A text-book of surgical principles and surgical diseases of the face, mouth, and jaws : for dental students / by H. Horace Grant.

A TEXT-BOOK

OF

SURGICAL PRINCIPLES

AND

SURGICAL DISEASES

OF THE

FACE, MOUTH, AND JAWS

FOR DENTAL STUDENTS

BY

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PREFACE.

It is the object of this work to present to the student of dentistry a text-book that will succinctly explain the principles of dental surgery applicable to all operative procedures, and also to discuss such surgical lesions as are likely to require diagnosis and perhaps treatment by the dentist.

It is believed that only such details as belong to a technical understanding of the subject are in place in a book of this scope. An exhaustive analysis of the phenomena of inflammation and repair, as well as of the pathology of the essential processes of acute surgical diseases, is not desired by the student of dentistry during his college days, and the majority make no effort to acquire more than a clear understanding of these subjects.

Again, very few doctors of dentistry expect to practice even minor surgery, and those who do would seek to perfect their knowledge in another theater, and take as a book of reference some of the more pretentious works on surgery. Hence it is unprofitable for the dental student, during his college course, to purchase a work that is so prolific in detail as to be bulky, or that is in large part devoted to subjects in which he has no practical interest.

It is believed the arrangement and subject-matter of this book will be found to cover the needs of the dental

student without encumbering him with any details foreign to the course usually taught in the colleges at this day. The book makes no claim to original thought. The author has, in his own language and in the simplest way, given the accepted views of surgical principles and such diseases as are herein discussed. No authorities are cited, as the aim of the book is to get the most facts in the least space compatible with intelligent instruction.

The book is submitted with the hope that it will be found useful to that class for which it is designed.

H. H. GRANT.

September 1, 1902.

CONTENTS.

CHAPTER XXIII.

CHAPTER XXIV.

CHAPTER XXV.

CHAPTER XXVI.

CHAPTER XXVII.

CHAPTER XXVIII.

CHAPTER XXIX.

CHAPTER I.

BACTERIOLOGY.

From our present knowledge we deduce that the basis of surgical pathology is, without question, germ infection, and consequently the study of this subject becomes that of bacteriology. With the advance of this view of disease the older theories were left behind and the possibilities of present surgery were contemplated and achieved.

Bacteria is the generic term for microbic organisms. These microbes are of the lowest order of the vegetable kingdom, and, unlike ordinary parasites of insect life, are without volition, and often without motion, though some forms have undirected movements called "ameboid," like the movements of wandering blood-corpuscles and free cells in the tissues.

A bacterium consists of a cell composed of protoplasm or glue-like mass, surrounded by a thin membrane. Some have a distinct coloring-matter, while others are pale.

Germs are found everywhere; every touch of clothing or finger contact carries with it to wounded surfaces countless numbers of bacteria. Usually three forms are recognized: the *micrococci* or *globular*—far the most numerous; the *bacilli*, or *rod-shaped;* the *spirilla*, or *spiral-shaped.*

All acute inflammatory processes, whether in the domain of surgery or medicine, are caused by bacterial infection.

Not all bacteria tend to pathologic manifestations, many germs being harmless. Those tending to produce disease are termed *pathogenic.* Some have special func-

tions, as the pus-producing, called *pyogenic.* Some produce special disease, as the micrococcus of pneumonia, termed *pneumococcus;* or that of gonorrhea, termed *gonococcus.* Some produce decomposition, and are termed *saprogenic* germs.

When micrococci in process of development are arranged in pairs, they are termed *diplococci;* when in clusters, like a bunch of grapes, *staphylococci;* and when in rows, like a chain, *streptococci.*

Bacteria require favorable conditions for development, and though they grow best in the human body, under certain favorable conditions and special precautions they may be cultivated in an artificial medium of gelatin.

The cocci multiply by direct division or fission, and with such rapidity that, in the space of twenty-four hours and under favorable conditions, one coccus may multiply to 15,000,000 or more.

The bacilli multiply more slowly by a spore or budding process; also by transverse division. As will be seen later, the moisture and the temperature of the body are most favorable for this growth.

In the presence of colonies of saprogenic bacteria, in decomposing tissues, there is developed a poisonous alkaloid called *ptomain.*

Ptomains are not a secretion from bacteria, nor has it been proved that they emanate from them. They develop in the presence of bacteria, and thus are formed some of the so-called *toxins* of septic infection.

Such poisonous germs develop in decomposing and improperly cooked food, and cause severe, and sometimes fatal, symptoms. For example, the so-called *tyrotoxicon* in ice-cream and spoiled milk, and the ptomains in chicken salad, etc.

These toxins are the causative agents of sapremia, the blood-poisoning due to retained after-birth in labor and abortion, and to sloughs and gangrene. Forms of the toxins of pathogenic bacteria, rendered less virulent by attenuation, constitute the antitoxin serums used to

prevent and cure diseases, as diphtheria and tetanus. Vaccination likewise is in a degree an example.

Most forms of bacteria flourish best at the temperature of the body, with the natural moisture of the tissues. Hence after an injury in which the vessels are broken, a favorable lodging and nourishing field for multiplication is furnished. Such conditions as are opposed to warmth and moisture tend to retard or prevent multiplication. The freezing-point destroys many forms of germs but is less destructive to spores. Heat is much more reliable as a destructive agent to these microbes, and moist heat

FIG. 1.—Staphylococcus pyogenes aureus; pure culture on blood-serum after twenty-four hours at 22° C. (Ernst).

or boiling water will more promptly destroy them than dry heat. The latter at a high grade, sustained for some thirty minutes to an hour or more, is employed in the sterilization of surgical dressings.

It is manifest, however, that such measures are inapplicable to living tissues, and here certain chemical germicides are employed. The most common, as well as the cheapest, and perhaps fully equal to any other in value, is corrosive sublimate or bichlorid of mercury. On fresh wounds it cannot well be used in stronger solution than 1 : 500, and then is safe only on very small surfaces. It is usually employed in solutions of 1 : 1000 or

1:1500, or even in weaker strength. As it rusts instruments, it cannot be employed to sterilize them. After boiling for a short time, sterilized knives, scissors, and needles are best placed in 1:30 solution of carbolic acid. Other instruments should be well boiled in plain water, and then wrapped in a sterilized towel until required by the operator.

Formalin, in the strength of 1:10,000, is valued highly as an irrigating fluid in suppurating surfaces.

Iodoform is seldom used as a local applicant, owing to its feeble effect and its offensive odor. A variety of

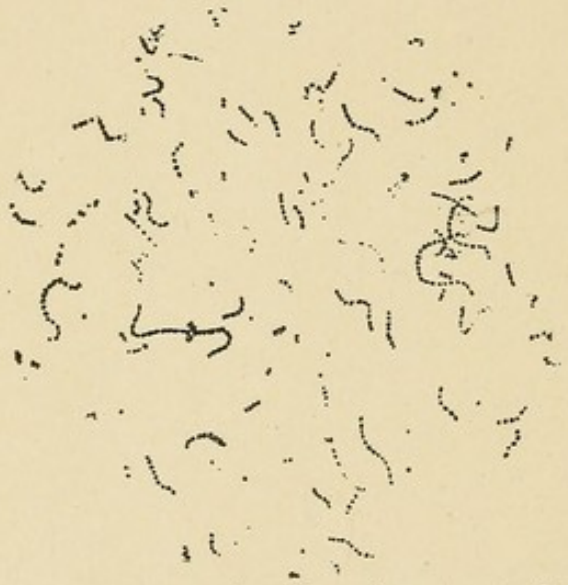


FIG. 2.—Streptococcus pyogenes; bouillon culture, twenty-four hours (Ernst).

germicides are employed, all having the same general effect, but none surpassing, for general service, those here recommended.

In order to produce a pathologic manifestation bacteria must exist in large colonies, otherwise the resistance of nature will prevent any effect. It is estimated that it requires one-third of a billion of the cocci of suppuration to produce a small abscess. Thus it appears that such results of infection necessitate at least from thirty to fifty hours to permit of the multiplication of a focus to such a multitude.

By *antisepsis* is meant the destruction of such colonies,

either before they have reached the damage-producing stage or after their effects are evident.

By *asepsis* is meant the prevention of the admission of pathogenic germs to wounded surfaces.

As antiseptics or germ destroyers on living tissues, such solutions as have been mentioned, while not destroying all the germs in the tissues, render the soil less favorable for their nutrition, and thus prevent and retard colonization.

Although pathologic bacteria are not usually found in healthy tissues, still they undoubtedly circulate harm-

FIG. 3.—Tetanus bacillus; old culture on bouillon, showing battledore forms and free spores (Ernst).

lessly in the vessels in many instances. In the course of their progress through the vessels they come upon a spot favorable for colonization, when they produce a pathologic demonstration in the absence of any open wound. By all odds, however, the usual mode of admission is through an acute wound or abrasion of the skin.

Granulating wounds and old ulcers do not readily admit germs.

The forms of bacteria most commonly encountered by the surgeon are those of suppuration, termed pyogenic or pus-making microbes. These germs are of the form

of cocci, arranged either in groups or in bunches, are of a yellow color, and are called *staphylo-* (*clustering*) *coccus pyogenes* (*pus-making*) *aureus* (*yellow*), or, when in rows, *strepto-* (*chain-like*) *coccus pyogenes.*

The *staphylococcus pyogenes aureus* is a microscopic, globular-shaped germ, which multiplies by fission, is very difficult to destroy, and grows rapidly. It usually requires from sixty to seventy-two hours after inoculation to produce pus. It is found in abundance everywhere—in the atmosphere and upon all exposed surfaces of the body and of other objects. It often exists in wounds the seat of other germs.

Streptococcus pyogenes is a less common germ. It is arranged in chains or rows, and is usually found in more virulent or phlegmonous suppurations and in rapidly spreading inflammations attended by much pus-formation.

These cocci are found in all acute abscesses, either alone or mixed. In order to produce symptoms, about 250,000,000 are required, and a state of the tissues favorable to their nutrition is necessary.

Practically speaking, suppuration never takes place in the absence of these germs, though experiments have proved that the injection of certain chemical irritants may at times produce a pus-like discharge without the presence of the germs.

Other forms of bacteria of special character produce certain manifestations, and often bear the name of the disease they give rise to.

The bacillus of tetanus produces lockjaw. From its shape it is called drumstick bacillus. It grows best in moist manure, and can be found about horse-stables.

The bacillus of tuberculosis is small, thin, and rod-shaped, non-motile, and usually not abundant in the tissues. These bacilli are not easily destroyed, and possess the power of multiplying for years, even in a quiescent state. They do not grow well in an artificial medium, but when once located in the tissues, though

making slow progress, are almost incapable of destruction by any means except excision of the infected parts.

The bacillus of anthrax is found in virulent carbuncles and malignant pustule, and is very difficult to destroy.

The gonococcus, as has been demonstrated by Neisser, produces gonorrhea.

The pneumococcus is found in the sputum of pneumonia patients. Many other special germs exist.

It is to be borne in mind that these germs are not

FIG. 4.—Bacillus tuberculosis in human gland (Ernst).

usually visible to the eye even under the microscope, unless *stained* artificially in a special manner, some reacting to one stain and some to another.

SUMMARY.

We find, in looking over the facts just stated, that the primary cause of all surgical diseases is the presence and colonization of germs, for which the general term is bacteria ; that such germs are of practically two forms, though of many varieties ; that they gain entrance to the body chiefly through wounds and abrasions ; that they multiply by direct division and by a process of

budding, and with such rapidity that one will become 15,000,000 in twenty-four hours ; that they are everywhere ; that not all forms are capable of producing disease ; that pathogenic bacteria cause special results or diseases, and that some varieties produce ptomains and other toxins, or poisons of great virulence.

Further, that bacteria grow best amid moist, warm surroundings, as near the temperature of the human body as possible. That they are susceptible of destruction by heat, cold, and chemicals ; and that some special forms produce constantly the same special diseases or effects.

CHAPTER II.

INFLAMMATION.

THE basis of nearly all pathologic change in one or another of its forms is *inflammation.* A knowledge of the phenomena accompanying inflammation is therefore essential to an understanding of disease.

Inflammation is defined as a persistent disturbance of the function of nutrition, characterized by heat, redness, pain, swelling, and disturbance of the function of the part affected.

It is the belief of the author that, up to the stage of infection, the steps in the process of normal repair are identical with those of inflammation, differing only in degree. In his teaching of this subject he has for years adopted a division into physiologic or reparative inflammation, and pathologic or destructive inflammation; the first occurring without any infection; the latter due to bacteria.

Any irritation, however temporary, sends an undue amount of blood to the part. If the irritation is momentary, this is termed a *blush* or *suffusion;* if it is more prolonged, but still temporary and without structural alteration, it is termed *hyperemia;* if still more persistent, it is *congestion*, and later *stagnation.*

We understand by the term hyperemia a persistent determination of blood to the part, a condition commonly called congestion. Arterial congestion is called *active*, and venous congestion *passive* hyperemia. Acute hyperemia is due to some mechanical or chemical irritation. Chronic hyperemia is the result of a moderate but persistent irritation.

When either form of hyperemia persists there is

offered a favorable field for germ infection, and the processes of inflammation are set up. The result is the formation of an exudate, the escape of the products of inflammation. As this exudate becomes organized and a new tissue is formed there results what is called a *hyperplasia*, which is simply an increase of tissue-cells. If this hyperplasia include all the cells of the part, it is called *hypertrophy*. True hypertrophy is not inflammatory, but is a multiplication and development of all the cells of the part, so as to increase in every direction the contour and extent of the limb or other tissue involved. A chronic hyperplasia may alter the shape and appearance of the part disastrously, but this is the result rather of infiltration than of growth.

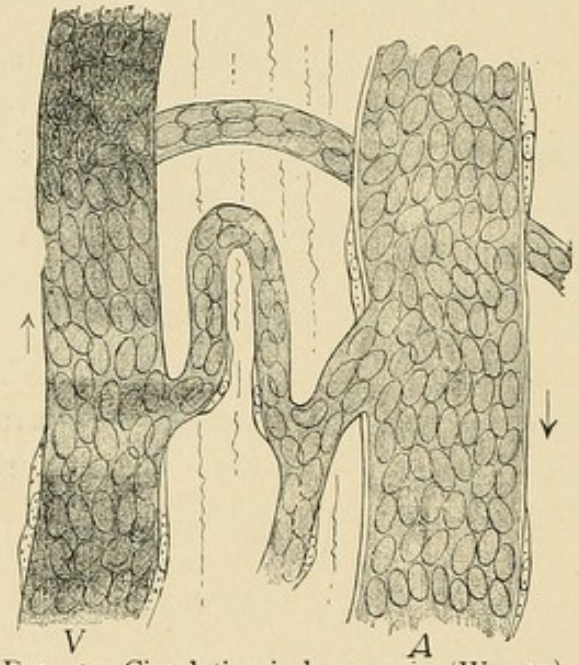


FIG. 5.—Circulation in hyperemia (Warren).

Owing to a diminished blood-supply, due to the presence of the exudation from the vessels or to impaired—so-called trophic—nerve changes, the size of a limb may greatly diminish or the limb may waste away. This process is termed atrophy. Even paralysis may succeed this change.

If, after ordinary suffusion and even hyperemia, the irritation stops, no leak occurs in the vessels, and the

normal condition is resumed without any other phenomena. When, however, the irritation still persists, the vessels dilate, the red corpuscles increasing in number, and, being heavier, seeking the center of the blood-current.

The white corpuscles still more proportionately increase in number, and are thrown toward the "shore," or walls of the vessels. A little later the current slows, by reason of its crowded condition, and the white corpuscles are

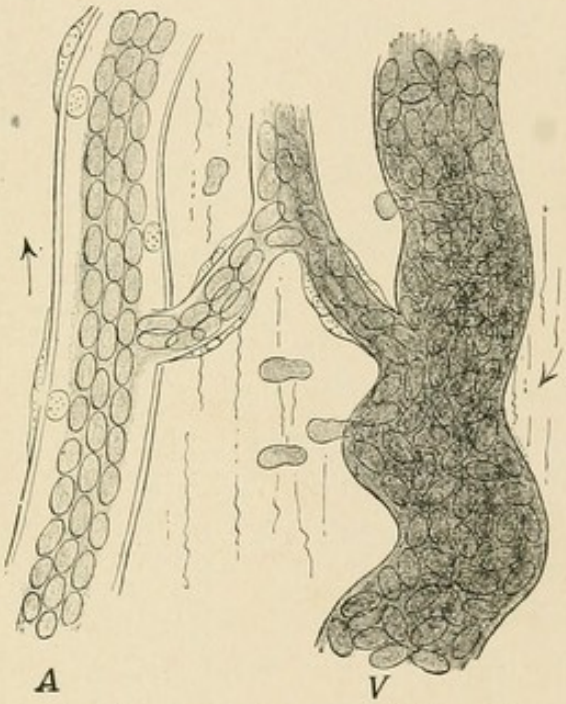


FIG. 6.—Passive hyperemia (Warren).

forced through the walls of the veins by an outward movement. This transmission is termed *diapedesis.*

Along with the white corpuscles which wander into the cellular tissue the serum of the blood also escapes. As a result of these processes a substance termed *fibrin* is formed, which causes injured tissues of both concealed and open wounds to adhere, and thus repair begins.

All this creates an inviting spot for any germ wandering in the blood, or gaining admission through an open wound, to establish a colony. Up to this point the steps in both forms of inflammation are identical, except in

degree. If the powers of nature are sufficient, infection is resisted and repair begins. If infection occur, the destructive processes are at once inaugurated.

The inquiry is natural that as injuries and irritations happen daily to almost every member of the human family, and as the germs are everywhere, why is it septic wounds are not universal? Truly such would be the case were it not for the resistant powers of nature. All bacteria are to be regarded as enemies resisted by the home-guards. This resisting power of nature is largely found in the white blood-corpuscles, or *leukocytes*. These soldier leukocytes are termed *phagocytes*, and they surround the invading bacteria, resisting and encapsulating them. This is termed *phagocytosis*. If successful, the infection is prevented, or perhaps only limited; if the bacteria are not overpowered, however, a pathologic inflammation is the result. We have seen how any persistent irritation increases the number of leukocytes enormously; hence these reinforcements are present to resist the invaders.

The influence which attracts the leukocytes to the point favorable for colonization of bacteria is called *chemotaxis*. By this same influence also the bacteria attract to themselves material for nourishment and growth.

We have seen that the local symptoms of inflammation are constantly *heat*, *redness*, *pain*, *swelling*, and *impaired functioning of the part*. These are easily accounted for. The increased blood-supply causes the heat and redness. The injury to the nerves and the pressure upon them by the escaped leukocytes—blood-serum and exudates—cause the pain, and in the same way the swelling is accounted for.

The impairment of function is due partly to the physiologic changes and partly to the pain caused by effort.

All inflammation must have an original irritation, and for all practical purposes this is a colony of bacteria, which, whenever located successfully, resists the phagocytes and creates a persistent and progressive disturbance of the nutrition of the part.

Any spot inviting the location of such a colony is a predisposing cause. Such spot is termed point of lessened resistance—*a locus minoris resistentia.*

Inflammations derive their qualifying names in some instances from their character and tendency ; those of a high grade are called *sthenic*, those of feeble vigor, *asthenic.* Those involving *serous* membranes are so named, whereas *adhesive* or *fibrous* inflammations indicate their character in tendency *to glue the parts together. Suppurative* are those producing pus ; *phlegmonous* are spreading inflammations, involving cellular tissue, often causing a burrowing abscess. *Hemorrhagic* and *gangrenous* inflammations define themselves.

The constitutional symptoms of inflammation are constant in character, but vary in degree with the acuteness and severity of the infection.

The fever of inflammation, which varies from the slight elevation of the temperature in the physiologic process to the limit seen in virulent septic infection, usually ranges in the pathologic form between 101° to 103° F., with malaise, headache, coated tongue, constipation, cold extremities and a feeling of chilliness, followed by hot flashes. The chilly feelings or *rigors*, as they are called, are distinct, and often very pronounced chills occur in the more severe infections. If the inflammation involve a functionating organ, as the lungs, pleura, bladder, etc., pain upon function as well as upon manipulation or pressure will follow.

Subacute inflammation is usually understood to be a mild, slowly progressing form, due to some germ not possessing marked destructive powers, as those of rheumatism, syphilis, etc.

Chronic inflammations exhibit much milder symptoms, both local and constitutional, than those characterizing the acute, but extensive destructive changes may go on in either soft parts or bone and lead to suppuration and ulceration.

Inflammation terminates in *resolution*,—a return to

normal condition,—*death of the part* by suppuration and gangrene, or *death of patient* by exhaustion from sepsis.

Resolution is understood to be a victory for the phagocytes, an absorption of the effusion and a removal of the irritation—a prevention of destruction.

Death of the part by suppuration and gangrene will be described under the respective headings.

The course and termination of inflammation may then be looked upon as resolution or the *subsidence* of the process, or *destruction* with *death* of the part.

By resolution is meant that the efforts of nature, partly by phagocytosis and perhaps partly by other favoring influences, have resisted infection. After a variable time the exudates are absorbed and the parts return to quite or almost the original condition. This is the most common termination. Destruction, however, may occur in several ways, as by suppuration, ulceration, gangrene, etc. Usually suppuration results when the inflammation continues. Pus consists of the *liquor puris*, or serum, with broken-down leukocytes, dead and dying, and the waste of perished connective-tissue cells. By suppurative inflammation is meant that inflammation which produces pus.

An abscess is a collection of pus inclosed in or circumscribed by the tissues. If this collection of pus is infiltrated through the tissues without any distinct limiting wall, it is termed a purulent infiltration, or, more commonly, as applying to general structures, a phlegmonous inflammation.

The circumscribed abscess, acute in character, is usually due to the staphylococcus (grape-shaped coccus). The phlegmonous and infiltrated form usually contains the streptococcus and is more destructive in tendency.

CHAPTER III.

INFLAMMATION (Continued).

TREATMENT.

THE treatment of inflammation is both local and constitutional.

Local Treatment. — The local treatment consists chiefly in rest of the part and, in the earliest stages, the application of evaporating lotions. Occasionally it may be necessary to extract blood by means of punctures or the application of leeches, or what are known as "wet cups." In the majority of cases, however, soothing applications are employed. These applications should be either cold or hot, as comforts the patient most. Over small inflamed surfaces the application of cold is often followed by a subsidence of determination of blood to the part and the promotion of resolution. Larger surfaces are usually better treated by the application of heat, in the form of poultices, hot cloths wrung out of antiseptic solutions, hot-water bags, and other measures of a similar nature. Such applications are not usually made directly over fresh wounds, but are more commonly made to abscesses, either to those forming or those already formed, and to angry wounds and sloughs.

Elevation of the part, together with its fixation in splints, if the site of inflammation be upon an extremity, is a valuable means of treatment.

Inflammations that are not very severe, especially those of the subacute or chronic type, are often benefited by evaporating lotions, of which the best, perhaps, is the well-known "lead-and-opium" solution. The strength of this lotion should be one part of the tincture of opium to four parts of dilute lead-water.

Various other lotions are employed for the same purpose and with similar result.

Phlegmonous inflammations, and those which threaten deep-seated suppuration, are to be treated by free incisions and irrigation with antiseptic solutions. Perhaps the best antiseptic solution is bichlorid of mercury in the strength of 1 to 1000 parts of water. Accumulations of pus should be opened promptly, evacuated thoroughly, irrigated antiseptically, and drained. In the more chronic forms of inflammation stimulating applications, as the tincture of iodin, or even fly blisters, and massage, compression, and support by bandages are measures often indicated.

Constitutional Treatment.—This is controlled largely by the character of the case. In the simpler and less severe forms rest and the usual rational steps are all that is required. In the acute inflammations of high grade the temperature should be reduced by sponging and by the administration of some of the well-known antipyretics.

In those cases in which the fever continues and a condition of blood-poisoning is superadded, the patient sinking into what is known as the "typhoid state," stimulation with whisky and the administration of strychnin and quinin are early indicated. The administration of opium to secure rest and relieve pain fills even the more imperative want of repose to the whole system, and should be given when indicated.

The administration of purgatives should be relied upon to keep the bowels well open, and free purgation is valuable in inflammation in most situations of the body.

The bromids often answer a satisfactory purpose in quieting the headache and restlessness in elevated temperatures, and, when pain is not the prominent symptom, should be used in preference to opium. In the author's experience antipyrin and antikamnia answer a good purpose in the restlessness and fever of acute inflammation.

In the earlier stages of all cases of inflammation the diet should be what is known as the soft diet, consisting of milk, eggs, broth, with toasted bread, and only the very lighter articles of food. The artificial foods, many of which are already peptonized or digested before administration, are often found to be of great service. A little later, when the acute stage has passed, or often throughout the chronic forms, stimulation of a less pronounced character, with tonic doses of iron, quinin, or strychnin, and the administration of a more liberal diet, constitute the indications.

SUPPURATION.

By this term is meant the formation of the liquid known as *pus*. So far as practical surgery is concerned, we know this to be accomplished by the colonization of the germs of suppuration, almost exclusively the staphylococcus and the streptococcus. Predisposing causes, some of which we have studied, tend to effect this colonization.

Septic cocci, introduced from without or circulating in the blood, even when they find a place favorable to colonization, are tens of thousand times destroyed by phagocytosis before a colony can be formed. When the predisposition permits of a colony up to 200,000,000 or 300,000,000, pus is formed.

Pus is ordinarily a light, yellow-looking fluid, of a varying consistency, composed of a sediment, which deposits on standing, and a pale serum. It is familiar to everybody. The serum has a peptonizing or softening effect on tissues, and some forms rapidly destroy cellular and less dense tissues. The sediment consists chiefly of broken-down tissues, altered leukocytes, here termed pus-corpuscles, and micro-organisms.

Pus varies in color according to its location, its virulence, and germs present. The odor is sometimes quite noticeable and even offensive. When blood is fully inter-

mingled with the pus, it is called *ichorous*, and if merely combined with it, *hemorrhagic*.

Pus is to be considered as the débris of the conflict between the leukocytes and the bacteria, with a victory for the latter. When pus is produced in an open wound and free drainage is permitted, the symptoms of inflammation are usually not increased, but when the discharge is interfered with and the collection is under the skin and tissues, without drainage, constitutional and local symptoms, sometimes of severe magnitude, supervene.

Infection of a wound, even to a moderate degree, is attended with more or less increase of pain, redness, and throbbing, from which free escape of the discharge usually gives marked relief. But pent-up pus under any circumstances presents symptoms better described under the head of abscess.

An *abscess* is a collection of pus, usually circumscribed by a limiting wall. This collection results from the colonization of the cocci of suppuration, the colony struggling with the resisting forces of nature until held in check, when the limiting wall is formed. This wall may widen and extend as the battle progresses.

Abscesses are *acute* and *chronic* (or cold), *circumscribed* and *diffuse*. They are also named from anatomic indications.

An acute *circumscribed abscess*, which is the usual form, presents the common symptoms of inflammation, with the heat, pain, and redness increased in severity.

Chilly sensations and the various constitutional symptoms of inflammation attend, to an extensive degree, the formation of large abscesses. Even small collections of pus under dense tissues may give rise to great pain and general fever.

The course of pus-formation is gradual, from four to six days being usually consumed in its progress, and sometimes, when deeply seated, a much longer time elapses before its presence is made known. As the tissues soften the fluid accumulates, a sense of a wave-like

motion, termed *fluctuation*, is communicated to the examining fingers, which is a characteristic symptom of accessible abscesses. A thinning of the overlying surface until it can be felt to be almost ready to rupture is termed *pointing*. A *pitting* on pressure of cellular tissue overlying deep-seated inflammation indicates suppuration.

The *diagnosis* of abscesses is usually easily made by symptoms, but when any doubt exists, their presence may be confirmed by the needle of the aspirator. There should be no delay in making this test when deep-seated suppuration is suspected, as no harm can follow, and disaster in the shape of burrowing of the pus, may be avoided.

An abscess in the region of an artery should be carefully differentiated from a possible aneurysm, the aspirator lending great aid; the opening of an abscess in the immediate vicinity of large vessels always calls for circumspection.

Treatment.—When hidden suppuration is suspected and the ordinary treatment of inflammation proves inefficient to prevent it,—that is, where resolution appears hopeless,—the use of warm poultices serves to demonstrate the collection.

The most serviceable poultices and those most readily procurable are gauze pads wrung out of hot antiseptic solutions, and covered with oiled silk. When pus is discovered, it should at once be set free, followed by antiseptic irrigation and proper drainage. The walls may require scraping with the curet; free exploration with the finger and probe will at times disclose troublesome sinuses, which may need to be cauterized.

The free application of pure carbolic acid, neutralized after one minute's exposure with alcohol, is appropriate to septic and gangrenous sinuses and pockets.

The drainage and packing should be removed from incised abscesses once or twice daily, as indicated in the early treatment. Later, as the discharge diminishes, the dressing may remain undisturbed for a day or two.

Sloughs and degenerated tissues should be cut away. A solution of formalin, of a strength of 1: 10,000, or peroxid of hydrogen, greatly lessens the discharge.

SUMMARY.

From the foregoing we have determined that inflammation is a disturbance of the processes of nutrition due to an irritation, pathologic bacteria becoming colonized on the irritated tissue; that in those instances in which such colonization is not effected a simpler process conducts the physiologic changes of repair. In both these forms of inflammation we have the same symptoms, though different in degree up to the development of infection. We have seen the phenomena of inflammation to be dilatation of the blood-vessels, with largely increased specific gravity of the blood; the escape of the leukocytes through the walls of the veins into the tissues, by which process, known as diapedesis, the fibrin needed for repair is produced. Into this soil favorable for colonization the soldier leukocytes, as phagocytes, are drawn by chemotaxis to resist invasion.

We have seen, too, that this inflammation, if not so arrested, tends to subside by resolution or to destroy the part; that it is both acute and chronic, and that it affects the constitution as well as the local part involved; that its treatment consists in encouraging the circulation to return to the normal, and thus promote the absorption and removal of the products of inflammation.

It becomes evident that the termination of inflammation known as suppuration is the result of the accumulation of the special germ in sufficient numbers to cause pus. That the various forms of pus are due to the character and the virulence of the infection, rather than to other germs. We see that pus, when free, is far less damaging than when confined as an abscess. Abscesses are indicated by the same symptoms as suppurative inflammation. They require free opening and drainage as soon as the diagnosis is made.

CHAPTER IV.

ULCERATION—ULCERS.—SINUS AND FISTULA.—THE PROCESSES OF REPAIR.

ULCERATION—ULCERS.

An ulcer is an infected spot about which the surface skin or mucous membrane is destroyed by a slow process of molecular or granular disintegration.

The process of ulceration varies in extent and duration according to the vitality of the part and the virulence of the infection.

The **causes** of ulcers may be looked upon as both local and constitutional. The local cause may be traumatism, particularly wounds, burns, frost-bites, etc. Such injuries usually produce healthy ulcers, which soon tend to repair and cicatrization, unless some constitutional dyscrasia retard. The local cause may also be distinct specific infections, as syphilis, etc.; or perverted action of the part from enfeebled circulation, as in varicose veins, diseased arteries, or impaired nerves. These ulcers are usually unhealthy, sluggish, and indolent, with little tendency to repair. The chief constitutional cause is usually impaired general nutrition, which combines with the local inertia and maintains, if it does not originate, the morbid process.

Unhealthy ulcers are described as *indolent* when they remain unchanged; *phagedenic* when they tend to rapid and destructive spreadings; *irritable* when they cause pain; *hemorrhagic* when they are disposed to bleed; *serpiginous* when they undermine the surface.

A healthy ulcer is one that exhibits a raw surface without acute inflammation, and with but little secretion, whicl is usually irritating. The edges are even

with the surrounding skin ; a palish blue line of cicatrization is seen at the margin, and it is covered with pinkish granulations over the field.

The unhealthy ulcer may be excavated, discharging a sanious or bloody fluid ; it may exhibit hardened edges, or may burrow beneath the skin. Ulcers may be of any size, even to the extent of encircling a leg or an arm ; usually those of the benign variety do not involve any but the tissues of the skin or mucous membrane.

Healthy ulcers heal by granulation, and such granulations, while covered with a pus-like secretion, do not,

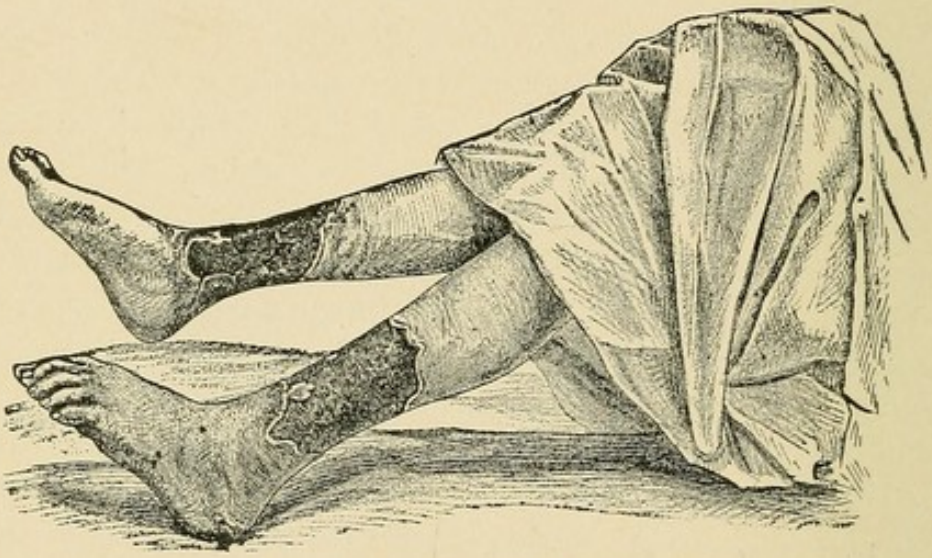


FIG. 7.—Varicose ulcer (Warren).

if cleanliness is observed, tend to produce infection, and the micro-organisms of suppuration may even be absent.

The **treatment** of the ulcer will be controlled wholly by its character and cause. Healthy ulcers should be cleansed with antiseptic lotions and protected by gauze, or, if no secretion is present, by rubber tissue under a bandage ; such measures as may be indicated to remove the cause are to be employed. Elevation of the part and rest will aid in regulating the circulation. Support by a bandage often improves the blood-supply. Indolent ulcers should be stimulated—the knife, curet, and stimulating antiseptics are called for.

Phagedenic and specific ulcers require cauterization with nitric acid to destroy the germ, followed by repeated cleansing, with drainage and fresh dressings. The more virulent ulcers, when favorably situated, often are best excised. In tedious ulcers, otherwise healthy, balsam of Peru and castor oil—1 part of balsam to 16 parts of the oil—makes a valuable dressing. Stimulating and protecting salves, such as benzoated oxid of zinc ointment, with 0.05 per cent. to 0.025 per cent. ichthyol, are serviceable.

In large and slowly growing ulcers, notably those following burns and frost-bites, skin-grafting on the healthy granulating surface is of great service. Constitutional supportive treatment, as strychnin, iron, quinin, cod-liver oil, and similar preparations, often renders valuable assistance to the impaired part. In elderly people with extensive ulcerations below the knee that will not heal, amputation without prolonged delay is indicated, as such conditions, when they do heal, usually recur.

SINUS AND FISTULA.

By the term *sinus* is meant a tract extending from some abscess cavity—due perhaps to diseased bone or to foreign matter buried in the structures—to the surface. When this tract extends from a normal cavity it is termed a *fistula*. Usually these tracts are simply elongated ulcers and may be due to similar causes.

A sinus may be congenital, as instanced by the congenital tracts sometimes encountered in the neck when, from imperfect development, a branchial cyst communicates externally in this region. Pathologically speaking, these tracts are usually either communications with ducts or hollow viscera, from traumatism or unhealed abscesses due perhaps to diseased bone or foreign bodies imbedded in the soft parts.

Abscesses in cellular tissues adjoining the rectum often seek an outlet through that channel, establishing a fistula. If such abscess opens upon the skin, the tract

should be called a sinus. If, however, it involves the rectum,—a normal cavity,—either with or without external opening, it is called a fistula. The cause of these abscesses may at times be inflammatory, but it is more commonly tubercular.

The **treatment** of sinus is determined by the cause. The course and direction of the tract must be ascertained with gentle manipulation by the probe. If it is due to disease of the bone or to a foreign body, this must be removed. If an old, unhealthy, granulating sinus be freely cureted, cauterized with pure carbolic acid, and packed with gauze, if no foreign body be present it will often heal. A chronic sinus may be extirpated if no foreign body be left. This treatment is especially appropriate in the tubercular form.

Fistula due to traumatism will often heal if the part is placed in a position favorable for approximation of the edges. In some cases repair will obtain if the edges of the fistula are freshened and sutured.

When fistula exists for months without improvement, the probability of a resulting spontaneous cure becomes lessened. Fistula of the salivary glands often baffles every effort at repair. It is here that careful dissection of the tract, with skilful suturing of the fistula, will sometimes result in a cure. The same is true of intestinal fistula through the abdominal wall, and of gastric or stomach fistula.

THE PROCESSES OF REPAIR.

The processes of repair represent changes which simulate normal growth going on in healthy wounds. The essential of this repair is the renewed activity of quiescent cells of the tissues. These cells, which in the embryonic stage by proliferation developed the organism and then rested, are now required to effect the repair of damage done to their perfected work. It is necessary to understand that each damaged tissue repairs its own loss: thus bone is replaced by bone, skin by skin, each struc-

ture being restored by the growth or proliferation of its own distinct cells.

After the hemorrhage of a recent wound has ceased and the edges of the wound are approximated, the first steps of repair are those of physiologic inflammation. Upon these products of inflammation the proliferating connective-tissue cells feed until lost tissue is replaced. If the approximation is close and accurate, little tissue is regenerated. If a considerable gap or loss is present, the process is slow, because considerable tissue must be regenerated. The first is called union by *first intention;* the second, union by *granulation.* The process is not, however, the same. Usually in union by first intention phagocytes are able to hold in check and destroy the germs.

Cell-proliferation is accomplished by division of the cells in two ways: Direct division of the nucleus and protoplasm of the cell and the formation of two cells by a splitting process; or a gradual process of fibrillation of the *nucleus*, around which rearrangement the protoplasm divides, thus forming other cells. This latter process is known as *karyokinesis*, and is the essential of most repair. Many of these newly formed cells, called fibroblasts, are not fixed, and, together with other so-called wandering cells, the origin of which is not wholly clear, become entangled in the trabecula of the new and pre-existing tissue, and are organized along with the fixed cells, thus contributing greatly to repair.

In the granulation form we have a process which usually—not invariably—succeeds suppuration and destructive conditions. Here, after nature has overcome the germs, the cells in the healthy tissue begin to grow, and, by karyokinesis, there are formed *granulations*—minute and innumerable bodies in which are seen miniature blood-vessels. These granulations grow and become organized in the deeper layers, and thus the wound is gradually filled in.

Although granulations are not seen in union by first

intention, and in fact do not usually form, yet the same principles are exhibited in the cell-proliferation of repair. In both instances this new tissue, although resembling that lost, is never strictly the same, nor does it ever completely resume the function of the old. This is more distinctly seen in wounds of organs of special sense, particularly the eye and ear, which, if severely damaged, are never fully restored to function.

Scar tissue is never so highly organized or nourished as normal tissue, and is more prone to ulceration and even malignancy. It also tends to contract, and when occupying a considerable surface, may cause great deformity by firm contraction.

Granulation tissue should fill in the center of the wound as it contracts, about the same time that its edges cicatrize. Should it happen that the granulations rise above the edges (so-called exuberant granulations, or proud flesh), they must be destroyed, either by the knife or, preferably, by the caustic, repeating the application until the wound cicatrizes.

It is to be borne in mind, then, that in repair union by first intention is the immediate process of physiologic inflammation, while in granulation it is physiologic inflammation succeeding pathologic, and later pursuing the same steps as in the similar condition—filling in the wider gaps by the same, but slower, process, and often being delayed and interrupted by the battle between the germs and the phagocytes. It should be remembered, too, that though tissues always reproduce like tissues, the so-called regenerated tissue is never identical in whole with the original, cicatricial tissue ever being imperfect.

Repair of gross losses of limbs or organs is impossible, because of the absence of needed tissue-cells, and because the substance to support granulation cells is not obtainable. For this last reason great losses of tissue, even in the trunk or muscles, fail of restoration; and for similar reasons nature presses forward in her efforts at

restoration until her stores are exhausted. Plastic surgery—skin-grafting and tissue transplanting—is frequently employed to stimulate suspended granulation and bridge over great losses which at first appeared to be permanent.

SUMMARY.

We learn, from the foregoing, that pus is the result of germs of suppuration, a quarter of a million being required to form a small abscess; that it is the result of infection of the products of inflammation; that it does damage chiefly from being confined, and hence demands free drainage. An accumulation of pus, we learn, is called an abscess, named acute or chronic (or cold); that acute abscesses give rise to the same symptoms as acute inflammation, except that there is more pain and that an added symptom of fluctuation, indicating fluid, is present. We also find that the treatment of acute abscesses is by free incision, with antiseptic irrigation and drainage; while that of cold abscesses is less active.

We find an ulcer to be practically an uncovered abscess, usually chronic, due to local and constitutional innutrition. Ulcers bear self-defining titles, the most important of which are *healthy* and *unhealthy*. Their treatment requires the removal of the cause and stimulation for repair.

We learn that both sinus and fistula are practically elongated ulcerated surfaces, although communicating with cavities and conveying discharges.

Repair, it is seen, is accomplished by renewed activity of original cells, which produce new tissue in place of that lost, and in the same manner as that lost was originally produced. That cells of one kind of tissue—as bone or skin—invariably produce their kind. That this growth is chiefly accomplished by indirect cell-division, called karyokinesis. That the outgrowth of this cell-proliferation is granulations, which later become organized into normal tissue to replace the lost, though never absolutely identical with the adjacent original structures.

CHAPTER V.

GANGRENE.—THROMBOSIS AND EMBOLISM.

GANGRENE.

By the term gangrene is meant death of a mass of the soft parts, in contradistinction to the molecular death in ulceration. The death of bone masses is termed *necrosis*. *Putrefaction*, *mortification*, and *slough* are terms applied to the gangrenous process, and usually indicate the extent of damage.

The **causes** of gangrene, like those of ulceration, are chiefly interference with the circulation, either by shutting off the arterial current or by the arrest and stagnation of the blood in the veins. This arrest is due to rupture of the vessels or to their obstruction by constriction or an embolus; in the venous current it is due to constriction of, or pressure upon, a large venous trunk.

We recognize two forms of gangrene—*dry* and *moist*.

Dry gangrene is due chiefly to gradual interference with the arterial supply, seen usually in elderly persons, and is termed "senile gangrene." It is the result of chronic inflammation of the inner arterial wall, usually an atheromatous degeneration. Senile gangrene generally begins in the toes or foot, at times in the fingers, where the blood-supply is always feeblest.

Symptoms.—Often after a bruise or slight abrasion the wound fails to heal, becomes congested, blackened, dry, and mummified. There is usually a burning pain, and sometimes an offensive odor is present early. At the base of this discoloration there is a line sharply marking off the disease. This line gradually extends until perhaps the whole foot or even the entire limb may be involved. There are evidences of general sepsis. The

calcareous condition of the vessels may be judged of when such indurations and nodulations are felt on the radial arteries.

In individuals affected with diabetes mellitus—sugar in the urine—a similar gangrene is often seen, even in younger persons, without atheromatous changes in the vessels being indicated. Gangrenous ulcers in young adults should always suggest an examination of the urine for sugar.

Moist gangrene is caused by a sudden destruction of a large artery of an extremity, or sometimes by arrest of the circulation in two or more large veins. Extensive contusion and laceration of the tissues at the time of injury favor infection and sloughing, the damage to the circulation inducing gangrene of the moist variety. Bed-sores, frost-bites, and burns may cause local moist gangrene. When infection sets up in any form, the gangrene may spread rapidly in a few days, involving even the entire limb.

