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A Comparative Study on Effectiveness of Ferric Citrate Versus Sevelamer Plus Iron Supplement in Patients with Chronic Kidney Disease

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Abstract: ***Chronic Kidney Disease (CKD) includes the continuum of kidney dysfunction from mild kidney damage to kidney failure, and it also includes the term, end-stage renal disease (ESRD). Some of the common complications of CKD include anemia, heart disease, high potassium, bone disorder and high phosphorus. Hyperphosphatemia is potentially a life altering condition that can lead to cardiovascular calcification, metabolic bone disease and development of secondary hyperparathyroidism. Iron deficiency anemia commonly occurs in people with CKD- the permanent, partial loss of kidney functions. Ferric citrate is an iron-containing phosphate binder which decreases serum phosphate, increase hemoglobin and replete iron stores in patients with CKD. Sevelamer is a phoshphate binding drug used to treat hyperphosphatemia in patients with CKD. In CKD the kidneys fail to excrete the phosphorus and result in positive phosphorus balance. TIBC test helps to know how well that protein can carry iron in the blood. This study aims to compare the effectiveness of ferric citrate versus sevelamer plus iron supplement in controlling hyperphosphatemia and iron deficiency anemia in patients with CKD.***

Method: ***This is a prospective study is going to be conducted in Department of Nephrology at Pushpagiri Medical College Hospital. Informed consent of the patients will be taken by explaining the whole procedure. About 50 patients are in consideration according to the inclusion and exclusion criteria, where 25 receiving ferric citrate and 25 receiving sevelamer plus iron supplement in stage 5 CKD patients on dialysis. Serum phosphorus and TIBC are the biomarkers in consideration. For the determination the residual blood will be collected from the laboratory.***

Key words: CKD, Hyperphosphatemia, Iron deficiency anemia, Ferric citrate, Sevelamer.

I. INRODUCTION

Chronic kidney disease (ckd), also called chronic kidney failure. The term includes the continuum of kidney dysfunction from mild kidney damage to kidney failure, and it also includes the term, end-stage renal disease (esrd). The symptoms of worsening kidney function are not specific, and might include feeling generally unwell and experiencing a reduced appetite. Some of the common complications of ckd include anemia, heart disease, high potassium, bone disease and high phosphorus.

Hyperphosphatemia: hyperphosphatemia in ckd patients is a potentially life altering condition that can lead to cardiovascular calcification, metabolic bone disease (renal osteodystrophy) and the development of secondary hyperthyroidism (shpt). It is also associated with increased prevalence of cardiovascular diseases and mortality rates. There are three main strategies for correcting hyperphosphatemia are diet (restricting dietary phosphate intake), enhancing elimination (removing phosphate with adequate dialysis), minimizing phosphate absorption (reducing intestinal absorption using phosphate binders).

Iron deficiency anemia: anemia commonly occurs in people with ckd-the permanent, partial loss of kidney functions. Anemia tends to worsen as ckd progresses. Most people, who have total loss of kidney function, or kidney failure, have anemia. A person has kidney failure, have anemia. A person has kidney failure that needs a kidney transplant or dialysis in order to live. Two forms of dialysis include hemodialysis and peritoneal dialysis. Hemodialysis uses a machine to circulate a person's blood through a filter outside the body. Peritoneal dialysis uses the lining of the abdomen to filter blood inside the body.

Ferric citrate: ferric citrate is an iron-containing phosphate binder that has been shown to effectively decrease serum phosphate, increase hemoglobin and replete iron stores in patients with chronic kidney disease. Ferric citrate binds dietary phosphate in the gastrointestinal tract, thereby decreasing absorption and lowering concentration of serum phosphorus.

Sevelamer: sevelamer is a phosphate binding drug used to treat hyperphosphatemia in patients with chronic kidney disease. When

taken with meals, it binds to dietary phosphate and prevents its absorption.

Serum phosphorus: the amount of reabsorbed phosphorus is the main regulator of the serum phosphorus level in subjects with normal renal function, or moderately reduced glomerular filtration rate. In chronic kidney disease (ckd) the kidney fails to excrete the phosphorus and the result is a positive phosphorus balance.

Tibc (total iron binding capacity): tibc is a blood test to see too much or too little iron in the blood. Iron moves through the blood attached to a protein called transferrin. This test helps to know how well that protein can carry iron the blood. In iron deficiency anemia tibc is increased.

