

## Original Articles.

### OBSERVATIONS ON ENDEMIC CRETINISM IN THE CHITRAL AND GILGIT\* VALLEYS.

BY R. MCCARRISON, M.B., B.CH.,

CAPTAIN, I.M.S.,

*Agency Surgeon in Gilgit.*

THE present study of Endemic Cretinism is based on an analysis of 203 cases of the disease, comprising the total cretinous population of the Gilgit and Mastuj districts. These districts extend over an area of about 500 miles of Himalayan country.

The cases have been collected by a house to house examination of almost every goitrous village in the district, so that few examples of the disease have escaped my observation.

At the outset I should, perhaps, direct attention to the fact that the observations to be detailed, and the conclusions to be drawn, refer only to cretinism as prevailing among the Chitrali and Gilgiti races. It will be found necessary when applying these results elsewhere, to take into consideration such factors as racial differences, habits of life, climatic conditions, etc., which are of importance in determining the prevalence of the disease. (1)

For convenience of discussion I propose to divide my subject into the following six sections:—

I. The incidence of cretinism and its relationship to the incidence of goitre.

II. Goitre in the individual and its relationship to cretinism.

III. Goitre in the mother and its relationship to cretinism.

IV. Debilitating factors and their influence on the mother in producing cretinism.

V. Types of the disease with associated symptoms.

VI. Conclusions.

#### I. THE INCIDENCE OF CRETINISM AND ITS RELATIONSHIP TO THE INCIDENCE OF GOITRE.

As is well known, endemic goitre, cretinism and deaf-mutism, are associated conditions. In this respect Gilgit and Chitral provide no exception to the rule.

There are certain facts, however, with regard to the association, which are deserving of comment,—

(a) Where goitre is commencing in epidemic form, as for example in Nagar, or among troops introduced into infected areas, the younger members of the community are the first to suffer. Such an epidemic, however, produces no cases of cretinism.

(b) In Chitral, on the other hand, where a relatively high percentage of children are goitrous, cretinism does occur, but is not common. I have been unable to trace a single instance, in which goitre in the child has given rise to cretinism.

Cretinism does not make its appearance in a goitrous family until the second or even the third generation.

(c) Now, in Gilgit, children suffer much less from goitre than do the children of Chitral, but they suffer much more from cretinism. Goitre is said to be of comparatively recent introduction into Chitral. In Gilgit, it has prevailed for centuries, and in districts where goitre is more prevalent among the adult population, cretinism is more common and of a graver type.

(d) Cretinism shows a marked tendency to occur in certain families. It is common to find several children in the same family, cretinous. I have met with instances where every child in the family has been a cretin.

While, therefore, cretinism is found to be intimately associated with goitre, the degree of this association is determined by the age of the endemic of goitre and by the extent to which the disease prevails among the adult population.

#### II. GOITRE IN THE INDIVIDUAL AND ITS RELATIONSHIP TO CRETINISM.

Just as endemic goitre is rarely found to produce myxœdema in the adult, so this condition is rarely a cause of cretinism in the child. Indeed, I have never met with such a case. This fact is opposed to the present day view that 75% of cretinism in goitrous localities is due to goitre in the individual. (3)

Facts bearing on this point have already been dealt with in the preceding section; the following further observations remain to be recorded:—

(1) There are in the present series of 203 cases, 88, or 44% in which there is an accompanying goitre. With the exception of two cases, in which the goitre was congenital, the history shows that the thyroid enlargement was subsequent and not prior to the appearance of the cretinic symptoms. It is possible that in some instances these histories may be incorrect, the accompanying Chart, however, should establish this general truth. The black line shows the number of cretins, the red line the number of goitrous cretins in the district at each year of age up to and over twenty years. From the chart it will be observed that the older a cretin is, the more likely he is to have a goitre. While only 17% of all cretins under the age of ten years are goitrous, no less than 70% over that age have an accompanying goitre.

(2) I can find little support for the view that goitrous cretins are, as a rule, less swollen and their condition relatively less grave than that of those without a goitre. Of the 88 goitrous cretins 20% are noted as being much swollen, while in the non-goitrous cases 25% are similarly

\* Read at Royal Society of Medicine, London.



much swollen. So far as my experience goes, I find that the presence or absence of a goitre is a matter of very little importance to the child's myxœdematous condition. The mental defect is, however, frequently greater, and nervous symptoms are more commonly present in these without a goitre. It is to be remembered that the so-called "goitre" is in reality made up, in the vast majority, of one or more adenomata in a functionally inactive or imperfectly active organ. The presence of such a goitre would not be beneficial to the child. There are, however, some few cases, in which the development of a goitre would appear to have been beneficial. Mr. James Berry, in his work on the thyroid gland, has instanced a case where the general body swelling diminished as the goitre enlarged. I have met with two similar cases (Nos. 5 and 159).

I have noted the presence of "fatty tumours" in 24% of my cases.

(3) Cretins are much more commonly goitrous than are healthy children.

