Adsorbing capacity of Cross Linked Polyelectrolyte (CLP) in effluent fluid of hemodialysis patients: An experimental study

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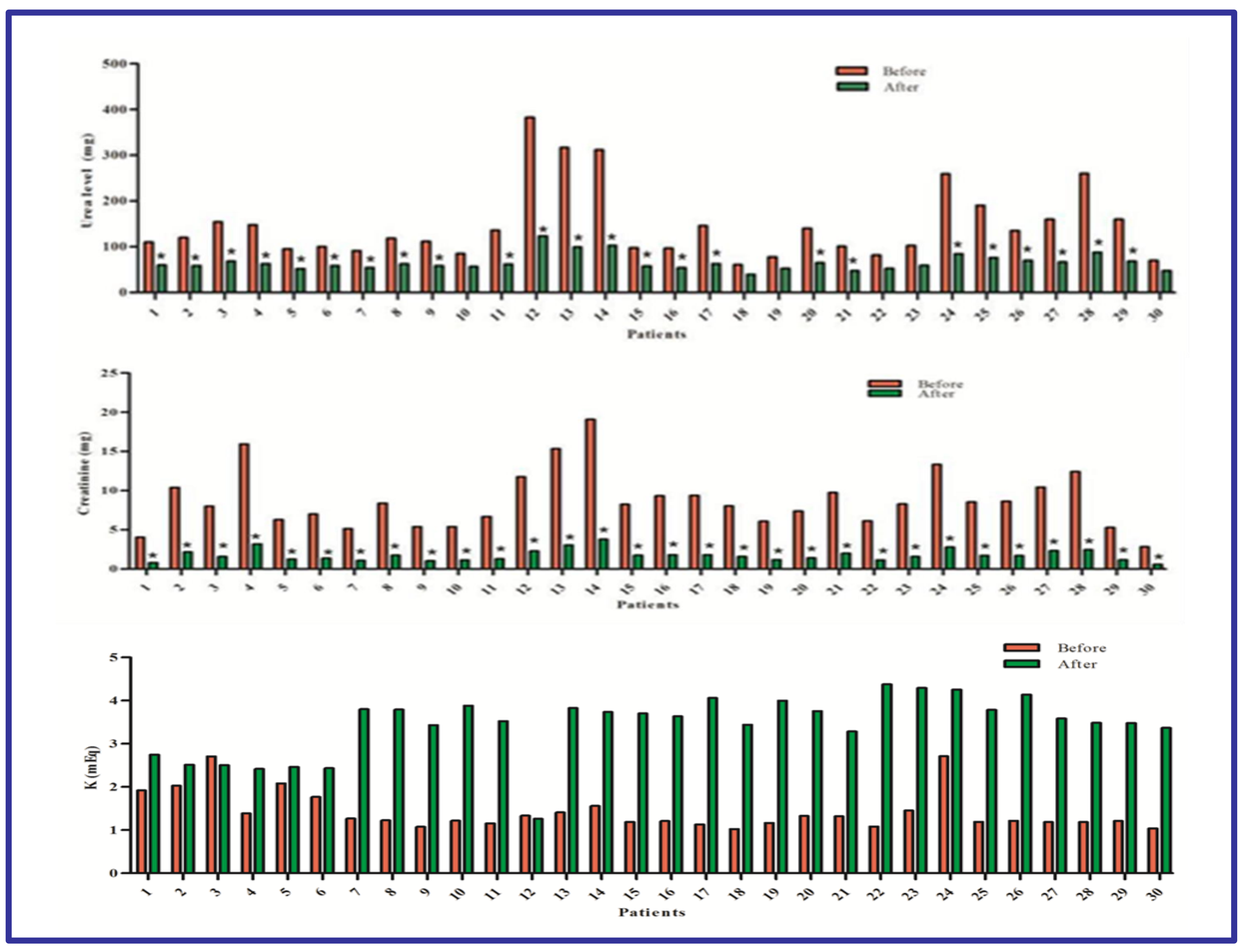
OBJECTIVES

Recent developments in polymer technology have generated materials with both uremia specific solute and fluid adsorptive properties, which portend renewed opportunities for the clinical use of oral sorbents to ameliorate azotemia, fluid overload, and dialysis dependency of uremic animals. These advances will provide medical approaches for renal replacement in patients with CKD and/or ESRD.
The aim of the present study was to evaluate the effect of Cross-Linked Polyelectrolyte (CLP) administration for adsorption and removal of excess fluid, electrolyte and nitrogenous waste products in CKD patients.

METHODS

Study protocol
500 ml of dialysate effluent fluid was collected from participants during the first hour of hemodialysis. Concentrations of urea, creatinine, uric acid, sodium and potassium in all samples were measured before CLP treating (Table 1). In the next step, all of the dialysate effluent samples were treated with 6g CLP, and then incubated for 4h at 37°.
The CLP employed in present study was Stockosorb 500 XL (Stockhausen, Krefeld, Germany), a Cross-linked acrylamide/acrylic acid copolymer partially potassium neutralized. The granule sizes ranged between 1.5 and 2.0 mm. When incubated at 37°C for 4h, the stockosorb 500 XL can adsorb up to 400% of its weight in distilled water and up to 80% of its weight in dialysate effluent fluid. In a desired CLP product with ideal properties, the starting toxic monomers should be converted to non-toxic products via polymerization processes. According to MTT test, Stockosorb 500 XL is non-toxic polymer, this means that the conversion of monomer to polymer is ~100% in this polymer.



RESULTS

CLP can adsorb up to 80 times its weight in dialysate effluent fluid (81±0.02). The results show a significant decrease ($p<0.001$, confidence interval: 95%) in amount of urea, creatinine, uric acid and sodium after CLP treating, Fig 1, 2, and 4. In contrast, the amount of potassium has been increased after CLP treating, Fig 3.
The mean adsorption percentage of urea, creatinine, uric acid and sodium are 50%±0.11, 80%±0.10, 76%±0.03 and 83%±0.02 respectively. Surprisingly, in most of the patients, potassium not only is adsorbed by CLP network but it is also efficiently transferred from CLP into the dialysate effluent fluid. The mean amount of potassium before and after CLP treating is 1.43 ±0.44mEq and 3.77 ±1.53mEq respectively.

CONCLUSIONS

TextFuture prospect
This study is a paradigm for using CLP to remove the body excess products from the intestinal tract in patients with volume and waste product overload. Using CLP beside to functional medical super adsorbents can be an adequate substitute for conventional dialysis methods, especially hemodialysis.

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