

in individuals who show no evidences of any thyroid deficiency. The gland has been found atrophied in scleroderma (Hektoen), and in various forms of dwarfism that were quite different from cretinism. Katzenstein found section of the nerves of the thyroid to be followed by marked atrophic changes.

Parenchymatous Degeneration.—Studies of the histology of the gland in various intoxications by different observers have been reported as showing many changes in the way of epithelial proliferation or desquamation, increase of stroma, etc., but the results have been so inconstant, and the structure of the thyroid is so variable, that little importance can be attached to them. It may be that in infectious diseases injury to the thyroid leads to detrimental effects to the individual, but if this is so there are no clinical or anatomical evidences to show it. Slight changes have been described in the thyroid following experimental operations in the bile ducts (Wiener, Müller, Hürthle).

Amyloid deposition occurs in either the normal gland or in goitres as a part of general amyloidosis, affecting here as elsewhere the arteries and stroma chiefly. In one hundred and eighteen autopsies in which amyloid disease was found at St. George's Hospital, amyloid was noted in the thyroid but once, but this is probably to be attributed to lack of search for it there. In goitre occasionally local deposits of amyloid may cause wax-like nodes, similar to local amyloid deposits that have been found in the larynx.

Hyaline degeneration is frequent in the stroma of goitres, in senility, and in tumors. It frequently is followed by calcification.

Fatty degeneration is not prominent in the thyroid, but may accompany the same changes in other organs. According to Erdheim, there is normally some fat in the epithelium of the thyroid.

Calcification of the stroma and arteries may occur in senility, and sometimes earlier in life. It is very common in goitres, especially in the walls of old cysts, which may be entirely enclosed in a shell of calcified material. Rarely ossification follows. The finding of areas of calcified materials in goitre is a frequent occurrence in autopsies.

INFECTIONS.—*Acute inflammation* of the thyroid is, on the whole, very infrequent. It is much more likely to occur in goitrous glands, which condition is sometimes called *strumitis*, to distinguish it from inflammation of non-goitrous glands, or *thyroiditis*. It would seem that the normal gland possesses in a marked degree the power of resisting infections, a characteristic that is perhaps due in part to its great vascularity, which is lost in the goitres with their frequent areas of degenerated tissue. When acute inflammation does occur it is nearly always suppurative, and the pus may burrow in disastrous ways in the tissues and organs of the neck. Infection may come through the blood stream, which is most frequent, or from extension from surrounding structures, or from direct external injuries, as in attempts at suicide by cutting the throat. Of 20 cases Lancereaux found that 4 occurred in the puerperal state, 3 in typhoid, 2 in nephritis, 2 in pyæmia, 2 in pneumonia, 1 in acute articular rheumatism, and 6 were independent of other diseases. Later observations have shown that of the febrile diseases thyroid infection is particularly frequent in typhoid, Schudmark having collected 13 authentic cases. Termination is most frequent by rupture and cicatrization, when the infection is not a complication of a mortal disease, although gangrene has resulted in several cases. In goitres the pus may accumulate in cystic spaces until large accumulations result. Of particular interest are the few reported cases in which myxœdema, cretinism, and Graves' disease have followed the healing of such destructive inflammations.

Chronic interstitial inflammation with formation of connective tissue may occur; little, however, is known about such a process. Probably certain cases of myxœdema, and perhaps of cretinism, are produced in this way. Often at autopsy thyroids are found that show so much

fibrous tissue that the suspicion of an interstitial thyroiditis is warranted, but as no results seem to have been produced by the lesion, and as there is no apparent cause, the condition is of no evident practical interest.

Tuberculosis occurs most frequently in generalized miliary tuberculosis, but naturally is overlooked clinically, and often at autopsy. Chiari found lesions in the thyroid in seven per cent. of his cases of pulmonary tuberculosis, and in twelve per cent. of Fraenkel's fifty cases they were present. Miliary tubercles are much more frequent than the larger caseous nodules. They generally start in the interacinous connective tissue. There are three cases in the literature in which, so far as clinical manifestations showed, the thyroid lesions were primary. Tuberculosis of the cervical glands seems to be transmitted to the thyroid much less often than might be expected. According to Roger and Garnier sclerotic changes are constant in the thyroid in chronic phthisis.

Syphilis might be expected to spare the thyroid in view of the large amount of iodine that the gland contains, but it cannot be said that syphilis is proportionately less frequent than other infections of this organ. Gummata have been occasionally observed, although scar formation of the irregular, deforming type seen in other organs is perhaps as frequent. During the stage of intoxication the thyroid often participates in the general glandular enlargement. In congenital syphilis thyroid gummata are not rare, although a diffuse sclerosis is more frequent, and cases of cretinism have been attributed to the thyroid sclerosis of congenital syphilis. Myxœdematous symptoms have resulted from syphilis of the thyroid in a few instances; they were relieved by antisyphilitic treatment.

Actinomyces may result from extension by way of the cervical fascia, and a number of such cases have been reported. Metastatic actinomycotic infection does occur, although very infrequently.

