

## **SIGNIFICANCE STATEMENT**

The kidney has a limited regenerative capacity. Nevertheless, renal cells are constantly replaced to preserve the integrity of the organ. Using intravital multiphoton microscopy and single-tubular cell ablation in healthy mice, we found that tubular cells are replaced exclusively by cells of tubular origin. Nevertheless, interstitial cells migrate to the site of tubular cells loss, an effect mediated by PDGF receptor- $\beta$  (PDGFR $\beta$ ) signaling. Furthermore, blockade of PDGFR $\beta$  signaling reduces the targeted migration of interstitial cells and compromises the regeneration of the tubular epithelium. Our data indicate an interaction between interstitial and tubular cells during regeneration, suggesting new targets for the treatment of kidney injury on the basis of the stimulation of endogenous repair mechanisms.