

Effect of Bee Stings on Thyroid Function in Hyperthyroid Women

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Abstract

This study was carried out to investigate the effect of bee stings on serum thyroid hormones (T₄&T₃) and thyroid stimulating hormone (TSH) in hyperthyroid women in Khartoum–Sudan. Fifteen women suffering from hyperthyroidism were included in this study (all had the symptoms of the disease) and other fifteen healthy ones were used as a control. Age of all respondents ranged between 30-60 years.

Treatment with bee venom was started by two stings on the first day, then the number was increased to four stings and repeated daily for two weeks. Venous blood samples were collected before and after treatments. Results of hormones analysis showed the bee venom significantly (P <0.05) reduced the levels of serum thyroid T₄ & T₃ hormones compared to those observed before treatments, which were slightly higher relative to those of control subjects.

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However the serum TSH increased significantly ($P < 0.05$) in response to the bee venom treatment. Results of this study indicated that bee stings can efficiently be used for treatment of hyperthyroidism and further studies are needed to confirm these findings.

Introduction

Apitherapy is medicinal use of the bee product to promote health and healing. The term comes from the latin (Apis=bee) and (therapy= treatment) (America Apitherapy society, 2001). The bee products include royal jelly, propolis, pollen, honey and bee venom.

It was mentioned in Chinese texts that apitherapy is an old practice (before 2000 years). It began as part of flock medicine and even to day most of the people using it, are either doing it themselves or with the help of practioners (Michael, 1999). From early days of islam prophet Mohamed (God prays and peace on him) stated that (Elghozi, 2003) cure in drink of honey or cauterization.

The bee venom is one of the important products of the honey bees. It comes from the venom sac, located at the level of the last segment of the worker abdomen, its quantity, and composition depend on the pollen consumed and the age of the bee. The venom is synthesized mainly as a defensive mechanism against predators, it causes pain and may have some pharmacological activity in the potential predators

(Shemidt and Buchmann, 1992). Each one sting was found to contain 0.1mg of pure dried venom (American apitherapy society, 2001). Bee venom was used for treatment of autoimmune diseases particularly arthritis and multiple sclerosis since 1950s (Ryan, 1954). Later on the bee sting was successfully used for treatment of malaria which “was” widely spread in the sudan (Kawkub 2003, personal.com).

Thyroid gland produces two iodoamino acids hormones 3.5.3 triiodothyronine (T_3) and 3,5,3,5 tetraiodothyronine (T_4 , thyroxine), which have important role in regulating general metabolism, development and tissue differentiation (Granner, 1999). The growth and function of the thyroid gland and the peripheral effects of thyroid hormones are controlled by at least four mechanisms:

- 1- The classic hypothalamo-pituitary-thyroid axis.
- 2- The pituitary and peripheral deiodinase.
- 3- Autoregulation of hormone synthesis by thyroid gland itself in relation to iodine supply.
- 4- Stimulation or inhibition of thyroid function by TSH receptor auto antibodies. In addition, the effects of T_3 may be modified by the status of the T_3 receptor (repression or activation) and potentially by nonthyroidal T_3 receptor agonists or antagonists, (Greenspan, 2003).

Diseases of the thyroid gland are manifested by qualitative or quantitative alterations in hormone secretion, enlargement of

the thyroid (goiter) or both. Insufficient hormone secretion results in the syndrome of hypothyroidism (myxedema) in which decreased caloric expenditure (hypometabolism) is a principal feature, conversely, excessive secretion of active hormone result in hypermetablism and other feature of a syndrome termed hyperthyroidism or thyrotoxicosis (which is characterized by high blood levels of thyroid hormones) (greenspan, 2003; Granner, 1999).

This hyperthyroidism can occur at an early stage or it may occur later in life. The increased thyroid hormone secretion is due to abnormal immunoglobulins (IgG), known as thyroid stimulating immunoglonbulins (TS1), acting by stimulating TSH receptors on the follicular cells, due to the increased T₃ and T₄ levels, TSH secretion is inhibited and its circulating level in thyrotoxicosis is usually low (Sukkar et.al, 2000).

