

THE PATHWAY FROM CKD TO ESRD: THE SYNDROME OF RAPID ONSET END STAGE RENAL DISEASE IN THE LAST CONSECUTIVE 100 ADULT ESRD PATIENTS IN A MAYO CLINIC DIALYSIS SERVICES MAINTENANCE OUTPATIENT IN-CENTER HEMODIALYSIS UNIT.

Macaulay Amechi Onuigbo MD MSc FWACP FASN MBA (1,2)
Nneoma Agbasi RMN MSc PGDip (3)

1Mayo Clinic College of Medicine, Rochester, MN, USA.
2Department of Nephrology, Mayo Clinic Health System, Eau Claire, WI, USA.
3North East London NHS Foundation Trust, United Kingdom.

OBJECTIVES

Despite several decades of intensive research, our complete understanding of the determinants and natural history of CKD to ESRD progression remains immature. Thus, notwithstanding these limitations in our knowledge of the natural history of CKD, yet, by common consensus, CKD to ESRD progression is unanimously and classically depicted as a predictable, linear, progressive and time-dependent decline in renal function, ultimately leading to ESRD and the need for renal replacement therapy (RRT). The foundation of the National Kidney Foundation KDOQI 2002 declaration and mandate to group CKD as CKD stages I, II, III, IV and V, is most fortuitously, based on this untested and unproven premise.

There is however accruing evidence that quite often, CKD to ESRD happenstance is unpredictable, precipitate and unexpected in otherwise a priori stable CKD patients. Moreover, in 2010, we first described in the journal, **Renal Failure**, the new unrecognized syndrome of rapid onset end stage renal disease (SORO-ESRD) - acute yet irreversible ESRD after AKI. Besides, the contribution of SORO-ESRD to the incident adult US ESRD population is unstudied. We studied this question in this analysis.

METHODS

A retrospective computer-based EMR analysis of real-time individual patient-level serum creatinine trajectories from CKD to ESRD of the last 100 adult consecutive ESRD patients who had been receiving maintenance outpatient in-center hemodialysis treatments for >90 days in four outpatient Mayo Clinic Dialysis Services Hemodialysis Units in Northwestern Wisconsin, USA, was completed in June 2011. The aim was to distinguish between patients who developed ESRD predictably as a time-dependent and progressive loss of GFR over time to reach ESRD and the need for renal replacement therapy (RRT) ("Classic" ESRD) versus patients with SORO-ESRD which is defined below.

Definition of SORO-ESRD: SORO-ESRD defines a patient with an a priori stable eGFR ≥ 30 mL/min/1.73 sq. m BSA, on or before the 90th day preceding first RRT, who developed precipitate unanticipated irreversible ESRD thereafter, following an AKI event.

RESULTS

Excluding 9 patients (deficient laboratory data), 31 of 91 (34%) ESRD patients, 18M:13F, age 72 (50-92) years, had **SORO-ESRD**. The remaining 60 patients had "Classic" ESRD (Figure 1). Two of 31 (6%) SORO-ESRD patients were renal transplant recipients (Figure 2). AKI in 31 SORO-ESRD patients followed Pneumonia (8), Acute decompensated heart failure (7), Pyelonephritis (4), Post-operative states (5), General sepsis (3), Contrast-induced nephropathy (2), and others (2).

Quite often, the interval between the precipitating AKI event and the need for RRT was a few days to 1-2 weeks; this period was usually less than 3-4 days following post-operative AKI and associated volume overload after cardiothoracic procedures.

The SORO-ESRD patients were older than the 60 "classic ESRD" patients - 71 \pm 12 (49-91) years vs 69 \pm 13 (38-93), p NS. Moreover, concurrent angiotensin inhibition was commoner in the 31 SORO-ESRD patients, 7 of 31 (23%) versus 3 of 60 "classic ESRD" patients (5%), t (89)=2.587, p=0.0113.

CONCLUSIONS

- ❖ The syndrome of rapid onset end stage renal disease (SORO-ESRD) is not uncommon in the general incident US adult ESRD population.
- ❖ Older age, associated renal senescence, and exposure to nephrotoxics including angiotensin inhibition, may predispose to SORO-ESRD.
- ❖ Larger studies are mandated to assess the impact of the phenomenon of SORO-ESRD on CKD care in general, RRT planning, AV-Fistula First programs, and renal allograft loss.
- ❖ Finally, SORO-ESRD once again reemphasizes the need for more preventive nephrology or 'RENOPREVENTION' to reduce AKI in our CKD patients. A just published 2013 meta-analysis in *AJKD* revealed again, further confirming our single-center experience, that preoperative use of RAS blockers was associated with increased odds of postoperative AKI and mortality in patients undergoing cardiovascular surgery. The *AJKD* investigators indeed proposed that RAS blockers be withheld at least 48 hours preoperatively in patients undergoing coronary artery bypass grafting and/or valvular surgery. This is only further testament validating our repeated calls for the practice of "RENOPREVENTION".

REFERENCES:

NKF K/DOQI Clinical Practice Guidelines for CKD. *Am J Kidney Dis* 39:S1-S266, 2002 (suppl 1).
Venkatchalam MA et al. *Am J Physiol Renal Physiol*. 2010 Mar 3. [Epub ahead of print].
The GISEN Group. *Lancet*. 1997;349:1857-1863.
Yoshida T et al. *Intern. Med.* 2008;47:1859-1864.
Conway B et al. *Nephrol. Dial Transplant*. 2009;24:1930-1937.
Onuigbo MA. Renoprotection vs. Renoprotection. *QJM* 2009; 102:155-167.
Onuigbo MA. Syndrome of rapid-onset end-stage renal disease. *Ren Fail*. 2010;32(8):954-958. *Medline*: 20722563.
Onuigbo M & Onuigbo N. Eds. In: CKD and RAAS Blockade: A New View of Renoprotection. LAP GmbH 11 and Co. KG. 2011.
Onuigbo MAC, Onuigbo NTC. In HEMODIALYSIS: how, when and why. NOVA Science Publishers; 2012:443-485.
Onuigbo MA. Renoprotection: A New Concept for Reengineering Nephrology Care. *Ren Fail*. 2013;35(1):23-8.
Onuigbo MAC. SORO-ESRD in two consecutive RTRs. *Indian J Nephrol*. 2013 May;23(3):222-5.
Onuigbo MA. Evidence SORO-ESRD in the AKI literature. *Ren Fail*. 2013 Jul;35(6):796-800.
Onuigbo MA, Achebe NJ, Musso CG. The syndrome of rapid onset ESRD. Volume 1. NOVA Science Publishers; 2013: 109-125.
Yaqoub R et al. *Am J Kidney Dis*. 2013;62(6):1077-1086.
Onuigbo MA et al. SORO-ESRD in incident Mayo Clinic HD patients. *Indian J Nephrol*. 2014; 24(2): 75-81.

