Modern Surgery - Chapter 17. Tumors, or Morbid Growths

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Tumors or Morbid Growths

XVII. TUMORS OR MORBID GROWTHS.

Division.—Morbid growths are divided into (1) neoplasms and (2) cysts.

Neoplasms.—A neoplasm is a pathological new growth which tends to persist independently of the structures in which it lies, and which performs no physiological function. We say that a tumor performs no physiological function in order to make clear that it is never a useful addition to the economy, but we must not imagine that the cells of a tumor are devoid of physiological activity. As Füttner ("Medicine," March, 1902) has shown, the cells of a carcinoma of the liver may secrete bile, and even the cells of a secondary focus developing in the course of hepatic carcinoma may also secrete bile. The cells of a tumor may be active, but this activity is not useful and does not constitute physiological function. A hypertrophy is differentiated from a tumor by the facts that it is a result of increased physiological demands or of local nutritive changes, and that it tends to subside after the withdrawal of the exciting stimulus. Further, a hypertrophy does not destroy the natural contour of a part, while a tumor does. Inflammation has marked symptoms: its swelling does not tend to persist, it terminates in resolution, organization or suppuration, and examination of a section under the microscope differentiates it from tumor. Inflammation, too, has an assignable exciting cause. A new growth is a mass of newly formed tissue; hence it is improper to designate as tumors those swellings due to extravasation of blood (as in hematocele), or of urine (as in ruptured urethra), to displacement of parts (as in hernia, floating kidney, or dislocation of the liver), or to fluid distention of a natural cavity (as in hydrocele or bursitis).

Classes of Tumors.—There are two classes of tumors; the first class includes those derived from or composed of ordinary connective tissue or of higher structures. These all originate from cells which are developed from the mesoblast. There are two groups of connective-tissue tumors: (a) the typical, benign, or innocent, which find their type in the healthy adult human body; and (b) the atypical or malignant, which find no counterpart in the healthy adult human body, but rather in the immature connective tissues of the embryo.

The second class of tumors includes those which are derived from or composed of epithelium: (a) the typical, or innocent, composed of adult epithelium; and (b) the atypical, or malignant, composed of embryonic epithelium.

Müller's Law.—Müller's law is that the constituent elements of neoplasms always have their types, counterparts, or close imitations in the tissues, either embryonic or mature, of the human body.

Virchow's Law.—Virchow's law is that the cells of a tumor spring from pre-existing cells. There is no special tumor-cell or cancer-cell.

The starting-point of a tumor is a focus of embryonal cells, which focus may have originated before the person was born or may have resulted after birth from some disease or injury. The nature of the tumor depends first upon the embryonal layer from which it took origin. Connective-tissue tumors spring from the mesoblast; epithelial tumors spring from the epiblast or the hypoblast. The nature of the tumor depends also upon the stage in which
the growth of its cells is arrested. If the cells remain embryonal, the growth is regarded as malignant; if they become fully developed, it is regarded as innocent.

The term "heterologous" is no longer used to signify that the cellular elements of a tumor have no counterpart in the healthy organism, but is employed to signify that a tumor deviates from the type of the structure from which it takes its origin (as a chondroma arising from the parotid gland). Tumors when once formed almost invariably increase and persist, though occasionally warts, exostoses, and fatty tumors disappear spontaneously. Tumors may ulcerate, inflame, slough, be infiltrated with blood, or undergo mucoid, calcareous, or fatty degeneration.

**Causes.**—The causes of tumors are not positively recognized, those alleged being but theories varying in probability and ingenuity.

*The inclusion theory of Cohnheim* supposes that more embryonic cells exist than are needful to construct the fetal tissues, that masses of them remain in the tissues, and that these may be stimulated later into active growth. The embryonic hypothesis seems to receive a certain force from the facts that exostoses do sometimes develop from portions of unossified epiphyseal cartilage, and that tumors often arise in regions where there was a suppression of a fetal part, closure of a cleft, or an involution of epithelium (epithelioma is usual at mucocutaneous junctions). This theory, which does not explain the origin of most neoplasms, cannot successfully be maintained even as a common predisposing cause.

*Hereditation* is extremely doubtful. S. W. Gross found hereditary influence by no means frequent in cancer of the breast. It is affirmed by some, denied by others, and doubted by a number. At most, hereditary influence may only predispose. Nevertheless, cases have occurred which cannot be explained by the term coincidence. In the celebrated "Middlesex Hospital case," a woman and five daughters had cancer of the left breast. A. Pearce Gould had charge of a woman for cancer of the left breast. The mother of this patient, the mother's two sisters, and two of the mother's cousins had died of cancer. Power reports a remarkable instance of family predisposition to cancer. A patient had his right breast removed for cancer in 1896. In 1897 cancerous glands were removed from the axilla. In 1898 he was seen again with an irremovable recurrent growth. His father died of cancer of the breast. He had two brothers, one of whom died of cancer of the throat when sixty-five years of age, the other having died of cancer of the axilla when he was only twenty-four years old. Of his eight sisters, four died of cancer of the breast, and the two who are living both suffer from cancer of the breast. One sister died when an infant, and one died after giving birth to a child."

*Injury and inflammation* may undoubtedly prove exciting causes. A blow is not infrequently followed by sarcoma; the irritation of a hot pipe-stem may excite cancer of the lip; the scratching of a jagged tooth may cause cancer of the tongue; chimney-sweeps' cancer arises from the irritation of dirt in the scrotal creases; and warts often arise from constant contact with acrid materials.

*Physiological activity* favors the development of sarcoma, and *physiological decline* favors the development of carcinoma.

Parasitic Influence.—This theory does not maintain that the tumor is the parasite, but that it contains the parasite, although Pfeiffer and Adamciewicz did at one time assert that a cancer-cell is not a body-cell, but a parasite resembling an epithelial cell. Some facts render a parasitic origin of malignant growths not improbable; as, for instance, the likeness of some tumors to infective granulomata, their occasional secondary development in distant parts of the body, the resemblance of the secondary to the primary growths, and the tenacity of their persistence. A parasitic origin of cancer is pointed to by its geographical distribution, the disease being very common in low and marshy districts, and Haviland and others maintain that certain houses become infected, the disease appearing in these houses among successive families inhabiting them. They speak of such abodes as "cancer-houses."

Some surgeons believe that cancer is contagious, but most observers deny it. Guelliott, of Rheims, believes that cancer is primarily a local infection. He believes this because Morea and Hanau have inoculated it from one animal to another of the same species, and if this can be brought about experimentally he sees no reason why it cannot happen accidentally. This surgeon says that cancer is very unequally distributed, that genuine cancer-centers and "cancer-houses" exist, and that numerous cases of accidental infection have occurred.* Mayet, of Lyons, holds that cancer can be reproduced by grafting or by injection of cancer-fluid. Graf could not find "cancer-houses" after a careful search.† Geissler claims to have produced the disease in a dog by planting fragments of cancer in the subcutaneous tissue and vaginal tissue, but Czerny, Rosenbach, and others dispute the claim. Roswell Park believes that Gaylord has really produced adenocarcinoma in the lower animals. Hauser disputes the assertion that cancer must be an infectious disease because it is followed by secondary growths. Secondary growths in an infectious disease are caused by the bacterium; secondary growths in cancer are caused by the transference of cells of primary growth.‡ Hauser says with truth that the close connection between innocent and malignant growths renders the parasite view untenable, because to hold it we would be forced to believe that every tumor has a special parasite or that one parasite may cause many kinds of tumors.

There seems to be no doubt that autotransference of cancer can occur, although it rarely does so. Sippel has reported a case in which vaginal carcinoma developed at the point where the vagina was in contact with a pre-existing cancer of the portio.§ Cornil has seen cancer transferred from one of the labia majora to the other, and from one lip to the other. Geissler was unable to transplant cancer, and Gratia also failed in his attempts. Duplay and Bazin say that transmissibility is possible, but only under conditions which are not practically realized. Haviland believes strongly in "cancer-houses." || Tillmanns elaborately discussed the subject of cancer in the Congress of 1895. His conclusions seem most sound and scientific. He says there is no evidence of a bacterial origin of cancer. The parasitic origin has not been proved, and protozoa have not certainly been found. Cancer can be trans-

† Archiv. f klin. Chir., 1895, 1, p. 144.
§ Centralbl. f. Gynäk., No. 4, 1894.
|| Lancet, April 27, 1894.
ferred from one part to another part of the same individual, or from one individual to another of the same species, but never to one of a different species. It is possible that cancer can spread by contagion; this is very rare, but can happen (as when penile cancer is followed by cervix cancer in a wife). Because it is sometimes possible to transfer cancer, this does not prove that the disease is parasitic or infectious; it simply shows that tissue has been successfully transplanted.

Actinomycosis, long thought to be a true tumor, is now known to arise from the ray-fungus. There can be no doubt that changes in the liver which practically constitute a new growth can arise from the growth of a cell called by Darier the "psorosperm." A disease due to psorosperms is called a "psorospermosis." It is affirmed by some that molluscum contagiosum, follicular keratosis, cancer, and Paget's disease are due to psorosperms. Some claim to find the parasite in all cases of cancer, while others can find it in only 4 or 5 per cent. of the cases.

Heneage Gibbes affirms* that dilatation of the bile-ducts of a rabbit's liver is caused by the chronic irritation arising from multiplication of the coccidium oviforme in them, and not in the columnar cells of the bile-ducts, as has been stated; and, further, that the large majority of glandular cancers show nothing that can be considered parasitic, the suspicious appearances noted in some few cases being due to endogenous cell-formation. The coccidium oviforme is a genus of the sporozoa, class protozoa, the lowest division of the animal kingdom. To this class belong the monera and infusoria. (For a further discussion of this subject see page 41.)

**Malignant and Innocent Tumors.**—Malignant growths infiltrate the tissues as they grow; benign tumors only push the tissues away; hence malignant tumors are not thoroughly encapsuled, while innocent tumors are encapsuled. Malignant tumors grow rapidly; innocent tumors grow slowly. Malignant tumors become adherent to the skin and cause ulceration; innocent tumors rarely adhere and rarely cause ulceration. Many malignant tumors give rise to secondary growths in adjacent lymphatic glands (cancer, except in the esophagus and antrum of Highmore, always does so); sarcoma rarely causes them, unless the growth be melanotic or unless it arises from the testicle or tonsil. Innocent tumors never cause secondary lymphatic involvement, although the glands near the tumor may enlarge from accidental inflammatory complications. The malignant tumors, especially certain sarcomata and soft cancers, may be followed by secondary growths in distant parts and various structures (bones, viscera, brain, muscles, etc.); innocent tumors are not followed by these secondary reproductions, although multiple fatty tumors or multiple lymphomata may exist. Malignant tumors destroy the general health; innocent tumors do not unless by the accident of position. Malignant tumors tend to recur after removal; innocent tumors do not if operation was thorough. The special histological feature of a malignant growth is the possession by its cells of a power of reproduction which knows no limit, the cells of the tumor living among the body-cells like a parasite, and invading and destroying the body-cells.

Tumors or Morbid Growths

Classification.—Tumors may be classified as follows:

I. Connective-tissue tumors (those derived from the mesoblast).
   1. Innocent tumors, or those composed of mature connective tissue:
      Lipomata, or fatty tumors; fibromata, or fibrous tumors; chondromata, or cartilaginous tumors; osteomata, or bony tumors; odontomata, or tooth-tumors; myxomata, or mucous tumors; myomata, or muscle-tumors; neuromata, or tumors upon nerves; gliomata, or tumors composed of neuroglia; angiomata, or tumors formed of blood-vessels; lymphangiomata, or tumors formed of lymphatic vessels.
      The term lymphoma, meaning a tumor of a lymphatic gland, was formerly applied to hypertrophy and hyperplasia of a lymphatic gland, no matter whether caused by syphilis, tubercle, Hodgkin's disease, or any other morbid impression. The term has been largely abandoned except as expressing enlargement of a gland, and does not convey any suggestion as to the cause. It is doubtful if there is such a thing as a true lymphoma, understanding by the term a neoplasm arising from and composed of lymphoid cells and resembling lymphatic structure. In the described cases the possibility of infection as a cause has not been eliminated.
   2. Malignant tumors, or those composed of embryonic connective tissue: Sarcomata and adrenal tumors.
      Endotheliomata are regarded as a variety of sarcomata.

II. Epithelial tumors (those derived from the epiblast or hypoblast).
   1. Innocent tumors, or those composed of mature epithelial tissue:
      Adenomata, or tumors whose type is a secreting gland; and papillomata, or tumors whose type is found in the papilla of skin and mucous membranes.
   2. Malignant tumors, or those composed of embryonic epithelial tissue Carcinomata, or cancers.

III. Cystomata are cystic tumors, the cyst-walls of which are new growths and the contents of which are produced by the cells of the newly formed cyst-walls.

IV. Teratomata (tumors containing epiblastic, hypoblastic, and mesoblastic elements).

Innocent Connective-tissue Tumor.—These growths mimic or imitate some connective tissue or higher tissue of the mature and healthy organism.

