usual type of sarcoma in this region is the round-celled. In 1 of my own cases the tumor was melanotic.

CANCER OF THE VAGINA.—Both carcinoma and sarcoma occur in the vagina, although carcinoma is more common. In sarcoma the growth nót infrequently resembles polypus, and it may reach considerable size before ulceration and hemorrhage occur. Carcinoma is more frequently found in the posterior than in the anterior wall of the vagina. It extends by infiltrating the neighboring tissues, and ulceration is found in the early stages.

Cures of malignant disease of the vagina are comparatively rare, and are obtained only by very early and extensive removal of the disease and the surrounding tissues. Butlin has collected 75 cases, of which 37 were sarcoma, 38 carcinoma. Seven of the patients were alive and well more than 3 years after operation; 5 of these had sarcoma, 2 carcinoma.

CANCER OF THE KIDNEY.—Malignant growths of the kidney are comparatively rare, being only five-tenths of 1 per cent. of all malignant neoplasms, according to Virchow. Kelynack, however, who has perhaps made the most thorough study of this subject, believes this estimate to be too small, and thinks 2 to 3 per cent. nearer the truth. Sarcoma is much more common than carcinoma, the reverse of the opinion held a few years ago. Many of the cases which in the various statistics were originally reported as cancers were undoubtedly sarcoma. Fifty per cent. of the cases of sarcoma of the kidney occur in children under the age of 10 years. Seventy-four out of 160 cases collected by Kelynack were in patients under 5 years of age. A tumor, situated in the space between the border of the rib and the crest of the ilium, is a most important physical sign in making the diagnosis. It varies greatly in size from a few ounces to 36 pounds. The position of the colon overlying the tumor is an important point in making the diagnosis. While the consistence of the tumor varies, fluctuation can usually be detected owing to cystic degeneratjon. Hæmaturia is also an important sign. In children the growth is usually very rapid, and often attains large size before it is noticed even by the mother. The conditions most likely to simulate it are omental and mesenteric tumors, cystic kidney, tuberculosis, hydronephrosis, and perinephritic abscess.

Treatment.—Until very recently the consensus of surgical opinion has been against operation, the results of operation having been so uniformly bad that little hope of cure was offered. American surgeons, one of whom was the first to perform nephrectomy for renal tumor, have been largely responsible for a change of opinion. At present the mortality of the operation is not far from 50 per cent. Of 150 cases collected by Czerny only 5 were beyond five years. Of 145 cases in children under 14 years, collected by G. Walker (Annals of Surgery, 1897, p. 529), only 4 survived beyond three years, and one of these has since died.

Careful examination of all the cases of malignant disease of the kidneys in which operation has been performed, and study of the final results, justify the conclusion, I think, that while the prognosis is still extremely bad, especially in children, operation should be advised in all cases in which there is reasonable probability of removing the entire tumor; and every portion of the fibrous capsule should be removed along with the tumor itself.

SARCOMA.

Sarcoma may occur at any age, though it is more frequent between the ages of 20 and 50 years. Of 136 cases observed by Roger Williams only 24 were under the age of 20 years. My own series of 316 cases shows a larger proportion in young persons; 62 were under the age of 20 years. I have observed 4 cases of sarcoma of the femur in persons under the age of 10 years.

Sex.—The male sex is more liable to sarcoma than the female. Of my 316 cases, 288 were male and 28 female.

Anatomical Situation.—A thorough knowledge of the parts of the body most prone to sarcoma will often be of aid in making a diagnosis. It is a remarkable fact that the disease very commonly attacks bony structures and shows a decided preference for certain bones, and especially the femur. Of 316 cases of sarcoma that I have personally observed, 84 originated in bones and 232 in the soft parts. Of the bones, the femur was most often the starting-point of the disease, as shown in the following summary:

LOCATION.	NO. OF CASES.	LOCATION.	NO. OF CASES.
Femur	13	Pubic bone	11
Tibia	5	Rib	1
Fibula	2	Sacrum	2
Ilium	11	Humerus	3
Vertebræ	3	Clavicle	2
Superior maxilla	13	Sternum	1
Inferior maxilla	8	Metacarpal bone	1
Mastoid	3	Phalanx	3
Scapula	2		

Of the soft parts the neck furnished the largest number of cases. In no less than 30 patients the disease began as a primary lympho-sarcoma of the neck. In 20 it began in the orbit, and in 20 in the thigh.

SYMPTOMATOLOGY OF SARCOMA.—Pain is rarely present at the beginning of the disease. A "lump" or swelling is the first thing that attracts the attention of the patient. Injury plays a much more important part in the development of sarcoma than in that of cancer. Of my 270 cases analyzed with reference to trauma, about one-third, or 31.8 per cent., gave a distinct history of antecedent local trauma. The injury need not be a severe one, a blow or contusion being the usual form of injury. In a considerable number of cases (31 that I have personally observed) the tumor developed within a few days after the receipt of the injury, so quickly that there could be no doubt of the etiological relationship between the tumor and the trauma. These cases may very properly be classified as examples of acute traumatic malignancy.

Traumatic sarcoma may occur both in the bones and in the soft parts. Of my first series of cases 18 occurred in the bones and 26 in the so't parts. All varieties of sarcoma were included: 29 round-celled, 5 spindle-celled, 5 melanotic, 3 mixed-celled, and 2 doubtful.

