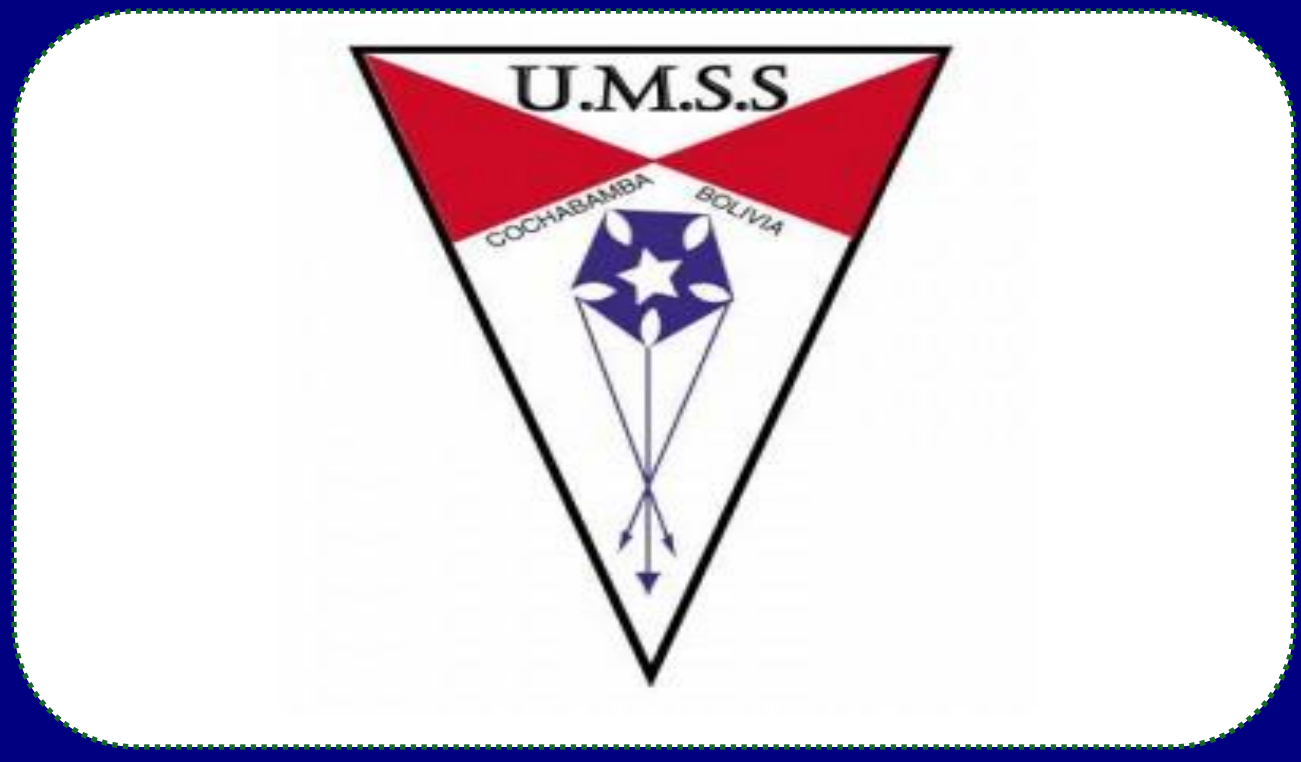




Bicarbonate-Based Solutions in the Management of Acute Kidney Injury

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Background

- Fluid administration constitutes an important part of the treatment of established acute kidney injury (AKI).
- Optimization of the hemodynamic status and correction of any volume deficit helps to minimize further extension of AKI, and facilitates recovery from AKI. The optimal hydration strategy for management AKI remains unknown.
- AKI is often associated with acidosis.
- Acidosis has been linked to several adverse effects that are deleterious to kidney function; it has been shown to increase interleukin production and endothelin secretion.

Objectives

- To evaluated the effect of bicarbonate-based solutions in the management of established AKI.
- To compare the effect of bicarbonate-based solutions and bicarbonate-free solutions on urine output, delta serum creatinine, and days to achieve basal creatinine.
- To assess the amount of fluids been administered on each group.

Hypothesis

We hypothesized that the use of bicarbonate-based solution will facilitate the recovery from AKI.

