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ORIGINAL ARTICLE

The Effect of Preoperative Albumin Levels on Early Graft Function after Kidney Transplant

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ABSTRACT

A retrospective study was carried out on 81 kidney transplant patients to evaluate the effect of low preoperative serum albumin level on early graft function. Patients were divided into two groups: Group I (42 patients) with serum albumin <4 gm/dL and group II (39 patients) with serum albumin ≥4 gm/dL. Though drop in serum creatinine levels during early postoperative days was higher in group "II" patients than in group "I" patients, it was not statistically significant, which is not in conformity with earlier published studies that showed greater fall in serum creatinine levels (and so better early graft function) in patients with higher serum albumin levels. Our results may be due to lesser number of overall patients in the study and, therefore, need to be validated with further studies involving larger number of patients.

Keywords: Chronic kidney disease, Kidney transplant, Renal allograft function, Short-term graft function.

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INTRODUCTION

Kidney transplantation is the treatment of choice and usually associated with better outcomes than dialysis in patients with chronic kidney disease (CKD). The potential demand for renal transplantation is increasing but there is perpetual shortage of kidney donors. These issues make every single transplanted kidney precious and hence, every effort should be made in the perioperative care of these patients to maximize graft survival. Low serum albumin level in CKD patients is a marker of poor general health status, resulting in comorbidity, malnutrition–inflammation complex, also known as protein-energy wasting.[1] Several studies examined the predictors of mortality or graft failure in kidney transplant recipients, but only few analyzed the association between pretransplant parameters and posttransplant outcomes.[2-4]

The grafted kidney's outcome in first few days is generally measured by urine output and serum creatinine values. Graft malfunction in the early postoperative period has been associated with decreased graft survival and increased recipient complications. A clear relationship between serum albumin levels and short-term renal graft outcome has not been properly evaluated. Hence, we tried to establish the relationship between serum albumin levels on graft function during the short-term renal graft outcome (early postoperative period).

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MATERIALS AND METHODS

This is a single-center retrospective study done on 81 patients undergoing kidney transplant from April 2011 to August 2013. The study was approved by the Institutional Review Committee and conformed to ethical guidelines of 1975 Helsinki Declaration.

Age, gender, weight, hemoglobin, hematocrit, serum potassium, urea, and creatinine were obtained from the preanesthetic evaluation records. All other parameters were obtained from the anesthesia chart, including those related with the intraoperative monitoring. The demographic and clinical data between the assigned groups were comparable. Transplant recipient workup included a complete hemogram, renal function test, liver function test, coagulation profile, viral markers, chest X-ray, electrocardiogram (ECG), and echocardiography. All transplant recipients received hemodialysis within 24 hours before surgery. A dedicated intraoperative monitoring of ECG, blood pressure, central venous pressure, urine output, core temperature, pulse oximetry, and end-tidal CO_2 was done. We preferred general anesthesia for our

transplant patients. Anesthesia was administered using a standard protocol in all patients. Induction of anesthesia was done using injection thiopentone 3 to 5 mg/kg, fentanyl 1 to 2 µg/kg along with oxygen/air/isoflurane at one minimum alveolar concentration, and muscle relaxation was achieved with atracurium 0.5 mg/kg. Forced air warming was used to maintain a core body temperature around 36°C. Our study had two groups of patients based on preoperative serum albumin. Patients with serum albumin <4 gm/dL were kept in group I and the patients with serum albumin ≥4 gm/dL were kept in group II. The trend in falling serum creatinine values was analyzed in the first five postoperative days in both groups. Our study group had a mixture of both genetically related and genetically unrelated living donors. To rule out any bias due to this factor, we further divided the study population into those receiving kidney from genetically related donors and other receiving kidney from genetically unrelated donors. The fall in serum creatinine trends was analyzed for the first 5 days in this group also.

Statistical Analysis

We evaluated data using the Statistical Package for the Social Sciences software (version 11.5). Correlation analysis and analysis of variance test techniques were used in the study for statistical computation. Multivariate analysis was used to compare various variables.

