The Thyroid

Grégoire Lason & Luc Peeters
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1. Introduction

The thyroid can be described as the thermostat of the human body. The organ has an influence upon all metabolic processes that can accelerate or decelerate.

Thyroid dysfunctions are frequent and can be diagnosed by a blood test or can be present but sub-clinical, making diagnosis more challenging.

Thyroid dysfunctions result in numerous typical symptoms, which, if occurring together, should alert the osteopath to the presence of a dysfunction.

The osteopath does not always resolve thyroid dysfunctions but mainstream medicine also has frequent problems getting a thyroid problem under control.

The osteopath can significantly contribute to the treatment of thyroid problems by influencing vascular, mechanical, homeostatic and neurological components of the organ.

The greatest challenges for the osteopath is initially recognizing the sub-clinical thyroid problems and then, during treatment, normalizing the function of the thyroid in the correct way.

Readers not familiar with visceral osteopathy should read Chapter 12 at the end of this e-book.
2. Anatomy


2.1. Position and Important Anatomical Data

The thyroid (**Figure 1, 2 and 4**) is a strongly vascularised gland on the front of the neck, and is brown red in colour.

Topographically the gland corresponds with spinal levels C₅ to T₁.

The gland has different anatomical variations in shape, from an H-form to a U-form (**Figure 3**).

The gland itself consists of 2 lobes orientated in a craniocaudal direction, the lobes being joined by an isthmus.

The lobes measure approx. 5 - 6 cm and the isthmus 1.2 to 1.5 cm.

The adult thyroid weighs approx. 25 to 30 g. with female ones usually being a little heavier.

The gland increases in size during menstruation and pregnancy.

A conical lobe (pyramidal) is often ascending out of the isthmus (usually to the left side) towards the hyoid, from which it is suspended via a fibromuscular band, the levator thyroidea m.

Rudimentary accessory nodules can also exist between the thyroid and the base of the tongue.

Normally two pairs of parathyroid glands are found just posterior to the thyroid.
Lateral view

Figure 1 - Lateral view of the thyroid

Ventral view

Figure 2 - Ventral view of the thyroid
Anatomic variations

Figure 3 - Anatomic variations of the thyroid – ventral view
3. Mobility
Unlike other organs the thyroid is not influenced by the diaphragm or respiration. It does though follow the up and down motion of the trachea and hyoid during swallowing.
4. Function

4.1. Thyroid Gland
The thyroid makes iodine and the amino acid tyrosine into the thyroid hormones thyroxin (T4) and triiodothyronin (T3).

80% of the hormone production is T4 and 20% T3.

T3 is actually the active form of T4.

T4 is a reserve, which can be metabolised by the liver into T3 when required.

Both forms are bound to special types of proteins (thyroxin binds to globulin, transthyretin and albumin), which allow the hormones to freely circulate in the blood. As long as the hormones are bound to one of these proteins they remain inactive.

The necessary quantity varies constantly and the body determines itself what is required.

T3 regulates the speed of various cellular metabolic processes (oxygen + glucose and fatty acids in ATP).

If low levels of thyroid hormones are only available then these processes are too slow: high hormone levels results in these processes being too rapid.

The thyroid is regulated by the pituitary and indirectly by the hypothalamus (Figure17).

The pituitary senses too little T3 and secretes “thyroid stimulating hormone” or thyrotropin (TSH).

In turn the pituitary is regulated by the hypothalamus. The hypothalamus produces the hormone TRH.

Hypothyroidism means not only that too little thyroid hormone is present. The metabolism of T4 into T3 can also be the problem (e.g.: a liver dysfunction). Similarly the cellular receptors for T3 can develop resistance, which reduces the effect of the hormone. Low levels of the transporting proteins can also occur.
4.2. Parathyroid Glands
The function of the parathyroid glands is to control the calcium level in the body.

Calcium is important for:

- Production of bone and teeth.
- Plays a central role in the function of muscles and nerves.
- Parathyroid hormone (PTH) regulates the calcium level in the blood.

The absorption of calcium in the blood is regulated by vitamin D. The co-effect between sunlight, diet and parathyroid hormone is important.

Too much parathyroid hormone results in the bones demineralising and releasing calcium into the circulation. Too much calcium in the blood means that PTH production must be reduced.
5. Pathology


5.1. Hypothyroidism

(Heuston 2001, Roberts et Ladenson 2004)

The first signs that can be indicative of hypothyroidism are:

- General slowing of metabolism, increased weight.
- Decreased heart rate (Sefidpar et al 1972).
- Slow thought processes and memory loss, depression (Fliers 2002).
- Oversensitivity to cold (can manifest as “dead” fingers).
- A dry, rough, cold and pale skin, dry and damaged hair.
- Slow reflexes.
- Constipation.
- Retarded or missed menstruation.
- Fatigue, sleepiness.
- Slower Achilles tendon reflex.
- Arthritis.
- Oedema and facial paleness.
- Headache or migraine.
- Fibromyalgia.

