Endemic Geitre
or
Bronchocele.
and
Allied Conditions.
Geitre or Bronchocele.

Shortly after beginning practice in Marsden my attention was drawn to the frequent occurrence of enlargement of the thyroid gland. I was at a loss to account for the comparatively speaking large number of cases, and determined upon making a more thorough investigation and study of the subject. The result is embodied in the following pages.

Definition

According to Lucain's Dictionary of Medicine, goitre is defined as a simple hypertrophy or cystic, fibroid, or fibro-cystic enlargement of the thyroid gland. It occurs endemically, is non-malignant and may and generally does continue for years without very great inconvenience. Other names have been applied to the disease, such as bronchocele, bronchocele (now applied to a tumour of a different nature) and more...
recently thyreolecide (Robinson). It has also from its prevalence in certain districts been named Derbyshire neck and Bethesda neck.
I shall confine myself to the term goitre.

Anatomy of the Thyroid Gland.

Before proceeding further it may not be out of place to shortly describe the situation and structure of the thyroid body.

It is situated in the lower part of the neck, embraces the front and sides of the trachea in its upper part and reaches up to the sides of the larynx. It is of an irregular, semilunar form, consisting of two lateral lobes united together towards their lower ends by a transverse portion named the isthmus. It usually extends so far back as to touch the lower portion of the pharynx and on the left side the esophagus also. The right lobe is generally a little larger than the left, and in goitre is the one more generally
affected. Each lobe is directed
inwards and backwards, reaching
from the fifth or sixth ring of
the trachea to the posterior border
of the thyroid cartilage.

The isthmus of the thyroid gland
is of considerable importance from
a surgical point of view. It
joins together the two lobes, connect-
ing them a little above their
lower ends and measures nearly
half an inch in breadth and from
a quarter to three quarters of an
inch in depth. It commonly
lies across the third and fourth
rings of the trachea but is
very inconstant in size, shape
and position" (Baillie's Anatomy).

It now and again happens
that the isthmus is absent—its
place being taken by areolar
or fibrous tissue only.

According to Klein the thyroid
gland consists of an outer fibrous
capsule, thicker and thinner septa,
and finally the fine trabeculae form-
ing the septa between the gland
alveoli. These are closed besides
of a spherical or oval shape and of various sizes. Each of these vesicles is lined with a single layer of polyhedral or columnar epithelial cells each with a spherical or oval nucleus. There is also a cavity differing in size according to the size of the vesicles and containing a homogeneous, viscid albuminous fluid—the so-called colloid. The vesicles are surrounded by networks of blood capillaries. In the connective tissue framework lie networks of lymphatics between the framework and the surface of the vesicles are lymph sinuses lined with endothelium. The large and small lymphatics are often filled with the same colloid material as the vesicles.

Function of the Thyroid Gland.

The consideration of the function of the thyroid gland has a most important bearing as will afterwards be seen upon the surgical treatment of goitre.

In one of the latest works on
Physiology (Power) it is stated that these organs (Thymus & Thyroid) sometimes included with the suprarenal bodies under the general title of the ductless glands seem to be remains of organs which may once have been of importance in the economy, but which in the process of evolution have come only to play a subsidiary part and "It is thought that both the Thymus and Thyroid bodies may minister to the formation of the white corpuscles of the blood".

Two further views advanced by Mr. Simon were that the gland, judging in part from its great vascularity was a regulator of the cerebral circulation, and secondly that it secretes something necessary to the perfect nutrition of the brain.

Mr. Herschel has shown however that the Thyroid gland plays anything but a subsidiary part in the animal economy.

According to him (British Medical Journal January 1885) "The Thyroid gland appears to consist of two distinct portions"
(a) glandular, consisting of highly vascular acini, which excrete into their interior a mucoid substance, this substance or something closely similar, being found in the lymph vessels of the gland - mucin excreting function? (b) highly vascular lymphoid nodules - hematogenous function.

In proof of this he goes on to show that removal of the thyroid gland gives rise to atrophic changes in the central nervous system and in the fat generally. It causes an increase in the general connective tissue and a mucoid conversion of the ground substance. This increase of mucin in the connective tissue is accompanied by an extraordinary secretion of the same stuff by means of the salivary glands and also those of the alimentary canal. While these changes are being wrought in the skeletal and alimentary structures the haemopoietic tissues are found to have undergone an obvious compensatory hypertrophy.

Mr. Koosley therefore believes
that the thyroid body is an 
excretory gland of the highest im-
portance.

Pathology of Goitre.

In simple hypertrophy 
of the thyroid gland there is merely 
an increase in volume of the normal 
structure. The gland is soft and 
compressible, appears coarser on section 
and the vesicles are larger and contain 
an increased quantity of the colloid 
material. A majority of the cases 
coming under my notice belong to this 
division.

An advance upon this constitutes the 
fibrous goitre where there is also an 
hypertrophy of the fibrous stroma 
giving to the gland greater con-
sistency. This increase in the fibrous 
stroma may not proceed equally in 
all parts of the gland and hence one 
part may be firmer and harder than 
another.

Following the tenacity of fibrous 
tissue to contract, in some parts 
of the tumour the vesicles may by 
this contraction become obliterated.
while others persist and may develop into cysts—constituting the fibro-cystic form of goitre.

In what is known as the cystic form of goitre we have the formation of one or more cysts in the substance of the gland. These cysts may develop in one of two ways. In what are called primary cysts there is simply an increase in the amount of the natural viscid contents of the vesicle, causing the vesicle therefore to enlarge and form a cyst. Two or more vesicles may coalesce to form a cyst. As might be expected, these cysts retain more or less the normal lining of the vesicle but as the pressure increases within the cyst the normal epithelial lining may degenerate. From Balfour's researches it seems not improbable that the lymphatics serve as efferent ducts to the secreting vesicles, and if more fluid be secreted than can be drawn off, naturally a cyst will form. The contents of the cysts usually consist of dull yellow or brownish viscous
fluid. There may also be cholesterine, fatty matter and calcareous particles. The walls of the cysts are chiefly fibrous; and this fibrous wall may become cartilaginous or lime salts may be deposited in it. Secondary cysts develop when the swollen parenchymatous tissue under goes mucoid softening. They have a tough wall which does not collapse on puncture to any great extent. As a general thing their contents are similar to those of primary cysts but more rarely according to Billroth in parenchymatous bronchoceles it happens that the whole substance becomes converted into a greisy granular pulp.

A capsule encloses all forms of bronchocele, this capsule being connected with the surrounding parts and the substance of the thyroid by very loose cellular tissue and blood vessels.

It is very rarely that a goitre if left to itself inflames and suppures. Mr. Hutchinson reports a case where suppuration took place.
in a cyst with calcareous walls. As these did not collapse, a shell-like cavity was exposed which moved up and down during deglutition.

Owing to the alteration in the blood supply due to the presence of the tumour, portions may break down into a softened coagulated mass or become necrosed, whilst central cicatrization is very common (Billroth).

Sometimes the blood vessels passing through the cyst become obliterated and the contents thus deprived of nutrition degenerate into a jelly-like sebaceous matter.

Symptoms and Complications.

