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ORIGINAL ARTICLE

Melatonin concentrations in patients with large goiter before and after surgery

Michal Karasek,[1,2] Aleksander Stankiewicz,[3] Elzbieta Bandurska-Stankiewicz,[3] Krystyna Zylinska,[4] Marek Pawlikowski [4] & Krzysztof Kuzdak [5]

1. Laboratory of Electron Microscopy, Chair of Pathomorphology, Medical University of Lodz, Lodz, Poland.
2. Clinic of Endocrinology, Polish Mother's Memorial Hospital – Research Institute, Lodz, Poland.
3. Regional Hospital in Olsztyn, Poland.
4. Department of Experimental Endocrinology and Hormone Diagnostics, Institute of Endocrinology, Medical University of Lodz, Lodz, Poland.
5. Department of Surgical Endocrinology, Institute of Endocrinology, Medical University of Lodz, Lodz, Poland.

Correspondence to: Prof. Dr. Michal Karasek, Laboratory of Electron Microscopy, Chair of Pathomorphology, Medical University of Lodz, 92-216 Lodz, Czechoslowacka 8/10, Poland.
TEL./FAX: +48 42 675 7613
E-MAIL: karasek@psk2.am.lodz.pl

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Abstract

OBJECTIVES. Surgical removal of a very large goiter may traumatize adjacent anatomical structures. The manipulations that involve superior cervical ganglia may alter melatonin secretion. To test this hypothesis we decided to study diurnal serum melatonin profiles in patients with a very large goiter before and after the surgery.

MATERIAL AND METHODS. The study was performed on 10 women (mean age–46.5±1.6 years; mean±SEM; range 39–54 years) with very large non-toxic nodular goiter (mean thyroid volume—125.8±25.9 cm^3; mean±SEM; range 82.6–326.7 cm^3). Diurnal serum melatonin profiles were estimated two days before the operation and 10 days after the surgery. Blood samples were collected at 08:00, 12:00, 16:00, 20:00, 22:00, 24:00, 02:00, 04:00, 06:00 and 08:00 h. Melatonin concentration was measured using RIA kit.

RESULTS. Nocturnal serum melatonin concentrations (at 24, 02, and 04 hours) were significantly higher after the surgery than before the operation.

CONCLUSIONS. Very large goiter may compress the superior cervical ganglia altering indirectly the melatonin synthesis. It cannot be excluded, however, that the presence of the large goiter in some other way affects melatonin secretion.

Introduction

Thyroid diseases are increasingly diagnosed and goiter present a serious problem in many countries [1, 2]. The number of people with goiter is estimated to be 300 – 655 million (approximately up to 12% of the world population) [2, 3]. Surgical removal of the goiter is still one of the basic treatment methods [4, 5]. In Poland the number of thyroidectomies increased from 5,684 in 1982 to 16,482 in 1997 [6]. Surgical removal of very large goiter may traumatize adjacent anatomical structures. Among such structures are superior cervical ganglia which are the main source of pineal gland innervation, and they play a very important role in the control of melatonin synthesis [7, 8]. Therefore, in consequence, the manipulations that involve superior cervical ganglia may alter melatonin secretion. To test this hypothesis we decided to study diurnal serum melatonin profiles in patients with very large goiter before and after the surgery.

Material and methods

The study was performed on 10 women (mean age—46.5±1.6 years; mean±SEM; range 39–54 years) with very large non-toxic nodular goiter (mean thyroid volume—125.8±25.9 cm^3; mean±SEM; range 82.6–326.7 cm^3) admitted to the Regional Hospital in Olsztyn to undergo a thyroidectomy.

Diurnal serum melatonin profiles were estimated two days before the operation and 10 days after the surgery. Each subject served as her own control. One day before and during blood sampling the period of darkness in patients' room lasted from 21:00 to 07:00 h. Blood samples were collected at 08:00, 12:00, 16:00, 20:00, 22:00, 24:00, 02:00, 04:00, 06:00 and 08:00 h; the nighttime samples were taken under dim red light. All blood samples were allowed to clot for 45 min, serum was removed after centrifugation, and stored at –20°C until assayed. Melatonin concentration was measured using RIA kit (DRG Inst. GmbH, Marburg; Cat. No. IH RE 29301, sensitivity 3.5 pg/ml, intra assay CV—8%, inter assay CV—14.8%). The samples from all subjects (pre- and post-assay) were run together. The data were statistically analyzed using paired Student's t-test.

The study was approved by the Regional Committee for Studies with Human Subjects. The experimental protocol was explained to each patient, and informed consent was obtained.

Results

Nocturnal serum melatonin concentrations (at 24, 02, and 04 hours) were significantly higher after the surgery than before the operation (Fig. 1).

Discussion

The relationship between the pineal gland and the thyroid has been suggested in many reports [see 9, 10]. Especially, the involvement of melatonin in the control of proliferation of thyroid follicular cells has been shown in experimental animal models [10, 11]. However, the data on the pineal-thyroid relationship in humans are scarce. No changes were seen in melatonin levels in both hypothyroidism and hyperthyroidism [12]. A decrease in nocturnal melatonin concentrations was observed in the patients with recurrent non-toxic nodular goiter in comparison with the control group of healthy women [13].

