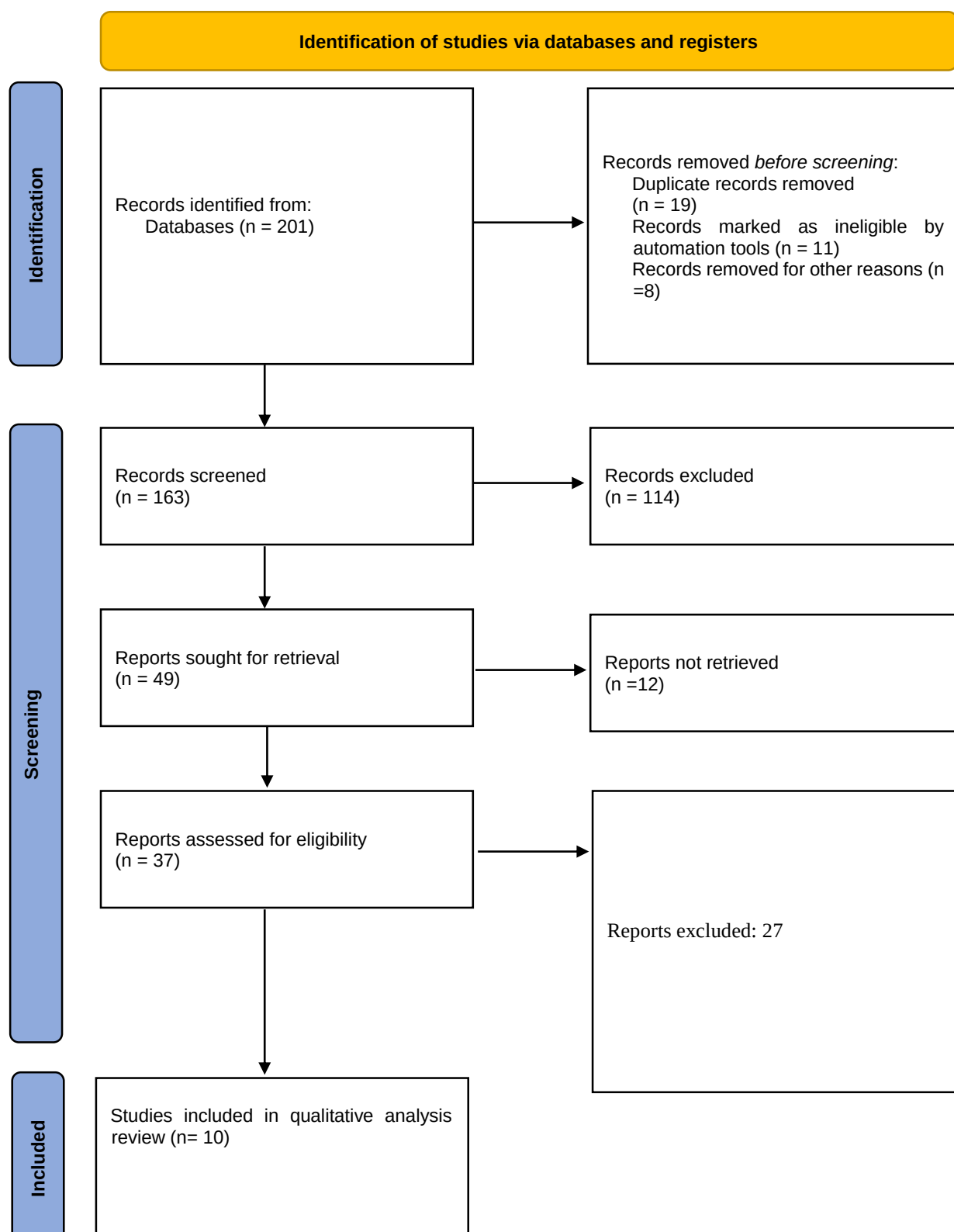
Studies were included when they reported original human clinical data after injection or implantation of stem-cell-derived or regenerative cell products for SUI. Studies were excluded when they were animal studies, in vitro experiments, narrative reviews, conference abstracts without extractable clinical data, duplicate interim reports superseded by fuller publications, or retracted reports. For overlapping cohorts, the most complete peer-reviewed report was selected for outcome extraction. Two-stage screening included title and abstract screening followed by full-text assessment. Extracted variables included author, year, country, design, sample size, participant characteristics, cell source, processing method, injection route, dose, follow-up duration, continence outcomes, quality-of-life outcomes, urodynamic findings, adverse events, and authors’ conclusions.