### III. GOITRE IN THE MOTHER AND ITS RELATIONSHIP TO CRETINISM.

Our conception of endemic goitre has undergone some change of late years. The disease has hitherto been regarded as non-infectious. My investigations, however, have convinced me of its infectious nature. This view, although perhaps not yet sufficiently proven to demonstration, nevertheless provides the better explanation of its general phenomena, and of its sequel endemic cretinism.

There are, as is well known, certain infectious diseases of the mother such as tuberculosis, erysipelas, acute rheumatism, malaria, and influenza, which are capable of producing pathological effects on the child's thyroid gland. It is believed that the toxins produced by the organisms of these diseases circulate in the foetus and give rise to the morbid condition. It is to these toxins that cases of sporadic cretinism, in which there is no associated goitre, are attributed. Although infectious agencies have an undoubted influence in the production of endemic cretinism, this action is not limited as has been supposed, to non-goitrous cases of the disease. Of all infectious diseases which impair the unborn child's thyroid mechanism, the most important is endemic goitre. It is that disease which is beyond all others most frequently associated with cretinism.

Now in almost every case of cretinism goitre is present in one or both parents. It is present in the mother in 86% of my cases, in the father in 40%. The presence of a goitre was not noted in the mother in 28 cases. In 20 of these the mother herself was not seen or was dead. If these are excluded as uncertain, goitre is found to have been absent in the mother in only eight cases or 4%. While, therefore, cretinism can occur in the child of a woman free from goitre, it

must be established as a rule that in endemic localities, goitre in the mother is one of the most essential conditions for the development of cretinism in the child.

Maternal goitres are in over 80% of cases degenerated, the seat of adenomatous or of cystic change. Such an organ cannot be regarded as possessing the same potential powers of functional activity as a normal gland. The investigations of Baumann have shown that a goitre contains less thyroïdin than a normal gland, thus demonstrating the functional deficiency of the goitrous organ. Despite this defect the thyroid mechanism of the majority of goitrous women is capable of meeting the additional demands which pregnancy or other accidental circumstances may make upon it. There is, however, a minority in which this is not the case, and it is this minority which constitutes the mothers of cretins.

The experiments of Halstead and Edmunds on animals have shown the effect of an impaired action of the thyroid mechanism of the mother on the offspring. They afford, I think, an explanation of the train of events which gives rise to cretinism especially when they are considered in connection with the infectious origin of goitre. In describing these experiments I quote from Edmund's work on the subject: "Halstead found in the puppies of a bitch from which the thyroid gland had been removed, and which had been sired by a dog that had also in part been deprived of its thyroid gland, that the thyroid lobes in the puppies were twenty times larger than those of normal puppies." Edmunds repeated this experiment and obtained a similar result. He found that the changes observed on microscopical examination were those of "compensatory hypertrophy" and "were presumably due to an attempt to compensate for the absence of thyroid in the mother." The function of the thyroid mechanism is to neutralize toxins produced in the ordinary course of metabolism. In the case of the thyroidless bitch of this experiment there were more toxins circulating in the blood than her impaired thyroid mechanism could deal with. These toxins called forth a response on the part of the puppies gland and determined the resultant congenital goitre.

Dr. Richardson in his work on the Thyroid Gland surmises that the reverse of this experiment would probably occur and would account for a certain percentage of the cases. He says: "should the mother have an excess of thyroid secretion, the gland in the young would not develop and consequently the child would show cretinic symptoms after weaning." "The occurrence of a cretinic condition without goitre where goitre is endemic, suggests that the parenchymatous increase of the maternal gland, in conjunction with the normal hypersecretion of pregnancy, prevents the development of the foetal gland." I am of opinion that it is



