Introduction

It is well known that the extravasation of calcium solution may cause soft tissue and skin necrosis. Uremic patients who undergo total parathyroidectomy and autotransplantation for secondary hyperparathyroidism usually suffer from postoperative hypocalcemia, which can last for 2–3 months until the parathyroid graft is functioning properly. During this period, the hypocalcemia must be treated. Oral calcium supplements and calcitriol are usually adequate, but intravenous (i.v.) calcium administration becomes necessary if severe hypocalcemia or symptomatic hypocalcemia develop despite oral calcium. We reviewed 371 uremic patients who underwent parathyroidectomy for secondary hyperparathyroidism between January 2000 and June 2005. The patients were hemodialyzed three times per week for 14–18 h per week with dialysate containing 7.0 mmol/l calcium. Calcitriol or 1.25-dihydroxy vitamin D was prescribed if the serum levels of intact parathyroid hormone (iPTH) were higher than three times the normal level (>200 pg/ml). We gave i.v. calcitriol if the serum levels of iPTH were higher than 1000 pg/ml. Patients with bone pain, general weakness with disability, skin itching, normal levels of aluminum, and iPTH levels higher than 10 times the normal level (>650 pg/ml) despite calcitriol suppressive treatment were referred for surgery. After total parathyroidectomy, 90–120 mg of tissue was transplanted into the subcutaneous tissue of the forearm or thigh. Postoperatively, i.v. calcium chloride was given if the patient’s serum level fell below 7 mg/dl or if they experienced symptoms of hypocalcemia. Ninety-six patients received i.v. calcium solution for symptomatic hypocalcemia postoperatively. Three of our own patients (3%) and another patient who was transferred to our hospital suffered skin necrosis after the i.v. calcium infusion. We report the clinical manifestations and management of these four patients.
Case Reports

Case 1

A 46-year-old man underwent total parathyroidectomy and the autotransplantation of 120 g parathyroid tissue into his right forearm for secondary hyperparathyroidism associated with end-stage renal disease managed by hemodialysis. Postoperatively, he was given one ampoule of calcium chloride (5%, 20 ml, 13 meq) slowly as a direct i.v. injection for hypocalcemia via the left great saphenous vein. About 1 h later, he noticed multiple yellow and erythematous tender papules along the venous track above the injection site. He came back to our clinic 11 days later, with multiple skin and soft tissue necrotic lesions. Three lesions were about 1.5 × 0.5 cm in size and one lesion was 3 × 2 cm in size (Fig. 1). He was referred to a plastic surgeon and after 1 month of wound care, he underwent debridement and repair of the skin defect with a rotation advanced flap. Total necrosis of the flap was confirmed 3 weeks later, so he was managed with wound care again, and the wound healed 2 months later. Thus, the wound took 4 months to heal after the calcium chloride injection.

Case 2

A 21-year-old man was on hemodialysis for end-stage renal disease, with chronic rejection and graft failure post renal transplantation. He also had asthma. He underwent parathyroidectomy and autotransplantation into his left forearm for secondary hyperparathyroidism. Postoperatively, he was given calcium chloride in a 100-ml bag for i.v. infusion via a small vein in the dorsum of his right hand. An erythematous and tender papule appeared 1 h after the injection. Another dose of calcium chloride was given via a small vein in his right lower leg the next day. Papules were noted above the injection site, with erythema and tenderness soon after the injection. Two areas of skin and soft tissue necrosis developed 2 weeks later: one, 3 × 1.5 cm in size, on the dorsum of his right hand, and one, 5 × 1.5 cm in size, on his right lower leg. After 4 weeks of wound care, he underwent debridement with a split-thickness skin graft, and the wound healed well. The wound took 3 months to heal after the calcium chloride infusion.

Case 3

A 52-year-old women underwent total parathyroidectomy and autotransplantation into her left forearm for secondary hyperparathyroidism associated with end-stage renal disease managed by hemodialysis. She was given calcium chloride in a 100-ml bag for i.v. infusion via a small vein in her right lower leg. Yellow and red vesicles with some serous discharge over the venepuncture site appeared 1 day later. She came back to our clinic 2 weeks later with one 6 × 5-cm area of skin necrosis over her right lower leg. After 1 month of wound care she underwent a split-thickness skin graft. The wound healed 1 month after the operation.

Case 4

A 51-year-old man with end-stage renal disease, and diabetes mellitus, was suffering secondary hyperpara-