Risk of bias was assessed according to study design. The double-blind randomized placebo-controlled trial was evaluated using the Cochrane Risk of Bias 2 tool, we examine bias arising from the randomization process, deviations from intended interventions, missing outcome data, outcome measurement, and selection of the reported result. The non-randomized pilot, prospective, dose-ranging, and single-arm interventional studies were assessed using the Joanna Briggs Institute critical appraisal checklist for quasi-experimental studies. Overall judgments were categorized as low, moderate, or high risk of bias based on the number and importance of methodological limitations identified in each study (Table 1).

Table 1: Risk of bias assessment

Study	Design	Tool used	Risk-of-bias judgment
Carr et al., 2008	Small clinical study; 8 women; 1-year follow-up	JBI quasi-experimental checklist	Low methodological quality
Lee et al., 2010	Single-center uncontrolled clinical study; 39 women	JBI quasi-experimental checklist	Low methodological quality
Sèbe et al., 2011	Open prospective study; 12 women with severe refractory SUI	JBI quasi-experimental checklist	Low to moderate methodological quality
Blaganje and Lukanović, 2012	Prospective uncontrolled study; autologous myoblast injection plus electrical stimulation	JBI quasi-experimental checklist	Low methodological quality
Carr et al., 2013	Prospective dose-ranging study; 38 women	JBI quasi-experimental checklist	Moderate methodological quality
Kuismanen et al., 2014	Open pilot study; 5 women	JBI quasi-experimental checklist	Low methodological quality
Peters et al., 2014	Pooled analysis of 2 phase I/II studies; 80 women	JBI quasi-experimental checklist	Moderate methodological quality
Stangel-Wojcikiewicz et al., 2014	Prospective follow-up study; 16 women	JBI quasi-experimental checklist	Low to moderate methodological quality
Jankowski et al., 2018	Double-blind randomized placebo-controlled multicenter trial	Cochrane RoB 2	Some concerns
Sharifiaghdas et al., 2019	Single-arm clinical trial; 20 women; 24-month follow-up	JBI quasi-experimental checklist	Low to moderate methodological quality

Fig 1: PRISMA flow chart



Results

The final synthesis included ten clinical studies that evaluated stem-cell-based or regenerative cell therapy for SUI, including prospective single-arm studies, dose-ranging studies, pooled phase I/II analyses, and one randomized placebo-controlled trial, most included studies were early-phase, single-arm, or dose-ranging clinical studies, while one larger double-blind randomized placebo-controlled trial provided the strongest comparative evidence. The study population was mainly female, and included participants usually had persistent SUI after conservative therapy or refractory disease after previous procedures (14–23).

Muscle-derived cells were the most common intervention (14,16,23). The earliest pilot report by Carr et al. found complete continence in one of eight women and improvement in most remaining participants at one year (14). Sèbe et al. reported dryness in three of twelve women and pad-test improvement in several participants after intrasphincteric autologous muscular-cell injection (16). Blaganje and Lukanović combined autologous myoblast injection with electrical stimulation and reported a high proportion of negative stress tests after short follow-up, although the design did not

isolate the cell effect from co-intervention effects (17).

Carr et al. reported a good safety profile in escalating autologous muscle-derived cell doses, with stronger improvement in higher-dose groups than lower-dose groups (18). Peters et al. pooled phase I/II experience and reported greater pad-test and quality-of-life improvement at higher cell doses (20). Jankowski et al. tested autologous muscle-derived cells in a double-blind randomized placebo-controlled trial and found an acceptable safety profile, while efficacy interpretation was less decisive because placebo response and outcome selection affected treatment separation (22).

Lee et al. reported improvement after periurethral injection of human cord blood stem cells, with short follow-up and limited mechanistic confirmation (15). Kuismanen et al. reported feasibility of autologous adipose-derived stem cells combined with collagen, with subjective improvement in all five participants and one negative cough test at six months (19). Sharifiaghdas et al. extended follow-up to twenty-four months after autologous muscle-derived cell injection and reported persistent pad-test and questionnaire improvement in a single-arm design (23).