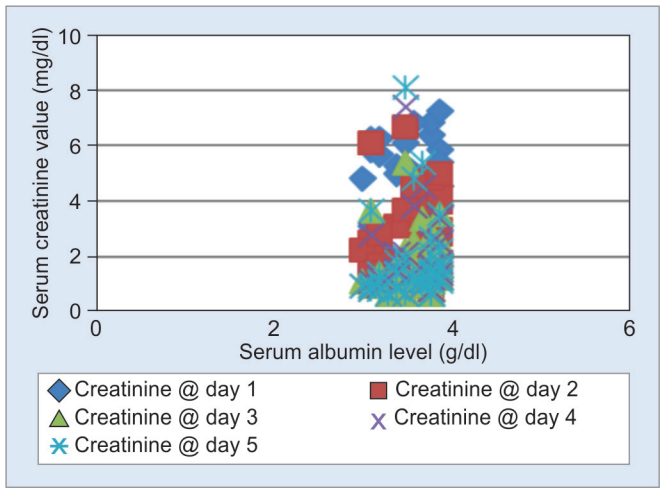
RESULTS

In our study among the 81 recipients, there were 13 females and 68 males. The mean age of recipients was 35.80 years. Table 1 compares other variables between the two groups. The overall mean serum creatinine levels on postoperative days 1, 2, 3, 4, and 5 were 3.86, 2.43, 1.56, 1.50, and 1.48 mg/dL respectively. The overall mean preoperative albumin of our study population was 3.96 gm/dL.

The fall in serum creatinine was studied in the two groups of recipients. Group I was with serum albumin <4 gm/dL, and group II was with serum albumin ≥4 gm/dL. There were 42 patients in group I and 39 in group II.

Table 1: Demographic data comparison in the two groups

	Comparison between two groups		
	Group I	*Group II*	*Total*
Mean age (years)	36.59	34.92	35.7
Mean weight (kg)	60.07	57.20	58.69
Gender ratio (male:female)	35: 7	33: 6	68:13
Genetically related donors (father, mother, brother, sister)	31	25	56
Genetically unrelated donors (husband, wife)	11	14	25
Preoperative albumin level (gm/dL)	3.59	4.37	3.9



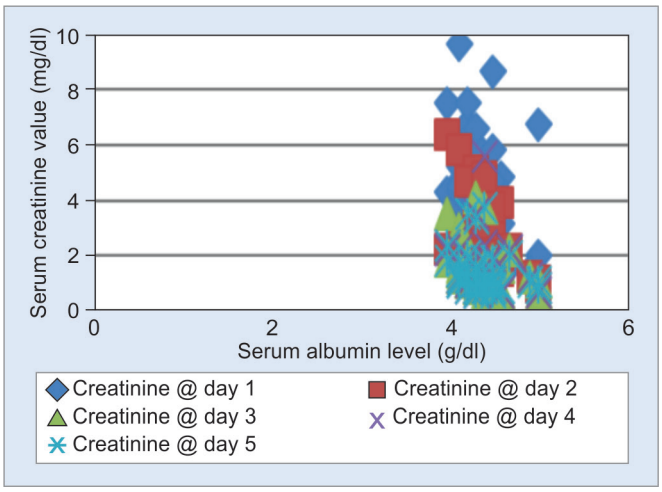
Graph 1: Serum creatinine values in group I (albumin <4 gm/dL) during the five postoperative days

In group I, the mean preoperative serum albumin was 3.6 gm/dL, the minimum value was 3 gm/dL, and the maximum value was 3.9 gm/dL. The mean serum creatinine during the first five postoperative days was 3.63, 2.41, 1.64, 1.63, and 1.65 mg/dL respectively (Graph 1). Studying the fall in serum creatinine by calculating the difference between adjacent day values, we found that on second postoperative day there was a fall in serum creatinine value by 1.98 mg/dL, on third postoperative day the level further dropped by 0.77 mg/dL, and on fourth postoperative day 0.01 mg/dL. On the fifth postoperative day there was a marginal rise in serum creatinine value by 0.02 mg/dL (Table 2).

Table 2: The trend of fall in serum creatinine in the two groups as studied during the first 5 days

	Group I (albumin <4 gm/dL)		*Group II (albumin ≥4 gm/dL)*		
Postoperative days	*Creatinine (mg/dL)*	*[a]Difference in serum creatinine*	*Creatinine (mg/dL)*	*[a]Difference in serum creatinine*	*p-value*
First	3.63		4.11		0.33
Second	2.41	↓ 1.98	2.45	↓ 1.66	0.91
Third	1.64	↓ 0.77	1.46	↓ 0.99	0.35
Fourth	1.63	↓ 0.01	1.36	↓ 0.10	0.27
Fifth	1.65	↑ 0.02	1.30	↓ 0.06	0.18

[a]The drop and rise is indicated by down and up arrows respectively; The difference in serum creatinine is fall or rise of serum creatinine compared with previous day value



Graph 2: Serum creatinine values in group II (albumin ≥4 gm/dL) during the five postoperative days

In group II, the mean serum albumin was 4.37 gm/dL, the minimum albumin in this group was 4 gm/dL, and maximum value was 5 gm/dL. The mean serum creatinine during the first five postoperative days was 4.11, 2.45, 1.46, 1.36, and 1.30 mg/dL respectively (Graph 2). Studying the fall in serum creatinine by calculating the difference between adjacent day values, we found that on the second postoperative day there was a fall in serum creatinine value by 1.66 mg/dL. Similarly, there was a fall in serum creatinine levels on third, fourth, and fifth postoperative days by 0.99, 0.10, and 0.06 mg/dL respectively. Hence, in group II, there was persistent drop in serum creatinine levels in all consecutive 5 days, but in group I we found a marginal rise in serum creatinine value on the fifth postoperative day (Table 1). When we compared the trend of fall in serum creatinine on the second, third, fourth, and fifth day in two groups, we could not find any statistically significant difference.

