Original Research Article

A study of micro albuminuria in predicting the outcome of critically ill patients

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Abstract

Introduction: Normally, as blood passes through healthy kidneys, it filters the waste products out and leaves in the things the body needs, like proteins in the blood is normally unable to pass through the glomerular capsule due to their large size. In normal urine, protein concentration is very low (less than 100mg/day) which cannot be detected by usual tests. These proteins are screened by tubular epithelial cells. However, it may be mentioned that there are a number of conditions such as diabetes mellitus, hypertensions, eclsmpsia, sever febrile illness, immune system disorders, abnormal swelling, malnutrition, or cancer and many other systematic infections which can result in protenuria. **Aims and Objective:** To Study Micro albuminuria In Predicting the Outcome of Critically Ill Patients **Methodology**: This was the prospective study in adult patients admitted to MEDICAL-ICU in Malla Reddy Institute of Medical Sciences, Hyderabad. will be recruited between December 2013 to July 2015. **Result:** A comparison between the survivors and non-survivors showed that the non-survivors had a significantly higher median APACHE II score and lower median ΔACR score. ACR2 was significantly higher in the patients who died on the ICU in comparison to those who survived. There was however no significant difference in the ACR1 value between the two groups. Change in urine albumin on intensive care unit admission (albumin-keratinize ratio (ACR1) and after 24 hours (ACR2) in survivors and non-survivors *p< 0.05 was considered significant, Wilcoxon test (paired samples). For all patients, ACR2 were significantly associated with increasing age. Both ACR1 and ACR2 were strongly associated with the duration of ICU stay. Duration of mechanical ventilation was correlated with ACR2. On admission serum keratinize was positively associated with ACR2 but failed to correlate with ACR1. ACR1, ACR2 and Δ ACR were not associated with estimated GFR (MDRD) on admission. ACR and ACR1 and ACR2 were strongly with APACHE II scores **Conclusion:** The study indicated that microalbumimnuria; a simple, non-invasive and inexpensive bedside tool could be effectively utilized to identify patients who are likely to survive in the ICU

Keywords: Microalbuminurea, APACHE score.

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INTRODUCTION

Normally, as blood passes through healthy kidneys, it filters the waste products out and leaves in the things the body needs, like proteins in the blood is normally unable to pass through the glomerular capsule due to their large size. In normal urine, protein concentration is very low (less than 100mg/day) which cannot be detected by usual tests. These proteins are screened by tubular epithelial cells. However, it may be mentioned that there are a number of conditions such as diabetes mellitus, hypertensions, eclampsia, sever febrile illness, immune system disorders, abnormal swelling, malnutrition, or cancer and many other systematic infections which can result in proteinuria.[1] Large quantity of albumin is lost in nephrosis whereas small quantities are seen in acute nephritis, strenuous exercise and pregnancy whereas microalbuminuria is seen in complication of diabetes mellitus and hypertension which is an indicator of future renal failure[1,2]. Other causes include presense of uroliths and tumors, both of which may Cause information directly or associated with secondary bacterial infection[2,3]. Mechanism of albuminuria[4] in the traditional

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model, increase in the glomerular permeability leads to increasing amounts of albumin filtered per days as represented by the increasing thickness and length of the blue arrows. Small amount of this filtered albumin may be endocytosed by 1 receptor, the megalin/cublin recepter, and directed to the lysosome, where it is degraded to amino acids that are returned to the blood supply (purple dashed arrow , although this pathway has not been demonstrated in vivo). The resulting levels of albuminuria extending from microalbuminuria to macroalbuminuria to nephrotic levels are thought to be directly related to the level of glomerular permeability dysfunction. The term micro-albumiburia is referred to the low urine albumin concentration and not the molecular size. As the albumin detected is the normal albumin molecules[5] These guidelines do not take into account- the sex differences in keratinize execution, and however, currently several researchers have advocated sex-specific cut points of the Albumin: keratinize ratio to define microalbuminuria[6,7]. According to NICE (2008) guideline[8], "microalbuminuria" refers to albumin excretion above the normal range, but, below the level of detection by tests for total protein. When using the urinary Albumin and keratinize, various factors affecting albumin and keratinize excretion need to be taken into account. Kholo *et al*[9] identified factors affecting albumin excretion including blood pressure, time of day, fasting, salt intake and volume status. Microalbuminuria occurs when the kindly leaks small amounts of albumin into the urine, in other words, when there is an abnormally high permeability for albumin in the renal glomerules[10,11]. Urine albumin excretion as a traditional clinical tool- From the above, it is clear that increased urine albumin extension is a marker of poor renal prognosis. It is an indication for active interventional measures. Alternatively, reduction of proteinuria is an indication of the response to treatment and signifies improved renal prognosis. Increased glomerular permeability to plasma proteins occurred within 30 minutes to 4 hours of injury or surgery, and was proportional to the magnitude of the insult[12,13]. This evidence led to the hypothesis that increased glomerular and vascular permeability occur simultaneously, and may share common pathways during the early stages of acute systemic inflammation. The Acute physiology and chronic Health Evaluation (APACHE) Score[14] is probably the best-known and most widely used score. The original APACHE score was first used in 1981 and score for three patient factors that influence acute illness outcome (pre-existing disease, patient reserve, and severity of acute illness). The APACHE II scoring system was released in 1985 and incorporated a number of changes from the original APACHE. These included a reduction in the number of variable to 12 by eliminating infrequently measured variables such as lactate and osmolality. The weighting of other variables were altered; most notably, the weightings for Glasgow Coma Score and acute renal failure were increased. In addition, weightings were added for end-organ dysfunction and points given for emergency or non-operative admissions. Each variable is weighted from 0 to 4, with higher scores denoting an increasing deviation from normal. The APACHE II is measured during the first 24 h of ICU admission; the maximum score is 71. A score of 25 represents a predicted mortality of 50% and a score of over 35 represents a predicted mortality of 80%. The APACHE II severity score has shown a good calibration and discriminatory value across a range of disease processes, and remains the most commonly used international severity scoring system worldwide.

