Commentary: The Practice of Dialysis in the Intensive Care Unit in a Developing Country

Introduction and Aims: In developing countries, little is known about renal replacement therapy (RRT) for acute kidney injury (AKI) in critically ill patients. The aim of this study is to describe characteristics of patients, clinical practice of renal support and outcomes in intensive care units (ICU) in a developing country.

Methods: Patients who underwent RRT for AKI from May 2003 to July 2008, in four ICUs in our institution were included in this retrospective study. Patients with end stage renal disease or younger than aged 18 years were excluded. We have considered: patient demographics, indications of RRT, number of dialysis session, comorbidties, APACH II score for illness severity, mechanical ventilation, use of vasoactive drugs, and mortality rate.

Results: 105 critically ill patients admitted during the study period were treated with RRT, with a mean age of 56.13 ± 16.8 (19–85) years. Sixty five were male and 40 female; all received intermittent hemodialysis. The total number of dialysis sessions was 284, and the mean number was 3.7 ± 2.9; mean length of session was 225.22 ± 75,16 (60–290) min. The majority of the cases (67%) were from medical ICU, followed by 30.2% from surgical ICUs (including cardiothoracic surgery ICU) and 2.8% were from burn ICU. The most common comorbidities were type 2 diabetes mellitus in 46 (44%) and hypertension in 35 (33.4%). Sepsis was a contributing factor to AKI in 60 patients (57.14%), hypovolemia in 30 (28.5%), and cardiogenic shock in 9 (8.5%). The APACHE II score was 25.86 ± 11.8; the majority of patients (66.7%) were ventilated; 63 (60%) were under vasoactive drugs and 88 (83.8%) were oliguric. The most common indication for initiation of dialysis was hyperkalemia in 51 (48,5%) of the cases, followed by severe acidosis in 35 (33.3%) and acute pulmonary edema for 20 (19%). ICU mortality was 68.5% and increased to 95.2% when more than two organs were involved.

Conclusions: Our experience suggests that indications for initiation of RRT in ICU are not greatly different from that in industrialized countries; yet, the big difference is in a high mortality rate among our patients. (*Ethn Dis.* 2014;24[2]:226–228)

Key Words: Dialysis, Renal Replacement Therapy, Acute Renal Failure, Hemodialysis, Ethnicity

Authors

Omar Maoujoud, MD; Yassir Zajjari, MD; Mohammed Asseraji, MD; Taoufiq Aatif, MD; Samir Ahid, MD; Zouhair Oualim, MD

Introduction

Technological advances in developed countries have led to the availability of multiple forms of renal replacement therapies (RRT), including intermittent hemodialysis (IHD), continuous renal replacement therapy (CRRT), and sustained low-efficiency dialysis (SLED) for critically ill patients with acute kidney injury (AKI).[1] The situation is not the same in developing countries; few data are available about the practice of RRT in intensive care units (ICU). To date, no sustainable treatment program exists for AKI in many of the 48 countries in the sub-Saharan region of Africa. Only one study describes outcomes of ICU patients requiring dialysis in an African institution[2]; in this review, ICU records between January 2003 and December 2004 of all patients requiring RRT were analyzed from the Johannesburg Hospital, South Africa. To increase our understanding of RRT practices in Morocco, we conducted a retrospective study to describe characteristics of patients, clinical practice of renal support, and outcome of RRT in four ICUs from a university hospital in Morocco.

Methods

Patients who underwent RRT for AKI from May 2003 to July 2008 in four ICUs in our institution were included in this retrospective study; patients with end stage renal disease or aged <18 years were excluded. We analyzed: patient demographics, indications of RRT, number of dialysis sessions, comorbidities acute physiology and chronic health evaluation II (APACHE II) score for illness severity, mechanical ventilation, use of vasoactive drugs, and mortality rate. Also, we recorded data about technical aspects of RRT including: vascular access, number and duration of dialysis sessions, type of hemodialyzer membrane, dialysate composition and temperature, blood flow rate, ultrafiltration, anticoagulation and dialysis dose.

