Xournals

Academic Journal of Medical and Health Care Sciences

ISSN UA | Volume 01 | Issue 01 | January-2019

Dysfunctioning Thyroid- A Fatal Risk for Men and Women.

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Available online at: www.xournals.com

Received 6th September 2018 | Revised 19th October 2018 | Accepted 24th December 2018

Abstract:

Thyroid is an endocrine gland that is a very essential part of human body as it secret the hormones that almost effects every part of the body, it not only has effect on human body development but it also effects the sexual activity and fertility rate of a person irrespective of his or her sex. Thyroid gets readily effected by several diseases and gives rise to any one of the two conditions one hyperthyroidism and other would be hypothyroidism. Such symptoms can now be temporarily managed with the help of various drugs.

Our study starts with the aim of finding out whether the condition or let's say health of the thyroid has any direct or indirect influence over the fertility rate of the females and males or not and if yes, can it be of risk to their life. In order to come to a conclusion work of many meticulous researchers have been taken into consideration and it had been found that women or men both when had dysfunctioning thyroid had effected fertility rate. Not only this in females it was found that the menstrual pattern was highly influenced because of the thyroid hormone.

Keywords: *Thyroid, Hypothyroidism, Hyperthyroidism, Fertility, Sperms.*

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Introduction

In 130-120 A.D Galen described about thyroid in his work "De Voce". It was termed as thyroid by Thomas Whorton in (1614-1673), because thyroid gland is at proximity to the thyroid cartilage.

In Greek and German its name is "*thyreos" and "Schilddruse"* respectively which means shield but given the appearance of this very gland, it appears to be of butterfly in shape or when seen is observed to be as capital H. As it consist of two lateral lobes which remains connected to isthmus.

When talking of characteristic features of this gland its lateral lobes are approximately 3 to 4 cm in length and 15 to 20mm wide. It is located between trachea and larynx medially, while laterally it is between carotid sheath and stern mastoid muscles.

When talking about the whole gland at once, it is found that in normal adult it is 6 to 7 cm wide approximately, 3 to 4 cm in length, when talking about weight it ranges from fifteen to twenty five gram. Although the thyroid is asymmetrical in nature. This fact cannot go unnoticed that the right side of the gland that is right lobe is double the size of left lobe. The upper pole of the lobes reaches to the height of thyroid cartilage, however lower pole reaches tracheal ring V-VI.

Thyroid gland and its various hormone play numerous of roles in development of organs, it is mainly useful because it has a vital role in physiological mechanisms in maintaining homeostatic control and growth of body and expenditure of energy in all vertebrates. Thyroid is formed at the floor pharynges, it is basically formed from midline anlage, and it is composed of foregut endoderm cells that builds up thyroid, later these thyroid progenitors specially give raise to the follicular cell pedigree that in due course will form units that will produce hormone known as the "thyroid follicles", which eventually makes up the thyroid gland.

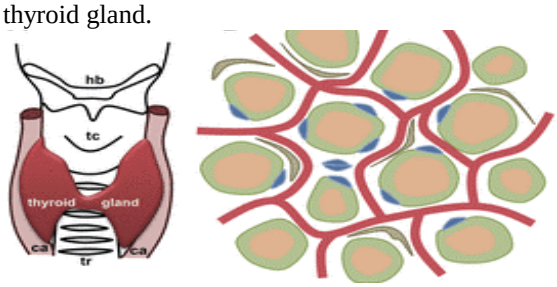

Fig 1: Showing thyroid gland and thyroid follicle

Thyroid follicle has distinguished cells inside these follicles, these cells are epithelial in nature and are known as thyrocytes. These cells produce various thyroid hormones such as, triiodothyronine and thyroxine which is commonly known as T3 and T4. These hormones are dipeptides that are iodinated their synthesis, storage and secretion is a complex reaction.

According to Rousset et al. transport of this hormone is bidirectional in nature.

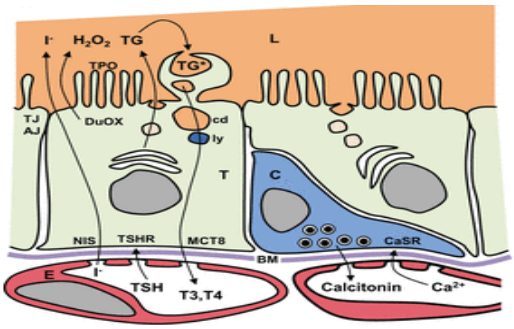

Fig: 2 Depiction of Synthesis, storage and secretion of hormones.

Growth of Thyroid Gland

In mammals a full grown thyroid gland is result of assembling of two diverse embryologic structures. It is believed that this merger origin imitates the endocrine function of the gland.

