FARIS (C.M.), THACHER (H.C.) et al

COMPARATIVE SURGERY;

WITH ILLUSTRATIVE CASES,

By C. M. Faris, H. C. Thacher, J. F. Ortschild,
and F. C. Beall,

AND AN INTRODUCTION,

By Harvey Cushing.

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[179] It is the purpose of this communication to report some of the cases which indicate, it is hoped, a new development in our present plan of teaching operative surgery; for latterly as the work has been conducted, it has necessarily subjected vagrant animals to the risks and discomforts attending more or less serious surgical procedures carried out for the relief of merely hypothetical maladies.

Four years ago an effort was made in our medical school —and so far as I know for the first time in any school—to change in a radical way those methods of conducting an operative course, which, for the past generation, have been widely adopted and generally regarded as most practicable by the surgical teachers in the leading medical institutions.

Heretofore it has been the universal custom, I believe, whenever anatomical material has been sufficiently abundant to justify its being shared by the clinical departments, to employ the human cadaver for the practical teaching of operative handicraft. And though the opportunities thus offered are admirable in many respects the method is open to serious objections. If I may judge from my own experience not only as a participant but subsequently as an onlooker at these exercises, the students are usually coached in the performance

[179] of the more or less stereotyped operations principally on the head and extremities,—the various time-honored amputations, excisions of bones and joints, set ligations of vessels, etc., etc.,—and thus it is the perfected *operation* rather than the *method of operating* upon which chief emphasis is laid.

A course of this kind, in which students are called upon to play an active part, may be not only an excellent surgical supplement to the study of human topographical anatomy but is useful, too, as an introduction to the handling of the surgeon's tools,—still it seems to me that the one great essential of modern surgery is conspicuously wanting. The paramount call upon the instructor, in this Listerian era, is that he shall emphasize and drill into his students, not as mere onlookers or hearers but as actual performers, the significance of that much-abused term surgical "technique," of which to-day the all-important element is asepsis—the first and the everlasting thing to be indelibly stamped on the make-up of everyone who proposes to undertake operative work whether as a surgeon or investigator. Surgical cleanliness, which must become a reflex matter—an operator's second nature—and which, like all other reflexes, must be learned early, is necessarily disregarded in the time-honored methods of teaching this branch in the most unsurgical surroundings of a dissecting room. Next in importance to the acquirement of this reflex habit of cleanliness is the ability to dissect and to gently manipulate living tissues without so damaging them as to interfere with perfect reactionless healing; and a third great requisite, which cannot be learned upon the cadaver, is an acquirement of skill in the proper control of hæmorrhage from the large as well as small vessels, for the old-fashioned rough methods of hæmostasis happily are still followed by few. Nor, finally, can facility in the particular technique of visceral surgery, whether abdominal, thoracic, or intracranial, be properly obtained through practice on the lifeless body, a fact which almost all of those who have been pioneers in these fields of work have emphasized.

With these ideas in mind, our present course of operative instruction was first started upon living animals, stray dogs

being used for the purpose, and so far as our opportunities [179]
permitted, all of the formalities, that would be observed in regard to a patient admitted for treatment to the surgical wards of the hospital, have been followed. Clinical histories, of which examples will be shown you, have been kept on regular hospital history sheets; the effect of the anæsthesia on the pulse and respiration has regularly been recorded; the detail of the operative preparation both for the staff and patient has been followed; pathological and post-operative notes made; and in case of a fatality, a formal autopsy performed and its results added to the record.

The work has proved so interesting to the instructor and seemingly so acceptable to the groups of undergraduates and graduate students, to whom it has been possible to extend it, that it is gratifying to learn of the establishment, in several other institutions, of courses modeled on similar lines. Our aim has not been to turn out a multitude of operating surgeons, any more than the aim of the manual training departments in some of our modern schools is to turn out finished cabinet-makers or iron-workers, but rather to teach the proper use of the hands and respect for the materials on which they work, through simple actual problems, so that not only may all understand the way work is done and appreciate good work when it is done, but also the few, who are by nature best fitted, may learn of their special aptitude for this particular form of handicraft and be encouraged to continue with it.

After a course of training of this sort and with an acquirement of proper surgical reflexes, a student, when his turn comes, should be found a safe and valuable helper in the hospital operating room where blunders in technique must not occur; and furthermore he may with profit to himself be an [180]
understanding onlooker at the surgical work of others, an occupation, which, for those who have never taken part in or conducted operations themselves, must be granted to be a comparatively fruitless expenditure of time.

For the carrying out of our plan of work, it has been necessary to assume lesions, for the relief of which operative therapy was appropriate—a stricture of the œsophagus, for

[180] example, which called for a gastrostomy of one form or another. And it has been our custom, in order that the students, just entering upon their first year of clinical instruction, might become familiar with actual cases rather than their text-book presentation, for them to select from the hospital records cases that were supposed to represent the clinical condition of the animals presented for operation.

We have endeavored to combine this instruction in operative work with the necessary experimentation of the various laboratories, so that, for example, when a gastric fistula was needed in the physiological department, for the study or demonstration of the gastric secretion, the gastrostomy patient mentioned above would suffice, and thus a double purpose be served, with a possible sparing of animal life. The surgical share, also, in many experimental investigations has been undertaken at the same time that the students are learning how to operate—how to handle the tissues and to work with gloved fingers, how to tie and to sponge, how gauze should be used in "walling off" the peritoneal cavity, how incisions should be made and how closed, and a multitude of other things, not the least of which is the proper feeling of responsibility for the general welfare of the anæsthetized patient.

Though satisfactory enough in its ends the benefits arising from such a course are confined to the class and the preceptor and are entirely at the expense of the animal. There is naturally a feeling of regret in the minds of many—of none greater than our own—that animals, particularly dogs, should thus be subjected to operations, even though the object be a most desirable one and accomplished without the infliction of pain, and did expense permit, we would gladly have used animals with which there is an association of less acute sentiment on the part of all. This feeling in the past few months has been somewhat mitigated by the fact that, learning of our work, the owners of animals actually suffering from maladies of a surgical nature, and maladies which most veterinarians are loth to operate upon, have begun to bring these animals to us for treatment, so that there is promise of a clinic, which may

furnish us with enough material to obviate in large measure [180] the need of using normal animals.

The surgical report of some of these cases will be made by Messrs. Beall, Faris, Ortschild, and Thacher and it can be seen why the title of Comparative Surgery has been chosen for this report. In the past the work has been conducted at a great disadvantage owing to our cramped quarters, and though every effort has been made for the comfort of the animals before and after the operations, not until the completion of the building, now being erected, will it be possible to give them the real hospital care and accommodation which they deserve.

TWO CASES OF HÆMORRHAGIC CYST OF THE THYROID GLAND.

By C. M. Faris.

Case I.—*Large tumor of the right thyroid gland.*

The patient, a valuable and well-bred, Irish-setter dog, actively used every season for field work, was brought to us for operation by Dr. Cox in March, 1899. On the right side of the neck, in the region of the thyroid, was a tumor measuring on its surface about 8 by 12 cm. (Fig. 1). The time of its first appearance was not ascertainable. The growth has progressively increased in size and of late has greatly interfered with respiration. The mass was very hard to the feel, roundish in outline, with a smooth surface, and so tense as not to impart to the fingers any sense of fluctuation. It was quite movable from side to side, though not in an up and down direction. Pressure against the tumor made the animal breathe with a marked inspiratory effort; but without such pressure and when the animal was quiet, there was no evidence of dyspnœa. The right pupil was contracted.

Operation.—March 6, 1899. Ether anæsthesia. *Extirpation of gland and cyst.*

The usual transverse incision (Kocher), with its convexity downward, was made over the tumor. The outer capsule was exposed after division of the platysma and anterior thyroid muscles. The tumor was found to be very adherent, vascular, and its enucleation proved most difficult. It was necessary to divide the right sterno-mastoid muscle and even with this exposure, in the efforts to separate the cyst from the surrounding

[180] tissues, it ruptured and several ounces of dark grumous blood-clot escaped. The tissues became so stained that a clean dissection and individual ligation of the groups of thyroid vessels were precluded. Before the mass was finally freed there had been hæmorrhage from several large vessels that had been divided before they could be recognized and secured with clamps. The enucleation was finally accomplished; the divided muscles were reunited with fine silk and the skin closed with a subcuticular silver suture. No drainage was used. An intravenous saline infusion was given.

FIG. 1.—Profile view of cervical tumor in Case I.

[181] The animal made an uneventful recovery. The wound healed per primam.

Subsequent History.—The animal lived until the autumn of 1904, four and one-half years after the operation. Death was said to be from old age. His shortness of breath had disappeared after the operation, and for several seasons he proved as useful as ever before as a field dog.

Pathological Report.—The specimen is a large roundish thick walled (1 to 2 cm.) cyst, containing a pasty, grumous, brownish-red material. Its outer surface shows a somewhat shredded fibrous capsule over which lie a number of very large blood-vessels. The inner surface of the cyst wall is divided into irregular spaces by numerous trabeculæ. On section, the walls are

found to be made up of several concentric more or less distinct [181] layers, some of which are fibrous and tough, others more friable, having in places the color and appearance of normal parenchyma. Scrapings from the latter show epithelial cells with large vesicular nuclei. Examination of the contents of the cysts showed cholesterin crystals and degenerated blood-cells.

The microscopical findings will be described below.

CASE II.—*Large tumor of the right thyroid gland.*

A large, thoroughbred, Russian-greyhound bitch, nine years of age, was admitted in March, 1904, with the following history:

FIG. 2.—Anterior view of cervical tumor in Case II.

She was a house pet and, having been spayed when four years of age, had grown very stout. Her health had been good until the past year when the present tumor started to develop. For several months she has been dull, inactive and irritable. She occasionally snaps when at play with the children, a thing which never occurred before. There has been some muscular twitching. She has grown very fleshy, has lost most of her hair, and the skin has become dry and scaly. There has been considerable distress for breath, with sighing and wheezing sounds particularly noticeable during her sleep, which is very restless.

Examination.—The pulse rate is 60; the beats irregular in rhythm and quality. No definite exophthalmus is present though the eyes have the usual prominence characteristic of the hound.

[181] The right pupil is much larger than the left: both react normally to light. Her skin is rough and scaly though there is no eruption suggesting a cutaneous disease. She has lost most of her coat. She is very fat, and must weigh nearly 100 pounds.

On the right side of the neck, in the region of the thyroid gland, is a swelling about the size of a base-ball; its surface is smooth, almost spherical in outline (Figs. 2 and 3). It gives no sense of fluctuation nor is there any bruit or pulsation.

Considerable interest was aroused as to the diagnosis in this case. The tumor, prominence of the eyes, irregularity of the pulse,

FIG. 3.—Profile of neck in Case II. Owing to the extended position of the neck the tumor is less prominent than it otherwise appeared.

nervousness and irritability were suggestive of exophthalmic goitre. Myxœdema was suggested by the change in the nutrition of the skin, the loss of hair, the increase in weight as well as the mental and physical inactivity. The animal however had been spayed and was reaching an age when dogs are liable to show such changes of coat and form.

Operation.—March 12, 1904. Ether anæsthesia. *Enucleation of right thyroid and cyst.* The operation was conducted as in the former case and almost the same difficulties were encountered owing to the vascularity of the tumor and the adhesions about the capsule. In spite of all care, the cyst, as in Case I, ruptured during the manipulations of the tumor. Enucleation was finally

accomplished. The left lobe of the thyroid was inspected and [181] seemed normal in size. The wound was closed with silver as in the case above. Healing was absolutely without inflammatory reaction and recovery was uninterrupted.

The animal lived for about a year after the operation, when at her owner's request and owing to her poor physical condition, she was chloroformed. Though for a time after the operation her respiration had seemed to improve and her tremors to be less, the general nutritional state was not altered. The condition of the skin became worse; a cataract developed in the right eye. There were distressing attacks of paroxysmal dyspnœa with an extraordinary depression of the intercostal spaces during the inspiratory act. Thyroid extract was administered for some time before her death without bettering her condition.

Pathological Note.—The gross appearances of the tumor removed at the operation differed but slightly from those of the tissues described under Case I. There is the same thick walled cyst, which, when collapsed and after hardening, measures 8 by 6 by 4 cm., and which contains the same dark reddish, friable, grumous material. The surface of the cyst wall on section presents a laminated appearance, with superimposed fibrous layers between which can be made out, in some areas, narrow strips of thyroid parenchyma. Several small cysts, the larger of which measures 1½ cm. in diameter are to be seen in the surface of the section. No parathyroids can be found.