# OBSERVATIONS ON ENDEMIC CRETINISM IN THE CHITRAL AND GILGIT VALLEYS.

BY CAPT. R. McCARRISON, M.B., B.CH., I.M.S.,  
*Agency Surgeon in Gilgit.*

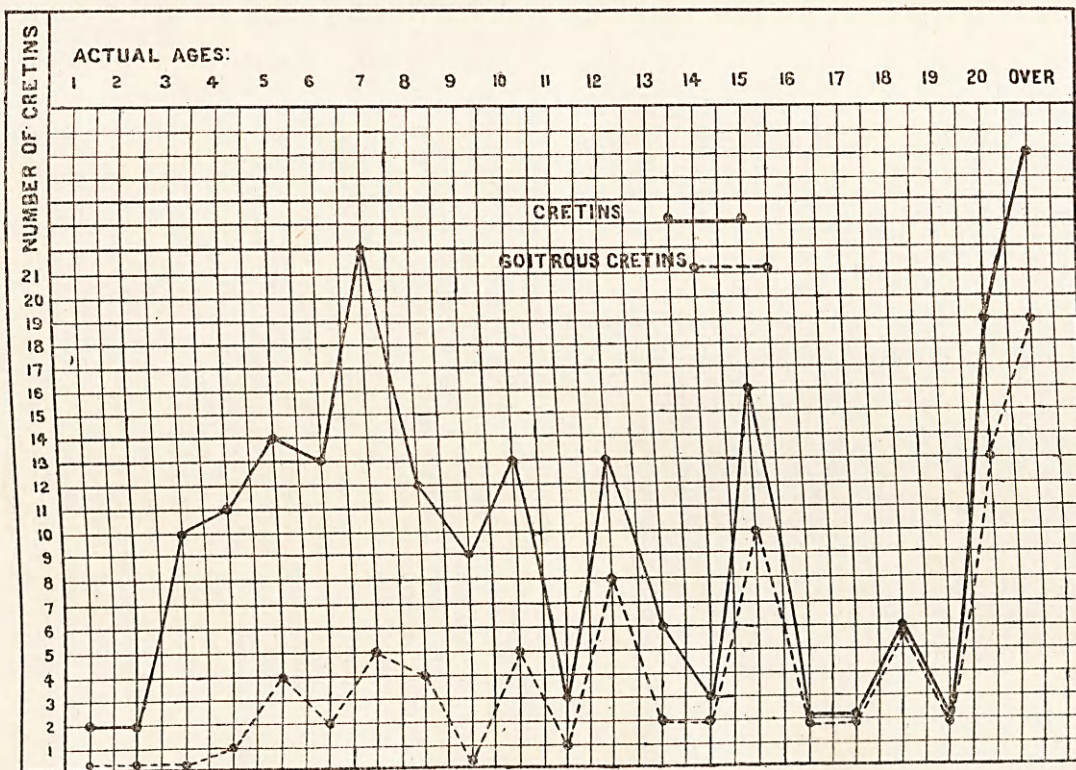


CHART SHOWING ACTUAL NUMBER OF CRETINS AT EACH YEAR OF AGE ; ALSO THE NUMBER  
OF GOITROUS CRETINS AT THESE AGES.



unnecessary to assume a reverse picture to that of the experiment quoted, believing as I do that its results are applicable directly to the goitrous pregnant woman. That in such a woman there is no excess of unutilized secretion is shown by the fact that the administration of the gland extract causes a reduction in size of the hypertrophied organ in both pregnancy and goitre. It appears to me that it is not the excess of secretion but the greater excess of demand that is of importance. It is the failure to meet all demands which constitutes a temporary inefficiency of these glands, and places the woman in a position identical with the partially thyroidless animal of the experiment. The goitrous mothers of cretinous children very commonly exhibit in their own persons signs of thyroid insufficiency during pregnancy; of these signs perhaps the most noticeable is that of tetany.

There is then a certain minority among goitrous pregnant women in which the thyroid mechanism is deficient. These are the mothers of cretins. The results of the experiment are applicable to them, but with this difference, that whereas the partially thyroidless bitch, under non-goitrous conditions, gave birth to offspring congenitally goitrous, the partially thyroidless woman, under continuous exposure to goitrous influences, gives birth to cretins.

The children of Gilgit, as I have already stated, are relatively immune to goitre. Succeeding generations have under continuous goitrous influences developed this degree of natural resistance to it. That children in other localities are not naturally immune to goitre, but are indeed more susceptible to it than adults, is shown by the cases of the epidemic in Nagar.(1) This immunity wears itself out and from puberty onwards the disease becomes more and more frequent, until almost half the population suffers from it during the later years of life.

I regard the immunity as due to the minimal action of the toxic agent of goitre on the developing foetal organism, which gives rise in the child to considerable cumulative powers of resistance. But where, owing to insufficiency of the maternal thyroid, toxic agencies are allowed freer play, this action on the developing foetal organ is continuous and excessive, resulting in comprisatory hypertrophy, or atrophy of whole or part of the thyroid mechanism. I believe that just in so far as the mother's thyroid potentiality possesses the inherent power of response to every demand, so far may we expect her child to be born temporarily immune to goitre, with congenital goitre or with cretinism; all of these I regard as being but stages in the same process and the evidence of the minimal, medial, or maximal action of the toxic agents on the unborn child's thyroid mechanism. The following cases may be quoted in support of the views which have

been expressed, others will be found in the appendix:—

No. 100. The mother is partially myxœdematous (Fig. 1). She has a small goitre and suffers from tetany. These attacks are worse during pregnancy and they are more frequent



FIG. 1.

during the spring months, when she may have as many as two or three during one month. There is no unconsciousness during them. She has always been myxœdematous, but believes that she is better than she used to be. She gives a very goitrous and myxœdematous family history. She has had eight children before the present child. They were all, according to her "born cretins." All were very swollen from birth, and all died before the age of three years. The child shown in the photograph is two years old. It is remarkably swollen.\* The parents in this case are well-to-do.

Nos. 190 and 191. Family very poor. Mother has a large tumorous goitre and suffers from tetany during pregnancy; she is coarse skinned and somewhat swollen. Her son, aged twenty-four (No. 190), the right-hand figure as seen by the spectator is a typical nervous cretin of an extreme degree. He is a deaf-mute. Her daughter (No. 191) is a typical myxœdematous cretin, aged eighteen, whose hearing and speech are defective. The mother has had nine children, of whom four are alive and all show signs of cretinism, the two youngest in lesser degree than the two eldest just described.

