

Observations on Thyroidism
as a Concomitant of Puberty.

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Observations on Thyroidism as a Concomitant of Puberty.

When doing the routine inspection of the 13 year age group of School Children in Ayrshire, one or two cases of Enlarged Thyroid Gland, accompanied with signs of Thyroidism or Hyperthyroidism were made out, and in view of the inter relationship of the Thyroid Gland and the Sexual System, in so far as the influence of the one on the other is concerned, I made an investigation throughout the group for such cases as presented an enlarged Thyroid Gland accompanied or unaccompanied by symptoms of Thyroidism at that age, in view of its connection with the period of Puberty.

The children examined in all numbered 2495 comprising boys and girls. The boys numbered 1276 of these and the girls 1219. The area covered, comprised the districts of North and South Ayrshire.

In North Ayrshire the districts are chiefly manufacturing, colliery, and health resorts, while in South Ayrshire or Carrick district they are chiefly colliery and agricultural. Of the 1219 girls examined, 16 showed enlarged thyroids, which were of recent development, and of these 9 showed symptoms of Thyroidism as evidenced by rapidity of pulse, tremor, enlarged thyroid gland, and in nearly all, some ocular signs, although in no case was Exophthalmos very

(very) pronounced.

The cases are as follows.

No 1. Girl, 13 years of age. Height 4ft 8 in. Weight 6st 2 lbs.

General health good and appeared well nourished, not anaemic. Had measles and whooping cough when a child. No history of consumption in the family.

Father. A miner, in good health. family history good.

Present History. The Thyroid gland was enlarged, began about 3 months before so far as aware, but not quite certain as to time.

Pulse rate was 80 per minute and of good volume.

No nerve tremor and no ocular signs. Was slow in answering questions. This case was only seen once

as left district shortly afterwards for Lanarkshire.

Case No 2.

Girl, 13 years of age. Height. 4ft 9 1/2 in. Weight. 5st 8 lbs.

Had measles, whooping cough and chickenpox when young

In good health, but very emotional and easily made cry which was of recent date. The pulse rate was 90.

and tension fair. No sign of Thyroidism made out.

Not seen again as was in Hospital with Scarlet

Fever when next visit was made. Father. miner.

Case No 3.

Girl. age 13 yrs. Height. 4ft 7 in. Weight 5st 4 lbs.

Had measles when young.

Family History. Father. Coal miner in good health. family history good, no history of Thyroid enlargement in any other

Case 3 Cont^d

Present History. Thyroid enlargement, of recent date, but no sign of Thyroidism present. Pulse rate was 72 per minute, volume good. No nerve tremors made out. In appearance healthy, not anaemic, somewhat stout. Seen for first time in Oct. 1913 and again in April 1914, condition unchanged. Mammary development was present but no history of menstruation.

Case No. 4.

Girl, age 13 yrs. Height 4ft 10 1/2 in. Weight 5 st. 8 1/2 lbs.

No illnesses in childhood.

Present History. Thyroid enlargement first noticed at Medical Inspection in Sept. 1913. Appearance was somewhat pale and anaemic, but no signs or symptoms of Thyroidism made out, Pulse rate was 72 per minute and of good quality. When seen later in February 1914 the condition was practically as before but not so anaemic looking. Mammary development was showing, but not any menstruation.

Case No. 5.

Girl, age 13 yrs. Height 4ft 7 in. Weight 4 st. 12 lbs.

Had whooping cough in infancy and measles 6 years ago.

Enlargement of Thyroid recent in origin, seen in Oct. 1913 at which time was emotional and cried readily. The pulse rate was about 80 per minute.

Family History was good, no history of Thyroid enlargement.

Case N^o 5. Cont^d.

When seen later in April, 1914. there was Thyroid enlargement. Pulse was 84 per minute & tension good.

No signs of Thyroidism, such as tremor or ocular signs were made out. There was some mammary development present though not much, but no sign of menstruation.

The general appearance and physique were good.

Case N^o 6.

Girl, age 14 yrs. Height. 5 ft 3 $\frac{3}{4}$ in. Weight 72 lb.

