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Original Article ENDOCRINOLOGY & METABOLISM

Biochemical and clinical outcomes of once-daily teriparatide in refractory chronic hypoparathyroidism: A single-center experience

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ABSTRACT

OBJECTIVE: Chronic hypoparathyroidism causes disrupted calcium-phosphate balance due to parathyroid hormone (PTH) deficiency. In refractory disease, recombinant PTH (1–34) (teriparatide) can support conventional therapy. This study assessed short-term biochemical and clinical outcomes under real-word of once-daily teriparatide in refractory hypoparathyroidism.

METHODS: Ten patients with chronic hypoparathyroidism who received subcutaneous teriparatide (20 μg/day) between January 2021 and September 2025 were retrospectively analyzed. The median duration of teriparatide therapy was 9 months (interquartile range: 4–22), with a maximum of 27 months. Clinical records, biochemical parameters, and calcium/vitamin D supplementation requirements were systematically reviewed.

RESULTS: Albumin-corrected calcium increased significantly at 3 months (median 7.79 vs. 6.5 mg/dL, p=0.038) but not at 6 months (p>0.05). Phosphorus decreased at 3 months (p=0.012) with a non-significant trend thereafter (p=0.06). No correlation was observed between calcium change and treatment duration (ρ=-0.8, p=0.2). All patients reported symptomatic relief and reduced intravenous calcium requirements, though complete independence was not achieved.

CONCLUSION: Once-daily teriparatide provided transient biochemical improvement and clinical relief in refractory hypoparathyroidism but was insufficient to maintain sustained normocalcemia, suggesting possible pharmacological limitations of once-daily intermittent PTH replacement that warrant further investigation in larger prospective studies. Individualized treatment duration, alternative dosing regimens, and longer-term controlled studies are warranted to optimize therapeutic outcomes.

Keywords: Hypocalcemia; hypoparathyroidism; parathyroid hormone; teriparatide.

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Chronic hypoparathyroidism is a rare but challenging endocrine disorder caused by insufficient or absent secretion of parathyroid hormone (PTH), resulting in disrupted calcium–phosphate homeostasis, chronic hypocalcemia, and hyperphosphatemia [1]. In adults, the most common acquired etiology is post-surgical hypoparathyroidism, which typically occurs as an iatrogenic complication following anterior neck surgery involving the thyroid or parathyroid glands [2]. Other causes include autoimmune destruction, genetic defects in parathyroid development or calcium-sensing receptor signaling, and previous neck irradiation [1, 2].

Although the condition is uncommon, its chronicity often imposes a substantial treatment burden, frequent hospitalizations, and impaired quality of life [3, 4]. Current standard therapy relies on oral calcium supplements and active Vitamin D analogs, aiming to maintain serum calcium within the low-normal range [5]. However, this

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approach does not replace the deficient hormone itself and fails to restore physiological calcium–phosphate regulation [1, 6]. Long-term conventional treatment may lead to hypercalciuria, nephrocalcinosis, renal impairment, and fluctuating serum calcium levels, while some patients continue to experience symptomatic hypocalcemia despite optimized medical therapy [1, 5]. These cases are considered refractory hypoparathyroidism, representing an important therapeutic challenge [7, 8].

In recent years, recombinant human PTH (rhPTH) analogs have emerged as potential replacement therapies for such patients [6]. Among them, rhPTH (1–34), or teriparatide, represents the biologically active N-terminal fragment of the native hormone [9]. Initially approved for osteoporosis, teriparatide has demonstrated efficacy in improving calcium control, reducing the need for calcium and calcitriol supplementation, and alleviating hypocalcemic symptoms in patients with chronic hypoparathyroidism refractory to conventional therapy [9, 10]. Beyond its calciotropic effects, intermittent PTH (1–34) administration preferentially stimulates bone formation, whereas continuous exposure has broader renal and phosphaturic actions, potentially influencing calcium–phosphate balance [11]. Subcutaneous administration once or twice daily has been the most widely used regimen, whereas continuous infusion through insulin pump systems has also been investigated to achieve smoother biochemical stability in selected patients [12].

While rhPTH (1–84) represents the first and currently the only approved hormone replacement therapy for chronic hypoparathyroidism, its limited availability in many countries, including our region, has led clinicians to rely on off-label teriparatide (PTH 1–34) use [13–15]. Nevertheless, real-world evidence regarding its efficacy, optimal dosing frequency, and safety profile remains scarce, particularly in non-trial settings [15].