In cases of hypothyroidism the thyroid produces too little of the hormone thyroxin (T4) and triiodothyronin (T3) or too little of the active T3 hormone reaches the cells. The second scenario can be due to reduced action of the enzyme that turns T4 into T3 or due to cellular resistance to the T3 hormone. There are some similarities to insulin resistance in diabetes. It is also possible that low levels of transthyretin (prealbumin), the transporter of T3 and T4, result in too little hormone reaching the target.

Hypothyroidism means that the motor is running slower. The heart rate, blood pressure and blood circulation is slower, therefore the cold extremities. Furthermore, there is a decrease in energy level, fitness and digestion - with constipation as a possible consequence. Also slow wound healing and poor mental and memory functions are all typical. The effect of hypothyroidism is recognised in every cell, tissue and organ of the body.

A common form of hypothyroidism is the Hashimoto disease (inflammation of the thyroid). In case of this autoimmune disease antibodies are formed which act upon the thyroid. The consequence is that less or no hormones are produced.
In general it is accepted that most thyroid conditions are due to autoimmune reactions (Collin et al 1994, Sategna-Guidetti et al 1998). The body makes antibodies against its own thyroid tissue. This can lead to thyroiditis / hypothyroidism.

Hypothyroidism is more frequent in older age groups.

Thyroid problems can also contribute to glaucoma. (Cross et al 2008).

In the past insufficient iodine was seen as the most common cause of hypothyroidism. Iodine is essential for the thyroid and for the production of thyroid hormones. Too little iodine leads to an enlarged thyroid (struma or goiter) and thus hypothyroidism. In the western world iodine insufficiency still occurs. Too little iodine can be avoided by consumption of iodised table salt, fish and seaweed.

**The daily recommended intake of iodine is:**

- 0-1 year: 50 mg.
- 1-6 yrs.: 90 mg.
- 7-12 yrs.: 120 mg.
- >12 yrs.: 150 mg.
- Pregnancy and breast-feeding: 200 mg.

Normally dietary sources should be adequate. However, in Belgium the daily intake of iodine in 1992 averaged 50 to 60 mg/day - 2 to 4 times below the recommended amount! Inadequate intake of iodine during pregnancy was apparent in Brussels where more than 90% of cases consumed only 100 mg/day. This lead to the development of goiter (Siminoski 1995) in approx. 10 % of the women during pregnancy together with signs of thyroid stimulation. This explains the high frequency of thyroid conditions in women versus men in Belgium. Newborns in Belgium had an average concentration of iodine in the urine of 4.8 mg/dl versus 15 mg/dl in Toronto and 18 mg/dl in Los Angeles, where iodine intake is normal. Importantly, thyroid hormones play an essential role in metabolism of the cells, most specifically in the brain. This development is most apparent during the foetal phase and until the end of the 3rd year (Koibuchi 2008).

Hypothyroidism is also related to a spontaneous abortion in the first trimester of pregnancy (Rao et al 2008).

In case of insufficiency or in times of greater need (growth, pregnancy) it is recommended to increase the consumption of iodine-rich foods: seaweed, cod, herring, soy, shellfish, green beans, cabbage, dairy products, eggs.

If the patient already has hypothyroidism no extra iodine should be given immediately. Supplements such as kelp without clear evidence of actual dietary insufficiency have no use and can even result in further hypothyroidism. The reason
for this is that iodine can concentrate in the thyroglobulin found in the thyroid. Iodine-rich thyroglobulin increases the chance of developing an immune reaction.

During pregnancy and periods of growth the requirement of iodine is increased. The thyroid is vulnerable during pregnancy. For the unborn child T3 is from the mother and is essential for normal brain development. Too little or congenital defect can lead to mental deficiency syndrome and 'cretinism'. Too little, even if marginal, can slow growth of the cerebrum. The retardation can continue after birth (Pop et al 1999).

Certain studies have shown that in case of hypothyroidism a low antioxidant status is present. For example, selenium is often deficient.

Patients taking thyroid hormones are more susceptible to heart and vascular disease. The dosage of hormone supplementation can also be too high and cause hyperthyroid symptoms.

Hypothyroidism occurs at least as often as diabetes.

In natural medicine it is often advised to switch to high protein and low carbohydrate diets.