Recipient's ages were then considered and the fall in serum creatinine trends was studied. We further evaluated the fall in serum creatinine trend as per the blood relation of the donor, and the fall in serum creatinine was not statistically significant on any of the 5 days (p-values 0.42, 0.85, 0.86, 0.19, and 0.09 respectively). The population of recipients was further divided based on gender. The fall in serum creatinine was not statistically significant on any of the five postoperative days (p-values 0.05, 0.09, 0.17, 0.60, and 0.27 respectively).

DISCUSSION

Hypoalbuminemia is associated with increased morbidity in general population and mortality in patients with acute illness.[5,6] Albumin is a serum protein, i.e., synthesized in the liver, and its serum levels are regulated by synthesis and degradation. Degradation occurs throughout all tissues, but predominantly occurs in muscle, liver, and kidneys.[7] Serum albumin concentration is a powerful predictor of survival of patients with CKD.[8] Albumin concentrations are controlled by several factors including rate of synthesis, catabolic state, and distribution between the intra- and extravascular spaces in the body. Many conditions, such as malnutrition, catabolism, liver, and renal dysfunction as well as systemic infection reduce serum albumin concentration.[9-11] The incidence of medical and surgical complications is higher in renal transplant recipients during first few days; so the relationship between serum albumin and short-term outcome of these patients was evaluated. Earlier studies have suggested that there is a strong correlation between serum albumin levels and renal graft survival in renal transplant patients. Low pretransplantation serum albumin levels were associated with poor long-term graft outcomes and with more post-transplantation complications.[12]

Guijarro et al[13] found that serum albumin was an independent risk factor among kidney transplant patients. They also found that hypoalbuminemia was associated with reduced renal function. Of note, renal function was correlated with number of acute rejection episodes, but it does not appear that the number of acute rejections was independently associated with hypoalbuminemia. They found that hypoalbuminemia is common and serum albumin is a strong independent risk factor for all-cause mortality after renal transplantation.[13] A study by Dahlberg et al[14] found no statistical significant association between hypoalbuminemia and death rates in their patients.

The present study describes the impact of pretransplant hypoalbuminemia on short-term graft function in kidney transplant patients. Most of our kidney transplant recipients were males (68 of 81). Most of the live kidney donations were from genetically related donors. After studying the trend of fall in serum creatinine in two groups, we found that the mean values of serum creatinine were less in group I on all 5 days. Also the drop in serum creatinine between two adjacent days during the first five postoperative days was more in group I as compared with group II. The difference in this drop was, however, not statistically significant. This suggested that even the patients with lower albumin recovered sufficiently well in terms of short-term renal graft function. Age of the recipients did not make any difference in short-term renal graft function. Similarly, blood relation and gender had no significant influence on the short-term renal graft function.

Molnar et al[15] analyzed 8,961 kidney transplant recipients, with albumin reference value as <3.77 gm/dL. They concluded that lower pretransplant serum albumin concentration during hemodialysis treatment period was associated with worse posttransplant short- and

long-term outcomes, including higher risk of delayed graft function, increased all-cause and cardiovascular death, and higher risk of graft failure. The association between pretransplant serum albumin and posttransplant mortality was robust in almost all subgroups of patients. However, we did not find any significant difference in short-term renal graft outcomes in patients with low serum albumin levels. This may be due to smaller sample size in our study. Extensive search of literature did not provide us with any significant material, which evaluated the role of albumin in the short-term kidney graft function.

The obvious limitation in our study is the small number of subjects in our study population (n = 81) and its single-center retrospective nature. This will need further validation with studies involving larger number of patients with lower serum albumin levels and also other factors affecting early graft function that need to be studied.

CONCLUSION

Our study showed that the serum albumin in preoperative period was reflected in serum creatinine in postoperative period. Lower preoperative serum albumin group patient had lower serum creatinine values, and higher preoperative albumin group patients had higher serum creatinine values after transplant but this was not statistically significant. The drop in serum creatinine level was more in patients with more serum albumin levels compared with patients with low serum albumin levels; however, this difference was again not statistically significant. Therefore, contrary to other earlier studies, we found no effect of preoperative albumin level on short-term graft function.

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