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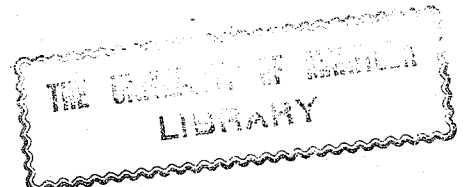
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ARNASON, J.

THYROID EXTERPATION.

- THESIS -

1917



search work on thyroids and parathyroids, we are at once
the many scientific workers, who have carried out re-
On reading the accounts of the results obtained by
matters of doubt.

tween the thyroid and the parathyroid glands are still
and the physiological and functional relationship be-
its importance to life has not been definitely settled,
true function of the thyroid gland. The question as to
has not been definitely solved. We do not yet know the
directly, it must be admitted that the problem in question
have been established for diseases that affect the thyroid
disclosed by those experiments, and fairly reliable cures
And yet, in spite of the facts that much has been
to life.

med in the attempt to discover its function and importance
entists and a vast number of experiments has been perfor-
portance has held the close attention of all leading sci-
During the last eighty years the question of its im-
function of the gland.

led many observers to a close study of the importance and
ly connected with it, have also been long known, and have
days of medicine. Certain diseases, more or less direct-
gland in man and mammals have been known from the earliest
The existence and the gross anatomy of the thyroid

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confronted with the fact, that many of these are conflicting. It is also very evident that extirpation experiments of thyroid only in most animals, and particularly in some of the carnivora, must be very difficult, owing to the close anatomical relationship between the thyroid and the parathyroids.

In my opinion this accounts, partly at least, for the somewhat indefinite results referred to before. There is further little doubt that results of extirpation of thyroid and parathyroids differ considerably in different classes of animals.

The physiological relationship between thyroid and parathyroids is one of the points upon which scientific workers have not quite agreed in the past. Professor Swale Vincent in his book on "Internal Secretion and the Ductless Glands" states: "Thyroid and parathyroids are to be looked upon as a single physiological apparatus, the two kinds of tissues being intimately associated embryologically, and working together physiologically. When the thyroid is removed the parathyroids appear capable of functionally replacing it to a certain extent, and their histological structure changes accordingly".

This view, though shared by some scientists, has been contradicted by others.

I have attempted to solve the problem by performing a series of experiments on rabbits, the results of which will be submitted after the history of the subject of Extirpation has been briefly reviewed.

H I S T O R I C A L.

During the years 1836-1880 a considerable number of extirpation experiments was performed by different observers. Experiments at this time were, however, often carried out under unsatisfactory or unknown conditions. The existence of the parathyroids was not known, and the records left are in many cases incomplete and unsatisfactory. We may therefore say that the results of these early experiments cannot be considered to have much importance, and a short summary will suffice to indicate the most important points in connection with thyroidectomy, which those experiments have brought to light.

To Raynard (64), a French scientist, belongs the honor of having first performed extirpation experiments upon animals in 1834-1835. He maintains that goitre can be treated in dogs just as in man. "Il réussit," says Raynard, "fréquemment pendant l'âge moyen de la vie. Il est fort avantageux pour les animaux âgés. Quant aux jeunes, depuis le sevrage jusqu'à deux ou trois mois, nous avons fait la remarque qu'il est suivi de la mort peu de jours après, même dès le lendemain de la disparition du goître. Les recherches cadavériques les plus minutieuses ne nous ont fait découvrir jusqu'à ce jour aucune lésion à laquelle on puisse attribuer la mort".

The most important experiments from this period were performed by Schiff (69,70) in 1857-1859. He did a series of thyroidectomies upon different animals, and reports that several dogs, a cat, and a rat died some days after the operation, but that some rabbits, rats, fowls, and dogs survived.

Several other observers extirpated the thyroid from dogs, rabbits, rats and other animals about this time. Generally speaking the animals were not observed to show any ill-effects after the operation with the exception of a few cases in which it proved fatal.

At this time cretinism had long been recognized, and in 1874 a condition later known as myxoedema was described (by Gull). In 1882 some Swiss surgeons noted the symptoms of "operative myxoedema" after an operation for goitre in man.

These early experiments can, therefore, not be said to have yielded definite results, and they left the subject of thyroidectomy open for future research. But they undoubtedly aroused interest in the subject, spurred scientists on to further investigations, and probably drew the attention of surgeons to a possible danger of total removal of the thyroid gland.

The most important experiments performed during the ten following years were done by Schiff and Horsley.

In 1884 Schiff (69) performed a new series of thyroidectomies upon rats, rabbits, cats, and dogs. His results briefly stated were as follows: Rats and rabbits showed no marked symptoms after removal of the thyroid, but in dogs and cats complete removal of the gland at one time resulted in the death of the animal within a few days. In most cases the animals died in the first week after the operation, and one dog only out of sixty survived for fifty days. Schiff thought that removal of the thyroid was not fatal when the two lobes of the gland were removed at different times. He stated, further, that grafting of a portion of the gland into the peritoneal cavity prevented the symptoms that usually followed the operation.

(36-43)
Horsley studied the effects of thyroidectomy upon different animals in considerable detail. The results of his experiments agreed fairly closely with those already obtained by Schiff. Thus, he found, that the carnivora - dogs, cats, and foxes - usually died soon after the operation with acute symptoms. In man and the monkey the operation was followed by chronic symptoms, which finally and invariably led to death. The Ungulata - sheep, goats, donkeys, pigs - showed a general cachexia which resulted in death after a more

or less prolonged period. (The Herbivora) Birds and rabbits showed no symptoms.

From these results Horsley came to the conclusion that the different effects of thyroidectomy upon various classes of animals, were due to differences in metabolism.

The general symptoms displayed by animals after thyroidectomy, as noted by these observers, were general malaise, muscular tremors, alterations in sensibility, vaso-motor disturbances, and cachexia.

Horsley, who first operated on monkeys, records the following train of symptoms in those animals, in the first six weeks: Fibrillary twitchings of the muscles of the limbs (which, however, ceased on voluntary movement), anaemia, and depression, cretinism, and myxoedema. The myxoedema, he states, led to the death of the animal in the sixth or seventh week. Horsley further describes infiltration by mucin into the subcutaneous tissue of the face and abdomen, a hypertrophy of the salivary glands, and a mucous secretion by the parotids. Subsequent observers have not been able to verify these last results (*vide infra*).

The great majority of scientific observers of this period (1886-1890) agree in the conclusion, that the thyroid gland is an organ essential to life.

the thyroid alone was being removed from the rabbit, with no ill-effects; but in the dog, where thyroid and parathyroids were in close contact, the whole apparatus was being removed with fatal results. Thus, he thought that anatomical differences explained the different results obtained in those two cases.

To prove this theory he removed the external parathyroids, along with the thyroid, from a number of rabbits, and came to the conclusion that the operation, when performed in this way, was as fatal in rabbits as in dogs. Out of fifty-five rabbits operated on in this way, twelve lived, however.

Gley also tried to remove the thyroid from dogs, without at the same time taking out the parathyroids, and found that the operation then was no more dangerous than in rabbits.

He further removed the external parathyroids from both these classes of animals, and concluded that the operation was harmless in either case.

The same observer noted, what had previously been learnt, that removal of ^{the} thyroid in rabbits gave rise to no symptoms. If, however, the external parathyroids were removed later the animal soon died with acute symptoms. The external parathyroids