Microscopic Examination of the Hardened Tissue.—The wall of the cyst is for the most part made up of dense fibrous layers, [182] between which, in places are zones of glandular substance. The cyst content is made up of a granular, faintly staining mass in which the shadows of blood corpuscles and cholesterin crystals are to be made out. Organization of this clot has begun to take place in some areas along the inner wall of the cyst; where new formed granulation tissue is more or less abundant. Such of the parenchyma of the gland as is still preserved, is altered from the normal. The vesicles, which are still recognizable as such, by their structure and colloid content, are much deformed, most of them being compressed into flattened figures that lie concentric with the curved layers of the cyst wall. Others of them have a crenated outline from the irregular incurving of the epithelial lining. Some of them are partly filled with blood and contain crystals as well as desquamated epithelial cells. The epithelium which remains, is for the most part fairly typical in appearance, though the cells seem less high and contain less protoplasm than normal. In some areas the parenchymal cells are so massed as to have lost all resemblance to their proper gland-

[182] ular arrangement. There is no colloid in these areas, and they are traversed by blood-vessels having extremely delicate walls.

Autopsy.—February 10, 1905. On opening the body the musculature was found to be pale, the panniculus abundant. The abdominal and thoracic viscera were for the most part normal. The lower intestine was injected and on opening the bowel, a hæmorrhagic enteritis extending from duodenum to anus was found. The ovaries were absent; the uterus much atrophied. A large cyst was present in the lower half of the left kidney. These organs, as were the adrenals, spleen, liver, pancreas, and stomach, were otherwise normal on section. There was no glandular en-

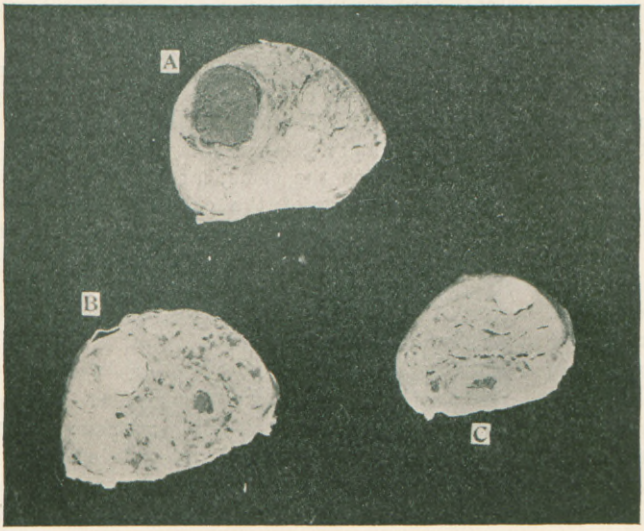

FIG. 4.—Slightly magnified photographs of three cross-sections of the hardened left thyroid gland removed at autopsy from Case II.

The letter *A* is placed near a hæmorrhagic cyst filled with recent clot; *B* is near a large intramural parathyroid body; *C* near a partially absorbed clot, the thick wall of which consists of compact parenchymal cells.

largement. The heart and lungs were normal except for the presence of a few calcareous nodules scattered throughout the latter. There was no thickening or sclerosis of the aorta. The brain and cord were normal aside from the thickened and adherent membranes characteristic of an old animal.

A careful dissection of the neck was made. No remnant of the

thyroid was found on the side (right) of the old operation; nor [182] were there any parathyroids to be found. No accessory thyroids were found in the mediastinal spaces.

The remaining thyroid gland, on the left, was found to be much larger than normal. It measured nearly 6 cm. in its long axis, and its transverse diameters on section were 2 by 1½ cm. The section showed numerous small cysts, the largest measuring

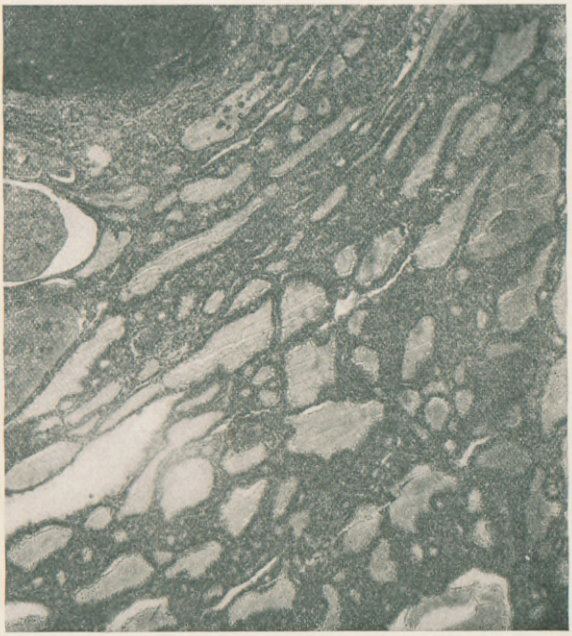

FIG. 5.—Microphotograph of section on the edge of a small organizing hæmorrhagic cyst (left upper corner). Showing compression of neighboring vesicles and hypertrophy in adjoining part of gland.

about 5 mm. across, and containing a small blood-clot (Fig. 4, *A*). One large parathyroid was present on the surface, equatorial in position, and the section subsequently showed another buried in the substance of the gland (Fig. 4, *B*). There were no polar parathyroids to be found. Microscopical examination of the liver, spleen, kidney, adrenal, and intestine added nothing to the knowledge gained by the gross appearances.

Sections of the thyroid showed alterations varying all the way from the normal, or nearly normal, to the profound changes that

[182] had been found in the cyst wall of the gland extirpated the year before. The various compartments of the gland were fairly well outlined by delicate fibrous trabeculæ. In some of these compartments the colloid containing vesicles were quite well preserved and lined by a single layer of low epithelium. More commonly, however, the epithelium was infolded and the cells higher in form, while between the vesicles there was a marked cellular proliferation (Fig. 5).[1] This process had gone on in
[183]

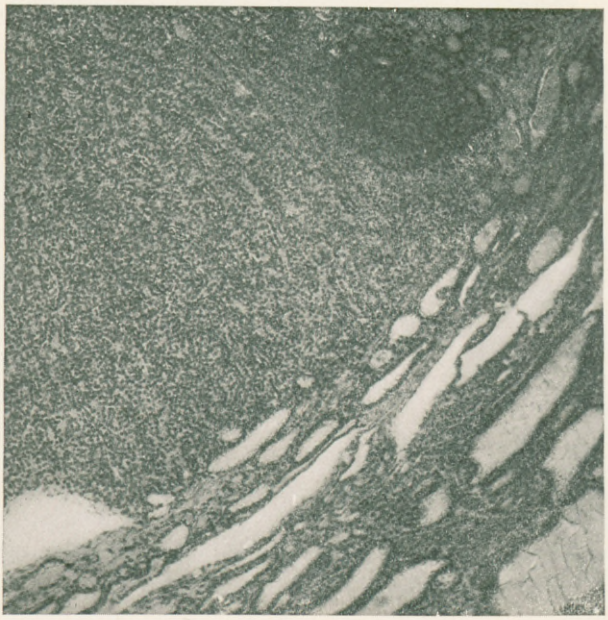

FIG. 6.—Edge of cyst shown in gross in Fig. 4, *C*. Showing zone of compact parenchymal cells.

[182] some places to such an extent that in some fields the infolding was so extreme and the multiplication of cells so great, that with the absence of colloid almost all trace of glandular arrangement was lost (Fig. 6). The appearances were closely akin to those seen in experimental thyroid hypertrophy or in advanced stages of exophthalmic goitre.

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[1] This, as well as the following microphotographs, has kindly been taken for us by Mr. T. M. Wright, Jr., a simple microscope and ordinary camera being used for the purpose.

In some of the compartments of the gland (there were four or five of them), hæmorrhages had occurred (Fig. 4, A) so that it was possible to see in miniature just what had taken place on a large scale in the hæmorrhagic cyst removed at operation. The extravasation seemed to have occurred in the central part of the lobule. This had distended and led to a thickening of the lobular fibrous capsule within which the parenchymal cells were massed and crowded together as a lining zone. Occasionally a flattened vesicle was to be seen containing colloid but for the most part the glandular structure in the zone lining the clot was completely lost. In two of the cysts, apparently those of longest standing, granulation tissue was growing out into the clot and large epithelioid cells filled with pigment were interspersed among the inner layer of parenchymal cells. In two of the cysts no effort at repair had taken place, the clot being sharply defined against the compressed glandular acini of the lobule and less evidence of the neighboring hypertrophic change had taken place in these instances. [182] [183]

A large parathyroid was found embedded in the substance of the gland near its middle, (Fig. 4, B). This, as was the case with the surface parathyroid, showed no apparent alteration from the normal.

Discussion.

Pathological changes in the thyroid gland of dogs are closely analogous to those occurring in man which are better known since they have been subjected to more careful study.

Aristotle, Pliny, Galen, and Aetius are said [2] to have mentioned swellings, which appear to have been goitres, in the necks of animals. Pliny even suggested that the animal's water supply might be responsible for the condition; an hypothesis supported by more recent writers, some of whom without success, have essayed to produce the malady in normal animals by administering in abundance the salts cantained in the water from those localities where the disease is most common. Particularly in certain parts of Europe, goitre is of as common occurrence in the lower animals, more especially horses and dogs, as it is in man himself. It is known in non-domesticated animals, as well. One writer is said to have described a new species of antelope, the distinguishing feature

[2] A. T. Sloan, Goitre in Animals. The Lancet, Lond., 1887, Vol. I, p. 1802.

[183] of which was a prominence of the neck which appeared with striking constancy.

The prevalence of goitre is especially noticeable in certain localities, whether from hereditary or geographical influences. Adami [3] has called particular attention to this in describing the so-called goitre regions of Canada and the continent of Europe.

As the pathological and ætiological factors seem to be so closely akin in man and animals, and as the veterinary literature on the subject is difficult of access, we will not limit ourselves to a consideration of the comparative pathology alone.

Simple cysts, as is well known, are of common occurrence in parenchymatous enlargements of the thyroids. The hæmorrhagic variety however is comparatively infrequent. Cysts, apparently of hæmorrhagic origin, have been found by Dr. Bloodgood among the thyroids from the surgical department. But no instance of a large encysted clot such as occurred in our two cases has been met with. They are, however, not unknown. Thus, Bradley [4] has described cases from Dr. Shepard's service in the Montreal General Hospital, some of them the exact clinical and pathological counterpart of our canine cases.

Many conjectures have been advanced in explanation of the way in which these hæmorrhagic cysts are produced. Though trauma may play a part, the predisposing elements are undoubtedly attributable to vascular changes. Thus, Witzel, noticing the ease with which the vessels of the thyroid were torn during operations, suggested that some structural alteration in the vessel wall, possibly a degenerative change, might be responsible for the hæmorrhage. Farner noticed that the ruptured vessels sometimes tore longitudinally. Budde observed that, in cystic thyroids, the smaller arteries showed a connective tissue increase in the sub-endothelial layer without an increase in the intima; also that a degene-

[3] Adami, On Ætiology and Symptomatology of Goitre. Montreal Medical Journal, 1900, Vol. 29, p. 1.

[4] W. I. Bradley, On Hæmorrhagic Cysts of the Thyroid Gland. Journal of Experimental Medicine, 1896, Vol. I, p. 401.

rative process was demonstrable in the elastica, expressing it- [183]
self as a separation of the internal membrane of Henle. This was often associated with deposits of calcium salts and as the process occurred in subjects too young for sclerosis, it was considered ætiologically significant in explaining the fragility of the vessels described by Witzel and Farner.