Lipomata are congenital or acquired tumors composed of fat contained in the cells of connective tissue, which cells are bound together by fibers. If the fibers are excessively abundant, the growth is spoken of as a fibrolatty tumor. A fatty tumor has a distinct capsule, tightly adherent to surrounding parts, but loosely attached to the tumor; hence enucleation is easy. Fibrous trabeculae run from the capsule of a subcutaneous lipoma to the skin; hence movement of the integument over the tumor or of the tumor itself causes dimpling of the skin. An ordinary circumscribed lipoma is of doughy softness, is lobulated, of uniform consistence, and on being tapped imparts to the finger a tremor known as pseudofluctuation. A fatty tumor is mobile, although it may be attached to the skin at points by trabeculae. Lipomata are most frequent in middle life, and their commonest situations are in the subcutaneous
Lipomata

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tissues, especially of the back or of the dorsal surfaces of the limbs; they
usually occur singly, but may be multiple and sometimes symmetrical. Senn
described the case of a woman who had a fatty tumor in each axilla. A lipoma
may grow to an enormous size (in Rhodius's case the tumor weighed sixty
pounds), and the growth may be progressive or may be at times stationary
and at other times active. The skin over a fatty tumor sometimes atrophies
or even ulcerates; the tumor itself may inflame or partly calcify. When a
lipoma has once inflamed it becomes immovable. Subcutaneous lipoma
of the palm of the hand or sole of the foot bears some resemblance clinically
to a compound ganglion; it is apt to be congenital. Lipomata of the head
and face are rare. In the subcutaneous tissues of the groins, neck, pubes,
axilla, or scrotum a mass of fat may form, unlimited by a capsule and known
as a “diffuse lipoma.” A diffuse lipoma may dip down among the muscles.

Such masses attain large size. The typical diffuse lipoma is occasionally
seen on the neck. It begins back of the mastoid process on one side or on
both sides. When large, it completely surrounds the neck, a huge double chin
forming in front, a great mass hanging on each side, and the posterior portion
being divided into two halves by a median depression. A nevolithoma is a
nevus with much fibrofatty tissue. A very vascular fatty tumor is called lipoma
telangiectodes. If the tumor stroma contains large veins, the growth is called
a cavernous lipoma. A tumor containing much blood can be diminished in
size by pressure. Fatty tumors may arise in the subserous tissue, and when
such a growth arises in either the femoral or inguinal canal or the linea alba
it resembles an omental hernia and is spoken of as a fat-hernia. In the retro-
peritoneal tissues enormous fibrofatty tumors occasionally grow, and these
neoplasms tend to become sarcomatous. Lipomata may arise from beneath
synovial membranes and will project into the joints, being still covered by

Fig. 84.—Fatty tumor.
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synovial membrane. Fatty tumors occasionally arise in submucous tissues, between or in muscles, from periosteum, and from the meninges of the spinal cord (J. Bland Sutton). A fatty tumor may undergo metamorphosis. The stroma may be attacked by a myxomatous process or a calcareous degeneration. The fat-cells themselves may become calcareous. Oil-cysts sometimes form. A xanthoma is a growth composed of fatty tissue in and about which there is marked infiltration with small cells. Such a tumor is flattened and slightly elevated. Several or many of these growths occur in the same person. The eyelids are the most common seat of xanthoma. The tumor may undergo involution or may become sarcomatous.

Diabetics are liable to develop xanthomata.

Treatment.—A single subcutaneous lipoma should be extirpated. The capsule must be incised, when the tumor can be torn out forcibly or can be enucleated by dissection; drainage is always employed for twenty-four hours, as butyric fermentation will be apt to occur, and necrosis of small particles of fat predisposes to infection. Multiple subcutaneous lipomata, if very numerous, should not be interfered with unless troublesome because of their size or situation, when the growth or growths causing trouble should be removed. It is difficult to extirpate entire a diffuse lipoma, and several operations may be needed to effect complete removal. Liquor potassae, once recommended as possessing power, when taken internally, to limit the growth of multiple lipomata or diffuse lipoma, seems to be useless. Subperitoneal lipomata are rarely diagnosticated until the belly has been opened or the growth has been removed.

Fibromata are tumors composed of bundles of fibrous tissue. There are two forms, the hard and the soft. A hard fibroma consists of wavy fibrous bundles lying in close contact. Here and there connective-tissue corpuscles exist between the fibers. A fibroma has no distinct capsule, though surrounding tissues are so compressed as to simulate a capsule. Fibromata are occasionally congenital, are most usual in young adults, but they may occur at any period of life, and in any part of the body containing connective tissue. Pure fibromata, which are rare, are generally solitary, grow slowly, are of uniform consistence, have not much circulation, and are hard and movable. Fibromata may form upon nerves, they may arise in the mammary gland, they may develop in the lobe of the ear, and they may spring from various fibrous membranes, from the periosteum of the base of the skull (nasopharyngeal fibroma), and from the gums (fibrous epulides). A soft fibroma contains much areolar tissue, the spaces of which are filled with fluid, so that the tissue seems edematous. Soft fibromata grow from the skin, mucous membranes, subcutaneous tissue, intermuscular planes, and periosteum. Soft fibromata are especially apt to arise from the skin of the scrotum, labia, inner surface of arm and thigh, and of the belly wall of a pregnant woman. They are not usually multiple, grow slowly, but more rapidly than the hard fibromata, and may become quite large and possess distinct pedicles. Fibromata may become cystic, calcareous, osseous, colloidal, or sarcomatous, and may inflame, ulcerate, or even become gangrenous.

A painful subcutaneous tubercle, which is a form of fibroma commonest in females, arises in the subcutaneous cellular tissue, usually of the extremities. It is firm, very tender, movable, rarely larger than a pea, and the skin over it
Fibromata seems healthy. Violent pain occurs in paroxysms and radiates over a considerable area, of which the tubercle is the center. These paroxysms may occur only once in many days or many times in one day. Pain is always developed by pressure, and may be linked with spasm. Nerve-fibrillae are now known to exist in these tubercles, a fact which was long denied.

A mole is a fibroma of the skin which is congenital or appears in the early weeks of life. It is rounded or flat, is usually pigmented and of a brown color, is slightly elevated above the cutaneous level, and has a few hairs or an abundant crop of hair growing from it, and varies in size from a pin's head to several inches in diameter, or may even occupy an extensive area of a limb or of the trunk. The tumor rarely grows after the thirteenth or fourteenth year. A mole may become malignant, melanotic carcinoma may arise from its epithelial structures, or melanotic sarcoma from its connective-tissue elements. A mole is an extremely vascular structure; it bleeds freely when cut or scratched, and it sometimes ulcerates. Occasionally several or many moles exist in the same individual. If a mole begins to increase rapidly in size, operation is imperative, as rapid growth probably indicates malignant change.

Fibrous epulis is a fibroma arising from the gums or periodontal membrane (J. Bland Sutton) in connection with a carious tooth or retained snag; it is covered by mucous membrane, grows slowly, may attain a large size, and sometimes has a stem, but is more often sessile. It may undergo myxomatous change or may become sarcomatous.

Fibrous tumors may arise from the ovary, the intestine, and the larynx. Pure fibromata of the uterus are very rare, but fibromyomata are very common (see Myomata, page 255); hence the term "uterine fibroid" should be abandoned.

Folliscum fibromm is an overgrowth of the fibrous tissue of both the skin and the subcutaneous structure. Senn excludes this form of growth from consideration with fibromata because of its infective origin. It may be limited or widely extended; it may appear as an infinite number of nodules scattered over the entire body or as hanging folds of fibrous tissue in certain areas. Keloid is a fibroma of the true skin. It is a hard, fibrous, vascular growth, with a broad base, arising in scar-tissue; it is crossed by pink, white, or discolored ridges, and is named from a fancied likeness to the crab. It has rarely attacked mucous membrane. It is more common in negroes than in whites, and is most frequent in the cicatrices of burns, though it may arise in the scar of any injury, as the scar from piercing the ears, and in the scars of syphilitic lesions, tuberculous processes, smallpox, or vaccination. It is rare in early childhood and in old age. It grows slowly, lasts for many years, and may eventually undergo involution and disappear. It is almost useless to remove keloid by operation, as it will usually return. The fibrous tissue of keloid springs from the outer walls of the blood-vessels (Warren). The papillae of the skin above the tumor are destroyed or replaced by fibrous tissue.

Morpheu, spontaneous or true keloid, is a name used to designate a growth of this description which does not arise from a scar; but it seems certain that scar-tissue was present, though possibly in small amount from trivial injury. Fibrous and papillomatous growths covered with endothelium may spring from any serous membrane. Such a growth of the choroid plexus calcifies
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early and constitutes a psammoma or brain-sand tumor. Such tumors are met with not only in the choroid plexus, but also in the conarium and the dura. All psammomata are not fibrous; some are gliomatous and some are endotheliomatous. A cholesteatoma is a fibrous growth covered with endothelium and containing layers of crystalline fat. It occurs especially in the pia mater, but may arise in either of the other membranes or even in the brain substance, and is called a pearl tumor.

Treatment.—When in accessible regions fibromata should be enucleated. Fibromata should not be let alone, because any fibrous tumor may become a sarcoma. If a hard fibroma of the skin exists the skin is incised and the tumor is “shelled out.” A soft fibroma is removed by an incision carried round the base of its pedicle. A painful subcutaneous tubercle should be excised. If a mole shows the slightest disposition to enlarge, or if it is subjected to pressure or irritation, it should be removed, because if allowed to remain it might develop into a malignant growth. It is often desirable to remove a hairy or pigmented mole, not only because it may become malignant, but also because it is unsightly. Fibrous epulis requires the cutting away of the entire mass, the removal of the related snag or carious tooth, and sometimes the biting away of a portion of the alveolus with rongeur forceps. A naso-pharyngeal fibrous polyp usually contains sarcomatous elements or becomes a spindle-cell sarcoma. If it has a pedicle, it may be removed by the cautery loop. In a severe case a part of the superior maxillary bone is removed by osteoplastic resection to permit of extirpation. Keloid should rarely be operated upon: it will only return, and will also recur in the stitch holes. Trust to time for involution, or use pressure with flexible collodion, by which method J. M. DaCosta cured a case following smallpox. It may be necessary to operate because of ulceration. If it is necessary to operate, remove the keloid and considerable adjacent tissue and fill the gap with Thiersch grafts. The administration of thyroid extract may be of benefit (a gr. v tablet three or four times a day). This drug must be given cautiously, as it may cause attacks characterized by fever, dyspnea, and rapid pulse. Thiosinamin hypodermatically has been used, it is claimed, with benefit. A 10 per cent. solution is made, and from 10 to 15 minims can be injected into the gluteal muscles every third day. I have seen two keloids cured by the use of the x-rays.

Chondromata (enchondromata) are tumors formed either of hyaline cartilage, of fibrocartilage, or of both. Chondromata are apt to arise from certain glands, the long bones, the pelvis, the rib cartilages, and the bones of the hands or feet, and often spring from unossified portions of epiphyseal cartilage. They may be single or multiple, and are most commonly met with in the young. They have distinct adherent capsules; they grow slowly, and if of osseous origin progressively hollow out the bones by pressure; they cause no pain; they impart a sensation of firmness to the touch, unless mucoid degeneration forms zones of softness or fluctuation; they are inelastic, smooth or nodular, immovable, and often ossify. A chondroma may grow to an enormous size. A chondroma of the parotid gland or testicle practically always contains sarcomatous elements, and any chondroma may become a sarcoma. Chondromata are notably frequent in persons who had rickets in early life. Ecchondroses, which are “small local overgrowths of cartilage” (J. Bland Sutton), arise from articular cartilages, especially of
Osteomata

the knee-joint, and from the cartilages of the larynx and nose. Loose or floating cartilages in the joints may be broken-off ecchondroses or portions of hyaline cartilage which are entirely loose or are held by a narrow stalk, and which arise by chondrification of villous processes of the synovial membrane; only one or vast numbers may exist; one joint may be involved, or several; they may produce no symptoms, but usually produce from time to time violent pain and immobility by acting as a joint-wedge. An ecchondroma may arise within the medullary canal of a long bone, from foci of dormant cartilage, and may lead to the development of a solitary cyst of large size by softening of the tumor. The femur is the most usual site of disease. It begins very insidiously and progresses gradually. There are slight lameness, trivial pain, tenderness below the level of the trochanter, apparent shortening and some bulging of bone. The bone may bend or at some spot may thin so that the cyst can be felt. Such a bone fractures from slight force, and after a fracture, when the effused blood and inflammatory exudate have been absorbed, a tumor can be distinctly detected. A solitary cyst of a long bone is apt to be regarded clinically as a sarcoma (Bergmann-Virchow).

**Treatment.**—Remove chondromata whenever possible, for, if allowed to remain undisturbed, they are apt to resent this hospitality by becoming sarcomatous. Incise the capsule and take away the growth, using chisels and gouges if necessary. Incomplete removal means inevitable recurrence. Amputation is very rarely demanded. Loose bodies in the joints, if productive of much annoyance, are to be removed, the joint being opened with the strictest antiseptic care. Amputation is sometimes performed for a solitary cyst of a long bone, the surgeon having looked upon the growth as sarcomatous. If a correct diagnosis is arrived at, an attempt should be made to remove the cyst without amputation. Bergmann succeeded in extirpating such a mass from the femur.