At my request Dr. C. J. Kane, late house surgeon to the General Memorial Hospital, has recently made an analysis of the last 100 cases of sarcoma observed at the hospital during the past three years with reference to antecedent injury. He found that in 63 per cent. local injury of some form was noted at varying intervals before the development of the tumor, and that in 27 other cases there was a history of chronic irritation, leaving but 10 cases in which there had been neither trauma nor irritation. Of 270 personal cases analyzed with reference to trauma I found that 86, or 31.9 per cent., gave a history of distinct injury prior to the discovery of the tumor. In 31, or 11.5 per cent., the tumor developed almost immediately after the injury. The only reason for separating these so-called acute cases or examples of acute traumatic malignancy is that in these cases the connection between the injury and the tumor is so close and definite that it cannot be easily explained away. If we can establish an etiological relationship between the trauma and the development of sarcoma in this group of acute cases, the same relationship will probably be found to obtain in the cases of slower development. Various theories have been offered to explain the relation between trauma and cancer. The opinion that has received the most support has been the so-called "constitutional diathesis." The person possessing this diathesis is supposed to be in danger of developing a tumor after an injury, while another not possessing it will be safe. My own views already expressed (*Annals of Surgery*, February, 1898) are that the relationship between injury and the development of sarcoma or carcinoma can be most rationally explained on the theory that such tumors are of infectious or micro-parasitic origin. Granting for the moment this to be the true origin of malignant tumors, their development following an injury would be in perfect accord with tuberculous lesions of the bone that not infrequently develop from local trauma. We are also familiar with osteomyelitis and periostitis following

local trauma without any lesion of the skin or known source of infection. Any explanation that would apply to these lesions would apply to sarcoma. The most probable explanation would appear to be that the infectious

FIG. 1104.—Chondro-Sarcoma of the Ilium.

agent of the malignant tumor exists somewhere latent in certain individuals, and is harmless until some local injury, by diminishing the vitality of the tissues, lowers their resisting power, and thus furnishes a favorable nidus for the development of the tumor germs.

Character of Swelling.—This varies with the type of sarcoma. In the round-celled variety the consistence may be so soft as to resemble an abscess, and in certain cases it may be extremely difficult to differentiate a sarcoma from a deeply seated abscess, especially a "cold" abscess, originating from caries of bone. A sarcoma of high vascularity may have sufficient pulsation to simulate an aneurism. Pain is of less importance than is generally supposed. Sarcoma, like carcinoma, is seldom painful at the first, except in certain cases in which, from its anatomical situation, there is pressure upon important nerves. The most painful sarcomata that I have observed have originated in the vertebræ. I have observed four cases, and in all the pain has been very severe.

DIAGNOSIS.—The conditions most likely to be mistaken for sarcoma are tuberculous, syphilitic, and inflammatory swellings. A careful history, together with the physical signs, will in most cases enable one to make a correct diagnosis. Sarcoma usually develops more quickly than a tuberculous tumor. Pain is more frequent in sarcoma. Local heat is also usually present in sarcoma and absent in tuberculous swellings, and the superficial veins are more prominent in sarcoma.

Inflammatory swellings may even more closely simulate sarcoma. The more rapid development, greater pain and tenderness, together with more or less increase in pulse rate and temperature, will in most cases establish the diagnosis. We must remember, however, that in rapidly growing sarcomas we may also have an increase in pulse rate, and also a decided rise in temperature. Marked tenderness is, however, rare in sarcoma or carcinoma.

SARCOMA OF BONES.—Sarcoma may develop in any bone, but occurs most frequently in the long bones, especially the femur. It may be of either central or periosteal origin. Of Gross' collection of 165 cases of sarcoma of the long bones, 67 occurred in the femur, 46 in the tibia, 21 in the humerus, 13 in the fibula, 7 in the ulna, 6 in the radius. Of 24 personal observations of sarcoma of long bones 13 were in the femur, 5 in the tibia, 3 in the humerus, 2 in the fibula, and 1 in the radius. The periosteal tumors are of a much higher degree of malignancy than are those of central origin. The periosteal sar-

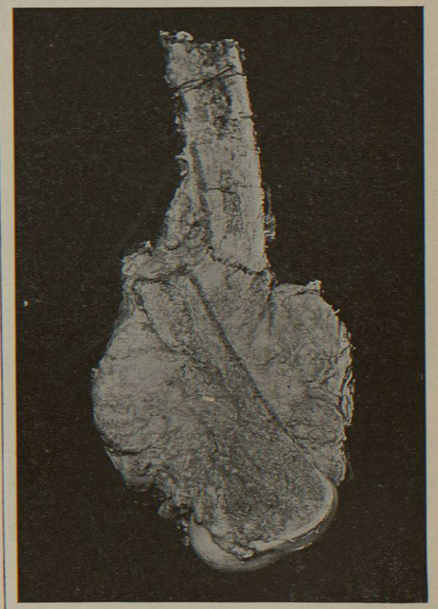

FIG 1105.—Acute Traumatic Sarcoma of Femur in a Case of Recent Fracture, Caused by the Kick of a Horse.

comas usually start in the shaft or at some distance from the joint, while the central sarcomas begin near the ends. Reinhardt, who collected 54 cases of sarcoma of the long bones treated at the Göttingen Clinic between 1880 and

1895, found 18 of the femur and 19 of the tibia. Metastasis occurred in 33 per cent. of the cases. The duration of the disease was from three months to nine years. The difference in malignancy between the round-celled and spindle-celled varieties was not apparent. Of 15 cases of spindle-celled sarcoma 2 were well over three years after the operation. Of 10 cases of the round-celled variety 3 were well over three years after the operation, and of the 54 cases, 7 (= 18 per cent.) were well after the lapse of the same period of time.

Periosteal sarcoma of the femur is probably the most malignant tumor that exists. Of 68 cases collected by Butlin, treated by the most extensive operations—either by amputation at the hip-joint or by very high amputation—only 1 was known to have been cured.

The prognosis of sarcoma in the long bones in general is better than in the femur alone. Gross found that of 90 cases traced for a considerable period after operation, 26.6 per cent. were well after a period of more than 3 years. His statistics also show that the giant-celled sarcomata are much less malignant than the other variety, two-thirds of the cases being of this type.

