

ASSESSMENT OF DOPPLER INDICES OF SUPERIOR THYROID ARTERY IN CLINICALLY EUTHYROID ADULTS

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Received : 24/09/2022

Received in revised form : 29/10/2022

Accepted : 08/11/2022

Keywords:

Color flow Doppler ultrasonography, Thyroid gland, pulsatility index.

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DOI: 10.47009/jamp.2022.4.5.81

Source of Support: Nil,

Conflict of Interest: None declared

Int J Acad Med Pharm

2022; 4 (5); 399-401



Abstract

Background: To assess doppler indices of superior thyroid artery in clinically euthyroid adults. **Materials and Methods:** Seventy- six adult clinically euthyroid patients of both genders were included in the study. All patients underwent detailed clinical evaluation including history taking, resting pulse rate, neck examination. Ultrasonography of the thyroid gland with doppler of bilateral STAs was performed and mean values of PSV, RI, and PI were calculated. **Result:** Out of 76 patients, male comprise 30 and females 46. The mean peak systolic velocity (PSV) in males was 17.6 cm/sec and in females was 16.9 cm/sec. The mean pulsatility index (PI) in males was 1.2 and in females was 0.86. The mean resistivity index (RI) in males was 0.61 and in females was 0.59. The difference was non- significant ($P < 0.05$). **Conclusion:** The mean values of doppler indices of STA in euthyroid subjects revealed no gender difference. These values may be used as reference for assessing thyroid status and identifying diffuse thyroid disorders at an earlier stage.

INTRODUCTION

The thyroid gland is one of the most superficial endocrine glands of human body. It is located in the anterior neck and extends from C5 – T1 vertebrae.^[1] It consists of two lobes which are connected by central isthmus.^[2] The functional unit of thyroid gland is the thyroid follicle which produces two thyroid hormones – triiodothyronine (T3) and thyroxine (T4) and calcitonin. Thyroid hormones are essential for the metabolism, growth and protein synthesis. Another important hormone called calcitonin is responsible for calcium homeostasis.^[3] Ultrasound of thyroid gland is nowadays the most common investigation as thyroid pathologies are associated with alterations in thyroid volume, echogenicity and blood flow patterns of the thyroid gland.^[4] In early stages of diseases, thyroid glandular parenchyma is often found normal. Pathological studies have found altered glandular vascularity in various diseases. Doppler studies on thyrotoxicosis have found high systolic velocities. A number of studies have found the alterations in glandular vascularity in various thyroid disorders.^[5] High systolic velocities have been found in thyroid arteries with Doppler studies; the peak systolic velocity (PSV) of the superior or inferior thyroid arteries has been found to be useful in

differentiating various causes of hyperthyroidism. Doppler ultrasound of the thyroid gland is cheap and easily available test with no radiation exposure and is less time consuming.^[6] The present study aimed at assessing doppler indices of superior thyroid artery in clinically euthyroid adults.

MATERIALS AND METHODS

A sum total of seventy- six adult clinically euthyroid patients of both genders were included in the study. Approval from ethical review committee of the institute was obtained. All enrolled patients gave their written consent for participation.

All patients underwent detailed clinical evaluation including history taking, resting pulse rate, neck examination. Patients were made to lie in supine position with the neck extended. Linear probe of frequency 7–12 MHz was used with a coupling agent. B mode scan was done to look for echogenicity of the gland. Ultrasonography of the thyroid gland with doppler of bilateral STAs was performed and mean values of PSV, RI, and PI were calculated. The results were compiled and subjected for statistical analysis using Mann Whitney U test. P value less than 0.05 was set significant.

RESULTS

Out of 76 patients, male comprise 30 and females 46 [Table 1].

The mean peak systolic velocity (PSV) in males was 17.6 cm/sec and in females was 16.9 cm/sec. The

mean pulsatility index (PI) in males was 1.2 and in females was 0.86. The mean resistivity index (RI) in males was 0.61 and in females was 0.59. The difference was non- significant ($P < 0.05$) [Table 2, Figure 1].