Cytotoxins.—In connection with the general study of the formation of toxins for different animals by immunizing them against various tissues from a different species attempts have been made with the thyroid. The only reports published at the time of this writing are by Gontscharukov and Mankovsky, each of whom, after injecting the immune serum into dogs obtained symptoms that were considered comparable to those resulting from thyroidectomy. Their work is, however, limited, and other more extensive work, as yet unpublished, furnishes results which are by no means corroborative.

In this connection may be mentioned the recent trials of the serum and of the milk of goats in the treatment of exophthalmic goitre. These trials have been made on the assumption that this disease is due to hyperactivity of the thyroid, and that the serum and milk of goats contains an excess of the substance that the thyroid should neutralize. Lanz, and also Moebius, have tried this treatment, and both consider it of positive benefit.

TUMORS.—*Benign tumors* of the thyroid, if of epithelial nature, are difficult or impossible to differentiate from hypertrophy of compensatory or functional nature; they are all described in the article on *Goitre*. Benign mesoblastic tumors are rare, although fibromas, chondromas, and osteomas have been described. They present no special peculiarities because of their origin in the thyroid.

Years.	Carcinoma.	Sarcoma.
One to ten
Ten to twenty	3	2
Twenty to thirty	13	9
Thirty to forty	33	12
Forty to fifty	38	28
Fifty to sixty	40	26
Sixty to seventy	19	20
Seventy to eighty	3	2
Eighty to ninety	1	..

Malignant tumors have also been discussed in the article on *Goitre*, but since its publication the elaborate study

of all available cases by Erhardt has appeared, and a rather full abstract of this in English may be of value. Trustworthy reports were found of about 150 carcinomas and 100 sarcomas. Of the carcinomas 65 occurred in

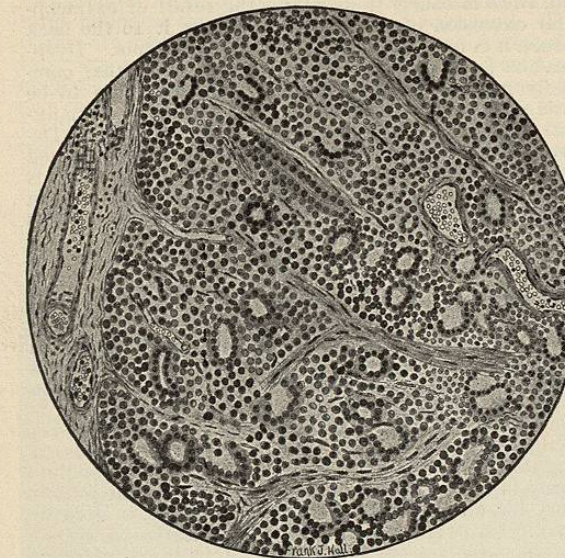


Fig. 474.—Primary Carcinoma of the Thyroid.

men and 85 in women; of the sarcomas 40 were in men and 59 in women, these results agreeing with the general prevalence of thyroid diseases in women. The preceding table shows the age status of the malignant tumors.

It will be noted that the usual earlier occurrence of sarcoma is not the rule in thyroid tumors, for which fact there is no evident explanation. Trauma seemed to be the starting-point of the tumors in 3 cases, while in 3 others acute infectious disease preceded the growth, and in 2 it accompanied pregnancy. Out of 200 reports it is expressly stated that goitre preceded the tumor in 104; in but 21 was the absence of goitre specifically noted, while in the remainder this point was not mentioned. In view of the great frequency with which nodules are found in thyroid glands that are not enlarged, it is possible that in even some of the 21 cases in which there was no goitre, some small goitrous nodules existed. A location of the goitre behind the sternum seems favorable to malignant transformation, probably because of irritation. Naturally, thyroid cancer is more frequent in goitrous than in non-goitrous districts.

Anatomical Features.—Carcinoma is not to be distinguished from sarcoma by any clinical features, and anatomically also these two varieties of new growth resemble each other more closely when they are located in this organ than when they develop in almost any other organ in the body. Occasionally the growth is so diffuse from the start that its origin cannot be determined. For some time the capsule seems to offer a barrier to extension, but invasion of both blood and lymph vessels occurs early. Although sometimes of enormous size, especially when the seat of cystic and hemorrhagic dilatations, yet occasionally scirrhous carcinomas are formed of such small size that it may be impossible to palpate them. In such cases as this, careless autopsies may fail to explain, or may explain incorrectly, the origin of the metastases found. The greater part of the growth in the thyroid results from fusion of secondary growths, rather than from a process of infiltration. Histologic diagnosis is particularly difficult, not only between sarcoma, carcinoma, and endothelioma, but especially between carcinoma and benign adenomas. Medullary carcinoma is the most frequent form of carcinoma, although adeno-carcinoma and cylindrical-celled forms are not infrequent. Asso-

