

## Intraoperative Albumin Plus Crystalloid Solution Versus Crystalloid Alone in Renal Transplant Surgery

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### ABSTRACT:

#### BACKGROUND:

Chronic renal failure is defined as an irreversible deterioration in renal function which classically develops over a period of months or years. renal transplantation is the treatment of choice for end stage renal failure and during surgery the maintenance and restoration of intravascular volume are essential tasks to achieve sufficient organ function in renal transplants.

#### OBJECTIVE:

To study the comparison between normal saline 0.9% with glucose 5 % and normal saline 0.9% , glucose 5 % with albumin in renal transplantation.

#### METHODS:

The study data from 50 patients 47 patients underwent living donor kidney transplants three were excluded because they are diabetics .twenty three patients received normal saline 0.9% , glucose saline 5%,and twenty four received normal saline 0.9 with glucose 5% and albumin 100 milliliter .

#### RESULT:

There was no statistical difference between the two groups in the primary measurement of outcome measure in the urine output in the 1<sup>st</sup> day and the serum creatinine in the 1<sup>st</sup>and 3<sup>rd</sup> day .

#### CONCLUSION:

Although statistically there was no difference in the two groups, it might be its useful to combine a colloid with a crystalloid in the fluid management regimen to improve microcirculation, oxygen perfusion and to avoid large volumes of crystalloid.

**KEY WORDS:** renal transplant ,crystalloid , albumin

### INTRODUCTION:

Chronic renal failure results in a steady decline in glomerular filtration rate and which has deleterious effects on multiple organ systems throughout the body. Patients with glomerular filtration rates below 30 ml/min (normal,120 ml /min) will show a rise in blood nitrogen wastes products, mainly urea, creatinine and begin to retain fluid and electrolytes. Once urine production falls below 400 ml /day, the patient becomes oliguric and is not able to excrete dietary fluid and electrolyte loads . Abnormalities in Na,k,Ca,Mg,and phosphate levels can develop, with the most life threatening being hyperkalemia .<sup>(1)</sup>

Absolute or relative blood volume deficits often occur in patients undergoing surgery. The preoperative medical starts of the patients, medication, anesthesia, surgical trauma, and inflammatory reactions may all alter intravascular volume state. Appropriate intravascular volume replacement is a fundamental component of critical care management <sup>(2,3)</sup> .

There is controversy as to whether crystalloids or colloids are preferred for intravascular volume replacement<sup>(4,5)</sup>. Maintenance and restoration of intravascular volume are essential tasks to achieve sufficient organ function in renal transplants. Crystalloid solutions are the first choice to correct fluid and electrolyte deficits in renal transplant. Particularly in situation of increased capillary permeability, colloid solution is indicated to achieve sufficient tissue perfusion; Natural colloids can restore intravascular volume and stabilize hemodynamic conditions. In addition to a faster, more effective and prolonged restoration of intravascular volumes colloid solutions are able to improve microcirculation. Intravascular volume is crucial factor in the maintenance of hemodynamic stability, tissue oxygenations, and organ function. In principal, fluid intake and renal function govern fluid homeostasis.

#### Crystalloids

Isotonic crystalloid Solutions as e.g. normal saline 0.9, glucose water 5% are my commonly used to compensate for general losses of water and

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electrolytes and are usually the first choice for fluid replacement. Isotonic crystalloid Solutions does not contain oncologically active macromolecules. therefore , their effect on plasma volume expansion of approximately 200 ml for every 1000 ml administered , with an intravascular half life 20 to 30 min , is very limited <sup>(6)</sup>

To substitute for blood loss, crystalloid solutions must be used in four to five fold greater amounts, compared with colloid solutions to exert the same volume effects. Moreover, it was demonstrated that crystalloids could not effectively restore microcirculatory blood flow in models of hemorrhagic shock <sup>(7,8)</sup>

Colloids :

General consideration

Because of their content of macromolecules colloid are retained within the intravascular space to a much greater extent, resulting in a greater intravascular volume effect. The volume effect exerted by colloid and their volume – supporting capacity with time depend on their concentration molecular weight, molecular structure, colloid osmotic pressure, metabolism and elimination rate.