The only treatment to be recommended for sarcoma of the femur is amputation at the hip-joint. The mortality of the operation has been remarkably diminished by the introduction of more modern methods of controlling the hemorrhage and of keeping the wound aseptic. Wyeth's method of steel pins, I believe to be by far the best. I have used it in 6 cases of amputation of the hip for sarcoma—4 cases of sarcoma of the femur, and 2 cases of sarcoma of soft parts—without a single death. Butlin's statistics of 47 cases show a mortality of 25 per cent. Wyeth's recent statistics of 250 cases operated upon by

FIG. 1106.—Recurrence of Sarcoma of Lower Jaw, Ten Years After Resection of One-Half of Lower Jaw.

this method show a mortality of only 22 per cent.; and, including cases of tumor only, the mortality was but 13 per cent.

Even if the patient is not cured, the disease returns in the lungs or abdomen, and death is less painful and far less distressing than if amputation had not been performed.

Of 52 cases of sarcoma of the tibia and fibula collected by Butlin, 9 remained well for more than 3 years.

In cases of giant-celled sarcoma of the bones the question is not entirely settled as to the necessity of amputation. Butlin believes that in certain cases these tumors may be successfully treated by scooping out, and in others resection may be sufficient. He states, however, that for the large majority of central tumors (of the tibia or fibula) amputation through the lower part of the thigh or at the knee must be performed. Personally I do not believe it good surgery to scoop out or even resect a long bone for sarcoma. The mere operation of scooping out I believe materially increases the risk of generalizing the

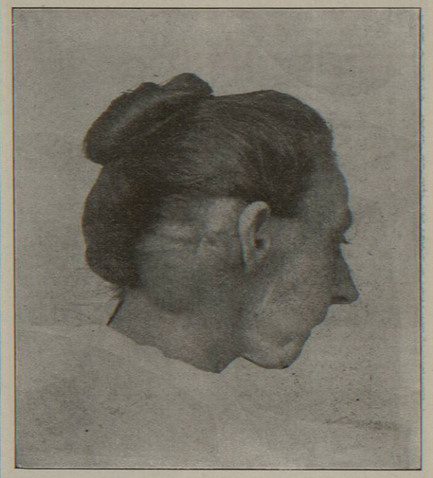

FIG. 1107.—Recurrent Sarcoma of Lower Jaw Five Years After Resection of One-Half of Inferior Maxilla.

disease by getting the infected cells into the circulation. Amputation should be performed above the bone involved.

Sarcoma of the humerus is rather rare. Butlin's statistics show 32 cases with 2 deaths due to operation, and with but 2 cases well long enough to be called cured.

Sarcoma of the radius and ulna is so rare that it need not be further mentioned.

Poinsot has collected 25 cases of sarcoma of the scapula with 2 deaths from operation, but with only 1 cure.

Doll (*Archiv f. klin. Chir.*, Bd. xxxviii., p.131) collected 32 cases in which the scapula alone was removed for sarcoma, with a mortality of 25 per cent., and with no known cures.

SARCOMA OF THE UPPER AND LOWER JAW.—The jaw, both upper and lower, furnishes a frequent starting-point for sarcoma. It occurs usually in patients over 40 years of age. Martens collected 62 cases of sarcoma of the upper jaw operated upon at the Göttingen Clinic, and of these 50 were over 40 years of age and but 12 under 40 years. The disease usually begins in the alveolar process or in the region of the antrum. The first symptom is usually an irritation at the root of a tooth or a looseness of a tooth. The course of the disease is usually rapid, and often so rapid that the trouble is mistaken for an inflammatory condition. The mortality of resection of the upper jaw for sarcoma is about 30 per cent. Resection of the lower jaw for malignant disease gives a

mortality of about 14 per cent. Butlin has collected 104 cases of resection of lower jaw for sarcoma with 8 deaths. Only 4 cases passed the 3-year limit. The accompanying photographs (Figs. 1106 and 1107) illustrate well the prolongation of life by operation, though final cure was not obtained. In 1 case the disease recurred behind the ear 5 years after operation, and in the other 10 years after operation. The recurrence took place in the tissues in a region formerly occupied by the angle of the jaw.

SARCOMA OF THE LYMPHATIC GLANDS (Lympho-Sarcoma, Hodgkin's Disease).—Sarcoma very frequently originates in lymphatic glands, especially in the glands of the neck. Of my 316 cases of sarcoma no less than 30 began in the lymph glands of the neck. The prognosis is almost absolutely bad. The type is usually small, round-celled, and operation, though performed early, rarely checks the progress of the disease. Butlin states that he "cannot discover a single instance in which a thoroughly successful removal has been accomplished." The accompanying photograph is a good illustration of a well-advanced lympho-sarcoma of the neck in a colored man. I operated in May, 1900, and apparently removed all of the enlarged glands, though some extended down under the clavicle to the pleura. I anticipated a speedy recurrence, but thus far, seven months after the operation, there has been no return. There is at present no well-recognized distinction in the use of the terms Hodgkin's disease, lympho-sarcoma, and malignant lymphoma, though all are used in describing sarcomatous disease of the lymphatic glands. In England there is a tendency to restrict the term lympho-sarcoma to the more rapid cases, particularly when associated with metastases, and to apply the term Hodgkin's disease to cases in which the glands alone are involved, and especially to cases in which the glands in different localities are affected. The illustration here given shows the latter type, the glands in neck, axilla, and groin being extensively involved.

SARCOMA OF THE BREAST.—Sarcoma of the breast is one of the rarer forms of tumor found in this locality. It is rarer than either adenoma or fibro-adenoma. Of 100 cases of breast tumors collected by Bryant, only 4 were sarcoma. The majority of cases occur between the

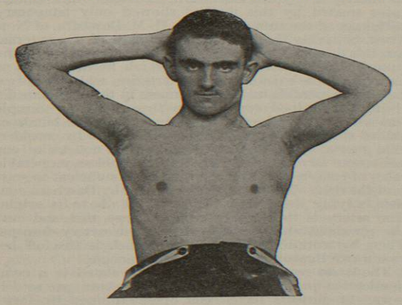

FIG. 1108.—Lympho-Sarcoma of the Neck and Axillæ. (Malignant lymphadenoma.)

ages of 30 and 40. Of my own cases, 8 in number, all were over 30 years of age; 4 between 30 and 35; 4 over 35. Of 12 cases collected at the St. George's Hospital by Shield, 4 were between 30 and 40, 6 between 40 and 50, and 2 over 50 years of age.