II. REVIEW ARTICLES

Yoram Yagil et al., (2015); conducted a study on 'Managing hyperphosphatemia in patients with CKD on dialysis with Ferric citrate. Ferric citrate is a novel phosphate binder that allows the simultaneous treatment of hyperphosphatemia and iron deficiency in patients being treated for end -stage renal disease with hemodialysis (HD). Multiple clinical trials in HD patients have uniformity and consistently demonstrated the efficacy of the drug in controlling hyperphosphatemia with a good safety profile, leading the US Food and Drug Administration in 2014 to approve its use for that indication. A concurrent beneficial effect, while using ferric citrate as phosphate binder, is its salutary effect in HD patients with iron deficiency being treated with an erythropoietin-stimulating agent (ESA) in restoring iron that becomes available for reversing chronic kidney disease (CKD) related anemia. Ferric citrate has also been shown in several studies to diminish the need for intravenous iron treatment and to reduce the requirement for ESA. Ferric citrate is thus a preferred phosphate binder that helps resolve CKD-related mineral bone disease and iron deficiency anemia.

Geoffrey A. Block et al., (2015); A 12-Week, Double-Blind, Placebo-Controlled Trial of Ferric Citrate for the Treatment of Iron Deficiency Anemia and Reduction of Serum Phosphate levels >4.0mg/dL are relatively common in chronic kidney disease stages 3 to 5 and are associated with higher risks of progressive loss of kidney function, cardiovascular events, and mortality. Double-blind, placebo-controlled, randomized trial 149 patients with estimated glomerular filtration rates <60ml/min/1.73m (2), iron deficiency anemia (hemoglobin, 9.0-12.0 g/dL; transferrin saturation [TSAT] ≤ 30%, serum ferritin ≤ 300ng/ml),and serum phosphate levels ≥ 4.0 to 6.0 mg/dL.Use of intravenous iron or erythropoiesis-stimulating agents was prohibited. Randomization to treatment for 12 weeks with ferric citrate coordination complex(ferric citrate)or placebo. Coprimary end points were change in TSAT and serum phosphate level from baseline to end of study. Secondary outcomes included change from baseline to end of treatment in values for ferritin, hemoglobin, intact fibroblast growth factor 23 (FGF-23), urinary phosphate excretion, and estimated glomerular filtration rate. The incidence and severity of adverse effects were similar between treatment arms. The study is limited by relatively small sample size and short duration and by having biochemical rather than clinical outcomes. Short-term use of ferric citrate repletes iron stores, increases hemoglobin levels, and reduces levels of serum phosphate, urinary phosphate excretion, and FGF-23 in patients with chronic kidney disease stages 3 to 5.

Julia B. Lewis et al., (2014); conducted on “Ferric Citrate controls phosphorous and delivers iron in patients in dialysis”. Patients on dialysis require phosphorus binders to prevent hyperphosphatemia and are iron deficient .We studied ferric citrate as a phosphorus binder and iron source. In this sequential randomized trial, 441 subjects on dialysis were randomized to ferric citrate or active control in 52-week active control period followed by a 4-week placebo control period, in which subjects on ferric citrate who completed the active control period were randomized to ferric citrate or placebo. The primary analysis compared the mean change in phosphorus between ferric citrate and placebo during the placebo control period. Hemoglobin levels were statistically higher on ferric citrate. Thus, ferric citrate is an efficacious and safe phosphate binder that increases iron stores and reduces intravenous iron and erythropoietin- stimulating agent use while maintaining hemoglobin.

Keitaro Yokoyama et al., (2014); conducted a study on "A randomized trial of JTT-751 versus sevelamer hydrochloride patients on hemodialysis". In this phase 3, multicentre, randomized, open label, parallel-group study, we compared the efficacy and safety of JTT-751 versus sevelamer hydrochloride in patients undergoing hemodialysis. A total of 230 patients with a serum phosphate ≥ 1.97 and < 3.23 mmol/L were randomized to JTT-751 (dose adjusted between 1.5 and 6.0g/day) or sevelamer hydrochloride (dose adjusted between 3.0 and 9.0g/day) for 12 weeks. The primary outcome was change in serum phosphate from baseline to end of treatment. Secondary outcomes included the changes in corrected serum calcium and intact parathyroid hormone (PTH). The changes in ferritin, transferrin saturation and erythropoiesis-stimulating agent dose were additional outcomes. Efficacy and safety of JTT-751 was comparable to sevelamer in patients on hemodialysis with hyperphosphatemia. Differential adverse effects were observed; biochemical markers of iron status increased in patients treated with JTT-751.