Had measles, whooping cough and scarlet fever when younger.

Family History good. no history of Thyroid enlargement.

Father, Coal miner.

Present History. Thyroid enlargement for about 2 years.

No sign or symptom of Thyroidism was made out. Pulse rate was 76 per minute. Seen for first time in September 1913. and when seen later in April 1914 the condition was unchanged. In appearance was tall healthy and well nourished, no tremor, not emotional, but somewhat dull mentally.

Mammary development was present, but no history of menstruation.

Case N^o 7.

Girl age 14 years. Height. 4 ft 6 in. Weight 54 lb.

Thyroid enlargement present but no sign of Thyroidism.

Only once examined as left school shortly afterwards.

Case No. 8.

Girl, age 13 years. Height 46 1/2 in. Weight 5 st.

She had measles at 5 years of age and 2 years ago in 1911 suffered from an attack of chorea which lasted from 8 to 10 weeks, but had been all right since.

Family History. Father, coal miner, alive and at present in good health, but has a Tubercular history in his family. Mother deceased 9 years ago, dying at age of 25 years. The cause of death said to have been Tuberculosis of Bowel. Family all well and no sign of any trouble. She has only one sister, the other members being those of the step mother; the older sister suffered from chorea also, but is now quite well.

Personal History. Nothing noticed until October 1913 when attention drawn to Enlarged Thyroid at school medical inspection. At the same time there were signs of Tachycardia the pulse rate being 130 per minute. There was also tremor present and decided heaving pulsation of Thyroid and neck vessels. The eyes did not show exophthalmos but there was a distinct widening of interpalpebral angle. Graef's sign was not made out and convergence was good. In addition to the tremor there was decided nervous excitability present and on account of this further examination was deferred.

The report from the teacher was to the effect that she was easily made cry, that she was not so good at class

Case No. Cont^d

(class) work as formerly, was easily confused.

She had only observed this recently.

In December she was again seen and on this occasion appeared to be worse, although she had been having things very much easier. The Thyroid enlargement was much as before, pulsation of thyroid and neck vessels more pronounced. The pulse rate was increased to 140 per minute and the tremor still showed, being much exaggerated on doing a fine movement, such as buttoning her frock. The eyes appeared more staring though no decided exophthalmos, convergence still good. The skin was moist, face appeared pale, showing a peculiar yellowish white colouration or pigmentation, somewhat patchy. The mucous membranes were better coloured than formerly.

The heart sounds were good, though action rapid, and does not complain of breathlessness, although respiration seemed slightly faster, but was not counted. Has not suffered from palpitation so far as she is aware, even after some exertion. The general nutrition appears good and much the same as 3 months ago. She is forgetful and does not remember things so well, is very emotional and easily excited, although she said she felt all right when I saw her. The knee jerks are somewhat inactive though present. She is slow at answering questions and teacher reports her, as not improving at

Case No. 8 Cont'd.

(at) school work since last visit and thinks even worse, but is certainly not so smart as she had been.

Best Mammary development present but no history of menstruation. When seen later in April 1914 the signs were still present, pulse 110 per minute, tremor still active, and a slight degree of exophthalmos present. Graef's sign was not made out. Pigmentation of skin as before.

Case No. 9.

Girl. 13 years. Height. 4 ft 10 in. Weight 62 lbs.

Had measles while a child.

Family History. Father, coal miner, at present in Asylum. Insanity supposed to follow on spinal injury and developed about 3 weeks after sudden death of a daughter. No history of alcohol or tuberculosis. With above exception family history good.

Present History. Thyroid enlargement only recently noticed; pulse rate 110 per minute. Tremor decided and aggravated upon fine movements. No exophthalmos present though one eye appears larger than the other, does not wink much and shows a weakness of convergence in right eye, which is also the one which appears larger than the other. Face appears somewhat pigmented, darkening of skin but no sign of anaemia, skin moist. Knee jerk reflexes are normal. Mentally is forgetful, at times confused and does not seem to understand things readily. Teacher reports that at lessons much about the same, that she does not appear to

Case No. 9. Cont.