**Osteomata.**—Osteomata are tumors which are composed of osseous tissue. J. Bland Sutton says that osteomata are ossifying chondromata. Osteomata take origin from bone, cartilage, connective tissue, especially tissue near the bone, serous membrane, and certain glands and organs. Compact osteomata, which are identical in structure with the compact tissue of bone, arise from the frontal sinus, mastoid process, external auditory meatus, and other regions in those beyond middle life; they are small, smooth, round, densely hard, with small and occasionally cartilaginous bases.

('ancellous osteomata, which comprise the great majority of bone-tumors, are similar in structure to cancellous bone. They spring from, and are crusted with, cartilage; they may have fibrous capsules, and are often movable when recent, but soon become fixed; they have broad bases, are angled, nodular, firm (but not so hard as are the compact osteomata), painless except when pressed, occur particularly at the ends of long bones, may grow to large size, and are commonest in youth. Osteomata near joints become overlaid by bursae, which in rare instances communicate with an adjacent joint.

The term exostosis has been used as being synonymous with osteoma, but wrongly so, as an exostosis is an irregular, local, bony growth which does not tend to progress without limit, and which is, hence, not a tumor. A true exostosis is seen in the ossification of a tendon-insertion, in a limited growth from one of the maxillary bones, and in a local growth from the last phalanx of the
big toe, which latter form of growth is known as a subungual exostosis. Exostoses of the retrocalcaneal bursa occasionally arise when this bursa is inflamed. Inflammation of this bursa is known as Achillodynia or Albert's disease. The bony masses sometimes found in the brain, lungs, testicle, various glands, and tumors are not true osteomata. Osteomata do not tend to become malignant and do not recur after removal.

**Treatment.**—Osteomata which are non-productive of pain or trouble do not demand removal. If they produce pain by pressure, if they press upon important structures, if they cause annoying deformities, or if they grow rapidly, then remove them by means of chisels, gouges, or the surgical engine. Subungual exostosis should always be removed. The nail should be split and part of it taken away, and the bony mass be gouged away or be cut off with forceps.

**Odontomata** *are tumors composed of tooth-tissue. They spring from the germs of teeth or from developing teeth.* J. Bland Sutton divides them into (1) those springing from the follicle; (2) those springing from the papilla; and (3) those springing from the whole germ.

**Epithelial odontomes, or multilocular cystic tumors,** arise from the follicle, occur oftenest in the lower jaw, dilate the bone, have capsules, and are made up of masses of cysts which are filled with brown fluid. These cysts are met with most frequently before the age of twenty. **Follicular odontomes, or dentigerous cysts,** oftenest spring from the follicles of the permanent molars. In a dentigerous cyst there exists an expanded follicle which distends the bone, the follicle being filled with thick fluid and containing a portion of a tooth. A fibrous odontome is due to thickening of the tooth-sac, which prevents eruption of the tooth; fibrous odontomes are usually multiple, and are apt to occur in rickety children. A cementome is due to enlargement, thickening, and ossification of the capsule, the developing tooth being encased in cement. A compound follicular odontome is due to ossification of portions only of an enlarged and thickened capsule, and the tumor contains bits of cementum, portions of dentine, or small misshapen teeth. A radicular odontome springs from the papilla and arises after the crown of the tooth is formed and while the roots are forming; hence it contains dentine and cement, but no enamel. Composite odontomes are formed of irregular, shapeless masses of dentine, cement, and enamel. All the above forms occur in man. They present themselves as hard tumors associated with teeth or in an area where teeth have not erupted. Occasionally an odontome simulates necrosis; it is surrounded by pus, and a sinus forms.

**Treatment.**—The diagnosis is scarcely ever made until after an incision; hence, be in no haste to excise large portions of bone for a doubtful growth; incise first and see if it be an odontome, which requires only the removal of an implicated tooth, curetting with a sharp spoon and packing with iodoform gauze.

**Myxomata** are tumors composed of mucous tissue. They are rare as independent growths, although myxomatous change is frequent in the stroma of other tumors. The tissue type of these tumors is found in the vitreous humor of the eye and in the perivascular tissues of the umbilical cord (Whar-

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*This section is abridged from J. Bland Sutton's striking chapter upon odontomes in his recent work on "Tumors."
Bowlby states that myxomata are in reality soft fibromata whose intercellular substance has been replaced by mucin. The myxomatous state may be a stage in the formation of a fibroma, a stroma not having developed. Myxomata may result from myxomatous degeneration of cartilage, of muscle, or of fibrous tissue. These tumors are soft, elastic, usually pedunculated, tremulous, and vibratory. The stroma is very delicate and carries minute blood-vessels. Cutting into a myxoma causes a straw-colored, clear jelly to exude. Myxomata grow slowly, are encapsuled, have but little circulation, and the diagnosis may be impossible before removal of the growth. Some pathologists place myxomata among the malignant tumors, but most consider them as benign tumors, though they tend strongly to become sarcomatous (myxosarcomata). A sarcoma may undergo myxomatous degeneration.

Myxomata may arise from the skin; from the mucous membrane of the nose, the frontal sinus, the antrum, the womb, the auditory meatus, and the tympanum (gelatinous polyps); from the parotid and mammary glands; from the subcutaneous tissue, the nerve-sheaths, the intermuscular septa, the rectum, and the bladder (polyps). They may be congenital, but occur most often in young adults, as a result of inflammation. A sudden increase of growth indicates beginning malignancy (sarcomatous change). When a tumor begins to undergo myxomatous transformation we give to it a compound name; for instance, a chondroma undergoing myxomatous change is a chondromyxoma, a fibroma undergoing a like change is a fibromyxoma, etc. Mucous polypi grow from the mucous membrane of the nose, particularly from the outer wall near the middle turbinated bone, and often from the roof of the nares. Mucous polypi are soft and jelly-like, of a grayish color, and have stems or pedicles; they may be seen through the anterior nares, may project behind the veil of the palate, and may bulge out from the passages of the nose; they may be, and usually are, multiple; they may be present in one nasal fossa or in both; and they occur most commonly in youths and adults between the ages of fifteen and thirty-five years.

Hydatid moles of pregnancy are due to myxomatous changes in the chorion.

Treatment.—In treating myxomata, remove them promptly and thoroughly, because of the danger of sarcomatous change. Polyps of the bladder are removed by means of cutting forceps after suprapubic cystotomy has been performed. Nasal polyps may usually be twisted off or be removed by the wire snare or galvanocautery. Occasionally when the growths are numerous and recur rapidly after removal, the inferior turbinate bone should be removed with a saw (Rouge's operation). This operation secures ready access to the area of disease, which can be attacked radically. A very soft myxoma breaks up when removal is attempted, and the base must be cauterized.

Myomata are tumors composed of unstriped muscle-fiber mixed often with fibrous tissue. They are called liomyomata. Tumors composed of striated muscle-fiber and spindle-cells are known as rhabdomyomata. They are very rare and are always sarcomatous. Liomyomata are found in the womb, in the prostate gland, in the walls of the gullet, vagina, stomach, bladder, and bowel, in the broad ligament, ovary, and round ligament, in the scrotum, and in the skin. Myomata usually begin during or after middle age; they are encapsuled, they grow slowly, they are firm and hard, and produce annoyance by their size and weight or by obstructing a viscus or...
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channel. A liomyoma of the posterior portion of the middle of the prostate gland is known as a "middle lobe."

The so-called uterine fibroid is a myoma or fibromyoma. Uterine myomata may originate within the walls of the womb (intramural myomata), from the muscular structure of the mucous lining (submucous myomata), or from the muscular tissue of the serous covering (subserous myomata). Intramural uterine myomata may be single or multiple and may grow to an enormous size. Submucous myomata project into the cavity of the womb (fleshy polyps), and may project into the vagina. They distend the uterus and are often accompanied by menorrhagia or metrorrhagia. In some rare cases the projecting tumor is detached by Nature and the patient is cured; in some cases the myoma becomes gangrenous. A fleshy polyp may produce inversion of the fundus of the womb. Subserous uterine myomata cause trouble only by the inconvenience of weight or the discomfort of pressure. Uterine myomata are commonest in single women, and arise most frequently between the ages of twenty-five and forty-five. Negro women are especially prone to develop such tumors. They may never produce any symptoms. Some of these growths, by enlarging until they ascend above the pelvic brim, produce abdominal distention; some become jammed or impacted in the pelvis, and produce by pressure retention of urine, obstruction to the passage of feces or hydronephrosis. Impaction may occur temporarily at each menstrual period. Many myomata produce uterine hemorrhage; some cause retroversion of the womb; some protrude from the cervical canal; some are so large that they cause disastrous pressure upon the colon (obstruction), upon the iliac veins (great edema), or upon the ureters (hydronephrosis). Uterine myomata usually shrink after the menopause. Pregnancy in a myomatous womb usually ends in abortion. Uterine myomata may undergo fatty, calcareous, or myxomatous change, and may be infected by septic organisms as a result of the use of a uterine sound or of infection of the pedicle after oophorectomy. Infection of a uterine myoma causes great enlargement, elevated temperature, sweats, and exhaustion.

The symptoms of myomata of the alimentary canal are similar to or identical with the symptoms of malignant growths. Myomata of the skin are rare growths; they are encapsulated, firm or elastic, and painless.

Treatment.—Cutaneous myomata are removed in the same manner as fibrous tumors. Uterine myomata are treated by rest and the administration of ergot, barium chlorid, and dilute sulphuric acid. If this treatment fails to arrest serious bleeding due to a flesh polyp, dilate the cervical canal and remove the growth. If there be dangerous bleeding in a woman who has some years to wait for the menopause and who has not a removable polyp as the cause, perform oophorectomy in order to bring on an artificial menopause. When a myoma becomes impacted at each menstrual period, remove the ovaries and Fallopian tubes. Subserous myomata may be removed from the uterus after abdominal section, the resulting wound in the uterus being sutured. Hysterectomy is indicated for some very large tumors, for tumors that grow after the menopause, and for infected myomata. If the abdomen be opened to perform oophorectomy, and the tubes and ovaries are found so implicated in the growth that they cannot be removed completely, or the broad ligament is found so drawn out that a safe pedicle cannot be secured, perform a hyster-
ectomy.* A recent suggestion for the shrinkage of uterine myomata is to ligate both the uterine and ovarian arteries. If a myoma of the prostate causes severe obstruction, perform a suprapubic cystotomy and remove the major portion of the enlarged gland; or make both a suprapubic and a perineal opening, push the gland into the perineum and shell it out with the finger, or make permanent suprapubic drainage.

**Neuromata.**—A *true neuroma* springs from nerve-tissue (brain, cord, or nerve-trunks); it is composed of medullated or non-medullated nerve-fibers which form a plexus or network, and which are not continuous with the fibers of the nerve-trunk or other area from which the tumor grows. *True neuromata*, which are rare growths, arise during middle life; they are small in size; are due to injury or hereditary tendency, and they may be single or multiple. There is usually around the tumor, rather than in it, severe neuralgic pain, which is greatly intensified by dampness, by blows, or by rough handling. The parts below a neuroma are cold, swollen, often anesthetic, and frequently present motor paralysis or trophic disorder. A *false neuroma* or *neurofibroma* is a fibrous tumor growing from a nerve-sheath, and is identical in structure with the sheath. *False neuromata* may be single, but they are often multiple; they may be as small as peas or as large as oranges; they are smooth and movable, and may cause great pain or may be painful only when pressed or struck; they may spring from roots, trunks, or branches, and they may be linked with the disease known as "molluscum fibrosum." In *plexiform neuroma* some branches of a nerve enlarge and lengthen like an artery in a cirrhotic aneurysm; the mass feels like beads or like a bag of worms; it is mobile, and no pain is felt on moving it; and it is generally congenital. In plexiform neuroma the nerve-sheath undergoes myxomatous change. *Malignant neuroma* is a primary sarcoma of a nerve-sheath, though any neuroma may become sarcomatous.

**Traumatic neuroma** are false neuromata and are occasionally well exhibited after nerve-section or amputation. On nerve-section the distal end shrinks and atrophies, the proximal end enlarges and becomes bulbous. A traumatic neuroma is composed of fibrous tissue which contains nerve-fibers. Such a growth is usually, but not always, painful on pressure or during dampness, and is most commonly seen in a stump which did not heal by first intention. In performing an amputation cut the nerves high up, and thus keep them out of the scar, permit them to remain mobile in their sheaths, and so prevent a tender stump. A tender stump may be due to anchoring of a nerve in a scar, the nerve ceasing to glide when the individual moves the extremity. The condition known as painful subcutaneous tubercle was discussed on page 250.

**Treatment.**—A false neuroma is to be removed, if possible, without destroying the nerve-trunk. If, in removing a neuroma, it is necessary to excise a portion of a nerve-trunk, always endeavor to suture the ends of the divided nerve so as to facilitate restoration of function. For multiple neuromata—at least should the number be large or should molluscum fibrosum exist—surgery can do nothing. Plexiform neuromata may often be removed, but amputation may be required. Painful neuromata in stumps should be excised.