The thyroid diseases are more frequent in women, which is probably related to the fact that many thyroid diseases are of the autoimmune type, secondary to the effect of sexual steroids in the immunological system. Although it had never been completely cleared up, it seems that estrogens and progeterones may modulate the lymphocyte differentiation as well as the induction of autoimmune response (Medina et.al, 2002).

Treatment of hyperthyroidism include radioactive Iodine and antithyroid drugs (chemophtery) or surgical excision of the thyroid gland. The selection of a particular form of treatment of hyperthyroidism is determined by the patient status and

circumstances. This includes the sex, age, associated disorders and the size of the gland. Radioactive iodine is the first line treatment of hyperthyroidism, it induced destruction of the thyroid cells by the local radiation (Harbert, 1984). The second form of chemical therapy (antithyroid drug) for treatment of hyperthyroidism includes thiocyanate, propylthiouracil and inorganic iodine etc. these drugs exert a direct effect on the thyroid gland, to disrupt one of the several steps in the biosynthesis and secretion of thyroid hormones, thus decrease their level in serum. (Capin, 1994, and RAO and Lakshmy, 1995). Although apitherapy is widely used in folkloric medicine, but information is lack on its use as an antithyroid.

In this study the levels of serum T_4 , T_3 and TSH before treatment of suspected patients were used for the evaluation of thyroid functions, these results along with those obtained after treatment and those of the control group were analyzed to investigate the effectiveness of honey bee venom in treatment of hyperthyroidism.

Material and Methods

This study was conducted at Elkhalia investment company in Khartoum, during September to December 2003. Fifteen women suffering from hyperthyroidism were included, their ages ranged between 30-60 years. They were diagnosed according to the levels of thyroid hormones and thyroid stimulating hormone, beside they showed the symptoms of the

disease, except the eye signs of the graves' disease. Fifteen healthy women of similar ages were used as a control group.

Treatment of hyperthyroid patients with bee sting was started by giving each patient two stings on the first day, then the number was increased to four stings from the next day and repeated daily for two weeks. The active honey bee was held at thoracic (around arterial area of the neck) by forcep. The bee was pressed and excited by the forcep and was held for 5 minutes and then removed according to El-sarrag method, (2003).

Blood samples (5ml) were collected from cubical vein of patients before and after treatment. Serum was separated and was kept frozen at -20°C until the hormones were determined. Total T_4 and T_3 were measured by radioimmunoassay (Ria) and TSH was measured by the immunoradiometric assay (IRMA) techniques, in the Sudan Atomic Energy Agency laboratories. Analysis of variance was carried out for results using SAS computer program (SAS, 1988).

Results and Discussion

The effect of bee stings on serum T_4 is presented in Table (1). The level of T_4 in hyperthyroid women (205 nmol/L) was significantly higher ($P < 0.05$) compared to that (96.6 ± 14 nmol/L) of the control group. The bee stings treatment of patients resulted a significant ($p > 0.05$) reduction in T_4 level (115 ± 2.8 nmol/L).

It is well established that the aim of all therapy for hyperthyroidism is to diminish the excessive secretion of the thyroid hormones by blocking the organic binding of iodine and/or destroy the thyroid cells (Salvador, 1998; Rao and lakshmy, 1995). On the other hand hyperthyroidism as an autoimmune disease may respond to external immunoregulatory factors. Boutin et.al (1994) found that the bee venom had immunoregulatory role on the production of IgG antibodies. Therefore the reduction in thyroxine level after treatment of hyperthyroid women with the bee venom may be due to the reduction in IgG, which is a common cause of hyperthyroidism, where the IgG antibodies bind to TSH receptor on the thyroid gland stimulating thyroid hormones production, So the mechanisms of the action the bee venom has not been elucidated, it is conceivable that other mechanisms may be involved, partly for the complex composition of the bee venom and its broad action on other biochemical parameters, (Dotimas and Hider, 1987).