No. 82. Mother has had three perfectly healthy children. She then developed goitre, and subsequently gave birth to the present child who became a cretin after a convulsive

\* This child has improved very markedly under thyroid feeding. R. M. C.



fit at the age of two years. This cretin is twenty years of age and is very swollen.

IV. DEBILITATING FACTORS AND THEIR INFLUENCE ON THE MOTHER IN PRODUCING CRETINISM, CONGENITAL OR ACQUIRED.

(1) *Mental disease*.—The importance of mental disease in the parents of cretinous children is so slight that from an etiological point of view it may be neglected.

(2) *Alcoholism*.—Alcoholism, owing to the fact that the religion of the people prohibits its use, exerts no influence.

(3) *Syphilis and Tuberculosis*.—Syphilis and tuberculosis are rare as yet, although of late years they have become more prevalent. In only one of my cases is there a history of tuberculosis. (No. 180).

(4) *Nervous Disease. Tetany*.—The only important nervous disease is tetany. In a recent study of the affection, I found that of 56 mothers who are sufferers from tetany, 13 or 23% have cretinous children.

(5) *Consanguinity*.—Among the Syeds of Gilgit cretinism is much more common than among other classes of the community. The Syeds of all Mahomedan countries, as descendants of the Prophet, are permitted to marry only in their own sect. In Gilgit these Syed families are few and it is practically impossible for one of their members to marry out of a goitrous family. As a consequence the stock is goitre-tainted, and the taint is accentuated by in-breeding. There is a history of near marriage in 14% of my cases, and in some it is the only factor present in addition to goitre in the mother. In-breeding is, therefore, a factor of some importance.

(6) *Psychic factors*.—Fright, worry, mental depression and impressions received by the mother during pregnancy have great weight as determining factors. There is a reliable history of one or other of these in over 40% of my cases. The following are examples:—

No. 142. Goitrous mother, haunted by spirit while pregnant with her first child. This child is a cretin and deaf-mute. Her second and third children are alive and healthy.

No. 157. Goitrous mother lost her first two children who were healthy, while pregnant with her third child. She "remained always crying and in grief for them." Her third child was "born a cretin" and is deaf-mute. The next three children are alive and healthy.

No. 177. Mother goitrous. First two children girls, are alive and healthy. Third child, a son, died during the fourth pregnancy. The fourth child was "born a cretin" and is deaf-mute. The fifth child was healthy, but was a girl. Sixth child deaf-mute. Cause stated by mother to be "grief at the death of her only son."

No. 175. Mother goitrous. First five children died young, the deaths of several of these

occurring during the mother's seventh pregnancy. Her seventh child is a cretin and deaf-mute. Her sixth child is alive and healthy.

She attributed her evil fortune at the death of her children to a "spirit," which preyed greatly upon her mind during her seventh pregnancy. Afterwards the priests exorcised the "spirit." Her eighth child was born normal and is alive and well.

No. 22. Mother goitrous. Had two healthy sons then changed to a house which she believed to be haunted. Her next three children are all cretins.

No. 85—90. Woman goitrous. Husband died after she had borne to him a male child. This child fell from a roof at the age of one year and became a typical nervous cretin (Fig. No. 2).



FIG. 2.

Woman suffers from tetany and has a small tumourous goitre. Second husband was a man of another village to whose house she took her cretinous son. She had two sons by this husband, they are both cretins and deaf-mute and both of an extreme grade of 'nervous cretinism.' There were, as is so often the case in this country, living in the same house as her second husband, two other married women. Of these, one had already borne two daughters who are perfectly healthy. But after the arrival of the first woman and her cretinous son, she gave birth to a child who is a "nervous" cretin and deaf-mute. This child is quite helpless. The other woman was not a mother at this time, but she afterwards had two children, a boy and a girl, both of whom are "nervous" cretins and deaf-mutes.

It will have been observed that the type of cretinism is in all cases the same. The mothers attribute the fact that they gave birth to



cretinous children to "their continually seeing the first woman's cretinous boy in the house" and "to fear that their unborn child might be like him." There is no other history of difficult labour, near marriage or illnesses during pregnancy, to account for the condition of the children in the case of the last two mothers. A very exceptional fact in the case of the last mothers is that she has no goitre. There is in her case no other history whatever apart from the mental impression.

A history of the baneful influence of "the powers of evil" is very common, and so much so that one is forced to acknowledge it as real. Other frequent histories are that while in the jungle with the goats the mother was 'haunted by a fairy,' that she 'saw visions,' or that she 'saw the dead;' forms of delusional insanity which, though regarded by the mother as being the causal or exciting factor in producing cretinism in the child, may perhaps be considered as evidence of the defective functional activity of her own thyroid gland. It is known that some cases of delusional insanity are due to this cause and that they may be relieved by thyroid feeding. On the other hand, it is possible that the psychic influences caused the functional depression.

