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The therapeutic effectiveness and safeguard of lanthanum carbonate in conjunction with calcium carbonate for managing hyperphosphatemia in hemodialysis patients: A meta-analysis of randomized controlled trials

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ADMINISTRATIVE INFORMATION

Support - N/A.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 24 July 2024 and was last updated on 24 July 2024.

INTRODUCTION

Review question / Objective To conduct a meta-analysis of randomized controlled trials (RCTs) on the efficacy and safety of lanthanum carbonate and calcium carbonate combination in hemodialysis patients with hyperphosphatemia.

Condition being studied Hyperphosphatemia, a condition characterized by an excessive amount of phosphorus in the blood, is a common concern for individuals undergoing dialysis. This is primarily because the kidneys, the organs responsible for filtering waste products and excess minerals from the blood, are unable to perform this function effectively in patients with renal impairment. As a result, dialysis patients may struggle to maintain phosphorus levels within the normal range. To manage hyperphosphatemia, several strategies are employed, including dietary modifications to reduce phosphorus intake, the use of phosphate binders to help excrete excess phosphorus, and adjustments to dialysis treatments, such as increasing the frequency or duration of dialysis sessions. Additionally, monitoring and appropriately adjusting levels of calcium, phosphorus, and parathyroid hormone, which are closely related to phosphorus homeostasis, is crucial in the management of hyperphosphatemia. In cases where hyperphosphatemia is severe and not controllable through non-pharmacological measures, drug treatment or other more invasive treatment options may be necessary. Therefore, the management of hyperphosphatemia in patients undergoing dialysis requires a comprehensive approach that considers the patient's overall condition and treatment goals and is tailored by healthcare professionals to ensure the best possible outcomes.

METHODS

Participant or population Patients with continuous hemodialysis who have hyperphosphatemia (hemodialysis duration exceeding 6 months and blood phosphorus level above 1.80 mmol/L) and patients with other

preexisting conditions that may affect calcium, phosphorus, and parathyroid hormone metabolism were excluded.

Intervention The control group was given calcium carbonate alone, while the observation group was given a combination of lanthanum carbonate and calcium carbonate (combined medication).

Comparator In the study, the control group was administered calcium carbonate monotherapy, whereas the observation group received a combination therapy consisting of lanthanum carbonate and calcium carbonate. The purpose of including the combination medication was to explore the potential synergistic effects and improved therapeutic outcomes that might be achieved through the concurrent use of these two compounds. The control group served as a comparison to assess the additional benefits, if any, conferred by the combined medication approach.

Study designs to be included Clinical RCTs published in English.

Eligibility criteria Retrospective research, animal study, comprehensive review, conference solicitation, and repeated published literature.

Information sources Two researchers independently examined the literature applying the pre-established inclusion and exclusion criteria and completed individual literature information collection forms. Any discrepancies were determined through consensus reached with a third investigator. The extracted data comprised the title, publication time, first author, study design and implementation, intervention measures in the control group and observation group, usage, and dosage of the included drugs (lanthanum carbonate and calcium carbonate), outcome measurement, and evaluation.

Main outcome(s) Evaluation indicators were based on blood phosphorus level, blood calcium level, immunoreactive parathyroid hormone (iPTH) levels, clinical effective rate, and the occurrence of adverse reactions were the main outcome indicators. The criteria for clinical effective rate are as follows: after treatment, blood phosphorus levels should be ≤ 1.80 mmol/L and show stability or a decrease, which is considered significantly effective; after treatment, if the blood phosphorus levels are> 1.78 mmol/L but show a significant decrease, it is regarded as effective; if there is no significant alteration in the blood phosphorus levels after treatment, it is considered ineffective. The clinical effective rate is calculated as the sum of the number of significantly effective cases and the number of effective cases divided by the total number of cases.
Exclusion criteria: Retrospective research, animal study, comprehensive review, conference solicitation, and repeated published literature.

Quality assessment / Risk of bias analysis Each study's evidence quality was evaluated using the Cochrane risk assessment tool, which considers seven domains: selection bias (randomization and allocation), performance bias, detection bias, attrition bias, reporting bias, and other biases. Each study was categorized as having low, high, or unclear risk of bias. The Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) system was utilized to assess the level of evidence and the strength of recommendations.

Strategy of data synthesis Two researchers independently examined the literature applying the pre-established inclusion and exclusion criteria and completed individual literature information collection forms. Any discrepancies were determined through consensus reached with a third investigator.

Subgroup analysis A subgroup analysis is a detailed examination of a particular segment of a study population, focusing on whether there are any notable variations in treatment outcomes or effects based on specific demographic or clinical factors.

Sensitivity analysis Sensitivity analysis was conducted to evaluate how a model's output responds to changes in its input parameters. By varying these inputs within a reasonable range, the analysis provides insights into the robustness and reliability of the model's predictions. It is a key tool for assessing the impact of uncertainty on model outcomes and is invaluable in decision-making processes, particularly in areas such as economics, finance, engineering, and healthcare.

Country(ies) involved China.

Keywords Lanthanum carbonate; Calcium carbonate; Hemodialysis; Hyperphosphatemia; Clinical effective rate.

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