Initiation of RRT was decided by a senior intensivist, intermittent hemodialysis was the only modality available during the study period. Procedure and schedule were prescribed by a nephrologist, and adjustment was made taking into account the type of comorbidities and specific indication of RRT (eg, hyperkalemia, acidosis, edema, etc).

Results

During the study period, 105 critically ill patients were admitted; each was treated with RRT. The mean age of the

study group was 56.13 ± 16.8 years; 65 were male and 40 were female. All received IHD. The total number of dialysis sessions was 284, and the mean number was 3.7 ± 2.9 sessions/patients. The majority of the patients (67%) were from medical ICU; surgical ICU (including cardiothoracic surgery ICU) cases accounted for 30.2% and 2.8% were from burn ICU. The most common comorbidities were: type 2 diabetes mellitus in 46 patients (44%) and hypertension in 35 cases (33.4%). Sepsis was a contributing factor to AKI in 60 patients (57.14%). The most common causes of infection were: respiratory and uriniary tract infections, hypovolemia in 30 (28.5%), and cardiogenic shock in 9 (8.5%). The mean APACHE II score was 25.86 ± 11.8; 66.7% of patients were ventilated; 63 (60%) were taking vasoactive drugs; and, 88 (83.8%) were oliguric. The most common indication for initiation of dialysis was hyperkalemia (7.3 ± 0.7meq/l) in 51 (48.5%) of the cases, followed by severe acidosis (PH:7.05 ± 0.4) in 35 patients (33.3%) and acute pulmonary edema 20 (19%). At the initiation of RRT, mean blood urea nitrogen was 15 ± 3.4 mmol/L and serum creatinine was 498±128.23 μmol/L. Standard bicarbonates dialysis, volumetric machines (4008E-Fresenius, Germany) and single-use polysulfone low-flux dialyzers were exclusively used (surface area of 1.4±0.3 m^2). Treatment times ranged from 60 to 290 min; mean 225.22 ± 75.16 min; blood flow ranged from 180 to 250 mL/min; dialysate flow was fixed at 500 mL/min and cool dialysate (35°C) was used in 60% of the cases, with variable Na (138–150 mEq/L). Anti-coagulation strategies consisted on administration of an initial bolus dose (4,000 units) of low molecular weight heparin, and an additional 1,000- unit bolus dose if necessary, Circuit and hemofilter thromboses were documented in 35 hemodialysis sessions. The most common problem during sessions was

hypotension, documented in 165 hemodialyis sessions (55%). To reduce hypotensive episodes, we used a cool dialysate, reduced ultrafiltration rate, high dialysate conductivity, and the hemodialysis session was lengthened. A double-lumen catheter was used as vascular access in all patients through femoral vein (90.45%) and internal jugular vein (9.55%). Mean ultrafiltration volume was 2.2 ± 1.7 litres per session. Dialysis dose was evaluated by single pool Kt/v; 65 (62%) of patients had Kt/v ≥1.2 (mean 1.21± 0,7). ICU mortality was 68.5% among patients requiring dialysis and increased to 95.2% when more than two organs were involved. In addition, anuric patients or with APHACH II score at 26 or higher had the highest mortality.

DISCUSSION

RRT for AKI in ICU is a challenging problem worldwide, but there are no reliable statistics about the epidemiology and the practice in developing countries. Based on some sporadic or regional publications, the mortality was also high as reported by Meyers[3] on risk factors and mortality rates in patients requiring dialysis for AKI in Johannesburg in three cohorts: 1968 to 1972 (110 patients), 1975 to 1984 (520 patients), and 1998 to 1999 (335 patients). The mortality rate was 32% in medical patients, 84% in surgical patients, and 36% in obstetric patients, with a mortality rate of 75% in septic abortions. The overall mortality rate in ICU patients was 73%. Ezekiel[2] reported on outcomes of 174 patients dialyzed for AKI in the ICU in Johannesburg from January 2003 to December 2004. 53% of patients using continuous venovenous hemodialysis died, compared with 38% treated with intermittent hemodialysis.