In cases of simple goitre the only indications of the disease are in many cases the swelling in front of the neck, and a sense of fulness in that region. The enlargement may be over the whole of the gland but more often it is irregular, and affecting the right lobe more than the left. In size the swelling may vary from that of
a cherry to a pumpkin, and may weigh as much as 4 or 5 lbs. (Estère).
As a rule the skin covering the tumour is not discoloured.
In addition to the sense of fulness there may be a feeling of dragging or constriction about the throat.
The tumour is generally soft to the feel except in the fibroid variety where of course there is more firmness and hardness. In large cystic goitres more or less fluctuation may be felt.
On swallowing, the tumour is seen to follow the up and down movements of the trachea, this sign being almost distinctive of the affection.
The remaining symptoms are principally due to pressure of the enlarged gland upon the important structures in the neck. Thus dysphagia may be present if the tumour reaches a great size, or when it presses on the oesophagus as happens when the lateral lobes meet behind the gullet (Tunui's Dict.
of Medicine).
Dyspnoea is a more common
symptom, and is due to pressure on the front and sides of the trachea, especially in young people where the rings of the trachea are more soft and yielding. The situation of the goitre has a very important bearing upon the occurrence of pressure on the trachea. Thus if it be situated in the lower part of the gland and spread downwards so as to interpose between the manubrium sterni and the windpipe, compression necessarily results, with of course difficulty of breathing. Dyspnoea due to compression is also more likely to follow when the growth is in the isthmus and covered only by skin and fascia.

According to Prof. Rose if the tracheal compression be of long duration fatty degeneration, softening and atrophy of the cartilages pressed upon result, and this condition is the cause of the sudden death which occasionally happens in goitrous cases, as the softer windpipe may be doubled upon
Dyspnea may also be due to pressure on both recurrent laryngeal nerves causing partial paralysis of the abductors of the vocal cords. Pressure upon the large blood vessels of the neck may obstruct the flow of blood, and give rise to a fungit condition of the head, especially when the pressure is upon the internal jugular vein.

The pressure effects do not seem to depend entirely upon the size of the gland, but other things have to be taken into consideration such as the situation of the tumour, whether it bulges internally or externally, the effect of the muscles and cervical fascia in binding down the bronchocele and causing it to press upon the parts beneath; and the rapidity of growth—a rapidly enlarging tumour not giving the adjacent parts time to accommodate themselves to the new growth. (Robins)

Of all the pressure effects dyspnea is the most dangerous.
Progress of the Growth

The disease after it has begun, increases like most non-malignant tumours at a very slow rate. In exceptional cases however, as mentioned by Saint Leger, and other authors, a very rapid development of the tumour may take place. Thus a large goitre has been known to form in a week. The rate of growth is often very irregular, with periods of seeming inactivity alternating with increase in size. If left to nature it may continue throughout the whole life of the patient, and I have several under my care of advanced age, in whom the tumour persists and even slightly enlarges.

The general health of the person suffering from goitre appears to exercise a considerable influence upon the progress of the disease. In females it seems to be liable to increase at the menstrual periods, though not invariably so.
Cretinism, Myxœdema and Cachexia Strumipriva

It had been long known that some connection existed between goitre and Cretinism, but the exact relation between them was involved in obscurity, until the researches of Mr. Horrocks threw a new light upon them.

From the fact that Cretins are found where goitre is prevalent, the inference was drawn that goitre and Cretinism are both due to the same cause, and that where this cause is operative in the highest degree it produces Cretinism and goitre, and in those districts where the endemiy may be said to be attenuated goitre only is found with perhaps a case or two of Cretinism; or in other words Cretinism is most probably the full development of the morbid state which in its imperfection results in goitre. (Robinson).

This statement is borne out by what I find in my own district where I have a large number
of mild goitrous cases but have met with only two cases of cretinism.

Among the earliest to diagnose and describe cretinism in this country, were Curling and Hilton Fagge, and in their cases neither goitre nor the thyroid gland could be made out by palpation. However later on, the absence of the thyroid did not obtain in all cases of sporadic cretinism, and there are now many instances on record of cretins where goitre is co-existent. In the two cases to which I have already referred as coming under my own observation, goitre is absent and a careful examination failed to reveal the presence of the thyroid gland.

According to Langdon Down, the typical cretin is stunted in growth and rarely reaches five feet in height. His skin is of a yellowish hue, thickened and wrinkled. There is a great increase of subcutaneous areolar tissue. The tongue large and thick, with hypertrophied papillae, always displays lessened power of co-ordination; and often hangs
from the mouth. The face is large, the lower jaw is drooping and its angle obtuse. The eyes are often affected by strabismus, obliquely placed and small, and the lids are commonly puffy. The belly is pendulous from the laxness of the skin. The lower limbs are generally short and deformed and the gait is waddling. The head is deformed, the forehead retreating, the top flat and the occipital region ill developed. The nose is broad and flattened.

The intellectual faculties are imperfectly developed. The esophagus is often unable to speak and his hearing is frequently defective. Many of these poor creatures lead only a vegetative existence.

Of the two cases occurring in my own practice, one is a girl aged ten years, and the other a boy aged four years. In both the figures are broad and sturdy with an appearance of laxity about their waist of firmness; their heads are large, flat on the top with rounded
retreating foreheads: their countenances vacant, and void of intelligence; the tongues large and frequently protruding from their mouths with saliva trickling down their chins; the skin flaccid and dull coloured; and the abdomen sunk and pendulous.

The girl is quite unable to talk so as to be comprehended by any outside her own family, and not always by the members of her own family. She walks with great difficulty and with a rolling, waddling gait. She possesses but little intelligence.

In the boy there is marked strabismus; the legs are short and crooked; he is quite unable to stand. Development is much delayed. He looks dull and takes very little notice of what is going on around him.

Birds often live to a great age. They are kindly treated by their neighbours in most districts; and in some villages are superstitiously regarded as sacred beings.
Myxoedema.

Almost the first to accurately describe myxoedema was Dr. W. Ord and it is his description which I will briefly give here.

It is a progressive disease in which the tissues of the body are invaded by a jelly-like, mucous yielding, droopy unaccompanied by albuminuria or other signs of primary affection of the kidneys. The exfoliative goldfine and chlorrin of the connective tissue, especially of the hands, feet and face under go a chemical reversion to the embryonic condition, being converted into mucin (Peppe).

With regard to the aetiology of the disease, it was at first considered to be invariably associated with adult life in women, but later observations showed that the disease was at least fully as common in men as in women. Of the actual cause nothing was known.

Symptoms.

The face is swollen in every feature, so as to suggest—
The existence of renal disease, and the late Dr. Mohun's argues very strongly in favour of the identity of myxoedema with Bright's disease. But while the negative results of a complete examination dispel this idea, the distribution and quality of the swelling are different from what is observed in common dropsy.

The swollen skin is singularly waxy, looking and anemic; and the swelling affects dependent and non-dependent features equally. Thus the upper and lower eyelids, and the upper and lower lips are uniformly enlarged; the ala nasi are thickened and broadened; the ridges of expression are blurred and coarsened or the lines obliterated.

The conditions described prevail throughout the body. The skin is everywhere thickened, translucent, dry and rough to the touch. The hands in particular lose all shape-lieness and expression and have received from Sir W. Gull the appropriate epithet 'pudgy-like'.