(7) *The influences of illnesses in the mother.*—As already stated, the most important factor is maternal goitre. There are, however, three other diseases which, when occurring in goitrous women, appear to favour the production of cretinism. These are malaria, rheumatism, and arthritis deformans. Others less frequently occurring are painful eye diseases and severe abscesses about the head. In 20% of all cases there is a history of illness in the mother to which the child's cretinism may reasonably be attributed.

The following will serve as illustrative cases:—

No. 169. Mother goitrous. Suffered from granular ophthalmia before her third child was born. The disease resulted in her total blindness. First two children healthy, the third a cretin. The fourth died at the age of four but was healthy.

No. 177. Mother goitrous. Suffered from rheumatism while she was pregnant with her second child, it is a cretin, non-goitrous and a very severe degree of the disease. Her first and third children are healthy. Her fourth child is dead.

No. 164. Mother goitrous. Developed severe bronchitis before her sixth child was born, from which she still suffers severely. Her first five children are normal. Her sixth is a cretin.

No. 161. Mother had abscess of the jaw before her third child was born. Her first two children are healthy. Her third is a cretin. Fourth and fifth children dead, but they "looked cretinous" according to her own statement.

I believe that illnesses in the mother are of more frequent occurrence than I have noted, it

was not till I had collected 78 cases of the disease that a few histories of such illnesses, which had been voluntarily offered, drew my attention to them.

(8) *Prolonged or difficult labour.*—There is such a history in 14% of cases. It is very frequently given in addition to other factors such as fright or mental distress or illnesses during pregnancy. Its importance is, therefore, difficult to estimate. It does, however, occur in certain cases where there is no other history, and in these it may be regarded as a debilitating factor acting on the child direct.

These are the main influences which operate on the unborn child to produce cretinism. They account for about 88% of the cases, and, since their action is solely through the maternal environment, they may be regarded as 'congenital.'

Cretinism, however, is not always congenital, in the strictest sense of the word. It may also be 'acquired.' It need not, that is to say, make its appearance at birth, but may ensue upon certain external quasi-mechanical eventualities. These may be divided into two classes:

(a) Nutritional. (b) Accidental.

(a) Nutritional factors are: insufficient milk, and ill-nourishment generally, exposure to cold, defective hygiene and the like. Their action, however, is slow and their influence slight. They account for 2% of my cases.

(b) The accidental circumstances which give rise to cretinism are three: Injury, Fright, or Nervous shock, and Disease.

Slightly over 10% of all cases of cretinism are to be classed as "accidental." About one half of these are goitrous, and in these also with the exception of one case, in which the goitre is congenital, the thyroid has enlarged subsequently to the onset of the cretinous symptoms. The ages at which the disease has made its appearance in these cases vary between six months and ten years.

It should, however, be pointed out that these "nutritional" and "accidental" factors are exciting rather than causal in their relation to the disease. To account for them I believe that it is necessary to pre-suppose a congenital instability of the thyroid mechanism together with the continued action of goitre toxins.

I recognise the possibility of a perfectly healthy child becoming a cretin after prolonged exposure to goitrous influences. I have not, however, met with such a case. These influences, of course, play a very important part in aggravating congenital cretinism, and if from any cause whatever the child's thyroid mechanism is incapable of combating them, it is reasonable to conclude that cretinoid symptoms may manifest themselves.

*Cretinism and Sex.*—In the series of cases which come under my observation, I have found a considerable preponderance of the male over the female sex. The proportion is as 5 to 2.



This preponderance is still maintained among cretins who are also goitrous, but it is much less marked, the proportion being as 5 to 4. The relatively higher death-rate among female children in Gilgit is responsible in some part for the lower proportion of female cretins.

#### V. TYPES OF THE DISEASE.

There are in this district two distinct types of the disease apart from the many divers grades of the affection which are ordinarily met with:—

1. The myxœdematous type.
2. The nervous type.

Cases commonly present the clinical features of a combination of these.

Deaf-mutism is an almost constant accompaniment of both types of the disease.

With regard to the myxœdematous type of cretinism few remarks are necessary. It corresponds to that form of the affection met with in Europe, and it is described in any text-book of medicine. It is noticeable that in Gilgit it is found for the most part among the richer families; such cretins are better clothed and fed, and the conditions of life under which they live correspond more closely with those of European cretins.

*Nervous Cretinism.*—One-third of all cases in the present series belong to this type of cretinism. Among these are included some of the very worst examples of the malady. Cretins of this type, in which the disability is more especially of the central nervous system in contra-distinction to those of the myxœdematous type in whom the defect is more especially physical, are usually to be found among the poorest of the people. They are commonly quite helpless and their bodies invariably bear the scars of burns or other injuries. Their parents frequently do not take the trouble to clothe them; and they are exposed to extremes of heat and cold greater than anything met with in England. Their diet consists only of a daily cake of unleavened bread.

The general appearance of such a case is as follows (Fig. 3):—

The skull is elongated, the antero-posterior diameter being long in proportion to the narrow lateral diameter. There is, as a rule, complete deaf-mutism. There is a knock-kneed spasticity of the lower limbs and the patient exhibits a complete or partial inability to stand upright. When supported on his feet he usually rests on his toes, and the knees may be close together or actually crossed; or the lower extremities may remain in a position of rigid extension. There is an increased knee-jerk and there may be marked flexion of the toes on the sole.