As regards the comparative frequency of the various types of sarcoma, of 17 cases examined at the Royal College of Surgeons, 7 were spindle-celled, 4 mixed-celled, and 6 myxo-sarcoma. Ulceration and fungoid granulations will frequently occur in rapidly growing sarcoma of the breast of high vascularity, and may produce severe and even fatal hemorrhages.

An important point in differentiating sarcoma from fibro-adenoma is the age of the patient, the latter tumors being seldom found after the age of 30. History of previous injury, which is found in nearly one-half of the cases of sarcoma, furnishes an additional aid in diagnosis.

Treatment and *Prognosis*.—The technique of the operation does not differ materially from that for carcinoma. While recurrence in the axillary glands is not common,

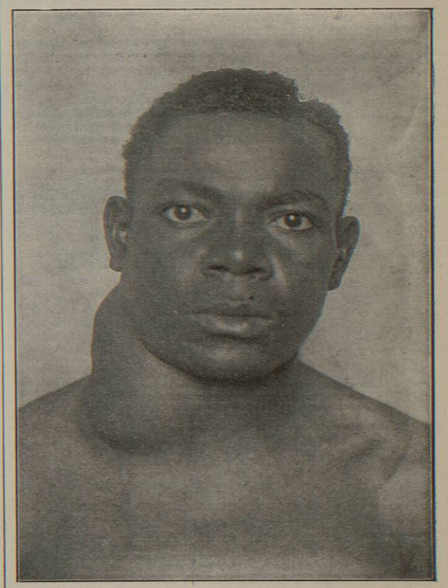

FIG. 1109.—Lympho-Sarcoma of Neck. Removed by operation.

it is occasionally observed, and the glands should in all cases be removed together with the breast. The tendency to recur locally is very great. While the disease, especially the round-celled type, usually runs a rapid course, occasionally the patient may live for many years in spite of repeated recurrences. One of my own cases, an angio-sarcoma of the breast in a woman 59 years of age, was operated on the first time in 1881. She remained free from recurrence 7 years, and then the tumor returned locally and grew for 2 years, when a second operation was performed. Two years later the disease returned a second time and continued to increase in size until the time of my first observation, January 20th, 1895. The tumor then was very large and entirely inoperable. Under 8 months' treatment with the mixed toxins, it decreased so much in size as to be easily removable under ether. The patient was well 6 months later, when last observed. Shield cites a patient, aged 45 years, who, when operated upon for primary spindle-celled sarcoma of the breast, nearly died of hemorrhage at the first operation. The disease recurred a number of times and was operated upon.

The patient finally died, at the age of 74, of extensive local recurrence.

Careful microscopical examination of the tissues surrounding sarcoma of the soft parts shows that infected cells are found at considerable distances beyond the substance of the tumor, both along the fascia and in the bundles of muscle fibres themselves. If we are to improve the results of operative treatment of sarcoma of the breast, we must abandon the old idea that sarcoma is an encapsulated tumor that can be easily shelled out, and must operate on lines similar to those we have adopted in dealing with carcinoma, *i.e.*, remove wide areas of healthy tissue beyond the apparent limits of the tumor.

Melanotic Sarcoma.—This form of sarcoma was described by Laënnec as early as 1806 under the name of melanosis, a term which he applied to all varieties of pigmented cancer. Virchow later divided these pigmented tumors into melanoma, melanotic carcinoma, and melanotic sarcoma. Most of the melanotic malignant growths were at first regarded as carcinomas, but in recent years there is a growing tendency to class them as sarcomas.

One of the most valuable papers on melanotic neoplasms is that of Ebermann, of St. Petersburg (*Deut. Zeit. f. Chir.*, vol. xliii., Heft iii., S. 498). He has collected all the cases observed at Koenig's hospital and private clinic at Göttingen, since 1889—15 in number. To these he has added 15 cases observed at the same clinic prior to 1889 and published by Zimmerman. Of these 30 cases, 26 were sarcomas and 4 carcinomas. All of the cases of carcinoma occurred in the rectum. The round-celled type predominated. Of the later series of 15 cases, 12 were round-celled and 3 spindle-celled. In 20 cases of Ebermann's 30 cases the origin of the growth was in the skin, 7 of which began in congenital pigmented warts. Of Eiselt's large collection of 104 cases, 47 originated in the eye and 40 in the skin.

Melanotic sarcoma may occur at any age, but is most frequent between the ages of 40 and 60 years. I have personally observed 23 cases of melanotic sarcoma. In 11 of these cases the starting point was in a pigmented mole, and in 7 of these cases it developed shortly after some form of trauma (in 4 cases after tying off the mole with a thread), or of local irritation. In 17 of my 22 cases the lymph glands were affected, usually those nearest the primary tumor. In more than one-half of my cases there was rapid generalization of the disease. In one case in which an autopsy was made, metastases were found in practically every organ.

Treatment.—Although rapid recurrence with a fatal issue after a varying interval of a few months to two or three years is the usual history of cases treated by operation, there are a few authentic cases of cure. In my article on sarcoma ("Twentieth Century Practice of Medicine," vol. xvii.), I cited 2 cases well 9 and 11 years after operation. Hence I believe it justifiable always to operate on primary melanotic sarcomas. Operations in these cases should be very extensive and should remove wider areas of skin than has hitherto been the custom. The nearest lymph glands should always be dissected out, whether enlarged or not. In a number of cases in which the prognosis was very bad, I have used, with every precaution, the erysipelas toxins, but with little apparent effect.