König, in speaking of the hæmorrhagic cysts, calls attention to the extreme dilatation that may occur in the vessels of the thyroid—the so-called Struma aneurysmatica,—in which the vessels may form cirsoid aneurysms in the parenchyma, the veins themselves forming small cysts. Owing to an increase in the size of the vesicles, the supporting connective tissue network, in which the blood-vessels run, is pressed upon with [184]
resultant nutritive changes. The walls of the vesicles become weakened, coalescence takes place between them, and in this way colloid cysts result and may increase to almost any size. Secondary hæmorrhage, occurring through the weakened and perhaps varicose vessels, would give the type of cyst and cystic content that characterizes these cases. The cysts, however, may not always be lined with thyroid epithelium, as might be expected if this were their method of formation, and Wölfner has on this ground been led to reject this theory in consequence. An extensive hæmorrhage, however, might easily spread to the capsule of the gland and only leave a trace of the original parenchyma as a shell on one side of the cyst the walls of which become gradually thickened by new formed tissue. This was the condition found in the two large cysts of our dogs, but in the small hæmorrhagic cysts in the left lobe of the last case, the clots were entirely surrounded by the compressed interlobular parenchyma. It is noteworthy too that in this gland there were no non-hæmorrhagic cysts whatever. We are inclined to agree with Bradley in the view that the cysts originate from the rupture of the intralobular blood-vessels primarily, and that the hæmorrhage may break into or separate and compress the interlobular vesicles.

The contents of these cysts may vary from pure blood mixed with thyroid secretion to dark grumous material, such as we have observed, containing pigment, cholesterin crystals, fat

[184] globules, and coagulated necrotic material. Papilloma have been described as occurring within the cysts, but Bradley thinks they are due to irregular infoldings of the walls rather than to neoplastic formation. The great increase in size that takes place in some cases is probably due to repeated hæmorrhages. Doubtless the epithelium lining the cyst ceases to secrete, is soon replaced by granulation tissue and plays no part in the tumor growth.

These cysts, when small, may become cicatrized through organization of the extravasated blood or the clot may remain in an inspissated condition for many years, as in our two cases, with a possible increment from time to time through fresh bleeding. In long standing cases the walls may become calcified or, according to some reports, even ossified. Suppuration of the contents may follow an infection. They may be found in either lobe and, indeed, there are reports of their occurrence in the accessory lobes of the thyroid. In one case of this sort, the writer, Pollard, thought the cyst had occurred secondary to a papillomatous growth.

The interesting complex of symptoms, in our Case II, had it not been for the animals old age, might have been mistaken for the clinical manifestations of myxœdema, for they closely resembled the symptoms shown by an animal after an experimental extirpation of both thyroids, a physiological sufficiency of parathyroid tissue having been left intact. The inefficacy of the treatment with thyroid extract, however, made this improbable and the post-mortem findings showed that the remaining gland possessed an abundance of actively functionating parenchyma. The changes in this remaining lobe, aside from those secondary to the cystic processes, were closely akin to those brought about by physiological hypertrophy, such as Dr. Halsted [5] has described, and which takes place in the portion of gland remaining after partial extirpation.

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[5] An Experimental Study of the Thyroid Glands of Dogs, with Especial Consideration of Hypertrophy of this Gland. The Johns Hopkins Hospital Reports, 1896, Vol. I, p. 373.

A REPORT OF TWO CASES OF UTERO-VAGINAL PROLAPSE. [184]

By H. C. THACHER.

CASE I.—*Acute descensus of uterus, bladder, and vagina during parturition.*

The patient, a large animal, of mongrel fox-hound type, was operated upon as an emergency case, November 1, 1904. She had received, three weeks previously, when early in her pregnancy, cancer transplantations in both inguinal breasts from the first of Mr. Ortschild's series of tumor cases. The wounds healed per primam and she had since been well and running free in the yard.

Present Illness.—So far as can be told, the animal reached her full term of pregnancy three days ago (October 29), when by her actions she was supposed to be in labor. She did not, however, succeed in delivering her pups and, seemingly as the result of the frequent efforts at expulsion, an œdematous mass began to protrude from the vagina. This prolapse has increased greatly in size and has apparently implicated the bladder, judging from the frequent efforts to micturate.

Examination.—The patient is a full grown, well-nourished animal with a greatly distended abdomen and lactating breasts. She looks sick, shivers almost constantly, and crouches frequently in a straining posture. Her pulse and respiration are rapid.

Protruding from between the labia majora is a large, pendent, rounded mass, measuring about 12 by 6 by 8 cm. Its surface is smooth, moist, cold to the touch; and the fundus of the protrusion is purplish red in color, suggesting almost complete strangulation. On the dorsal surface of the tumor appears the ring-like external os of the uterus. The tumor fluctuates on palpation. It does not seem to be painful or tender.

The animal was prepared for immediate operation as it was conjectured that one of the pups had become fixedly engaged in the superior strait.

Operation.—November 1, 1904. Ether. *Reduction of prolapse: total hysterectomy.*

On opening the abdomen, an enormous pregnant uterus was exposed. This was drawn out of the wound; the broad ligaments were divided and the two horns liberated. The lower part of the right horn was found to be softened and gangrenous. It was torn during the manipulations, disclosing a macerated, foul-smelling fœtus whose head was engaged in the pelvic inlet. The uterus contained eight other living, full-term puppies. By exert-

[184] ing traction upon the body of the uterus, aided by pressure against the prolapse externally, the latter was gradually reduced. Not until this was accomplished did the bladder become visible within the abdomen.

The uterus was then amputated as near the vagina as possible and the stump, after inversion and suture, was ventrally fixed in the parietal wound during its closure.

The animal survived the operation only twenty-four hours. The chart of pulse and respiration, kept during the anæsthetization, shows that the operative procedure was badly borne.

[185] *Autopsy.*—November 2, 1904. Nothing was found at the examination to account for death, beyond a slight localized peritonitis about the stump of the uterus and a considerable degree of hydronephrosis. The ureters and pelves of the kidneys were all dilated. There was no deformity of the pelvis. No cultures were taken.

CASE II.—*Recurrent vaginal prolapse, unassociated with pregnancy.*

An animal of Irish-setter type, two years of age, was admitted for treatment January 5, 1905, with the complaint that an irreducible mass was projecting from the vulva.

Past History.—She has been a pet dog; has always been well and had the best of care. Owing, possibly to lack of regular exercise, she has grown very heavy. She has never been pregnant. In July, 1904, she was lined for the first time and subsequently suffered from a prolapse of the vagina. The protrusion was successfully replaced by her owner and did not reappear for six months.

Present Attack.—About three weeks ago, without assignable cause—other than that she was at the time in heat—the prolapse recurred. The protrusion has resisted several forcible attempts at replacement and has gradually increased in size. It is a constant annoyance to the patient though it has seemingly in no way interfered with her health or activity.

Status Præsens.—The patient is a large well nourished bitch, weighing between 15 and 20 kilograms. Her general condition is excellent and aside from the local trouble, the examination proves negative.

Projecting from between the enlarged labia majora is a smooth, tense-looking, rounded mass, about 25 cm. in circumference and 7 cm. in length (Fig. 7). Upon the upper and posterior aspect of the protrusion lies the opening of the inverted vagina. The cervix uteri cannot be reached by the finger introduced within this opening. The greater part of the protrusion is covered with a somewhat congested, granular and thickened mucous membrane.

On the lower aspect of the mass—that which comes in contact with the ground when squatting—there is a large superficial ulceration covered with a greyish slough. The tumor has a tough, boggy, œdematous feel and is cold to the touch though its circulation seems good. The orifice of the urethra is drawn down into view on the anterior aspect of the neck of the tumor. [185]

Diagnosis.—Prolapsus vaginæ et vesicæ.

Operation I.—January 6, 1905. Preliminary morphia; ether anæsthesia. *Reduction of prolapse. Abdominal hysterectomy. Ventral fixation of stump.*

While the animal was being cleaned up for operation, an effort was made to reduce the prolapse; this was unavailing even with

FIG. 7.—Recurrent vaginal prolapse; condition before second operation.

complete muscular relaxation under the anæsthetic and with the hind-quarters elevated. The abdomen was opened by an 11 cm. intermuscular incision, through the inner margin of the right rectus. After exposure of the uterus, a long, steady traction upon its body brought about a partial reduction of the prolapse, the manipulations succeeding in drawing into the abdominal cavity the bladder whose walls were very much congested. Complete reduction, however, was only attained after combining pressure from without with the traction upon the uterus. After the reduction the uterus was drawn well into the wound, was amputated

[185] close to the external os and its stump was amputated and inverted with mattress sutures. The broad ligaments were then divided, the uterine horns freed from their ovarian attachments and the entire uterus removed.

The abdominal wound was closed in layers, the stump of the vagina being drawn up and securely fastened to the posterior sheath of the rectus in the hope that this would suffice to prevent a recurrence of the prolapse. The relaxed vaginal canal was packed with iodoform gauze.

Post-operative Note.—On the following day the prolapse was found to have recurred in its original form and was, if anything, even larger than before. There were otherwise no complications following the operation. With the exception of a single slight stitch abscess, the abdominal wound healed per primam.

Four weeks later a second and successful operation was conducted, as follows:

Operation II.—February 3, 1905. Preliminary morphia; ether anæsthesia. *Combined abdomino-vaginal operation. Amputation of prolapse by Whitehead's method for rectal prolapse.*

The abdomen was reopened in the line of the original incision. The stump of the vagina was freed from its attachments to the abdominal wall; the bladder was, this time, found in place in the abdominal cavity. On catheterizing the urethra, it was ascertained that a loop of this canal was drawn down with the prolapsed tissues into the neck of the tumor. By introducing a straight catheter into the bladder it was possible to place the urethra in a position where it was unlikely to be injured in the proposed operation.

An incision was then made encircling the neck of the prolapse about at the junction of the vulvo-vaginal mucous membrane and just so as to escape the urethral orifice. While the tumor was grasped and drawn away from the body, this circular incision was gradually deepened with the knife and by blunt dissection—the large vessels being secured as they were encountered—until the sub-mucous coat of the non-inverted portion of the vaginal canal was reached. The vagina, at this situation was then amputated section by section, as its edges were sutured securely to those of the vulval side of original incision. The abdominal wound was then closed as before with fixation of the vaginal stump in the parietal wound.

Convalescence was without incident. As after the first operation the ventral wound healed with a single stitch abscess. There has been no recurrence of the prolapse.

Pathological Report.—The specimen consists of a piece of tissue, 10 by 7 by 4 cm., roughly ovoid in shape and obliquely traversed by a lumen about 2 cm. in diameter. The tissue is firm and

elastic in consistency. The outer surface is, for the most part, [185] covered with mucous membrane which passes into the lumen above described. The surface is brownish red in color, somewhat granular and at one point slightly ulcerated. Within the lumen the mucous membrane is pink and smooth. On section the tissue is found to be very œdematous and somewhat vascular. It con- [186] sists of a meshwork of grayish, semi-translucent bands and fibers, the majority of which seem to radiate from the lumen. The sub-mucosa is dense and thickened. The mass weighs 125 grams in its present shrunken state.

Discussion.

Obstetrical complications, as illustrated by the first of these cases, are very common in domestic animals. Upon their occurrence in cattle and horses there is a large literature.[6] It is quite common for animals to die in labor without delivery. This is especially true of dogs.

The acute prolapses, which occur before and during parturition, are more frequently reported in the veterinary literature dealing with cattle—more attention being paid to this animal owing to its greater commercial value. According to Vennerholm,[7] it is of common occurrence in stall-fed and milch cows, particularly in animals standing in stalls with a floor sloping backwards for drainage. In pasture free animals it is comparatively rare. Relaxation of the pelvic floor and an extra large sized pelvic outlet[8] are predisposing factors. An unusually heavy uterus is also recognized as a causal factor and may have played a part in producing the lesion in the first of our canine cases.

As a rule, the prolapse in cattle appears only when the animal is recumbent and reduces spontaneously when the animal takes a standing posture. Rarely does the condition seem to offer any serious obstruction to labor. The usual veterinary treatment is an operative one in case the prolapse

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[6] Franck, Thierärzliche Geburtshilfe. Berlin, 1901. DeBruin, Geburtshilfe beim Rind. Wien u. Leipsig, 1897.

[7] Vennerholm in Bayer, and Fröhner's Handbuch der thierärzliche Chirurgie und Geburtshilfe. Wien und Leipsig, 1897.

[8] Streble, Journal of Comparative Pathology. 1901.

[186] does not spontaneously disappear after labor. The procedure consists of the use of metal clamps to close the labia and prevent the descent of the tumor.

Kitt[9] mentions the fact that prolapse is common—especially in animals dying from anthrax or black-leg—as an agonal occurrence.