In those cases which are capable of walking there is a peculiar stiffness of gait and they may walk on their toes; as each foot reaches the ground there is a certain amount of 'give' at the knees and ankles, which produces a sort

of bobbing motion. There is sometimes flat foot. The upper limbs assume a position of right-angled flexion; the thumb may be drawn



FIG. 3.

into the palm and the fingers closed over it, while the wrist is flexed. Purposeless movements of the upper limbs are common. The spastic rigidity is always worse in the lower limbs. The head may be turned slowly from side to side, and in several of the worst cases I have seen, grimaces occurred. The face is characteristically cretinoid. The degree of swelling varies considerably; it may be marked or slight and confined to the face, hands, wrist and ankles. The abdomen is, as a rule, swollen and protuberant. There is always considerable stunting of growth which may be extreme or relatively slight. The patient's mentality is much disordered. There appears to be a loss of sensibility in the skin. Puberty is delayed and the sexual organs are ill-developed. A history of convulsive seizures has in a few instances been obtained. A coarse nystagmus and internal strabismus have been noted in some cases. All degrees of this condition are seen, from a spastic paralysis of the lower limbs to a general rigidity. In short, the condition is one of cretinous idiocy with associated cerebral diplegia. Photograph No. 11 affords a good illustration of this class of case. The subject is twenty-four years of age, is about 3½ feet high, obviously myxœdematous and presenting practically every feature of the type which I have just detailed. His sister is a typical myxœdematous cretin and is very swollen.

I have sought in the course of my observations to find in the histories of these cases some etiological reason for dissociating the obvious cretinoid condition from the no less obvious spastic condition of the limbs. I have not been able to



find that cretins of this type are more frequent among the class of 'accidental cretins.' Nor has a history of prolonged labour, of infectious diseases, of convulsions or of any other affections of childhood afforded any grounds for the dissociation of the nervous from the cretinoid symptoms. The factors which give rise to the diplegic symptoms are ante-natal in all cases; and I believe that it is to the congenital disability of the thyroid mechanism that this condition, like the myxœdematous type, is due. Even in those cases where there is a history of possible injury at birth I believe that this factor operates as 'an accidental' circumstance acting in the way I have described in the preceding section.

In the course of this paper I have referred to the thyroid defect in cretinism as being one of the 'thyroid mechanism,' a defect in which the parathyroids are also included in contra-distinction to the more limited defect of the thyroid proper, which is usually considered to be the morbid anatomical factor in cretinism. There can be no doubt that such a lesion exists but that it should extend to the parathyroids is not usually considered. These organs are, in the light of the most recent research on the subject, capable of functionally replacing the thyroid in the absence of the latter, though not completely so. They are, while possessing their own functional powers, an added safeguard to the organism in the case of insufficiency of the thyroid proper; while, their own insufficiency would appear, in some measure, to determine the nervous symptoms present in many cases.

The symptoms which are characteristic of 'nervous' cretinism are very similar to those which occur in animals after the complete removal of the thyroid and parathyroid glands. Indeed, as the symptoms are described by Murray, they are practical identical; a fact which affords some ground for the belief which I have expressed. I have, however, obtained results in three cases, by means of the therapeutic test of thyroid feeding, and by detailed *post-mortem* examination of the glands in a fourth, which to my mind, amount to actual proof that the nervous symptoms are due to a thyroid defect.

I have had an opportunity during the past year of treating three cases of nervous cretinism on the lines indicated. Without giving full details of these cases, it may be said that the administration of the fresh and dried extracts of sheep's thyroid has produced a marked improvement in the nervous symptoms. The spasm has disappeared; in one case the double interval strabismus (Fig. 4) with the associated coarse nystagmus has almost entirely disappeared. In another, a child who could only rise to its feet by a means of support and who could only take two stumbling paces before its legs gave way, after three months treatment walked for a distance of over thirty yards without falling. This child is nine years of old. It was very much swollen, and, according to its mother, could not

speak the simplest word. She affirms that it can now say "Ma" and "Da," though it refused to do so before me. There is not the slightest



FIG. 4.

doubt that its hearing has very much improved, and the mother has found it possible during the last month to employ it in certain little offices such as the collecting of bits of wood. The child has grown one inch in height in three and half months, while the swelling has disappeared and the skin become smooth and soft.

The therapeutic test, then, has provided results in these three cases which amply justify my views as to the nature of the condition.

Since writing this paper I have succeeded in one case in overcoming the intense prejudice of the people against *post-mortem* examination. This case, No. 85, has been referred to in Section IV, and is one of very great interest. The disease made its appearance at the end of the first year of life, and the factor which determined its manifestation was said to be a fall from a low roof. It will be remembered that the mother suffered from signs of thyroid insufficiency. The nervous symptoms in the case (Photo No. 3.) were very marked and were the most striking feature of the condition. The swelling was slight and limited to the face, wrists, and ankles, with fatty pads in the axilla. There was no very marked stunting of growth and the case might readily have been considered to be one of cerebral diplegia with pronounced mental defect. The naked eye appearances seen at the *post-mortem* examination of the child were a slight but uniform enlargement of the thyroid gland. It was very firm to the touch and was not nodular. Parathyroid glands could not be found in spite of the most careful search.

