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Original Article

Paricalcitol Versus Calcitrol in the Treatment of Secondary Hyperparathyroidism in Hemodialysis Dependent Patients

Bilal Javaid,[1] Muhammad Irfan,[1] Irfan Elahi,[2] Sara Akrum,[1] Sumaira Hassan,[1] Ijaz Nabi[1]

[1]Faisal Abad Medical University, Faisal Abad, [2]King Edward Medical University, Lahore

Abstract

Objective: To compare the efficacy of paricalcitol with calcitriol for treatment of secondary hyperparathyroidism in dialysis patients.

Methods: This Randomized Controlled Trial (RCT) was carried out in Department of Nephrology, FMU & Allied Hospital, Faisalabad in six months period from 13th November 2023 to 12th May 2024. A total of 100 dialysis dependent patients having secondary hyperparathyroidism were included and divided into two groups. Patients in Group A received paricalcitol at a dose of 1µg/day for a period of 12 weeks. Patients in Group B took calcitriol at a dosage of 0.5 micrograms per day for a period of 12 weeks. The effectiveness was evaluated after a treatment period of twelve weeks.

Results: The mean age of patients in group A was 48.48 ± 6.57 years and in group B was 48.0 ± 8.01 years. Out of these 100 patients, 52 (52.0%) were males and 48 (48.0%) were females. Efficacy in Paricalcitol was seen in 41 (82.0%) patients and in Calcitriol was seen in 29 (58.0%) patients with p-value of 0088 which is statistically significant.

Conclusion: This study concluded that paricalcitol is better than calcitriol for treatment of secondary hyperparathyroidism in dialysis patients.

Keywords: Dialysis, Secondary Hyperparathyroidism, Paricalcitol.

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Corresponding Author: Dr. Bilal Javaid **Email:** dr.bilaljavaid160@gmail.com

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Introduction

Chronic kidney disease (CKD) is defined as a continuous decrease in the number of functioning nephrons. The steady decline in renal function is the main sign of CKD. CKD is a common condition that affects people all around the globe.[1] By 2040, it is anticipated that CKD will move up to the fifth spot on the worldwide list of the principal source of death. There is a possibility that it may surpass other causes of mortality. It will be leading cause of death worldwide by the end of this century.[2] The decrease in glomerular filtration rate (GFR) is linked to the development of serious consequences such as high BP, low red blood cell count, high potassium levels, metabolic acidosis, and abnormalities of the mineralized bone.[2]

Secondary hyperparathyroidism (SHPT) is seen in about 70% of individuals with late stages of chronic renal disease.[3] The patient exhibits a medical disorder called SHPT, characterized by increased levels of parathyroid hormone (PTH) in the blood and hypertrophy of the parathyroid glands. There is a higher likelihood of developing cardiovascular disease and fractures, which eventually results in worst quality of life and increase death rate.[4]

Research findings indicate that 12.5% of the population in Pakistan is afflicted with Chronic Kidney Disease CKD.[5] Patients with chronic renal illness may exhibit complications such as SHPT, bone abnormalities, and cardiovascular disease. Despite notable progress in therapy, it is crucial to acknowledge that patients with stage 5 CKD undergoing hemodialysis treatment still have a higher mortality risk. Despite significant treatment improvements in recent years, it is crucial to accept this truth. ESRD patients often require hemodialysis.[6]

Calcitriol, the biologically active version of Vitamin D, is administered to dialysis patients.[7] There is no text provided. It stimulates the reabsorption of phosphate and calcium in the gastrointestinal system and enhances bone resorption and remodeling. The process of resorption and bone remodeling might result in the occurrence of hypercalcemia and hyperphosphatemia.[8] Paricalcitol, a synthetic analog of Vitamin D, may enhance the survival rate of patients with CKD on hemodialysis. Additionally, it helps to regulate levels of iPTH and PO49. Efficacy of paricalcitol and calcitriol was noted in 78.6% and 55.2% patients respectively.[7]

The reason for doing this research was the scarcity of local data on this topic and the frequent occurrence of secondary hyperparathyroidism in hemodialysis patients. Typically, these individuals are administered calcitriol. However, despite this, hypercalcemia and hyperphosphatemia still exist. Therefore, a vitamin D derivative that may effectively treat secondary hyperparathyroidism while without impacting calcium and phosphorus levels may be of considerable interest. We formulated a research to conduct a comparative analysis of paricalcitol and calcitriol inside the specific demographic of our local people in Pakistan. Improved medical care may lead to a substantial decrease in both illness rates and death rates.