AIMS AND OBJECTIVE

To study micro albuminuria in predicting the outcome of critically ill patients

MATERIAL AND METHODS

Consecutive adult patients admitted admitted to MEDICAL-ICU in Malla Reddy Institute of Medical Sciences, Hyderabad. will be recruited between December 2013 to July 2015. Inclusion Criteria**:** All adult patients (> 18 years old) admitted to the medical intensive care unit of krishna hospital were included. The patients with diabetes and hypertension II receptor on angiotension converting enzyme (ACE) inhibitor/ angiotension II receptor blockers (ARB) therapy. Exclusion Criteria Aanuric Patients, Microscopic Hematuria. Pre- existing Chronic Kidney Disease[99], Females with menstruation, Pregnant Females, Retrospectively, patients with marked proteinuria due to and renal and post renal causes viz. previously undiagnosed chronic kindly were also executed.

RESULTS

Table 1: Comparison of demography, median ICU stay, median APACHE II score, median levels of urine albumin-keratinize ratio (ACR)on intensive care unit admission (ACR1) and after 24 hours (CR2) and Δ ACR (ACR1-ACR2) between survivors and non-survivor

	Survivors	Non survivors	*P value
Number of patients	91%	9%	
Medicine Age(IQR), years	60(41.25-70)	59(47.25-65)	
Male:Female ratio	48:43:00	06:03	
Medicine ICU stay (IQR), days	4(2-8)	3(2-4.25)	0.128
Medicine APACHE II score (IQR)	12(7-17)	20(18.25-21.5)	0.002*
Medicine ACR1(IQR),mg/g	29(10.33-88.38)	64.89(34.26-182.04)	0.108
Medicine ACR2(IQR), mg/g	27.48(5.68-72.17)	152.7(34.65-286.86)	0.013*
Medicine ΔACR (IQR), mg/g 2	6.443(-6.6 -36.72)	-83.47(-126.08 - -5.46)	0.003*
Sr. Creatinine	1.2(1-1.58)	1.6(1.350 – 1.825)	0.072

(Man whitney test, * p<0.05 was considered significant)

A comparison between the survivors and non-survivors showed that the non-survivors had a significantly higher median APACHE II score and lower median ΔACR score. ACR2 was significantly higher in the patients who died on the ICU in comparison to those who survived. There was however no significant difference in the ACR1 value between the two groups.

Table 2: Change in urine albumin on intensive care unit admission (albumin-keratinize ratio (ACR1) and after 24 hours (ACR2) in survivors and non-survivors

	ACR1 Medicine (IQR)	ACR2 Medicine (IQR)	*P Value
Survivors	29(10.33 -88.38)	27.48(5.68 -72.17)	*0..452
Non Survivors	64.89(34.26- 182.04)	152.7(34.65- 286.86)	*0.0195

*p< 0.05 was considered significant, Wilcoxon test (paired samples)

Table 3: Associates' of urine albumin with age, intensive care unit (ICU) stay, duration of mechanical ventilation, serum keratinize, estimated glomerular filtration rate (Eger), for all patients (Spearman ranked correlations).

	ACR1, mg/g	ACR2,mg/g	ACR, mg/g
Age, years	Rs=0.99	Rs=0.205	Rs=0.030
	P=0.326	*P=0.041	P=0.768ss
Length of ICU study, days	**rs=0..255	rs=0.351	rs=0.008
	*P=0.010	*P=0.000	P=0.941
Mechanical Ventilation, days	rs=0.126	Rs=0.217	rs=0.114
	P=0.210	*P=0.030	P=0.259
Serum keratinize, mg/dl	rs=0.135	rs=0.284	rs=--0.057
(on admission)	P=0.180	P=0.004	P=0.575
Eger (MDRD),ml/min/1.73m2	rs=0.071	rs=0.109	rs=--0.140
(on admission)	P=0.484	P=0.278	P=0.164
APACHE II Score(Day1)	rs=0.247	rs=0.303	rs=--0.034
	*P=0.013	*P=0.002	P=0.733

*p, 0.05 was considered significant, **rest, ranked spearman, ACR= albumin- keratinize ratio

For all patients, ACR2 were significantly associated with increasing age. Both ACR1 and ACR2 were strongly associated with the duration of ICU stay. Duration of mechanical ventilation was correlated with ACR2. On admission serum keratinize was positively associated with ACR2 but failed to correlate with ACR1. ACR1, ACR2 and Δ ACR were not associated with estimated GFR (MDRD) on admission. ACR and ACR1 and ACR2 were strongly with APACHE II scores (Table 3).