Herein, we present our institutional experience with subcutaneous teriparatide administered at a fixed dose of 20 μg once daily in ten patients with refractory chronic hypoparathyroidism, evaluating short-term biochemical and clinical outcomes under real-world clinical settings.

Highlight key points

- Once-daily teriparatide therapy resulted in an early improvement in calcium–phosphate balance in patients with refractory chronic hypoparathyroidism in real-world clinical practice.
- The biochemical improvement observed at the 3rd month was not sustained at later follow-up, suggesting limited long-term efficacy of intermittent once-daily PTH replacement.
- Although sustained normocalcemia was not achieved, patients consistently experienced symptomatic improvement and a reduced need for intravenous calcium supplementation.
- No significant association was found between treatment duration and calcium response, indicating that therapeutic efficacy may be influenced by factors other than exposure time alone.
- These findings support the need for individualized treatment strategies and alternative dosing regimens to improve long-term metabolic control in refractory hypoparathyroidism.

MATERIALS AND METHODS

Study Design and Population

This retrospective case series was conducted at the Department of Endocrinology and Metabolism, Basaksehir Cam and Sakura City Hospital, a tertiary referral center. Ten patients diagnosed with chronic hypoparathyroidism and treated with teriparatide between January 2021 and September 2025 were included in the analysis. All patients had persistent hypocalcemia despite optimized conventional therapy with oral calcium and active Vitamin D analogs. Refractory hypoparathyroidism was defined as persistent symptomatic hypocalcemia requiring recurrent intravenous calcium supplementation despite maximally tolerated doses of oral calcium and active Vitamin D. Written informed consent was obtained from all participants before inclusion.

Treatment Protocol

All patients received subcutaneous teriparatide administered at a fixed dose of 20 μg once daily. The treatment was initiated after inadequate biochemical and symptomatic control under standard therapy. Once-daily dosing was preferred due to local clinical practice patterns and reimbursement constraints. As teriparatide is reimbursed exclusively for osteoporosis in our region, its use in hypoparathyroidism requires a formal off-label application; accordingly, dose escalation was not pursued during the study period in patients who demonstrated partial clinical and biochemical benefit, though it remains a viable option through renewed regulatory application in cases of insufficient long-term response. Oral calcium and calcitriol doses were titrated as clinically indicated to maintain serum calcium within the target range. Patients were followed up at baseline, 3 months, and 6 months after teriparatide initiation.

Data Collection and Variables

Clinical and biochemical data were retrieved from electronic medical records, including demographic characteristics, disease etiology, duration of hypoparathyroidism, and treatment history. Laboratory variables included serum albumin-corrected calcium, phosphorus, magnesium, creatinine, PTH, alkaline phosphatase (ALP), and 25-hydroxyvitamin D concentrations, along with 24-h urinary calcium excretion. The primary outcome was the change in serum calcium concentration from baseline to 3 and 6 months, while secondary outcomes included changes in serum phosphorus, urinary calcium excretion, and the requirement for intravenous calcium supplementation. Adverse events, particularly symptoms of hypo- or hypercalcemia, were recorded at each visit to assess treatment efficacy and tolerability.

Statistical Analysis

All statistical analyses were performed using the IBM Statistical Package for the Social Sciences Statistics for Windows, Version 29.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as median values with interquartile ranges (IQR; between the 25th [Q1] and 75th [Q3] percentiles), given the small sample size and non-normal data distribution. Accordingly, non-parametric statistical tests were applied. Paired comparisons of biochemical parameters between baseline, 3-month, and 6-month time points were conducted using the Wilcoxon signed-rank test. The relationship between changes in serum calcium levels (ΔCa) and the total duration of teriparatide therapy was assessed using Spearman's rank correlation coefficient (ρ). Due to the exploratory nature of the study, no adjustment for multiple comparisons was applied. All statistical tests were two-tailed, and a $p<0.05$ was considered statistically significant.

Ethical Approval

The study protocol was approved by the Institutional Ethics Committee of Basaksehir Cam and Sakura City Hospital and conducted in accordance with the principles of the Declaration of Helsinki. The ethics committee approval number was E96317027-514.10-277446986, dated May 30, 2025.

