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Lactated Ringer's vs. normal saline solution for renal transplantation: Systematic review and meta-analysis☆

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ABSTRACT

Background: The administration of potassium solutions may result in hyperpotassemia during surgery; normal saline solution (NSS) traditionally used in renal transplant may cause hyperchloremic acidosis.
Objective: To compare the safety of Lactated Ringer's (LR) against NSS in renal transplantation.
Search strategy: A systematic review was completed on Central Cochrane Registry – controlled trials, Medline, Lilacs, EBSCO and Embase, accessing review articles and contacting expert clinicians. There was no language restriction.
Selection criteria: Randomized controlled trials on adult patients undergoing renal transplantation.
Data collection and analysis: Independent trial selection, quality assessment and data extraction were performed. The mean differentials were estimated with a 95% confidence interval (95% CI). Heterogeneity was evaluated with statistic *I*-square (I^2) and the fixed and random effect models were used.
Results: Four trials with a total of 237 patients were included. At the end of surgery, the potassium differential was non-significant (means difference (MD: −0.26 mEq/L; CI 95%: −0.58 to 0.05 $p = 0.10$; $I^2 = 75\%$); the pH was lower in the NSS group (MD: 0.06; CI 95%: 0.05–0.08; $p < 0.001$; $I^2 = 17\%$). No difference in Creatinine was identified on the third postoperative day (MD: −0.05; CI 95%: −0.59 to 0.48; $p = 0.85$; $I^2 = 0\%$).

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Conclusions: The use of RL vs. NSS during the renal transplantation perioperative period results in lower potassium and chloride levels and a higher pH, with no significant Creatinine changes.

Lactato de Ringer vs. Solución salina normal para trasplante renal. Revisión sistemática y metaanálisis

Palabras clave:
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RESUMEN

Antecedentes: La administración de soluciones con potasio puede causar hiperpotasemia durante cirugía, la Solución Salina Normal (SSN), usada tradicionalmente en trasplante renal, puede generar acidosis hiperclorémica.

Objetivo: Comparar la seguridad del Lactato de Ringer (LR) con SSN en trasplante renal.

Estrategia de búsqueda: Se realizó una revisión sistemática en el Registro Cochrane Central de ensayos controlados, Medline, Lilacs, EBSCO y Embase, en artículos de revisión y contactando clínicos expertos. No hubo restricción de idioma.

Criterios de selección: Se incluyeron ensayos controlados aleatorios en pacientes adultos sometidos a trasplante renal.

Recogida y análisis de datos: De forma independiente se realizó selección de estudios, evaluación de la calidad y extracción de datos. Se calculó diferencia de medias con su intervalo de confianza del 95% (IC 95%). Se evaluó la heterogeneidad con el estadístico *I*-cuadrado (I^2). Se usaron los modelos de efectos fijos y aleatorios.

Resultados: Se incluyeron cuatro estudios con un total de 237 pacientes. Al final de cirugía la diferencia de potasio no fue significativa (Diferencia de Medias (DM: −0,26 mEq/L; IC 95%: −0,58 a 0,05 $p = 0{,}10$; $I^2 = 75\%$), el pH fue menor en el grupo de SSN (DM: 0,06; IC 95%: 0,05 a 0,08; $p < 0{,}001$; I2:17%). No hubo diferencia en la creatinina al tercer día posoperatorio (DM: −0,05; IC 95%: −0,59 a 0,48; $p = 0{,}85$; $I^2 = 0\%$).

Conclusiones: El uso de LR comparado con SSN en el perioperatorio de trasplante renal genera menores niveles de potasio y cloro y mayor pH, sin cambios significativos en la creatinina.

Introduction

Intraoperative fluid management during renal transplantation has traditionally been done with normal saline solution (NSS) because the administration of potassium solutions such as Lactated Ringer's (LR) in large volumes to surgical patients may lead to hyperpotassemia[1]. Several papers have been published on the topic, showing that the administration of large volumes of NSS, as is usually the case in patients undergoing renal transplantation (RT), is associated with hyperchloremic metabolic acidosis[1–4].

According to Steward's theory, fluids usually administered during surgery may alter the acid–base balance and predispose to metabolic acidosis due to a rise in chloride levels[5,6]. Such acidosis may lead to hyperpotassemia due to the extracellular shifts of potassium ions[1–3,7]. Hyperchloremia may at the same time result in vasoconstriction of the afferent arteriole and renal graft injury[2,3]. Other acidosis-related complications may be changes in mental status and abdominal discomfort due to disruptions of the splanchnic vasculature[7] and it has even been associated with higher mortality in surgical patients[8].

Kidney transplant is the most usual transplantation in our country and around the world[9]; RT results have improved with the advancement of surgical, immune suppressor, and anesthesia techniques. The presence of hyperpotassemia associated with hyperchrolemic metabolic acidosis may contribute to the graft dysfunction, and hence should be prevented in these patients[10].

Several trials have been published comparing the use of LR with NSS but they include few patients[2,3,11–14]. We did a meta-analysis to assess the effects of LR vs. NSS on the incidence of hyperchloremic metabolic acidosis, hyperpotassemia, volume of fluids infused and kidney graft dysfunction in patients undergoing renal transplant.

Methodology

This systematic review followed the methodology recommended by the Cochrane Collaboration[14]. This protocol has not been published and was not registered.