Case II illustrates a condition much more rare. Some cases of prolapse unassociated with pregnancy, have been reported in young animals—colts—suffering with "colic."[10] Reports of cases in which the bladder has formed part of the prolapse are still more uncommon. Franck recognizes two main types—one with simple inversion of the bladder, the other with its extrusion through the torn vagina. Very little attention seems to have been paid to complications of this nature which have arisen in dogs and the literature upon the subject is scant and inaccessible.[11]

A REPORT OF EIGHT CASES OF CANINE NEOPLASM.

By J. F. Ortschild.

Case I.—*Adeno-carcinoma of breast with glandular metastases.*

A small, long-haired, yellow, Skye-terrier bitch, sixteen years of age, a nullipara and a house-pet, was admitted to the clinic in September, 1904.

History.—For the past six years the patient has been kept for the most part within doors and under close observation. Not until two months ago, was a small hard mass noticed in one of the breasts. It has been rapidly increasing in size and has become ulcerated. There is no history of traumatism.

Examination shows a very old, feeble, emaciated and inactive dog. The mucous membranes are pale; only a few loose teeth remain.

In the right, most posterior, inguinal breast, there is an ulcer-

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[9] Kitt, Pathologische Anatomie der Hausthiere. München, 1901.

[10] Koepke, Berliner thierärzliche Wochenschrift. 1892.

[11] Since writing the above report a third case of prolapse of the nature of this supposedly more rare type, has come under our observation.

ating, fungated growth, the size of a hickory nut (Fig. 8). The [186] ulcerated surface has, upon one side, an overhanging edge, but there is nowhere any definite undermining of the epithelial margin. The surrounding skin is darkly pigmented. On palpation the tumor is firm and has an irregular, nodular outline. The moist ulcerated surface is reddish in color, with some gray streaks made by superficial sloughs. The nipple does not seem to be involved in the growth, though it is somewhat retracted.

In the subcutaneous tissue to one side of the tumor are three or four hard, freely movable, discrete nodules, presumably involved glands.

FIG. 8.—Tumor of right inguinal breast of Case I.

Operation.—October 7, 1904. Morphia; ether. *Amputation of breast.*

The breast, the tumor, the glands and the neighboring fat of the inguinal region were removed in one piece, and though the surface of the tumor had been ulcerated, an effort was made to secure primary union and the wound was closed without drainage.

Subsequent history.—The wound broke down in large part and closed slowly by granulation. Soon after the operation an ulcer appeared at the angle of the mouth. This ulcer proved phagedenic, spread rapidly and assumed the clinical appearance of a

[186] cancrum oris (noma), finally involving the gums and the adjoining cheek. The patient died from this infection two weeks later.

[187] *Autopsy.*[12]—October 21. There were no visceral metastases; the abdominal and thoracic organs were practically normal. The eroding ulcer of the mouth had eaten its way into the nasal cavities, which were filled with pus. No cultures were taken.

Pathological Note upon the Tumor.—The mass on section shows a rather homogenous surface, which is slightly moist, of a pinkish gray color, and is flecked with yellowish points, which can easily be scraped off with the blunt edge of the scalpel. The

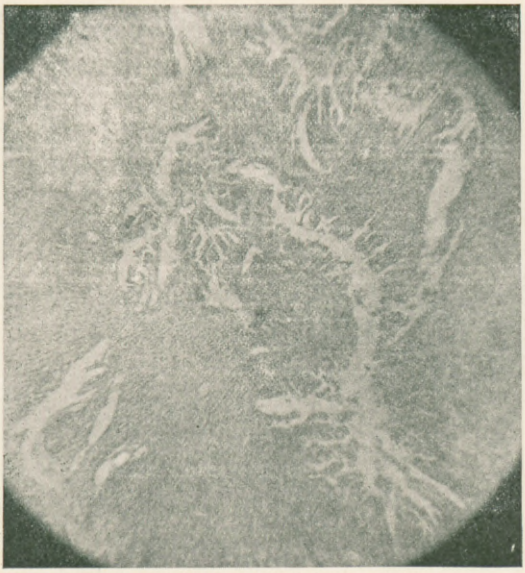

FIG. 9.—Low-power magnification. Showing character of adenomatous growth in primary tumor.

glands are quite deeply pigmented; the deposition of pigment being most marked in the centre. Their appearance led to an operative diagnosis of melanotic sarcoma.

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[12] Owing to the length of Mr. Ortschild's report, the post-mortem notes, as well as the histories of the animals that were used for experimental transplantation, must necessarily be greatly abbreviated. It is hoped that his interesting observations may be given more in detail in a later communication. (Cushing.)

Histologically, the primary growth is found to be in reality a [187] carcinoma. Its most striking feature (Fig. 9), is that of a malignant adenoma, with a stroma infiltrated by glandular elements. The stroma, however, is very cellular, containing large ovoid cells full of brown pigment granules. There are many cysts lined by high epithelium, some of them containing papillomatous growths.

The large metastatic nodule has similar characteristics, the cystic and adenomatous elements predominating (Fig. 10). In the lymph glands containing early metastases, the adenomatous structure is not apparent, the cells making up the area of new-formed tissue, being for the most part similar to the pigmented

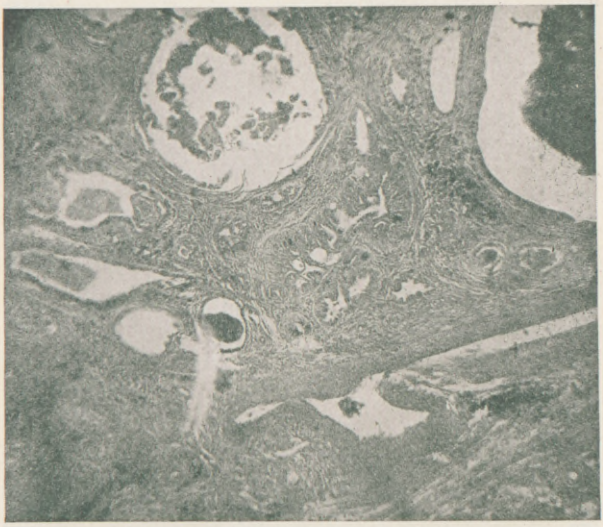

FIG. 10.—Metastatic nodule; field showing glandular and cystic characteristics.

(mesoblastic?) cells of the primary growth (Fig. 11). Diagnosis: Adeno-cysto-carcinoma.

Transplantations from the tumor, immediately after its removal on October 7, were made into three dogs, one of which was practically of the same strain as the original host. Pieces of tissue were transplanted in one animal into the liver and between the transversalis fascia and peritoneum; in another case into the two inguinal breasts, both of which were supposed to be hypertrophied (in reality, as subsequent observations showed us, the

[187] prominence of the mammæ was due to underlying inguinal herniæ—compare Mr. Beall's report); in the third, a pregnant animal, a sub-peritoneal as well as a mammary inoculation was made. A portion of the original tumor, as well as a fragment of an involved gland, was used for transplantation in each animal.

The subsequent history of these animals cannot be entered into here, other than to say, that the third of them is Case I, of Mr. Thacher's series, and that the second was found dead, six months

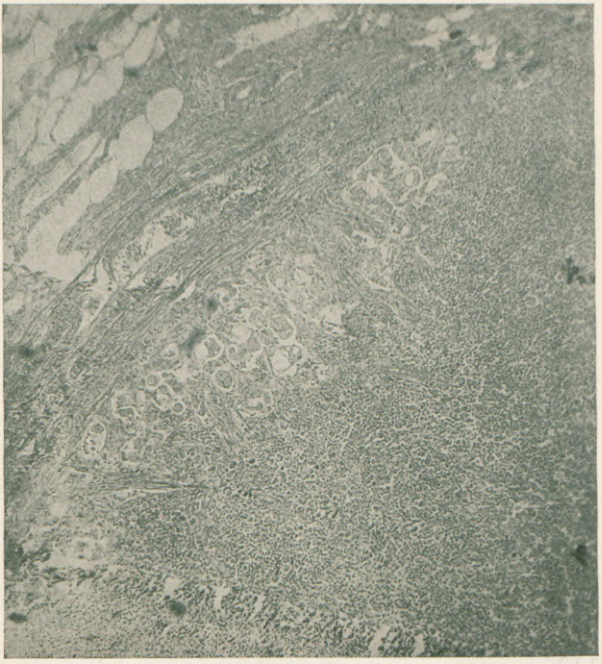

FIG. 11.—Lymph node with very early marginal metastasis.

later, with an increase in size of the piece of tissue transplanted from the tumor into the right breast, and with enlarged and pigmented lymphatic glands in the inguinal region of the opposite side, namely, that into which the fragment of glandular metastasis had been transplanted.

[188] CASE II.—*Mixed (teratomatous) tumor of the breast with multiple metastases.*

A small, gray-haired, Skye-terrier bitch, was admitted January 16, 1905. She had been a vagrant animal and no history was

obtainable. She was an old dog, though seemingly in good condition; not cachetic nor anæmic. She was evidently a multipara from the appearance of the nipples. [188]

Special Examination.—Scattered about the ventral surface of the thorax and abdomen, are numerous hard subcutaneous nodules, varying greatly in size (Fig. 12). The largest, evidently the primary growth, occupies the second left thoracic breast, on a

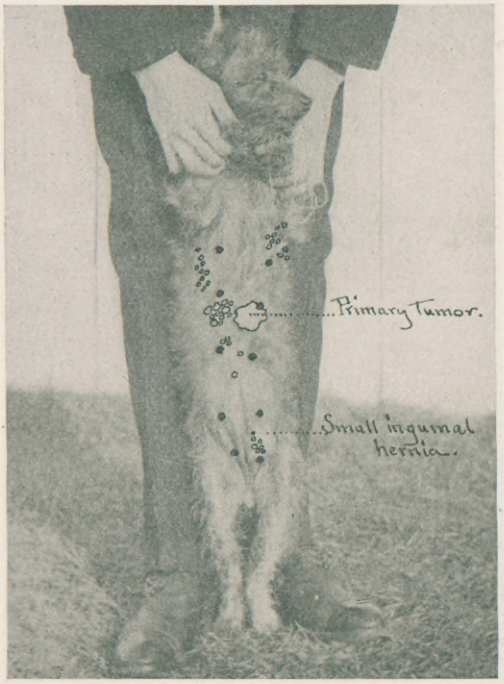

FIG. 12 (Case II).—Showing situation of primary growth and the palpable metastases. Site of nipples indicated by solid black dots.

level with the costal margin. It is made up, seemingly, of a conglomerate mass of separate tumors, forming in all an irregular growth about 5 by 4 cm. in length and breadth, and 3 cm. in thickness. It is freely movable on the underlying tissues; is covered by thin, freely movable skin, under which run considerably dilated vessels. The nipple is not adherent nor retracted. The growth is not sensitive on pressure and is very hard to the feel. From this main growth, a chain of nodules, varying in size

[188] from a buckshot to a large pea, spreads across the mid-line onto the right side. Though some of these nodules are fused, they, for the most part, are individually movable. The chief collection of them is clustered into a prominent tumor, almost as large as the primary growth (Figs. 13 and 14). A chain of these nodules, extending up toward the right axilla, can be palpated through the skin of the thorax. Higher up on the left side, above the

FIG. 13.—Photograph after patient was shaven in preparation for operation.

axillary nipple, can be felt a similar chain. Two other large clusters are present, one over the left pectoral region, and another over the left inguinal breast, which was supposed to be hypertrophied (in reality overlying an inguinal hernia). There are a number of other individual nodules all of which are firm, but without the stony hardness possessed by the primary growth. No masses are palpable within the abdomen.

Operation.—January 16, 1905. Morphia; ether.

Through three separate incisions, the main tumor, together

with the second left breast and the surrounding tissue, the mass [188]
of discrete nodules, together with the adjoining second right breast, and the larger one of the individual tumors, were removed. The wounds were closed without drainage.

Pathological Note.—The primary tumor presents, in gross, an irregular, nodular surface like that of a compact bunch of grapes.

FIG. 14.—Same as Fig. 13. To show prominence of primary tumor and projecting nipple.