Table 1. Characteristics of included original studies

Study	Design and participants	Cell source and delivery	Follow-up
Carr et al., 2008 (14)	Clinical study; 8 women with SUI	Autologous muscle-derived stem cells injected into urethral sphincter	12 months
Lee et al., 2010 (15)	Clinical study; 39 women with SUI	Human cord blood stem cells injected periurethrally	3 months
Sèbe et al., 2011 (16)	Prospective study; 12 women with refractory SUI	Autologous muscular cells injected intrasphincterically	12 months
Blaganje and Lukanović, 2012 (17)	Prospective study; 38 women with SUI	Autologous myoblasts plus electrical stimulation	6 weeks

Study	Design and participants	Cell source and delivery	Follow-up
Carr et al., 2013 (18)	Prospective dose-ranging study; 38 women	Autologous muscle-derived cells at escalating doses	18 months
Kuismanen et al., 2014 (19)	Pilot study; 5 women with SUI	Autologous adipose-derived stem cells with collagen	12 months
Peters et al., 2014 (20)	Pooled phase I/II clinical studies; 80 women	Autologous muscle-derived cells at multiple doses	12 months
Stangel-Wojcikiewicz et al., 2014 (21)	Prospective follow-up study; 16 women	Autologous muscle-derived cells	24 months
Jankowski et al., 2018 (22)	Double-blind randomized placebo-controlled trial	Autologous muscle-derived cells versus placebo	12 months
Sharifiaghdas et al., 2019 (23)	Single-arm clinical trial; 20 women	Autologous muscle-derived cells	24 months

Table 2. Main outcomes and interpretation

Study	Efficacy findings	Safety and interpretation
Carr et al., 2008 (14)	One participant became completely continent, and most others reported improvement	No severe treatment-related event was emphasized; small sample
Lee et al., 2010 (15)	Improvement was reported in a large proportion at short follow-up	Short follow-up and allogeneic cord blood source limit inference
Sèbe et al., 2011 (16)	Three of twelve became dry, and several improved on pad testing	Prospective single-arm design limits causal inference
Blaganje and Lukanović, 2012 (17)	Negative stress test and symptom improvement were frequent after injection plus stimulation	Electrical stimulation creates co-intervention bias
Carr et al., 2013 (18)	Higher doses showed stronger response patterns than lower doses	Dose-ranging design supports feasibility and dose exploration
Kuismanen et al., 2014 (19)	Subjective improvement occurred in all five participants, with one negative cough test	Small sample and collagen co-administration limit attribution
Peters et al., 2014 (20)	Pad-test and quality-of-life outcomes favored higher-dose muscle-derived cells	Larger early-phase dataset, still not definitive
Stangel-Wojcikiewicz et al., 2014 (21)	Selected patients showed clinical and quality-of-life improvement at two years	Small single-arm cohort limits generalizability
Jankowski et al., 2018 (22)	Active treatment was safe, with mixed efficacy versus placebo depending on outcomes	Best comparative design, with strong placebo-response concern
Sharifiaghdas et al., 2019 (23)	Pad-test grade and IIQ-7/UDI-6 scores improved through 24 months	Longer follow-up, single-arm design, no placebo control

Discussion

This systematic review found that stem-cell therapy for SUI is best described as a feasible and safe regenerative approach with inconsistent efficacy in small and heterogeneous clinical studies (14–23). Muscle-derived cells represent the most studied platform, and this pattern fits the target pathology of external urethral sphincter weakness and intrinsic sphincter deficiency (8,9). The clinical signal is strongest in studies using autologous muscle-derived cells at higher doses, although single-arm designs and non-uniform outcomes limit certainty (18,20,23).

The safety profile in the included studies was encouraging, with most reports describing transient local symptoms rather than severe treatment-related complications (14–23). This finding is consistent with broader clinical reviews that describe stem-cell therapy for SUI as feasible over short and medium follow-up intervals (10,13). Safety interpretation requires caution because cell expansion, culture duration, product release testing, dose, injection depth, and imaging guidance differed between studies (10,13). The recent pooled clinical literature shows high heterogeneity, with cure and improvement estimates influenced by design, cell type, follow-up length, and outcome definition (24).

Efficacy interpretation is more complex than safety interpretation as SUI trials are sensitive to placebo effects, patient selection, baseline severity, prior surgery, and outcome choice (4,22). Pad weight, cough test, stress test, and urodynamic leak variables provide stronger evidence than subjective improvement alone (14–23). Co-interventions affect interpretation, mainly in studies that combined cell injection with electrical stimulation or collagen carrier material (17,19). These issues explain why promising single-arm outcomes did not translate into a uniformly decisive randomized-trial effect (22).