RESULTS

Patient Characteristics

A total of ten patients with chronic hypoparathyroidism were included, eight of whom were female and two male. The median age was 39.5 years (IQR: 35–41.5). Eight patients had post-surgical hypoparathyroidism, and two had the idiopathic form. Among the post-surgical group, three had previously received radioactive iodine ablation. The median duration from the initial surgery to teriparatide initiation was 43.5 months (IQR: 18.75–172).

All patients had previously received conventional therapy consisting of oral elemental calcium titrated up to 5 g/day and calcitriol up to 4 μg/day, in addition to 800 IU/day cholecalciferol and 720 mg/day oral magnesium salt. The median daily doses before teriparatide initiation were 5000 mg (IQR: 4800–5200) for oral calcium and 4 μg (IQR: 3.5–4.5) for calcitriol. Despite gradual optimization of these doses, all patients remained symptomatic and required regular intravenous calcium gluconate infusions to maintain biochemical or clinical stability. Quantitative data on intravenous calcium replacement were inconsistently available and thus excluded from analysis.

Evaluation for malabsorption syndromes was performed in nine patients; all had negative celiac serology. Upper gastrointestinal endoscopy was performed in four patients, and duodenal biopsies revealed gluten-sensitive enteropathy in one case.

Treatment Course and Biochemical Response

All patients received subcutaneous teriparatide at a fixed dose of 20 μg once daily. The median duration of therapy was 9 months (IQR: 4–22), with the longest follow-up period of 27 months in one patient. The reduced number of patients available for 6-month analysis (n=4) reflects the fact that four patients had not yet reached this timepoint at the time of data collection, rather than dropout or loss to follow-up; all ten patients remained on treatment throughout the observation period. The baseline, 3rd-, and 6th-month biochemical parameters – including serum albumin-corrected calcium, phosphorus, magnesium, ALP, 25-hydroxyvitamin D, and 24-h urinary calcium – are summarized in Table 1.

At baseline, the median albumin-corrected calcium was 6.5 mg/dL (IQR: 6.12–6.67). Median calcium increased to 7.79 mg/dL (IQR: 6.74–8.25) at month 3, showing a statistically significant increase compared with baseline ($Z=-2.07$, $p=0.038$). At month 6, the value was 6.96 mg/dL (IQR: 6.24–7.14), and the difference was not statistically significant compared with either baseline ($Z=-0.73$, $p=0.465$) or month 3 ($Z=-1.07$, $p=0.285$) (Fig. 1A). The association between the change in serum calcium concentrations (ΔCa; defined as the difference

TABLE 1. Biochemical parameters at baseline and during teriparatide therapy

Parameter	Baseline	3rd month	6th month
Albumin-corrected calcium (mg/dL)	6.5 (6.12–6.67)	7.79 (6.74–8.25) (n=9)	6.96 (6.24–7.14) (n=4)
Phosphorus (mg/dL)	5.5 (4.97–5.84)	4.95 (3.89–5.25) (n=9)	4.41 (4.3–5.08) (n=4)
Magnesium (mg/dL)	1.82 (1.6–1.91)	1.78 (1.62–1.93) (n=8)	1.59 (1.58–1.67) (n=4)
ALP (U/L)	72 (66.75–78.75)	87.5 (61.5–105.5) (n=8)	103 (80–151) (n=4)
25-hydroxyvitamin D (ng/mL)	21 (17.75–25.5)	16 (14.5–25.2) (n=6)	21 (20–31) (n=3)
24-h urinary calcium (mg/day)	55 (7–322) (n=5)	78, 75 (n=2)*	342, 34 (n=2)*

Data are presented as median (interquartile range) unless otherwise specified. For parameters available in fewer than four patients, median (range) is shown. *For parameters with data available in only two patients, individual values are presented instead of summary statistics. ALP: Alkaline phosphatase.

between 6th-month and baseline albumin-corrected calcium) and the total duration of teriparatide therapy was assessed. No statistically significant correlation was observed between ΔCa and the duration of treatment (ρ=-0.8, p=0.2), based on four paired observations, indicating that calcium response was not dependent on treatment duration within the observed follow-up period.

Median serum phosphorus levels decreased from 5.5 mg/dL (IQR: 4.97–5.84) at baseline to 4.95. mg/dL (IQR: 3.89–5.25) at month 3, demonstrating a statistically significant reduction (Z=-2.52, p=0.012). At month 6, the median phosphorus was 4.41 mg/dL (IQR: 4.3–5.08), showing a non-significant trend toward reduction compared with baseline (Z=-1.83, p=0.068), and no significant difference between months 3 and 6 (Z=-1.07, p=0.285) (Fig. 1B).

