Nephrol Dial Transplant (2005) 20: 217–219
doi:10.1093/ndt/gfh567

Nephrology
Dialysis
Transplantation

Case Report

Transient diplopia after parathyroidectomy for hyperparathyroidism in chronic haemodialysed patients

Andrea Trombetti[1], Catherine Stoermann[2], Pierre-Yves Martin[2], Pietra Pennisi[1], John Robert[3] and René Rizzoli[1]

[1]Service of Bone Diseases (WHO Collaborating Center for Osteoporosis Prevention), Department of Rehabilitation and Geriatrics, [2]Service of Nephrology, Department of Internal Medicine and [3]Thoracic Surgery Unit, Department of Surgery, University Hospital of Geneva, Switzerland

Keywords: chronic renal failure; extraocular muscles; parathyroid surgery; tetany

Introduction

An increase in serum levels of the parathyroid hormone (PTH) and hyperplasia of the parathyroid glands have been observed to occur in the early stages of chronic kidney disease with decreased renal function, in an attempt to maintain serum calcium within the normal range [1]. However, this secondary hyperparathyroidism becomes maladaptive when chronic renal failure progresses to end-stage renal failure, leading to severe hyperparathyroidism, which is refractory to medical therapy. When severe hyperparathyroidism is associated with hypercalcaemia and/or hyperphosphataemia, parathyroidectomy (PTX) should be considered. However, PTX in such cases can often result in an acute decrease of serum calcium and is one of the leading causes of acute hypocalcaemia. Hypocalcaemia is associated with a wide spectrum of symptoms and signs, mostly related to acute changes in serum calcium, rather than constantly low levels [2]. Among them, neuromuscular dysfunction, including tetany and seizure, is the hallmark of the clinical manifestations of acute hypocalcaemia. On the other hand, transient diplopia has been reported only rarely.

To illustrate this association, we report on three patients who, following PTX for severe hyperparathyroidism, experienced acute hypocalcaemia and thereafter transient diplopia, a rare complication of hypocalcaemia.

Correspondence and offprint requests to: René Rizzoli, MD, Service of Bone Diseases, Department of Rehabilitation and Geriatrics, University Hospital of Geneva, CH-1211 Geneva 14, Switzerland. Email: Rene.Rizzoli@medecine.unige.ch

Cases

Case 1

The first patient was a 39-year-old man on maintenance haemodialysis (HD) since November 1990, with end-stage renal failure secondary to chronic glomerulonephritis. In 1992 and 1996, he underwent cadaveric kidney transplantation with an unsuccessful outcome. Due to severe hyperparathyroidism, a total PTX with autotransplant of parathyroid tissue in the right arm was performed in August 1993. From 1999 onwards, secondary hyperparathyroidism progressively recurred, with a serum PTH level of 173 pmol/l (normal range: 1.1–6.9 pmol/l). Serum calcium was normal at 2.39 mmol/l (normal range: 2.2–2.6 mmol/l). The pre-operative serum alkaline phosphatase level was also normal at 82 U/l (normal range: 30–125 U/l). Recurrence was attributed to hyperplasia of the right arm's parathyroid tissue. The patient was receiving 1600 mg elemental calcium a day, but no vitamin D derivatives. Excision of the remaining parathyroid tissue of the patient's right arm was carried out in February 2003. Three days after surgery, he experienced general numbness due to severe hypocalcaemia. Since his albumin-adjusted calcium was only 1.5 mmol/l, he was prescribed a calcium supplement (1000 mg daily), calcitriol and the dose of active vitamin D was progressively increased. The dialysate calcium level was also increased from 1.5 to 1.75 mmol/l. The serum calcium level (and associated symptoms) then began to fluctuate, being normal immediately after his dialysis session and low in-between. One week later, he complained of transient diplopia along with generalized dysesthesia (pins and needles) associated with muscle cramps. Horizontal binocular diplopia was noticed while looking on the right side, with weakness of the left medial rectus. No other specific neurological abnormalities were detected. Chvostek's and Trousseau's signs were absent. Laboratory investigations revealed

hypocalcaemia (1.79 mmol/l) and hyperphosphataemia (1.92 mmol/l; normal range: 0.80–1.40 mmol/l). Serum potassium and magnesium were within the normal range. The intact PTH level (12.4 pmol/l) had decreased markedly as compared with its pre-operative level and the acid–base balance was unremarkable. Within 24 h of transient normalization of the serum calcium with a dialysis session, diplopia did not recur.

Case 2

This patient was a 26-year-old woman with end-stage renal failure secondary to reflux nephropathy, on maintenance HD since 1995. A subtotal PTX was performed in June 2003 for secondary hyperparathyroidism with a very high serum PTH (453 pmol/l) and serum alkaline phosphatase levels (632 U/l; normal range: 32–104 U/l), although the protein-corrected serum calcium level was normal (2.28 mmol/l). At the time of surgery, she was receiving 1200 mg elemental calcium and 0.25 μg calcitriol a day. The day after surgery, she experienced very transient diplopia with dysesthesia and muscle cramps. At that time, ophthalmological and neurological evaluations were normal, but Chvostek's and Trousseau's signs were present. A marked decrease in serum calcium to 1.74 mmol/l, with a possible hungry bone syndrome (the intact PTH level was 32 pmol/l), developed the day after surgery. Laboratory investigation also revealed hyperphosphataemia (2.02 mmol/l) and hyperkalaemia (7.2 mmol/l; normal range: 3.6–4.6 mmol/l), although magnesium concentration was normal (0.79 mmol/l; normal range: 0.65–1.05 mmol/l), as was the bicarbonate level. After intravenous administration of large amounts of calcium gluconate (10%) and oral calcium over the next 24 h, the level of serum calcium became normal and the symptoms disappeared.