The surface is of a pinkish white color with some few points of hæmorrhage. The rounded nodular projections are smooth and glistening. The mass is firm and rock-like in consistency. On [189]
section, bony resistance is met with, the knife penetrating only with the exertion of considerable force. The surface of the section shows an outer shell consisting of a layer of cancellous bone, varying in thickness from 1 to 2 cm. Radiating from this shell, into the substance of the tumor, are delicate bony trabeculæ, visible to the naked eye. In the central portion are irregular

[189] islands of non-calcified tissue. These islands are for the most part, whitish-gray, more or less translucent, and made up of soft tissue. Cartilaginous areas are to be made out.

The metastatic mass and the discrete nodule that were removed, resemble one another on cross section, very closely. They present a very cellular and granular appearance, with a more translucent cortical zone and a dark, pigmented center or medulla. No bony trabeculæ or cartilage can be detected. Some of the nodules are evidently lymph glands containing macroscopical areas of new growth.

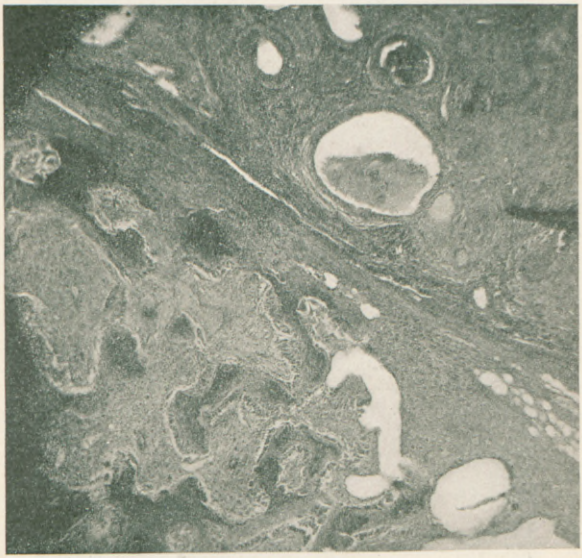

FIG. 15.—Field from primary tumor of Case II; showing bony trabeculæ, separated by a strip of fibrous tissue from an adenomatous area with cyst formation.

Microscopically, the tumor shows, in addition to the bony trabeculæ and cartilaginous areas, that are discernible with the naked eye, that the cellular areas are most diverse in structure (Fig. 15). Some of them are of a pure adenomatous type; others resemble carcinoma simplex. There are fields of closely packed, large, and small round epithelial cells, and in places the loose meshwork resembles embryonic connective tissue. In other places the tumor shows true osteoid tissue. The lamellæ of the bone are uniform, have no Haversian systems, and are lined by

numerous osteoblasts. The spaces between these lamellæ are [189]
filled with a meshwork of spindle cells in which are also found large cells resembling epithelial cells. Several areas show squamous epithelium. In many places there is no sharp demarkation between stroma and epithelial cells, one being invaded by the other. In the metastases, the neoplastic elements are mainly adeno-carcinoma (Fig. 16), with no cartilage or bone. Were it not for the cartilage and bone, the tumor could be correctly called an adeno-carcinoma.

Transplantations and Injections.—An emulsion of the original tumor was made immediately after the operation by grinding fragments of it in a mortar with sterile salt solution. The

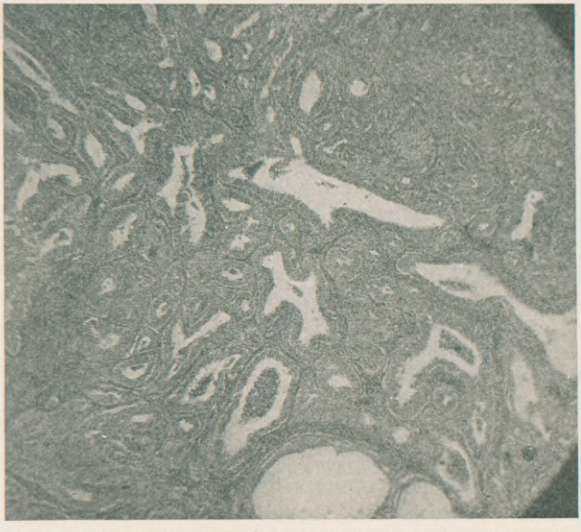

FIG. 16.—Metastasis from Case II. Field showing pure adenoma with cyst formation.

pulp thus obtained was used for injections. Portions from the metastatic nodules were similarly treated. This method was followed, owing to the success that has attended it in the transplantation from mouse to mouse of a malignant carcinoma simplex through many generations by Drs. Cloues and Gaylord at the Gratwick Laboratory.

Inasmuch as it was surgically impossible to remove all of the involved nodules from the original host, it was considered justifiable to use this dog for control inoculations from her own tumor. Before she came out of the anæsthetic, therefore, a small

[189] portion of the original bony tumor was aseptically inserted under the skin in the right axillary region. A small piece from one of the involved glands was similarly implanted on the left. In addition, 2 cc. of the emulsion from the gland were injected under the skin at the suprasternal notch and a similar quantity of the primary tumor emulsion into the subcutaneous tissue between the scapulæ. Corresponding implantations and injections were made into four other animals. One of these animals, a very old dog, died of an intercurrent infection two weeks later and before any macroscopical growth could have occurred; but in the subcutaneous tissues of this animal, at the site of the inoculations of the glandular emulsion, there were found, microscopically, numerous clusters of viable epithelial cells. The other four of the series were killed about five weeks later by a vicious bull dog that was inadvertently let into the yard. The bodies were too much mutilated to be of any pathological value, though a fresh series of transplants was made from the remaining tumors of the original host.

CASE III.—*Cysto-adenoma of the breast with metastases.*

A small, short-haired, very stout, almost toothless, decrepit and inactive, old, black-and-tan bitch was admitted for operation, January 16, 1905. She was a vagrant dog without a history. The condition of her nipples evidenced previous pregnancies.

Examination.—In the second left breast, there is a firm, oval nodule, about the size of a pea. There is no retraction of the nipple nor any discharge from it. A chain of three distinct nodules, similar to the above, is present in the second right breast. The nipple is not retracted but discharges a thin, yellowish fluid on pressure. In the third left breast, there is an indistinct mass of very firm tissue, suggesting matted glands. In the third right breast, there is a large oval mass, evidently the primary growth, 2 cm. in length by 1½ cm. in breadth and 1 cm. in thickness. This is firm, though not of bony hardness, freely
[190] movable, not adherent, circumscribed and irregularly nodular. The inguinal breasts are free from nodules but prominent owing to small underlying inguinal herniæ.

Before the patient was subjected to operation, she died from a phagedenic buccal infection that seemed to originate in the gums about her few remaining and diseased teeth.

Autopsy.—January 29, 1905. The largest tumor, upon removal, is found to be irregularly nodular, smooth, encapsulated, and somewhat elastic in consistency. It is generally light in color, mottled with white and dark brown areas. The surface, upon section, is granular and shows the same mottled appearance seen on the outer surface. The metastases have the same general aspect as this primary tumor.

The examination was otherwise negative, except for the pres- [190]
ence of calculi in the bladder and urethra and the extensive ulceration of the mouth.

Microscopic examination shows the tumor to be divided into compartments by fibrous bands radiating through it from the capsule. Except that there are no bony or cartilaginous elements discernible, the general structure of the growth is not unlike that found in Case II. The predominating type of tissue is adenomatous. This is cystic in places (Fig. 17). The cysts, some of them very large, are lined by high columnar epithelium and in many cases contain papilliform ingrowths. Many of the

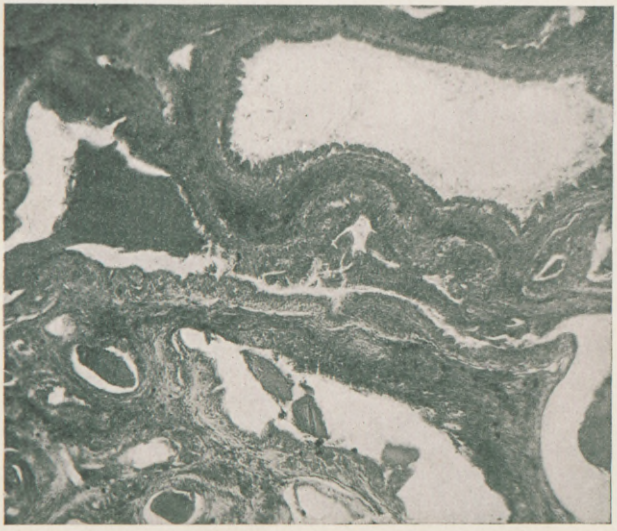

FIG. 17.—Section of tumor of Case III. Showing the more cystic portion of an adenomatous field.

cysts—and these have a lower form of lining epithelium—contain a homogenous mass of waxy looking secretion. Some of the areas are densely cellular, having the character of spindle-cell connective tissue. But even in these densely packed fields there are to be made out structures resembling epithelial glands.

CASE IV.—*Mixed (teratomatous) tumor of the breast with metastases. Lipoma.*

A valuable, black and brown, Gordon-setter bitch, 8 years of age, was brought in by her owner, February 3, 1905.

[190] *History.*—Until the present trouble developed, she had been a strong and healthy dog, used for active field work. She has had five litters of pups. The last litter was whelped nine months ago. When the pups were a month old, one of them bit the patient in the most posterior right inguinal breast. The breast became sore and a short time afterwards she developed, what her owner calls, "a milk breast." The mass remained small and did not

FIG. 18.—Right inguinal tumor in Case IV.

become particularly noticeable until four months ago, but since then it has been enlarging rapidly.

Examination.—The animal has a glossy coat and seems in excellent general condition. In the posterior inguinal region of the right side, between the last two breasts, there is a large irregularly oval mass (Fig. 18), measuring 10 by 7 by 8 cm. The tumor hangs pendent from the abdomen and is freely movable over the underlying structures. The overlying skin, though not adherent, is somewhat thinned out and injected; and at the most dependent part has become abraded leaving a superficial area of

ulceration about 4 cm. in diameter. The mass is irregularly, [190]
coarsely nodular, for the most part very resistant to pressure, though having several areas which are less firm and suggest the elasticity of tense cysts. The nipples are not retracted nor is there any discharge from them. The inguinal glands are palpably enlarged on this side.

In addition, there is a small mass under the skin of the left pectoral region, oval in shape and about 3 cm. in diameter. It is lobulated, firm, freely movable under the skin, and not adherent to the tissues beneath. The highest nipple on the left, closely [191]

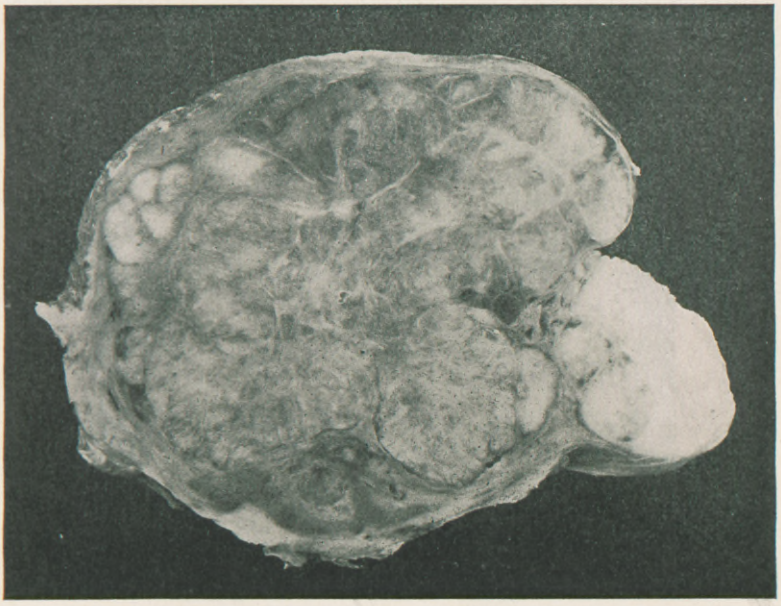

FIG. 19.—Photograph, ¾ natural size, of gross appearance of [190]
tumor from Case IV; mid-section showing more cellular part of tumor, no bone or cartilage being visible.

adjoining this tumor, is markedly retracted, but the gland itself does not seem to be, in any way, involved by this growth.

Operation.—February 3, 1905. Ether anæsthesia. *Amputation of breasts and tumor.*

The tumor with the two adjoining breasts and involved lymphatic glands was removed in one piece. The broad spindle-shaped opening in the skin was closed without drainage. The tumor over the left pectoral region was similarly excised together with the neighboring mamma.