Two other noteworthy phenomena...
are met with in the external examination of the body: "first a diminution, sometimes almost a disappearance of the thyroid body; and secondly a correlated transection with marked resilience of the skin in the lower triangle of the neck above the clavicle."

In this observation Dr. oat indicated the real origin of myxoedema. The nervous system becomes affected as well, and recent observations have brought out more strongly the fact that the central organs of the nervous system are affected in many cases to a large extent by the destructive increase of the connective tissue element.

"In the earlier stages an ever-increasing debility involves sensation, voluntary movement and intellect; in the latter, aberration of mind often supervenes." The face assumes a heavy and sad expression and Mr. Nordley has shown how closely this is imitated by the monkey in which artificial myxoedema has been induced. The speech becomes
slow and laboured though not slovenly or indistinct. Sensation is slow but finally sure. The whole system seems torpid and incapable of bracing up to meet any special demand upon it. The lassitude of the muscles occasions that drooping of the head which is a marked feature of this condition.

In the operations of the mind the same slowness is observable.

The daily duties of life may be performed as before but with much less expedition. "There is in fact an unwilling state of mind as of body."

It is further of importance to note that the heat of the body is almost always lower than normal.

As the affection advances.... the mind often becomes enfeebled, lethargic, quiet, and apathetic. Death comes either by coma or with the signs of uremic poisoning or by inanition."
Cachexia Strumipriva.

Prof. Kocher of Berne, and Reverdin, both of them Swiss surgeons, first drew attention (in 1883) to the condition known as Cachexia Strumipriva, and described it as following upon the extirpation of the thyroid gland for disease. In eighteen cases Kocher removed the whole of the thyroid gland, and in only two out of that number did the general health remain good after the operation, and in one of these two a small accessory thyroid gland had undergone an hypertrophic change, and in the other a recurrence of the gaitre had taken place and this no doubt prevented worse symptoms from developing. In the remaining sixteen there was more or less considerable arrange- ment of their general health, the changes being evidently progressive as they were more marked in the cases first operated upon, than in those where the operation was of recent date. Professor Kocher
describes the changes that take place somewhat as follows. A few months after the operation early fatigue, weakness, and sensation of heaviness in the limbs were complained of. In many cases these were preceded by actual pains in different parts of the body. Soon afterwards a sensation of coldness especially in the extremities was superadded. In winter time the hands and legs swelled, became bluish red and cold and the patient suffered from chilblains. The mental activity decreased; thought, speech, and movements became slower. At the same time the patients were themselves painfully aware of these facts. Simultaneously with the above symptoms, swellings of the face and body made their appearance which were sometimes at first only transitory but soon became lasting features; later on the nose became thick, the lips coarse, the hands and feet swollen, and the waist stouter; the skin became dry, and lost its
elasticity. Examination of the blood showed a relative richness of leucocytes inasmuch as the number of the red blood cells was greatly diminished. Professor Kocher concluded by remarking that the relationship of the above complexity of symptoms to cachexia was unmistakable. (Robinson.)

As little doubt can there be of the remarkable similarity of the symptoms to those of mycosis, but of Dr. Ord's description, Kocher, when he named the disorder Cachexia strumiformis, was unaware. When the disease does occur, it is more apt to do so in those under 20 years of age, during the growing period. In Kocher's cases nine were under 20, five between 20 and 30, and only two above 30. This accounts for the discrepancy, at any rate to some extent, between Kocher's results and those of Billroth, as the latter surgeon seldom operated upon young subjects, and in older subjects the disease does not appear so readily.
Dr. Felix Simond first completely enunciated the dictum thatcretinism, congenital or acquired myxœdema, and cachexia strumipriva are merely phases of one and the same state, and due to the same cause, namely arrest of the function of the thyroid gland (Horsley).

To Horsley belongs the credit of placing this theory on a sound basis. By his recent experiments he shews that the highest of all animals except man — the monkey becomes the subject of the disease described by Dr. Ors as myxœdema.

For a few days after the removal of the whole of the thyroid gland— an operation performed under strict antisepptic precautions — the animal presents little change. Then gradually muscular weakness and tremors were apparent, and by degrees there was a slow onset of deleteride terminating in complete or partial insensibility. In this state they seemed oblivious of everything going on around
them, and could only be roused when food was presented to them. As Mr. Harmsley observes, the same listless air is observable in severe crotamons.

Among the rarer symptoms were occasional attacks of dyspnoea.

Noteworthy changes also occurred in the composition of the blood during the first fortnight when the red corpuscles decreased greatly and the white corpuscles increased in number. However, after that time, the balance between the two became almost restored although the blood became impoverished and this is quite in accordance with the pallid look often observable in crotamons.

Perhaps an even more important change took place in the chemical composition of the blood. It was found that whereas mucin is absent from the blood of healthy monkeys, it is present (and in increasing quantities according to the duration of life after the operation) in the artificial
mypeudema.

The salivary glands underwent an enormous hypertrophy which was due simply to an increase of the secretion of mucin.

The next important point noticed was a gradual swelling of the abdomen, just as in mypeudema, due to hypertrophy of the great omentum and distension of the intestines.

The post mortem appearances are then described, the most important and interesting of which were the swollen jelly like subcutaneous connective tissue, and the increased size of the spleen.

The next shows by a comparison of symptoms that asthenia, mypeudema, and cachexia strumipriva are exactly like one another, and thus establishes the truth of what was propounded by Dr. Semion namely that they are simply different stages of one disorder, that disorder due to loss of function of the thyroid gland.
I append the tabular statement given by Mr. Horsley (British Med. Journ. Jan. 1885)

<table>
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<tr>
<th></th>
<th>Grelinism</th>
<th>Myxoedema (Ord.)</th>
<th>Cachexia Strumipriva (Kocher)</th>
<th>Cachexia after Thyroidectomy</th>
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<td><strong>Central Nervous System:</strong></td>
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<td>Epileptic</td>
<td>Tremors and Tremors</td>
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</table>
| Sensation            | Tardy appre- | Tardy appre- | Tardy appre- | Tardy appre-
|                      | cation    | cation           | cation                      | cation                      |
| Face                 | Immobile   | Immobile         | Immobile                    | Immobile                    |
|                      | Broad & thick | Broad & thick | Broad & thick | Broad & thick |
| Hands and Feet       | Cold       | Cold             | Cold                        | Cold                        |
|                      | Puffy      | Puffy            | Puffy                       | Puffy                       |
| Skin and Hair        | Puffy      | Puffy            | Puffy                       | Puffy                       |
|                      | Atrophic   | Atrophic         | Atrophic                    | Atrophic                    |
| Blood                | Oligemia   | Oligemia         | Oligemia                    | Oligemia                    |
| Urine                | Normal     | Normal           | Normal                      | Normal                      |
| Temperature          | Low        | Low              | Low                         | Low                         |
| Mode of Death        | Coma       | Coma             | Coma                        | Coma                        |
A glance at the table shows the almost identical nature of the symptoms under the various headings.

Then reviewing the various theories accounting for the production of cretinism, such as chalky water, miasma, hereditary influence etc., in fact all the causes which have been supposed to produce goitre, Hoarley quotes Baillegar in this connection, as confirming the proof that the gradual destruction of the thyroid gland by disease such as goitre, may determine the cretinous condition, and of course from what has been already said, myxoedema, and cachexia strumipriva as well.