Methods

This RCT was carried out in department of Nephrology, FMU & Allied Hospital, Faisalabad from 3th November 2023 to 12th May 2024. Patients aged between 18-70 years of both genders having secondary hyperparathyroidism from > 6 months were selected. By using WHO calculator at 5% level of significance, 80% power of study, anticipated efficacy in paricalcitol as 78.6% 7 and anticipated efficacy of calcitriol as 55.2%7 a sample size of 100 (50 in each group) was calculated. Patients with corrected Serum Calcium >10 mg/dl, Phosphorus >5.8 mg/dl, Severe hyperparathyroidism SPTH >800 pg/ml, Calciphylaxis, liver Disease, sarcoidosis and allergy to study drugs were excluded. Pregnancy or lactation, events of peritonitis and previous parathyroid surgery were also excluded. The patients were all split up into two groups in a random fashion. Patients in Group A received paricalcitol at a dose of 1 microgram per day for a period of 12 weeks. Patients in Group B took calcitriol at a dosage of 0.5 micrograms per day for a period of 12 weeks. The baseline level of parathyroid hormone, as well as the level, 12 weeks following treatment, was evaluated. The effectiveness was evaluated after a treatment period of twelve weeks. The patient's phone numbers were noted in order to conduct the follow-up. SPSS V-25 was used to examine all of the data. The effectiveness of the two groups was compared using the Chi square test, with a p-value of < 0.05 being deemed significant.

Results

Mean age in group A was 48.48 ± 6.57 years and in group B was 48.0 ± 8.01 years. With a male to female ratio of 1.1:1, there were 52 (52.0%) male patients and 48 (48.0%) female patients out of 100 total. Mean duration of dialysis was 10.11 ± 2.30 months. Mean BMI was 25.07 ± 2.95 kg/m^2.

Table 1: *Demographic Features of Patients*

	Group A		Group B		P
	N	%	N	%	Value
Male	27	54	25	50	
Female	23	46	25	50	0.421
Age					
18-45	22	44	24	48	
46-70	28	56	26	52	0.421
Duration of dialysis					
≤12	41	82	42	84	
>12	9	18	8	16	0.5

Pre- treatment and post treatment iPTH levels were 625.29 ± 8.33 and 449.18 ± 22.16 respectively. Efficacy in group A (paricalcitol) was seen in 41 (82.0%) patients and in group B (calcitriol) was seen in 29 (58.0%) patients with p-value of 0.044 which is statistically significant.

Table 2: *Comparison of efficacy between both Groups (n=100).*

		Group A (n=50)		Group B (n=50)		P
		N	%	N	%	Value
Efficacy	**Yes**	41	82	29	58	0.044
	No	9	18	21	42	

Discussion

Dialysis patients often have SPTH, which may result in renal osteodystrophy, increased risk of bone fractures, and higher rates of CVDs and total patient death.[10,11] The onset of SPTH often includes hypocalcemia and hyperphosphatemia in addition to a reduction in the kidneys' calcitriol production.[12,13] Vitamin D analogues are used to treat SPTH in patients.[14]

Synthetic derivatives of calcitriol and alphacalcidol may produce their therapeutic impact in a way comparable to that of natural forms of calcitriol. The types of vitamin D referred to be "nonselective" have the same level of attraction to vitamin D receptors in the intestinal mucosa, bone, and parathyroid glands. There is a significant likelihood of developing hypercalcemia and hyperphosphatemia.[15] Paricalcitol has a similar effect on PTH but a much lower effect on the intestinal mucosa and bones' vitamin D receptors. Following paricalcitol administration, there is a decrease in hyperphosphatemia and hypercalcemia. There have been contradictory findings from various research on the subject that have recently been published.[16]