ciated with papilliferous tendencies cyst formation often occurs, resulting in a growth described as *cystadenoma papilliferum malignum seu carcinomatodes*. The cases of scirrhous, in Erhardt's report, number but six, the growth in them being chiefly at the periphery, while the centre had been replaced by a mass of scar tissue. The rare instances of primary squamous-celled carcinoma are probably to be explained as originating from misplaced embryonal remnants rather than as growths due to metaplasia. The sarcomas are composed chiefly of round and of spindle cells. They are rarely encapsulated. Generally they infiltrate the gland diffusely; sometimes they entirely replace its structures. Much less frequent are cavernous and giant-cell sarcomas, while there are a few instances of osteoplastic sarcoma. Tumors of the type of the peritheliomas, with cells radiating about vascular channels, are not uncommon, the simpler endotheliomas being much less frequent. While a case of primary melanosarcoma exists in the literature, the report of this case makes it seem probable that the growth was really secondary. Other malignant tumors described are chondro-osteoid sarcoma and teratoma malignum.

Secondary tumors of the thyroid are but rarely found. Some of these are of vascular implantation, and some owe their origin to an extension from neighboring growths, especially of the larynx and œsophagus.

Extension and Metastasis.—After the growth once penetrates the capsule it usually grows rapidly and involves the surrounding tissues extensively, often fusing with the regional lymph-gland metastases. Often the trachea is infiltrated, twenty-two such cases being reported in the series. In these the growth took place either by direct extension from the thyroid or by transference by way of the tracheal lymphatics. The œsophagus is often also involved, as also is the sternum. While the large veins of the neck are often invaded and plugged by the growth, the arteries seldom are. The vagus and sympathetic usually resist invasion, but the recurrent laryngeal is often involved. Invasion of the muscles and other tissues of the neck is not particularly common. Metastasis usually takes place early in all

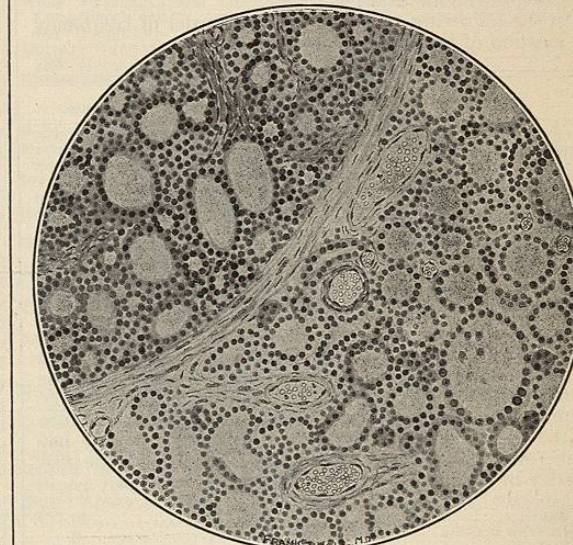


Fig. 475.—Secondary Carcinoma Nodule in Lung, Secondary to Carcinoma of the Thyroid shown in the Preceding Drawing. Illustrates tendency of secondary tumors to approach normal gland in structure.

varieties of sarcoma and carcinoma except the papilliferous cystadenomas. Of 94 bodies thoroughly examined but 14 were devoid of metastases. Of 46 carcinomas 23 had metastases by the blood stream alone, 9 by the lymphatics alone, and in 14 the metastasis was by way of both

these channels. Of 34 sarcomas the transmission was by the blood in 24, in 7 by lymph alone, and in 3 by both. This great relative frequency of dissemination of the carcinomas by way of the blood is explained by the great vascularity of the gland, the early invasion of the large veins of the neck, and the resistance to lymphatic transportation that the capsule of the gland seems to offer. Of 131 carcinomas and 107 sarcomas metastases were found in the lymph glands in 49 of the former and 18 of the latter. Erhardt has made an extensive study of the lymphatic system of the thyroid, both in health and in relation to tumor transportation, and as there seems to be no other accessible study of a similar nature, I will give here the main features.

The lymphatics of the lateral lobes anastomose to a slight extent, much less so than has been generally supposed. This fact explains the relative infrequency of transportation of carcinoma from lobe to lobe, in contrast to the frequent direct extension of sarcomas. The greater part of the lymphatics are collected into a few large stems on the lateral and posterior sides of the gland, where what appear to be lymph reservoirs containing large quantities of colloid can be found. These vessels pass to the glands about the large vessels in the neck, which are first and almost constantly involved when there is lymphatic dissemination. Then follows infection of the inferior and deep cervical glands below and behind the clavicles. These are in turn connected with the axillary and mediastinal glands, which are accordingly next involved. The isthmus is connected chiefly with the glands lying between the œsophagus and the larynx, whose involvement is important because of the serious pressure effects that are certain to result. These glands communicate with a retro-œsophageal plexus. There are some lymph vessels that pass directly from the upper poles of the lateral lobes to the submaxillary and sublingual glands, which are occasionally infected in early stages. Similar direct branches pass from the lower poles to the mediastinal glands. After the usual routes have become plugged with tumor growth the flow may pass in any conceivable way, with corresponding location of the metastases.