Symptoms.—The characteristic symptom of moist gangrene is the dark purplish discoloration seen on the surface, accompanied by blebs or blisters, and producing the offensive odor of decomposition. Septic products imprisoned in these processes are absorbed, and grave constitutional symptoms—high temperature and rapid pulse—characterizing blood-poisoning are set up.

Pain is not present in gangrene *per se*. All these conditions represent a faulty circulation of the blood, to which is added an infection. When the fault lies in the smaller arteries, the effects are slowly produced and less impression is made on the constitution. When, however, a large extent of tissue is suddenly deprived of nutrition and the evaporation of the retained fluids becomes impossible, rapid decomposition and infection set in.

Treatment.—The preventive treatment of gangrene consists of maintaining the equilibrium of the circula-

tion, the relief of tension and constriction when discovered, and the favoring of the venous current by elevation of the part. Warmth to the part promotes the flow of blood, and gentle manipulation is also of service. In the aged, careful attention should be given to sores on the extremities lest they become the seat of senile gangrene.

Operative measures promise little in the constitutional condition which produces senile gangrene, and unless septic processes are progressing and become dangerous, it is better to wait until the line of demarcation appears. Careful covering and protection will give better results in ordinary cases. If infection of a threatening character appears, amputation at a good distance from the point of the disease may be proposed.

In ordinary moist gangrene it is well to await the line of demarcation, especially in the superficial forms. When spreading and infective, prompt amputation at a distance from the point is the only indication. While awaiting changes in moist gangrene it is well to keep the parts enveloped in dressings saturated with solution of potassium permanganate, 5 grains to a pint of water, which diminishes both odor and infection. Stimulants and supportive treatment are required.

If an amputation is deemed proper, it should be done well above the diseased tissue. In senile gangrene amputation should not only be high above the line of demarcation, but even above the next articulation. It is impossible to tell where the obstruction in the artery is situated, and unless the amputation is made above the obstruction, the process will continue to spread. Even under the most favorable circumstances amputation under these conditions is often a disappointment, and the shock, added to the previous depression, either produces immediate death or hastens the fatal termination.

Sloughs and bed-sores should be allowed to separate themselves, at least partially, under antiseptic dressings. These dressings should be saturated, preferably with the

potassium permanganate solution, 5 to 10 grains to a pint of water. This is a mild antiseptic, but a very efficient deodorant. Loose portions of slough should be separated with the scissors and forceps.

THROMBOSIS AND EMBOLISM.

Thrombosis.—By thrombosis is meant the formation of a blood-clot in a vein. This clot, or thrombus, may wholly occlude the vessel, or may be adherent to the walls, with the stream passing by it. The clot is almost always the result of an infection of the vein-wall, or else of an injury.

Usually the infection causes softening of the thrombus and portions of it are washed away, either to lodge in the vein and form another thrombus, or, as is more common, to pass through the heart and be sent into the lungs, producing pulmonary embolism, often fatal. Or the pieces of thrombus may pass through the lungs and find their way into the arterial circulation, brain, kidneys, and other viscera.

Embolism.—The detached clot is termed an embolus. This clot is likely to be lodged in some vessel and occlude it. If infected, as in pyemia, abscesses will form ; if it be large enough to obstruct an artery of considerable size, gangrene may take place. Such clots, when arrested in the brain, are likely to produce *embolic apoplexy;* in other viscera, infection and abscess result.

Thrombi, though practically seen only in veins, may form in a diseased heart or in the terminals of damaged arteries. In the former situation they are most dangerous because they are soon detached and carried into the arterial circulation. In the arteries they may produce gangrene.

SUMMARY.

By *gangrene* we understand a process of mass decomposition or mortification, due to interference with the blood-supply. When the interference is abrupt, moist decomposition takes place ; when gradual and limited,

a dry mummification results. Sepsis sets up early in the moist form, and late in the dry. A line of demarcation should be awaited before amputation, unless sepsis threatens life. Sugar in the urine is to be suspected in idiopathic gangrene in young persons. The treatment is protective, consisting in enveloping the part in cotton batting. When present, antiseptic and deodorizing lotions, with quinin and stimulants, should be used. Operative measures are indicated in sepsis.

By *thrombosis* is meant a fixed clot in a vein. If this clot be detached and carried into some smaller vessel, usually an artery, it is termed an *embolus*. Such clots are generally infected, and when detached, carry infection into remote situations.

CHAPTER VI.

AUTO-INFECTION. — SURGICAL FEVER. — SAPREMIA AND SEPTICEMIA.

AUTO-INFECTION.

THOUGH it is distinctly a part of physiology to explain what is meant by elimination and the importance of getting rid of the many poisons hourly created in the organism through the skin, kidneys, bowel, and other emunctories, yet it is a prominent feature of the daily practice of the surgeon to look after this elimination, and it is well to be reminded of the importance of these functions.

The function of respiration, as well as that of perspiration, does not usually require special attention, though both are powerful auxiliaries of the direct excretory organs. However, they usually continue to act without artificial aid.

Auto-intoxication from retained products which should have been eliminated by the kidneys is well known to be a promptly destructive agent. A slower process of poisoning goes on as a result of imperfect functioning of the liver, and perhaps a still tardier but none the less depressing poisoning results from improper elimination by the intestines.

With a little care, in the vast majority of cases it is not difficult almost wholly to prevent these evils by the simplest attention and the administration of standard medicines. Of course, the existence of structural disease may render any treatment futile, but it too often happens that sluggish intestinal action, engorged liver, or overburdened kidneys, without structural changes in these organs, may impair the appetite and disturb the

rest of the patient, rendering him dull and stupid, and constantly retard his capability for resistance or improvement.

In all operations of election careful preparation must be made to secure the cooperation of all these functions, and when, as in emergencies, sufficient time has not been allowed for previous attention, more energetic and persevering measures of treatment must be kept in mind.

SURGICAL FEVER.

In spite of the measures taken to secure asepsis after operations of election, and, so far as possible, those of necessity and accident, but few large wounds heal without producing a rise in temperature. This rise, which is not, of necessity, a part of any infection, is usually noticed on the evening of the first day, accompanied by a corresponding increase in the rapidity of the pulse. Such rise depends largely upon the severity of the shock, and may at times run as high as 103° F. or even higher, although usually it is not above 100.5° F., the pulse generally averaging from 80 to 90. Slight malaise, headache, coated tongue, in fact, the ordinary indications of mild inflammation, are present, and persist usually for from twenty-four to thirty-six hours.

The *height* of temperature and the rapidity of the pulse, as well as the corresponding symptoms, are usually present on the evening of the second day. If fever persists or is increased in severity on the morning of the third day, some local cause is usually at fault and a change of dressing is indicated.

It is true that such fever may continue during the aseptic healing of large wounds when much effusion occurs and repair is slow. Local symptoms about the wound, with throbbing, redness and pain, or sweats, will indicate the presence of pus and sepsis, showing that the fever is no longer a reparative, but a destructive, one.

The **treatment** of aseptic fever consists chiefly in

attention to the emunctories (noted under Auto-infection) and such symptomatic indications as may arise.

When the septic processes are established one of the three forms in some degree of severity is present—sapremia, septicemia, or pyemia.

SAPREMIA.

While it is well known that all the so-called blood poisons are generated by the products of pyogenic organisms, yet these products act differently in each variety: not always so distinctly as clearly to indicate, beyond question, the phenomena, but to a degree characteristic enough to give each variety its name.

By sapremia is to be understood the action of the germs of putrefaction,—the saprophytic bacteria,—in the presence of which the ptomains are formed. The ideal causative agent of sapremia is found in the retained afterbirth in the puerperal state, whether following abortion or full-term delivery. Any decomposing product favoring absorption is a focus for the infection, acute spreading gangrene and infectious sloughs often offering a starting-point. If not promptly removed, however, the infection is soon generally distributed throughout the entire system, and septic intoxication or septicemia is the result.

Death can rarely be referred to the sapremia alone, for it does not follow the infection closely, the course almost always being determined by the general infection present, although the action of ptomains is similar to that of other alkaloidal poisoning—a constantly repeated dosage until the source is removed.

The **symptoms** of sapremia are those of infection generally. Not rarely the first symptom is a chill, with high temperature and a rapid pulse—perhaps disproportionately rapid. Sometimes foreshadowing trouble, the chill is preceded by a rise in temperature and quickened pulse, with nausea, vomiting, and often diarrhea. After the chill the temperature usually returns to the normal,

but the pulse remains rapid—in severe infections numbering above 100. If the decomposing product can be removed before a septic condition is set up in the blood, recovery will be very prompt and complete, the chills will not return, and the pulse will soon become normal. If, however, there is any delay, septicemia becomes established.

The **prognosis** in sapremia is better than in either of the other septic processes, because if the putrefying mass is accessible—as it often is—and can be promptly removed, a cure can usually be effected. In those instances in which the focus is not promptly eradicated, the course tends toward septicemia and death.

The **treatment** is both local and constitutional. When in any way the cause can be removed early, this step is imperative. If it is delayed until general infection occurs, it will most likely be useless, although even then, if an operation be not productive of too great a shock, it should be done.

Strong local antiseptics should be applied to the wound. Constitutionally, aside from free purgation and stimulation, the treatment is that to be described for septicemia.

SEPTICEMIA.

In this variety the general infection may follow a sapremia in which the poison has been distributed throughout the system, while the original focus continues to supply it, or before its successful removal. However, it not infrequently follows a very simple wound, one in which there occurs little local disturbance.

Slight wounds inflicted in conducting postmortems and in dissecting, as well as septic operations of seeming slight importance, are occasional sources of fatal septicemia, without even producing serious local distress.

The **symptoms** of septicemia, like those of sapremia, may be sudden or gradual. Usually a chill either announces the infection or follows the slight fever and malaise of a day or two after infection. Sometimes this

period of inoculation is even considerably longer, but usually by the third or fourth day after infection severe symptoms are manifested. In the less violent infections elevation of temperature occurs, with slight rigors and a correspondingly rapid pulse, the case being marked for a week or so by a degree of depression and prostration out of all proportion to the other symptoms. A grave condition is indicated by a severe chill, with high temperature and rapid pulse, succeeded by sweats.

The fever is characterized by remissions, but the pulse usually remains constantly above 100. Commonly the chill does not recur more than two or three times, but chilly sensations and cold feet and hands precede a rise in temperature.

When the infection is in the extremities, the lymphatic tracts are often outlined by a red line, exhibiting tenderness on pressure. Later, in the milder forms, lymph-nodes, which later suppurate, form in the course of these channels. These nodes are not only discolored, but prior to suppuration are painful, and although deeply seated, may cause great suffering. Although originally the septic processes begin in the wound, the poisons grow and multiply everywhere in the system after the disease becomes general, and the pulse becomes more rapid and grows weaker. Toward the close of the disease the temperature may even remain low, with occasional exacerbation. The author has never known recovery to follow a case of septicemia in which diarrhea, with involuntary evacuations, was a symptom.

Death in the more acute and violent form usually comes on within ten days. Severe cases may last for two weeks or more. In the milder form convalescence may be established after two weeks. The approach of death is usually announced by stupor. The mind becomes sluggish, and a restless delirium gives way to dulness and unconsciousness. Jaundice and a dusky color of the skin indicate grave blood changes.

TREATMENT.

If the case be seen early, free drainage and cauterization with pure carbolic acid, or even the actual cautery, are to be promptly employed, followed by energetic local disinfection. If the case is one occurring from infection from a large cavity or wound, the drainage, irrigation, and disinfection without the cautery is to be the line of treatment. Free elimination by the bowels and kidneys is to be obtained, although the danger of diarrhea in the later stages is to be borne in mind. Should the diarrhea become troublesome, charcoal and pepsin are to be administered. Hypodermic injections of strychnin, quinin, whisky, and other stimulants, as well as judicious feeding, are called for.

The antistreptococcic serum has in a small proportion of cases been reported as of great service. In the observation and experience of the author it has effected no permanent good. Efforts at supportive treatment should not be abandoned even in seemingly hopeless cases, as recovery, following apparently inevitable death, is at times seen.

SUMMARY.

By *auto-infection* or acute intoxication is meant absorption, either in a new wound or in the general circulatory tracts, of poisons generated in the body itself or ingrafted upon it in some one spot. The absorption of urine, bile, or the contents of the bowels, as well as inoculation of a second chancroid from the primary sore, are illustrations. Hence, cleanliness and care of the emunctories are essential.

Surgical fever, not septic, is the reaction from the shock of the wound, as well as the struggle of the leukocytes with bacteria. Usually it is past in forty-eight hours, but it may continue of a low grade and yet not become septic for a week or more. Symptomatic treatment alone is required.

Septic processes occur in the form of sapremia, which

is ptomain-poisoning; septicemia, which is the result of toxins and infective products in the general circulation, both through the lymphatics and blood-vessels—or pyemia, which is the direct transmission of pus into the vessels.

The symptoms in the first two are very similar, the history serving to make the diagnosis, which is an important step, as the cause of sapremia is often susceptible of removal. The general treatment consists of drainage, irrigation, and supportive measures. Anti-streptococcic serum is advocated by good authority.

CHAPTER VII.

PYEMIA.—ERYSIPELAS.—ACTINOMYCOSIS.

PYEMIA.

PYEMIA is the result of a septic infection of the veins, causing a phlebitis, then a thrombosis, of which clots, particles, or emboli are carried to the heart and thence distributed throughout the body.

Pus is not found freely circulating in the blood, but the germs of suppuration are carried in these emboli. When the emboli lodge, an abscess, known as a metastatic abscess, forms; ptomains and other septic products are carried in a similar manner. Pyemia usually follows a septicemia, even the mild variety.

The **symptoms** of pyemia will not, it is clear, occur until the septic products lodged in the infected veins have undergone softening and become developed and transported to a new location. The primary chill of pyemia is usually seen about the tenth day after infection. The initial chill, which is generally severe, may come on without warning, although usually in an otherwise healthy wound, some fever and acceleration of pulse will be noted. A temperature of 103° to 105° F. follows the chill, succeeded by exhausting sweats; at the decline of the fever there is a return to perhaps nearly the normal temperature, followed by a rise again in a short time.

The pulse continues to be rapid, and during the chill may reach 150. It is commonly stated that another chill, following within twenty-four hours, indicates the location of another embolus, yet it is highly probable that one point of infection may account for repeated chills. Frequently these chills vary in severity, but toward the close of the disease the shock may become

profound during the chill, and death immediately follow. The mind is usually clear, except at the time of the shock, when mild delirium may be present.

Embarrassed respiration, frothy and blood-stained serum, with harassing cough indicate that the emboli have lodged in the lungs. Metastatic abscesses may appear in the joints.

Pain, tenderness, and jaundice indicate that the emboli have invaded the liver. These metastatic abscesses may be very small, but at times large abscesses present and are opened. Later the shock of the chills is more depressing, the pulse is feebler, the lungs are more engorged, the emaciation is marked, the bowels are loose and uncontrollable, the skin is dusky and yellowish, the urine scanty and dark red, and the exhaustion progressive.

Death generally occurs in from one to two weeks, but four or six weeks may elapse, even in severe cases, before the fatal termination ensues. The progressive character of the affection must be kept in mind, lest the clear intelligence, the strong though quickened pulse, and the periodic defervescence of the fever may encourage false hope. On postmortem examination, innumerable small embolic abscesses are found in the lungs, liver, spleen, parotid gland, and perhaps in some of the joints.

Acute pyemia is, from its inception, practically a progress to the grave. In the milder chronic forms recovery is possible, but rare. The disease is far less frequent than formerly, since the almost universal employment of aseptic and antiseptic measures.

Treatment.—When possible, remove the cause, and if the thrombotic foci can be located, which in acute general pyemia is generally impossible, they should be well cleared out. Drainage and irrigation of abscesses, when located, are indicated, but promise little.

General constitutional treatment is practically the same as in septicemia. Nourishment, stimulation, and

rest constitute the general measures; strychnin and whisky are the essential stimulants.

ERYSIPELAS.

Erysipelas is an acute infection of the skin or mucous membrane and the underlying cellular tissues, due to the special germ—the streptococcus of erysipelas. It is almost unquestionably settled that this is not the ordinary pyogenic streptococcus. Certainly its effects are constant, and in any form it never suppurates unless mixed with other septic germs. The source of infection is through an abrasion or wound, and though some forms are looked on as idiopathic, this is probably not ever the case. Freely contagious, it is not actively so, and contact, usually mediate, is necessary, as well as a break in the tissues. Erysipelas is an especially dangerous infection to puerperal women.

Symptoms and Forms.—Erysipelas is seen in three forms—the facial, the general, and the phlegmonous.

By **general erysipelas** is meant that form which spreads from one part of the body until, if the strength be not exhausted, it may finally involve the entire cutaneous surface. This extent of spread is not often seen. It may rarely occur in children. The character of the local inflammation is about the same as in the facial form, and the symptoms are similar, except in the extent of surface involved and the protracted attack.

Phlegmonous erysipelas is almost invariably ingrafted upon a wound, commonly in an extremity. The *symptoms* of phlegmonous erysipelas are excessive redness of the skin, swelling of the part, a burning sense of pain, slight pitting on pressure, with deep-seated aching pain, tenderness, and evidence of suppuration and septic infection, with high temperature.

The *treatment* consists in early free incision and drainage, antiseptic irrigation, and the application of a hot bichlorid pack,—1 : 1000,—with supportive meas-

ures. The various preparations of iron with general treatment, such as is recommended for septicemia, complete the indications.

Facial Erysipelas.—*Symptoms.*—The beginning is usually a spot of tenderness upon the cheek or forehead, reddened and slightly swollen. This redness extends usually in one direction, but at times in several. There is a chill, followed by high temperature and quick pulse, and a formation of small blebs on the surface. The pain or burning of erysipelas is usually slight. The temperature is often 105° to 106° F., and it keeps up to the 100° mark for some days, with occasional remittances and exacerbations. At times such inflammation stops after a day's spread; at others it will go on until the whole face has been involved. Usually the spread is slow and the inflamed part becomes pale, with slight desquamation, while a new surface is red and swollen. This spreading is always by continuity of tissue; there is never any jumping or migrating. There is no difference from the symptoms in the general form, except that the facial variety rarely leaves that part of the body, while the general form usually starts on the trunk. The germ of each kind is the same, and when such spreading forms encounter a wound, cellulitis with phlegmon is likely to be set up.

The *treatment* of superficial erysipelas consists in the application of some soothing ointment—lanolin, zinc ointment, with impregnations of ichthyol are favorites. My own experience with the application of pure carbolic acid to the margin of the redness, and after a minute or so neutralizing with alcohol, has given favorable results. Usually after one or two paintings its spread will be arrested. Five-grain doses of the salicylate of soda every four hours appear to exert a favorable influence. As the cases progress and during convalescence tonics containing iron should be given, and fairly nourishing diet maintained.

All forms of erysipelas are contagious, and the patients

should be isolated, and every care be taken to burn dressings and contaminated bandages and drains.

ACTINOMYCOSIS.

In recent years the study of the so-called "lumpy jaw" in grazing animals, chiefly cattle, has led to the description of an infection, called actinomycosis, due to the ray fungus found in grain.

The disorder consists of the presence of a tumor,

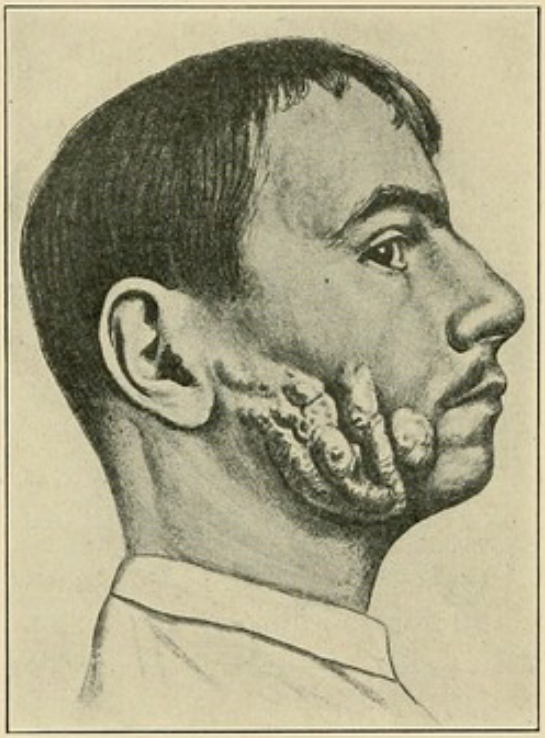


FIG. 8.—Actinomycosis of the cheek (Illich).

which is usually early shown to contain pus-like fluid, with granulation tissue somewhat similar to that of sarcoma. The fungi of actinomycosis may be seen in the discharge even without the aid of a microscope, and appear as grayish particles about the size of a millet seed, sometimes of a yellowish or greenish color. In the early growth these granules are soft, but later they become hardened and gritty.

Whether or not actinomycetes are actively pyogenic, or whether the infection is derived from the germs that

gain admission from without, has not been determined. The disease is found only in grazing animals and in men, and the germ is probably admitted with food.

The fungus usually finds its way into tissue through some slight wound, inflicted by a beard or grain. Such deposits are usually seen about the face or neck, having entered by way of the mouth, and are at times found in the female breast and other glands.

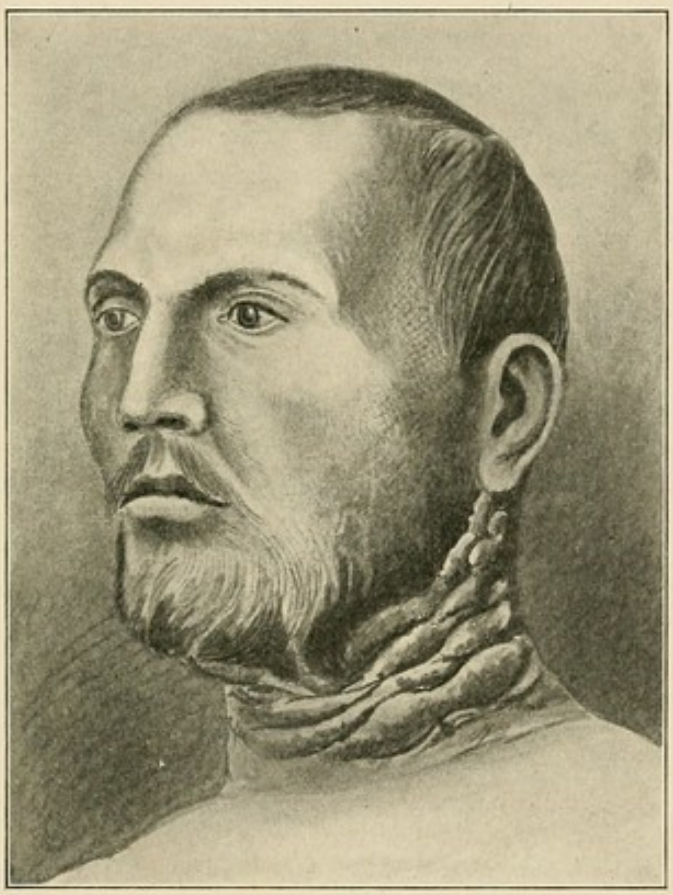


FIG. 9.—Actinomycosis, cervical type (Illich).

The diagnosis from sarcoma and tuberculosis must be made by the history and the finding of the granules in the discharge. The microscope will always settle the matter by disclosing the fungus. Besides, it does not appear that secondary deposits are found in the lymph-nodes communicating with the original focus. There is little pain in actinomycotic deposits. They grow slowly and produce a very gradual impression on

the health, except when secondary deposits in the lungs, liver, or other viscera have taken place, which is of rare occurrence.

Treatment.—Free extirpation of all diseased tissue is the first step. If this can be done, the chances are against recurrence. In the face and jaw, deposits can often be removed by very free excision. At times the tongue must be extirpated. If the tumor cannot be removed, in the course of years death follows from exhaustion.

The administration of iodin and iodid of potassium with construction tonics is of help even when operation is not advisable.

SUMMARY.

Pyemia is the direct introduction of the germs of suppuration into the open blood-vessels, sending the suppurating matter in emboli to many remote organs, inducing metastatic abscess. These abscesses are attended with daily chills and exhausting sweats. A clear intelligence is usually retained until the last. Jaundice, lung-infiltration, and pus in the joints, with diarrhea, exhaustion, and death, mark the course. It is almost invariably fatal.

Erysipelas is an infection with a special germ, producing a blood-poisoning; a uniform redness over the affected parts, usually the face; high temperature and a tendency to spread. Constitutional symptoms are severe, but the prognosis is usually favorable. Treatment consists of carbolic acid locally, either diluted or, if in full strength, immediately neutralized by alcohol. The phlegmonous form requires incision and drainage.

Actinomycosis is an infection due to the ray fungus of grain, and is seen in the face and neck. It is usually painless. It is differentiated from tuberculosis by the presence of the fungus in the growth, visible to the naked eye. Treatment is unsatisfactory, and consists in excision when possible.

CHAPTER VIII.

SURGICAL DIAGNOSIS.—PREPARATIONS FOR OPERATION.

SURGICAL DIAGNOSIS.

By the term diagnosis is meant the study of the symptoms presented by any lesion and the determination of the classification and nomenclature. By differential diagnosis is meant the comparison with other similar lesions, and a conclusion as to which class the one observed belongs.

It is in correct appreciation of the pathology of the conditions presented that the hope of a successful application of remedies for that condition lies. No accurate conclusions can be arrived at without a full understanding of all the causes and changes which belong to disease, and a full appreciation of all the influences at work in the economy. Physiology, anatomy,—both in health and in disease,—chemistry, microscopy, and experimentation all claim full recognition in this study.

Although at the present time it is fair to say that operative surgery has nearly reached perfection so far as human endurance goes, yet in the art of determining the nature of the condition requiring treatment and the probable results of interference there is a wide field for inquiry. The steps to be taken in the discussion of obscure medical lesions, when systematically conducted, are most formal and laborious, although even in detail often most important. The dentist has, however, little occasion to go into such extended investigation, but some part of the system is essential in order to arrive at intelligent conclusions. The family history, which includes a knowledge of the health of parents if living, or their age at death; the health of the immediate

family, brothers, and sisters; and if trace of inherited disease appears, careful investigation should go on into earlier generations. In addition, the previous history of the patient, his habits regarding smoking and drinking, the character of his employment, the date of the appearance of the first symptoms, as well as his age, physical vigor, general performance of functions, and particularly the presence of abnormal, or variation from the normal, ingredients of the urine.

In surgical conditions, when the administration of anesthetics is to be employed, lesions of the kidney and of the heart and lungs are to be weighed against the urgency of the operation. The existence of diabetes, albuminuria, erysipelas, and hemorrhagic diathesis all interfere with the safety of operations.

In the study of surgical lesions we look first to the probable cause, or *etiology*, of the lesion, to be found in the sex, age, race, occupation, previous climatic surroundings, as well as inheritance.

By *pathology* we mean the changes in the structures themselves due to disease.

By *subjective symptoms* are meant headache, pain, and other complaints of the patient; while the condition of the pulse, the range of temperature, and the presence of swellings are *objective symptoms.* The enlargement of the part, displacement, and deformity, etc., are *physical signs.*

By *prognosis* is meant the prediction that may be made as to the outcome.

The study of these various manifestations is conducted first by obtaining the general history, the symptoms and signs, then carefully inspecting the parts, and patiently comparing the injured or diseased side with the sound one, the damaged function with the normal one. Valuable information is obtained by this comparison, and by it suspicion of disease may often be excluded. The appearance of the skin, the actual and apparent age, the signs of premature decay, the exist-

ence of eruptions, the presence of cachexia, or constitutional blood changes, profound anemia, local paralysis, irregular pupils, indications of dropsy, swelling of eyelids, emaciation, loss of hair, wrinkled countenance, scars, tumors, enlarged glands—all these convey special meaning to the experienced eye.

The *measurement of the parts*, especially in fracture and in swellings over the liver, heart, and limbs, will disclose variations and abnormal conditions.

By *palpation* and *manipulation* the sense of touch often gives clear information. In dislocations, fractures, sprains, abscesses, broken ribs, and injuries of joints, the exploration is thus made. By *percussion* in surgery the existence of fluid in tumors and cavities and fluctuation generally are determined. The lungs, the pericardium, the abdomen, all yield decisive and explicit information in response to skilful palpation and percussion.

The *examination of the urine* is important in all obscure conditions, and should never be omitted when the administration of an anesthetic is contemplated, or even when an operation is to be undertaken without it. While it is true that it may sometimes be necessary to operate in the presence of the contra-indications arising from disease of the kidney, it is to be remembered that albumin or sugar in the urine should discourage exploratative and avoidable surgery.

PREPARATIONS FOR OPERATION.

As we have seen that the course, not only of all disease, but also of all structural change in disease, arises through the agency of bacteria, and the fact that such germs are constantly alert for a fertile field of lessened resistance to colonize and multiply, the opportunity offered by a fresh wound must be most carefully guarded by the surgeon. The ordinary methods of cleanliness are all inadequate for this occasion. Those intrusted with these preliminary steps should be impressed with

the truth that if the field be rendered thoroughly aseptic, and all instruments, coverings, dressings, and hands brought in contact with it be similarly sterile, any organ or structure of the body may be exposed without danger of sepsis; but that failure completely to effect this cleanliness is almost sure to be followed by pus and destruction of function, if not of life.

Besides, it is to be remembered that these germs are present everywhere, and must not only be faithfully removed from all instruments and dressings, but must be kept from subsequently contaminating them. We have also seen that despite such cleanliness or asepsis some germs are sure to gain access to every wound, and only the vigor of the patient, through the repelling power of the leukocytes, prevents their colonization. Therefore anything that lessens the productive power of the germs and impoverishes the supply of nourishment upon which they are striving to subsist diminishes the danger.

By **sepsis,** or rather *infection* in this sense, is meant the partial or complete colonization of the germs of suppuration. The term sepsis in surgery is usually understood to mean constitutional infection.

By **antisepsis** is meant the antagonism of infection which has already taken place. The agents of antisepsis are chemical germicides in the living tissues, sterilization by heat on inanimate surfaces the habitat of germs.

By **asepsis** is meant the prevention of infection either by cleanliness or germicides. At the present time clean wounds, as uninfected cuts are termed, are rarely treated with germicides unless contaminated by much handling or exposed to possible infection by some accidental touch from the operation field.

Prior to any operation the field is thoroughly cleaned with hot water and soap, and in many instances turpentine and other penetrating irritants are used. In operations about the mouth and the eyes the less vigorous

measures are employed, but when the field can be easily reached, a poultice of soft soap diluted with linseed oil is often applied the night before, and the washings made at the hour of operation.

After the preliminary washing the skin is usually covered with sterile dressing until the anesthetic is administered, when, after a final cleaning, the wound is washed with a solution of mercury, alcohol, or ether. Wounds that have become infected should be cureted, followed by repeated washings with hot water and bichlorid of mercury.

As a matter of fact, no scrubbing can remove all the germs from an infected wound, but by these means the conditions may be made so favorable that primary union may be obtained. Irrigation of septic wounds or unclean surfaces during operation is of great service in preventing suppuration.

Solutions for irrigation most in use are corrosive sublimate, 1 : 1000 or weaker, or normal salt solution, 1 dram to a pint of water. The latter, though not a strong antiseptic, leaves the field less favorable for colonization.

For the cleansing of the hands, vigorous washing and scrubbing with hot water and soap, and later dipping them in weak bichlorid solution, is the common plan. Great care must be taken to clean the finger-nails. Many surgeons use rubber gloves made for the purpose ; these can be sterilized by boiling,

Tablets of corrosive sublimate—$7\frac{1}{2}$ grains—are obtainable at the pharmacists, and one of these, if placed in a pint of water, will make a solution of 1 : 1000.

A solution of formalin—$\frac{1}{10}$ of 1 per cent.—makes a satisfactory irrigant. About 15 drops of the official solution in a pint of water give about the strength. A stronger solution may be used to mop sinuses or ulcers about the field to be disinfected.

Carbolic acid solutions of full strength may be applied to suppurating tracts, and in a few minutes time may

be neutralized by pouring absolute alcohol over the cauterized surface. A solution of carbolic acid in water—1 : 30—may be used for irrigation. During the operation it also serves to submerge catheters and sounds, as well as other instruments.

Lysol makes an odorless solution for sterilizing instruments, and is sufficiently strong for most purposes.

Dental instruments that are being used upon a septic case may be rapidly sterilized by dipping them in wood-alcohol and passing then through a flame. The alcohol will rapidly burn off without damage to the instrument.

Iodoform has so offensive an odor that it is now little used. After careful preparation all dressings are sterilized by dry heat in ovens made for the purpose.

CHAPTER IX.

ANESTHESIA.

THIS term is understood to imply the loss of sensibility to pain, and is applied to both general insensibility and local numbness. Local anesthesia is induced both by the application of some benumbing mixture and by the infiltration of the surrounding skin with one of the well-known anesthetizing agents. The freezing mixtures are all objectionable, because, while never acting perfectly, they often leave intense smarting and burning pain in the cut after the numbness has subsided. Besides, they lessen the vitality of the part and tend to prevent union. Ice and salt applied on the spot in a small piece of gauze and ether poured over the skin are both emergency measures that serve to divert the apprehensions of the patient. The spray of ethyl-chlorid which is usually used for local superficial anesthesia is prepared in a glass tube. When the small cap is removed, the spray is thrown over the field until a white frost appears. As previously stated, these measures are unsatisfactory, although they often serve a valuable purpose.

The injection and infiltration method, however, has been a wonderful boon to the sufferer, and recent perfections of the method have made it possible to perform operations of considerable, even capital, magnitude without pain. Practically speaking, all surgeons agree that local anesthesia should not be employed for extensive operations unless the general anesthetic is physiologically contraindicated.

The materials commonly used are cocain and eucain hydrochlorate. Locally, especially to mucous membranes, a 5 per cent. solution applied externally will

produce a numbness sufficient for superficial cuts. In the hypodermic use of cocain it is best to employ a weak solution, about 1 or 2 per cent., and infiltrate adjacent structures. From ⅔ to 1½ drams of a solution containing ⅛ to ½ grain of cocain may be injected under the skin, and a considerable extent of insensibility will be obtained in four minutes, its effect continuing for twenty minutes. If this is done in a region where the circulation can be cut off with a ligature, the constitutional effect is prevented. This method is used in extracting teeth and roots, removal of tissues from any exposed surface, amputation of the fingers, circumcision, and even the performance of herniotomy. The author almost invariably uses this agent in performing circumcision on the youth and adult.

Cocain, employed hypodermically, is unsafe for children under ten years of age. The symptoms of cocain poisoning are nausea, dizziness, pallor, cold clammy skin, severe headache, with faintness and dilated pupils. If the more severe symptoms appear, the patient becomes delirious, the pulse slow, and at last convulsions and heart failure intervene. In the adult a grain or more is required to produce severe symptoms, though in some instances even ½ grain will cause discomfort. There is no physiologic antidote, but stimulants,—whisky, ammonia, hypodermics of strychnin,—warmth, and rest are the indications.

Eucain is less dangerous, and is by many preferred. The dose and method are about the same. It is less reliable as a local anesthetic, and externally has but slight numbing effect.

Chloretone in ½-grain infiltration solution, injecting 1 or 2 drams, while a less reliable agent, is a very efficient one, and without danger.

Schleich's solution of morphin and cocain is used for infiltration of larger surfaces, but has no especial value. If care is observed in the cocain or eucain solution, using no more than ½ grain to 1 dram or 1½ drams of

water, every ordinary emergency requiring local anesthesia can be safely met, and more satisfactorily than by other supposedly less dangerous mixtures.

Spinal Anesthesia by Cocain.—The injection of either of the aforenamed agents into the spinal canal by a specially made syringe, between the first and the second lumbar vertebræ, produces anesthesia of all the body below the intestines, and permits of any capital operation below this point without pain. For the past two years this agent has been generally employed for this purpose. The question is still in dispute as to whether this method is safer than general anesthesia, but it is pretty well conceded that, save in conditions contraindicating the general method, spinal cocainization is not to be preferred. The method has not been sufficiently tried to determine its mortality-rate, but it is not always efficacious in destroying sensibility; the after-effects are even more distressing than those of ether or chloroform, and the care and skill required in its use are not less than in general anesthesia. The danger of producing septic meningitis is not to be forgotten. That it has a fixed place in general surgery is, however, unquestioned.

General Anesthesia.—The administration of general anesthetics dates back only to 1842, but is recognized as the greatest boon to humanity in connection with surgery, dentistry, and obstetrics since medicine became a profession.

All the agents for producing general anesthesia act in the same way: by temporarily overcoming the power of the control of the spinal nerve-centers. Chloroform and ether are largely the preponderating agents in general surgery; nitrous oxid, in dentistry. Certain conditions of the patient make one or another agent unsafe.

Ether cannot well be used in the presence of burning gas or lighted lamp without the danger of explosion. Disease of the kidneys and bronchitis constitute contra-

indications to ether; patients suffering with asthma, atheroma of the arteries, or hypertrophy of the heart should also be subjected, by preference, to chloroform. Before definitely determining the propriety of any operation, the chest should be carefully examined and the urine tested for disease of the kidneys. In disease of the heart, except hypertrophy, ether is preferable. In disease of the kidney and lungs, chloroform answers best.

The bowels should be emptied before any operation. No solid food should be given for twelve hours before the administration of the anesthetic. All constriction should be removed; the mouth examined for false teeth, gum, tobacco, etc. A hypodermic syringe charged with strychnin should be at hand, and whisky and ammonia should be ready if needed. The patient to be etherized should lie on his back, though the semierect position, if need be, can be more safely taken than when chloroform is employed. Special inhalers are manufactured for giving ether. Usually eight to fifteen minutes are required to complete insensibility. The respirations must be carefully watched. As noted before, sudden dilatation of the pupils or dusky color in the face indicates great danger, and demands immediate withdrawal of the ether, the injection of strychnin, and perhaps the institution of artificial respiration. The patient taking ether breathes much more deeply and stertorously than one taking chloroform; usually the patient is talkative, or perhaps violent in the early stages. When the reflex of the eyelid is gone, ascertained by touching the conjunctiva with the finger, the patient is ready for the operation. Usually from four to eight ounces are required to keep the patient in the anesthetized state for one-half hour.

Chloroform is quite irritating to the nose and lips of the patient, and these should be protected with vaselin while the inhalation is going on. The inhaler, which is either a handkerchief or a paper cone, or preferably

the wire-covered receiver of Esmarch, should not touch the skin. The patient in the early stages should be allowed a breath of pure air from time to time. The pupils should be watched carefully for sudden dilatation,

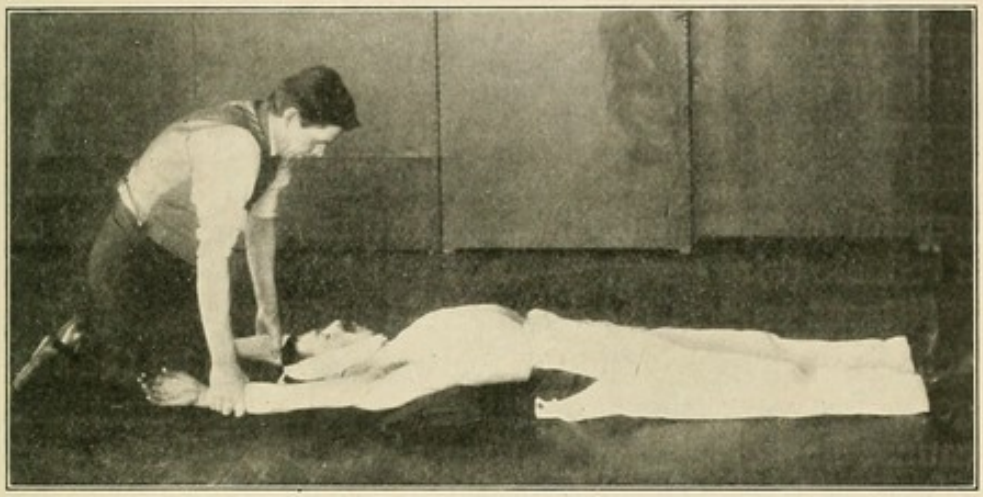


FIG. 10.—First movement: inspiration (Murray).

and the finger kept over the pulse. Loud, stertorous breathing, pallor of the face, feeble or absent pulse indicate danger. If there is danger of asphyxiation, the

FIG. 11.—Second movement: expiration (Murray).

tongue should be pulled forward, and the glottis opened by pushing forward on the angles of the lower jaw. If respiration ceases, resort must be made to artificial methods, described under the head of Drowning. If

the heart becomes feeble, strychnin is to be injected. Syncope may occur early in the administration and indicates heart failure. The head is to be lowered, artificial respiration, with strychnin and the galvanic battery, if available, kept up faithfully even after there appears to be no hope. Usually about two drams to half an ounce of chloroform are required for a half-hour operation. Chloroform and ether require an expert for safe administration, and under no circumstances should general anesthesia be induced without the presence of a reliable third party.

Nitrous oxid is the anesthetic usually selected by the dentist in the extraction of teeth, and is used by the surgeon for very short operative steps. The anesthesia cannot be kept up longer than about one minute. Nitrous oxid produces insensibility by diminishing respiration, which, however, does not wholly cease, and should be carefully watched. The gas is preserved in a metallic cylinder, and to this a rubber bag is attached, having a mouth-piece with a valve. The patient may be either erect or recumbent. The flow of gas is regulated by a stop-cock on the cylinder. The mouth is kept open by a gag, as it would be held firmly shut by the muscular rigidity, the muscles not relaxing as in chloroform anesthesia. When the mouth-piece is inserted the nostrils are compressed by thumb and finger, and the patient inhales through the mouth. Soon slight cyanosis appears on the cheeks and ears, and in a minute, or sometimes less, the breathing becomes slow and stertorous; the pupils are dilated, and the conjunctivæ insensible. The pulse and respiration should be carefully watched. There is really almost no danger, although the appearance of the patient is alarming, but in event of failure of either heart action or respiration the usual methods should be employed. Consciousness usually returns within a minute or so after the inhalation stops. Its return is often announced by a cry, followed by laughter of a mild, hysteric form.

Schleich mixture is a compound of chloroform 45 parts by volume, petroleum 15 parts, and ether, from 80 to 180. It must have a boiling-point between 99° and 104° F. It is claimed that this mixture when inhaled is more readily taken, and that consciousness returns more promptly after the operation, with less succeeding distress, and that it is less dangerous than either chloroform or ether alone. It has never become popular in this country.

Practically ether is a safer anesthetic than chloroform, and in but moderately experienced hands gives less mortality. Its occasional disastrous after-effects upon the kidneys and lungs in a measure make up for this apparent advantage. The vomiting and protracted nausea, together with the ether odor after inhalation, sometimes do great damage to sensitive wounds after capital surgical operations.

Statistics indicate chloroform to have a mortality of about 50 per cent. greater than ether; but in skilled hands there is much less difference. The mortality from chloroform is about 1 to 3000 inhalations.

Chloroform is used by preference in most southern and western hospitals of this country. In rural practice it is almost exclusively used because of its smaller bulk and greater convenience.

SUMMARY.

Surgical diagnosis means the determining from what malady the patient suffers. Age, sex, family, and personal history, habits, occupation, are all important.

Symptoms: Condition of liver, kidneys, lungs, and heart; appearance of the skin, measurements, palpation, manipulation, the use of aspirator, the temperature of the body, are all included in the steps.

In *preparing for an operation* not only must the diagnosis be made, if possible, but whether an anesthetic is used or not, all points of contraindication, as diseases of kidneys, heart, lungs, or blood, etc., are to be consid-

ered. The field must be rendered aseptic, or in accidents, vigorous antiseptic cleansing employed, and careful attention to dressings and after-treatment provided for.

