Determination of the functioning of autotransplanted parathyroid tissue in muscle


Abstract

Twenty dialysis and renal transplant patients with parathyroid hyperplasia underwent a total parathyroidectomy and an autotransplantation in forearm muscle. Twelve patients were available for investigation of the function of the transplanted parathyroid tissue. Differential studies of the two arms revealed functioning of the transplanted tissue in all cases. This was more readily demonstrated by determining the intact hormone in both arms.

The serum calcium levels declined in all patients postoperatively. Most patients needed high doses of intravenous calcium in the immediate postoperative period to maintain these levels.

The surviving patients were recently recalled and investigated for functioning of the transplanted parathyroid tissue. Parathyroid hormone (PTH) levels were determined in blood from antecubital veins in both arms using both a mid-molecule (RIA, Incstar Corporation) and an intact hormone (Allegro Immunoradiometric assay, Nichols Institute) kit.

Results

Of the 20 patients, 8 had died of renal failure and 12 were available for investigation. The minimum follow-up period was 6 months. Ten had functional renal transplants and 2 had returned to dialysis. All the patients showed a difference in PTH levels between the autografted arm and the normal arm. The ratio ranged from 1.68 to 17.69 using the intact hormone method (mean 6.26; SD 4.37) and from 1.13 to 2.37 (mean 1.68; SD 0.39) using the mid-molecule method (Fig. 1).
All the patients improved symptomatically after parathyroidectomy. The 2 patients with grossly elevated PTH levels do not have normal renal function and 1 has returned to dialysis.

All patients except 1 have intact PTH levels on the transplanted side. These are normal or above normal (10 - 6.5 pg/ml). The mean systemic PTH (non-transplanted arm) on intact hormone assay is less than normal in 1 patient, i.e. < 10 pg/ml (Fig. 3). This patient is normocalcaemic. Two patients are on oral calcium supplementation and 1 is hypercalcaemic. The rest maintain normal serum calcium levels. Mean serum calcium is 2.34 mmol/l: range 2.11 - 2.75. None of the patients is clinically hypoparathyroid.

**Discussion**

TP-A is a controversial procedure. It seems rather drastic to remove an essential endocrine organ and rely on a tenuous nonvascularised autograft. Protagonists of 3/4-gland excision voice fears of permanent hypocalcaemia. However, there is no doubt that autographed parathyroid tissue in muscle does function and can maintain calcium homeostasis. Halsted, among others, demonstrated the survival of autographed parathyroid tissue in animals. This was subsequently also demonstrated in humans. Wells et al. showed, by determining PTH in efferent veins from the graft site, that tissue was functioning. Subsequently many clinical studies have been published with convincing evidence of the effectiveness of the procedure.

Is there then an indication for TP-A? It is indicated in parathyroid hyperplasia and would seem to be a logical option in situations where the stimulus to hyperplasia is ongoing. TP-A has therefore been advocated for primary hyperplasia and especially familial forms of the condition. For the same reason it has been performed in patients with end-stage renal disease. The rationale is that it is easier and safer to treat recurrent disease by excising tissue in the arm than in the previously operated neck. TP-A has also been advocated in conjunction with total thyroidectomy for malignancy. This is to avoid the possibility of leaving devascularised parathyroid glands in the neck.

Determination of intact hormone is superior to other methods for demonstrating the functioning of transplanted parathyroid tissue. Four of our patients had ratios between the transplanted and non-transplanted arms of < 1.5:1 on mid-molecule assay, whereas all had greater ratios using the intact hormone method. This is because the half-life of intact hormone is very short and the other fragments accumulate in renal failure.

**REFERENCES**