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Primary cilium length and urine primary cilia can be an indicative of acute kidney injury

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Objectives: The primary cilia, an organelle which protrudes into the cell surface, of renal tubular epithelial cells is associated with the pathogenesis of various kidney diseases including acute kidney injury (AKI). We found that primary cilia length of injured kidney epithelial cells had diverse range of lengths. Besides, injured kidney released the fragments of primary cilia into the urine. Here, we investigated the correlation of between the alterations of primary cilia length and the detection of urine primary cilia protein and ischemia/reperfusion (I/R)- and cis-diamminedichloroplatinum II (cisplatin)-induced renal injury.

Methods: Mice were subjected to 30 minutes of bilateral renal ischemia or intraperitoneally injected cisplatin (10 mg/kg body weight). In some mice, (2-(2,2,6,6-Tetramethylpiperidin-1-oxyl-4-ylamino)-2-oxoethyl) triphenylphosphonium chloride monohydrate (Mito-TEMPO, a mitochondria-specific antioxidant), was injected.

Results: We found that I/R- and cisplatin-induced shortening the primary cilia length and deciliation in kidney epithelial cells. In addition, Mito-TEMPO treatment prevented the changes of primary cilium length and deciliation. These findings indicate that I/R and cisplatin induce shedding kidney primary cilia via increasing oxidative stress, consequently shortening of renal primary cilia length and increase of primary cilia proteins in the urine.

Conclusions:

These results suggest that the alterations of renal primary cilia length and urine primary cilia protein can be useful indicative in the diagnosis of AKI.