*See J. Bland Sutton’s admirable article on “Uterine Myomata” in his work on “Tumors.”*
Gliomata.—These tumors develop from neurogliia and more often from the white substance than from the gray. They are usually single, and arise in the brain, rarely in the cord, and very rarely in the cranial nerves. They may take origin in one of the cerebral hemispheres, in the cerebellum, in the pons, or in the medulla. Some gliomata are soft and bear a close relationship to sarcoma; others are hard and resemble fibroma.

A glioma is a circumscribed growth in contrast to a gliosis, which is a widespread and unlimited hyperplasia of the neuroglia. Syringomyelia is due to gliosis of the spinal cord.

"A glioma consists of cells containing rounded or oval nuclei with very little protoplasm and fine protoplasmic extensions which interlace and form an intercellular reticulum" (Stengel).

A glioma passes almost insensibly into surrounding tissue, and there is no distinct edge; hence, because of the slight differentiation from brain substance, it may be overlooked during exploration. It is harder than the surrounding tissue; is vascular and of a pink or red color; and the normal shape of the part is often very little altered, although the tumor may reach the size of a lemon.

Hemorrhage may take place into a glioma, softening may occur, cavities may form, or the growth may become sarcomatous or psammomatus. The symptoms of a glioma of the brain depend on the situation.

Treatment.—When the growth can be localized it is justifiable in some cases to attempt its removal. Even a partial removal may be of benefit.

Angiomata or Hemangiomata.—An angioma is a tumor composed largely of dilated blood-vessels. The older surgeons called such growths erectile tumors. Some of the so-called angiomata are not genuine new growths, but are due to dilatation and elongation of blood-vessels.

Simple or capillary angiomata, nevi, or "mother's marks," which affect the skin or subcutaneous tissue, are composed of enlarged and twisted capillaries and of anastomosing vessels surrounded by fat. These growths are congenital or appear in the first few weeks of life; they are flat and slightly raised, and are of a bright-pink color if composed chiefly of arterioles, and are bluish if composed mainly of venules; they are but little elevated; they can be almost completely emptied by pressure; they occasionally pass away spontaneously, but usually grow constantly and may become cavernous; they may ulcerate and occasion violent or fatal hemorrhage. One or several large vessels connect a nevus to adjacent blood-vessels. Port-wine or claret stains are pink or blue discolorations due to superficial nevi of the skin; they may be small in extent or they may involve a very large area, are not elevated, and do not usually spread. Telangiectasis is a form of nevus involving the skin and subcutaneous tissue in which many arterioles and venules exist. Simple angiomata are common on the forehead, the scalp, the face, the neck, the back, and the extremities. They may appear on the labia, the tongue, or the lips.

Cavernous angiomata, or venous nevi (Fig. 85), resemble in structure corpora cavernosa of the penis; there are large endothelial lined spaces with thin walls carrying blood, and there may be distinct vessels as well. Arteries send blood into the spaces, and veins receive it from the spaces. These channels and sinuses are enormously distended capillaries. Cavernous
angiomata arise in the skin and subcutaneous tissues; they are usually congenital, but may develop from simple angiomata; they are purple or blue in color; are more distinctly elevated than the capillary nevi; may be either cutaneous or subcutaneous; swell when the child cries, and are apt to pulsate; they may be emptied by pressure, and often look like cysts with very thin walls. Cavernous angiomata may arise in the breast, the tongue, the lip, the cheek, the gums, the subcutaneous tissues, or the muscles. If an angioma contains an excess of fat, the growth is called a "nevoid lipoma."

**Plexiform angiomata** are known as "cirsoid aneurysms" or aneurysms by anastomosis (page 306).

Angiomata noticed soon after birth may disappear completely or may enlarge progressively.

**Treatment.**—These growths if large or growing must be treated. A capillary nevus can often be quickly cured by touching it with fuming nitric acid. A second application of acid may be required. The growth may be destroyed by heat—"a knitting-needle at a dull-red heat or the galvano-cautery" (Wharton). **The application of ethylate of sodium or the employment of electrolysis will destroy the growth. Astringent injections are dangerous unless the base of the nevus is ligated, because they may lead to the formation of emboli.**

Small port-wine stains may be removed by electrolysis or multiple incisions, but extensive stains are ineffaceable. Small nevi may be ligated under harelip pins; larger nevi may be strangulated in sections by the Erichsen suture (Fig. 86), or may be completely excised. Excision is usually the best plan for the cure of angiomata. It is rapid, thorough, and leaves but a trivial scar. Excision should always be employed if we feel sure that the edges of the wound can be subsequently approximated and that there will not be a dangerous loss of blood. It is sometimes justifiable to excise an angioma even when approximation of the wound will obviously be impossible. In such a case the raw surface should be covered with Thiersch grafts.

Most superficial nevi and many cavernous angiomata can be treated by
excision. The incisions must be beyond the dilated vessels. In large angiomata involving the skin and also deeper parts, or involving a structure, like the lip, which it is undesirable to remove, electrolysis should be employed. The operation should be carried out with aseptic care, and, if the tumor is large, an anesthetic should be given.

The positive pole produces a firm and hard clot. One or more needles connected with the positive pole are inserted in the tumor, and these needles are insulated to within about a quarter of an inch of their points. A flat moist pad is placed upon the skin near the tumor and attached to the negative pole, and the pad is moved from time to time during the operation.

From twenty-five to seventy-five milliamperes is the proper strength, and the current is passed for ten minutes. The current is increased for a moment before withdrawing the needles, otherwise they will stick to the tissue and cause bleeding when torn loose. After the withdrawal of the needles the nevus will be found to be hard, but the hardness will gradually disappear. It may be necessary to repeat the operation a number of times at intervals of ten days.*

**Lymphangiomata** are tumors composed of dilated lymph-vessels and are often, though not invariably, congenital. A *lymphatic nevus* is a colorless or faintly pink elevation; if it is punctured with a needle, lymph flows from the puncture. One or several nevi may be present in the same individual. The dilatation is due to blocking of the lymph-channels. Local lymphangioma of the tongue is manifested by a cluster of papillary projections containing lymph. *Macroglossia* is a congenital enlargement of the anterior portion of the tongue, which enlargement grows more and more marked until finally the tongue is forced far out of the mouth. This condition of tongue enlargement is due to lymphangioma of the mucous membrane. *Lymph scrotum* is due to a similar growth. A collection of these warty-looking dilatations is called *lymphangiectasis.* Just as cavernous angiomata constitute a variety of blood-vessel tumors, so *cavernous lymphangiomata* constitute a variety of lymph-vessel tumors, and the spaces of the latter are filled with lymph instead of with blood. Areas affected with lymphangiectasis are liable to repeated attacks of erysipelas-like inflammation. Whether this inflammation is causative or secondary is not known. In tropical countries blocking of lymph-channels may be brought about by the filaria sanguinis hominis, a parasite which lurks in the lymph-vessels during the day and is found in the blood only at night. Lymphangiectasis is often the first stage of an elephantiasis.

**Treatment.**—A lymphatic nevus requires excision. In macroglossia the bulk of the mass should be removed by a V-shaped cut, the mucous membrane being sutured so as to cover the stump. In conditions due to the filaria, anilin-blue has been given internally.

**Malignant Connective-tissue Tumors, or Sarcomata.**—The sarcomata are composed of embryonic tissue-cells, the intercellular substance being very scanty. They develop from connective tissue, rarely have a definite stroma, and the constituent cells, as a rule, proliferate with great rapidity. If a sarcoma has a stroma of connective tissue, this stroma contains lymphatics and such a sarcoma infects adjacent glands. In most cases there

*Cheyne and Burghard's "Manual of Surgical Treatment."
Malignant Connective-tissue Tumors, or Sarcomata

is no connective-tissue stroma and no lymphatics. In a sarcoma without a definite stroma the blood-vessels are not surrounded by lymph-spaces and are quickly invaded by cells (B. H. Buxton). The rapidly growing forms are very vascular, the blood flowing in vessels whose walls are very thin or running in canals lined by endothelium and bounded by sarcomatous cells. Such a tumor may pulsate and have a bruit, and hemorrhage often takes place into its substance. A slow-growing sarcoma has but few vessels. Sarcoma tends strongly to infiltrate adjacent parts. The growth disseminates by means of the blood and the vessel-walls, particles of the tumor being carried by the venous blood to the heart and from this organ to the lungs, where they lodge and form secondary growths. Emboli from these secondary foci are sent out by the arterial blood to various portions of the body, as the bones, kidneys, brain, liver, etc. This process is known as "metastasis." In some cases sarcoma is disseminated widely throughout the body, almost all the tissues showing minute white spots of secondary sarcoma which resemble tubercles. Such widespread dissemination is called sarcomatosis. Sarcoma follows the vein-walls for considerable distances and builds elongated masses of tumor-substance inside the veins. The tumor may possess a capsule when it is in an early stage, but soon loses this except in very slow-growing varieties or in mixed forms growing by central proliferation, but secondary sarcomata are often encapsuled. Sarcomata may arise at any age from birth to extreme senility, but they are commonest during youth and early middle age. They are not hereditary, and often follow traumatism and inflammation. A number of observers maintain that they are due to parasites (the question of the parasitic origin of malignant disease is discussed on page 246). A sarcoma may be primary or may arise from malignant change in an innocent connective-tissue growth (chondrosarcoma, fibrosarcoma, etc.). A sarcoma rarely affects adjacent lymphatic glands unless it contains lymphatics, and the great majority of sarcomata do not contain them. Occasionally sarcoma-cells are carried to adjacent glands by the vein-walls rather than by the lymph-stream. Sarcoma of the tonsil, sarcoma of the testicle, melanotic sarcoma, and lymphosarcoma do affect the glands. The skin over the tumor may give way, a bleeding fungus-mass protruding (fungus haematodes), and suppuration may cause septic enlargement of adjacent glands. After removal of a sarcoma the growth tends to recur, and the recurrent tumor may be either more or less malignant than its predecessor, the degree of malignancy being in direct ratio to the number and smallness of the cells. A sarcoma is malignant by local tissue-infection and by dissemination. Sarcomata rarely cause

Fig. 87.—Sarcoma of the antrum.
pain when they are not ulcerated. They are commonest in the skin and connective tissue of the extremities, but they arise also from bone, neuroglia, periosteum, the lymphatic glands, the breast, the testicle, the eyeball, the parotid, and other parts. Not unusually a pigmented mole becomes sarcomatous. Hemorrhages into a sarcoma often occur, with the result of suddenly increasing the size of the mass and forming blood-cysts. Sarcomata are subject to partial fatty degeneration, to myomatous changes which produce cavities filled with fluid, to calcification, and occasionally to necrosis of large masses.

**Varieties of Sarcomata.**—The following species of sarcomata are recognized:

1. **Round-celled Sarcoma.**—A tumor composed of round or spherical cells. The intercellular substance is scanty, the mass is soft and vascular, and grows with great rapidity. It often softens, and may become cystic. The cells may be small or large. The smaller the cells the more malignant the growth (Fig. 88). A growth composed of small round cells is the most malignant form of sarcoma. **Lymphosarcoma** is a form of round-celled sarcoma which arises from lymphatic glands, lymphoid tissues, the thymus gland, the spleen, and some other structures. The structure of a lymphosarcoma resembles the structure of a lymph-gland in the fact that it has a reticulum which looks like lymphadenoid structure. **Chloroma** is a form of lymphosarcoma arising particularly from the periosteum of the bones of the cranium and face. The cells contain greenish pigment, hence the name. What is known as **glioma** of the eyeball is not a true glioma, but is really a sarcoma composed of small round cells.

2. **Spindle-celled Sarcoma.**—A tumor composed of large or small spindle-shaped cells lying in a matrix, which may be homogeneous, but which may show some attempt at fiber-formation. Angular cells and stellate cells are
Varieties of Sarcomata

often present. The cells may be placed in columns, which are at some places nearly parallel, and which at others diverge or interlace. Often there is no orderly arrangement. Spindle-celled sarcomata are usually harder than round-celled growths, but are sometimes quite soft. Cystic changes may occur. If there is a large amount of intercellular substance the growth is known as a fibrosarcoma. A rhabdomyoma is really a spindle-celled sarcoma containing striated muscle-cells. The spindle-celled sarcomata often contain cartilage. Spindle-celled growths are by no means as malignant as round-celled tumors. Often they do not show any tendency to metastasis. The greater the amount of intercellular substance, and the fewer and smaller the cells, the less the malignancy. Spindle-celled growths constitute the majority of sarcomata met with in practice.

3. Giant-celled or myeloid sarcoma is characterized by the presence of very large cells, with many nuclei looking exactly like the myeloplasts of bone-
marrow. The remainder of the growth is composed of spindle-cells, of round-cells, or of both spindle-cells and round-cells. Such a growth is maroon-colored on section. It arises most usually from bone, especially from the interior of a long bone, hence is often called osteosarcoma. It may, however, arise from other structures than bone. It is the least malignant form of sarcoma. Metastases rarely occur, and the growth often admits of complete extirpation and cure.