In the following table is shown the order of frequency of location of the vascular metastases.

	Carcinoma.	Sarcoma.
Lungs	66	63
Bones	43	23
Liver	21	15
Kidney	13	7
Pleura	10	6
Brain	7	5
Scattering	7	6

The great frequency of osseous metastasis in thyroid tumors, similarly to what occurs in the prostate, is well known. At the same time, no satisfactory explanation seems to be forthcoming. Such metastases are most often located near the epiphyses, and often lead to spontaneous fracture, which differs from that resulting from primary bone tumor in that sometimes the bone reunites because of the formation of abundant osteophytes. Iodine has been found in the bone metastases. A table of the frequency of involvement of the bones is of interest.

Skull	30	Humerus	10
Inferior maxilla	30	Pelvis	8
Sternum	18	Scapula	4
Vertebrae	11	Malar	2
Ribs	11	Palate	1
Femur	10	Clavicle	1

Symptomatology.—The mere fact that a thyroid increases rapidly in size is hardly an indication of the presence of a malignant growth, since such an increase in size so often happens either in goitrous or in non-goitrous glands. The relative frequency of non-malignant enlargements, as compared with those which are malignant, is apt to divert suspicion, particularly when goitre previously exists.

Probably the most important of the symptoms is immobility of the gland during the act of swallowing, which was noted in forty per cent. of the collected cases. However, this symptom is sometimes present in benign goitre, and, since in cancer it usually is the result of extracapsular extension of the growth, binding it to the neck tissues, it is not, as a rule, a very early symptom. Dyspnoea also is of slight value, because the goitre that commonly precedes it usually causes this symptom to be wrongly attributed, although in the case of a malignant growth the dyspnoea is particularly severe. Deformity of the larynx and trachea may be observed by laryngoscopic examination when the dyspnoea is not too great. Occasionally hæmoptysis results from intratracheal extension. Obstruction of the œsophagus is sometimes severe, with symptoms much the same as in stricture from other causes; the obstruction is usually located about 20 cm. below the teeth, and phlegmon may result from the tissues becoming infected. The superficial veins are prone to be more distended than in simple goitre, and sometimes they may be palpated when filled by tumor growth, from which metastases with their resulting symptoms may develop. Occlusion of the carotid, with the consequent loss of pulsation, is of significance as regards malignancy, but still more so is the direct entrance of the vessel into the tumor mass, a condition which can be made out without difficulty. Paralysis of the recurrent laryngeal is of great importance, for although it may occur in goitre, it does so rarely. Of twenty cases of this complication, in seventeen the involvement was unilateral, in three bilateral. The vagus usually escapes and the instances of tachycardia and arrhythmia from this cause are rare. The sympathetic is involved a little more often than the vagus; it is indicated by a pin-point pupil, a narrowed palpebral opening, and local vascular dilatation with local sweating and local heat. Only in the latest stages does involvement of the hypoglossal and spinal accessory occur, with paralysis of the tongue and drooping of the shoulder. Neuralgic pains, that radiate to the ear, shoulder, and occiput, often develop in the growth, and sometimes at quite an early stage. Fever of mild grade, independent of complications, is not rare. It is important to note that cachexia is not a common accompaniment of the disease; it was observed in only twenty out of one hundred and fifty cases. The destruction of the gland does not lead to manifestations of cachexia strumipriva, partly because of the slowness of the process, but probably more because the tumor is able to form colloid itself. In six reported cases the features of exophthalmic goitre were present, and in three of these they were relieved by operation.

The average duration is about two years, with no great differences between carcinoma and sarcoma, although the most acute growths are usually sarcomas, the most chronic being the scirrhus carcinomas. Death rarely results from cachexia because of the location of the growth, which most often kills by involvement of the air passages, (either from asphyxia or from pneumonia). The asphyxia may result from œdema of the glottis, from kinking of the trachea, or from sudden swelling of the tumor through hemorrhage or congestion. Fatal hemorrhage is rare; the blood may escape into the air passages or even into the tissues.

Operative treatment is difficult, first because suspicion of malignancy in the goitrous neck comes late, and also because of the respiratory complications that are usually present at the time operation is sought. Narcosis is usually extremely dangerous, and Erhardt advises that operation be begun under local anesthesia, and that chloroform be given if the operation becomes too painful. In the early stages it may be possible to enucleate the entire gland with success, but this is probably done oftenest when the growth is in a goitre that has not shown its malignant change clinically. Of course, thorough clearing out of the neck is the only operation possible when the capsule has been penetrated and the glands are involved. The cachexia strumipriva is to be combated by thyroid medi-

cation as the lesser of the two evils. Of 68 partial thyroidectomies (unilateral) performed during the past ten years 6 were fatal immediately after the operation—10 per cent. against 2.88 per cent. in benign goitre. Of 17 thyroidectomies involving resection of surrounding structures, including trachea or œsophagus, 5 were fatal. The results are much better now than in the previous decade. In several instances the patients remained free from a recurrence of the growth for a period of several years. In one case, according to the report, the recurrence took place as late as eight years after the removal of the original growth. Recurring growths are usually diffusely infiltrating and inoperable, frequently requiring tracheotomy.

