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The effect of iodine in patients using povidone-iodine mouth wash on thyroid function

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ABSTRACT

Background: Thyroid gland is a key part of endocrine system and it performs its functions via two most important thyroid hormones thyroxine (T4) and triiodothyronine (T3). Thyroid gland is mainly regulated by thyroid-stimulating hormone (TSH). Povidone-iodine (polyvinylpyrrolidone-iodine, PVP-I) mouthwash is commonly used to treat infections of the oral cavity and oropharynx and iodine released from PVP-I can interfere with thyroid function. In this study the effect of brief treatment with povidone-iodine mouth wash on thyroid function was assessed. The aim of the present study was to assess whether iodine is absorbed through oral transmucosal route and interfere with TSH in serum.
Methods: Fifty one patients with acute and chronic pharyngitis and tonsillitis were recruited and out of which forty-seven patients were treated with 20 ml of PVP-I mouthwash twice daily for 3 weeks and blood was collected from the respective patients before and after treatment with PVP-I. Serum thyroid stimulating hormone concentration was measured from the collected blood samples of the patients.
Results: In the present study there was a small increase in serum TSH concentration during the therapy with PVP-I but the concentration determined was within the normal range.
Conclusions: Based on the results of this study we conclude that the use of PVP-I for a brief period transiently increase TSH value and prolonged use should be avoided in people with an increased risk of thyroid dysfunction and other autoimmune disorders.

Keywords: Povidone-iodine, Thyroid function, Thyroid stimulating hormone

INTRODUCTION

Iodine is a micronutrient essential for the production of thyroid hormones and the main source of iodine is the diet containing foods rich in iodine.[1] Thyroid gland is a key part of endocrine system and it performs its functions via two most important thyroid hormones: thyroxine (T4) and triiodothyronine (T3). Thyroid gland extracts iodine from blood and combines amino acid tyrosine to make T3 and T4 which is under the control of both pituitary gland and hypothalamus via thyroid stimulating hormone (TSH) and TSH releasing hormone (TRH), respectively.[2,3] Thyroid hormone synthesis and secretion is mainly regulated by TSH secreted by pituitary gland and thereby protects the body from thyroid gland related diseases like hypo- and hyperthyroidism.

When large amount of iodine is consumed, reduction in thyroid hormones synthesis and release occurs and this phenomenon is called the "Wolff Chaikoff effect.[4] Thyroid hormone levels return to normal after a few days of this effect, termed the "escape" phenomenon.[5] However, in some susceptible patients thyroid cannot escape from the transient inhibitory effect of iodine and hypothyroidism may develop after prolonged iodine

administration.[6] High iodine intake can also lead to iodine-induced hyperthyroidism. Basedow observed that there is occurrence of thyrotoxicosis arising from excess iodine exposure termed Jod-Basedow phenomenon.[7] So excessive intake of iodine can cause either hypo- or hyper thyroidism in susceptible individuals.[8] Povidone iodine (polyvinylpyrrolidone iodine, PVP-I) mouth wash is commonly used to treat infections of the oral cavity and oropharynx. It is active against Gram positive and negative bacteria, bacterial spores, fungi, protozoa and several viruses.[9] PVP-I mixture is a complex of bactericidal agent iodine and carrier molecule povidone. PVP-I has a broad spectrum of antimicrobial activity and free iodine (from povidone iodine) readily penetrate bacterial membrane channels (porins) and cause oxidation of proteins within the bacterial cytoplasm.[9] Since iodine is released from PVP-I, it can also interfere with thyroid function. Excess iodine in some patients can interfere with the synthesis of thyroid hormones resulting in low thyroid hormone levels or hypothyroidism and can be diagnosed by elevated TSH levels.[10,11] TSH is the considered and accepted to be the first-line screening test for the diagnosis of the majority of patients suspected of having hypothyroidism or hyperthyroidism and is measured by automated immunoassays.[12] In this study, patients with acute and chronic pharyngitis and tonsillitis were treated with PVP-I. The effect of brief treatment with PVP-I mouth wash on thyroid function was assessed by measuring TSH levels.