Mean in group A was 48.48 ± 6.57 years and in group B was 48± 8.01 years. Out of these 100 patients, 52 (52.0%) were males and 48 (48.0%) were females. In our study efficacy in Paricalcitol was seen in 41 (82.0%) patients and in Calcitriol was seen in 29 (58.0%) patients with p-value of 0088 which is statistically significant. Efficacy of paricalcitol and calcitriol was noted in 78.6% and 55.2% patients respectively.[7]

Numerous studies have shown that paricalcitol is a reliable and secure medication for efficiently and swiftly reducing the concentration of intact PTH to desired values in cases of secondary hyperparathyroidism'.[17] The analog conversion between dosages of paricalcitol and calcitriol shows a similar degree of PTH decrease, with a ratio of roughly 4:1, as reported in many investigations.[18]

Xie (2017) assessed the safety and efficacy of paricalcitol in combination with other VDRAs for the treatment of SHPT in dialysis patients. The research came to the conclusion that there was insufficient data to justify paricalcitol's usage in the treatment of SHPT. In order to examine the survival rates of two groups, one getting paricalcitol and the other receiving calcitriol. In a study by teng et al,[19] at the 36-month follow-up, there was a significant difference in the death rates between the two groups. Furthermore, patients who transitioned from using calcitriol to paricalcitol saw a greater improvement in survival compared to those who transitioned from paricalcitol to calcitriol.[9] Patients who received paricalcitol died at a rate that was similar to that of those who received doxercalciferol, but far less often than those who received calcitriol. Following a 37-week period of observation, the mortality rate for the groups receiving paricalcitol, doxercalciferol, and calcitriol was 15.3, 15.4, and 19.6, respectively.[20]

Conclusion

This study concluded that paricalcitol is better than calcitriol for treatment of secondary hyperparathyroidism in dialysis patients. So, we recommend that paricalcitol should be used routinely in dialysis patients with SPTH for reducing the morbidity and mortality of these particular patients.

Ethical Approval: The IRB/EC approved this study via letter no.48/REC/FMU/2023-24/309 dated September 5, 2023.

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Authors' Contribution

BJ,IN: Conception

MI,SH: Design of the work

IE,SA: Data acquisition, analysis, or interpretation

MI,IE,SA,IN: Draft the work

BJ,SH: Review critically for important intellectual content

All authors approve the version to be published

All authors agree to be accountable for all aspects of the work

References

1. Yang C-W, Harris DC, Luyckx VA, Nangaku M, Hou FF, Garcia GG, et al. Global case studies for chronic kidney disease/end-stage kidney disease care. Kidney Int Suppl. 2020;10(1):e24-e48.
2. Fernandez-Fernandez B, Sarafidis P, Kanbay M, Navarro-González JF, Soler MJ, Górriz JL, et al. SGLT2 inhibitors for non-diabetic kidney disease: drugs to treat CKD that also improve glycaemia. Oxford University Press; 2020. p. 728-33.
3. Bozic M, Diaz-Tocados JM, Bermudez-Lopez M, Forné C, Martinez C, Fernandez E, et al. Independent effects of secondary hyperparathyroidism and hyperphosphataemia on chronic kidney disease progression and cardiovascular events: an analysis from the NEFRONA cohort. Nephrol Dialy Transplant. 2022;37(4):663-72.