He then takes up Kocher's view as to the origin of cachexia strumipriva. Kocher tries to show that the symptoms of the disorder he described are the physiological symptoms of chronic asphyxia, due to narrowing of the trachea, consequent upon the softening and atrophy produced by ligature (during operation) of the arteries.
supplying it. This theory is successfully disposed of by shewing that there have been numerous less cases of stenosis of the larynx and trachea, without a symptom of myxoedema.

"There remains then the theory that these varieties of a general state of malnutrition are due to the loss of function of the thyroid gland."

Dr. Orr in describing myxoedema as has already been pointed out, made reference to the alteration of the thyroid gland. There seems no reason to doubt but that in those cases of myxoedema where there appears to be a thyroid gland, it has ceased to fulfil its function and is therefore practically non-existent.
Diagnosis of Goitre.

There is generally very little difficulty in determining the existence of goitre. The fact of its implicating the thyroid gland, and the movements up and down of the enlarged gland on swallowing, point at once to the disorder.

It may be necessary however to ascertain the exact nature of the tumour whether it be simple hypertrophy, or cystic, or fibrous enlargement.

Simple hypertrophy can be generally recognised by the presence of a diffused mass and the 'want of consistent hardness'.

Cystic Goitre is determined by the presence of fluctuation in a part of the gland, or more accurately by passing in a very fine trochar and thus ascertaining if fluid be present, and if so, the nature of it.

It is necessary to bear in mind that when a cyst contains much soft trabecular structure, that
The fluid drawn out is mixed with blood.

Fibroid enlargement of the thyroid gland is known by the consistency and hardness of its substance; or if doubt exists by the negative character of an examination by means of the trochar.

The diseases most likely to be confounded with goitre are scirrhous, calculus, lymphadenoma, aneurism, and fatty tumours of the neck. Scirrhous is rare and it is recognised by its extreme hardness and by the pain which generally accompanies this form of cancer. The involvement of the neighbouring glands and the general effect upon the health of the patient help to clear up the diagnosis.

Where calculus is suspected its presence or absence can readily be made out by exploring with a fine needle. The history and general condition of the patient will aid in settling the point whether we have to deal with goitre or lymphadenoma.
Aneurism is distinguished by the characteristic pulsation and other signs of aneurism, care being taken not to be deceived by a pulsating goitre, circumscribed and seated immediately over the carotid artery. In goitre the most firmly fixed portion stretches towards the middle line: in carotid aneurism the firmest attachment is under the sternomastoid

Prognosis. The prognosis is favourable in nearly every case of goitre. I have never seen a fatal case. Death is said to have occurred from suffocation due to a goitre having attained an immense size, and especially where the tumour passes behind the trachea and thus compresses it from both front and back.

I have generally found my cases amenable to treatment, the swelling either disappearing, or being arrested in its progress.
Aetiology of Goitre.

As to what actually gives rise to goitre it may safely be asserted that we are as yet in ignorance. It is true that almost innumerable theories have been propounded, but not one of them can explain all the known facts with regard to the occurrence of the disease. It is generally believed that where goitre is endemic there must be some impurity in the potable water. The theory which has gained most support is that there is an excess of lime and magnesia but I will endeavour to show that goitre may be endemic in a district where to say the least, the drinking water is unusually free from these impurities. It seems to me not improbable that goitre can be caused by a variety of circumstances and that the cause is not limited to any one particular impurity. Before theorizing any further, it will be well to consider and at what
conditions goitre does actually arise.
In the first place then let us examine into the-

Geographical Distribution.

In England it has been found to prevail in Derbyshire, certain parts of Yorkshire and Lancashire, Sussex, Kent, and Nottinghamshire, and in the counties of Durham, Cumberland, and Northumberland. In Scotland it exists in Perthshire, the east part of Fife, Roxburgh, the upper part of Selkirk and Peebles, the east part of Ayr and along the Nith Valley; and also on the coast of the Isle of Arran.

On the Continent it is found in France particularly in Savoy; in Spain; in Germany chiefly in the region of the Black Forest; in Switzerland in the Valais; in Austria mostly in Styria; in Northern Italy particularly in the Alps; in some parts of Russia;
and said also to occur in Norway.
In Asia it occurs in some western parts of Siberia; in Western China and Tartary; in Bengal in India, and in the island of Sumatra.
In Africa, Mungo Park observed it among the negroes of Barbarzy; Thompson among the inhabitants of the Western bank of Lake Tanganyika; and Livingstone in the Lopere and Kebirrâ districts of Central Africa.
In many different parts also of North and South America cases are met with (Abunuor).
It is thus seen that the disease is found in almost all quarters of the globe, and is not confined to any particular race or nation.
It is even said that in the districts where it occurs that the lower animals may be goitrous, but direct evidence of this has not come under my own observation.
As most of the theories concerning the causation of goitre are connected with the question of water supply, and as this again is intimately associated with the geology of a district, it will now be advisable to consider the

**Geological Distribution.**

Saint-Lager, whose laborious investigations in connection with this subject are well known, has very thoroughly traced the geological distribution of goitre in France, and his results have been thus tabulated by Professor Lebour:

**The Goitriferous and Non-Goitriferous Rocks of France.**

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<tr>
<th>Layer</th>
<th>Goitre is endemic</th>
<th>Goitre is not endemic</th>
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<td>Recent</td>
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<td>Glacial</td>
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<tr>
<td>Pliocene</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Alluvial deposits
Drift deposits
Pliocene deposits generally

(over)
Goitriferous and Non goitriferous
Rocks of France (cont.)

Goitre is endemic or goitre is not endemic

The gypseous marls of Paris basin
The calcareous marls of the Paris basin
The Brie limestone

Cenozoic

Sands and clays with pyrites, limestones of Paris basin
The ammonitic pyrites
Limestones and black shales of the South of France
Clays with pyrites, limestones of Provence and Languedoc

Cretaceous

The chalk with flints and iron pyrites of Northern France
Limestones of the South
The chalk marl
The upper greensand
Iron pyrites
The gault with pyrites, clays
The pyritic marls of the lower greensand
The white hippurite
Goitiferous and Non-goitiferous Rocks of France (cont.)

Goitre is endemic. Goitre is not endemic.

-------- The Portlandian --------
The Kimmeridgeian (bande) with fujitos

-------- The Corallian --------
-------- The upper Oxfordian --------
The lower Oxfordian with fujitos

-------- The Inferior oolite ------
-------- at the outcrop of the well ------
known bed of fujitos or marlstone)
Leasoo, bituminous, and
fujitos, marls, limestones, arkoses
and shales

-------- The mottled fujitos marls --------
of the Kemper

-------- The muschel kalk (var. --------
variable in distribution) --------
-------- The variegated grit --------

-------- The Autumn shales (fujitos --------
and bituminous) --------

-------- Coal measures (only at --------
outcrop of fujitos coals) --------

-------- Anthracitic fujitos shales --------
--------- Metamorphic coal measures --------
--------- will vein --------

-------- Carboniferous limestone --------

-------- Carboniferous limestone --------

-------- Granite and gneiss --------
-------- Porphyrites and other --------
-------- gneiss rocks --------

-------- Schistos of the altered deposits --------
--------- of metamorphic --------

-------- Devonian --------
-------- Silurian --------
-------- Cambrian --------
-------- Cambrian --------
-------- Granitic limestones --------
-------- Porphyrity and other --------
-------- gneiss rocks --------

-------- Eruptive --------


The following table has been compiled by Dr. Robinson from data given in Professor Lebour's papers on the subject.