### **METHODS:**

50 patients undergoing kidney transplantation were divided in to two groups, group one which received normal saline 0.9 + glucose water 5 % group two which received normal saline 0.9 + glucose water 5 % + albumin 100 ml for intraoperative fluid replacement during surgery For kidney transplantation. Exclusion criteria were Age < 18 years old , diabetes or serum potassium level > 5.5 mg / ml before surgery. General anesthesia was induced with combination of I.V midazolam (1-2 mg ) , fentanyl ( 1 /microgram/ kg ) , and propofol ( 1-3 mg / kg ). Anesthesia was maintained using isoflurane in air / oxygen and muscle relaxation non depolarizing neuromuscular blockers. <sup>(9,10)</sup>

Standard monitoring, non – invasive monitoring of systemic arterial blood pressure , pulse oximeter , ECG , temperature, central venous pressure, left kidney was procured from living donors. The donor kidney was flushed with ice cold Ringer lactate before transfer for implantation in to recipient. The donor kidney was implanted in the

right retroperitoneal space of the recipient with vascular anastomoses to the right or left external or internal iliac artery and vein . furosemide was given 1- 2 mg / kg after declamping.

Preoperative and postoperative immunosuppressive therapy was administered according to institutional guidelines. Briefly, all patient received triple. Therapy comprising tapering doses of steroids simulect , calcineurin inhibitor , and either mycophenolate <sup>(11)</sup> . The clinician caring for the patient determined precise combination and doses of medications .

The goal was to conduct clinical effectiveness study, which means that we wanted to assess the impact of interventions in actual clinical practice.

Study fluid was used for all intra operative Fluid replacement with the exception of blood or blood products that were administered if clinically indicated..

At the end of surgery after application of the surgical dressing, study fluids were discontinued. Post operative I.V fluid, therapy was the same for all patients and was administered according to the institutional protocol. Urine output was replaced (milliliter for milliliter) with an I.V infusion of dextrose 5 % , 0.9 NaCl .(the albumin is given only intraoperative)

The outcome measures were the postoperative urine output, serum creatinine , requirement for dialysis, and graft loss . Differences in continuous variable between the two groups were tested using t- tests. AP value < 0.05 was considered to be significant.

### **RESULT :**

Forty seven Patient were divided in to two groups, group one which receive normal saline 0.9 + glucose water 5 % group two which received normal saline 0.9 + glucose water 5 % + albumin 100 ml for intraoperative fluid replacement during surgery For kidney transplantation..three patients were excluded after randomization because of preoperative diabetic . There were 23 patients in N.S groups and 24 patients in Albumin group .All 47 patients were included in the final analysis. The study groups were similar with regard to demographic factors{ table 1}.

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**Table 1: Demographic and perioperative variables .**

| Number of patients                 | N.S (n=23) | Albumin (n=24) | P-value |
|------------------------------------|------------|----------------|---------|
| Age                                | 34±14      | 34±11          | N.S     |
| Sex . NO . ( % ) men               | 16 (70% )  | 18(75%)        | N.S     |
| Preoperative hemodialysis          | 23         | 24             | N.S     |
| Volume of study fluid / L          | 2.5±0.5    | 2.5±0.5        | N.S     |
| Operating room time /h             | 4±0.5      | 4±0.5          | N.S     |
| Blood lose / ml                    | 300±50     | 300±60         | N.S     |
| baseline serum creatinine , mgl dl | 6±2.8      | 7±2.1          | NS      |

Urine output in 1st 24 h in normal saline group was 10±2.1 litter and in the albumin group 11 ± 1.6 litter. Graft loss occurred in one patient in the normal saline group and one patient in albumin group due to rejection. Serum creatinine an 1 st day was 3.1±2mg/dl in group normal saline and 2.8±1.8 mg/dl in albumin group. serum creatinine

in the 3<sup>rd</sup> day in the albumin group 1.3±0.5 mg/dl while in normal saline group 1.6±0.4and there were no significant difference s in the result . 3 patient in normal saline group required dialysis and in group Albumin 2 patients required dialysis postoperative .{table 2} .