Methods

-We analyzed data from 59 hospitalized patients from a University based hospital; who developed hospital acquired AKI. Patients with chronic kidney disease K-DOQI stages 4 and 5; with kidney allograft; contrast induced AKI; previous renal replacement therapy were excluded.

-The treating nephrologist determined the initial and subsequent type of fluid to be used (bicarbonate-based or bicarbonate free solutions), as well as the initial and subsequent volumes and he rate of administration of resuscitation fluid, depending on clinical sings and the subsequent response to fluid administration.

Methods

-Twenty-nine patients received bicarbonate-based solutions (80 mEq/L of 8% sodium bicarbonate in 0.45% saline); the amount of the study fluid was administered at physician discretion for a maximum of 7 days; thirty patients received different types of bicarbonate-free solutions (0.9% saline, 0.45% saline, ringer lactate, or colloids) again the type of fluid and the amount was administered at physician discretion.

- All other aspects of patient care, including nutrition, pharmacologic support, cardiovascular monitoring, were conducted at discretion of the treating clinicians.

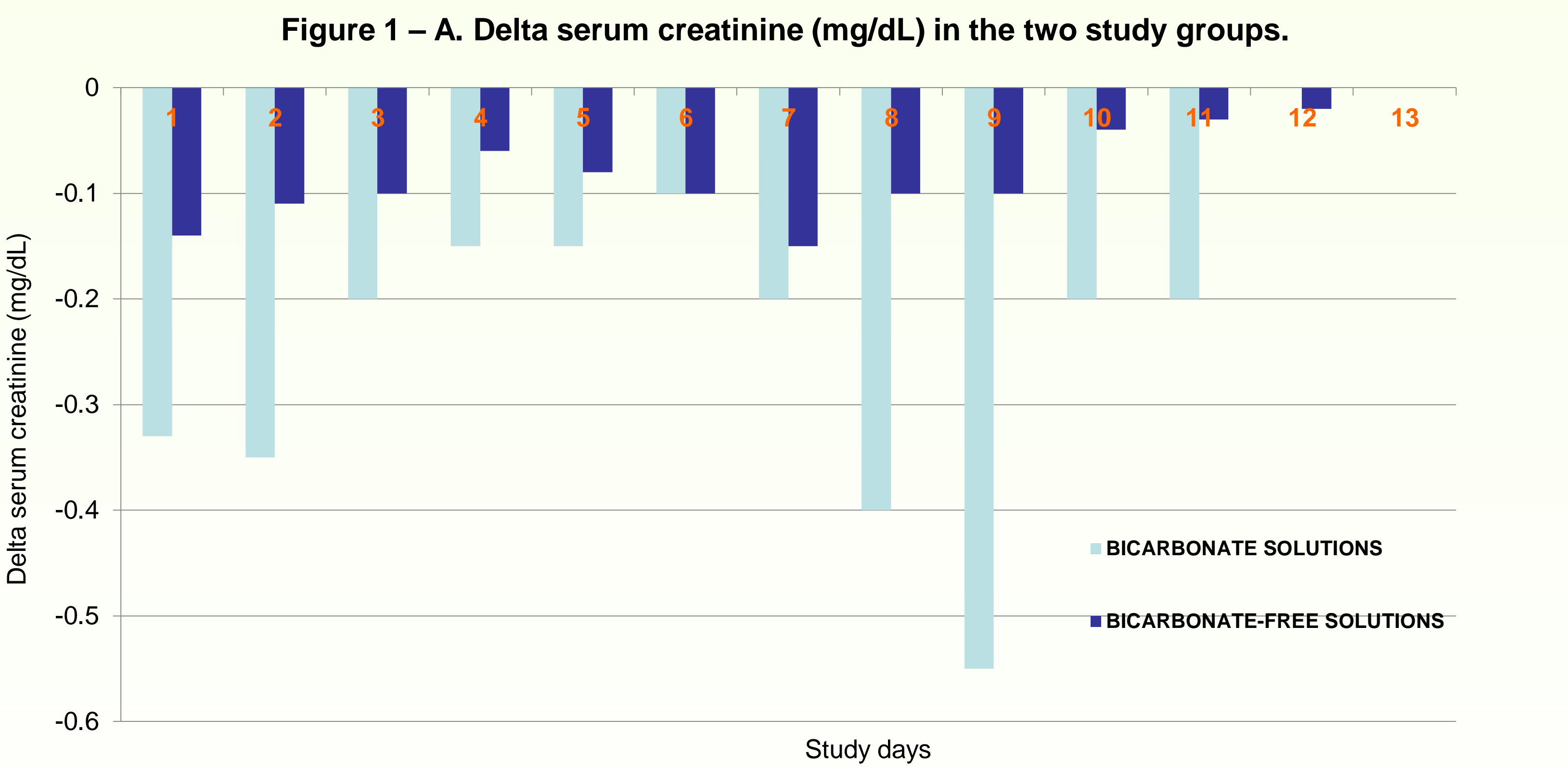
Results

Table 1. Baseline Characteristics of the Patients		
Characteristics	Bicarbonate Group (N = 29)	Bicarbonate-Free Group (N = 30)
Age — yr		
Median	64.1	66.6
Inter-quartile range	37-85	37-97
Male sex — no. (%)	21 (72,41)	14 (46,66)
Physiological variables		
Mean arterial pressure — mmHg	83	84
Heart rate — beats/min	77	76
Respiratory rate /min	20	19
Urine output — ml/hr	65.92	57.74
Co morbid conditions (%) ^a		
Diabetes	9 (31,03)	11 (36,66)
Hypertension	8 (27,58)	9 (30)
Cardiac failure	9 (31,03)	9 (30)
Liver disease	2 (6,89)	2 (6,66)
CKD	13 (44,82)	10 (33,33)
CVD	0	1 (3,33)
Obesity	2 (6,89)	2 (6,66)
Obstructive uropathy	1 (3,44)	2 (6,66)