Other biochemical parameters are summarized in Table 1. Baseline median magnesium was 1.82 mg/dL (IQR: 1.6–1.91), 25-hydroxyvitamin D was 21 ng/mL (IQR: 17.75–25.5), PTH was 4.09 pg/mL (IQR: 3.1–10.2), and ALP was 72 U/L (IQR: 66.7–78.7). At month 3, median ALP was 87.5 U/L (IQR: 61.5–105.5). Baseline 24-h urinary calcium data were available in five patients, with a median of 55 mg/day (IQR: 7–322). Corresponding values at month 3 were 75 mg/day and 78 mg/day (two patients), and at month 6 were 342 mg/day and 34 mg/day (two patients). Urinary calcium data were insufficient for robust statistical analysis and were therefore interpreted descriptively.

Clinically, all patients reported a reduction in muscle cramps, paresthesias, or other hypocalcemic symptoms by the 3rd month of therapy. Due to the retrospective design, symptom improvement was based on patient reports rather than standardized clinical scales. At this point,

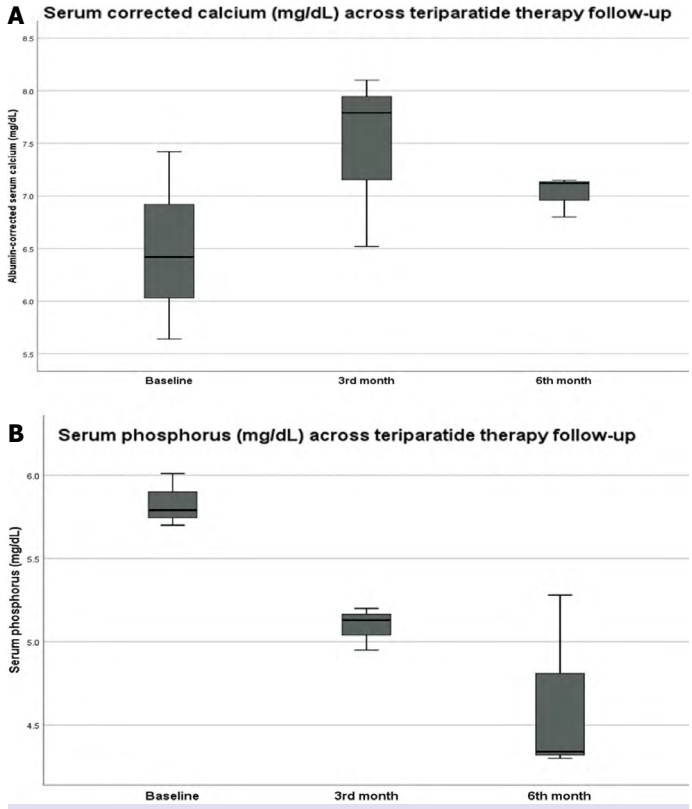


FIGURE 1. Changes in serum albumin-corrected calcium **(A)** and phosphorus **(A)** concentrations during teriparatide therapy in patients with refractory chronic hypoparathyroidism. **(A)** Serum albumin-corrected calcium concentrations (mg/dL) at baseline, 3rd, and 6th months of teriparatide therapy. **(B)** Serum phosphorus concentrations (mg/dL) at baseline, 3rd, and 6th months of teriparatide therapy. Boxplots represent median values (horizontal line), interquartile ranges (boxes), and ranges (whiskers).

requirements decreased in all cases, with median daily doses of 2000 mg (IQR: 1750–2250) for calcium and

1.5 µg (IQR: 1.25–1.75) for calcitriol. At the 6-month follow-up, mild recurrence of hypocalcemic symptoms was observed in all patients, accompanied by an increase in oral calcium and calcitriol doses compared to month 3, though still lower than pre-teriparatide levels. Median daily doses were 3500 mg (IQR: 3250–3750) for calcium and 2.5 µg (IQR: 2.25–2.75) for calcitriol.

Four patients no longer required intravenous calcium supplementation. Among the six patients who continued to require intravenous calcium, a marked reduction in infusion frequency was documented in all cases: One patient reduced from weekly to monthly infusions; one patient required only a single infusion throughout the entire follow-up period, compared with infusions every 3 weeks before treatment; two patients reduced from monthly infusions to two infusions over 6 months; and two patients reduced from monthly infusions to a single infusion over the 6-month follow-up period. No teriparatide-related adverse events were observed during follow-up. Patients remain under ongoing clinical and biochemical monitoring for long-term outcomes.