The *anesthetic* may be local, usually cocain or eucain, in diluted solutions of $\frac{1}{3}$ to $\frac{1}{2}$ grain; or general, as chloroform, ether, or nitrous oxid. The contraindications to the use of chloroform are feeble heart, lung diseases, and kidney lesions. In emergency operations ether is unsuitable at night; it is likewise in the presence of kidney lesions and in bronchitis objectionable. Pneumonia may be induced by prolonged inhalation of ether. Artificial respiration, injections of strychnin and nitroglycerin, may be employed if dangerous symptoms arise. The pulse and respiration and the pupils must always be carefully watched by the anesthetizer.

CHAPTER X.

WOUNDS, INCLUDING SHOCK.

THE essential dangers of all wounds, whether operative or accidental, are hemorrhage, shock, and sepsis. Were it not for the terrors of hemorrhage, many who are deterred by fear would essay the rôle of surgeon. We have, however, already seen that a cool judgment will be able to control almost all external hemorrhages. It is only when by accident, in dissecting tumors and adhesions, a large vessel in the neck, axilla, or groin is torn open, or a chance cut divides a very large artery, that sudden exsanguination to a fatal, or even very alarming, degree can occur in the hands of a surgeon of ordinary skill. The pathologic conditions may cause a persistent loss of blood ending disastrously, but ordinarily very severe external hemorrhage is easily managed. This subject is elsewhere discussed, as well as the special phase of hemorrhagic diathesis.

Shock is the impression made on the nervous system by the traumatism of severe injuries and operations. Though a somewhat similar depression may follow extreme fright without other injury, there is no doubt that a very powerful factor in shock is loss of blood. The pathology of the condition is not understood, and, independent of hemorrhage and anesthesia, it is not often that any distinct lesion can be made out post-mortem. Age, temperament, surroundings, all influence severity of shock. The young and confident and cheerful bear severe injuries proportionably better than the old or gloomy. The situation of the injury also influences the severity of the depression.

Symptoms.—Great depression, cold skin, sunken eyes,

temperature 96° to 98° F., respiration shallow, pulse feeble and quick, nausea, faintness, and often indifference to all surroundings. These symptoms appear immediately upon receipt of the injury, or on recovery from the anesthetic, while the depression from concealed hemorrhage, from which it must be differentiated, comes on two or three hours later. In the hemorrhage, too, the patient is restless, anxious, has extreme thirst, and suffers from dyspnea. None of these symptoms is so pronounced in shock, and except the thirst, they are usually not marked at all.

Prognosis of shock is controlled by the conditions named. It may promptly disappear, even though at first quite profound. Pain and hemorrhage add to the intensity, and when these are corrected, relief is often very prompt. Usually, when not progressive after the first hour or so, the prognosis is good. When, however, improvement is not marked in six or eight hours, the chances become greatly lessened, though reaction is often witnessed even after twelve or more hours of profound shock. When improvement begins, the pulse increases in volume and diminishes in frequency, and the body warmth returns, the temperature going above the normal. This is termed *reaction.*

Treatment.—Precaution should be taken before any operation to secure warmth and protection. Stimulants are to be given to the weak, and such other medicines as are indicated to preserve as nearly as possible a healthful condition of the system. Everything is done to control hemorrhage. When this has been excessive, the saline solution elsewhere described is to be employed, and indeed even when there is no history of bleeding, it has seemed of great value. Warmth is applied to the body by hot-water bottles and gentle frictions. The head should be lowered, hypodermic injections of whisky, strychnin, nitroglycerin, morphin (if there be pain), as indicated. Perfect quiet should be maintained and comforting assurances given the patient.

Injections of hot salt water into the rectum are less efficient than the direct introduction of the saline solution, but in the absence of suitable apparatus may be employed.

Sepsis.—Infections have already been so far considered that it is but left to say that all surfaces upon the skin or accessible mucous membrane should be thoroughly prepared before operation, and all wounds carefully cleaned with soap and hot water, and then further sterilized by germicides and antiseptics.

WOUNDS.

We define a *wound* as a solution of the continuity of the soft parts, made by cutting or tearing. Simple wounds are those that have a tendency to repair, passing successively through the ordinary course. Infected wounds are those in which germs have effected colonization. Here we have a disposition to extend and to show gangrenous or inflammatory tendencies, with general systemic symptoms.

Wounds are *incised*, *punctured*, *lacerated*, *contused*, *gunshot*, and *poisoned*.

Contused and lacerated wounds show much the same conditions. The surrounding tissues are bruised and discolored, and if lacerated there is a tearing of the external and often the deeper parts, to every differing degree. In parts of contused wounds the tissues may be almost pulpified. Usually there is little hemorrhage in either contused or lacerated wounds, though there may be considerable extravasated blood. The pain is usually more persistent than in incised wounds, and the aching continues.

Treatment.—In contusions without break of the skin cold applications, often the cold drip, offer the best plan of treatment. Witch hazel; solutions of dilute lead-water, with one-fourth part laudanum, and other evaporating lotions are appropriate in less severe bruises. Later, hot applications promote absorption

of the effused blood. When lacerations are present, thorough cleaning should be made with hot water and soap, and later measures for antisepsis or asepsis and to control hemorrhage employed. Devitalized tissue, sloughs of skin or muscle should be promptly removed. The edges of the wound should be approximated as nearly as can be done and insure drainage. Deep wound cavities should be packed with gauze.

The **incised wound,** whether operative or accidental, presents the most favorable opportunity for repair; often if properly managed it will heal without perceptible scar. It is the result of a cut by a sharp instrument, is usually of moderate depth, and the edges are so placed as to be easily brought into accurate adjustment.

The first step of **treatment** is control of hemorrhage, either by pressure or ligature. In small wounds pressure and torsion usually suffice, though spurting vessels should either be tied or compressed by sutures. The wound itself should be thoroughly cleansed, and if accidental, rendered aseptic by germicides; operative wounds, if proper preparation has been made, do not need this. Hot sponges applied to oozing surfaces will often control annoying bleeding. As a rule it is better to secure absolute hemostasis before closing a wound in which primary union is desired. In all large wounds this is imperative, but in small and shallow wounds the sutures will often arrest bleeding that cannot be completely checked by sponging and pressure.

Sutures of silkworm-gut, catgut, or silk should be so introduced as to close the deeper part of the cut as well as the superficial, lest there accumulate in the dead space effused fluids to favor infection. Drainage is to be employed when such effusion is feared. The drain, which may be either gauze or, in larger wounds, rubber tubing, should be removed in from twelve to thirty-six hours, as by this time all uninfected wounds have sufficiently ceased to receive the extravasated fluids as to be safe.

In **infected wounds** provision must be made to permit the escape of inflammatory products. Here drainage is necessary to prevent extravasation. Often in uninfected wounds a suture left untied at the first dressing can be tied when the drain is removed. In the tying of sutures tension should be avoided. After suture a sterile dressing is placed well over the wound. If closed without drainage, the uninfected wound may be left for from three to six days without inspection, unless it becomes painful or the temperature rises. If, on inspection, evidences of infection are present, such of the sutures as seem indicated are removed and irrigation with drainage employed. When all goes well, sutures may be allowed to remain for from six to eight days if necessary. In wounds of the face it is usually best to remove sutures by the fourth day.

Punctured wounds are made by pointed instruments or foreign bodies, sometimes sharp, sometimes quite blunt. Not rarely splinters, broken needles, thorns, fish-hooks, and other foreign bodies remain in the wound. Unless such vulnerating bodies invade a large blood-vessel, a clean punctured wound made by a sharp object causes little damage. When septic, or when blunt or lacerating, as accidental wounds, usually the defective drainage encourages inflammation, which often becomes a very serious matter. Should a foreign body be retained, it should be removed if located. Splinters and thorns can often be seen, and broken needles and pieces of glass can be felt. The X-ray will sometimes be of help. Even when the foreign body is known to be in the structures but cannot be located, it is not wise to search blindly for it.

Treatment.—When such wounds seem favorable for healing and free from foreign bodies or marked infection they should be closed, either by sealing with gauze and collodion or dressing with a gauze pad. If pain and tenderness continue, the wound should be freely enlarged under cocain anesthesia, to facilitate drainage. A hot

bichlorid pack should be used as a poultice until the soreness passes away, when the lesion should be treated as a lacerated wound.

If it is suspected that foreign bodies are imbedded in the wound, but it is impossible to locate them, incision and drainage should be kept up until the body is located or the wound begins to heal. Such wounds usually bleed very little. Of course, if arteries or veins of any size are penetrated, the wound should be enlarged and the bleeding point secured.

Poisoned wounds are practically only those inflicted by the sting or fang of some venomous reptile or insect. The bites of animals not suffering from disease are no more harmful than other punctured wounds, unless by accident some poison from offal or carrion be thus introduced. Few insects in this country occasion any serious injury other than painful stings, and perhaps none causes fatal issue. Spiders, scorpions, and centipedes cannot destroy life, except very rarely in the feeble or in children. Among serpents, rattlesnakes, copperheads, and the spreading adder are, however, venomous enough fatally to infect any one, and death often follows quickly.

The **symptoms** of such infections are burning pain, swelling, shock, nausea, and vomiting, and in the severe forms feeble pulse and mental wandering. Of course, the history is necessary in order to make an accurate diagnosis.

Treatment.—That of stings of bees and other insects, including that of the tarantula and scorpion, should consist in applications of dilute ammonia or saturated solution of soda bicarbonate. If need be, stimulants may be employed.

Serpent-bites, as previously referred to, require very energetic measures. If upon an extremity, a ligature should be tightly applied above the bite, and the point freely excised and cauterized with nitric acid, or, preferably, the "actual cautery." If the wound be well

sucked or a cupping-glass applied before cauterization, soon after reception, it is a great help, and harmless to any one applying an unbroken lip to the bite. A solution of permanganate of potassium 10 per cent., injected into the wound, is highly commended. Usually free stimulation with whisky is to be employed. If such patients do not perish in from eight to twelve hours, the prognosis becomes more favorable.

Dissection wounds have been referred to in another place in discussing Septicemia. Hydrophobia is also separately described.

Gunshot wounds require no other notice here than the peremptory caution never to probe them until they have been thoroughly cleaned, and not then unless some clear indication is present. They should be cleaned, closed up, and treated as a punctured wound. When involving serious relations, the general surgeon should be summoned.

SUMMARY.

Shock after wounds is due largely to hemorrhage. Temperament and age also influence it. If the bleeding stops with warmth and support, the patient usually reacts in from two to six hours. The treatment is warmth and quiet, with control of the hemorrhage and pain. Stimulants should be given as needed.

Wounds are breaks in the soft parts due to violence. They are incised, punctured, and contused. Incised wounds should be cleaned, the hemorrhage controlled, the wound sewed up, dressed antiseptically, and drained if required. Punctured wounds should be enlarged if drainage indicates it, and kept well open with hot applications and antiseptic poultices. Contused wounds require cleaning and drainage, with dressings to aid granulation.

Foreign bodies in wounds should be removed when located, but blind searching is harmful.

Insect- and serpent-bites should be constricted if possible, excised, and cauterized when dangerous.

CHAPTER XI.

EMERGENCIES.

HYDROPHOBIA.

HYDROPHOBIA, or rabies, in man is never primary, but is produced by an infection from some animal affected by the disease. This infection is almost always by the saliva, although other fluids of the animal have full power of transmission. Besides the dog, cats, wolves, and foxes may develop the disease spontaneously. It does not appear that either man or other domestic animals except those noted can communicate it. Only about 15 per cent. of those bitten develop the disease, and bites on exposed portions, as the hands and face, are most dangerous. Direct inoculation of the saliva will also produce the affection.

The stage of inoculation in man is usually from twenty to fifty days, sometimes three months or even more. During this time the wound heals. The active symptoms are usually announced by irritation of the scar, nervousness, anxiety, and loss of appetite; and in a day or so a sense of constriction in the muscles of deglutition and respiration sets up. These symptoms are aggravated by noises, currents of air, and excitement of any kind. Swallowing soon becomes impossible. A dreadful terror fills the mind; later convulsions, and soon paralysis and death, follow.

Paroxysms of delirious raving and violent struggling occur at varying intervals in the earlier stage of the attack; later on, from exhaustion, they may diminish or cease. Death usually takes place by the third day, the mind remaining clear to the very last.

Treatment.—Immediately upon the infliction of the

bite excision and cauterization should be employed, as in snake-bite. If possible, as a precaution, the patient should be sent to an institute for inoculation with the Pasteur lymph, which has shown signal value in preventing the outbreak.

When the attack has developed, death is inevitable. Palliative treatment in the way of quiet, in a dark room, with morphin, bromids, chloroform, restraints, is all that can be done.

EPILEPSY.

In sudden attacks of convulsions or unconsciousness application is made to the nearest person for information; hence a general knowledge is desirable. The commonest cause of such condition in the adult is *epilepsy*. If any history can be obtained, it will serve to explain the occurrence, but this is often impossible at the moment. In most forms of epilepsy the patient falls, without warning or screaming, and writhes on the ground, with bluish countenance and open, prominent eyes, convulsive movements of lips and cheeks, as well as of the whole body. Often the tongue is bitten and a bloody foam appears at the lips and nostrils. Consciousness is usually regained in a few minutes, but the patient does not become rational for a half-hour or so. The diagnosis of the attacks is the only point of interest, as they are almost never fatal, and require no treatment at the time except to prevent the patient from injuring himself. Some hard object at hand should be pressed into the mouth to prevent injury to the tongue, while his struggles are restrained.

APOPLEXY.

This is a much more serious affair. Here, too, the patient falls unconscious, but without convulsive movements. The body is quiet, the pulse slow, and breathing usually labored; eyes closed and irresponsive to light. Consciousness does not return for hours, and

the patient cannot be roused. Death may take place immediately. In such patients found after falling the condition may be mistaken for alcoholic intoxication, and though the two conditions may be combined in the same patient, the odor of the breath and other general surroundings will aid in distinguishing. The immediate treatment of apoplexy consists in the application of cold to the head while the patient lies recumbent, until he can be removed to a convenient shelter and put under the care of a physician.

SUNSTROKE.

Often the patient so stricken falls, but usually consciousness is not immediately lost. The patient is dazed, greatly prostrated, perhaps irrational, and soon becomes insensible, although it is possible to rouse him. The temperature is usually high, and the pulse quick and feeble. Alcoholism may be combined with this condition, and the two may be confused. As in apoplexy, the diagnosis is aided by the odor of the breath and by the general surroundings.

The immediate **treatment** of sunstroke is the application of cold cloths and ice-bags to the head, shelter from the heat, and prompt transference to the nearest hospital or similar refuge, and immediate medical attention. A hypodermic injection of strychnin is often a good step at first call.

FOREIGN BODIES IN THE EYE.

Foreign bodies often lodge in the eye on the street, and the attention, even perhaps of the nearest person, is sought to effect their removal. Sometimes such bodies may be wiped off of the inverted lid with one end of a handkerchief rolled up into a thread or cord. The lid is everted by pressing on it with a probe or lead-pencil while drawing upward on the eyelashes.

When the foreign body is forced into the tissue of the cornea or sclerotic coat, the patient should be referred

to an oculist, as some troublesome abrasion will likely be left. A few drops of a solution of morphin, one grain to one-half ounce of distilled water, will relieve the pain in the eye due to the irritation from these bodies.

FOREIGN BODIES IN THE NOSE.

The attention of the dentist will rarely be called to troublesome foreign bodies in the nose, but occasionally a neglected case will be encountered. Children push beans, small coins, pebbles, and other similar articles up the nose, but commonly no harm results for even days afterward, and plenty of time may be allowed to get skilled aid. To remove such objects a flexible extractor with a short hook or shoulder will often suffice. At times it may be necessary to push small objects into the pharynx and then remove them through the mouth. Fixed bodies may require excision.

FOREIGN BODIES IN THE EAR AND AIR-PASSAGES.

Foreign bodies in the ear may usually be washed out with a syringe and warm water.

Foreign bodies occasionally lodge **in the pharynx.** Sometimes such a body is a large lump of imperfectly masticated food, which may be so placed as to occlude the glottis and produce suffocation. Troublesome, but not so promptly dangerous, symptoms may arise from coins, marbles, etc., carelessly put into the mouth by children. Usually the finger thrust into the pharynx will remove the larger bodies. Fish-bones and bits of wood sometimes lodge in the throat and produce great annoyance; commonly they can be seen in good light and removed with small dressing forceps. Many substances temporarily lodged in the pharynx pass into the stomach or are pushed down and either pass out by the bowel, or if not, may be extracted through the abdomen.

Foreign bodies passing into the larynx and trachea produce most serious and alarming symptoms, from which there is no safe relief until the body is either

expelled or extracted. The accident is announced by violent and unintermitting coughing, and symptoms of impending suffocation, which, indeed, may take place at any moment. Sometimes inverting the body head downward and shaking or striking on the back will give relief; if not, prompt measures should be taken for tracheotomy.

BURNS.

Burns and scalds produce practically the same lesion—usually the scalds are more superficial, and commonly, too, more extensive proportionately.

This accident is the most common fatality among surgical emergencies, and its gravity depends more upon the extent of surface destroyed than upon the depth of the burn. Burns are defined as presenting three degrees: (1) *Erythema* or congestion of skin; (2) *vesication;* (3) *destruction of skin and deeper tissues* to any extent.

In extensive burns there is usually profound shock, during which the majority of fatal cases terminate.

After thirty-six hours the prognosis, even in most extensive burns, becomes much more favorable. Septic infection and extensive suppuration are fatal sometimes in those who survive the shock. Other things being equal, the old and very young present the most unfavorable prospect. Burns that involve one-fourth or more of the cutaneous surface even to the first degrees are almost always fatal. Later on extensive suppuration produces exhaustion and disease of the kidney.

Symptoms.—These vary with the extent as well as with the degree of burn. Unless shock be severe, the pain is usually very harrowing, perhaps resisting any opiate. Swelling of the skin with either reddening and a few scattered blebs or extensive vesication with large and deep blisters, and, in fatal cases, stupor and death, soon terminate the case.

In the third degree the structures may be burned deeply and even the bones be charred.

Treatment.—When there is severe shock, stimulation

with ammonia, whisky, strychnin, and almost always opium, in the form of morphin hypodermically, are the immediate indications. If the extremities become cold, hot bottles are of value. After the shock is past good nourishing food is of great importance.

Local treatment is, however, the great measure of relief. In moderate burns applications of soft cotton cloths—part of an old sheet—freely wetted in a saturated solution of bicarbonate of soda are useful. Over this a layer of dry absorbent cotton helps to keep out the air.

In more severe burns, where there is extensive vesication, it is best to open the blisters, and if there be time and the strength of the patient justifies it, irrigate with 1 : 1500 solution bichlorid of mercury, and apply the solution of soda, boric acid, or salicylic acid. In the country, and indeed in all severe burns when shock is extreme, the carron oil (equal parts of lime-water and linseed oil) is often hurriedly used with the best results as to relief from pain, although neither aseptic nor agreeable of odor.

Usually the pain has almost disappeared by the third day, when stimulating ointments may be substituted. Extensive sloughs may be cut away, and the surfaces irrigated daily with bichlorid solutions. Later, skin-grafting may be of service, while vicious contractions of tendons and the webbed-like prolongations of scar-skin seen about the elbow, neck, and fingers must be guarded against with all possible care.

SUMMARY.

Hydrophobia in man is derived from the feline and canine species. It develops only in about 15 per cent. of those bitten. Incubation period is from thirty to ninety days. Early symptoms are constriction in the throat, dread of swallowing, convulsions, and exhaustion. Death inevitable; duration, two to four days. Preventive treat-

ment by excision of the bite and cauterization indicated. Inoculation by the Pasteur method when possible.

Epilepsy differs from apoplexy and sunstroke in the convulsions and activity during the attack and the usually easy return to consciousness, with the history often of many previous attacks.

In *apoplexy* the patient is motionless, and paralysis is usually present.

In *sunstroke* the temperature is high and the pulse quick and weak.

Foreign bodies in the nose produce no urgent symptoms ; in the *pharynx*, where they obstruct the air-passages, lumps of food or large coins can usually be removed by the finger. When in the *larynx*, tracheotomy is usually required.

Burns are the commonest fatal accident. They are of three degrees. The most fatal period is during shock. Treatment is morphin internally and soothing applications and dressings locally. Later supportive treatment and encouragement of granulation. Vicious cicatrices must be watched for.

CHAPTER XII.

HEMORRHAGE.

HEMORRHAGE, even to the experienced, is always a matter of annoyance and concern; not alone because it may not yield to ordinary measures, but because any loss of blood is to many enfeebled patients a serious misfortune, and to even the robust undesirable. But to the beginner, even minor blood-flow is usually a terror, because any delay in its control alarms the patient and friends, as well as unnerves the surgeon. If, however, the operator will bear in mind that any external accessible hemorrhage can safely be managed by a little patience, and will but think over the best and simplest plan, he will rarely experience any serious annoyance. Concealed and internal hemorrhages are, however, often disastrous in spite of the best directed efforts.

Ordinarily hemorrhages may be divided into—(1) *Primary;* (2) *reactionary;* (3) *secondary*, whether arterial or venous. The blood in arterial hemorrhage is a bright red, and appears in jets, intermitting and synchronous with each heart-beat, usually continuing, unless arrested, until syncope arises. Small arteries often pour a continuous flow. As a rule, venous hemorrhage is a steady, dark-colored current, soon stopping of itself.

Capillary bleeding is an oozing of a bright, arterial-like blood, without spurt and often persisting for many hours.

Primary hemorrhage succeeds the division of the vessels; usually, if arterial, it requires to be arrested by some agent; it ceases of itself from small arteries and most veins. Arterial hemorrhage, even when from small vessels, usually requires some steps.

Reactionary hemorrhage comes on when the clot that

first forms in the veins is dislodged by the strengthened heart. While the same is true of the arteries and capillaries, as the reaction following chloroform and shock, yet sometimes it is due to a slipping ligature or an overlooked vessel. Usually reactionary hemorrhage comes on twelve to twenty hours after primary.

Secondary hemorrhage is due to slough of vessel or to premature separation of a ligature. It is seen six to fourteen days after injury, due chiefly to infection of the wound and extension of infection to the vessel, almost always an artery.

Symptoms of hemorrhage are local and constitutional.

The *local symptoms* need no description. When either a large vein or artery is severed, there is a profuse rush of blood, and unless proper treatment is instituted, death may speedily take place. In injuries of smaller vessels the flow continues until pressure or syncope arrests it.

Constitutional symptoms of hemorrhage are of highest importance, especially when the bleeding is concealed. As the loss goes on the pulse first becomes quicker, the face pale, the respirations shallow and hurried. If the loss is rapid and progressive, soon shortness of breath, flashes of light, roaring in the ears, and fainting and syncope are added. If, as often happens, the flow ceases during syncope, when the heart action is very weak the hemorrhage may not recur at once or even later. When a large vessel is divided, however, the blood continues to escape, unconsciousness persists, and death follows, either with convulsions or by prompt heart failure.

When the flow is less prompt, syncope is recovered from, but recurs, the dyspnea becoming more distressing. Convulsions come on and death soon ensues.

Slighter hemorrhages are arrested by coagulation of the blood in the vessels, which is favored by laceration of their lining at the time of injury ; cold and the air are helps in this coagulation.

Diagnosis.—Open hemorrhage proclaims itself. In

concealed hemorrhage the diagnosis is made by the symptoms given, and often by clots seen, and in cases of doubt by removing stitches or perhaps the introduction of an aspirator.

Treatment.—In most cases of external hemorrhage the treatment is promptly local, and the matter is simple. Elevation of the part, the application of cold, pressure with sponges wrung out of hot water for capillary oozing, compresses over obstinate bleeding that cannot be located by general methods.

The application of ligatures, either tied directly on the bleeding vessel after it is picked up on the forceps, or carried by a needle underneath the bleeding spot and then tied, is the most acceptable method. The ligature for ordinary cases should be either No. 1 or 2 catgut. Silk is less satisfactory, as it is more likely to become a foreign body. The ligature should be tied in a double knot and the thread passed under twice in the first tie.

Small arteries may be controlled by torsion, by grasping the vessel with the forceps, drawing it well out, and twisting it three or four times. This ruptures the inner coat and causes coagulation.

Acupressure, or the passing of a pin underneath the vessel, and then making compression by twisting the pin or applying a figure-of-eight ligature, is now rarely employed. When the means suggested will not control inaccessible bleeding the wound should be enlarged freely so as to render the spots accessible, or compresses charged with styptics often succeed, temporarily at least.

The most commonly employed chemical styptic is the salt, or a solution of subsulphate of iron, either on a piece of gauze packing or directly to the spot. The chlorid of adrenalin has recently proved a valuable styptic, applied locally in a solution of 1 : 3000. Such measures are objectionable because a slough forms, which is a favorable site for infection, and primary union is always prevented. These measures are chiefly applicable to inaccessible wounds in the mouth or in the bone.

When a ligature has slipped in reactionary hemorrhage or sloughs occur in the secondary form, religation, and perhaps a new wound to find the vessel may become necessary. Free enlargement of the wound is to be made when needed to reach the source of bleeding.

When excessive hemorrhage has left the patient exhausted, the introduction of the normal salt solution—a dram of sterilized fine salt to a pint of a distilled water—should be practised, either directly into a vein, or, as is more commonly employed, into the cellular tissue of the legs, arms, or under the mammary gland. A medium-sized aspirating needle secured to the nozzle of a clean fountain syringe will answer as an apparatus. About 10 to 20 ounces of the solution at 100° F. is the proper amount, repeated in a few hours if indicated.

The constitutional treatment of acute hemorrhage is hardly to be considered, though after control the administration of fluids, stimulants, as whisky and strychnin, may be indicated.

In concealed or inaccessible hemorrhage much the same treatment may be tried, though it offers little prospect.

Hemophilia.—This is a condition in which, due to disease of the blood-vessels as well as to a want of coagulability of the blood, the oozing persists in spite of all attempts at control. It is wholly a constitutional condition, rare in this country, though common in Switzerland and other parts of Europe.

Symptoms.—Usually the condition is hereditary, and presents a history of troublesome bleeding from babyhood, as well as a family history of the condition. The child bleeds at the slightest cut, the oozing persisting perhaps for days in spite of all applications and pressure. It may cease only on syncope, and then often recurs. Extraction of a tooth is perhaps the most common cause of uncontrollable hemorrhage in this condition, and often results in exhaustion and death after perhaps a week or

more of bleeding. With such a history no operation should be undertaken so long as avoidable, and even the simplest wounds are to be regarded as dangerous. The author has twice seen death follow extraction of a tooth despite most skilful treatment.

Treatment.—Preventive treatment, in avoiding the opportunity for injury or wound, should never be forgotten. When a wound is made it is usually better to have it free, so that the vessels may contract and pressure be applied to advantage. Styptics on the wound should be early used. It is found that the coagulability of the blood progressively diminishes as the flow continues, and hence the prospect of a cessation is less favorable, other things being equal. Rest of the patient and quietude by opium will assist the other measures. If the vessel can be seen, it should be tied, of course, but usually neither ligature nor forceps will avail. In one instance seen in consultation, the attending physician had lanced a small abscess in the neck, and though we transfixed the margin of the wound with a needle, and wound a figure-of-eight ligature about it, the oozing continued and in a few days sepsis and acute anemia carried the child off.

NASAL HEMORRHAGE.

Hemorrhage from the nose, or epistaxis, is a very common occurrence in children, and not rarely also in young adults. It may arise from falls and blows, but frequently comes on without any apparent cause. In children it rarely requires any other attention than domestic remedies, although sometimes the surgeon is called. In the aged, where the loss of blood is more serious, greater emergency arises. In elderly people, too, some actual lesion is much more likely to be found.

Treatment.—Ordinarily bathing the forehead and face will control the bleeding. Finely pounded ice applied in a handkerchief to the bridge of the nose will usually stop the bleeding in a few minutes. The application of a solution of the chlorid of adrenalin—1 : 3000—by

a mop or sprayed from an atomizer answers well in troublesome cases. If more energetic measures are indicated, the spray of Monsel's solution of iron—1 part to 3 parts of water—up into the nostril will almost always control the bleeding. If this fails, the posterior nares may be plugged by passing a small-sized hollow English flexible catheter back through the nose into the throat. The catheter should carry a stout silk thread which is brought out of the mouth by the fingers or a dressing forceps. A pledget of gauze the size of the end of the little finger, saturated with dilute Monsel's solution, is then drawn tightly against the posterior opening, and tied to another pledget at the nostril opening. This plug should be removed in twenty-four hours and the canal washed out with antiseptics. Such extreme measures should not be resorted to until other treatment has been faithfully tried, because, in addition to causing great discomfort, there is always some risk of sepsis.

SUMMARY.

Primary external bleeding, no matter how severe, can almost always be controlled in time to save life if proper means are at hand. Recurrent hemorrhage is due to overlooked vessels or dislodged clots. Secondary hemorrhage is due to slough of an artery or a large vein from infection. Hemorrhage is controlled by pressure or by a tourniquet. Then the blood-vessels are secured and ligated with catgut. Small vessels may be twisted. Pressure with compresses controls oozing. When hemorrhage is concealed, the symptoms are pallor, coldness of the extremities, feeble pulse, clamoring for fresh air, and fainting or syncope. The treatment of concealed hemorrhage is recumbency, cold to the surface, injection of normal salt solution. In recurrent hemorrhage, if severe enough, the dressing should be removed and the bleeding vessel found. In secondary hemorrhage the

bleeding vessel should be found, or else the trunk ligated through the sound tissues on the heart side.

The hemorrhagic diathesis is not common in this country, and is usually inherited. It makes all wounds dangerous, particularly the extraction of teeth. It is a contraindication to all avoidable operations. When bleeding occurs, pressure, styptics, recumbency, and, of course, the ligature, are appropriate.

Epistaxis is usually controlled by the application of cold to the bridge of the nose. When necessary, a spray of the diluted Monsel's solution of iron or a pledget of gauze saturated with this solution pushed into the nose will usually answer. If the hemorrhage persists, resort may be had to plugging both the posterior and anterior outlets, taking into consideration the risks of sepsis and ulceration.

CHAPTER XIII.

TUMORS.

THE tumors of the skin and of the bony and glandular structures about the face and neck are of nearly every variety. It is therefore necessary for the student of dentistry to have an idea of the growth and morphology of tumors in general.

By a *tumor* is meant a circumscribed enlargement of new living tissues. The growth is non-inflammatory and without physiologic function.

The term tumor is often colloquially applied to any abnormal nodule or prominence, but pathologically the term comprehends a neoplasm. Ordinarily inflammatory swellings indicate their character readily. The more obscure, though sometimes delaying diagnosis, soon cease to grow and often decrease in size or wholly disappear.

Cause and Pathology.—Tumors originate from pre-existing *embryonic* cells. Usually these cells are congenital, though there is reason to believe the original matrix of a tumor is occasionally developed after birth, or even late in life, as the result of some microbic action. These cells may be fixed or detached from the primary matrix and carried by the circulation to another site, where a similar tumor develops. These new growths, whether benign or malignant, always resemble in part some normal tissue, although as a mass they are abnormal in tissue formation. It is easy to understand that, as the essential growth of the tumor must arise from the cells of embryonic or abnormal tissue, in its growth it will still present in its new construction the product of these new cells. These cells are variously derived from the different layers of the embryo, and they, of course, persist in their own genetic identity throughout.

Benign tumors are those that do not tend to ulceration and the production of blood changes, and, except from large size and pressure upon important organs, do not tend to shorten life. These growths are *primary* in origin, and often so closely resemble the surrounding tissues from which they spring that even the microscope cannot always determine the distinction. From this resemblance they are termed *homologous*.

Secondary tumors are usually *malignant* and are not microscopically like the surrounding tissues. They are termed *heterologous*. Their cells are immature and in some varieties the constituency of the entire growth is distinctly embryonic.

The growth of tumors is, as just stated, by the proliferation of the matrix cells, as in all normal development and repair. The benign are usually single and often encapsulated and movable. They are of slow growth and painless, except when pressing upon sensitive structures.

Malignant tumors often multiply in the form of secondary deposits. They are usually fixed in the surrounding tissues by infiltration, and grow rapidly. They are essentially painful, and early show a tendency to invade surrounding heterologous structures. Though it is true that many tumors for years looked upon as benign may later develop a malignant course, it is probable that the embryonic cells were latent in the growth from its origin. It is not clear with our present knowledge of pathology how a transformation could occur, although the future study of bacterial agencies may explain it.

Diagnosis.—The determination of the character of a tumor is controlled by the situation of the tumor, the age and sex of the patient, and the history, appearance, and character of its growth, aided by the microscope.

Classification.—Tumors are classified with reference to their origin and structure, and it will interest us as dentists practically to take up only those connected with the mouth and jaws, although these will not represent

every variety, as many tissues of the body are not here involved. However, the definitions of the various forms here taken up will clearly indicate the nomenclature and pathology of all important neoplasms.

Tumors chiefly encountered by the dentist are, for practical purposes, best classified as:

1. Papilloma or warty growth.
2. Adenoma or glandular growth.
3. Fibroma or fibrous growth.
4. Chondroma or cartilaginous growth.
5. Lipoma or fatty growth.
6. Osteoma or bony growth.
7. Odontoma or tooth growth.
8. Angioma or blood-vessel growth.
9. Sarcoma or malignant growth.
10. Carcinoma or malignant growth (cancer).
11. Cystoma or cystic growth.
12. Retention cysts—not growths at all.

It is quite common to find tumors composed of two or more kinds of tissue, as adenofibroma, adenocystoma, etc.

PAPILLOMA.

This growth is an enlarged epithelial papilla, and is commonly termed wart, horn, etc. It consists of an outgrowth from the epithelial cells, with a network of connective tissue. It is found chiefly on the skin and mucous membrane, and is usually multiple and sometimes numerous. That seen on the skin, as a rule, is hard, and chiefly observed in youth, and is of little importance. That seen on the mucous membrane of the genital organs is soft in variety, and indicates uncleanliness—perhaps specific discharges. Certain papillomatous prolongations in the bladder and in the rectum cause hemorrhage and other pathologic manifestations. Similar growths in the ovaries and over the peritoneum have a tendency to malignancy.

Papillomata interest us as dentists chiefly in the hyper-

trophied papilla seen on the face. This condition is more frequently observed in advanced life, and the growth may have a flattened or sessile base or a pedunculated attachment, or it may be a horn-like process.

Warty growths are not common inside the mouth, but are occasionally seen. Many of these papillomata present no tendency to malignancy, although ulceration and irritability are frequently noticed. Some, however, after years of quiescence have taken on evidence of carcinoma of the epithelial type.

The **diagnosis** of papilloma is usually easily made. To determine against malignant tendency is not always easy, and doubtful cases should be promptly extirpated.

Treatment.—The treatment of warts in young persons need rarely be energetic, as the removal of irritation will usually be followed by the disappearance of the growth. When treatment is desired, the growth may be snipped off with scissors or removed with repeated cauterizations with chromic acid, first scarifying the wart until it bleeds, and applying the moistened crystals of the acid. This step repeated every two days for a week will usually succeed. Later in life extirpation by free incision should be employed in all irritated or troublesome papillomata, without waiting to see what course they may take.

ADENOMA.

Practically this tumor is the outgrowth of some glandular tissue; occasionally the whole gland is involved. While these new structures closely resemble the tissue from which they spring, usually many of the elements of the gland itself are not found in the neoplasm, but an excess of other tissue is present. Adenomata are prone to recurrence, and not rarely combine the elements of malignancy, as in the adenosarcoma. They are usually encapsulated, and often tend to cystic degeneration and malignancy.

Glandular tumors vary greatly in size; though usually not large, they occasionally become enormous. The diagnosis and prognosis of these growths are controlled largely by the structures in which they are found.

Adenomata of the sweat-glands are not common, but are seen as small indurated tumors under the skin, usually multiple. They are often seen on the face. Extirpation is a successful treatment.

Adenomata of mucous membranes are seen as *polypi* in the nose and pharynx, sometimes attaining considerable size. Not all such growths are true adenoids by any means, but many consist of a distinct cell growth; others are hyperplastic and retention cysts. Adenoid growths in the nasopharynx and in the antrum of Highmore at times take on a malignant tendency.

The **diagnosis** of growths of this character in the pharynx and nose is made by the history of difficult breathing, altered voice, cough, and discharge. Usually there is little pain. Inspection with suitable light and instruments indicates the lesion.

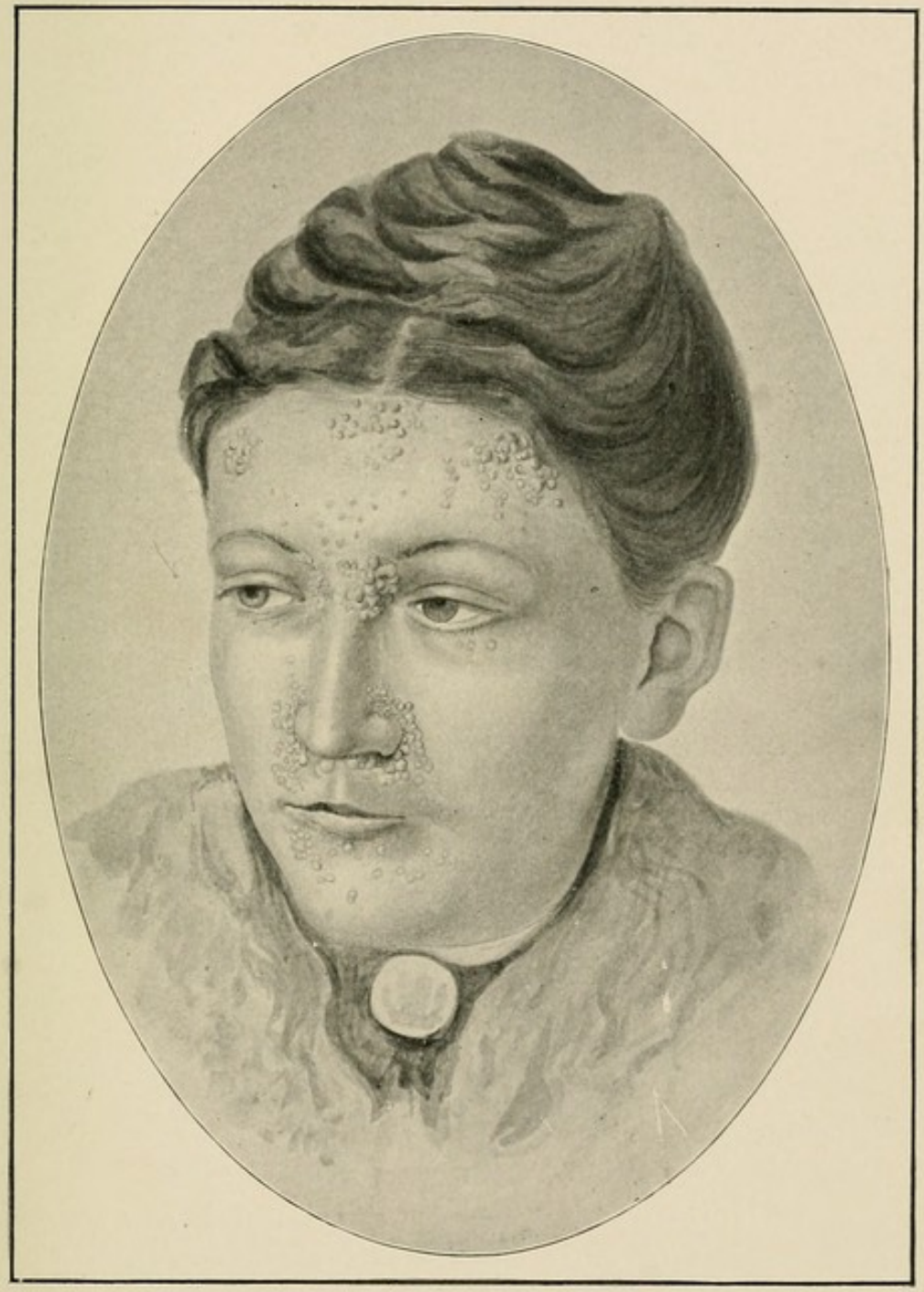
The **prognosis** is usually favorable; after removal recurrence is rare.

The **treatment** is removal with snare or forceps or thermocautery. Troublesome hemorrhage sometimes follows, but pressure and cold will usually control it.

Adenomata of the tongue and the parotid gland are not at all common, and when encountered, require more troublesome and difficult operations than are contemplated out of general surgery.

FIBROMA.

This tumor is formed of hard tissue, often very dense, disposed about the vessels and nerves of the part involved. They usually are surrounded by a defined capsule. They may be found in any tissue of the body, in the glandular and functionating organs as well as in the muscles, tendons, and periosteum. They



PERRY'S CASE OF ADENOMATA.

are painless, except when from size or location they press on vital structures or nerves. The so-called keloid and the fibroma molluscum are examples in the skin. Forms of polypi and growths on the face as well as in tonsils are of this character. Immense growths are seen in the uterus; usually muscular tissue is interwoven with the fibrous in the larger tumors.

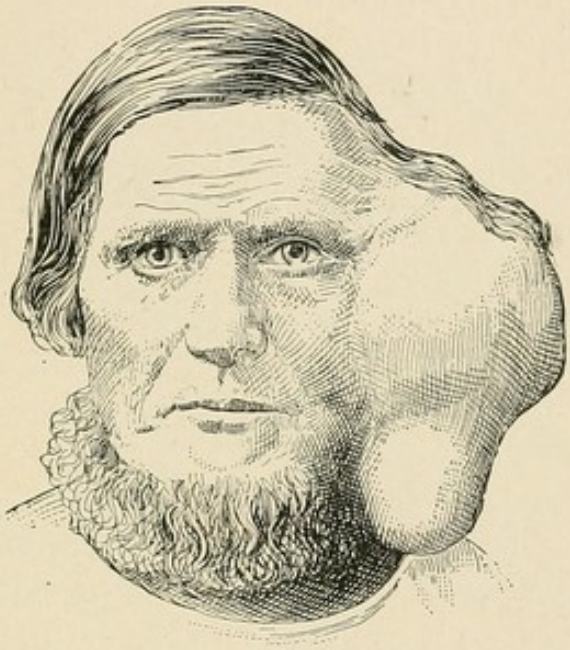


FIG. 12.—Fibrocystic tumor of parotid region (Nancrede).

Such growths show little tendency to malignancy, but when the situation is favorable they should be removed.

LIPOMA.

These tumors consist of masses of subcutaneous fat, always superficial and encapsulated. They have a dimpled, somewhat indented surface, often suggesting a false sense of fluctuation; they are painless, movable, and slow growing, without tendency to ulceration or malignancy, and require treatment only when unsightly or in the way of the clothing.

Such tumors are seen not infrequently on the face, nose, neck, and shoulders. If operation is undertaken at all, the tumor with capsule should be extirpated.

OSTEOMA.

This term properly belongs to the growths from the center of the bone structure. Exostoses or prominences on the surface of the flat and long bones are not, strictly speaking, osteomata. These growths are seen in the bones of the face, sometimes symmetric, but usually unilateral, and in the long bones and the phalanges. They grow slowly, and are thus diagnosticated from malignant growths in bone, which are usually of rapid progress, generally painful, and indicate disturbance in the circulation of the surrounding skin. Osteomata do not demand surgery except when pressure or other interference with function indicates it.

Disfiguring growths of the superior maxillary bone are seen often to be of large size, firm in structure, and of bony origin. Usually they offer little to surgical skill. When interfering with function or comfort removal is indicated.

A symmetric enlargement of the facial bones, termed **leontiasis,** is frequently seen. It begins in the young adult, and is apparently associated with some decay of the vital forces, as it usually ends in death.

A symmetric enlargement of the whole skeleton, noticeable chiefly in the face and hands and feet, and termed **acromegaly,** is worthy of a passing notice here. It is very rare and, like leontiasis, the cause is not known. There is no treatment.

CHONDROMA.