[190] *Subsequent History.*—Both wounds healed by primary union leaving almost invisible scars. The patient has remained well.

Pathological Note.—After removal, the tumor presented the same general characteristics described above. The cystic areas were, however, more in evidence especially in the lower and more posterior part of the tumor. The growth on section is found to contain bone, cartilage, cysts, fibrous and cellular areas, all of which are discernible to the naked eye. The dense fibrous
[191] tissue is particularly abundant in the centre of the growth, with bands which radiate out towards the periphery (Fig. 19).

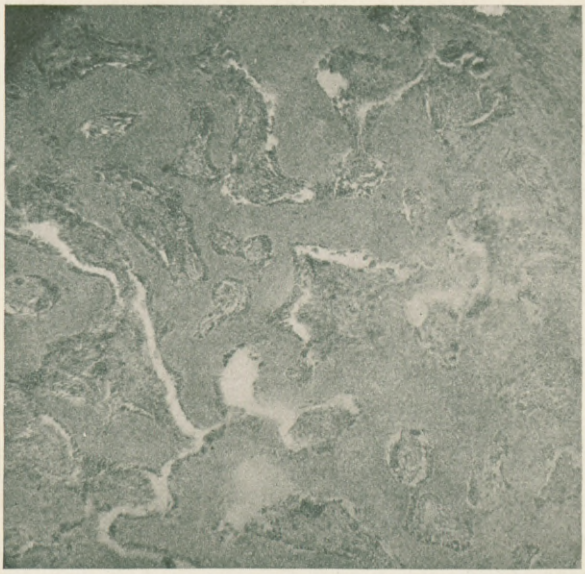

FIG. 20.—Microphotograph of field with bony trabeculæ. Case IV.

Within these septa the more cellular areas have an opaque, yellowish, granular appearance, and upon pressure exude a dirty yellow substance.

Microscopial examination.—The mass is a mixed tumor, very similar to that of Case II, the description of which might well apply to this tumor. There are found all the areas noted with the naked eye, cartilage, bone, cysts, fibrous and cellular tissue. Large cystic areas, lined by a low epithelium are found in which a coagulated fluid is present. Other cysts show papillomatous ingrowths. Some areas are purely adenomatous; others are en-

tirely fibrous; while still others show tissue resembling em- [191]
bryonic connective tissue (Figs. 20 and 21). As the adeno-carcinomatous elements predominate, were it not for the bone and cartilage, the diagnosis of adeno-carcinoma would be made.

The small tumor from the left pectoral region, macroscopically, is a fatty tumor, a diagnosis confirmed by histological examination.

Transplantation from the malignant tumor was made into one dog.

CASE V.—*Intra-cystic papilloma of the breast, with metastases.*

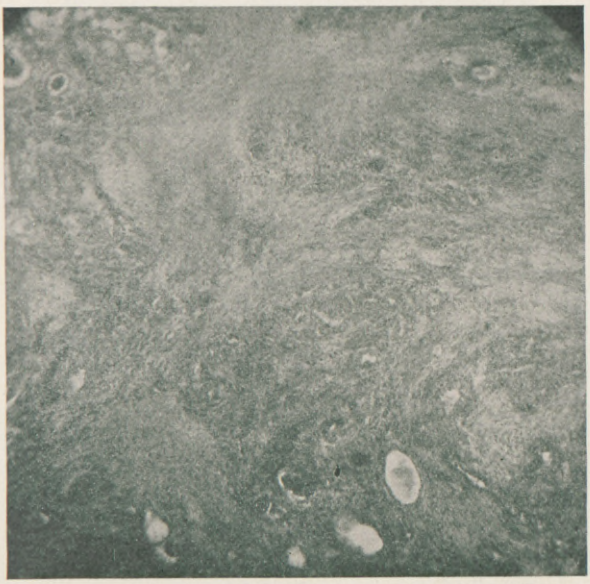

FIG. 21.—Fibrous and cystic area from tumor of Case IV.

The patient, a valuable black, Gordon-setter bitch, ten years of age, was brought in by her owner, February 15, 1905.

History.—She had always been well and actively used as a field dog. When nine months of age she had her first litter of pups. A second litter was whelped three years ago when she was seven years old. One of the pups of this litter in suckling injured the right inguinal breast. Apparently an abscess formed, which discharged pus. This finally healed, leaving a small palpable nodule in the breast. The mass has increased slowly in size up to the present time and has become so large

[191] that it incapacitates her from active exercise (Fig. 22). The owner has never noticed any discharge from the nipple.

Examination.—The animal has a glossy coat and seemingly is in the best of condition. In the right inguinal region between the two most posterior breasts, is a large, heavy pendent mass, measuring 10 cm. in length, by 6 cm. in breadth and thickness. It is freely movable over the underlying tissues. The overlying skin is thin and injected but not adherent to the tumor. It is

[192]

FIG. 22 (Case V).—Large pendent tumor at right inguinal breast.

[191] without abrasion. The mass is irregularly lobulated, hard, and firm, but not of bony consistency. There are several softer, elastic and fluctuating areas suggesting cysts. Under the last breast and extending from it towards the inguinal region is a deeper lying soft swelling. The nipples are not retracted. On compressing the tumor there shot out from the inguinal nipple, for a distance of several feet, a fine stream of serous blood-stained fluid.

In the region of the left most posterior inguinal mamma are a

number of discrete rounded nodules, varying in size up to 1 [191] cm. in diameter. They are freely movable under the skin and to the feel resemble the firmer areas of a primary growth. The neighboring nipple is not retracted nor can any discharge be expressed from it. The inguinal glands are enlarged on both [192] sides.

Just posterior to the third and to the fourth mammæ on the left side are two nodules the size of cherries, that possess characteristics resembling those of the firmer portions of the main tumor.

Operation.—Feb. 15, 1905. Morphia; ether. *Amputation of breasts and tumor.* The large tumor with the two adjoining mammæ was removed with a wide margin of healthy tissue. After removal of the tumor and the breasts the deeper lying mass

FIG. 23.—Median section of tumor from Case V (½ natural size). Showing cyst with intracystic vegetations in upper half of section (*I*) and compact tissue in lower half (*II*). Breast and nipple (*X*) in right upper corner.

described above was examined and found to be a small right inguinal hernia. This was operated upon by Mr. Beall and is Case III of his series. One of the nodules—that posterior to the third left breast—was also removed, through a separate incision, and the wound closed with interrupted silk sutures.

Subsequent Note.—The wound, made by the larger operation on

[192] the right side, superficially broke down in part and healed by granulation. The smaller wound healed by primary union. The animal died eleven days after operation from a very virulent infection of the left hind foot.

Pathological Note.—The tumor is encapsulated, of a reddish color, with small somewhat translucent and more whitish nodular areas, varying in size from a fine shot up to that of a buckshot or larger, and surrounded by darker areas. Its surface is very vascular.

Upon section (Fig. 23), the tumor is found to be made up of

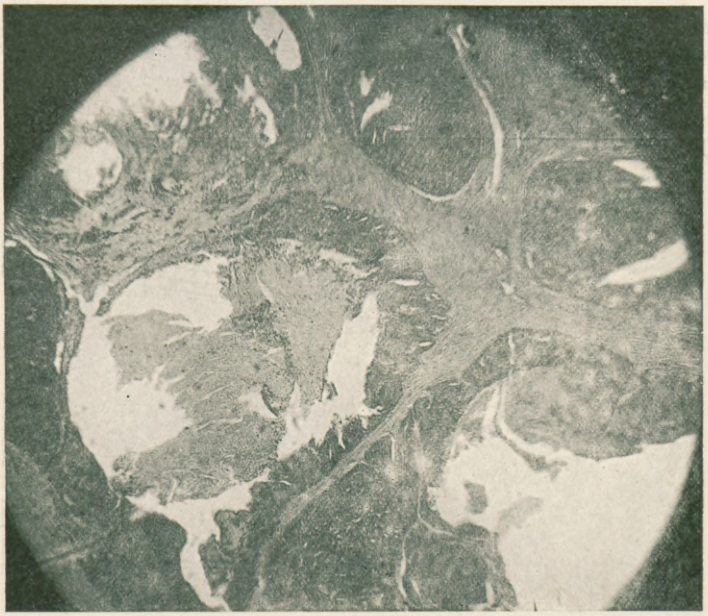

FIG. 24.—Microphotograph of tumor, Case V, showing alveolar arrangement.

two more or less distinct areas. The anterior portion consists of comparatively solid tissue, but posteriorly the knife enters a large cyst which contains thin blood-stained fluid similar to that which could be expressed from the nipple before the operation. The cavity of the cyst measures 5 by 4 by 3 cm. Its outer wall is very thick, especially in the most ventral portion, where it measures 2 cm. The wall in these thick areas is mainly fibrous, somewhat firm and elastic, and contains several small, round, yellowish areas.

The inner surface of the cyst wall is very irregular, numerous [192]
pockets being formed by the irregularities. The entire right half of the cyst—and to a less extent the remainder—is lined with coarse vegetations. The surface of these fungous ingrowths, some of which are distinctly pedunculated, is coarsely granular and presents a very ragged appearance. The vegetations are reddish in color and lodged between the larger projections are numerous reddish coagula. These papillary ingrowths present, on section, an appearance similar to that of the isolated areas in the cyst wall, as well as that of the more solid portion of the tumor. This solid part of the growth seems to be made up of compact masses of papilliform growths such as individually project into [193]

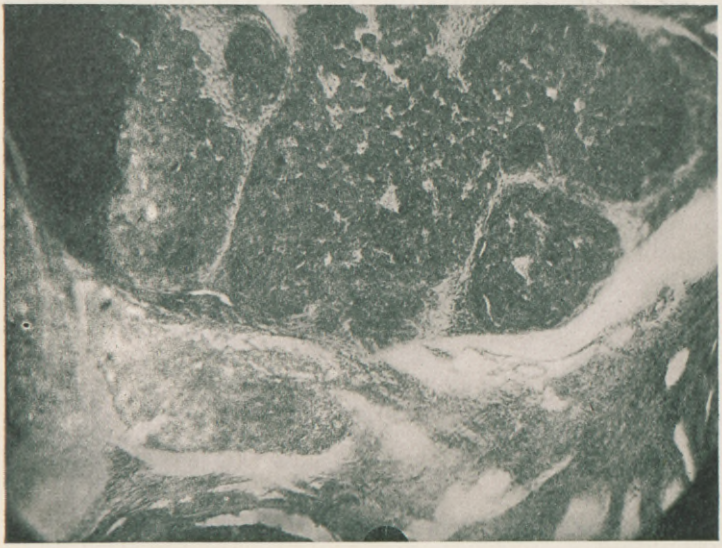

FIG. 25.—Microphotograph of metastasis to lymph gland from Case V.

the cyst cavity. Between the masses of cellular tissue can be [192]
made out smooth walled channels, many of them containing shreds of blood coagula. The stalks of the cell masses contain a large amount of fibrous tissue. The cut surface is smooth, moist, yellowish and homogeneous, having a slightly granular appearance. [193]
Upon pressure there exudes a thick, semi-fluid, dirty, yellowish substance.

The whole tumor presents the characteristic appearance of an intracystic papillomatous growth. In the still cystic portion of

[193] the tumor the ingrowth only partially fills the cavity. The more solid portion apparently represents a pre-existing cyst that has become completely obliterated by the ingrowth. The metastatic nodule is similar, in all respects, to the solid portion of the original tumor.