I have made at the Laboratories of the Royal Institute of Public Health with Dr. H. Dold,



pathologist to the Institute, a study of the histological appearances of the thyroid gland in the case. We found that there was a great and uniform increase of the fibrous stroma of the organ. The glandular elements were compressed. Typical vesicles were wholly absent and such as were present were almost completely obliterated. Traces only of colloid were seen scattered here and there over the sections. The appearances were those of a Struma fibrosa. We were unable to find any trace of parathyroid tissue (Micro-photograph, Fig. 5).

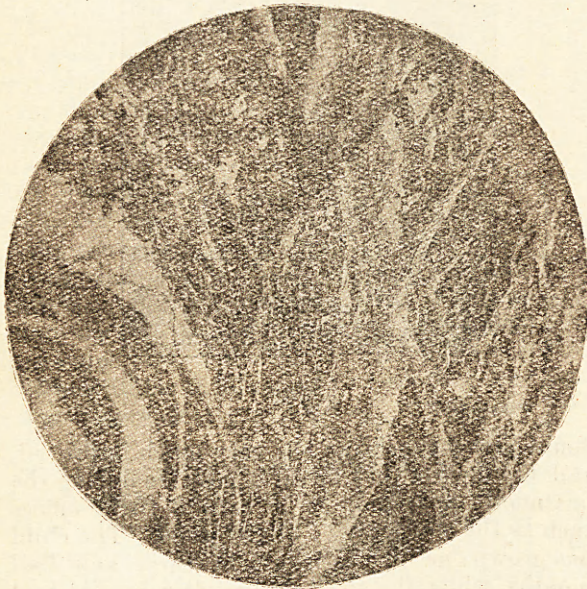


FIG. 5. Section of Thyroid Gland from a case of Nervous Cretinism.

Clearly, then, in this case there existed a pronounced defect not only of the thyroid but also of the parathyroid glands. The condition of the thyroid and the deficiency of colloid material furnishes, when considered in relation to the results obtained by thyroid feeding in three similar cases, a very striking proof of the truth of the views which I have expressed.

I may have drawn attention to the similarity between nervous cretins and cerebral diplegia, not only in symptomatology, but also in such facts as are known of its etiology. In cerebral diplegia cortical degeneration is, it is believed, due to the action of some toxic agent. In cretinism, the nervous symptoms are attributed, in my view, to toxins, which owing to a congenital insufficiency of the thyroid mechanism are no longer restrained in their action. In these cases of cerebral diplegia in which the etiology is obscure and in which the condition cannot reasonably be attributed to direct injury at birth, thyroid feeding may prove of benefit.

*Deaf-mutism as associated with cretinism.*—In no less than 87% of all cases there is an associated degree of deaf-mutism. In the majority of cases it is complete, in the minority it is partial. In the nervous type it is almost always

complete, less frequently so in the myxœdematous. The defect of speech may be caused in part by a swollen condition of the tongue, but it is mainly dependent on imperfect development of the higher brain centres, due I believe as in the case of the other nervous symptoms, to the unrestrained action of toxins. It is more frequently present in males than in females. The following cases are of interest as showing the relationship of goitre and cretinism to deaf-mutism:—

No. 5. The hearing and speech are said to have improved after the appearance of a goitre at the age of twelve years.

No. 137. The patient could hear and speak normally before the age of five years, when he fell from a roof and became a cretin and deaf-mute.

No. 149. The patient could hear and speak before the age of seven years when—after a fright—he became a cretin of the nervous type and quite deaf and dumb.

No. 159. The patient's hearing and speech are improving slowly since the development of a goitre at the age of thirty-five years. I have referred to the case of nervous cretinism under treatment where the hearing has undoubtedly improved and the child is said to be beginning to talk after three and half months' thyroid feeding.

## VI. CONCLUSIONS.

(1) The degree to which cretinism is associated with goitre is determined by the age of the endemic, and varies directly with the extent to which the latter disease prevails among the adult population.

(2) Cretinism is rarely, if ever, due to the development of a goitre in the individual. The thyroid enlargement, is, or may be, an effect, it is not the cause of the disease.

(3) Defective thyroid functionation in the mother is the essential factor in the production of cretinism.

(4) Cretinism is due to the action of toxic agents, notably that of endemic goitre, on the developing thyroid of the unborn child.

(5) The thyroid defect is congenital, but it may remain latent pending its manifestation through the impulse of some accidental circumstance.

(6) The defect in cretinism is one of the whole thyroid mechanism, of the parathyroids as well as of the thyroid gland. The diversity of symptoms is due to the extent to which the defect bears on the whole or part of that mechanism.

I should, perhaps, once more emphasize the fact that the conclusions have been drawn from data afforded solely by the Gilgit and Chitral districts.