Zinc insufficiency is also likely to be associated with hypothyroidism. Zinc is a mineral with multiple functions in the body: it is present in every cell of the body and is a part of more than 200 enzymes. Zinc plays an important role in many aspects of hormonal metabolism. Signs of deficiency include white stripes or flecks in fingernails and a decreased sense of taste and smell.

Approx. 1 million Belgians have problems related to their thyroid.

Studies demonstrate that removal of dental amalgam has a positive effect on treatment of thyroid problems (Sterzl et al 2006).

**5.2. Hyperthyroidism**

The first signs that would indicate a possible hyperthyroidism are:

- Weight loss despite normal hunger and diet.
- Feeling rushed.
- Heart palpitations.
- Warmth intolerance.
- Over-perspiration.
- Shakiness.
- Fatigue.
- Shortness of breath.
- Muscular weakness.
- Diarrhoea.
- Swelling of the throat.
6. Symptoms

6.1. Superior Vena Cava Syndrome
The superior vena cava syndrome is characterised by a partial or total occlusion of the superior vena cava, which is responsible for venous drainage from the head/throat and arms to the heart. The superior vena cava is situated in the mediastinum, the zone between the lungs and above the heart, where the trachea, the oesophagus, the great vessels, the thymus and several lymph glands are also found. This occlusion is usually due to pressure from external structures (almost always tumour or metastases in the mediastinum), but can also be the consequence of vessel wall defect (e.g.: aneurysm).
Poor arterial circulation to head and arms is then observable.

**Pemberton test** *(Pemberton 1946)*

The patient is asked to lift both arms, with a positive test showing almost immediate colour change, sometimes cyanosis if held for longer and congestion of the head. The colour changes are obvious almost immediately *(Figure 18)*. Inhalation stridor can also occur.
Lifting both arms effectively narrows the thoracic inlet.

![Pemberton test](image)

**Figure 20 - Pemberton test**

6.2. Psychiatric Disorders
The correlation between thyroid conditions and psychiatric problems is high. This has been demonstrated in several studies.

Development of panic attacks, phobias, obsessive and compulsive problems, depression, bipolar disorders and cyclothymic disorders occur more frequently in patients with thyroid conditions. Depression has been studied in particular.

Even very mild thyroid dysfunctions are associated with mood swings and can lead to changed cognitive functions *(Haggerty et Prange 1995)*.

A mother with a thyroid disorder is more likely to develop postnatal depression.

Patients with depression almost always show a functional problem of the central hormonal axis (hypothalamus-pituitary-thyroid).

25% of these patients have an elevated T4 serum level. T3 serum is often normal but can be low. TSH serum is mostly normal.

There is suspicion that an unbalanced sympathetic/parasympathetic system could be the cause of this phenomenon.

In patients with bipolar depression (alternating depression-euphoria) thyroid peroxidase antibodies are found. This certainly emphasizes the role that hormonal dysfunction can play.

These patients react well to non-medical anti-depressives.


A clear correlation between thyroid disease and Coeliac has been found. This correlation is found for both hyperthyroidism and hypothyroidism.


Though not yet fully understood, hypothyroidism and hyperthyroidism often lead to diverse muscle and joint pain.

Certain symptoms occur due to hypothyroidism, mostly as a result of muscle swelling which compresses nerves:

- Total muscle paralysis and pain, cramps and stiffness.
- Atrophy.
- Tendon inflammation in arms and legs.
- Carpal Tunnel Syndrome.
- Tarsal Tunnel Syndrome.
- In hyperthyroidism or Grave’s disease the patient can experience muscle weakness and fatigue.
- Muscle pain is less frequent in hyperthyroidism than in hypothyroidism.

Some people with hyperthyroidism lose muscular tension and force, a process of muscle damage.
Typical signs (hyperthyroidism) are:

- Difficulty with walking stairs.
- Lost grip strength.
- Difficulty lifting objects above head.
- In some cases the muscles involved with swallowing are weakened; resulting in hoarseness and swallowing difficulty (Castell et Donner 1987, Palmer 2000). This can indicate an entrapment of the recurrent n.

### 6.5. Contraception Medication

Many women demonstrate poor thyroid function. As long as sufficient thyroid hormones are produced - even if it is a less than normal amount - it goes unnoticed. Thyroid hormone binds partially with a protein produced by the liver: thyroxin-binding-globulin. For normal function it is actually the non-bound thyroid hormone (free thyroxin), which is important.

Oestrogen tablets have the effect of increasing the production of thyroxin-binding-globulin in the liver. This leads to more thyroid hormone becoming bound. A healthy thyroid will then produce more so as to maintain normal levels. The result is that no difference is noticed by the person. In women with slow thyroid function the increase in thyroxin-binding-globulin can result in too little thyroid hormone as the thyroid cannot adequately compensate.