Microscopical examination shows the tumor to be a very cellular one (Fig. 24). In some areas there are numerous fibrous bands running in all directions, dividing the tumor up into alveoli. In these alveolar areas the epithelial cells are compact, often filling the entire space. In other areas the appearance is

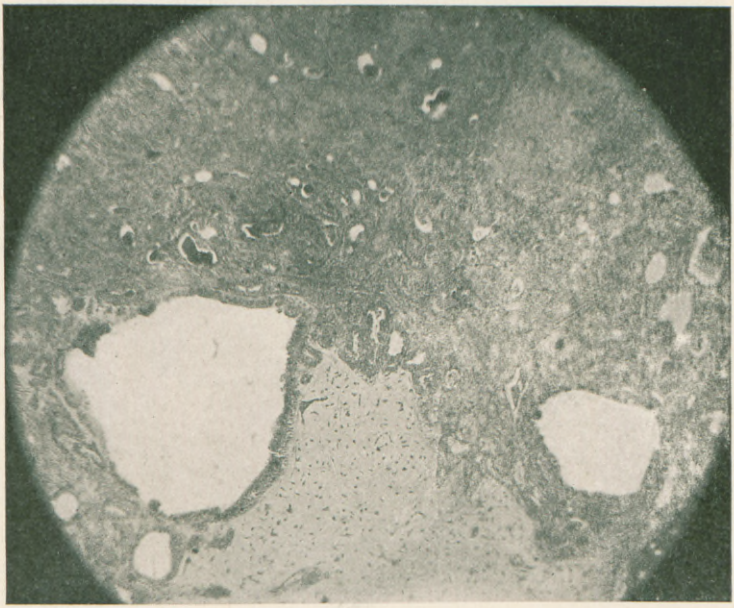

FIG. 26.—Microphotograph of metastatic nodule; field with adenomatous and myxomatous areas.

adenomatous, while in still others, the appearance is that of intracystic papillomatous growths. The section of the papilliform growths in the large cyst shows them to be almost entirely made up of cells of an epithelial nature, similar to those in the other areas of the tumor.

The metastasis to the lymph gland preserves the general character of the original tumor (Fig. 25). The alveolar arrangement and the papillomatous structure is beautifully shown. The metastatic nodule (Fig. 26) shows dense fibrous bands in places, also

large areas of myxomatous tissue in others, and preserves the [193] intracystic and adenomatous character of the original tumor.

Transplantation from this growth was made into two dogs.

CASE VI.—*Fibro-lipoma of the vaginal wall.*

History.—Small, fox-terrier bitch, eight years old, a house pet, was brought to the clinic, March 17, 1905. She had her first and only litter of pups seven years ago. Last July a lump, the size of a small pigeon's egg, was noted in the perineal region. This swelling grew slowly at first, but during the last few months has

FIG. 27 (Case VI).—Showing size and position of tumor. The dilated vaginal opening, blocked by the growth, is visible at the lowermost portion of the tumor in this view.

increased rapidly in size. The mass has caused no inconvenience to her so far as the owner has noticed.

Examination shows a small, old, active, fox-terrier bitch, very fat and in good general condition. The patient has difficulty in passing water. In the perineal region there is a marked posterior bulging of all structures making a solid mass outside the pelvis, considerably larger than a closed fist. The opening into the vagina is apparently blocked by this mass, a portion of which the size of a twenty-five cent piece, covered merely by mucous mem-

[193] brane, is externally visible through the vulva. This mucous membrane is dark red, hyperæmic and slightly ulcerated. The skin over the mass is not adherent but is thin. The mass seems to project through the pelvic outlet, is circumscribed, very firm, somewhat elastic, and of a tenseness suggestive of a distended bladder such as was observed once in a hernia case. (See Mr. Beall's first hernia case in fox-terrier.) In the anterior area the surface is more irregular. There are no enlarged glands palpable in the groins.

The extraordinary appearance of the mass is shown in the photographs (Figs. 27 and 28). It was supposed to represent a large prolapse containing bladder and intestine.

[194]

FIG. 28 (Case VI).—Profile view of large fibro-lipoma of anterior vaginal wall.

Operation.—March 17, 1905. Ether. *Enucleation of tumor.* The mass was found to be a large, solid, fibroid tumor of the vaginal wall and was enucleated through a median incision, extending from near the tip of the vulva to the mid-hypogastric region. Under the belief that the abdominal viscera made up part of the supposed prolapse, it was intended to open the abdominal cavity. Not until the tumor was almost entirely enucleated, did it become evident that it had no real connection through the pelvis and could not be other than an isolated growth. It was so

definitely encapsulated that, mostly by blunt dissection, could it [194]
be freed from the surrounding tissues. Only in one place was it adherent, viz., at the spot where it was covered merely by the exposed vaginal mucous membrane, and owing to this close attachment, the vaginal wall was torn during the enucleation and its lumen opened.

This rent in the vagina was first closed with interrupted sutures and the great gapping wound, from which the tumor was removed, was closed by drawing together the walls so as to obliterate the great dead spaces that would otherwise remain.

Subsequent History.—Wound healed by granulation.

Pathological Note.—The mass removed measures 11 cm. in length, 9 cm. in breadth, and 6 cm. in thickness. It is definitely encapsulated. The surface is smooth and of a reddish yellow color; surface vessels bein injected. The mass is irregularly lobular. The small area noted as being visible through the vulva is covered by adherent mucous membrane, measuring 2 cm. in diameter, which is hyperæmic and slightly ulcerated. The mass is solid, firm, somewhat elastic and of uniform consistency.

The cut surface is moist, glistening, not granular, but of a fibrous appearance. The general color is creamy white with numerous pearly white, glistening bands of tissue running irregularly through the mass. Nothing exudes upon pressure. There are some areas where the tumor does not appear so fibrous and where grossly there is a suggestion of myoxmatous tissue.

Microscopical Examination.—The sections of the tumor show it to be made up chiefly of fatty tissue, in which are scattered numerous irregular strands and areas of dense fibrous tissue. The tumor is a pure fibro-lipoma.

CASE VII.—*Diagnosis. Hygroma.*

History.—Long-haired, black and white, English setter, five years old, a valuable animal and a pet, was brought to the clinic, March 10, 1905. The dog has always been well. About 5 months ago a swelling was noted over the right shoulder. This swelling has persisted up to the present time. No further history was obtainable.

Examination.—The patient is a very active dog, in excellent condition. Mucous membranes are of a good color. The coat is glossy and smooth. Upon palpation a small mass about the size and shape of a pigeon's egg is palpable in the right scapular region. This mass is circumscribed, firm, elastic, and smooth, shows a slight fluctuation, and is not adherent to skin or underlying structures.

Operation.—March 17, 1895. Morphia; ether. *Amputation of tumor.*

[194] The mass, together with a large spindle-shaped portion of overlying, thick skin, was removed in one piece. The wound was closed without drainage, with interrupted fine silk sutures.

Subsequent history was uneventful.

Pathological Note.—The mass removed was found to be a cyst with a thin semi-translucent wall and of a bluish appearance. The contents of the cyst appear to be a clear fluid. The entire mass was placed in Zenker's solution for microscopical sections.

Microscopical Note.—The cyst wall is found to be composed of a dense layer of fibrous tissue, supporting, on its inner surface, a single layer of high, columnar epithelium. The inner surface is smooth and regular. The structure resembles that of a serous cyst.

CASE VIII. *Diagnosis. Adenoma.*

History.—Long-haired, grayish yellow, Scotch-terrier dog, ten years old, a pet, was brought to the clinic, March 14, 1905. The dog has been apparently well until two years ago. At that time a small swelling, about the size of a pigeon's egg, was noticed in the left groin. At first, this swelling increased in size very slowly and remained at the original site. About six months ago the mass rapidly grew in size, gradually became more and more pendent as it increased in size, until it assumed its present proportions and position.

Examination shows an old, very active dog, seemingly in good health. Mucous membranes are of good color. Abundant *panniculus adiposus* is present. When the dog is standing upon all four feet, there is a large mass hanging by a pedicle, free from the abdominal wall at the side of the penis (Figs. 29, 30 and 31). The long pedicle is apparently composed of little more than skin and numerous large vessels, which can be palpated through it; one of these a large pulsating artery. One side of the pedicle forms a portion of the sheath of the penis. The mass just swings clear of the ground when the dog walks. The mass itself measures 12 cm. in length, by 10 cm. in breath, by 5 cm. in thickness, is covered by thin skin which is generally deeply pigmented, with the exception of several areas over the lower surface where there is an absence of pigment, suggesting healed abrasion and where there are several areas of recent abrasion. The mass is very soft, almost spongy on palpation. It is not definitely circumscribed, nor lobulated, though the surface is somewhat irregular. Some areas are definitely firmer than the rest of the mass. The entire tumor is very vascular.

The left inguinal glands are much enlarged and firm.

It was exceedingly difficult to make a clinical diagnosis. The case was brought in as one of hernia and had many points of

resemblance to a hernia or a large varicocele in man though the [194] scrotum was not involved. It resembled also a pendent lipoma such as is met with in man. The enlargement of the glands was accounted for by the ulcerated surface of the tumor. This tumor is exceedingly interesting because of the difficulty of diagnosis, because of its pendent nature and its rich blood supply and, further, because it is our only instance of a tumor, other than a [195] cyst, occurring in a male dog.

FIG. 29 (Case VIII).—Showing pendent nature of tumor with animal on all fours.

Operation.—March 17, 1905. Morphia; ether. *Amputation of tumor and pedicle, and removal of mass of enlarged inguinal glands.*

A long incision was made from the tip of the penis to the groin and carried along each side of the base of the pedicle. The large vessels were secured and the tissue containing the glands of the inguinal region, together with the tumor, was

[195] removed in one piece. The wound was closed with interrupted silk sutures, a new sheath of skin being made for the penis.

Subsequent History.—The wound broke down in part, healing slowly by granulation.

Pathological Note.—On section the tumor mass removed shows a dark red, much congested surface, which is moist, glistening, and granular. The whole tumor appears to be made up of very cellular tissue divided into small areas or lobules by a small amount of fibrous tissues; the picture resembling somewhat that

FIG. 30 (Case VIII).—Profile view of growth with patient in erect posture.

of a thyroid. These lobules appear to be made up of smaller circular areas about the size of a pin head, which project from the surface upon pressure. Several small cysts are also to be noted, in two of which are small smooth bodies resembling papillomatous growths. There is a possibility of these being thrombi in blood spaces or vessels. There are numerous large channels with thin smooth walls running through the mass. In the lower most dependent portion is a large island of fibrous tissue, firm,

and of a pinkish color. In the subcutaneous tissue of the pedicle [195] are found two sebaceous cysts each about the size of a large pea, resembling those found in man.

The inguinal glands are firm and present upon section a moist, deeply pigmented, congested center, with a paler periphery.

Microscopical examination shows the entire tumor to be made up of lobules, varying greatly in size. There is a very small amount of connective tissue around each lobule. The cells, making up the lobules, are chiefly large, granular, polygonal cells,

FIG. 31 (Case VIII).—Front view. Growth suspended by penile sheath when animal is in this position.

with relatively clear, poorly staining nuclei. The stroma also appears to be very cellular. In many areas, the large cells form a solid lobule; in others, they surround alveoli; and in still other places alveoli are found, lined by cuboidal cells, and containing a peculiar substance, resembling cell detritus.

Histologically the enlarged lymphatic glands show merely a condition of endothelial hyperplasia.

[195] The tumor was diagnosed as an adenoma, from its alveolar structure though it was impossible to say from what glandular tissue it had originated.

[196] ## Discussion.

Tumors, and particularly carcinomata are of common occurrence in dogs. Gratia and Liénaux[1] report a series of six cases of carcinoma of the breast, which were used by them for inoculation experiments. E. Semmer,[2] of Dorpat, found among 3525 dogs, admitted to his clinic, 354 cases of tumor. Of this number about 8% were carcinomata. M'Fadyean[3] reports a series of 14 cases of tumor of the mammary glands of dogs. Fröhner's[4] figures for a period of eight years, ending with December, 1894, are exceedingly interesting. During this time, there were admitted to the veterinarian hospital and polyclinic in Berlin 60,471 dogs. Of this number 2871 had tumors, about one dog in every twenty. There were 1154 carcinomata; about 40% of all tumors, therefore, were of this nature.

Carcinomata of the skin and mammæ are the most common. These tumors generally appear late in the life of the dog. In my series of cases the age was obtainable in six cases; the youngest being five years and the oldest being sixteen years of age. Fröhner has never observed a carcinoma in a dog less than two years old. These tumors are most common in dogs between five and ten years of age, and occur more frequently in females than in males. Although carcinomata are the most common tumors of the breasts, nevertheless, fibromata, enchondromata, and sarcomata are not infrequently met with.

It seems to be a common opinion among veterinarians that when a tumor of the mamma has a bony structure, such as several of our cases exemplify, it is undergoing retrogressive changes or a process of self-healing. This view does not seem to me to be the correct one, in the light of my limited number of cases. The adenomatous portions of the tumors appear to be the portion that metastasizes.