This tumor is composed of cartilaginous structures. They are usually multiple, hard, and inelastic, and seen in parts of the body where cartilage is found. Occasionally they are observed about the jaws and sometimes in the tonsils. They are painless, and usually grow slowly. They are irregular and often nodular, and frequently recur after removal, not rarely showing malignant indications. When feasible, removal is indicated by enucleation, extirpation, or amputation.

ODONTOMA.

This is a tumor developing from dental tissue, usually placed abnormally. They have four sources of origin: (1) From the *enamel organ*, often as large epithelial cysts, frequently multilocular, involving large parts of the jaw—usually the lower. (2) From a *small dentigerous* (*tooth-forming*) *cyst* growing from the tooth-follicle,

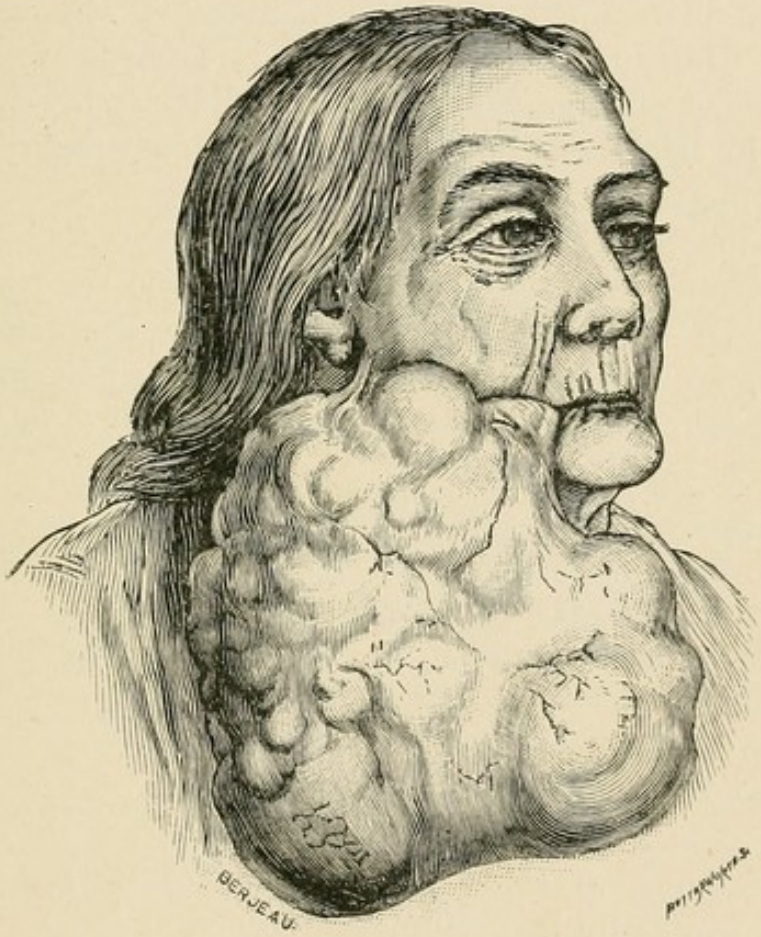


FIG. 13.—Chondroma of the submaxillary gland which had been slowly growing for forty-four years (Sutton).

which may undergo fibrous change and may become gradually ossified. Sometimes several hundred teeth are found in these fibrous masses. (3) From the *papillæ* as small tumors composed of cementum and dentin. They are attached only to the roots of the teeth, and are termed radicular tumors. (4) *Composite odontomata.*

These growths consist of tooth tissue, but lack tooth form. They are apparently composed of two or more germs intermingled, without regard to the normal arrangement, and are irregular masses of dentin, enamel, and other tooth-formation.

Odontomata are usually seen in early life and about puberty. They often constitute a deformity, and frequently infection and local inflammation cause them to produce distressing symptoms.

The **diagnosis** of odontomata is not always clear. Tumors of the bone and necrotic diseases are usually softer in structure than tooth tissue, and these serve to determine their character.

Odontomata are practically foreign bodies which tend to give trouble and can be cured only by removal. They do not incline to malignancy, but the continued irritation may establish epithelioma in the adjacent soft parts. The **treatment** is removal with the gouge and chisel.

ANGIOMA.

This form of neoplasm is composed of blood-vessels. They constitute the simple and cavernous nevi and the so-called cirsoid aneurysm or plexiform angioma. They are usually congenital, although some first begin to show in the first few weeks of life. Not infrequently they gradually become fainter and smaller until they disappear. Generally, however, they extend in size, and, as complications of other growths, may take on serious forms, especially in malignant tumors.

The *nevus* is the most common form. It is seen chiefly about the face and neck, sometimes on the lip, tongue, or inner cheek. The growth is often a bright red, berry-like tumor, at times prominent above the surface of the tissues, and at other times almost flat. The so-called port-wine mark is sometimes spread over half the face. These growths are merely enlarged arterioles and venules, sometimes sacculated and intercommunicating.

Diagnosis.—Usually this is unmistakable; the spot

is congenital (mother's mark). Its color, painlessness, disappearance on pressure, with prompt return and slow growth, all render the diagnosis a simple matter. The cavernous nevi are often developed later in life and are usually sacculated arterioles containing a good deal of blood. They are painless, and unless some complicating tumor presents, give little inconvenience except as a blemish. However, such growths occupying the eye, the antrum of Highmore, or the liver become a formidable menace.

The *cirsoid* or *plexiform aneurysm* is an exaggerated form of the above, always consisting of dilated arteries with a vigorous pulsation. At times it is painful. They are not common, but are seen chiefly on the forehead or scalp. These tumors sometimes get as large as a half potato and even larger.

Treatment of Nevi.—Small nevi in young children may disappear ; hence it is not well to hasten treatment. If they are growing, however, extirpation is most appropriate in all favorable cases. Those on the tongue may be ligated or removed with thermocautery. Electrolysis is of value in growths too extensive to justify extirpation. The ligature subcutaneously is employed to obliterate accessible cavernous nevi unsuitable for extirpation.

The cirsoid aneurysm is difficult to treat. The ligature, with or without excision, is the treatment when any is applicable.

CHAPTER XIV.

TUMORS (Continued).

CARCINOMATA.

THESE are tumors of malignant growth, familiarly known as cancer. Keenest interest attaches to carcinoma wherever situated, because of its wide-spread distribution in the human family, and the great dread in which it is held on account of its usual progressive tendency toward death. Although recent surgical progress has not succeeded in determining the primary cause of carcinoma, notwithstanding the patient investigation that has been unsuccessfully conducted to prove it a bacterial disease, yet experience has established that in its primary manifestations it is always local, and if promptly and thoroughly excised, will not recur in over 30 per cent. of cases.

Carcinoma histologically is an epiblastic epithelial cell formation of embryonic origin. These cells are without intercellular matrix, but form nests of cells, under a microscope resembling many small seeds in the compartments of a bulb or burr pod. The blood-vessels ramify in the stroma about the cell-nests. The blood-supply of these slow-growing tumors is usually scanty, and when cut into, they bleed little. The fibrous tissue, however, increases and compresses the vessels, causing later ulceration of the overlying skin.

Carcinomata have no capsule, but infiltrate the surrounding tissue. The poison of carcinoma is conveyed by the lymphatic vessels to neighboring glands, which in turn involve those of the next current.

Secondary deposits, called *metastases*, often take place in the stomach, liver, or other viscera after constitutional involvement has occurred. This metastasis is more com-

monly seen in the scirrhous carcinoma. The cancerous cachexia—the muddy complexion and sallow skin—indicates constitutional involvement and a hopeless condition.

Practically we see two varieties of carcinoma: (1) *Scirrhous* or spheroid-celled, with a form termed *encephaloid*, rarely seen except in complication, as with sarcoma. (2) *Epithelial* or flat-celled.

Scirrhous carcinoma arises from the epithelium of the acinous glands, and is a hard growth, with little vascularity, usually involving a gland. At first movable, the growth soon infiltrates the gland and the surrounding structures, becoming more or less fixed. The fibrous tissue in the growth puckers in the skin and produces a nodular, dimpled appearance. Usually they do not grow large. Pain is early felt, at first as a darting neuralgic flash, but later on assuming more the character of a constant ache. This is doubtless due to the involvement of nerve terminals in the growth. When cut into, such tumors bleed very little, but show a hard, gristly tissue, which at times holds a milky fluid. The lymphatic glands nearest the growth usually become hardened, tender, and swollen within the first six months.

The *encephaloid* form differs in being of rapid growth, with larger and more numerous blood-vessels, and a soft, fluctuating sensation to manipulation, due doubtless to blood in the growth. Such growths are rare, seen occasionally in the eye, ovary, and testicle, and in everything except microscopic appearance resemble the sarcoma. Such growths sometimes contain cyst-like cavities, which hold a mucoid, jelly-like fluid which fills out the alveola and stroma distinctly. This form is termed colloid. It is seen in both the scirrhous and encephaloid forms.

Epithelial carcinoma originates, as the name indicates, from skin or mucous membrane or their glands. Usually they begin as a warty growth, often at the mucocutaneous junction. Frequently this growth is a mere fissure, which, after a prolonged period of inactivity, has taken

on irritation and growth. Usually the tumor growth in epithelioma is very moderate, and even after months of duration still remains only a flat ulcer or a broad wart.

At times, however, ulceration marks the course of the growth, and without elevation of the parts extensive destruction of superficial tissues goes on. The growth of epithelioma is usually much slower than that of other forms of cancer, and it presents less tendency to recur when extirpated. Lymphatic and secondary deposits are often delayed a long time, sometimes several years, although there is no assurance that such growths will not at any time present evidences of cachectic infection, and be rapidly succeeded by exhaustion and death. The pain and generally depressing symptoms of epithelioma are also less prominent than in other forms.

Epithelioma of the larynx, throat, and internal mucous structures, in the rectum and on the penis, are more frequently attended with lymphatic sympathy. The usual forms are superficial, and present few constitutional symptoms.

The so-called *rodent ulcer*, which begins as a small scale on the nose or cheek, continues as a progressive superficial ulceration until it destroys the whole face to the bone, even eating up the eyelids. It is attended with little pain and few constitutional symptoms until it destroys the superficial bones and even opens large vessels.

Diagnosis.—Epithelioma of the face cannot well be mistaken for any other lesion if the history be carefully considered. It is seen rarely before the fortieth year, most commonly on the lower lip, most frequent in the male. It is often referred to the smoking habit. It is also seen on the cheek or nose in either sex as a warty growth, or a slow-growing indolent ulceration or fissure. It exhibits little tumor growth or lymphatic enlargement in early stages, with little pain and no tendency to heal.

Syphilis is to be eliminated by the history, age of the patient, and the failure of specific remedies to influence

the growth. Chancre of the lip has not rarely been diagnosed by good surgeons as epithelioma, and no doubtful case should be permitted to receive judgment until the specific treatment is tried. The symptoms of chancre of the lip are similar to those of chancre elsewhere. They usually get well without treatment in a

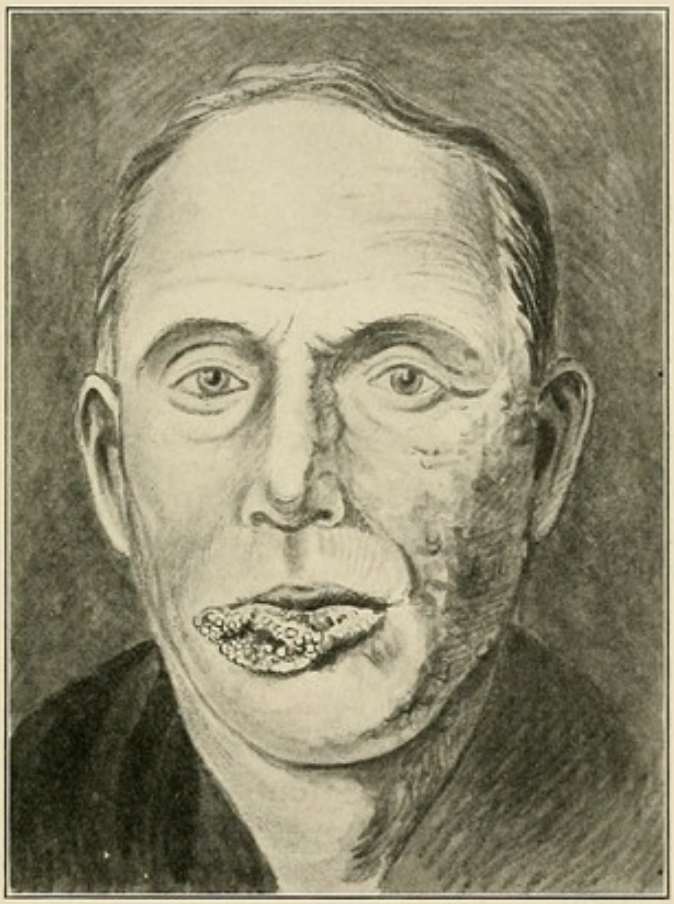


FIG. 14. —Carcinoma of the lower lip (Senn).

couple of months, and are attended with early involvement of the lymphatics.

Syphilitic ulcerations of the tongue resemble epithelioma somewhat, but they are usually multiple, painless, and without lymphatic involvement, and generally soon yield to constitutional treatment.

Tubercular ulcerations of the tongue and tonsils are also usually multiple, although lupus ulceration often greatly resembles that of epithelioma, but is generally

accompanied with tubercular lesions elsewhere or with a history in itself suspicious.

In the rectum and uterus, where columnar, rather than the squamous, epithelium prevails, epithelioma presents a different growth. It appears rather as an infiltrating mass into the structures, occasioning deposits which encroach upon or perhaps close up the lumen, as in the intestines and stomach. This form is called cylindric or *columnar epithelioma.*

The diagnosis of carcinoma is made upon consideration of the age,—above forty usually,—the presence of a painful tumor, which is often fixed, with adherent skin, later ulceration, lymphatic involvement in the first six months, with progressive growth, pain, loss of flesh, cachexia, offensive odor, and recurrence.

Treatment. — Regarding carcinoma as, for some months at least, a local disease, with a distinctly progressive and invariably fatal tendency, there can be but one treatment when available, and that is wide and complete extirpation.

When lymphatic involvement (which should always be sought for by exploration of the regions) has taken place, the glands should be completely removed. When the growth, as an epithelioma, is seated on the face, free excision is early demanded. When the tongue is involved, it may require to be amputated. Plastic surgery will often cover the defect left by free operation, but no hesitancy to sacrifice tissue is to be entertained in the presence of extensive involvement.

When there is extensive glandular involvement that is not susceptible of removal, or when progressive cachexia is evident, operative measures can do no good except for palliation. Caustics are not to be employed when the knife can be used. It should constantly be borne in mind that early and complete extirpation will cure most carcinomata, and that only early diagnosis, in the first few weeks, and prompt and efficient surgery can hope to rescue the sufferer.

SUMMARY.

By a tumor is understood a neoplasm, which is a growth originating from preexisting cells of embryonic life. It is congenital, and resembles normal tissue, though in all tumors, even benign, some abnormal tissue is present. In malignant growths the embryonic or immature cells largely predominate. Homologous tumors resemble surrounding tissues ; heterologous tumors differ. Benign tumors are painless, slow growing, and non-adherent. Tumors are classified according to their resemblance to normal structures. Papillomata are epithelial warts. Adenomata are glandular. Fibromata are hard. Lipomata are fatty. Other names correspond to the tissues involved. Odontomata are tumors of the tooth structures. Nevi are blood tumors involving small vessels.

Carcinomata or cancers are not only different in cells, but also in arrangement of stroma and blood-vessels. They are without capsule, and soon produce constitutional symptoms. Scirrhous and epithelial define themselves. Carcinomata are seen in middle and late life, and while at first local, after a few months become insusceptible of complete removal. Glandular involvement and the yellow cachexia indicate constitutional infection. Treatment is early extirpation.

CHAPTER XV.

TUMORS (Concluded).

SARCOMA.

A *sarcoma* or "flesh" tumor is the most primitive or embryonic of all growths arising from the mesoblast matrix. The center of these growths shows the embryonic nature of the cells less than the outer or peripheral portions, due to the tendency to organize as the growth progresses. Unlike the carcinomata, these tumors have little stroma, and the blood-vessels ramify between these cells, often seeming to have no walls but the cells themselves. Thus can be appreciated the high vascularity of the growth. These tumors usually grow much more rapidly than the carcinomata, except the encephaloid variety, which they closely resemble in clinical history and appearance. Lymphatic involvement is very infrequent, and secondary deposits are not the rule in these growths, although the transportation by the blood of fragments of growth to other situations often results in similar neoplasms. Sarcomata, however, grow by the infiltration method, and tend to recur locally even more than carcinomata. Moreover, they are more difficult to eradicate. Sarcoma is found in every tissue from the eye and the brain to the shaft of bone, growing with an irregular pace, but usually extending over a few months in any situation. The cause which sets to growth the quiescent embryonic cell is often a blow or injury of some kind upon the part.

Three forms of sarcoma are generally recognized :

1. Round-celled.—This is the most rapidly growing and malignant form, sometimes attaining a great size. The tissue of this growth is so markedly like ordinary granulation tissue that the microscopist may be de-

ceived if only limited portions of the tumor are submitted.

In the *lymphosarcoma*, a variety of the round-celled sarcoma, the cells resemble the tissue of the lymphatic glands. The situation and conformation of these tumors indicate nomenclature as to varieties, but such classification is of no pathologic significance.

2. Spindle-celled sarcoma is so named from the shape of the cells composing it. It is less vascular, slower of growth, and less malignant than the foregoing variety.

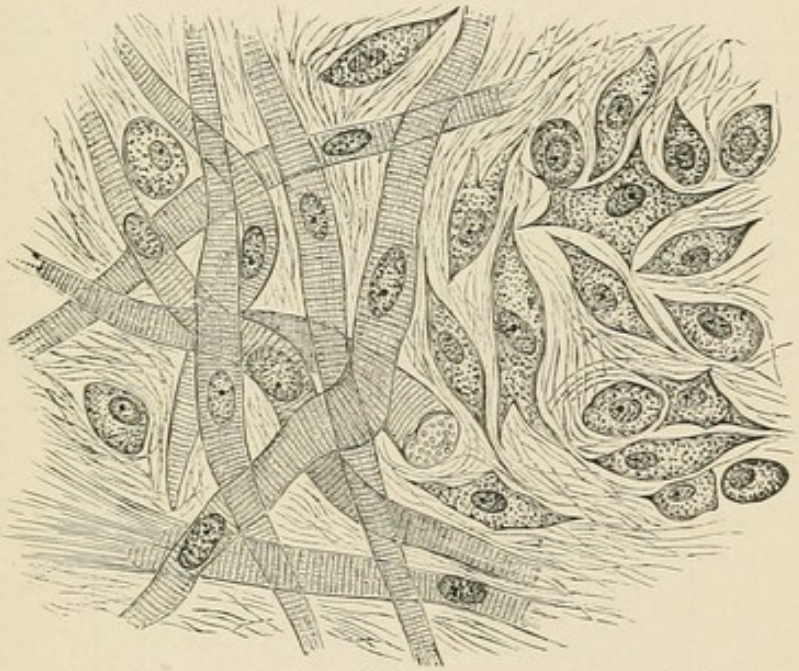


FIG. 15.—Cells from a spindle-celled sarcoma of the neck of the uterus; some of the cells present a cross-striation (Pernice).

It is seen chiefly in the skin, ovary, testicle, and eye. This form of sarcoma is usually softer and less tense than the round-celled.

In the center of bones there are often found sarcomata with a mixture of the round- and spindle-cells, called mixed-celled sarcomata.

3. Myeloid or Giant-celled Sarcoma.—This tumor usually springs from the medulla of bones, and resembles the tissue of young bone. These growths are some-

times subperiosteal, and, indeed, are at times seen elsewhere in the tissues.

Symptoms and Course.—Unlike carcinoma, this form of malignant growth is more frequent in the growing period of life and in early maturity. The different forms progress differently. The round-celled, seen usually in the softer structures, grows with great rapidity, often surrounded by a capsule. Frequently it contains cysts, is the cause of little pain, and makes in the early stages an

FIG. 16.—Sarcoma of the skull secondary to sarcoma of the jaw (Tiffany).

inconsiderable impression on the health. Later, however, a cachexia appears, ulceration sets up in the growth, and sepsis is inaugurated. The growth gradually infiltrates outside the capsule, blood-vessels become large, and hemorrhage into the tumor, or at times escaping at the point of ulceration, may become a prominent feature. The lymphatics usually show no sympathy with the growth. In the giant-celled form in the bone the progress is often slow, and a long time may elapse before the tumor attracts attention.

Sarcoma is nearly always more or less compound, presenting features of the adenoma, the fibroma, the chondroma, or some of the other growths of the connective-tissue type.

The **diagnosis** is made by the history ; rapid growth ; early ulceration ; evident constitutional involvement ; the microscope, in the absence of a question of inflammatory growth, which resembles the cell growth directly, will settle the doubt. From carcinoma, in the absence of the microscope, the distinction usually rests on the lymphatic involvement attending carcinoma, rapidity of growth, and painlessness.

Prognosis.—The tendency of sarcoma to recur *in loco* makes the prognosis a little more hopeful where amputation can early remove it. But operations on the tonsils, testicle, throat, and trunk are highly unpromising. The round-celled variety is the least hopeful of all forms. The myeloid offers the best prospect.

Treatment.—Amputation far above the growth in soft structure and above the joint in bone involvement is imperative. Nothing short of free and extensive removal offers any hope. Reoperation in recurrence, as often as there is a prospect of removing all the diseased tissue, is to be approved, although the hope is a frail one. Hypodermic injections of the toxins of erysipelas, prepared ready for use by several reputable firms, have been claimed to cure some inoperable sarcomata, but the experience of most surgeons has been disappointing. Little is claimed for it except in the myeloid variety, and even here it has justified the confidence of few surgeons. The X-ray therapy for recurrent and inoperable sarcoma is now being extensively tried and seems promising. Most sarcomata grow irregularly: first fast, then slow, but the usual course of the more malignant forms is over four to ten months from development. The myeloid form is an exception, and may continue for years.

CYSTS.

By a cyst is practically understood a cavity, either normal or newly formed, lined with a distinct wall and having fluid or semisolid contents. Some cysts may contain other cysts within them, even made up of material different from the mother cyst. Some contain the normal secretion of the structures from which they arise, and others a new exudate due to inflammation or disease. We describe cysts as of four varieties :

1. Those in Preexisting Cavities or Spaces.—Of these there are three :

(**a**) **Exudation cysts,** which are due to oversecretion in the closed cavities that they involve, as in the bursæ of joints, sheaths of tendons, etc.

(**b**) **Retention cysts,** due to the confining, in glands or cavities, the secretion that should normally escape, but is prohibited by disease or obstruction of the efferent channels. The cysts may naturally consist of mucus, the secretion of glands either with or without distinct ducts. For instance, sebaceous cysts are due to the plugging-up of the orifice of the sweat-glands, and are seen chiefly on the scalp, face, and shoulders (see description).

(**c**) **Mucous cysts,** due to obstruction and dilatation of mucus-secreting glands in mucous membranes, as ranula, etc., which see.

(**d**) **Extravasation cysts** or hemorrhage into closed serous cavities.

2. Neoplasms.—This variety is the cyst in self-made cavities. These cysts usually contain mucus, sometimes serum, which may undergo degeneration and perhaps infection. They are due usually to some persistent local irritation.

There is also a form of new-made cyst containing blood, and due to the extravasation of blood into the tissues, where it becomes encapsulated.

3. Congenital Cysts.—These arise from the folding-in of the early embryonic growth of some small portion

of the epiblastic or skin-producing layer, thus permitting its cells to go on to form normal structures in the improper situation. Most of these cysts are termed *dermoids*, and usually contain skin secretions, as hair and sebaceous materials, but at times bone and teeth are to be found in the cysts. Dermoids are usually found in

FIG. 17.—Branchial cyst (Gould).

the testicle and ovary, but sometimes in other situations, especially the eye.

The congenital occlusion of cavities which should be normally open, as the so-called branchial cysts in the neck and one or two forms of hydrocele, belong to this division.

The treatment of these cysts, as well as the dermoid, is careful dissection and extirpation. The diagnosis is usually not made in dermoids until removal or incision.

Parasitic Cysts.—The best illustration is the hydatid or echinococcus. These cysts are usually pale bodies, resembling a bunch of grapes, contained in a larger cyst, termed the mother cyst. Within the small cyst are the echinococci, called microscopic "scolices," each having four suckers and a pair of hooklets with which to fasten itself to the cyst structures. These hooklets are diagnostic of the pathology of the cyst, and with the aid of the microscope can be seen on section of the cyst. The growth of these daughter cysts sometimes causes rupture of the mother cyst, with perhaps fatal result, depending upon the situation. Frequently the small cysts undergo calcification and cease to grow. Echinococci are seen chiefly in the eye, liver, ovary, and breast. Extirpation is indicated when accessible.

SUMMARY.

Sarcomata resemble embryonic tissue, with better developed cells in the outer portions; frequently encapsulated. They have little stroma, are highly vascular, grow rapidly, do not give rise to much pain, have no lymphatic involvement, rarely have secondary deposits, but infiltrate surrounding structures. They are round-celled, spindle-celled, and giant-celled, the latter being the least malignant. They occur earlier in life than carcinomata, recur *in loco*, and are very difficult to eradicate. They are more rapidly destructive than carcinomata, and more likely to recur, unless prevented by high amputation.

Cysts are cavities, usually newly formed, containing fluids. Exudation and retention cysts are very similar. New formed cysts usually contain mucus; sometimes they are malignant. Congenital cysts are seen in ovaries, testicles, and in connection with improperly closed congenital tracts.

CHAPTER XVI.

SYPHILIS.

So widely spread and seen in such a variety of forms, syphilis is a subject of great interest to all students, and particularly to dentists. Not only are its ravages frequently misunderstood and neglected by the patient, but the lesions are a dangerous menace to family and friends, as well as to the fingers of the oral surgeon who examines the mouth. Thus a woman who has innocently acquired the disease in the mouth may infect, if careless, those whom she may kiss or who may have occasion to manipulate the neighborhood of the lesion. So the instruments, fingers, and dressings of the dentist contaminated unsuspectedly by the syphilitic virus from a diseased mouth may convey the poison.

Syphilis is a disease of the blood, of venereal origin, manifesting itself, however, in every part of the body. In the majority of cases infection arises through the contact of the lesion of the first or second stage with an abrasion upon the person of another, although it is occasionally transmitted by means of towels, drinking-cups, and like mediate means.

ACQUIRED SYPHILIS.

Acquired syphilis is distinguished from inherited syphilis by such markings that the two are best described under different headings.

Acquired syphilis is studied in four stages :

1. *The period of inoculation* is the period between infection and the first manifestation.

2. *Primary stage* is the appearance of the first sore and its progress.

3. *Secondary syphilis* is the expression of the disease in the skin and soft parts.

4. *Tertiary stage* is when later manifestations are seen.

Although the immense majority of cases of syphilis originate upon the genitals, the characteristic features are the same wherever the lesion is located. Extra-genital chancre situated on the face is of chief interest to the dentist.

The period of incubation, the stage of inoculation, usually extends from fifteen to thirty days after infection —commonly about three weeks. During this time the patient notices nothing. The *initial lesion* is always a *chancre.*

Primary Stage.—The sore, or chancre, first appears as a small ulcer, with an indurated base and a slight swelling of the part where it is placed. The ulcer enlarges until it is perhaps as large as half the little finger-nail, and at the end of a week or so is a lump of swollen tissue with some induration, about the size of the end of the little finger. The sore is usually painless or nearly so; there is some stiffness in the lip, if this be the location of the sore, but no severe smarting or tenderness. The ulcer is covered with a grayish discharge, small in amount. Usually almost invariably the sore is single, and will not inoculate the adjoining skin of the patient. Two chancres are rare in the same patient, and where they occur, they are the result of a simultaneous inoculation. Enlargement of the lymphatics under the jaw, upon the infected side first, later upon the other, is to be expected about the second week. These glands are almost painless and do not suppurate. The sore may get better in a few weeks, but often remains sluggish a long time, with some slight spread of the ulceration, if untreated.

Secondary Syphilis.—The secondary symptoms are to be looked for about six weeks from the appearance of the initial sore. If specific treatment has been employed, or sometimes in vigorous constitutions, it may be several

months before the secondary manifestations; in rare instances well-authorized diagnosis of chancre will be followed by no secondary symptoms—at least none are noticed.

These symptoms are usually preceded by a sense of feverishness, slight temperature, and malaise. Early an eruption appears, consisting of rose-colored spots without elevation, scattered over the back, breast, inside thighs, palms, and soles. The eruption spreads slowly, and a week or two elapses before the entire body is covered. As it fades it leaves a brownish or copper-

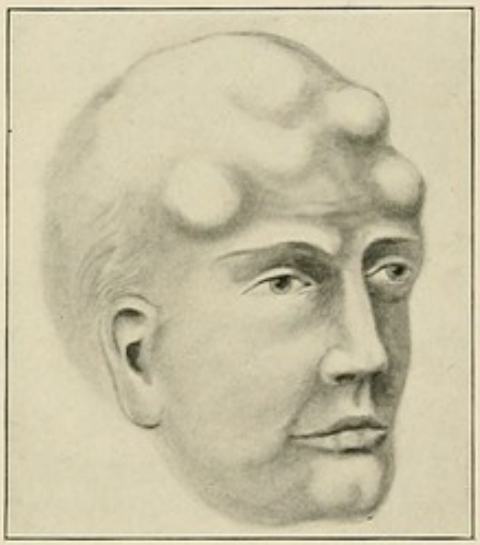


FIG. 18.—Syphilitic nodes of the skull.

colored spot. Other eruptions may succeed this; in the second stage, papular and even ulcerating forms present. Usually these conditions are more severe than the patient will neglect, and come under the notice of the physician rather than the dentist. During this stage the hair, not only of the head, but face, eyebrows, etc., often falls out in considerable quantities. *Mucous patches* occur in the mouth, on the tongue, lips, or side of the cheek. These ulcers vary in size, and often are multiple —three or four in number. They usually appear shortly after the eruption, and the two taken with the history confirm a doubtful diagnosis. These *patches* are capable

of transmitting syphilis in the same way as the initial lesion, though not so readily, and are to be cautiously manipulated. The blood in the other forms of the secondary eruption is feebly endowed with the infecting

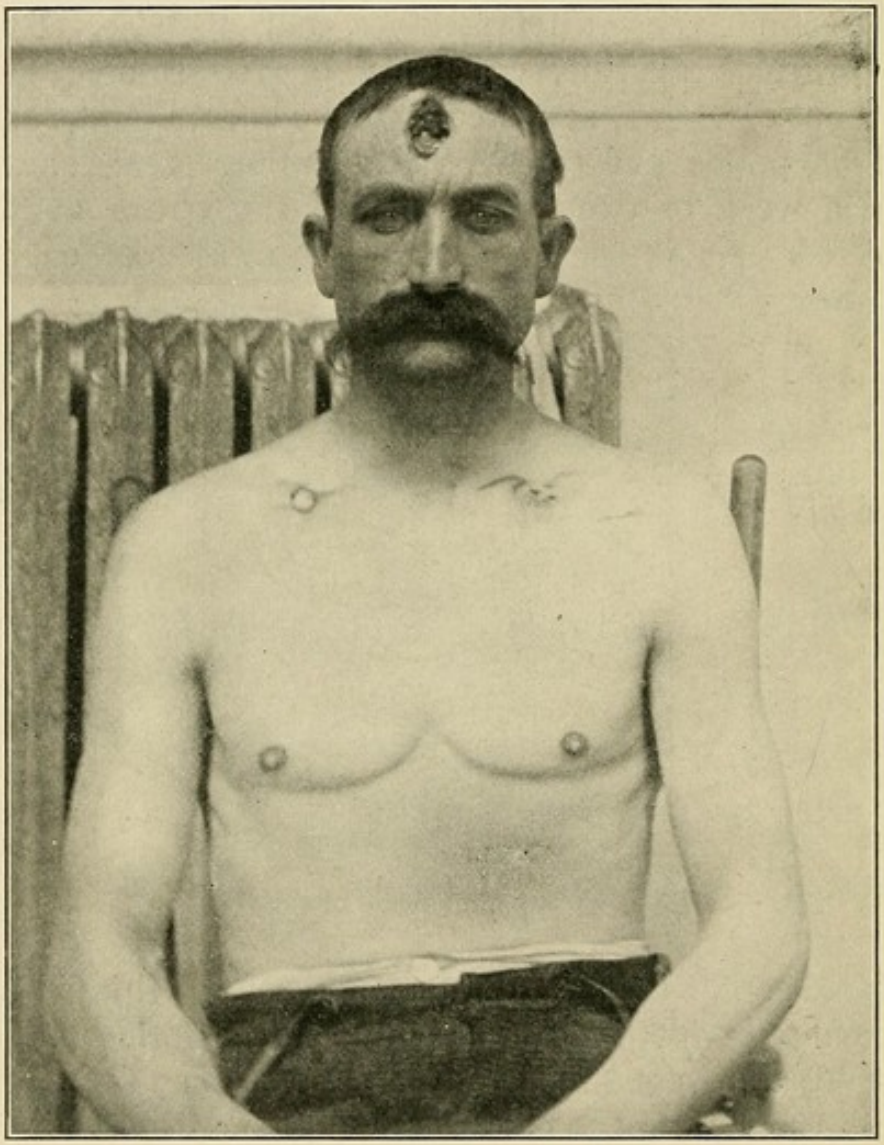


FIG. 19.—Syphilitic sequestrum of frontal bone. Gumma over each clavicle.

power, but after a short specific treatment loses the tendency.

Immunity from syphilis in the great majority of cases arises after one infection. The germ has not been isolated, but it is believed to exist. In order for infection to occur, a break in the skin or mucous membrane

must be present to the virus, and some constitutions appear to be insusceptible to infection.

Tertiary Syphilis.—The tertiary manifestations of syphilis are found everywhere in the body and are of all varieties; eruption, ulcerations of skin, and mucous membrane; gummatous deposits in any tissue, brain, or other vital organ; caries and necrosis of bone in any of a thousand forms. These lesions are not communicable. They may appear at any period after the secondary stage, but are rarely deferred more than two or three years, and in cases that have received proper treatment

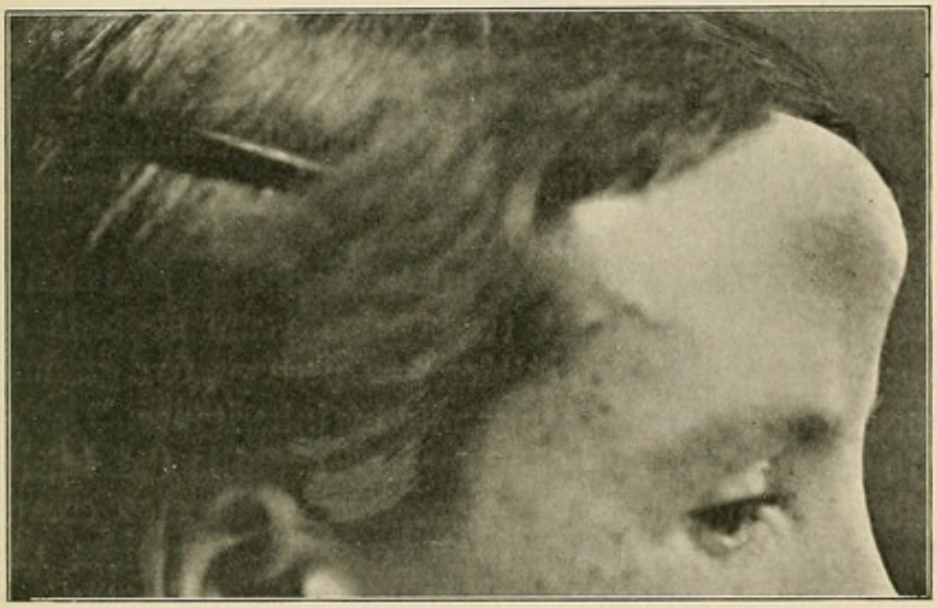


FIG. 20.—Gumma of the frontal bone (C. A. Porter's case).

are not seen at all. The tendency of tertiary lesions is to destruction, while the primary and secondary disappear of themselves. Of the many tertiary lesions, the *gumma* and the *mucous ulcerations* and *syphilitic necrosis* interest the dentist.

The *gummata* are processes of softening in which a small, chronic, abscess-like collection forms, and later ulcerates, leaving a sluggish sore that does not tend to heal. Such conditions have been referred to under Diseases of the Mouth. Gummatous deposits also form in bones or even in the brain. Under specific treatment gummata may often be absorbed.

Mucous ulcerations are usually the result of broken-down gummata, and are seen in the mouth and rectum.

Syphilitic gummata of the brain are an exception to the effect of the iodids, and are not easily absorbed. They are usually followed by paralysis, and these lesions are at times very painful, causing distressing headaches. The same is true of the syphilis of the bones. In osteomyelitis there is frequently no pain in the daytime, but it becomes so severe at night as to require the use of opiates. Night-pains are also frequently seen in syphilis of the brain.

Diagnosis.—The diagnosis of acquired syphilis in most of its forms is made out without difficulty if the history can be obtained, and in the first and second stages the physical appearances are usually unmistakable. In any of its forms the administration of the specific treatment will confirm the diagnosis.

The **prognosis** in acquired syphilis is usually favorable. In the last twenty-five years syphilis in general has been much milder, due, perhaps, to a gradual inoculation of the human family by inheritance.

In many of the milder types of syphilis the initial lesion is insignificant in appearance and may escape observation altogether. Even without treatment the secondary symptoms may be quite mild and the tertiary symptoms never appear. Usually, however, unless treatment is instituted early, the eruption is profuse, and the other symptoms follow in order. When proper treatment is early begun and faithfully continued, as far as the individual is concerned, the disease is usually regarded as overcome in two years, counting from the appearance of the last symptom, although the power to transmit the disease to offspring may persist for years later.

Treatment.—The local treatment of the initial lesion rarely requires anything more than frequent washes, for cleanliness' sake, with what is known as the black wash, and either boric acid or calomel or some bland

powder may be applied afterward. Excision of the chancre is never of any use, nor is routine cauterization. Inflamed and phagedenic sores should be cauterized if there be any tendency to spread. As soon as the character of the sore is determined to be syphilitic, constitutional treatment should be begun, but not before, lest the patient be in doubt as to whether or not he has had syphilis. The constitutional treatment of secondary manifestations is best conducted, under ordinary circumstances, with the protiodid of mercury, this being the most convenient, although any of the forms of mercury may be used.

As far as the practice of the dentist is concerned, the simplest method is to begin with administering a tablet containing a fourth of a grain of protiodid four times a day, increasing it one tablet every other day until the gums begin to be a little bluish and tender; usually seven or eight tablets will be enough to accomplish this. The number of tablets should then be reduced one-half, and continued until all symptoms have disappeared. The treatment should be intermittently resumed and continued for a year or two, in proportion to the severity of the attack.

In the later stages of the second and third forms the iodid of potassium may with advantage be combined with the mercury. A saturated solution of the iodid in distilled water may be started at five drops, and this increased a drop daily until the point of tolerance is reached, which is recognized by the coryza, reddened face and nose, and the eruption that characterizes the first stage of poisoning by iodid of potassium. The drug should then be withdrawn, the patient meanwhile being closely watched to see if any new symptoms appear.

In tertiary syphilis it seems of little use to push mercury, the best results being obtained by the iodids. Some tonic or bitter is acceptable, combined with the iodids, by which the appetite is kept up. Tincture of gentian, sarsaparilla, stillingia, are good combinations.

INHERITED SYPHILIS.

As has been intimated in this description, the power to transmit syphilis to the offspring is limited to the active stage of the primary and secondary periods, and, practically speaking, any person who has passed the fourth year since the primary lesion is out of danger of transmitting the disease to the fetus *in utero;* indeed, one who has reached the end of the second year after careful treatment is practically safe. It is well to advise that marriage should not be entered into sooner than one year from the last manifestations after discontinuing treatment. When the syphilitic father, by virtue of his blood infection through the semen,—not by the direct virus, however,—infects the ovule of the mother, and the syphilitic child results, in the great majority of cases the mother, if not previously immune, is also infected, and presents the classic symptoms of the second stage of syphilis. Even if this pregnancy terminate by abortion, the mother is not likely to escape infection. If the father be free, but the mother be suffering from secondary syphilis, the child will likewise suffer, whether this infection has occurred before the conception or afterward during uterine gestation.

Symptoms.—In the majority of cases symptoms of the hereditary syphilis are seen in the first three months. The child is very often born dead, and abortion, often several times in succession, is very common. When the child is born alive, it may at first appear vigorous, but commonly it is withered and feeble, with hoarseness and a characteristic snuffling sound. An early, blister-like eruption, called *pemphigus*, appears upon the face and body; later mucous patches, disease of the eye, etc., are present. Most of these children die early. Those who reach the sixth to the tenth year show suspicious indications. Faulty hearing and often blindness, with other evidences of diseased organs and imperfect development, are a part of the history.

These lesions are not inoculable. The chief interest to the dentist lies in the imperfect development of the teeth and jaws, with attending necrosis. The peculiar serrated or notched tooth, crescentic excavation on the edges, with deformed, peg-shaped stumps are characteristic.

Hereditary syphilis may affect any organ in the body, and such symptoms are of highest interest from a diagnostic standpoint. The subject is too extensive to be dwelt on here. Usually, from a diagnostic point, the history from childhood, with the presence of unexplained eye, nose, or ear troubles or some nervous peculiarities, notched or irregular teeth, will make a clear diagnosis.

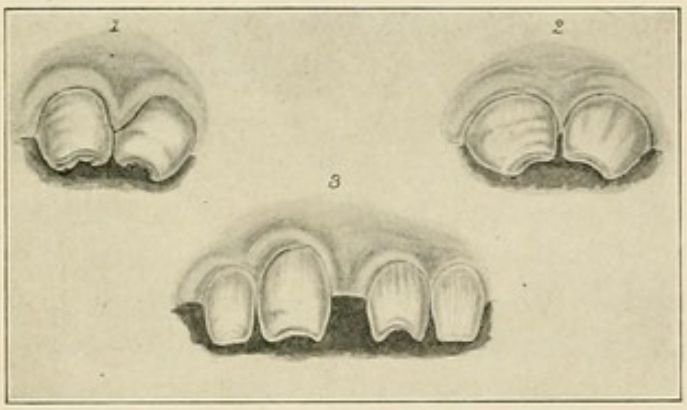


FIG. 21.—Hutchinson's teeth (Parker): 1. The central upper incisors of a lad, aged fifteen years, the subject of inherited syphilis. The teeth are short, convergent, narrow from side to side at their edges, and show in each a vertical notch. 2. These teeth present similar characters. The notches, however, are less deep, while the narrowing from side to side is very marked. 3. The upper incisors of a girl aged seventeen years. There is a wide space between the central ones, and both these teeth, although of nearly normal length, are narrow, and show deep vertical notches. As is usual, the lateral incisors are of normal size and form. These teeth are not so typical as those shown in 1 and 2.

The **treatment** of hereditary syphilis in the infant is by inunction with the mercurial ointment. In the older child the iodid of potassium, usually in syrup, with small doses of the bichlorid of mercury, care in diet, and exercise constitute the course.

SUMMARY.

Syphilis is a blood disease often innocently acquired ; it manifests itself in nearly every organ and part of the body.

Acquired syphilis has an incubation period of from fifteen to thirty days. Then the primary stage, ushered in by the chancre, lasts from forty-two to sixty days before the rose-rash and the mucous patches begin the second stage. The manifestations of the tertiary stage are often delayed a year or two. The chancre is a painless ulcer with involvement of adjacent lymphatics in about two weeks.