Mixed Malignant Tumors of the Thyroid.—In reporting a case of a malignant tumor in the thyroid of a dog in 1901, which was remarkable in that the primary growth



Fig. 4716.—Primary Mixed Tumor (sarcoma and carcinoma) of the Thyroid. The sarcomatous tissue is seen extending obliquely across the section.

consisted of a mixture of sarcomatous and carcinomatous elements, and had produced metastases of each kind of tumor tissue, as well as of the mixed variety, I searched the literature for other instances of mixed malignant tumors. I was able to find only two such instances, both of which were in the thyroid. Since that time a similar case has been reported by Woolley, and another by Leo Loeb, in each case in the thyroid. That all the existing instances in which a primary tumor presented a mixture of carcinoma and sarcoma were thyroid tumors, in the face of the infrequency of malignant tumors of the thyroid, is certainly of some significance, but it has not yet been determined what the significance is.

Metastasis of normal thyroid tissue and of benign thyroid neoplasms has been reported in a number of instances. This apparent exception to the rules of tumor- and tissue-growth would seem to be best explained, in the light of the latest studies, as due entirely to misinterpretation of histological pictures or to inaccurately studied cases. An example is the report of Oderfeld and Steinhaus published as recently as in 1901. This report concerned an instance in which a growth had developed in the left frontal bone, having the structure of normal thyroid gland, and it did not recur after removal. In the ab-

sence of any evidence of disease in the thyroid itself, this growth was believed by the writers to be the result of metastasis of normal thyroid tissue, which had proliferated in its new location as does a thyroid graft. A similar case had been reported by Riedel. In less than two years the authors named above were obliged to report an entirely different explanation. The patient had died in the mean time with multiple metastases, all of which had a structure that resembled normal thyroid. The thyroid itself showed no growth except a small encapsulated nodule, which also was of the structure of normal thyroid. They were obliged to conclude that, after all, their case was one of carcinoma of the thyroid with metastases, remarkable chiefly for the resemblance of the structure of the tumor to that of the gland. A study of many cases of thyroid carcinoma shows that the metastases have a decided tendency—which is particularly true of adenocarcinoma—to reproduce the structure of normal thyroid-gland follicles. It is highly probable that the above-mentioned facts are sufficient to explain the supposed instances of transportation of normal gland tissue or adenomas, and that it is safe to assume that when any structure of the thyroid produces metastases it is to be considered *prima facie* evidence of the malignancy of that structure.

Tumors of the thyroid in lower animals are by no means infrequent, especially in dogs, in which goitre is common. They have also been described in horses. They seem to differ not at all from those observed in man. Of the five sarcomas reported, one was in a dog, and another, that of Loeb, was in a white rat. It may be recalled that Loeb's work on the transplantation of tumors was done with a thyroid sarcoma from a rat.

H. Gideon Wells.

REFERENCES.

Many of the matters pertaining to the pathology of the thyroid have been discussed in previous volumes, under the topics of *Goitre*, *Cretinism*, *Myxœdema*, and *Organotherapy*, to which the reader is referred.

General.

Hektoen: American Textbook of Pathology, 1901, 890.
Wells: Physiology and Therapeutics of the Thyroid Gland and its Congeners. Journ. Amer. Med. Assn., 1897, October 30th, November 6th and 13th.
Murray: Gulstonian Lecture on the Pathology of the Thyroid. Lancet, 1899, March 11th, 667.
Hutchinson: Practitioner, April, 1901.

Anatomy.

Poirier et Charpy: Traité d'anatomie humaine, 1901, iv., 566.
Marshall: Variations in the Form of the Thyroid. Journ. of Anat. and Physiol., 1895, xxix., 234.
Perrando: Anatomy of the Thyroid in the New-born. Studi Sarsaresi, vol. ii., sec. 11, 1902.
Reinbach: The Secretion of Colloid. Ziegler's Beiträge, 1894, xviii., 596.
Bozzi: Histology of Secretion and Excretion of Colloid. Ziegler's Beiträge, 1895, xviii., 125.
Streiff: Reconstruction of Thyroid Structure. Arch. f. mikr. Anatomie, 1897, xviii., 579.
Erdheim: Fat Granules in Thyroid Cells. Ziegler's Beitr., 1903, xxxiii., 158.
Kashiwamura: Relations of Age to Structure. Virchow's Arch., 1901, cxlvi., 377.

Physiology.