DISCUSSION

In this real-world cohort of ten patients with refractory chronic hypoparathyroidism, once-daily teriparatide (PTH [1–34], 20 µg/day) achieved temporary biochemical stabilization and marked symptomatic relief but was insufficient to ensure sustained normocalcemia. These findings illustrate both the clinical value and the inherent pharmacological constraints of intermittent PTH replacement in restoring long-term calcium homeostasis.

rhPTH (1–84) was approved by the U.S. Food and Drug Administration in 2015 for the treatment of refractory hypoparathyroidism, following the pivotal Phase III, randomized, double-blind, placebo-controlled replace trial [13]. In that study, once-daily subcutaneous administration of 50–100 µg of rhPTH (1–84) enabled 53% of patients to reduce their calcium and Vitamin D requirements by more than 50%, while 43% achieved independence from active Vitamin D with less than and 500 mg of daily elemental calcium supplementation [13]. Moreover, treatment was associated with significant reductions in serum phosphorus and urinary calcium levels, as well as improvements in quality of life compared with conventional therapy [13, 16]. Despite the approval of rhPTH (1–84), its availability and accessibility remain limited worldwide, leading to continued off-label use of teriparatide (rhPTH [1–34]) as an alternative in clinical practice [17].

Several case reports and small series have evaluated the use of both rhPTH (1–34) and rhPTH (1–84) in managing refractory hypocalcemia, employing either intermittent subcutaneous injections or continuous subcutaneous infusion systems [5, 9, 18]. Andrysiak-Mamos et al. [18] reported that subcutaneous injections of rhPTH (1–34) resulted in rapid correction of hypocalcemia and resolution of symptoms within days to weeks in three patients with post-operative hypoparathyroidism unresponsive to conventional therapy. Similarly, Saraiva et al. [9] Described a patient with chronic post-operative hypoparathyroidism who achieved sustained normocalcemia without supplementation using continuous subcutaneous infusion of rhPTH (1–34) through an insulin pump. Supporting these findings, Fuss et al. [5] Demonstrated that while twice-daily injections of rhPTH (1–34) or rhPTH (1–84) provided transient biochemical improvement, only continuous subcutaneous infusion of rhPTH (1–34) ensured long-term stability. Collectively, these reports suggest that continuous delivery systems may achieve more stable PTH concentrations and improved calcium-phosphate balance compared with once-daily administration.

In our cohort, all patients received once-daily subcutaneous teriparatide at 20 µg/day. A statistically significant biochemical improvement was observed at 3 months, characterized by increased serum calcium and decreased phosphorus levels. This reduction in serum phosphorus, together with transient calcium stabilization, underscores the short-term clinical utility of teriparatide as an adjunctive therapy in refractory hypoparathyroidism. However, by month 6, the improvement in calcium concentrations was not sustained, and mild recurrence of hypocalcemic symptoms was observed in all patients, necessitating escalation of oral calcium and calcitriol supplementation. While intravenous calcium requirements decreased, complete independence was not achieved in most cases. No significant correlation was found between changes in serum calcium and the total duration of teriparatide therapy, indicating that the biochemical response was not dependent on treatment length within the observed follow-up period. It should be noted, however, that this correlation analysis was based on four paired observations, which limits the statistical power of the test and precludes definitive conclusions regarding the relationship between treatment duration and calcium response. These findings are consistent with earlier reports showing that intermittent teriparatide administration may offer transient biochemical stabilization, but not the

steady-state control observed with continuous infusion regimens [5, 9]. The observed pattern may be explained by teriparatide's short plasma half-life (approximately 1 h) and its rapid renal clearance, leading to fluctuations in serum calcium levels [19]. Beyond these pharmacokinetic considerations, additional mechanisms may have contributed to the attenuation of response at 6 months. Repetitive intermittent PTH receptor stimulation has been proposed to induce progressive receptor desensitization, potentially reducing calciotropic efficacy over time; however, this mechanism has not been formally demonstrated in the context of hypoparathyroidism treatment and remains speculative. Adaptive renal mechanisms, including compensatory changes in tubular calcium reabsorption with prolonged PTH exposure, may represent a further contributing factor. In addition, the escalation of oral calcium and calcitriol doses observed at 6 months in our cohort reflected a deliberate clinical decision in response to insufficient biochemical control, rather than patient non-compliance, underscoring the limitations of fixed-dose once-daily teriparatide as a standalone stabilizing agent in this population. Furthermore, intermittent PTH exposure predominantly stimulates osteoblastic bone formation, whereas continuous exposure also influences renal calcium reabsorption and phosphate excretion to a greater extent, potentially explaining the differential biochemical outcomes [20].