Nan Chen et al., (2013); Hyperphosphatemia in patients with advanced chronic kidney disease (CKD) is associated with adverse

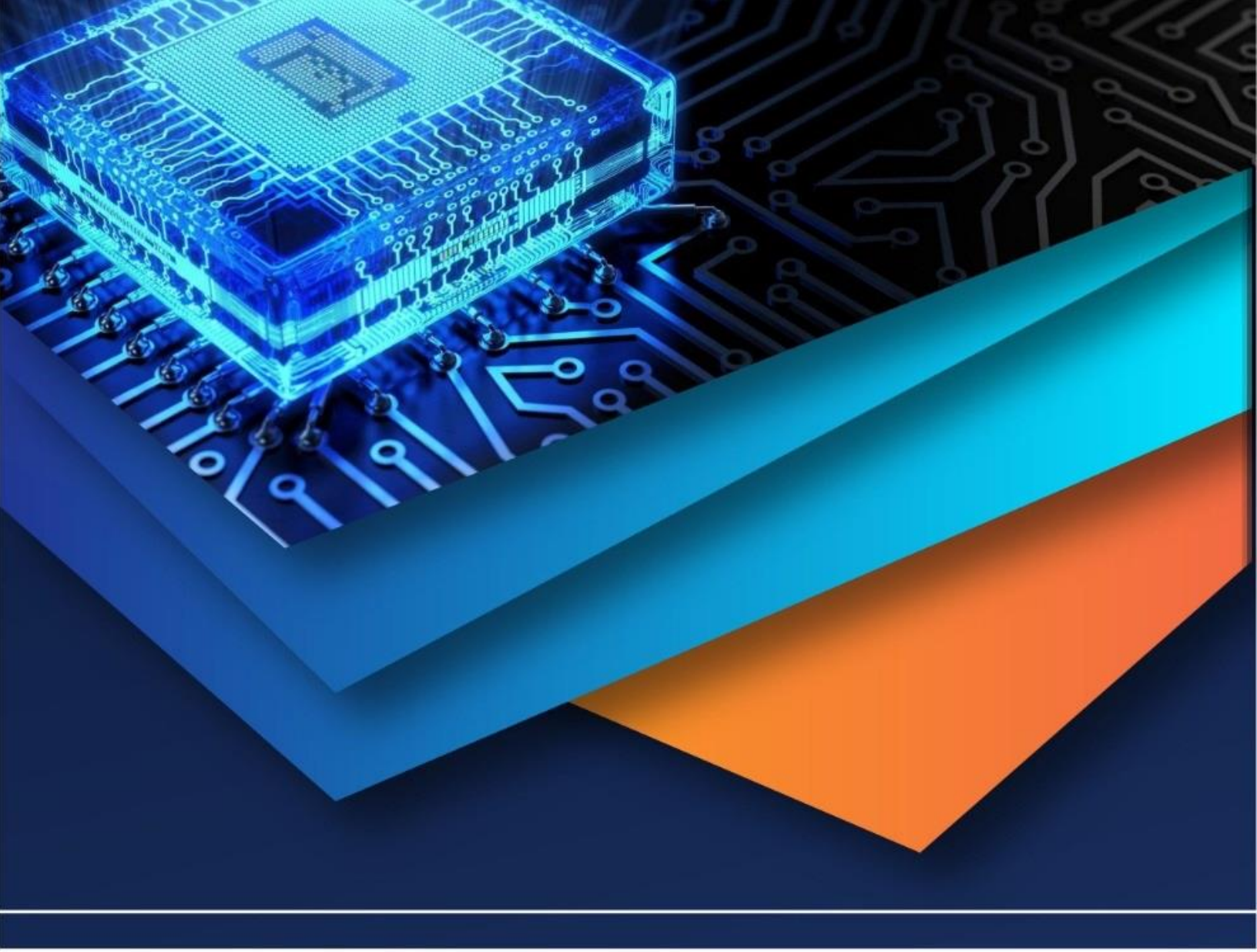
outcomes, including vascular calcification and higher mortality rates. While phosphate lowering is an integral aspect of CKD management, the efficacy and safety of phosphate binders in a contemporary cohort of Chinese hemodialysis patients (who have different genetics and dietary patterns than other populations) has not been previously described. Moreover, sparse data are available on strategies for optimal dose titration when transitioning from a calcium-based to a polymer-based phosphate binder. This randomized, double-bind, dose-titration study compared sevelamer carbonate (starting dose 800mg three times daily) with placebo over 8 weeks duration in Chinese CKD patients on hemodialysis. Patients were required to be using calcium-based binders prior to study start. In all, 205 patients were randomized (sevelamer, n=70); mean age was 48.6 years, 61% were male and the mean time on dialysis was 4.4 years. The mean serum phosphorus decreased significantly in patients treated with sevelamer carbonate [change -0.69±0.64 mmol/L] (-2.14±1.98 mg/dL)] but remained persistently elevated with placebo [change -0.06±0.57 mmol/L (-0.91±1.76mg/dL)] (P <0.0001). When compared with placebo, sevelamer carbonate treatment resulted in statistically significant greater mean reductions from baseline in serum total (-17.1 versus -3.3%) and low-density lipoprotein cholesterol (-33.5 versus -7.6%) (P<0.0001 for both). Sevelamer carbonate was well tolerated with 96% adherence compared with 97% adherence in the placebo arm. Overall, adverse events experienced by patients in the sevelamer carbonate and placebo treatment groups were similar and consistent with their underlying renal disease. This study demonstrated that hyperphosphatemia developed quickly following the cessation of phosphate binders and remained persistently elevated in end-stage CKD in the placebo-treated group. Gradually titrating up sevelamer carbonate from an initial dose of 2.4g/day to an average daily dose of 7.1±2.5g/day was well tolerated, safe and efficacious in contemporary Chinese hemodialysis patients.