Roos: Properties of Thyroidine. Zeit. f. physiol. Chemie, 1895, xxi., 19, and xxii., 16.
Cristiani: Implantation Experiments. Journ. d. Physiol. et Path. gén., 1901, iii., 124 and 298.
Lange: Thyroid in Pregnancy. Zeit. f. Geburtsh. u. Gynäk., xl., 34.
Halsted: Regeneration and Hypertrophy. Johns Hopkins Hospital Report, 1896, i., 373.
Blum: Antitoxic Function of Thyroid. Virchow's Arch., 1900, cxlii., 375.

Chemistry.

Oswald, A.: Beschaffenheit und Funktion der Schilddrüse, Strassburg, 1901.—Zeit. f. physiol. Chem., 1901, xxxii., 121.—Virchow's Archiv, 1902, cxlix., 444.
Baumann: Original Papers on Thyroidine. Zeit. f. physiol. Chem., 1896, xxi., 381 and 481, 1896, xxii., i.
Hutchinson: On the Composition of Colloid. Journ. of Physiol., 1896, xx., 474.
Gautier: Arsenic in the Thyroid. Compt. rend. Acad. des Sciences, 1899, cxxix., 929.

Pathology.

Erhardt: Review of Subject of Malignant Tumors of the Thyroid. Beitr. zur klin. Chir., 1902, xxxv., 343.—*Ibid.*, The Lymph Vessels and Glands of the Thyroid in Relation to Malignant Tumors. Cent. f. Path., 1902, xliii., 379.

Oderfeld and Steinhaus: Metastasis of "Normal" Thyroid Tissue. Cent. f. Pathol., 1901, xii., 206, and 1903, xiv., 84.
Shurley: Thyroid Tumors at Base of Tongue. Phil. Med. Journ., September 13th, 1902, 362.
Loeb, Leo: Transplantation of Thyroid Tumors in Rats. Journ. of Med. Research, 1902, viii., 44.
Wells: Mixed Malignant Tumors, "Sarcomatoma," of the Thyroid. Journ. of Path. and Bact., 1901, vii., 357.
Thuesen: Intratracheal Colloid Struma. Amer. Journ. Med. Sci., 1902, cxxiii., 1051.
Blum: Renal Alterations Following Thyroidectomy. Arch. Path. u. Physiol., 1901, clxvi., 403.
Schudmark: Post-typhoid Suppuration. Wien. klin. Wochenschr., July 19th, 1900.
Roger and Garnier: Tuberculosis of Thyroid. Arch. gén. de Méd., April, 1900.
Lanz: Treatment of Exophthalmic Goitre with the Milk of Thyroid-ectomized Goats. Münch. med. Woch., 1903, No. 4, 146.
Moebius: *Ibid.*, 149.
Gontcharukov: Thyroid Cytotoxin. Cent. f. Pathol., 1902, xiii., 121.
Wiener: Influence of Bile on Thyroid. Cent. f. Physiol., 1899, xiii., 142.—See also Müller, in Ziegler's Beiträge, 1896, xix., 152.

THYROID CACHEXIA.—See *Thyroid*.

THYROIDECTOMY. See *Goitre*. (*Surgical*.)

THYROID EXTRACT. See *Organotherapy*.

TINEAS, THE.—There are included under the general term of *Tinea* several diseases of the skin, both of the hairy and the non-hairy parts, caused by the parasitic action of various kinds of fungi belonging to the order of *Hyphomycetes* or mould fungi. These fungi have an affinity for the keratinized portions of the skin and its appendages—hair, nails, and epidermis. They attack these structures in man and some of the lower animals (horses, dogs, cats, birds), and infection in the former can often be traced to the latter source.

Although these moulds thrive best upon the surface of the skin, certain varieties sometimes penetrate beyond the superficial horny structures into the corium or subcutaneous tissues, causing the so-called *kerion* and *hyphomycetic granulomata*.

In all of the various diseases caused by these fungi they may be readily detected by the following procedure: A small piece of crust, scales, hair, or pus is placed in a

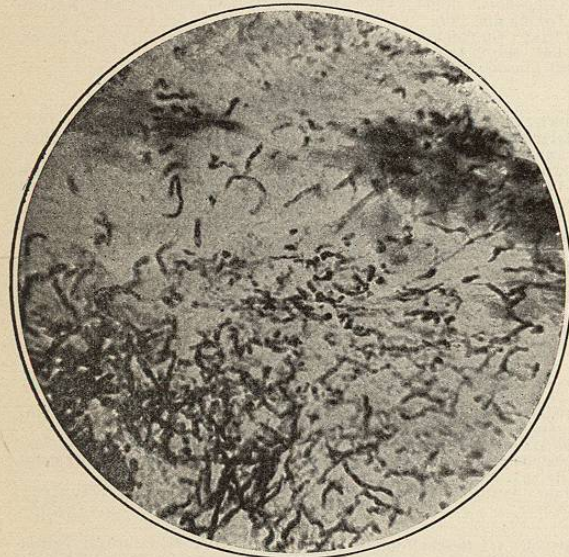


FIG. 471.—Section of Favus scutulum, showing Spores and Mycelium of the Fungus, Achorion Schönleinii. (Bausch and Lomb one-eighth inch objective, one inch eyepiece.)

few drops of liquor potassii or a weak solution of caustic soda upon a glass slide and allowed to remain for a few moments; a cover glass is then pressed gently over it. A one-seventh objective and low eyepiece will disclose the conidium or spores and the mycelium or threads, which

vary in their size, shape, and arrangement according to the variety of the fungus to which they may belong. The spores are small, round or oval, bodies; and the mycelia long, sharply defined, narrow tubes which fork or branch in various directions.