Mucous patches are seen in the mouth and nose, and may even destroy the palate and nasal bones if neglected. Infection is derived both from the initial lesion and the mucous patches, as well as rarely through the blood. The tertiary lesions do not communicate the disease. These lesions are seen late ; they include bone syphilis, gummata, and skin lesions, chiefly ulceration. In the second and third stages the hair often falls out. The treatment in the primary and secondary stages consists chiefly of mercury and cleanliness, with careful diet. Stimulants must be avoided. In the tertiary stage iodids are advantageously combined, and stimulants, nourishment, and exercise are highly valuable. Transmission to offspring is possible only in the primary and secondary stages. If well two years, there is little risk. Infection of the ovule by the father conveys syphilis to the mother through the fetal circulation.

Abortion or premature birth of dead child is very common. Symptoms of *inherited syphilis* are seen in early life. Child is feeble, has eruption, may be blind or deaf, exhibits ulcers and imperfect teeth. They often improve or regain complete health. Treatment by mercurial inunction and iodid of potassium.

CHAPTER XVII.

TUBERCULOSIS OF THE BONES, SKIN, AND MUCOUS MEMBRANES.

Tuberculous Bone Disease.—The exceeding frequency of tuberculous bone disease has made it familiar in some of its manifestations to every observer in life. To the laity it is universally known as *bone scrofula* or *white swelling*.

Tuberculosis as it interests the dentist is manifested in the *skin*, in the *lymphatic glands*, in the *mucous membrane*, and in the *bones*. Tuberculosis of the lungs, the most common prominent manifestation, is not difficult of recognition when far enough advanced to address itself to the dentist.

The *germ*, as we have seen, is the bacillus of Koch. It is slow in growing, and offers great resistance to all germicides ; indeed, it is almost impossible to eradicate it from tissues when once fully ensconced. In an affected area the germs are few in number and are not *directly* transmissible by hereditation, although the "tuberculous tendency" is distinctly characteristic in families.

Tuberculosis, however, is feebly contagious by infection through the inhalation of the germ or by direct admission into the blood. The young are far more susceptible to the disease, and aside from that form known as tuberculous phthisis, or consumption of the lungs, childhood is the age of predilection. Skin tuberculosis, however, is more frequently seen in adult life.

Pathology.—The disease gets its name from the form of its manifestation. The *tubercle* is the result of an irritation of tissue-cells by the bacillus, which accumulate, nature making an effort to destroy the germ by phagocytosis. These *tubercles* consist of white blood-

corpuscles, epithelial and the so-called giant-cells, with a stroma and an enveloping membrane. They appear to the naked eye as small white nodules. These tubercles merge, soften in the center, and thus form a diseased spot sometimes encapsulated, sometimes merely surrounded by the limiting wall of resisting cells. These latter may hold progress in abeyance until nature has surrounded the focus with a capsule, and thus render it temporarily harmless. The germs in the encapsulated tubercle perish from starvation, and the contents are in rare instances absorbed. In other instances the germs retain their vitality until some favorable opportunity permits renewed progress in the focus.

By *caseation* of the tubercle is meant the cheesy softening which gradually takes place in the slowly growing process, producing a yellowish mass, characteristic of the destructive tubercular process. Further softening and liquefaction of these tubercular masses produce a puriform fluid, which in many instances contains no germs of suppuration, and from which, indeed, the tubercle bacilli are often absent; or, if present, dead. Such collection is termed a *cold abscess*, and presents none of the symptoms of the acute inflammation. Infection of such collections with the germ of suppuration, however, promptly produces mixed infection, characterized by *hectic fever*.

When a favorable course is taken by the tubercle, cicatrization of the cavity goes on until the destroyed structure is replaced by fibrous tissue and the damage thus repaired. These processes are the course of tuberculosis in all organs and structures of the body. When the organ attacked is a vital one, as the lungs, pleura, peritoneum, or brain, death almost always results unless promptly treated; and at the best the prognosis is unfavorable. In the less important tissues, as bone, skin, and joints, the prognosis is much more favorable and the process much slower.

As dentists, we study the manifestations of tuberculo-

sis in the skin, mucous membrane, glands, and bone. It is particularly in bone tuberculosis that the various steps of the pathology are best studied.

When deposits take place in the form of *acute miliary tuberculosis*, treatment gives little promise and the patient is soon overwhelmed by the general infection.

Two forms interest us :

1. Tubercular periostitis, seen in the ribs and occasionally upon the surface of the maxilla and other long bones as small surface patches of necrosis, with sinuses and local ulcers.

2. Tubercular osteomyelitis, beginning in the epiphyses, first as a deposit of the germ, soon forming a tubercle nodule which softens, extends, and perhaps undergoes caseation, possible encapsulation, or cicatrization, but usually suppuration and abscess formation, with sinus. Not infrequently a spot of lessened resistance is furnished by an injury, and here the germ circulating in the blood prospers and multiplies. In the early stages there is inflammation causing, when in the neighborhood of a joint, stiffness and pain on motion, with tenderness, slight elevation of temperature, a swelling of the joint, often fusiform in shape, with later softening, fluctuation, hectic, ulceration.

If the disease is in the head of the inferior maxilla, motion of the jaw will be limited by pain, swelling, and tenderness, becoming worse at night. Similar local symptoms will characterize this lesion in the fixed facial bones.

Diagnosis is made by the history of the patient, together with the symptoms noted. When fluctuation or sinuses appear, the case is plainly bone disease, which may be either one of the foregoing forms. The ordinary methods of differentiating tuberculosis and syphilis from infective inflammation are to be employed.

Treatment.—In all conditions without external communication and suppuration constitutional remedies, good hygiene, and favorable climatic conditions consti-

tute the treatment. Even small collections of tuberculous caseation and cold abscesses are better left undisturbed until the skin begins to thin. Aspiration of deep-seated collections is often beneficial; recollection is usually less, and repeated aspiration with constructive measures may prove curative. When joints are involved, fixation and rest should be persisted in until a cure is effected, or until the conditions demand operation.

When abscesses form, or when progressive disease of the bone, particularly of the face, resists conservative measures, removal of the cause is to be undertaken. This is chiefly accomplished by free incision and removal of all diseased bone with the curet and chisel, as widely as is consistent with the condition. Vital structures, like the spinal column, and even the larger joints, are better treated by rest and care, after removing the collections of puriform material. The opening of large uninfected abscesses is always dangerous, as hectic will surely follow the admission of germs, and possibly a general infection be set up. Careful asepsis and dressings must be employed. When sinuses indicate dead bone, they should be freely enlarged, and the caseous or necrotic disease thoroughly removed by chisel and curet, followed by antiseptic irrigation and gauze packing to the bottom. *Pure carbolic acid* may be poured into these sinuses if *alcohol* is added within a *minute* afterward to neutralize the excess. Weak solutions of formalin, $\frac{1}{10}$ of 1 per cent., appear to limit suppuration in these sinuses.

Tuberculosis of the skin is termed *lupus*. This is a raised, reddish-brown break in the skin, usually elongated and with irregular outlines, with a tendency to ulceration. This ulcer spreads slowly, although imperfect cicatrization in parts may be observed. The ulcer is rarely deeper than the skin, for the most part painless, and of limited extent for a long time; but when it assumes a phagedenic or malignant form—"lupus exedens"—it destroys both bone and cartilage as it ad-

vances. The whole of the face may be one raw ulcer extending to the bones, and perhaps destroying them. Even this form is consistent with years of life, and such hideously deformed unfortunates may be seen in hospitals and on the streets for years and years.

Treatment of lupus is not so satisfactory as would be expected. When small and favorably situated, free extirpation is recommended. When this is not appropriate, curetment and cauterization with pure carbolic acid, followed by washing with alcohol, appears the most satisfactory.

Tuberculosis of mucous membrane of the mouth has already been discussed.

Tuberculous lymphatic glands of the neck are of interest to the dentist. They are chiefly seen in children, beginning as a slow, painless enlargement, sometimes single, sometimes multiple, sometimes hard and later softening, breaking down and discharging through the sinus.

The **diagnosis** of the nature of the condition is made by the scrofulous appearance, usually blonde complexion, and the history.

We exclude, in diagnosis, the so-called Hodgkin's disease, or lymphadenoma, in which most of the lymphatics of the body are successively involved, and a pernicious anemia and exhaustion cause death.

Treatment.—There is considerable difference of opinion among surgeons as to the treatment of this condition. The author believes, however, that so long as the glands are single or few, the expectant plan should be followed. When softening and breaking down or sinus and discharge become a complication, prompt and complete extirpation is demanded.

Local applications of stimulants to absorbent glands, with the administration of iodid of iron and good nourishment, the withdrawal of all cooked sugar, pastry, and indigestible articles of diet, work great results, aided by the resistance of nature.

SUMMARY.

By *tuberculosis of bone* we understand a softening effect of the structures invaded by the bacilli, with liquefaction and apparent abscess formation, to which admission of germs of suppuration add sepsis and mixed infection. Bone-lesions are seen as tubercular periostitis, slight in extent, and osteomyelitis, which affects first the epiphyses and occasionally the medulla, and later the joints. The progress of the disease is slow, and in strong constitutions may be arrested by nature. If inflammation occurs in joints, pain, tenderness, and rigidity, with later suppuration, mark the course. The treatment of these conditions is rest, fixation, aspiration of pus collections, if necessary evacuation of the abscess under antiseptic precautions. Sinuses should be cleaned out and cauterized, and dead bone cureted when the abscess opens and discharges.

Tuberculosis of skin and mucous membrane is sometimes extensive and severe, and as such is troublesome to manage. Enlarged lymphatic glands usually respond to constitutional treatment, but the progress is slow.

CHAPTER XVIII.

DISEASES OF THE BONES AND LYMPHATICS.

DISEASES OF THE BONES.

If the student constantly keeps in mind the idea that the processes of inflammation are the same in all structures, hard and soft, and are pathologic when the germs overcome the resistance of nature, it will be easy to understand that inflammation, ulceration, sloughing, and gangrene have their counterpart in all the various structures of the body. Hence we have *acute* and *chronic*, as well as *specific* inflammations of bone, which produce effects in proportion to situation and severity, and which are easily understood.

Periostitis.—By the term *periostitis* is meant disease of the outer or periosteal covering of the bone. So uniformly, however, does this inflammation extend into the bone that the term **osteoperiostitis** is more appropriate. Almost always this inflammation is suppurative, and unless early evacuation of the pus is obtained, considerable destruction of the bone, as well as severe constitutional symptoms, are set up.

A familiar example of acute osteoperiostitis is the bone felon of the phalanges. Less frequently such infections are seen in other situations upon the legs, and rarely in the bones of the arm and cranium. Such lesions are the result of infection, commonly from a puncture or even a diseased hair-follicle, a bruise producing a spot of lessened resistance which attracts and nourishes some germ floating in the blood.

Symptoms.—Tenderness, and in a day or so pain; throbbing, often very severe at night; swelling over the

part, and redness. Dependency of the part aggravates the suffering. If the trouble is in a large bone, elevated temperature and constitutional symptoms are usually set up.

Diagnosis is usually easy.

Treatment consists in free incision through the periosteum, with irrigation and drainage. If diseased bone is present, it should be removed with the curet.

Chronic tubercular and syphilitic lesions of this character belong to a class to be studied a little later.

Osteomyelitis is an inflammation of the shaft and marrow, or medulla, of the bone. Usually this condition begins from within the medulla, but occasionally the germs of periostitis spread through the bone by direct invasion. The cause is usually a wound, as a fracture, communicating with the air ; a bullet wound is a common source. Osteomyelitis is at times seen to set up in the course of a low or infective fever, like typhoid or scarlet. The first form is termed *septic*, and the latter *infective* osteomyelitis. In the former the germ of suppuration gains admission from without ; in the latter the special germ, floating in the blood, finds a favorable spot and multiplies. In the latter form the infection is usually in the epiphyseal ends of the bone.

The **course** of an inflammation of the bone structure is to fill the vessels with blood, and because of their unyielding walls, to produce such congestion, stagnation, and infiltration with blood, and perhaps pus, that the bone dies in a considerable portion, making a slough or gangrene of the bone, termed *necrosis*. The shaft of the bone in its central portion usually becomes this slough, and around it and through openings, termed *cloaca*, in those portions that do not die is poured out the pus and various inflammatory exudates. These exudates are discharged through sinuses in the skin and soft parts. Organization of the less virulent exudates forms a shell of bone which surrounds the dead slough ; this slough later becomes loosened from the surrounding shell.

This central slough or dead bone is termed *sequestrum;* the surrounding shell the *involucrum.*

The **symptoms** of acute osteomyelitis are usually severe, and consist in local pain, fever, early delirium, swelling of the part, and a general condition resembling

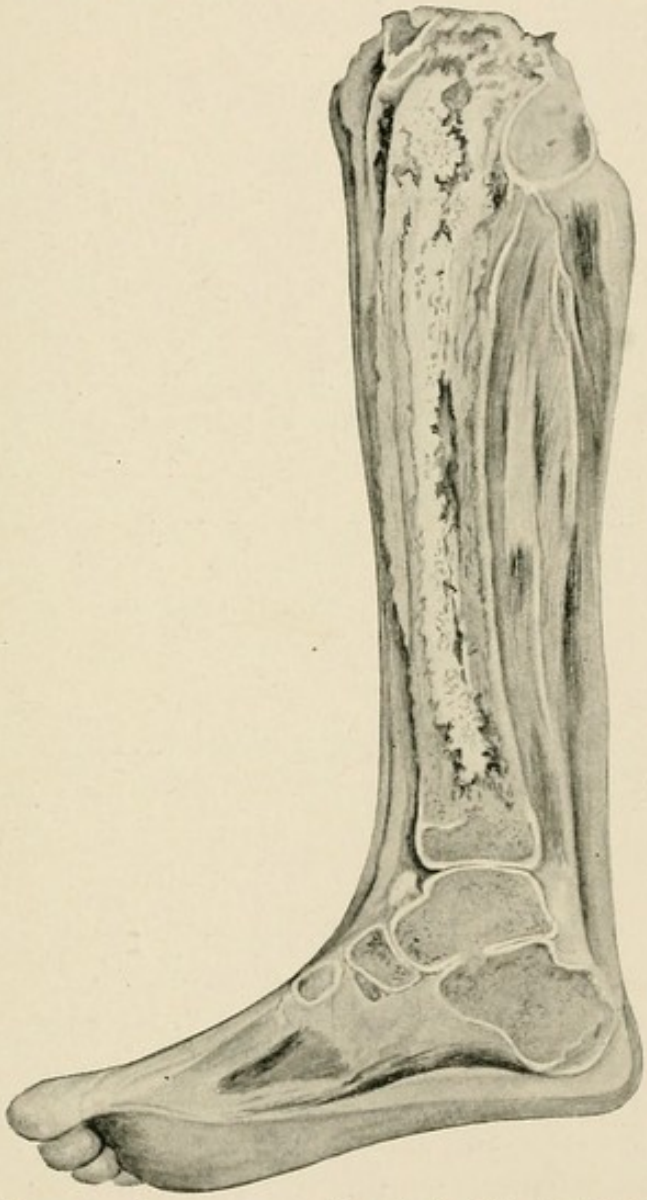


FIG. 22.—Acute osteomyelitis of the tibia (Nichols).

acute typhoid fever. Pus soon forms, and unless deeply seated, redness and fluctuation indicate it. In children the symptoms often resemble rheumatism. A high grade of septic infection often arises, and death may take place within a week. In perhaps 50 per cent. of cases

the progress is less rapid, but in all there is considerable destruction of bone in a short time. If a joint becomes involved and suppurates, it will almost surely be destroyed. When the trouble is the result of infection through an open wound, there is usually an opportunity for drainage, and the escape of pus renders the progress less rapid and destructive.

The **diagnosis** of osteomyelitis, when an open wound is present, is usually not difficult, though even then enough stress is not always put on the character of the infection in the bone structures. When, however, the disease is of the infective form, it may be mistaken for rheumatism and typhoid fever. The local symptoms, especially the localized redness and pain, with quick pulse and temperature, will aid in settling the matter. When the destructive character of the inflammation is borne in mind, it is easy to see how important early diagnosis and treatment must be. Even when death does not take place soon, severe osteomyelitis, notwithstanding it is most carefully treated, will usually leave a life-long cripple.

Treatment.—Only during a stage of diagnosis are the usual poultices and antiseptic applications permissible. As soon as localized inflammation of bone can be made out, chloroform and free incision through all diseased tissue,—and frequently into the medulla if indicated,—irrigation, and drainage are demanded. If joints are involved, they must be opened freely, irrigated with antiseptics, and drained. As a rule, it is better not to disturb the bone too much after free drainage, as it will separate itself better than the surgeon can do it at this stage.

Osteomyelitis beginning in the epiphysis,—"acute epiphysitis,"—when promptly recognized, gives a good prognosis as to recovery of useful joint, but after suppuration involves the joint amputation is likely to be required.

Necrosis.—By this term, as we have already seen, is meant death of the bone *en masse*. This mass may be

the body of the bone-shaft, or it may be a slab of that body, just as gangrene may involve the whole leg, or only a slough of one side or a portion of it. When this slough is the shaft, its inner part undergoes destruction, the discharges escape through openings in the shaft termed *cloaca*, the dead portion or *sequestrum* separates from the outer part, which is increased in density by organization of inflammatory materials thrown out by the periosteum. This outer covering surrounding the sequestrum is the *involucrum*. It is perhaps full of cloaca, but still remains the support of the limb. If the sequestrum, however, is a surface slab, there is no involucrum. So long as the dead fragment remains, either within the involucrum or upon its external surface, suppuration and sinuses will persist.

Symptoms of necrosis are the sinuses and discharge, and through a sinus a probe will feel rough dead bone, often moveable. Sometimes fragments will be discharged, and in this way a spontaneous cure may be effected.

Treatment.—Usually it is best to let dead bone separate itself from the living before attempting to extract it. When, however, the dead bone, though loose, is imprisoned in the involucrum, or held to the surface of the shaft by small adhesive points, incision and removal, with enlargement of the cloaca in the involucrum if necessary, are indicated. After removal, irrigation with drainage should be made. Granulation and healing of the sinus will usually result.

Osteomyelitis may easily attack either jaw, the infection arising from a diseased tooth, originating usually as a periostitis. Such conditions should be promptly and freely drained. Sometimes total necrosis of the jaw is seen, but extensive disease, aside from specific, is rare.

Chronic osteomyelitis, except occurring in the course of syphilis or tuberculosis, is rare, and usually pursues a subacute course, with tenderness, attacks of pain, and periods of intermission. Finally, an abscess dis-

closes the seat of necrosis, and later a sequestrum may be removed.

DISEASES OF THE LYMPHATICS.

Note is made in the discussion of blood poisons of the extent of such foci along the lymphatics, with redness and tenderness, termed **lymphangitis.** Such a condition may be septic or tubercular. Mild inflammations of this character subside without treatment; severer forms require poultices, hot packs, and often such constitutional remedies as purgatives and sedatives. Suppuration, as has been said under infected wounds, may often develop (see Septicemia). In the milder forms of lymphangitis compresses saturated with alcohol seem to exert a specific influence. Tubercular lymphangitis is chronic, and is due to the transportation of the bacilli from one gland to another. Extirpation is the only remedy.

The treatment of tubercular *adenitis* is elsewhere discussed.

Obstruction of the lymphatics by a chronic inflammation in some instances occasions a swelling of the part, a brawny thickening of the skin, and an edematous pitting, often with aching pain and some temperature. This condition is known as *lymphedema.* It is most commonly seen after injuries to glands and ducts from accident or surgical operations. Such conditions may exist for years, and often without much constitutional distress. In the acute form infection, suppuration, and death may at times be the course.

The presence in the lymphatics of the parasite termed *filaria sanguinis hominis* produces that painless form of lymphangitis called **elephantiasis.**

The treatment of chronic lymphedema is support and elevation of the part. Little is to be hoped for beyond contributing to the comfort of the patient.

For elephantiasis removal of the nerve-supply by excision has been tried with little benefit. Amputation is to be recommended in suitable cases.

Lymphadenoma indicates a condition of multiple glandular hypertrophy without tendency to suppuration. In the true form there is found a condition of *leukocythemia*, or great increase in the white corpuscles. It is rather an affection for internal medication than for surgery.

Malignant lymphoma, or Hodgkin's disease, is a

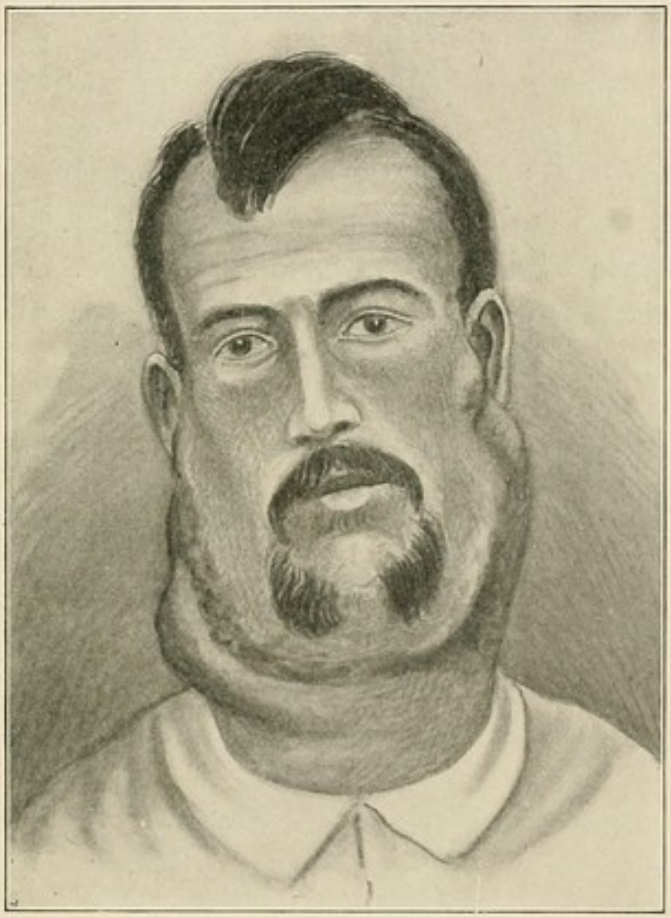


FIG. 23.—Malignant lymphoma ; Hodgkin's disease (Nancrede).

swelling of one or more glands, perhaps first in the axilla, groin, or neck. It is painless, and at first without depression of the general health. Other glands become involved, and in the course of a year nearly all the glands of the body are affected. Weakness, enfeebled circulation, and death are the course. It is probably a more virulent form of lymphadenoma.

The disease is chiefly observed in young adults, al-

though it is seen in children. The diagnosis is made by the progressive involvement. The cause is unknown. It pursues an uninterrupted course to the grave.

SUMMARY.

Chronic disease of the bone is due to tuberculosis or syphilis, and occasionally to chronic inflammation, termed osteomyelitis. This last is due to infection, and in the acute stage is very disastrous. The dead bone, or sequestrum, that results acts as a foreign body and should be removed as soon as it loosens.

Necrosis of the bones of the jaw may produce extensive sequestra, and is due to any of these causes. The treatment is removal by curetment or bone forceps after the dead bone has separated from the living, or before if it is causing much constitutional disturbance.

CHAPTER XIX.

DISEASES AND ULCERATIONS OF THE GUMS AND MOUTH.

Gingivitis.—Gingivitis, or inflammation of the gums, is due to an infection after irritation, either from food or minerals, like lead and mercury, or to the presence of tartar on the teeth.

Symptoms are tenderness and swelling of the gums, bleeding on touch, offensive, laden breath, and increased salivation. Occasionally ulcerated spots appear. Deposits of tartar, often quite large and deeply burrowing, will usually be seen. When the inflammation is due to mercury, the characteristic blue on the gum-line of the front teeth, with fetid breath, loosened teeth, and the increased flow of saliva, together with the history, make the diagnosis easy. Scurvy is treated of elsewhere.

Treatment.—The removal of the tartar, followed by a simple mouth-wash, will usually effect the cure when this is the cause.

In mercurial gingivitis the recognition of the cause, free elimination by purgation, and the internal administration of chlorate of potassium in 3-grain doses three times daily. A mouth-wash of equal parts of peroxid of hydrogen and listerin answers admirably. The simplest diet only must be allowed, and nothing hot must be taken in the mouth. If considerable ulceration follows the salivation, cauterization with crystals of silver nitrate is useful.

In lead-poisoning the gargles are usually sufficient; iodid of potassium in solutions of 3 to 5 grains three times daily is of service in this form of gingivitis.

Ulcers.—Ulcers in the mucous membrane of the

mouth are usually chronic, and due to local traumatism, tuberculosis, or malignancy.

The accidental or intentional ingestion of caustics may leave ulcers and cicatricial tissues. Commonly such ulcers heal unless constantly disturbed by the movement of the jaws, and may be so situated that the cicatrix will endanger the freedom of the articulation. The diagnosis of such lesions is made by the history. The treatment consists in antiseptic gargles and occasionally a stimulating caustic application.

Syphilitic ulcerations are seen on the tonsils, the side and surface of the tongue, and on the walls of the cheek. They are usually gummata, and belong to the later stages, although mucous patches are often seen. Usually they are multiple. Commonly these ulcerations are slow growing and painless, but at times the ulcer is very destructive, eating away the soft structures and even the palate bone, and invading and destroying the nose in spite of any treatment.

Diagnosis of this lesion is usually made from the history of the case as well as the existence of other syphilitic manifestations elsewhere. These are multiple ulcers, painless and slow growing, attended by offensive breath, usually swollen tissues, and commonly improvement under mercury and the iodids, with the history and the other lesions if syphilitic.

The **treatment** here is that of syphilis: cleanliness, gargles of listerin, borax, myrrh, with specific remedies soon produce a return to the normal.

Tubercular ulcerations, or lupus, are usually single, painless, and without offensive odor. Unlike syphilitic ulcers, the tissues do not swell, but are nearly level with the healthy structures. The reddened, granular appearance of lupus has been noted. Other indications of tuberculosis—enlarged glands, with constitutional diathesis, and family history—aid in the diagnosis. This form does not, of course, show improvement from mercury. The treatment is clearly the gargling and con-

stitutional tonics elsewhere discussed; extirpation may at times be appropriate.

Epithelioma is chiefly seen on the tongue, if within the buccal cavity, although occasionally on the inner wall of the cheeks. When located on the tongue, usually the tip or the lateral margins are the seats.

A history of smoking is very common. Heredity seems to have little influence. The growth is more or less elevated, with ulcerated surface and indurated base. The discharge is offensive, and the ulcer is painful, sometimes agonizing. In the later stages phonation is much impaired.

Diagnosis.—Chancre and gumma are seen in younger persons, and are attended with early lymphatic involvement. Care should always be taken in doubtful cases to determine diagnosis by mercury. The microscope will aid in deciding against tuberculosis.

Treatment of epithelioma is extirpation of the organ, preferably by Kocher's method, unless the case is seen very early. Recurrence in the stump is the rule.

Scurvy.—Although this is a condition not often met with in inland districts, and rarely, if at all, in civil life, it presents symptoms of occasional interest. The pathology is not clear. Bacterial origin has not been proved to account for it, although some sort of parasite is believed to be a feature in the etiology. The disease is essentially one of profound denutrition, seen in badly nourished sailors and soldiers living in overcrowded quarters. Bad food and an insufficient supply, especially of vegetables and acids, are the exciting causes. Among shipwrecked sailors, and on badly ventilated ships and in prisons, where vegetable food is unobtainable, scurvy exists as an epidemic or complicates every other ailment.

Symptoms.—The premonitory indications are those of prostration and general weakness. The complexion of the patient is yellow, the appetite fails, and the digestion becomes impaired. Then the gums swell,

bleed easily, ulcerate, and give off an offensive odor. So-called *purpuric* spots, blood under the skin and in the mouth, soon appear. Sometimes considerable hemorrhages take place from the rectum and nose. Extensive ulcerations and infections and sloughs are developed, and fractures of the long bones or epiphyseal separations are common. These symptoms increase in severity and extend if the means of obtaining proper diet are not at hand, and exhausting hemorrhages and septicemia destroy the patient. If, however, proper hygienic surroundings and food can be obtained, even the most deplorable cases soon improve and recover.

Treatment is chiefly dietetic, with fresh air and cleanliness. The vegetable acids, lemons, lime-juice, and fruits of all acid kinds, are medicinal. Salt and sugar should be withheld. Strychnin and quinin are to be employed. Alcoholic stimulants in moderation may be of service. Bitter tonics and the constructives are indicated later on.

Locally, a mouth-wash of listerin 3 parts and hydrogen peroxid 1 part will greatly aid and comfort. Nourishing food as soon as it is acceptable to the mouth should be insisted on.

SUMMARY.

Inflammation of the gums usually requires removal of the cause and mild mouth-gargles. Tartar should be removed, mercury withdrawn, and sweets and acids withheld. Hot food is contraindicated. Listerin, chlorate of potassium, and, if necessary, mild cauterization are indicated. Ulcers, simple, syphilitic, or tubercular, require mild, bland, cold diet; cleanliness and soothing gargles, with specific treatment when indicated. Tuberculosis and malignant lesions, if not susceptible of extirpation, are treated on the expectant plan.

Scurvy is diagnosticated by the history, and should receive the standard treatment of appropriate food, cleanliness, and acid vegetables.

CHAPTER XX.

TUMORS OF GUMS AND ALVEOLAR BORDER, INCLUDING DISEASE OF THE BONES OF THE JAW.

A GENERAL *hypertrophy* of the gums, occupying tooth sites of the alveolar border, is of rare occurrence, and when seen, is usually allied with some other indications of physical ailment. Hemophilia and cretinism may be associated. Such conditions do not, as a rule, need any treatment, but well-defined and obstructive hypertrophy should be removed by curet or knife if the general condition of the patient indicates it.

TUMORS OF THE GUMS AND ALVEOLAR BORDER.

Fibrous and papillomatous outgrowth from the gums, resembling polypi, are often seen about diseased teeth. Usually they are small, and can be trimmed away with the scissors. If they are too large for this, a ligature may be used to prevent annoyance from bleeding, after which the polyp can be cut off. There is little tendency to return.

A form of this growth is known as **epulis.** The epulis, however, is of several varieties, and often malignant. It may involve the gums alone, or disease may extend into the bone itself.

In the **simple fibroma,** beginning usually as above discussed, about a diseased tooth, a symmetric and hard growth forms on both sides of the gum border, often increasing in size from that of the thumb to a small-sized orange. Such growths are usually painless and without ulceration, and are most frequently seen on the lower maxilla. Such conditions are non-malignant, usually of slow growth, and without ulceration. When

early removed by taking out the diseased section of the bone, including the socket of the tooth, this form of epulis does not recur.

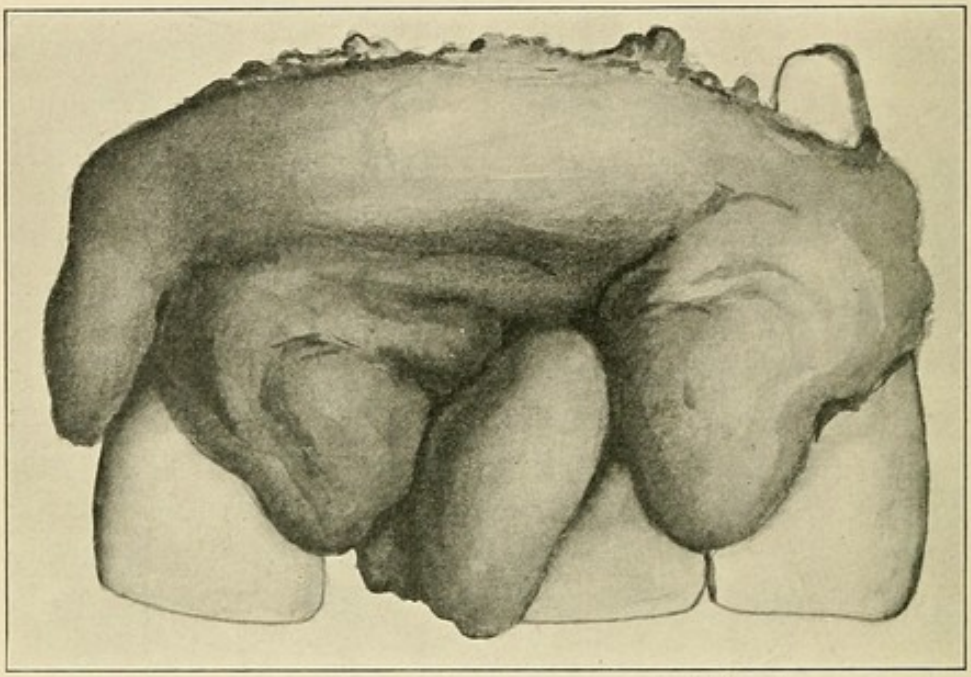


FIG. 24.—Periosteal sarcoma, or epulis (Mears).

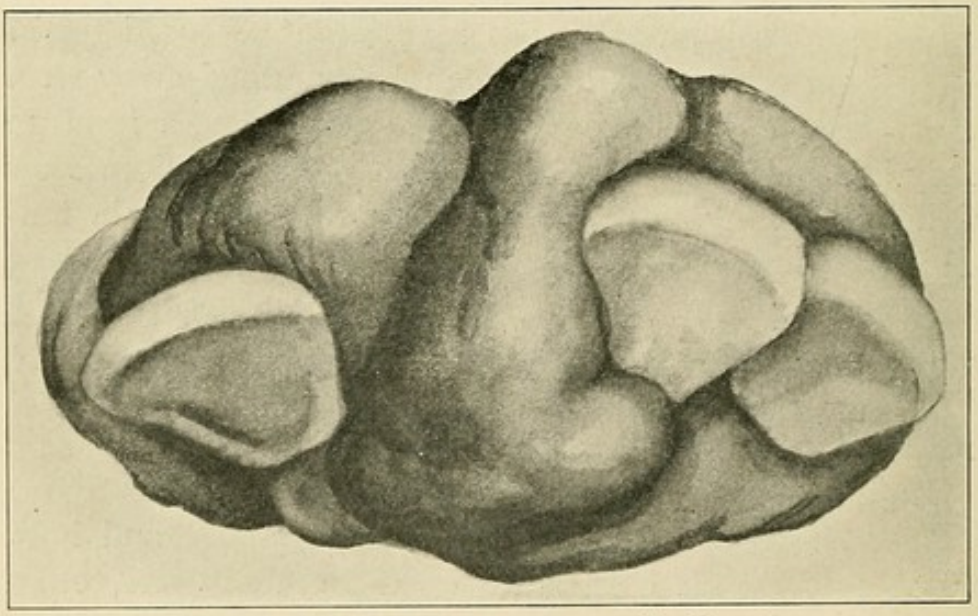


FIG. 25.—Periosteal sarcoma, or epulis (Mears).

In a few instances *angiomatous* growths, rather than fibrous, make up the body of the epulis. Here, after the removal, the actual or thermocautery will aid in de-

stroying the vessels of the growth at the margin of the wound.

When the growth has persisted for a long period and is painful and perhaps ulcerated, a suspicion of malignancy should be entertained—sarcoma chiefly; and when in the presence of such a history the bone is found diseased, a free extirpation is required. Twice within the past year the author had occasion to remove one-half of the inferior maxilla for fibrous epulis, which

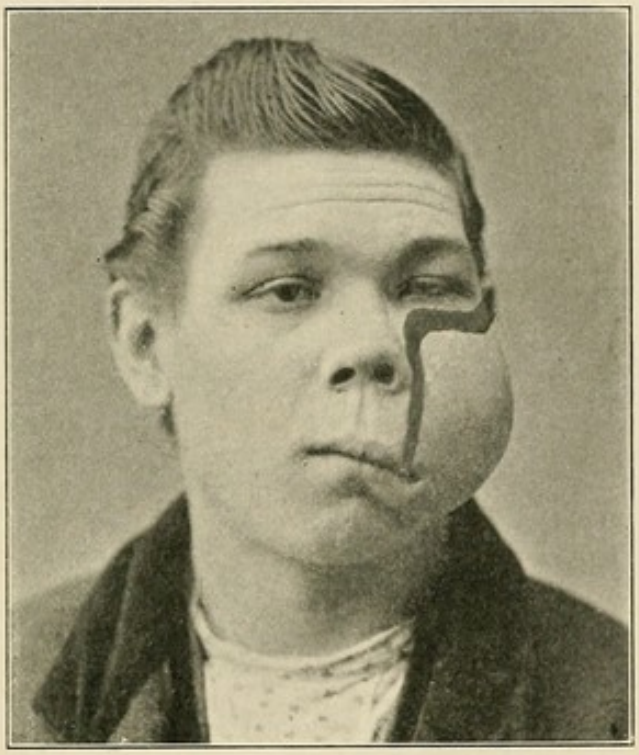


FIG. 26.—Fibroma of the upper jaw, caused by blow (Mears).

before operation indicated no bone disease. In each case the microscope showed round-celled sarcoma. Such disease of the gums at times surrounds the dentigerous cysts, and when such is the case, free removal of mucous membrane, as well as the bone, is required. No delay should be permitted in any form of epulis, as the protracted irritation always keeps up the growth, which has no tendency to spontaneous cure; an early operation often prevents return and malignant degeneration. Nothing short of extirpation of half of the diseased maxilla

is to be thought of in the presence of malignant epulis. When this is thoroughly done, early recurrence is rare.

This description is meant to cover the various forms of epulis, a term that applies to any tumor of the gums, whether fibrous, angiomatous, chondromatous, or malignant. The varieties of these tumors are characterized by the essential features of each.

The firm, healthy-looking **fibroma,** with usually

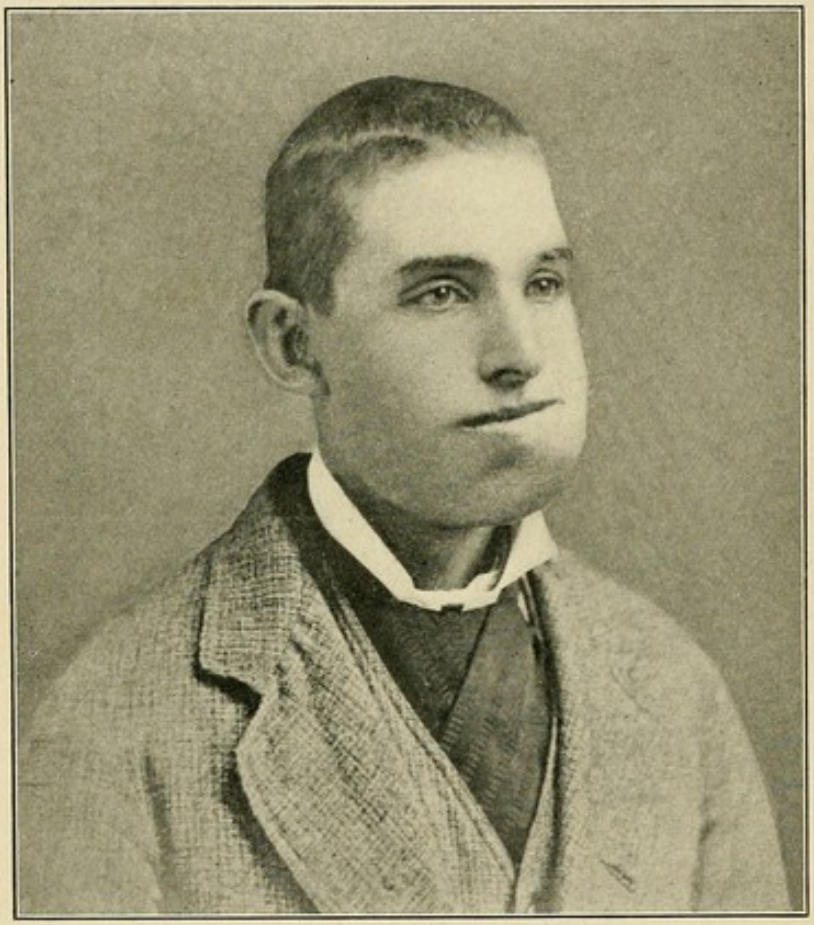


FIG. 27.—Chondroma of lower jaw (before operation).

broad periosteal attachment, is painless, and unless irritated by food or teeth, without ulceration. Sometimes bleeding occurs from bruising by mastication.

The **osteoma** of the gums is not strictly epulis, although it requires to be differentiated. Such tumors may be removed with the chisel if not too hard.

Chondromata also may originate from the periosteum, and appear as a lateral growth from the gums and jaw.

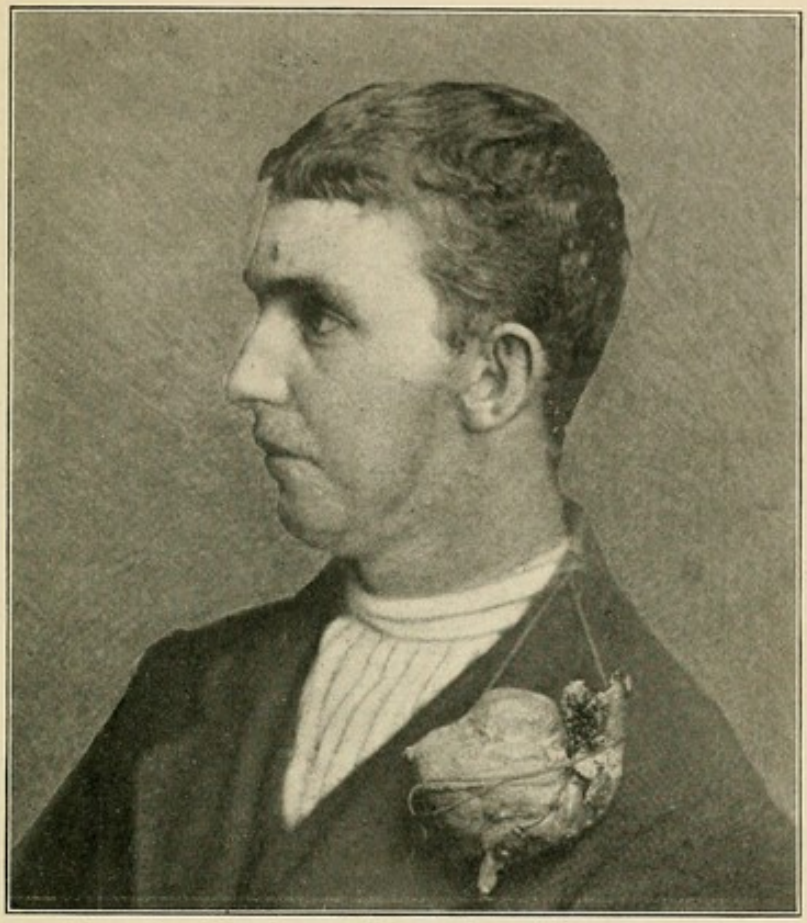


FIG. 28.—Chondroma of lower jaw (after operation).

Such tumors usually belong to young adult life; they do not influence the general health. Usually they can be

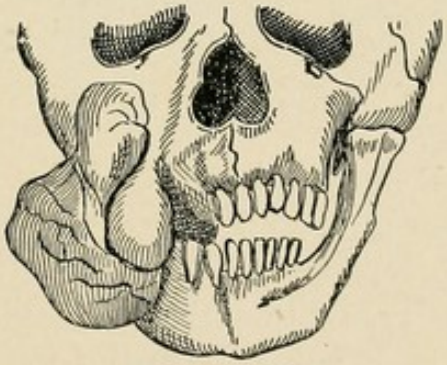


FIG. 29.—Osseous tumor of the right superior maxilla.

removed without imperiling the jaw-bone, especially if seen early. Later, removal of the jaw may be necessary if any operative measures seem desirable.