The reduction in serum phosphorus observed at 3 months aligns with the known phosphaturic action of PTH, mediated through downregulation of sodium-phosphate cotransporters in the renal proximal tubules [21]. However, the non-significant trend toward higher phosphorus levels at 6 months may reflect waning hormonal efficacy, suboptimal compliance, or adaptive renal mechanisms. Notably, serum ALP levels showed a modest rise, which may reflect increased bone turnover associated with PTH exposure. Similar increases in bone turnover markers have been documented in patients receiving both rhPTH (1–34) and rhPTH (1–84) [10, 22]. Because teriparatide dose escalation was not attempted in our cohort, it remains uncertain whether higher or more frequent dosing could have yielded more stable biochemical control.

No adverse events related to teriparatide were observed during follow-up. Concerns about a potential osteosarcoma risk with long-term PTH exposure stem from pre-clinical rat models, where prolonged high-dose administration induced osteosarcoma formation [23]. However, extensive post-marketing surveillance and longitudinal data from osteoporosis trials have not confirmed an increased osteosarcoma risk in humans [24]. Moreover, the long-term extension of rhPTH (1–84) therapy in hypoparathyroidism, reported by Mannstadt et al. [22], demonstrated sustained efficacy and biochemical stability over a 5-year period without skeletal safety concerns or osteosarcoma occurrence. In our cohort, the median duration of teriparatide treatment was 9 months, with one patient continuing therapy for 27 months, and no adverse skeletal or systemic effects were observed. Although these findings support the short- to mid-term safety of teriparatide in refractory hypoparathyroidism, longer observation is warranted to confirm its long-term tolerability and bone safety profile. Our findings reflect real-world clinical practice in a tertiary referral center and may therefore differ from tightly controlled clinical trial settings. An important area of uncertainty in our cohort concerns renal calcium handling. Conventional therapy for chronic hypoparathyroidism is associated with a well-established risk of hypercalciuria and nephrocalcinosis, which represents one of the principal long-term complications of this treatment approach [1, 8]. Although teriparatide has been suggested to exert a more favorable effect on urinary calcium excretion compared with standard therapy [10, 13], the limited and inconsistent availability of 24-h urinary calcium data in our cohort, present in only five patients at baseline and two at follow-up, precludes any meaningful assessment of nephrocalcinosis risk in this series. This gap should be explicitly acknowledged not merely as a methodological constraint but as a clinically relevant unresolved question. Prospective studies in this population must incorporate mandatory, protocol-driven urinary calcium monitoring to adequately characterize the renal safety profile of teriparatide in refractory hypoparathyroidism.

This study has several limitations. The retrospective design, small sample size, and variability in follow-up intervals may limit the generalizability and external validity of our findings. Notably, the limited number of patients with 6-month data (n=4) is attributable to variable treatment durations at the time of data collection rather than attrition, though this nonetheless restricts the interpretability of longer-term outcomes. Symptom improvement was based on patient self-reports rather than standardized clinical scales, which introduces potential subjectivity. Quantitative urinary calcium data were incomplete, precluding a comprehensive assessment of renal calcium handling and nephrocalcinosis risk. Although 24-h urinary calcium collection was re-

quested at each clinical visit, a substantial proportion of patients did not provide complete samples at follow-up timepoints, reflecting the challenges of timed urine collection in a chronically ill population managed in a real-world clinical setting rather than under a prospective protocol. Furthermore, bone turnover markers other than ALP and bone mineral density measurements were not systematically evaluated, limiting conclusions regarding skeletal effects. Real-world evidence on teriparatide use in refractory hypoparathyroidism remains scarce, particularly in regions where approved PTH replacement therapy is inaccessible; in this context, even small observational cohorts contribute meaningful clinical data to guide future prospective investigations. Despite these constraints, the present study contributes real-world data to the scarce literature on teriparatide use in refractory hypoparathyroidism, particularly within a Middle Eastern clinical context that remains underrepresented in existing studies. Prospective, multicenter trials with standardized biochemical, skeletal, and patient-reported outcome measures, including mandatory 24-h urinary calcium monitoring to adequately characterize renal calcium handling and nephrocalcinosis risk, are warranted to better define the long-term efficacy, safety, and optimal dosing strategies for teriparatide in this population. Furthermore, the absence of adjustment for multiple comparisons, while consistent with the exploratory design of this study, represents an additional analytical limitation; accordingly, the reported p-values should be interpreted as hypothesis-generating rather than confirmatory.