Table 1: Patients distribution

Total- 76		
Gender	Male	Female
Number	30	46

Table 2: Superior thyroid artery doppler indices

Parameters	Males	Females	P value
Peak systolic velocity (PSV) cm/sec	17.6	16.9	0.94
Pulsatility index (PI)	1.2	0.86	0.82
Resistivity index (RI)	0.61	0.59	0.97

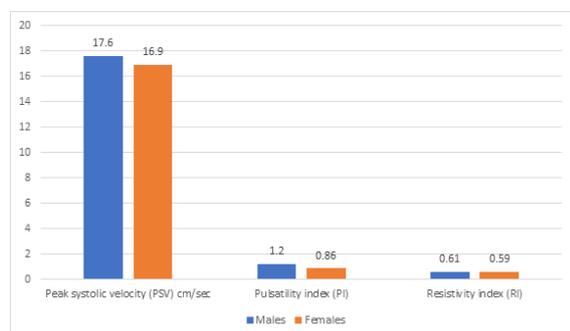


Figure 1: Superior thyroid artery doppler indices

DISCUSSION

Diseases of thyroid gland are very common worldwide. There is a significant burden of thyroid diseases reported from India as well.^[7] Various studies report that around 42 million people in India suffer from thyroid diseases. Thyroid diseases range from various congenital anomalies, inflammatory diseases, autoimmune diseases and tumors.^[8] Pathological disorders of thyroid include simple goiter, hyperthyroidism, hypothyroidism, thyroid nodules, thyroiditis and thyroid cancers. Diagnosis of thyroid diseases is most commonly done by estimating thyroid hormone levels in the blood. Ultrasonography of thyroid gland also is very practical approach in diagnosing thyroid diseases.^[9] The superficial location of thyroid gland makes the evaluation of anatomy, normal anatomical variants and pathological conditions by Doppler ultrasonography feasible.^[10,11] The present study aimed at assessing doppler indices of superior thyroid artery in clinically euthyroid adults.

Our results showed that out of 76 patients, male comprise 30 and females 46. Salroo et al,^[12] evaluated thyroid volume and spectral indices in normal euthyroid adults. 182 normal euthyroid adults (102 males and 80 females) were included in the study. The mean thyroid volume was 7.8 ± 1.9 ml with no significant difference in males and females. The mean peak systolic velocity obtained was 15.65 ± 6.5 cm/s. The mean pulsatility index and

resistivity index were 0.95 ± 0.29 and 0.58 ± 0.13 , respectively. There was no significant difference in the values obtained among both genders, and no significant difference was seen in values of the right and left inferior thyroid arteries. The study showed no significant difference in the indices of thyroid volume and the inferior thyroid arteries measured by Doppler ultrasonography in euthyroid adult males and females. As thyroid vascularity is altered in many thyroid pathologies, the study will serve as the baseline for the evaluation of thyroid volume and Doppler parameters in patients with altered thyroid function.

Our results showed the mean peak systolic velocity (PSV) in males was 17.6 cm/sec and in females was 16.9 cm/sec. The mean pulsatility index (PI) in males was 1.2 and in females was 0.86. The mean resistivity index (RI) in males was 0.61 and in females was 0.59. Joish et al,^[13] found the normal range of Doppler indices like mean peak systolic velocity (PSV), resistivity index (RI), and pulsatility index (PI) of STA in clinically euthyroid adult individuals. A total of 208 subjects, with a mean age of 37.7 years, underwent Doppler evaluation of STA; 148 of them were women and 60 were men. The mean PSV obtained was 16.94 ± 5.3 cm/s. Mean PI and RI were 0.93 ± 0.31 and 0.5 ± 0.13 , respectively. There was no significant difference in the values obtained among both the genders. Kim et al,^[14] enrolled 60 control subjects to compare PSV of STA in Graves' disease and destructive thyroiditis and found a mean PSV of 17.55 cm/s.

In a study by Trimboli et al,^[15] a normal appearing thyroid gland on B mode ultrasound scan did not correlate with normal thyroid hormone levels in 25% cases. Jebreel et al,^[16] found that there was varying expression of vascular endothelial growth factor gene in different types of thyroid pathologies, both benign and malignant. Singh et al,^[17] consisted of 140 patients divided into two groups 70 each i.e normal thyroid and pathological thyroid respectively. The mean age of the pathological group was 44.11 ± 10.54 years and mean age of normal group was 42.54 ± 10.27 years. The study

consisted of 27 males and 113 females. Totally 119 were hypothyroid and 21 were hyperthyroidism. In the pathological group 6 had low T3 and t4 levels and 17 had increased TSH levels whereas in the normal group 7 had increased TSH levels. Pathological group the mean PSV was 21.87 ± 1.20 , mean PI was 1.02 ± 0.23 and mean RI was 0.74 ± 0.06 . The normal group the mean PSV was 16.4 ± 1.29 , mean PI was 0.91 ± 0.46 and mean RI was 0.54 ± 0.04 . The results suggested patients with increased TSH levels had increased PSV, PI and RI which was significant.

CONCLUSION

The mean values of doppler indices of STA in euthyroid subjects revealed no gender difference. These values may be used as reference for assessing thyroid status and identifying diffuse thyroid disorders at an earlier stage.

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