I have been unable to find, in the literature at my command, any tumor corresponding to Case VIII, except one re-

ported by Kitt.[5] The one described by him occupied a simi- [196]
lar position, was the same shape, and presented a similar gross appearance before removal. However, from his description after removal, the tumors do not resemble one another. Kitt's tumor was an adenoma sebaceum (*Talgdrüsenadenom*).

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CASES OF HERNIA IN DOGS.

By F. C. BEALL.

CASE I.—*Large irreducible, right, inguinal hernia: enterocele; cystocele.*

The patient, an old fox-terrier bitch, was admitted November 5, 1904. The only history obtainable from her owner, beyond the fact of several pregnancies, states that for six months there has been a noticeable tumor in the lower abdominal region. This has been progressively enlarging. For the last two months the dog has been losing in weight and strength. Latterly she has been vomiting almost every day. There has been constant dribbling of urine.

Examination shows an old, seemingly well bred, though poorly nourished, animal with pale mucous membranes.

[196] Hanging from the left half of the abdomen is a large, soft tumor (Figs. 32 and 33), covered by normal, freely movable skin, which has a faintly bluish tinge. Coursing irregularly over its surface are ridges made by several greatly dilated subcutaneous veins. The tumor is generally smooth and rounded except near its base on the median surface. Here, the two lowest mammary glands have been drawn out onto the tumor by the stretching of the skin, and, in consequence, an area about the size of the hand is roughly and loosely folded. On the posterior wall of the tumor,

FIG. 32 (Case I).—Large right inguinal hernia containing intestines and greatly distended bladder.

just below the symphisis pubis, as the patient stands, is a purplish ecchymotic area. Palpation of the contents of the tumor show that it is composed of two distinct parts. One, a more or less pear shaped mass, constitutes its main bulk and is every-
[197] where, except just at its base, in contact with the overlying skin, though not attached at any point. This portion of the tumor is distinctly pedunculated, rather firm and elastic, giving the im-

pression of a very thick walled cyst without distinct fluctuation. [197]
Around the base of this harder mass, especially on the median side, can be made out a softer, irregular, "wormy" mass that does not seem to be connected with the firmer portion of the tumor. It can be traced across the median line to the right inguinal ring which is easily made out. In this soft mass at the base of the tumor, peristaltic movements were discernible while the animal was being cleaned up for operation. The tumor could not be reduced by taxis even under the anæsthetic.

FIG. 33 (Case I).—Lateral view of hernia sac.

Operation.—November 11, 1904. Morphia; ether. *Herniotomy.* A long incision was made through the skin on the mesial side of the neck of the tumor. The sac was exposed and liberated as well as possible, but owing to its large size was very awkward to handle nor could any of its contents be reduced until it had been opened and the inguinal ring identified and incised in the line of the external oblique fibres.

In addition to the round ligament, which in the dog normally

[197] passes through the inguinal ring with a process of peritoneum, the sac contained about 200 cc. of a pale straw colored fluid, a free, irregularly shaped blood-clot, the size of a walnut, several loops of small intestine, one of which was a dark bluish color—apparently almost strangulated—and a very large distended bladder, measuring 12 by 6 by 8 cm. (The length of the bladder, normally, in a dog of this size is about 3 cm.) The surface over the fundus of the bladder was congested, granular and covered in part with a fibrinous deposit, evidencing an old hæmorrhagic peritonitis and doubtless the source of the free blood-clot found in the sac. Some difficulty was experienced in reducing these structures; this was particularly true of the bladder and a considerable enlargement of the ring was necessary before it could be replaced in the abdomen. The sac, which was very thin and tore in several places despite the greatest care, was then freed; its neck was ligated and the fundus cut away. The abdominal wound was closed in layers, the internal oblique fibers having been brought down to Poupart's ligament and secured by imbricating as were also the edges of the external oblique aponeurosis. The operative procedure differed but little from that advocated for the corresponding lesion in man. The only anatomical differences lay in the presence of a large venous radicle from the epigastric which passed through the external ring.

Post-operative.—Though the animal stood the operation well and no serious complications were anticipated, she was found dead the following morning.

Autopsy.—The examination revealed the following conditions: The whole mucosa of the stomach, except just around the pylorus, was thickly studded with deep ulcers, some of them extending through all but the serous coat of the stomach wall. The ulcers were sharply outlined and had elevated hæmorrhagic edges showing that they could not have been due to post-mortem digestion. The right kidney was completely atrophied, its substance being represented by a dense fibrous tissue only 4 mm. in thickness. The ureter in this side, though patent throughout, was only about one-third the size of the one on the left. The bladder was very large—10 cm. in its longest axis—and presented the appearances described with the operation. The walls were about ½ cm. in thickness. The mucous membrane was swollen, rough and of a dark red, almost black color at the fundus. The other organs were practically normal.

Anatomical Diagnosis.—Recent operative wound. Chronic, round ulcers of the stomach. Obstructive hypertrophy with congestive inflammation of the bladder. Atrophy of right kidney and ureter.

CASE II.—*Bilateral inguinal hernia.* [197]

The patient, a little, old, shaggy-haired bitch, of Skye-terrier type, was admitted January 13, 1905. The history obtained from her master is as follows: The dog is eight years old. She has twice been pregnant, having had only one pup at the first, and two at the second occasion. She is a very active dog and her owner thinks the ruptures are due to "jumping after cats"

FIG. 33 (Case II).—Large left and small right inguinal herniæ.

against high palings. Two years ago and not until two years [198] after the second pregnancy, a tumor was first noticed in the left inguinal region. When first seen it was small and reducible. It has gradually increased in size until now it is about as large as a closed fist (Fig. 33). A second tumor was noticed on the right side about two months ago. It is now about the size of an egg.

The larger tumor, on the left side, is not reducible; the one on the right usually disappears of itself when the dog is relaxed and placed upon her back.

[198] *Operation.*—January 13, 1905. *Radical cure of left inguinal hernia.*

The sac was cut down upon by an oblique incision, carried upward and outward from the external ring in the line of the external oblique fibres. The sac was dissected out, opened, its contents —in this case small intestine only—replaced in the abdominal cavity. The sac was ligated at the external ring and excised. The wound was closed in layers with fine silk interrupted sutures, imbricating the external and internal oblique muscles as in Case I.

Recovery was uneventful. The wound healed per primam.

Operation 2d.—February 10, 1905. *Radical cure of right inguinal hernia.*

An operation similar to that above described, was performed upon the right side, where the small hernia had, in the interim, increased in size almost to that of the original large left hernia. The recovery was rapid and complete with primary union.

CASE III.—*Small right inguinal hernia.*

The patient, a fine large Gordon-setter bitch (No. V, of Mr. Ortschild's series), was operated upon by Mr. Ortschild and myself, February 15, 1905, for the removal of a large malignant tumor of the right inguinal breast. In the fatty tissue under the breast a small hernial sac, containing the prolapsed round ligament and its meso-ligamentum, was unexpectedly found. The hernia was treated as in the other instances.

DISCUSSION.

Hernia, as is well known, is frequently met with in the dog. The most common form, perhaps, is the mid-ventral, either epigastric or umbilical, of which we have seen several instances. These ruptures occur in both sexes with about equal frequency and, according to our experience, are usually small and not productive of symptoms. They are usually congenital. Inguinal hernia, on the other hand, aside from the very rare congenital form, is very much more common in the female and, as in the cases cited above, may reach a seriously incapacitating size. The smaller inguinal hernias, such as the last case illustrates, are probably not at all uncommon in bitches and we have heretofore in the clinic doubtless over-

[13] Un caso di ernia doppia in un cane. Mod. zoöiatro, Torino, 1900, XI (221-6).

looked them many times. What were at first considered to [198]
be merely hypertrophied inguinal mammæ, have, on several occasions, been found to be normal breasts whose prominence was due to an underlying rupture. In one of Mr. Ortschild's cases a piece of tumor had been implanted in one of these supposedly enlarged breasts which increased further in size and led us to believe that the tumor itself was enlarging. The dog became emaciated and one morning was unexpectedly found dead. The autopsy disclosed a hernia containing a strangulated loop of small intestine.

All of the cases but one, that I have been able to find in the veterinarian literature, have occurred in the female. This was a case of Parascandale's.[18] The greater frequency of this form of hernia in the female is doubtless to be explained on anatomical grounds. The broad ligaments of the dog's bicornuate uterus are attached to the horns just as the mesentery is to the intestine, forming the mesometria. The round ligaments arise as processes from the broad ligaments at about their middle and run backwards to the inguinal canals (the uterus of the dog, it is to be remembered, is for the most part an abdominal organ) carrying with them processes from the broad ligaments. Each round ligament, as it passes through the inguinal canal, is practically free, being attached only loosely to the dorsal wall of the canal by folds of peritoneum which are continuous with those of the broad ligament. The canal is lined by an extension of peritoneum (analogous to the Canal of Nuck) which passes about 2 cm.—in a medium sized dog—beyond the external abdominal ring. There exists normally, therefore, a peritoneal diverticulum which traverses the abdominal parietes. With the dog on its four feet this sac looks backward, inward, and slightly upward and the pressure of the abdominal contents on its upper wall probably serves to keep it entirely closed. During pregnancy, however, the round ligament is put on a stretch by the enlarged uterus, and this seemingly tends to loosen and weaken the surrounding structures and to enlarge the whole canal. After pregnancy the relaxed tissues would allow the small peritoneal sac to sag and

[198] point downward, instead of upward, so that with an enlarged opening the prolapse of abdominal viscera would be comparatively easy. That the frequency of inguinal hernia in the female dog is due, in great part at least, to the weakening effects of pregnancy on the abdominal wall, is shown by the fact that this form of hernia is almost unknown in the male dog. And this, notwithstanding the fact that the tunica vaginalis of the testicle retains its peritoneal connection through the inguinal ring and does not become obliterated as in man.[14]

[199] The viscera, most often found in these canine hernias, are the round and broad ligaments of the uterus, the uterus itself (sometimes even the pregnant uterus), the small intestine,

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[198] [14] The persistence of these peritoneal canals is very commonly regarded as a favoring cause of inguinal hernia (of the so-called congenital variety) in man and his erect posture may suffice to make this the more probable. Bland Sutton, however (Transactions of the Pathological Society. London, Vol. XXXIX, 1888), has called attention to the fact that these peritoneal processes remain patent in the monkey and yet inguinal hernia is a rare malady in these animals. He has made a report upon a single instance of the condition.

He says, "Some surgeons are of the opinion that a patent funicular pouch is to be regarded as predisposing to the occurrence of a hernia." * * It is, however, a remarkable fact that, among mammals, obliteration of this process above the testis is altogether exceptional, indeed, in the majority this process not only remains open but freely communicates with the peritoneal cavity. The only exceptions which have come under my notice are the chimpanzee and the gorilla. Professor Owen has found the process obliterated in a chimpanzee. In three specimens of this mammal dissected by me the process was patent. * * * * * Up to the present time I have examined post mortem more than

[199] 800 monkeys, including examples of all the chief species, excepting the gorilla. In every male, the funicular process was unobliterated and communicated freely with the peritoneal cavity. There was no separation of a piece to form a tunica vaginalis. * * * * Theoretically, if an unobliterated funicular pouch predisposes to hernia, this accident should occur in monkeys frequently. So far I have only seen three cases. In each instance they were of the variety known as congenital, the contents completely surrounding the testis."

and the omentum. Our first case is of interest in that the [199] sac contained the entire bladder which had become greatly distended and hypertrophied. I have been unable to find any other case of cystocele reported as occurring in the dog although the possibility of its occurrence is mentioned.

The malady in the canine does not seem to be commonly attacked on modern surgical principles by veterinary surgeons. A series of twelve cases has been reported by Hobday from the Royal Veterinary College of London.[15]

In his Operationslehre für Tierärzte, Hering states that inguinal hernias are most commonly met with in stallions and boars, rarely in oxen, sheep, and dogs, and very exceptionally after castration. He describes, in addition to the more common forms which we have met with, several other varieties of hernia that occur in animals and which are anatomically similar to those met with in man.

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[15] Hobday, Operative Treatment for Hernia in the Dog. Veterinarian, London, 1896, LXIX, 195-200. Cf. also, Einige Beobachtungen über Hernien. Wchnschr. f. Tierh. u. Viehzucht, München, 1897, LXI, 217, 225, 229. Duscourneau, Hernie inguinale irréductible chez la chienne. Bull. Soc. Centr. de Méd. Vét., Paris, 1901.