4. Alveolar Sarcoma.—A tumor containing both round-cells and spindle-
cells, and characterized by the formation of acini, filled with round-cells of large size resembling epithelioid cells. The walls of the acini are formed of spindle-cells and fibrous tissue, and in these trabeculi are the blood-vessels. The collection of the cells into the alveoli makes the structure resemble that of a cancer. Such growths are often pigmented. Alveolar sarcomata arise
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particularly from moles of the skin, but may arise from lymphatic glands, serous membranes, the testicle, and other parts. Such growths are very malignant.

5. Melanotic or Black Sarcoma (Fig. 89).—The color of such a tumor is due to pigment in the cells or matrix. These growths are usually composed of round-cells, but may consist of spindle-cells, and they are sometimes alveolar. Melanotic sarcomata spring from parts which contain pigment (the skin and the choroid coat of the eye); they are apt to arise from pigmented moles; they are very malignant; they implicate related lymphatic glands, and during their existence the urine contains pigment.

6. Hemorrhagic sarcoma is a sarcoma containing blood-cysts which result from parenchymatous hemorrhages.

7. Angiosarcoma takes origin from the outer coat of a blood-vessel. The growth is often very vascular, and when the blood-vessels are notably dilated the tumor is called a telangiectatic sarcoma. The ordinary forms of angiosarcoma are only moderately malignant, but alveolar and melanotic forms occur which are highly malignant. Angiosarcoma may arise in the skin, in a serous membrane, and in a salivary gland.

8. Cylindroma, or Plexiform Sarcoma.—In this variety the cells adjacent to vessels have undergone hyaline or myxomatous degeneration; the cells distant from vessels are unchanged. Section shows the normal cells apparently contained in spaces with hyaline walls. These degenerative changes occur most often in the angiosarcomata. Cylindromata arise from the brain, salivary glands, lachrymal glands, and rarely from the subcutaneous tissue. The growths are only moderately malignant.*

9. Mixed tumors consist partly of mature and partly of embryonic tissue, the cellular elements exceeding the adult elements in amount. Among these mixed tumors are fibrosarcoma or the recurrent fibroid tumor, myxosarcoma, chondrosarcoma, gliosarcoma, and osteosarcoma.

10. Endotheliomata are tumors springing from endothelium, and the name is retained no matter what change the growth ultimately undergoes. Many writers include under the term endothelioma psammoma, myxosarcoma, angiosarcoma, and plexiform sarcoma. Others consider endothelioma a special and characteristic form of sarcoma. Some would not consider it with the sarcomata at all. The growth may take origin from the “endothelium of the blood-vessels and of the perivascular lymph-spaces, of the lymph-vessels, and of the great serous cavities (peritoneum, pleura, meninges).”† The characteristic cell is the endothelial cell, usually known as the epithelioid cell. The structure of these tumors is very variable and depends upon the origin. Some tumors “recalling the original vascular network” (“American Text-Book of Pathology”), others being distinctly alveolar. Many pathologists consider a psammoma of the dura to be an endothelioma with a fibrous stroma. A psammoma contains calcareous particles. In appearance an endothelioma strongly resembles cancer, and such a growth is often spoken of as endothelial cancer. Such growths can arise in many different situations, but are particularly common in the peritoneum, pleural membrane, membranes of the brain, ovary, and testicle. I have removed an

*Stengel, “Text-book of Pathology.”
†“An American Text-Book of Pathology,” edited by Hektoen and Reisman.
endothelioma of the tonsil, and also one of the mammary gland. The proliferating endothelial cells lie in lymph-spaces. Many endotheliomata grow rapidly, secondary growths form, and metastases are apt to pass to the serous membranes. Certain endotheliomata grow slowly, do not infiltrate adjacent structure, and do not produce secondary growths. In the brain and cord endothelioma may produce no symptoms for a long time. It is not as yet possible, clinically, to distinctly recognize endotheliomata from ordinary sarcoma.

11. Mycosis fungoides is a disease which resembles sarcoma in many particulars and may be a form of sarcoma. It attacks the skin and subcutaneous tissues. The skin at first becomes red and swollen; numerous nodules form; the nodules become distinct tumors, soften at their centers, and fungation occurs. Microscopically the tumor resembles a lymphadenoma. Mycosis fungoides is considered by some pathologists to be multiple cutaneous sarcoma.

Treatment of Sarcomata.—Remove a sarcoma at once if it is in an accessible spot. Never delay removal. Cut well clear of it. If affecting a part where amputation is impossible, the rapidly growing sarcoma will almost inevitably return, and the very malignant variety, if uninterfered with,
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may terminate life in six months; but even in such case operation postpones the evil day and renders it possible that death will occur from metastatic growth in an organ, and that the patient will escape the horrors of ulceration and hemorrhage from the original tumor. Slowly growing and hard tumors offer some prospects of cure. The mixed tumor (as a recurrent fibroid) may repeatedly recur, and yet the patient may be cured at last by a sixth, an eighth, or a tenth operation. In a case of spindle-celled sarcoma of the breast the younger Gross performed 22 operations in the course of four years, and eleven years later the woman was well. In sarcoma of a long bone amputation should, as a rule, be performed, though in some cases of giant-celled sarcoma of the radius, ulna, or fibula excision may be employed. In sarcoma of either jaw-bone, excision; of the eye, enucleation; and of the testicle, castration, is demanded. Sarcoma of the ovary in adults demands removal, but in children the operation is generally useless. Sarcoma of the kidney in adults calls for nephrectomy, but in children the operation is usually of little avail. In my experience, in the cases of sarcoma of the kidney which survived operation, the growth always appeared in the other kidney. In melanotic sarcoma remove the growth and adjacent lymph-glands, or in some cases amputate. Removal of a sarcoma when there is no hope of a cure is often justifiable to prolong life, to relieve the patient of a foul, offensive, bleeding mass, and to permit of an easier road to death by means of metastasis to an internal organ. In an inoperable case the ligation of the vessel of supply may do good. In sarcoma of the tonsil Dawbarn advises the extirpation of the external carotid artery and the ligation of its branches. The operation is performed first on one side of the tumor and in a week or so on the other side. I employed it in 3 cases with distinct benefit. Occasionally, though very rarely, suppuration cures a sarcoma. Wyeth, of New York, reported a case of sarcoma of the abdominal wall. It was found possible to remove only part of the growth; suppuration followed and the tumor disappeared, and ten years later had not returned. A study of statistics seems to indicate that more cases of sarcoma are cured after operation if the wound suppurates than if it remains aseptic, and it has been proposed to deliberately infect the wound with pus germs to lessen the danger of recurrence. This proceeding, however, is dangerous to life.

It has been observed that an attack of erysipelas occasionally greatly benefits a sarcoma, causing large masses of the growth to soften or to slough and exposing a granulating surface. Busch noticed this in 1866, but the fact had been observed in the seventeenth century. Interest was decidedly awakened by Billroth's case of sarcoma of the pharynx which was cured by an attack of facial erysipelas. It was suggested that in inoperable cases of sarcoma erysipelas might be established artificially. Fehleisen inoculated tumors with cultures of erysipelas. Lassar, in 1891, employed the toxins (cultures rendered sterile by heat and filtration). In 1892 Coley began his observations. The first plan was as follows: a bouillon culture is made of the streptococci; this culture is filtered through porcelain and an injection is given once a day into and about the sarcoma. It was suggested that in inoperable cases of sarcoma erysipelas might be established artificially. Fehleisen inoculated tumors with cultures of erysipelas. Lassar, in 1891, employed the toxins (cultures rendered sterile by heat and filtration). In 1892 Coley began his observations. The first plan was as follows: a bouillon culture is made of the streptococci; this culture is filtered through porcelain and an injection is given once a day into and about the sarcoma. The first dose is \( \text{ml} \), and it is progressively increased; it should cause a febrile reaction, and sometimes establishes softening or suppuration. Coley's present method is as follows: make cultures of erysipelas cocci in cacao broth; after three weeks inoculate
them with the bacillus prodigiosus, and cultivate the mixed growth for four weeks. The mixed cultures are maintained at a temperature of 136° F. until they become sterile. This sterile fluid contains the toxins. The dose is from 1 to 8 minims. The material is very powerful and may cause high fever. Begin with a small dose and gradually increase until the proper amount of reaction ensues (103°–104° F.). The injection may be about the sarcoma or at a distant point. It seems definitely proved that cases are occasionally cured by Coley's fluid. Spindle-celled sarcomata are influenced most favorably. Round-celled sarcomata are very refractory and so are cancers. The method is not entirely free from danger. It seems of value in post-operative cases to prevent recurrence. For this purpose it is applied twice a week for several months. Emmerich and Scholl claim good results from the injection of erysipelas serum. A sheep is injected with cultures of erysipelas, the blood is drawn, the serum separated, filtered to remove cocci, and injected about the sarcoma. Results are not definite. Among other agents which have been used to inject inoperable sarcomata we may mention alcohol, chlorid of zinc, arsenic, corrosive sublimate, thiosinamin, pepsin, alkalies, etc. The injection of anilin products into the sarcoma, which has received a qualified commendation from some observers, has been abandoned by most surgeons. The x-rays are sometimes of benefit, but are not so serviceable as in carcinoma.

Adrenal Tumors.—Some of these tumors bear a strong resemblance to adenomata and carcinomata. Some adrenal tumors are benign, and among such tumors we note fatty growth, fibrous growth, and a growth resembling glioma. Another benign growth imitates the structure of the cortex of the adrenal. Malignant tumors occur, and many of them are identical or almost identical with sarcoma. One form is composed of epithelioid cells and resembles endothelioma.

Accessory adrenals are common. They are known as adrenal rests. "They are found oftener in the connective tissue about the main adrenals, but also in the kidneys, the right lobe of the liver, along the renal vessels and spermatic veins, in the inguinal canals, and in the broad ligaments" ("American Text-Book of Pathology"). Tumors may take origin from adrenal rests.

Innocent Epithelial Tumors.—These growths imitate an epithelial tissue of the mature and healthy organism.

Papillomata, or Warts.—Papillomata are formed upon the type of cutaneous and mucous papillae. A papilloma consists of a fibrous stroma which contains blood-vessels and lymphatics and is covered with epithelium of the variety appertaining to the diseased part. Papillomata grow from the skin and from mucous membranes; they may be single or multiple; many may form in one region or various distant parts may be affected; they may be painless or may be ulcerated or bleeding; they vary in color from light pink to deep brown or black. Papillomata of the skin are usually hard; papillomata of mucous membranes are soft. A skin-wart may be smooth and rounded, or may look like a cauliflower, the epidermis upon it being very rough. A papilloma of a mucous membrane looks like a cauliflower. Papillomatous masses may gather around the anus, the vagina, or the penis during the existence of a filthy discharge (venereal warts) (Fig. 91), and crops of warts may appear on the hands of those who work in irritant material (as petroleum). Papillomata are apt to arise in mucous membranes about carcinomata or
chronic ulcerations. A large crop of warts may disappear in a single night; hence the popular belief in the efficacy of charms. Warts are particularly common on the skin of the back of the hands and fingers, the skin of the back, and the skin of the neck and scalp. A single skin-wart may reach the size of a walnut and become pigmented. The squamous epithelium covering a skin-wart may become horny (a wart-horn). Other cutaneous horns arise from the nails, from the scars of burns, or from ruptured sebaceous cysts.

*Villous papillomata* grow chiefly from the bladder, but they may also grow from the stomach and intestine. A papilloma of mucous membrane covered with squamous epithelium looks like a wart of the skin. Papillomata of the larynx are formed of squamous epithelium. Villous papillomata form tufts like the villous processes of the chorion; they may be single or multiple, and may be sessile or pedunculated; they are very vascular, and are apt to bleed freely. Papillomata may arise in cysts of the paroophoron, in cysts of the mammary gland, from the choroid plexuses of the ventricles of the brain, and from the spinal membranes. Papillomata may give rise to hemorrhage or may impair the function of a part. Any papilloma may become a cancer.

**Treatment.**—Venereal warts are treated by repeatedly washing with peroxid of hydrogen, drying with cotton, and dusting with a powder composed of borated talcum or of equal parts of calomel and subnitrate of bismuth, or of oxid of zinc and iodoform. If they do not soon dry up, cut them off with scissors and burn with the Paquelin cautery. Ordinary warts may usually be destroyed in a short time by daily applications of lactic or chromic acid. In multiple warts of the face Kaposi applies daily for several days a portion of the following combination: sublimed sulphur, 3v; glycerin, 5iss; acetic acid, 3iss. Keeping a wart constantly moist with castor oil will usually cause it to drop off. Warts, and even extensive callosities, may be removed by painting once a day for five days with pure carbolic acid and covering with
lint kept wet with boric acid. A convenient plan is to paint a wart daily with a solution containing 1 part of corrosive sublimate to 30 parts of collodion (hydrarg. chlor. corros., 3ss; collodion, 3xv). Large warts should be excised. Villous papillomata of the bladder demand the performance of a suprapubic cystotomy in order to remove them. A papilloma of the larynx may be removed with the cautery loop or may be destroyed with the cautery.