III. CONCLUSION

Ferric citrate an iron containing phosphate binder, helpful in controlling hyperphosphatemia and iron deficiency anemia. In case of sevelamer, as a phosphate binder an additional iron supplement is required. We are estimating the blood samples and analyze which drug is more efficacious.

REFERENCE

[1] Brugnara C, Eckardt KU. Hematologic aspects of kidney disease .In : Taal MW, Brenner and Rectors's the Kidney". 9th ed. Philadephia: Saunders; 2081-2120: 201
[2] Hippokratia K 7 , Phosphorus metabolism in chronic kidney disease, 50-52, 2011, 15 (suppl).
[3] Yokoyama k, Akiba T, Fukagawa M , Nakayama M , sawada K, Kumagi Y , chertow GM, Hirakata H. A randomized trial of JTT-751 versus sevelamer hydrochlor ide in patients on hemodialysis". 2014 May; 29(5):1053-60.doi: 1093/ndt/gft483 .Epub 2013 Dec 2
[4] Yoram Yagil Stephen Z. Fadem, kotagel S. Kant, udayan bhatt, Mohammed Sika, Julia B. Lewis, Dana negoi, and for the Collaborative Study Group. Managing hyperphosphatemia in patients with chronic kidney disease on dialysis with ferric citrate: latest evidence and clinical usefulness, Theradv Chronic Dis. 2015 Sep; 6(5): 252-26
[5] Perry CM, Plosker G. sevelamer carbonate: A review in hyperphosphatemia in adults with chronic kidney disease, 771-792 May 2014; 74(7
[6] Julia B Lewis, Mohammed Sika , Mark J. Koury , Peale Chunng , Gerald Schulman, Mark T. smith, Frederick c. Whittier, Douglas R. Linnfert, claude M. Galphin, Balaji P. Athreya, A. Kaldunkaldun Nossuli, Ingrid J. Chang, Samuel S. Blumenthal, john Manley, Steven Zeig, Kotagal S. Kant, Jose Olivero, Tom Greene, and Jamie P. Dwyer, for The collaborative study Group. Ferric citrate Controls Phosphorus and Delivers Iron in Patients on Dialysis , 493-503. 2015 Feb;26(2)
[7] Shahrzad Ossreh Clinical and Economic aspects of sevelamer therapy in end –stage renal disease patients. Int J Nephrol Renovasc Dis. 2014; 7: 161-168. 2014; 7
[8] Adam Pennoyer, Pharm D and Mary Barna Bridgeman, Pharm D,BCPS, CGP. Ferric citrate (Ayurixa) for the Treatment of Hyperphosphatemia. P T. 329-330, 334-339, 2015 May;40(5)
[9] Nan Chen, Xiongfei wu, Xiaoqiag Ding: " sevelamer carbonate lowers serum Phosphorus effectively in haemodialysis patients: A randomized, double-blinded, placebo-controlled, dose-titration study". Nephrol Dial Transplant (152-160) doi:10.1093/ndt/gft23(2014).



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