(6) remember things and is at times stupid.

When seen later in April condition much the same.

Mammary development showing, but did not ascertain as to menstruation.

Case No. 10.

Girl, age 13 years. Height 4 ft 10 in. Weight 60-8 lbs.

Had measles in 1907.

Family History. Father, Ironworker, alive & healthy, no history of tuberculosis, at times given to alcoholic excess. Mother, Millworker, suffering from *Phtisis pulmonalis*.

Present History. Nothing noticed until October 1913, when enlarged Thyroid made out at Medical Inspection, but had been noticed at school as being excitable for a short period before that.

Appearance, face grey and anaemic looking, slight pigmentation in areas. Eyeballs staring, interpalpebral angle widened, slight Graef's sign made out.

Thyroid enlarged and throbbing with pulsation in vessels.

The pulse rate was 130 per minute and the tension low.

There was distinct tremor present, the knee jerks were normal.

The general nutrition was fair, but she was easily exhausted, and at such times feels short of breath. She is nervous

and excitable, easily made cry and is quite in a fear as she describes it. Teacher of school reports that she is not so smart at lessons and suffers from a decided lack

Case No. 10. Contd.

(lack) of interest, which he notices is recent, and further that she seems afraid and confused.

She has not menstruated so far, though mammary development is showing. Seen later in April the condition is much similar. The pulse rate was 126, tremor, and slight exophthalmos still showing. Slight Graef's sign still made out, the convergence was good. The appearance somewhat improved as not so anaemic looking.

Case No. 11.

Girl, age 13 yrs. Had measles and whooping cough in infancy, and appendicitis one year ago.

Family History Father, coal miner, healthy. Family history good.

Present History. Thyroid enlargement not noticed until Medical Inspection in September 1912. The pulse rate was 125 per minute and there was distinct throbbing in Thyroid and neck vessels.

In appearance she was thin and rather poorly nourished, though well cared for; had a slight degree of scoliosis of spine and was somewhat anaemic looking. There was slight exophthalmos and Graef's sign was made out, though not pronounced, and convergence was weak on the right eye. There was also present some slight pigmentation of face. Tremor was very noticeable and was exaggerated on movement, the knee jerks were normal. Mentally she was slow, somewhat confused, and teacher reports that she was not so good at lessons as formerly which, so far as I could learn, was of recent development.

Case N^o 11. Cont^d

and that she was nervous, excitable and emotional, all of which were growing worse. When seen later in April 1914. the pulse rate was 134 per minute, slight exophthalmos and Graefe's sign present. Slight pigmentation of face, but appears better than formerly. Tremor as before.

Mammary development present, but so far had not menstruated^d

Case N^o 11^{1/2}

Girl. 13 years. Had pneumonia as well as measles when a child.

Family History. Father coal pit enginemán. healthy... other family history good. no history of tuberculosis or enlarged thyroid.

Present History. Enlarged Thyroid first noticed at Medical Inspection in end of September 1913, at that time pulse rate was 110. The girl was very emotional, easily made cry and not so good at school work. There was slight tremor present.

Later February 1914. Thyroid enlargement about the same. The pulse was 140 per minute, though she had been off school resting since visit in September. The tremor had developed. There was pulsation in Thyroid gland and in vessels of neck, so much so that body seemed to shake when sitting.. In appearance somewhat pale, but not anaemic looking; the mucous membranes were of good colour. Exophthalmos was present but not great, mother says at times more noticeable than others. No weakness of convergence made out.

Interpalpebral angle was widened. but no definite Graefe's sign. The knee jerks were normal, or at most, very

Case N^o 12 Contd.

(very) slightly exaggerated. She is excitable and nervous, irritability of temper present at times. Her mother describes her as having become peculiar in her manner and gives a history which suggests a crisis as having been present on one occasion. Mammary development showing, but so far has not menstruated.

Case N^o 13

Girl age 13 yrs.

Family History Father coal miner, healthy; mother and family all well, no enlarged thyroid in family; but a history of a goitre in a grandmother, who is still living.