This effect has only been examined in relation to oestrogen tablets. It is suspected that use of other forms of oestrogen (patches, gels, nose spray etc.) will not result in the same effect as the extra protein production in the liver would not occur.
7. Clinical Examination

7.1. General Examination
Is the patient under or over weight?
Are the muscles normal or atrophic?
Is the patient nervous, agitated?
Is there pallor, excessive sweating?
Is the patient overdressed and yet feels cold?
Is there any hoarseness in the voice? Is there signs of fatigue in the voice?
Is there stridor?

7.2. Observation of the Hands
Is there thyroid acropachy?

Thyroid acropachy (Figure 21) is clubbing of the nails, digital swelling and periosteal thickening.

Sweaty palms?

Figure 21 - Clubbing of the nails, digital swelling
7.3. Eye Examination

Are the eyelids retracted? (commonly the upper eyelid is retracted so that the sclera of the eye above the iris is visible)

Is there immobility of the eyelids? (this means that the eyelids do not follow the up and down movement of the eyeball) (Figure 23).

Is there conjunctivitis?

Is there ocular injection? An eye that appears red due to illness or injury. The term usually refers to injection and prominence of the superficial blood vessels of the conjunctiva or sclera. (Figure 22).

Is there exophthalmia? Bulging of the eyes (Figure 24).

Is there proptosis? Anterior bulging of an eyeball out of the orbit (Figure 25).

Is there ophthalmoplegia? This is paralysis of eye musculature (Figure 26).

Is there periorbital swelling?

Is there an optic neuropathy?

![Figure 22 - Ocular injection](image)

![Figure 23 - Eyelid not following eye motion](image)

![Figure 24 - Exophthalmia](image)

![Figure 25 - Proptosis](image)
7.4. Observation of the Anterior Neck
Is the thyroid visibly enlarged and is the enlargement symmetrical?

Are there postoperative scar?

Observe the swallowing.

Ask the patient to stick out their tongue and observe if there are thyroglossal cysts.

**Pizzillo’s test**

The patient has both hands behind the head and presses their head backwards against the hands.

The patient is asked to swallow while holding this position.

Any swelling of the thyroid will ascend during the swallowing and be clearly visible.

7.5. Palpation

*(Nordmeyer et al 1997)*

The osteopath stands behind the patient and places the thumbs on the occiput and palpates the thyroid with two fingers from each hand.

The patient has the neck slightly flexed.

**The thyroid is palpated for:**

- Size
- Sensitivity.
- Surface regularity.
- Consistency/density.
- Nodules.

Does the thyroid move during swallowing?
8. Techniques

8.1. Mobilisation and Stretching of the Suspensory Lig. of Berry

The patient is supine; the osteopath stands at the head of the patient and supporting the head with their knee.

Using two fingers the osteopath hooks laterally and as far posteriorly as possible from the thyroid and lifts it in ventral direction while the patients head is moved into ipsilateral lateral flexion and contralateral rotation; this lever serves to relax the soft tissues in the area which are being mobilised.

*Video 15 - Mobilisation and stretching of the suspensory lig. of Berry*
8.2. Stretching of the Levator Thyroidea

The patient is supine; the osteopath stands next to the patient.

Contact is made on the cranial side of the thyroid using three fingers of the caudal hand. At the same time, contact is made with the caudal side of the hyoid with three fingers of the cranial hand.

Both contact points are progressively stretched away from one another, while the patient exhales.

The stretch is held a short while and the patient is asked to swallow a few times.

Video 16 - Stretching of the levator thyroidea m.
8.3. Stretching of the Cervical Fascia in the Sagittal Plane

The patient is supine and the osteopath stands at the head end.

One hand is placed upon the sternum and the fingers of the contralateral hand hook caudally under the hyoid.

While the patient exhales the sternum is moved in caudal direction and the hyoid in cranial direction.

This is repeated until an improved mobility is gained.

Video 17 - Stretching of the cervical fascia in the sagittal plane
10. About the Authors

Both authors are holders of university degrees, namely the Master of Science in Osteopathy – University of Applied Sciences, and are very active with the promotion and academic structuring of osteopathy in Europe. In 1987 they began The International Academy of Osteopathy (IAO) and are, to this day, the joint-principals of this academy. The IAO is since several years the largest teaching institute for osteopathy in Europe. Both osteopaths are members of diverse professional organisations, including the American Academy of Osteopathy (AAO), the International Osteopathic Alliance (IOA) and the World Osteopathic Health Organisation (WOHO), as part of their mission to improve osteopathic development.

This osteopathic encyclopaedia aims to demonstrate the concept that a proper osteopathic examination and treatment is based upon the integration of all body systems.
This e-book is a product of Osteo 2000 bvba.

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