<table>
<thead>
<tr>
<th>Geological Formation</th>
<th>Geographical Distribution</th>
<th>Goitre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Sedation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deposits of sand, gravel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and clay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drift deposits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pliocene</td>
<td>Including the London basin</td>
<td>Absent</td>
</tr>
<tr>
<td>Miocene</td>
<td>and that of Hampshire and the Isle of Wight</td>
<td>Absent</td>
</tr>
<tr>
<td>Eocene</td>
<td>In Sussex, Sussex (as at Newhaven), Hampshire</td>
<td>Present in scattered cases</td>
</tr>
<tr>
<td></td>
<td>Chalk with flints</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dorsetshire (doubtful)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Buckingham, and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kent (rare)</td>
<td></td>
</tr>
<tr>
<td>Cretaceous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper Greensand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saulet (Folkestone)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>marl contains</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iron pyrites</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Greensand</td>
<td>especially at Aumpall in Bedford; sparingly in Sussex</td>
<td></td>
</tr>
<tr>
<td>Weald Clay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>About Cambridge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wealden</td>
<td>Wells at St. Albans</td>
<td></td>
</tr>
<tr>
<td>and Hastings</td>
<td>Haselmere and</td>
<td></td>
</tr>
<tr>
<td>Sands (Essex)</td>
<td>Horsham</td>
<td></td>
</tr>
<tr>
<td>Geological Formation</td>
<td>Geological Distribution</td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------------</td>
<td></td>
</tr>
<tr>
<td>Jurassic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lias</td>
<td>Absent (except at Helmsley which extends from Desmoult)</td>
<td></td>
</tr>
<tr>
<td>Rhastic beds</td>
<td>Absent</td>
<td></td>
</tr>
<tr>
<td>Triassic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New red sandstone</td>
<td>Absent (in Cheshire &amp; west side of firth)</td>
<td></td>
</tr>
<tr>
<td>Polynite &amp; manganite</td>
<td>Absent (practically)</td>
<td></td>
</tr>
<tr>
<td>Permian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limestone</td>
<td>Absent</td>
<td></td>
</tr>
<tr>
<td>Red Sandstone</td>
<td>Absent</td>
<td></td>
</tr>
<tr>
<td>True coal measures</td>
<td>Absent (?)</td>
<td></td>
</tr>
<tr>
<td>Millstone grit</td>
<td>Absent</td>
<td></td>
</tr>
<tr>
<td>Carboniferous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shale, shales</td>
<td>Present (as in certain localities in Weardale &amp;c.)</td>
<td></td>
</tr>
<tr>
<td>System</td>
<td>Carboniferous</td>
<td></td>
</tr>
<tr>
<td>Devon</td>
<td>Presence along each side of Pennine/Range &amp;c. in West of Yorkshire</td>
<td></td>
</tr>
<tr>
<td>Limestone</td>
<td>Presence in West of Yorkshire especially at Haworth and Otley (highest strata)</td>
<td></td>
</tr>
<tr>
<td>Carboniferous</td>
<td>Presence in Westmorland and Cumberland</td>
<td></td>
</tr>
<tr>
<td>Sotholite</td>
<td>Presence in Cheshire and Lancashire</td>
<td></td>
</tr>
<tr>
<td>Millerite</td>
<td>Presence in Cheshire and Lancashire</td>
<td></td>
</tr>
<tr>
<td>Coal Measures</td>
<td>Presence in Cheshire and Lancashire</td>
<td></td>
</tr>
<tr>
<td>Millstone Grit</td>
<td>Presence in Cheshire and Lancashire</td>
<td></td>
</tr>
</tbody>
</table>
Geological Formation: Geograph. Distrib.: Goitre

Devonian or older sandstone
Silurian
Cambrian
Precambrian

{Iron pyrites
occurs in slate
Granites, porphyries
and eruptive rocks
Generally

Absent (or nearly so)

"On the whole there is a striking sameness in the geological distribution of the disease in the two countries" (Lebour).

The table is seen at a glance to be incomplete as some districts have been very fully investigated while others have been left intact.

An examination of the two tables shows that (as Saint Lafer pointed out) goitre is often associated with strata containing iron pyrites, although there are some noteworthy exceptions, such as in the case of the true coal measures and in the
Cambrian and Pre-Cambrian strata. I wish here also to point out that goitre is represented as being absent from localities where the millstone grit is present, a statement to which I shall have occasion to refer later on.

In addition to the above tables I may add another compiled from Dr. Bichellani's work on the Medical Topography of Bengal and appearing in Parte, 'Hygiene'.

<table>
<thead>
<tr>
<th>Goitre &amp; Cretinism in Kumaon (Code)</th>
<th>Water derived from Percentage of Pop. affected</th>
<th>With Goitre With Cretinism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Granite and gneiss</td>
<td>0.2</td>
<td>0</td>
</tr>
<tr>
<td>Silica slate &amp; hornblende</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Clay slate</td>
<td>0.54</td>
<td>0</td>
</tr>
<tr>
<td>Green Sandstone</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Limestone rocks</td>
<td>33</td>
<td>3</td>
</tr>
</tbody>
</table>

I can now briefly consider some of the theories brought forward to account for the occurrence of goitre, and then discuss them in connection with the conditions under which goitre appears in Morocco.
Theories.

(a) A peculiar state of the atmosphere in goitrous districts has been by some maintained to be the cause, and as goitre often appears in deep valleys it has been asserted that the air has become stagnant from being confined among the hills and thus engendered a peculiar condition favourable to the production of this particular disorder. That this is so is highly improbable from the fact that the disease is not by any means limited to these districts, but occurs after enough on plains where there is free movement of the atmosphere. It has occurred even on the sea shore and in one well known instance in mid-ocean among a ship's crew.

That the temperature of the air has little influence in the production of the disease, may be gathered from the fact that goitre occurs in the hottest, as well as in the coldest countries.

(b) The Saracinian Commission appointed for the purpose of determining
The etiology of goitre, came to the conclusion that the causes were multiple - insensitivity of locality, humidity, absence of sun's rays, lack of ventilation, insufficient nourishment and poverty.

It seems to me there is no reason to doubt but that the conditions named may contribute to the disease by lowering the vitality of the persons living under their influence just as they would in the case of almost any other disorder.

(c). In the "Lancet" of Mar. 19th 1881, Dr. Wooton advanced the theory that goitre is due to a vaso-motor paralysis of the inferior thyroid artery, due to disease or altered function of the inferior cervical ganglion and assumes that the tendency to this paresis is inherited and may occur anywhere. This is contrary to what is known concerning the endemicity of goitre, as it seems to be established that goitre confines itself to a few (comparatively speaking) well ascertained localities.
(d). From very early times the opinion has been held that there is a relationship between goitre and impure drinking water, and so strong is the belief that certain kinds of water can produce goitre, that in France and Italy many of those who desire to escape military conscription resort to springs which have acquired such a reputation.