Conclusion

Once-daily teriparatide (20 μg) contributed to the short-term improvement of calcium-phosphate homeostasis and reduced intravenous calcium dependency in patients with refractory chronic hypoparathyroidism. However, its effects were not sustained beyond 3 months, suggesting that once-daily administration at a fixed dose may be insufficient for long-term biochemical control in some patients, though definitive conclusions regarding optimal dosing strategies cannot be drawn from this limited dataset. Individualized therapeutic strategies and alternative dosing regimens warrant evaluation in future prospective studies. Larger, prospective, controlled studies are warranted to confirm the long-term efficacy, safety, and optimal administration protocols for teriparatide in this challenging patient population.

Ethics Committee Approval: This study was approved by The Republic of Turkiye, Istanbul Governorship, Provincial Directorate of Health, Basaksehir Cam and Sakura City Hospital Ethics Committee (E-96317027-514.10-277446986 – 30.05.2025).

Informed Consent: Written informed consents were obtained from patients who participated in this study.

Conflict of Interest: The author declare that there is no conflict of interest.

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Authorship Contributions: Concept – AP, EH; Design – AP, SB; Supervision – AH; Materials – AP, SB, RDUT; Data Collection and/or Processing – AP, SB, RDUT; Analysis and/or Interpretation – AP, SB, RDUT; Literature Search – AP, SB; Writing – AP; Critical Reviews – EH.

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REFERENCES

1. Bilezikian JP, Khan A, Potts JT Jr, Brandi ML, Clarke BL, Shoback D, etal. Hypoparathyroidism in the adult: epidemiology, diagnosis, pathophysiology, target-organ involvement, treatment, and challenges for future research. J Bone Miner Res 2011;26:2317-37. [CrossRef]
2. Shoback DM, Bilezikian JP, Costa AG, Dempster D, Dralle H, Khan AA, et al. Presentation of hypoparathyroidism: etiologies and clinical features. J Clin Endocrinol Metab 2016;101:2300-12. [CrossRef]
3. Büttner M, Singer S, Taylor K. Quality of life in patients with hypoparathyroidism receiving standard treatment: an updated systematic review. Endocrine 2024;85:80-90. [CrossRef]
4. Kaul S, Gosmanova EO, Castriota F, Hitchens A, Candrilli S, Parikh R, et al. Recent trends in hypoparathyroidism-related inpatient and emergency department admissions and costs in the United States. J Endocr Soc 2023;7:bvad050. [CrossRef]
5. Fuss CT, Burger-Stritt S, Horn S, Koschker AC, Frey K, Meyer A, et al. Continuous rhPTH (1-34) treatment in chronic hypoparathyroidism. Endocrinol Diabetes Metab Case Rep 2020;2020:EDM20-0009. [CrossRef]
6. Maeda SS, Moreira CA, Borba VZC, Bandeira F, Farias MLF, Borges JLC, et al. Diagnosis and treatment of hypoparathyroidism: a position statement from the Brazilian Society of Endocrinology and Metabolism. Arch Endocrinol Metab 2018;62:106-24. [CrossRef]
7. Rubin MR, Cusano NE, Fan WW, Delgado Y, Zhang C, Costa AG, et al. Therapy of hypoparathyroidism with PTH(1-84): A prospective six year investigation of efficacy and safety. J Clin Endocrinol Metab 2016;101:2742-50. [CrossRef]
8. Khan AA, Bilezikian JP, Brandi ML, Clarke BL, Gittoes NJ, Pasieka JL, et al. Evaluation and management of hypoparathyroidism summary statement and guidelines from the second international workshop. J Bone Miner Res 2022;37:2568-85. [CrossRef]
9. Saraiva M, Chaves AC, Assunção G, Saraiva J, Carvalho R. Continuous teriparatide treatment in chronic hypoparathyroidism: a case report. Am J Case Rep 2021;22:e931739. [CrossRef]
10. Winer KK, Ko CW, Reynolds JC, Dowdy K, Keil M, Peterson D, et al. Long-term treatment of hypoparathyroidism: a randomized controlled study comparing parathyroid hormone-(1-34) versus calcitriol and calcium. J Clin Endocrinol Metab 2003;88:4214-20. [CrossRef]