We expected that manipulations during surgical removal of very large goiter might alter melatonin secretion via possible lesions of superior cervical ganglia during the surgery. Surprisingly, in all patients nocturnal melatonin concentrations were significantly higher after the operation than before the surgery. One of the possible explanations of this finding is that a very large goiter may compress the superior cervical ganglia altering their function and, subsequently, control melatonin synthesis. It is also possible that the presence of goiter in some other way affects melatonin secretion. We also considered the possibility that lower melatonin concentrations before the surgery could be the effect of pre-surgical stress. However, it seems unlikely because it has been demonstrated that in patients suffering from chronic appendicitis, cholelithiasis, and inguinal hernia mean melatonin concentrations did not differ before and after surgery (2–5 and 2 days, respectively) [14].

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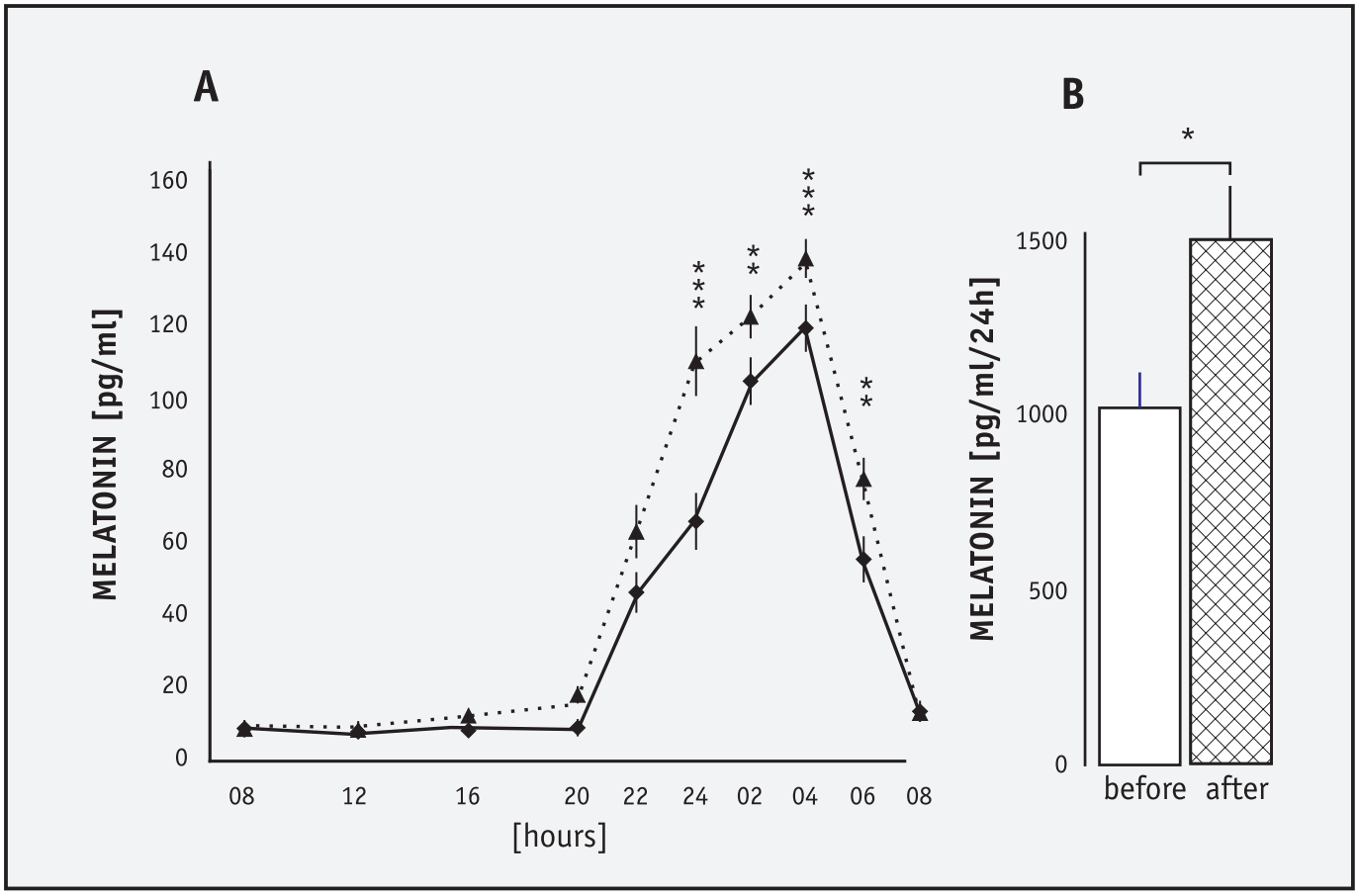

Fig. 1. Diurnal serum melatonin profiles (A) and area under curve (B) in patients with very large goiter before (solid line) and after (dotted line) surgery. Data are expressed as mean±SEM; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

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