Angiomata of the gums are frequently seen as a

form of epulis. Bright-red, sometimes pulsating, they are chiefly seen in children. They sometimes attain a considerable size, and may bleed to a most annoying degree on manipulation or mastication of hard food. Usually they originate in the periosteum, or perhaps in the pulp-cavity, and grow up around and between the teeth. At times they are painful and very troublesome. Such growths are apt to bleed a great deal on attempt at extirpation, and preparation is to be made to control

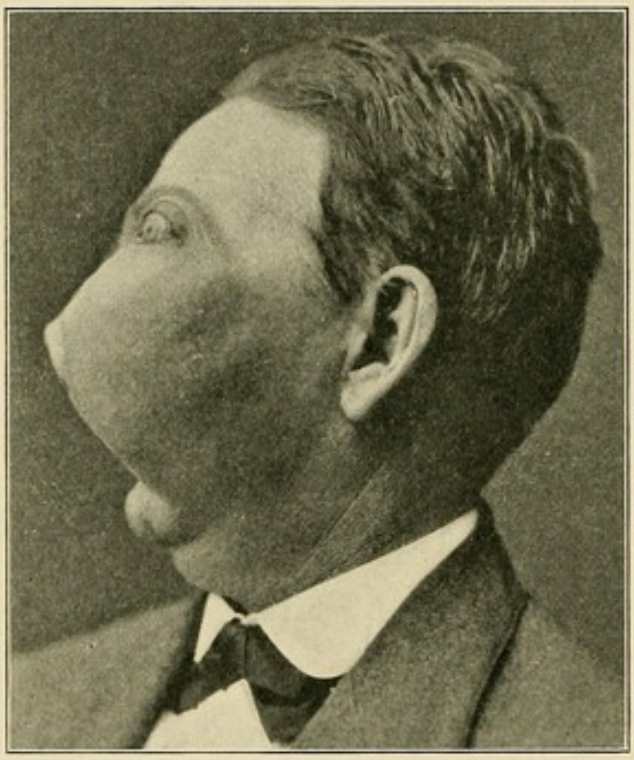


FIG. 30.—Sarcoma of the antrum (Mears).

by pressure. Removal is effected by paring off the growth from the gum and removing the diseased bone with cutting forceps and chisel. Packing with styptic gauze, if necessary, will control the hemorrhage.

Sarcoma is seen not only in the form of epulis, but also in the central bone cavity, in the antrum, and in the bony walls. When it arises from the lateral periosteum it may grow like the angioma, surrounding the teeth and even pushing them in abnormal positions.

The myeloid form is the most frequent, and produces a

somewhat symmetric swelling, which may surround the ramus. Those originating in the periosteum are of the other varieties. The growth of these tumors is irregular, but when it becomes active, it progresses rapidly. The softer forms, in which there is less fibrous tissue but more vascularity, grow more rapidly than the myeloid.

The **diagnosis** is often obscure in the earlier stages. Sarcoma may be mistaken for fibroma and chondroma. The rapidity of growth and the evident infiltration with surrounding tissue, as well as the influence on the general health, determine the nature.

Treatment.—The early and complete removal of these growths is the only treatment. If the tumor is well encapsulated, without infiltration, a removal of the attachment with a piece of the bone may secure immunity from return ; but in the myeloid form, and whenever the surrounding tissues of the bone, periosteum, and mucous membrane are infiltrated and enlarged, the ramus of the lower jaw, or the half of the upper, will require removal.

Extensive sarcoma of the upper jaw, especially when the cavity of the antrum is involved, offers little prospect even with extirpation of the diseased maxilla, and it is often questionable surgery to excise the superior maxilla.

The starvation of such growths by the ligation and extirpation of the external carotid artery is recommended as having given good results : and wherever the bone is removed, it should be preceded by this step not only to secure better hemostasis, but also to deprive the situation of the growth of nutrition.

ALVEOLAR ABSCESS.

By this is meant suppuration in the alveolus of a tooth, usually first involving the periosteum of the tooth and its covering, as well as the lining of the alveolus. It is caused by infection of this highly favor-

able spot, by entrance from without through diseased tooth-cavities, either filled or unfilled; or, as sometimes happens, lowered vitality in a bruised alveolus or root will permit circulating germs to colonize; suppurative inflammation thus arises.

Symptoms.—Almost every one has suffered from this form of toothache. First, there is acute throbbing pain, with exquisite tenderness of the diseased tooth to the touch; early heat, swelling, and redness of the gum set up; even swelling of the cheek is seen, although not so marked in the earlier stage. The tooth seems lengthened, and indeed is somewhat pushed out from the alveolus. If these symptoms disappear without suppuration, which is not often the case in the presence of infection, the pain and swelling subside. In those cases, however, in which an abscess forms, the swelling of the face, as well as of the gum, goes on. Even dropsical infiltration of the eyelid and cheek supervenes. The body-temperature is often elevated. Although the severity of the pain diminishes, it is usually worse at night, and indicates the throbbing of an abscess. Fluctuation may be made out where pus points. This is most commonly at the mucous junction of the gum and cheek, but at times it is on the tongue side or through the pulp-cavity of the tooth. Sometimes it penetrates the alveolar wall and may perforate the cheek, or in rare instances burrow along down the jaw into the neck. In the upper jaw escape of pus may take place over the roof of the mouth, or even into antral or nasal cavities. These unusual openings are seen only in severe and grossly neglected abscesses, but sinuses in the above-mentioned situations, which have no other history, should be carefully traced to determine the possible connection.

Diagnosis.—Usually the history, severe toothache, pain and tenderness, with the swollen gum direct a suspicion to beginning abscess, and often fluctuation will be detected. In neglected cases, where the ab-

scess has ruptured within the mouth and much relief has resulted, careful inspection will disclose a small sinus through which compression will express some pus. Tenderness of the tooth to tapping or compression will usually indicate the origin of the disease.

Treatment.—If the tooth be not too much diseased, temporizing measures may be employed, the abscess opened at the gum border, and then perhaps the tooth may be saved and later filled. Before the occurrence of suppuration, warmth to the face, a hot-water bag, or a dry hot bag will alleviate the pain, while treatment of the cavity may be conducted as appears rational. If, however, suppuration appears probable, incision should be made for exploratory purposes, and unless free drainage can be thus obtained, the tooth should be extracted. When the tooth is hopeless, it should, under any circumstances, be promptly and completely extracted and the alveolar cavity cureted. If the abscess has discharged into the cheek or mouth and a sinus persists, it must be opened up under an anesthetic and scraped out, and put in a condition to heal.

DISEASES OF THE BONES OF THE JAW.

Necrosis and periosteal inflammations of the bones of the jaw are nearly always syphilitic when not due to traumatism, except in some localities where phosphorus workers contribute to the number.

Inflammation of the periosteum is not common aside from these causes, but the symptoms are the same even if from simple traumatism: pain and swelling, more distressing at night; tenderness, which enables one to locate the spot of inflammation; and probable suppuration. Here prompt and free incision, with irrigation and drainage, is indicated.

In the chronic form, tubercular, syphilitic, or from phosphorus, rational treatment on established lines is indicated.

Necrosis may follow the periostitis when treatment

is neglected. The symptoms are suppuration, usually through a sinus, and small in amount, loosening of the teeth, offensive breath, and the sensation of dead bone to the probe. In syphilitic and phosphorus necrosis the history is usually obtained. Mercury and scurvy may be the producing factors. Under any circumstances the history should be carefully obtained to determine the diagnosis.

Treatment.—When loose pieces of bone are located, they should be removed, but force should not be made, nor should operative interference be undertaken, until the sequestrum has well separated. The general health should be supported, and measures for cleanliness persevered in until the dead bone can be felt to move freely.

Phosphorus-necrosis is a far less frequent lesion than formerly, because of the careful prophylactic meas-

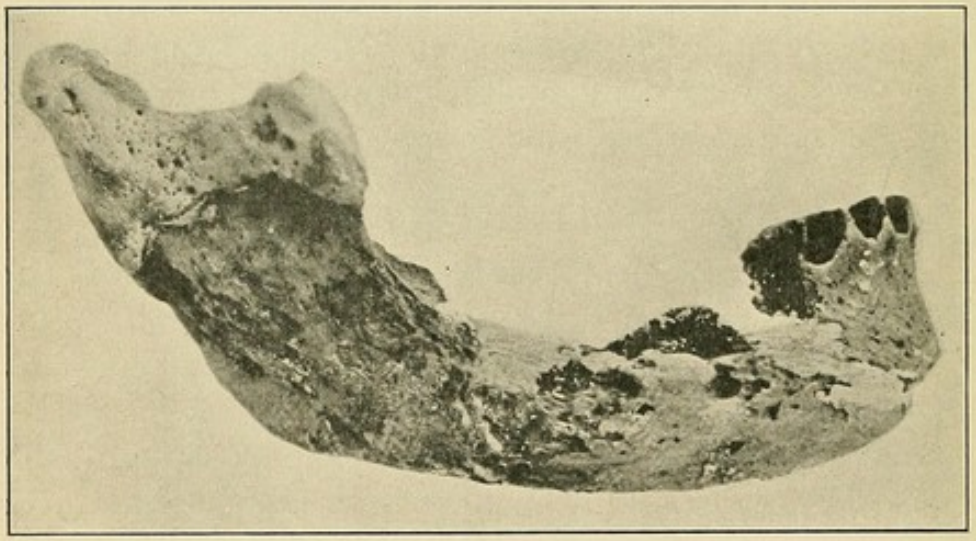


FIG. 31.—Phosphorus-necrosis of one-half of the lower jaw (Mears).

ures that are taken in all factories where the drug is used. The prophylaxis consists in ventilation, cleanliness, and early recognition of the symptoms, as well as the use of more easily oxidized phosphorus than formerly.

The **symptoms** in those exposed to phosphorus fumes are, first, painful tenderness in the gums and jaws, in the

beginning occasionally, later constantly; redness of the gums; swelling, ulceration, and discharge of pus, which is offensive and unhealthy. Later on necrosis may involve extensive portions of either jaw, and a sequestrum form. The general health suffers, and exhaustion with septic infection may precede death. If the articulation of the lower jaw becomes involved, false ankylosis may be present. Slough of muscle and cellular tissue may succeed the infection, and a slow process of destruction of the soft parts, as well as of bone, may set up.

The **course** of phosphorus-necrosis is essentially chronic and often lasts for years.

Diagnosis is made chiefly by the history. The granular bone deposits over the dead surface are peculiar to this form of necrosis.

Treatment.—In the early stages cleanliness and careful attention to the teeth, with, of course, immediate removal of the cause. All hopeless teeth should be carefully extracted, so as to leave no open space for infection; cavities should be carefully protected with temporary fillings. Astringent and antiseptic mouth-washes should be employed regularly. Constitutionally, turpentine is recommended as an antidote. After the period of inflammation is passed, the ordinary operative measures are to be applied to the diseased bone.

Cysts of the alveolar border are of two kinds:

First, those that are inflammatory in character and begin at the root of a diseased tooth, within the peridental membrane. Usually such cysts are small and are not noticed until the tooth is loosened. At other times they may even extend to and occupy the whole antrum. *Second*, the so-called dentigerous cyst, referred to under another caption. These growths originate from the inner surface of the enamel covering of the tooth, and contain a clear fluid, which, if not set free by the eruption of the tooth, collects around it and forms a cyst which incloses the tooth. The tooth later becomes loosened and may fall into the cyst cavity. Usually the

site of these cysts is in the anterior teeth. They may remain limited to the alveolar structure, or may invade the antrum or protrude into the mouth.

The **symptoms** are indication of a firm, but thin-walled, fluctuating tumor, which is painless and grows slowly, and occupies the site of an absent permanent tooth. The use of an exploring trocar in the tumor will determine its character. Such conditions are important in diagnosis, chiefly because the larger ones may

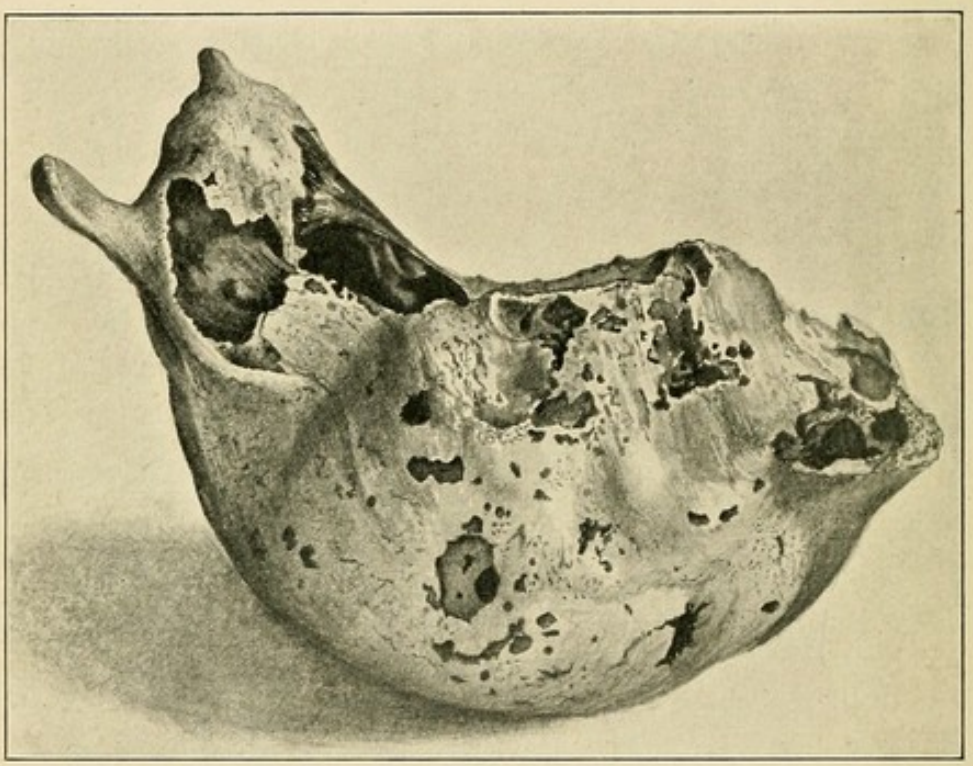


FIG. 32.—Cystic tumor of the jaw, probably dentigerous (Warren Museum).

be mistaken for malignancy, and induce extirpation of the jaw unnecessarily.

The **treatment** of the inflammatory cyst is usually nothing more than extraction of the loosened and displaced tooth. The dentigerous cysts require incision with a strong knife or chisel, and curetment of the cavity, irrigation, and packing with gauze wet with a disinfecting solution. Excess of bone should be removed with a gouge, that the cavity may be obliterated.

SUMMARY.

Epulis is a tumor of the gums and may be fibrous, mucous, angiomatous, cartilaginous, or bony; it may be benign or malignant. Usually it is easily removed, which should be the treatment, with wide excision if there is doubt as to malignancy.

Sarcoma may involve the antrum as well as the gums, and are diagnosticated by the rapid growth and large size they quickly attain. Early and complete extirpation is the only hope. Ligation of carotids in inoperable growths is recommended.

Alveolar abscess is the ordinary gum-boil. It may at times penetrate the cheek, or even in neglected cases open in the roof of the mouth. Treatment consists in immediate extraction of the tooth if diseased too much to save; and if the bone is diseased, incision and the curet.

In *periostitis* or *necrosis* diseased bone should be removed as soon as loose.

Phosphorus-necrosis is rare. Treatment rational: cleanliness, turpentine internally, and removal of sloughs.

Cysts due to disease of tooth-roots or inclusion of undeveloped structures should be cureted and packed. Dead bone should be removed.

CHAPTER XXI.

SURGICAL LESIONS OF THE MOUTH AND FACE.

TUBERCULOSIS of the skin is seen on the face in the form of **lupus vulgaris,** often in connection with tubercular manifestations elsewhere in the patient, although it is usually a primary manifestation. It is seen on the nose, eyelids, and cheeks. The bacillus is not often found in lupus, as usually the germs of suppuration have destroyed them. The simple form of lupus may be manifested merely as reddish-brown nodules under the surface of the skin, which, while not showing ulceration, may be broken down by slight pressure. These nodules sometimes cicatrize and get well. At other times, however, usually after a long time, ulceration sets up. A reddish, granular ulcer may extend until considerable portions of the face are involved. This is *lupus exedens* and simulates malignancy. Parts of the ulcer may heal while the other extends. In this form the ulcer takes on a serpiginous growth, undermining and producing extensive destruction of the bone, resembling the rodent ulcer of epithelioma. In the **hypertrophic variety** warty tubercles form, simulating a species of elephantiasis; later, these ulcerate.

Cicatrization follows in parts of these ulcers, and often great deformity is produced. Portions of the nose and eyelids are eaten away. In the exedens variety the progress is slow and spreads by gradual extension in every direction. It is to be distinguished from epithelioma by the absence of pain, lymphatic involvement, and tendency to cicatrization. Syphilis is distinguished by the history, painlessness, and response to specific measures.

The **treatment** for skin tuberculosis is free excision rather than curetment, which should be reserved for cases insusceptible of complete removal with the knife. The injection of antitubercular serum is reported to have had favorable effect upon these manifestations. The

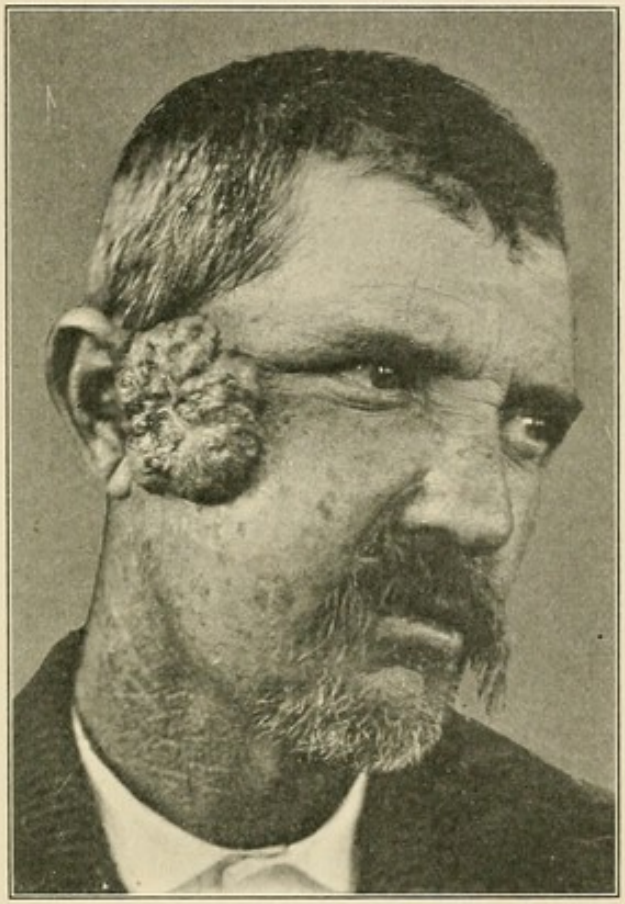


FIG. 33.—Sarcoma cutis (Matas).

injection is also helpful as a diagnostic, producing a reaction in the presence of tuberculosis.

Epithelioma.—Epithelioma of the face is usually single, beginning as a wart or fissure, either on the lip or cheek, and growing very slowly with a localized ulceration and a tendency to an elevation or tumor growth, with lancinating pain, at times, and a serous or watery discharge from the sore. After a few months, more or less, glandular sympathy is shown by the lymphatics. The growth of epithelioma ordinarily is

slow, and years may elapse before cachexia and sepsis carry off the victim.

In the **rodent ulcer** the appearance is very much like that of lupus exedens, except that ulceration of the rodent cancer does not cicatrize, and usually has more discharge and pain.

The **diagnosis** of facial epithelioma is usually unmis-

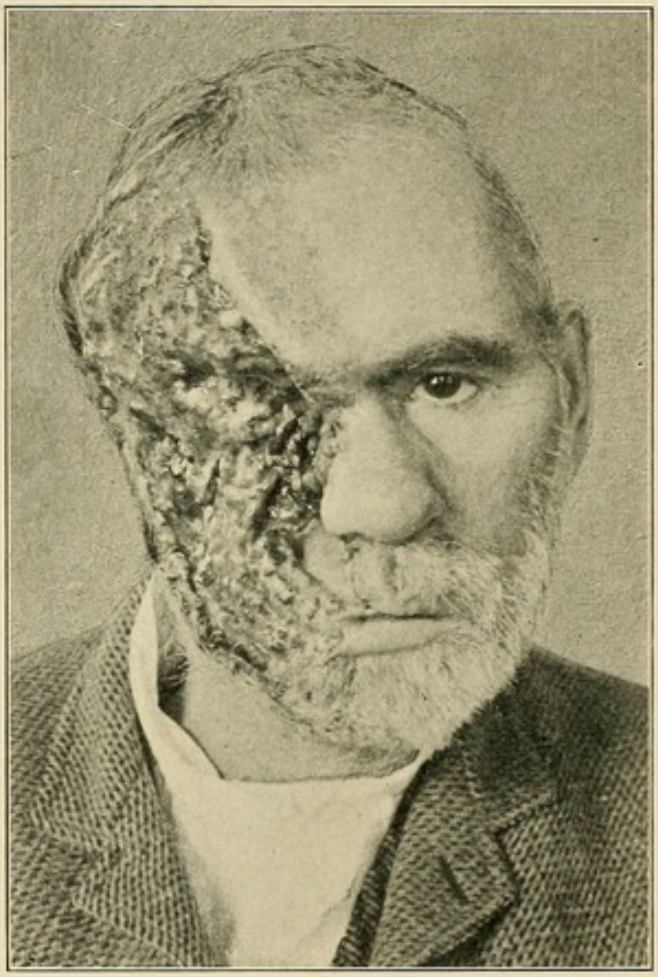


FIG. 34.—Rodent ulcer, originating in the scar from a gunshot wound of forty years' duration; no infection of the cervical glands (Warren).

takable. It is seen in old people, commonly as a wart or fissure, grows slowly, with later involvement of lymphatics. Chancre is diagnosed by history, rapid growth, early involvement of lymphatics, and response to specific medication. Treatment is early and complete extirpation; the continued administration of arsenic for months after removal is advocated, but appears unnecessary. The

Röntgen ray is advocated for both tubercular and malignant ulcerations.

Chancre of the Lip.—This condition, while rare, has sometimes been mistaken for epithelioma and extirpated, with, of course, no real benefit. The sore is inflamed; usually, too, it is quite sensitive, but not painful. Ulceration with the characteristic crater is seen. The growth is rapid, and lymphatic involvement occurs often within two weeks; other symptoms soon appear, and the growth yields to antisyphilitic treatment. In young people a recent growth should never be pronounced epithelioma without a course of mercury.

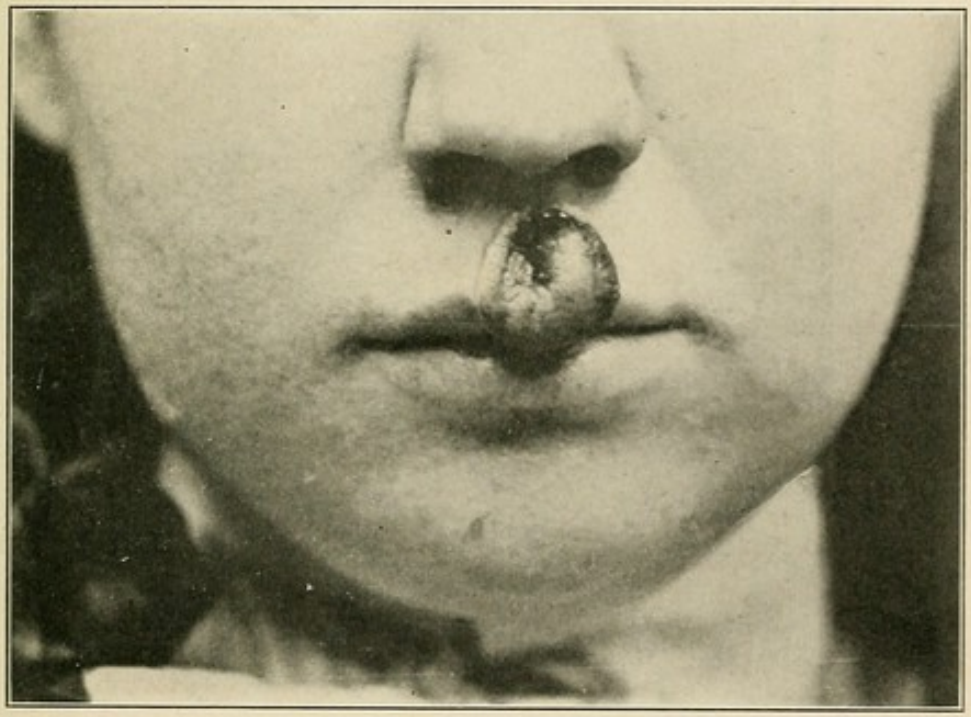


FIG. 35.—Chancre of the upper lip (Porter).

Cancrum oris, or **noma,** is a gangrenous ulceration, most likely of mycotic source, although the germ is not yet certainly isolated. It grows with great rapidity, and is attended with profound constitutional symptoms early in the attack. It is seen rarely before the third year, and not later than the tenth, in feeble, badly nourished children. Frequently it occurs in the course of an acute infectious fever. Death usually results within a week.

The **treatment** consists in early removal of the slough, cauterization with nitric acid, and the administration of stimulants.

Other forms of local sloughs on the face are very rare.

Acne Rosacea.—This is a chronic hyperemia, usually an inflammation of the epithelial layer of the skin, seen chiefly at the tip of the nose, but at times on the cheeks and chin. In the early stages it appears as a mild redness, disappearing on pressure, and always

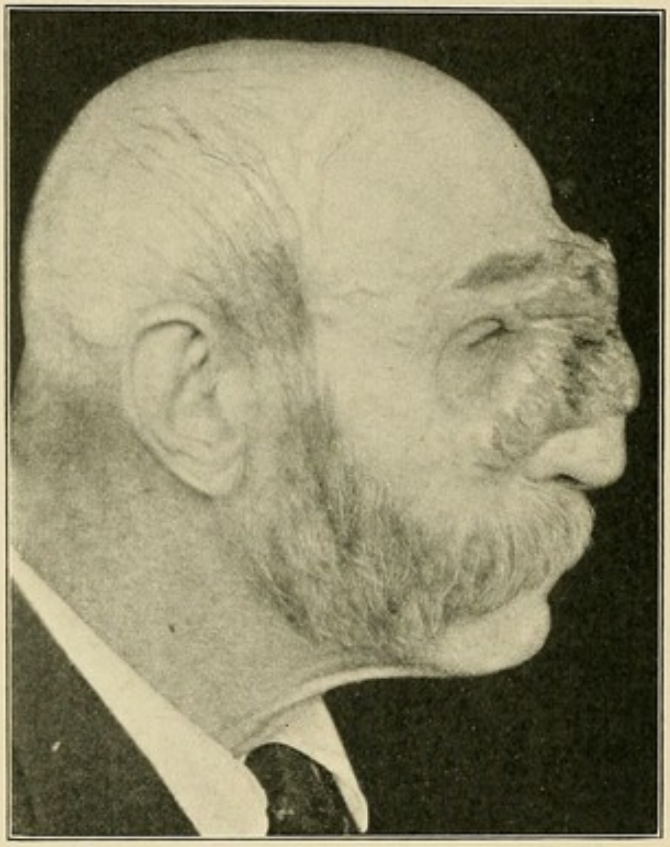


FIG. 36.—Small round-cell sarcoma (Weir).

painless. After a time the skin becomes roughened and scaly, and the local blood-vessels permanently dilated; livid pimples appear over the field of irritation. The disease is very disfiguring at times, but has no tendency to ulceration, although in a more aggravated form productive of soft, fleshy growths from the size of a pea to that of an egg, which may form on the nose and chin. This condition is called *rhinophyma*.

The disease is essentially chronic, and usually does not completely yield to treatment until middle age.

Diagnosis from lupus is not always clear before ulceration in that affection. Tubercular ulcerations, as well as those of syphilis, declare themselves by breaking down. The excavations in acne rosacea are always elevated.

Rhinophyma may simulate malignant tumors. The history of previous course will usually differentiate.

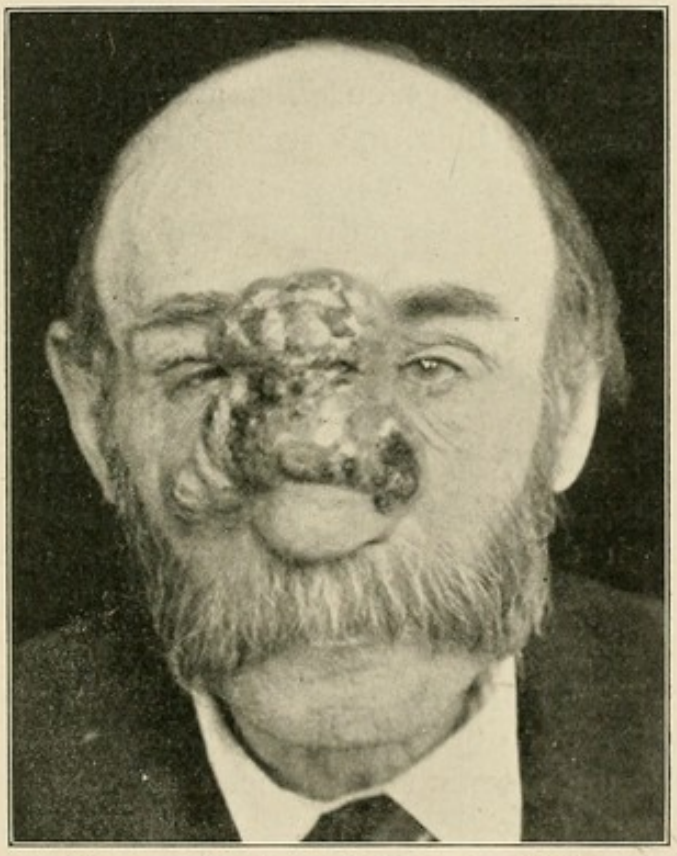


FIG. 37.—Small round-cell sarcoma (Weir).

Treatment.—The diet must be regulated, constipation corrected, and alcoholic stimulants be given up. Locally, sulphur in powder, ichthyol in 5 to 8 per cent. ointment, applied when convenient, and washing with hot water and strong soap are measures of service, but the disease is very stubborn. Electrolysis is sometimes of service. Excision is to be employed in rhinophyma.

Acne Vulgaris.—The dentist will often be asked advice about this very common affection. It consists

in a papular and pustular eruption on the forehead and face. It is seen usually between the ages of fourteen to twenty-five, rarely later than thirty, in both sexes. It is usually due to the disease of the sweat-follicles, which are often filled up with the so-called comedo, or flesh-worm, which is a plug of sebaceous matter obstructing the duct of the gland.

Some of these comedos are deep-seated, and suppuration, which may be several days reaching the surface, will occasion pain and soreness.

The **course** is always chronic, and not infrequently scars and discolorations may result in considerable disfigurement for months or years. Eventually the affection disappears. The condition is due to disturbance of digestion; rich food, sweets and spices, constipation, are all factors in establishing acne, although often the cause cannot be traced.

Treatment is eminently unsatisfactory, for although a helping influence is not difficult to obtain, yet cure of this distressing and humiliating eruption is often long enough deferred to make heart-sick the patient and the physician.

Constitutionally, care in diet and attention to the bowels is most important. The sulphid of calcium in $\frac{1}{6}$-grain doses four times daily, and 5-drop doses of Fowler's solution of arsenic three times daily, are among the standard measures internally. Locally, washing the skin twice daily with strong soap, expressing gently the comedos as soon as they can be got out, opening pustules or even inflamed papules with a small tenotomy knife, the application of hot gauze pads to inflamed papules, precipitated sulphur over the face at night, are among the most efficacious measures.

SUMMARY.

Lupus, which is seen in several forms, is a tubercular germ, sometimes, as in the lupus exedens, of a malignant tendency. It is always difficult to eradicate.

Epithelioma is more painful, and has a later glandular involvement, with cachexia; the rodent ulcer is a form between the two in point of virulence.

Cancrum oris is a local gangrene of the cheek, rapidly destructive, and requiring prompt cauterization.

Acne vulgaris is the ordinary pimple of the face, due to comedos. It is best treated by hot bathing, strong soap, and germicides.

Acne rosacea is a lupus-like redness of the cheek or nose or of both. Alcohol and rich diet add to it; also gouty tendency. Treatment is abstinence and purgation.

CHAPTER XXII.

SURGICAL LESIONS OF THE FACE (Continued).

Sebaceous Tumors, or Steatoma.—These are oval and globular-shaped cysts, varying in size from that of a pea to that of a hen's egg, and containing sebaceous material in more or less cheesy or fluid state. They are retention cysts of sebaceous glands. Although these tumors are most common in the scalp, they are frequently seen on the face and neck, as well as on other parts of the body. They are practically large comedos, although often containing small hairs and fat-globules.

The **diagnosis** of steatoma is easy. These tumors are usually knob-like, painless, and moderately movable. They have often the peculiar shiny appearance of stretched skin. Fluctuation can sometimes be distinguished. Fatty tumors are excluded by their greater freedom of motion and more irregular and flattened contour. Steatoma are often, indeed usually, multiple. In the more chronic growths, sometimes ulceration takes place, with escape of contents.

Treatment is by incision of the skin without opening the cyst-wall, which is easily separated by the handle of the scalpel from the skin, and the unruptured cyst is readily enucleated. The cyst-wall must be removed in entirety, else the tumor will return. Sometimes, when it is inadvertently ruptured, it may have to be pulled away piecemeal. If the sac is not wholly removed, it should be cauterized with carbolic acid or even nitric acid. Usually there is little trouble attending extirpation. A stitch or two will insure union.

Keloid.—True keloid develops often without obvious cause, although usually some injury can be traced. It appears as an oblong growth of fibrous tissue, elevated

to one-fourth of an inch or more, and looking like scar-tissue. It is sometimes linear, sometimes flat, irregular, often sending out prolongations. Usually the growth is firm, elastic, devoid of hair, and painless; sometimes

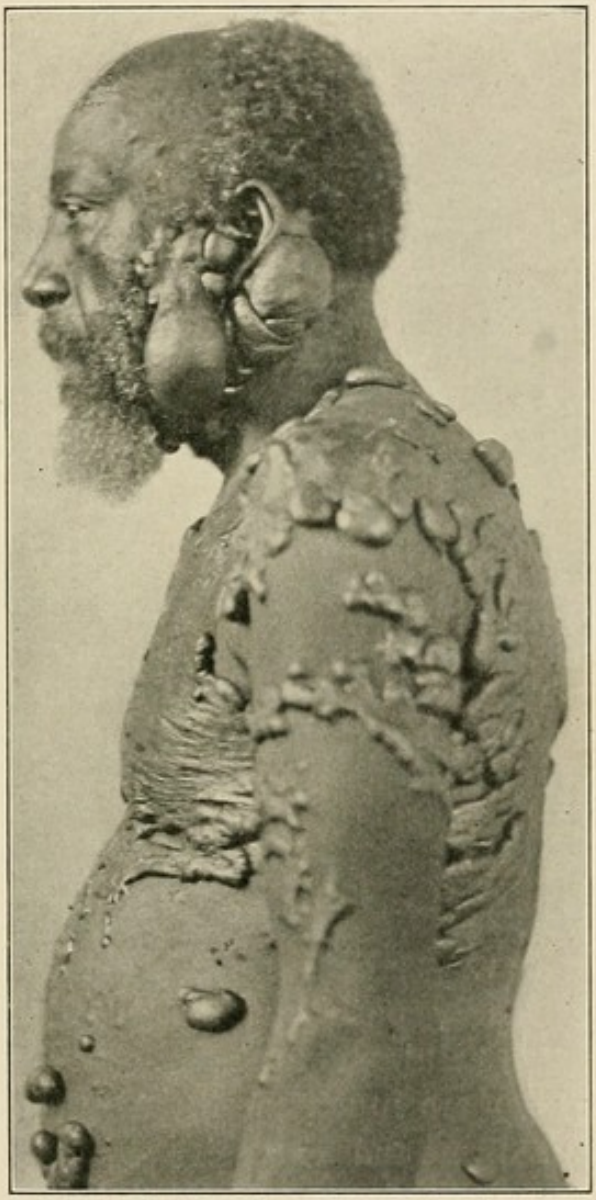


FIG. 38.—General keloidal disease in a negro, with molluscum fibrosum (Matas).

it presents an itching or burning sensation. They grow slowly, and usually remain small. Sometimes they are multiple. They do not ulcerate. Keloids are much more frequent in the negro than in the white. They are seen chiefly on the chest and neck; less frequently

on the face and ears. It is not at all a common affection, although scar tissue, after a lapse of time, often assumes a keloid appearance, although not strictly a new growth. The diagnosis is not difficult to one who has once seen similar growths. There is no treatment to be approved, as it usually recurs after excision. It is to be regarded as a permanent lesion.

SURGERY OF THE NOSE.

Tumors of the external surface of the nose are rarely any other form except the lipoma and the papilloma, to which reference has already been made. Malignant growths are rarely seen within the nose, although epitheliomatous patches are common on the skin surface. Lupus and syphilis have been described.

Polypi are found very frequently in the nose. They are almost always benign. The gelatinous form is small and soft, frequently multiple, and appears as a bluish mass springing from the mucous membrane of the middle turbinated bone. Upon inspection in a good light they are easily seen. They are painless, and usually give trouble only by stopping up the nose.

Treatment is removal with a snare passed over them. The smaller may be readily twisted off with forceps.

Fibromatous polypi are large, firm tumors, usually single, and often of sufficient size to depress the palate, or more commonly push out the nasal bone. They, too, are usually painless, but firmly obstruct and distort the nose. They are much more difficult to deal with, as they have firm and extensive attachments. The galvanocautery is the best agent to remove them.

Deformity of the nose is congenital; it can be acquired either by disease or traumatism. In many instances great mental distress is felt by the patient because of a nasal defect easily remedied.

The most common deformities are saddle-nose, pug-nose, and hump-nose. Each of these conditions is susceptible of great relief by properly directed surgery.

The short nose may be lengthened, the redundancy may be removed from the large nose by careful and well-directed dissection, and a wire, platinum, or celluloid support may be introduced, which will hold up the flat nose. These various mechanical supports are often eminently satisfactory, and may serve a life-time without producing irritation. Of course, absolute asep-

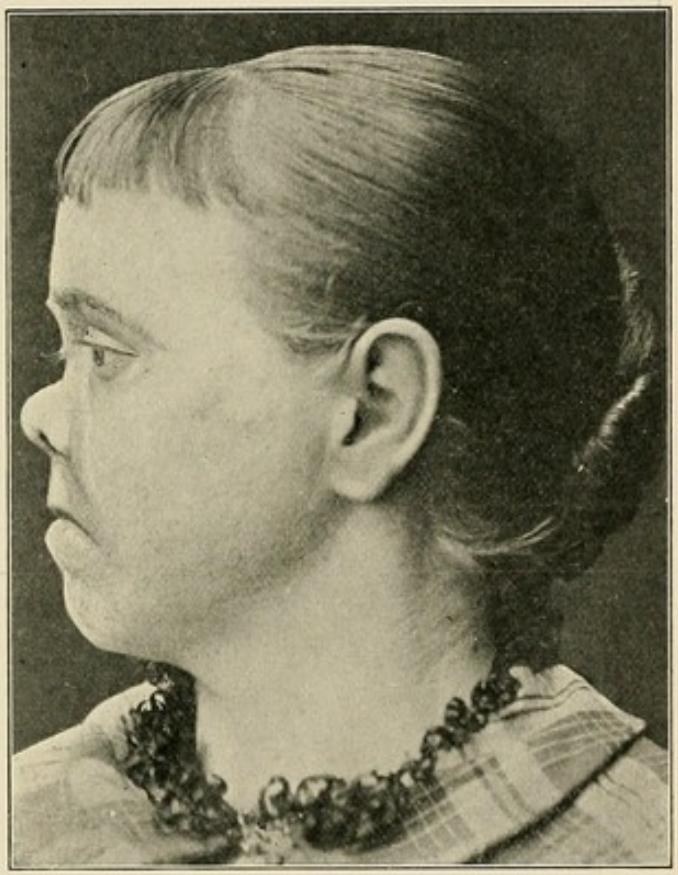


FIG. 39.—Deformity due to congenital syphilis; insertion of platinum support (Weir).

sis is necessary in the introduction, and in instances where irritation sets up later the support must be removed. The depressions in the nose due to congenital syphilis of the bones are best remedied in this way. When a destructive process of tertiary syphilis has destroyed the soft parts as well, plastic operations are required. Roberts and Weir have suggested and executed plastic operative steps for such deformities as

FIG. 40.—Result after insertion of platinum support (Weir).

FIG. 41.—Angular deformity of the nose (Curtis).

FIG. 42.—Result after removal of the bony hump (Curtis).

saddle-nose, which accomplish the correction, but leave a scar.

FIG. 43.—Flattening of the nose from destruction of the cartilaginous septum by syphilitic disease.

Deflection of the nasal septum to some degree is so common as to be almost universal, but when this is pathologic, either from accident or disease, it requires

attention. Although not nearly so common in children as in adults, it is in them a more serious interference with health, disturbing the lymphatics of the posterior nasal and pharyngeal region by occasioning insufficient oxygenation, encouraging abnormal growths and tonsillar hypertrophy.

The occurrence of persistent headaches, chronic eye pains, asthmatic symptoms, and especially disturbed respiratory action or persistent catarrhal lesions of the nasal tract indicate operative steps. Although many methods have been employed to remove the spur or bony deflection, the most satisfactory is the revolving saw and surgical engine, which cuts away the septum and leaves a permanent perforation or fenestrum. The same may be done with punch forceps. Cocain anesthesia is always required. Such steps are troublesome and bloody, and the special apparatus of the rhinologist is required to facilitate them.

Chronic empyema of the frontal sinus is rare. It is suggested by persistent dull pain over the region, with tenderness and perhaps bulging, with accompanying mental depression, and an ever-present sense of weight in the forehead and root of the nose. A discharge of pus from the nose not connected with disease of the antrum and not local catarrh is to be referred to empyema of the frontal sinus.

Treatment.—When the diagnosis is determined an opening should be made over the sinus, and a communication with the curet established between the two cavities. The canals should then be well washed out, and drainage established or else the canals packed with gauze.

SUMMARY.

Sebaceous tumors of the face require enucleation. Keloids are rare in the white race, and the treatment is unsatisfactory. *Surgery of the nose* is productive of great benefit in many ways. The special lesions should be studied individually.

CHAPTER XXIII.

CLEFT-PALATE.—HARELIP.

CLEFT-PALATE.

CLEFT-PALATE is a congenital defect in the roof of the mouth, sometimes involving the alveolar margin of the superior maxilla, often extending posteriorly through the soft palate and uvula. It is usually complicated with harelip.

Plastic operations for the closure of the cleft have been more or less popular since the middle of the eighteenth century, but with the progress of prosthetic dentistry mechanical obturators have superseded operative measures in very many of the worst instances. This is particularly true of neglected cases, in which the condition is allowed to go on untreated to adolescence. Undoubtedly it is wise surgery to operate early on suitable cases, and it is the belief of the writer that not only the correction of the altered voice, but also the general vigor of the patient, demands early interference.

Lane has shown how imperfect oxygenation and consequent infection of the nasal and pharyngeal respiratory apparatus result from obstructions in and malformations of the nasal canals, with consequent deterioration of health. There is no good reason why operations should not be done in the first three months of infantile life, and there are abundant proofs that it is then equally successful and facilitates feeding, breathing, and phonation.

In the simple form of cleft-palate of the soft parts only the operation is termed *staphylorrhaphy*. When the defect is central, splitting the uvula and velum up nearly, or quite to, the posterior bony border, it may easily be closed by freshening the edges and suturing.

In the infant chloroform should be administered, and the patient placed on the back, with the head hanging a little over the end of the table where the operator sits.