METHODS

Study population

Subjects with acute and chronic pharyngitis and tonsillitis were recruited for the study and the effect of brief treatment of PVP-I containing mouth wash on thyroid function was assessed. Individuals whose age was less than 18 years and above 60 years and those who reported having hypo- and hyper thyroidism, medical or surgical comorbidities, autoimmune disorders and pregnant or nursing mothers were excluded from the study. Forty-seven patients were treated with PVP-I out of which 23 were male and 24 were female.

The study was conducted over a period of four months from May 2018 to August 2018 in the Department of ENT, Stanley Medical College, Chennai and the study received prior approval from Institutional Ethics Committee. Informed consent was obtained from the patients.

Mouth rinse protocol

Patients were given commercially available PVP-I mouth wash and instructed to rinse 20 ml of diluted mouthwash (5 ml of PVP-I mouthwash in 15 ml of water) twice daily for 3 weeks.

Blood collection procedure

Blood was collected from each patient before and after treatment with PVP-I for 3 weeks either on in/outpatient basis in the laboratory of our institute.

Blood analysis method

TSH values were calculated using Electro chemical luminescent immuno assay (ECLIA) method.

Statistical analysis

Difference in TSH concentration in patients before and after treatment with PVP-I mouth wash was analyzed by paired t test ($p<0.05$) (Software used- SPSS version 23).

RESULTS

Age group of patients

The age group of patients studied was in the range of 18 to 60 years. 51 patients were recruited for the study and number of patients in different age groups represented in Table 1.

Table 1: Age group of patients recruited.

Age group (in years)	No. of patients	%
>18	8	15.7
21 to 30	20	39.2
31 to 40	13	25.5
41 to 50	8	15.7
51 to 60	2	3.9

Clinical conditions studied

Different clinical conditions of the patients were studied. Out of 51 patients recruited for the study, 14 had acute and 7 had chronic pharyngitis, 16 had acute and 14 had chronic tonsillitis (Figure 1).

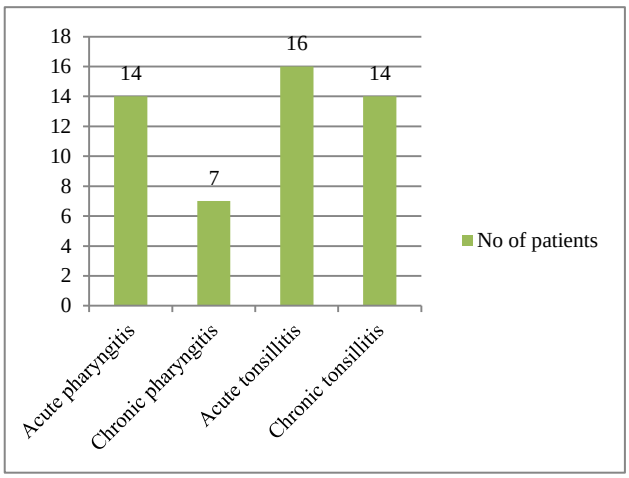

Figure 1: Clinical conditions of the patients studied.

Comparison of TSH Values

Before treatment with PVP-I

The normal range of TSH in blood is 0.5 to 4.2 mIU/ml. Out of 51 patients recruited, 2 patients had TSH value below 0.5 mIU/ml and 2 patients had TSH value above 4.2 mIU/ml. These 4 patients were omitted from the study. So total number of patients treated with PVP-I were reduced to 47. The mean TSH value in patients before treatment with PVP-I was 2.36±1.09 mIU/ml.