So leading to prove that water is the vehicle by which the goitre-producing agent enters the body, Johnstone found that in the jail at Durham where goitre was at one time common among the prisoners, the disorder entirely disappeared on a new supply of water being introduced. (Edin. Med. Journ.).

Saint Lager whose name has on more than one occasion been already mentioned found many instances where those who drank a particular water suffered from enlargement of the thyroid gland, while others who avoided this particular water escaped. His views have been supported and his
statements corroborated by many others among whom may be mentioned McClellan and Baillarger. Billroth also attributes the increased prevalence of goitre in Vienna to the fact that a new water supply has been introduced into the city from Styria in Austria, where as has already been stated, goitre is endemic.

There seems therefore to be very strong evidence in favour of the idea that some impurity in drinking water is, if not the only cause, certainly a very important one in the production of goitre.

What then is the Impurity?

Here we are upon very debatable ground if I may be allowed the expression, and there seems to be no theory which is universally accepted. In Parker's "Hygiene it is stated (p. 57) that "the impurity in the water which causes goitre is not yet precisely known", and further "It seems therefore that the question is still undecided and it is much
to be desired that more extended
inquiry should be made with
careful analysis" — as well as records
of local and other conditions which
probably contribute more or less to
the production of the disease.
Saint Lager in his great work on
goitre has conclusively proved that
the view advanced by that in
sustainable, viz. that it is due to the
absence of Iodine and the same
authority has satisfactorily disposed
of the theories that it is caused by
organic matter, fluorine, silica,
absence of phosphates, carbonic acid,
oxygen or turbidity.
Snow water was in former days con-
considered to be the cause, but this
opinion is met by the statement
that goitre does not exist in Green-
land or Lapland, and that it is
prevalent in Sumatra where there
is never any snow.
Saint Lager himself after de-
molishing the theories of others, ad-
vances one which appears to rest
on very insecure foundations.
As has already been remarked an
examination of the tables giving the geological distribution in France and England reveals the fact that goitre is frequently associated with the occurrence of metallic iron veins. He was led from this to attribute the production of goitre to the presence in the drinking water of iron pyrites, or more seldom copper or some other metallic sulphide. He however relies entirely on the geological evidence, but it is evident that it would have been easy to have brought forward chemical evidence if his theory had been tenable.

Against it we have to consider the fact that in many districts where iron abounds goitre is quite unknown. In the iron is precipitated so often and for very long periods without the least tendency to goitre, and in many cases of goitre now, it is given with benefit. Besides, the quantity contained in most drinking water is far too small to have any appreciable effect.
The view which seems to find the greatest favour is that goitre is produced by means of drinking water which is rich in lime and magnesian salts. Thus, Roberts in his "Theory and Practice of Medicine" says: "The mass of evidence goes to prove distinctly that it (goitre) is due to the impregnation of the drinking water with excess of lime and magnesian salts—these salts having been dissolved in the percolation of water through geological strata containing them."

Again, Thornton writes that: "The impurity is stated by many to be due to an excess of lime and magnesia, which theory seems borne out by a geological examination of the localities in which goitre is indigenous in England."

Parker also has the following — "and certainly the evidence that the waters of goitrous places are derived from limestone and dolomitic rocks, or from serpentine in the granitic and metamorphic regions, is very strong."
It would certainly seem from the geological table of Saint-Lager, and more particularly of McClellan, as well as from other evidence that limestone and magnesia are capable of producing goitre; but the evidence is equally strong that it cannot be the only cause, as Saint-Lager found many instances where it occurred in the absence either of limestone or magnesia, and Dr. Grange who at one time devoted himself to proving that magnesia alone was sufficient to cause enlargement of the thyroid gland ha. now set reason for abandoning that view, owing chiefly to geological reasons.

Dr. Bruce Low in the district of Helmsley, Yorkshire for which he is medical officer of health, and in which goitre prevails, to a considerable extent found the amount of magnesia in the water to be only 0.35 to 0.9 grain per gallon.

Having thus glanced at the various theories regarding the causation
of the disease let me now state the different conditions under which it occurs in my own district, and consider how far these conditions are in accordance with the various theories which have been advanced.

The village of Marsden, with a population of 3500, is situated in the West Riding of Yorkshire near the borders of Lancashire. It is placed at the head of a deep and narrow valley, through which runs a small river – the Colne. Near the source of this river, amid moorland and supplies in great part by the small streams which unite to form the Colne, are two large reservoirs belonging to the Corporation of Huddersfield and from which a considerable part of the inhabitants of Marsden derive their water supply. The hills on either side of the valley and at its head form almost a rude amphitheatre. The greater part of the village is built on the 'floor' of this amphitheatre.
The hills form part of the great Pennine Range, stretching from the Cheviot Hills to the Peak in Derbyshire and attaining a height of 1400 feet above the level of the sea.

Considering the geology of the district, we find that these hills are composed entirely of sandstone with a thin covering of soil. This sandstone, as already indicated, is many hundreds feet in thickness, belongs to the Millstone Grit series, and is therefore non-calcareous. As is to be expected neither coal nor ironstone have been found. The stone is hard and white, and well adapted for building purposes.

Below the bed of the river but at a great depth, lie the Hydralc series. The soil covering these hills of sandstone, where it is not moor land, is of no great depth, is stiff, cold and damp. The crops are grown except grass, so that the soil is never ploughed or turned up except in rare instances.

Springs are common in the
district, and water is plentiful. Of the quality I shall speak again.

The rainfall is heavy, principally on account of the formation and height of the hills, which intercept the winds which blow laden with moisture from the sea. It averages about 55 inches annually.

The climate generally is cold and damp.

The valley has often been said to closely resemble in conformation many of those in Switzerland, where goitre extensively prevails.

Coming now to the question of water supply, I have made several analyses principally with the view of determining the amount of lime and magnesia present.

I took, in the first place, a sample from a tap within my own house which is supplied by the reservoirs belonging to the Huddersfield Corporation, and the situation of which have been already described. I have only to add that they are partly fed with springs.

The method of analysis was the
same as in all instances and is that
given by Waals in his work
on water analysis.

Seven hundred cubic centimetres of
the water to which a few drops of
hydrochloric acid had been added,
were evaporated over a water bath
to complete dryness and then heated
to nearly 150° Cent. The platinum
dish in which the evaporation was
performed, was with the residue weighed
after cooling with the following
result,

Weight of Dish and Residue = 423.35 milligrams.
Weight of Dish = 422.85 "
Weight of residue = 49 "

Since 100 c.c. of water weigh 1000
centigrammes, 100 c.c. constitute
a miniature gallon wherein the
centigramme corresponds to the
grain. Therefore according to the
above weighing the residue is
equal to 4.9 grains per gallon.
The residue was then treated
with a few drops of hydrochloric
acid, and 50 c.c. of distilled water
were added. The silica was thus,
precipitated and after filtration
the precipitate was washed, dried,
ignited in a porcelain capsule and
weighed:

Weight of Dish + Precipitate = 10.338 m.g.
Weight of Dish = 10.332 m.g.

\[ \therefore \text{Silica} = 6 \text{ m.g.} \]

and equal therefore to \(0.6\) grain per
gallon.