Present History. First complained of shortness of breath in September and was seen by Medical Inspector in October 1913. when enlargement of Thyroid was first noticed. There was some tremor present and pulse was about 100 when seen later in March 1914. The Thyroid enlargement was as before. The pulse rate was 112 per minute and the tremor was quite distinct. There was pulsation in Thyroid and vessels of neck. The interpalpebral angle was widened and the convergence in right eye was weak. There was no other sign of Thyroidism. In appearance looks fairly well nourished and shows no sign of pigmentation or anaemia, but complains still of shortness of breath. Mentally, slow in response to questions, not emotional nor excitable, rather inclined to be dull & slow, but seems to be fairly good at lessons. Knee jerks normal

Case N^o 13 Contd.

Mammary development present, but no history of menstruation so far.

Case N^o 14

Girl age 13 yrs. Height 5ft Weight 7st 14lbs

Had measles when young, but no other illness.

Family History. Father, coal miner, deceased. Death said to be due to Heart failure. Mother healthy & family 5 members. 2 of whom, younger members, are said to be mentally defective.

No history of enlarged thyroid in any other member of the family.

Present History. Thyroid enlargement not noticed until inspection in October 1913. In view of the history of mental deficiency in other members of family, enquiry was made as to specific signs, but no trace of syphilis was noticed in case in question.

The pulse rate was 104 per minute, soft but of fair volume. There was a pulsatile thrill in Thyroid and pulsation in neck vessels. There was widening of interpalpebral angle, more so in left eye than in right, and a weakness in convergence of right eye. The skin was moist. There was tremor present but was slight, the knee jerks were normal. In appearance looked fairly well, not anaemic but some pigmentation of skin present of yellowish brown colour. Somewhat dull mentally, forgetful, excitable and irritable, and teacher reports that not so good at lessons as formerly.

Mammary development present, but had not menstruated.

Case N^o 14 Cont.

This case was seen again in March, when condition was found to be as before, no improvement being noted, pulse being 110 per minute and tremor more noticeable.

Case N^o 15.

Girl, age 14 yrs. Height 4ft 6 1/2, weight 4st 12 lb. at 13 yrs.

Had measles in 1906.

Family History Father coal miner, healthy.

Mother had enlarged thyroid, but not exophthalmic goitre, so far as I could learn. Family history good otherwise.

Personal. Enlarged Thyroid first noticed at Medical Inspection in December 1912. when tremor was also noted.

Present History. Thyroid gland enlargement still present, pulsation showing in it and also in neck vessels. The pulse was soft and fairly small, the rate being 124 per minute. The tremor is present, and easily made out, though she informs me it was worse a year ago; it is exaggerated on movement. No exophthalmos made out; but widening of interpalpebral angle shows, when asked to look straight into one's face, in the ordinary way, not noticed. Graef's sign was absent. Convergence was good. In appearance looks healthy and bright, not anaemic and no pigmentation. Does not suffer from any mental confusion, is intelligent and answers questions rapidly and correctly. The teacher reports her as being a good pupil. Not vivacious however or sociable, more inclined to keep by herself and does not mix with other girls of her own age, not excitable or irritable. Knee jerk reflexes normal.

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Case No. 15 (cont'd). Symptoms began, when between 12 and 13 years of age. Has been menstruating for past 4 or 5 months, with amelioration of tremor, which she tells me is less than it was. Mammary development was present.

Case No. 16.

Girl age 13 years. Height 5 ft. Weight 62 1/2 lbs.

Had measles in 1909, whooping cough in 1910, and mumps in 1913.

Family History. Father, coal miner, healthy.

Mother, alive and healthy, family history good, no history of enlarged thyroid in family.

Present History. Enlarged thyroid first noticed at inspection in March 1914. Pulse rate was 104 per minute, soft but volume fairly good. Tremor was also present but slight.

Interpalpebral angle showed slight widening only, but there was weakness of convergence in right eye. The thyroid was enlarged and pulsation was noticeable. The knee jerk reflexes were normal. The mental condition was usual, no emotional excess, nor excitability, and was fairly intelligent. In appearance was healthy looking, not anaemic. Mammary development was showing, but so far had not menstruated. When seen again in April the condition was much the same, no better and no worse.