**Table 2: postoperative result in 1<sup>st</sup> and 3<sup>rd</sup> day after transplant**

| Number of patients                            | Normal sline=23 | ALBUMIN =24 |
|---|-----------------|-------------|
| 24h urine out put /l                          | 10±2.1          | 11±1.6      |
| serum creatinine mg/dl in 1 <sup>st</sup> day | 3.1±2           | 2.8±1.8     |
| serum creatinine mg/dl in 3 <sup>rd</sup> day | 1.3±0.5         | 1.6±0.4     |
| Patients requiring dialysis                   | 3               | 2           |
| Graft loss                                    | 1               | 1           |

### DISCUSSION:

This is the first study that has compared the effects normal saline 0.9 + glucose water 5 % to normal saline 0.9 + glucose water 5 % + albumin 100 ml for intraoperative fluid replacement during surgery For kidney transplantation. . There was no significant difference between the two groups in the primary outcome measure of the serum creatinine on 1st day the result suggest that the administration of 100 ml albumin is safe in Renal transplant patient and may be superior to normal saline for I.V fluid therapy in this setting .

These results have important implications for patient management because more than 400 in Iraq and 10.000 kidney transplants in the united state are performed annually with many thousands more conducted worldwide each year<sup>(12)</sup>.

There are several reasons why kidney function may worsen in the perioperative period or in the intensive care setting . These include the use of definite nephrotoxic substance or potentially nephrotoxic substance {e.g ACE inhibitors<sup>(13)</sup> or volatile anesthetics<sup>(14)</sup>.

For starting the function of the new kidney by preserving organ perfusion , which in turn , is

achieved by maintaining the effective circulating volume and , hence , cardiac output .Crystalloids ,

albumin , gelatin and etherified starch are the most frequently used colloids for intravascular volume replacement<sup>(15)</sup>.I.V fluid composition may have an impact on renal function , although this point is controversial<sup>(16)</sup>.

A few small studies have suggested that administration of NS may be detrimental to renal function<sup>(17,18,19,20,21,22)</sup>

Based upon starlings equation, colloid osmotic pressure should theoretically be important for maintaining fluid balance in patients by virtue of its influence on fluid flux between the intravascular and extravascular compartments .

Depressed colloid osmotic pressure could contribute to interstitial fluid overload and oedema formation impaired blood flow, oxygen transport, hepatic and renal dysfunction might result. oedema in the lungs would lead to deterioration in gas exchange .

If increasing colloid osmotic pressure is deemed clinically desirable, it can be accomplished by administration of either natural or artificial colloid<sup>(23)</sup> .

Saline decreases colloid osmotic pressure. Albumin and hetastarch were found both in rising colloid osmotic pressure and maintaining the colloid

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osmotic pressure –pulmonary arterial wedge pressure gradient<sup>(24)</sup>. A decrease in the colloid osmotic pressure –pulmonary arterial wedge pressure gradient was associated with the occurrence and severity of pulmonary oedema<sup>(25)</sup>. Most patient undergoing kidney transplantation in united states receive normal saline 0.9 and glucose water 5% for I.V fluid therapy during surgery<sup>(26)</sup>. This is the first study to compare the effects of normal saline 0.9 and glucose water 5% and normal saline 0.9 and glucose water 5% + Albumin in patient ESRD for renal transplant our finding that normal saline and glucose water is not detrimental to Renal function in these patients. In addition , the administration of normal saline 0.9 and glucose water 5% + Albumen in patient undergoing kidney transplantation seems safe and may be superior to N.S because it will increase the colloid osmotic pressure .

### CONCLUSION:

Crystalloid solution represents the basic treatment to correct water and electrolyte deficits. therefore , they are always the 1<sup>st</sup> choice to the intravascular volume but in cases with microcirculatory disturbance and increased capillary permeability , colloid solution are necessary to guarantee sufficient tissue perfusion , it may be useful to combine a colloid with a crystalloid in the fluid management regimen to improve microcirculation , oxygen perfusion and to ovoid large volumes of crystalloid if needed .

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