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LETTER TO THE EDITORS

Living donor parathyroid allotransplantation with robotic transaxillary procurement in a kidney transplant recipient

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Dear Sirs,

Hypercalcemia as a result of tertiary hyperparathyroidism is frequently encountered in patients with end-stage renal disease (ESRD). It is successfully treated by subtotal parathyroidectomy. Severe hypocalcaemia after parathyroidectomy is uncommon, but in 1–2% of patients can occur [1]. It is a quite serious complication causing dependence on high dose of calcium and vitamin D supplementation with long-term risks of paresthesias, multiorgan calcinosis, and renal failure. Parathyroid cell allotransplantation has been described sporadically over the last 30 years as a potential therapy for permanent hypoparathyroidism [2–5]. We herein report an original case of parathyroid allotransplantation, in which the parathyroid was harvested from a living related donor using a robotic surgical approach.

A 23-year-old Caucasian female with ESRD secondary to congenital medullary sponge kidneys received a living related kidney transplant from her mother at the age of 14 years. The graft ceased to function 2 years later because of chronic rejection, and she was placed back on peritoneal dialysis. A year later, she developed severe secondary hyperparathyroidism and underwent a subtotal parathyroidectomy. Following parathyroidectomy, she developed severe (average 5.7 mg/dl; normal range 8.7–10.6 mg/dl), hyperphosphatemia (average 8.3 mg/dl; normal range 3.0–4.5 mg/dl), and hypomagnesemia (average 0.8 mg/dl; normal range 1.8–2.4 mg/dl), which failed to improve. She was treated with calcium carbonate (14.062 mg qid; 45 pills/day), magnesium oxide (400 mg bid), and calcitriol (1,25-dihydroxyvitamin D) (2 μg/day) to help the absorption of calcium tablets. She complained of fatigue, paresthesia, cognitive impairment, and tetany and required emergency assistance with i.v calcium infusion several times because of severe hypocalcemia.

At the age of 17 years, she received a new HLA-identical living related kidney transplant from her sister. On admission for the second kidney transplant, her total calcium was 6.2 mg/dl despite the aggressive replacement therapy. The kidney functioned immediately with rapid normalization of the renal function. Immunosuppression consisted of thymoglobulin induction, tacrolimus, mycophenolate mofetil, and low-dose steroids for maintenance. Postoperatively, the patient started to complain of perioral and extremity numbness, tingling, and weakness with signs of latent tetany despite receiving intravenous and oral calcium supplementation along with phosphate binders. Subsequently, the treatment of hypocalcaemia required an extremely high dose of oral calcium carbonate (18.750 mg qid; 60 pills/day) in addition to high dose of calcitriol (5 μg/day) and magnesium oxide (800 mg bid). It was difficult for the patient to swallow 60 pills a day just for calcium supplementation, and despite all these efforts, her serum calcium stayed in the range of 6.6–8.0 mg/dl, the serum phosphate in the range of 5.5–8.5 mg/dl, the serum magnesium in the range 0.9–1.3 mg/dl, PTH remained <1 pg/ml (normal range 12–88 pg/ml), and the 24-h urine calcium was 450 mg/24 h. In light of the symptomatic and refractory hypocalcemia, her young age, and her ongoing immunosuppression, a parathyroid transplantation seemed an excellent solution. No signs of organ calcinosis were detected. Her sister, who had previously donated the kidney to her, expressed desire to donate parathyroid tissue but was concerned with the cosmetic outcome.

The parathyroid gland was approached robotically through a transaxillary incision. The right superior parathyroid (4 mm in diameter and 50 mg in weight) was removed with the robotic technique and preserved in saline solution after histologic confirmation of its nature. The gland was then divided into several small pieces and immediately implanted in the right sternocleidomastoid muscle of the recipient where there was a keloid that we revised contextually. The postoperative course of the donor was uneventful, tolerating the procedure well with no surgical or medical complications. Twenty-four months after the operation, the donor is clinically free of symptoms and reported complete satisfaction with the postoperative cosmetic appearance. Within 5 weeks after parathyroid transplant, the symptoms of muscle weakness, paresthesia, and twitching resolved, and the recipient was able to carry out all the activities of daily living without any help. The

Table 1. Serum calcium, phosphate, magnesium, and PTH evolution before and after parathyroid transplantation.

		Months after transplant						
Data	Before transplant	1	3	6	9	12	18	24
Total calcium (mg/dl)	6	8	8.9	9	9.3	8.9	8.6	8.7
Ionized calcium (mg/dl)	3.3	4	4.4	4.6	4.9	4.7	4.6	4.6
Phosphate (mg/dl)	7.5	6	4.3	4	3.7	4.1	3.6	4
Magnesium (mg/dl)	1	1.5	1.9	1.8	2	2.1	2	2.3
PTH (pg/ml)	0.9	8	10	18	18	27	35	42

calcium, the phosphate, the magnesium, and PTH levels normalized and remained within the normal limits up to the present time (Table 1). The 24-h urine calcium was 210 mg/24 h after 12 months. Two years after transplant, she leads a very active life and takes 1 g/day of calcium as normal supplementation present in almost all kidney transplant patients.

Theoretically, parathyroid allotransplantation could be an ideal treatment to restore normal calcium homeostasis. Living or cadaveric parathyroid transplantation has been performed with good results (ref). However, the need for long-term immunosuppression limits the applicability of this approach.

Robotic transaxillary surgery was developed in South Korea in the late 2000s. Kang *et al.* [6] reported for the first time the use of this technique for thyroid cancer. Since then, several large patient series and multi-institutional analyses have showed that this approach in thyroid and parathyroid surgery is safe, feasible, efficient, and without an increased complication rate compared with the conventional technique [7,8]. Additionally, in most cases, the robotic approach provides an excellent visualization of the recurrent laryngeal nerve (RLN). Patients reported a lower degree of postoperative discomfort, a higher degree of cosmetic satisfaction, and subjective improvements in swallowing discomfort [7]. Because of its complexity, the procedure is not free from complications. The most common complications reported are transient hoarseness, permanent RLN injury, Horner syndrome, and transient ipsilateral arm paralysis [6].

Recently, pump delivery of PTH in the treatment of hypoparathyroidism is gathering much interest. Winer *et al.* [9] have showed to be effective in decreasing the urine calcium excretion and maintain eucalcemia compared with the daily PTH dose. Some concerns remain on the high cost, the inconvenience of injection treatment, and the long-term effectiveness [9,10]. In young patients with an ongoing immunosuppression therapy, transplantation could still be a better choice.

Allotransplantation of a graft procured with living donor robotic parathyroidectomy from a well-matched donor is potentially an excellent option to cure refractory hypocalcemia in kidney transplant recipients with severe hypoparathyroidism. The procedure is safe and esthetic for donor and leads to the procurement of a high-quality parathyroid graft for transplantation.

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Conflict of interest

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