11. Jilka RL. Molecular and cellular mechanisms of the anabolic effect of intermittent PTH. Bone 2007;40:1434-46. [CrossRef]
12. Winer KK, Zhang B, Shrader JA, Peterson D, Smith M, Albert PS, et al. Synthetic human parathyroid hormone 1-34 replacement therapy: a randomized crossover trial comparing pump versus injections in the treatment of chronic hypoparathyroidism. J Clin Endocrinol Metab 2012;97:391-9.
13. Mannstadt M, Clarke BL, Vokes T, Brandi ML, Ranganath L, Fraser WD, et al. Efficacy and safety of recombinant human parathyroid hormone (1-84) in hypoparathyroidism (REPLACE): a double-blind, placebo-controlled, randomised, phase 3 study. Lancet Diabetes Endocrinol 2013;1:275-83. [CrossRef]
14. Marcucci G, Masi L, Cianferotti L, Giusti F, Fossi C, Parri S, et al. Chronic hypoparathyroidism and treatment with teriparatide. Endocrine 2021;72:249-59. [CrossRef]
15. Puliani G, Hasenmajer V, Simonelli I, Sada V, Pofi R, Minnetti M, et al. Safety and efficacy of PTH 1-34 and 1-84 therapy in chronic hypoparathyroidism: a meta-analysis of prospective trials. J Bone Miner Res 2022;37:1233-50. [CrossRef]
16. Cusano NE, Rubin MR, McMahon DJ, Irani D, Tulley A, Sliney J Jr, et al. The effect of PTH(1-84) on quality of life in hypoparathyroidism. J Clin Endocrinol Metab 2013;98:2356-61. [CrossRef]
17. Orloff LA, Wiseman SM, Bernet VJ, Fahey TJ 3rd, Shaha AR, Shindo ML, et al. American Thyroid Association statement on postoperative hypoparathyroidism: diagnosis, prevention, and management in adults. Thyroid 2018;28:830-41. [CrossRef]
18. Andrysiak-Mamos E, Żochowska E, Kaźmierczyk-Puchalska A, Popow M, Kaczmarska-Turek D, Pachucki J, et al. Treatment of severe life threatening hypocalcemia with recombinant human teriparatide in patients with postoperative hypoparathyroidism - a case series. Endokrynol Pol 2016;67:403-12.
19. Satterwhite J, Heathman M, Miller PD, Marín F, Glass EV, Dobnig H. Pharmacokinetics of teriparatide (rhPTH[1-34]) and calcium pharmacodynamics in postmenopausal women with osteoporosis. Calcif Tissue Int 2010;87:485-92. [CrossRef]
20. Bilezikian JP, Brandi ML, Cusano NE, Mannstadt M, Rejnmark L, Rizzoli R, et al. Management of Hypoparathyroidism: Present and Future. J Clin Endocrinol Metab 2016;101:2313-24. [CrossRef]
21. Murray RD, Lederer ED, Khundmiri SJ. Role of PTH in the renal handling of phosphate. AIMS Med Sci 2015;2:162-81. [CrossRef]
22. Mannstadt M, Clarke BL, Bilezikian JP, Bone H, Denham D, Levine MA, et al. Safety and efficacy of 5 years of treatment with recombinant human parathyroid hormone in adults with hypoparathyroidism. J Clin Endocrinol Metab 2019;104:5136-47. [CrossRef]
23. Jolette J, Wilker CE, Smith SY, Doyle N, Hardisty JF, Metcalfe AJ, et al. Defining a noncarcinogenic dose of recombinant human parathyroid hormone 1-84 in a 2-year study in Fischer 344 rats. Toxicol Pathol 2006;34:929-40. [CrossRef]
24. Andrews EB, Gilsenan AW, Midkiff K, Sherrill B, Wu Y, Mann BH, et al. The US postmarketing surveillance study of adult osteosarcoma and teriparatide: study design and findings from the first 7 years. J Bone Miner Res 2012;27:2429-37. [CrossRef]