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Circadian variation of mineral and bone parameters in end-stage renal disease

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Mineral and bone parameters are actively managed in end-stage renal disease (ESRD). However, whether these undergo circadian variation, similar to normal physiologic conditions, is not known. We investigated the circadian variation of mineral and bone parameters in patients on long-term hemodialysis. Seventeen ESRD patients on long-term hemodialysis and eight volunteers without kidney disease were studied under controlled conditions. After enrollment, subjects had all medications that affect calcium-phosphate-parathyroid hormone balance (phosphate binders, vitamin D analogues, and calcimimetics) discontinued. Thereafter, for a period of five days, subjects consumed a diet controlled in calcium (1200 mg per day) and phosphorus (1000 mg per day) content provided by the research kitchen. On the sixth day (a non-dialysis day for the ESRD patients), enrollees underwent twelve two-hourly blood draws for phosphate, ionized calcium, parathyroid hormone (PTH), total 25-hydroxy vitamin D (25OHD), and fibroblast growth factor-23 (FGF-23). In the ESRD patients plasma phosphate demonstrated significant circadian variation ($P<0.00001$). The peak occurred around 3:30 am and nadir occurred around 11:00 am. Ionized calcium ($P=0.0036$), PTH ($P=0.0004$) and 25OHD ($P=0.009$) also varied significantly during the circadian period; for ionized calcium peak and nadir occurred around 12:15 pm and 8:00 pm, parathyroid hormone 5:45 pm and 10:15 am, and 25OHD 9:45 am and 4:00 pm respectively. FGF-23 did not show a significant circadian variation. Only phosphate ($P<0.0001$) and PTH ($P=0.00008$) demonstrated circadian variation in the control group. Blood concentrations of phosphate, calcium, PTH and 25-hydroxy vitamin D, exhibit a circadian variation in patients with ESRD. Knowledge of these phenomena is pertinent for clinical testing and may be valuable in understanding the pathophysiology of mineral and bone disorders of end-stage renal disease.

Biography

Hariprasad Trivedi, MD, is a Professor of Medicine at the Medical College of Wisconsin. He is the Director of the Dialysis Program for the college and Chief of Clinical Research for the Division of Nephrology. He has published more than 35 papers in reputed journals and serving as an Associate Editor of repute.

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