In the above series of cases I have confined the histories chiefly to those cardinal signs, which

(which) establish the diagnosis of Thyroidism, and when using the term Thyroidism, I mean those signs and symptoms which are due to an excess of Thyroid secretion and which are practically similar to those of Exophthalmic Goitre, which disease is now held to be due to excess of Thyroid secretion. The chief or cardinal signs of this condition are rapid action of heart, usually associated with low tension pulse; tremor which is rhythmic in character, and is increased on movement; some degree of enlargement of Thyroid Gland and in a pronounced case exophthalmos. The last sign is frequently modified and shows just as a widening of interpalpebral angle, and is sometimes not present, particularly in the early stage. Von Graef's sign ^{and} lagophthalmos are not usually demonstrated unless exophthalmos is present. Weakness of convergence is a sign that is frequently present, usually unilateral, and may be demonstrated at an early stage. Mental symptoms are often present, such as pronounced emotionalism, some degree of mental confusion, forgetfulness; often an irritability or a dullness may be present, in others excitement. At least most cases show some degree of instability ^{or} of loss of equilibrium of nerve tone and this shows itself in one or other of the various ways mentioned above. In the literature it mentions the enlargement of the Thyroid in girls at puberty, but does not

(not) suggest that there are signs of Thyroidism, in fact the literature on this point is meagre, mentioning it merely as a physiological enlargement or hyperplasia without further comment. In the number examined viz 1219 girls at this age, namely 13 years in those cases given, only 16 showed presence of enlarged thyroid, which makes a relatively small percentage affected, being 1.31 per cent, so that evidently the enlargement of thyroid gland is not a very frequent occurrence at that developmental period.

Of these 16 cases of enlargement, 9 or about 56.25 per cent of the total enlargements showed distinct signs of thyroidism, which condition may be of temporary duration, but at same time suggest themselves as being cases of early exophthalmic goitre, which apparently have their genesis in a fundamentally necessary developmental process, namely that of the development of sexual function at puberty. It is interesting in this connection that at the same time the boys of same routine group, namely those of 13 years of age, were also examined for presence of thyroid enlargement, but no case of such was discovered. This would lead one to presume that in males the part played by the Thyroid Gland in sexual development was not so great as in females and also that if such enlargement does occur, it must be in a relatively much smaller percentage.

Again it may be due to the fact that sexual develop.

(development). in males is not so decided, nor such a great economic strain on the organism as in the female, and being more gradual in its process, may not call for the same activity on the part of the thyroid gland, as it does in the female sex.

That thyroid secretion is necessary to the development of the sexual function is well seen in the case of the cretin, which condition is due to insufficiency of the thyroid gland.

In this condition there is no development of the sexual function, which fact presumes that ovarian development in the female does not take place, if the case remain untreated by administration of Thyroid gland substance in some form or other. However if such material be given to supply the natural deficiency of thyroid in question, then not only does the general condition improve, but the sexual function develops and it is presumed therefore that Thyroid gland secretion activates the ovary by its secretion. This is more evident if the treatment is started early in life, but even if begun late it may produce results. Murray¹ records a case of a female cretin, who at the age of 28 years was only 34½ inches high, in which scanty menstruation had only occurred a few times, and the mammary glands were quite undeveloped. Under thyroid treatment, she grew 4 inches in 3½ years, menstruation became regular and abundant, and breasts and nipples became remarkably well developed. The connection is still further seen or observed in the condition of

(of) myxoedema, another condition developing usually in later life, which is due to insufficiency of Thyroid gland. In this condition there is usually failure of the sexual function and when such cases were examined post. mortem it was noticed in the case of females, that the ovaries were atrophied. This was held as clearly demonstrating the co-relationship and interdependence of one on the other. In contrast to the above is the condition of Exophthalmic Goitre which is held to be due to over activity of the Thyroid gland, but the actual cause of which has not so far been satisfactorily agreed upon. The above mentioned cases in number 16, all showing Thyroid enlargement at the period of puberty, would suggest that the developing ovaries and adneca. make some demand on the thyroid gland for secretion required in their development, and while this demand is usually met without any enlargement of the thyroid, in a certain per. centage this demand can only be met by an increased activity of the gland. This increased activity results in an enlargement of the gland, but the secretion in a number of these merely meets physiological requirements ~~but~~ without giving rise to any signs or symptoms of excess of thyroid secretion, while in another per centage of cases, the secretion is produced, apparently in excess, and gives rise to signs of Thyroidism.