The edges of the split should be freely trimmed from the palate margin downward, first on one side, then on the other; a strip, $\frac{1}{14}$ to $\frac{1}{10}$ of an inch wide, is cut away down to $\frac{1}{8}$ of an inch of the free edge, and the strips allowed to drop down. Sutures of fine chromicized catgut are now introduced from the upper margin through the dependent strips (which form a new uvula and velum) and tied. If the strips are longer than necessary, the redundancy may be cut off. Usually, by the end of two weeks, the catgut will be absorbed, but if any trouble

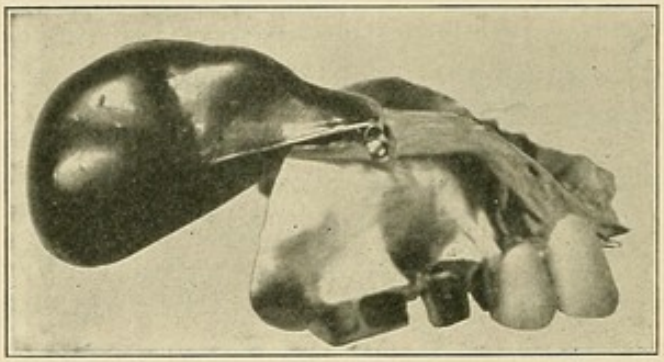


FIG. 44.—The hollow bulb or hard-rubber appliance used in the mechanical treatment of cleft-palate (Moriarty).

arises, it may be removed in from six to ten days. It is well to spray the wound with diluted peroxid of hydrogen every three or four hours after the first day.

The operation upon the hard palate is termed *uranoplasty*. The writer prefers the steps as indicated by Lane. Under an anesthetic (chloroform), with the child in the position just indicated, and a good mouth-gag between the jaws, a free incision is made on one side to the bone parallel with the cleft, for its whole length, including the soft palate. The width of this incision from the margin of the cleft varies with that of the cleft; usually it approaches the teeth. A flap is now dissected up, composed of all tissues, including periosteum (care being taken to draw out the palatine ves-

sels and either tie or twist them) to within $\frac{1}{10}$ inch of the cleft margin. The mucous membrane, including periosteum, is now split along the opposite margin of the cleft and is raised up for $\frac{1}{8}$ of an inch; the opposite flap is turned over, periosteal side out, and tacked with catgut sutures underneath the split surface. The soft parts of the velum and uvula are united with catgut also. The dissection is facilitated by a curved blade, two lines wide and two inches long, on a straight handle. The figures are intended to illustrate.

A slender needle-holder and short, slightly curved needles are essential to easy execution of these steps.

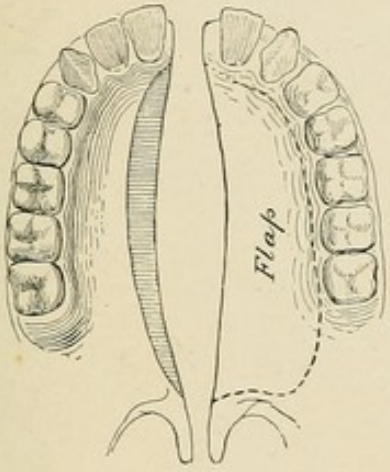


FIG. 45.—Lane's operation for cleft-palate.

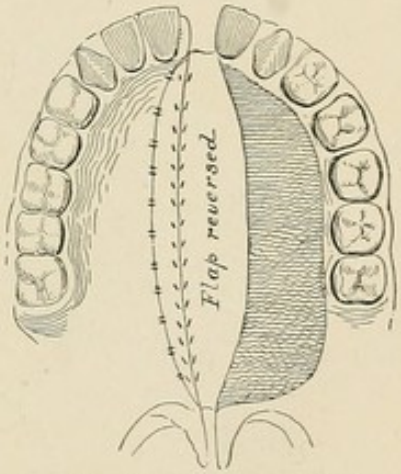


FIG. 46.—Flaps sutured.

Mouse-toothed tissue-forceps are found of service in holding the flaps.

Complete success may not always be attained in the first operation, but the defects can easily be corrected at a second sitting. Loss of blood may follow careless rupture of the palatine artery, and hence the raising of the periosteal flap should be carefully done. The after-treatment consists in frequently cleaning the surface with diluted peroxid of hydrogen.

The sutures, if not harmful, may be allowed to remain until absorbed, or can be removed any time after eight days if indicated. More elaborate operations are suggested for specially complicated clefts.

HARELIP.

Harelip is the most common congenital deformity, rivaling even clubfoot, the two often, however, presenting in the same individual. All forms of imperfect

FIG. 47.—Harelip in a negro, showing irregular single harelip (Shepherd).

development are hereditary, sometimes directly so, at others intermittent—*i. e.*, skipping a generation or so.

Harelip may be regarded as single, double, and com-

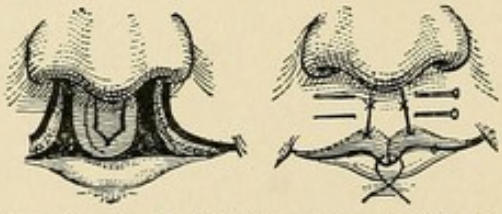


FIG. 48.—Operation for double harelip without cleft-palate (Shepherd).

plicated. If the growth of the bone in embryonic life is arrested, as is that of the soft parts, cleft-palate and other bony deformities may complicate the condition. In single harelip there is no bony deficiency usually,

and the condition is described as simple, although in other instances the cleft may involve the nostril or run irregularly across, causing a most troublesome deformity with which to deal.

Operative steps promise the only hope of relief, and should be instituted preferably about the third month. The operation is termed *cheiloplasty*. The first step after anesthesia and cleansing the part is to free the margins of the cleft well up through the frenum and on both sides, to give easy approximation. The edges of the cleft should

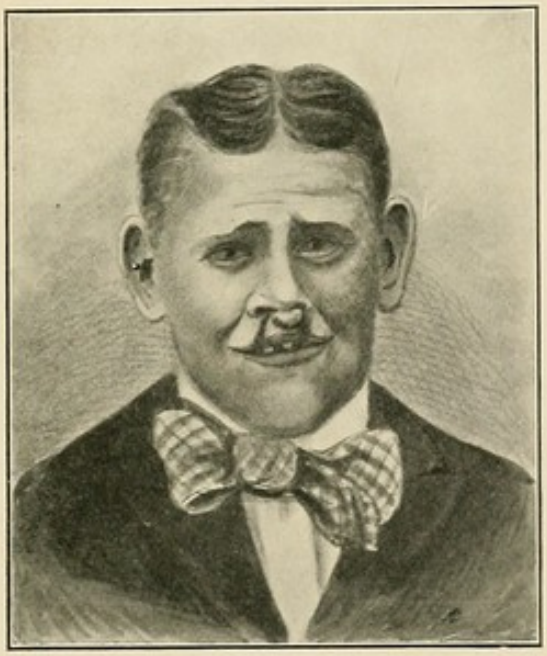


FIG. 49.—Double harelip with cleft-palate and protruding intermaxillary bone.

be pared so as to restore the contour of the lip, and great care should be observed properly to place the vermilion border in constructive operations. No tissue should be wasted, and the operator should patiently remove and replace the sutures until a good form results. All possible tension should be avoided and full allowance for retraction made. When the premaxillary bone projects it should be fractured forcibly, and the sides freshened and sutured to the fixed alveolar border. It frequently happens that a long vomer attaches to the protruding bone. Then a subperiosteal resection of a V-shaped

portion of the vomer, with base down, will be necessary before the protruding portion be replaced. At times it

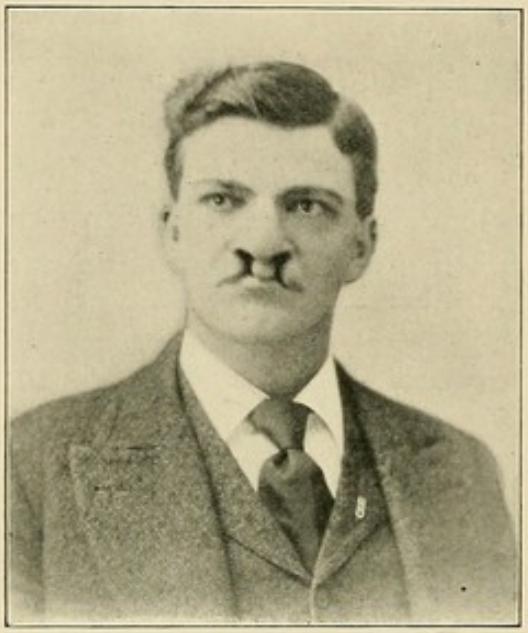


FIG. 50.—Double harelip (before operation).

may be necessary to excise the protruding premaxillary bone.

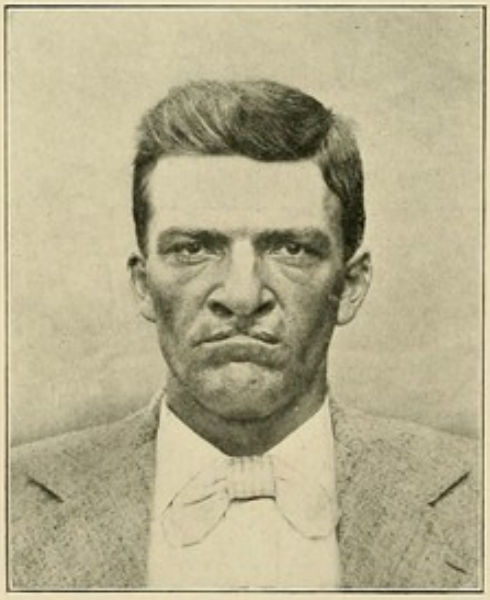


FIG. 51.—Double harelip (after operation).

All sutures should pass through the skin and perforate the opposite mucous membrane, or vice versâ. The sutures should be tension sutures, two or three of silk-

worm-gut, with the remainder of No. 1 plain catgut, to get approximation of the mucous membrane. The silk-

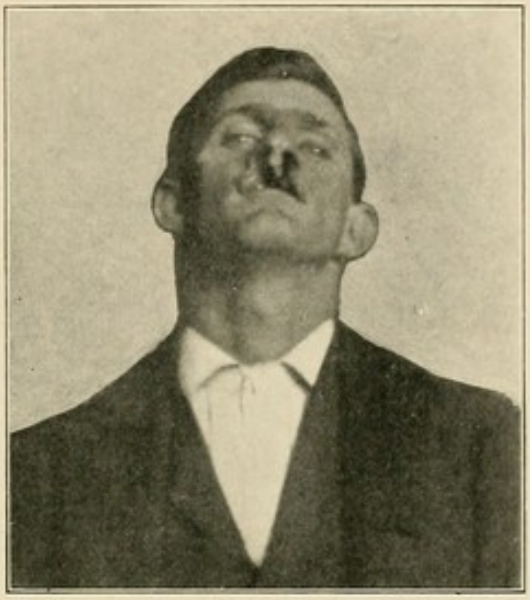


FIG. 52.—Double harelip (before operation) (original).

worm-gut should be removed not later than the fifth day.

The after-dressing consists in a gauze compress, cut to fit the wound, and held in place by a long strip of best

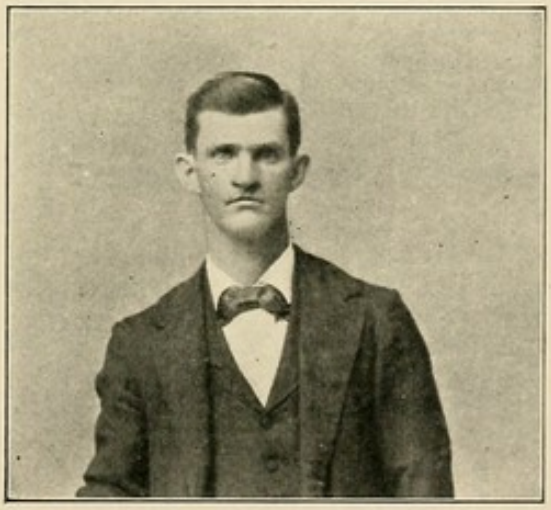


FIG. 53.—Double harelip after resection of wedge of vomer and repair of soft parts (original).

rubber adhesive plaster, applied so as to take off tension by drawing the cheeks together. It is well to dress the

wound daily. After the fifth or sixth day the gauze and plaster may be discontinued and a zinc ointment applied. Union will almost always succeed if the paring is freely done and tension avoided. Children with harelip and cleft-palate usually are poorly nourished, and must be allowed to take food from a spoon or by nursing mother or by bottle during the repair. Cleansing of the wound once daily with peroxid of hydrogen is usually all that is required.

When harelip and cleft-palate coexist, the latter must be repaired first, as more room is thus allowed for working in the mouth, although both may be done at the same sitting in less severe conditions. These photographs (Figs. 50, 51, 52, and 53) represent two cases of double harelip with protruding intermaxillary bone and cleft hard palate, operated on by the author. The cleft-palate in each case was successfully closed by an obturator after recovery.

SUMMARY.

Cleft-palate should be operated on early in suitable cases. Cases that have been neglected to adult life have been often successfully treated with the obturator. *Harelip* is the most common congenital deformity. It should be operated on in the first three months of life. If cleft-palate complicates, this should be repaired first. Harelip pins are no longer used. Careful approximation of the surfaces, with as little tension as possible, by silkworm-gut sutures passed completely through the tissues, reinforced by catgut sutures where needed, answer the best indications. Silkworm-gut suture should be removed about the fourth day.

CHAPTER XXIV.

LESIONS OF THE LIPS AND TONGUE.

LESIONS OF THE LIPS.

Angioma of the lips, or **nevi,** are unsightly tumors, consisting of dilated blood-vessels, veins, arteries, or capillaries. A red, berry-like tumor, beginning well within the mucous border and noticed at birth, is the

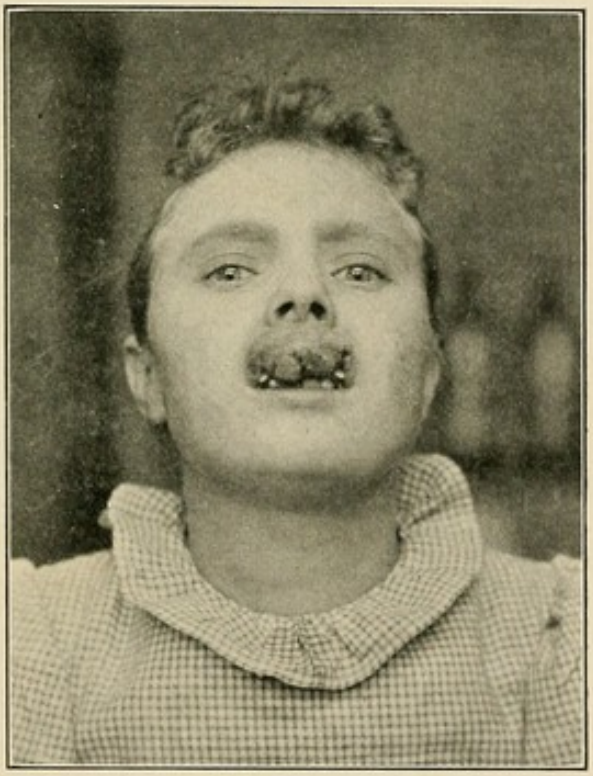


FIG. 54.—Angioma of the upper lip, showing the condition before treatment (Dandridge).

usual origin. Its growth is usually slow, but in a few years constitutes a blunt eversion of the lip, perhaps as large as the thumb, sometimes pulsating, and more or less diminishing upon pressure over the vessels. These

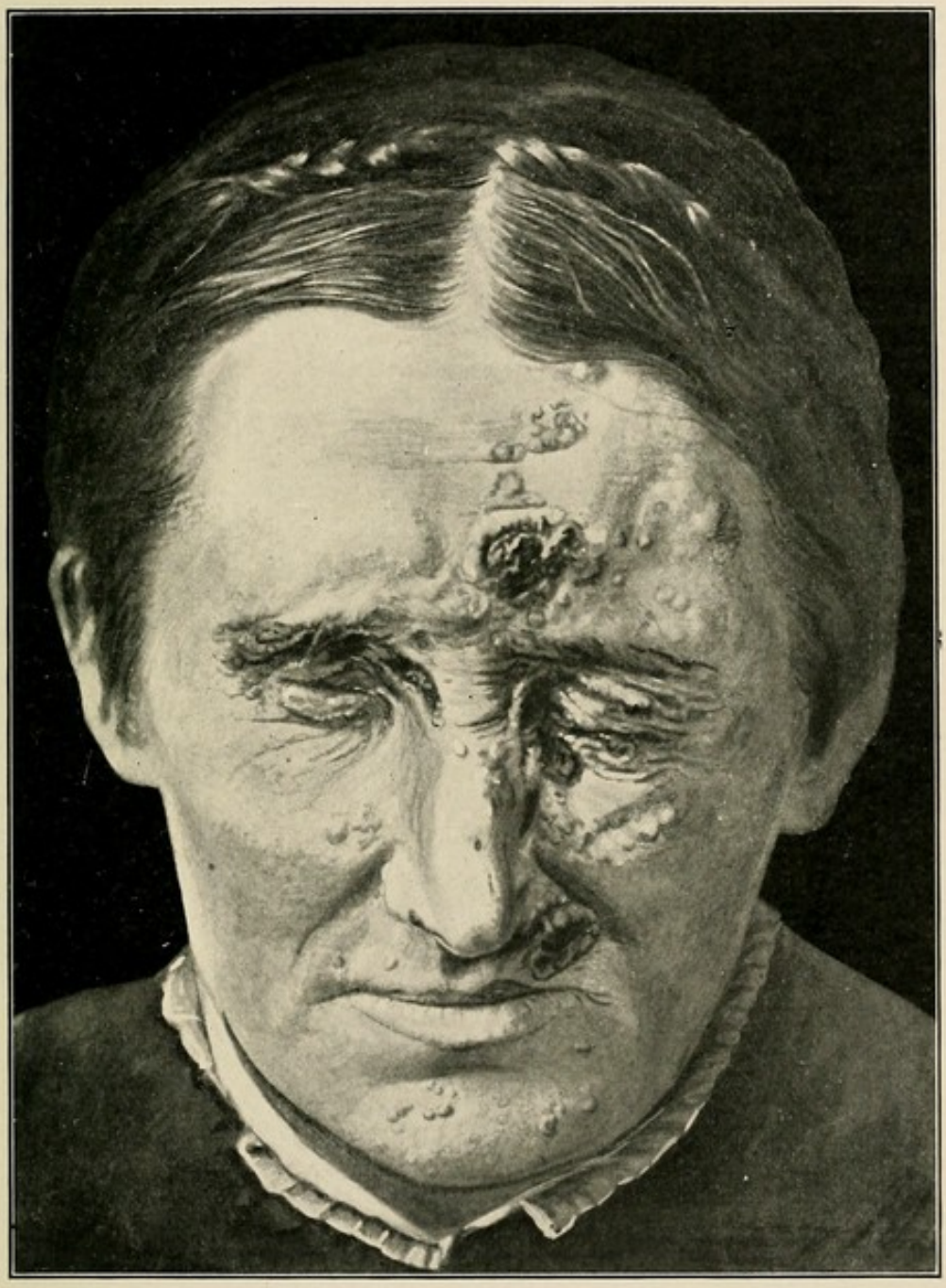
lesions are always congenital, though often the patients do not notice them until months after birth. Angiomata vary in structure, but in this situation they consist chiefly of dilated veins and capillaries, surrounded by increased fatty or fibrous tissue. They bleed freely, even dangerously, if carelessly incised. The diagnosis is unmistakable.

Treatment.—In many instances these tumors may be safely and promptly removed by incision, and a plastic operation repairs the defect. Electrolysis is appropriate to the smaller growths. Ligation is at times suitable.

FIG. 55.—Angioma of the upper lip, showing the condition after treatment (Dandridge).

The injection of astringents, and even the use of the thermocautery, is dangerous in tumors of much size because of the tendency to produce thrombosis.

Epithelioma is the almost uniform character of malignant lesions of the face. It is chiefly seen in the male on the lower lip. It may appear at any time after twenty-five or thirty years, but is most common in late



Multiple Benign Cystic Epithelioma (J. C. White).

life. The irritation from the smoker's hot pipe-stem or that of a sharp tooth is believed to be the origin in some cases. It first appears as a fissure in the mucous membrane, or occasionally as a warty growth, tender, and at times ulcerated, with darting pains and even a slight hemorrhagic discharge. These are the progressive symptoms, to which are added increasing pain, more extensive ulceration, lymphatic involvement, loss of appetite and strength, with later cachexia. Usually at least six months will elapse before existence of glandular involvement is presented. This is chiefly in the submaxillary region, but may extend until the glands of the cheek in various situations become involved.

The **diagnosis** includes the exclusion of simple ulcerations that are sometimes tedious and chronic, and chancre. In individuals past forty-five simple ulcerations that tend to resist ordinary treatment should be regarded as malignant; earlier in life the absence of pain, extension, and the non-involvement of the lymphatics justifies longer delay, although to be cured excision must be early.

Chancre, while greatly resembling epithelioma, is early succeeded by enlarged lymphatics and the secondary symptoms of the disease; moreover, it promptly responds to anti-syphilitic remedies.

Tubercular ulcerations on the lip are infrequent and usually secondary.

Treatment.—As elsewhere suggested, the treatment of all accessible malignant disease consists in prompt and thorough removal. Epithelioma of the face is a striking illustration of the tendency of apparently benign growths to take on malignancy after years of quiescence. Several years may elapse from the discovery of the lesion before it begins a destructive ulceration. Besides, the tendency to recurrence is less in this form of carcinomata than in any other. In this is found great encouragement to prompt and thorough work. Not only is free extirpation of the entire ulcer

imperative, but careful search for enlarged lymphatics, both in the immediate region and all about the jaw and in the neck, is demanded. All such glands, both deep and superficial, should be freely extirpated. In the greater majority of epitheliomata of the lip an early operation consists in the simple V-shaped removal of the

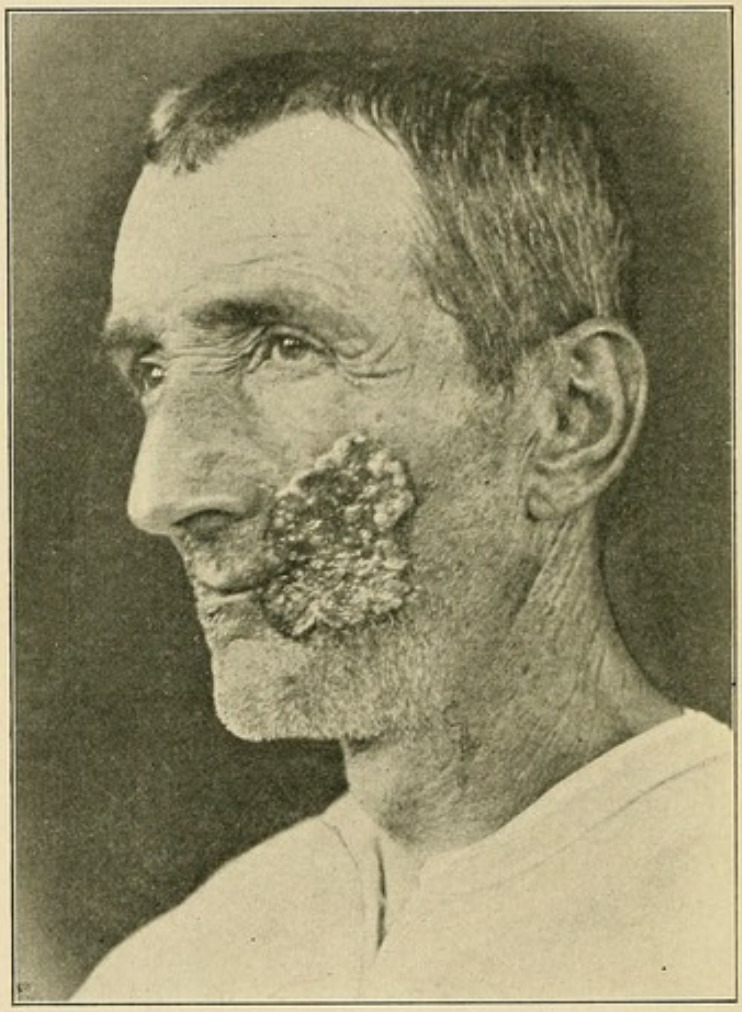


FIG. 56.—Epithelioma of the skin (Matas).

ulcer. This furnishes a greater percentage of cures than any other form of malignancy, and usually, if recurring, relief is experienced for five or ten years. In epithelioma, both primary and recurrent, and in recurrent scirrhus, repeated exposure to the Röntgen rays has seemed curative. Time has not yet elapsed to prove fully the value of this treatment, but it seems to promise

much for inoperable and recurrent malignant lesions, as well as intractable tubercular ulcers and lupus.

Cut wounds of lips and of tongue are very common, either from sharp instruments or from bruising against the teeth. The inside of the cheek and the lip and border of the tongue may suffer in a similar manner. A foreign body may remain in such wounds within the mouth. Pain and hemorrhage are the immediate symptoms, the hemorrhage often being stubborn and troublesome, and if the lingual artery is involved, operative steps may be required. This is rare, however. Usually wounds on the lips are carefully cleaned, and the edges accurately approximated by silk or horse-hair. Catgut does not answer well, for if cut short, it becomes untied; and if left long, it gets in the way. The sutures are usually removed on the fourth day. Wounds of the tongue commonly do not require suture, but when there is troublesome hemorrhage or gaping, the needle should penetrate to the bottom of the gap and close it up well. Even less frequently is suture required in wounds within the cheek. All wounds within the mouth tend to give an odor to the breath. Mouth-washes containing some form of carbolic acid, of which listerin, camphophenique, and many others are examples, should be employed frequently through the day; sloughs may be removed with the scissors, as indicated.

LESIONS OF THE TONGUE.

Hypertrophy of the tongue, or **macroglossia,** is congenital—angioma of the tongue. It is very rare. Other forms of hypertrophy, the result of inherited syphilis, may be seen in later childhood. For **angioma of the tongue,** amputation of the tip should be done as indicated.

Syphilis of the Tongue.—Ulcerations of the tongue are always to be regarded with suspicion, and when at all chronic, may be set down as syphilis, tuberculosis, or cancer.

Chancre of the tongue is comparatively frequent. The history as to causation is not easily obtained, but the early glandular involvement and the eruption will usually indicate the trouble. Upon suspicion anti-syphilitic treatment will be of great service. Secondary lesions of syphilis, redness of the tongue and fissured surface, are common. They require constitutional treatment and history for positive diagnosis. Gummata appear later, in the tertiary form. Usually lymphatic involvement is not encountered in secondary and tertiary lesions. Ulcerations of broken gummata may invade the hard palate.

Treatment of all these lesions is cleanliness, mouth-washes, and the exhibition of the specifics for the disease, in the manner outlined elsewhere in this book.

Tuberculosis of the tongue usually is multiple, and though somewhat resembling syphilitic ulcerations, is not attended with the history of the primary sore, nor the gummatous swellings of the tertiary stage. The ulcers are superficial, perhaps somewhat elevated above the surface,—while those of syphilis are excavated,—painless, and without infiltration. The discharge is slight. The germ may sometimes be found in the layer of false membrane that covers the ulcer.

Treatment.—Like the treatment of all superficial and skin tuberculoses, free incision offers the best prospect.

Carcinoma of Tongue.—The form taken by cancer of the tongue is epithelioma. The affection is frequent, and is believed to be often caused by irritation of jagged teeth and by pipe and cigar smoke. The development is usually slow, and in earlier stages may be confounded with syphilitic and tubercular lesions.

Epithelioma is nearly always seen at or after middle life. It usually progresses slowly, but unlike epithelial tumors of the lip, produces early lymphatic involvement, and the disease is almost hopeless, in later stages at least.

Symptoms.—The form is chiefly that of an ulcer with

indurated edges and an offensive discharge. The situation is usually at one edge, or perhaps the tip. The glands under the jaw and at the root of the tongue become involved early and swallowing is painful. The characteristic darting pains of carcinoma are common; cachexia soon appears.

Diagnosis from other ulcers is made by history and

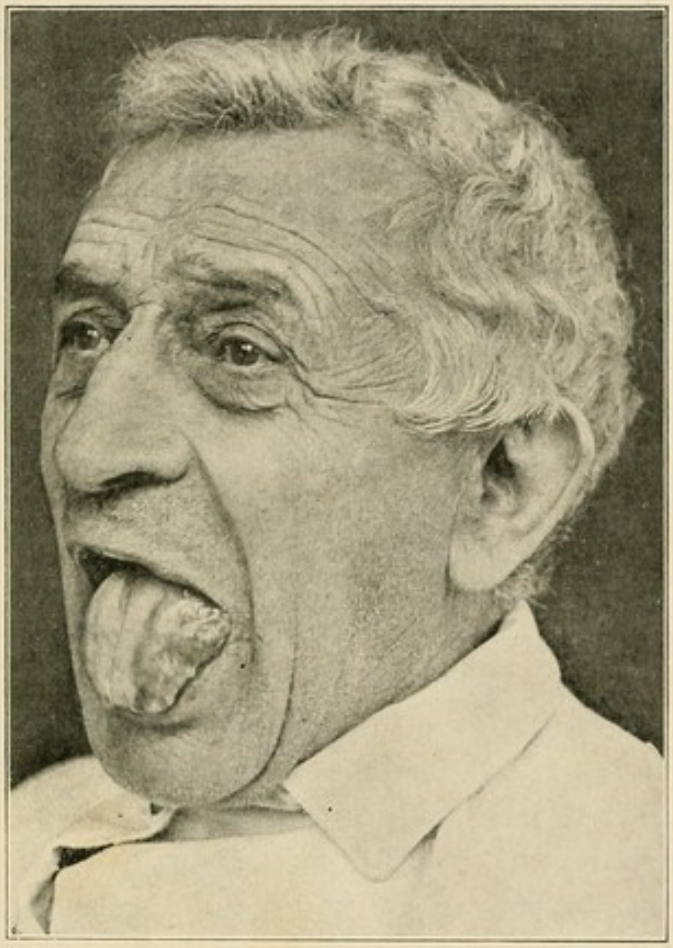


FIG. 57.—Cancer of the left half of the tongue and the floor of the mouth. Rapid recurrence after removal of half of the tongue (Dandridge).

age of patient, as well as by trial of antisyphilitic treatment in doubtful cases.

Treatment is early extirpation. If the growth is limited to the tip, it may be removed by a wedge-shaped incision. When the edges are involved, usually half the tongue must be sacrificed, and in ulcers involving the floor or surface of the tongue the entire organ must go.

Operations upon the tongue are to be approached with care; not alone is there danger of very troublesome hemorrhage, but septic pneumonia often follows an otherwise successful operation. Careful preparatory treatment, not only of the mouth, but of the teeth as well, should precede all operations; and as after removal of the tongue it will be necessary to feed by a stomach-tube, the patient should be accustomed to the passage of the tube beforehand. Extirpation of the tongue is in every way a dangerous operation, only to be undertaken by an experienced hand. (Further description would be out of place in this book.)

SUMMARY.

Angiomata of the lips are vascular birth-mark tumors; are seen on either border, varying in size from that of a pea to that of a small egg. Treatment consists in either extirpation or, in small growths, electrolysis.

Epithelioma is most common on lower lip in elderly smokers, as a warty growth, with later shooting pains, and in a year or so lymphatics under the jaw are infected. Early extirpation is imperative.

Cut wounds of the lip heal readily. Arteries should be either tied or compressed with suture or pin. The vermilion border should be approximated with catgut sutures, not too tightly, and deeper skin and muscular cuts should be united with silkworm-gut.

Chronic ulcerations are syphilitic, malignant, or tubercular. The age and history will help determine, and treatment will help in the diagnosis. *Syphilis* in the third stage is usually single, and with its history will exclude malignancy, while tuberculosis is multiple. Treatment of *carcinoma* is extirpation at the earliest moment.

CHAPTER XXV.

DISEASES OF THE SALIVARY GLANDS.

Infection and suppuration of the salivary glands arise chiefly in the course of some constitutional fever, either scarlet or typhoid. Chronic suppurations are almost always tubercular, although actinomycosis is sometimes a cause. The gland chiefly involved is the parotid. This gland lies at the angle of the jaw, in front of the ear, and does not show in health. There is apparently, but without explanation, much sympathy between the parotid gland and exhausting systemic diseases, for it becomes swollen and painful in many constitutional conditions without suppuration and sometimes reddening of the overlying skin presents. When softening and suppuration occur, the abscess should be promptly opened, as sometimes the pus seeks exit through the mouth or ear or burrows down into the neck.

Extensive involvement of adjacent glands may take place in neglected infections of the parotid. The diagnosis should be confirmed by the introduction of the exploring needle. Such abscesses should be cautiously opened by dissection until the pus is reached, and then an artery forceps passed in and the cut dilated until free drainage is obtained. The situation of the external carotid and internal maxillary artery in the gland must be remembered, as dangerous hemorrhage may ensue if deep and careless incisions are made.

Chronic suppurations of the parotid usually involve many other glands in the tuberculous process, and the propriety of extirpation becomes a difficult question, for unless all diseased tissue can be removed,

the expectant plan is best. Removal of the parotid gland is too difficult an operation to be justified unless benefit be assured.

Similar affections of the other salivary glands, notably the sublingual, are to be treated in the same way. Acute suppuration here is rare, but tubercular infiltration is perhaps more common.

Adenoma of the salivary glands is perhaps not seen except as sarcoma, which is the most common tumor of these organs. Usually it grows rapidly and pushes in the wall of the pharynx so as to interfere with swallowing, and displaces the structures of the cheek and neck externally. Commonly these growths give early pain by involving the facial nerve in its course through the parotid gland, and facial paralysis may thus be induced. Ulceration externally, and even internally, may occur early.

The **prognosis** is highly unfavorable, as the growth is usually rapid and involves tissue that cannot be eradicated. If seen early, the parotid may be removed. Death takes place from exhaustion usually; or septic pneumonia or hemorrhage from ulceration of the walls of large vessels in the neck may terminate the case at any time.

Carcinoma of the salivary glands is less common. Like cancer elsewhere, it is usually seen in advanced life, and is more often secondary, especially in the submaxillary and sublingual glands. Carcinoma of the parotid grows more rapidly than is usual with that form of malignancy, and adjacent lymphatic involvement is early. Pain and paralysis from pressure on the facial nerve are prominent.

The **diagnosis** is made easily by the age of the patient and the general features of the case.

The **treatment** is, if seen early, removal of the affected gland. As before indicated, extirpation of the parotid is a very trying operation, with only slight promise in malignant diseases. It involves a perma-

nent destruction of the facial nerve and a consequent paralysis of that side of the face. Recently extirpation of the external carotid artery after ligation has been suggested,—and in limited number of cases tried,—thus cutting off the blood-supply in carcinoma of the salivary glands, tonsils, tongue, and antrum. This operation, heroic though it sounds, is less so than extirpation of the parotid or tonsil, and even when more

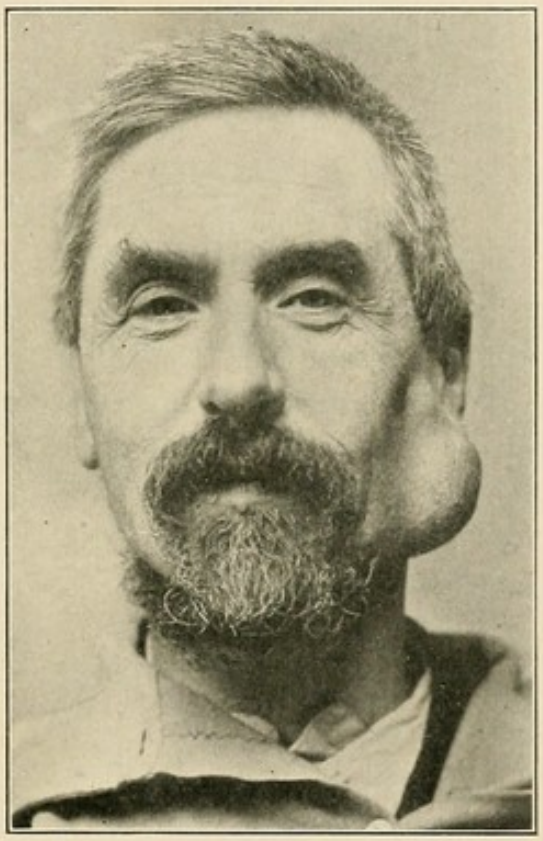


FIG. 58.—Parotid tumor (Gould).

radical steps are contemplated, should be the preliminary to diminish the tendency to recurrence.

Salivary Calculi.—Salivary calculi are most commonly seen in the submaxillary or sublingual glands or their ducts, but they are not by any means common. They are usually seen in young adult life, from twenty to forty years, and are commonly due to some foreign substance either lodged in the duct, or perhaps carried up into the gland during the process of mastication.

Around these foreign bodies secretions of the gland become crystallized, and thus the calculus is formed.

The **symptoms** are pain and swelling, with great tenderness at the side of or beneath the tongue, involving the submaxillary triangle and even the base of the tongue. The pain and tenderness are usually severe, with elevation of temperature and a general feeling of malaise. Usually the foreign body can be felt, especially if it is within the duct; but if there is much swelling, this cannot be accomplished unless the calculus is of large size. The introduction of a probe at the orifice of the duct until it encounters the calculus will readily determine the diagnosis when the stone is within the duct, and will usually reach it if it is in the gland itself. If the duct cannot be found or is closed up for any reason, exploration with a needle into the swelling is likely to encounter the calculus, which may be diagnosticated by the peculiar grating feeling it communicates through the needle. These swellings are to be differentiated from malignant and other tumors by their acute history and the evidence of inflammation that accompanies them.

Treatment.—Usually when the diagnosis is made there is little difficulty in the removal of the calculus, either from the duct or the gland. Frequently a temporary salivary fistula results, which soon gets well without treatment. The incision is preferably made within the mouth, and only when there have been suppuration and destruction of the surrounding parts should there be any effort made to reach the foreign body through the skin, not only on account of the scar that such procedure leaves, but also because there is more risk of salivary fistula.

Salivary Fistula.—This lesion is even less common than calculus. It is occasionally seen, however, after extensive destruction from these foreign bodies in the cheek, and also from traumatism from other causes, as

well as from operations for the removal of malignant growths and tumors in this situation.

The **diagnosis** is easily made by the presence of a sinus through the tissues of the neck or cheek, from which the characteristic salivary fluid is poured out.

The **treatment** of this condition should be conducted on the expectant plan, for a few weeks or more, with stimulation by lunar caustic. If the fistula does not close through these measures, an incision should be made through the mucous membrane, and the cut surface of the duct stitched into this wound, while the skin is closed up by suture. Usually this succeeds.

Ranula.—Ranula is a soft, fluctuating tumor at the surface or side of the tongue, due to an occlusion of the orifice of the submaxillary or sublingual ducts. It is a glossy, smooth, painless tumor, which continues to grow until it varies in size from that of a small almond to even that of a hulled walnut. Its annoyance to the patient both in mastication and in general use of the tongue leads him to seek treatment. Ranula is quite a common affection, seen, as in the case of salivary fistula, in young adult life. Sometimes the constriction of the duct is sufficient only partially to occlude it, and by pressure upon the tumor its contents can be made to escape into the mouth, and the tumor disappears.

The tumor is to be diagnosticated from other lesions by its situation, its smooth, fluctuating outline, the absence of pain and tenderness, and usually the history of recent gradual development.

Treatment.—This is by no means satisfactory, inasmuch as there is a constant tendency to recurrence. The simplest treatment is the best, which consists in passing a seton of coarse thread through the base of the tumor, taking pains to keep up the ulceration thus established until a permanent opening is made through which the contents of its duct can escape into the mouth. When these measures do not prevent the

redevelopment of the tumor, extirpation of the cyst and the gland is to be employed.

SUMMARY.

Abscess of the parotid gland occurs occasionally in typhoid and scarlet fever. Abscess should be promptly opened by cautious dissection, as important vessels are in close proximity. Extirpation of the parotid is very difficult and dangerous.

Malignant growths of the parotid are not common; they grow rapidly. If the growth cannot be extirpated, ligation and extirpation of the external carotid, or ligation of the common carotid, are recommended.

Salivary calculi cause pain, swelling, and great tenderness underneath the tongue; often the calculus can be felt by the fingers. It can be located by passing a probe into the duct, if it is open. Usually the stone can be removed through the mouth.

Salivary fistula is indicated by a sinus through the neck or cheek, discharging salivary fluid. Usually they heal without operation, but at times incision and suture are required.

Ranula is a tumor under the tongue; its contents are clear mucus. Treatment is unsatisfactory. Extirpation is to be done when other measures fail.

CHAPTER XXVI.

DISEASES OF THE MAXILLARY AND OTHER SINUSES.—EMPYEMA OF THE ANTRUM.—CYSTS AND POLYPI.—ACROMEGALY.

Diseases of the Maxillary Sinuses.—When it is remembered that the mucous membrane—the so-called Schneiderian—of the nose communicates through foramen and passages with the antrum of Highmore or maxillary sinus, as well as with the frontal and ethmoid cavities, it will be seen that important and even vital structures may be involved by the extent of septic inflammation, the outer air thus communicating with cavities in close proximity to the brain. The antrum of Highmore is located in the superior maxilla, with the orbital floor as its roof. It communicates with the corresponding middle meatus of the nasal cavity by a short canal at its base. There is not very free communication in health between these two cavities, as forcible distention with air is often required to open freely the mucous membrane that lines the foramen. The cavity of the antrum is irregular on all its surfaces; its walls are thin and easily displaced by the pressure of fluids, and solid growths push the orbital floor up and displace the eyeball. The frontal sinus on the corresponding side communicates with the antrum through the nasal passage, and when the frontal sinus is overdistended with fluids, purulent or otherwise, it is claimed a direct passage into the antrum is often effected. The ethmoid and frontal sinuses thus drain freely into the nasal passage, and accumulations are not only less rare, but the tendency to auto-infection is removed, while in the antrum satisfactory drainage by nature is not possible, and infection

progresses readily. Inflammatory and suppurative accumulations within the antrum, if not relieved, may force their way into the orbit, or internally into the nose or mouth. This discharge may run back into the fauces during sleep and produce nausea and vomiting of a most distressing character.

Diseases of the maxillary sinus have become a field for the dental surgeon. The forms of lesion which interest him chiefly are: 1. Traumatism from extraction of teeth. 2. Acute infections through the nose. 3. Tumors. 4. Disease of the bone.

When, as often happens, the roots of the teeth run up under the antrum and penetrate almost into that cavity,—and at times a root or even a whole tooth may become loosened and fall into the cavity,—disease of these roots often sets up the infection. Accidents in extraction may also break into and infect the cavity. Fractures externally and bullet or penetrating stab wounds may account for the lesion. The results of such cases are pain, swelling, and, if not properly treated, suppuration, but usually such conditions declare themselves and are promptly treated. In one case coming under the observation of the author a blow from a base-ball permanently depressed the anterior antral wall, with recovery only after a troublesome suppurative inflammation.

By far the most common cause of trouble in the sinus is acute inflammation, with more or less suppuration. The cause is the admission of germs from without through the nasal communication. Influenza is believed to be a most potent factor, and, indeed, antritis is one of its symptoms. Any pyogenic infection of the nose is prone to extend to the antrum.

Symptoms.—Whatever the cause, inflammation of the antrum produces the same character of symptoms: neuralgic pain in the side of the face, tenderness on pressure, swelling and often redness of the skin over the sinus, offensive breath, and discharge from the nose,

especially on forcible snuffing up. Chilly sensations, rigors, fever, and general malaise are present.

Transillumination with an electric bulb in the mouth ascertains whether the cavity is transparent; and if opaque, that some solid contents are inclosed. It does not, however, declare the nature of the obstruction. Nausea and offensive discharge are present often in severer forms.

Diagnosis.—In abscess the symptoms are acute, fever is often present, and the discharge is usually seen in the sputum, and often from the nasal canal.

Cysts and polypi, as well as other tumors, grow slowly, cause little pain in the early stage, and present a history of comparatively long standing.