COPD	1 (3,44)	2 (6,66)
Co morbid sum ^b		
0	9 (31,3)	6 (20)
1	6 (20,68)	8 (26,66)
3	6 (20,68)	9 (30)
>= 3	8 (27,58)	7 (23,33)
Etiology — no. (%) ^c		
Pre-renal	6 (20,68)	5 (16,66)
Obstructive nephropathy	1 (3,44)	1 (3,33)
Sepsis	16 (55,17)	16 (53,33)
CRS	3 (10,34)	3 (10)
HRS	1 (3,44)	0
Rhabdomyolysis	1 (3,44)	1 (3,33)
Multifactorial [*]	1 (3,44)	4 (13,33)
CrCl — ml/min per 1,73m2		
MDRD	27.4	32.76
CKD-EDPI	26.16	31.33

Results

Chronic kidney disease (CKD) was present in 13(44.8%) of the 29 patients who received bicarbonate-based solutions [CKD stage 2 (30.8%) and stage 3 (69.2%)]; CKD was present in 10(33.2%) of the 30 patients who received bicarbonate-free solutions [CKD stage 2 (30%) and stage 3 (70%)]. In the bicarbonate-based solutions group 7(24.1%) patients had stage 1 AKI; 14(48.3%) had stage 2 AKI; and 8(27.6%) had stage 3 AKI. In the bicarbonate-free solutions group 14(46.7%) patients had stage 1 AKI; 14(46.6) had stage 2 AKI; and 2(6.7%) had stage 3 AKI.

Table – 2 Differences between bicarbonate-based solutions and bicarbonate-free solutions			
Characteristics	Bicarbonate-based group (N=29)	Bicarbonate-free group (N=30)	P value
Median (IQR) Baseline serum creatinine (mg/dL)	1.12 (0.9 – 1.3)	1.08 (0.9 – 1.23)	<0.001
Mean ±SD Δ serum creatinine (mg/dL)	- 0.29±0.47	- 0.07±0.42	0.007
Median (IQR) 24 hour urine output (mL)	1,592 (1,409 – 1,905)	1,647 (1,296 – 2,192)	0.294
Median (IQR) Study solutions – volume received (mL/day)	1,000 (500 – 2,000)	1,000 (1,000 – 2,000)	0.903
Mean ±SD Return to baseline serum creatinine (days)	5.6±2.1	7.6±2.8	<0.001



Conclusions

- Bicarbonate-based solutions for the treatment of established AKI could improve renal function, accelerating renal recovery.
- An adequately powered randomized controlled trial is warranted to support the use of bicarbonate-based solution in patients with established AKI.