I desire to express my indebtedness to my assistant, Sirdar Sahib Kehar Singh, whose untiring help and whose knowledge of the



Chitrali and Gilgiti languages rendered possible the accumulation of material on which this paper is based.

## REFERENCES.

- (1). McCarrison, 'Observations on Endemic Goitre in the Chitral and Gilgit Valleys, Medico-Chirurgical Transactions.' Vol. 89.
- (2). Baillarger. 'Enquêts sur le goitre et le Cretinism.' Baillière et fils. Paris, 1873.
- (3). Richardson. The Thyroid and Parathyroid Glands, Blonkiston, 1905.
- (4). Berry. Diseases of the Thyroid Gland. Churchill, 1901.
- (5). Edmunds. The Pathology and Diseases of the Thyroid Gland. Pentland, 1901.
- (6). Vincent and Jolly. *Journal of Physiology*, Vol. xxxii, 1904.
- (7). Murray, Diseases of the Thyroid Gland, Lewis, 1900.
- (8). Vincent, The Thyroid and Parathyroid Glands, *Lancet*, August 18, 1906.

### X-RAYS AS AN AID TO DIAGNOSIS IN SOME COMMON SURGICAL CONDITIONS.\*

BY F. POWELL CONNOR, F.R.C.S.,

CAPT., I.M.S.

THE Röntgen-Rays are now employed in such a variety of ways in almost every branch of medicine, that all that it will be possible to do here is to touch upon a fringe of the subject, *viz.*, to demonstrate their great utility in a few important surgical conditions.

*Methods of Examination.*—The most important of these are:

(i) Fluoroscopy—direct, stereoscopic or localizing.

(ii) Skiagraphy—direct (in different positions), stereoscopic, and localizing by some such methods as Mackenzie Davidson's Cross-Thread Localizer.

These are the two chief methods utilized for most conditions, especially the ordinary bone lesions. In the case of hollow viscera various ingenious methods have been introduced to facilitate examination.

(iii) The introduction of a metallic bougie (bladder, œsophagus, etc.)

(iv) The bismuth method, which, as I shall show, is of great value in abdominal investigations.

(v) Introduction of air or gas (stomach); or of oxygen (bladder, joints, etc.)

In the case of foreign bodies the stereoscopic method is particularly valuable.

Besides bone lesions, growths in the chest and abdomen; calculi, whether vesical, renal or appendicular; abscesses, such as hepatic, psoas, etc., are a few of the surgical conditions that can be readily examined by Röntgen methods.

*Bone Lesions.*—I will deal with two common fractures to illustrate the extreme value of the X rays in such conditions. But, it is as well only to regard this method of examination as

an aid to other clinical methods, or as an High Court of appeal, rather than an every-day clinical method. It must also be remembered that the eye gains a great deal by practice, and it is not everyone who can tell what constitutes a slight abnormality at first sight.

To take a well-known condition first, Colles' fracture, examination by Röntgen methods has very much upset the old stereotyped description found till recently in text-books. Morton\* has examined 170 cases diagnosed as Colles' fracture, and his results are most interesting. Injury to the styloid process of the ulna, for instance, was supposed to be a rare condition in former days, and yet it was found to exist in about one-half of these cases. Again, the line of fracture was said to be, as often as not, over 1 inch from the carpal border, while in this series only two were over 1 inch from the corpus, and in 72% of the cases it was only  $\frac{1}{2}$  inch or less. The wrist-joint was involved in only 25 cases, and the displacement of the lower fragment was found to be backwards twice as often as all the other displacements put together. Impaction occurred in 57 per cent. of the cases. Fig. I represents a skiagram of a severe Colles with much displacements of the lower fragment (A), and fracture of the ulnar styloid (B).

Supra-condyloid fracture of the humerus is another very common fracture, which I should like to touch upon. It is described in all surgical books, but to my mind very badly in most, and much too little stress is laid upon it. To me it seems to deserve as much attention at the elbow as Colles' fracture receives at the wrist. It is a fracture involving the humerus just above the condyles, and sometimes passing through the epiphyseal line when present, but generally just above that level. I have seen it so often among the out-patients at the Medical College Hospital, that I have begun to collect cases to see what proportion of all cases of fracture at the elbow belong to this class.

The fracture is generally caused by a fall on a partly flexed arm, much as in the case of a Colles. It is frequently due to quite a slight fall, particularly in children, but is not by any means always through the epiphyseal line. Unfortunately most of these cases come to the hospital some days or weeks after the accident. One reason for this is perhaps that the majority occur in the mofussil, and another is that most of these cases are diagnosed as bad sprains at first, and such cases are not uncommon. Though the fracture is obvious in the skiagram, clinically it is far from apparent. Being incomplete, and with little displacement—

(a) The length of the humerus is not appreciably affected.

(b) No crepitus can be obtained.

(c) And examination is rendered very difficult owing to the condition being an extremely

\* Read before the Medical Section of the Asiatic Society of Bengal.

\* *Lancet*, March 16, 1907.