Sox9 activation is involved in tubule repair after unilateral partial nephrectomy

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Sox9 activation is involved in tubule repair after unilateral partial nephrectomy

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Abstract:

Aims: Tubule repair has been noticed after kidney tissue damage, however the cellular mechanism behind remains unclear. Here we successfully constructed a mouse unilateral partial nephrectomy model mimicking renal carcinoma surgery, and further investigated whether this procedure triggered regenerative action.

Main methods: We used the unilateral partial nephrectomy model to study kidney repair. Kidney function after nephrectomy was measured using creatinine and urea nitrogen assay kit. Wound healing was assessed by Masson Trichrome Staining. Tissue regeneration was tested by $Sox9^+$ cells Immunofluorescence staining. The differentiation potential of $Sox9^+$ cells were assessed by immunoanalysis with various tubular cell markers. Notch activation was determined by qPCR and western blotting.

Key findings: In this model, we found that massive $Sox9^+$ cells emerged one day after the surgery and lasted for up to 20 days. Then, we have demonstrated that $Sox9^+$ cells had proliferative capacity and could regenerate epithelial cells in the proximal tubule, the loop of Henle, the distal tubule segment, the collecting duct, and the parietal layer cell, but not the podocyte. In the end, we revealed that the Sox9 activation was involved with Notch signaling pathway.

Significance: The current study reveals that Sox9 activation can contribute to kidney tubule regeneration after unilateral partial nephrectomy in mice.

Key words: Sox9, Nephrectomy, Regeneration, Notch.

1. Introduction:

The kidney is the organ for urine production and water/organic matters reabsorption. Some reports have revealed it has mild regenerative capacity after injuries. One of them points out that tubular epithelial Sox9 activation promotes regeneration of the proximal tubule, the loop of the Henle, and distal tubule segment after ischemia reperfusion kidney injury (IRI) [1]. Another report indicates that $Sox9^+$ cells play a key role in tubular regeneration after folic-acid induced kidney injury [2]. Besides that, some groups have obtained the potential progenitor cells from the kidney. One of them claims that $Pax2^+/Oct4^+$ epithelial cells from adult kidney are able to differentiate into epithelial cells and endothelial cells *in vivo* [3]. In addition, nontubular