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Hypertrophy of the thryoid gland. Revision of experiments made 25 years ago.

By WILLIAM STEWART HALSTED.

For some years I have thought that the hyperplasia of the remaining thryoid tissue which has followed excision of a portion of the thyroid gland might be due to infection of the wound, and was, in most cases, not a compensatory hypertrophy; and for the following reasons:

1. In 1888 I found that hyperplasia of the thyroid glands of dogs occurred after the injection of several c.c. of a bouillon culture of *Staphylococcus aureus* into the peritoneal cavity, and also when a mild form of peritonitis had been produced in these animals—a peritonitis which was not rapidly fatal.

2. Experiments conducted in 1906 and 7 in the Hunterian laboratory seemed to prove that for the successful transplantation of a parathyroid glandule, a considerable deficiency must be created.

3. Have observed that symptoms of hyperthyroidism and even exophthalmic goiter may develop promptly after tonsillitis, appendicitis, pneumonia, typhoid fever and other infections.

4. Twice in the course of the past five years I have had the opportunity to examine the remaining lobe of the thyroid gland after excision of the other in dogs whose wounds had healed throughout without suppuration and have noted that there was no hyperplasia of the former.

5. The inconstant results obtained by other experimenters.

Last October I proposed to Dr. Hunnicutt, my assistant the Hunterian laboratory, that he undertake a series of experiments with view to determining the matter definitely. Observing aseptic precautions in the strictest manner Dr. Hunnicutt has made a large number of experiments and we are able to report that in the nine dogs whose thyroids thus far have been examined there has been not the slightest evidence of hyperplasia in a single instance. The average time allowed to elapse between the removal of the first and second lobes was 55 days, the shortest

interval being 30 and the longest 81 days. In one of the dogs there was a superficial stitch infection for a few days, otherwise there was in no case the slightest evidence of suppuration.

From a restudy of the report of my experiments on extirpation of the thyroid gland made in 1888, I find that, for the major part of the experiments, the wounds of the dogs were left open, and that after 22 days, with 3 exceptions (Nos. 105, 126 and 127) there was hypertrophy, macroscopic and microscopic, of the remaining gland in the animals whose wounds were permitted to heal by granulation, whereas when the wound healed absolutely per primam the hyperplasia of the remaining thyroid tissue did not develop except in dogs which died from some intercurrent disease such as pneumonia or distemper.

Of the three exceptions referred to the tip only of one thyroid gland was ligated in two (nos. 126 and 127) and no tissue removed at the operation. 132 days later, examination of the thyroid lobe revealed no hyperplasia, except perhaps to a very slight and questionable degree in one of the sections of the lobe of one of these dogs. The absence of hypertrophy in dogs 126 and 127 after 132 days may possibly have been due to the long interval between the first and second operations. The hyperplasic picture may, possibly, have been present and vanished, although from observations of 25 years ago we know that extreme hyperplasia may persist for 104 days and we have no absolute proof from them that having been once established it disappears. From a study of the elaborate and important work of David Marine and Marine and Lenhart I am quite convinced that the return to normal is to be expected. In one of Dr. Hunnicutt's dogs the lobe first removed showed marked hyperplasia, whereas 87 days later the second lobe presented the normal histological appearance.

In the remaining case (No. 105) the veins at the upper poles of both lobes were ligated and unnecessary manipulation carefully avoided. On the 51st day there was no evidence of hyperplasia.

That there is such a thing as true compensatory hyperplasia is proved, I think, by my experiments in transplantation of the parathyroid glandules. Thus when both thyroid lobes have been

[1] Johns Hopkins Hospital Reports, Vol. I, Table IV.

removed and only a film of thyroid transplanted with one parathyroid gland, this film hypertrophies enormously and on microscopical examination displays the typical picture of hyperplasia. In one instance the graft was examined 15 months after operation.[1] It would be interesting to determine the amount of deficiency which it is necessary to create for the successful transplantation of the thyroid gland; also whether hyperplasia necessarily ensues when the transplant lives. In other words will a thyroid graft always fail to take unless the deficiency created is so great that hyperplasia must develop?

Should it become a definitely established fact that hyperplasia may be produced by infection, not only are a number of things explained which otherwise seemed inexplicable, but new lines of investigation suggested.

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Partial occlusion of the thoracic and abdominal aortas by bands of fresh aorta and of fascia lata

By W. S. HALSTED, M.D.

Ligation of the human abdominal aorta has been made 19 or 20 times and always with fatal result.

Dubois, Assalini, Bujalsky, Pirigoff, Cooper, Keen and perhaps others attempted to occlude the abdominal aorta gradually by means of cleverly devised instruments which, carrying snares of silk, metal or catgut might be tightened or loosened at will. The instruments traversed the abdominal wall and hence infection was a complication common to all of the methods and defeated the plans of the operators.

In 1904 assisted by Dr. W. F. M. Sowers, I began a series of experiments on dogs in the hope of finding a safe method of occluding the aorta and curing aortic aneurysm. Bands of silver and aluminum curled about the aorta by an instrument constructed for this purpose were rolled tighter by the fingers until the desired degree of occlusion of this vessel was obtained. The abdominal wounds were closed with the expectation that they would have to be reopened one or more times for the purpose of

[1] *Journal of Experimental Medicine*, 1912, Vol. XV, Plate 30, Fig. 2.