

A long, long haul against a severe disease

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Although achievements in modern medicine have enabled mankind to cure or control many diseases, numerous challenges remain. Acute kidney injury (AKI), a serious illness causing significant mortality and morbidity, is one such challenge [1]. AKI occurs in the perioperative period and is diagnosed by laboratory abnormalities, such as elevated blood urea nitrogen and creatinine, or by a drop in urine output. AKI may lead to a number of complications, including metabolic acidosis, high potassium levels, uremia, changes in body fluid balance, and effects on other organ systems. The current treatment for AKI consists of supportive care such as renal replacement therapy as well as treatment of the underlying disorder.

Over the past few years, international guideline groups have attempted to establish consistent definitions and staging systems for AKI. The staging system known as Risk, Injury, Failure, Loss, End (RIFLE) was established in 2004 [2]. This was modified to create the Acute Kidney Injury Network (AKIN) [3], and then further modified to create the Kidney Disease: Improving Global Outcomes (KDIGO) system in 2012 [4]. These systems are based on serial creatinine measurements. National Institute for Health and Care Excellence (NICE) guidelines published in 2013 suggest that these systems need further development and simplification to be useful for clinicians.

Recent studies have found several biomarkers for AKI that reflect glomerular filtration rate decrease and renal tubular

injury early after cardiac surgery, including urinary neutrophil gelatinase associated lipocalin (NGAL) [5], liver-type fatty acid-binding protein (L-FABP) [6], kidney injury molecule-1 (KIM-1) [7], interleukin-18 (IL-18) [8], and serum cystatin C [9]. However, controversies regarding the accuracies of these biomarkers in the clinical setting still exist.

No therapeutic modalities to date have shown efficacy for treating AKI. In severe cases, hemodialysis can be used. However, hemodialysis is difficult and time-consuming, and can cause complications including low blood pressure, fatigue, chest pains, leg-cramps, nausea, headache, and sepsis. Patients undergoing hemodialysis have trouble remaining employed, and face severe economic difficulties. Although kidney transplantation is an effective treatment method, patients are rarely able to find a suitable kidney donor. Even after a kidney transplant, patients may suffer from transplant rejection, infection, sepsis and side effects of medications. Therefore, prevention of AKI is more important than treatment. Anesthesiologists must strive to avoid hypotension and drugs with renal toxicity during surgical procedures.

Recently, it was reported that human liver tissue was built using a three-dimensional printer. Perhaps in 20 or 30 years, it will be possible to replace non-functional human organs with artificially created organs at relatively low cost. However, until that day arrives, medical doctors, including anesthesiologists, must strive to cure or control AKI and other severe diseases.

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