The embryonic thyroid with its follicular progenitors is created from a focal or middle thyroid anlage on the floor of pharynges. The ultimobranchial bodies (UBBs) and C cell precursor (blue) is created from a combined parallel thyroid anlage (lta) it is restricted to the greatest caudal of the pharyngeal pockets. Both the middle and horizontal primordia evaginate and move installed in sub-pharyngeal mesoderm. In well evolved creatures, these primordia circuit to frame a composite organ, while in every other vertebrate the UBBs form into particular organs: the ultimobranchial organs (UBGs). I-IV, pharyngeal curve numbers. (B) The vertebrate thyroid for the most part shows up as a compacted organ, in spite of the fact that its shape fluctuates from a solitary mass to two isolated bodies, with the bi-lobed organ as a recommended middle of the road.

Thyroid follicles are known to be the functional unit of the thyroid, these are as discussed earlier spherical shaped group of cells that are arranged nearby protein rich material used for storage, and these material are named as colloid.

Functioning of Thyroid Gland

Thyroid functions because of iodide (I-), it is used by follicular cells and for active uptake it requires energy for the process of transport mechanism, the energy remains ATPase dependent.

Let's see this transport mechanism in detail, Iodide is taken up by capillary process by blood in exchange of Na+, by this process thyroid gland gets empowered to concentrate iodide of approximately 30-50 times of the circulating concentration.

On daily basis after normal intake of iodide thyroid gland clears approximately 20ml of plasma iodide per minute. In addition this vigorous time to time uptake seems to be the main reason or control point for the synthesis of hormone, thyroid is stimulated by the hormone thyrotrophin that gets secreted by pituitary gland, and this hormone is commonly known as thyroid stimulating hormone, TSH.

Synthesis of Thyroid hormone

Process of synthesis and storage takes place amongst follicular cells and the colloid, the process of synthesis is a complex one, once iodide gets inside the follicular cell, and it gets oxidized to active iodine by hydrogen peroxidase, in this reaction thyroid peroxidase a heme-containing enzyme works as a catalyst.

Iodine is rapidly conveyed across the follicular cell in same manner which happens at basal surface. Then respectively at the apical-colloid junction iodine gets assimilated with residues produced by glycoprotein thyroglobulin molecules, this residue is commonly known as tyrosine.

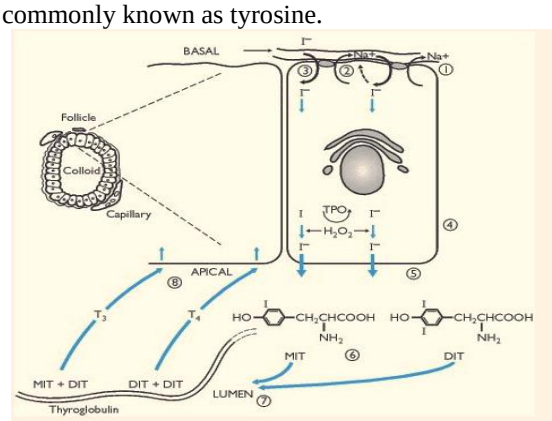

Fig 3: Process of up taking iodine by Thyroid Gland, Pic credit: NCIB.

On an average one quarter of the 140 tyrosine residue gets iodinated, after iodination thyroglobulin moves into colloid of follicle where it gets incorporated in the protein, at this stage a coupling reaction takes place between the pairs of iodinated tyrosine particles. As a result of this coupling, two tyrosine particles produces tetra-iodothyronine or thyroxine (T4) at the same time the reaction of DIT with mono-iodotyrosine (MIT) produces tri-iodothyronine (T3).

Process of Secretion of Thyroid Hormone

Now these thyroid hormones are kept in this state and it keeps on releasing when thyroglobulin particle is occupied back by the follicular cells. Process of secretion is quite simple. TSH influence the colloid droplets that contains thyroglobulin that has thyroid hormone due to which these droplets are taken back up in the follicular cells by the process known as pinocytosis. Once this droplets reaches back it gets fused by lysosomes and hence causes hydrolysis of thyroglobulin which initiates the release of T3 and T4.

On daily basis approximately 100µg T4 and almost 10µg T3 is secreted in blood stream.

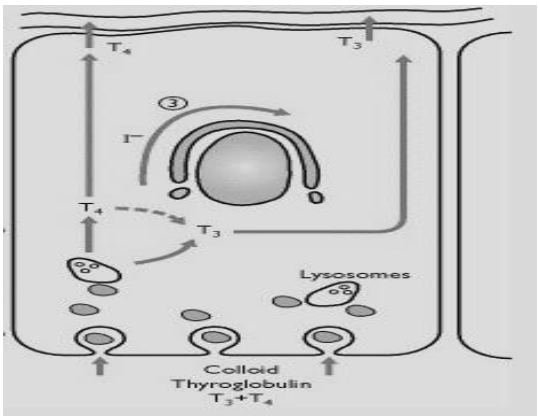

Fig 4: Process of secreting hormone, Pic credit: NCIB.

In multiple study it has been found that dysfunctioning of thyroid can lead to various health issues, as thyroid play a vital role in regulation of hormones.

In this study we will be focusing on the various diseases that dysfunctioning of thyroid causes in a women or a man.