The filtrate was next rendered alkaline with ammonia
and there was only a very faint precipitate showing traces merely of
alumina oxide of iron, and phosphoric
acid forming phosphate, with these oxides.

After filtration the filtrate was treated with oxalate of ammonia
which precipitated the lime as
oxalate of lime. This precipitate
was ignited and weighed on cooling,
with this result:

Weight of dish of precipitate = 10.340 m.g.
Weight of dish = 10.331

\[ \therefore \text{Carbonate of lime} = 9 \text{ m.g.} \]

\(\therefore\) equal to \(0.9\) grain per gallon.

The filtrate was then concentrated
by evaporation in a platinum dish
rendered alkaline with ammonia and then to this was added phosphate of soda and more ammonia. The whole was allowed to stand for 12 hours, then filtered in the cold and the phosphate washed with ammonia to which an equal quantity of water had been added. The filter was then ignited and weighed a pyro-phosphate of magnesia 005 (0.490).

Weight of dish + precipitate = 17149 m.

Weight of dish __________ = 17136 m.

13 m.

: equal to 1.3 grain per gallon & allowing for the wash water one milligramme to 50 C.C. we have 1.2 grain pyrophosphate of magnesia per gallon.

The sulphate in the water were determined by 700 C.C. of water and converted into sulphate of baryta by adding slight excess of solution of chloride of Barium and a few drops of hydrochloric acid, then boiling and filtering. The precipitate was then washed, ignited, and weighed giving, after determining the weight of the dish a residue = .9 grain sulphate of baryta per gallon.
The analysis of the residue was not pursued further.

The total hardness of the water was determined by means of a standard solution of soap prepared according to Wanklyn's formula. In each case a good lather was obtained persisting for 3 minutes. The water under consideration gave 3 degrees of hardness.

Giving then the analysis of the water residue the hardness as far as I have determined there we have

- Hardness: 3 degrees.
- Total solids: 4.9 grains per gallon
- Silica: 0.6
- Carbonate of lime: 0.9
- Magnesia (as hydrosulphate): 1.7
- Sulphate of lime (Sulphate of Magnesia)
- Sulphate of Barium: 0.9
- No trace of iron was found.

The next sample of water I examined was that from a spring and had the reputation of being a very good water an opinion borne out by the analysis.
Harmonia base 3 degrees.
Total Solids 4.2 grains per gallon
Silica a trace.
Carbonate of Lime .8 "
Magnesia (or gypsum) 1.3 "
Sulphate (of Barium) .1 "

A third sample taken from a well in the village of the water supplying which had to flow a considerable distance through fields part of the way in an open drain, did not give such a favourable analysis:

Total Hardness 5 degrees.
Total Solids 8.6 grains per gallon
Silica 1.3 "
Carbonate of Lime 1.9 "
Magnesia (or gypsum) 1.5 "
Sulphate (of Barium) 2.5 "

Comparatively few were in the habit of using the last water.

It will thus be seen from the above analysis that the water of this district is soft and contains a small quantity of solids. It is therefore not rich in lime and magnesia salts.
The great majority of the population male and female are employed in woollen mills situated along the banks of the river.

The people generally speaking are strong and robust, although their teeth begin to decay early and it is matter of common observation that it is rare to find especially among young women a good set of teeth.

That this however must be attributed to the present habits of the people seems evident from the fact, well authenticated, that formerly the inhabitants had even to an advanced age generally good sound teeth.

Under my own observation there have come in all seventy-two cases of enlargement of the thyroid gland, but I have no doubt that as many as at least three per cent of the population are affected. The great majority of cases are in women and at least one half first showed signs of goitre at the age of puberty. In only two cases have I
seen it in children under 14 years of age, and in only five cases have I observed enlargement of the thyroid in males.

The intellect of my goitrous patients does not seem to have been affected, as there is no marked difference between them and their neighbours in that respect.

The disease is not limited to any particular part of the township, as I have seen, in every portion of the village, nor, as may be inferred from the number, is it limited to any one family. In a fair number of instances I find that both mother and daughter (sometimes several daughters) are affected. In one family, the mother suffers from the presence of a large goitre; two sons, and two daughters have enlarged thyroid glands. Two daughters in the same family have so far escaped.

In few of the cases does the enlargement come to be of serious inconvenience.
The two cases, of echymosis which I have already described are the only instances which have come under my notice.

What then are the conclusions to be drawn from the facts which I have just stated?

1. Goitre is endemic in all wood; in other words it is associated with the millstone grit and in a district where the potable water is shown to be free to a greater extent than usual from lime and magnesian salts.

2. It occurs in a deep valley, thus favouring the idea that owing to some unknown cause goitre has a tendency to attack the inhabitants of such a locality.

3. It is influenced by sex, more women being attacked than men, said to be due to the fact that women are greater water-drinkers than men.

4. Age also exerts a considerable influence the affection a, a rule not beginning before puberty.
5. Heredity seems to have a considerable influence as in many cases one or both parents (generally the mother) are goitrous. I have seen a grandmother, mother, and two daughters affected at the same time with goitre although they had all been born at different parts of the township & therefore not exposed (as might be objected) to the same influences throughout.

6. Pregnancy does not in my experience affect goitre. Neither have I observed, as has been alleged, that goitre predisposes to post partum haemorrhage. In an experience of nearly 600 cases of midwifery I have never had a case of flooding.

It would appear therefore that there are several factors which may be concerned in the production of goitre. It may I believe be caused by potable water containing lime and magnesium salts, but certainly such water is not the only
cause. Saint Leger long ago pointed out that goitre occurs in many districts where the strata contain neither of these, and my own analysis confirms his statement.

It is probable that the actual poison if poison it can be called is such as to defy the skill of the analyst.
Treatment of Goitre.

Goitres have been known to disappear without any treatment, especially in those cases where they have arisen during pregnancy.

It is of course evident that change of residence from a goitrous to a non-goitrous district may be of the greatest benefit, and some care, require no other means of cure.

Very few persons however are in a position to be able to do this, and where such is the case avoiding the suspected water as much as possible is the next indication.

Where patients are sent to the seaside it may assist recovery if they avail themselves of sea water or sea weed baths.

Iodine, either internally or externally or both, seems the medicinal agent of most value in the treatment of this disorder. Internally, the medicine appears to be of greatest use in the fibroid form of goitre and given in small dose, of mixture of iodine with sodide of
Potassium freely diluted. Iodine of roe is also very useful, and it is well to improve the general condition of the patient by means of tonics especially iron in combination with others.

Externally, iodine is used in various forms and in all kinds of goitrous enlargements. When the disease is of the simple soft form blistering, or painting the skin over the swelling with mixture of iodine (or if necessary the ointment) or rubbing with iodine ointment may be sufficient. An ointment of the biniodide of mercury has been introduced into practice in India by Capt. Cunningham, and is said to have seldom failed in effecting a cure if properly applied, while also it is affirmed that in no case has it produced salivation. The mode of applying it was to smear over the enlargement with the ointment and then cause the patient to sit for some time in the direct rays of the sun. It is said that as
many as 60,000 patients were treated in
this way with marked success. Other
writers speak disparagingly of the
treatment, but Sir Joseph Fayrer has
added his powerful testimony to its
efficacy.

