

Effects of percutaneous ethanol injection therapy on subsequent surgical parathyroidectomy

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Abstract

Background. Renal hyperparathyroidism (RHPT) is a serious complication of long-term dialysis treatment. Two intervention methods can be administered to treat RHPT, namely percutaneous ethanol injection therapy (PEIT) and a parathyroidectomy (PTx). PEIT is associated with a significant adverse event, adhesion formation. This study was performed to investigate the effect of PEIT on subsequent PTx.

Methods. A total of 80 subjects were included in the study. The patients had a diagnosis of RHPT for which surgery was indicated. They were divided according to whether they underwent PEIT (PEIT group) or not (non-PEIT group). The outcomes of PTx following PEIT were evaluated.

Results. There were 19 patients in the PEIT group and 61 in the non-PEIT group. The operation time was significantly longer in the PEIT group but no significant differences in the amount of bleeding or frequency of recurrent nerve paralysis were observed. The intact PTH levels immediately following surgery were slightly higher in the PEIT group. The postoperative intact PTH levels were found to be significantly higher in those who received two or more courses of PEIT. The number of patients with an intact PTH level >60 pg/ml on postoperative Day 1 was significantly higher in the PEIT group.

Conclusions. These findings suggested that PEIT prior to PTx can affect the subsequent surgical outcome due to associated adhesions and dissemination. For patients with a possibility of either a decreased efficacy or a lack of efficacy for PEIT, it is therefore important to consider PTx from the very beginning of the treatment.

Keywords: haemodialysis; laryngeal recurrent nerve paralysis; parathyroidectomy; percutaneous ethanol injection therapy (PEIT); renal hyperparathyroidism

Introduction

Renal hyperparathyroidism (RHPT) is a serious complication of long-term dialysis treatment [1]. The European

Dialysis and Transplant Association (EDTA) report published in 1991 showed that up to 40% of patients undergo surgical treatment for RHPT after 15 years of dialysis [2]. RHPT is a form of renal osteodystrophy that causes increased bone fragility [3], and in addition, it has also been reported that hypercalcaemia and hyperphosphataemia associated with RHPT induce ectopic calcification in the vascular walls and heart valves, thereby significantly affecting the patient's survival prognosis [4–9]. In patients with severe RHPT refractory to medical treatment, parathyroid gland intervention is usually required. There are two types of such methods, percutaneous ethanol injection therapy (PEIT) and a parathyroidectomy (PTx). Determining which of these methods is the most appropriate intervention for individual cases is therefore a major issue for clinicians. PEIT is easy to perform on an outpatient basis; however, it has been associated with a significant adverse event, namely adhesion formation. An indistinct margin of the parathyroid gland is often found during surgery following PEIT due to the firm fibrous membrane. In addition, PEIT is not always effective for all advanced RHPT cases. PTx is considered to be the last treatment option in patients with severe RHPT resistant to medical treatment and PEIT. This method is also the sole procedure available for the treatment of advanced RHPT [10]. The therapeutic outcome of PTx has been reported to be reliable and stable. This study was conducted to determine whether similar results can be expected when PTx is performed in patients who underwent PEIT by investigating the effect of PEIT on subsequent PTx.

Subjects and methods

A total of 80 subjects were included in the study. The patients had a diagnosis of RHPT, for which surgery was indicated, from January 2004 to December 2005. The subjects were divided according to whether they underwent PEIT (PEIT group) or not (non-PEIT group). The absence of ectopic parathyroid glands was confirmed in all patients based on scintigraphy. The surgical procedure performed was a parathyroidectomy plus a partial autotransplantation in all patients. An analysis was performed to compare the pre- and postoperative biochemistry results as well as intact

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Table 1. Clinical and biochemical characteristics of the study patients

Characteristics	PEIT group (<i>n</i> = 19)	Non-PEIT group (<i>n</i> = 61)
Age (years)	56.7 ± 9.7	57.2 ± 10.4
Duration of HD years	16.8 ± 5.9	13.7 ± 7.0
No. of PTGs detected by ultrasonography	3.4 ± 0.7	3.6 ± 0.6
No. of PTGs removed	4.0 ± 0.39	4.1 ± 0.51
Total weight of the removed glands (mg)	2334.2 ± 1296.9	2230.9 ± 1408.7
Amount of bleeding (ml)	34.2 ± 24.7	28.0 ± 22.1
Operating time (min)	178.8 ± 37.5	153.5 ± 34.4 ^a
Preoperative s-Ca level (mg/dl)	10.5 ± 0.7	10.2 ± 0.7
Postoperative s-Ca level (mg/dl)	8.7 ± 0.7	8.8 ± 0.6
Preoperative intact PTH level (pg/ml)	911.4 ± 437.8	816.7 ± 386.3
Postoperative intact PTH level (pg/ml)	93.3 ± 148.7	26.7 ± 10.9
Intact PTH level Year 1 postoperatively (pg/ml)	193.5 ± 259.0	113.0 ± 272.9
Frequency of cases with higher postoperative Intact PTH levels (>60 pg/ml)	5/19	0/61 ^b
Frequency of hoarseness	2/19	1/61

PTGs: parathyroid glands.