After treatment with PVP-I

47 patients were treated with PVP-I for 3 weeks, out of which 44 patients showed slight increase in TSH value but were within the normal range of 0.5 to 4.2 mIU/ml (Figure 2). Three patients showed TSH value slightly above 4.2 mIU/ml. The mean value after treatment with PVP-I was found to be 3.23±1.07mIU/ml. The difference by paired t-test is significant ($p<0.05$) (Software used-SPSS version 23). There was found to be a slight increase in TSH level following mouth rinsing with PVP-I mouth wash but the TSH values were within the normal limit.

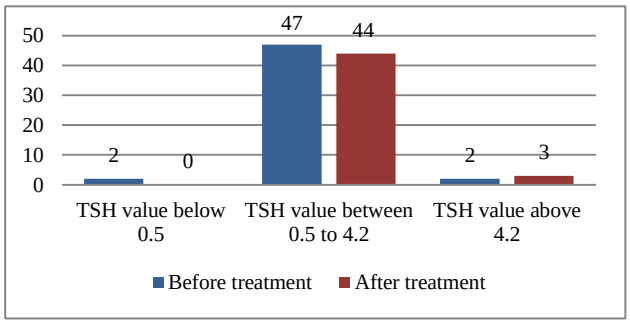

Figure 2: Serum TSH values of patients before and after treatment with PVP-I.

DISCUSSION

Povidone-iodine is used as disinfectant in many patients undergoing various kinds of treatments. One of the potential side effects of chronic excess iodine consumption is the thyroid dysfunction in susceptible individuals. A study was conducted to check whether iodine was absorbed during the chronic 6 month use of PVP-I solution which showed that serum TSH concentrations were slightly but significantly higher after 6 weeks of treatment compared to pre-treatment values and also remained at this slightly increased level throughout the 24 week treatment period and returned to baseline values 3 weeks after the last exposure to PVP-I. However, throughout the study, all serum TSH values were well within the normal range and this small rise in serum TSH was attributed to excess iodine intake.[13] The effect of long-term treatment (3-133 months) with PVP-I on thyroid function was assessed and it was concluded that patients treated with PVP-I for a prolonged time particularly those with risk factors should be monitored carefully for manifestations of thyroid dysfunction.[14] In a case reported, it was observed that the patient developed iodine-induced hypothyroidism due to gargling PVP-I for a prolonged period but hypothyroidism resolved spontaneously upon discontinuation of the gargling.[6] In a previous study conducted in nurses, most of the iodine incorporated during working hours of nurses was attributed to gargling of PVP-I.[15]

The effects of povidone iodine used during caesarean operations on maternal thyroid hormones was analysed and it was determined that when povidone iodine was used, preoperative and postoperative, thyroid hormone changes occurred.[16] Povidone iodine produced a significant increase in postoperative TSH values compared with preoperative values and it influenced TSH values in the mother but due to the short duration of caesarean operations povidone-iodine use may be reliable.[16] However, in operations lasting longer hours, if thyroid hormone level changes occur, the use of povidone-iodine should be considered.

The transcutaneous absorption of iodine in patients with thyroid carcinoma undergoing total thyroidectomy who received single topical application with povidone iodine was assessed.[17] Urinary iodine excretion on the first day after operation increased up to 7 times that of the preoperative value but the increased urinary iodine returned to preoperative values on the third or fifth day after operation.[17]

Many studies have reported elevated urinary or serum iodine level in patients treated with povidone-iodine preparation but returned to normal levels after the cessation of the treatment and some of the study results are mentioned above.[6,13,14] In this study, we have tested whether iodine was significantly absorbed from PVP-I mouth wash and whether it was a risk factor for developing hypothyroidism by studying serum TSH concentrations. Serum TSH concentrations were slightly higher after 3 weeks of treatment compared to pre-treatment values but were well within the normal range. Increase in TSH values though were within the normal limits cannot be neglected.

Limitations

In the present study, there were few research limitations that include small sample size and lesser duration of the study, single variable (serum TSH) was only considered, patient's compliance could not be ensured and dietary intake of iodine was not considered. These limitations are to be considered while performing further studies.