Some Recent Methods for the Treatment of Inoperable Cancer.

During the last few years several methods for the treatment of inoperable cancer have been introduced and advocated by distinguished men.

Treatment of inoperable cancer by means of ovariectomy combined with administration of thyroid extract was first used by Dr. George Beatson (*Lancet*, 1896, 62–104). Two or three cases were reported in which the thyroid extract was employed as an adjunct to the operative removal of the tubes and ovaries. Beatson's published cases are of great interest. Some of them undoubtedly show great improvement, but none has remained well sufficiently long to justify one in considering the disease cured. This method was taken up by a number of well-known English surgeons, notably Mr. Watson Cheyne, who reported two cases with marked improvement in one and little effect in the other. Beatson's conclusions were: "We must look in the female to the ovaries for the exciting cause of carcinoma, certainly of the mammary organs." This would seem in general to be a pure hypothesis entirely unsupported by facts. It would seem to me that the important trophic changes that have been noted after removal of the ovaries in cases thus far observed can be fully explained in a much more simple way without the necessity of elaborating a new theory as to the origin of cancer. The explanation that I would offer is that the changes were brought about simply by diminished vascularity of the breast resulting from the ovariectomy which diminishes the blood supply of the tumor, which in nearly all cases is followed by at least temporary diminution in its size and general improvement in its symptoms. The administration of the thyroid extract has in a certain number of cases been followed by a temporary improvement. I have myself used thyroid extract in a number of cases without any apparent change. I do not think that the results of oöphorectomy thus far offer sufficient encouragement to justify a general adoption of the method.

Injections of Alcohol.—This method, first advocated by Schwalbe and Hasse in 1872, and recently revived by Kuh, of Chicago, gives little promise of success in inoperable cancer.

Ligature of Arteries or Cutting Off the Blood Supply.—Ligature of the arteries giving nutrition to the tumor is said to have been introduced by Harvey in 1651. It has been much used in non-malignant tumors of the thyroid. Ligature of the carotid for malignant tumors of the pharynx has been tried in a number of cases, but usually only with slight temporary benefit. Dr. J. D. Bryant, of New York, has reported a case of inoperable naso-pharyngeal sarcoma which disappeared after ligation of both external carotid arteries, the patient remaining well for nearly ten years afterward. Several other similar cases treated by this method showed only temporary shrinkage of the tumor. Dr. R. H. M. Dawbarn, of New York, believing that the simple ligature of the external carotids does not sufficiently cut off the nutrition of the tumor, has described a method which he designates as excision of the external carotid arteries, which he advocates in inoperable malignant tumors in those regions deriving their blood supply from these arteries. Simple ligature of the external carotid, even in the hands of skilled surgeons, has been hitherto attended by considerable mortality. This, however, should not make one hesitate to advocate the procedure in hopeless, inoperable cases of cancer, provided the results are sufficient to warrant the risk. The operation advocated by Dawbarn consists in tying the external carotid just above its origin. The artery is then caught with forceps, tied, and cut; the proximal end is grasped with an artery forceps. Then, by working upward, each branch is tied off between two ligatures and divided as reached.

The latest results of this method (as stated in a communication just received from Dr. Dawbarn) are as follows: 14 patients have been operated upon by Dawbarn and 9 by other men. He states that there have been but 4 deaths that could with fairness be attributed to the operation, thus showing a mortality of 17.4 per cent. In regard to the actual value of the operation, based upon the number of cures or the duration of life following the operation, this cannot at present be accurately estimated. Dawbarn states that all but 2 cases have been hospital cases and difficult to trace. In the spring of 1900 Dr. Dawbarn presented 5 patients before the New York Surgical Society, operated upon between 1895 and 1898. He states that all of them were either carcinoma or sarcoma cases, the diagnosis having been confirmed by pathologists. One patient with round-celled

sarcoma of the naso-pharynx was well 5 years and 6 months after operation. A second patient operated upon April 18th, 1896, with sarcoma of superior maxilla, was well 4 years after operation. In none of the cases did the tumor entirely disappear. These results would seem to prove that, in a certain percentage of cases of malignant tumors deriving their blood supply from the external carotid arteries, the disease is temporarily held in check and life prolonged. Whether any of these patients have been actually cured cannot be determined until a longer time has elapsed. I believe that in most of the cases the relief will prove temporary. Until the after-history of the patients already operated upon has been carefully traced, I do not believe the operation should be generally adopted.

The Treatment of Cancer by Cataphoresis, originally proposed by W. J. Morton, of New York, is strongly advocated by G. B. Massey, of Philadelphia. His latest results may be found in *The Medical Record* of April 7th, 1900. He states that he has used the method in 37 cases, of which 7 were operable and 30 inoperable. Of the operable cases 4 were cured and 1 probably cured; 2 were failures. Of the inoperable cases, 6 were cured; 2 probably cured; probable failure in 2; complete failure in 20. Of 37 cases 10 were cured, 7 were doubtful, and 22 were regarded as failures. While many of the cases were recent, in several the freedom from recurrence extended over more than 3 years. One case, an epithelioma of the cervix uteri, was well 3 years and 6 months; 1 case of sarcoma of the soft and hard palate was well 6 years. Another case of sarcoma of the upper jaw remained well 2 years; in 2 cases death occurred during application.

I do not deem that the method should be advocated in cases removable by operation. If, however, 6 cases in 30, or even a much smaller number of inoperable cases were cured, the method is certainly worthy of a more thorough trial. The duration of the so-called cures is manifestly too short at present to permit of estimating percentages accurately.

The treatment of cancer by means of *x*-rays, or with liquid air, is at present in the experimental stage, and no results have thus far been obtained to warrant the hope that these agents offer any better means of dealing with malignant tumors than do the older and more familiar methods.

