



Mathematical modelling for representation of the primary hyperparathyroidism

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The parathyroid is an important endocrine gland that plays crucial role in biomineral homeostasis in human beings. A common parathyroid endocrine disorder is the primary hyperparathyroidism (1). The physiological changes due to the primary hyperparathyroidism is very interesting. In medical physiology, the application of the medical mathematical modelling for representation of the medical disorders is very interesting (2). Here, the authors use the simple mathematical modelling technique for representing the condition of primary hyperparathyroidism. Basically, the stable stage of parathyroid function is expected and there must be a stable parathyroid hormone pooled within parathyroid. This pool is affected by the production rate of hormone by the endocrine cell within the parathyroid gland, the hormonal secretion rate into the plasma circulation and the decay of the hormone molecule. This pool can be represented as the following equation; “overall parathyroid pool (A) = production from parathyroid (B) – secretion to plasma (C) – decay of hormone (D)”. Based on this equation, the A is usually normalized to a stable state by the human physiological function and D usually occurred at a fixed rate. Hence, the main variable parameters are B and C. The equation can be rearrange as “ $C = B - A - D$ ”. Since A and D are fixed parameter

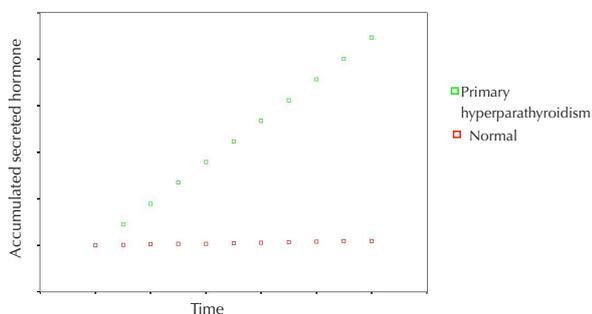


Figure 1. The expected accumulated secreted hormone in the plasma pool in normal and primary hyperparathyroidism.

■ Implication for health policy/practice/research/ medical education

At any time, the accumulated secreted hormone in the plasma pool can be calculated using integral approach and represented as “ $\int_0^t C(t) = B^2t/2 - Et + k$ ” where k is a constant.

■ **Keywords:** Parathyroid glands, Primary hyperparathyroidism, Parathyroid pool

as already mentioned. Hence, the equation can be written as “ $C(t) = B(t) - E$ ” where E is a constant at any time (t). At any time, the accumulated secreted hormone in the plasma pool can be calculated using integral approach and represented as “ $\int_0^t C(t) = B^2t/2 - Et + k$ ” where K is a constant. In primary hyperparathyroidism, an increase in production of hormone is expected (3) and the increased amount of B can be expected. The expected accumulated secreted hormone in the plasma pool in normal and primary hyperparathyroidism is shown in Figure 1. The accumulated secreted hormone in primary hyperparathyroidism is significantly increased comparing to normal stage when time passes. This study can be a good referencing data for further pathophysiology study in primary hyperparathyroidism.

Authors' contribution

SY and VW wrote the manuscript equally.

Conflicts of interest

The authors declare no conflict of interest.

Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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