It is possible that this excess may owing to its function of activating the ovaries, stimulate fresh demand, which further stimulating the thyroid, gives rise to more excess, and thus action of one producing action and reaction, the increase goes on until the classic symptoms of Exophthalmic Goitre develop. At least ovarian activity seems to bring about exacerbations of exophthalmic goitre, as Oppenheim⁽²⁾ mentions a case which always had an exacerbation of the symptoms during menstruation, when it is presumed that the ovary is in a more active condition than usual. This would suggest that the ovary demands more of the thyroid secretion at such times than under ordinary circumstances. In fact it is well known that there are cases in which the thyroid undergoes physiological enlargement at such times, and surely it can only be because of increased demand due to ovarian activity. Further in certain cases of pregnancy such enlargements are also found, which are presumed to be on the same footing as those of puberty and menstruation. In this connection Thompson³ records the history of a patient in which partial thyroidectomy was performed during the early months of pregnancy. The patient had a hypertrophied thyroid but exhibited no sign of Thyroidism. Half of the

The organ was excised and subsequently the uterus decreased in size until it was almost normal and of the same consistency as a non pregnant organ. No history of bleeding was given and later when curetted, only some atrophied decidua and villi were removed. Six months later the patient again became pregnant. The remaining portion of thyroid was much enlarged until the fourth month. Gestation continued to term and was followed by a normal labour. The thyroid then subsided. The notes state that the gland has a direct connection with the sexual system of man and higher mammals through its secretions. Thus a lack of thyroid secretion influences sexual activity adversely. On the other hand sexual activity, whether physiological or pathological, causes a hyperactivity of the thyroid. Reviewing this it appears that the thyroid though enlarged did not give rise to symptoms of Thyroidism, but was merely meeting physiological demands or requirements no excess of secretion being evidently present. The partial removal upset the equilibrium, with result that it became a case of thyroid insufficiency with consequent diminution in the activity of the sexual process and a retrogression until it returned to a condition of comparative inactivity. In the subsequent pregnancy the demand for thyroid secretion could only be met by a further hypertrophy, which in fact took place, increasing until the fourth month, when apparently a balance or equilibrium was reached.

(reached), and the pregnancy went on an ~~inter~~ uninterrupted course to a finish, after which as the demand did not continue existent, the thyroid subsided, evidently without giving rise to any symptoms of thyroidism. This would presume that the original stimulus arose from the sexual function and the thyroid enlarged as a result.

The undernoted record for which I am indebted to my friend Dr. Clark is of interest as showing a connection between the ovary and thyroid gland. A girl patient aged 15 years, menstruated for first time about 6 months before being seen and at the time it was noticed that she was unduly excited, not only during the period, but also for a few days preceding and also following it. No tremor of hands or staring of eyes was noted so far as could be learned. Menstruation continued regularly until she came under observation 6 months after first period. Each succeeding menstruation period seemed to make her more excitable and nervous than those preceding and in January 1917, her hands were noticed as being very "shaky" and she complained of shortness of breath. When seen in February a few days before her period was due, as she felt so weak she had to take to bed. Had scarlet fever and whooping cough when young, otherwise had always been healthy. There was no history of exophthalmic goitre in family.

On examination pulse was found to be rapid,

(rapid) averaging 100 per minute, heart was normal otherwise.

Lungs were clear and respiratory murmur was good.

The urine showed a slight trace of albumin.