The Treatment of Inoperable Cancer by the Mixed Toxins of Erysipelas and of Bacillus Prodigiosus.—The results of this method during the last two years have given me no reason to change the conclusions expressed in an earlier paper, and I have nothing new to add in the way of improvement in technique or of preparing the toxins. While the results are far better in spindle-celled sarcoma than in any other form, a sufficient number of round-celled sarcomas have been successfully treated to make it advisable to give every patient with inoperable sarcoma the benefit of a brief trial. If no improvement has occurred at the end of three or four weeks of daily injections, the treatment is not likely to be successful. If improvement does occur, the treatment should be kept up, either until the tumor has entirely disappeared or until it has become evident that the injections have lost their inhibitory influence. The toxins may be given for long periods in moderate doses without harm to the patient. The after-history of my own successful cases may be found in the June, 1900, number of the St. Paul *Medical Journal*. The risks of the treatment are practically *nil*, if proper precautions are observed. In upward of 200 cases I have had but 2 deaths, both of which occurred more than four years ago. It should be remembered that the method is advised only in inoperable sarcoma; in other words, in the entirely hopeless cases. The percentage of probable cures depends largely upon the type of cell, varying from perhaps 3 or 4 per cent. in the round-celled to nearly 50 in the spindle-celled variety. The most promising field for the employment of the toxins is, I believe, the adminstration of small and safe doses directly after primary operation, without waiting for the recurrence to appear. If the toxins can, in a considerable number of cases, destroy or permanently cure large inoperable tumors, it is quite reasonable to suppose that administration after operation would destroy the invisible portions left behind, and in a considerable number of cases prevent recurrence.

Method of Preparing the Toxins and Technique of Administration. The preparation that I have used the past three years is the one described in my last paper, viz., the mixed, unfiltered toxins of the streptococcus of erysipelas and the bacillus prodigiosus, made from cultures grown together in the same bouillon and sterilized by heating to 58° C. In children and patients much reduced in strength I have used the filtered toxins prepared by passing the mixed living cultures through a porcelain filter. This preparation is much weaker than the unfiltered, the relative strength of the two being about as 1 to 10 or 15. The effect of the filtered solution upon the tumor is less marked than that produced by the unfiltered. In the earlier cases the toxins were made from cultures of streptococcus of erysipelas obtained from a fatal case, but during the last three years a sufficiently high degree of virulence has been obtained by frequently passing the cultures through rabbits. This increase in virulence has been, I am convinced, a direct factor in the success of the toxins, and, in fact, it was to increase the virulence of the erysipelas cultures that, in 1892, I first combined the bacillus prodigiosus with the streptococcus of erysipelas, Roger, of Paris, having proved that the latter germ had the power of making the streptococcus more virulent in rabbits, though, so far as I know, it had never been used in the human body, nor had the combination ever been suggested in connection with the treatment of malignant tumors.

I am quite convinced that the process of degeneration of tumor tissue is greatly increased by the prodigiosus toxin. Many opinions have been expressed as to the nature of this process, by means of which a cure is effected. The aim should be not to cause too much depression, for in that case the patient is unable for some time to stand even small doses. Many of the successful cases steadily gained weight during the treatment, which disproves the statement of some writers that the treatment is exceedingly depressing and causes rapid emaciation. This may be true if the doses are too large, but not when the method is judiciously carried out. Strychnine may cause speedy death or act as an excellent tonic, according to the dose administered.

Aseptic Precautions. Inasmuch as the administration of these as well as other toxins undoubtedly increases the liability to infection if pathogenic germs are present, too great caution cannot be exercised in sterilizing the hypodermic needle and the skin. If a tumor be ulcerated or broken down, great efforts should be made to keep the parts aseptic. Lack of such precautions has certainly been the cause of death in a number of the fatal cases.

Duration of Treatment. Fortunately it is possible in most cases to tell in a comparatively short time whether or not the toxins are likely to be effective. If no beneficial results are apparent after four weeks' treatment, I believe it useless to continue the injections. In nearly all my successful cases marked improvement was seen within a week after the first injection, though final cure required in some cases several months of treatment. In one case, one of inoperable spindle-celled sarcoma of the abdominal wall, the tumor entirely disappeared under thirty injections and the patient is now well, one year and a half later. The question of danger of long-continued injections of the toxins is an important one. One patient with thrice recurrent rapidly growing carcinoma of breast and axilla had the toxins steadily for two and one-half years. The doses were moderate, seldom producing a chill, and averaged two a week. The tumor disappeared. The patient gained ten pounds in weight and her general health was perfect. The tumor finally recurred, ran a rapid course, causing death in six months.

Final Results in Cases Treated Previous to 1899. Of 21 successful cases treated prior to 1899, the final results are as follows: One patient with inoperable, spindle-celled

sarcoma of the neck and pharynx, treated with living cultures of streptococcus of erysipelas, for four months, during which time one severe attack of erysipelas occurred, was in good health 6 years after treatment. The tumor in the pharynx did not entirely disappear, but the malignancy was evidently destroyed. Five patients were well from 6 years to 8 years after treatment. Of these, 3 were afflicted with inoperable spindle-celled sarcoma, one with round-celled sarcoma, and one with epithelioma. In all of these cases the diagnosis was confirmed by the microscopical examination of well-known pathologists. The history of one of the patients is of the greatest interest. The original growth, a very extensive infiltrating, spindle-celled sarcoma of the chest wall, entirely disappeared under four months' treatment with the toxins in 1894. After remaining well for 6 years, a similar growth has recently developed on the opposite side in a corresponding locality. The patient is again under the toxin treatment and is showing improvement.

Fifteen of the 21 cases remained well for a period of from 3 years to 7 years and 6 months. Of these, there was recurrence in 2 after 3 and 6 years respectively, 1 dying of metastases in the abdomen, the other being the case referred to as now under treatment.