Adenomata.—Adenomata are tumors corresponding in structure to normal epithelial glands. They have a framework of vascular connective tissue, and they may contain acini and ducts like racemose glands or tubes like tubular glands. The acini or tubules contain epithelium of either the cylindrical or polyhedral variety. Adenomata grow from secreting glands, but cannot produce the secretion of the glands from which they spring; or, if they do secrete, the fluid is retained, and not discharged by the gland-ducts. Adenomata occur in the mammary gland, the parotid, the ovary, the thyroid gland, the liver, the sweat-glands, the sebaceous glands, the kidney, the pylorus, and the prostate; and they may spring as pedunculated growths from the mucous lining of the intestine and uterus. They are encapsuled, are usually single, but may be multiple, are of slow growth, but may attain a great size; they do not tend to recur after thorough removal, do not involve adjacent glands, and do not disseminate; they are firm to the touch; they tend to become cystic (especially in the thyroid gland), the fluid which distends the ducts being due to mucoid liquefaction of the proliferating epithelium. If cysts form, the growth is spoken of as a cystic adenoma. If the framework of an adenoma contains considerable fibrous tissue, the tumor is named a fibro-adenoma. Adenomata are particularly liable to become carcinomatous.

In the breast a fibro-adenoma has a distinct capsule; it is elastic and movable, is usually superficial, and one occasionally exists in each gland. They are most common before the age of thirty, and are often painful, especially during menstruation. Cystic adenomata of the breast attain a large size; they are encapsulated and grow slowly, are most common after the thirtieth year, and are rarely painful. Both fibro-adenoma and cystic adenoma may arise in the male breast. Young unmarried women not unusually develop in the breast small, very tender, and painful bodies, most usually around the edge of the areola, which bodies increase in size and become more tender during menstruation; they are only cysts of the mammary tissue.

Adenomata of the thyroid gland usually begin before the fifteenth year. Adenomata may arise in the prostate if that gland be already the seat of senile hypertrophy. Adenomata of mucous glands may arise in the young or middle-aged. Adenomata of mucous membranes often cause hemorrhage and interfere with function.

Treatment.—Adenomata should be extirpated. To let them alone exposes the patient to the danger of cancerous change. By confusing adenomata of the mammary gland with small cysts of that structure an erroneous belief has arisen that the former, as well as the latter, may sometimes be cured by the local use of iodin, mercury, ichthyol, and the internal use of iodid of potassium. The treatment in the breast, as elsewhere, is excision.

Malignant Epithelial Tumors, Carcinomata, or Cancers.—Cancers are tumors growing from epithelial surfaces, and are composed of
embryonic epithelial cells which are clustered in spaces, nests, or alveoli of fibrous tissue, and which proliferate enormously, extending beyond normal anatomical boundaries and as an invading host entering into connective tissue. This unrestrained and unlimited reproduction of epithelial cells is the characteristic of cancer. The cells of a cluster are not separated by any stroma, and the walls of the alveoli carry blood-vessels and lymphatics. The growth may be cancerous from the start, or may have begun as an innocent epithelial tumor. Cancers are always derived from epithelium (of glands, of skin, of mucous membrane, etc.), and if found in a non-epithelial tissue must be secondary, or must have arisen from a depot of embryonal epithelial cells of prenatal origin lying in the midst of a non-epithelial tissue. Carcinomata have no capsules, rapidly infiltrate surrounding tissues, and are firmly anchored and immovable. In the beginning a cancer is a local lesion; but it soon attacks related lymph-glands and by means of the lymph is carried to other structures, producing secondary tumors and diseases and enlargement of adjacent and finally of more distant lymph-glands. When lymphatic vessels are obstructed, lymph filled with cancer-cells may flow in a direction the reverse of that pursued in health. Secondary growths are identical with the parent growth. Widespread or general dissemination is due to carcinomatous thrombosis of a vein or perforation of the wall of a vein, multiple emboli forming. Strange to say, emboli of cancer-cells may be surrounded with blood-corpuscles and move against the blood-current. A metastatic focus consists of cells identical in character with those of the primary focus. For instance, the cells of a primary carcinoma of the liver may secrete bile, and the cells of a metastatic area may do the same. Fürterer has reported a case of carcinoma of the thyroid with pulmonary metastases which secreted colloid. Metastases from a columnar-celled rectal cancer are composed of columnar cells. Metastases from a squamous-celled epithelioma are composed of squamous cells. Cancer is rare before the age of forty, and never occurs before puberty; and is sometimes linked with continued irritation as a cause (cancer of the penis in phimosis; cancer of the lip from the hot stem of a clay pipe; chimney-sweeps' cancer from soot in the scrotal folds; cancer of the gall-bladder when gall-stones exist). Dennis says that all clinical evidence points strongly to the view that inflammatory changes following irritation are responsible for cancer. Hereditary influence seems in some instances to favor the development of carcinoma. That cancer is due to parasitic influence is warmly advocated by many pathologists and surgeons. It is true that transplantation has taken place, but only by autoinfection or by transplantation to an animal of the same species.
The facts that transplantation can be sometimes carried out, and that contagion is a possible occurrence under exceptional circumstances, do not prove that cancer is a parasitic disease, but simply prove that it can be transplanted. It is not that the cancer carries a parasite which will cause the disease in sound tissues, but rather that the cells of the cancer may themselves take root and grow in sound tissues (page 246). The parasitic theory arose from observation of the metastasis which occurs during the progress of the disease, and received support from the fact that inoculation of another part of an individual suffering from cancer may be followed by the development of a tumor like the original growth. For instance, if a cancer is growing upon the lower lip, the upper lip may be inoculated (contact cancer). It has also been pointed out that carcinoma is especially common in regions predisposed by their situation to injury and infection, and that, “among the lower animals at least, tumors resembling carcinomas have been transplanted from one to another” (“Recent Studies upon the Etiology of Carcinoma,” by Joseph Sailer, “Phil. Med. Jour.,” June 7, 1902). Roswell Park believes that Gaylord has really produced adenocarcinoma in a number of animals. But there is great doubt as to the cancerous nature of some of the tumors which have been successfully transplanted from one animal to another.

In successful transplantations there is as yet no proof that epithelial cells were not transferred with the supposed parasites, and if they were transferred the success of the experiment does not prove that cancer is due to parasites, but simply proves again what we knew before—that epithelial cells can be transplanted. Many parasites have been regarded as causative by different observers. Bacteria, yeast-cells, and protozoa have been found by different experimenters. It is not thought that bacteria are causative. Yeasts are regarded as causative by some. It is certain that they may exist in cancer, but it is by no means certain that they cause the disease. They may be only a contamination. Gaylord and others regard the protozoa as causative, but this statement does not seem to be proved. Many of the supposed parasites of cancer have been shown to be cell-degenerations or contaminations. We are justified in concluding that the parasitic origin is not as yet proved, and we agree with the elder Senn that it is improbable. A carcinoma is often the seat of pricking pain; the growth tends strongly to recur after removal; is prone to ulcerate, causing pain, hemorrhage, and cachexia; makes rapid progress, and is often fatal in from one to two and a half years. It is more common in women than in men, and rarely exists in association with tubercle. After a cancer has existed for a time in an important structure, or after a superficial cancer has ulcerated and become hemorrhagic, there are noted in the individual evidences of illness and exhaustion. We speak of this condition as the cancerous cachexia, and in it the muscles are wasted, the body-weight is constantly diminishing, the complexion is sallow, the face is sunken, pearly white conjunctiva contrast strongly with the yellow skin, the pulse is weak and rapid, and night-sweats add to the exhaustion. The above condition is due to the absorption of toxic products from the diseased tissues, and also to pain, loss of sleep, bleeding, deprivation of exercise, and malassimilation of food. Mental depression is not a cause of recurrence, but is simply expressive of a condition of nutritive failure which may favor recurrence (J. D. Bryant). Recurrence after operation is due to the growth of cells which
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were not removed. Cancer may kill by obstructing a canal, by destroying the functions of a viscus or organ, by hemorrhage, by anemia, by sepsis, or by exhaustion.

**The Alleged Increase of Carcinoma.**—Is cancer increasing? The apparent death-rate from cancer increases year by year. It is pointed out by W. Roger Williams that in England and Wales the mortality from cancer has increased from 1 to 5646 in 1840, to 1 to 1306 in 1896, and the proportion to deaths from other causes has risen from 1 to 129 in 1840, to 1 to 22 in 1896.*

Roswell Park comments on the increasing number of deaths from cancer in New York State, and says if it continues for the next ten years the disease will kill more persons annually than phthisis, smallpox, and typhoid combined. Such statements are truly alarming, and yet the reality of this apparent increase is doubtful. A part of the apparent increase is due to the greater frequency of exploratory operations for diagnostic purposes, to the greater frequency of post-mortem examinations, and to more correct diagnoses of obscure internal conditions. Again, death certificates are filled in more accurately than was once the case. Neusholme says that just as deaths certified as due to old age grow apparently fewer every year, so other non-specific certifications grow fewer, and cancer gains as they lose. The experience of most practical surgeons is that there is a real increase in cancer, but the extent of the increase cannot be ascertained with any accuracy.

**Classification of Carcinomata.**—Carcinomata are classified as follows: (1) Epithelioma; (2) rodent ulcer, or Jacob's ulcer; (3) spheroidal-celled cancer; (a) scirrhous; (b) encephaloid; (c) colloid; and (4) cylindrical-celled cancer. Clinically we speak of cuirass cancer, a condition sometimes arising when the mammary gland is cancerous and due to the infiltration of the cutaneous lymphatics with cancer-cells; chimney-sweeps' cancer and paraffin workers' cancer, if either of these occupations seems to have been causative; cancer à deux, a phrase used in France to signify that carcinoma has occurred in two persons of a household who are not blood relations, but have been in close contact; contact cancer when it follows close contact—for instance, when a cancer of the upper lip follows a malignant growth of the lower lip; when a carcinoma of the face follows a like growth of the hand; when a carcinoma of the face follows a like growth of the hand; when a cancer appears on the penis of a husband whose wife has cancer of cervix uteri or vagina. A melanotic carcinoma is a form of encephaloid in which the cells contain melanin. Scirrhous cancer contains much fibrous tissue and is densely hard. An encephaloid is very soft or brain-like. Marjolin's ulcer is an epithelioma which arises from the epithelial edge of a chronic ulcer, a scar, or a sinus.

**Epitheliomata.**—An epithelioma arises from surface epithelium, and may arise from squamous cells or cylindrical cells, according to the location. Squamous-celled epithelioma takes origin from the skin or from a mucous membrane covered with pavement epithelium. It is especially apt to appear at the junctions of skin and mucous membrane (as the lips) or the point of juxtaposition of different kinds of epithelium. Such a growth may arise in the anus, vagina, penis, scrotum, lips, tongue, mouth, nose, skin, and other situations. There is an ingrowth of surface epithelium into the subepithelial connective tissue, colonies of cells growing inward and forming epithelial nests.

* Lancet, Aug. 20, 1898.
It may arise without discoverable cause, it may follow prolonged irritation, or it may arise in a wart or fissure. In the nipple it is not very unusually, and in the scrotum and nose it is occasionally, preceded by a persistent eczema, due possibly to psorosperms, and known as Paget's disease. Paget's disease is not true eczema, but is rather malignant dermatitis. A crust gathers on the part, and beneath this crust is a raw, red, and moist surface, the edge of which is slightly elevated and somewhat indurated. In the beginning there is a strong resemblance to eczema. The nipple is apt to retract. The parts are the seat of a constant itching and scalding sensation. The area may become cancerous in a few weeks, but may not for years. Squamous epithelioma generally begins as a warty protuberance which soon ulcerates. A malignant or true cancerous ulcer has a hard, irregular base, uneven edges, a foul, fungus-like bottom, and gives off a sanious or ichorous discharge. This ulcer is the seat of sharp, pricking pain, sometimes bleeds, and extends over a considerable area, embracing and destroying every structure. Epithelioma usually affects lymphatic glands early, but such infection may be delayed for eight or ten months. Epitheliomatous glands break down in ulceration, making frightful gaps and often causing fatal hemorrhage. Dissemination is not nearly so common as in other forms of cancer, but it does sometimes occur.

Cylindrical-celled Epithelioma.—This form of growth takes origin from structures covered with or containing cylindrical epithelium, and it contains cylindrical or columnar cells. It is composed of a stroma of fibers between which lie tubular glands lined with columnar epithelium and containing masses of epithelial cells. Such tumors are found in the uterus and gastrointestinal tract, and may begin from the surface epithelium or from the cells of tubular glands. In these tumors there is an acinus-like structure and the spaces are filled with proliferating epithelium. Cylindrical-celled cancers also arise from the mammary gland, liver, and kidney. One of the most common seats of cylindrical cancer is the rectum. Cancer of the rectum may occur at an earlier age than cancer elsewhere, being not uncommon between the ages of twenty-eight and forty. Cylindrical-celled epitheliomata are at first covered with mucous membrane, but they soon ulcerate and involve the submucous and muscular coats in the growth. They grow rather slowly, usually, but not always, cause lymphatic involvement, and finally disseminate widely. They require often from five to six years to cause death.