Treatment.—In the milder forms of infection hot applications, with some sedative, purgation, quinin, and extract of belladonna are of service. In neuralgic pain, prior to suppuration, antikamnia has given relief in the author's hands. When protracted suppuration occurs, drainage is indicated. If the cause is a damaged tooth, this should be extracted, and a perforation made through the socket into the antrum. When the teeth are sound, it is better to push a trocar through the wall of the antrum just above the root of the second bicuspid, taking care that the trocar is not forced through the posterior or opposite wall of the antrum. The mucous membrane should first be incised and the trocar forced through, and free drainage made. If with antiseptic irrigation the discharge does not soon cease, it is well to curet the antrum, and if disease of the bone be suspected, it should be explored for. When chronic suppurative disease of the nasal canal coexists with antral abscess, drainage through the nose, with curetment and irrigation with boric acid solutions should be employed.

It is claimed that over half of all cases of chronic antral disease have a complication in nasal polypi, and very often polypi in the antrum itself. They may exist for years without noticeable symptoms. Their existence

is to be suspected if nasal polypi exist with antral symptoms. Mucous cysts and polypoid growths occupying the antrum are reached by exploration above the second bicuspid. An opening is made which will admit the little finger, and the lesion removed by the curet. Afterward irrigation should be employed, and the wound packed with gauze. Such exploration bleeds freely, and may require a tight packing. On removal after twenty-four hours and the repetition of the irrigation the packing may be more loosely replaced.

Of the other tumors of the antrum, the bony growths are likely to be sarcoma, or rarely carcinoma, and require extensive surgery for their removal, as they are usually not early presented for treatment. The growth of malignant tumors of the antrum is usually rapid, and great deformity soon presents, though perhaps in the earlier stages there is little pain. Involvement of the lymphatic glands of the neck and jaw, while not early, usually becomes a symptom in malignant growths. Bony growths and cysts can be distinguished from malignant by exploration and the history.

Treatment.—Bony growths without malignant symptoms should be allowed to remain unless they are in the early stages. Cysts should be cureted, washed out, and packed or treated as indicated.

In malignant growths of the antrum and superior maxillary bone the prognosis is most unpromising. If seen early, the superior maxillary should be fully removed. This, however, is not a promising operation.

Bone disease, as has already been said, indicates the removal of all diseased bone with the gouge. It is claimed that ligation and excision of the external carotid artery starves the growth in malignant disease of the antrum, even after the tumor has become inoperable. Such a step should always be a part of the operation for removal of the superior maxilla for malignancy.

Acromegaly.—By this term is described a rare form of hypertrophy of the bones of the skeleton, giving a

giant shape especially to the feet, face, and hands. All the bones of the skeleton participate in the enlargement. Usually it is first noticed in the hands; later on the soft parts covering the bones are thickened and hypertrophied. Usually the condition is seen in young adults, and progressively increases. The pathology is unknown. Physical weakness and impaired sensation attend later,

FIG. 59.—Leontiasis ossea (cast in Warren Museum).

and the patient usually succumbs in a few years to some intercurrent affection. The inferior maxilla often becomes enormously enlarged, although the appearance is not so much a deformity as a striking feature. The same applies to the enlargement of the feet and hands.

No especial treatment has seemed to be of any service.

A similar form of hypertrophy which is limited to the bones of the face and skull is termed *leontiasis*, the

facial skeleton having a fancied resemblance to that of a lion. The hypertrophy is symmetric, and progresses in the direction of the cavities, as well as the outer surfaces. Thus the eyeballs are pushed out of the sockets, and the nasal passages, as well as the cranial cavity, diminished in caliber. The progress of the malady is very slow, and, like acromegaly, is usually accompanied by evidences of sympathy in the general constitution. After many years progressive exhaustion leaves the victim to succumb to some intercurrent disease.

CHAPTER XXVII.

NEURALGIA.

By neuralgia is meant functional disturbance of a nerve, with paroxysmal pain. No appearance of disease can be detected, and the pain is to be regarded as a symptom of an irritation not located. Inflammatory changes called *neuritis* may exist with neuralgia, but not necessarily so, and when present, usually soon subside, although the paroxysmal neuralgia remains.

Neuralgia is caused by depressed conditions of the system and impoverished blood, notably by malaria and rheumatism, as well as by syphilis. Frequently tumors and other forms of pressure produce the pain. Neuralgia is more common in the middle and later periods of life, and more frequently seen in women than in men.

Symptoms.—The pain is usually not constant. The beginning is abrupt, and when due to malaria or rheumatism, may be periodic. Attacks may last a few days or a week and then pass away, and recur in weeks or months. More or less tenderness, and perhaps even swelling, is always present in the protracted form, although the paroxysms may be intermittent. The points of tenderness will indicate the situation of the nerve that is causing the pain. In the severe form of facial neuralgia, known as *tic douloureux*, there are twitching of the muscles of the face and painful spasm of an agonizing character.

As dentists we are chiefly concerned with neuralgia of the trifacial or fifth pair of cranial nerves. These nerves run from the Gasserian ganglion on the petrous portion of the temporal bones in three branches—first,

second, and third. The ophthalmic or first division passes out through the sphenoid fissure, after which its frontal branch becomes the point of interest. This branch emerges from the orbital cavity at the supra-orbital notch, and is distributed above the eye. This branch is not often severely affected. Tenderness at the point of exit, as well as over the forehead, will indicate the seat of trouble. The ordinary medical treatment of neuralgia will usually control it in this situation. Quinin, arsenic, antikamnia, warmth, blisters, general tonics, and opiates as indicated is the general outline suggested. Salicylates are of service in the rheumatic form. It is dangerous to continue too long the administration of morphin lest the habit become established. Croton-chloral or the tincture of gelsemium sometimes answers well in controlling the pain. In acute neuralgias the author has found a distinctly curative value in the triturate of aconitia, in $\frac{1}{200}$ to $\frac{1}{150}$ grain doses four times daily until numbness of the tongue results. If in spite of these measures the pain and spasm of muscles continue as a chronic condition, removal of the nerve is to be recommended.

An incision parallel to the eyebrow, over the supra-orbital notch, will expose the nerve at its exit, when it should be twisted out (avulsion). If necessary, the notch or foramen should first be chiseled out, so as to permit full removal of the nerve.

The superior maxillary, or second division of the trifacial, emerges from the foramen rotundum, and, giving off three branches to the teeth as it passes across the sphenomaxillary fossa and the floor of the orbit, emerges at the infra-orbital foramen, and spreads out between the eye and the angle of the mouth. In this branch is seen the most dreadful form of neuralgia—*tic douloureux*. In severe cases the pain is hardly ever absent, and the least movement—attempts at talking, eating, or laughing—is sufficient to cause painful spasm of the muscles with the most excruciating agony. Life becomes almost

insupportable to the unhappy patient, and appeals for relief are imperative. Even morphin fails to give comfort; hunger and emaciation follow imperfect digestion and mastication of food.

The operative treatment in this branch should be primarily the removal, as far as possible, of the nerve through the infra-orbital canal; if possible, back to the foramen rotundum. The steps are exposure of the infra-orbital canal by a free incision, transversely, grasping the nerve when freed by artery clamps. The periosteum of the orbital plate is freed at the margin of the orbit, and with a retractor the eyeball lifted up. The foramen and the infra-orbital canal are now opened with a small chisel or a delicate bone forceps (even a strong grooved director will sometimes do), and the nerve drawn out as far as possible and twisted off.

Other operations, more difficult and mutilating, proceed through the walls of the antrum and sphenomaxillary fossa to the sphenoid bone, and cut off the nerve at this point. It is the advice of good surgeons to do first the avulsion operation through the orbit, and if the disease returns, to attempt more radical steps. These operations usually give relief for from six months to two years. If after this there is a severe return, removal of the Gasserian ganglion is to be advised. This is perhaps best done after a modification of the method of Hartley. This consists in making a horseshoe incision through the scalp from the zygoma, between the external angular process of the superior maxilla and the tragus of the ear, exposing the bone and making an osteoplastic resection, turning down the flap, and breaking the lower border at the zygoma. Then the dura is loosened at the foramen, the branches cut off, and traction made on the stumps until the ganglion is drawn out of its bed. This operation has a high mortality, and requires great skill and courage for its performance. It yields the most protracted, and often gives permanent, relief. The dangers are from hemorrhage,

meningitis, and also from sloughing of the eye from impaired nutrition. The author believes this operation should be the one recommended for recurrent neuralgias of the second division if unrelieved by simpler steps.

The inferior dental, or third division, emerges at the foramen ovale, and supplies the gums of the teeth of

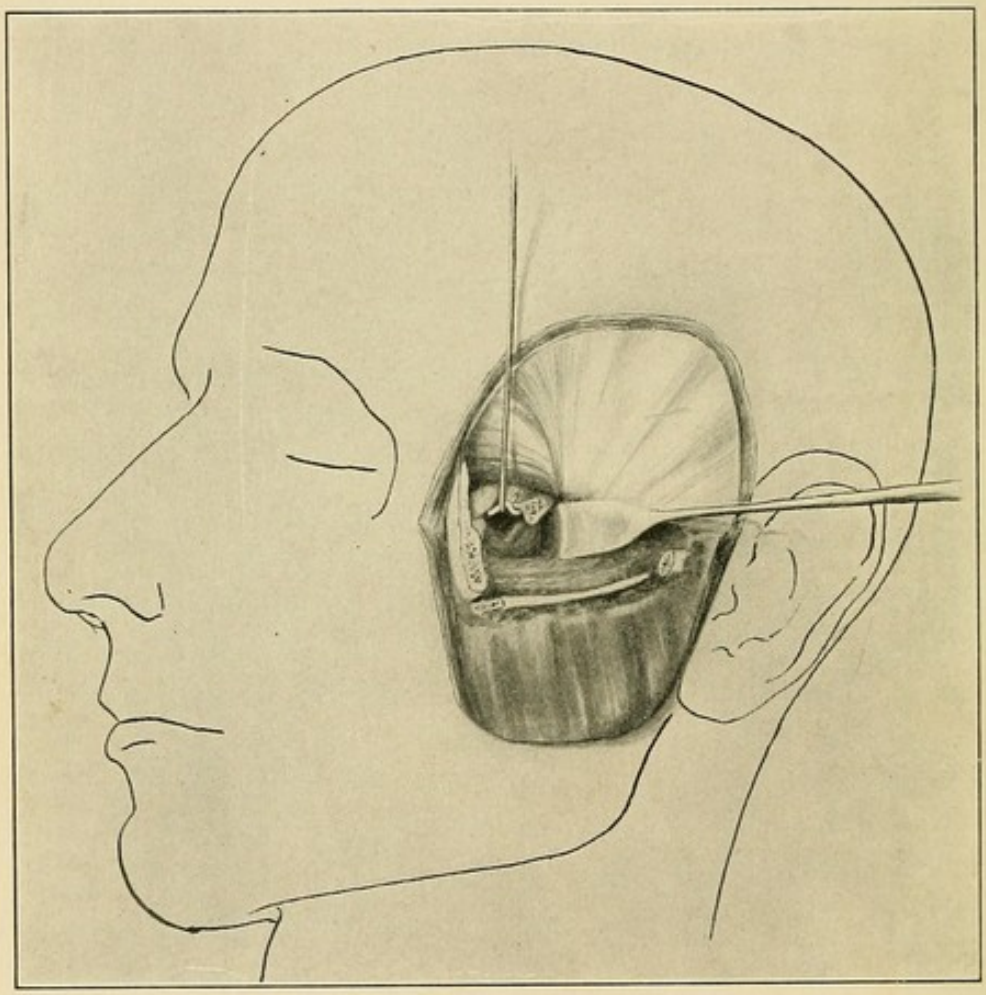


FIG. 60. — Operation on second division, fifth nerve, in sphenomaxillary fossa; temporal muscle drawn backward (Richardson).

the lower jaw by two branches. The inferior passes between the internal lateral ligament and the ramus, and enters the dental foramen along with the inferior dental artery. The nerves lie in a canal in the horizontal ramus and emerge at the mental foramen to supply the chin and lips.

This branch is quite frequently the seat of troublesome neuralgia. Operative steps are usually trephining the ascending ramus an inch and a half above the angle, and exposing the nerve high up. It may then be drawn out, and traction will usually remove the distal portion from the canal and the jaw. If the inferior dental artery be divided, pressure will usually stop the bleeding; if not, ligation will be needed. Other steps more complicated have been described for removing the nerve.

SUMMARY.

Neuralgia of the nerves of the face as a chronic condition affects the trifacial nerve. If such conditions do not respond to antiperiodics, general tonics, etc., operative measures may be required. Removal of the terminal filaments within the bony canal gives relief in most cases for a year or so. If the pain returns and is violent, removal of the Gasserian ganglion within the skull should be suggested. The operation has a high mortality, and is to be recommended only as a last resort.

CHAPTER XXVIII.

DISLOCATIONS, WITH SPECIAL REFERENCE TO THE INFERIOR MAXILLA.—ANKYLOSIS OF THE LOWER JAW.

DISLOCATIONS.

By the term **dislocation** or **luxation** is meant a slipping out of place of movable articulations.

We regard a *simple* dislocation one in which no notable complication is present.

A *compound* dislocation is an open one—one with a wound communicating externally.

In *complicated* dislocations, fracture, extensive laceration of soft parts, rupture of large blood-vessels, etc., may be part of the lesion.

Complete and *incomplete*, *recent* and *old*, are applied to dislocations, as the terms indicate. Some dislocations become old earlier than others: in the lower jaw the luxation is regarded as old after three or four weeks.

By *primitive* is meant that the bones remain where first displaced. A later accident or disease which produces gradual muscular contraction may alter the position and produce a *consecutive* dislocation.

Congenital, *recurrent*, *spontaneous*, *traumatic*, *bilateral*, *single*, and *double* explain themselves. In the naming of dislocations the distal bone entering into the joint is said to be the dislocated one.

The **causes** of dislocation are muscular contractions, occasionally alone, but usually in collusion with external mechanical violence. Muscular relaxation and previous displacement predispose to dislocation.

The **pathology** of a dislocation should be clearly under-

stood. Always in complete dislocation there is some rent of the ligaments.

When a capsule exists, it is torn through. Ligaments stretch only under often-repeated and long-continued tension. Nerves, blood-vessels, tendons, and muscles are torn and bruised and margins of the bony wall of the joint may be broken.

The **prognosis** after replacement of the dislocation is usually favorable, and perfect function is restored. However, particularly in the old, chronic rheumatic pains, atrophy, and paralysis are among occasional sequences. Even when the dislocation is not reduced, good functional results are often obtained.

The **symptoms** of dislocation are deformity, interference with motion, and loss of power and function. Besides these pain, swelling, and great distress present in a few hours.

The **treatment** consists in replacing the displaced bones as soon as the diagnosis is made. Usually an anesthetic is employed, and extension and counterextension with manipulation will effect restoration. When tendons or ligaments interfere to prevent reduction, incision and direct manipulation may be called for. In old dislocations the danger of too violent efforts at reduction must be kept in mind. Here arthrotomy and excision may be indicated. After reduction support with the bandage, usually for a few weeks, is all that is required. Compound dislocations after replacement require treatment on the plan indicated in compound fracture. Amputation is sometimes the best course.

Dislocations of the Lower Jaw.—The dislocation of special interest to the dentist is that of the lower jaw. This accident is, without very satisfactory explanation, much more common in women than in men; it is seen chiefly in young adults, and is one of the most frequent dislocations. It is not uncommon to find the incomplete form as a chronic relaxed condition of the ligaments, noticed under the heading of *subluxation*. The

complete form is both unilateral and bilateral, but when uncomplicated by fracture, is always forward, because of the contour of the skull.

In this joint there is an interarticular fibrocartilage, with a double synovial sac: one between the condyle and cartilage and one between the cartilage and bottom of the glenoid cavity. The capsular ligament partially surrounds the neck of the bone, and two lateral ligaments, internal and external, hold it up against the skull. The temporal and masseter muscles, practically

FIG. 61.—Bilateral dislocation of the jaw (Makins).

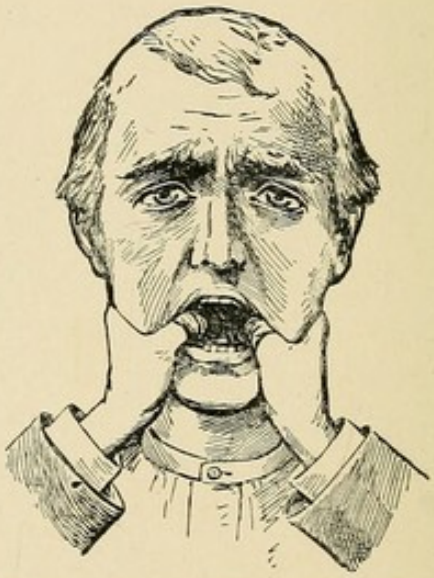


FIG. 62.—Mode of manual reduction (Makins).

opposing each other, serve to maintain the position of the condyle. The socket in which the condyle rests is quite a notch, and except for the great leverage allowed by the shape and function of the jaw, would be almost safe against displacement.

Causes.—These are nearly always muscular contractions acting often over some foreign body between the teeth. Attempts to bite large apples or oranges, yawning, or widely opening the mouth for any reason are the usual causes. Blows on the chin or side of the cheek from behind sometimes cause luxation. Attempts at

extraction of the teeth in rare instances dislocate, as they sometimes fracture, a jaw.

The **symptoms** of dislocation of the lower jaw are almost unmistakable. When the dislocation is bilateral the chin is thrust forward, the mouth is partly open and cannot be closed. When unilateral, the line of the teeth is interrupted, and the chin one-sided. Saliva dribbles from the mouth. The condyle can be felt and usually seen in the temple, while the depression left by the escaped condyle can be made out with the finger. The stretched tendon of the temporal muscle can be seen and felt above the cavity, carried forward by the coronoid process.

As most of these symptoms are always present, the diagnosis is very easy.

Prognosis.—Many recurrent dislocations of the lower jaw are encountered, and it is to be remembered that the lesion is prone to recur, even after perfect restoration. Replacement in the recent form is easy, but after three or four weeks adhesions take place about the head of the bone, and in many instances make it almost impossible to restore the bone without resort to arthrotomy.

Treatment.—The simplest and most common method consists in introducing the thumbs, previously wrapped with bandages for protection, well back on the molar teeth, and then pressing downward on the angle of the jaw with the thumbs, while the fingers lift up the chin, thus disengaging the condyle and permitting it to return to the glenoid cavity. This step is usually accomplished without anesthesia, but where it is not successful, it is better to relax the muscles with chloroform and repeat the manipulations. In the rare instances when this fails, wedges of cork may be put well back on the displaced side or sides and then used as levers, while pressure backward and downward is made on the coronoid process. In old dislocations not yielding readily arthrotomy is to be employed.

After reduction the joint should be held in place for a couple of weeks with a Barton bandage, and the patient fed on a liquid diet.

Subluxation of the jaw is seen in individuals of relaxed constitutional vigor, often young women. It is indicated by a clicking of the bone against the socket in eating and talking. Often this is very annoying. Considerable latitude of motion is sometimes permitted. The lesion is not one of great importance, and usually gets well under tonics and massage.

ANKYLOSIS OF THE LOWER JAW.

By ankylosis of the temporomaxillary joint is meant an interference, more or less complete, with the functions of the joint, limiting the ability to open the mouth from partial interruption to almost absolute fixation.

Ankylosis, besides being partial and complete, is *temporary* (or false) and *permanent*—usually bony or true ankylosis.

Temporary or **false ankylosis** is due to conditions outside the articulation. It is quite a common thing for the irritation caused by the eruption of a wisdom-tooth greatly to interfere with movement of the jaw, partly from pain and muscular spasm, and partly from swelling of the tissues. Severe tonsillitis often greatly limits movement.

The **symptoms** are usually clear, and in a short time, with such treatment as the tooth indicates, will pass away. When, however, from persistent irritation, or from tubercular disease of the glands about this region, or from abscess seated in the cellular tissue or even the masseter muscle itself, or from disease involving the periosteum and bone, there is established a chronic inflammatory infection of the fascia and structures generally in this region, a more serious and persisting obstruction to function is encountered.

The symptoms of such infection are the swelling and

pain on movement, with the ordinary indications of suppuration if pus exists. Sometimes the mouth can be only half opened, or even less. In long-persisting inflammations adhesions of a very troublesome nature may form.

Syphilitic and tubercular lesions, as well as traumatism, may leave, after apparent recovery, bands and cicatricial contractions, both within the mouth and in

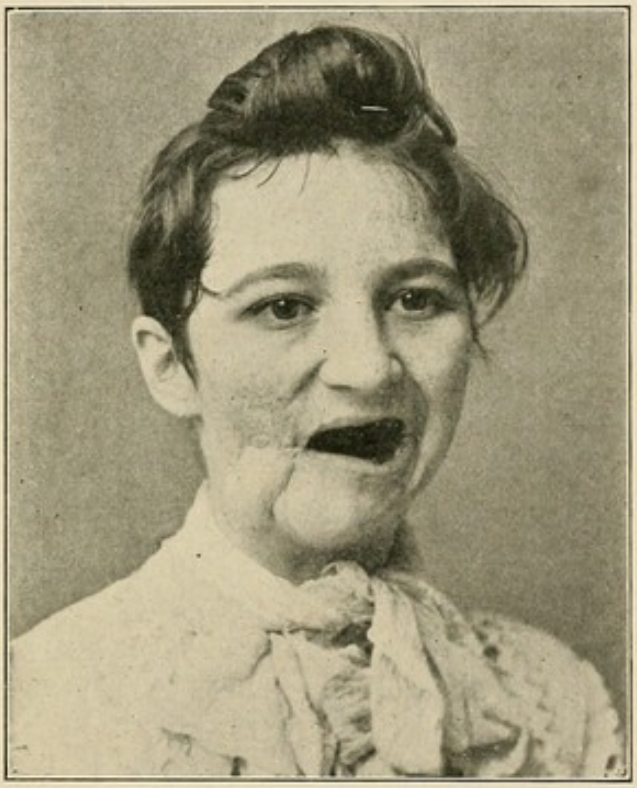


FIG. 63.—Operation in front of cicatrix, opening but one-half of the mouth and leaving cicatrix (Mears).

interstitial deposits, which occasion long-persisting and even permanent obstruction.

Treatment.—When the false ankylosis is due to tooth eruption, either removal of the tooth or such scarification of the covering mucous membrane as will free it, are the indications. When chronic inflammations of specific character are present, warmth, protection, and appropriate local and constitutional treatment should be employed. When local bone disease is present, the indications for treatment given under a previous head-

ing should be followed—that is, curetment or excision, etc. Forcible stretching of cicatricial tissues or the division of bands gives no permanent results, as the irritation is increased by the stretching, and the divided bands reunite. The formation of a false joint in front of the cicatricial tissue by an osteotomy is sometimes attempted, but all these measures are disappointing, although improvement sometimes is secured.

The treatment is tedious and painful, and usually

FIG. 64.—Closure of twenty-seven years' duration, due to osseous ankylosis of temporomaxillary articulation, showing non-development of lower jaw (Mears).

discouraging to the patient. Mild and expectant methods should be thoroughly exhausted before severer steps are undertaken.

True Ankylosis.—This condition means either fibrous or bony adhesions within the temporomaxillary articulation. The causes are tubercular or rheumatic lesions of the joint proper, rarely traumatic or infective. Ankylosis of this character is said occasionally to follow middle-ear disease, scarlet fever, and diphtheria.

Symptoms.—The fixation of the joint is complete. After the acute stage there is no pain except on forcible movement. Fulness of the joint can often be felt externally. The history will complete the diagnosis.

The **treatment** of fibrous ankylosis when there is still some motion under forcible manipulation consists in breaking up the adhesions under an anesthetic. If this can be safely done, a wedge of cork should keep the mouth open for three days. After this, passive motion should be carefully kept up to maintain the movement secured. Unless the greatest patience is practised disappointment will follow from recontraction.

When the ankylosis is due to bony formations resort must be had to osteotomy. Various methods are suggested. The author has had best results from the removal of the condyle (Humphrey's operation); thus by a resection removing the restriction to motion. The only risk in such an operation is hemorrhage from the internal maxillary artery, which passes up between the internal lateral ligament and the condyle. The artery is avoided by attacking the condyle from the outer surface, and enucleating the opened joint with the finger and periosteal elevator. The head of the bone when exposed should be removed with wire or chain saw, and the wound closed with small drain. Passive motion should be begun after a week. The result is usually good.

SUMMARY.

Dislocations are separations of articulating surfaces due to violence and muscular contraction, with rupture of the ligaments and other soft parts, sometimes communicating with the air. When complete and recent, diagnosis is easily made by the appearance and the loss of motion and power. Reduction should be made at once, usually under anesthesia, as muscular opposition may be difficult to overcome. All dislocations left unreduced for a few weeks present great difficulties. Extension and manipulation are the usual steps. When reduction is not possible, it is best to perform an arthrotomy.

The lower jaw is very frequently displaced on one or

both sides. The dislocation is usually produced by overextension. The diagnosis is simple on inspection. Reduction is easily accomplished, usually even without anesthesia. Pressure with the thumbs on the molar teeth will throw the condyle into place. After reduction a bandage should be worn a few weeks to prevent recurrence. Subluxation is due to muscular relaxation and requires constitutional treatment.

Ankylosis of the lower jaw may be due to a painful wisdom-tooth or to inflammation of the soft parts in the mouth; or in the true form to deposits about the bony articulation. When due to muscular spasm or pain the treatment is expectant, with the removal of accessible causes. When bands have formed about the soft parts, stretching or cutting promises very little. In true ankylosis involving the articulation, if the adhesions cannot be broken up under chloroform, it is better to excise the affected condyle.

CHAPTER XXIX.

FRACTURES, WITH SPECIAL DESCRIPTIONS OF THE BONES OF THE FACE.

By the term *fracture* in surgery is meant the breaking of a bone into two or more pieces as the result of a violence, either mechanical or muscular.

Varieties.—If this breaking be a full separation, it is termed a *complete* fracture. If the bone be bent and splintered, but not fully separated, it is termed an *incomplete* or *green-stick* fracture.

All complete fractures may be looked on as of two classes or varieties—*simple*, or closed, fractures, *compound*, or open, fractures.

Although this is the ordinary division of fractures, it is perhaps easiest to describe all variations from the *simple* or *closed* fractures as complications. Thus simple fracture is a break of the bone at one point, hidden by the skin and overlying tissues.

When the bone is broken in more than one place, or when several bones are broken, it is a *multiple* fracture. When the bone is shattered, it is a *comminuted* fracture. When similar fractures occur in corresponding bones, it is called a *double* fracture.

When any one of these injuries communicates with the external surface, it is a *compound* or *open* fracture. When at the time of accident one end of the fractured bone is forced into the other it is an *impacted* fracture.

When dislocations are present, or when arteries are torn or the soft parts are extensively lacerated, the fracture is so *complicated*. These various complications are merely degrees of severity, and offer additional difficulty in proportion to their extent. The management of them

is rational and in no way exceptional, save in the open or compound fracture, which is subject to special management, to be considered presently.

Forms of fracture are chiefly *transverse* and *oblique*, which define themselves. When the bone is split up the shaft, it is termed *longitudinal.* When radiating, as in the bone of the skull, the fracture is termed *stellate.* Other fractures have special names, as T-*shaped* and V-*shaped* fractures.

In complete fractures the displacement is *lateral* when the ends slip past each other; *angular* when the direction of the bone is so altered as to make a distinct angle; *rotary* when the axis is twisted upon itself.

The **causes** of fracture are both *predisposing* and *exciting.* Predisposing causes are *age*, *occupation*, and the condition of general health. Certain diseases, as syphilis and rickets, as well as the constitutional condition termed *fragilitas osseum*, and which is not well understood, lead to many fractures from very moderate violence. Exciting causes are *violence* from a fall or from a heavy colliding body, or a fracture may result from *vigorous muscular contraction.* Mechanical violence may act directly on the bone at the point of break, or indirectly through other bones. Thus in a fall the person may strike a resistance with the leg below the knee and suffer a fracture of the tibia (direct violence); or alighting on the feet, may break the hip-joint; or on the buttocks, may fracture the base of the skull (indirect violence).

Symptoms of fracture are classically three: *preternatural mobility*, or a false joint; *crepitation;* and *actual loss of power.* These three symptoms do not actually exist together in any other form of injury. Pain, swelling, deformity, and shock are in no way pathognomonic, but succeed dislocations and sprains as well.

By *preternatural mobility* is meant increased freedom and latitude of motion, most marked under an anesthetic,

with the production often of a varying deformity. It of itself usually clearly indicates fracture.

Crepitation is the sense of roughness produced by rubbing the fractured ends together. Often a sound can be heard, but chiefly crepitus is determined by the touch. It discloses the presence of a fracture.

Loss of power is indicated by inability to lift the injured leg or hand. Often this is partly due to the pain caused by exertion, but care will show there is actual loss of power and function.

Diagnosis.—The above characteristic symptoms determine the nature of the injury. An opinion in doubtful cases should never be given until after examination under the anesthetic.

Deformity in dislocation persists only until reduced, and then does not recur ; in fracture it is easily made to disappear, but immediately recurs if the manipulation is discontinued. In sprains the deformity is due to swelling, and it cannot be made to disappear. The comparison with the corresponding limb as to measurements and contour is of great value. A shortening almost invariably attends fractures of the long bones. Green-stick fractures are indicated by the irreducible deformity in the shaft of the bone. Such form is usually seen in children only. In elderly people, after sixty years of age, very slight violence is often sufficient to cause fracture of the neck of the thigh-bone. Separation at the epiphyseal junction is seen in very young children, with sometimes great deformity and displacement.

Pain and extravasation of blood, with sometimes superficial blisters at the point of fracture, are valuable indicators.

Process of Repair in Fractures.—The steps in the repair of fractures, like those in the repair of soft parts, consist in effusion of inflammatory products. These products, called lymph in the soft parts, are termed *callus* in the bone. This callus is a firm, cartilaginous material surrounding the separated ends, ensheathing them and

fixing them in position. Gradually this material becomes organized if the fragments are not too widely separated, and bony union takes place. The excess of the callus is absorbed, and although the shaft of the bone never returns exactly to its normal appearance, and usually is found to contain a good deal of redundant callus, still in time it assumes very nearly the original size.

Treatment of Fractures.—The description of the complications of fractures, as well as their treatment, is perhaps best described by naming them individually. The general treatment of fractures consists first in transporting the patient to some place of safety, and then *setting* the fractured bone, and holding it in place by means of splints and bandages.

In the ordinary simple fracture, even when not complicated with the form of double or multiple fracture, usually the administration of an anesthetic is required for its suitable diagnosis and fixation. After the anesthetic is administered the fractured ends are placed as nearly as possible in their normal relations, and steadied in this position by means of splints. These latter may be improvised from thin boards or may be made of material already prepared from tin or felt. For some forms of fractures fixed dressings of plaster-of-Paris are employed. Splints are held in place by bandages, but they should always be well padded, and the limb underneath the splints should be protected from pressure by cotton batting. It is not advisable to apply plaster-of-Paris dressings to any fracture before the fifth or sixth day, as the swelling that comes on directly after the injury will make the bandage too tight; or if the bandage is put on after the swelling has occurred, when it subsides the dressing will have become too loose.

In the treatment of comminuted fractures it may be necessary to cut down upon the shattered bone and remove the fragments if accurate apposition of them cannot be obtained. It is to be remembered, however,

that excellent results are often obtained where considerable comminution can be felt; and, besides, the conversion of a simple fracture into a compound one should never be lightly undertaken. Of course, it is understood that all antiseptic and aseptic precautions are to be taken before entering upon such operative steps.

The treatment of *compound* fractures is a much more comprehensive and difficult step than that given above. In the first place, a compound fracture is always infected before the surgeon sees it. If it involve a joint or is in the thigh, the immediate danger from shock is often great. The prognosis in compound fractures involving very large bones or communicating with joints is essentially grave, and the immediate treatment required may be amputation. In the less severe form of compound fracture the first step after the patient is in suitable surroundings, preferably in an infirmary, is thorough cleansing of the wounded surfaces; control of all hemorrhage; if necessary, enlarging the wound; then thoroughly scrubbing all the wound surfaces, both within and without, with a strong solution of bichlorid of mercury, and providing carefully for thorough drainage. In a few instances it may be permissible to close up a compound fracture with sutures and dressings without drainage and treat it as a simple fracture. The ordinary dressings placed upon a fracture should be removed two or three times within the first ten days to permit inspection, and, if necessary, reposition of the fragments. After this time, as we have already seen, repair has progressed so far as to fix the fragments, and thus prevent displacement. Usually the fractured bone has united sufficiently to permit of the use of the part in from twenty to sixty days. Fractures repair more readily in the young and vigorous than in the old and infirm; also smaller bones unite more promptly than the larger ones.

In some few instances, where the fracture has been improperly fixed, imperfect union results. The bony structures are replaced by fibrous material, and a false

joint is formed. In some cases this is due to the impaired nutrition of the patient, but most commonly to improper fixation.

FRACTURES OF THE LOWER JAW.

Fracture of the lower jaw is one of the most common in the whole body. It is usually due to direct violence, as a fall or blow, and sometimes is the result of crushing force. The bone may be broken in either of the rami, or it may be a double fracture, simple, comminuted, or compound. Sometimes only the alveolar border is broken off; at others, the coronoid or the condyloid process. In fractures of the alveolar process the portion of the bone may be still adherent in its normal position, held there by the soft parts; or it may be completely separated. Fractures of the coronoid process occasionally occur from the violent contraction of the temporal muscle. Most commonly fractures are seen in the horizontal body of the bone. Oftentimes the displacement in this form of fracture is slight. The line of the teeth seems to be a little irregular—the displacement is usually upward or downward, although it may be inward or outward. The majority of fractures of the body of the bone are compound, as the structures covering the bone are thin and the violence usually ruptures them. In multiple and double fractures, especially compound, the displacement is greater, and often great difficulty is experienced in holding the separated fragments.

Symptoms.—The symptoms of fracture of the inferior maxillary bone are usually well marked. The line of the teeth is irregular, the displacement can be seen as well as felt, and in the majority of cases there is some bloody expectoration, even if the fracture is not actually compound. Pain and swelling are usually present; crepitation can be made out on manipulation.

The **prognosis** is usually favorable, even where the fracture is compound. In neglected cases, however, or

where extensive injuries are present, considerable trouble is experienced.

Treatment.—The treatment of unilateral simple fractures of the inferior maxillary bone consists first in the replacement of the fragments, and then in their support and fixation by suitable splints. The mouth should first be washed out with listerin and water, and all bleeding controlled. The most suitable simple splint is the metal splint shown in figure 65. In its absence a substitute can be made of sole leather, felt, or heavy paste-board. The splint should be lined with a layer of

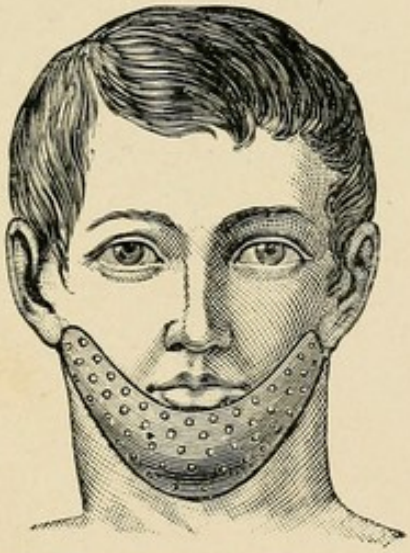


FIG. 65.—Levis' metallic splint for fracture of the lower jaw.

gauze, and held in place preferably by the Barton bandage. The apparatus devised by Hamilton, or the ordinary four-tailed bandage, answers very well. In double or multiple fractures, however, other measures are usually required. Fixation may often be accomplished by fastening together the teeth on each side of the break by a silver wire or silk ligature wrapped around them; or, if there are not teeth adjacent to the fracture, a band may be fastened around a remote tooth to which a short arm is attached. Around these arms the wire may be wrapped and the teeth thus steadied. An arm may be placed upon both the inner or outer side of the tooth,

and thus a double wire may be applied. In compound fractures where there is much displacement the wire may

FIG. 66.—"Four-tailed bandage" for fracture of the jaw.

be passed through the body of the bone by first drilling a hole which may involve a part or the entire thickness

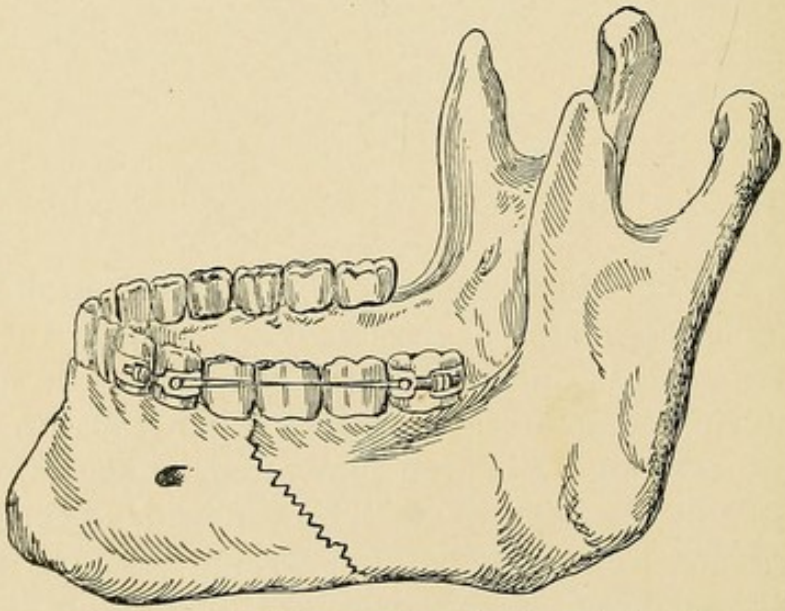


FIG. 67.—Angle's apparatus, showing adjustment.

of the bone; through this opening silver wires may be passed and fastened. As a rule, extensive injuries to the maxillary bone are compound, at least upon the mucous

surface, but where these operations are necessary it is advisable to make an incision through the skin as well, if access cannot be secured without it.

What is known as the *interdental* splint is perfected by taking an impression, and then upon this impression constructing a vulcanized splint to which arms are attached. Then the teeth in the broken portions will fit into the indentations made in the splint, and the arms may be used in giving support.

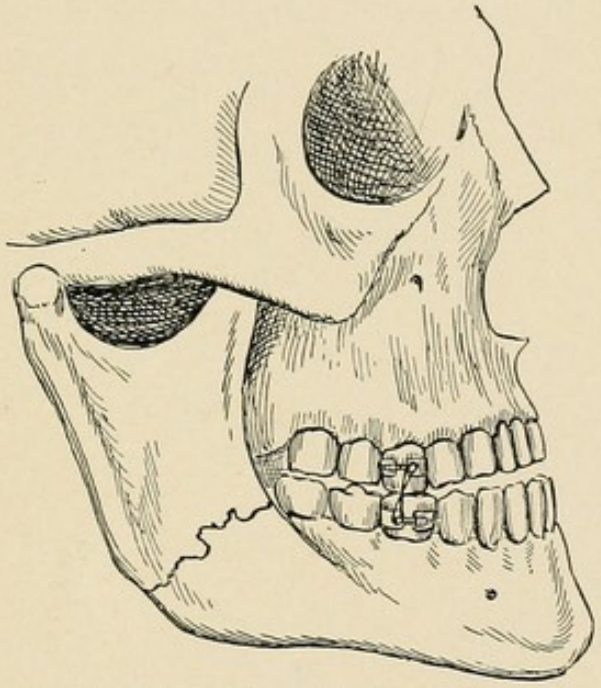


FIG. 68.—Angle's appliance for fracture through angle.

Angle's method for the fixation of the lower broken jaw to the intact upper one is effected by placing bands upon the teeth of the upper and lower jaw, and around the short arms fixed upon these bands wrapping a wire which holds them together, thus using the upper jaw as a splint. These bands may be used upon both sides of the jaw if the fracture is complicated. It is well to remember of compound fractures of the lower jaw that they respond more readily to treatment than open fractures elsewhere. As a rule, it is not possible to do any closing up of fractures involving the mucous membrane, especially on the inner side. Compound frac-

tures in which the bones are wired together should also be left open. Where fixation is effected without involving the mucous membrane the external wound should be closed up by suture. If in either simple or compound fractures suppuration takes place, the wound should be carefully watched, as sometimes the pus burrows down beneath the jaw and points either in the neck or in the pharynx. Free incision and drainage should be promptly made if such condition arise, and if the bone be found diseased, proper steps should be taken for its cure.

Failure of union resulting in ununited fracture is not uncommon in the inferior maxilla. The cause is doubtless imperfect fixation, although constitutional causes often are combined. The treatment consists in freshening the ends of the bone, either with a drill or saw, and wiring them together. If such wounds, or similar operative wounds for the primary fracture, can be closed up, the wire may be left indefinitely, but when kept open, the wire should be removed in two or three weeks, as soon as its usefulness is past.

Fracture of the superior maxillary bone is a condition of great severity, due usually to a crushing force, and except in rare instances the shock and injury to the soft parts are of more importance than the fracture. Only in fracture of the alveolar border will the dentist see such cases in the acute stage. Fracture of the alveolar border is easily diagnosticated on examination : crepitus and movement are felt. It may sometimes be necessary to wire the fragments, or to use an interdental splint, but usually simple replacement will be all that is required.

When fracture of the bones of the face has occurred from crushing force the shock, hemorrhage, and cerebral complications make the condition one for the general surgeon ; the prognosis is grave. After a few days, if the patient rallies and improves, special apparatus and wiring of fragments may be employed as indicated.

Diet after the less severe fractures of these bones is chiefly liquid, perhaps administered through a tube introduced through a space left by an extracted tooth. In severe injuries rectal feeding may be required for a short time.

FRACTURE OF THE NASAL BONES.

The nasal bones are quite liable to fracture, with considerable displacement, and a disfiguring deformity results unless proper treatment is instituted.

The **symptoms** are the deformity, and usually crepitus; hemorrhage from the nose and occlusion of the nostrils also attend.

The **treatment** consists, after stopping the hemorrhage and cleansing the nasal tract with an antiseptic irrigant, in restoring the normal contour of the nose by pressure and manipulation. Usually this can be easily done, although occasionally both reduction and maintenance are troublesome. When the bridge is sunken, a piece of rubber tubing carried well up each nostril will hold the replaced fragments, at the same time permitting the air to pass through. The tube can be removed on the fourth day. Where this plan is not efficient or is not tolerable to the patient, the sides of the nose may be transfixed with a slender needle or pin and thus held together, the pin being removed after three or four days. A band of rubber may be passed in a figure-of-eight about the points of the pin, to regulate the direction of the pressure.

When the bones deviate to either side, the septum may be transfixed so as to correct the deformity. If the pin cannot be made to hold the bones in the desired position, rubber bands attached to the end of the pin and secured to a piece of adhesive plaster stuck to the cheek may be employed to draw the bones into desired position.

The complete correction of the deformity should be secured before concluding the first dressings, as failure

to secure normal reposition will leave a reproachful monument to poor skill.

SUMMARY.

Fractures of bone are complete and incomplete (*i. e.*, bent and splintered). They are open and closed, with a variety of complications. They are caused by violence and muscular action, disease and age predisposing. Fractures are due to indirect violence when the bone breaks remote from the injured point. False joint, crepitation, and loss of power are characteristic.

Union takes place first by callus, which afterward becomes partly organized and partly absorbed.

Treatment is by fixation with splints. Compound or open fractures require antiseptic cleansing and special care. Non-union is sometimes the result of imperfect fixation.

Fracture of the lower jaw, *single* or *double*, is usually compound. Simple splint is often all that is required, but in double fractures wiring may be needed. There are various methods of wiring, as the condition suggests.

Fracture of the superior maxilla is due to very severe violence; usually the general condition is grave.

Fracture of the nasal bones requires care in adjustment of the fragments to avoid mortifying deformity.

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