TINEA FAVOSA, or favus, is a contagious and very chronic disease of the hairy and non-hairy parts, due to

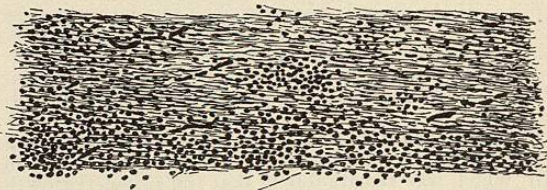


FIG. 4718.—Microsporon Audouini (small-spore fungus) in Hair. (Engman.)

the action of the fungus, Achorion Schönleinii, which causes the formation of cup-shaped yellow crusts about the hairs, and subsequent atrophy and baldness of the part.

The most common location for favus is upon the scalp, but any portion of the integument may be attacked. The nails especially are not infrequently involved by secondary inoculation from the scalp. The disease is rarely contracted after childhood, and is said to be more frequent in males. It is usually seen in this country (United States of America) among the poorer classes of foreigners, especially in Polish, Russian, German, and Italian children.

The fungus gains access to the scalp generally through direct contagion from another child, or from one of the pet, domestic animals, and shows its presence there by causing a superficial, slightly red, scaly patch, which slowly changes its aspect until it presents, at several of the follicular openings, a small yellow point pierced in its centre by a hair. These points gradually increase in size and develop into the "cups," crusts, or scutula, characteristic of the disease. They vary in size, but at an early stage show the scooped-out or cup-shape, which is produced by the luxuriant growth of the fungus at the mouth of the follicle and the rapid increase and piling up of its elements and tissue debris at the peripheral portion in a uniformly concentric manner. The convex or under surface of the scutula is rather firmly attached to the skin, at the mouths of the follicles, and when removed discloses an oozing, slightly excavated and reddened surface. If the crusts are allowed to remain for a sufficient length of time the surface upon which they rest becomes atrophic, white, and permanently bald. The yellow color of the crusts may, from the admixture of foreign material, become correspondingly modified. As the disease progresses new foci of infection may appear or the initial patch may spread peripherally, and as the scutula increase in size and numbers, they join each other, producing diffuse, "mortar-like masses," often extending over a large surface. When this occurs a peculiar mouse-nest odor is apparent.

The hairs are involved very early in the disease; their nutrition is interfered with by the mechanical influence of the mass in the follicle, and by the direct parasitic action of the fungus which grows upon the shaft and in the medulla, with the result that the hairs become lustreless, friable, brittle, and break off or fall out. When the stumps are of sufficient length a frosted or peculiar powdered effect is often seen in a reflected light, due to the access of air into the split-up shaft.

The disease is generally slow in its progress, and varies in different climates and different individuals in the rapidity of its extension and growth. The fungus, having gained access to the follicle, increases proportionately to the fertility of the soil, and produces the favus scutulum, varying in size from a pea to a silver dime, the presence of which by its pressure and probably by the toxicity of

the organism causes a mild inflammation. This inflammation and the mechanical pressure of the scutulum, if long continued, produce an atrophy of the tissues, the contraction of which loosens the crust and it is then either knocked or cast off, leaving a pinkish-white atrophic surface, free from hair. As this process of recent infection of new and atrophy of old infected follicles is continuously going on, a patch may present crusts in various stages of evolution, with atrophy between them.

Favus of the non-hairy parts presents the same essential characteristics, in the lanugo hair follicles, as upon the scalp, except in certain cases in which a special variety of the fungus or a peculiar condition of the soil causes alterations similar in appearance to those of *tinea circinata* (*favus à lésions trichophytoïdes*). In neglected cases great yellow masses may be scattered generally over the surface of the body.

Favus of the nails (*Onychomycosis favosa*) may occur in two forms: in one a scutulum is formed in the deep cells of the nail, and is distinguished as a small yellow mass through the clear nail substance above it; in the other variety the nail plate is lustreless, fissured, split, and raised from its bed, but the microscope is necessary to confirm the diagnosis.

If the characteristics of favus are kept in mind the diagnosis is not difficult, except in atypical forms, when it is necessary to demonstrate the fungus in the scales in order to differentiate the condition from certain types of eczema.

The distinguishing microscopical characteristics of the favus fungus are the predominance and great variety as to the size of the spores, the short and jointed appearance of the mycelia, and the ease with which they break up into single cells (*Kaposi*).

Prognosis.—Favus is one of the most difficult of scalp diseases to cure, and consequently a very guarded prognosis must be given; months and often years are necessary to effect a cure.