A rodent or Jacob's ulcer is scarcely ever met with except upon the face, though Jonathan Hutchinson saw one upon the forearm, and James Berry met with one upon the arm. It is especially common upon the nose and forehead. It begins after the age of forty as a little warty prominence which ulcerates in the center, the ulceration progressing at a rate equal to the new growth. The ulcer becomes deep; it is not crusted; its edges are irregular, hard, and everted; the floor is smooth and of a grayish color; the discharge is thin and acrid; and the parts about the sore contain numbers of visible vessels. Jacob's ulcer grows slowly, may last for years, does not involve the lymphatics, produces no constitutional cachexia, and is rarely fatal. A rodent ulcer is usually considered to be a malignant epithelial growth which springs from a sweat-gland, a sebaceous gland, or a hair-follicle, but Kanthack
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asserts that before ulceration the rete and the sweat-glands are normal, but the sebaceous glands are destroyed. The base and edges of the ulcer are hard, which differentiates it from lupus; and, further, the bacilli of tubercle may sometimes be cultivated from the discharge of an area of lupus (page 180). Rodent ulcer begins below the skin, ordinary epithelioma begins in the skin, and a rodent ulcer contains no cell-nests. A rodent ulcer very rarely undergoes cicatrization, a fact which differentiates it from lupus. Occasionally, but very rarely, a small portion of the growth sloughs out and a temporary scar forms at this point.

Glandular Carcinoma.—Glandular carcinomata in structure resemble racemose glands. They consist of a stroma of connective tissue and alveoli filled with proliferating epithelial cells. If the proportion between the fibrous stroma and the cellular elements is about the same as in a normal gland, the growth is called simple. When the cellular element is in excess the growth is soft (medullary), and when the fibrous stroma is in excess the growth is hard (scirrhous).

1. Scirrhous carcinoma is a white and fibrous mass which has no capsule, which infiltrates tissues, and which draws in toward it, by the contraction of its outlying fibrous processes, adjacent soft parts, thus producing dimpling, or, as in the breast, retraction of the nipple. It is composed of spheroidal cells in alveoli formed of connective-tissue bands. The commonest seat of scirrhus is the female breast. It occurs also in the skin, vagina, rectum, prostate, uterus, stomach, and esophagus. It is most frequent in women after forty. It begins as a hard lump which is at first painless, but which after a time becomes the seat of an acute, localized, pricking pain. This lump grows and becomes irregular and adherent, causing puckering of the soft parts. After the skin or mucous membrane above it has become infiltrated ulceration takes place and a fungous mass protrudes which bleeds and suppurates. The adjacent lymphatic glands usually become cancerous, the time occupied being from six to ten weeks, and constitutional involvement is rapid and certain.

2. Medullary or encephaloid carcinoma is a soft gray or brain-like mass. It is a rare growth, it has no capsule, and it may appear in the kidney, liver, ovary, testicle, mammary gland, stomach, bladder, and maxillary antrum. An encephaloid cancer often contains cavities filled with blood, and this variety is known as a "hematoid" or a "telangiectatic" carcinoma. These growths are soft and semi-fluctuating, they infiltrate rapidly and soon fungate, and they terminate life in from a year to a year and a half. If the cells of encephaloid become filled with melanin, the condition is called "melanosis" or "melanotic cancer."

3. Colloid cancer is extremely rare. It arises from either a scirrhus or an encephaloid, when the cells or the stroma of such a growth undergo colloidal degeneration. On section there will be seen in the center of the growth a series of cavities filled with a material resembling honey or jelly; the periphery is frequently an ordinary scirrhus or encephaloid cancer. Colloid degeneration is most prone to attack carcinomata of the stomach, mammary gland, and intestine. The name colloid cancer is often given to glistening, gelatinous, malignant growths springing from the ovary, testicle, mammary gland, or gastro-intestinal tract. The condition is due to mucous degeneration of the
connective tissue or of the epithelial tissue of a carcinoma. Only a portion of the tumor may degenerate or the entire mass may become gelatinous.

Syncytioma Malignum.—By this name is meant a malignant epithelial growth arising from the site of the placenta during pregnancy or the puerperal state. It resembles placenta in appearance and rapidly causes metastases by way of the blood-vessels. It is quickly fatal.

Treatment.—Carcinomata demand early and free excision, with removal of implicated glands. Anatomically related lymph-nodes must be removed even if they show no evidence of involvement. If operation is early and thorough, and if certain regions are involved, a considerable proportion of cases can be cured. Carcinomata of the lip, the skin, and the mammary gland can often be cured. A recurrent growth may be removed as a palliative measure, to lessen pain and to relieve the patient from ulceration and hemorrhage, but such an operation is rarely curative. If a growth does not recur within five years after removal, a cure has probably been attained; in fact, if there is no recurrence within three years, the case is probably cured. The three-year limit has been usually accepted since Volkmann's paper on the subject. A rodent ulcer should be excised or else be curetted and cauterized with the hot iron or the Paquelin cautery. In cancer of the lower lip, remove the growth by Grant's operation (q. v.), or by a V-shaped incision, or cut away the entire lip. In every case remove the glands beneath the jaw. In cancer of the tongue, excise this organ and also the lymph-nodes from beneath the jaw and in the anterior carotid triangles. In cancer of the breast, remove the breast, the pectoral fascia, and the great pectoral muscle, and take away the fat and glands of the axilla. In cancer of the rectum, if near the surface, excise the rectum from below; if above five inches from the anus, do the sacral resection of Kraske and then remove the growth. In cancer of the esophagus, perform gastrostomy; in cancer of the pylorus, perform pylorectomy or gastro-enterostomy; in cancer of the bowel, do resection with end-to-end approximation, side-track the diseased area by an anastomosis, or make an artificial anus; in cancer of the penis, amputate and remove the glands of the groin. Erysipelas toxins and erysipelas serum have been tried in inoperable carcinoma, but without any positive benefit. Von Leyden and Blumenthal ("Deutsche medicinische Wochenschrift," Sept. 4, 1902) report benefit to human beings suffering from cancer by the injection of serum expressed from carcinomatous tumors. Such observations require many confirmatory studies before we can assume that a remedy has been found. The same is true of the employment of pyoktanin, thiosinamin, and of all other drugs that have been suggested. The x-rays are of distinct value in certain cases of carcinoma. Surface growths may be apparently cured, although unfortunately they are apt to return even after total disappearance. Deeper growths are apparently not benefited. In some cases ligation of the artery of supply or extirpation of the artery, as suggested by Dab-barn, notably retards growth. I have been able to confirm this statement. In cancer of the breast, oophorectomy occasionally produces benefit or even cure (Beatson's operation). In inoperable cases palliative operations may be justifiable to relieve some urgent discomfort or get rid of a foul or bleeding mass. Gastro-enterostomy, gastrostomy, and colostomy are palliative operations. In a malignant growth of the nasopharynx tracheotomy may be
required, and in a malignant growth of the bladder it may be advisable to perform suprapubic cystotomy. In an inoperable case relieve the pain by opium, giving as much as may be required to secure ease. Opium so used seems not only to relieve pain, but to retard the growth of the tumor and to favor the development of fibrous tissue in the stroma.

**Cystomata.**—A cystoma is a benign cystic tumor in which the cells of the cyst-wall constitute the new growth. The cyst contents are derived from the cells of the wall. The tumor is the cyst-wall; the cells of this wall are derived from the epiblast, the hypoblast, or the mesoblast, and are either epithelial or endothelial. The cells of the cyst-wall adhere to connective tissue which seems to constitute a part of the wall. A thick wall contains much connective tissue, a thin wall very little. The nature of the contents is dependent on the character of the cells which constitute the tumor. Cysts lined by endothelium contain serous fluid; a cyst of the thyroid gland usually contains colloid material; a cyst lined by flat epithelial cells contains matter resulting from fatty degeneration, etc.

Cystomata may be congenital or acquired, and an acquired cystoma may arise after injury or follow inflammation. The cyst may increase in size progressively or its growth may be halted. The wall may become calcareous or even bony. When a cyst has one cavity, we call it monolocular; when there are several or many cavities, it is called multilocular.

**Varieties of Cystomata.**—The chief varieties are: Traumatic epithelial; atheromatous; mucous; mesoblastic.

**Traumatic Epithelial Cystomata.**—These growths have been called traumatic dermoids. Such a growth may arise after an injury which carries and deposits epithelial cells or a bit of skin deep into the connective tissue. For instance, a punctured wound of the hand may be followed by an epithelial cystoma. It may arise after a scalp wound or in the scar of a burn. The cyst grows only to a certain size and then remains stationary. It is lined by pavement epithelium and it contains products of the fatty degeneration of epithelial cells.

**Treatment.**—Extirpation of the wall.

**Atheromatous Cystomata.**—These growths, according to Senn, are met with particularly in the ovaries, in the orbital region, and at the base of the tongue, but they can arise almost anywhere. They may remain small or may attain a great size. Such a cystoma contains epithelial cells which have undergone fatty degeneration and sometimes contains oil. An atheromatous cystoma is deep seated and is not connected with the skin, in contrast to a sebaceous cyst, which is superficial and is a part of the skin. An atheromatous cystoma is lined with epithelium, but not with skin. A dermoid cyst is lined with skin or other definite structures. An atheroma is due to the displacement of a mass of epithelial cells, which mass was the matrix of the cystoma. “The displacement of the matrix of an atheroma occurred at a time prior to the differentiation of the epiblastic cells into the organs representing the appendages of the skin, while the matrix of a dermoid cyst points to a later displacement of the matrix” (“Pathology and Surgical Treatment of Tumors,” by Nicholas Senn). Atheromatous cystomata may be congenital, but may not appear until puberty or even much later.

**Treatment.**—Extirpation of the wall of the cystoma.
Teratomata

Mucous Cystomata.—A mucous cystoma, like an atheromatous cystoma, is due to the displacement of epithelium, but in the former condition it is pavement epithelium and in the latter it is columnar epithelium. The one is filled with fatty debris and the other with a mucoid material. Such a mucous cystoma must not be confused with a retention-cyst of a mucous membrane. Mucous cystomata are found particularly about the lips, mouth, and pharynx. They rarely attain any considerable size. Cystoma lined with ciliated epithelium may arise in the testicle, the liver, and the brain.

Treatment.—Incise, cauterize, and drain. The wall is so delicate that excision is rarely possible.

Mesoblastic Cystomata.—They are lined with endothelial cells. They contain serous fluid, often grow to a large size, and sometimes disappear spontaneously. Mesoblastic cystomata are probably distended lymph-spaces. They are congenital and are most common in the neck, axilla, and perineum. In one case seen by the author such a cystoma of the neck appeared late in life, but it is probable that it had existed in childhood, and after disappearing for a long time had reappeared. The most common form of mesoblastic cyst is known as hydrocele of the neck.

Treatment.—Excision is very difficult. In one case in which I assisted Professor Keen it was successfully accomplished. The usual treatment is to tap frequently, after each tapping washing out with carbolic acid (2 to 5 per cent.), and applying pressure.

Cystoma of bone, of the thyroid gland, of the mammary gland, etc., are considered in the sections on Regional Surgery.

Teratomata.—The teratomata contain tissues or higher structures derived from two or all of the blastodermic layers. The tumors we previously considered are derived from only one of these layers. The elder Senn, in his work on "Tumors," thus defines a teratoma: "A teratoma is a tumor composed of various tissues, organs, or systems of organs which do not normally exist at the place where the tumor grows. The highest type of a teratoma is a foetus in foetu. In the simpler varieties the tumor is composed of heterotopic tissue, such as bone, teeth, skin, mucous membrane, etc. All teratoid tumors are congenital; that is, the tumor either exists at the time of birth or the patient is born with the essential tumor matrix. A teratoma never springs from a matrix of post-natal origin." Any human structure may be found in a teratoma. Various fetal malformations belong to this group, as do also double monsters, in which one of the embryos is rudimentary. The members of this group most often seen by the surgeon are branchial cysts and dermoid cysts.

Branchial Cysts.—When a branchial cleft fails to become completely obliterated, a branchial cyst may form. The branchial clefts are the analogues of the gill-slits of a fish. There are four of these clefts on each side of the neck. They are called clefts, but they are really grooves, and each groove on the skin has its counterpart in the mucous membrane of the pharynx. Each pharyngeal groove is covered with hypoblastic epithelium; each cutaneous groove is covered with epiblastic epithelium, and the two grooves are separated by mesoblastic structures. When the sides of a cleft do not unite and an opening forms in the mucous membrane, a complete branchial fistula results. When the sides of a cleft fail to unite, and, although the mucous
membrane is not perforated, the skin does not cover the cleft, an *incomplete branchial fistula* results. When the sides of a cleft toward the pharynx fail to coalesce, a *pharyngeal diverticulum* is produced. When the pharyngeal surface and the cutaneous surface both close, but the deeper part of a cleft remains open and epithelial cells are caught in mesoblastic elements, a *branchial cyst* is formed.

The essential cellular element of such a cyst is epithelium, either from the skin or pharynx; hence the branchial cyst is not a dermoid, because its histological elements are derived from only one of the blastodermic layers. Branchial cysts are most common in the triangle of election of the left side. They are round, smooth, often fluctuating, and are very deeply situated, being in close relation with the great vessels. Some cysts contain mucus, others serous fluid, others fatty débris.