The cases were all hopelessly inoperable, and the diagnosis was confirmed by the microscope except in two cases. In these two instances the history of the cases with the clinical appearances made the diagnosis of sarcoma unquestionable. The type of tumor in the 15 cases that passed the 3-year limit was as follows:

Spindle-celled sarcoma	8
Round-celled sarcoma	2
Mixed-celled sarcoma	3
Epithelioma	1
Clinical diagnosis only	2

It is worthy of special note that 2 of the successful cases now well, 3 years and 9 months and 4 years and 3 months respectively, were sarcoma of the parotid gland. Butlin, in his last edition of "Operative Treatment of the Parotid Gland," states that, "up to the present time there are very few instances of cure by operation of undoubtedly malignant disease of the parotid." In my 2 cases treated by the toxins the diagnosis was not only confirmed by a competent pathologist, but further by a history of repeated recurrences after operation. Another case still is also worthy of special mention, inasmuch as it shows that the toxins may be taken for long periods of time without harm. The patient, a well-known physician, with eight times recurrent spindle-celled sarcoma of the soft parts of the chest (anteriorly), was treated with small doses of the mixed toxins with varying intervals of rest for upward of two years. The patient regained his usual health, and has now been perfectly well over 6 years from the beginning, and 4 years since the cessation of the treatment. The tumors, while originally pure spindle-celled, were becoming more mixed with round cells and more vascular with each recurrence; in other words, the disease, as so often happens, was increasing in malignancy until the toxins were begun.

In addition to these 15 cases that have passed the 3-year limit, I have had 8 others in which the tumors disappeared. One, a spindle-celled sarcoma of the abdominal wall, was well 1 year and 6 months, when the patient returned to her home in Europe and was lost sight of. One, an extensive round-celled sarcoma of the iliac fossa, was well 1 year and was then lost sight of. A third, a spindle-celled, recurrent sarcoma of the leg, is now in perfect health, without recurrence, nearly two years after treatment. A fourth, a twice recurrent, spindle-celled sarcoma of the palm of the hand, disappeared and the patient remained well 2 years and 6 months, when the tumor recurred. Refusing amputation of the arm, she was under the care of a Christian scientist for 8 months, during which time the tumor in the hand reached the size of a cocoanut and extended above the elbow. I then amputated the arm just below the shoulder-joint, but she died of metastases 3.5 months later. Though the patient was an especially intelligent girl twenty-two years of age, while under the Christian Science treatment she watched a small tumor, the size of an English walnut, grow to the size of a cocoanut, and yet was made to believe it was actually getting smaller and improving. She also stated that she felt no pain. This is a good illustration of the utter impossibility of placing any value upon personal statements of patients in regard to improvement or cure of malignant tumors by Christian Science.

A fifth case, a chondro-sarcoma of the ilium, of large size, disappeared, and the patient after remaining well for 7 months, had a recurrence which proved fatal in about 1 year's time. A sixth, a round-celled angio-sarcoma of the breast, was well 6 months later, when the patient was lost sight of. A seventh, a recurrent fibro-angioma of the lip, was well when last heard of, over two years after treatment; and an eighth, a recurrent, spindle-celled sarcoma of the thigh, disappeared, but the patient, after remaining well for a year, had a recurrence locally and in the groin, which no longer yielded to the treatment.

In addition to these 23 personal cases, I would mention 2 other cases in which I directed the treatment, although it was carried out by other surgeons. One case (Johnson's), a large-spindle-celled sarcoma of the pharynx, entirely disappeared, and the patient was well more than 6 years later. The second (Storrs and Griswold's), an inoperable sarcoma of the breast and axilla, disappeared under seventy-eight injections of the mixed toxins, and is now well more than 4 years after treatment. The diagnosis in both of these cases was confirmed by microscopical examination, in the latter case by the highest authority in this country, Prof. William H. Welch of Johns Hopkins University. *William B. Coley.*

CANCRUM ORIS. See *Mouth*, etc.

CANELLA BARK.—*Canella Alba. Wild Cinnamon.* The bark of *Canella alba* Murray (fam. *Canellaceæ*). This is a handsome, middling-sized, spicy, evergreen tree, with thick, shining, aromatic leaves and small, purple, deliciously fragrant flowers. The bark of the smaller branches is silver-gray. It is a native of the West India Islands, especially of Jamaica, Cuba, and the Bahamas, and also of the southern part of Florida. The bark of this tree was first made known in Europe in the early part of the seventeenth century, and since then has been in continuous but very limited demand. It has been frequently confounded with Winter's Bark (*Drymis Winteri* Forster), and with *Cinnamodendron corticosum* Miers. It is now very little used excepting in its home, where it is highly esteemed, more as a condiment than as a drug.

Before the bark is collected, the limbs are generally beaten all over, in order to loosen the outer layers, which are discarded, and then the inner portion is separated in quills and chips and dried. It comes in broken quills, sometimes 30 or 40 cm. long and .5 thick (12 to 15 in. by ¼ in.), but averaging much smaller, say from 5 to 10 cm. long by 2 or 3 mm. thick; the outer surface is roughish and bright buff-colored, the inner smooth or finely striated, yellowish or creamy white; fracture short and granular, odor rather agreeable, cinnamon-like; taste pungent and bitter. It contains numerous large oil cells, especially in the outer portion.

The leading constituent is the *essential oil*, of which it contains from three-fourths to one per cent. It is a composite oil, capable of being separated into several, one of which is *eugenol*, the leading ingredient of oil of cloves. With this there is some cineol. A considerable percentage of mannite can also be separated. The bitter principle needs further study. Canella is a stimulant tonic, similar to other aromatics, over which it appears to have no other advantage than the possession of a bitter principle. It is not poisonous, and is seldom given alone, in doses of .5 to 2 gm. (gr. viii. to xxx.). *W. P. Bolles.*

CANITIES, or *grayness of the hair*, may be congenital or acquired, partial or complete.