The eyes showed marked exophthalmos. Von Graefe's, Stellwag's and Joffroy's signs were all present, and there was also a slight internal squint of right eye. The hands were very tremulous. The skin was moist and warm to touch, but temperature was only 98° F. The thyroid gland was definitely enlarged and pulsating. Patient was very excitable and flushed on the slightest provocation.

Progress. She was treated by application of ice bag to the heart region and Radagen was given in 5 grain doses 3 times daily, in addition to general treatment by light diet etc.

Under this treatment the symptoms abated somewhat, the pulse falling to 106, tremor and excitement became milder, until crest of menstrual period, when she was considerably easier within 24 hours. After the menstrual she made rapid progress and within a week was able to be up & go out. Radagen was continued and Thyroid gland was noticed to be somewhat diminished in size and the pulsation almost gone.

For some months under Radagen the symptoms showed amelioration but in July it was stopped and the symptoms were again a great deal worse in August. In the month of November she was operated upon for a supposed Appendicitis when the right ovary was found to be enlarged and removed. The appendix was normal. Since the enlarged

(enlarged) ovary was removed, the symptoms and signs of exophthalmic goitre have disappeared, although patient has had no treatment of any kind since her operation.

It is interesting in connection with above case that when under treatment with Radagen while the symptoms of the Exophthalmic Goitre were ameliorated, menstruation almost ceased as a function, but that when the Radagen administration was stopped the menstrual returned in full force as also did the symptoms of the exophthalmos. It would appear from the above that it was impossible for this patient to functionate sexually, at least so far as menstruation is concerned, without the exophthalmos and would support the view of the condition being in many cases, due either directly or indirectly to the demand or stimulus made upon the thyroid, by the developing sexual function and at the same time that the function is unable to go on without it.

Regarding the cases given above it is perhaps a coincidence that these cases, with exception of two, all belong to coal miners' families. The housing conditions in these varied, although most of them lived in miners' rows, where the houses are of the one room thick order, and ventilated only on one side, with no inside water supply, this being obtained from a common outside Kennedy well, which supplies several houses. This might suggest a

(a) toxæmia as being a cause, but under the varying circumstances found, it would be difficult to suggest what such toxæmic element might be. It is not the water supply as these are varied and not of the same character and most of them are from excellent gravitation supplies. The only common features are the employment of the fathers, with 2 exceptions, and the fact that all are at the developmental period of puberty and showing sign of development sexually. One can hardly apportion blame to the father's employment for a condition commencing at such a time, it is therefore reasonable to suppose that the other common feature has its bearing on the situation. Particularly is this so, when in cases of sexual activity, such as pregnancy an allied enlargement of thyroid is frequently found. Why however its secretion should exceed the physiological requirements is more difficult to say.

One of the cases mentioned suffered from Chorea previously and another from appendicitis. In these cases it is easy to suppose that the nervous system as a result of those conditions, may be out of tone and therefore unable efficiently to regulate the nerve force governing such co-related secretions as that of Ovary and Thyroid Gland, and on account of this an increased activity may result. This excess of secretion so produced may help to further

(further) disarrange the balance and the condition grows worse until the symptoms of thyroidism are fully developed.

I conclude therefore that puberty may frequently be the initial cause of a condition of thyroidism, which is the result primarily of the demand of the developing sexual organs, and presumably the ovary, for their harmonious secretion from the thyroid gland. But that owing to certain instabilities of the nervous system, this is produced irregularly and in excess, giving rise to the condition of thyroidism is a result of the secretion of the ovaries not being able to fully combine therewith, and that, at least it is a frequent concomitant of puberty.

D^r. Blair Bell ⁽¹⁴⁾ gives results of experimental removal of ovaries on the thyroids of rabbits, which showed increased activity.

He notes that the character of the secretion is altered however and presumes from that, that the enlargement at puberty is due to insufficiency of the ovarian secretion. If that were always so then it is reasonable to suppose that all developing ovaries would at some stage, show insufficiency, as while not developed they are in a state of immaturity and hence reasonably insufficient. But it is only ⁱⁿ the very small number that such enlargement is found and it would to my mind appear to be more the result of an over activity of the ovary than an insufficiency.

