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Human dental pulp stem cells and their application to an animal model of stress urinary incontinence

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Stress urinary incontinence (SUI), the most common type of urinary incontinence, is defined by an involuntary leakage of urine due to physical stress involving an increase in bladder pressure. It is associated with life quality issues, depressive symptoms and social discomfort. The pathophysiology is represented by tissue damage of the external urethral sphincter affecting both muscle and nerve tissues. The current therapies are mainly based on rehabilitating methods, pharmacological and/or surgical treatments. However, these therapies cannot resolve the primary cause of incontinence, indeed only symptoms can take relief by such treatments [1]. Mesenchymal stem cells might represent an alternative tool for therapy of SUI. The aim of the study was to evaluate the regenerative potential of human dental pulp stem cells (hDPSCs) in an animal model of SUI. As reported in literature, hDPSCs are easily accessible during routine tooth extraction procedures, own a wide differentiation potential and do not present ethical issues [2, 3]. The first phase of the study demonstrated that hDPSCs were able to reach the myogenic commitment in vitro; then, in the second phase, after surgically inducing urinary incontinence in female rats, we injected pre-differentiated hDPSCs in the urethral sphincter. Four weeks after cell injection the sphincter thickness was almost recovered, hDPSCs engrafted in the external urethral sphincter, committed towards myogenic lineage in vivo and promoted neo-angiogenesis. The urodynamic study showed an appreciable recovery of the continence in rats treated with hDPSCs which, interestingly, were also detected within the nerve, thus suggesting their participation in re-innervating the formerly injured nerve. Our findings, combined with further investigations on paracrine and immunomodulatory effects of hDPSCs, might allow to propose them as a promising tool for future alternative therapies in the treatment of SUI.

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References

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Key words

External urethral sphincter, human dental pulp stem cells, urinary incontinence.

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