Bagshaw et al[4] reported in a large cohort study conducted during 10 years in Australian ICUs: 91,254 patients

were admitted to ICUs; 4,754 patients had a diagnosis of AKI; APACHE II score was 16.4 ± 7.8; and hospital mortality was significantly higher for patients with AKI than those without (42.7% vs 13.4%; OR, 4.8; 95% CI, 4.5 to 5.1; P<.0001).

Mortality of ICU patients with AKI has changed little over last years despite significant advances in care.[5] A recent international study of 23,000 critically ill patients with AKI revealed that the in-hospital mortality is high, exceeding 60%[6] and a recent large trial in the United States confirmed this finding that intensive renal support (intermittent haemodialysis, continuous venovenous hemodiafiltration and extended daily dialysis) in critically ill patients with AKI did not decrease mortality, improve recovery of kidney function or reduce the rate of non-renal organ failure as compared with less-intensive therapy.[7] In Morocco, no data are available about RRT in ICU, Hachim[8] reported that dialysis was required for AKI in 74.5% of patients with pre-eclampsia and eclampsia. In a prospective study of 178 consecutive women with eclampsia, Mjahed[9] found that the incidence of AKI was 25.8%, dialysis was needed in a third of patients and AKI was associated with a higher mortality rate (32.6% vs 9.1%).

Our study had certain limitations. Given the retrospective design, we cannot rule out selection bias or residual confounding. Our study is also based on a single-center experience, which may limit its generalizability. We were unable to evaluate risk factors and predictors of outcome and mortality and long-term outcomes of AKI. In addition, we did not have data on the effect of timing of dialysis on mortality in ICU and on all RRT complications. Lastly, we were unable to obtain cost-to-charge ratios, which may limit the generalizability of our findings to other institutions.

AKI remains a challenging problem in developing countries because of late

presentation of patients to health care facilities, and the lack of resources to support patients with established AKI in many countries. More resources are required to prevent AKI and to provide RRT for those patients requiring dialysis. In our experience, the use of IHD was associated with poorer outcomes and a higher mortality rate when compared with studies from other countries and larger sample sizes; this may be related to high illness severity at initiation of RRT.

REFERENCES

1. Naicker S, Aboud O, Gharbi MB. Epidemiology of acute kidney injury in Africa. *Semin Nephrol*. 2008;28:348–353.
2. Ezekiel L NS, Wadee S, Mer M, Richards G. The outcome of renal replacement therapy in an intensive care unit in South Africa. Abstract presented at the World Congress of Nephrology; 2005 June 26–30; Singapore 2005.
3. Meyers AMBR, Hsu P. Acute renal failure requiring dialysis. Abstract presented at the VII African Congress of Nephrology, 2002 Jan 16–19; Cairo, Egypt 2002.
4. Bagshaw SM, George C, Bellomo R. ANZICS Database Management Committee. Changes in the incidence and outcome for early acute kidney injury in a cohort of Australian intensive care units. *Crit Care*. 2007;11(3):R68.
5. Mehta RL, Kellum JA, Shah SV, et al. Acute Kidney Injury Network (AKIN): report of an initiative to improve outcomes in acute kidney injury. *Crit Care*. 2007;11:R31.
6. Uchino S, Kellum JA, Bellomo R, et al. Acute renal failure in critically ill patients: a multinational, multicenter study. *JAMA*. 2005;294: 813–818.
7. VA/NIH Acute Renal Failure Trial Network. Intensity of renal support in critically ill patients with acute kidney injury. *N Engl J Med*. 2008;359(1):7–12.
8. Hachim K, Badahi K, Benghanem M, et al. Obstetrical acute renal failure. Experience of the nephrology department, Central University Hospital ibn Rochd, Casablanca. *Nephrologie*. 2001;22:29–31.
9. Mjahed K, Alaoui SY, Barrou L. Acute renal failure during eclampsia: incidence risks factors and outcome in intensive care unit. *Ren Fail*. 2004;26:215–221.