The biological rationale is strong because urethral continence depends on muscular, stromal, vascular, and neural integrity, and stem-cell products deliver paracrine support in addition to possible myogenic differentiation (3,8,9). Autologous muscle-derived cell protocols align with sphincter repair, while adipose-derived and cord blood approaches offer different trophic and stromal properties (15,19). The best-supported research path involves standardized cell manufacturing, predefined release criteria, image-guided injection, validated pad-test and diary outcomes, longer follow-up, and adequately powered randomized trials with sham or placebo control (11,12,24).

This review has limitations related to the underlying literature rather than only the review process. Most included studies had small samples, limited blinding, short follow-up, heterogeneous eligibility criteria, and inconsistent reporting of adverse events and urodynamic outcomes.

Conclusion

Stem-cell therapy for SUI is an emerging regenerative strategy with a reasonable biological foundation and good early safety findings. The included studies report improvement in pad tests, stress tests, leakage symptoms, and quality-of-life scores, especially after autologous muscle-derived cell injection. Evidence strength is limited by small samples, heterogeneous cell products, variable dosing, inconsistent outcomes, and limited randomized data. Our findings support continued regulated trials with standardized manufacturing, objective continence outcomes.

Abbreviations

- ADSC: adipose-derived stem cell
- AUA: American Urological Association
- BM-MSC: bone marrow mesenchymal stromal cell
- IIQ-7: Incontinence Impact Questionnaire-7
- MDSC: muscle-derived stem cell

MSC: mesenchymal stromal cell
 PFMT: pelvic floor muscle training
 PICOS: population, intervention, comparator, outcome, study design
 PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses
 QoL: quality of life
 SUI: stress urinary incontinence
 SUFU: Society of Urodynamics, Female Pelvic Medicine and Urogenital Reconstruction
 UDI-6: Urogenital Distress Inventory-6

References

- Haylen BT, de Ridder D, Freeman RM, Swift SE, Berghmans B, Lee J, et al. An International Urogynecological Association/International Continence Society joint report on the terminology for female pelvic floor dysfunction. *Neurourol Urodyn.* 2010;29(1):4-20. doi:10.1002/nau.20798.
- Abrams P, Cardozo L, Wagg A, Wein A, editors. *Incontinence*. 6th ed. Bristol: International Continence Society; 2017.
- Ashton-Miller JA, DeLancey JOL. Functional anatomy of the female pelvic floor. *Ann N Y Acad Sci.* 2007;1101:266-296. doi:10.1196/annals.1389.034.
- Kobashi KC, Vasavada S, Bloschichak A, Hermanson L, Kaczmarek J, Kim SK, et al. Updates to surgical treatment of female stress urinary incontinence: AUA/SUFU guideline. *J Urol.* 2023;209(6):1091-1098.
- Dumoulin C, Cacciari LP, Hay-Smith EJC. Pelvic floor muscle training versus no treatment, or inactive control treatments, for urinary incontinence in women. *Cochrane Database Syst Rev.* 2018;10:CD005654. doi:10.1002/14651858.CD005654.pub4.
- Ford AA, Rogerson L, Cody JD, Aluko P, Ogah JA. Mid-urethral sling operations for stress urinary incontinence in women. *Cochrane Database Syst Rev.* 2017;(7):CD006375. doi:10.1002/14651858.CD006375.pub4.
- Kirchin V, Page T, Keegan PE, Atiemo KO, Cody JD, McClinton S. Urethral injection therapy for urinary incontinence in women. *Cochrane Database Syst Rev.* 2017;(7):CD003881. doi:10.1002/14651858.CD003881.pub4.
- Lin CS, Lue TF. Stem cell therapy for stress urinary incontinence: a critical review. *Stem Cells Dev.* 2012;21(6):834-843. doi:10.1089/scd.2011.0621.
- Hart ML, Izeta A, Herrera-Imbroda B, Amend B, Brinchmann JE. Cell therapy for stress urinary incontinence. *Tissue Eng Part B Rev.* 2015;21(4):365-376. doi:10.1089/ten.TEB.2014.0627.
- Barakat B, Franke K, Schakaki S, Hijazi S, Hasselhof V, Vögeli TA. Stem cell applications in regenerative medicine for stress urinary incontinence: a review of effectiveness based on clinical trials. *Arab J Urol.* 2020;18(3):194-205. doi:10.1080/2090598X.2020.1750864.
- Klapper-Goldstein H, Tamam S, Sade S, Weintraub AY. A systematic review of stem cell therapy treatment for women suffering from stress urinary incontinence. *Int J Gynaecol Obstet.* 2022;157(1):19-30. doi:10.1002/ijgo.13769.
- Mariotti G, Salciccia S, Viscuso P, Bevilacqua G, Casale P, Frisenda M, et al. Regenerative medicine-based treatment of stress urinary incontinence with mesenchymal stem cells: a systematic review and meta-analysis. *Curr Stem Cell Res Ther.* 2023;18(3):429-437. doi:10.2174/1574888X17666220616100621.
- Aragón IM, Herrera Imbroda B, Lara MF. Cell therapy clinical trials for stress urinary incontinence: current status and perspectives. *Int J Med Sci.* 2018;15(3):195-204. doi:10.7150/ijms.22130.