CONCLUSION

In our study, patients treated with PVP-I for a brief period had transient increase in TSH value. Even though PVP-I is used effectively for treating oral or

oropharyngeal infections such as pharyngitis and tonsillitis, prolonged use should be avoided especially in people with an increased risk of thyroid dysfunction and other autoimmune disorders.

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REFERENCES

1. Leung AM, Braverman LE. Consequences of excess iodine. Nat Rev Endocrinol. 2014;10(3):136-4
2. Rousset B, Dupuy C, Miot F, Dumont J. Thyroid hormone synthesis and secretion. In: Feingold KR, Anawalt B, Boyce A, eds. South Dartmouth: Endotext, MDText. com, Inc; 2015.
3. Mariotti S, Beck-Peccoz P. Physiology of the hypothalamic-pituitary-thyroid axis. In: Feingold KR, Anawalt B, Boyce A, eds. South Dartmouth: Endotext, MDText. com, Inc; 2016.
4. Wolff J. Excess iodide inhibits the thyroid by multiple mechanisms. Adv Exp Med Biol. 1989;261:211-44.
5. Markou K, Georgopoulos N, Kyriazopoulou V, Vagenakis AG. Iodine-induced hypothyroidism. Thyroid. 2001;11(5):501-10.
6. Sato K, Ohmori T, Shiratori K, Yamazaki K, Yamada E, Kimura H, et al. Povidone iodine-induced overt hypothyroidism in a patient with prolonged habitual gargling: urinary excretion of iodine after gargling in normal subjects. Intern Med. 2007;46(7):391-5.
7. Leung AM, Braverman LE. Iodine-induced thyroid dysfunction. Curr Opin Endocrinol Diabetes Obes. 2012;19(5):414-9.
8. Katagiri R, Yuan X, Kobayashi S, Sasaki S. Effect of excess iodine intake on thyroid diseases in different populations: A systematic review and meta-analyses including observational studies. PLoS One. 2017;12(3):e0173722.
9. Lachapelle JM, Castel O, Casado AF, Leroy B, Micali G, Tennstedt D et al. Antiseptics in the era of bacterial resistance: a focus on povidone iodine. Clin Pract. 2013;10(5):579.
10. Chung HR. Iodine and thyroid function. Ann Pediatr Endocrinol Metab. 2014;19(1):8-12.
11. Kohler S, Senn O, Saleh L, Wass JAH, Schmid CH. Timing of thyroxine dose adjustment in hypothyroid patients: when are TSH levels stable?. J Thyroid Disord Ther. 2014;3(3):1000161.
12. Pirahanchi Y, Jialal I. Physiology, Thyroid Stimulating Hormone (TSH). In: Stevenson RL, Pratt H, ed. Treasure Island. StatPearls Publishing; 2019.
13. Ader AW, Paul TL, Reinhardt W, Safran M, Pino SAM, Mcarthur W, et al. Effect of mouth rinsing with two polyvinylpyrrolidone-iodine mixtures on iodine absorption and thyroid function. J Clin Endocrinol Metab. 1988;66(3):632-5.
14. Nobukuni K, Hayakawa N, Namba R, Ihara Y, Sato K, Takada H, et al. The influence of long-term treatment with povidone-iodine on thyroid function. Dermatol. 1997;195(S2):69-72.
15. Nobukuni K, Kawahara S. Thyroid function in nurses: the influence of povidone-iodine hand washing and gargling. Dermatol. 2002;204(S1):99-102.
16. Findik RB, Yilmaz G, Celik HT, Yilmaz FM, Hamurcu U, Karakaya J. Effect of povidone iodine on thyroid functions and urine iodine levels in caesarean operations. J Matern Neonatal Med. 2014;27(10):1020-2.
17. Tomoda C, Kitano H, Uruno T, Takamura Y, Ito Y, Miya A, et al. Transcutaneous iodine absorption in adult patients with thyroid cancer disinfected with povidone-iodine at operation. Thyroid. 2005;15(6):600-3.

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