Further in D^r. Clark's case quoted above, the

The ovary on one side was removed on account of enlargement
 and inflammation. Now surely this would be an active
 ovary, presumably overactive, as we often find in in-
 flamed organs. However if we conclude it to be in-
 sufficient and that this caused the thyroid activity, then
 surely its removal would make the insufficiency more
 so, and according to that theory, in this case the ex-
 -ophthalmic goitre ought to have increased, instead
 of which the condition subsided and completely dis-
 -appeared. This would support the contention that
 the activity of the thyroid is secondary to increased
 stimulation from the ovary or ovaries. If in those
 cases mentioned it were due to a toxæmia, we
 would presume that in the boys, who are liable
 to the same toxic influences as the girls, we should
 find it present in the male sex — frequently almost
 if not just as frequently, as in the female. All
 the literature on the subject suggests the condition as
 being much more frequent in females and it is
 only in relation to the female that temporary physiol-
 -ogical enlargement seems to be found, and the question
 naturally arises, why? Is it to be presumed that
 the thyroid, as a gland, is not so necessary for a
 similar development in the male, or is it only
 slightly related in that respect, the chief ones
 being placed upon some other member of the ductless

(ductless) glands, with only a subsidiary function of the Thyroid, while in the female the reverse holds. That there is co-⁽⁴⁾relation of the ductless glands is reasonable, and D. Blair Bell gives many reasons in favour thereof, showing that one is dependent on the other and vice versa. As a suggestion it is not unreasonable to presume that as the sexes differ in conformation and are complementary to each other in function, that the gland structure governing the development of each sexually, should differ, although these might be complementary to each other. As say for example, that the thyroid is the chief agent governing in the female with the pituitary or other as complementary, while in the male the pituitary or other is the governing gland with the thyroid as complementary, in the development of the ovaries and testicles respectively, which are complementary to each other. The pituitary suggests itself as the chief agent governing in the male as removal of the Pituitary in adult dogs, according to Sweet & ⁽⁵⁾Allan caused or rather resulted in atrophy of the testicles.

With regard to the enlargement of Thyroid which is sometimes seen in pregnancy, and which is frequently referred to in the literature, is presumably of the same character as that of puberty and presumably brought about in the same way.

⁽³⁾
 Thompson's case which is quoted above would show that it is directly brought about by the physiological demand of the enlarging or growing fertilised ovum in the uterus, and presumably due to the ovary or ovaries of the mother, as it is difficult to suppose that the ovary, being an internal secreting gland, ceases functioning in that respect, when the uterus, its co-related organ, is in a condition of physiological activity. There may be a resting from ovulation, but even that is doubtful as there have been cases recorded of super-fecundation, which could only occur if ovulation continued after pregnancy is established, and if such occur, surely it is reasonable to suppose that ovarian activity goes on even in pregnancy. Hence it is reasonable to presume that this physiological enlargement of the thyroid, at such times is in response to ovarian stimulus or demand, but whether the demand is caused by ovarian secretion in the blood acting on the thyroid direct or reflexly through the nervous system is difficult to suggest. Either way is quite reasonable and physiological. That the one is dependent on the other there seems no doubt and the condition at puberty would suggest

(suggest) to my mind that the primary demand, if such we may describe it, arises from the ovarian end of the chain, and according to the record of cases given at the beginning that Thyroidism is a frequent concomitant of such demand and response.

In extension, since we have this hyperactivity of the thyroid at puberty, at the beginning of sexual activity, due to stimulation from the ovary, may we not as readily in later life have an opposite condition brought about due to a lack of this stimulation, and in this way explaining some cases of myxoedema. We know that a great many cases of Exophthalmic Goitre become cases of myxoedema later on, and according to Dr. Jarrant⁽⁶⁾ there is a definite cycle from thyroid excess to thyroid insufficiency. May these not be brought about by the atrophy of the ovary cutting off the activating secretion, leading thereby to lessened activity of the thyroid and later to atrophy, and may this not suggest an explanation also, why as a rule women tend to become fat, due to lessened metabolism after the menopause, as it is well known that thyroid secretion increases metabolism.

References.

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