Effects of thyroid hormone on female body

There are many disorders that a female may face because of dysfunctional thyroid. Hyperthyroidism is a condition which is also known as thyrotoxicosis it is a result of elevated T3 and T4 levels in body, it generally comes along with several characteristics

such as- anxiety, hyperactivity, tachycardia and weight loss.

There may be numerous causes of hyperthyroidism few of them are listed below:

- Graves' disease
- Toxic adenoma
- Thyrotoxicosis facticia
- Thyroid malignancy
- Pituitary adenoma

Whereas some of the reasons for hypothyroid disorder could be:

- Cretinism
- Goiter
- Congenital goiter
- Excess iodide
- Idiopathic myxedema
- Hashimoto's syndrome
- Interferon

In view of the fact that thyroid is one of the major endocrine gland Nilsson stated in-"development of the thyroid gland" that it is the thyroid hormone that is essential for the development of any organism and is required for the process of homeostasis. And cases of congenital hypothyroidism when left untreated can lead to cretinism, which results in dysfunctioning of brain that can be irreversible or can be the root cause for dwarfism. Salisbury shows what really cretinism is, she focuses on the fact that Webster's encyclopedia unabridged dictionary defines the term "Acretin" as a person who is human despite of deformities. And its counter term "cretinism" is defined as an untreated congenital hypothyroidism that could come along goiter or in absence of it. She goes on pin points iodine deficiency as the major cause of endemic cretinism, although this case was contradicted in Canada.

As after the discovery of importance of iodine in thyroid gland at the end of 19th century right shortly after world war Canada introduced iodized salt.

Gillam in his work stated that-"It is now found that, in this developed world around 15% of the population suffer from difficulty in thyroid hormone synthesis, this defect is result of congenital hypothyroidism, which often leads to goiter.

Another study was conducted by Kris Poppe in 2007, where he focused on the effect of thyroid hormone on female reproduction, and goes on explaining that the menstrual pattern of a women is influenced directly by thyroid hormones. Because of which women with dysfunctioning thyroid often show signs of menstrual irregularities and get exposed to morbidity during pregnancy, not only this they can suffer from infertility and infertility is a huge term, and is defined as the failure of conceiving, after continuous intercourse for one year without contraception.

Another study that supports the claim of pope is of Benson, where Benson has clearly mentioned that impact of hypothyroidism on a woman's menstrual cycle is nothing new and it has been identified in year 1950, he says that hypothyroidism effects on cycle length and blood flow.

Outcome of dysfunctional thyroid on male reproduction system

According to Krassas, when a study was conducted on animals it was found that if there is observable changes found in the normal thyroid it effects human body and decreased sexual activity and fertility rate is seen.

Very few scientist have made male reproduction process a part of their study, a recent advancement was seen when Clyde et al conducted a study, wherein the number of subjects conjugated were only three, after thorough investigation of those three hyperthyroid males they found that two had oligospermia and had decreased motility, also the third patient showed borderline low sperm count and had decreased motility of sperm.

A work on the hypothalamic pituitary testicular axis in thyrotoxicosis by Kidd et al suggested affirming the theory -dysfunctional thyroid is directly proportional to infertility in males. In this study Kidd and his fellow researcher examined five patients with the condition of hypothyroidism and came to a finding that suggested that they all have low total sperm counts i.e. it was less than 40*106/ml.

On the contrary when Griboff examined five patients to study effect of hypothyroidism on male fertility rate and spermatogenesis, he took male aged from 30 to 64 years they suffered from primary hypothyroidism and found that all of them had normal sperm count.

Although Griboff had a point of contradiction many support the theory, a research had been conducted by Vignera where he wrote that thyroid hormones has direct and indirect influence on the testis, also it exert different sorts of effects on different cell types which includes Sertoli cells, germ cells and Leydig cells. And excess or deficiency of the hormone produced by thyroid can alter the functions of testis and may induce semen abnormalities as well. He supports his theory based on the fact that 3, 5, 3-triiodothyronine (T3) and Thyroxine (T4) regulates the functioning of

the testis by means of genomic and non-genomic effects.
Abalovich in his work clearly stated that thyroid is one of the most important hormone that could be present in a human body as excess of it can give rise to several disease but it's excess circulation in case of suffering from thyrotoxicosis results in asthenozoospermia in more than half of the patients. Whereas in 40% of the patients suffering from thyrotoxic it had been found that they become positive responder of the conditions such as Oligozoospermia and tetratozoospermia.

At first it was Hudson and Edward who reported low rate of advancement in forward motility of sperms. In his study he took almost sixteen men, they were all adults and had thyrotoxicosis because of Graves' disease they were all compared with twenty one euthyroid controls.

Conclusion:

To conclude it would not be wrong to say that thyroid is an essential gland of a human body, and irrespective of the sex of a person it hamper's their fertility. And in order to have a healthy thyroid one need to have a balance amount of iodine content in the body. If the thyroid starts dysfunctioning it can give rise to all sort of chronic as well as acute condition. But there still remain some questions unanswered i.e. the discrepancy found in the study of Griboff that suggested that all the patients under examination bore the negative result for low sperm count.

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