

BASIC RESEARCH

Urethral sphincter regeneration using stem cells from amniotic fluid

A triple injection of muscle, neuron and endothelial progenitor cells derived from human amniotic fluid stem cells (hAFSCs) has shown promising results in mice with urethral sphincter damage, according to a new study published in *BJU International*.

Urethral sphincter damage—which can be caused by vaginal delivery, obesity, diabetes or age—can lead to urinary incontinence, which has profound effects on quality of life. Cell therapy has been championed as a potential treatment

option for the regeneration of striated muscle, and previous studies of adipose-derived stem cells and bone marrow stromal cells have shown some success. However, given the additional importance of innervation and angiogenesis in regeneration of the urethral sphincter, a team of scientists from Korea proposed that combined cell therapy might be more efficient than single injections.

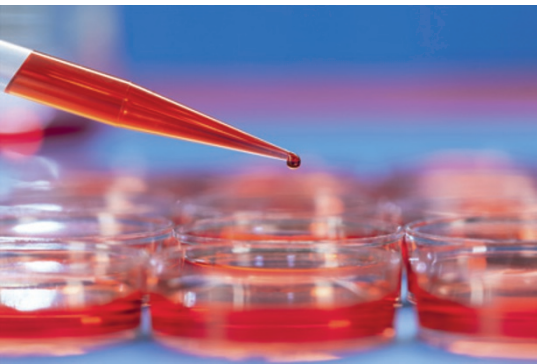
Chun *et al.* differentiated hAFSCs donated by pregnant women into muscle, neuron and endothelial progenitor cells and injected them into the urethral sphincter region of pudendal neurectomized ICR mice, singly or in double or triple combinations. Urodynamics showed significantly improved leak point pressure in the triple combination group compared with any of the single or double combination groups. Histological and immunohistochemical analyses revealed the formation of new striated muscle fibres and neuromuscular junctions at the injection site.

“We found that the combined injection of early-differentiated hAFSCs into the urethral sphincter had synergistic effects on urethral sphincter regeneration,” says Tea Gyun Kwon, who led the study. “The best ratio of cell combination for sphincter regeneration was 8:1:1 for muscle, neuron, and endothelial progenitor cells, respectively.”

The number of injected muscle cells had the greatest effect on urethral sphincter function, but the researchers found that progenitor cell quality also affected tissue regeneration; for example, differentiated muscle progenitor cells cultured in conditioned medium showed better morphological and functional tissue reconstruction than 5-Aza-2-deoxycytidine-treated cells.

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Original article Chun, S.Y. *et al.* Combined injection of three different lineages of early differentiating human amniotic fluid-derived cells restores urethral sphincter function in urinary incontinence. *BJU Int.* doi:10.1111/bju.12815



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