4. Zhang Z, Cai L, Wu H, Xu X, Fang W, He X, et al. Paricalcitol versus calcitriol+ cinacalcet for the treatment of secondary hyperparathyroidism in chronic kidney disease in China: a cost-effectiveness analysis. Front Public Health. 2021;9:712027.
5. Kashif MA. To compare anti-albumin urea effects of valsartan alone with combination of valsartan and amlodipine in patients of chronic kidney disease. Pak J Med Sci. 2016;32(3):613.
6. Imtiaz S, Alam A. Epidemiology and demography of Chronic Kidney Disease in Pakistan-A review of Pakistani literature. Pak J Kidney Dis. 2023;7(1):2-7.
7. Zhang T, Ju H, Chen H, Wen W. Comparison of paricalcitol and calcitriol in dialysis patients with secondary hyperparathyroidism: a meta-analysis of randomized controlled studies. Therap Apher Dialy. 2019;23(1):73-9.
8. Qaisar MA, ul Abideen Z, Chattah FS, Nadeem M, Qaisar ZHMA, ul Abideen Z, et al. Comparison of Paricalcitol (IV) and Alfacalcidol (IV) in Treatment of Secondary Hyperparathyroidism (SHPT) in Hemodialysis Patients. J Rawalpindi Med Coll. 2020;24(4):378-83.
9. Liu Y, Liu L-Y, Jia Y, Wu M-Y, Sun Y-Y, Ma F-Z. Efficacy and safety of paricalcitol in patients undergoing hemodialysis: a meta-analysis. Drug Desi Develop Ther. 2019;13:999-1009.
10. Martín-Carro B, Navarro-González JF, Ortiz A, Zoccali C, Floege J, Ferreira MA, et al. Mineral and bone metabolism markers and mortality in diabetic patients on haemodialysis. Nephrol Dialy Transplant. 2023;38(11):2589-97.
11. Vazquez MA, Oliver G, Amarasingham R, Sundaram V, Chan K, Ahn C, et al. Pragmatic Trial of Hospitalization Rate in Chronic Kidney Disease. N Engl J Med. 2024;390(13):1196-206.
12. Eidman KE, Wetmore JB. Managing hyperparathyroidism in hemodialysis: role of etelcalcetide. Int J Nephrol Renovasc Dis. 2018:69-80.
13. Pérez-Ricart A, Galicia-Basart M, Alcalde-Rodrigo M, Segarra-Medrano A, Sune-Negre J-M, Montoro-Ronsano J-B. Effectiveness of cinacalcet in patients with chronic kidney disease and secondary hyperparathyroidism not receiving dialysis. PLoS One. 2016;11(9):e0161527.
14. Kubodera N. A new look at the most successful prodrugs for active vitamin D (D hormone): alfacalcidol and doxercalciferol. Molecules. 2009;14(10):3869-80.
15. Dusilová-Sulková S. Vitamin D metabolism and vitamin D traditional and nontraditional, target organs: implications for kidney patients. J Renal Care. 2009;35:39-44.
16. Cardoso MMdA, Machado-Rugolo J, Lima SAM, Andrade LGMd, Curado DdSP, Ponce D. Cost-effectiveness analysis of intravenous paricalcitol vs. oral calcitriol in the treatment of hyperparathyroidism secondary to chronic kidney disease. Braz J Nephrol. 2022;45:95-101.
17. Hassan AB, Ghalib KW, Jahrami HA, El-Agroudy AE. Prevalence of Musculoskeletal Manifestations in adult kidney transplant's recipients: a systematic review. Medicina. 2021;57(6):525.
18. Franchi M, Gunnarsson J, Gonzales-Parra E, Ferreira A, Ström O, Corrao G. Paricalcitol and Extended-Release Calcifediol for Treatment of Secondary Hyperparathyroidism in Non-Dialysis Chronic Kidney Disease: Results From a Network Meta-Analysis. J Clin Endocrinol Metabol. 2023;108(11):e1424-e32.
19. Teng M, Wolf M, Lowrie E, Ofsthun N, Lazarus JM, Thadhani R. Survival of patients undergoing hemodialysis with paricalcitol or calcitriol therapy. N Engl J Med. 2003;349(5):446-56.
20. Tentori F, Hunt W, Stidley C, Rohrscheib M, Bedrick E, Meyer K, et al. Mortality risk among hemodialysis patients receiving different vitamin D analogs. Kidney Int. 2006;70(10):1858-65.