Case 3

The third patient was a 42-year-old man with predialysis renal failure secondary to obstructive nephropathy. In January 2000, he underwent a total PTX with autotransplantation for severe hyperparathyroidism [intact PTH: 132 pmol/l; protein-corrected serum calcium: 2.20 mmol/l; high levels of alkaline phosphatase: 403 U/l (normal range: 98–279 U/l)]. At that time, he was receiving 1.5 μg calcitriol once a day. Hypocalcaemia developed 24 h after surgery. Despite the introduction of a large dose of calcium ($\leq$12 g per day) and increasing the dose of calcitriol to 2 μg per day, 10 days after surgery he complained of paresthesiae of the distal extremities and circum-oral area, Chvostek's and Trousseau's signs and muscle cramps. He also complained of transient diplopia, but clinical examination revealed no abnormalities. Laboratory investigations on readmission after surgery showed marked hypocalcaemia (1.32 mmol/l), hyperphosphataemia (2.17 mmol/l) and hypomagnesaemia (0.57 mmol/l). Hypoparathyroidism was diagnosed on the basis of low levels of PTH in the serum (1.1 pmol/l). With calcium supplements and active vitamin D derivatives, the serum calcium increased slowly and became normal within 1 week.

Discussion

We have described three patients with ESRD who presented with transient diplopia, in the absence of other causes of neurological disorder, and acute hypocalcaemia following a PTX for renal hyperparathyroidism. The common characteristic of these patients was rapidly developing hypocalcaemia as well as manifestations of neuromuscular irritability. In all three cases, the duration of double vision was brief and binocular and on clinical examination no specific ophthalmological or neurological abnormalities were detected.

Diplopia in these cases was most probably a manifestation of tetany of the extraocular muscles induced by hypocalcaemia. Acute hypocalcaemia directly increases peripheral neuromuscular irritability [3]. The primary determinants of symptoms and signs in patients with hypocalcaemia are related to the kinetics and relative change of serum calcium. PTX performed on these patients led to a marked decrease in serum calcium within a few days of the operation.

Other factors could contribute to this clinical presentation, including the acid–base status (although no such modifications were observed), magnesium depletion, a potassium imbalance and emotional stress after surgery, all of which could affect epinephrine concentrations and elicit tetany in patients with hypocalcaemia [4].

Classically, tetany can affect all muscles except the extraocular ones [5]. Nevertheless, diplopia has been observed in patients with hypocalcaemia. For example, a report described a 15-year-old boy complaining of attacks of a thick tongue, double vision and heart failure. He was diagnosed as having idiopathic hypoparathyroidism with marked hypocalcaemia (1.09 mmol/l) [6]. Another report described a 74-year-old male with idiopathic hypoparathyroidism revealed by a non-insulin-dependent diabetes mellitus and severe hypocalcaemia (1.6 mmol/l) [7]. However, to our knowledge, diplopia was not observed after PTX. An article published in 1960 stated that patients with severe hypocalcaemia after a subtotal PTX for renal hyperparathyroidism could experience blurring of vision and difficulty in accommodation [8].

These case reports raise the question of prevention of post-PTX hypocalcaemia. Given the frequency of this complication, a daily follow-up of serum calcium is mandatory. Pre-operative administration of calcitriol to all such patients if they are not already being treated with a vitamin D metabolite should be recommended as well as early administration of high doses of oral calcium. Accordingly, a clinical algorithm has been proposed recently [9].

In conclusion, diplopia is a rare manifestation of acute hypocalcaemia and should be noted as a potential complication of PTX in dialysis patients. Although rare, if this complication were made known to nephrologists it could avoid unnecessary neurological investigations.

Acknowledgements. We acknowledge the editorial assistance of Dr Anne Appleton, Médecin-Chef, Unité de Sénologie (Breast Unit), Clinique de Genolier, CH-1272 Switzerland, Mrs Marianne Perez and Mrs Bhalla Praveen.

Conflict of interest statement. None declared.

References

1. Slatopolsky E, Gonzalez E, Martin K. Pathogenesis and treatment of renal osteodystrophy. *Blood Purif* 2003; 21: 318–326
2. Fonseca VA, Bloom RD, Dick R, Dandona P. Tetany despite normocalcemia and normomagnesemia following parathyroidectomy. *Postgrad Med J* 1987; 63: 885–886
3. Macefield G, Burke D. Parasthesiae and tetany induced by voluntary hyperventilation: increased excitability of human cutaneous and motor axons. *Brain* 1991; 114: 527
4. Harvey AM, Lilenthal JL, Jr. Observations of the nature of tetany. The effect of adrenaline. *Johns Hopkins Med J* 1942; 71: 163
5. Adams RD. *Principles of Neurology*. McGrawhill, New York, 1993
6. Karsten J, Szijjarto L, Lebbink J. A boy with heart failure, a thick tongue, and double vision. *Lancet* 1997; 349: 1516
7. Itoh H, Matsuda Y, Nishiyama M *et al*. Non-insulin-dependent diabetes mellitus complicated with idiopathic hypoparathyroidism. *Intern Med* 1995; 34: 904–907
8. Stanbury SW, Lumb GA, Nicholson WF. Elective subtotal parathyroidectomy for renal hyperparathyroidism. *Lancet* 1960; 1: 793–799
9. Cozzolino M, Gallieni M, Corsi C, Bastagli A, Brancaccio D. Management of calcium refilling post-parathyroidectomy in end-stage renal disease. *J Nephrol* 2004; 17: 3–8

Received for publication: 8.7.04
Accepted in revised form: 5.10.04