New technique of parathyroidectomy to prevent parathyromatosis and hypoparathyroidism

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Abstract A 54-year-old woman with end-stage renal disease and on haemodialysis for 4 years developed severe secondary hyperparathyroidism and was operated upon. The two upper and the largest lower parathyroid glands were resected. The right lower gland was dissected from the lower pole of the thyroid and, by gently pulling upwards, the lateral walls were dissected using electrocautery. The lower aspect of the gland maintained the blood supply through small mediastinal and thymic vessels of the neopedicle, which allowed its mobilization to a more superficial plane. Because of the large size of the gland, the part opposite to the neopedicle was resected and the cutting surface was sealed with fibrin adhesive. Pre-thyroidal muscles were reapproximated and the remnant of the parathyroid gland was pulled out through a small hole in the inferior part of the midline and sutured with fine silk to the muscle. The gland was therefore placed in a subcutaneous position in the lowest part of the operative field just above the sternal border. The postoperative course was uneventful and, 8 months after surgery, the patient maintains a normal parathyroid function.

Key words: chronic renal failure; hypoparathyroidism; parathyroidectomy; parathyroid gland surgery; parathyromatosis

Introduction

Total and subtotal parathyroidectomy traditionally have been recommended for the treatment of hyperparathyroidism (HPT) in chronic renal failure [1–5]. Although subtotal parathyroidectomy causes hypoparathyroidism, recurrence of autonomous HPT may develop in some cases due to embryonic remnants or seeding of parathyroid cells during the operation (parathyromatosis) [6,7]. Subtotal parathyroidectomy avoids hypoparathyroidism but there is a higher risk of recurrence, and neck reoperations are technically difficult [8]. Total parathyroidectomy with autotransplantation of parathyroid tissue into the forearm or the sternocleidomastoid musculature may result in a non-functioning graft due to vascular failure or in recurrent secondary HPT because of local spread of parathyroid tissue [9]. Total or subtotal parathyroidectomy with further implantation of cryopreserved tissue requires sophisticated facilities and functioning parathyroid tissue is not always obtained after thawing.

We describe here a new technique of parathyroidectomy designed to avoid parathyromatosis and hypoparathyroidism in a single dialysis patient.

Case

A 54-year-old woman with end-stage renal disease had been on haemodialysis for 4 years. She developed secondary HPT with a mean serum concentration of intact parathormone (iPTH) of 76.8±35.0 pmol/l, serum calcium of 10±0.1 mg/dl, serum phosphorus of 7.3±1.0 mg/dl, and alkaline phosphatase of 357±167 U/l over the preceding year. Signs of severe secondary HPT were detected by X-rays of the hands and skull. Calcium carbonate (5–10 g/day) and then aluminum hydroxide (1.4 g/day) were used as phosphate binders. Dialysate calcium concentration was 2.5 mmol/l. The patient was given 0.25 mg of calcitriol three times a week with no possibility of increasing the doses due to development of hypercalcaemia and hyperphosphataemia. After failure of i.v. bolus calcitriol treatment, the indication for parathyroid surgery was established. Imaging by scintiscanning defined three parathyroid glands in the upper left thyroid lobe and areas of increased uptake in the lower lobes.

Operative technique

A Kocher’s incision was carried out and the two upper parathyroids and the largest lower parathyroid were resected following a standard procedure. The right
lower parathyroid gland was dissected from the lower pole of the thyroid and, by gently pulling upwards, the lateral walls were dissected by electrocauterization while the lower aspect of the gland remained connected to the upper mediastinum (Figure 1). Blood supply through small mediastinal and thymic vessels of the neopedicle allowed mobilization of the parathyroid gland to a more superficial plane. Because of the large size of the gland, the part opposite to the neopedicle was resected and the cutting surface was sealed with fibrin adhesive (Tissucol®, Inmuno, Viena) to prevent parathyromatosis derived from seeding of parathyroid cells. The sternothyroid and sternohyoid muscles were reapproximated and the remnant of the parathyroid gland was pulled out through a small hole in the inferior part of the midline and sutured with fine silk to the muscle without compromise of its blood supply (Figure 2). The gland was therefore placed in a subcutaneous position in the lowest part of the operative field just above the sternal border. The weights of the resected parathyroids were 0.990 g for the upper right gland, 0.753 g for the upper left, 0.579 g for the lower left and 0.033 g for the lower right portion. Microscopic examination showed a nodular hyperplasia.

The postoperative course was uneventful, and serum calcium levels within the first week after the operation ranged between 8.50 and 9.70 mg/dl. Intravenous calcium therapy was instituted during the first two postoperative days, i.e. 16 and 10 ampoules of calcium gluconate every 24 h, respectively (one ampoule of calcium gluconate contains 45 mg of elemental calcium) and 1 μg of calcitriol per day. Oral administration of calcium (calcium carbonate 15 mg/day, calcitriol 1 μg per day) was started on the third postoperative day. Dialysate calcium concentration was increased to 3 mmol/l. Eight months after surgery, the patient maintains a normal parathyroid function. Alkaline phosphatase decreased from 550 U/l before surgery to 113 U/l at 8 months. Ultrasonography of the neck showed an ectopic, subcutaneous parathyroid gland with clear margins with no evidence of infiltration of the surrounding tissue or images compatible with other parathyroid glands (Figure 3). Ultrasonography with fine needle aspiration for parathyroid hormone assay [10,11] showed a higher parathyroid hormone content (iPTh level 33.4 pmol/l) as compared with serum iPTh concentration (7 pmol/l).

![Fig. 1. The right lower parathyroid gland is dissected except for its inferior pole.](image1)

![Fig. 2. The gland is placed into a subcutaneous position through the pre-thyroidal musculature plane.](image2)

![Fig. 3. Ultrasound examination of the neck showing the gland in a superficial position with no evidence of infiltration of the surrounding structures.](image3)
Discussion

The present case shows that the operative technique of subtotal parathyroidectomy carried out in this patient offers advantages as compared with other surgical procedures commonly used in the treatment of renal HPT. Eight months after operation, a functioning gland was demonstrated, hypoparathyroidism has been avoided and there is no evidence of local spread of parathyroid tissue. Local spread resulting in hypoparathyroidism has been a main disadvantage of parathyroid autotransplantation. In addition, the fact of maintaining an adequate parathyroid function prevents stimulus and growth of other embryonic remnants or ectopic glands, or seeding of parathyroid cells. Preservation of the blood supply of the parathyroid gland through mediastinal branches is the novel aspect of this technique, so that local spread of parathyroid tissue to secure the blood supply is avoided. Moreover, preservation of the capsule also contributes to preventing infiltrating and disorganized parathyroid cell growth.

When the parathyroid gland is of an excessive size (≥1 cm), such as in the case reported here, a piece of the gland may be resected and only a fragment may be moved to a superficial position. Contamination of the operative field with parathyroid cells is avoided by sealing the surface of the gland with fibrin adhesive. The subcutaneous location of the parathyroid offers an easy operative access for a second operation in patients with recurrent HPT allowing either total or subtotal resection.

This novel operative technique may open up new perspectives in the management of secondary HPT, but controlled prospective comparisons with conventional surgical technique are required to assess fully its safety and efficacy.

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