Results given in table (1) show the effect of bee venom on serum T₃ level. The level of serum T₃ in hyperthyroid women (3.3 ± 0.09 nmol/L) was significantly ($p < 0.05$) higher relative to that of the control group (1.5 ± 0.1 nmol/L) and its level was significantly reduced after treatment. These result are in line with the above mentioned about T₄. (Weatherall *et.al*, 1984)

The effect of bee venom on serum TSH level is presented in Table (1). It is obvious that the level of serum TSH of thyroid

patients (0.3 ± 0.09 mIU/L) was significantly lower ($P < 0.05$) than that of the control groups (1.4 ± 0.1 mIU/L). treatment hyperthyroid patients with bee venom elevated its level significantly. The elevation in serum TSH level after the bee stings treatment may be attributed to the reduction of serum thyroid hormones as the pituitary secretion of TSH is greatly affected by the circulating thyroid hormones, and/or the secretion of TSH may be stimulated by one or more of the active ingredients of the bee venom. It was found that injection of rats with 0.5 mg/kg body weight of melittin compound of the bee venom caused an increase in the pituitary function (Dunn and Killion, 1988). On the other hand the previously mentioned effect of bee venom on regulating immune globulins may suggest disassociation of antibodies from TSH receptors, thus normalize hypothalamopituitary-thyroid axis. These results throw light on the effect of bee stings on thyroid function. Further studies are needed for confirmation and understanding of the mode of action of apitherapy.

Table (1) the effect of bee venom on serum T₄, T₃ and TSH levels in hyperthyroid women.

Hormones Group	T₄ nmol/L	T₃ nmol/L	TSH mIU/L
A ← Patient before treatment	205 ± 5.2 b	3.3 ± 0.09 b	0.3 ± 0.09 b
B ← patient of the treatment	115 ± 2.8a	2.5 ± 0.1a	1.2 ± 0.1a
C ← control	96.6 ± 1.4a	1.5 ± 0.1a	1.4 ± 0.1a

Means within columns followed by different letters are significantly different (p <0.05).

Conclusion & Recommendation

Thyroid function disorders (hyperthyroidism) are widely spread especially among females. Findings of this study may suggest bee stings as a promising antithyroid treatment for hyperthyroid patients. Further research is suggested to confirm these results, especially in the following fields:

1. Isolation of the various constituents of the bee venom.
2. To study the biochemical effect of the active ingredients on the various tissues.
3. To consider the various factors related to hyperthyroidism e.g. sex, age and pregnancy etc.

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تأثير لسع النحل علي وظيفة الغدة الدرقية في حالة فرط إفراز الغدة الدرقية للنساء

الملخص:

أجريت هذه الدراسة لمعرفة تأثير لسع النحل علي مستوى هرمونات الغدة الدرقية (رباعي ايودو وثلاثي ايودو الثيرونين "T₄ & T₃") والهرمون المحفز للغدة الدرقية (TSH). الخرطوم – السودان.

استخدمت في هذه الدراسة 15 امرأة مصابة بمرض فرط إفراز هرمون الغدة الدرقية (تبدو عليهن أعراض المرض) و15 امرأة سليمة كمجموعة تحكم تتراوح أعمارهن بين 30-60 سنة.

بدأ العلاج بسم النحل بعدد اثنين لسعة في اليوم الأول ثم ضوعفت لعدد أربعة لسعات في اليوم الثاني واستمرت لمدة أسبوعين. أخذت عينات دم قبل بدء العلاج وبعده لقياس تركيز الهرمونات أعلاه. أظهرت النتائج أن مستوى الفرق معنوي بين هرمونات الغدة الدرقية بدم النساء المريضة مقارنة مع مجموعة التحكم قبل العلاج، وكان تأثير العلاج ايجابيا حيث انخفض مستوى هرمونات الغدة الدرقية وان الفرق في مستويهما بعد العلاج غير معنوي، كما ارتفع مستوى الهرمون المحفز للغدة الدرقية إلي التركيز الطبيعي بعد العلاج وكان الفرق غير معنوي بعد العلاج مقارنة مع مجموعة التحكم.

تؤكد الدراسة فاعلية سم النحل في علاج فرط الغدة الدرقية وتشجع إجراء المزيد من البحوث لتأكيد جدوى العلاج لسع النحل لمثل هذه الحالات.