Involvement of SDF-1 in recruitment of alpha smooth muscle actin-positive cells to the urinary bladder.

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Abstract

Trials on the urinary bladder regeneration by acellular grafts have not always reported functional success because of suboptimal formation of smooth muscle layer1. We reported that marrow-derived stromal cells (MSC) migrated into acellular extracellular matrix grafts and expressed a smooth muscle cell-like phenotype in regenerated bladder tissue2. However, the mechanism causing migration of the MSC into regenerating bladder remains still unknown.

To elucidate the mechanism underlying cellular recruitment into the grafts, we investigated the involvement of stromal cell-derived factor 1 (SDF-1) in bladder muscle regeneration in vivo and in vitro culture systems and two in vivo animal models. In vitro culture system showed that SDF-1 secreted from bladder smooth muscle cells (BSMC) induced migration of MSC expressing alpha smooth muscle actin (SMA) but not calponin 1. In vivo bladder patch repair model with the acellular grafts showed SDF-1 expression and myofibroblast-like cell migration in the whole graft including regenerating smooth muscle layer. Another in vivo model, where SDF-1 was released from gelatin hydrogels fixed on rat bladder walls, showed recruitment of myofibroblast-like cells to the bladder. These data suggest that SDF-1 produced from regenerating BSMC recruit myofibroblast-like cells into the grafts, thereby contributing to the initial phase of bladder regeneration.

Summary/Conclusion

1. SDF-1 was produced by bladder cells including BSMC and recruited cells having features of myofibroblast during bladder regeneration.
2. Taking into account that myofibroblasts appear at the first inflammatory phase and play a role of tissue contraction in the secondary remodeling phase3, SDF-1 could be a pivotal signal for inducing the inflammatory phase of bladder regeneration through migration of myofibroblast-like cells into the graft.

References