DISCUSSION

Comparison of Receiver Operating Characteristic (ROC) curves of APACHE II, ACR1, ACR2 and the change of ACR2 and ACR1 (ΔACR) to predict mortality in patients admitted to intensive care unit. APACHE II had the highest area under the curve (0.80) followed by ACR2 (0.750), ACR1 (0.66) and ΔACR (0.19)[15]. The data so far available from other shows that microalbuminuria can be considered as an effective marker not only to predict the outcome in critically ill patients but in many other scenarios. In our study too we found that microalbuminuria at 24 hours of ICU admission (ACR2) was a good predictor of mortality as compared to the time tested but a cumbersome APACHE II score, in critically ill patients. It was found to be associated with age, length of ICU stay, and estimated glomerular filtration rate and was less cumbersome. The available data so far includes only a small number of patients hence large randomized

trials would be necessary to conform the finding of the other findings of the other pilot studies, and to farther strengthen its role as a marker status studies from across the world should be promoted. Considering the limitations of this study as mentioned earlier, further studies are required in the surgical group of patients.

CONCLUSION

The study indicated that microalbumimnuria; a simple, non-invasive and inexpensive bedside tool could be effectively utilized to identify patients who are likely to survive in the ICU. Microabuminuria not only could identify the patients group who were likely to survive the ICU but also could comment on the patient's response toward the goal directed therapy unlike the APACHE-II which so far is designed only to predict the mortality. Microbuminuria was not be calculated in patients existing Renal and Post-Renal pathology hence suggesting that our search for the ideal prognostic marker for ill patients is still a hypothetical concept.

REFERENCES

1. Tietz (2006), textbook of CLINICAL CHEMISTRY and MOLECULAR DIAGNOSTICS 4th ed. 575-590.
2. Amir said Alizadeh Naderi, MD and Robert F. Reilly, MD (2008), Primary Care Approuch to Proteinuria. J Am. Board Fam. Med. 21, 569 -574.
3. Tietz (2008), Fundamental of CLINICAL CHEMESTRY. 6th ed. 636-654.
4. Am J Physiol Renal Physiol 2925: F1589-1600,Dec 2008
5. Ho CP. Chronic kindly disease –old disease with new global challenges. HKMA CME Bulletin April, 2008; p 4-7.
6. Warram JH, Gearin g, Laffel L. Krolewski AS (1956), Effect of duration of type I diabetes on the prevalence of stages of diabetic nephropathy defined by urinary albumn/creatinine ratio. J Am. Soc Nephrol. 7, 930-937.
7. Connell SJ, Hollis S. Tieszen KL, McMurry JR, Dornan TL (1994), Gender and the clinical usefulness of the albumin: creatinine ratio. Diabet med. 11, 32-36.
8. NICE Chronic Kindly Disease (2008), Early identification and management of chronic kindly disease in adults in primary and secondary care. Am. J. Kindly Dis.
9. Khosla et al, Microalbuminuria. Clin Lab Med 26 (2006) 635-653.
10. James GD, Sealey JE, Alderman M, Ljungman S, Mueller FB, Pecker MS, Laragh JH (1988), A longitudinal study of urinary creatinine and creatinine clearance in normal subjects: race, sex, and age differences. Am. J. Hypertens. 1, 124-131.
11. Goldwasser P, Aboul-Magd A, Maru M (1997), Race and creatinine excretion in chronic renal insufficiancy. Am. J. Kindly Dis. 30, 16-22.
12. Gosling P, Sutcliffe AJ, Cooper MACS, et al: burn and trauma associated proteinuria: the the role of lipid peroxidation, renim and myoglobin . Ann Clin Biochem 1988; 25; 53-9.
13. Shearman CP, Gosling P, Walker KJ, et al: is low Proteinuria an early predictor of a severity of acute panreatitis? J Clin Pathol 1989; 42: 1132-5.
14. Wong DT, Knaus WA. Predicting outcome in critical care: the curent status of the APACHE prognostic scoring system. Can J Anaesth 1991; 38: 374-83.
15. Bakker A.J. Detection of microalbuminuria. Receiver operating characteristic curve analysis favoures microalbuminuria-to-creatinine ratio over albumin concentration. Diabetes care 1999; 22:307-13.

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