Other methods have been adopted such
as applying compresses wrung out of
a saturated solution of iodide of
potassium; and of suspending pure
iodine above the patient's head in
bed so that during the night a certain
quantity of the drug may be inhaled.

Thomson in Linnæus' Dictionary
advises, if the enlargement is fibrous
and of some consistence, to employ
injections of the tincture of iodine
into, or serous pusses through, the
substance of the gland. The injection
of 15 minims to 1 drachm of the tincture
of iodine should be used twice a
week at first, then weekly and
afterwards fortnightly.

The greater number of cases are
benefited by this treatment whilst
on others no impression can be made.

In injecting it is necessary to
first freeze the stern by means of
the ether spray, and then push the needle of the syringe well into the substance of the thyroid, care being taken that it is not introduced into a vein or into the trachea. The fluid is then slowly injected. After injection the needle is carefully withdrawn and the syringe retained on the puncture for a minute or so. It is generally an operation of comparatively little danger, and in favourable cases the gland although painful and tender for a few hours, begins then to decrease in size and if the injections be persevered with, in about a month or five weeks a goitre of ordinary size ought to be cured. The injection should not be carried too far however as according to Billroth in very young or weak subjects the symptoms of iodine poisoning may develop. Iodine can be found in the urine and saliva a very short time after the operation. When by the action of the iodine the colloid substance has been absorbed then the remaining structure
shrinks into a circular-like mass.
In the Lancet (March 1887) Dr. Waaker describes how reasoning by analogy he tried fluoric acid instead of cocaine and was of opinion that it diminishes the number of injections required.
In some cases he was obliged to use the cocaine and fluoric acid alternately as the latter by itself seemed to become powerless. There seems no great advantage in adopting his plan.

The treatment by means of setons is as follows: The setons are made of from two to eight lengths of silk and then passed well through the enlargement. They should not be kept in longer than is necessary to establish suppuration and a free exit should be kept up for the discharge of the pus. There is a slight risk of producing blad-dering.
Ligation of the thyroid arteries for the relief or cure of goitre is not now much resorted to as it only proves of temporary benefit on
account of the great vascular supply of the gland, and the ready occurrence of free anastomoses. It is besides a somewhat difficult and dangerous operation.

In treating cystic goitre, it is now almost the most advisable plan to empty the cyst and then inject a solution of the perchloride of iron sufficient to expand the cavity again. In this manner the cyst is transformed into an abscess, a suppurative discharge being set up. The patient is to be kept at rest for several days, as following upon the operation there is always some constitutional disturbance. The cannula is to be kept plugged in the gland until the fourth day, when it is removed and replaced by a large india rubber drainage tube which is made with a middle layer of webbing. Poultices have to be freely applied and as the cyst becomes smaller, the india rubber drainage tube is to be shortened until the goitre has disappeared which generally happens in from
one to four months.

In the Brit. Med. Journal (Jan. 1883) Mr. W. J. Dixon gives his experience of 33 cases treated by injections of iodine in adenomatous goitres. He used for each injection 30 to 60 minutes of brisk, of iodine and he characterizes the operation as perfectly safe in opposition to the statement of Mr. Horsley in his recent lectures at the Brown Institution, that there was a danger of sudden death following the operation. Mr. Dixon asserts that in no case was there faintness produced by the operation and the only discomfort observed from the injection were now and then neuralgic pains in the teeth and behind the ears lasting for a few minutes, and in one case a rather troublesome hoarseness was produced which remained for about ten days and then entirely disappeared. He advises that in order to avoid puncturing either the trachea or a vein, to select a spot between the anterior jugular vein and the sternomastoid muscle
on either side.

Commenting upon this, in the following number of the Brit. Med. Jour., Dr. Felix Semow shows that Mr. Iivy takes too sanguine a view of the operation and confers all Dr. Harvel in his caution. He quotes from Rose, Morell Mackenzie, Sommer, Boditl, Paul Buns, Moritz Schmidt and Seitz, proving that in their hands suppuration and putrefaction of a goitre and even sudden death have repeatedly occurred.

Dr. Semow points out also that Mr. Iivy himself appears to have had a narrow escape of this accident as the hoarseness lasting for about 10 days, which the latter records would seem to have been most likely due to a lesion of one of the laryngeal motor nerves. To the danger mentioned by Mr. Harvel namely, that of injecting the iodine into a vessel and causing sudden death Dr. Semow adds two other (a) Suppuration and putrefaction of the goitre; (b) lesion of the pneumo-gastric or of the recurrent laryngeal nerve.
followed in some instances by spasm in others by lasting paralysis of the vocal cords.

Mr. Thornton also in the Lancet for March 18th 1883 publishes what he calls an unusual mishap in the treatment of cystic goitre. Rather more than three weeks after the cyst bas commenced to discharge the diminution in the size of the goitre ceased although the discharge still kept up. Examination showed that the cannula was on the opposite side of the trachea to that on which it had been inserted and that it had passed gradually from the right to the left side of the trachea and it was evident that the greater bulk of the goitre was on the right side and that its cyst cavity emptied itself by a channel which passed across the trachea into a smaller cavity on the left side and into which the cannula passed.

Lately recently Prof. Geo. Buchanan at a meeting of the Glasgow Pathological Society showed a cyst-
which had returned after lapping
and injection of mixture of iodine
had been finally excised.
Mr. Howesley believes that sudden
death occurring after the injection of
iodine is due not to the canula
piercing a large vein and injecting
air, but that it is the injection
into one of the enormously large
veins of the iodine or ferric chloride
d solution, with instant thrombosis
of the right side of the heart as
a consequence.

Avoidance of this awful accident
would seem to be perfectly easy
by following the rule of Denme,
namely to test the possibility of
having wounded a vein by waiting
after the puncture for a flow of
blood to indicate the same, before
injecting the fluid.

The precautions used by Mr. Thornton
are: A tape is passed round the
neck under the base of the goitre
and held tightly by an assistant
standing behind the patient
whilst the injection is going on
and for two or three minutes after.
The nozzle is fixed at right angle to the body of the syringe, enabling the injection to be made without holding the syringe below the level of the opening into the cyst and preventing the injection of air. Division of the enlarged isthmus, or better still, excision has been proposed by Dr. Duncan Gibb and successfully carried out by Mr. Balshorpe and others. Sydney Jones the latter of whom advocates excision. "The simple operation is performed by removing the isthmus between silk ligatures; and it is, followed invariably by shrinking of the goitre and no myxoedematous symptoms." The operation seems a thoroughly good one, easily carried out and at once gives relief to the urgent symptoms by relieving the pressure upon the trachea and nerves.

If that fails there is no great objection to removing a lobe or part of a lobe, and still less objection to removing a cyst by excision. Very different is it when we come
to consider the question of thyroidectomy. A consideration of the
diseased organs following this operation
and so forcibly described by Kocher
under the name of Cachexia Strumica: and of the important investiga-
tions of Mr. Harvey demonstrating
the extreme importance of the
thyroid gland to the animal economy,
leads us to consider the operation
as an unjustifiable one for the
cure of goitre.