*Treatment.*—In old children and in adults it may be possible to extirpate, although this is very difficult and often impossible. Other methods employed are incision, cauterization with the Paquelin cautery, and packing with gauze; frequent tapping and injection with iodin; incision and drainage, every antisepic care being observed. In all young children and in some older persons with deep cysts, the latter plan is the only one advised, and it will often fail, but will sometimes produce a cure.

**Dermoid Cysts.**—These cysts were first studied and described by Lebert. The name dermoid implies that the cyst contains skin, and it does contain skin or mucous membrane, the chief mass of the tumor being derived from proliferation of the cells of a portion of displaced epiblast or hypoblast. A superficial dermoid is formed by the inclusion in mesoblastic tissues of a portion of the epidermis or mucous membrane. Superficial dermoids are situated in the region of fetal fissures which have closed. A deep dermoid is formed from a collection of epithelial cells completely separated from the epiblastic tissue from which they originated. When a cyst originates from epiblastic cells so immature that the skin appendages have not as yet been formed, it will contain only atheromatous material like that found in a sebaceous cyst. When a cyst arises from epiblastic cells after they have so matured that the appendages of the skin have been formed, it will contain atheromatous matter, sweat, sebaceous matter, and hair. The first form is known as an atheromatous cystoma; the second, as a dermoid. A deep-seated dermoid may contain also such structures as prove it must have taken origin from “a displaced matrix representing different tissues and organs” (Senn). Such a dermoid may contain portions of organs, bone, cartilage, and teeth.

Dermoid cysts are most commonly found in the ovary and in regions where, during bodily development, the blastodermic layers come in contact; for instance, in the neck, the eyelids, the orbital angles, the region of the coccyx, the root of the nose, and the floor of the mouth. Such cysts are also found in the ovary, testicle, brain, eye, mediastinum, lung, omentum, mesentery, and carotid sheath. A dermoid cyst may be defined as a heterotopic cyst, the wall of which is composed of connective tissue lined with epithelium, and containing material formed by the proliferation of epithelium and often hair, teeth, or even bone.

Sarcoma may form from the connective-tissue elements of the wall of a dermoid cyst. A dermoid cyst may become cancerous, or innocent epithelial...
tumors may originate from the cyst lining. The epithelial cells may become fatty, and an oil-cyst may actually form. If the cyst epithelium was derived from mucous membrane, mucus may gather in the sac. A dermoid cyst may inflame or even suppurate. A dermoid cyst is free from pain unless it suppurates, inflames, or develops into a malignant tumor; it grows slowly and rarely attains any considerable size unless it arises in the ovary. Such cysts tend to appear in particular regions. A subcutaneous dermoid may or may not fluctuate. It is not in the skin as is a sebaceous cyst, but the skin can be moved over it. A sebaceous cyst moves with the skin. Subcutaneous dermoids about the orbit are adherent to the underlying periosteum. A sacral dermoid bears a striking likeness to a spina bifida. The matrix of a dermoid is congenital, but the cyst often does not appear until puberty or later.

Treatment.—Complete extirpation. If any of the epithelium of the cyst-wall is left, the cyst will re-form. A superficial dermoid is removed in the same manner as a sebaceous cyst, and if it is adherent to underlying periosteum the portion of this membrane to which it adheres is also removed. A deep dermoid is removed as a tumor would be if operation is feasible.

Cysts.—A cyst is a cavity, abnormal or pathological in character, lined by a membrane and containing material usually fluid or semi-fluid. It is necessary to bear in mind the distinction between a cystoma and a cyst. Hektoen and Riesman, in "An American Text-Book of Pathology," insist on this distinction. They say: "A cystoma is a true tumor, arising from active proliferation of a matrix destined to form cystic spaces; whereas a cyst is a secondary formation not primarily due to tissue proliferation." Cysts are divided into the following classes: Retention-cysts; cysts from softening; tubulo-cysts; and parasitic cysts ("American Text-Book of Pathology").

Retention-cysts.—A retention-cyst is formed by blocking of the duct of a gland or by a failure in the absorption of the proper amount of the secretion of a ductless gland. A few characteristic forms of retention-cysts will be described.

Sebaceous Cysts.—These arise when the excretory duct of a sebaceous gland is blocked by dirt or occluded by inflammation. The orifice of the duct is often visible as a black speck over the center of the cyst. They are very common in the scalp, being known as wens, and upon the face, neck, shoulders, and back. Arising in the skin, and not under it, the skin cannot be freely moved over a sebaceous cyst. A sebaceous cyst is lined with epithelium and is filled with foul-smelling sebaceous material. A sebaceous cyst may suppurate. When a cyst ruptures and the contents become hard, a horn is formed. Another form of horn has been previously alluded to as due to horny transformation of a wart.

Treatment.—To treat a sebaceous cyst, incise the portion of skin above it, and dissect the sac entirely away with scissors or a dissector, trying not to rupture the delicate wall. If even a small particle of the wall is left, the cyst will re-form. If it ruptures during removal and it is feared that some portion may remain, paint the interior of the wound with pure carbolic acid. If acid is not used, close without drainage; but if acid is used, drain for twenty-four hours. If an abscess forms in a sebaceous cyst, open it, grasp the edges of the cyst-lining with forceps, dissect out this lining with scissors curved on the flat, cauterize with pure carbolic acid, and drain for twenty-four hours.
Tumors or Morbid Growths

*Mucous Cysts.*—A mucous cyst is due to the blocking of a mucous gland or a mucous crypt. Mucous cysts occur particularly in the mucous membrane of the mouth and genito-urinary organs, and are filled with thick, adhesive mucus containing numerous epithelial cells. Such a cyst is of spherical outline, and the epithelial membrane which lines it is strongly adherent to tissues beyond.

*Treatment:* Incision, curetment, cauterization with pure carbolic acid, and packing or extirpation of a considerable part of the cyst, and curetment and cauterization of the part remaining.

*Oil Cysts.*—An oil cyst is due to fatty degeneration of epithelium lining a sebaceous cyst, or a milk cyst of the breast. As previously noted, a dermoid may result in an oil cyst.

*Treatment:* Extirpation, as for sebaceous cysts.

*Salivary Cysts.*—A retention-cyst of a salivary gland is known as a *ranula* (*q. v.*). These cysts are most common in the submaxillary or sublingual gland.

*Lacteal or Milk Cysts.*—Such a cyst occasionally arises in the mammary gland during lactation, and is the result of blocking of a lactiferous duct (see Cysts of Mammary Gland).

Among other forms of retention-cysts, most of which are discussed in special sections of this book, we mention *hydrosalpinx,* a cyst due to blocking of a Fallopian tube; cysts due to obstruction of the bile-ducts (the most common form is known as a *cholecyst,* which is a dilated gall-bladder the result of obstruction); cyst of the thyroid gland; cyst of the pancreas; and *hydromephrosis,* a condition produced by obstruction of the ureter.

*Cysts from Softening.*—These cysts are formed by the disintegration of degenerated tissues. For instance, after a hemorrhage into the brain, softening may follow and a cyst arise. Cystic changes of this sort are frequently observed in sarcomata and carcinomata. A cyst from softening has a wall of connective tissue, but there is no endothelial or epithelial layer.

*Tubulo-cysts.*—This name was given by J. Bland Sutton to cysts formed in certain remains of embryonal ducts, which vestiges in the developed body ought to have been destroyed. A small cavity is left unobliterated, and in this space fluid gathers. The source of the fluid is usually the lining cells of the cavity. Branchial cysts are frequently considered under this heading. Two of the commoner tubulo-cysts are cysts of the vitello-intestinal duct and cysts of the urachus.

*Cysts of the Vitello-intestinal Duct.*—Such a cyst presents itself as a small, bright red, globular mass, which appears to arise from the umbilicus of a baby or a young child, and which usually has a distinct pedicle, but may be sessile. A cyst of this character forms when the vitello-intestinal duct atrophies from the gut toward the umbilicus, but a remnant at the umbilicus escapes obliteration, and from this remnant a cyst forms. The wall of such a cyst contains unstriped muscular fiber and is lined with mucous membrane. Occasionally the duct in the process of involution is not destroyed,—its caliber is simply lessened,—and the duct remains open in the navel and feces come from it. If the duct fails of obliteration at the intestinal end, a diverticulum remains at this point (Meckel's diverticulum).

*Treatment:* A pedunculated cyst at the navel is treated by ligating its base
Parasitic Cysts

and cutting the stalk beyond the ligature. A cyst with a thick base is dissected out. The surgeon must be careful to avoid confounding an umbilical hernia with a cyst of the navel.

Urachal Cysts.—The urachus is the obliterated allantois and is a cord running from the summit of the bladder to the umbilicus. This structure is in the middle line of the abdomen and in front of the peritoneum. A portion of the allantois may not be obliterated at birth, and in consequence of this failure a cyst forms. It grows to a considerable size, may push the peritoneum away and reach the pelvis, may communicate with the bladder, may break through the umbilicus or grow backward toward the spine.

Treatment: Extirpation of the lining membrane, partial closure of the cavity by suture, and packing the unobliterated part.

Parasitic Cysts.—Parasitic cysts are due to the development of certain parasites in the tissues. The form most often encountered is known as hydatid disease.

Hydatid cysts are especially common in Iceland, and are frequent in Australia and South America, but are very rare in the United States. In the United States 91 per cent. of cases occur in foreigners (Lyon). They are due to echinococci. The adult echinococcus is the tapeworm of the dog (tænia echinococcus), and its ova or larvae gain access to man’s body by accompanying the food he eats and passing into the alimentary canal, from which situation they are transported to various organs by the blood. Osier says the embryo (which has six hooklets) burrows through the wall of the bowel and enters the peritoneal cavity or muscles; it may enter the portal vessels and reach the liver, or may enter the systemic circulation and pass to distant parts. The danger depends on two factors: “the situation and the liability of the cyst to suppurate” (Sidney Coupland). The organs most usually attacked are the liver and lung. In 60 per cent. of cases the liver suffers, and in 12 per cent. the lung (Thomas). Lyon estimates that the liver is the seat of disease in 73 per cent. of cases. Cysts sometimes arise in the intestine, genito-urinary passages, brain, or spinal canal. When the embryo lodges, the hooklets disappear and a cyst is formed. This cyst is composed of two layers, an outer capsule (cuticular membrane) and an inner layer (endocyst). The cyst contains clear saline fluid. As the cyst grows, daughter-cysts bud out from the wall of the mother-cysts, the structure of the daughter-cysts being identical with that of the mother-cysts. From the lining membrane of all the cysts, after a time, growths arise known as scolices, which represent the head of the echinococcus and exhibit four sucking disks and a row of hooklets (Osler).

The fluid is not albuminous, is occasionally saccharine, is thin and clear, and may contain scolices or hooklets.

A hydatid cyst may calcify, may rupture, or may suppurate. These cysts are very firm, but usually fluctuate. Palpation with one hand while percussion is practised with the other gives a persistent tremor (hydatid fremitus). If the cyst can be safely reached, some fluid should be drawn and examined for diagnostic purposes. When a cyst suppurates, positive constitutional and local symptoms arise. Hydatid cysts of the brain and cord tend to produce death in the same manner as do tumors. In the liver a cyst may rupture into the pleural sac, into the belly cavity, into the stomach,
or into the bowel, producing shock, hemorrhage, and probably death. In rare cases hydatid cysts rupture into the pericardium or into a great abdominal blood-vessel, or externally. Rupture into the bile-passages is usually followed by suppuration of the cyst. Suppuration of a cyst may follow uncleanly tapping. It has been recently pointed out that eosinophilia is noted in most persons suffering from hydatid disease.

**Treatment:** An unruptured hydatid cyst of a superficial structure should be incised and the sac-wall should be dissected out. Hydatids of the brain have been successfully removed in Australia. A cyst of the kidney is removed through a lumbar incision. Omental cysts should be radically removed if possible; if this is not possible, open the abdomen, surround the cyst with gauze, evacuate through a trocar, stitch the cyst-wall to the wound, incise, irrigate, and drain with gauze. Bond advocated evacuating the cyst, closing it with sutures, and dropping it back in the abdomen. Gardner says tapping is dangerous, as it may cause rupture of the cyst. In a hydatid of the liver the abdomen should be opened, the cyst should be surrounded with gauze pads, and tapped with a trocar and cannula. When the cyst is emptied of fluid it is grasped with forceps and pulled to the incision in the abdominal wall; it is sutured to this incision, the trocar opening is enlarged, and the endocyst is removed by irrigation.* This operation is called *marsupialization.* If the cyst is on the summit of the liver, it may be reached by a transpleural hepatotomy. If aspiration is performed to settle a diagnosis, operate at once after doing it, because of fear that the cyst may leak and disseminate the disease throughout the peritoneal cavity. If hydatid fluid is disseminated throughout the peritoneal cavity, it may or may not lead to the development of new cysts, but it is almost certain to cause a febrile condition known as *hydatid toxemia.*

* John O’Conor, of Buenos Ayres, in *Annals of Surgery,* May, 1897.