Congenital canities usually occurs in the form of tufts, but may occur as round patches. This form of canities is rare. In some families it is hereditary, a white tuft of hair occurring in a large number of their members. General congenital canities is part of that general absence of pigment that is known as albinism.

Acquired canities is the form most often seen. It usually begins at about thirty-five years of age, but in some families and under certain circumstances it may begin much earlier. Beginning in early life, it constitutes premature canities; beginning at middle life, it is one of the changes incident to growing old. Few people reach fifty years of age without some gray hair.

The hair on the temples is most often that which first changes color, though there is no definite rule as to where the disease first appears. The beard may be first affected, but usually it is affected secondarily to the scalp hair. The pubic and axillary hair may escape all change in color, though at last they, too, generally are affected. When once grayness begins it is slowly or rapidly progressive. Exceptionally and rarely the normal color may return to gray hair, just as it is possible to have a third set of teeth. The change in color takes place first at the root of the hair. As the pigment becomes more and more deficient the color of the hair slowly changes from gray to a creamy or snowy white. In most cases the change in color is the only change that the hair undergoes. Alopecia may set in, but it bears no definite relation to change in the color of the hair.

Too many well-authenticated cases are now on record to allow of doubt as to the sudden occurrence of canities, over night in some cases. Such instances are almost always in relation to severe mental shock, such as the reception of some fearful intelligence.

Ringed hair is a peculiar and rare form of canities in which the hairs are marked by alternate rings of white and normal color. The diameter of the hairs is unchanged. The white rings are narrower than the colored ones. Very few of these cases are on record.

Etiology.—Canities is due to an interference with the pigment formation in the hair papilla. The gray color is the combined result of a deficiency of pigment, the presence of air bubbles between the cells of the cortex, and the essential color of the hair. When the hair is white there is no longer any pigment in the hair. The occurrence of sudden blanching of the hair is due to the entrance of air bubbles between the cortical cells. That air between the cells is one factor in causing a gray color is shown by placing a gray hair under the receiver of an air pump and exhausting the air. It will be seen that the hair regains its normal color to a greater or less extent.

Age, heredity, nervous shock or strain, neuralgia, injury to the scalp, and all debilitating diseases, are predisposing causes of canities. There is no adequate explanation for the occurrence of ringed hair.

Treatment.—Nothing can be done for most cases of canities. If it is due to some removable cause the color may return when the cause is removed, but no promise of this should be made. Jaborandi and acetic acid seem to have some influence on the color of the hair, and may be tried, the first internally and the last externally. Hair dyes should never be advised. Once used they must be persisted in. Many of them are harmful, especially those containing lead. *George T. Jackson.*

CANNABIS INDICA.—*Indian Cannabis. Indian Hemp.* "The flowering tops of the female plant of *Cannabis sativa* Linn., grown in the East Indies" (U. S. P.). "The dried flowering or fruiting tops of the female plant of *Cannabis sativa* Linn., grown in India, from which the resin has not been removed" (B. P.).

Cannabis sativa is indigenous to Central Asia, but has been cultivated throughout Europe and America for its valuable fibre, from which hemp is manufactured. It is a member of the order *Urticaceæ*, and allied, botanically, to the common hop plant *Humulus lupulus* Linn. The United States Pharmacopœia has adopted the name Indian cannabis, as the name of Indian hemp is often given to a native plant, *Apocynum cannabinum* Linn., which is entirely different and bears no botanical or therapeutic resemblance. *Asclepias incarnata* Linn. is also popularly known as white Indian hemp.

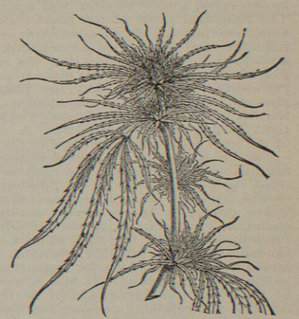

Fig. 1110.—The Hemp Plant—Pistillate Inflorescence. (Baillon.)

Cannabis sativa is a large, very variable, annual herb, with an upright, slender, usually branching stem from 1 to 3 metres high (3 to 10 feet), long-petioled, graceful, palmately divided leaves, and small, clustered, dicœcious flowers. The bark of the stems and branches has an exceedingly tough fibre. The leaves are opposite (or alternate above), stipulate, and consist of from five to seven (excepting near the top of the stem, where they are simpler) linear-lanceolate, pointed, sharply serrate leaflets. Flowers in axillary clusters. In the staminate on male plant the flowering top is in lax, spreading, or drooping panicles, consisting of five sepals and as many opposite, large-anthered stamens. In the female plant it is in small, erect spikes, each flower in the axil of an upright, pointed bract, consisting of a single one-seeded, two-styled carpel enveloped in a broad, spathe-like, one-leaved perianth. Fruit (the hemp seed of commerce), a roundish-pointed achenium containing a single pendulous, oily seed.

The plant contains a large amount of resin, which exudes upon the surface of the plant, more particularly upon the flowering branch. This resin becomes most abundant at the period of fructification, and as the fruit forms it diminishes in a very marked degree. During cultivation any loss of resin is prevented by eliminating the male plants or by gathering the tops before the fruit begins to form. In temperate climates the plant is almost destitute of resin, and for medicinal purposes that which is grown in India and Southern Asia is alone utilized.

Fig. 1111.—Staminate Inflorescence of the Same. (Baillon.)

Indian hemp is collected in three forms: first, the flowering tops of the female plant, known as "gunjah," which we recognize officially in the Pharmacopœia; secondly, the leaves, "bhang," which are used for smoking; and, thirdly, the resin, "churrus," or "charus," which enters into the composition of "hashish," and is also used for smoking.

The tops as they reach us consist of compressed masses of branches and leaves with flowers, and at times with specimens of immature fruit, the whole matted together