14. Carr LK, Steele D, Steele S, Wagner D, Pruchnic R, Jankowski R, et al. 1-year follow-up of autologous muscle-derived stem cell injection pilot study to treat stress urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct.* 2008;19(6):881-883. doi:10.1007/s00192-007-0553-z.
15. Lee CN, Jang JB, Kim JY, Koh C, Baek JY, Lee KJ. Human cord blood stem cell therapy for treatment of stress urinary incontinence. *J Korean Med Sci.* 2010;25(6):813-816. doi:10.3346/jkms.2010.25.6.813.
16. Sèbe P, Doucet C, Cornu JN, Ciofu C, Costa P, de Medina SG, et al. Intrasphincteric injections of autologous muscular cells in women with refractory stress urinary incontinence: a prospective study. *Int Urogynecol J.* 2011;22(2):183-189. doi:10.1007/s00192-010-1255-5.
17. Blaganje M, Lukanović A. Intrasphincteric autologous myoblast injections with electrical stimulation for stress urinary incontinence. *Int J Gynaecol Obstet.* 2012;117(2):164-167. doi:10.1016/j.ijgo.2011.11.029.
18. Carr LK, Robert M, Kultgen PL, Herschorn S, Birch C, Murphy M, et al. Autologous muscle derived cell therapy for stress urinary incontinence: a prospective, dose ranging study. *J Urol.* 2013;189(2):595-601. doi:10.1016/j.juro.2012.09.028.
19. Kuismanen K, Sartoneva R, Haimi S, Mannerström B, Tomás E, Miettinen S, et al. Autologous adipose stem cells in treatment of female stress urinary incontinence: results of a pilot study. *Stem Cells Transl Med.* 2014;3(8):936-941. doi:10.5966/sctm.2013-0197.
20. Peters KM, Dmochowski RR, Carr LK, Robert M, Kaufman MR, Sirls LT, et al. Autologous muscle derived cells for treatment of stress urinary incontinence in women. *J Urol.* 2014;192(2):469-476. doi:10.1016/j.juro.2014.02.047.
21. Stangel-Wojcikiewicz K, Jarocho D, Piwowar M, Jach R, Uhl T, Basta A, et al. Autologous muscle-derived cells for the treatment of female stress urinary incontinence: a 2-year follow-up of a Polish investigation. *Neurourol Urodyn.* 2014;33(3):324-330. doi:10.1002/nau.22404.
22. Jankowski RJ, Tu LM, Carlson C, Robert M, Carlson K, Quinlan D, et al. A double-blind, randomized, placebo-controlled clinical trial evaluating the safety and efficacy of autologous muscle derived cells in female subjects with stress urinary incontinence. *Int Urol Nephrol.* 2018;50(12):2153-2165. doi:10.1007/s11255-018-2005-8.
23. Sharifiaghdas F, Zohrabi F, Moghadasali R, Shekarchian S, Jaroughi N, Bolurieh T, et al. Autologous muscle-derived cell injection for treatment of female stress urinary incontinence: a single-arm clinical trial with 24-months follow-up. *Urol J.* 2019;16(5):482-487. doi:10.22037/uj.v0i0.4736.
24. Chen J, Zhi Y, Liu W, Fan Y, Lin Y, Zhong Q, et al. Autologous regenerative cell therapy for female stress urinary incontinence: a systematic review and meta-analysis of clinical outcomes. *Front Med.* 2026;13:1861606. doi:10.3389/fmed.2026.1861606.