^a*P* = 0.0075.

^b*P* = 0.0025.

Table 2. Comparison depending on the times of PEIT performed

	Once or one course (<i>n</i> = 8)	Two or more courses (<i>n</i> = 11)
No. of glands removed	3.9 ± 0.4	4.0 ± 0.4
Total weight of removed glands (mg)	1952.5 ± 624.5	2588.6 ± 1374.9
Operating time (min)	177.6 ± 26.5	179.5 ± 43.9
Preoperative intact PTH (pg/ml)	795.2 ± 273.1	982.9 ± 511.3
Postoperative intact PTH (pg/ml)	22.8 ± 17.8	176.4 ± 153.1 ^a

^a*P* < 0.05.

PTH levels (preoperative, postoperative and Year 1 postoperatively), number of the parathyroid glands detected by ultrasonography, operation time, the amount of bleeding, the number of parathyroid glands removed, the total weight of the removed glands and the frequency of the postoperative complication of hoarseness. Informed consent was obtained from all subjects.

Statistical analysis

For comparisons of the PEIT and non-PEIT groups, the homogeneity of variance for each group was confirmed using the *F*-test, and testing was performed using Student's *t*-test. If neither group had a normal distribution, then the Mann–Whitney test was performed. In addition, for the analysis using a 2 × 2 contingency table, such as testing for the frequency of postoperative complications and patients with high postoperative PTH levels, Fisher's exact probability test was performed. The results were shown as mean ± SD. A *P*-value < 0.05 was considered to be statistically significant.

Results

Comparison according to the history of PEIT

There were 19 patients in the PEIT group and 61 in the non-PEIT group, with no significant difference in the back-

ground of patients in these groups. The operation time was significantly longer in the PEIT group, but no significant differences were noted in the amount of bleeding or the frequency of recurrent nerve paralysis (Table 1). Pre- and postoperative blood test results showed no significant difference to exist in the preoperative biochemistry results and intact PTH levels; however, the intact PTH levels immediately following surgery were slightly higher in the PEIT group. No difference was noted in the intact PTH levels between the PEIT and non-PEIT groups at 1 year after the operation. The number of the patients with an intact PTH level >60 pg/ml on postoperative Day 1 was significantly higher in the PEIT group (Table 1). A comparison of patients who underwent one course of PEIT and those who underwent two or more courses of therapy revealed no difference in the number of the parathyroid glands removed, the total weight of the removed glands and the operation time, although the postoperative intact PTH levels were found to be significantly higher in those who underwent two or more courses of PEIT (Table 2).

Discussion

PEIT and PTx are both options for the treatment of severe RHPT refractory to medical treatment. PEIT can be performed with minimal invasiveness and it is easily performed on an outpatient basis [11,12]. However, its efficacy is somewhat uncertain in some patients. A previous study showed that patients in whom these intact PTH levels sufficiently decreased to the target levels were those with a lower density of blood flow distribution in the parathyroid glands. The remaining patients had little response to PEIT [13]. Although the therapeutic outcome of PTx has been reported to be reliable and stable, it is difficult to perform PTx following PEIT due to adhesion, which is a significant adverse event associated with PEIT [10].

The effects of PEIT prior to a PTx on subsequent surgery were investigated. Postoperative data were studied to assess the degree of difficulty of surgery due to adhesions associated with PEIT. There was no significant difference in

the amount of bleeding, which is an index for the difficulty of surgery; however, a significant difference was observed regarding the operation time. In addition, the postoperative intact PTH levels were somewhat but not significantly higher in the PEIT group than in the non-PEIT group. These findings suggest that repeated PEIT damages the capsule of the parathyroid gland, thus causing the dissemination of hyperplastic parathyroid cells. Some residual parathyroid tissue caused by adhesions and dissemination might exist during a parathyroidectomy, thus leading to higher postoperative intact PTH levels. PEIT can cause not only adhesions but also dissemination.

PEIT can be a useful strategy for controlling RHPT if it is performed for patients who are likely to respond to the therapy [14]. However, based on the surgical outcomes for patients who underwent PEIT, repeated PEIT should be avoided and surgical treatment is preferable in patients who demonstrate a poor response to the initial PEIT.

In conclusion, PEIT prior to a PTx can affect subsequent surgical outcomes due to associated adhesion and dissemination; therefore, PEIT should be performed only for those who are likely to respond to the therapy, and repeated PEIT should be avoided. PEIT should be administered with a full understanding of its advantages and disadvantages. For patients with a possibility of either a decreased efficacy or lack of efficacy for PEIT, it is important to consider PTx from the very beginning of treatment.

Conflict of interest statement. None declared.

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