Treatment.—The indications for treatment are to remove the crusts with a sulphur salve or carbolized oil, to resort next to epilation, and then immediately afterward to apply some parasiticide, which should be rubbed vigorously into the parts. The methods of treatment and

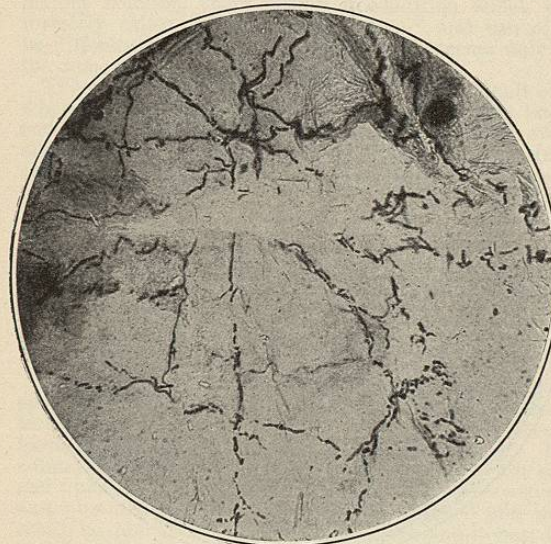


FIG. 4719.—Microsporon Audouini (small-spore fungus) in Horny Layer. (Eyepiece, three-fourth inch; objective, one-twelfth inch; oil immersion.)

agents recommended are innumerable. The hairs should be epilated well beyond the diseased area, and, whatever remedy be selected, it should be applied immediately. George T. Jackson has had good results in both ring-

worm and favus with iodine (one drachm of the crystals rubbed up in an ounce of goose grease). The writer has been encouraged by the results obtained from the thor-

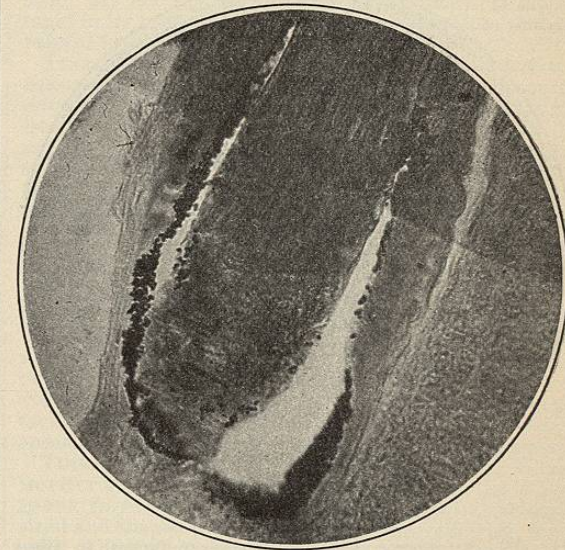


FIG. 4720.—Microsporon Audouini (small-spore fungus) in the Follicle and Hair. (Eyepiece, two inches; objective, one-eighth inch.)

ough application of equal parts of trikresol and alcohol after epilation. Sulphur, chrysarobin, pyrogallol acid, tar, and numerous other parasitocides have their advocates, however. Many of them will prove efficacious in conjunction with epilation, patience, and perseverance. The most encouraging remedy of all is probably that of radiotherapy. The patch or patches should be exposed to a tube of low vacuum for from ten to twenty minutes, two or three times a week, until the hairs fall out. This procedure often effects a cure. The healthy scalp should be protected by lead foil. Upon the glabrous skin favus should be treated as ringworm (*Tinea circinata*).

TINEA TRICHOPHYTINA OR RINGWORM.—The presence of the ringworm fungi excites upon the skin several clinical types of disease, which vary in their symptoms according to the locality attacked and the variety of the fungus concerned.

Formerly the ringworm fungi were thought to be identical until Sabouraud demonstrated (and his observations have in the main been confirmed) that they should be divided into two groups—a small-spore (*Microsporon Audouini*) and a large-spore fungus (*Megalosporon*). The latter he subdivides into *Megalosporon ectothrix* and *Megalosporon endothrix*, according to whether its elements lie outside (*ectothrix*) or in the shaft of the hair (*endothrix*), which is believed by many to be a fanciful division, as these two forms seem to be "a question of soil rather than of origin" (Crocker).

The small-spore form chiefly attacks the scalp of children, and is responsible for the majority of the resistant cases of ringworm in them. Upon microscopical examination the spores are seen to have a lack of any particular arrangement, being in irregular groups or swarms, which is characteristic. Each spore is separate from the other, and they are located outside the shaft of the hair, with a few thin, curved, branching mycelia in the medulla.

The large-spore form causes a small percentage of scalp ringworm, but is the one most commonly found in that of the beard, glabrous skin, and nails. The spores in this variety are arranged in chains with short-jointed mycelium here and there; these elements being in more or less profusion either in or outside the shaft or they may occupy both localities—an endo-ectothrix.

Wherever the large-spore fungus is found, especially